The World Pandemic Had A Hit on People's Mental Wellness - Results from 2020 Australia General Social Survey

Yuzhi Pi,Chengle Yang, Yiran Mei

2022/3/20

1.Introduction

In December 2019, cases of pneumonia of unknown causes were reported to WHO from Wuhan City, China. The virus was later identified as a novel coronavirus and named COVID-19 by the WHO. The outbreak rapidly spread all over the world in the following months and was therefore characterized as a pandemic, referring to a public health emergency of international concern.

The pandemic has dramatically changed people's lives around the world: the stay-at-home order that was implemented by the governments forced people to stay indoors. Public places such as restaurants, gyms, and clubs were shut down. Everyone other than essential workers had to work remotely, and there were no social activities such as visiting friends and families, hosting parties, etc. Consequently, mental health issues and people's well-being became the centre of discussionthe primary topics open to discussion in the society. According to the research conducted by World Happiness Report, although the restriction orders curtail the virus from spreading across the world, the fact that the policies themselves are restricting people's physical availability and their ability to maintain social connections could be damaging everyone'for people's mental health. (https://worldhappiness.report/ed/2021/social-connection-and-well-being-during-covid-19/)

It is crucial to understand the importance of mental wellness - well-being and mental health are strongly associated with an individual's day-to-day performance. One's productivity, mood, physical health, creativity, and learning abilities are all affected by the well-being of our mind. Deteriorated mental well-being could lead to mental illnesses such as depression, which could result in much more serious self-harming activities and even suicidal behaviours.

On the other hand, Australia was one of the first Western countries that declared border closure and a series of social distancing rules following WHO's "global pandemic" notice on March 11, 2020. Because of this, Australia becomes an ideal target for investigating how the pandemic and its related policies impacted people's well-being and mental health. With this, the analysis in this report aims to investigate whether the pandemic has had an impact on Australians' mental well-being using data available in the 2020 Australian General Social Survey (AGSS) (https://www.abs.gov.au/statistics/people/people-and-communities/general-social-survey-summary-results-australia/2020).

The analysis examines 15 survey questions and their results presented under the "Wellness" section on the AGSS website, and the effect of the pandemic is incorporated in time: we look at the difference between people's responses between 2019 and 2020, which is pre-pandemic and during the pandemic. The paper will include the following sections: a data section where more details on the AGSS and the data cleaning process will be explained; a result section where the key results will be explained in detail; a discussion selection that outlines the limitation and future outlooks; an additional survey created for the purpose of this research to gain further insight into the relationship between pandemic and wellbeing. Furthermore, the AGSS data has sorted the response by the respondent's gender, which allows us to examine whether there exists differences in terms of the degree of impact between different gender groups. Age group differences were also examined to further enrich the depths of the analysis, however age group information is only available for the 2020 results. More explanation regarding the data will be presented in the data section below. After gaining an

insight into the relationship between the pandemic and mental wellness, the result of this report should assist the government to set up wellness programs or other mental health benefits during crisis times in the future, in a more effective and efficient way.

2. Data

2.1 Data Source

All the analysis conducted throughout this report is based on data available in AGSS, published by the Australian Bureau of Statistics in 2020 (). The data is analyzed using R. () The data was released on ABS's website s on June 29, 2021, in the form of Excel Worksheets. There are 13 worksheets in total available on the ABS website, and this report analyzes only a subset of all the data available. More specifically, data included in this report are from the spreadsheet titled Table 1 and Table 2 under the website section "Data downloads", as this research intends to investigate whether there exists a difference in people's wellbeing across different gender and age.

More insights into the General Social Survey - the survey used to be conducted once every four years before 2019, but it was conducted again in 2020. Its main purpose is to provide data on the "social characteristics, wellbeing and social experience of people in Australia". (https://www.abs.gov.au/statistics/people/people-and-communities/general-social-survey-summary-results-australia/2020#general-social-survey-and-the-covid-19-pandemic) For the purpose of this report, only the "wellbeing" aspect and data related to wellbeing is saved and analyzed.

We believe that the AGSS data cannot be replaced by data obtained from other datasets. ABS is the official Statistic Bureau of the Australian government, which means that the data collected, processed, and released by ABS should have high quality. ABS have the access to boarder participants and is well funded to have excellent data process abilities. Thus, it is reasonable to conclude that the data cannot be replaced by data from other sources.

The spreadsheets were first downloaded from the website, and then they were imported into R studio using package "readxl" before further cleaning.

2.2 Survey methodology

The scope of the Australia General Social Survey includes all Australians aged 15 and above, who are classified as "usual residents" of the country. There is no limitation on the geographical location of the survey participants, households were randomly selected from all over Australia to participate in the survey, and one person who aged above 15 will be selected to complete the actual questionnaire. However, according to ABS, these people were excluded from the AGSS: 1) visitors to private dwellings 2) overseas visitors who have not been working or studying in Australia for 12 months or more, or do not intend to do so 3) members of non-Australian defence forces stationed in Australia and their dependents non-Australian diplomats, diplomatic staff and members of their households 4) people who usually live in non-private dwellings, such as hotels, motels, hostels, hospitals, nursing homes and short-stay caravan parks (people in long-stay caravan parks, manufactured home estates and marinas are in scope) 5) people in Very Remote areas 6) discrete Aboriginal and Torres Strait Islander communities.

Although ABS states that excluding the parties above will have little impact on the aggregate estimates of the survey results, it does create limitations regarding the survey's ability to represent the Australian population. More details will be discussed in the discussion section below.

In terms of method of collection - for the year of 2020, the survey was distributed in the form of an online questionnaire or via phone interview. The participants had the choice to choose either one of the delivery formats. There was no face-to-face collection due to the restrictive policies associated with COVID-19. The collection period spams from June 15, 2020, to September 5, 2020.

Upon the collection of the results, the data is then processed to provide an estimate for the whole population. The data and results included in this report is based on the estimation generated by this process. The

estimation is calculated based on weights. The weight is assigned to the one person in each household to complete the survey, in order to reflect the number of people or households they represent among the entire Australian population. The number is assigned to an individual based on their probability of being included in the survey sample. Then, according to ABS, "The person and household level weights are then calibrated to align with independent estimates of the in scope population, referred to as 'benchmarks' " (https://www.abs.gov.au/methodologies/general-social-survey-summary-results-australia-methodology/2020). The benchmark ensured that the people or households that completed the survey are representing those who are similar, and the estimate can be generalized to the entire population instead of a sample. The population is set at 20,269,036, which is the Australian population as of June 2020. This population includes all individuals above the age of 15 and excludes those who live in a non-private dwelling, or lie in very remote areas or the Aboriginal and Torres Strait Islander communities.

Limitations of the survey collection methodology will be further explained in the discussion section.

2.3 Data Characteristics

The two Excel Worksheets include 33 survey questions in total. The questions were categorized into 8 sections: 1) Community Involvement 2) Family and Community Support 3) Cultural Tolerance and Discrimination 4) Trust 5) Stressors 6) Crime and Safety 7) Health and 8) Demographics of the Survey Participants.

The difference between these two worksheets is that, in the Table 1 worksheet, the results are presented by the gender of the respondent, whereas in the Table 2 worksheet, the results are presented by the age range of the respondent. These two worksheets were used together to better investigate whether there exists a difference in people's well-being across different gender and age, but only Table 1 worksheets includes the results for both 2019 and 2020.

Among the 33 survey questions, 15 questions were selected as we believe that they effectively reflect the participants' wellbeing. Among the 15 questions, 11 were actual survey questions and 4 were selected for the purpose of gaining an insight into the demographics of the survey sample. The 11 actual survey questions are: 1) Had face to face contact with family or friends living outside the household at least once a week in the last 3 months 2) Had other forms of contact with family or friends living outside the household at least once a week in the last 3 months 3) Able to get support in times of crisis from persons living outside the household 4) Has experienced discrimination in last 12 months 5) Feels most people can be trusted 6) Feels the healthcare system can be trusted 7) Has experienced at least one personal stressor in the last 12 months 8) Always or Often feels rushed for time 9) Always or Often has difficulty getting to the places needed 10) Has difficulty accessing service providers 11) Self-assessed health status

While the 4 demographic related questions are: 1) Age group 2) Labour Force Status 3) Education 4) Main Source of Household Income

2.4 Data Cleaning

The cleaning process includes two parts: extracting useful data from the table1 and modify the table into a tidy data frame for further plotting and analysis.

Firstly, we used grepl() to locate and filter() to extract the data when extracting single line questions (answers were either yes or no) such as Q1-Q4 and Q7-Q10. Another function slice() was used to extract the multiple line data from the table when extracting the survey result containing multiple choices, such as Q5, Q6, and Q11-Q15.

In the second part, we removed the empty column generated from the data importing process and rename the column for better classification. For the single line data question, we created two new columns for the year and gender information after transposing the data by using mutate() and t(). For the rest of the questions, we simplified the options for some questions with the function replace() and removing the columns containing the info for the whole sample group. Then, we used the function pivot_longer() to convert the table into a tidy format. Finally, we try to avoid too much information in a single column by separating the column "name" into two parts.

We also extracted some information from Table 2 as it provides information on respondents' age range, which adds another aspect to our investigation other than gender. The cleaning process for the sames questions in Table 2 is similar to the steps discussed previously.

```
# extract data from xlsx
# create all raw table name
all_raw_table = rep(0, 17)
# read all data into each table
for (i in 1:17) {
# assign name for each table
all_raw_table[i] <- paste("Table", i, sep = "")
# extract all worksheet from xlsx with helper function

allsheets <- read_excel_allsheets(paste("data/GSS_Table", i, ".xlsx", sep = ""))
# extract exact worksheet
sheet <- allsheets[[paste("Table ", i, ".1_Estimate", sep = "")]]
#glimpse(sheet)
assign(all_raw_table[i], sheet)
}

#consider "eval(as.symbol(all_raw_table[index]))" as the variable name which is the raw table extract f
#or just use Table+index, eg. Table1, Table9
```

clean table

3. Discussion and Results

3.1 Survey

We constructed a supplementary survey to examine how COVID-19 and its related policies were perceived to affect people's well-being and mental health in Australia, supplementing the original survey with additional COVID-19-specific questions. The questionnaire is composed of 17 questions, which cover some more comprehensive aspects of demographics (questions 1), support from family and community (questions 2-5), stressors (questions 6-9), and impact of COVID-19 (questions 10-17). We offer respondents multiple-choice answers for categorical questions, a linear scale for questions pertaining to personal feelings, short answers for open-ended questions, and the checkbox for questions that may have more than one answer. With the second type of ranking scale, respondents can indicate their perceptions between "none" and "completely" from 0 to 10. With regard to check-box question 17, the order of the answers presented may affect the choice tendency, which is why we shuffled the order of the options to minimize possible bias.

3.2 Results

3.2.1 Results from the Actual Survey Questions

From the 11 survey questions analyzed in this report, responses for some of those showed no significant change in total between 2019 and 2020, such as questions 2, 3. In fact, people reported experiencing less discrimination in 2020 compared to 2019. Other than this, in general, the participants have experienced a slight decline in other forms of contact and have found them less able to receive support from those who live apart(figure). In contrast, respondents suggested a remarkable escalating limitation on face-to-face contact with family or friends not living together and intensified difficulty reaching the target locations after the introduction of COVID-19 restrictions(figure). They also felt being less in a rushed situation, but more likely to experience at least one personal stressor during the 12-month period(figure). This is a strong indication that COVID-19 have restricted interpersonal interaction and communication and the availability of transit, which could be the reason why more people report encountering personal stressors. In addition, although

results from Question 3 showing positive changes from discrimination and Question 8 and 9 also provides positive feedbacks, people still reported increased personal stressor encounters. This suggests even though the pandemic has improved people's stress levels from certain aspects, its overall effect on people's wellness remains pessimistic.

Additionally, it is observed that for certain questions, there is no obvious discrepancy among answers provided by males and females. For instance, the responses to Question 4, 5 and 6 showed consistency in the movement between genders(figure). Both females and males respondents indicated a decreasing occurrence of discrimination in the last 12 months. On the other hand, the participants' interpersonal trust and confidence in the healthcare system were solid throughout the outbreaks for both genders(figure). Specifically, for Question 5, it is estimated that the number of people who have trust in the health system is 13379.4 (in thousand) in 2019, and the number increased to 15490.6 (in thousand) in 2020. The number increased by 15% over the year. Similar trend is also observed for Question 6. This is actually quite surprising, as one might think people would rather lose hope to the health system with the ongoing "anti-mask" protests around the world. According to the study conducted by Well Being Trust, "Deaths of despair have been on the rise for the last decade, and in the context of COVID-19, deaths of despair should be seen as the epidemic within the pandemic". (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwellbeingtrust.org%2Fwp-content%2Fuploads%2F2020%2F05%2FWBT_Deaths-of-Despair_COVID-19-FINAL-FINAL.pdf&clen=4560004&chunk=true) However, in the AGSS dataset, we observe that there is increasing trust and confidence among people towards the health system and others.

When being asked to self-assess the health status in 2019 and 2020, most of the respondents rated themselves excellent in 2020, and the distribution of the responses to the question was uniform among all ages(figure). However, more females suggested a health level of excellent whereas the number of male respondents who rated themselves' health status as "excellent" showed a decline. Women participants also demonstrated less difficulty accessing service providers, compared to the increased difficulty according to the men participants(figure). The changes and differences in those aspects might not be simply identified as the result of COVID-19 and could be biased since these questions mostly relied on personal feelings.

3.2.2 Results Related to Survey Demographics

In the midst of the demographic-related questions, question 1 displayed a relatively stable trend(figure). It is perceivable that the female population in the age group of 70 years and over increased 10.32% while the male population decreased by 0.91%(figure). This could be considered unexpected regarding the statement that the elderly were more vulnerable to the COVI-19 and facing a higher risk of severe symptoms due to age-related physiology changes and chronic health conditions, and therefore we anticipated a drastic contraction of the older population (https://www.who.int/news-room/feature-stories/detail/who-delivers-advice-and-support-for-older-people-during-covid-19#:~:text=The%20COVID%2D19%20pandemic,potential%20underlying%20health%20conditions.).

Between 2019 and 2020, the number of female respondents working full-time remained comparatively constant, while a substantially large number of male respondents failed to hold their full-time positions(figure). The number of unemployed participants in females and males both grew. In addition, respondents not in the labour force escalated, and the number of men among them increased more than women(figure). We could also observe that fewer women and more men worked part-time jobs after the outbreak(figure). The changes in the level of highest non-school qualification and main source of household income were synchronous and similar in size, and it is unsurprising that more participants considered the government pensions and allowance as the main source of income in 2020 compared to 2019(figure). It should also be noted that the respondent group in two years may not be the same, and the COVID-19 may be but one of the drivers of change, not strictly controlling for the omitted variable biases.

##3.3 Discussion ### 3.3.1 General Findings As previously discussed in the result section, there are a few points that are quite surprising. Foremost, AGSS shows that people have experienced less discrimination in 2020 compared to 2019. This is interesting as, since the beginning of the pandemic, hate crimes towards Asian communities have significantly increased. This even led to a massive online campaign calling to "Stop Asian Hate" (https://www.hrw.org/news/2020/05/12/covid-19-fueling-anti-asian-racism-and-xenophobia-

worldwide). With this, one would expect there will be more people reporting discrimination during the pandemic. However, the AGSS results show otherwise. A potential explanation could be the fact that restricted social connections and face-to-face interactions limited the act of discrimination, as they often stem from those interactions.

Similarly, it is also surprising that fewer people reported having difficulty getting to the places they needed (Question 9). Australia's border was closed to all non-residents on March 20, 2020 (https://7news.com.au/lifestyle/health-wellbeing/australia-closes-borders-to-stop-coronavirus-c-752927), while the next day, Australia declared that all "non-essential services" would be closed until further notice. (https://www.abc.net.au/news/2020-03-20/coronavirus-covid-19-scott-morrison-enhanced-social-distancing/12075532). All of these policies aims to limit people's activities and their ability to travel to non-essential places, but the AGSS shows that more are satisfied with their ability to get to the place needed. One potential explanation could be that the pandemic decreased people's desire of going out. From a psychological point of view, people autonomously started to decrease their outdoor activities, therefore reporting to have less difficulty getting to places needed.

Moreover, the fact that people are having more trust in each other and in the health system is also worth discussing. According to the study conducted by Well Being Trust, "Deaths of despair have been on the rise for the last decade, and in the context of COVID-19, deaths of despair should be seen as the epidemic within the pandemic". (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwellbeingtrust.org%2Fwp-content%2Fuploads%2F2020%2F05%2FWBT_Deaths-of-Despair_COVID-19-FINAL-FINAL.pdf&clen=4560004&chunk=true) Together with the worldwide protests regarding freedom and mask policies, one would infer that there would be more negative emotions exist within the society. However, in the AGSS dataset, we observe that there is increasing trust and confidence among people towards the health system and others.

Most importantly, the result presented in the previous section confirms that people are experiencing more stress during the pandemic. The estimated number of people encountering at least one personal stressor in the last 12 months increased by 6% overall, and that number for females increased by 7% compared to 5.5% for males. This is crucial as this indicates that regardless of the information conveyed by the other questions (declining discrimination, increased satisfaction in the ability of getting to places wanted, increased trust in the healthcare system and others, improved health self-assessment results), people still feel more stressed and more likely to encounter stressor during the pandemic. In other words, pandemic's overall effect on people's wellness remains negative.

3.3.2 Implications

There are a few implications on the result of this analysis. As discussed above, the survey shows that more Australians encountered at least one personal stressor in 2020, and the increment is more prominent for females. This suggests that the Australian government could initiate more wellness programs towards female populations, as they are more likely to feel stressed.

Another implication is that the government should devote more effort into raising mental health awareness in general during crisis times. The government needs to understand that there are multiple aspects affecting the well-being of the population. Although many countries, including Australia, provided economic aid and other subsidies during the pandemic, not many countries initiated mental health support programs that are widely accessible.

Appendix

```
#draw Diagram
for (i in 1:4) {
  data <- eval(as.symbol(extract_table_names[i])) %>% slice((2:7)) %>%
    subset(Gender != "Total")
  question <- eval(as.symbol(extract_table_names[i])) %>% slice(1) %>% select(Data) %>% unlist()
```

```
  title1 <- q_names[i]
  title2 <- paste(q_names[i], " by age group", sep = "")
  caption1 <- paste("Figure", i, ".1: ", "Question", i, " created by Group 11 in STA304, Winter 2022", s
  caption2 <- paste("Figure", i, ".2: ", "Question", i, " by age group created by Group 11 in STA304, W
  print(ggplot(data, aes(x=Year, y=as.numeric(Data), fill=Gender)) +
          labs(x="Year", y="Number(in thousand)") +
          geom_col(position = "stack") +
          scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
          geom_text(aes(label = round(as.numeric(Data),1)), size = 3, hjust = 0.5, vjust = 3, position =
          ggtitle(title1) +
          theme(plot.title = element_text(size=16, hjust=0.5)) +
          theme_minimal() +
          theme(legend.position="bottom") +
          labs(caption = caption1))
  data2 <- eval(as.symbol(paste(extract_table_names[i], "_AGE_2020", sep = "")))
  print(ggplot(data2, aes(x=Age)) +
          geom_line(aes(y = as.numeric(Males), colour = "Males", group = 1)) +
          geom_line(aes(y = as.numeric(Females), colour = "Females", group = 1)) +
          geom_line(aes(y = as.numeric(Total_persons), colour = "Total_persons", group = 1)) +
          labs(x="Age Group", y="Number(in thousand)") +
          ggtitle(title2) +
          theme(plot.title = element_text(size=16, hjust=0.5)) +
          theme_minimal() +
          theme(legend.position="bottom") +
          labs(caption = caption2))
}
```

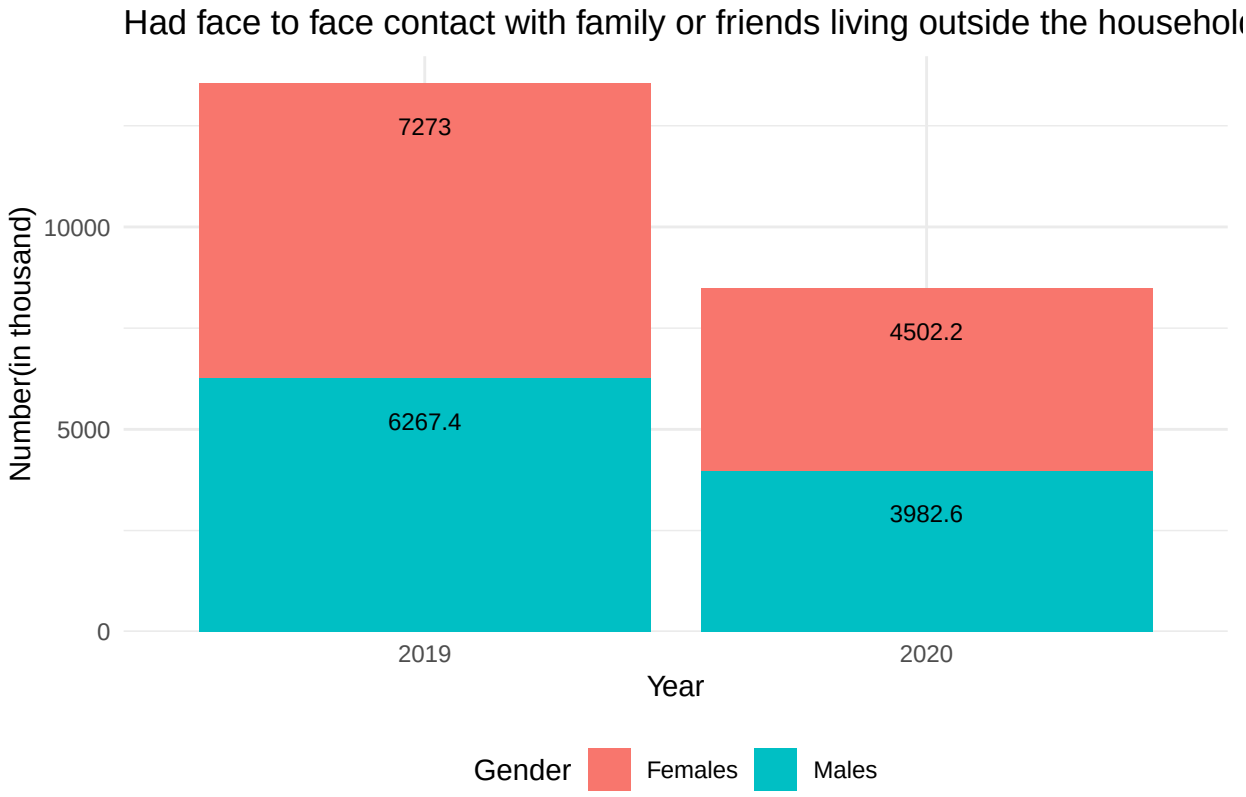

Figure1.1: Question1 created by Group 11 in STA304, Winter 2022

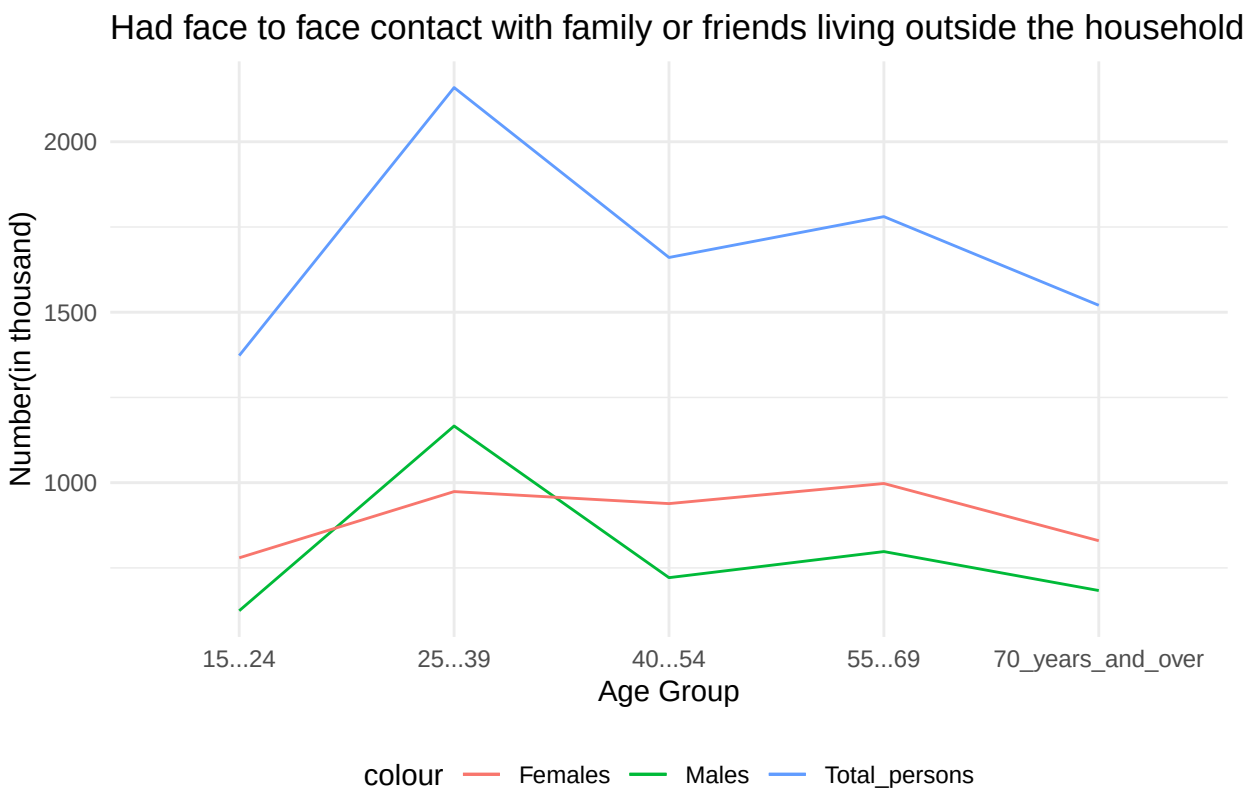

Figure1.2: Question1 by age group created by Group 11 in STA304, Winter 2022

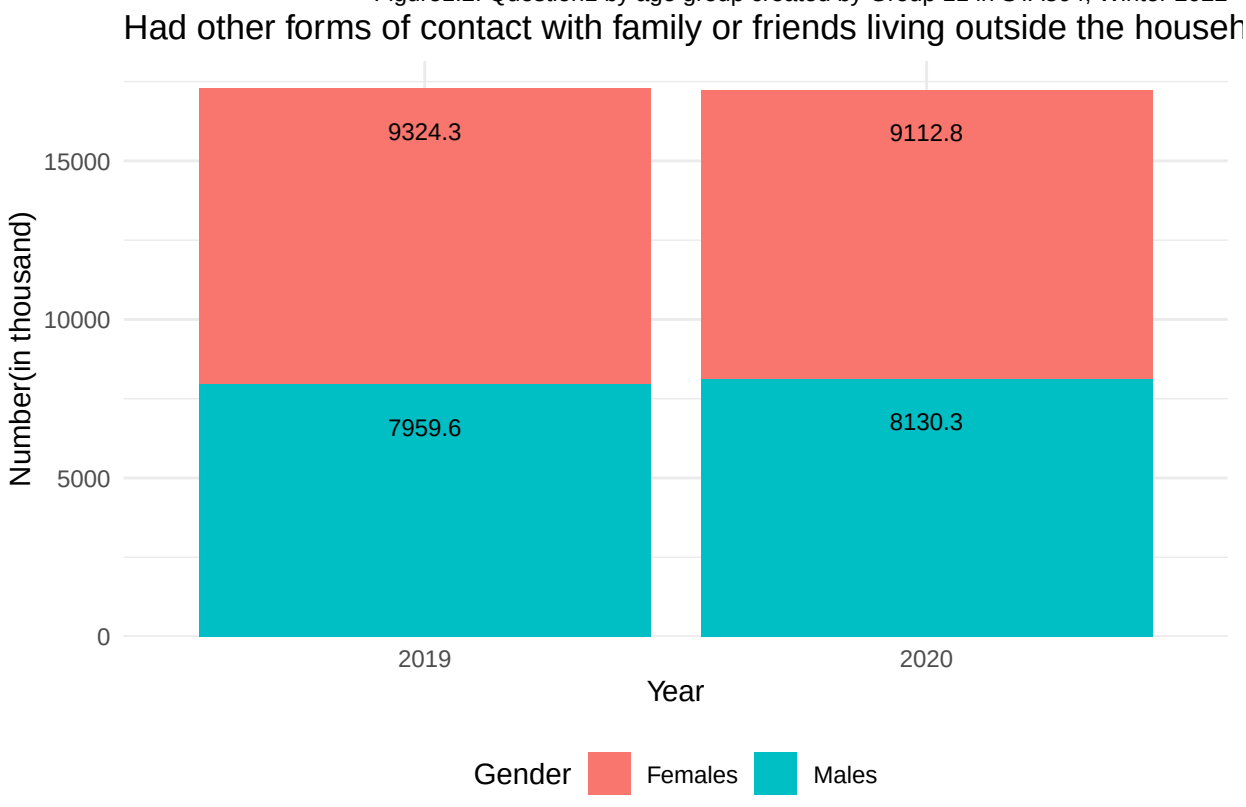

Figure2.1: Question2 created by Group 11 in STA304, Winter 2022

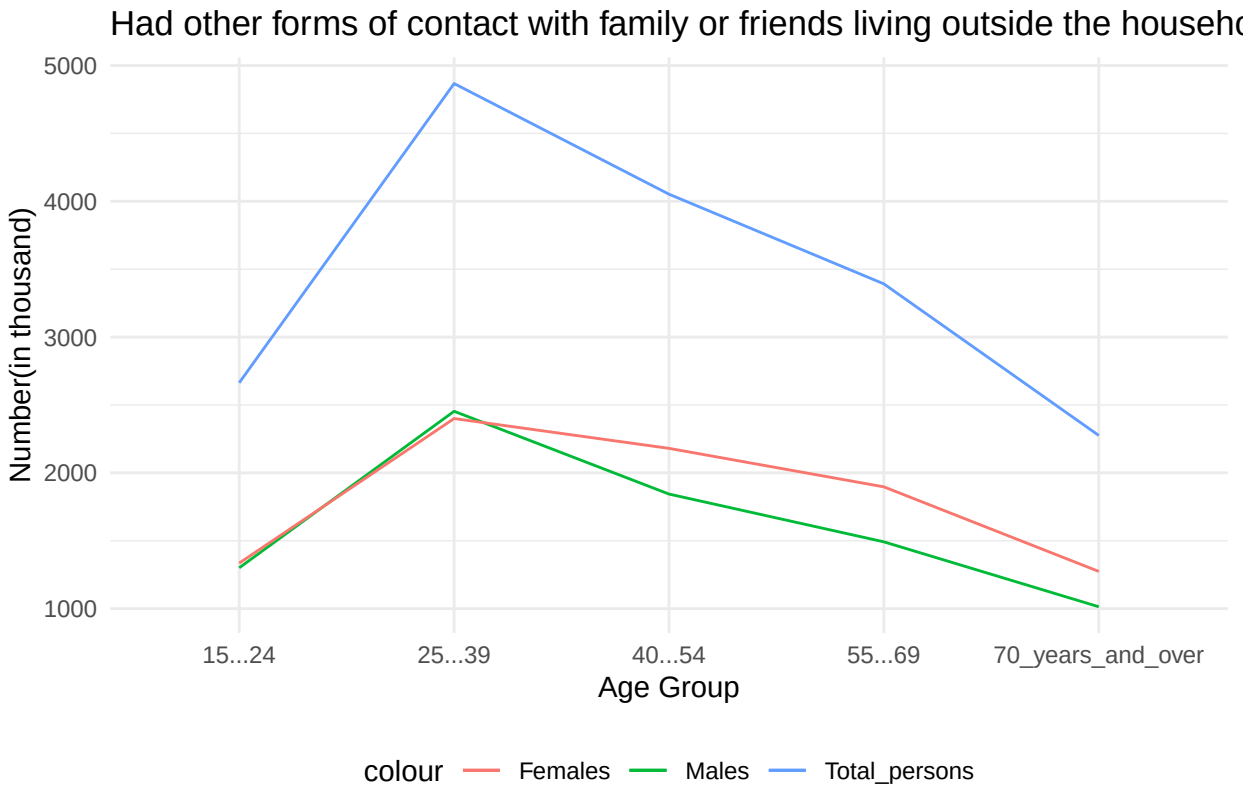

Figure2.2: Question2 by age group created by Group 11 in STA304, Winter 2022

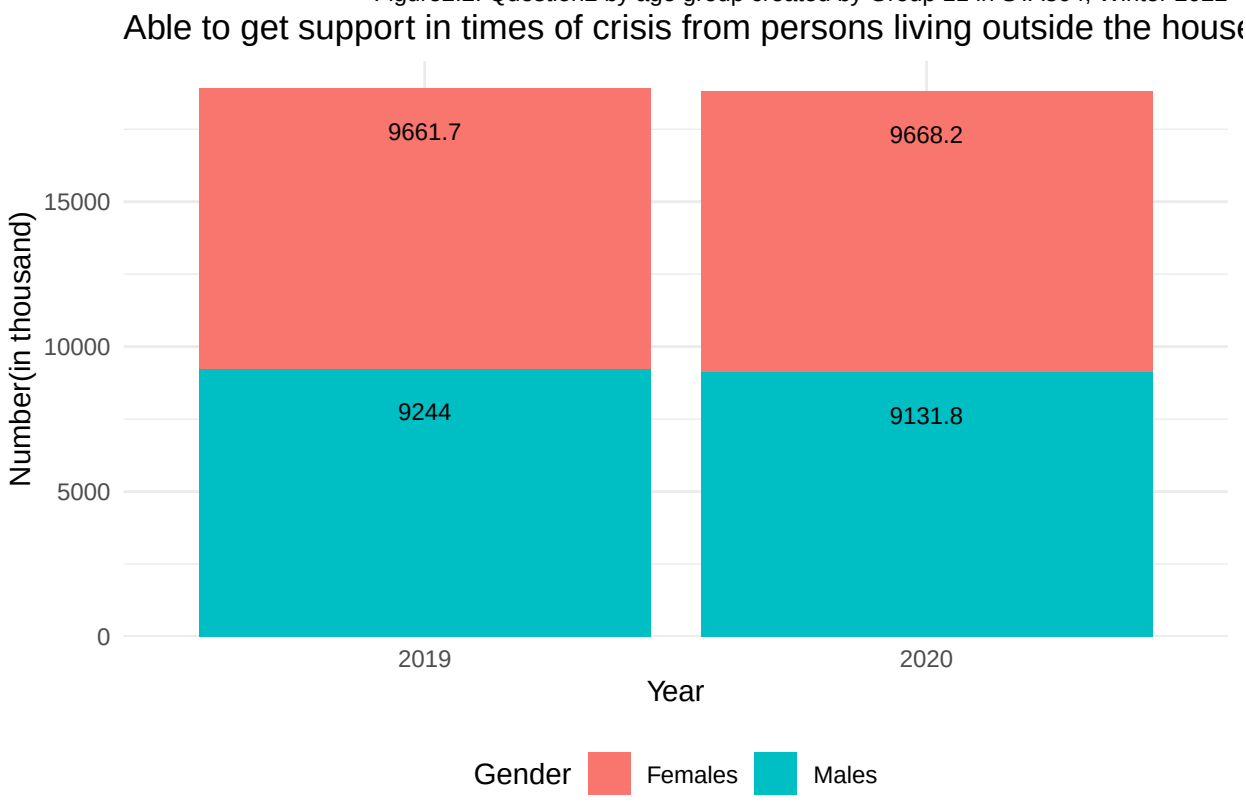

Figure3.1: Question3 created by Group 11 in STA304, Winter 2022

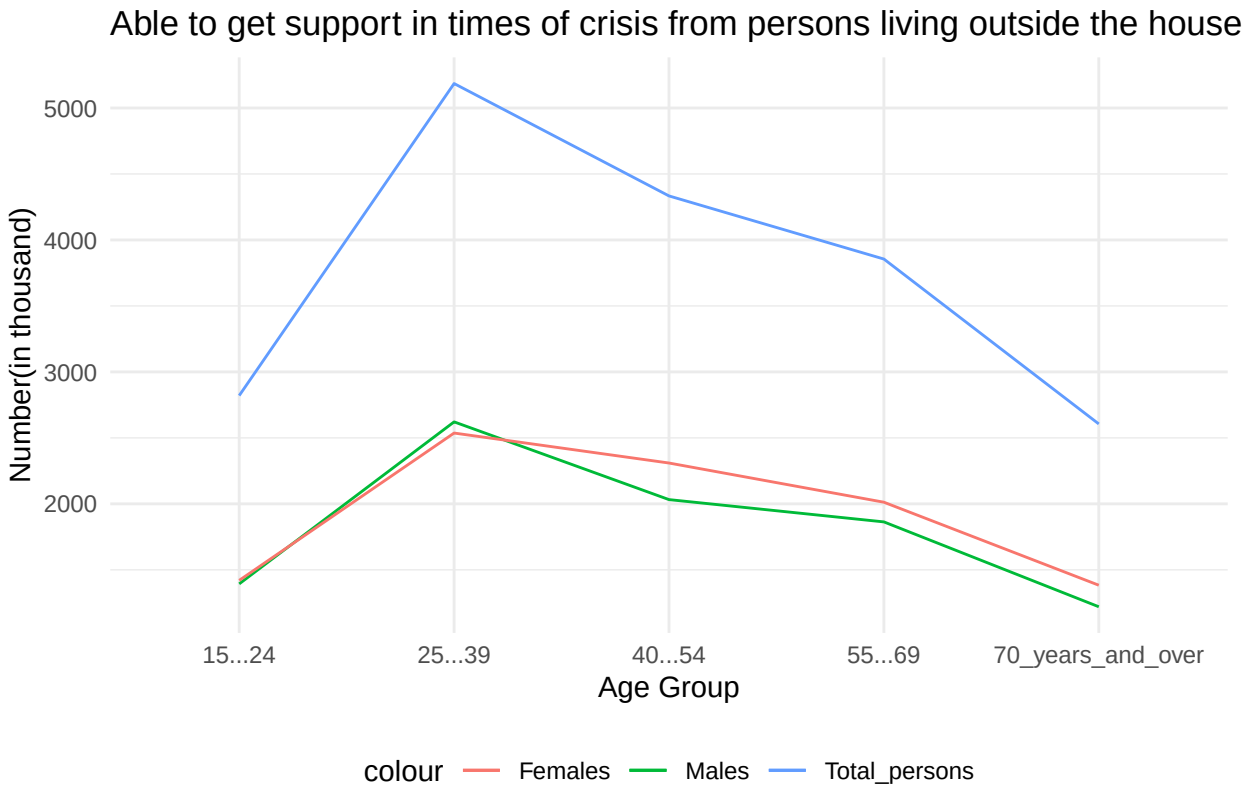

Figure3.2: Question3 by age group created by Group 11 in STA304, Winter 2022

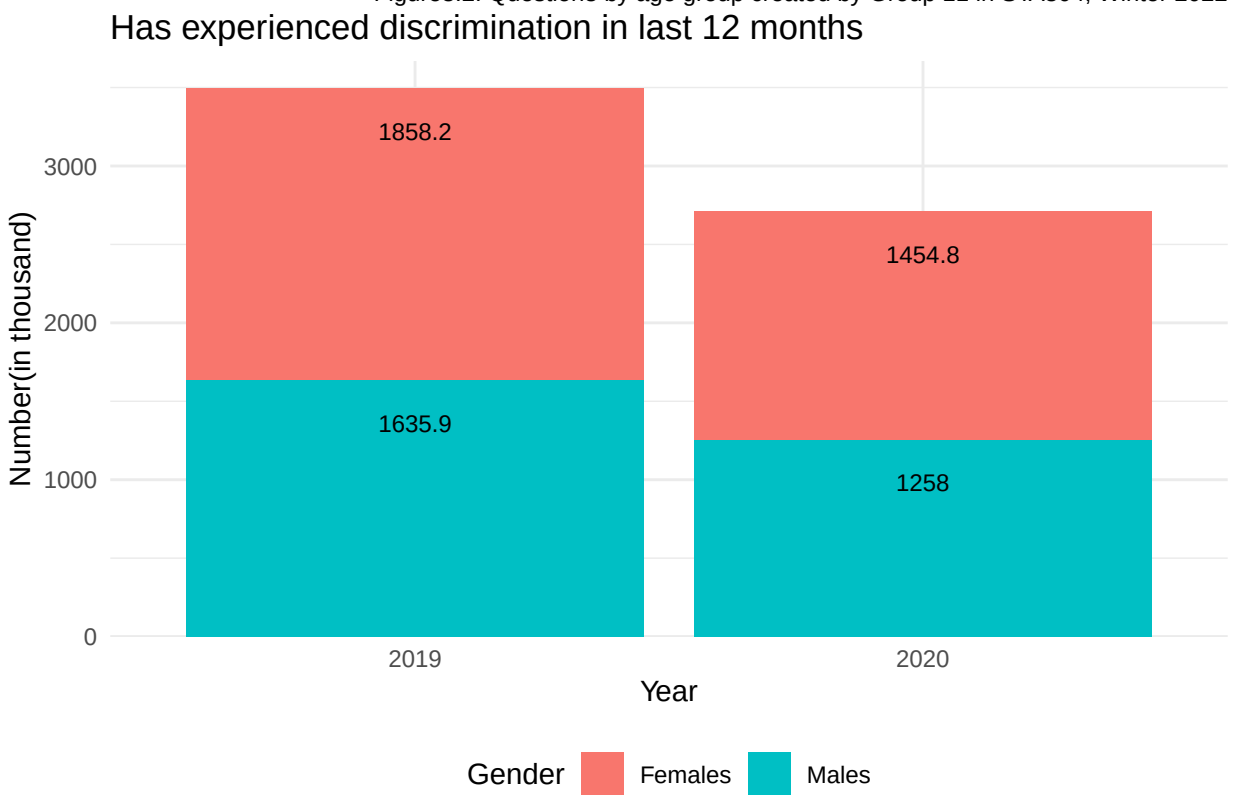

Figure4.1: Question4 created by Group 11 in STA304, Winter 2022

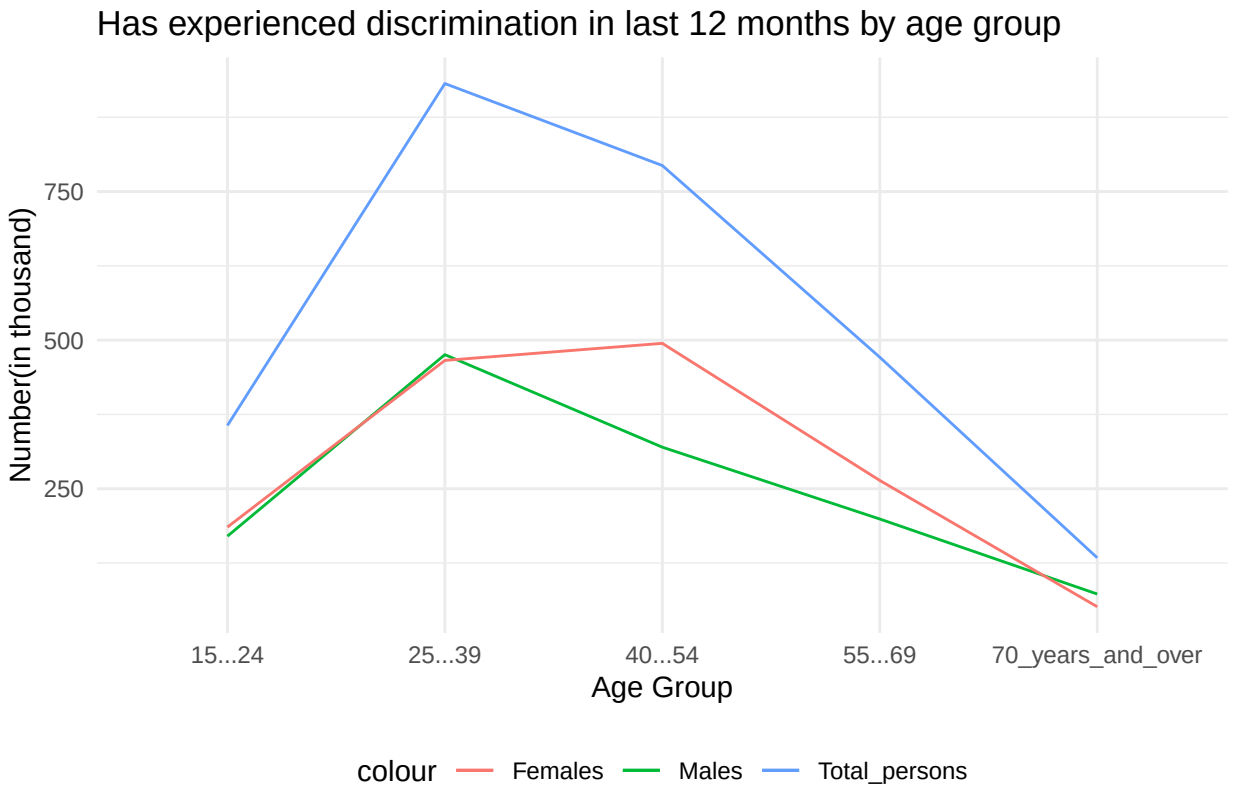

Figure4.2: Question4 by age group created by Group 11 in STA304, Winter 2022

```
ggplot(Q5, aes(x=Year, y=as.numeric(value), fill=Gender)) +
  geom_col(position = "stack") +
  facet_wrap(~`Feels most people can be trusted`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Year", y="Number(in thousand)") +
  ggtitle("Feels most people can be trusted") +
  geom_text(aes(label = round(as.numeric(value),1)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure5.1: Question5 created by Group 11 in STA304, Winter 2022")
```

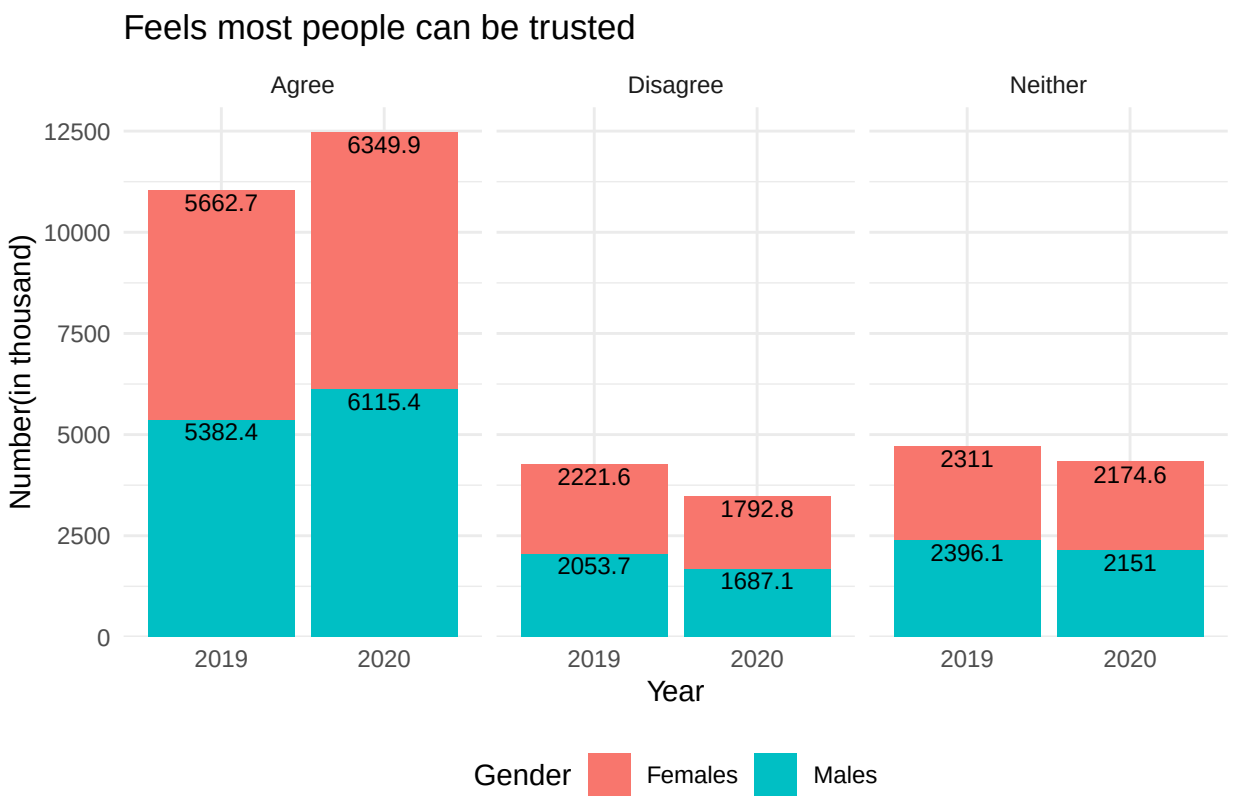

Figure5.1: Question5 created by Group 11 in STA304, Winter 2022

```
ggplot(Q5_AGE_2020, aes(x=Gender, y=as.numeric(value), fill=`Feels most people can be trusted`)) +
  geom_col(position = "stack") +
  facet_wrap(~`Age Group`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Gender", y="Percentage") +
  ggtitle(paste("Feels most people can be trusted", " by age group", sep = "")) +
  geom_text(aes(label = round(as.numeric(value),4)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure5.2: Question5 by age group created by Group 11 in STA304, Winter 2022")
```

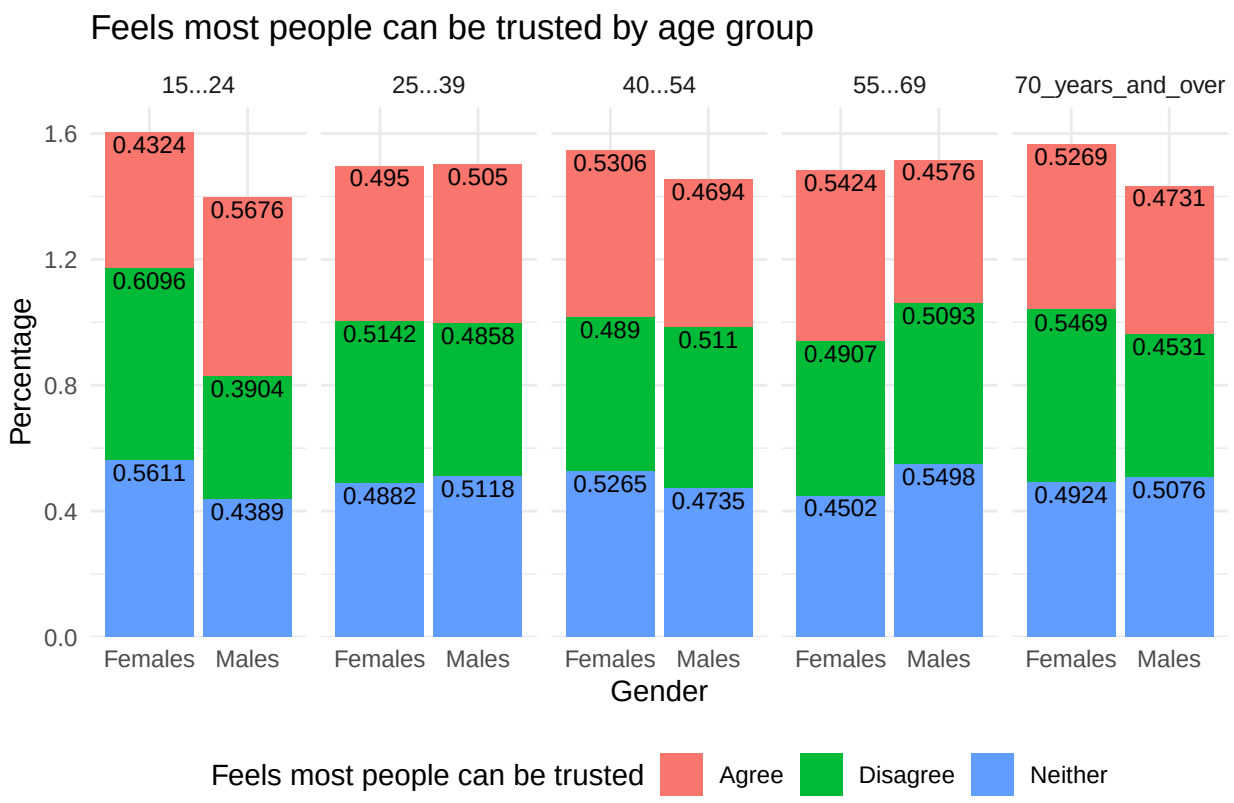

Figure5.2: Question5 by age group created by Group 11 in STA304, Winter 2022

```
ggplot(Q6, aes(x=Year, y=as.numeric(value), fill=Gender)) +
  geom_col(position = "stack") +
  facet_wrap(~`Feels the healthcare system can be trusted`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Year", y="Number(in thousand)") +
  ggtitle("Feels the healthcare system can be trusted") +
  geom_text(aes(label = round(as.numeric(value),1)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure6.1: Question6 created by Group 11 in STA304, Winter 2022")
```

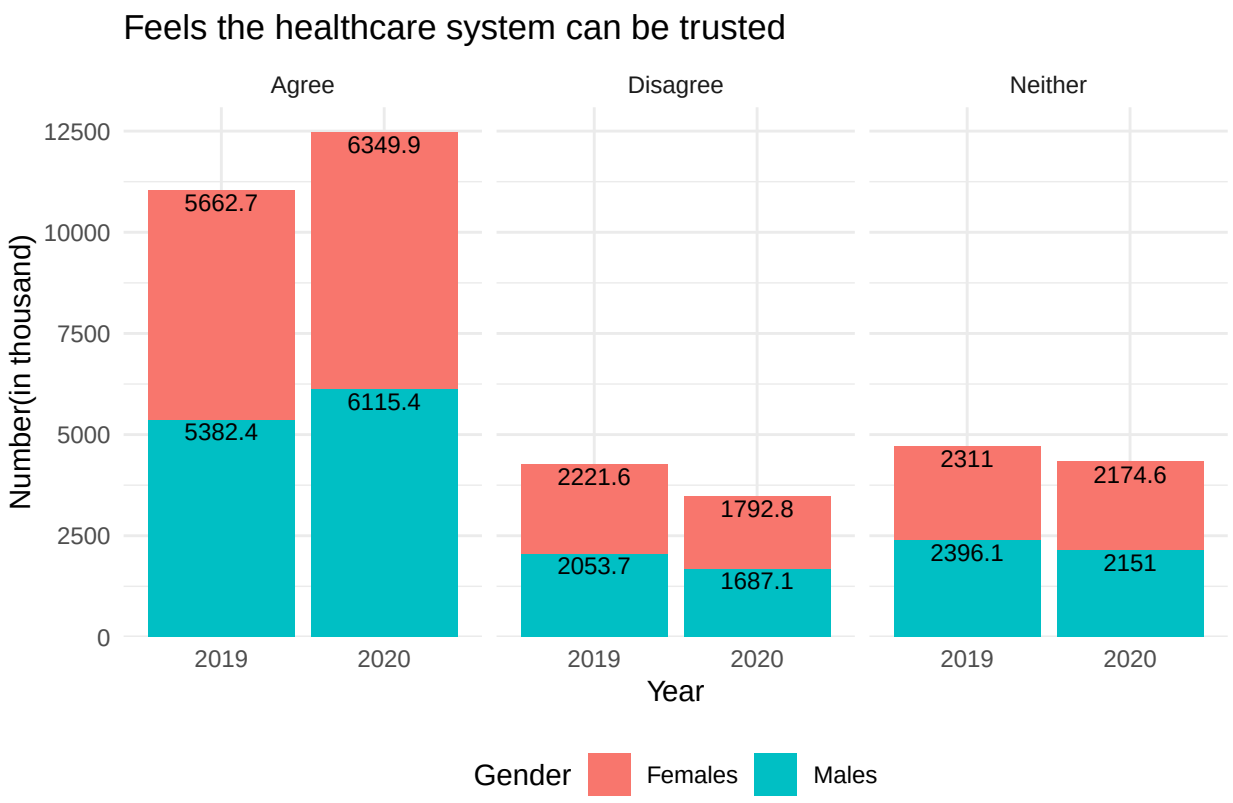

Figure6.1: Question6 created by Group 11 in STA304, Winter 2022

```
ggplot(Q6_AGE_2020, aes(x=Gender, y=as.numeric(value), fill=`Feels the healthcare system can be trusted
  geom_col(position = "stack") +
  facet_wrap(~`Age Group`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Gender", y="Percentage") +
  ggtitle(paste("Feels the healthcare system can be trusted", " by age group", sep = "")) +
  geom_text(aes(label = round(as.numeric(value),4)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure6.2: Question6 by age group created by Group 11 in STA304, Winter 2022")
```

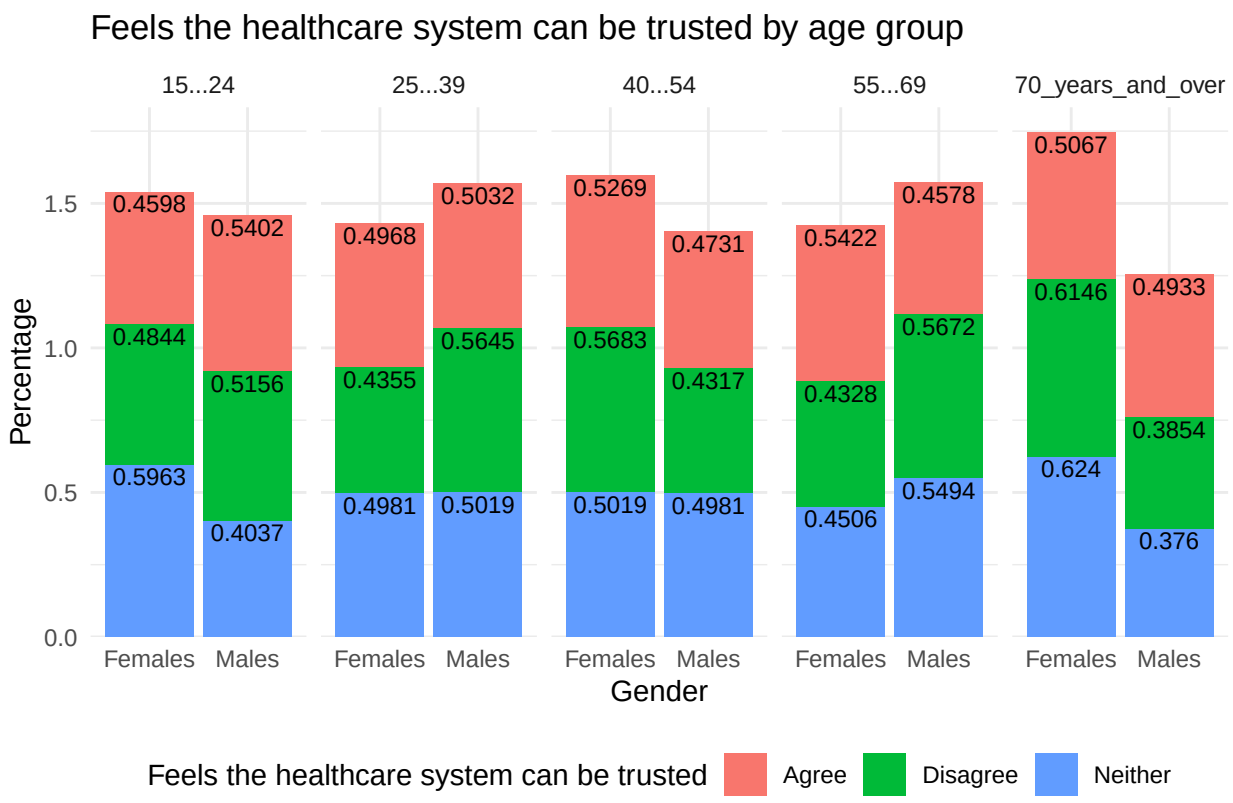

Figure6.2: Question6 by age group created by Group 11 in STA304, Winter 2022

```
for (i in 5:length(extract_table_names)) {
  data <- eval(as.symbol(extract_table_names[i])) %>% slice((2:7)) %>%
    subset(Gender != "Total")
  question <- eval(as.symbol(extract_table_names[i])) %>% slice(1) %>% select(Data) %>% unlist()
  title1 <- q_names[i]
  title2 <- paste(q_names[i], " by age group", sep = "")
  caption1 <- paste("Figure", i+2, ".1: ", "Question", i+2, " created by Group 11 in STA304, Winter 202
  caption2 <- paste("Figure", i+2, ".2: ", "Question", i+2, " by age group created by Group 11 in STA30
  print(ggplot(data, aes(x=Year, y=as.numeric(Data), fill=Gender)) +
          labs(x="Year", y="Number(in thousand)") +
          geom_col(position = "stack") +
          scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
          geom_text(aes(label = round(as.numeric(Data),1)), size = 3, hjust = 0.5, vjust = 3, position =
          ggtitle(title1) +
          theme(plot.title = element_text(size=16, hjust=0.5)) +
          theme_minimal() +
          theme(legend.position="bottom") +
          labs(caption = caption1))
  data2 <- eval(as.symbol(paste(extract_table_names[i], "_AGE_2020", sep = "")))
  print(ggplot(data2, aes(x=Age)) +
          geom_line(aes(y = as.numeric(Males), colour = "Males", group = 1)) +
          geom_line(aes(y = as.numeric(Females), colour = "Females", group = 1)) +
          geom_line(aes(y = as.numeric(Total_persons), colour = "Total_persons", group = 1)) +
          labs(x="Age Group", y="Number(in thousand)") +
          ggtitle(title2) +
          theme(plot.title = element_text(size=16, hjust=0.5)) +
          theme_minimal() +
```

```
          theme(legend.position="bottom") +
          labs(caption = caption2))
}
```

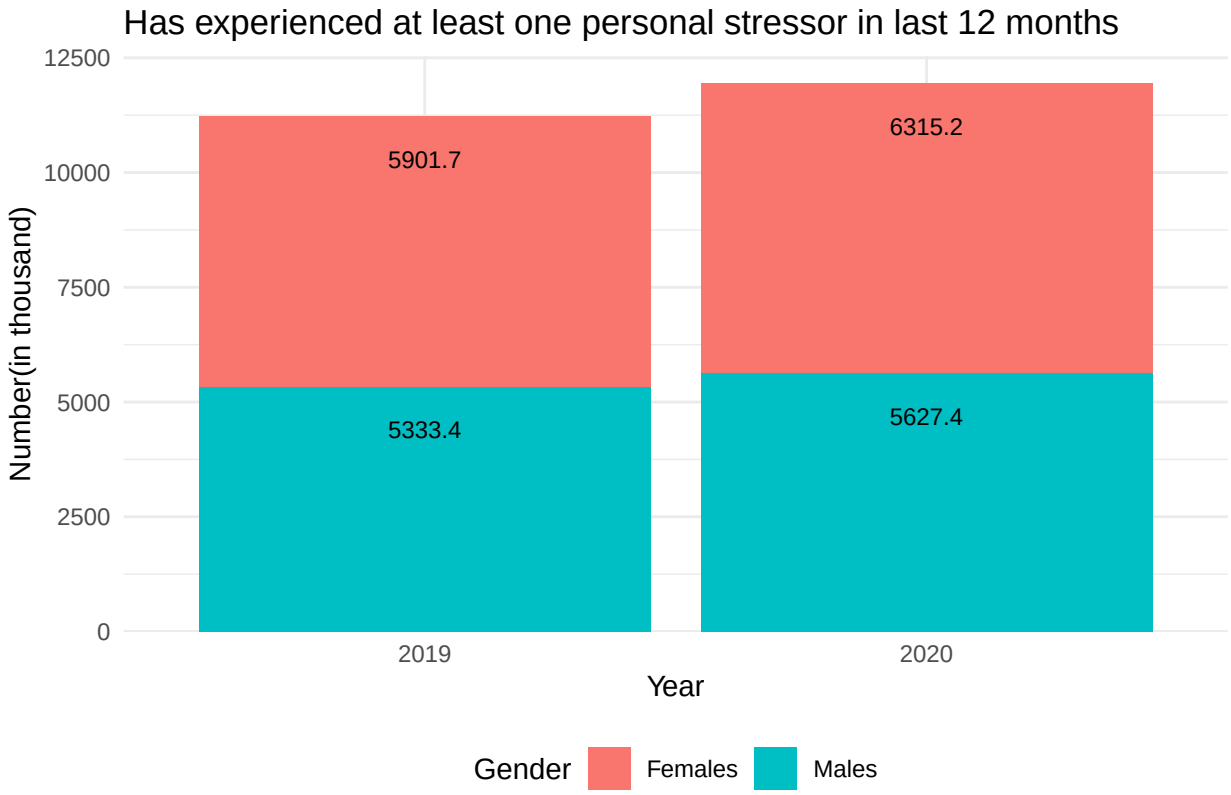

Figure7.1: Question7 created by Group 11 in STA304, Winter 2022

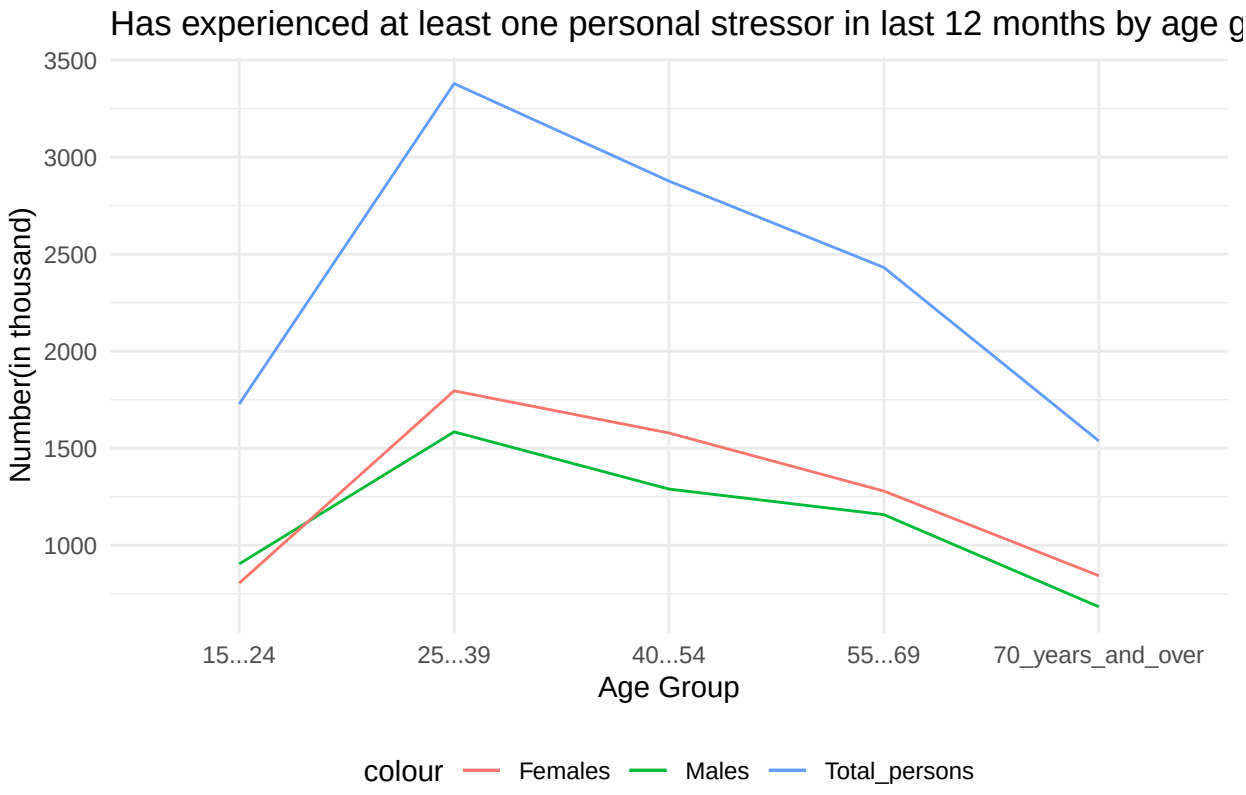

Figure7.2: Question7 by age group created by Group 11 in STA304, Winter 2022

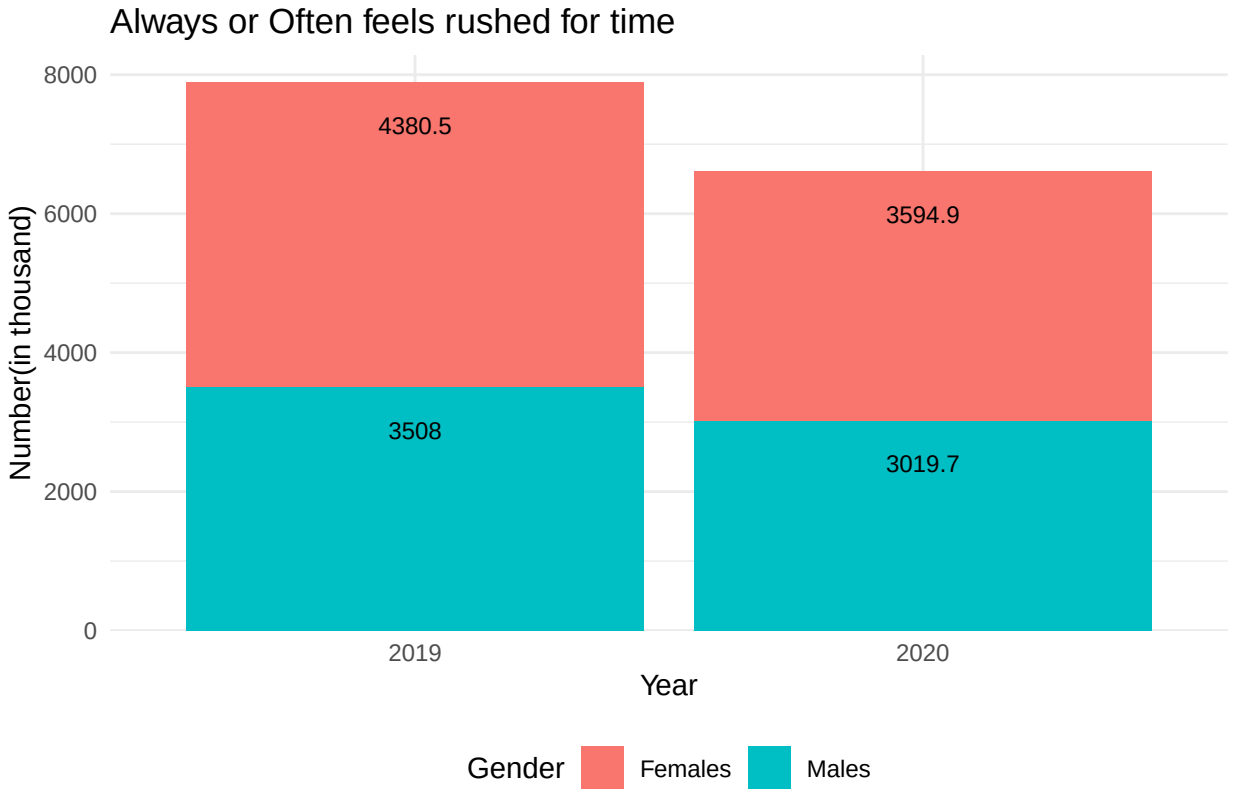

Figure8.1: Question8 created by Group 11 in STA304, Winter 2022

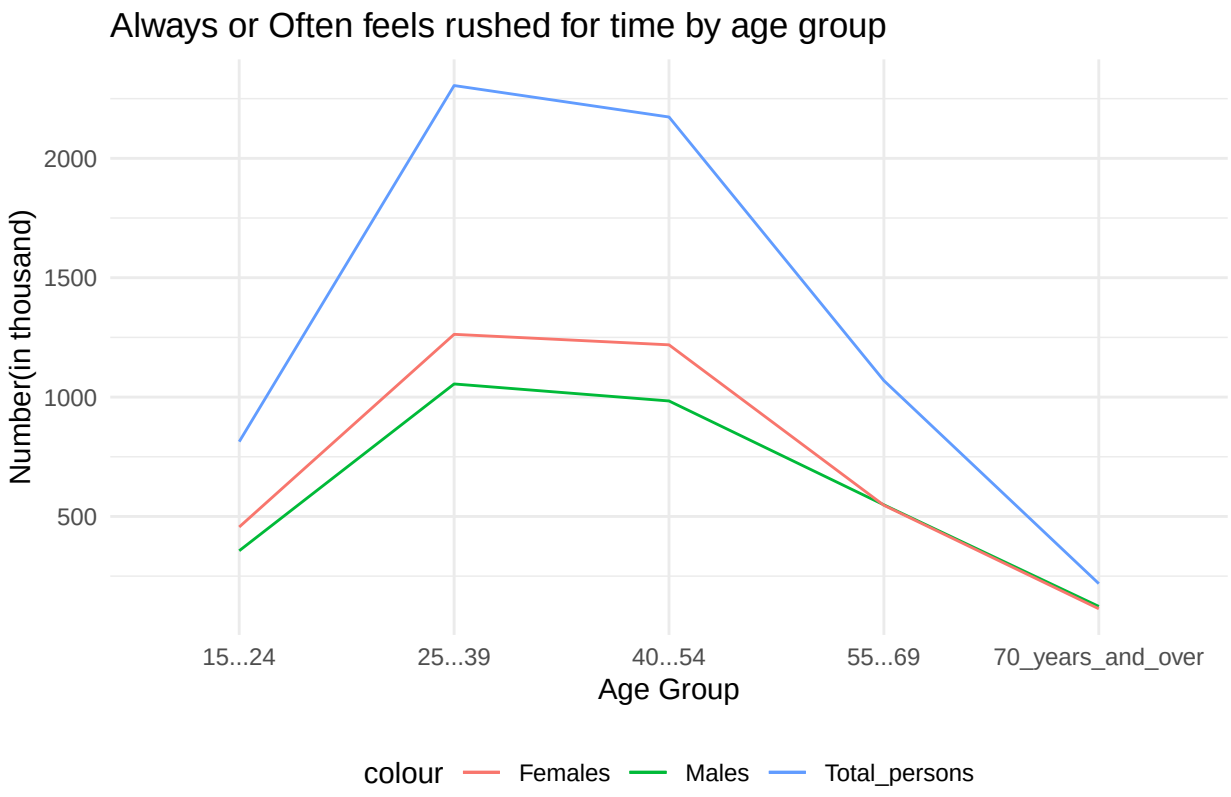

Figure8.2: Question8 by age group created by Group 11 in STA304, Winter 2022

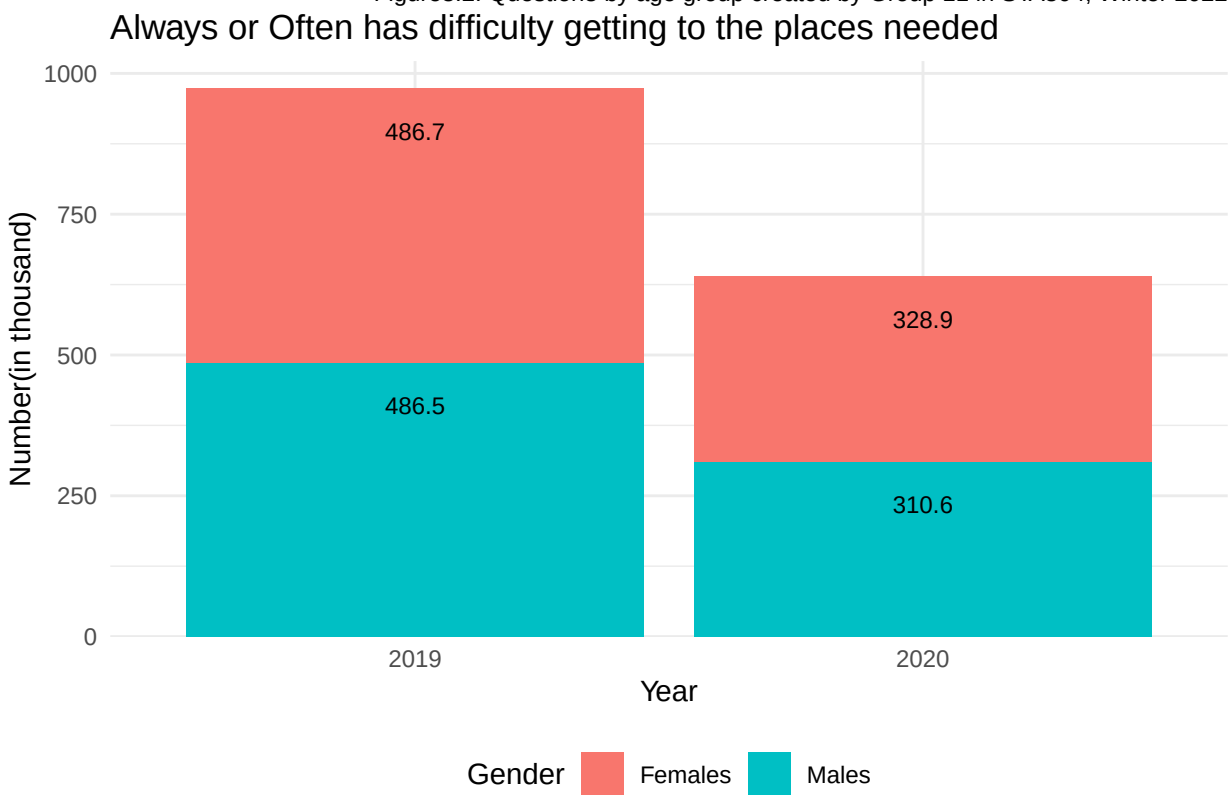

Figure9.1: Question9 created by Group 11 in STA304, Winter 2022

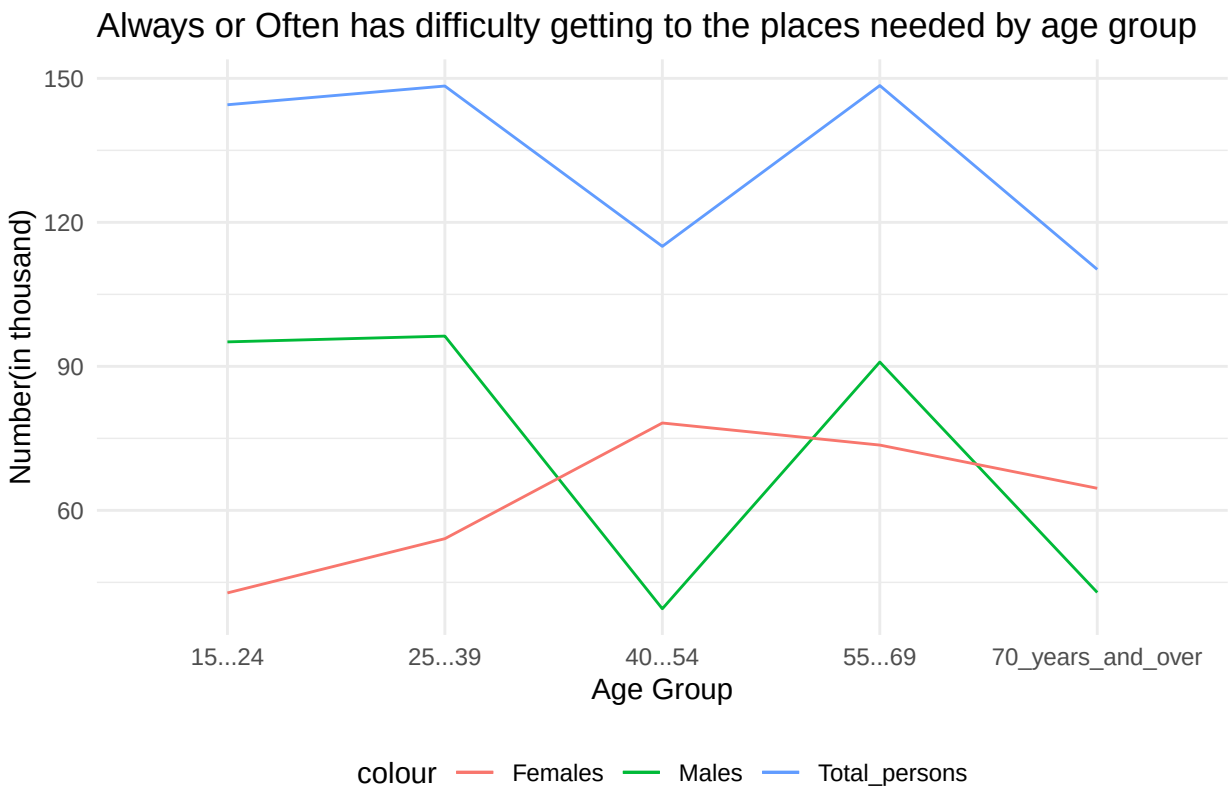

Figure9.2: Question9 by age group created by Group 11 in STA304, Winter 2022

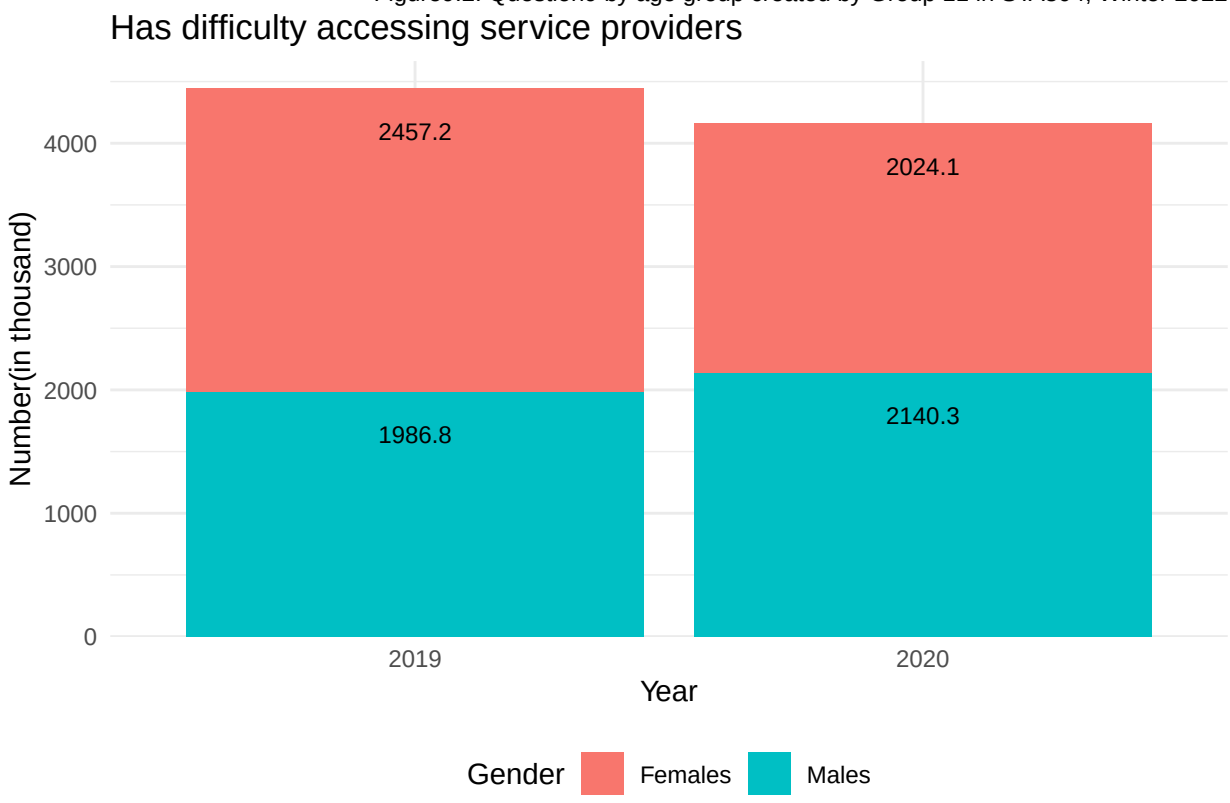

Figure10.1: Question10 created by Group 11 in STA304, Winter 2022

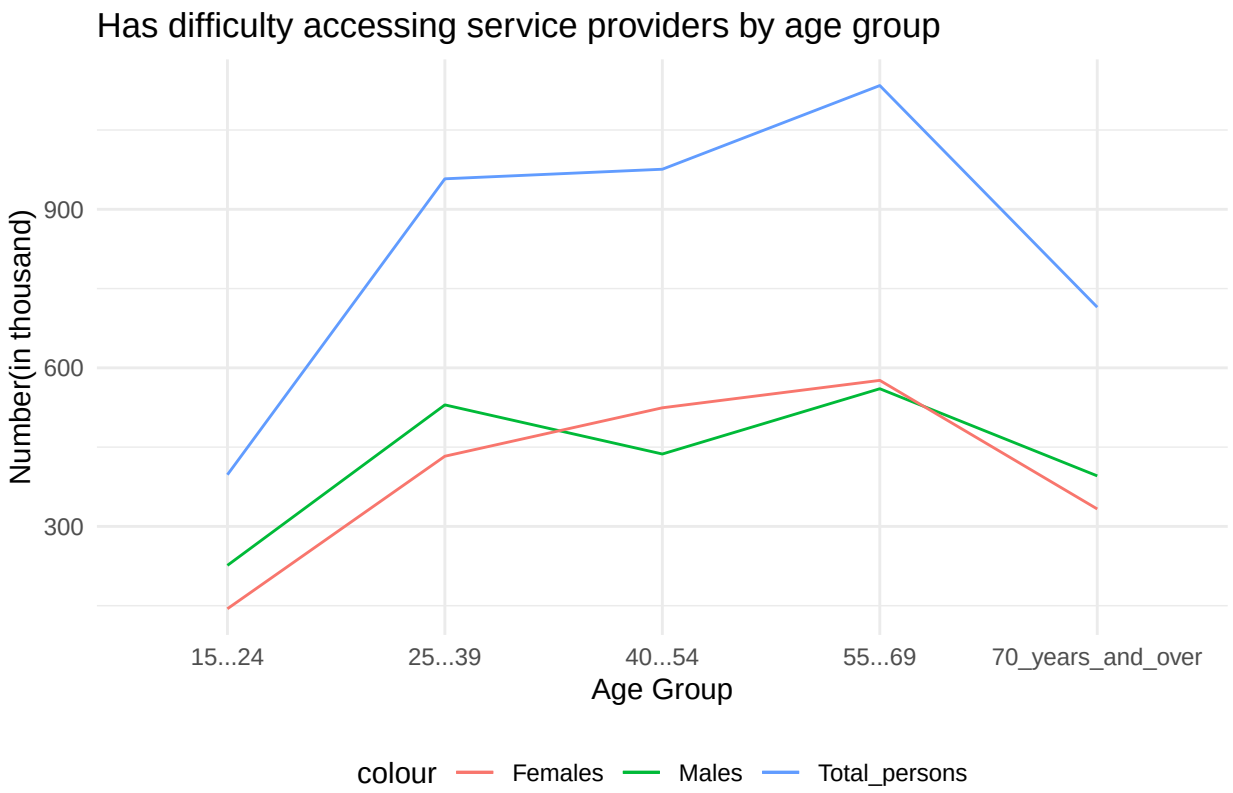

Figure10.2: Question10 by age group created by Group 11 in STA304, Winter 2022

```
ggplot(Q11, aes(x=Year, y=as.numeric(value), fill=Gender)) +
  geom_col(position = "stack") +
  facet_wrap(~`Self-assessed health status`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Year", y="Number(in thousand)") +
  ggtitle("Self-assessed health status") +
  geom_text(aes(label = round(as.numeric(value),1)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure11.1: Question11 created by Group 11 in STA304, Winter 2022")
```

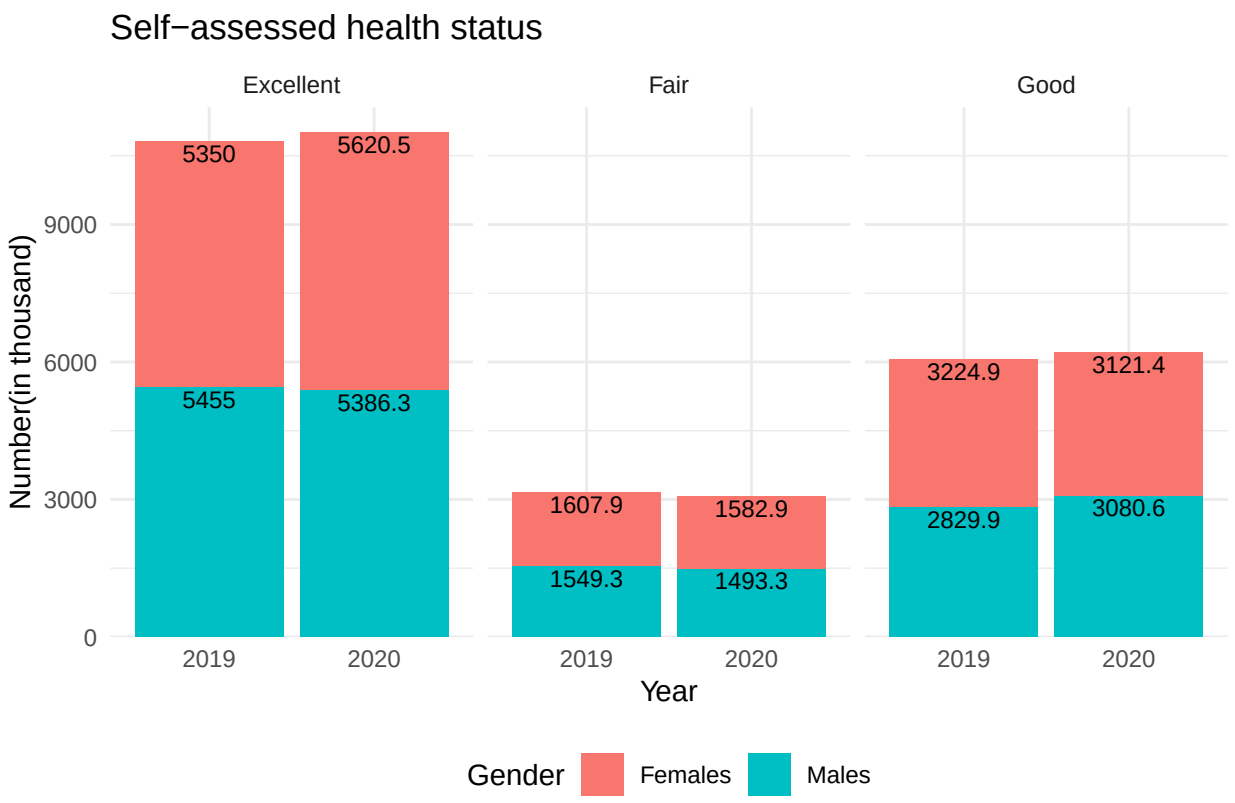

Figure11.1: Question11 created by Group 11 in STA304, Winter 2022

```
ggplot(Q11_AGE_2020, aes(x=Gender, y=as.numeric(value), fill=`Self-assessed health status`)) +
  geom_col(position = "stack") +
  facet_wrap(~`Age Group`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Gender", y="Percentage") +
  ggtitle(paste("Self-assessed health status", " by age group", sep = "")) +
  geom_text(aes(label = round(as.numeric(value),4)), size = 3, hjust = 0.5, vjust = 1, position = "stack
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure11.2: Question11 by age group created by Group 11 in STA304, Winter 2022")
```

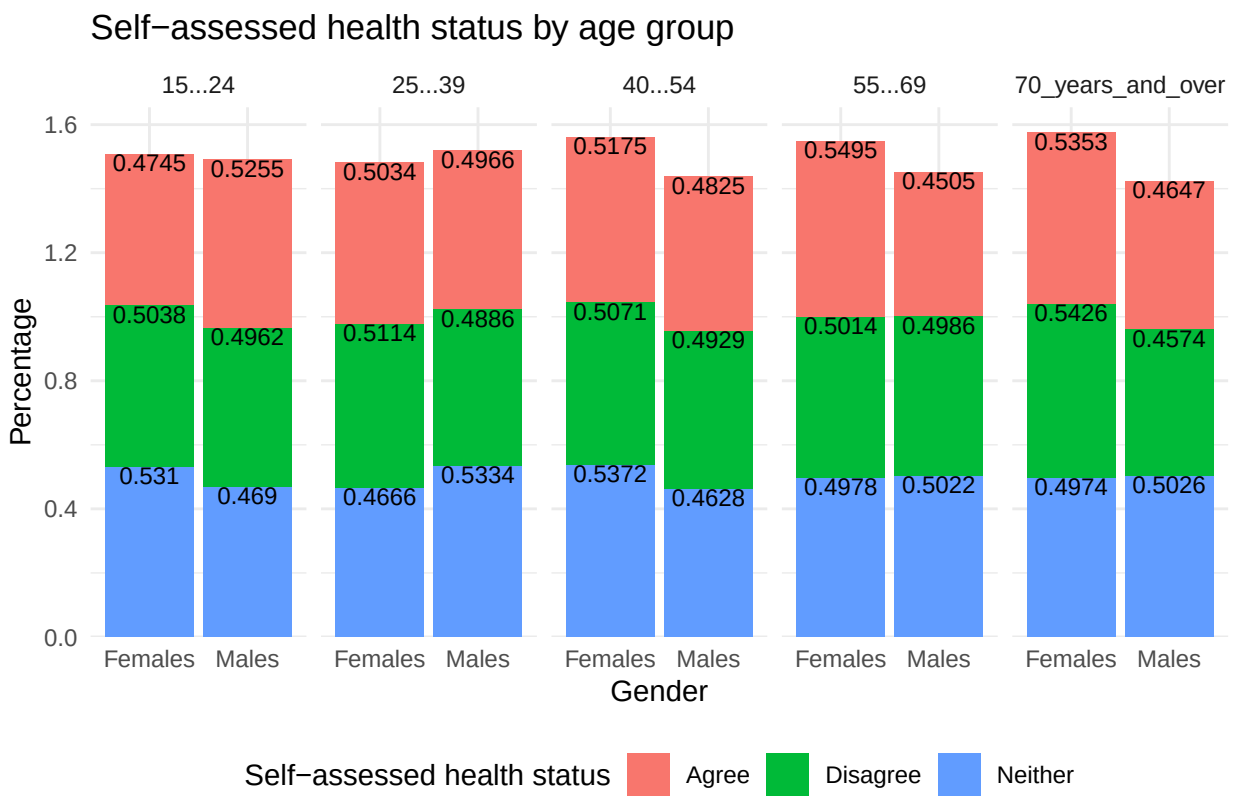

Figure11.2: Question11 by age group created by Group 11 in STA304, Winter 2022

```
ggplot(Q12, aes(x=Year, y=as.numeric(value), fill=Gender)) +
  geom_col(position = "stack") +
  facet_wrap(~`Age group`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Year", y="Number(in thousand)") +
  ggtitle("Age group") +
  geom_text(aes(label = round(as.numeric(value),1)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure12: Question12 created by Group 11 in STA304, Winter 2022")
```

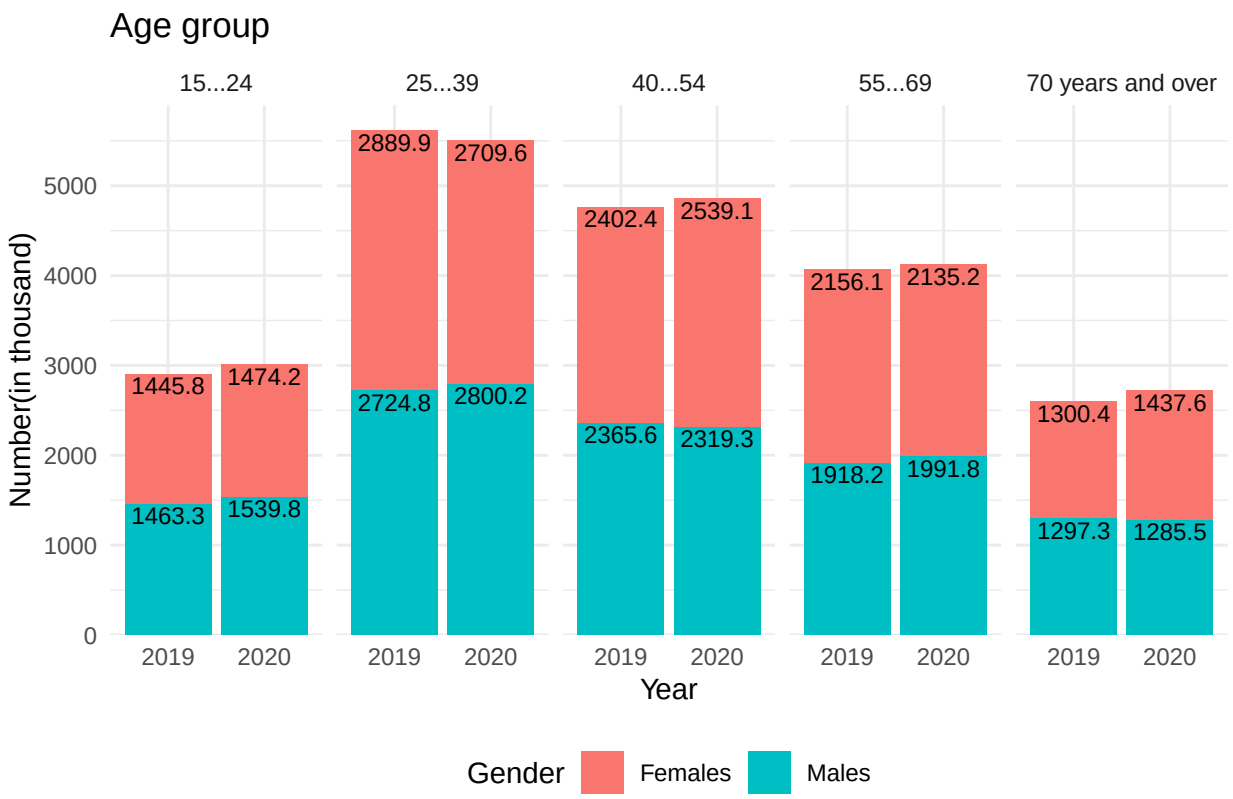

Figure12: Question12 created by Group 11 in STA304, Winter 2022

```
ggplot(Q13, aes(x=Year, y=as.numeric(value), fill=Gender)) +
  geom_col(position = "stack") +
  facet_wrap(~`Labour force status`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Year", y="Number(in thousand)") +
  ggtitle("Labour force status") +
  geom_text(aes(label = round(as.numeric(value),1)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure13: Question13 created by Group 11 in STA304, Winter 2022")
```

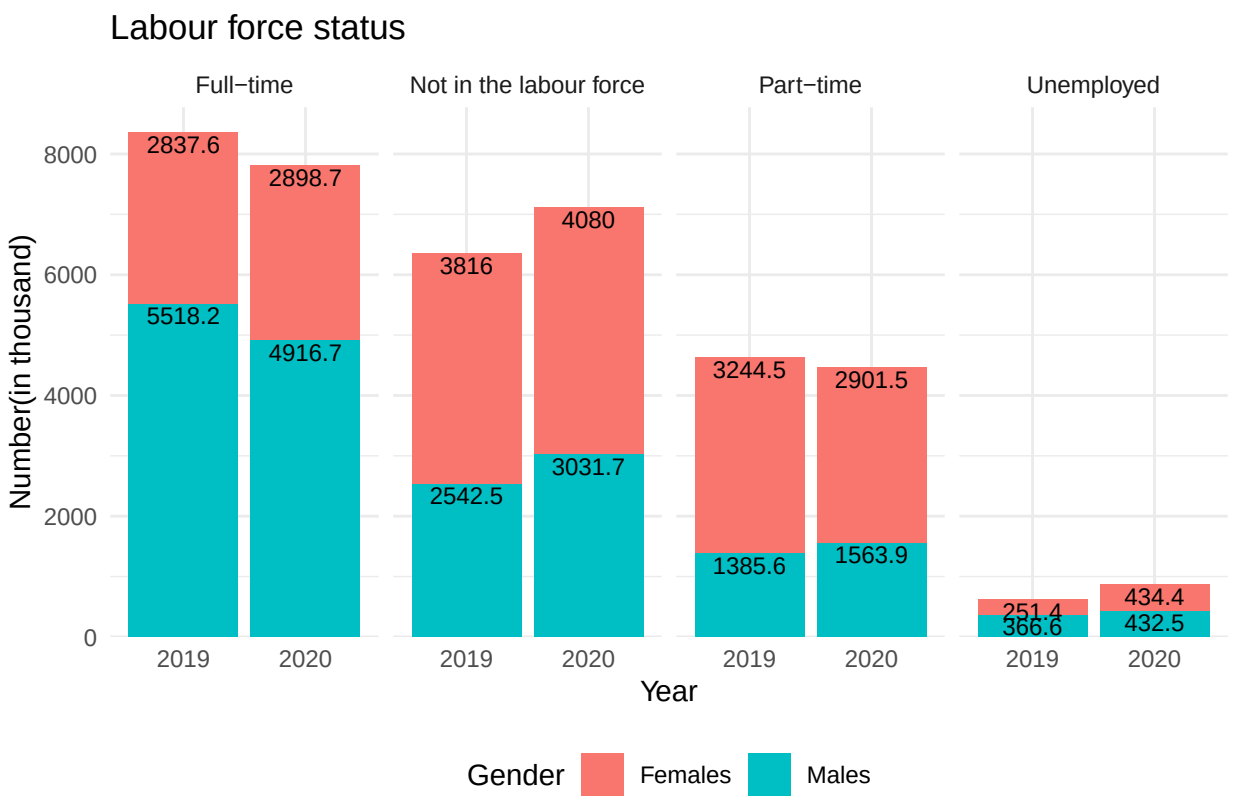

Figure13: Question13 created by Group 11 in STA304, Winter 2022

```
ggplot(Q14, aes(x=Year, y=as.numeric(value), fill=Gender)) +
  geom_col(position = "stack") +
  facet_wrap(~`Level of highest non-school qualification`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Year", y="Number(in thousand)") +
  ggtitle("Education") +
  geom_text(aes(label = round(as.numeric(value),1)), size = 3, hjust = 0.5, vjust = 1.2, position = "sta
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure14: Question14 created by Group 11 in STA304, Winter 2022")
```

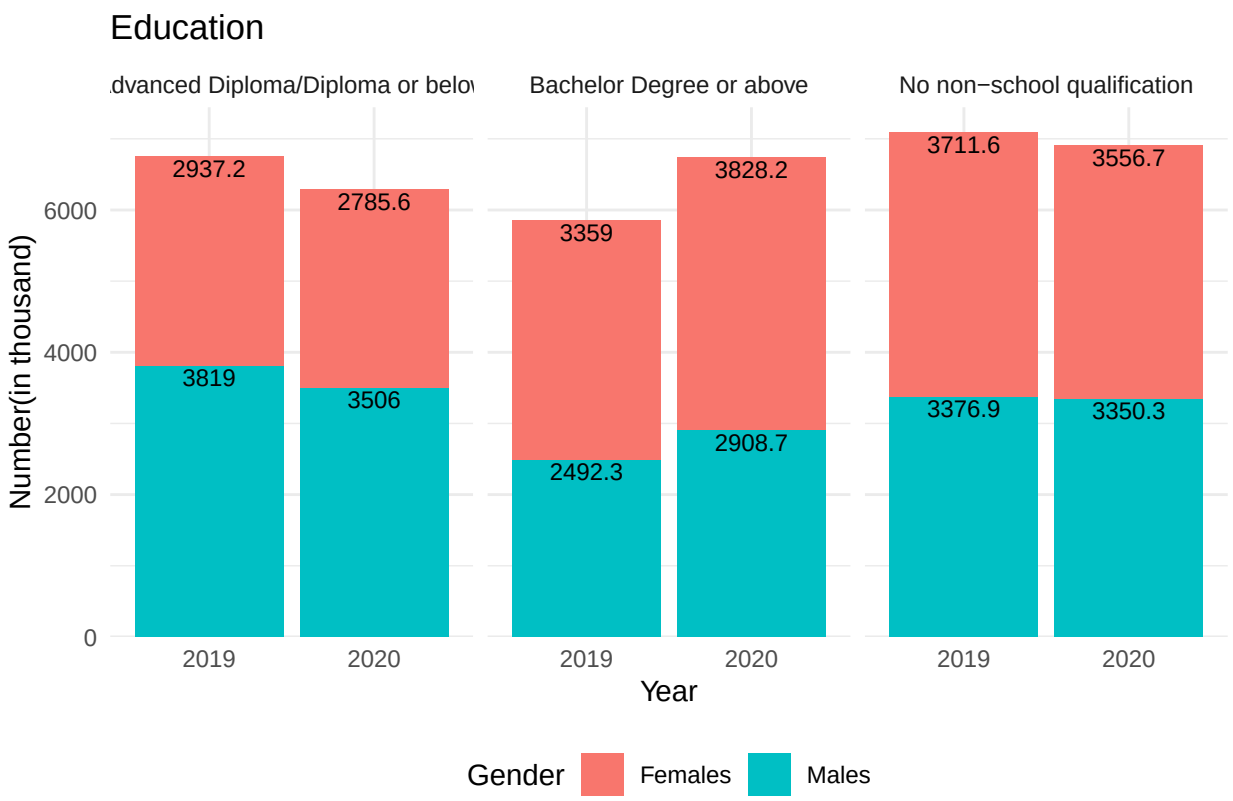

Figure14: Question14 created by Group 11 in STA304, Winter 2022

```
ggplot(Q15, aes(x=Year, y=as.numeric(value), fill=Gender)) +
  geom_col(position = "stack") +
  facet_wrap(~`Main Source of Household Income`, nrow = 1) +
  scale_y_continuous(expand = expansion(mult = c(0, 0.05))) +
  labs(x="Year", y="Number(in thousand)") +
  ggtitle("Main Source of Household Income") +
  geom_text(aes(label = round(as.numeric(value),1)), size = 3, hjust = 0.5, position = "stack") +
  theme(plot.title = element_text(size=16, hjust=0.5)) +
  theme_minimal() +
  theme(legend.position="bottom") +
  labs(caption = "Figure15: Question15 created by Group 11 in STA304, Winter 2022")
```

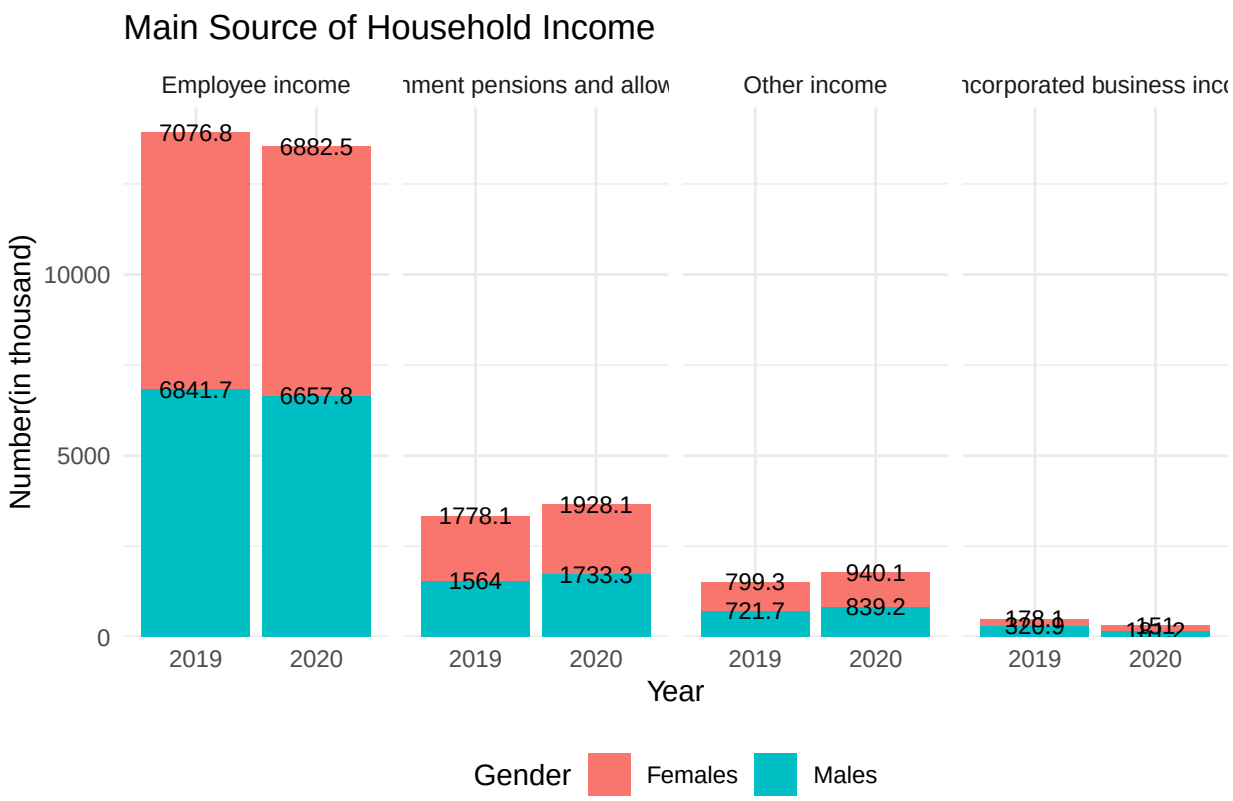

Figure15: Question15 created by Group 11 in STA304, Winter 2022