

Consistent Demographic Patterns in Cannabis Use Across Canada May Positively Correlate to High Frequency Use*

Understanding Cannabis Usage in Canada: An analysis of the 2021 Canadian Tobacco and Nicotine Survey (CTNS)

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The widespread use of tobacco, vaping, and cannabis in Canada has been an ongoing public health concern given their commonly associated negative health impacts including respiratory issues, impaired cognitive development, and addiction. To gain a deeper understanding of the factors driving usage rates for cannabis specifically, this paper aims to investigate the relationship between demographics such as gender and region, versus consumption method and frequency in Canada. By utilizing the data from Statistics Canada, we found that young adults and males are more likely to use cannabis products with higher usage rates in certain regions of Canada. The implications and possible solutions for addressing high usage rates are also discussed.

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*Code and data are available at: <https://github.com/emilykimto/CTNS-analysis.git>

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1 Introduction

In 2018, the Canadian government led by Prime Minister Justin Trudeau, made the landmark decision to legalize the use of marijuana after a century of prohibition. While this move was praised as a step towards progressive drug policy by some, others expressed concerns about the potential negative effects on public health. Of particular concern was the potential increase in cannabis usage rates among the general population, especially young adults who would be at a higher long-term risk of negative health outcomes similar to those associated with tobacco, such respiratory issues, impaired cognitive development, and addiction.

In light of this recent legalization and the still ongoing research surrounding the effects of marijuana, I analyzed data from the 2021 Canadian Tobacco and Nicotine Survey (CTNS) obtained from Open Government Data of Statistics Canada to uncover the demographic that would be the most impacted by any negative health effects of cannabis products. To gain a more comprehensive understanding of what factors drive usage rates, I explore the estimand, how does user characteristics such as age, gender, and region correlate with cannabis consumption methods (smoking, vaping, taking edibles) and their respective frequencies of usage in Canada.

I will first discuss the source of our data, its biases, and review the CTNS sampling and key features. Then, I will create a model and discuss analysis results to identify the demographic patterns of cannabis usage in Canada, cannabis product type, and consumption frequency to discuss potential underlying user behaviour and motivations. Finally, I discuss the implications of the findings and possible solutions as to how public policy can better tackle the ongoing phenomenon of increasing substance use, as well as the weaknesses and future steps of this paper.

2 Data and Methods

2.1 Data Management

This paper utilizes the R statistical programming language (R Core Team 2020), along with packages tidyverse (Wickham et al. 2019), here (Müller 2020), janitor (Firke 2021), and dplyr (Wickham et al. 2022). The figures in this paper have been created using ggplot2 (Wickham 2016) and the tables have been created using knitr (Xie 2023) and kableExtra (Zhu 2021). The color styles in graphs have been created using the RColorBrewer packages (Neuwirth 2022).

2.2 Source

This paper uses data extracted from the Public Use Microdata File (PUMPF) for the 2021 Canadian Tobacco and Nicotine Survey (CTNS). The CTNS is a national survey conducted by Health Canada to collect information about the prevalence of cigarette smoking, vaping, and cannabis use in Canada. Until 2017, Statistics Canada administered the Canadian Tobacco, Alcohol and Drugs Survey (CTADS), which gathered information on the use of tobacco, alcohol, and drug use across Canada (Canada 2022b). However, in 2019, the Canadian Alcohol and Drugs Survey (CADS) was carried out specifically to collect data on alcohol and drug use, separately from the Canadian Tobacco and Nicotine Survey (CTNS), which is focused mainly on gathering data on tobacco and nicotine use, including cannabis (Canada 2022b).

The PUMPF is a dataset that contains anonymized, individual-level data from the CTNS (Canada 2022b). It is a subset of the full survey dataset that involves balancing the preservation of respondent confidentiality and providing the most useful data which is then made available to researchers and analysts who require access to detailed information on tobacco, nicotine, and cannabis use in Canada (Canada 2022b). The CTNS PUMF includes information on a wide range of variables, including frequency of use, attitudes and beliefs, and use of cessation aids (Canada 2022b). It also includes demographic variables such as age, gender, and province of residence (Canada 2022b).

Data collection for the 2022 reference period was conducted from December 1, 2020 to May 3, 2021, and was gathered directly and voluntarily from survey respondents either through an electronic questionnaire (EQ) or through CATI (computer- assisted telephone interviewing) (Canada 2022a). The 2021 CTNS electronic questionnaire was developed in consultation with Health Canada, and underwent a process of cognitive testing through in-depth interviews conducted by Statistics Canada’s Questionnaire Design Resource Centre to test the survey content in both of Canada’s official languages (Canada 2022a).

2.3 Sampling

The CTNS is designed to provide a comprehensive picture of tobacco, nicotine, and cannabis use, attitudes, and behaviours among non-institutionalized Canadians ages 15 years and older who are not members of collectives or living on reserves (Canada 2022a). The survey has a stratified sample and cross-sectional design with sampling units: individuals aged 15 to 24 and individuals aged 25 and older (Canada 2022a). For the former (individuals aged 15 to 24), the CTNS sample has a one-stage design, and the individual is the sampling unit (Canada 2022a). For the latter (individuals aged 25 and older), the CTNS sample has a two-stage design where the sampling unit for the first stage is the dwelling, and the sampling unit for the second stage is the individual (Canada 2022a). The CTNS used different methods for stratification. For those aged 15 to 24, the sample was stratified by age group and province, with a systematic sample selected independently for each group (Canada 2022a). For those aged 25 and older, the sample was stratified by province and a simple random sample of dwellings was selected (Canada 2022a). In terms of sampling and subsampling, the survey allocated samples to produce province-level and region-level estimates for the age groups. The initial sample size was 12,000 individuals aged 15-24 and 15,000 dwellings for those aged 25 and older (Canada 2022a). The survey sent an initial sample of 27,000 dwellings or individuals for collection (Canada 2022a).

2.4 Key Features

This paper investigates the relationship between demographic factors and cannabis use in Canada. More specifically, it explores the estimand, how does characteristics such as user age, gender, and region correlate with cannabis consumption methods (smoking, vaping, taking edibles) and their respective frequencies of usage in Canada. The variables I selected for my analysis can be seen in Table 1.

Table 1: Variable Descriptions

Variable	Variable Description
AGEGROUP	Age group of person
GENDER	Gender of person
PROV_C	Province of residence (collection)
CAN_10AR	Frequency smoked cannabis - past 30 days
CAN_25AR	Frequency vaped cannabis - past 30 days
CAN_17R	Frequency consumed edibles - past 30 days

The variables were measured using answer categories, which are as follows:

- AGEGROUP: 15 to 19 years old, 20 to 24 years old, 25 to 34 years old, 35 to 44 years old, 45 to 54 years old, 55 to 64 years old, 65 years old and older.
- GENDER: Male, Female, Not stated.

- PROV_C: Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia.
- CAN_10AR: Daily, Less than daily but at least once a week, Less than once a week but at least once in the past month, Not at all, Valid skip, Not stated.
- CAN_25AR: Daily, Less than daily but at least once a week, Less than once a week but at least once in the past month, Not at all, Valid skip, Not stated.
- CAN_17R: At least once in the past 30 days, Not at all, Valid skip, Not stated.

2.5 Bias and Ethics

The 2021 Canadian Tobacco and Nicotine Survey (CTNS) dataset is a valuable resource for understanding smoking habits and attitudes in Canada. However, it is important to consider the ethical and bias implications of the survey.

When it comes to online surveys that rely on voluntary participation from respondents, it's important to ensure that the survey is designed in an ethical manner, meaning that questions are phrased neutrally and not leading, and that respondents are not coerced into participating. To avoid this, the questionnaire underwent cognitive testing through in-depth interviews in both of French and English, conducted by Statistics Canada's Questionnaire Design Resource Centre (Canada 2022a). In addition, since participation is voluntary, there may be some bias in the data, as certain individuals or groups may be more likely to respond than others. This can result in a skewed sample that doesn't accurately reflect the population being studied. To address this, the 2021 CTNS implemented a variety of strategies to increase the representation of the sample and minimize potential biases. First, the CTNS used a stratified random sampling method to select participants from all Canadian provinces and territories, ensuring that the sample was diverse and reflective of the Canadian population (Canada 2022a). Additionally, the survey was available in both English and French and used a mix of online and phone surveys to reach a broad range of participants (Canada 2022a).

3 Model

Through exploratory analysis, I discovered a correlation between the gender variable and frequency of smoking cannabis. The relationship appears to be linear as the figures generally demonstrate increasing trends. This also aligns with a 2017 featured research article published the Canadian Institutes of Health Research, in which men were identified as more likely to use cannabis recreationally (Gender and Health 2017). The gender influence continues as the article reported a higher probability for women to consume edible products while men reported more smoking, vaporizing, and use of hash concentrates and oils along with higher rates of use overall (Gender and Health 2017).

To further proceed with the analysis and predict the future situation regarding gender and cannabis use via smoking method, I will create a simple linear regression model. In the model,

gender will be the predictor variable and cannabis use via smoking method the response variable. One important aspect to note is that this simple linear regression only accounts for the relationship between the two chosen variables and does not account for other variables that may also be influencing the response variable.

4 Results

When looking at Figure 1, we can see that the majority of respondents identified as male or female with a small portion as “not stated” Among male respondents, there was a higher frequency of smoking cannabis compared to female respondents with a significant, visible difference in “Daily” and “Less than daily but at least once a week” usage. This trend holds true across all answer categories, with higher rates of cannabis use via smoking method among males compared to females aside from the least frequency response “Less than once a week but at least once in the past month”, which may correlate to the aforementioned article in which women tend to use cannabis for medicinal uses whereas males more often use cannabis for recreational purposes.

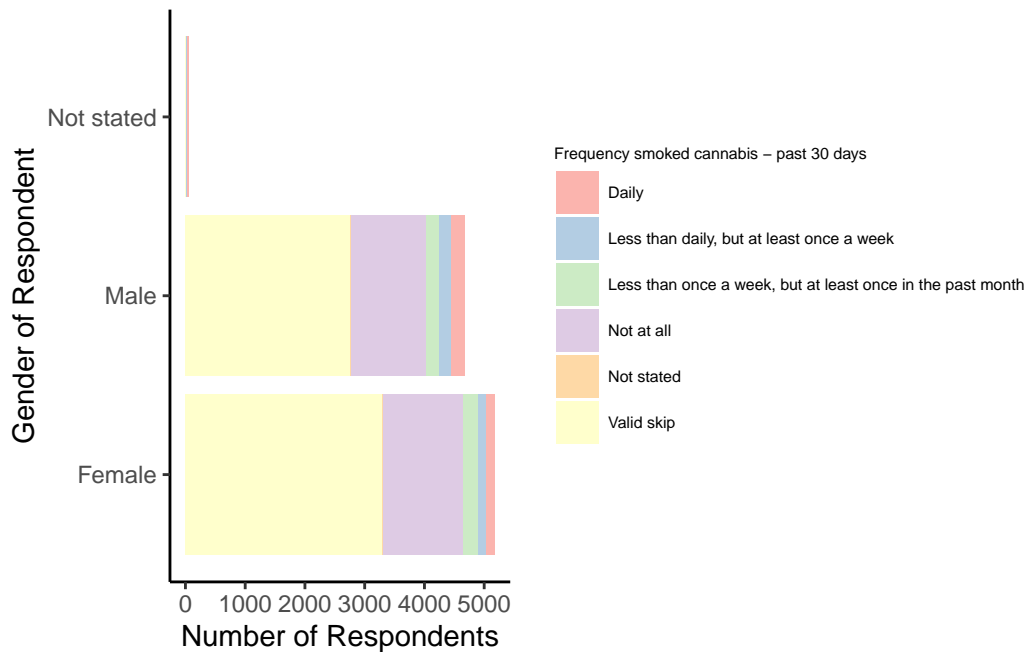


Figure 1: Frequency smoked cannabis - past 30 days against Gender

Figure 2 further highlights the trend of higher cannabis usage through smoking and vaping among male respondents compared to their female counterparts. Notably, the data shows a

significant difference between the genders in terms of the “not at all” category for cannabis vaping, indicating that more male respondents prefer smoking over vaping.

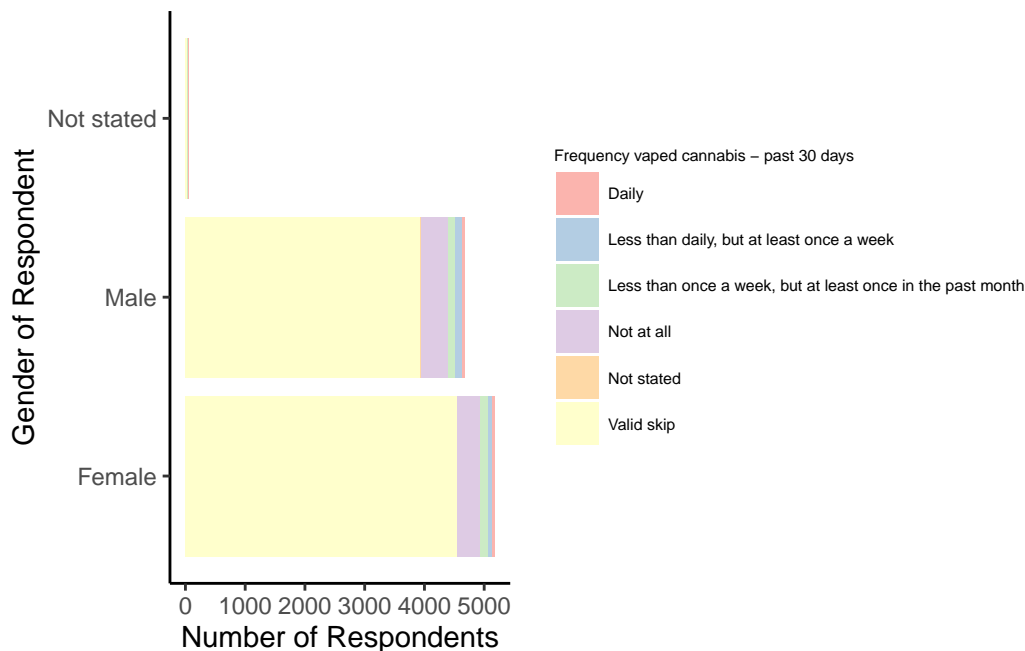


Figure 2: Frequency vaped cannabis - past 30 days against Gender

Figure 3 depicts a large number of respondents indicating a valid skip, with a larger proportion being females, as with the other figures. The graph also further demonstrates the consistent trend of males engaging in more cannabis use, with more males consuming edibles more frequently than their female counterparts.

In Figure 4, we can see that the top two provinces with the highest number of respondents are Ontario and Quebec. Interestingly, the number of male and female respondents in these provinces are almost equally represented, which seemingly contrasts the initial hypothesis that there would be more male cannabis users. However, it is important to note that the graph displaying the relationship between gender and province of residence is affected by the presence of factors like valid skips and not stated responses which accounted for a significant portion of the survey answers, as shown in the earlier figures. On the other end of the spectrum, the survey has the lowest number of respondents from Newfoundland and Labrador and New Brunswick.

Figure 5 demonstrates the top three age groups with the highest number of respondents, namely 20 to 24 years old, 15 to 19 years old, and 65 years and older. These results allude to the broader societal trends in which the higher number of younger respondents may be due to the fact that cannabis use has become increasingly normalized and socially accepted among younger generations. On the other hand, the higher number of older respondents may

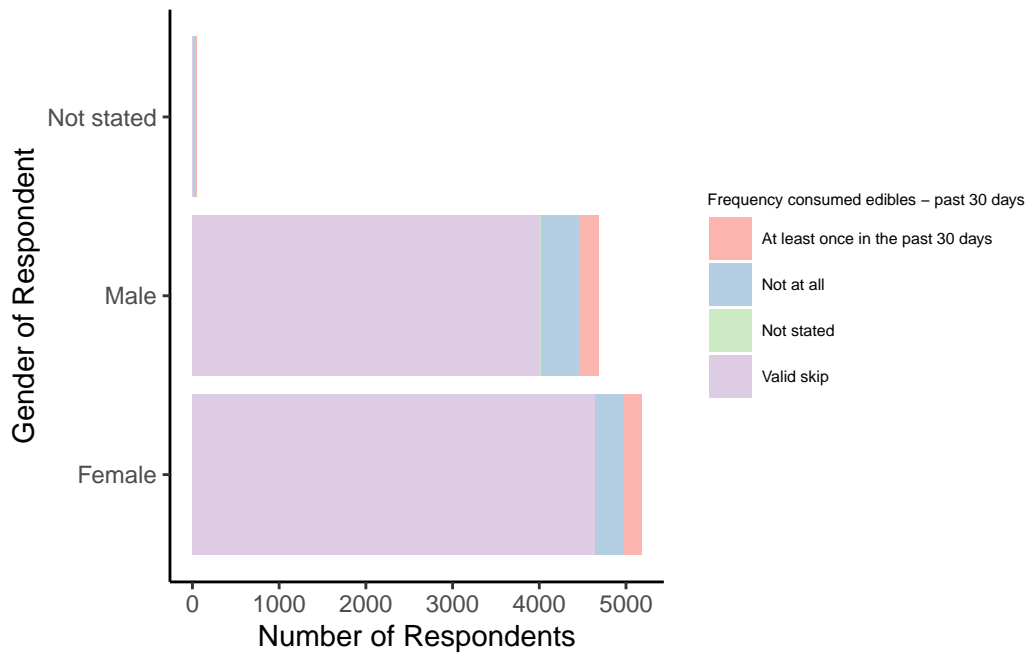


Figure 3: Frequency consumed edibles - past 30 days against Gender

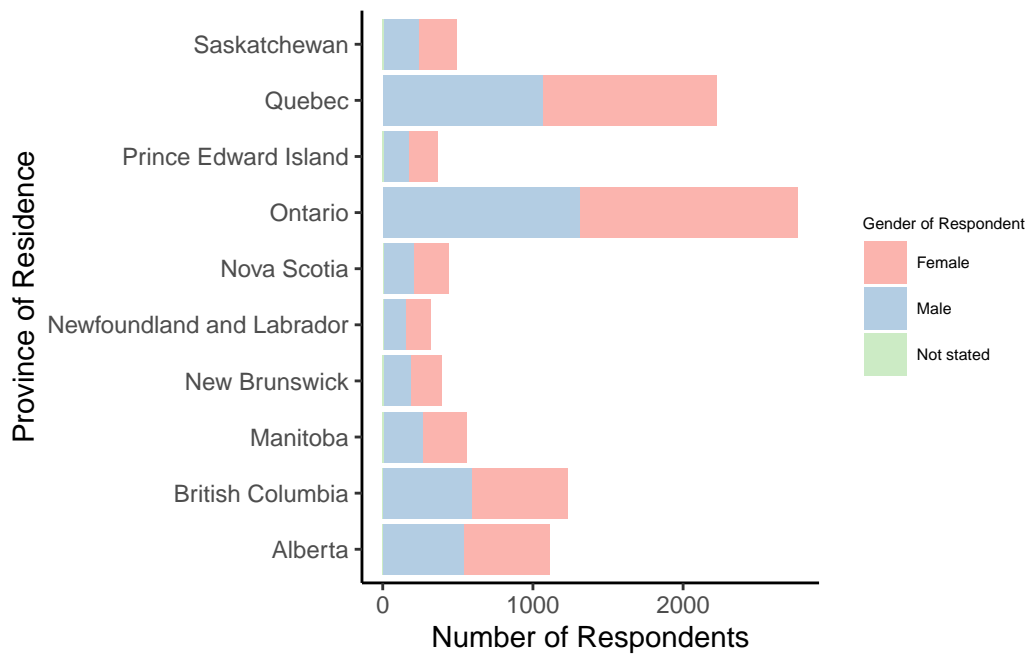


Figure 4: Gender against Province

be attributed to the fact that cannabis use has become more widely accepted for medicinal purposes, leading to an increase in use among older adults. In terms of the ratio of male and female respondents within these age groups, it is also equal to that of Figure 4. Furthermore, it is important to note that the previous figures revealed a trend of more male respondents reporting cannabis usage via smoking, vaping, and consuming edibles. This indicates that the prevalence of cannabis use may be higher among males across all age groups.

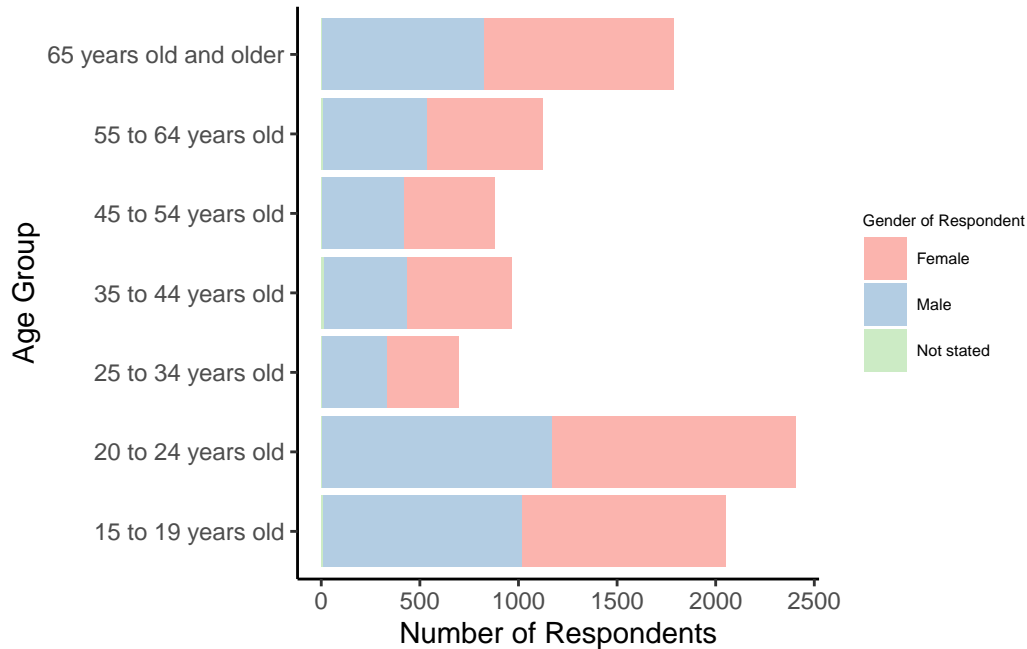


Figure 5: Gender against Age Group

5 Discussion

5.1 The Demographic Patterns of Cannabis Usage across Canada

5.2 Why do Canadians use cannabis?

Data - cannabis product types and their consumption frequency.

Discuss potential underlying user behaviour and motivations.

5.3 Weaknesses and Next Steps

Discuss implications and possible solutions

A Appendix

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