How Socioeconomic Factors Affect Average Age of First Birth in Canada*

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Abstract

The average age for having a first child has recently shifted from the early 20s to late 20s. This paper investigates potential factors to research the likelihood of having children at an early age depending on gender, education level, occupation, income, and mental health. Whereas women are more likely to have their first children at earlier stages than men, education, occupation types, and income are other variables that impact individuals to have their first child in later stages of their lives. It is crucial to assess the underlying factors of this changing trend for further application in the labor market and potential upcoming health outcomes for women.

Contents

1 Introduction

The trend of having children at an early age has been shifted within the last couple of decades. According to Statistics Canada, the average age of mothers having their first children has been steadily increasing since the mid-1960s (Government of Canada 2018b). People also prefer to have fewer children overall and the most frequent average age for people to have their first child has shifted from the early 20s to early 30s. As a result, the period for childbearing has shortened with time as women choose to have fewer children in a shorter period in their life (Government of Canada 2018a). There are many potential factors that might have contributed to such an outcome. According to recent research at the Pew Research Center, "Women and (men) have taken longer to complete their education, establish themselves at work, achieve financial independence from their parents and get married" (Cohn 2020). Similarly, some believe specific factors to a region cause such a trend. For instance, researchers think the increased housing prices might be one of the main reasons British Columbia has seen the most significant change in maternal age ("B.c. Sees Biggest Changes in Maternal Age - Researchers Blame Housing Prices | CBC News" 2019). Moreover, another article on the issue by The New York Times suggests that maternal age significantly varies depending on the geographical area and the level of education ("B.c. Sees Biggest Changes in Maternal Age - Researchers Blame Housing Prices | CBC News"

*Code and data are available at: https://github.com/hellowoshibb/Age_of_First_Birth_Analysis

2019). Not only in Canada, but the same pattern has been observable in the United States. According to the same article, in big cities such as New York and San Francisco, the average maternal age has shifted to 31 and 32 in contrast to smaller towns such as Todd Country and Zapata Country where the average maternal age is 20 and 21(Bui and Miller 2018). In this paper, we will be examining the likelihood of having children at an early age in Canada depending on factors such as gender, education level, occupation, income, and mental health. We gathered the data from the 2017 Statistics Canada General Social Survey (C31 Main Survey-Family). We believe it is vital to investigate the potential variables that would impact the likelihood of having children at earlier or later ages. Depending on any variables, further research could be conducted to analyze any need for additional employee benefits, especially related to maternity and paternity leave, and the trend's potential health outcomes for mothers in the future. So, the paper aims to be helpful in the labor market and maternal health in pregnancy periods. To conduct our analysis, we divided potential variables into four main categories. First, we looked at the age distribution of Canadians when they have their first child and then conducted a similar graph by looking at each participants' gender. As the second group of variables, we wanted to assess the socioeconomic factors on the outcome, therefore using each participant's education levels. For the third group of variables, we used individuals' occupation and income to investigate socioeconomic factors further. Lastly, we checked if there is any relationship between satisfaction levels of the life of the individuals and early parental age. We found that Canadians are more likely to have their first children at earlier periods since the age distribution graph is skewed right, and women lean more to have children earlier than men. As the other research in the literature suggests, the more education someone gets, the less likely they are to have babies in their earlier ages. Similarly, the other socioeconomic variables of occupation and income factors also negatively affect the likelihood of having children in an earlier stage of life. The more people earn, the less likely they will get kids at an earlier age. Moreover, people with occupations requiring postsecondary education are more likely to have children later in their lives. In contrast, although the potential relationship of satisfaction level of life and the average age of the first child is not significant, individuals in the 25-30 age range have slightly higher satisfaction levels, whereas individuals below 20 years old have one of the lowest satisfaction levels of life. Our findings are significant to accept and approve previous research of shifting trends on the individuals' average age at their first child. It will also be helpful to utilize these findings in employment rights and needs such as maternal and paternal leave policies or investigate the potential health outcomes of such a changing trend and its impact on women's health in the future. The paper will proceed with the Data section, in which we will be talking about the features of data and variables and explaining the graphs we used in our analysis. Then in the Results section, we will further elaborate on our findings, summarizing each plot and its outcomes. Proceeding with the Discussion section, we will be discussing the learnings and applications of our results in the case of increasing average maternal age. Additionally, we will mention the potential weaknesses of the paper and further research that could be conducted in the future. The study then follows with the Survey section in which we construct our survey with several questions, aiming to cover the weakness of the original research.

2 Data

The dataset we chose is collected from the Canadian General Social Survey (GSS) Cycle 31 Main Survey - Family. The GSS program was developed in 1985 in Canada with six survey themes, each focusing on a different topic in depth. (Government of Canada 2017) The six themes are caregiving, families, time use, social identity, volunteering, and victimization. (Government of Canada 2017) Each of them is used to aim at a different aspect of improving Canadian's well-being, informing social research, and acting as an effective training tool for quantitative analysis. (Government of Canada 2017) Our paper is interested in the socioeconomic factors that could potentially affect the average age of first birth in Canada. Since our subject is closely related to the parental history, household information, education and health information of Canadian families, these are the survey's subjects; we choose the "Families" theme over other themes which contains all the variable information that we need. What is good about this survey is that the questions in the survey contain detailed information that covers every aspect of respondents' families, which makes it useful for in-depth statistical studies. The weakness of this survey is that it might be too long to answer, resulting in a high abandonment answering rate. In addition, most of the answering options for the survey are collected as non-numeric, discrete, categorical data instead of continuous numeric values—for example,

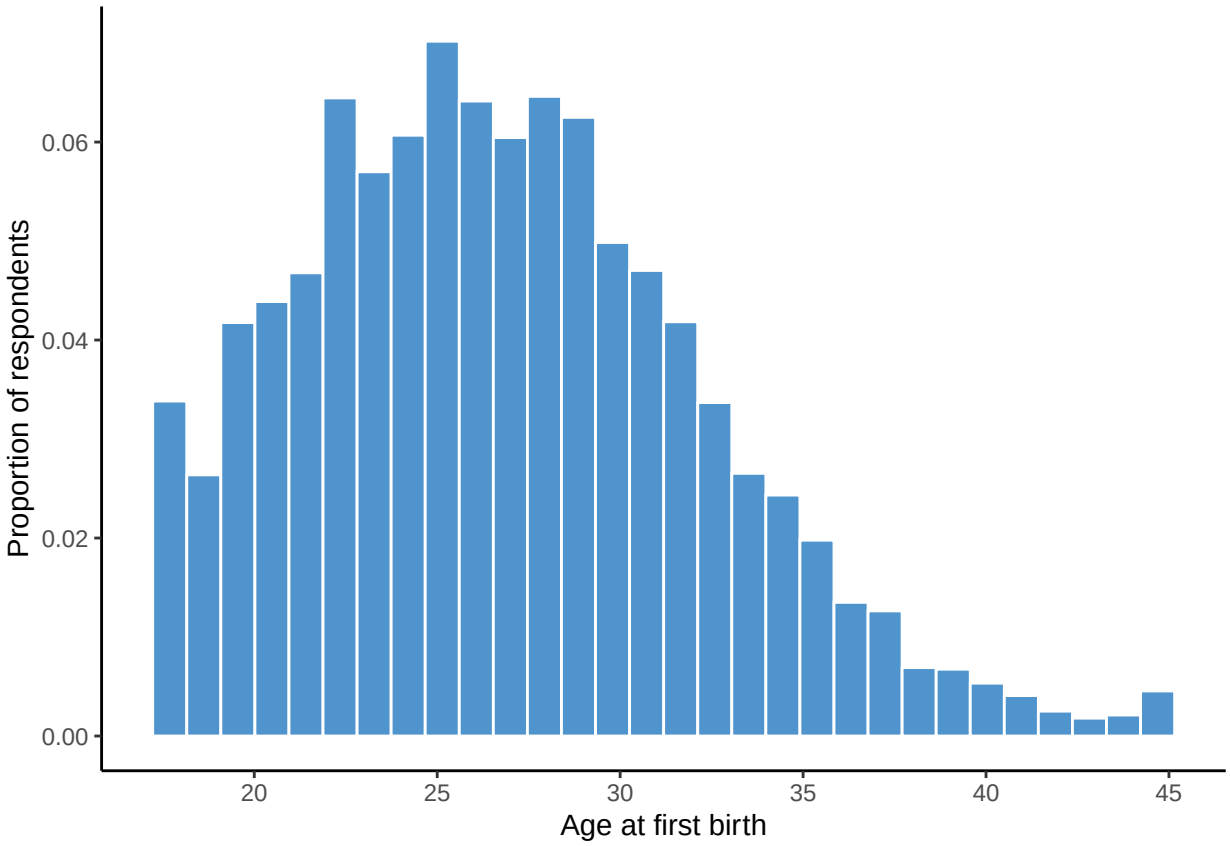

Figure 1: Distribution of age at which respondents have their first child

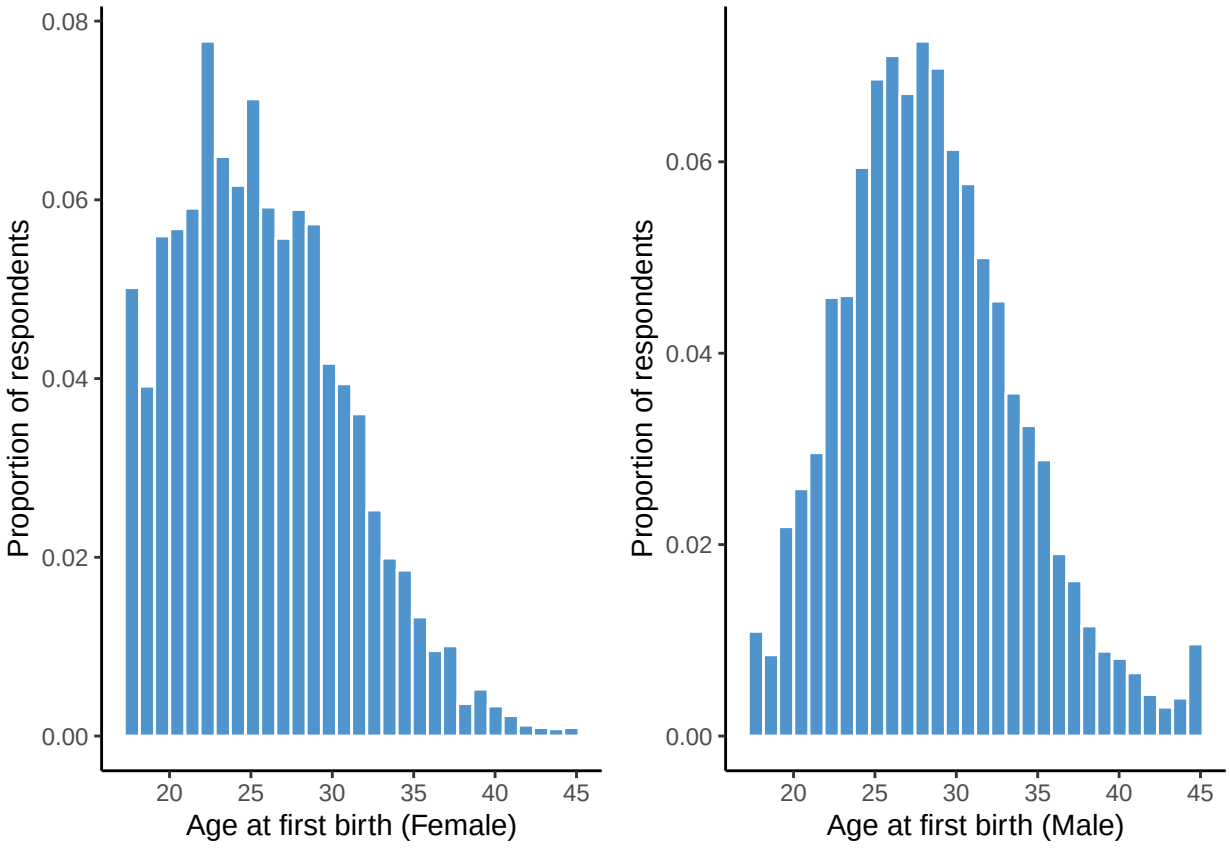

Figure 2: Distribution of age at which respondents have their first child by gender

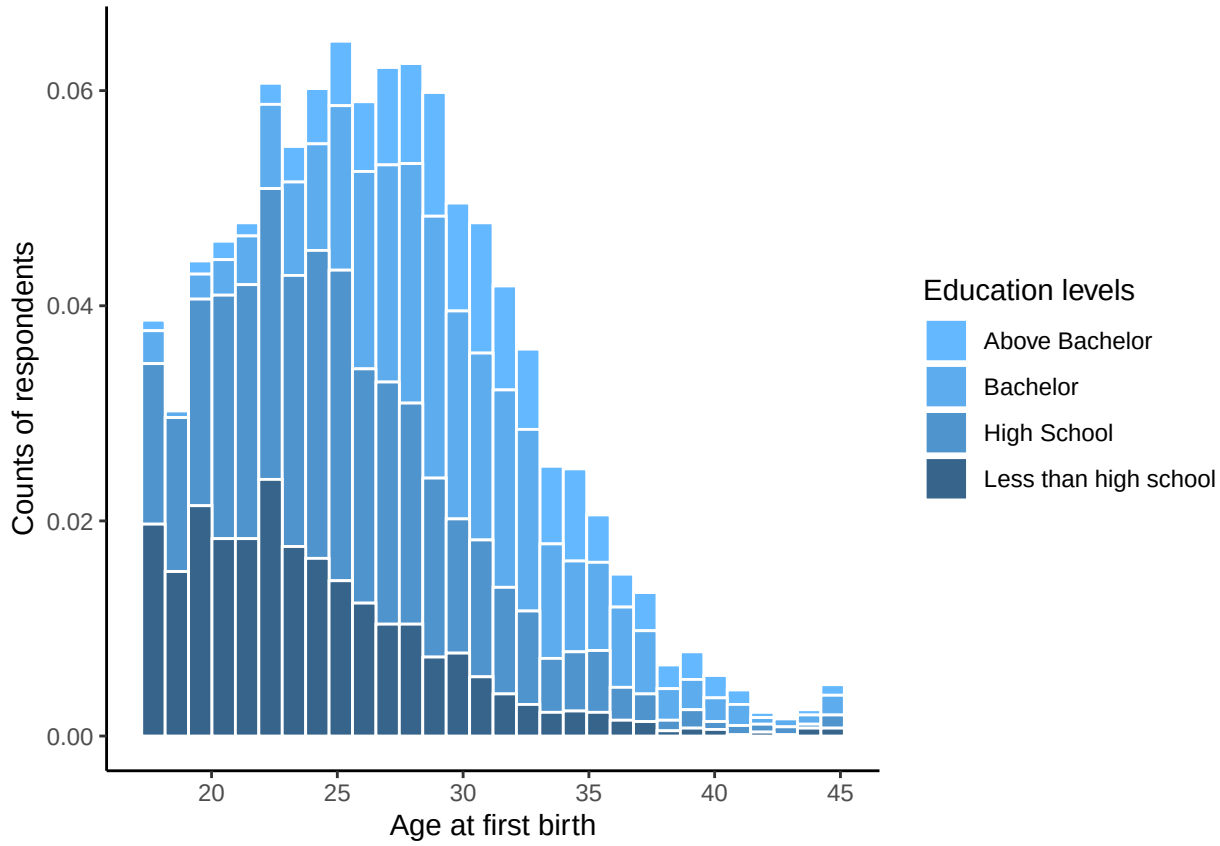

Figure 3: Distribution of age at which respondents have their first child by education levels

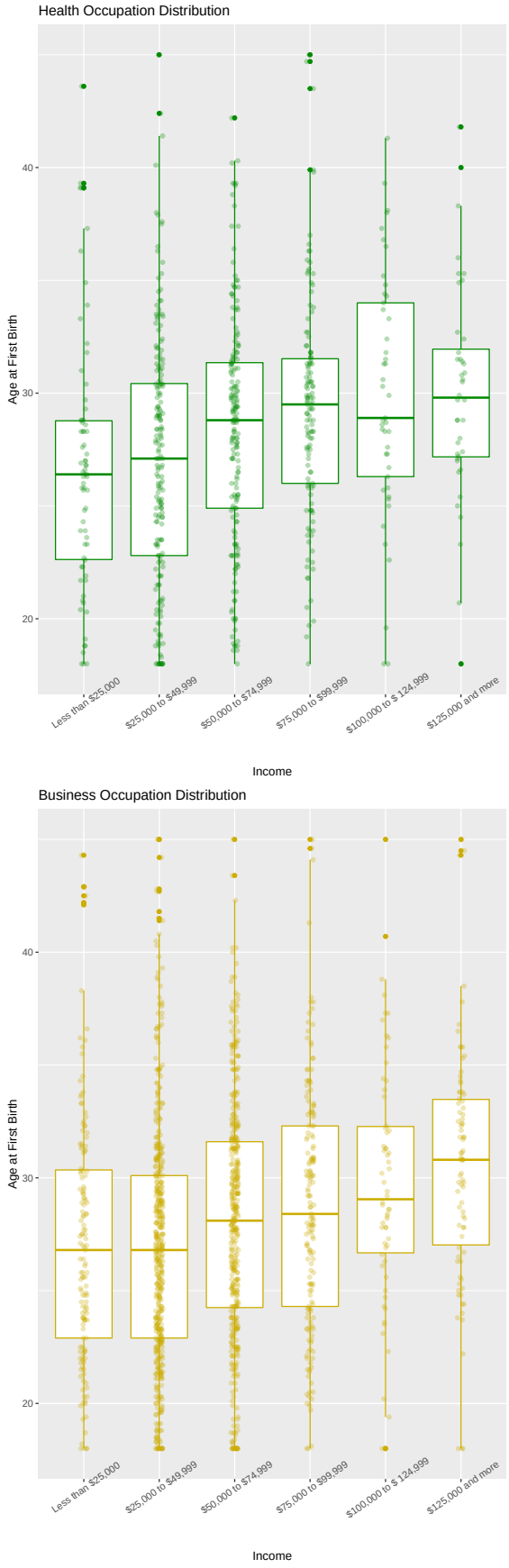

Figure 4: Part1 : Distribution of age at which respondents have their first child by occupation and income

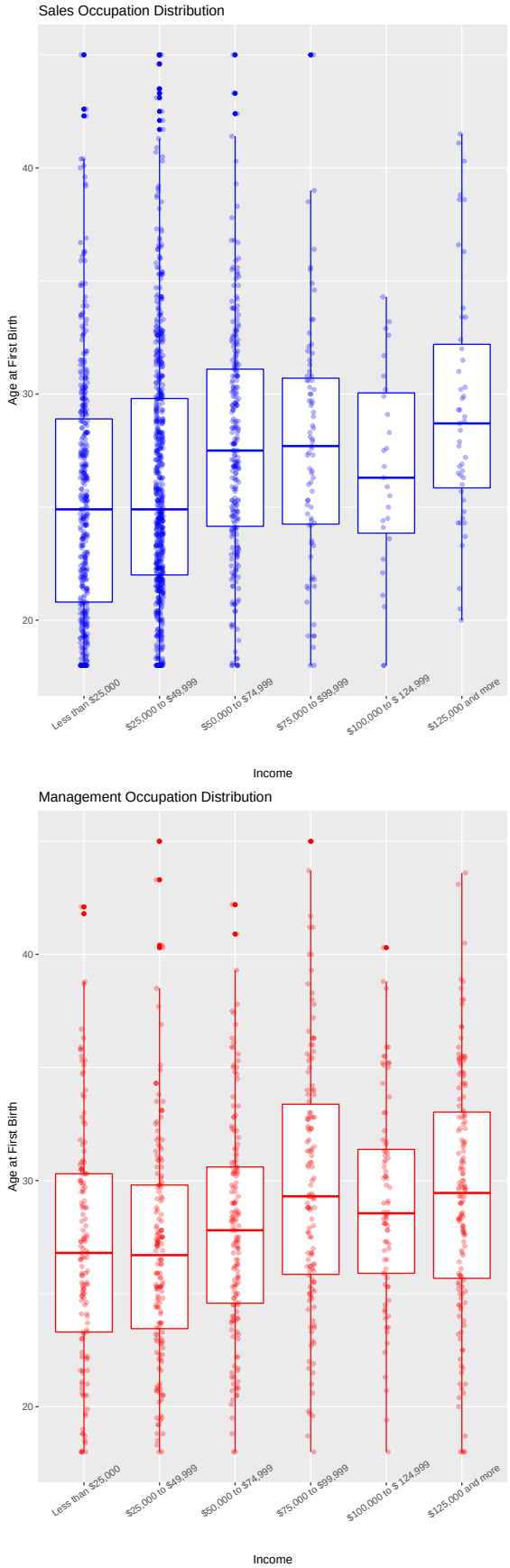

Figure 5: Part2 : Distribution of age at which respondents have their first child by occupation and income

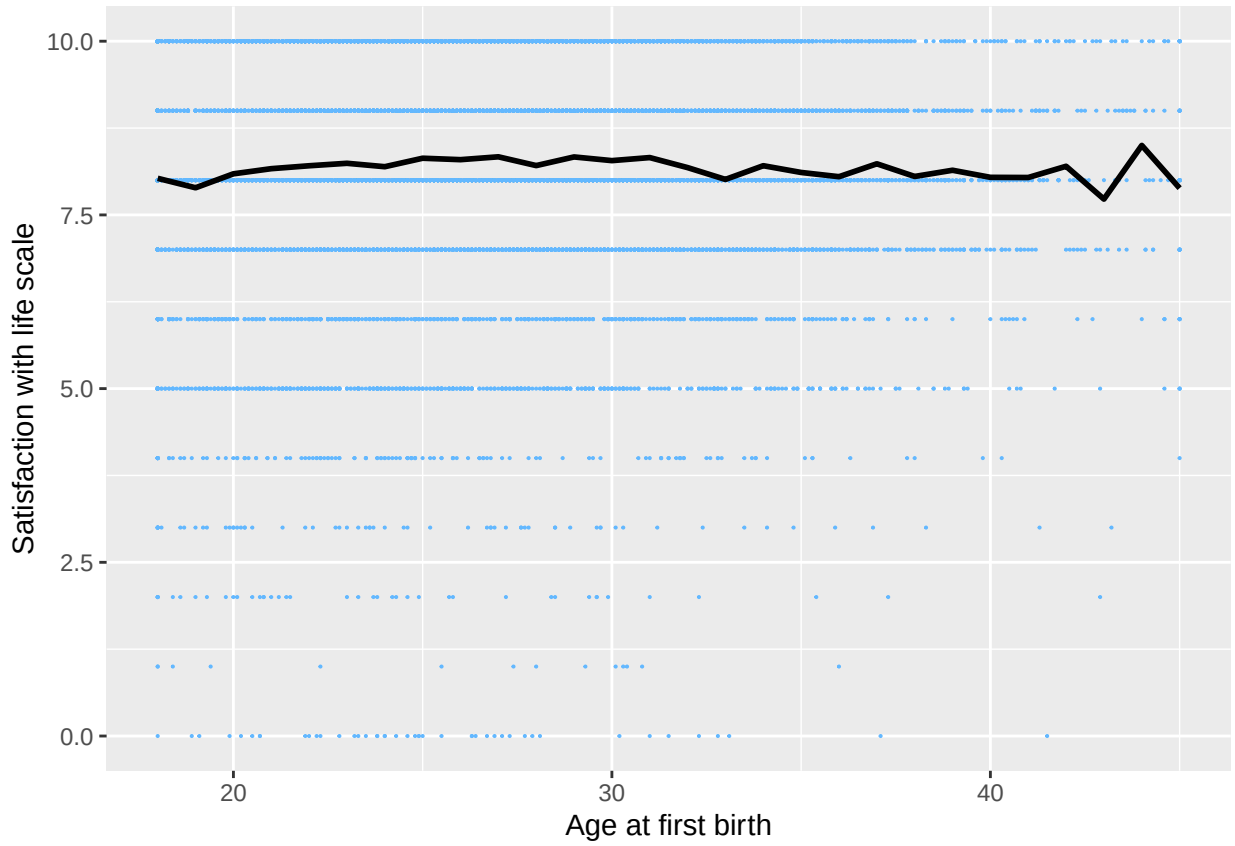

Figure 6: Feelings about life as a whole vs age at which having their first child

income recorded as less than 25k instead of the actual income number. The disadvantage is that quantitative analysis is hard to perform on top of the categorical data, and limited types of graphs can be produced using discrete values.

In particular, we choose Cycle 31 of the GSS Families survey; The data is collected from 2017-02-01 to 2017-11-30 with a target demographic of all non-institutionalized people aged 15 and up who live in Canada's ten provinces. (Government of Canada 2019). The data is collected using a cross-sectional design which combines landline and cellular telephone numbers. (Government of Canada 2019) The selection process of the data collection used a stratified sampling method, a method of dividing a population into smaller groups called strata and selecting random samples from each strat (Nickolas 2021). In this survey, the strata are at the province level; proxy replies are not authorized for this survey. The advantages of using this sampling approach are that it is free from researchers' bias since it is selected by strata and has as many representative samples from each stratum as possible. Landline and cellular telephones are the most commonly used telecommunication medium, so it is adequate to use them to reach out to people. Also, by phone, they can decide who is answering the survey. The disadvantages and trade-offs of this sampling approach are that it is impossible to select all differences by selecting random representations and classifying every community member, and calling people by cellular telephones and landlines will need to use a lot of manual labor than asking people to answer online surveys. The non-response data in the survey is either DK which means "don't know," or RF, which means "refuse to answer." These answers are changed into NA in our data cleaning step and are removed when we make analysis plots.

For Figure 1, 2, 3, 4, 5, Our response variable is "age at first birth," which is the respondent's age when they have their first child. We used other variables in this paper as factors to analyze their relationships with the "age at first birth" variable. One variable is gender, including females and males. The income variable contains 6 levels: Less than $25,000, $25,000 to $49,999, $50,000 to $74,999, $75,000 to $99,999, $100,000 to $124,999 and $125,000 and more. Occupation types include heath occupation, business occupation, sales occupation and management occupation. Lastly, we have the respondent's rating about the level of satisfaction with life scaling from 1 to 10. For our graphs, new variables were created from the summary statistics of the existing ones. An age variable was created which contained rounded values to the nearest whole number, and within each age the mean satisfaction value was calculated.

In Figure 1, we have the distribution of age at which respondents have their first child. The x-axis is the age at which respondents have their first child, and the y-axis shows the percentage of the respondents in this age group of the entire sample. The age group is divided into small groups with individual bars representing them from age 18 to 45, each bar approximating one year of age. At the two endpoints of the graphs, the first bar represents age 18 and below, and the last bar represents age 45 and above. The heights of the bars show the frequency of this age group. Figure 2 is similar to Figure 1; the difference is that we divide the distribution graph by gender, and we use it to analyze how gender as a factor influences the age of people who have their first child. Figure 3 is another distribution graph; we split the distribution into different education levels and we can see the portion of people in each education level in a diverse age group. For instance, at age 25, most people who have their first kid have a high school education level, and a tiny portion of people have education above the bachelor level. In Figure 4 and Figure 5, we have four boxplots. Each boxplot analyzes data based on one type of occupation; we have heath, business, sales and management. Each boxplot also contains six boxes representing an income level from less than $25,000 to more than $125,000. Within each box, it draws from the first to the third quartile of the data of age at which respondents have their first child. At the median, a vertical run through the box. We also add raw data points to our boxplots to better visualize the distribution of data points. In our last graph, Figure 6, we have the x-axis as the age of first birth and the y-axis as respondents' rating regarding their satisfaction with life from 1 to 10. The trendline shows the average life satisfaction rating as the age at first birth increases, and we also add raw data points to this plot to visualize the spread of sample points.

3 Results

The programming language R (R Core Team 2020) was used to load the data from the CHASS website using the tidyverse package. The janitor (Firke 2021) and tidyverse (Wickham et al. 2019) packages were used to

correct variable names, manipulate string values into numerical values, and clean up the dataset. Once this was done, readr (Wickham, Hester, and Bryan 2022) was used to open the cleaned file and begin analysis.

As the dataset had been cleaned, little further data manipulation needed to be done except removing observations with missing values and creating summary statistic variables of existing data to use in our analysis. Once this was done, all variables of interest were plotted against the average age of first birth to visualize the data and its relation to the response variable using the ggplot2 (Wickham 2016), forcats (Wickham 2021), and gridExtra (Auguie 2017) packages to create our graphical data. It was possible to analyze the trends between our chosen socioeconomic factors in the survey for our thesis. The knitr (Xie 2021) package was used to generate the pdf for this report.

From the raw data displaying the distribution of first birth ages (Figure 1), Canadian partners are reported most often to have their first child at the age of 25. The graph shows a right skew indicating that most Canadians have their first child early in life (in their 20s). Notable are the spikes in frequency at the end of the graph, at ages 18 and 45. This is due to the survey methodology not recording ages below 18 and above 45. As a result, all ages below 18 and above 45 are condensed into the same values.

By grouping the data by gender and plotting multiple graphs, we are given a comparison of the average age of when one has their first child between women and men. (Figure 2) shows that females are inclined to have children earlier than men in Canada. We observe a right skew in the distribution for females, with the most common age to have a first child being in the 20-25 interval, while the male distribution is less skewed, and the most frequent ages are in the 25-30 interval. By separating the graphs by gender, we can determine that the spike in (Figure 1) at ages above 45 is caused entirely by men, and it is observed that a low proportion of women have their first child after 40-45 years of age. This finding could be explained by women gradually becoming unable to have children due to natural human aging and men choosing to have partners and have their first child at older ages with women of younger age. This conclusion may also explain why the average age for men appears to be higher than for women.

To gain more information about the relationship between socioeconomic factors and the age at which Canadians have their first children, we plotted the data from our first graph. Still, we grouped information between different education levels of individuals. (Figure 3) shows varying levels of skew between different education groups. Generally, it can be seen that the higher education level that one receives, the later they have their first child on average. This trend can be observed in the 25-30 age range, where births for people with less than a high school education decrease while births for people with a bachelor's education or higher increase. As these individuals are in their studies through their early 20s, they stop education before or after high school and therefore are not distracted by post-secondary education. It is reasonable to believe that one of the contributing factors towards this trend is the burden of post-secondary education distracting individuals from choosing to have a child, consequently delaying their opportunities years later than those with no post-secondary education.

We then wanted to compare the impact of an individual's occupation and income on our findings. To do this, we grouped our observations into four different occupation categories. The summary statistics for the average age of having a first child were displayed in order from occupational income, resulting in 4 boxplot graphs containing statistical information for each income level within an occupation, shown in (Figure 4). Results trend towards individuals with higher incomes having their first child at later ages than lower-income individuals across all four occupational categories. It can also be observed that from our dataset, individuals working in sales have children the earliest compared to the other occupations. The mean age in the lowest income bracket is below 25, and the mean in the highest group is further from 30 than the other occupations. Possible explanations could be that less time is required in post-secondary studies in the sales occupation compared to health, business, and management, which often require post-undergraduate studies to enter the industry.

Lastly, we attempted to compare findings between the age at which individuals have their first child and their self-assessed satisfaction of life as reported on the survey. The raw data of the study comparing age at first birth vs life satisfaction is included along with a line graph showing the mean satisfaction level of each age in (Figure 6). From the plot, we can observe that there appears to be no significant relationship between life satisfaction and an average of the first child, although there are some notable results. Individuals who

have their first child between 25-30 report slightly higher life satisfaction than other age periods. Individuals below 20 years old report one of the lowest satisfaction ratings in the dataset. The strange peaks and troughs at years 43-45 are likely attributed to the low number of observations for that age range, as seen by the raw data. A larger sample size would be needed to obtain a more accurate picture of the relationship between first birth age and satisfaction at much older ages.

4 Discussion

In this paper, we have taken data from the Canadian General Social Survey and graphed the results appropriately for our goal, which was to understand the potential impact of socioeconomic factors on the average age that individuals have their first child. Initially, results of prior research from journals were discussed for their ideas, and these discussions were used to arrive at a starting thesis. We expanded on this thesis by selecting variables included in the survey dataset relevant to our initial research and the socioeconomic factors we wanted to have. The thesis was expanded upon by utilizing multiple forms of graphical data and methods of comparison to fully grasp how each of our chosen elements may affect the average age. Our dataset obtained was the 2017 edition of the Canadian General Social Survey on Families, and was obtained using the University of Toronto Database from Computing in the Humanities and Social Sciences (CHASS). Data was cleaned and analyzed using packages mentioned in the previous sections, and all variables were plotted and analyzed for our conclusions.

From the results shown in our graphical data discussed previously, we have learned from our analysis that there is a correlation between the average age one has their first child and socioeconomic factors such as income, education, and occupation. Results in Figure 3 and Figure 5 show that there are positive relationships between the level of education a person receives and the age at which they have their first child and their income. This relationship exists for all types of occupations in the Canadian General Social Survey, as regardless of occupation, the trend between income and the average age is present. Interestingly, while the trend can be observed in each occupation type when comparing occupations, there is variance between them. Some have a higher average age for a first child than others. This finding is most evident when looking at individuals who work in sales, as the mean ages in each income bracket are significantly lower than the other three occupations. As noted in the previous section, this can be attributed to the length of time required in post-secondary education to enter the occupation. This result brings further notice that our chosen socioeconomic variables correlate with each other and are not independent of each other. Regardless of covariance, the data shows that a higher income and level of education, traits commonly associated with 'better' socioeconomic standing, are related to having a first child at an older age. This analysis supports the research found in previous articles discussed at the beginning of our report that these factors are correlated. As referenced in the introduction, there is potential for these results to have applications for research into maternal health, employee benefits, and predictions in the labor market based on economic trends.

There are also some weaknesses of the paper. In the original survey, when asking the age that respondents have their first child, 18 years old and below 18 years old are counted as one group. In addition, 45 years old and above 45 years old are counted as one group. As a result, we could not see the age spread out in these two groups, and since they count together, the proportions of these two groups will be higher than other age groups. To improve on this, we could split up the age group by each year from 10 to 80 years old in the future. This grouping will give us more information, and below 10 and above 80 years old are most likely physically incapable of having babies, so age over that range will be insignificant to discuss in this paper. Including the raw age value instead of an interval would also be more useful as having more detailed information is useful for graphing, and the data may be cleaned later if an age range is required. Another survey weakness may be the length and duration of how long it takes to complete. The initial survey is long and might cause a high abandonment answering rate, shrinking the sample size for the remaining questions. However, it is also important to highlight that although the length of the survey is a potential weakness, it might be interpreted as a strength since the questions cover lots of aspects in various topics. Therefore, it is a very detailed survey that can be used for multiple purposes. To mitigate the weaknesses without cutting from its content, questions which have close overlap with each other might be incorporated and asked as one question. Additionally, because there are many categorical variables instead of continuous

numerical variables as participant responses, it is not easy to conduct quantitative analysis if needed, such as the income variable that we use in our graph analysis. We attach a supplementary survey in the appendix which addresses the concerns we have. To favor more quantitative analysis from our data, we changed some of the questions to a "fill in the blank" format to have more numerical data in the survey, so that we may have more detailed numerical data as mentioned earlier. Therefore, it would be easier for researchers to conduct quantitative analysis. In addition to all these, the occupation variable is broadly categorized in the original survey. To better understand each occupation's relation with the average age of the first child, we need to have a more specific categorization for better interpretation. To do this, we used the "International Standard Classification of Occupations" in the question asking about occupations in our survey ["International Standard Classification of Occupations" (2020)][. That way, we can also understand how people with specific occupations require, on average, how many years to build their careers, how much time on post-secondary education, prove themselves in their jobs, and more. The socio-economic analysis of that question can be used in specific job markets, such as maternal and paternal leave regulations in the finance/health/law/etc job markets. Lastly, some education levels in the survey we used were not included, examples being education levels before high school and specific levels of post-undergraduate education. This might have caused us to miss some information in our study by misrepresenting the participants in those groups. To improve on this in our survey, more specific education levels are included.

To proceed with this research further, we can use a regression model for further predictions for the variables we are interested in to see the change in the response variable, age at the first child. The model will try to predict the average age of a person who is likely to have their first child, depending on their education and income levels and their satisfaction level of life. Secondly, we can also study any potential correlations between each variable. Since education, income, and occupation are likely to have similar effects on the outcome variable, watching the correlations within these variables will lead us to better interpret each variable's impact on the response variable of average age at the first child. This paper is particularly interested in the relationship between life satisfaction and the age of having the first child. To expand on this in the future, we can investigate factors related to life happiness such as anxiety level, depression, stress level, etc. In our supplementary survey, further questions are included to obtain data about mental health issues such as anxiety and depression, as well as mental health questions related to work and finance concerns. Lastly, we are interested in the data of individuals if they have a second child, as further research may be done on the trends between our socioeconomic factors and if the same conclusions can be reached from the age someone has their first child and their second child. To obtain this data, we include questions in our survey asking if the respondent has had a second child, and if so, the age they had them. We also ask for the gender of the first child to analyze if there is any significance between the gender of the first child and the age at which a second child is born, as well as the relation between any socioeconomic factors.

Additionally, besides Canada, the trend has existed for a while in other countries, as mentioned in the Introduction. We can study different countries and compare to Canada in this recent trend for further study. The government can make further implementations in the health or labor market depending on the comparison. That brings other research studies to conduct such as predictions of pregnancy health in the future if the trend of later ages at first child continues to move towards older generations. Since pregnancy is a crucial period of a female body, further assessments can be done by the healthcare system. Similarly, depending on the analysis of education, income, and occupation variables, new policies might be implemented in the labor market for the benefits of employees and employers so that the production and the happiness level are maximized in the country.

5 Appendix

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March 20, 2022

Toronto Polling
100 St. George Street
Toronto, ON
M5S 3G3

Dear participants,

We have created a survey to investigate more on factors that influence the average age of people having their first child. The questions evaluate multiple aspects of participants to determine the likelihood of having a first child at earlier or later stages of an individual's life. Your input is significant for us to conduct a reliable analysis of the recent trend on the topic, which will be used in various areas, from employment rights and policies to health predictions. We highly appreciate your time and effort.
Please access the online survey through the URL link or the QR code below. The survey should take approximately 5 minutes to complete. Your answers will remain anonymous, and the information won't be shared.
Thank you so much for your participation in advance.

Sincerely,
Toronto Polling

Link: https://forms.gle/r1CXMv3nPHZVokaKA

QR code:

Figure 7: (#fig:QR_code)Coverpage of the supplementary survey

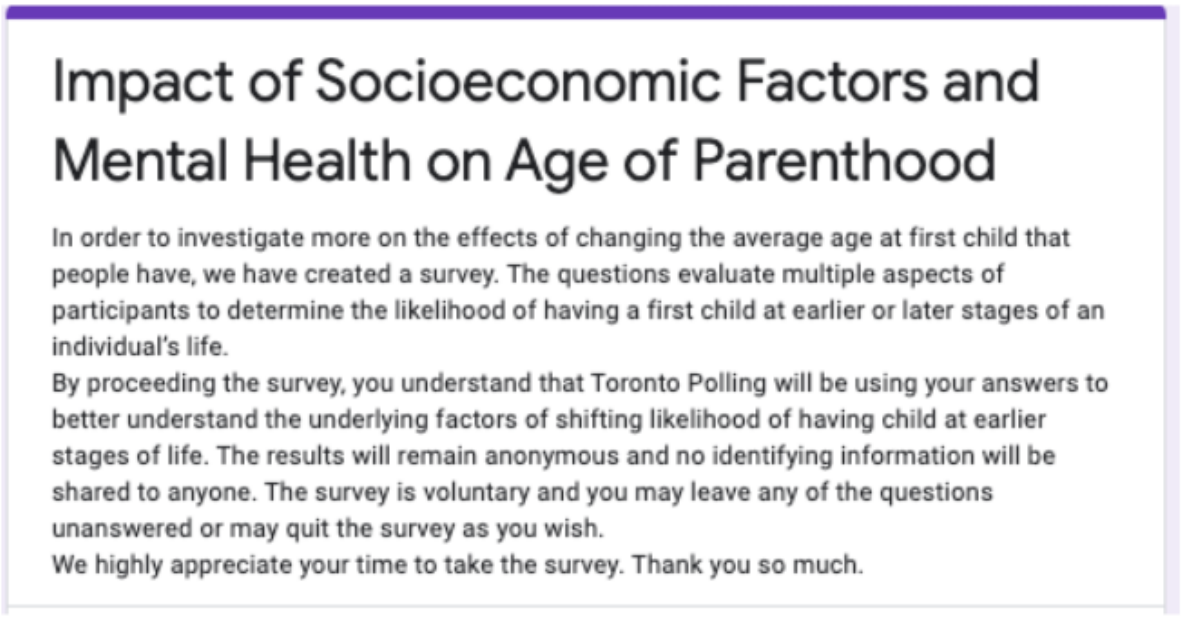

Figure 8: Screenshots of the supplementary survey

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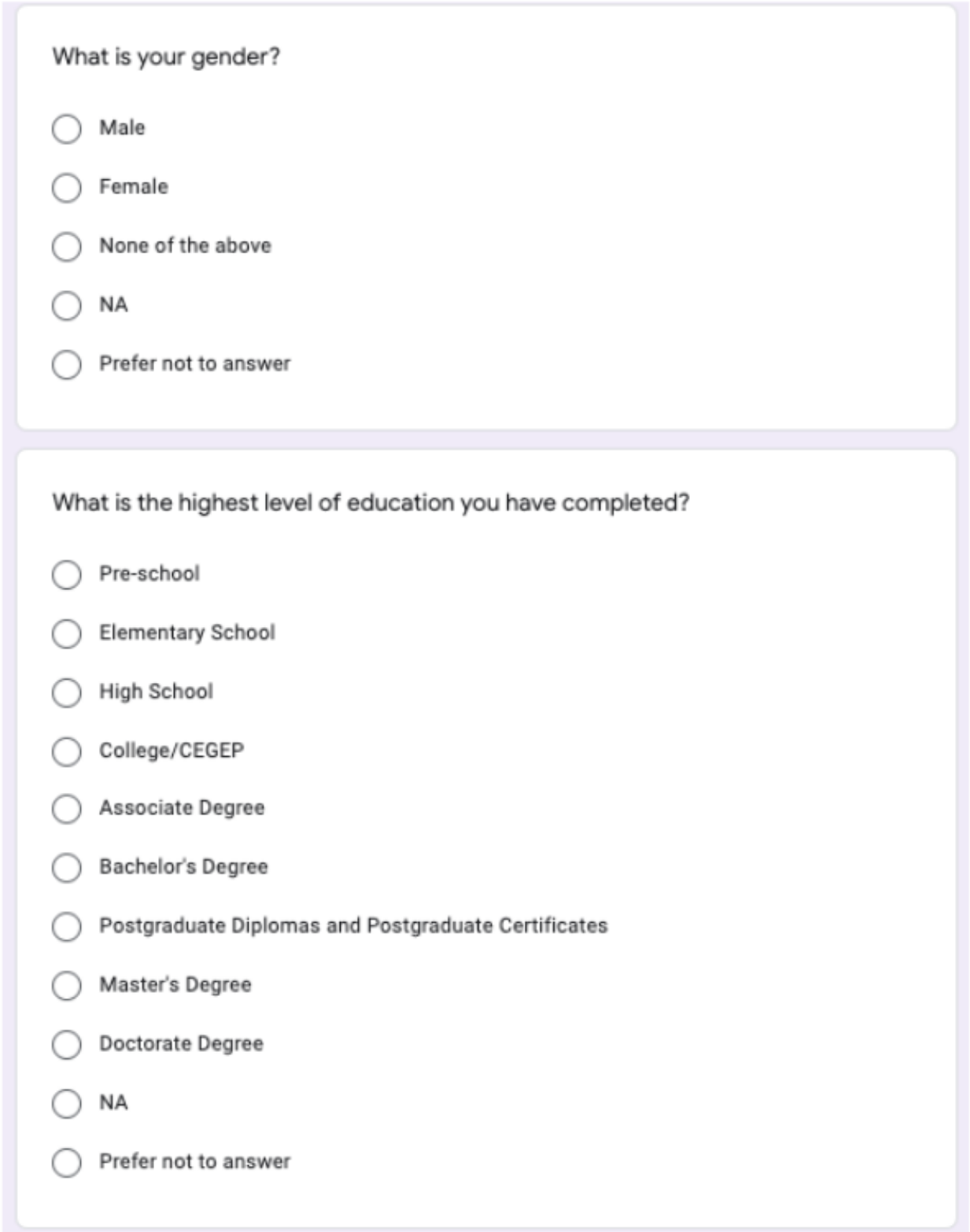

Figure 9: Screenshots of the supplementary survey

What is your occupation?

- ◯ Managers (Chief executives, senior officials and legislators/Administrative and commercial managers/Production and specialized services managers/Hospitality, retail and other services managers)
- ◯ Professionals (Science and engineering professionals/ Health professionals/ Teaching professionals/Business and administration professionals/Information and communications technology professionals/Legal, social and cultural professionals)
- ◯ Technicians and associate professionals (Science and engineering associate professionals/Health associate professionals/Business and administration associate professionals/Legal, social, cultural and related associate professionals/Information and communications technicians)
- ◯ Clerical support workers (General and keyboard clerks/Customer services clerks/Numerical and material recording clerks/Other clerical support workers)
- ◯ Service and sales workers (Personal service workers/Sales workers/Personal care workers/Protective services workers)
- ◯ Skilled agricultural, forestry and fishery workers (Market-oriented skilled agricultural workers/Market-oriented skilled forestry, fishery and hunting workers/Subsistence farmers, fishers, hunters and gatherers)
- ◯ Craft and related trades workers (Building and related trades workers, excluding electricians/Metal, machinery and related trades workers/Handicraft and printing workers/Electrical and electronic trades workers/Food processing, wood working, garment and other craft and related trades workers)
- ◯ Plant and machine operators and assemblers (Stationary plant and machine operators/Assemblers/Drivers and mobile plant operators)
- ◯ Elementary occupations (Cleaners and helpers/Agricultural, forestry and fishery labourers/Labourers in mining, construction, manufacturing and transport/Food preparation assistants/Street and related sales and service workers/Refuse workers and other elementary workers)
- ◯ Armed forces occupations (Commissioned armed forces officers/Non-commissioned armed forces officers/Armed forces occupations, other ranks)
- ◯ NA
- ◯ Prefer not to answer

Figure 10: Screenshots of the supplementary survey

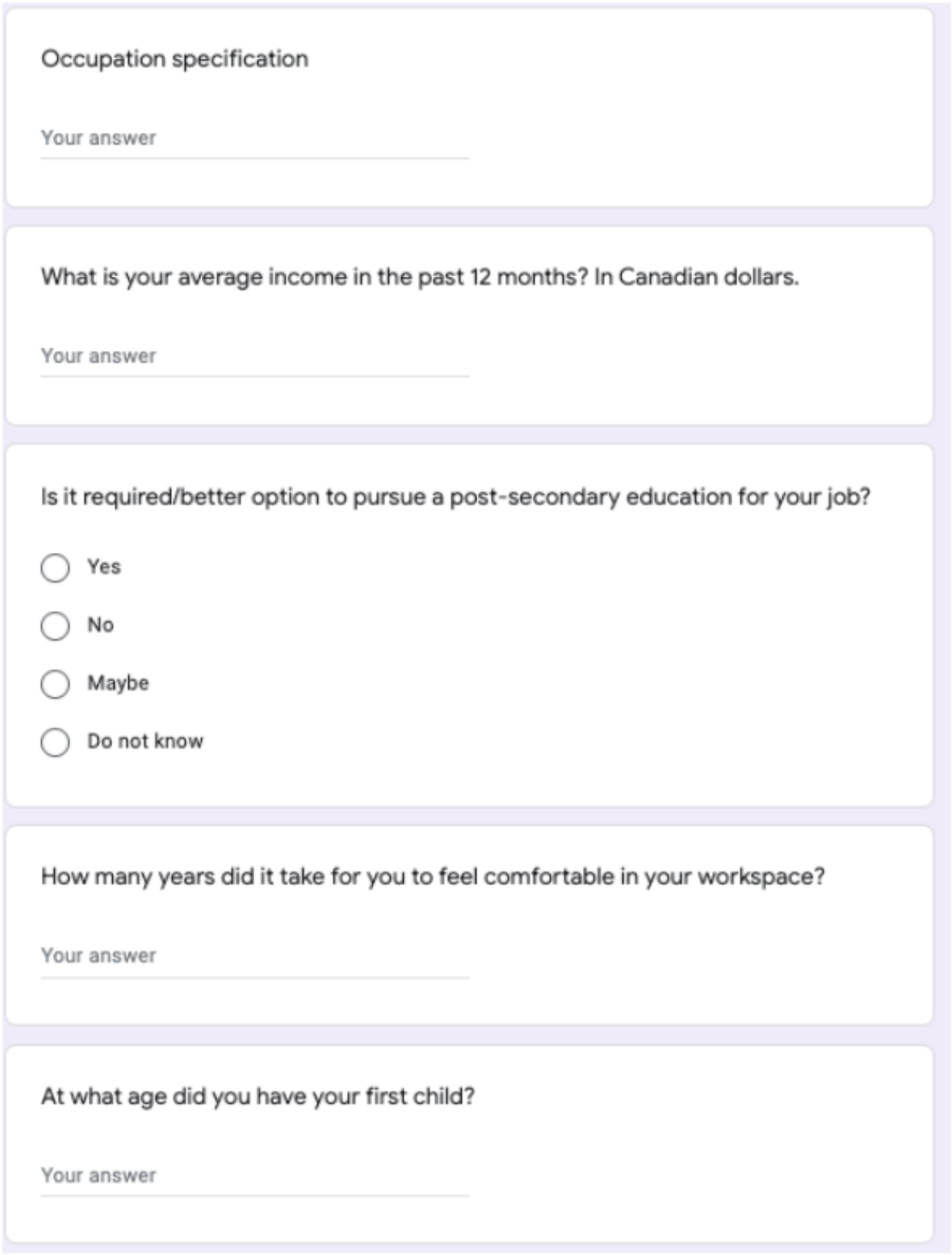

Figure 11: Screenshots of the supplementary survey

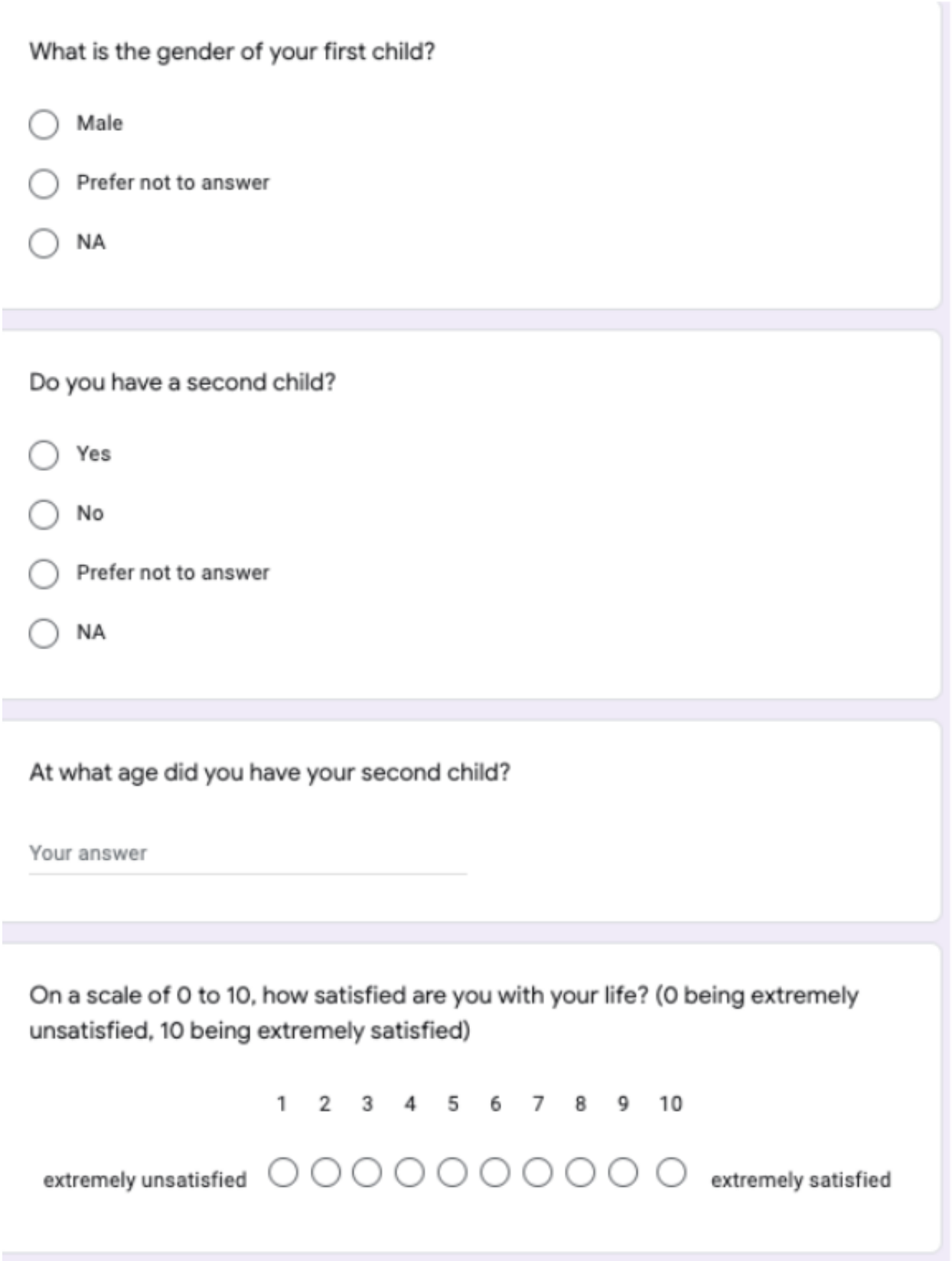

Figure 12: Screenshots of the supplementary survey

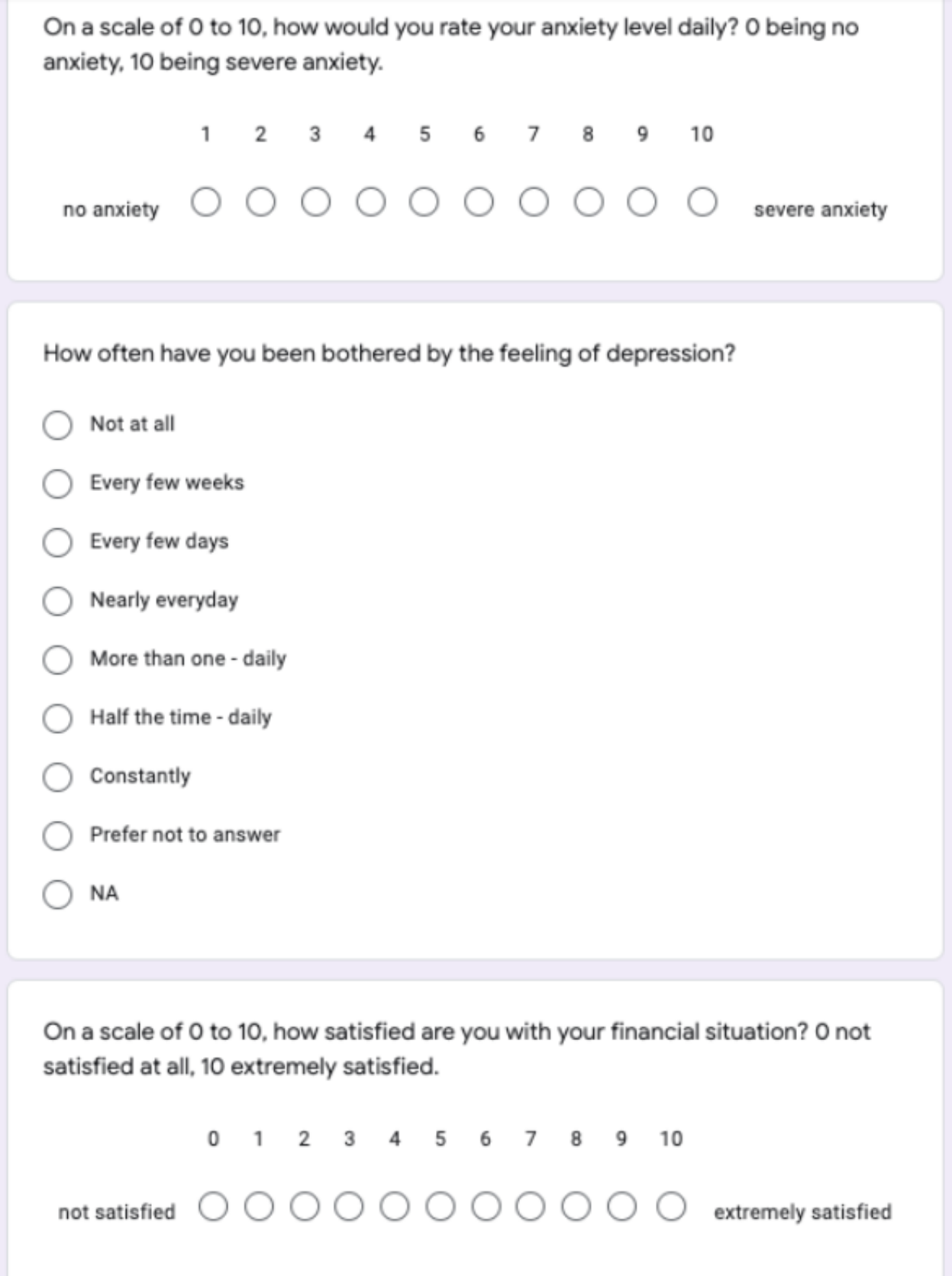

Figure 13: Screenshots of the supplementary survey

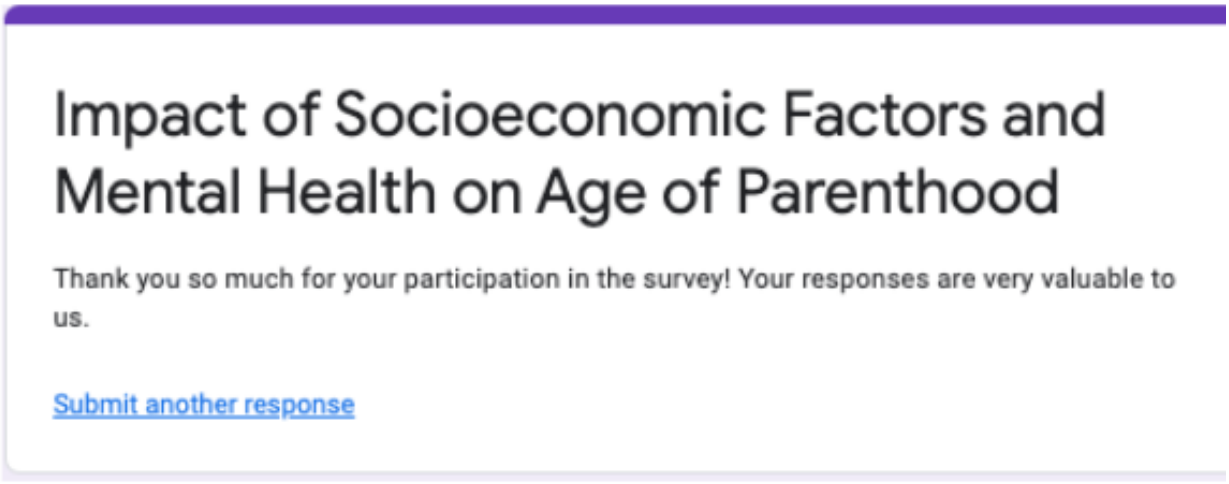

Figure 14: Screenshots of the supplementary survey

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