



## **ITC Four Country Smoking and Vaping Survey, Wave 1 (4CV1) Technical Report**

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# 1. Summary and overview of the project

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## 1.1 Introduction

The International Tobacco Control Policy Evaluation Project (ITC Project) was established in 2002 to monitor and evaluate key health policies implemented in countries that are signatories to the Framework Convention on Tobacco Control (FCTC)—the first-ever international public health treaty—that was adopted in May 2003 by all 192 member states of the World Health Organization. Over the past two decades, the ITC Project has provided invaluable data to inform governments and other stakeholders on whether public health policies designed to reduce the health, economic, and societal costs of tobacco use throughout the world, are effective. The ITC Project conducts longitudinal surveys in representative cohorts in over 28 countries.

Since 2002, the ITC Four Country (4C) Survey has conducted longitudinal surveys of a nationally representative cohort of approximately 1,500 to 2,000 adult smokers (aged 18 years or older) in each of Australia (AU), Canada (CA), the United Kingdom (UK), and the United States (US). Nine full waves (i.e., involving all four countries) of the 4C Survey plus two interim waves (involving one country each) were conducted between 2002 and 2015, and the final wave, Wave 10, was conducted in AU and the UK only. The new and expanded **Four Country Smoking and Vaping (4CV) Survey** was initiated after the conclusion of the 4C Survey. **The 4CV Survey was designed to investigate the relationship between the use of vaping devices (such as e-cigarettes) and tobacco use, and to inform emerging policies on nicotine vaping products (NVPs) in the four countries.** The ITC 4CV Project expanded upon the existing ITC 4C Survey infrastructure, conceptual model, and methodologies to examine the use and evolution of the NVP market and policy environments by surveying adult smokers, recent ex-smokers, and vaping device users (i.e., vapers) in AU, CA, England (EN, not the entire UK), and the US -- four countries with similar cigarette-smoking rates, but divergent policies related to NVPs.

Over the past few years, demand for NVPs has grown rapidly, and data are required to inform public health policies. While NVPs seem much less harmful compared to combustible tobacco products (the known leading preventable cause of premature death in high-income countries), the effect of NVP use on tobacco cessation, uptake, and/or sustained use is currently not well understood. Tobacco control experts are divided on whether policies should support, restrict, or ban NVP use. The specific objectives of the ITC 4CV Project are to:

- 1) describe how NVP and cigarette use differ among smokers and former smokers both over time and between important subgroups (e.g., age, gender, income, those planning to quit cigarettes, nicotine dependence level), in particular whether the interactions between NVP and cigarette use vary across countries;
- 2) examine how differences in tobacco control and NVP policies between countries are related to different patterns of NVP and cigarette use; and
- 3) contribute to the methods for monitoring health behaviours (e.g., NVP use) by comparing characteristics of the online samples recruited in this study with samples collected by conventional methods, and to explore the extent to which behaviours of the self-identified early adopters of NVPs provide useful indications of the behaviour of the broader adult smoker population.

This report provides the methodological background and key statistical indicators for the 4CV Wave 1 Survey (4CV1) and provides information on the sampling methods, procedures, and survey administration. This report also provides survey outcome rates, measures of representativeness, and guidelines for data analysis for 4CV1 data. Refer to the ITC Project website ([www.itcproject.org](http://www.itcproject.org)) for

country-specific timelines of smoking and vaping/NVP policies in each of Australia, Canada, England/UK, and the US.

## 1.2 Summary description of the 4CV1 sample

### Methods statement for a study using only 4CV1 data

Methodological details for each country are available via the ITC website (<http://www.itcproject.org/methods>). In brief, the ITC Four Country Smoking and Vaping Wave 1 Survey (4CV1) sample comprised the following cohorts: (1) re-contact smokers and former smokers who participated in the previous wave of the ITC 4C Project, regardless of vaping status, (2) newly recruited current smokers and former smokers (quit in the past 24 months) from country-specific panels, regardless of vaping status, and (3) newly recruited current vapers (use a vaping device at least weekly) from country-specific panels. The smoker sample in each country was designed to be representative of smokers, and used either probability-based sampling frames or non-probability opt-in sampling frames, or a combination of these. Respondents for the ITC 4CV1 Survey were recruited via random-digit-dialing (RDD) sampling frames, or web-based or address-based panels, or a combination of these frames, as an expansion to the previous ITC 4C Project.

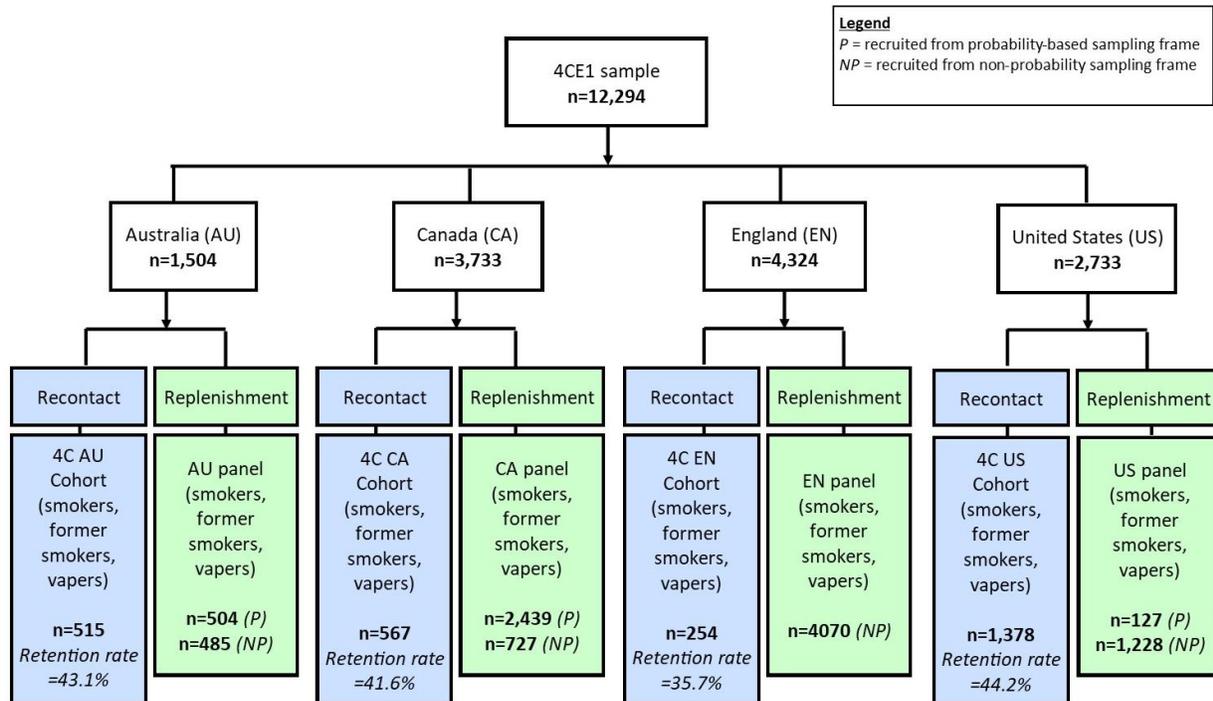
### Methods statement for a study using 4C data (last wave or multiple waves) and 4CV1 data

Methodological details for each country are available via the ITC website (<http://www.itcproject.org/methods>). In brief, for the ITC Four Country (ITC 4C) Project, the sample in each country was designed to be representative of smokers, and used either probability-based sampling frames or non-probability opt-in sampling frames, or a combination of these, for initial recruitment. Respondents for the ITC surveys were smokers\* recruited via random-digit-dialing (RDD) sampling frames, or web-based or address-based panels, or a combination of these frames. Respondents at each survey wave analyzed in this study were either re-contact/cohort respondents (recruited in previous waves) or replenishment respondents (new respondents in the last completed follow-up survey wave to replace the respondents from previous wave who could not be re-contacted). The newly recruited replenishment participants were selected using the same sampling design as in the initial survey wave, with the exception that in the last completed ITC Four Country (ITC 4C) survey waves in Canada (Wave 9), the US (Wave 9), Australia (Waves 9 and 10) and the UK (Waves 9 and 10), the replenishment respondents were sampled from both the original sampling frame as well as a new panel frame (a change necessitated by the increasing challenges in the representativeness and practicalities of conducting RDD recruitment and telephone surveying).

In Australia, Canada, the United Kingdom, and the United States, the most recent wave of data came from the ITC Four Country Smoking and Vaping (4CV) Project, which was a new study including the previous ITC Four Country (ITC 4C) Project participants among its respondents. The ITC 4CV Wave 1 sample comprised the following cohorts: (1) re-contact smokers and former smokers who participated in the previous wave of the ITC 4C Project, regardless of vaping status, (2) newly recruited current smokers and former smokers (quit smoking in the past 24 months) from country-specific panels, regardless of vaping status, and (3) newly recruited current vapers (use a vaping device at least weekly) from country-specific panels.

\*The 4C Wave 9 US Survey also recruited adult former smokers (quit in the past 12 months), non-cigarette tobacco/nicotine users, non-smokers; as well as a youth sample.

Figure 1.1. ITC 4CV1 Main\* Sample by country, recontact vs. replenishment status, and probability-based (P) vs. non-probability (NP) sampling frame



Note: Refer to Table 1.1 for details on sampling frame and user status.

\*Main sample = Final realized 4CV1 sample with speeders/satisficers removed, long-term former smokers (>5y) removed, and the AU CCV sample removed (See Section 6). *Note on former smoker subsamples in the main sample: In each of CA, EN, and US, cohort respondents who had quit >2y ago were interviewed, while in AU, only respondents who had quit <2y ago were interviewed. Thus, the main sample AU former smokers (quit <2y ago) are defined differently than the main sample CA, EN, US former smokers (quit between 2-5y ago).*

**Table 1.1.** Sources and sample sizes for 4CV respondents.

Country, subsample	Sources	Main* Sample size	Core* sample size
AU, smokers/former smokers 18+	ITC 4C cohort (retention rate 43.1%)	515	515
	Roy Morgan Single Source (probability-based)	504	504
	Survey Sampling International	485	485
CA, smokers/former smokers 18+	ITC 4C cohort (retention rate 41.6%)	567	515
	Léger Marketing, where possible from their probability-based panel	2439	2439
CA, additional vapers 18+	Léger Marketing	727	727
EN, smokers/former smokers 18+	ITC 4C cohort (retention rate 35.7%)	254	232
	Ipsos	3519	3519
EN, additional vapers 18+	Ipsos	551	551
US, smokers/former smokers aged 25+	ITC 4C cohort	1372	1296
	GfK Knowledge Panel (probability based)	127	127
	Ipsos	212	212
US, smokers/formers smokers aged 18-24	ITC 4C cohort (retention rate 44.2%)	6	6
	Lucid (GfK partner panel, opt-in)	496	496
	Ipsos	26	26
US, additional vapers 18+	Ipsos	494	494
Total		12294	12144

\*Main sample (see Section 6) = Final realized 4CV1 sample with speeders/satisficers removed, long-term former smokers (quit >5y ago) removed, and the AU additional vapers sample removed. *Note on former smoker subsamples in the main sample: In each of CA, EN, and US, cohort respondents who had quit >2y ago were interviewed, while in AU, only respondents who had quit <2y ago were interviewed. Thus, the main sample AU former smokers (quit <2y ago) are defined differently than the main sample CA, EN, US former smokers (quit between 2-5y ago).*

\*\* Core sample (a subsample of the main sample) (see Section 6) = Records for respondents from CA, EN, and US who quit >2y ago have been removed from the main sample so that the former smoker samples in each country meet the same definition. *The core sample should be used for analyzing former smoker samples across AU and other countries.*

Table 1.2: Original target sample sizes (realized sample sizes in the main sample) for CA, EN and US

Subsample	CA	EN	US	AU
Smokers/former smokers aged 25+	2350 (2271)	2960 (2886)	1590 (1,711)	1500 (1504)
Smokers/former smokers aged 18-24	750 (735)	1100 (887)	500 (528)	
Additional at-least-weekly vapers	715 (727)	500 (551)	500 (494)	600 (0)*

\*Refer to Section 6 for description of the AU additional vapers sample.

### 1.3 Overview of the project

#### Note on terminology:

*In this report, the term “ITC-owned cohort/respondents” refers to those respondents who were originally recruited from an RDD sampling frame purchased by ITC. The “ITC-owned respondents” have subsequently provided ITC with their contact information for the purpose of re-contacting them at each wave.*

*The term “panelist” or “panel-owned cohort/respondents” refers to respondents recruited for the ITC Survey via a country-specific panel firm. ITC does not have the right to contact the panelists directly, and thus, the panel firm handles all communications with the panelists.*

- The 4CV1 Survey was launched on July 11, 2016, and was completed on November 29, 2016.
- The 4CV1 Survey sample was expanded to include cigarette smokers, former smokers (who had quit smoking within the past 24 months) and vapers.
- Respondents from the original ITC 4C Survey (i.e., those who had completed the survey in the last wave in each country) were asked to continue participating in an expanded 4CV1 Survey. Inclusion criteria varied slightly between AU vs. the other three countries (see Section 3.3).
- Survey respondents were recruited from two or more sources in each country: 1) the ‘ITC-owned’ cohort (i.e., those originally recruited via a RDD sampling frame and whose contact information was maintained over time in an ITC database), 2) from country-specific panel firms, or 3) from partner panel firms affiliated with the main firm.
- In AU, CA, and EN, the survey was offered by web only. However, in the US, a small proportion of respondents (n=46) completed a telephone interview.
- At each wave of this multi-country survey, at least two or more survey firms worked together in a coordinated effort to complete fieldwork at each wave (see Section 5.1 for a summary of the firms and their roles at each wave).

- Most aspects of the study protocol and survey measures were standardized across the four countries, but there are some differences, particularly between AU vs. the other three countries.
- Table 1.1 (above) provides a summary of the countries surveyed at 4CV1, survey fieldwork period by country/wave, survey samples in each country/wave, and retention rates at 4CV1 (i.e., percent retained from Wave 9 CA/US or Wave 10 AU/EN of the ITC Four Country Project).
- Figure 1.1 (above) provides a summary of the sample for all four countries, including the counts, source, and if the sampling frame was probability vs. non-probability.
- Table 1.2 (above) provides the original target sample sizes (realized samples sizes in the main sample) for CA, EN, and US.
- See Section 6 for quality control and uniformity procedures applied the sample.
- See Section 7 for survey outcome rates.

## 2. Survey Measures

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### 2.1 Survey Development

#### 2.1.1 The ITC Survey Development Process

The survey development process comprises two main phases. They are:

Phase 1: teleconferences, and

Phase 2: operationalization.

Phase 1 begins with a series of teleconferences with the research investigators, the project management team, and the survey management team. During the teleconferences, the team systematically reviews the questionnaire from the previous wave, examines dropped questions from earlier waves, and considers suggestions for new lines of questioning. After the teleconference period is over, the draft survey is then sent to the ITC Survey Management Group (SMG) for operationalization of the survey (Phase 2). Phase 1 usually takes about 12 weeks, depending on the extent of the survey content changes.

Phase 2, the operationalization of survey development, involves comprehensively and iteratively reviewing and revising the survey to ensure that routing, question wording, response options, and all other survey elements are refined and cross-referenced for consistency, clarity, and accuracy. At the conclusion of Phase 2, the final draft of the survey is generated by SMG and sent to the firm(s) for programming and testing. Phase 2 usually takes about 12 weeks, depending on the extent of the survey content changes.

During the period when the survey firm is programming and testing the survey, additional revisions are made in consultation between the programming firm and SMG, until a fieldwork version of the survey is achieved. The fieldwork version of the survey is sent to SMG by the programming firm and is retained in the SMG database. The updated last version of the survey in the database will later be used to cross reference with the data set.

#### 2.1.2 4CV1 Survey Development Process and Timeline

For the 4CV1 Survey, Phase 1 lasted from September 23, 2015 until February 1, 2016. During the first month of survey development, the investigator team divided into eight working groups. Each group reviewed and made recommendations for major changes in one of eight survey sections. The working groups connected by both email and teleconference to make their initial recommendations for their respective sections. After the first month, the sections were consolidated into the first draft of the overall survey, and then full-team teleconferences ensued to review and refine the content over two full rounds. After Phase 1, a further revision was necessary to ensure comparability with the ITC 6 Europe Survey. Phase 2 of 4CV1 survey development lasted from February 1 to April 29, 2016 (the date on which the survey was sent for programming).

Table 2.1: Summary of the 4CV1 survey development timeline.

Wave	Teleconferences	Survey operationalization
4CV1	September 23, 2015- Feb 1, 2016	Feb 1, 2016 – Apr 29, 2016

## 2.2 Survey Content

### 2.2.1 Summary of the 4CV1 survey content

- The 4CV1 Survey content is summarized in Table 2.2.

**Table 2.2 Measures in the 4CV1 Survey questionnaire**

<b>Demographic Variables:</b> Gender, age, ethnicity, education, income, state of health
<b>Other personal moderators:</b> Quitting history, nicotine dependence, levels of stress including financial stress and depressed mood, use of intoxicants ( <i>e.g.</i> , alcohol, cannabis), and experiences of use
<b>Environmental moderators:</b> Number of smokers/vapers in the household, and in social network
<p><b>Policy-specific (proximal) variables</b> (same measures for cigarettes/smoking and vaping devices/vaping unless indicated):</p> <ol style="list-style-type: none"> <li>1) Price paid per unit of product, total weekly cost, product type/variant, purchasing unit, price perceptions</li> <li>2) Use of cessation services, recall of advice, vaping device and/or other medicines use in conjunction with professional assistance, advice on appropriateness of vaping device use</li> <li>3) Advertising/ marketing: noticing advertising and frequency in key channels (TV, print, internet), susceptibility to advertising, reports about whether vaping product advertising makes them think about cigarettes</li> <li>4) Health warnings and packaging: salience and noticing of health warnings (if any), brand usage, perceived risks, perceived impact on product use; forgoing cigarettes/vaping because of the warnings</li> <li>5) Vapor-free laws: exposure to vaping across a range of settings, perceived impact on product use, reports on restrictions</li> <li>6) Restrictions on access: perceived availability</li> <li>7) Nicotine content, flavor and other product characteristics: nicotine content and flavors of vaping product brands used, perceived addictiveness of vaping products and cigarettes, and vaping product appeal</li> <li>8) Media campaigns: awareness and recall of media campaigns on vaping</li> </ol>
<b>Psychosocial mediator (distal) variables:</b> Social norms for both vaping products and cigarettes, outcome expectancies, intentions for vaping, reasons for vaping, self-efficacy and intentions to quit smoking; relative harmfulness, health concerns, functions of smoking, substitutability of functions to vaping products.
<b>NVP and tobacco use behaviors:</b> Key outcomes along with some of the distal variables for intermediary analyses. Use of vaping devices and other tobacco products: frequency of use, duration, and intensity of use ( <i>e.g.</i> , cigarettes per day); usual brand/type of product; quit attempts (smoking), duration of abstinence (smoking), product switching.

### 2.2.2 Comparison of 4CV1 Survey content to previous 4C Survey content

- 4CV survey content was developed by reviewing the ITC 4C Wave 10 Survey (4C10), and revising content to delete variables that were no longer of interest or useful in analyses, and to add content to measure vaping frequency/product use and transitions between smoking and vaping. Additional content to measure important tobacco or vaping policies in one or more of the four countries was also added.
- Of the survey content in 4CV1, 28% was also in the ITC 4C10 Survey.
- Of the survey content in 4CV1, 25% was also in the ITC Four Country Wave 9 Canada and US Survey (4C9 CA/US).
- Five entirely new sections were added to the 4CV1 Survey: 1) Vaping screening , 2) Vaping device warning labels, 3) Cigarette advertising and promotion, 4) Vaping product advertising and promotion, and 5) Delayed discounting task.
- The Anti-Smoking Campaigns and Light Mild Sections from the ITC 4C Wave 10 Survey were omitted from 4CV1.
- The order of sections in 4CV1 was generally similar to that of 4C10, with some exceptions: In 4CV1, the Vaping Screening and Consumption Sections were added at the beginning of the survey, whereas the ITC 4C Wave 10 Replenishment Web (4C10-Pw) Survey included an early section on Stop-Smoking Medications or Vaping Devices on the Last Quit Attempt. Perceived Harm and Addiction questions were asked around the middle of the survey for 4CV1 compared to near the end for 4C10-Pw; and in 4CV1 Warning Labels questions were asked near the middle of the survey, compared to being asked around the first third of the survey in 4C10-Pw.

## 3. Study sample

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### 3.1 Overview of 4CV1 sample and quotas

- In order to achieve an adequate sample to study the natural trajectory of vaping, the impact of vaping on tobacco use, and the impact of both tobacco and NVP policies on nicotine product use, the sample consisted of:
  - a cohort in each country designed to be representative of smokers and former smokers (quit smoking in the past 24 months) in that country (but using stratified sampling within the age ranges of 18-24 years old (y), and 25y+ in each of CA, EN, and US), and
  - a supplementary sample of current at-least-weekly vapers aged 18y+.
- Sample was recruited from two or more sources in each country:
  - 1) the 'ITC-owned' cohort (i.e., those originally recruited via an RDD sampling frame and whose contact information was maintained over time in an ITC database),
  - 2) country-specific panel firms (including both Replenishment sample and, in some cases, a Recontact sample from the previous 4C wave), or
  - 3) partner panel firms affiliated with the main firm.
  - Firms varied in their quality of sample; some firms had high-quality probability-based samples, and others had opt-in samples, or a combination of these. For this reason, quotas based on one or more of region, sex, and age, using national benchmarks were used to further ensure that appropriate distributions were realized in the final study sample. In CA and EN, 'concurrent users' who met criteria for both the smoker quota and the vaper quota were allocated to the vaper quota first, and then once the vaper quota was filled, such concurrent users were allocated to the appropriate smoker quota (based on age range). This issue only occurred in CA and EN because in these countries the entire Replenishment sample (comprising three sample subgroups) came from one firm only.
- Inclusion/exclusion criteria differed between:
  - the Recontact vs. Replenishment samples, and
  - the AU sample compared to the other three countries' samples (CA, EN, US).

### 3.2 Inclusion criteria in Canada, England, and United States (Recontact and Replenishment) samples vs. Australia sample (Recontact and Replenishment)

#### 3.2.1 4CV1 sample inclusion/exclusion criteria for 4CV1 CA, EN, US Recontact and Replenishment

##### Recontact Sample of 4C10/9 CA, EN, US respondents (including both ITC-owned and panel-owned):

- All past 4C respondents from CA, EN, and the US\* were eligible to complete 4C1, regardless of current status (*see note on the 4C US sample below*).

Thus, the past 4C9/10 CA, EN, US user types in 4CV1 CA, EN, US\* included:

- Current smokers (smoke at least monthly, smoked at least 100 cigs in life), regardless of vaping status
- Former smokers (smoked at least monthly in past, smoked at least 100 cigs in life), regardless of vaping status

*\*Note on the 4C US past respondents:*

*The 4C US sample had been expanded at Wave 9 to include recruited current smokers, recruited non-cigarette tobacco users, recruited vapers, recruited former smokers (quit in the past 12 months), recruited non-users, and recruited youth (regardless of tobacco use status). To be eligible for the current 4CV1 Study, the 4C Wave 9 US respondents had to have been recruited as adult smokers or vapers (thus, the non-users and youth were not eligible for the 4CV1 Survey).*

*During fieldwork 16 respondents from the US 4C9 Survey who were tobacco /vaping device-naïve were invited to the 4CV1 Survey in error. These cases were removed from the data set, but can be obtained from the ITC Data Management Core upon request.*

CA, EN, US Replenishment Sample (panel-owned only):

- Former smokers (quit in the past 24 months, smoked at least 100 cigs in life), regardless of vaping status
- Current smokers (smoke at least monthly, smoked at least 100 cigs in life), regardless of vaping status
- Current vapers (vape at least weekly), including former smokers quit >24 months ago

Thus, panelists who met the following criteria were *excluded* from the 4CV1 CA, EN, and US samples:

- Respondents who **had not smoked cigarettes in past 24 months** and who **did not currently** vape at least weekly.

### 3.2.2 4CV1 sample inclusion/exclusion criteria for 4CV1 AU Recontact and Replenishment

*Note: Differences between the CA, EN, US criteria vs. AU are indicated in **bold**.*

Recontact Sample of 4C10 AU respondents (including both ITC-owned and panel-owned):

- Past 4C respondents who were current smokers **or who had quit in the past 24 months** were eligible to complete the survey (**note: those who had quit longer than 24 months ago were not surveyed for 4CV1 AU**).

Thus, the past 4C10 AU user types in 4CV1 AU included:

- Current smokers (smoke at least monthly, smoked at least 100 cigs in life), regardless of vaping status
- Former smokers (quit in the past 24 months, smoked at least monthly in past, smoked at least 100 cigs in life), regardless of vaping status

AU Replenishment Sample:

From a probability-based sampling frame (Roy Morgan Research Single Source Panel)

- Former smokers (quit in the past 24 months, smoked at least 100 cigs in life), regardless of vaping status
- Current smokers (smoke at least monthly, smoked at least 100 cigs in life), regardless of vaping status

From an opt in sampling frame (i.e., University of Queensland/Cancer Council Victoria-recruited 'AU additional vapers' sample)

- Current vapers (vape at least weekly), regardless of smoking status

Table 3.1. Definition of user types.

Type of respondent recruited to 4CV1	Definition and inclusion/exclusion criteria	
	Australia	Canada, England, US
<b>1) ITC-owned participants from 4C9/10</b>	<p>Past ITC-owned 4C10 AU participants who were:</p> <ul style="list-style-type: none"> <li>• Current smokers (smoke at least occasionally, smoked at least 100 cigs in life), regardless of vaping status</li> <li>• Former smokers (quit in the past 24 months, smoked at least 100 cigs in life), regardless of vaping status</li> <li>• At-least-weekly vapers who had quit smoking for longer than 24 months</li> </ul>	<ul style="list-style-type: none"> <li>• All past ITC-owned 4C respondents were eligible, regardless of current status.</li> </ul> <p>Thus, the 4CV1 user types included:</p> <ul style="list-style-type: none"> <li>• Current smokers (smoke at least occasionally, smoked at least 100 cigs in life), regardless of vaping status</li> <li>• Former smokers (quit &lt;24 months ago, or &gt;24 months ago; smoked at least monthly in past; smoked at least 100 cigs in life), regardless of vaping status</li> </ul>
<b>2a,b) Panel-owned current smokers/former smokers, aged 25y+</b>	<p>Adults aged 25y+ who were:</p> <ul style="list-style-type: none"> <li>• Current smokers (smoke at least occasionally, smoked at least 100 cigs in life), regardless of vaping status</li> <li>• Former smokers (quit in the past 24 months, smoked at least 100 cigs in life), regardless of vaping status</li> </ul>	<p>Adults aged 25y+ who were:</p> <ul style="list-style-type: none"> <li>• Current smokers (smoke at least occasionally, smoked at least 100 cigs in life), regardless of vaping status</li> <li>• Former smokers (quit in the past 24 months, smoked at least 100 cigs in life), regardless of vaping status</li> <li>• Cohort panelists surveyed at 4C9 (CA/US). All were eligible, regardless of current smoking/vaping status. (Note: Non-users recruited at 4C9 US were not invited).</li> </ul>
<b>2c) Panel-owned current smokers, aged 18-24y</b>	<ul style="list-style-type: none"> <li>• Same as above, but aged 18-24y.</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above, but aged 18-24y.</li> </ul>
<b>3) Panel-owned vapers (new recruits)</b>	<ul style="list-style-type: none"> <li>• Current vapers (vape at least weekly), regardless of smoking status</li> <li>• This group was not targeted for recruitment in AU, but would be surveyed if identified when screening for smoker/ former smokers</li> </ul>	<ul style="list-style-type: none"> <li>• Current vapers (vape at least weekly), regardless of smoking status</li> </ul>
<b>4) New recruit vapers (opt in sample recruited by Cancer Council Victoria)</b>	<ul style="list-style-type: none"> <li>• Current vapers (vape at least weekly), regardless of smoking status</li> <li>• Recruited via vaper registry, and online and print advertisements</li> </ul>	N/A

### 3.3 Description of country panel firms' recruitment procedures

#### **GfK Knowledge panel Authorized Language for Client Communications Involving Descriptions of KnowledgePanel® Methodology**

##### **Sample: United States smokers and former smokers**

The survey was conducted using the web-enabled KnowledgePanel®, a probability-based panel designed to be representative of the U.S. population. GfK provided the following description for their panel at the time of the 4CV1 Survey: Initially, participants are chosen scientifically by a random selection of telephone numbers and residential addresses. Persons in selected households are then invited by telephone or by mail to participate in the web-enabled KnowledgePanel®. For those who agree to participate, but do not already have internet access, GfK provides at no cost a laptop and ISP connection. People who already have computers and Internet service are permitted to participate using their own equipment. Panelists then receive unique log-in information for accessing surveys online, and then are sent emails throughout each month inviting them to participate in research.

Details available at: <http://www.gfk.com/products-a-z/us/knowledgepanel-united-states/>

#### **Lucid**

##### **Sample: United States smokers and former smokers, aged 18-24y**

GfK provided the following description for their opt-in panel partner, Lucid, at the time of the 4CV1 Survey: Lucid sources recruit traffic through partners that own ad space on websites and have access to respondents that are looking to join Double Opt In panels.

#### **Ipsos MORI**

##### **Sample: England smokers, former smokers, and vapers; United States smokers and vapers**

Ipsos MORI provided the following description for their relevant panels at the time of the 4CV1 Survey: Ipsos MORI's online panels are subject to a rigorous recruitment procedures aimed at ensuring accuracy, consistency and non-duplication. To join, panel applicants are validated by a means of sophisticated vetting procedures, using a variety of opt-in recruitment channels. Shortly after joining, panel members' survey-taking behaviour is tested, with those most likely to make intentional or unintentional errors on future surveys deactivated. Subsequently, panelists' behaviour is monitored and tracked across all surveys. Ipsos employs purging procedures based on these data to remove suspects from eligible sampling pools. In view of the scope and scale of the 4CV research, approved panel partners, that met Ipsos quality control procedures, were also used in EN (but not in the US) to support with the project. Fieldwork was conducted between July 7, 2016 and Nov 22, 2016.

#### **Leger**

##### **Sample: Canadian smokers, former smokers, and vapers**

Respondents were selected at random from the Leger web panel to participate in the study. Leger provided the following description for their panel at the time of the 4CV1 Survey: Leger's online panel has approximately 475,000 members nationally – with between 10,000 and 20,000 new members added each month, and has a retention rate of 90%. The Leger panel is high-quality because most panel members are recruited among a pool of respondents participating in random-digit-dialing surveys, which have a wide reach employing probability sampling. In other words, the "population" of the Leger panel was from samples that can be considered nationally representative of Canada. Additionally, all respondents who completed the previous wave of the study were recruited and qualified.

## **Roy Morgan Research (RMR)**

### **Sample: Australian smokers, former smokers, and vapers.**

RMR's tasks in this project were carried out in compliance with ISO 20252 Market, Opinion & Social Research. RMR's face-to-face proprietary survey Single Source is representative of the Australian population aged 14y+ in terms of gender, age and geographical location. Sample selection was conducted for Single Source via face-to-face, door-to-door interviewing using a randomized cluster sampling approach for household selection and a rule of priority approach for respondent selection within the household. Rigorous sampling procedures were applied each month to ensure that respondents reflect the key demographic characteristics of the Australian population. Interviewing for Single Source is conducted weekly, so our sample was replenished continuously.

This survey method also serves as a form of validation for the respondent – we know that someone who claims to be “male, aged 29 years, living in Tamworth, NSW” is indeed that, because we have met with him and interviewed him in his own home. For 4CV1, RMR drew Single Source respondents who were over 18y, interviewed after October 2014 (when fieldwork was conducted for ITC 4C10), had provided a telephone number for re-contact and indicated during their Single Source interview that they smoked factory-made cigarettes (FMC) or used a vaping device at that time. Those who recently quit smoking would be identified during the computer-assisted telephone interview (CATI) screening survey. By re-contacting Single Source respondents who broadly qualified for 4CV, we were able to ensure that the sample would be representative of the Australian smoking population. The sample was then screened via CATI to ensure it met the University of Waterloo's specifications and were automatically sent an email invitation from the telephone interviewing system, once they qualified for the research and had provided an email address.

Survey Sampling International (SSI) was RMR's partner to obtain the 4CV1 sample in AU. SSI panelists were recruited via partnerships with other corporations or invited by banners, invitations and messages. To minimise the impact of different partnerships on survey results, SSI uses a combination of personality and psychographic characteristics to understand and identify the underlying traits which make a difference in the way people answer survey questions. By asking participants a short set of key questions, SSI can control the characteristics of people within the sample and allows SSI to provide an exceptionally consistent sample blend. SSI uses also uses digital fingerprinting, to ensure that the same person does not take a survey more than once from the same device.

The CATI recruitment survey for Single Source sample was converted to an online format for SSI panelists and collected additional personal information (email address, physical address, and best contact number). The questions were phrased in exactly the same manner, although the response options were slightly modified to better suit an online environment.

When an SSI panelist completed the online recruitment survey, their details were transferred into the Roy Morgan re-direct survey. Once an hour the re-direct survey automatically sent out an invitation to the 4CV1 survey using the email format provided by the Cancer Council Victoria (CCV).

## 4 Description of 4CV1 CA, EN, US, and AU Replenishment sample regional quotas

### 4.1 Overview of types of quotas applied to the sample

- The types of quotas used in the 4CV1 sample are summarized in Table 4.1.

Table 4.1 Types of quotas applied to sample composition

Sample component	Quota cells
AU smokers/former smokers age 18+	Geographic regions crossed with sex (realized approximately)
CA, US smokers/former smokers age 18-24	Geographic regions; language in Canada
CA smokers/former smokers age 25+	Geographic regions; language
US smokers/former smokers age 25+	None; most of the sample was from the 4C cohort, expanded in 4C Wave 9
CA, US, EN additional vapers age 18+	Geographic regions
EN smokers/former smokers age 18-24	Geographic regions crossed with sex
EN smokers/former smokers age 25+	Geographic regions crossed with sex and age group

### 4.2 4CV1 Australia Replenishment sample quotas

- The research team assigned quotas to one of the AU subsamples to ensure appropriate sex, age, and regional distributions were realized in the final study sample.
- A summary of the AU Replenishment sample subgroups and whether quotas were used or not is provided below (Table 4.2).

Table 4.2. Summary of 4CV1 AU Replenishment sample subgroups and whether quotas were used or not. *Note: Row number (i.e., 2a,b) corresponds to Row Number in "Type of Respondent" Column in Table 4b.*

4CV1 Australia replenishment sample subgroups	Quotas used (Yes or No)
2a,b) Smokers/former smokers (quit in past 24 months) aged 18y and older recruited from a probability-based panel	Yes
4) Vapers (at-least-weekly) recruited from an opt-in sampling frame	No

- The AU Replenishment smoker/former smoker sample aged 18 years and older, recruited from a probability-based panel (RMR), was allocated proportionally to stratum size based on AU census data.

- The DMC established targets for female and male cigarette smokers/former smokers aged 18y+ in each of the following regions (refer to Appendix 2.1: Allocation (per stratum) of 4CV1 Australian panel sample):
  - 1) New South Wales and Australian Capital Territory,
  - 2) Victoria,
  - 3) Queensland,
  - 4) South Australia,
  - 5) Western Australia,
  - 6) Tasmania,
  - 7) Northern Territory.
- No quotas were established for the ‘AU additional vapers’ sample from UQ/CCV, which was recruited from a non-probability sampling frame.

### 4.3 4CV1 Canada Replenishment sample quotas

- The research team assigned quotas for the CA subsamples to ensure appropriate sex, age, and regional distributions were realized in the final study sample.
- A summary of the CA Replenishment sample subgroups and whether quotas were used or not is provided below (Table 4.3).

Table 4.3. Summary of 4CV1 CA replenishment sample subgroups and whether quotas were used or not. *Note: Row number (i.e., 2a, 2b, etc.) corresponds to Row Number in “Type of Respondent” Column in Table 4b.*

4CV1 Canada Replenishment sample subgroups	Quotas used (Yes or No)
2a) Smokers/former smokers (quit in past 24 months) aged 25y+ and older recruited from a probability-based panel	Yes
2b) Smokers/former smokers (quit in past 24 months) aged 18-24y recruited from a probability-based panel	Yes
3) Vapers (at-least-weekly) aged 18y+ recruited from a probability-based panel	Yes

- The CA replenishment sample recruited from a probability-based panel (via Leger) was allocated proportionally to stratum sizes based on CA census data.
- The DMC established targets for English-speaking and French-speaking respondents for the three sample subgroups of vapers aged 18y+, cigarette smokers/former smokers aged 18-24y, and cigarette smokers/former smokers aged 25y+, in each of the following regions (refer to Appendix 2.2: Allocation (per stratum) of 4CV1 Canadian web panel sample):
  - 1) British Columbia – Vancouver,
  - 2) British Columbia – all areas other than Vancouver,
  - 3) Alberta,
  - 4) Saskatchewan,
  - 5) Manitoba,
  - 6) Ontario – Toronto,
  - 7) Ontario - Greater Toronto Area (GTA), excluding metropolitan Toronto,
  - 8) Ontario – all areas other than Toronto and the GTA,
  - 9) Quebec – Montreal, 10) Quebec – all areas other than Montreal,
  - 11) New Brunswick,
  - 12) Nova Scotia,

- 13) Prince Edward Island,
- 14) Newfoundland and Labrador
- *Important: Because all Replenishment sample subgroups, i.e., 1) vapers aged 18y+, 2) smokers/former smokers aged 18-24y, and 3) smokers/former smokers aged 25y+, were recruited from the same source (Leger’s web panel), concurrent users (i.e., who smoke and vape) were first counted to the appropriate vaper quota, and once the vaper quota was filled, then concurrent users were counted towards the appropriate smoker/former smoker quota.*
- If the quota value was very small (i.e., for vapers in Eastern Canadian provinces, they were presented as one value for the aggregated regions).
- The panel firm and UW monitored survey response in the cohort sample and adjusted the replenishment sample quotas during fieldwork to achieve the final representative sample.

#### 4.4 4CV1 England Replenishment sample quotas

- The research team assigned quotas for the EN subsamples to ensure appropriate sex, age, and regional distributions were realized in the final study sample.
- A summary of the EN Replenishment sample subgroups and whether quotas were used or not is provided below (Table 4.4).

Table 4.4. Summary of 4CV1 EN replenishment sample subgroups and whether quotas were used or not. *Note: Row number (i.e., 2a, 2b, etc.) corresponds to Row Number in “Type of Respondent” Column in Table 4b.*

4CV1 England Replenishment sample subgroups	Quotas used (Yes or No)
2a) Smokers/former smokers (quit in past 24 months) aged 25y+ recruited from an opt-in panel	Yes
2b) Smokers/former smokers (quit in past 24 months) aged 18-24y recruited from an opt-in panel	Yes
3) Vapers (at-least-weekly) aged 18y+ recruited from an opt-in panel	Yes

- The EN Replenishment sample recruited from a non-probability based panel (Ipsos) was allocated proportionally to stratum sizes based on EN census data.
- The DMC established targets for female and male respondents for the three sample subgroups of vapers aged 18y+, smokers/former smokers aged 18-24y, and smokers/former smokers aged 25y+, in each of the following regions (Refer to Appendix 2.3: Allocation (per stratum) of 4CV1 England web panel sample):
  - 1) North East,
  - 2) Yorkshire and Humber,
  - 3) East Midlands,
  - 4) East of England,
  - 5) London,
  - 6) South East
  - 7) South West
  - 8) West Midlands,
  - 9) North West.
- *Important: Because all Replenishment sample subgroups, i.e., 1) vapers aged 18y+, 2) smokers/former smokers aged 18-24y, and 3) smokers/former smokers aged 25y+, were recruited from the same source (Ipsos’s web panel), concurrent users (i.e. who smoke and vape) were first*

counted to the appropriate vaper quota, and once the vaper quota was filled, then concurrent users were counted towards the appropriate smoker/former smoker quota.

- The panel firm and UW monitored survey response in the cohort sample and adjusted the Replenishment sample quotas during fieldwork to achieve the final representative sample.

#### 4.5 4CV1 United States Replenishment sample quotas

- The research team assigned quotas for some of the US subsamples to ensure appropriate sex, age, and regional distributions were realized in the final study sample.
- A summary of the US Replenishment sample subgroups and whether quotas were used or not is provided below (Table 4.5).

Table. 4.5. Summary of 4CV1 US Replenishment sample subgroups and whether quotas were used or not. *Note: Row number (i.e., 2a, 2b, etc.) corresponds to Row Number in “Type of Respondent” Column in Table 4b.*

4CV1 US Replenishment sample subgroups	Quotas used (Yes or No)
2a,b) Smokers/former smokers (quit in past 24 months) aged 18y+ recruited from a probability-based panel	No
2a,b) Smokers/former smokers (quit in past 24 months) aged 18y+ recruited from an opt-in panel	No (this subsample of n=238 was surveyed in error, but retained)
2b) Smokers/former smokers (quit in past 24 months) aged 18-24y recruited from an opt-in panel	Yes
3) Vapers (at-least-weekly) aged 18y+ recruited from an opt-in panel	Yes

- The US vaper Replenishment sample recruited from a non-probability panel (Ipsos) was allocated proportionally to stratum sizes based on US census data.
- The DMC established targets for vapers aged 18y+ old in each of the following regions (Refer to Appendix 2.4 Allocation (per stratum) of 4CV1 US web panel sample):
  - 1) Northeast,
  - 2) Midwest,
  - 3) South, and
  - 4) West.
- The US young adult (aged 18-24y) smoker/former smoker Replenishment sample recruited from a non-probability panel (Lucid via GfK) was allocated proportionally to stratum sizes based on US census data.
- The DMC established targets for smokers/former smokers aged 18-24y old in each of the following regions (Refer to Appendix 2.5 Allocation (per stratum) of 4CV1 US web panel sample):
  - 1) Northeast,
  - 2) Midwest,
  - 3) South, and
  - 4) West.
- No quotas were established for the US smoker/former smoker replenishment sample aged 25y+, given that these respondents were recruited from a high-quality probability based sample.

## 4.6 Fieldwork issues related to quotas

At 4CV1 there were over 130 lines of complicated quotas with specific conditions. Three issues from 4CV1 fieldwork and their resolutions are described below.

- 1) The overlap between the sample subgroups (i.e., concurrent users were supposed to be counted towards the vaper quota first, and then start filling the respective smoker quota) was not readily accommodated by the survey software (Acuity4). An issue in which the quotas were briefly not functioning as intended was uncovered and resolved right away. As a result, some respondents were accepted into the survey instead of being terminated on the basis of full regional quotas. Ultimately, these respondents were used in the sample (i.e., n=238 US smokers were added to the sample) and helped offset the lower response in the US ITC-owned cohort sample.
- 2) Initially, the team did not include specific quotas for French-speaking respondents in CA. Due to the delay between launching the English and French surveys, French quotas were subsequently added because the open quotas were rapidly filling with English-speaking participants. This resulted in 15% French-speaking representation, where, ideally it would have been about 21%.
- 3) Because the Wave 1 panel target samples were so large (see Tables 4, 2a-c), the England panel firm ultimately needed to draw upon its partner panel firms to recruit new panelists for the harder-to-reach young adults (aged 18-24y) in this study, and also offered a higher incentive for this group. The Canadian panel firm used the same strategy of increasing the incentive for the young adult group, and also used a labor intensive customized recruitment process to achieve the targets for this sub-sample.

## 5. Study procedures and survey firms

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- All study procedures for all samples were cleared by a research ethics research committee at the University of Waterloo (Ontario, Canada) as well as a committee at the country-specific institution, if applicable.
  - The Medical University of South Carolina (South Carolina, United States) waived ethics review for this study deemed minimal risk;
  - a research ethics committee at King’s College London (London, England) provided ethics clearance for the England sample; and
  - a research ethics committee at the Cancer Centre Victoria (Melbourne, Australia) provided ethics clearance for the Australian sample.
- Study procedures were conducted in a coordinated effort by four country-specific survey firms, plus the host survey firm (the Survey Research Centre, SRC, at the University of Waterloo in Ontario, Canada), and other institutions/firms that provided logistical and/or administrative support (i.e., Logistic Solutions in England, and the University of Waterloo Administrative Team in Canada).
- Study procedures differed between the:
  - 1) AU sample compared to the other three countries’ samples (CA, EN, US),
  - 2) ITC-owned vs. panel-owned samples, and
  - 3) Recontact vs. Replenishment samples.
- Note on the relationship between the ITC-owned vs. panel-owned and Recontact vs. Replenishment samples:
  - All ITC-owned respondents were Recontact sample,
  - Panel-owned respondents were either Recontact sample, or newly-recruited Replenishment sample, and
  - All Replenishment sample at 4CV1 were panel-owned respondents.

### 5.1 Overview of survey firms and responsibilities

- Six survey firms and the University of Waterloo Administrative Team were involved in 4CV1 Fieldwork. The firms/team and their main responsibilities were:
  1. The SRC at the University of Waterloo:
    - a) programmed and hosted the web survey,
    - b) provided all other relevant firms with PINs and URL templates to link web panelists to their survey records,
    - c) securely transferred data files to other firms as necessary (for mailing incentives, etc),
    - d) managed email and telephone communications with the “ITC-owned” past 4C respondents for CA, EN, and the US.
  2. Leger Marketing Solutions (Canada):
    - a) recruited Leger Canadian smoker/former smoker/vaper web panelists (English-speaking and French speaking) to complete the survey, including all past 4C9 Canadian respondents as well as ‘fresh’ Replenishment sample,

- b) monitored activity and sent email reminders to any Leger panelists who had been invited but had not yet submitted a completed survey per the usual schedule determine by Leger,
  - c) provided incentives to Leger panelists who submitted a completed survey,
  - d) provided to ITC disposition outcomes for all Leger panelists who were invited to participate,
  - e) provided to ITC demographic information (plus whether each respondent participated in 4C9) about all invited Leger panelists, and
  - f) maintained data files that link each panelist to his/her unique survey PIN and also that will allow ITC to re-survey the Wave 1 survey completers at Waves 2 and 3.
3. GfK (formerly Knowledge Networks, United States):
- a) recruited GfK Knowledge Panel (KP) and opt-in panelist (Lucid) American smoker/former smoker/vaper web panelists (English-speaking) to complete the survey, including identified past target 4C9 US respondents as well as 'fresh' replenishment sample,
  - b) monitored activity and sent email reminders to any GfK/opt-in panelists who had been invited but had not yet submitted a completed survey per the usual schedule determine by GfK,
  - c) provided incentives to GfK/opt-in panelists who submitted a completed survey, and
  - d) provided to ITC disposition outcomes for all GfK/opt-in panelists who were invited to participate, and
  - e) provided to ITC demographic information (plus whether each respondent participated in 4C9) about all invited GfK/opt-in panelists, and
  - f) maintained data files that link each GfK KP panelist to his/her unique survey PIN and also that will allow ITC to re-survey the Wave 1 survey completers at Waves 2 and 3.
4. Ipsos Mori (England):
- a) recruited Ipsos British smoker/former smoker web panelists (English-speaking) to complete the survey,
  - b) recruited Ipsos British vaper web panelists (English-speaking) to complete the survey,
  - c) recruited Ipsos American vaper web panelists (English-speaking) to complete the survey,
  - d) monitored activity and sent email reminders to any Ipsos panelists who had been asked to complete the survey but who had not yet submitted a completed survey per the usual schedule determine by Ipsos,
  - e) provided incentives to Ipsos panelists who submitted a completed survey, and
  - f) provided to ITC disposition outcomes for all Ipsos panelists who were invited to participate, and
  - g) provided to ITC demographic information about all invited Ipsos panelists, and
  - h) maintained data files that link each panelist to his/her unique survey PIN and also that will allow ITC to re-survey the Wave 1 survey completers at Waves 2 and 3.
5. Logistic Solutions (England):
- a) Mailed invitation letters to the British ITC-owned past 4C10 respondents who did not provide an email address to ITC (n=395),

- b) emailed incentives (£16 Amazon e-gift card) to 'ITC-owned' 4CV1 participants who completed the web survey (using data files transferred by SRC).
- 6. The UW Administrative Team:
  - a. Coordinated and mailed invitation letters to the CA (n=473) and US (n=538) ITC-owned past 4C respondents who had not previously provided an email address to ITC, and
  - b. coordinated and emailed/mailed the Canada (\$25 cheque or \$25 Amazon e-gift card) and US survey incentives (\$25 cheques) to 'ITC-owned' 4CV1 respondents.
- Note: The Canadian Survey was also conducted in French. All procedures for the French Canadian sample were the same as those for the English Canadian sample, but the French Survey launched 2 months after the English survey.

## 5.2 ITC-owned Cohort re-contact procedures – Canada, England, US

- ITC-owned respondents from CA, EN, and the US who were invited to the 4CV1 Survey were managed by the UW SRC; these respondents met the following definition:
  - They were part of the 4CV1 Recontact sample (i.e., respondents who had participated in the last wave of the ITC 4C Survey, and were presently being invited to participate in 4CV1).
  - They had originally been recruited from an RDD sampling frame, and had provided their contact information and agreed to receive requests for participation in future surveys from ITC.

### 5.2.1 Invitations and reminders for CA, EN, US ITC-owned cohort members (email vs. letter)

- ITC-owned cohort members were recruited differently depending on if they had previously provided ITC with their email address (vs. all past correspondence having been done by phone and postal address):
  - ITC-owned CA, EN, US cohort members who had provided an email address: were invited to participate in the 4CV1 Survey by email invitation, plus a series of email reminders (see Section 5.2.1.1) until submitting a completed survey.
  - ITC-owned CA, EN, US cohort members who had NOT provided an email address to ITC: were mailed an invitation letter, and were prioritized to receive a telephone reminder call, in order to maximize the uptake of the web survey by past phone respondents (see Section 5.2.3 for details of telephone reminder calls).

#### 5.2.1.1 *Email invitations for ITC-owned CA, EN, US cohort members who had previously provided their email address to ITC*

- On Day 1 of fieldwork all ITC-owned cohort members (i.e., who completed the previous 4C wave) who had previously provided an email address to ITC were emailed an invitation to participate in the survey.
  - The email invitation described the study and invited the person to participate by clicking on the direct link to the survey.
  - The survey firm contact phone number and email address were provided in the survey and in the emails/invitation letter. Respondents could phone/send a message to opt out. They could also call/email the institutional ethics contact to opt out.

- If the email invitation ‘bounced back’, then the respondent’s record was updated so that he/she would: 1) receive a telephone reminder call for ‘bounced email addresses’, and 2) be required to provide his/her updated email address in order to be eligible for the 4CV1 Survey.
- All ITC-owned CA, EN, US cohort members who had not completed the survey after receiving the initial email invitation were sent reminder emails on Days 3, 8, 10, and 15. Note: Day 1 is the day the initial email invitation is sent).
- A final set of reminder emails was sent at 6 weeks, 3 weeks, and 4 days before the survey was closed, to all outstanding invitees who had not submitted a completed survey AND not responded stating that they did not wish to participate.
- At appropriate time points during fieldwork, the survey firm(s) identified the number of partially completed surveys, and sent email reminders to partial respondents.
- ITC-owned CA, EN, US cohort respondents who were emailed the study invitation were prioritized to receive Telephone Reminder Calls, depending on their mode of participation at the previous 4C Wave and by their country (see Section 5.2.3).
- If the email invitation ‘bounced back’, then the respondent’s record was updated so that he/she would: 1) receive a telephone reminder call for ‘bounced email addresses’, and 2) be required to provide his/her updated email address in order to be eligible for the 4CV1 Survey.

#### *5.2.1.2 Letters for ITC-owned CA, EN, US cohort members who had NOT provided their email address to ITC*

- On Day 1 of fieldwork all ITC-owned cohort members (i.e., who completed the previous 4C wave) who had NOT previously provided an email address to ITC were mailed an invitation letter that:
  - described the study,
  - invited the respondent to participate via the URL address and a unique PIN,
  - stated that respondents must provide an email address and be willing to receive study correspondence by email to be eligible for the survey, and
  - included information on how to opt out of the study and future contact.
- ITC-owned cohort members who had NOT provided an email were prioritized to receive a telephone reminder call inviting them to participate in the web survey and provide an email address to which the survey link could be sent (see Section 5.2.3).

#### **5.2.2 Procedures to ensure all respondents provide an email address**

- All 4CV1 participants were required to provide their email address and to be contacted in the future by email, in order to be eligible for the survey.
- All recruitment letters, emails, and phone calls described this requirement.
- All respondents who accessed the survey via the URL address and PIN (i.e., from the method other than the direct email link to the survey) were required to provide their email address in the screening portion of the survey in order to meet eligibility criteria.

#### **5.2.3 Telephone reminder calls – ITC-owned CA, EN, US cohort**

- At the beginning of fieldwork, the ITC-owned cohort members were categorized into six priority groups for receiving a telephone reminder call. (i.e., Group 1 was prioritized as the most important cohort members to be phoned, then Group 2, etc.).

- The objectives of the telephone reminder calls were to: 1) increase the survey response overall, and 2) promote conversion from the telephone-administered to the web-administered survey.
- Categorization into a priority group was determined based on two factors: 1) having provided an email address to ITC, and 2) having completed the survey by web (vs. phone) at the last wave (Table 5.1).
- The original protocol was to phone only Groups 1-5 in each country; however, because the actual rate of survey accrual was slower than projected in CA and the US, Group 6 in each of CA and the US (but not EN) were also telephoned for reminder calls.

**Table 5.1.** Description of 4CV1 Survey Reminder Call priority groups for the ITC-owned cohort from Canada, England, and the United States.

Priority group	Provided email to ITC	Survey mode at last wave
<b>Group 1 (top priority)</b>	No	Phone
<b>Group 2</b>	No	Web
<b>Group 3</b>	Yes, but invalid	Phone
<b>Group 4</b>	Yes, but invalid	Web
<b>Group 5</b>	Yes, valid	Phone
<b>Group 6 (last priority)</b>	Yes, valid	Web

#### 5.2.3.1 Protocol for telephone reminder calls for the ITC-owned cohort in Canada, England, and the US

- Telephone reminder calls were conducted by the UW SRC.
- Slightly different phone scripts were used depending on the situation, but in general, the script stated that the intended person had been invited to participate in the 4CV1 survey and we were calling to request participation. If possible, the interviewer would also obtain updated email address and/or contact information during the call.
- At any time, the respondent could suggest an alternate recruitment call time, or withdraw from the survey.
- To avoid call-scheduling bias, calls were made at various times of the day and on different days of the week, including the weekend.
- Overall, 7 call attempts were made; on the 7<sup>th</sup> call attempt, the interviewer left an appropriate voicemail message per the 4CV1 Reminder Call Scripts.

#### 5.2.4 US phone interviews

- In the field, the survey response in the US ITC-owned cohort was slower than the research team projected (possibly this was partially attributable to a fatigue effect of US citizens being polled for the upcoming US election, or perhaps this was due to the changing surveying environment in the US).
- Thus, the research team added a telephone interview component for US cohort members who reported that they would be willing to complete the survey by phone, but could not complete the survey by web for some reason. This resulted in 46 telephone-administered survey completes from the US (15% of the n=300 ITC-owned cohort sub-sample).

- The UW SRC conducted the interviewing using the web survey with a leading modified script to introduce the phone interview. The phone survey protocol was similar to that used for the reminder calls.

### 5.3 ITC-owned cohort re-contact procedures – Australia

- ITC-owned respondents from AU who were invited to the 4CV1 Survey were managed by RMR; these respondents met the following definition:
  - They were part of the 4CV1 Recontact sample (i.e., respondents who had participated in the last wave of the 4C Survey, and were presently being invited to participate in 4CV1).
  - They had originally been recruited by ITC from an RDD sampling frame, and had provided their contact information and agreed to receive requests for participation in future surveys from ITC.

#### 5.3.1 Invitations and reminders for AU ITC-owned cohort members (email vs. letter)

- The UW SRC hosted the 4CV1 AU Survey, but RMR (in Melbourne, Australia) handled all communications with the ITC-owned AU cohort and the RMR-owned AU cohort. This section describes procedures for the ITC-owned AU cohort (Section 5.4 provides procedures for the RMR (panel)-owned AU cohort).
- ITC-owned AU cohort members were recruited differently depending on if they had previously provided ITC with their email address (vs. all past correspondence having been done by phone and postal address):
  - ITC-owned AU cohort members who had provided an email address: were invited to participate in the 4CV1 Survey by email invitation, plus a series of letter, email, and phone reminders (per Section 5.3.1.1) until submitting a completed survey.
  - ITC-owned AU cohort members who had NOT provided an email address to ITC: were mailed an invitation letter, and if they did not respond, were then telephoned and asked to participate.

##### 5.3.1.1 *Email invitations and follow up for ITC-owned AU cohort members who had previously provided their email address to ITC*

- On Day 1 of fieldwork all ITC-owned AU cohort members (i.e., who completed the 4C Wave 10 Survey) and had previously provided an email address to ITC, were emailed an invitation to participate in the survey.
  - The email invitation described the study and invited the person to participate by clicking on the direct link to the survey.
  - The survey firm contact phone number and email address were provided in the survey and in the emails/invitation letter. Respondents could phone/send a message to opt out. They could also call/email the institutional ethics contact to opt out.
- If the email invitation ‘bounced back’, then the respondent’s record was updated so that he/she would: 1) be mailed an invitation letter and receive the standard follow up to the mailed invitation, and 2) be required to provide his/her updated email address in order to be eligible for the 4CV1 Survey.

- All ITC-owned AU cohort members who had not completed the survey after receiving the initial email invitation were sent a reminder letter on Day 6, a reminder email on Day 8, and then were telephoned on Day 9 or 10 for a reminder phone call.
- A final set of reminder emails was sent at 1 week before the survey was closed, to all outstanding invitees who had not submitted a completed survey AND not responded stating that they did not wish to participate.
- The survey firm reminded respondents with partially completed surveys, concurrently with those who had not submitted a completed survey AND not responded stating that they did not wish to participate.
- If the email invitation ‘bounced back’, then the respondent’s record was updated so that he/she would: 1) receive a telephone reminder call for ‘bounced email addresses’, and 2) be required to provide his/her updated email address in order to be eligible for the 4CV1 Survey.

#### 5.3.1.2 *Letter invitations and follow up for ITC-owned AU cohort members who had NOT provided their email address to ITC*

- On Day 1 of fieldwork all ITC-owned cohort members (i.e., who completed the previous 4C wave) who had NOT previously provided an email address to ITC were mailed an invitation letter that:
  - described the study,
  - invited the respondent to participate via the URL address and a unique PIN,
  - stated that respondents must provide an email address and be willing to receive study correspondence by email to be eligible for the survey, and
  - included information on how to opt out of the study and future contact.
- ITC-owned AU cohort members who had responded to the mailed invitation letter were subsequently telephoned for a reminder phone call.

#### 5.3.2 Procedures to ensure all ITC-owned AU cohort respondents provided an email address

- Procedures are the same as those described in Section 5.2.2.

#### 5.3.3 Protocol for telephone reminder calls for the ITC-owned AU cohort

- Telephone reminder calls were conducted by RMR.
- At any time, the respondent could suggest an alternate recruitment call time, or withdraw from the survey.
- To avoid call-scheduling bias, calls were made at various times of the day and on different days of the week, including the weekend.
- Overall, 3 call attempts were made; on the 3<sup>rd</sup> call attempt, the interviewer left an appropriate voicemail message, and then no further attempts were made to contact the intended participant.

#### 5.3.4 Thank you emails/letters for the ITC-owned AU cohort

- RMR sent a thank you email to all ITC-owned AU cohort members who completed the 4CV1 Survey. If the email bounced back, then RMR mailed a thank-you letter to the respondent, which included a request for an updated email address.

## 5.4 Panel-owned recontact procedures

### 5.4.1 Procedures for panel-owned cohort members from CA, EN, US (Leger, Ipsos, GfK)

- All communications with the panel-owned cohort members were conducted by the respective country panel firms.
- The panel firms identified panelists who participated in the last wave of the 4C Survey and emailed them invitations for the 4CV1 Survey. The emailed invitations had an embedded direct link to the participant's unique web survey record. All cohort panelists from CA, EN, and US were eligible for the 4CV1 Survey, regardless of current cigarette and NVP use status.
- After completing and submitting his/her web survey, the panel-owned cohort respondent was redirected to the panel firm's (Leger, Ipsos, GfK) website via a URL.
- The survey incentive was credited to the respondent's web panel account after completing the 4CV1 Web Survey.
- Respondents who were not eligible for the web survey were also be re-directed back to the panel firm's (Leger, Ipsos, GfK) website by a URL.
- The panel firms' (Leger, Ipsos, GfK) sent email reminders to those invited panelists who had not yet completed the survey, per their normal protocols.

### 5.4.2 Procedures for panel-owned cohort members from AU

- Procedures for the panel-owned AU cohort were the same as those for the ITC-owned AU cohort described in Section 5.3.

## 5.5 Panel-owned replenishment procedures

### 5.5.1 Procedures for panel-owned replenishment samples from CA, EN, US (Leger, Ipsos, GfK)

- The SRC hosted the 4CV1 Web Survey for all samples, but communications with panelists were handled by the country panel firms.
- In some cases (i.e. for the Ipsos EN sample and the GfK US smoker sample), the firms sub-contracted to their panel partners.
- The panel firms (Leger, Ipsos, and GfK) emailed the 4CV1 Survey invitation to their panelists who meet preliminary eligibility criteria\* (see below) and provided them with a link to the 4CV1 Web Survey.
- Respondents who completed the web survey were sent back to their respective panel firm's website and were credited their study payment.
- A respondent who left a partially completed survey was able to return to the survey at a later time, up until the end of the fieldwork period.
- Panel firms (Leger, Ipsos, GfK) sent reminder emails to selected panelists who had not submitted a completed web survey (incompletes), until quotas were achieved (fieldwork ended) per their regular procedures.

- \* **Preliminary eligibility criteria** were based on the panel firms' (Leger, GfK, Ipsos) existing knowledge of the panelists, and used to screen in potential eligible panelists. Criteria were:
  - Past respondents from the panel (Leger, GfK) who participated in the ITC Four Country Wave 9 Survey (4C9) should be invited to participate in the 4CV1 Survey (regardless of current smoking status, with the exception that recruited non-users from the 4C9 US Survey were not invited to 4CV1).
  - For the Replenishment smoker/former smoker sample, the panel firms (Leger, Ipsos, GfK) identified any panelist who had reported being a smoker at any panel update in the past 24 months.

- For the Replenishment vaper sample, the panel firms (Leger, Ipsos) identified any panelist who had reported using NVPs at their last panel update.

### 5.5.2 Procedures for the panel-owned AU replenishment smoker/former smoker sample (RMR)

- RMR sampled any panelists who had reported that they were smokers at any point during the past 2 years.
- RMR then phoned the identified panelists and screened them for eligibility (i.e., those who reported being current smokers, former smokers with the past 24 months, or current at-least-weekly vapers).
- Those who screened positive were then emailed an invitation to participate in the 4CV1 Survey.
- If the invited panelists had not responded within 7 days of being sent the email invitation, then RMR sent a Reminder Email on Day 8.
- If the invited panelists had not responded within 1-2 days of being sent the Reminder Email, then RMR telephoned the panelists to ask them to participate in the 4CV1 Survey. If the intended panelist was not reached by phone after 3 attempts, then a message was left on the 3rd attempt if an answering machine is available.
- Panelists that started the survey but had not submitted a completed survey were sent emails notifying them of the survey end date and asking them to submit their completed survey.
- RMR sent a thank you email to all ITC-owned AU cohort members who completed the 4CV1 Survey. If the email bounced back, then RMR mailed a thank-you letter to the respondent, which included a request for an updated email address.

### 5.5.3 Procedures for the panel-owned AU replenishment additional vaper sample (RMR)

- In AU, a non-probability, opt-in sample of ‘early adopter’ vapers was sampled. The target for this sample was n=600 vapers recruited from 3 sources:
  - An existing database of past research participants who had signed up for future studies on the HABIT website at UQ, provided by Dr. Coral Gartner, a co-investigator. The research team sent an email to those registered on the website to identify anyone who was interested in the 4CV1 Survey.
  - Advertisements on vapers websites (e.g., Aussie Vapers and Vapers café).
  - Advertisements in vaper shops/cafés.
- All interested persons who responded to the recruitment materials were sent to the UQ website and were screened for eligibility for the survey.
- All interested and eligible participants (from all 3 sources) provided consent to participate by registering their contact details (names, mailing address, phone, email address) on the UQ website. All potential participants were required to view the Participants Information Sheet prior to clicking the “Proceed to Survey” link.
- Upon registration, potential participants were told that they had been assigned a unique PIN (from a pre-determined list provided by the UW SRC), were given an email with instructions on how to return to their survey should they stop their survey prior to submitting it, and were sent a Participant’s Information Sheet for their record. Specifically, they were told that they should use the URL link provided in the email to get back into the survey to continue where they had left off should they leave the survey for any reason.
- Upon clicking on the “Proceed to survey” button, the study participants were directed to the SRC website (based in CA) to complete the web survey.

- Upon submitting the completed survey, participants were redirected back to the UQ website for incentive processing.
- All completers were sent a thank you email. This also allowed their email addresses to be verified. Participants with invalid email addresses were phoned by the research team to update their email address.

## 5.6 Study Incentives

Table 5.2. Summary of 4CV1 incentives by country and sample source.

Country/panel	4CV1 Survey incentive type	Responsible for processing
<b>AU</b>		
'ITC-owned' cohort	cheque for \$40 OR entry into a draw for \$1,000 (one name will be drawn for every 100 completed surveys)	RMR
Leger panelists (cohort and new recruits at 4CV1)	<b>[Cohort]</b> cheque for \$40 OR entry into a draw for \$1,000 (one name will be drawn for every 100 completed surveys) / <b>[New recruits]</b> entry into a draw for \$1,000 (one name will be drawn for every 100 completed surveys)	RMR
Additional vapers	entry into a draw for \$1,000	CCV
<b>Canada</b>		
'ITC-owned' cohort	choice of a \$25 CAD Amazon e-gift card or a \$25 CAD cheque	UW administrative team
Leger panelists (cohort and new recruits at 4CV1)	\$25 CAD or AIR MILES equivalent	Leger
<b>EN</b>		
'ITC-owned' cohort	£16 Amazon e-gift card	Logistic Solutions
Ipsos panelists (all are new recruits at 4CV1)	<b>[Age=18-24]</b> 3,200 points; broadly the equivalent of £20 <b>[Age=&gt;25]</b> 2,000 points; broadly the equivalent of £16	Ipsos
<b>US</b>		
'ITC-owned' cohort	Check for \$25 USD	UW administrative team
GfK Knowledge Panel panelists (cohort and new recruits at 4CV1)	<b>[Age=18-24]</b> 15,000 points / <b>[Age=&gt;25]</b> 10,000 points	GfK
US Opt in panelists (Lucid)	Points worth \$5-7 USD	GfK/Lucid

## 6 Quality Control and Uniformity

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### 6.1 Incongruent cases and requests for withdrawal

- Any cases in which a respondent's identity was determined to be incorrect, or if data were incongruent, or if a respondent requested their data be withdrawn were subsequently removed from the Main Data Set (see Section 6.3 for the definition of the 4CV1 Main Data Set and the 4CV1 Core Data Set). Any ineligible cases were also removed from the main data set.
- The number of cases removed as incongruent cases or withdrawals were 5 in AU, 5 in CA, 11 in EN, and 25 in US.

### 6.2 Identification and removal of 'satisficers/speeders' from the data set

- There were two criteria for poor data quality that were identified from a cursory look at the data:
  - 1) Seconds per question (secperQ) and
  - 2) % of responses that were either Refused or Don't Know (%RDK).
    - Very extreme values occurred for both of these variables: times of less than 1.7 seconds per question, which by published estimates doesn't allow time for even reading the question, and RDK responses for more than 70% of the questions completed.
- The strategy was to create a group of normal respondents by dropping all 'suspicious' respondents, those with very low secperQ and/or high %RDK, and to use this main group to calculate normal behaviour ranges. Then suspicious behaviour could be defined relative to the normal behaviour.
- The initial criteria for creating the normal group were high and somewhat arbitrary, because the goal was to get rid of anyone who might not have been answering responsibly.
  - Anyone with secperQ less than or equal to 3.5 (approx. the 90th percentile for the normal group) or %RDK greater than 38.24% (the 99th percentile for the normal group) was removed from the normal group.
  - 361 respondents were culled at this stage.
- The normal group was then split by country. Frequency distributions by country were used to create more precise cut-offs for 'suspicious' responding. 'Suspiciousness points' were assigned, based on the cut-offs for the respondent's country, and all respondents – initially suspicious and initially normal – had points assigned. Respondents were removed from the dataset if they scored too many points.
- Points were assigned on these bases:
  - 1) SecperQ -- The calculated value was time taken to complete the survey divided by the number of questions answered by the respondent. Very short times suggest poor data quality.
    - 3 points were assigned if the respondent's value was lower than the normal group's minimum. This could only apply to respondents not in the normal group.
    - 2 points were assigned if the respondent's value fell between the minimum and the normal group's 1<sup>st</sup> percentile. This could apply to respondents in the normal group as well as to suspicious respondents.
    - Because time per question was considered the most important of the 3 data-quality criteria, it was weighted more heavily, so the points assigned here were 2 and 3, rather than 1 and 2 as for the next two criteria.

- 2) %RDK -- The calculated value was the number of questions answered with either Refused or Don't know, divided by the number of questions answered by the respondent. Large numbers represent poor data quality.
    - 2 points were assigned if the respondent's value was higher than the normal group's maximum. This could only apply to respondents not in the normal group.
    - 1 point was assigned if the respondent's value fell between the maximum and the normal group's 99<sup>th</sup> percentile. This could apply to respondents in the normal group as well as to suspicious respondents.
    - 1 extra point was assigned if %RDK was over 70%
  
  - 3) %Topbox -- This was a new criterion that arose from the observation that quite a few respondents checked only the first item (the 'top box') in many of the checklists. This is as fast a way of responding carelessly as checking off Refused or Don't know for the entire list. It only applies to checklists; all other questions, including other series, require an answer for every item in the list. The calculated value was the number of checklists answered by checking off only the first item, divided by the number of checklists answered by the respondent. Large numbers suggest poor data quality.
    - 2 points were assigned if the respondent's value was higher than the normal group's maximum. This could only apply to respondents not in the normal group.
    - 1 point was assigned if the respondent's value fell between the maximum and the normal group's 99<sup>th</sup> percentile. This could apply to respondents in the normal group as well as to suspicious respondents.
- Points results: The range of possible points was 0-8. The actual range in the data was 0-6. 94.77% of the respondents had 0 points.
  - Cut-offs for dropping respondents: A cut-off of 3 points was considered, but this meant dropping 269 respondents, many of whom were concurrent users. These users are extremely valuable, because they are of interest as dual product users and because they contribute data to both the smoker and vaper groups. Therefore it was decided that a stricter criterion, a cut-off of 4 points, would be applied to concurrent users. Concurrent users with 3 points would be kept in the dataset but tagged as 'uncertain' so they could be removed from analyses if desired. For non-concurrent-users, anyone with a cut-off of 3 points was dropped from the dataset. This resulted in dropping a total of 182 respondents from the dataset.
  - Caution: Because speed counted for only 3 points, concurrent users could not be dropped on the basis of speed alone, since their cut-off was 4 points. One respondent, whose secerpQ was a very improbable 1.77, was therefore kept in the dataset.
  - Comparison between respondents who were dropped and those who were kept in the dataset:
    - Dropped respondents were more likely to be in the 18-24 and 25-39 age groups than in the 40+ age group. There was a significant effect of age group.
    - They were significantly more likely to be male than female.
    - England had significantly more dropped respondents than other countries, but this was because the majority of the dropped respondents were from the Ipsos panel in England, which provided a very large proportion of the respondents overall.
    - Dropped respondents were more likely to be concurrent users than either smokers-only or vapers-only; however, this was not statistically significant.

- They were somewhat more likely to have higher education and higher income. The association with education was significant but that with income was not. This suggests that intelligence and test-taking experience allow respondents to figure out ways to 'beat the system' – i.e to complete surveys quickly.
- The number of cases removed as satisficers/speeders were 13 in CA, 48 in EN, and 26 in US. No cases of satisficers/speeders were identified in the AU sample.

### 6.3 Definition of the 4CV1 Main Sample and the 4CV1 Core Sample

- The **4CV Main Sample Data Set** is the final realized 4CV1 data set with speeders/satisficers removed, long-term former smokers (>5y) removed, and the AU CCV sample removed (See Section 6).
  - Note on former smoker subsamples in the main sample: In each of CA, EN, and US, cohort respondents who had quit >2y ago were interviewed, while in AU, only respondents who had quit <2y ago were interviewed.
  - Thus, the main sample AU former smokers (quit <2y ago) are defined differently than the main sample CA, EN, US former smokers (quit between 2-5y ago).
- The number of cases removed for having quit >5y ago were 95 in CA, 50 in EN, and 79 in US.
- The **4CV Core Sample Data Set** is a subsample of the main sample. The 4CV1 Core Sample data set includes records for respondents from CA, EN, and US who quit >2y ago have been removed from the main sample so that the former smoker samples in each country meet the same definition.
  - The core sample should be used for analyzing former smoker samples across AU and other countries.
- The number of cases removed for having quit 2-5y ago were 52 in CA, 22 in EN, and 76 in US.

## 7 Outcome rates

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Table 7.1. Outcome rates by country, for new recruits

Country	AU	CA	EN	US-GfK	US-all***
Total interviewed	1575	3182	4129	131	1377
Refusals/breakoffs	116	309	328	12	335
Not known if eligible*	6338	67194	171438	434	1422
Estimated rate of eligibility and quota-not - full	49.3%	19.7%	13.3%	28.0%	36.6%
Estimated number of eligible and quota-not-full non-respondents	3123	13204	22784	122	580
Response rate	32.7%	19.1%	15.2%	49.6%	60.1%
Cooperation rate	93.1%	91.1%	92.6%	91.6%	80.4%
Median survey length**	48 min	44 min	39 min	NA	45 min

\*Sent to Survey Research Centre (SRC), did not respond, unknown if eligible. Roy Morgan (and their partner SSI) in AU and IPSOS in EN pre-screened respondents before sending them to SRC's website. Léger in CA and GfK in the US pre-identified individuals that would likely be eligible before sending them to SRC's website.

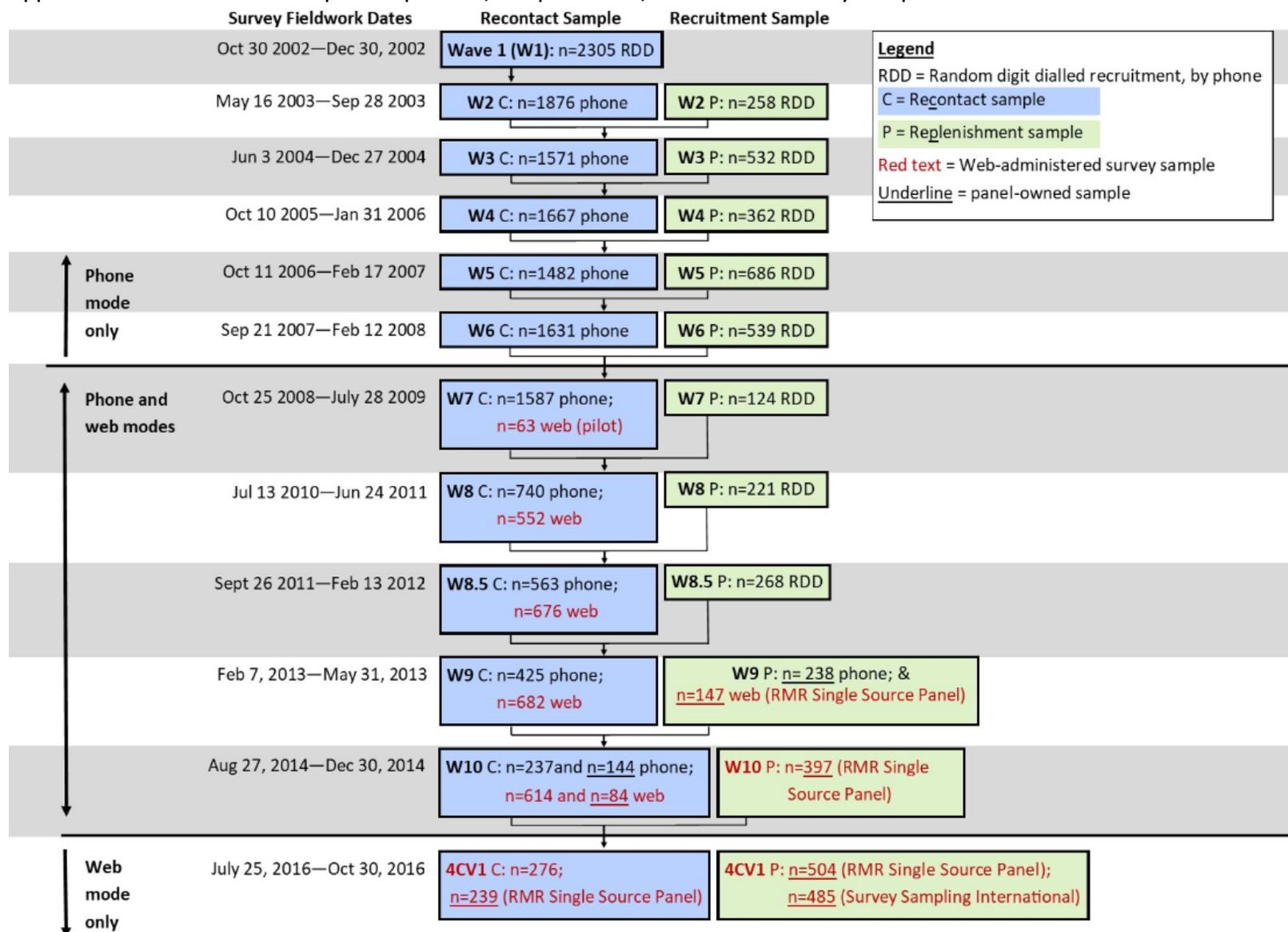
\*\* The questionnaire differed somewhat from country to country.

\*\*\* Rates in the US-all column should be viewed with caution and are likely to be over-estimates; Lucid (for respondents aged 18-24) and IPSOS (for respondents recruited as vapers) were not able to provide the total number of respondents they invited to the survey.

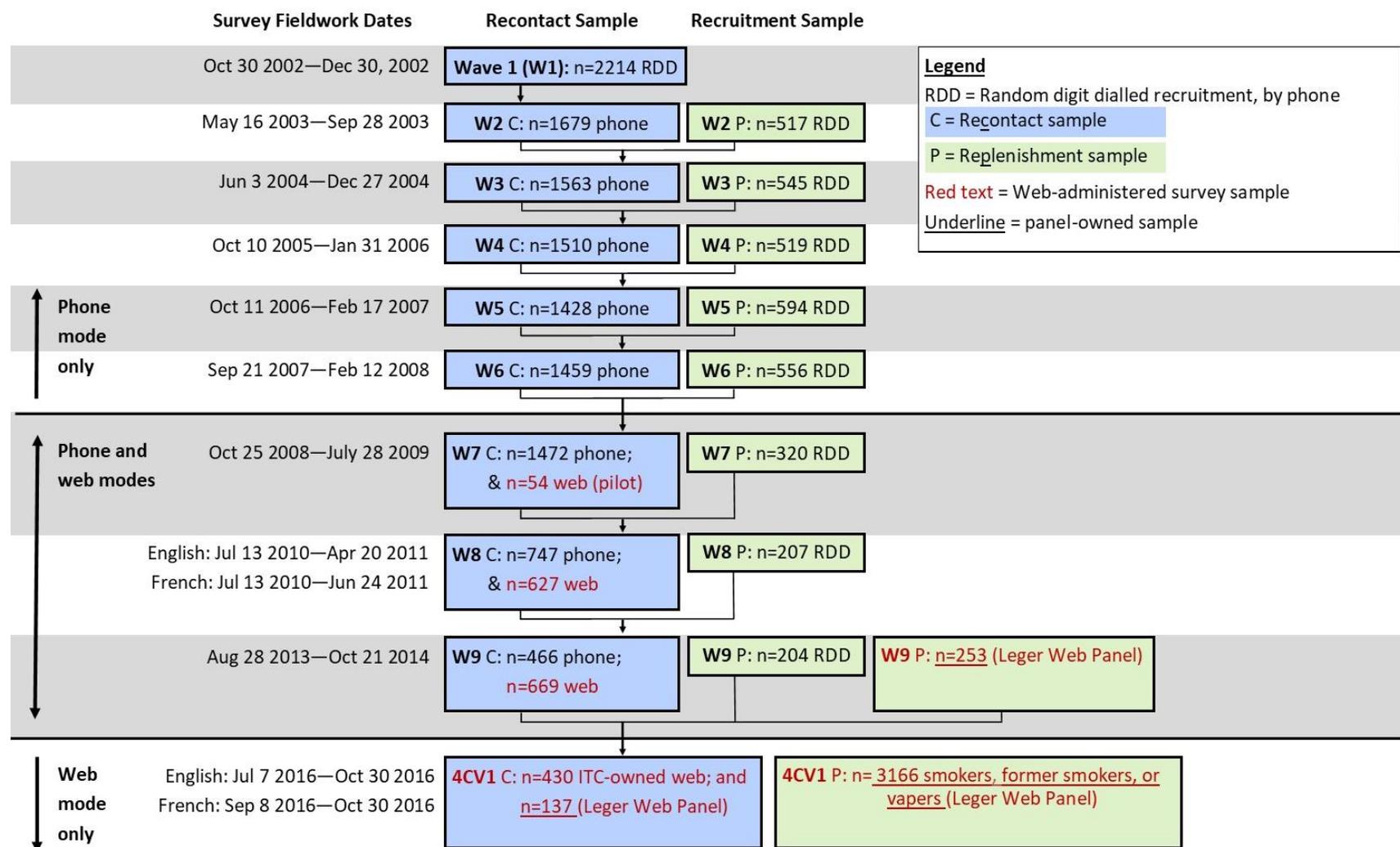
## Appendices

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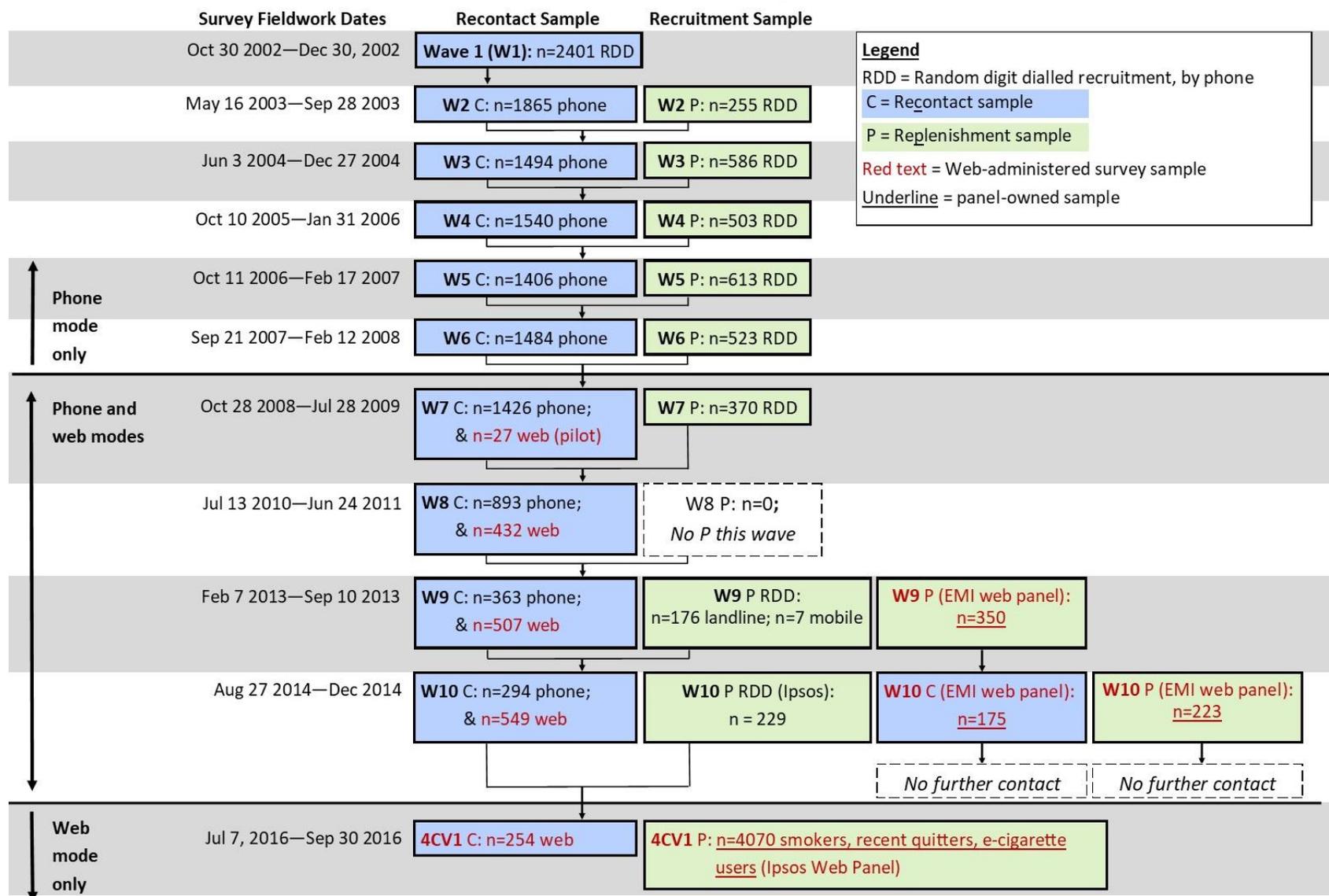
Appendix 1.1. ITC Australia sample composition, sample source, and mode of survey completion over Waves 1-10 and 4CV1



Appendix 1.2. ITC Canada sample composition, sample source, and mode of survey completion over Waves 1-9 and 4CV1

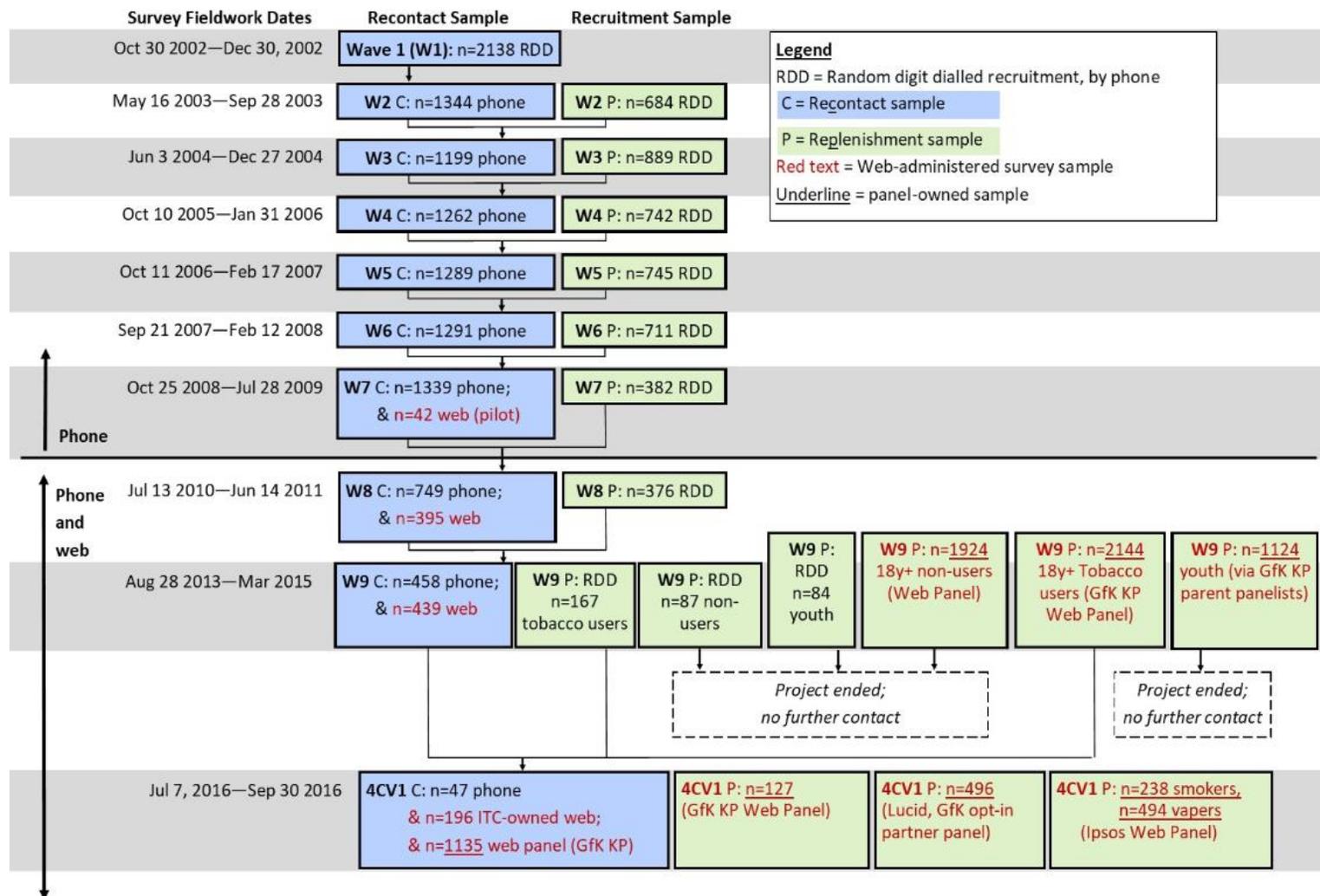


Appendix 1.3. ITC England sample composition, sample source, and mode of survey completion over Waves 1-10 and 4CV1



Appendix 1.4. ITC United States sample composition, sample source, and mode of survey completion over Waves 1-9 and 4CV1

ITC 4C US sample composition, sample source, and mode of survey completion over Waves 1-9 and 4CV1, Nov 23, 2018



\*During fieldwork 16 respondents from the US 4C9 Survey who were tobacco /vaping device-naïve were invited to the 4CV1 Survey in error; these cases were removed from the dataset.

## Appendix 2.1: Allocation (per stratum) of 4CV1 Australia panel sample

Last updated by C. Boudreau on Nov 1, 2016

Initially created by M.E. Thompson on Jun 23, 2016

### Notes:

- 1) All quotas must be met or slightly exceeded by the end of fieldwork.
- 2) Cells in gray are meant to be easily modified (just type in a new number); all other cells/calculations are automated and thus those cells shouldn't be modified.
- 3) Except for the overall quota of 600, there are no age/gender/region specific quotas for the AU dedicated vaper group
- 4) For the purpose of quotas, the Australian Capital Territory (ACT), which obviously includes Canberra, is included with New South Wales (NSW)

	Population Estimates/Projections <sup>*1</sup>						Estimated numbers of smokers <sup>*2</sup>					
	Men		Women		Total		Men		Women		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
New South Wales (NSW) & ACT	2,863,061	32.1%	2,966,168	32.7%	5,829,229	32.4%	543,982	32.1%	412,297	32.7%	956,279	32.4%
Victoria (VIC)	2,231,756	25.0%	2,325,868	25.7%	4,557,624	25.3%	424,034	25.0%	323,296	25.7%	747,330	25.3%
Queensland (QLD)	1,777,507	19.9%	1,824,130	20.1%	3,601,637	20.0%	337,726	19.9%	253,554	20.1%	591,280	20.0%
South Australia (SA)	754,670	8.5%	674,778	7.4%	1,429,448	7.9%	143,387	8.5%	93,794	7.4%	237,181	8.0%
Western Australia (WA)	1,000,811	11.2%	984,245	10.9%	1,985,056	11.0%	190,154	11.2%	136,810	10.9%	326,964	11.1%
Tasmania (TAS)	197,101	2.2%	202,762	2.2%	399,863	2.2%	37,449	2.2%	28,184	2.2%	65,633	2.2%
Northern Territory (NT)	96,501	1.1%	84,642	0.9%	181,143	1.0%	18,335	1.1%	11,765	0.9%	30,100	1.0%
Total Australia	8,921,407	100.0%	9,062,593	100.0%	17,984,000	100.0%	1,695,067	100.0%	1,259,700	100.0%	2,954,768	100.0%

### Notes:

- \*1 Adult (i.e., 18 and older) population estimates/projections by regions for 2014
  - \*2 Estimated number of smokers using a 19% prevalence for men and 13.9% for women
  - \*3 A total of 1168 cohort individuals are eligible at 4CE wave 1  
Assuming a retention rate of 45.1780821917808%, about 527 of them should successfully be recontacted at wave 1  
Hence, 1500 - 527 = 973 new individuals will need to be recruited
- |  |      |
|--|------|
| # of cohort individual eligible at 4CE wave 1: | 1168 |
| Assumed retention rate:                        | 45%  |
| Total sample size for 18+ smokers at wave 1:   | 1500 |

# Appendix 2.2: Allocation (per stratum) of 4CV1 Canada panel sample

Last updated on Nov 15, 2016

**Notes:**

- 1) All quotas must be met or slightly exceeded by the end of fieldwork.
- 2) Cells in gray are meant to be easily modified (just type in a new number); all other cells/calculations are automated and thus those cells shouldn't be modified.
- 3) Except for language specific strata (e.g., ML-Eng & ML-Fr) respondent should be recruited regardless of their language preference/choice

Strata	Population Estimates/Projections <sup>*1</sup>						Quotas			Revised Quota 18-24 (Nov 15, 2016)
	18-24		25+		18+		E-cig	smokers		
	N	%	N	%	N	%		18-24	25+	
<b>Maritimes</b>	202,424	6.0%	1,751,820	6.9%	1,954,244	6.8%				
Maritimes - English	178,221	5.3%	1,540,441	6.0%	1,718,662	6.0%	43	40	104	46
Maritimes - French	24,203	0.7%	211,379	0.8%	235,582	0.8%	6	5	14	6
Newfoundland and Labrador	41,438	1.2%	394,339	1.5%	435,777	1.5%				
Prince Edward Island	13,382	0.4%	104,680	0.4%	118,062	0.4%				
Nova Scotia	84,359	2.5%	695,751	2.7%	780,110	2.7%				
Nova Scotia - English	81,153	2.4%	669,313	2.6%	750,466	2.6%				
Nova Scotia - French*2	3,206	0.1%	26,438	0.1%	29,644	0.1%				
New Brunswick	63,245	1.9%	557,050	2.2%	620,295	2.2%				
New Brunswick - English	42,248	1.3%	372,109	1.5%	414,357	1.4%				
New Brunswick - French*2	20,997	0.6%	184,941	0.7%	205,938	0.7%				
<b>Quebec</b>	729,037	21.7%	6,009,099	23.6%	6,738,136	23.4%				
Québec - English	135,793	4.1%	1,040,122	4.1%	1,175,915	4.1%				
Québec - French	593,244	17.7%	4,968,977	19.5%	5,562,221	19.3%				
Greater Montreal	382,166	11.4%	2,903,414	11.4%	3,285,580	11.4%				
Greater Montréal - English	129,554	3.9%	984,258	3.9%	1,113,812	3.9%	28	29	67	34
Greater Montréal - French*2	252,612	7.5%	1,919,156	7.5%	2,171,768	7.5%	54	57	130	66
Rest of Québec	346,871	10.3%	3,105,685	12.2%	3,452,556	12.0%				
Rest of Québec - English	6,239	0.2%	55,864	0.2%	62,103	0.2%	2	1	4	2
Rest of Québec - French*2	340,632	10.2%	3,049,821	12.0%	3,390,453	11.8%	84	76	206	88
<b>Ontario</b>	1,345,274	40.1%	9,772,452	38.4%	11,117,726	38.6%				
GTA	611,698	18.2%	4,309,824	16.9%	4,921,522	17.1%	122	137		158
Toronto	278,906	8.3%	2,062,093	8.1%	2,340,999	8.1%			140	
GTA minus Toronto	332,792	9.9%	2,247,731	8.8%	2,580,523	9.0%			152	
Rest of Ontario	733,576	21.9%	5,462,628	21.5%	6,196,204	21.5%	153	165	370	190
<b>Prairies</b>	631,852	18.8%	4,529,481	17.8%	5,161,333	17.9%	128	141		163
Manitoba	128,823	3.8%	873,556	3.4%	1,002,379	3.5%			59	
Manitoba - English	124,185	3.7%	842,108	3.3%	966,293	3.4%				
Manitoba - French*2	4,638	0.1%	31,448	0.1%	36,086	0.1%				
Saskatchewan	108,873	3.2%	767,014	3.0%	875,887	3.0%			52	
Saskatchewan - English	107,240	3.2%	755,509	3.0%	862,749	3.0%				
Saskatchewan - French*2	1,633	0.0%	11,505	0.0%	13,138	0.0%				
Alberta	394,156	11.8%	2,888,911	11.3%	3,283,067	11.4%			195	
Alberta - English	387,455	11.6%	2,839,800	11.2%	3,227,255	11.2%				
Alberta - French*2	6,701	0.2%	49,111	0.2%	55,812	0.2%				
<b>British Columbia</b>	443,889	13.2%	3,400,949	13.4%	3,844,838	13.3%	95	99		114
Greater Vancouver	256,806	7.7%	1,805,885	7.1%	2,062,691	7.2%			122	
Rest of BC	187,083	5.6%	1,595,064	6.3%	1,782,147	6.2%			108	
<b>Total Canada</b>	<b>3,352,476</b>	<b>100.0%</b>	<b>25,463,801</b>	<b>100.0%</b>	<b>28,816,277</b>	<b>100.0%</b>	<b>715</b>	<b>750</b>	<b>1723</b>	<b>867</b>

**Notes:**

- \*1 Population estimates/projections for July 1, 2016  
Downloaded from Statistics Canada/CANSIM (<http://www5.statcan.gc.ca/cansim/a33?RT=TABLE&themID=3433&spMode=tables&lang=eng>) on Jun 8, 2016  
See other spreadsheets in this Excel file
- \*2 Estimated (from 2011 Census\*5) percentages of population who speak French at home most of the time
  - Greater Montreal: 66.1%
  - Rest of Quebec: 98% \*5
  - Ontario: 2.2%
  - Nova Scotia: 3.8%
  - New Brunswick: 33.2%
  - Manitoba: 3.6%
  - Saskatchewan: 1.5%
  - Alberta: 1.7%
- \*3 253 individuals from the LégerWeb Panel completed the wave 9 survey  
Assuming a retention rate of 50%, 127 of them should successfully be recontacted at wave 1  
Hence, 1850 - 127 = 1723 new individuals will need to be recruited  
Assumed retention rate: 50% \*4  
Total sample size (from Léger) for 25+ at wave 1: 1850
- \*4 As per email from Lisa Covens <lcovens@leger360.com>, 220 (or 87%) of the 253 LégerWeb respondents who completed the wave 9 survey are still members of their panel  
Hence, assuming a recontact/retention rate of 70% for 4CE1 is fairly conservative
- \*5 See table in cells P10-S13, and the following links:  
<https://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-cma-eng.cfm?LANG=Eng&GK=CMA&GC=462>  
[https://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/2011003/tbl/tbl3\\_1-4-eng.cfm](https://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/2011003/tbl/tbl3_1-4-eng.cfm)  
[https://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/2011003/tbl/tbl3\\_1-2-eng.cfm](https://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-314-x/2011003/tbl/tbl3_1-2-eng.cfm)  
<https://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-cma-eng.cfm?LANG=Eng&GK=CMA&GC=535>

## Appendix 2.3: Allocation (per stratum) of 4CV1 England panel sample

Last updated by C. Boudreau on Sep 27, 2016

Created by C. Boudreau in June 2016

**Notes:**

- 1) All quotas must be met or slightly exceeded by the end of fieldwork.
- 2) Cells in gray are meant to be easily modified (just type in a new number); all other cells/calculations are automated and thus those cells shouldn't be modified.
- 3) See file quotas4CE-w1-IPPOS.pdf containing email exchange with Mark Gosnell <Mark.Gosnell@ipsos.com> about those quotas

	Estimated		Quotas <sup>*3</sup>
	Nb smokers <sup>*1</sup>	% Pop <sup>*2</sup>	
Men aged 25-34	1,157,809		
North and Yorkshire & the Humber		26.3%	116
Midlands		17.7%	78
London and East of England		32.8%	145
South		23.1%	102
Men aged 35-49	1,316,428		
North and Yorkshire & the Humber		26.3%	132
Midlands		18.3%	92
London and East of England		29.6%	149
South		25.7%	128
Men aged 50 and over	1,402,432		
North and Yorkshire & the Humber		28.6%	152
Midlands		19.7%	105
London and East of England		23.4%	125
South		28.3%	151
Women aged 25-34	770,883		
North and Yorkshire & the Humber		26.4%	78
Midlands		17.7%	52
London and East of England		32.8%	97
South		23.1%	67
Women aged 35-49	1,086,033		
North and Yorkshire & the Humber		26.6%	110
Midlands		18.4%	76
London and East of England		28.9%	120
South		26.1%	108
Women aged 50 and over	1,357,263		
North and Yorkshire & the Humber		28.6%	148
Midlands		19.5%	101
London and East of England		23.5%	122
South		28.5%	146
<b>Total</b>	<b>7,090,848</b>		<b>2700</b>

	Estimated		Quotas <sup>*3</sup>
	Nb smokers <sup>*1</sup>	% Pop <sup>*2</sup>	
Men aged 18-24	656,876		
North and Yorkshire & the Humber		28.9%	150
Midlands		19.8%	103
London and East of England		25.9%	135
South		25.4%	132
Women aged 18-24	479,654		
North and Yorkshire & the Humber		29.1%	110
Midlands		19.7%	75
London and East of England		26.4%	100
South		24.8%	95
<b>Total</b>	<b>1,136,530</b>		<b>900</b>

	% Pop	Quotas
North East	4.8%	24
North West	13.0%	65
Yorkshire & the Humber	9.8%	49
East Midlands	8.6%	43
West Midlands	10.4%	52
East of England	11.1%	56
London	15.8%	79
South East	16.3%	81
South West	10.2%	51
<b>Total</b>		<b>500</b>

**Notes:**

\*1 Estimated number of smokers as of Jul 2016; see spreadsheet "Nb smk" in this Excel file

\*2 Estimated percentage of population in each 4 geographic regions per gender/age group; see spreadsheet "Nb smk" in this Excel file

\*3

$$\text{quota}_{g,a,h} = \frac{\hat{N}_{g,a}}{\hat{N}} \times 2700 \times \text{prop}_{g,a,h}$$

$\hat{N}_{g,a}$  = estimated number of smokers for gender  $g$  and age group  $a$

$$\hat{N} = \sum_{g=1}^2 \sum_{a=1}^3 \hat{N}_{g,a}$$

$\hat{N}$  = total estimated number of smokers

$\text{prop}_{g,a,h}$  = proportion of the population gender  $g$  and age group  $a$  that resides in region  $h$

## Appendix 2.4: Allocation (per stratum) of 4CV1 United States panel sample of vapers

Last updated by C. Boudreau on Jun 14, 2016

**Notes:**

- 1) All quotas must be met or slightly exceeded by the end of fieldwork.
- 2) Cells in gray are meant to be easily modified (just type in a new number); all other cells/calculations are automated and thus those cells shouldn't be modified.

**Quotas for adult (i.e., 18+) e-cigarette users**

Census Region	Population Estimates/Projections <sup>*1</sup>		Quotas
	N	%	
Northeast	44,223,902	17.9%	89
Midwest	52,359,918	21.2%	106
South	92,091,900	37.2%	186
West	58,633,704	23.7%	119
<b>Total</b>	<b>247,309,424</b>	<b>100.0%</b>	<b>500</b>

**Notes:**

- \*1 Adult (i.e., 18 and older) population estimates/projections per state/Census Region for 2016  
 Downloaded from CDC (<http://wonder.cdc.gov/population-projections.html>) on Jun 14, 2016  
 See spreadsheet "Projections 18+" in this Excel file

## Appendix 2.5: Allocation (per stratum) of 4CV1 United States panel sample of smokers/former smokers, aged 18-24y

Last updated by C. Boudreau on Sep 6, 2016

**Notes:**

- 1) All quotas must be met or slightly exceeded by the end of fieldwork.
- 2) Cells in gray are meant to be easily modified (just type in a new number); all other cells/calculations are automated and thus those cells shouldn't be modified.

**Quotas for smokers ages 18-24**

Census Region	Population Estimates/Projections <sup>*1</sup>		Quotas
	N	%	
Northeast	5,023,858	17.0%	85
Midwest	6,182,797	20.9%	104
South	11,013,171	37.2%	186
West	7,387,949	25.0%	125
<b>Total</b>	<b>29,607,775</b>	<b>100.0%</b>	<b>500</b>

**Quotas for smokers (and quitters) ages 25 and older**

Census Region	Population Estimates/Projections <sup>*2</sup>		Total	Quotas	
	N	%		IPSOS	GfK <sup>*3</sup>
Northeast	39,200,044	18.0%	59	38	21
Midwest	46,177,121	21.2%	69	70	0
South	81,078,729	37.2%	121	68	52
West	51,245,755	23.5%	77	50	27
<b>Total</b>	<b>217,701,649</b>	<b>100.0%</b>	<b>326</b>	<b>226</b>	<b>100</b>

**Notes:**

- \*1 Population estimates/projections for 18-24 years old per state/Census Region for 2016  
 Downloaded from CDC (<http://wonder.cdc.gov/population-projections.html>) on Jun 8, 2016  
 See spreadsheet "Projections 18-24" in this Excel file
- \*2 Population estimates/projections for 25+ years old per state/Census Region for 2016  
 These estimates/projections were obtained by simply taking the difference between projections for 18+ and projections for 18-24  
 Downloaded from CDC (<http://wonder.cdc.gov/population-projections.html>) on Jun 8, 2016  
 See spreadsheets "Projections 18-24" and "Projections 18+" in this Excel file
- \*3 Total - # already recruited by IPSOS

## Sampling Weights and Design of the International Tobacco Control (ITC) 4CV Wave 1 Survey

C. Boudreau<sup>1,2</sup>, M.E. Thompson<sup>1,2</sup> and Y. Li<sup>2,3</sup>

This short document describes the various longitudinal weights (section 2.1) and cross-sectional weights (section 2.2) available for the ITC 4CV wave 1 Survey (labelled as wave V1 in this document to prevent confusion with previous waves of the ITC 4C Survey). It also provides some guidance on which set of weights should be used depending on the analysis they are performing, as well as some basic characteristics of the sampling design and protocol.

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<sup>4</sup>This document was created using L<sup>A</sup>T<sub>E</sub>X, and last updated on Sep. 21, 2018

## 1 Important remark about quitters

After careful consideration, it was decided not to compute cross-sectional weights for long-term quitters (i.e., those who had quit smoking more than five years ago at the time of wave V1 data collection) in Canada, the US and England. This resulted in a total of 224 long-term quitters (79 from the US, 95 from Canada and 50 from England) not receiving any cross-sectional weights. Note that this only applies to cross-sectional weights, and that longitudinal weights were computed for those quitters; see section 2.1.

As mentioned in section 2.4.1, the vast majority of quitters in the ITC 4CV sample were initially recruited as smokers. Since quitting is one of the reasons for dropping out of the survey, quitters in the 4CV sample should not be viewed as representative of quitters in the general population. This lack of representativeness becomes more and more important when length of quit gets longer. Hence the decision to remove those who have quit more than five years ago. This has also the advantage of making the quitters in Canadian, US and English samples more comparable to those in the Australian sample, where it was decided that respondents who had quit more than two years ago were not to be recontacted at wave V1. Last but not least, since this sample of 224 long-term quitters would have had “represented” millions of quitters in those three countries (e.g., about 20% of Canadians and about 17% of Americans are long-term quitters), this would have resulted in very high sampling weights for those respondents. Consequently, analyses including all quitters (i.e., both those who have quit more than five years ago and those who have quit within the last five years) would have been dominated by those long-term quitters. Likewise, analyses involving all respondents (i.e., cigarette smokers, e-cigarette users and quitters) would have been greatly biased towards the behaviours of those long-term quitters.

## 2 Sampling weights

Four sets of longitudinal weights (section 2.1) and 18 sets of cross-sectional weights (section 2.2) were computed at wave 1 of the ITC 4CV Survey; see tables 1 and 2 below. The 18 sets of cross-sectional weights can be divided into 3 categories:

1. The first 7 sets of cross-sectional weights (see section 2.2.1 and column 2 of table 2) were computed for the main sample. That sample consists of 12295 respondents (2733 from the US, 3734 from Canada, 4324 from England, and 1504 from Australia). It includes all respondents except the 581 Australian respondents from the dedicated CCV sample, the 224 long-term quitters (79 from the US, 95 from Canada, 50 from England, and 0 from Australia) mentioned in section 1 and the 87 respondents (26 from the US, 13 from Canada, 48 from England, and 0 from Australia) deemed to be fraudulent (also referred to as speeders in some 4CV documentation).
2. The next 7 sets of cross-sectional weights (see section 2.2.2 and column 3 of table 2) were computed for the reduced US sample. This sample is the main US sample of

2733 respondents (mentioned above) minus the 494 US e-cigarette users recruited by Ipsos; hence, the reduced US sample consists of 2239 respondents. Those e-cigarette users were recruited via a non-probability based panel, and those sets of cross-sectional weights were thus computed to give data users the flexibility to remove those individuals if they so desired for their specific analyses. Since this only applies to US respondents, no such weights were computed for respondents from Canada, England or Australia.

3. The last 4 sets of cross-sectional weights (see section 2.2.3 and column 4 of table 2) were computed for Australian respondents using e-cigarettes. This sample contains all 816 Australian respondents that were using e-cigarettes at the time of wave V1. This was done to allow for weighted analyses including the 581 respondents recruited via the dedicated CCV sample. This concerns Australian respondents only, and no such weights were computed for respondents from the US, Canada or England.

Weight	Variable Name
Rescaled waves 8–V1 longitudinal weights	kWTS967v
Rescaled waves 8.5–V1 longitudinal weights (Australia only)	kWTS969v
Rescaled waves 9–V1 longitudinal weights	kWTS971v
Rescaled waves 10–V1 longitudinal weights (England and Australia only)	kWTS973v

Table 1: List of the available longitudinal sampling weights for wave V1 of the ITC 4CV Survey

Weight	Variable Names		
	Main sample*	reduced US sample <sup>†</sup>	AU e-cig users <sup>‡</sup>
Wave V1 cross-sectional inflation weights	kWTS100v	kWTS102v	n/a
Wave V1 cross-sectional inflation weights for e-cigarette users	n/a	n/a	kWTS304v
Rescaled wave V1 cross-sectional weights for cigarette smokers	kWTS201v	kWTS203v	n/a
Rescaled wave V1 cross-sectional weights for e-cigarette users	kWTS301v	kWTS303v	kWTS305v
Rescaled wave V1 cross-sectional weights for dual users	kWTS401v	kWTS403v	kWTS405v
Rescaled wave V1 cross-sectional weights for quitters	kWTS501v	kWTS503v	n/a
Rescaled wave V1 cross-sectional weights for quitters who use e-cigarettes	n/a	n/a	kWTS505v
Rescaled wave V1 cross-sectional weights for all tobacco users	kWTS601v	kWTS603v	n/a
Rescaled wave V1 cross-sectional weights for all respondents (i.e., all tobacco users and quitters)	kWTS101v	kWTS103v	n/a

\* The main sample consists of 12295 respondents (2733 from the US, 3734 from Canada, 4324 from England, and 1504 from Australia). It includes all respondents except the 581 Australian respondents from the dedicated CCV sample, the 224 long-term quitters (79 from the US, 95 from Canada, 50 from England, and 0 from Australia) mentioned in the remark section of page 1 and the 87 respondents (26 from the US, 13 from Canada, 48 from England, and 0 from Australia) deemed to be fraudulent (also referred to as speeders in some 4CV documentation).

<sup>†</sup> The reduced sample is the main US sample of 2733 respondents minus the 494 US e-cigarette users recruited by Ipsos; hence, the reduced US sample consists of 2239 respondents. Those e-cigarette users were recruited via a non-probability based panel, and those sets of cross-sectional weights were thus computed to give data users the flexibility to remove those individuals if they so desired for their specific analyses.

<sup>‡</sup> This sample contains all 816 Australian respondents that were using e-cigarettes at the time of wave V1. As detail in section 2.2.3, this was done to allow for weighted analyses including the 581 respondents recruited via the dedicated CCV sample.

Table 2: List of the available cross-sectional sampling weights for wave V1 of the ITC 4CV Survey

## 2.1 Longitudinal sampling weights

- 1- Variable `kWTS967v` contains the waves 8–V1 longitudinal weights for the 1202 respondents (258 from the US, 467 from Canada, 240 from England, and 237 from Australia) who completed the wave 8 survey, and were successfully retained and interviewed at wave V1 (and all the waves in between). These weights are designed to make these 467 Canadian smokers (and quitters) representative of the Canadian population of smokers at the time of wave 8 data collection; likewise for the US, England and Australia.
- 2- Variable `kWTS969v` contains the waves 8.5–V1 longitudinal weights for the 276 Australian respondents who completed the wave 8.5 survey, and were successfully retained and interviewed at wave V1 (and all the waves in between). These weights are designed to make these 276 smokers (and quitters) representative of the Australian population of smokers at the time of wave 8.5 data collection.
- 3- Variable `kWTS971v` contains the waves 9–V1 longitudinal weights for the 2662 respondents (1400 from the US, 661 from Canada, 269 from England, and 332 from Australia) who completed the wave 9 survey, and were successfully retained and interviewed at wave V1 (and all the waves in between). These weights are designed to make these 1400 US smokers (and quitters) representative of the American population of smokers at the time of wave 9 data collection; likewise for the Canada, England and Australia.
- 4- Variable `kWTS973v` contains the waves 10–V1 longitudinal weights for the 819 respondents (304 from England, and 515 from Australia) who completed the wave 10 survey, and were successfully retained and interviewed at wave V1. These weights are designed to make these 304 English smokers (and quitters) representative of the English population of smokers at the time of wave 10 data collection; likewise for Australia.

**Note:** It was decided to no longer compute waves 1–V1, waves 2–V1, ..., waves 7–V1 longitudinal weights. There are essentially 3 reasons for this: 1) before wave 8, all interviews were conducted by phone, whereas (practically<sup>1</sup>) all interviews at wave V1 were done online, 2) the tobacco landscape in the 4 countries has changed quite a lot since waves 1–7 took place, and 3) given the high level of attrition of cohorts 1–7 respondents between waves 8 and V1, the wisdom of conducting longitudinal analyses of those cohorts is becoming more and more questionable. Note that this is different from conducting cross-sectional analyses, or waves 8–V1, waves 8.5–V1, waves 9–V1 or waves 10–V1 longitudinal analyses. Though cohorts 1–7 respondents (successfully retained and interviewed at wave V1) will be part of the sample when conducted such cross-sectional or longitudinal analyses, they are only a fraction of the sample, as opposed to the whole sample when conducting waves 1–V1, waves 2–V1, etc. longitudinal analyses. It is thus perfectly acceptable to include cohorts 1–7 respondents with cohorts 8–V1 respondents in cross-sectional and longitudinal analyses.

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<sup>1</sup>46 US cohort respondents were exceptionally allowed to complete the V1 survey by phone.

## 2.2 Cross-sectional sampling weights

User group <sup>†</sup>	US		Canada	England	Australia	
	Main <sup>‡</sup>	Reduced <sup>‡</sup>			Main <sup>‡</sup>	E-cig <sup>‡</sup>
Cigarette only	1347	1347	2179	2664	1147	0
Dual users	980	542	1036	1222	192	292
Pure e-cigarette users	37	20	71	17	5	29
Quitters						
E-cig users	126	87	103	181	38	495
Do not use e-cig	243	243	344	240	122	0
Total	369	330	447	421	160	495
Total	2733	2239	3733	4324	1504	816

<sup>†</sup> Variable `kUserGroup` in the dataset

<sup>‡</sup> See notes below Table 2

Table 3: 4CV wave V1 respondents by country and user group.

### 2.2.1 Cross-sectional weights for the main sample

1- Variable `kWTS100v` contains the wave V1 cross-sectional inflation weights for the main sample of 12294 respondents (2733 from the US, 3733 from Canada, 4324 from England, and 1504 from Australia).

These weights were computed by dividing the respondents into four broad user groups (variable `kUserGroup`<sup>2</sup> in the dataset): i) cigarette only users, ii) dual users, iii) pure e-cigarette users and iv) quitters; see table 3. For the US, Canada and England, the quitter group consists of individuals that have quit cigarette smoking within the last 5 years; whereas in Australia it consists of individuals that have quit cigarette smoking within the last 2 years. Not that some of those quitters were using e-cigarettes at the time of wave V1 data collection. The pure e-cigarette users group consists of individuals who have smoked less than 100 cigarettes in their lifetime and were using e-cigarettes at the time of data collection, as well as who have quit more than five years ago (more than 2 years ago in Australia) and using e-cigarettes. In addition to those 4 groups, quitters were further divided into 4 sub-groups (variable `kQuitGroup`<sup>3</sup> in the dataset): iv.a) those who had quit within the last year, but were using e-cigarettes at the time of wave V1 data collection, iv.b) those who had quit 1–5 years ago (1–2 years in Australia), but were

<sup>2</sup> Where 1 = cigarette only, 2 = dual users, 3 = pure e-cigarette users, and 4 = quitters; see [appendix](#)

<sup>3</sup> Where 1 = quit within the last year and uses e-cigarettes, 2 = quit more than 1 year ago and uses e-cigarettes, 3 = quit within the last year and does not use e-cigarettes, and 4 = quit more than 1 year ago and does not use e-cigarettes; see [appendix](#)

using e-cigarettes at the time of data collection, iv.c) those who had quit within the last year and were not using e-cigarettes at the time of data collection, and iv.d) those who had quit 1–5 years ago (1–2 years in Australia) and were not using e-cigarettes at the time of data collection; see table 3.

Calibration/target figures (e.g., estimated number of individuals that are dual users and estimated number of individuals that are e-cigarette users) were then obtained for each of the four groups and four subgroups. In the US, those calibration figures were obtained from the 2016 [National Health Interview Survey \(NHIS\)](#); whereas as the 2015 [Canadian Tobacco Alcohol and Drugs Survey \(CTADS\)](#), the 2015 [Opinions and Lifestyle Survey \(OPN\)](#), and the 2016 [National Drug Strategy Household Survey \(NDSHS\)](#) were used for Canada, England and Australia, respectively. For groups i, ii and iv, estimated number of individuals in each cells of the following cross-tabs were obtained: user group  $\times$  gender, user group  $\times$  age group, user group  $\times$  geographic region, user group  $\times$  ethnicity (US only), user group  $\times$  education (except for Canada) and user group  $\times$  language (Canada only). For quitters (group iv), estimates were also obtained for the 4 subgroups mentioned above. Since the pure e-cigarette groups are fairly small (see table 3), it was not possible/practical to use as many cross-tabs as for the other three groups. Hence, for group iii, separate estimates were obtained for gender (male vs. female) and age group (18–24 vs.  $> 24$ ) in the US, Canada and England (since there are only 5 such respondents in Australia, they were combined into a single group for weight calculation purposes). A raking procedure was then applied to calibrate the weights using the above mentioned cross-tabs; this was done separately for each country.

These weights are designed to make respondents in each of the four groups representative of the corresponding population at the time of wave V1 data collection. For example, the `kWTS100v` weights of the 1036 Canadian dual users (i.e., individuals who smoked traditional cigarettes and also use e-cigarettes) are designed to make them representative of the Canadian population of dual users at the time of data collection; likewise for the other countries and the other groups. If interests lie in a target population that consists of two or more of the four user groups, the `kWTS100v` weights are still appropriate. For example, when studying Canadian cigarette smokers, one can simply combine the `kWTS100v` weights of the 2179 cigarette only users with those of the 1036 dual users (for a total of 3215 respondents in the analysis), and assigned a weight of 0 to respondents in the other two user groups.

Last but not least, since these are inflation/un-rescaled weights, they should not be used in analyses involving two or more countries. The various rescaled weights (i.e., variables `kWTS101v` to `kWTS601v`) described below were created especially for such multi-country analyses; see section 2.3 for more information on inflation versus rescaled weights.

- 2- Variable `kWTS201v` contains the rescaled wave V1 cross-sectional weights for the 10767 (2327 from the US, 3215 from Canada, 3886 from England and 1339 from Australia; see table 3) respondents who were cigarette smokers at the time of wave V1 data collection. These are simply the wave V1 cross-sectional inflation weights (variable `kWTS100v`) of

those 10768 respondents rescaled to sum to sample size in each country (i.e., 2327 in the US, 3216 in Canada, 3886 in England and 1339 in Australia). These weights are designed to make these 3215 Canadian cigarette smokers representative of the Canadian population of cigarette smokers at the time of wave V1 data collection; likewise for the US, England and Australia.

- 3- Variable `kWTS301v` contains the rescaled wave V1 cross-sectional weights for the 4589 (1143 from the US, 1210 from Canada, 1420 from England and 816 from Australia; see table 3) respondents who were e-cigarette users at the time of wave V1 data collection. These are simply the wave V1 cross-sectional inflation weights (variable `kWTS100v`) of those 4589 respondents rescaled to sum to sample size in each country. These weights are designed to make these 1210 Canadian e-cigarette users representative of the Canadian population of e-cigarette users at the time of wave V1 data collection; likewise for the US, England and Australia.
- 4- Variable `kWTS401v` contains the rescaled wave V1 cross-sectional weights for the 3530 (980 from the US, 1036 from Canada, 1222 from England and 292 from Australia; see table 3) respondents who were dual users at the time of wave V1 data collection. These are simply the wave V1 cross-sectional inflation weights (variable `kWTS100v`) of those 3530 respondents rescaled to sum to sample size in each country. These weights are designed to make these 1036 Canadian dual users representative of the Canadian population of dual users at the time of wave V1 data collection; likewise for the US, England and Australia.
- 5- Variable `kWTS501v` contains the rescaled wave V1 cross-sectional weights for the 1397 (369 from the US, 447 from Canada, 421 from England and 160 from Australia; see table 3) quitters at the time of wave V1 data collection. These are simply the wave V1 cross-sectional inflation weights (variable `kWTS100v`) of those 1397 respondents rescaled to sum to sample size in each country (i.e., 369 in the US, 447 in Canada, 421 in England and 160 in Australia).

Though these weights are designed to make these 447 Canadian quitters as representative as possible of the Canadian population of quitters at the time of wave V1 data collection, the vast majority of those quitters were initially recruited as smokers. Consequently, they are an imperfect sample when it comes to be representative of the whole population of quitters; see section 2.4.1 on the representativeness of quitters in the ITC 4CV sample. The same cautionary note also applies to the US, England and Australia. Furthermore, the US, Canadian and English samples consist of those who have quit smoking within the last five years, whereas the Australian sample consists of those who have quit smoking within the last two years. Since the target populations are different, care must be taken when comparing Australian quitters with those of the other three countries.

- 6- Variable `kWTS601v` contains the rescaled wave V1 cross-sectional weights for the 11345 (2490 from the US, 3389 from Canada, 4084 from England and 1382 from Australia; see table 3) respondents who were tobacco users (i.e., cigarette smoker and/or e-cigarette

users) at the time of wave V1 data collection. These are simply the wave V1 cross-sectional inflation weights (variable `kWTS100v`) of those 11346 respondents rescaled to sum to sample size in each country. These weights are designed to make these 3389 Canadian tobacco users representative of the Canadian population of tobacco users (i.e., cigarette smoker and/or e-cigarette users) at the time of wave V1 data collection; likewise for the US, England and Australia.

- 7- Variable `kWTS101v` contains the rescaled wave V1 cross-sectional weights for the main sample of 12294 respondents (2733 from the US, 3733 from Canada, 4324 from England, and 1504 from Australia; see table 3). These are simply the wave V1 cross-sectional inflation weights (variable `kWTS100v`) of those 12294 respondents rescaled to sum to sample size in each country (i.e., 2733 in the US, 3733 in Canada, 4324 in England and 1504 in Australia). These weights are designed to make these 3733 Canadian tobacco users and quitters representative of the Canadian population of tobacco users and quitters at the time of wave V1 data collection; likewise for the US, England and Australia.

In addition to the warning about the representativeness of quitters in the ITC 4CV sample (see variable `kWTS501v` above), it should be noted that tobacco users and quitters are ultimately two distinct populations. Hence, great care must be taken when deciding to analyse them together using the `kWTS101v` weights. This is probably fine when the goal is to carry out descriptive inference about the joint population of tobacco users and quitters. However, carrying out analytical inference (e.g., linear regression and logistic regression) from that same joint population is probably much more questionable.

### 2.2.2 Cross-sectional weights for the reduced US sample

As mentioned at the beginning of section 2.2, the following 7 sets of weights only applies to the US sample.

- 1- Variable `kWTS102v` contains the wave V1 cross-sectional inflation weights for the reduced US sample of 2239 respondents. As noted below table 2, the reduced sample is the main sample of 2733 respondents minus the 494 US e-cigarette users recruited by Ipsos (identifiable via the variables `kOWNERID` and `kEC309v`<sup>4</sup> in the dataset). Those e-cigarette users were recruited via a non-probability based panel, and the 7 sets of cross-sectional weights were thus computed to give data users the flexibility to remove those individuals if they so desired for their specific analyses.

These weights were computed the same way as the wave V1 cross-sectional inflation weights for the main sample (see variable `kWTS100v` in section 2.2.1). Consequently, respondents were divided into four broad user groups (cigarette only users, dual users, e-cigarette only users and quitters), and the weights were then calibrated (user group  $\times$  gender, user group  $\times$  age group, user group  $\times$  4 Census Regions, user group  $\times$  ethnicity,

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<sup>4</sup>Use  $!(\text{kOWNERID}=5 \text{ and } \text{kEC309v} \in \{1,2\})$  to exclude the 494 US e-cigarette users recruited by Ipsos, where  $!$  is the logic symbol for not.

user group  $\times$  education and the 4 quitter sub-groups) based on figures from the 2016 NHIS.

- 2- Variable `kWTS203v` contains the rescaled wave V1 cross-sectional weights for the 1889 respondents (see table 3) from the reduced US sample who were cigarette smokers at the time of wave V1 data collection. These are simply the wave V1 cross-sectional inflation weights (variable `kWTS102v`) of those 1889 respondents rescaled to sum to sample size (i.e., 1889). These weights are designed to make these 1889 US cigarette smokers representative of the US population of cigarette smokers at the time of wave V1 data collection. In other words, variable `kWTS203v` is the analogue of variable `kWTS201v`, but for the reduced sample.
- 3- Variable `kWTS303v` is the analogue of variable `kWTS301v`, but for the reduced US sample of 649 respondents who were e-cigarette users at the time of wave V1 data collection.
- 4- Variable `kWTS403v` is the analogue of variable `kWTS401v`, but for the reduced US sample of 542 respondents who were dual users at the time of wave V1 data collection.
- 5- Variable `kWTS503v` is the analogue of variable `kWTS501v`, but for the reduced US sample of 330 respondents who were quitters at the time of wave V1 data collection.
- 6- Variable `kWTS603v` is the analogue of variable `kWTS601v`, but for the reduced US sample of 1996 respondents who were tobacco users (i.e., cigarette smoker and/or e-cigarette users) at the time of wave V1 data collection.
- 7- Variable `kWTS103v` is the analogue of variable `kWTS101v`, but for the reduced US sample of 2239 respondents. Hence, the same cautionary notes listed for variable `kWTS101v` also applies here.

### 2.2.3 Cross-sectional weights for the Australian e-cig users

As mentioned at the beginning of section 2.2, the following 4 sets of weights only applies to the Australian sample of 816 respondents (235 from the main sample and 581 from the CCV sample; see table 3) that were using e-cigarettes at the time of wave V1. No such weights were computed for respondents from the US, Canada, England or for Australian respondents that are not e-cigarette users.

It should first be mentioned that CCV vaper sample (identifiable via the variable `kOWNERID`<sup>5</sup> in the dataset) consists of self-selected individuals recruited mainly through on-line sites. They are a group of vaper activists and early adopters. They are thus not a representative sample of vaper users in Australia. This is why those respondents are excluded from the 7 sets of weights computed in section 2.2.1. Nevertheless, respondents from the CCV sample can be of scientific interests, and some data users might want to include them in their analyses. This is why the following 4 sets of weights were computed.

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<sup>5</sup>Use `kOWNERID=7` to select the 581 Australian respondents from the dedicated CCV sample.

The initial plan was to compute weights for the entire/full sample of 2085 Australian respondents. Though this was technically possible, those weights would have been unstable. It was thus decided to instead compute weights for the 816 respondents that were using e-cigarettes at the time of wave V1. There are 617 quitters (individuals who have quit cigarette smoking within the last 2 years) in the full sample. Of those, only 122 (or 19.7%) are not e-cigarette users. However, according to the 2016 NDSHS data, 96.4% of those who quit within the last two years are not using e-cigarettes. This huge difference between the ITC sample of quitters and the 2016 NDSHS target data results in the weights of quitters who do not use e-cigarettes being extremely large (the average weight of a quitter who does not use e-cigarette is about 200 times that of a quitter who uses e-cigarettes); making the weights unstable.

- 1- Variable `kWTS304v` contains the wave V1 cross-sectional inflation weights for the Australian sample of 816 respondents (235 from the main sample and 581 from the CCV sample; see table 3) that were using e-cigarettes at the time of wave V1.

These weights were computed in a very similar way as the wave V1 cross-sectional inflation weights for the main sample (see variable `kWTS100v` in section 2.2.1). However, respondents were first divided into three (dual users, e-cigarette only users and quitters using e-cigarettes) instead of for user groups. The weights were then calibrated (user group  $\times$  gender, user group  $\times$  age group, and the 2 quitter sub-groups) based on figures from the 2016 NDSHS.

- 2- Variable `kWTS305v` contains the rescaled wave V1 cross-sectional weights for the 816 (235 from the main sample and 581 from the CCV sample; see table 3) Australian respondents who were e-cigarette users at the time of wave V1 data collection. These are simply the wave V1 cross-sectional inflation weights (variable `kWTS304v`) of those 816 respondents rescaled to sum to sample size (i.e, 816). These weights are designed to make these 816 e-cigarette users representative of the Australian population of e-cigarette users at the time of wave V1 data collection. In other words, variable `kWTS305v` is the analogue of variable `kWTS301v`, but for all 816 Australian e-cigarette users.
- 3- Variable `kWTS405v` is the analogue of variable `kWTS401v`, but for the 292 (192 from the main sample and 100 from the CCV sample; see table 3) Australian respondents who were dual users at the time of wave V1 data collection.
- 4- Variable `kWTS505v` contains the rescaled wave V1 cross-sectional weights for the 495 (38 from the main sample and 457 from the CCV sample; see table 3) Australian respondents who had quit cigarette smoking but were using e-cigarettes at the time of wave V1 data collection.

### 2.3 Inflation versus rescaled weights

The main reason for rescaling the weights is to facilitate joint analyses involving data from multiple ITC countries. Taking wave V1 as an example, from the data used to calibrate the

weights, there were about 39.8 million cigarette smokers in the United States at the time of wave V1 data collection; whereas there were only 3.6 millions such individuals in Canada, 7.4 millions in England and 2.7 millions in Australia. Hence, any joint analysis using data from all four countries will be dominated by the US if the inflation weights (i.e., variables [kWTS100v](#) or [kWTS102v](#)) are used.

On the other hand, the various rescaled weights sum to the sample size, as described above. Hence, if the rescaled weights are used, England and Canada will have a slightly greater impact on the results (since the Canadian and British sample sizes are larger than the Australian and US samples; see table 3), but no country will dominate the analysis. In summary, rescaling the weights to sum to the sample size is a simple and efficient way to make countries with different population sizes comparable. This also holds true when comparing 4CV data to other ITC countries; for example, ITC Netherlands and ITC 6E.

Last but not least, it should be mentioned that rescaling the weights will not affect the results when estimating population means and proportions/percentages, as well as when fitting various statistical models (e.g., logistic and linear regressions). However, the rescaled weights should not be used to estimate population totals (e.g., the total number of daily smokers or e-cigarette users).

## 2.4 Additional remarks

### 2.4.1 Cautionary note about quitters

As mentioned above (see variable [kWTS501v](#)), the vast majority of quitters in the ITC 4CV sample were initially recruited as smokers. Since quitting is one of the reasons for dropping out of the ITC Survey, quitting experience of our cohort respondents could well be affected by being in the sample and because of the sampling design itself, quitters in the ITC 4CV sample should not be considered to be representative of quitters in the population. For example, comparisons between the quitters in the ITC sample and quitters in the cross-sectional [Smoking Toolkit Study](#) showed an important discrepancy in distribution of length of time quit.

As described in the section detailing the construction of the wave V1 cross-sectional inflation weights (see variable [kWTS100v](#)), the sampling weights of quitters were calibrated on gender, age group, geographic region, ethnicity (US only), education (except for Canada), language (Canada only) and use of e-cigarettes  $\times$  length of quit ( $\leq 1$  year vs.  $> 1$  year). Quitters in the ITC 4CV sample should thus be representative of the population in terms of those variables, but not in terms of other related attributes. Again, they are an imperfect sample when it comes to be representative of the whole population of quitters.

### 2.4.2 Cautionary note about e-cigarette users

Comparisons on measures related to e-cigarettes between the 4CV1 Survey and other ITC countries must be viewed with caution, as weight construction for the 4CV1 Survey was done in a different fashion than of other ITC countries.

As described in the section detailing the construction of the wave V1 cross-sectional inflation weights (see variable `kWTS100v`), weights were computed by first dividing respondents into four broad user groups: cigarette only users, dual users, pure e-cigarette users and quitters. The sampling weights of dual users and of quitters were then calibrated on gender, age group, geographic region, ethnicity (US only), education (except for Canada) and language (Canada only), whereas those of pure e-cigarette users were calibrated on gender and age group. The sampling weights of quitters were also calibrated on use of e-cigarettes and length of quit ( $\leq 1$  year vs.  $> 1$  year). In other ITC countries, separate estimates for the number of individuals that are dual users and individuals that only smoke cigarettes were not available at the time of weight calculation. Hence, the weights were calibrated using smoking prevalences (often by age/gender groups and/or geographic regions), and thus have no special adjustment for e-cigarette usage.

### 2.4.3 Covariates to include in statistical modelling

As with other surveys, it is good practice to include the survey design variables and the variables used in the weight construction, when fitting statistical models (e.g. linear or logistic regression models) using ITC 4CV data. Hence, we highly recommend that any statistical model includes the following covariates:

- gender (labelled `sex` in the dataset)
- age (labelled `kAGE`, continuous, and `kageGroup`, categorical, in the dataset)
- user group (labelled `kUserGroup` in the dataset); see description of the `kWTS100v` weight variable.

The geographic region (labelled `kStrata` in the dataset) should also be used as the stratification variable in the statistical software. Though somewhat less essential, users should also strongly consider adding the following covariates:

- ethnicity (labelled `ethnic` in the dataset), when fitting models using US data
- education (labelled `kDE312v` in the dataset), when fitting models using US, English and/or Australian data
- language (labelled `kcaFrench` in the dataset), when fitting models using Canadian data
- use of e-cigarettes and/or length of quit (labelled `kQuitGroup` in the dataset), when fitting data using quitters; see description of the `kWTS100v` weight variable
- frequency of use of e-cigarettes/vaping (labelled `kEC309v` in the dataset), when fitting models with e-cigarettes users.

## 3 Data Collection & Sampling Design

### 3.1 ITC 4C Survey

Respondents in these countries had previously been surveyed in the ITC Four Country (4C) Survey, as described at <http://www.itcproject.org/methods>. The respondents of the first few waves of the ITC 4C Survey were recruited by telephone. Telephone recruitment continued in later waves, but was eventually supplemented by recruitment from commercial panels in Canada (wave 9), the UK (waves 9 and 10) and the US (wave 9), as more and more of the sample (including telephone recruits) were responding online. Respondents (mainly the telephone recruits) for whom contact information has been retained by the ITC Project are referred to as the ITC-owned in this document.

### 3.2 Data Collection and Recruitment

- During the design stage of ITC 4CV, it was decided that all survey response data would be collected through an online questionnaire, hosted by the [Survey Research Centre](#) at the University of Waterloo. This requirement was later relaxed for 46 respondents in the US, who were members of the ITC-owned cohort and who agreed to participate by telephone, but not online.
- All members of the ITC-owned cohort were to be invited to the new study. (Exception: In Australia, those who had been quit for more than 24 months at Wave 10 of the ITC 4C Survey were not contacted for the new study.)
- New respondents in each country were to be obtained from the best possible survey firms and sources, subject to budgetary constraints. In Australia, the main part of the sample was a custom-recruited by telephone and in part obtained from a partner (SSI) by the firm [Roy Morgan Research](#); in the US, Canada and England, firms with online panels supplied the recruits.

### 3.3 Sample Sizes and Inclusion Criteria

- US, Canada and England
  - In the US, Canada and England, the sample consisted primarily of cigarette smokers or recent (within past 24 months) quitters of cigarette smoking, aged 18 and over.
  - Because of the importance of studying younger smokers, it was decided to obtain altogether 500 such individuals in the 18–24 age group in the US and 900 in England, and 750 in Canada. The sample sizes in Canada and England are larger because of the expected lower retention rates between waves 1 and 2.

- The wave 1 sizes of the samples aged 25 & older were chosen so as to provide at least 1400 who would be present in both waves 1 and 2 (about 18 months later), according to retention rate estimates provided by the firms at the design stage.
  - As well, an additional sample of 500 at-least-weekly users of e-cigarettes were to be recruited in the US and England, and 715 in Canada.
  - In Canada, geographic quotas crossed with language (i.e., French vs English) were applied to each of the three groups: 18–24 smokers (and recent quitters), 25 & older smokers (and recent quitters), and the sample of 715 e-cigarette users.
  - In the US, geographic quotas were used for the sample of 18–24 smokers (and recent quitters) and for the sample of e-cigarette users. No quotas were used for the sample of 25 & older smokers (and recent quitters), as the majority of those individuals were cohort members from the ITC 4C Survey.
  - In England, geographic quotas crossed with sex were applied to the 18–24 age group of smokers (and recent quitters). For the sample of e-cigarette users, only geographic quotas were used; whereas, geographic quotas crossed with sex and age group (i.e., 25–34 vs 35–49 vs 50 & older) were used for the sample of 25 & older smokers (and recent quitters).
- Australia
    - In Australia, the sample was to consist mainly of cigarette smokers or recent (within past 24 months) quitters of cigarette smoking, aged 18 and over.
    - The sample size was to be approximately 1500, determined by the available budget.
    - Male/female crossed with geographic quotas were applied.
    - As well, an additional sample of users of e-cigarettes (vapers) was to be recruited by [Cancer Council Victoria](#) by referral sampling from vaper sites. This technique eventually yielded 581 respondents.

### 3.4 Sample Sources

- US
  - The ITC-owned members invited were wave 9 respondents who had been recruited as smokers by telephone in waves 1 through 8, and recruited as smokers or recent quitters by telephone or by the firm [GfK](#) (probability-based online [KnowledgePanel](#)) in wave 9.
  - ITC 4CV new recruits who were being recruited as smokers or recent quitters in the 25 & older age group were supplied by the GfK KnowledgePanel.
  - ITC 4CV new recruits who were being recruited as smokers or recent quitters in the 18–24 age group were supplied from an opt-in panel by the GfK partner [Lucid](#).

- The sample of 500 who were being recruited as e-cigarette users (but who could also be smokers) was supplied by [Ipsos US](#).
- There were also 238 additional smokers supplied by Ipsos US because of a quota programming issue, and retained in the sample.
- Canada
  - The ITC cohort members invited were wave 9 respondents who had been recruited as smokers by telephone in waves 1 through 8, and recruited as smokers by telephone or by the firm [Léger](#) (probability-based online panel) in wave 9.
  - ITC 4CV new recruits aged 18 & older who were being recruited as smokers or recent quitters were supplied by Léger, where possible from their probability-based panel.
  - The sample of approximately 715 who were being recruited as e-cigarette users (but who could also be smokers) was also supplied by Léger.
- England
  - The ITC cohort members invited were wave 10 respondents who had been recruited as smokers by telephone in waves 1 through 10. Those supplied by the online panel firm EMI in waves 9 and 10 were not included.
  - ITC 4CV new recruits aged 18 & older who were being recruited as smokers or recent quitters were supplied by [Ipsos UK](#), where possible from their own panel.
  - The sample of approximately 500 who were being recruited as e-cigarette users (but who could also be smokers) was also supplied by Ipsos UK.
- Australia
  - The ITC cohort members invited were wave 10 respondents who had been recruited as smokers by telephone in waves 1 through 10, and had not been quit by more than 24 months at wave 10.
  - ITC 4CV new recruits aged 18 & older who were being recruited as smokers or recent quitters were custom recruited by Roy Morgan Research.
  - The additional sample of 581 users of e-cigarettes (vapers) was recruited by [Cancer Council Victoria](#) by referral sampling from vaper sites.

### 3.5 Sampling Protocols

- Canada and England

In Canada and England, all new respondents were being recruited from the same sources, regardless of smoking and e-cigarette use status. Both Léger and Ipsos found it most economical to give priority to filling the e-cigarette user quotas, and thus to begin with, dual users or recent quitters who used e-cigarettes were assigned to the

e-cigarette user quotas; as these were filled, dual users and recent quitters who used e-cigarettes were assigned to the smoker/recent quitter quotas. However, the e-cigarette user quotas were not filled until relatively late in the fieldwork period. Thus, in each of Canada and England, the overall new sample in each age-sex-geography group should be approximately representative of the corresponding Léger or Ipsos population which is the union of smokers, recent quitters and e-cigarette users.

When the ITC cohort respondents are put together with the new recruits, discrepancies from the overall population in proportions of cigarette only users, dual users, and e-cigarette only users (and, to some extent, quitters who use neither) can be corrected in the combined sample by weighting; the weights are expected to be fairly smooth within age groups (18–24 and 25 & older).

- US

In the US, in each age group, the new recruit sample had two separate pieces: one part consisted of those recruited as smokers or recent quitters (who could also be e-cigarette users), and one part consisted of those recruited as e-cigarette users (who could also be smokers or recent quitters). An unweighted combination of the two samples would be expected to depart from representativity. For example:

- The relative proportions of the group who use cigarettes only and the group who use e-cigarettes only would not reflect their proportions in the population, because these sample groups come from different sources;
- There are two groups of recent quitters: those recruited with smokers and recent quitters and those recruited as e-cigarette users. The overall sample is thus likely to over-sample recent quitters who are e-cigarette users and under-sample those who are not.

When the ITC cohort respondents are put together with the new recruits, discrepancies from the overall population in proportions of cigarette only users, dual users, and e-cigarette only users are corrected in the combined sample by weighting.

- Australia

The situation in Australia resembles that in the US, with the new part of the sample being recruited in two pieces, and the added difficulty that the CCV vapor sample is quite different from the subsample of e-cigarette users in the main sample, in terms of age-sex composition, socioeconomic status (SES), and frequency of vaping.

When the ITC cohort respondents are put together with all the new recruits, discrepancies from the overall population in proportions of cigarette only users, dual users, and e-cigarette only users will be corrected to a large extent in the combined sample by weighting according to demographics and geography.

### 3.6 Cautionary notes

- Although it offers rich possibilities for analysis, the ITC 4CV Survey is not particularly well suited for estimation of prevalences. The weighted data will give prevalences of cigarette, e-cigarette and dual use that match those of the national health surveys used to calibrate the weights. However, because of rapid change in patterns of use, the calibration figures may not correspond well to the pattern which existed at the time of data collection.
- If the desired analysis involves quitters or comparison of quitters and smokers, please contact the DMC for advice.
- Cross country analyses, even among the four countries of the survey, should take into account differences in sample composition with respect to demographics, time-in-sample, and perhaps other characteristics.
- When comparing characteristics of e-cigarette users across groups or countries, controlling for frequency of use is advised.

## Appendix: pseudo code

Pseudo code detailing how variables `kUserGroup` and `kQuitGroup` were created (for US, Canada and England). The code for Australia as identical, with the exception that cut-off for quitters is 2 years instead of 5.

```
if {smokes cigarettes at least monthly or occasionally (ie, kFR309v in (1,2,3))}
  and {uses e-cig less than once a month or not at all
      (ie, kEC309v in (4,5,6,7,8) or kNC304=4)}
  then kUserGroup=1; /* cig only */;

else if {smokes cigarettes at least monthly or occasionally (ie, kFR309v in (1,2,3))}
  and {uses e-cig at least monthly (ie, kEC309v in (1,2) or kNC304=3)}
  then kUserGroup=2; /* dual user */;

else if {never smoked cigarette or quit over 5 years
        (ie, kFR309v=9 or kQA439=10)}
  and {uses e-cig at least monthly (ie, kEC309v in (1,2) or kNC304=3)}
  then kUserGroup=3; /* pure ecig */;

else if {quit cigarette smoking (ie, kFR309v in (4,8))}
  then kUserGroup=4; /* quitter */;

if {quitters (ie, kUserGroup=4)} then do;
  if {quit within the last 12 months (ie, kQA439<=6)}
    and {uses e-cig at least monthly (ie, kEC309v in (1,2) or kNC304=3)}
    then kQuitGroup=1;
  else if {quit 1-5 years ago (ie, 6 < kQA439 <= 9)}
    and {uses e-cig at least monthly (ie, kEC309v in (1,2) or kNC304=3)}
    then kQuitGroup=2;
  else if {quit within the last 12 months (ie, kQA439<=6)}
    and {uses e-cig less than once a month or not at all
        (ie, kEC309v in (4,5,6,7,8) or kNC304=4)}
    then kQuitGroup=3;
  else if {quit 1-5 years ago (ie, 6 < kQA439 <= 9)}
    and {uses e-cig less than once a month or not at all
        (ie, kEC309v in (4,5,6,7,8) or kNC304=4)}
    then kQuitGroup=4;
end;
```

## Appendix 4.1 National Benchmark Surveys referenced for sampling weights construction

Table A4.1.1 National Benchmark Surveys

Survey	Comments and limitations
AU: 2016 National Drug Strategy Household Survey (NDSHS): sample size 23772 (ages 14+)	Face-to-face data collection by Roy Morgan for Australian government, Australian Institute of Health and Welfare; same time as 4CV1; may underestimate NVP use (sale is illegal) and overestimate short-term quitting.
CA: 2015 Canadian Tobacco, Alcohol and Drugs Survey (CTADS): sample size 15154 (ages 15+)	Telephone data collection by Statistics Canada; one year prior to 4CV1; did not have an education question, making calibration with respect to education not possible.
EN: 2015 Opinions and Lifestyle Survey (OPN): sample size approximately 14500 (adults aged 16+)	Face-to-face data collection by Office of National Statistics; one year prior to 4CV1; possible to infer cessation from responses but not quit duration, necessitating supplementation with data from the Smoking Toolkit Study, which is also nationally representative and conducted face-to-face.
US: 2016 National Health Interview Survey (NHIS): sample size 33028 adults aged 18+.	Face-to-face data collection by US Census Bureau; same time as 4CV1.

## Appendix 4.2 Online Material

Table A4.2.1: Questions in the Benchmark Surveys

**Australia: 2016 National Drug Strategy Household Survey (NDSHS); sample size 23772 (ages 14+)**

Smoking questions	<p>D6: Would you have smoked at least 100 cigarettes (manufactured or roll-your-own), or the equivalent amount of tobacco in your life?</p> <p>Yes; No</p> <p>D13[D14]: How often, if at all, do you now smoke manufactured cigarettes [roll-your-own cigarettes]? (Mark one response only)</p> <p>Daily; At least weekly (but not daily); Less often than weekly; Not at all</p>
Vaping questions	<p>D27: How often, if at all, do you currently use electronic cigarettes? (Mark one response only)</p> <p>Daily; At least weekly (but not daily); At least monthly (but not weekly); Less than monthly; I used to use them, but no longer use; I only tried them once or twice; Never used</p>
Quitting questions	<p>D10. How often do you now smoke cigarettes, pipes or other tobacco products? (Mark one response only)</p> <p>Daily; At least weekly (but not daily); Less often than weekly; Not at all, but I have smoked in the last 12 months; Not at all and I have not smoked in the last 12 months</p> <p>D11: About what age were you when you last smoked?</p> <p>Age in years:</p>

**Canada: 2015 Canadian Tobacco, Alcohol and Drugs Survey (CTADS); sample size 15154 (ages 15+)**

Smoking questions	<p><b>SS_Q40:</b> Have you smoked at least 100 cigarettes in your life?</p> <p>Yes; No; RF; DK</p> <p><b>SS_Q10:</b> At the present time, do you smoke cigarettes every day, occasionally or not at all?</p> <p>Every day; Occasionally; Not at all; RF; DK</p>
Vaping questions	<p><b>ELC_Q110:</b> Have you ever tried an electronic cigarette, also known as an e-cigarette?</p> <p>Yes; No; RF; DK</p> <p><b>ELC_Q115:</b> At the present time, do you use an electronic cigarette, also known as an e-cigarette every day, occasionally or not at all?</p> <p>Every day; Occasionally; Not at all; RF; DK</p>
Quitting questions	<p><b>SC_Q010:</b> When did you stop smoking?</p> <p>Less than 1 year ago; 1 to 2 years ago; 3 to 5 years ago; More than 5 years ago; RF; DK</p>

**England: 2015 Opinions and Lifestyle Survey (OPN); sample size approximately 14500 (adults aged 16+)**

Smoking questions	<p><b>CigNow:</b> Do you smoke cigarettes at all nowadays?</p> <p>Yes; No; Ref/DK</p> <p><b>CigEver:</b> Have you ever smoked cigarettes regularly?</p> <p>Yes; No; Ref/DK</p>
Vaping questions	<p><b>EcgEver:</b> Have you ever used an electronic cigarette (e-cigarette)?</p> <p>No, I have never used one and I will not use one in the future; No, I have never used one but I might use one in the future; Yes, I have used one in the past but I no longer use one; Yes, I currently use one; I tried one, but did not go onto use it; I do not know what an e-cigarette is; Ref/DK</p>
Quitting questions (Smoking Toolkit Study)	<p><b>Q632A1:</b> Which of the following applies best to you?</p> <p>I smoke cigarettes (including hand-rolled) every day; I smoke cigarettes (including hand-rolled), but not every day; I do not smoke cigarettes at all, but I smoke tobacco of some kind; I have stopped smoking completely in the past year; I stopped completely more than a year ago; I have never been a smoker (i.e. smoked for a year or more).</p> <p><b>NEW70a1.</b> How old were you when you stopped smoking?</p> <p>Age in years:</p>

**United States: 2016 National Health Interview Survey (NHIS); sample size 33028 adults aged 18+**

Smoking questions	<p>SMKEV: Have you smoked at least 100 cigarettes in your ENTIRE LIFE?                  Yes; No; Refused; Don't know</p> <p>SMKNOW: Do you NOW smoke cigarettes every day, some days or not at all?                  Every day; Some days; Not at all; Refused; Don't know</p>
Vaping questions	<p>ECIGEV2: Have you ever used an e-cigarette even one time?                  Yes; No; Refused; Don't know</p> <p>ECIGCUR2: Do you now use e-cigarettes every day, some days, or not at all?                  Every day; Some days; Not at all; Refused; Don't Know</p>
Quitting questions	<p>SMKQTNO: How long has it been since you quit smoking cigarettes?                  (enter number)</p> <p>SMKQTTP: (enter time period) Day(s); Week(s); Month(s); Year(s); Refused; Don't know</p>

Table A4.2.2: Benchmarks for the user groups and former smoker subgroups for weights calibration

Percentages represent proportions within the target population of smokers, vapers, and former smokers. In these tables an *exclusive smoker* is a user of cigarettes but not vaping products; an *exclusive vaper* is an individual who vapes at least monthly but is not a current or former user of cigarettes; a *user of both* is an individual who smokes at least occasionally and vapes at least monthly.

**(a) Australia**

**Sources: Prevalences: 2016 National Drug Strategy Household Survey (NDSHS) Population: Quarterly Population Estimates (for Jun 2016) - Australian Bureau of Statistics**

User group	Former smoker subgroup	Calibration target	Percentage
Exclusive smoker	NA	2467761	70.3%
User of both	NA	93607	2.7%
Exclusive vaper	NA	37063	1.0%
Former smoker	<1 yr +Ecig	22993	0.7%
Former smoker	1-2 yrs +Ecig	9514	0.3%
Former smoker	<1 yr +no Ecig	647857	18.4%
Former smoker	1-2 yrs +no Ecig	230825	6.6%

**(b) Canada**

**Source: 2015 Canadian Tobacco, Alcohol and Drugs Survey (CTADS)**

User Group	Former smoker subgroup	Calibration target	Percentage
Exclusive smoker	NA	3105023	57.9%
User of both	NA	488784	9.1%
Exclusive vaper	NA	149584	2.8%
Former smoker	<1 yr +Ecig	57395	1.1%
Former smoker	1-5 yrs +Ecig	113486	2.1%
Former smoker	<1 yr +no Ecig	373151	7.0%
Former smoker	1-5 yrs +no Ecig	1073328	20.0%

**(c) England**

**Sources: 2015 Opinions and Lifestyle Survey (OPN) and Waves 117-122 (Jun-Nov 2016) of the Smoking Toolkit Study**

<b>User Group</b>	<b>Former smoker subgroup</b>	<b>Calibration target</b>	<b>Percentage</b>
Exclusive smoker	NA	6524983	58.8%
User of both	NA	1098356	9.9%
Exclusive vaper	NA	131240	1.2%
Former smoker	<1 yr +Ecig	434531	3.9%
Former smoker	1-5 yrs +Ecig	618021	3.7%
Former smoker	<1 yr +no Ecig	410341	5.6%
Former smoker	1-5 yrs +no Ecig	1877093	16.9%

**(d) United States**

**Source: 2016 National Health Interview Survey (NHIS)**

<b>User Group</b>	<b>Former smoker subgroup</b>	<b>Calibration target</b>	<b>Percentage</b>
Exclusive smoker	NA	33900369	62.8%
User of both	NA	4208571	7.8%
Exclusive vaper	NA	1701853	2.4%
Former smoker	<1 yr +Ecig	285862	2.1%
Former smoker	1-5 yrs +Ecig	1567634	2.1%
Former smoker	<1 yr +no Ecig	1426451	9.0%
Former smoker	1-5 yrs +no Ecig	8802801	13.8%

## Appendix 5. 4CV1 Standard terminology and definitions for academic publications (Final Version: 12 Oct 2018)

This document provides standard terms for use in the P01 Supplement and other manuscripts using 4CV1 data. The terms were determined in consensus by the 4CV1 investigator team.

Recommended main terms are in **bold**; optional qualifiers are in **square brackets**. Needed qualifiers may be omitted after first use if this intention is stated.

For complete clarity, all terms for products, product classes, and user groups should be defined in a paper when first used. Where an intended classification does not match the definition for one of the recommended main terms, another explicit term should be used and carefully defined.

Concept (products)	Main term	Definitions	Comments
Cigarette	<b>Cigarette [roll-your-own or RYO, factory made or FM]</b>	Traditional cigarette made with tobacco, roll-your-own or factory made.	The term is unlikely to require the use of the “conventional” or “traditional” qualifier as the term “e-cigarette” will no longer be used routinely in papers (except where explicitly describing questions which include it, or in defining a NVP).

Concept (products)	Main term	Definitions	Comments
Device to deliver substance in vapour or aerosol form for inhaling.	<b>Vaping device</b>	A device, sometimes called a vaporizer or personal vaporizer, designed to produce from a liquid (called a vaping liquid) a vapour or aerosol for inhaling. This definition includes disposable e-cigarettes, rechargeable cartridges or pods which liquids, tank devices; they can be open or closed systems; the liquid may or may not contain nicotine.	Preferred term for the devices. Please do not use if you intend to include heated tobacco products. Alternative not preferred is “vaporizer”.  Do not use the term “e-cigarette” or the like except in the context of defining vaping device or NVPs.
	<b>Nicotine vaping product (NVP)</b>	A vaping device or vaporizer delivering nicotine in the vapour or aerosol.	The word “product” here and later is being used to refer to the combination of the device and the substance(s) it contains; i.e. where the focus is on the functional use, rather than on the physical device.  Only use where the products are known to contain nicotine.
	<b>Cigalike</b>	A vaping device designed to resemble a cigarette.	Use only if necessary. Use another term such as “tobacco stick” or “heated cigarette” for something like a Heets stick.
	<b>Electronic nicotine delivery system (ENDS)</b>	An electronic or battery operated device designed to deliver an inhaled dose of nicotine or other substances; not for Nicotine Replacement Therapy.	ENDS could refer to NVPs or HTPs – but FCA says not. (See second Appendix.) Avoid using this term if possible.
	<b>Heated tobacco product (HTP)</b>	Products that heats tobacco but to a lower temperature than needed for combustion, to deliver an aerosol for inhaling; used in combination with a quantity of solid tobacco, either in a cigarette-like form or in some kind of pod.	Term “heat-not-burn” is not advised for use. If using the term HTP, you may want to give at least one example product.

Concept (products)	Main term	Definitions	Comments
Practice of using a vaping device	<b>Vaping</b> <b>Nicotine vaping</b>	Use of a [personal] vaporizer or vaping device. Use of a vaping device containing nicotine.	Does not apply to use of HTPs. "Vaping" can be used for nicotine vaping if it is previously clear that only nicotine vaping is being considered. For non-nicotine vaping, the qualifier "non-nicotine" should always be used. "Vaping" alone can also be used when it is made clear the reference is to either vaping with nicotine or more generally vaping regardless of specific content.
User of a vaping device	<b>Vaper</b> <b>Nicotine vaper</b>	Someone who uses a vaping device, with or without nicotine. Someone who uses a vaping device with nicotine.	"Vaper" can be used for nicotine vaper if it is previously clear that only nicotine vaping is being considered. "Vaper" alone can also be used when it is made clear the reference is to vaping with or without nicotine or the context clearly implies it is with nicotine.
The substance produced by vaping	<b>Vapour</b>	The substance produced by vaping.	On first introduction of the term it may be better to say "aerosol, commonly referred to as vapour". Use only when referring to NVPs, not when referring to HTPs. We don't yet have consensus on a term for the emissions of HTPs, but would like to avoid "vapour" if possible.
The liquid used in vaping	<b>[Nicotine] vaping liquid</b>	The liquid used for vaping.	Commonly called e-liquid, but not a particularly useful term. Recommend we avoid the term "e-liquid". Can be qualified by core constituent; e.g. "nicotine vaping liquid" or "nicotine liquid" where it can be inferred readily that the liquid is for vaping.

Concept (products)	Main term	Definitions	Comments
Therapeutic nicotine	<b>Nicotine replacement therapy (NRT)</b>	An approved nicotine therapy.	Do not describe vaping as NRT unless it becomes an approved medicine (and only for the forms that are approved medicines).
All potentially harm reduced products	<b>Alternative nicotine product (ANP)</b>	All potentially harm reduced nicotine products when in a context of possible use outside approved therapeutic use; includes all vaping and any recreational or long-term non-therapeutic use for NRT; includes recreational oral nicotine products like Zyn; may include clean smokeless tobacco.	Where important, make it clear if recreational use of NRT is included. Or specifically excluded. “Clean smokeless tobacco” if included should be defined through examples.
All combusted tobacco products	<b>Smoked tobacco</b>	Products in which tobacco is burned to produce smoke for inhaling; includes cigarettes, cigars, bidi, pipes, some shisha devices.	Some shisha devices do not burn the tobacco (also ANPs like Eclipse), but use a carbon coal to heat it to release the desired nicotine and flavours. If the intention in using the term “smoked tobacco” is to include all shisha, this should be stated. For now, do not take this term to include HTPs. There is a discussion starting on whether certain products such as some HTPs should be included as combusted (as there is some combustion), or heated (as the intent is not to combust the tobacco).
Smokeless tobacco used orally	<b>Oral tobacco</b>	Tobacco products in which tobacco leaf or powder is put into the mouth; includes snus, oral snuff, chewing tobacco.	Recommend use “oral” instead of “smokeless” to avoid confusing chew and oral snuff with HTPs. Any use to include nasal snuff should mention nasal snuff explicitly.
Combined market for combusted tobacco and other nicotine delivery products	<b>Nicotine market</b>	The consumer market for all nicotine delivery products, including cigarettes, other combusted tobacco products, smokeless tobacco, NVPs, HTPs and NRT.	Could be qualified with “recreational” or “therapeutic” where a distinction is important.

Concept (products)	Main term	Definitions	Comments
Exposure of others	<b>Secondhand vapour</b>	Effluent exhaled or emitted during vaping.	“Secondhand aerosol” would seem more correct than “secondhand vapour” because generally particles are present as well as the gaseous component. However, it may be reasonable to use “secondhand vapour” with suitable qualification.
	<b>Passive vaping</b>	Inhaling secondhand vapour.	Either term “secondhand vapour” or “passive vaping” can be used depending on whether focus is on the effluent or on its inhalation.

Concept (user types)	Main term	Definitions	Comments
Cigarette smoker (definitions consistent with terminology in 4CV1/2 questionnaires)	<b>Current smoker</b>	Someone who has smoked at least 100 cigarettes in lifetime, and currently smokes at least monthly. Corresponds to FR225 = 1-2 or FR225 = 3 and BI345 = 1. (Appendix 1)	This definition of current smoker is in line with the eligibility criterion for being recruited as a smoker in the ITC 4C surveys, and seems to be preferred as the meaning of “current smoker” by several of the commenters. In 4CV1, corresponds to FR225 = 1-2 or FR225 = 3 and BI345 = 1. (100 cigarettes was confirmed only if the respondent smoked monthly or less frequently.)  The eligibility criterion for 4CV1 was to be smoking daily, weekly, monthly or “at least occasionally”, corresponding to FR309v = 1-3. The word “occasional” need only be used when describing the eligibility criteria.  The terms “occasional use” or “occasional user” are not advised for use.
	<b>Daily smoker</b>	A current smoker who currently smokes daily. Corresponds to FR309v = 1 (Appendix 1)	
	<b>Non-daily smoker</b>	A current smoker who does not smoke daily.	
	<b>Weekly smoker</b>	A current smoker who smokes at least weekly but not daily. Corresponds to FR309v = 2 (Appendix 1)	
	<b>Monthly smoker</b>	A current smoker who smokes at least monthly but not weekly. Corresponds to FR225 = 3 and BI345 = 1 (Appendix 1)	

Concept (user types)	Main term	Definitions	Comments
Users of both cigarettes and NVPs	<b>Concurrent user</b>	Someone who both vapes nicotine and smokes at least monthly	<p>This term is introduced to remove confusion created by reserving “dual user” to describe someone with daily use of both NVPs and cigarettes. See Borland dual use paper for explanation. You will need to define it when first used as it is not currently understood. Concurrent use also only refers to using two sources of nicotine.</p> <p>Not included in these definitions are respondents who reported using either product less than monthly. They are not treated as current users</p> <p>Also not included are respondents who use vaping devices without nicotine. Groups like these may be given names (which should be defined carefully) specific to their contexts. “Predominant use” will need to be defined before using it.</p> <p>NB: Concurrent use of smoking and HTP and HTP and NVPs will need to be dealt with at some point.</p>
	<b>Dual daily user</b>	Someone who smokes daily AND uses NVPs daily.	
	<b>Concurrent non-daily user</b>	Someone who smokes weekly or monthly AND uses NVPs weekly or monthly but not daily.	
	<b>Predominant smoker</b>	Someone who smokes daily but uses NVPs weekly or monthly but not daily.	
	<b>Predominant vaper</b>	Someone who vapes nicotine daily but smokes weekly or monthly but not daily.	

Concept (user types)	Main term	Definitions	Comments
User of a vaping device	<b>Vaper</b>	Someone who uses a vaping device, with or without nicotine.	<p>Vaping at least weekly was the eligibility criterion to be recruited in 4CV1 as a vaper. Qualify by preceding “vaper” with “nicotine” if referring to vaping nicotine and this is not clear.</p> <p>If using the term “current vaper” please use it for someone who vapes nicotine at least monthly and define it as such.</p> <p>At some point we might like to redefine “experimental” to also include past users who are open to trying again.</p> <p>“Ever vaper” will generally be used as an inclusion criteria, or as “only ever tried” to distinguish those who have only ever tried “once or twice” from experimental vapers.</p>
	<b>Daily [nicotine] vaper</b>	A vaper who uses a VNP daily.	
	<b>Weekly [nicotine] vaper</b>	A vaper who uses a VNP at least weekly, but not daily.	
	<b>Non-daily [nicotine] vaper</b>	A vaper who uses a VNP less often than daily, but at least monthly.	
	<b>Experimental vaper</b>	Someone who uses a VNP less often than monthly.	
	<b>Ever vaper</b>	Someone who has tried vaping at least once.	
User of a HTP	<b>User of HTP[s]</b>	Someone who uses a HTP or HTPs.	<p>Do not use “vaper” for user of HTP. Please only use “user of HTP” or in full without abbreviation if you need to mention users of HTPs. Or “HTP user”.</p>

Concept (user types)	Main term	Definitions	Comments
Former smoker	<b>Former smoker</b>	Someone who has smoked at least 100 cigarettes in lifetime, and is no longer smoking cigarettes.	Qualification with recent and long-term as yet unquantified, but the advice is not to use “recent” for anything more than 6 months or “long term” for anything less than 1 year if possible. Having quit within the previous two years is an eligibility criterion for our study, so we will often be dividing smokes as quit for > or < 2 years.
	<b>Quit within the previous two years</b>	The state of being a former smoker who at the time of the interview had quit within the previous two years.	
Former vaper	<b>Former [nicotine] vaper</b>	Someone who vaped at least weekly in the past but currently does not vape.	Deliberate use of different term than for smoking, as all past use is much shorter than for smoking and few have quit vaping after developing a vaper lifestyle. We may eventually want to differentiate former daily from former non-daily vapers. Try not to use “former NVP user”. Should be restricted to nicotine vaping, unless it is made clear it is either or non-nicotine.
	<b>Recent former [nicotine] vaper</b>	Someone who used NVPs in the past but has stopped doing so within the previous 2 years (or 24 months).	
Daily nicotine user	<b>Daily nicotine user</b>	Someone who uses a nicotine-containing product daily.	Whether or not to include NRT as a nicotine-containing product could depend on the context.

Table A5.1: Cigarette screening variables FR225, BI345, QA439, and FR309v from the ITC 4CV1 Survey.

Varname	4CV1 Survey Questions
FR225	<p><b>Ask all.</b></p> <p>How often, if at all, do you CURRENTLY smoke ordinary cigarettes (either factory-made/packet or roll-your-own)?</p> <ol style="list-style-type: none"> <li>1 Daily</li> <li>2 Less than daily, but at least once a week</li> <li>3 Less than weekly, but at least once a month</li> <li>4 Less than monthly, but occasionally</li> <li>5 Not at all; I've quit smoking completely</li> <li>6 Not at all; I've never been a smoker</li> <li>8 Refused</li> <li>9 Don't know</li> </ol> <p><i>This is an essential question that will help to determine your eligibility. Please do your best to answer. If you can't or don't wish to answer this question, you will not be able to continue.</i></p> <p><b>If response=1, 2 or 6, go to FR309v.</b></p> <p><b>If response=3, 4 or 5, go to BI345.</b></p> <p><b>If response=8 or 9, go to BI473, then BI904. (DC: if In4C=1 then C-B11.5; if In4C=2 then P-C11.5)</b></p>
BI345 [A]	<p><b>Ask if (FR225=3, 4 or 5) and [(In4C=2) or (In4C=1 and country=US)].</b></p> <p><b>If (In4C=1 and country=CA, AU or UK), then BI345 is not asked and will be set=1.</b></p> <p>Have you smoked 100 or more cigarettes over your lifetime?</p> <ol style="list-style-type: none"> <li>1 Yes</li> <li>2 No</li> <li>8 Refused</li> <li>9 Don't know</li> </ol> <p><i>100 cigarettes= 5 packs of 20 cigarettes OR 4 packs of 25 cigarettes.</i></p> <p><i>This is an essential question that will help to determine your eligibility. Please do your best to answer. If you can't or don't wish to answer this question, you will not be able to continue.</i></p> <p><b>If response=8 or 9, go to BI473, then BI904. (DC: if In4C=1 then C-B11.5; if In4C=2 then P-C11.5)</b></p>

Varname	4CV1 Survey Questions
QA439	<p><b>Ask if FR225=5.</b></p> <p>How long ago did you quit smoking?</p> <ul style="list-style-type: none"> <li>01 Less than 1 week ago</li> <li>02 1-2 weeks ago</li> <li>03 3-4 weeks ago</li> <li>04 1-3 months ago</li> <li>05 4-6 months ago</li> <li>06 7-12 months ago</li> <li>07 1-2 years ago</li> <li>08 2-3 years ago</li> <li>09 3-5 years ago</li> <li>10 More than 5 years ago</li> <li>88 Refused</li> <li>99 Don't know</li> </ul> <p><i>This is an essential question that will help to determine your eligibility. Please do your best to answer. If you can't or don't wish to answer this question, you will not be able to continue.</i></p> <p><b>If response=88 or 99, go to BI473, then BI904. (DC: if In4C=1 then C-B11.5; if In4C=2 then P-C11.5)</b></p>
FR309v	<p>(Derived variable for all respondents -- cigarette smoking status, to be used in question filters throughout survey.)</p> <ul style="list-style-type: none"> <li>1 Current Daily Smoker (FR225=1)</li> <li>2 Current Weekly Smoker (FR225=2)</li> <li>3 Current Occasional/&lt; weekly Smoker (FR225=3-4 AND BI345=1)</li> <li>4 Recent Quitter: Quit in last 24M AND has smoked 100+ lifetime cigs (FR225=5 AND BI345=1 AND QA439=1-7)</li> <li>8 Long-term Quitter: Quit more than 24M ago AND has smoked 100+ lifetime cigs (FR225=5 AND BI345=1 AND QA439=8-10)</li> <li>9 Non-Smoker: Has never been a smoker OR has not smoked 100+ lifetime cigs. (FR225=6 or BI345=2)</li> </ul>

Table A5.2: Definitions from official websites (as of October 12, 2018)

Organization	Terminology and definition(s)
<p><b>Campaign for Tobacco-Free Kids</b></p>	<p><b>Heated tobacco products (HTPs)</b> are those that produce aerosols containing nicotine and other chemicals, which are inhaled by users through the mouth. They contain the highly addictive substance nicotine (in the tobacco), which makes them addictive. They also contain non-tobacco additives, and are often flavoured. HTPs mimic the behaviour of conventional cigarette smoking, and some make use of specially designed cigarettes to contain the tobacco for heating.  <a href="http://www.who.int/tobacco/publications/prod_regulation/htps-marketing-monitoring/en/">http://www.who.int/tobacco/publications/prod_regulation/htps-marketing-monitoring/en/</a></p> <p>The term “<b>electronic cigarettes</b>” covers a wide variety of products now on the market, from those that look like cigarettes or pens to somewhat larger products like “personal vaporizers” and “tank systems.”  <a href="https://www.tobaccofreekids.org/assets/factsheets/0394.pdf">https://www.tobaccofreekids.org/assets/factsheets/0394.pdf</a></p> <p><b>Juul</b> and other devices, referred to as “pod systems” or “closed vapor systems” or “pod-based products”— also some interesting info on new systems that have come out:  <a href="https://www.tobaccofreekids.org/assets/images/content/2018_07_18_New_Ecigs_Post_Juul.pdf">https://www.tobaccofreekids.org/assets/images/content/2018_07_18_New_Ecigs_Post_Juul.pdf</a></p>
<p><b>Framework Convention Alliance</b></p>	<p><b>Heated Tobacco Products:</b> HTPs work by heating tobacco at a lower temperature than conventional cigarettes to produce an aerosol that contains nicotine and other chemicals that is inhaled by the user. HTPs should not be confused with <b>electronic nicotine delivery systems (ENDS)</b>, which are a separate and distinct category of products that do not use leaf tobacco. HTPs are composed of two elements – the sticks or pods that contain the tobacco and the device used to heat the tobacco. For each product, these two elements are indivisible such that one cannot be used without the other.  <a href="https://www.fctc.org/wp-content/uploads/2018/09/FCACOP8Brief_HTPs_EN.pdf">https://www.fctc.org/wp-content/uploads/2018/09/FCACOP8Brief_HTPs_EN.pdf</a></p> <p><b>For ENDS see</b> <a href="https://www.tobaccocontrollaws.org/litigation/browse/tobacco-type/">https://www.tobaccocontrollaws.org/litigation/browse/tobacco-type/</a></p>
<p><b>Philip Morris International</b></p>	<p><b>E-cigarettes</b>, also called electronic cigarettes, are a popular smoke-free category of products without tobacco. These battery-powered devices vaporize a liquid solution that contains nicotine and/or flavors, also known as an e-liquid.  <a href="https://www.pmi.com/glossary-section/glossary/e-cigarettes">https://www.pmi.com/glossary-section/glossary/e-cigarettes</a></p> <p><b>Heat-not-burn products</b>, also known as heated tobacco products, only heat tobacco. The heating process generates a flavorful nicotine-containing vapor. And since the tobacco does not burn, the levels of harmful chemicals are significantly reduced compared to cigarette smoke.  <a href="https://www.pmi.com/glossary-section/glossary/heat-not-burn-products">https://www.pmi.com/glossary-section/glossary/heat-not-burn-products</a></p>

Organization	Terminology and definition(s)
<p style="text-align: center;"><b>Juul</b></p>	<p>A <b>JUULpod</b> is the cartridge that clicks into the top of the JUUL device. <b>JUULpods</b> contain a proprietary salt-based nicotine e-liquid formula, which is mixed under strict quality-controlled processes.  <a href="https://www.juul.ca/our-technology">https://www.juul.ca/our-technology</a></p>
<p style="text-align: center;"><b>US Centers for Disease Control</b></p>	<p>New and Emerging Tobacco Products: Considerations for Epidemiology and Surveillance  <b>‘Heat-not-burn’ tobacco products</b> heat tobacco sticks or capsules to produce an aerosol or ‘vapor.’ They are different from <b>electronic vapor products such as e-cigarettes</b>, which heat a liquid to produce an aerosol or ‘vapor.’  <a href="http://www.tacenters.emory.edu/documents/netconference_docs/SE2018/0628218_slides_EvaluationEmergingTopics">http://www.tacenters.emory.edu/documents/netconference_docs/SE2018/0628218_slides_EvaluationEmergingTopics</a></p>
<p style="text-align: center;"><b>Leave the Pack Behind</b></p>	<p><b>Heat-not-burn tobacco products.</b> The electronic devices aerosolize tobacco that can be inhaled without combustion either directly by heating up cigarette-like tobacco sticks or indirectly by heating up a liquid that passes through tobacco capsules. <b>Vapes</b> use e-juice (containing chemicals, flavourings and often nicotine), whereas <b>heat-not-burn tobacco products</b> use tobacco or tobacco capsules (containing chemicals and nicotine).  <a href="https://leavethepackbehind.org/heat-not-burn-tobacco-products/">https://leavethepackbehind.org/heat-not-burn-tobacco-products/</a></p>