ASSIGNMENT

TECHNOLOGY PARK MALAYSIA

CT127-3-2-PFDA

PROGRAMMING FOR DATA ANALYSIS

APD2F2206CS

HAND OUT DATE: 25 JULY 2022

HAND IN DATE: 21 AUGUST 2022

WEIGHTAGE: 50%

INSTRUCTIONS TO CANDIDATES:

1   Submit your assignment at the administrative counter.

2   Students are advised to underpin their answers with the use of references (cited using the American Psychological Association (APA) Referencing).

3   Late submission will be awarded zero (0) unless Extenuating Circumstances (EC) are upheld.

4   Cases of plagiarism will be penalized.

5   The assignment should be bound in an appropriate style (comb bound or stapled).

6   Where the assignment should be submitted in both hardcopy and softcopy, the softcopy of the written assignment and source code (where appropriate) should be on a CD in an envelope / CD cover and attached to the hardcopy.

7   You must obtain 50% overall to pass this module.

INDIVIDUAL ASSIGNMENT

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Introduction

The aim of this assignment is to perform data analysis on a dataset about staff's data of an organization from 2006 to 2015. The dataset includes employee's identity code, record date, birth date, hired date, termination date, age, length of service, city name, department name, job title, store code, gender, reason of termination, type of termination, year of status, employee status and business unit. From the data set given, student is asked to make analysis on the dataset to review any potential problem or any finding about the dataset and explain about their finding using R programming language. This will be a report of 4 question and 19 analyses about the dataset.
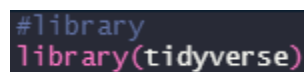
Assumption

To make the analysis process easier and better for reader to understand, a few assumptions were made:

1. This dataset is from an organization in a province named British Columbia in Canada as the name of the city in the dataset are cities in British Columbia.
2. Any information used to support the finding will be based on Canada and incident happen on real world.

Preparation

Load Library

Figure 1: Load Library

Tidyverse if the only R packages used in this assignment. Tidyverse is a collection of R packages for data science such as ggplot2, dplyr, tidyr, readr, purrr, tibble, stringr, and forcats (GeeksforGeeks, 2021). But the main package that are going to be used in this assignment are:

1. dplyr, a grammar of data manipulation that provide useful function such as mutate, select, filter and summarize that will be incredibly useful when it comes to data analysis (RStudio, n.d.).
2. ggplot2, a system for declaratively creating graphics (RStudio, n.d.)
3. forcats, a package that provide tools to solve common with factor including changing the order of the levels or value (Rstudio, n.d.).

Import Data

Figure 2: Import Data

Above is the code used to import dataset that will be used in this assignment. The file csv file needed is named as employee_attrition.csv. The dataset is read with header and skip the header using skip=1. The dataset is assigned to a variable named data.

Data Pre-processing

To begging, we first change the header into something else to avoid plagiarism.

```
#Changing header to prevent plagiarism
names(data) = c("ID", "Record_Date", "DOB", "Hired_Date", "Termination_Date", "Age", "Service_Length", "City", "Department", "Job",
                "Store", "GenderS", "GenderF", "Termination_Reason", "Termination_Type", "Status_Year", "Status", "Unit")
```

Figure 3: Pre-processing

Next, we will have a brief look at the dataset using two function, str() and summary()

```
> str(data)
'data.frame':	49652 obs. of  18 variables:
 $ ID               : int  1318 1318 1318 1318 1318 1318 1318 1318 1318 1319 ...
 $ Record_Date      : chr  "12/31/2007 0:00" "12/31/2008 0:00" "12/31/2009 0:00" "12/31/2010 0:00" ...
 $ DOB              : chr  "1/3/1954" "1/3/1954" "1/3/1954" "1/3/1954" ...
 $ Hired_Date       : chr  "8/28/1989" "8/28/1989" "8/28/1989" "8/28/1989" ...
 $ Termination_Date : chr  "1/1/1900" "1/1/1900" "1/1/1900" "1/1/1900" ...
 $ Age              : int  53 54 55 56 57 58 59 60 61 49 ...
 $ Service_Length   : int  18 19 20 21 22 23 24 25 26 17 ...
 $ City             : chr  "Vancouver" "Vancouver" "Vancouver" "Vancouver" ...
 $ Department       : chr  "Executive" "Executive" "Executive" "Executive" ...
 $ Job              : chr  "CEO" "CEO" "CEO" "CEO" ...
 $ Store            : int  35 35 35 35 35 35 35 35 35 35 ...
 $ GenderS          : chr  "M" "M" "M" "M" ...
 $ GenderF          : chr  "Male" "Male" "Male" "Male" ...
 $ Termination_Reason: chr  "Not Applicable" "Not Applicable" "Not Applicable" "Not Applicable" ...
 $ Termination_Type : chr  "Not Applicable" "Not Applicable" "Not Applicable" "Not Applicable" ...
 $ Status_Year      : int  2007 2008 2009 2010 2011 2012 2013 2014 2015 2006 ...
 $ Status           : chr  "ACTIVE" "ACTIVE" "ACTIVE" "ACTIVE" ...
 $ Unit             : chr  "HEADOFFICE" "HEADOFFICE" "HEADOFFICE" "HEADOFFICE" ...
```

Figure 4: Structure of data before pre-processing

```
> summary(data)
       ID        Record_Date           DOB             Hired_Date       Termination_Date        Age        Service_Length       City            Department            Job               Store        GenderS
 Min.   :1318   Length:49652       Length:49652       Length:49652       Length:49652       Min.   :19.00   Min.   : 0.00   Length:49652       Length:49652       Length:49652       Min.   : 1.0   Length:49652
 1st Qu.:3360   Class :character   Class :character   Class :character   Class :character   1st Qu.:31.00   1st Qu.: 5.00   Class :character   Class :character   Class :character   1st Qu.:16.0   Class :character
 Median :5031   Mode  :character   Mode  :character   Mode  :character   Mode  :character   Median :42.00   Median :10.00   Mode  :character   Mode  :character   Mode  :character   Median :28.0   Mode  :character
 Mean   :4860                                                                              Mean   :42.08   Mean   :10.43                                                            Mean   :27.3
 3rd Qu.:6335                                                                              3rd Qu.:53.00   3rd Qu.:15.00                                                            3rd Qu.:42.0
 Max.   :8336                                                                              Max.   :65.00   Max.   :26.00                                                            Max.   :46.0
   GenderF          Termination_Reason Termination_Type    Status_Year       Status              Unit
 Length:49652       Length:49652       Length:49652       Min.   :2006   Length:49652       Length:49652
 Class :character   Class :character   Class :character   1st Qu.:2008   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character   Median :2011   Mode  :character   Mode  :character
                                                          Mean   :2011
                                                          3rd Qu.:2013
                                                          Max.   :2015
```

Figure 5: Summary of data before pre-processing

Looking at the result of str() and summary(), we are able to identify the data that need to go through pre-processing for better and easier analysis.

```
#Modifying Data, fix issue
Mdata <- data %>% #Mdata means modified data
  mutate(
    Record_Date = as.Date(Record_Date, format = "%m/%d/%Y"),
    DOB = as.Date(DOB, format = "%m/%d/%Y"),
    Hired_Date = as.Date(Hired_Date, format = "%m/%d/%Y"),
    #1/1/1900 means haven't terminate, so change into NA
    Termination_Date = ifelse(Termination_Date == "1/1/1900", NA, Termination_Date),
    Termination_Date = as.Date(Termination_Date, format = "%m/%d/%Y"),
    City = as.factor(City),
    Department = as.factor(Department),
    Job = as.factor(Job),
    Store = as.factor(Store),
    GenderS = as.factor(GenderS),
    GenderF = as.factor(GenderF),
    Termination_Reason = ifelse(Termination_Reason == "Resignaton", "Resignation", Termination_Reason),
    Termination_Type = as.factor(Termination_Type),
    Status_Year = as.factor(Status_Year),
    Status = as.factor(Status),
    Unit = as.factor(Unit)
  )
```

Figure 6: Data Transformation

Data type for Record_Date, DOB, Hired_Date, Termination_Date are set to Date format as they are about date. For Termination_Date, as the dataset default termination date as 1/1/1900 for those who not yet been terminated, to avoid confusion, all 1/1/1900 is set to NA (non-applicable). The rest of the data are set to factor for easier view and order later. When randomly

plotting graph, I discover that there is a typo in Termination_Reason where "Resignation" is written as "Resignaton", so the typo is replaced with the correct word. Lastly, the modified data is stored in variable named Mdata(modified data).

```
#Problem discover when randomly making graph
ggplot(data, aes(x = Termination_Reason))+geom_bar()
```

Figure 7: Code that discover problem
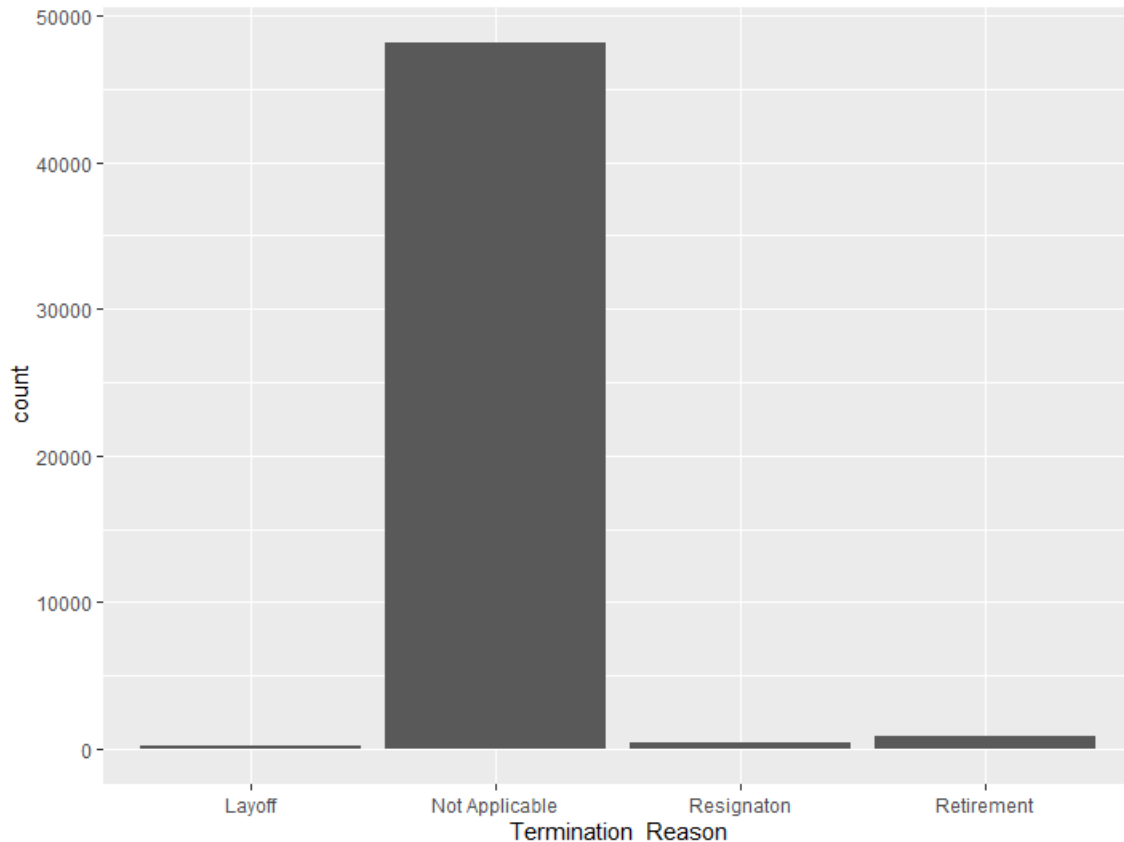
Figure 8: Termination Reason

Above is the graph that shows that there is a typo.

```
> str(Mdata)
'data.frame':    49652 obs. of  18 variables:
 $ ID                : int  1318 1318 1318 1318 1318 1318 1318 1318 1318 1319 ...
 $ Record_Date       : Date, format: "2007-12-31" "2008-12-31" "2009-12-31" "2010-12-31" ...
 $ DOB               : Date, format: "1954-01-03" "1954-01-03" "1954-01-03" "1954-01-03" ...
 $ Hired_Date        : Date, format: "1989-08-28" "1989-08-28" "1989-08-28" "1989-08-28" ...
 $ Termination_Date  : Date, format: NA NA NA NA ...
 $ Age               : int  53 54 55 56 57 58 59 60 61 49 ...
 $ Service_Length    : int  18 19 20 21 22 23 24 25 26 17 ...
 $ City              : Factor w/ 40 levels "Abbotsford","Aldergrove",..: 35 35 35 35 35 35 35 35 35 35 ...
 $ Department        : Factor w/ 21 levels "Accounting","Accounts Payable",..: 10 10 10 10 10 10 10 10 10 10 ...
 $ Job               : Factor w/ 47 levels "Accounting Clerk",..: 9 9 9 9 9 9 9 9 9 47 ...
 $ Store             : Factor w/ 46 levels "1","2","3","4",..: 35 35 35 35 35 35 35 35 35 35 ...
 $ Genders           : Factor w/ 2 levels "F","M": 2 2 2 2 2 2 2 2 2 1 ...
 $ GenderF           : Factor w/ 2 levels "Female","Male": 2 2 2 2 2 2 2 2 2 1 ...
 $ Termination_Reason: chr  "Not Applicable" "Not Applicable" "Not Applicable" "Not Applicable" ...
 $ Termination_Type  : Factor w/ 3 levels "Involuntary",..: 2 2 2 2 2 2 2 2 2 2 ...
 $ Status_Year       : Factor w/ 10 levels "2006","2007",..: 2 3 4 5 6 7 8 9 10 1 ...
 $ Status            : Factor w/ 2 levels "ACTIVE","TERMINATED": 1 1 1 1 1 1 1 1 1 1 ...
 $ Unit              : Factor w/ 2 levels "HEADOFFICE","STORES": 1 1 1 1 1 1 1 1 1 1 ...
```

Figure 9: Structure of data after pre-processing

```
> summary(Mdata)
      ID         Record_Date             DOB              Hired_Date         Termination_Date          Age         Service_Length        City                Department              Job
 Min.   :1318   Min.   :2006-01-01   Min.   :1941-01-15   Min.   :1989-08-28   Min.   :2006-01-01   Min.   :19.00   Min.   : 0.00   Vancouver      :11210   Meats          :10269   Meat Cutter  :9984
 1st Qu.:3360   1st Qu.:2008-12-31   1st Qu.:1958-05-28   1st Qu.:1995-06-02   1st Qu.:2010-06-23   1st Qu.:31.00   1st Qu.: 5.00   Victoria       : 4885   Dairy          : 8599   Dairy Person :8590
 Median :5031   Median :2011-12-31   Median :1968-12-07   Median :2000-03-31   Median :2013-05-31   Median :42.00   Median :10.00   Nanaimo        : 3876   Produce        : 8515   Produce Clerk:8237
 Mean   :4860   Mean   :2011-08-06   Mean   :1969-01-09   Mean   :2000-09-04   Mean   :2012-09-26   Mean   :42.08   Mean   :10.43   New Westminster: 3211   Bakery         : 8381   Baker        :8096
 3rd Qu.:6335   3rd Qu.:2013-12-31   3rd Qu.:1979-07-18   3rd Qu.:2005-10-13   3rd Qu.:2014-12-30   3rd Qu.:53.00   3rd Qu.:15.00   Kelowna        : 2513   Customer Service: 7122  Cashier      :6816
 Max.   :8336   Max.   :2015-12-31   Max.   :1994-12-31   Max.   :2013-12-11   Max.   :2015-12-30   Max.   :65.00   Max.   :26.00   Burnaby        : 2067   Processed Foods : 5911  Shelf Stocker:5622
                                                                              NA's   :42449                                        (Other)        :21890   (Other)        :  855   (Other)      :2307
     Store          GenderS         GenderF        Termination_Reason      Termination_Type   Status_Year         Status             Unit
 46      : 4422   F:25898   Female:25898   Length:49652         Involuntary   :  215   2013   : 5320   ACTIVE    :48167   HEADOFFICE:  584
 18      : 3876   M:23754   Male  :23754   Class :character     Not Applicable:48167   2012   : 5231   TERMINATED: 1485   STORES    :49068
 42      : 3827                            Mode  :character     Voluntary     : 1270   2014   : 5215
 21      : 3211                                                                        2011   : 5082
 43      : 2896                                                                        2010   : 4963
 16      : 2513                                                                        2015   : 4961
 (Other):28907                                                                        (Other):18880
```

Figure 10: Summary of data after pre-processing

This is how the data looks like after the pre-processing.

Data Exploration

In this step, simple graphs will be plotted to allow us to have a rough look about the dataset.

What is the relationship between age and termination reason?

```
#Remove NA and worker who haven't been terminated from the data
Terminated <- Mdata %>% drop_na(Termination_Reason) %>% filter(Status == "TERMINATED") %>% group_by(Age)
```

Figure 11:Code to get dataset for terminated worker only

For easier job, NA is remove using drop_na function and only people that are terminated are select. The data is store in variable name Terminated.

```
#Plot a box plot with jitters
ggplot(Terminated, aes(x = Termination_Reason, y = Age, fill = Termination_Reason)) +
  geom_boxplot()+geom_jitter(color="black", size=0.4, alpha=0.9)
```

Figure 12:Source code for figure 13

Above is the code for the graph.
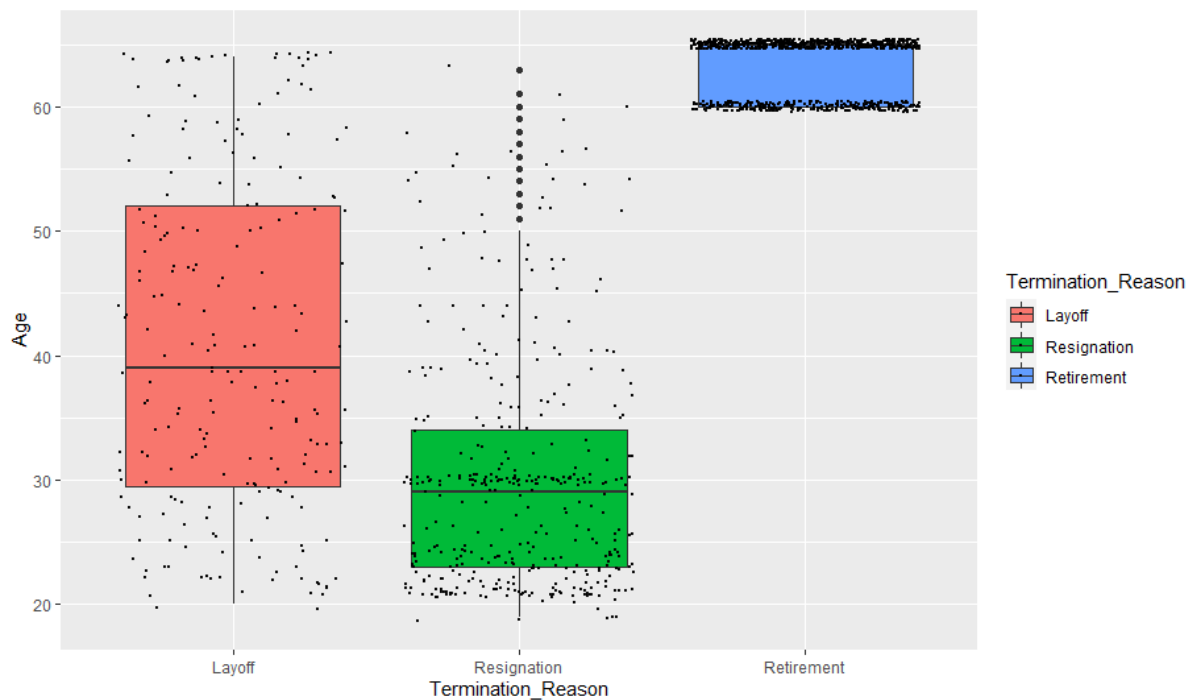
Figure 13: Termination Reason for each age

Based on the graph we could observe that:

Reason for termination:

1. Layoff

2. Resignation

3. Retirement

Trend for each reason:

Layoff – no clear trend

6

Resignation – about age 20 and 30

Retirement – at age 60 and 65

Question about the graph:

1. Why did people layoff?
2. Why did people resign?
3. Why did people retire?

Question 1: Why did people retire?

Analysis 1: Have a clearer look at relationship of retirement and age

```
#A1 what is the relationship between retirement and age?
ggplot(Terminated %>% filter(Termination_Reason == "Retirement"), aes(x = Age)) + geom_histogram() +
  labs(title = "Relationship between retirement and age")
```

Figure 14:Source code for figure 15

Explanation

This code function by filter line with termination reason as retirement and plot a histogram with age as the x axis with title "Relationship between retirement and age".
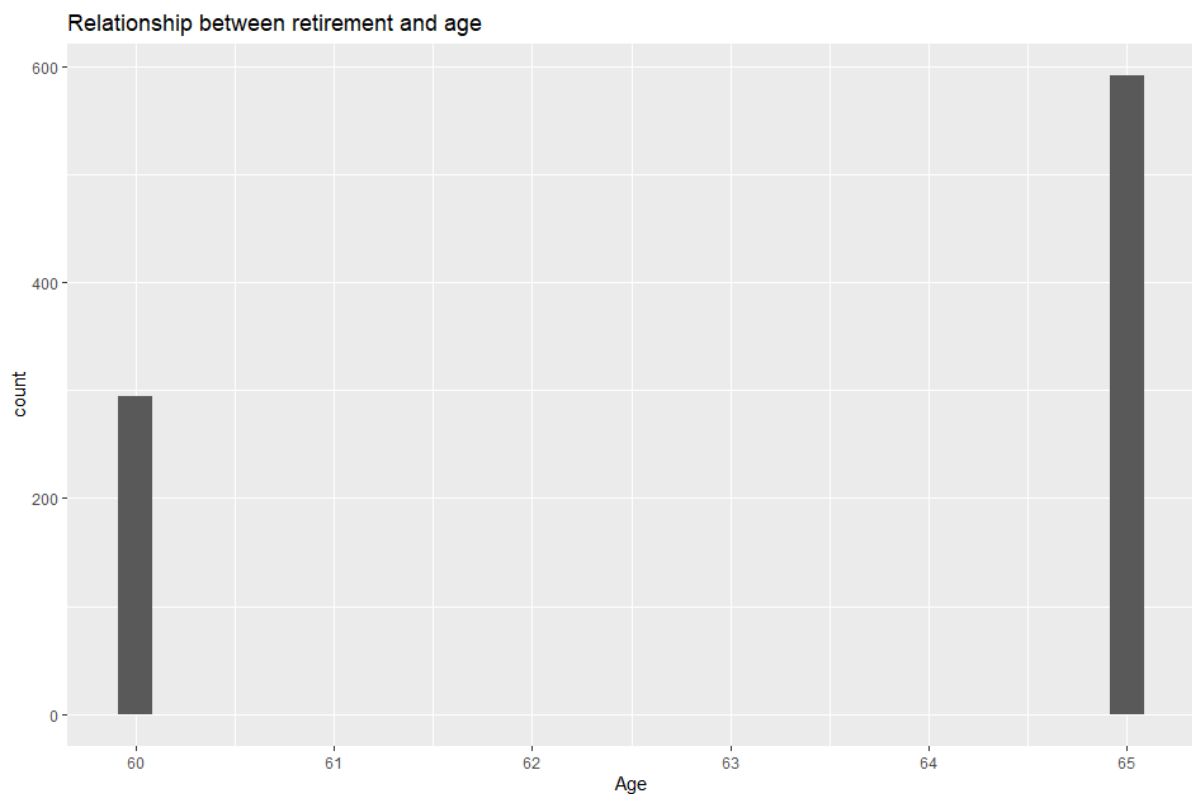
Figure 15: Relationship between retirement and age

Explanation

From the graph we could observe that there is only retirement at age 60 and 65. According to Canada Pension Plan (CPP) to qualify for retirement, one must be at least 60 years old but in order to receive pension, one must retire at or after age 65. Retirement age for Canada can be as late as 70 years old (). But from here we could also observe that there might be some problem with the data as it is not possible that there are no people who retire between age 60 and 65. Assume that the data do not have any problem, some of the reason that cause people to retire at later age than the minimum age that qualify for retirement are:

1. Their saving is not enough to cover living expenses (Rane, 2021)

   Since inflation never stop and the value of money are becoming smaller day by day, some senior worker may face financial problem as their pension and saving are not enough to cover living expenses such as food, utility fee and gas for cars. Thus, they are forced to continue work.

2. Senior workers are healthier than before

   Thanks to advance healthcare, many people are able to work beyond typical retirement age. Through research conducted by Oregon State University, working beyond retirement age can reduce the risk of death from all causes by 11 percent (Oregon State University, 2016).

Analysis 2: What is the distribution for each gender in every age?

```
#A2 What is the distribution for each gender in every age?
ggplot(Terminated %>% filter(Termination_Reason == "Retirement"), aes(x = Age, fill = GenderF)) + geom_histogram() +
  labs(title = "Distribution for each gender in every age")
```

Figure 16:Source for figure 17

Explanation

This code function by filter line with termination reason as retirement and plot a histogram with gender as the x axis with title "Distribution for each gender in every age"
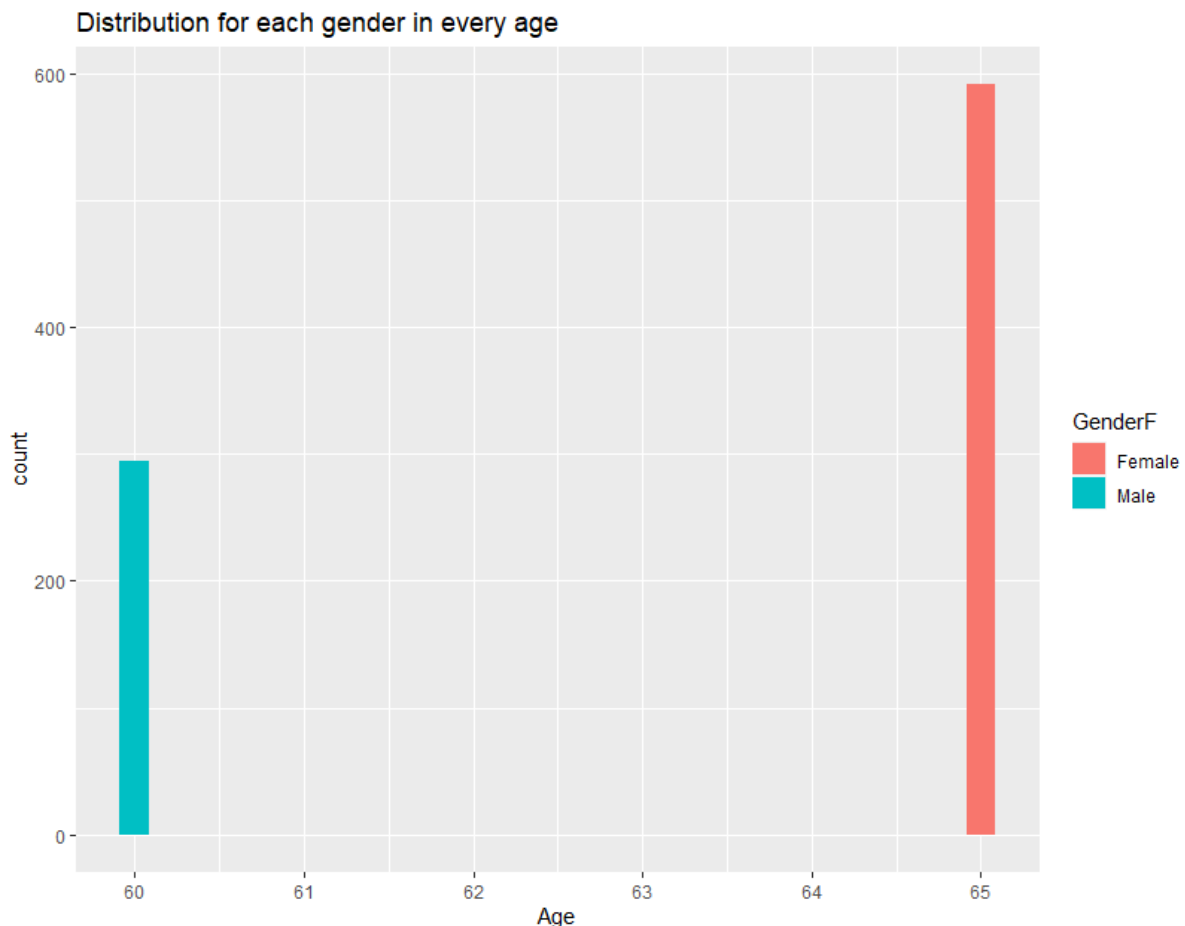
Figure 17: Distribution for each gender in every age

Explanation

In this graph we have a look at the distribution for gender at each retirement age. Where from the graph we could observe that there is only male retirement at age of 60 and female retirement at age of 65. Which once again indicate that there is a problem with the dataset as it is not possible that not only that people only retire at two ages but only one gender at one age. Anyways, we will continue the investigation with the dataset. If the company know the retirement age for worker, it is possible to take some measurement on prevent lose on company value due to resignation. For example, the company may (Turner, 2021):

1. Encourage knowledge-sharing across department to avoid knowledge silos as long-time employees would have formed some relationship across the company made them able to understand better on their job and other's job. Thus, by encouraging knowledge-sharing would be able to effectively avoid chaos when they leave.

2. Cross-train employee so that knowledge from long-time employees would be inherit by younger employee so that skill grow of young employee could be faster and to ensure that there would be new worker to replace the worker that going to retire.

Analysis 3: Who is the worker that might be retire soon?

```
#A3 Worker who might be retire soon
MightRetire <- Mdata %>%
  select("ID", "Record_Date", "DOB", "Hired_Date", "Age", "Service_Length", "City", "Department", "Job", "Store", "GenderS", "GenderF", "Status_Year", "Status", "Unit") %>%
  filter(Status_Year == 2015, Status == "ACTIVE") %>%
  group_by(Job) %>%
  mutate(
    Retire_TF = ifelse(between(Age, 55, 65), TRUE, FALSE)
  )
```

Figure 18:Source code for figure 19

Explanation

This code function by filter line with status year 2015 and status active and group the data found with job. And create a new column with the name Retire_TF and insert TRUE if the age of the line is between 55 and 65 and FALSE if not.

	ID	Record_Date	DOB	Hired_Date	Age	Service_Length	City	Department	Job	Store	GenderS	GenderF	Status_Year	Status	Unit	Retire_TF
1	1318	2015-12-31	1954-01-03	1989-08-28	61	26	Vancouver	Executive	CEO	35	M	Male	2015	ACTIVE	HEADOFFICE	TRUE
2	1319	2015-12-31	1957-01-03	1989-08-28	58	26	Vancouver	Executive	VP Stores	35	F	Female	2015	ACTIVE	HEADOFFICE	TRUE
3	1320	2015-12-31	1955-01-02	1989-08-28	60	26	Vancouver	Executive	Legal Counsel	35	F	Female	2015	ACTIVE	HEADOFFICE	TRUE
4	1321	2015-12-31	1959-01-02	1989-08-28	56	26	Vancouver	Executive	VP Human Resources	35	M	Male	2015	ACTIVE	HEADOFFICE	TRUE
5	1322	2015-12-31	1958-01-09	1989-08-31	57	26	Vancouver	Executive	VP Finance	35	M	Male	2015	ACTIVE	HEADOFFICE	TRUE
6	1323	2015-12-31	1962-01-09	1989-08-31	53	26	Vancouver	Executive	Exec Assistant, VP Stores	35	M	Male	2015	ACTIVE	HEADOFFICE	FALSE
7	1325	2015-12-31	1964-01-13	1989-09-02	51	26	Vancouver	Executive	Exec Assistant, Legal Counsel	35	F	Female	2015	ACTIVE	HEADOFFICE	FALSE
8	1328	2015-12-31	1956-01-17	1989-09-05	59	26	Vancouver	Executive	CHief Information Officer	35	F	Female	2015	ACTIVE	HEADOFFICE	TRUE
9	1329	2015-12-31	1967-01-23	1989-09-08	48	26	Terrace	Store Management	Store Manager	32	F	Female	2015	ACTIVE	STORES	FALSE
10	1330	2015-12-31	1967-01-25	1989-09-09	48	26	Terrace	Meats	Meats Manager	32	F	Female	2015	ACTIVE	STORES	FALSE

Figure 19: List of workers that might retire

Explanation

By using the above code, we are able to get a data set named MightRetire by filtering out active worker at year 2015 who are in between age 55 and 65. The reason to filter 55 to 65 but not 60 to 65 is because knowing worker that are going to retire in short time is useless as the company are unable to do anything as there is not enough time. Thus, the filter age is 5 years before the actual retire trend. Longer list of the worker that might retire soon can be locate in appendix. By able to locate worker that are going to retire soon, we are able to get every last value from the worker that are going to retire soon to prevent any lost for company. For example, the company could create knowledge transfer program to conserve the knowledge and experience of the more experience worker that are going to retire. By doing so, the newer worker would be able to inherit the knowledge from the worker that going to retire and the important knowledge will never be gone and will be enhance and improve from generation to generation.

Analysis 4: What job will be affected by retirement?

```
#A4 What job will be affected by retirement?
MightRetire %>% ggplot(aes(fct_rev(fct_infreq(Job)), fill = Retire_TF))+geom_bar() + xlab("Job") + coord_flip() +
    labs(title = "Distribution of retirement for each job")
```

Figure 20: Source code for figure 21

Explanation

This code function by plotting a bar chart starting from job with the biggest amount of retirement to the lowest and colour the bar with data in Retire_TF. X axis is named as Job as if not named, the system will write the name as fct_rev(fct_infreq(Job)). The title of the bar chat is "Distribution of retirement for each job".
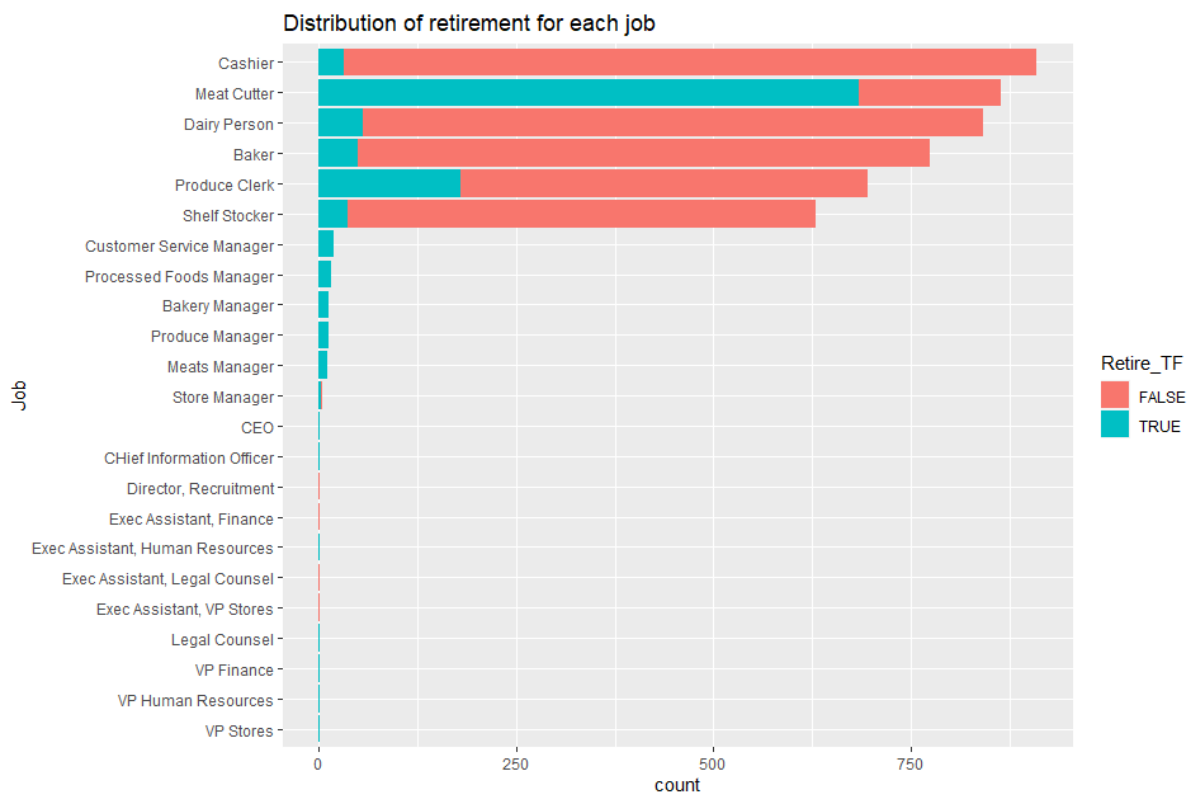
Figure 21: Distribution of retirement for each job

Explanation

From above graph we could observe that meat cutter is going to have a huge retirement wave soon as the workers that are going to retire is more than 50% of the whole group. In this case, the company should hire some new meat cutter to encounter for the retirement wave. If the company did not able to hire enough meat cutter to cover the meat cutter that going to retire, the meat shop needs to be close down due to lack of worker.

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Analysis 5: What is the distribution for meat cutter that are going to retire soon in each city?

```
#A5 what is the distribution for meat cutter and production clerk that are going to retire soon in each city?
MightRetire %>% filter(Job == "Meat Cutter") %>% ggplot(aes(fct_rev(fct_infreq(City)), fill = Retire_TF))+geom_bar() + xlab("City") + coord_flip() +
  labs(title = "Distribution of worker might retire for meat cutter in each city")
```

Figure 22: Source code for figure 23

Explanation

This code function by plotting a bar chart starting from city with the biggest amount of retirement to the lowest and colour the bar with data in Retire_TF. X axis is named as City as if not named, the system will write the name as fct_rev(fct_infreq(City)). The title of the bar chat is "Distribution of meat cutter that might retire in each city".
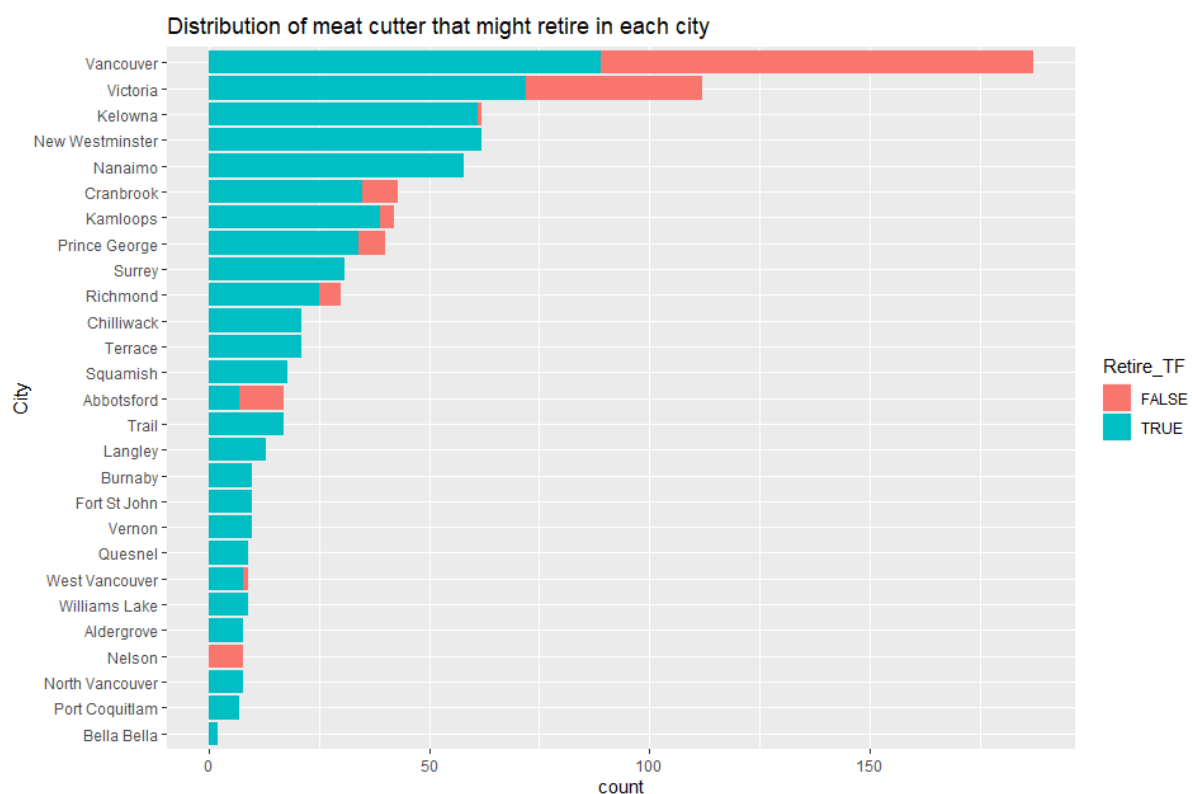
Figure 23: Distribution of meat cutter that might retire in each city

Explanation

From the above graph, we could observe that this huge wave of meat cutter retiring is going to affect all city as all of the cities are having 50% or more than 50% of retiring meat cutter. If this situation really happens, every other city will have to rely on Vancouver, Victoria, Kelowna, Nanaimo, Cranbrook, Kamloops, Prince George, Richmond, Abbotsford, West Vancouver and Nelson for meat as their city will have 0 meat cutter left. As stated in analysis 4, the company should try to hire enough meat cutter to cover the lost of retired worker or else those city's meat shop might need to be shut down due to lack of worker.

Analysis 6: What store are having more than 50% retirement rate?

```
#A6 What store are having more than 50% retirement?
#Calculate the percentage
StoreRetirement50 <- MightRetire %>% filter(Job == "Meat Cutter") %>% group_by(Store) %>%
  mutate(
    Total = n(),
    Count = sum(Retire_TF == TRUE),
    Percentage = round((Count/Total)*100, 0)
  )

#Plot the graph
ggplot(StoreRetirement50, aes(x = Store, y = City, fill = (Percentage>=50))) +
  geom_label(aes(label = Percentage), nudge_x = 0.5, nudge_y = 0.25) +
  geom_point(size = 1.0) +
  labs(title = "Store that having more than 50% retirement for meat cutter", fill = "More than 50%")
```

Figure 24: Source code for figure 25

Explanation

The code function by first filter out the worker that might retire and calculate the percentage by dividing the number of meat cutter with the total number of meat cutter in each store. After that, a scatter plot with label.
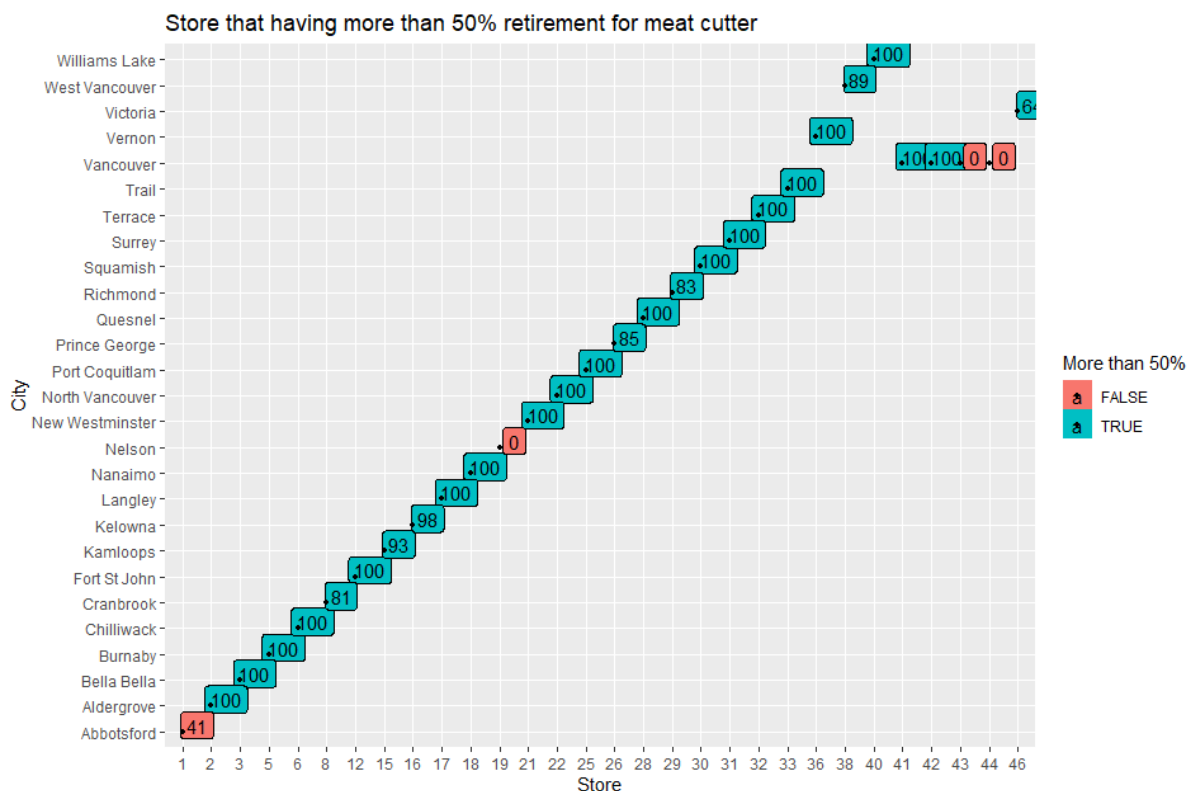
Figure 25: Store that having more than 50% retirement for meat cutter

Explanation

This graph indicates the stores that are going to have more than 50% retirement for meat cutter. Where true is going to have more than 50% retirement rate, false is not going to. Where from the graph we could observe that only store 1, 19, 43 and 44 is not going to survive after the huge retirement wave. To be able to recover after this situation, the company should consider:

1. Improve recruiting process

   To do so, the company could start an online career page, revisit job descriptions, streamline the application and interview process and consider additional candidate sources (Energage, 2021).

2. Improve work environment

   Environment is one of the main reasons that employee pay attention when it comes to finding job. An easy way to improve work environment is by improving the lightning so that the worker could have a better vision on what they are doing. Aside from that, for meat shop, the company should improve the air flow as great air flow in meat shop could improve meat cutter's health as the environment in meat shop will not be humid so that less bacteria and smell will be in meat shop.

Conclusion (Question 1)

In question 1 we have discussed on the reason of retirement. And through the 6 analysis done, we have discovered that the age for retirement is at age 60 and 65 only. Which indicates that there might be a problem with the data.

But most importantly, a huge problem is also revealed in this question through analysis 4 where we discover that there is a huge retirement for meat cutter coming up which the number is more than 70% of the whole meat cutter group. And after this retirement wave, all city except for Vancouver, Victoria, Kelowna, Nanaimo, Cranbrook, Kamloops, Prince George, Richmond, Abbotsford, West Vancouver and Nelson are going to have no meat cutter. Besides that, all store other than stores 1, 19, 43 and 44 are going to be close down due to lack of meat cutter.

In conclusion, to survive or to recover after this retirement wave, the company should consider knowledge transfer program by allocating meat cutter with experience to train young meat cutter so that there will always be meat cutter to replace the retired meat cutter. Aside from that, the company should also pay attention to welfare for retired employee by perhaps assisting retired employee on their retirement plan. Aside from that, the company consider improve hiring process by setting up a website and streamline the hiring process. To attract worker, the company should improve the work environment in meat shop by improving air flow and lightning.

Question 2: Why did people resign?

Analysis 1: Distribution of resignation age

```
#A1 Distribution of resignation age
ggplot(Terminated %>% filter(Termination_Reason == "Resignation"), aes(x = Age)) + geom_histogram() +
  labs(title = "Distribution of resignation age")
```

Figure 26: Source code for figure 27

Explanation

The code function by plotting a histogram with the title "Distribution of resignation age" by filtering out worker that resign with age as x axis.
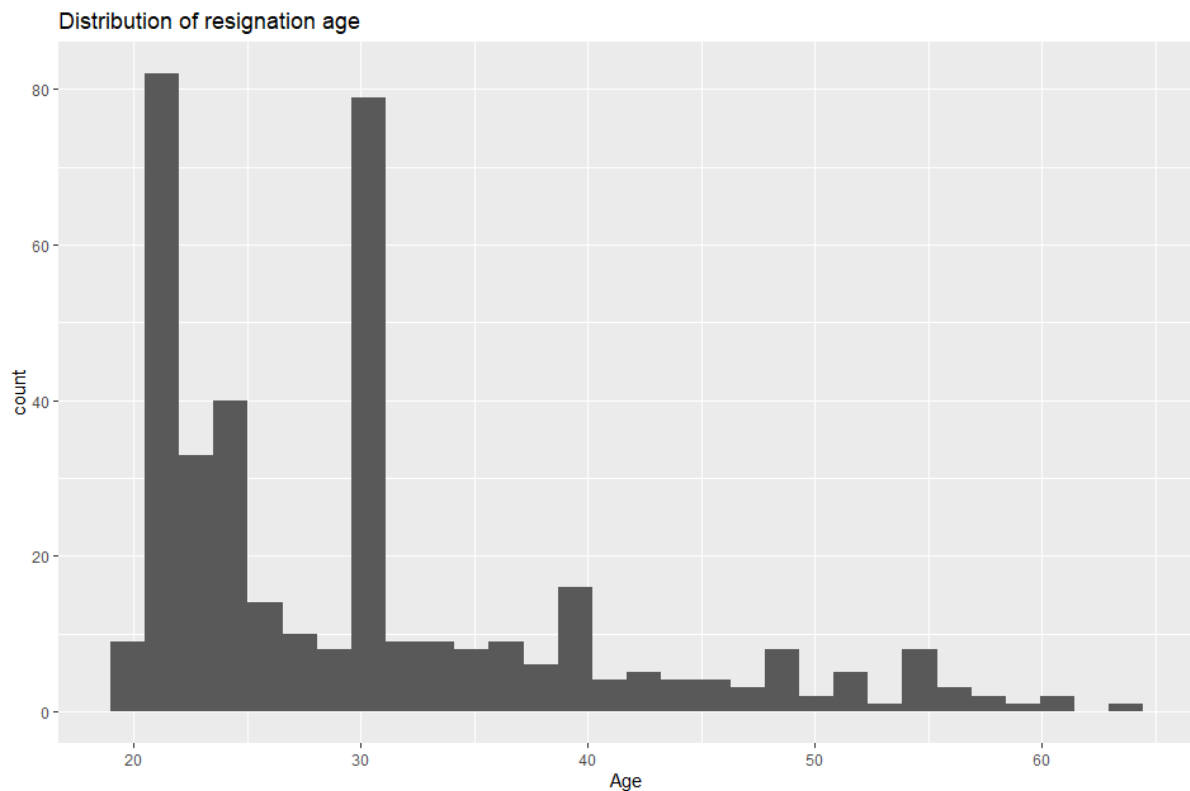
Figure 27: Distribution of resignation age

Explanation

From above graph we could observe that there is a trend for resignation in age of 21 and 30.

The reason that people resign at young are as following (Parker, K., & Horowitz, J. M, 2022):

1. Payment too low

2. No opportunities for advancement

3. Felt disrespected at work

4. Childcare issues

5. Welfare not good enough

6. Wanted to relocate to a different area

18

Analysis 2: Distribution of resignation for each job

```
#A2 Distribution of resignation for each job
Terminated %>% filter(Termination_Reason == "Resignation") %>% ggplot(aes(fct_rev(fct_infreq(Job)), fill = Job))+geom_bar() + xlab("Job") + coord_flip() +
  labs(title = "Distribution of resignation for each job")
```

Figure 28: Source code for figure 29

Explanation

This code function by plotting a bar chart starting from city with the biggest amount of resignation to the lowest. X axis is named as Job as if not named, the system will write the name as fct_rev(fct_infreq(Job)). The title of the bar chat is "Distribution of resignation for each job".
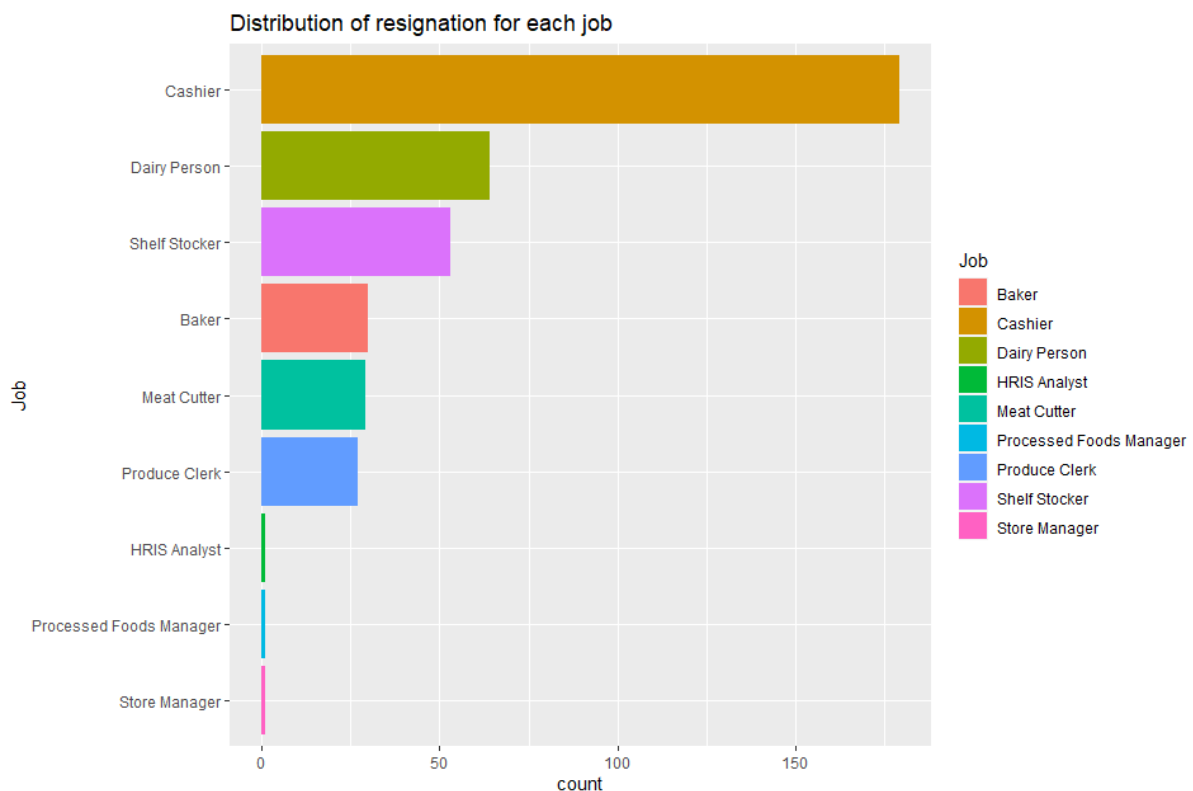
Figure 29: Distribution of resignation for each job

Explanation

From above graph we could observe that the worker who work as cashier has the highest resignation rate. The reason for this situation to occur may because of the lower salary. As we could observe from the graph, manager and technical worker resign less compared to normal worker who has lower salary. For example, average salary for cashier in Canada is only $15.23 per hour (Indeed, n.d.) while average salary for store manager is $21.20 per hour (Indeed, n.d.). To conserve cashier, the company may consider adding salary or providing benefit for cashier such as free meal and public transport. Another approach to this problem is by replacing some human worker with machine such as self-checkouts. By doing so, the company can just hire 1 or a few workers according to the shop size to make sure people pay.

Analysis 3: What is the relationship between resignation, age and gender?

```
#A3 What is the relationship between resignation, age and gender?
ggplot(Terminated %>% filter(Termination_Reason == "Resignation"), aes(y = Age, fill = GenderF)) + geom_bar() +
  labs(title = "Relationship between resignation, age and gender")
```

Figure 30: Source code for figure 31

Explanation

The code function by plotting a bar chat with the title "Relationship between resignation, age and gender" by filter in line with termination reason as resignation and y axis of the graph will be age. After that colour the graph according to the gender.
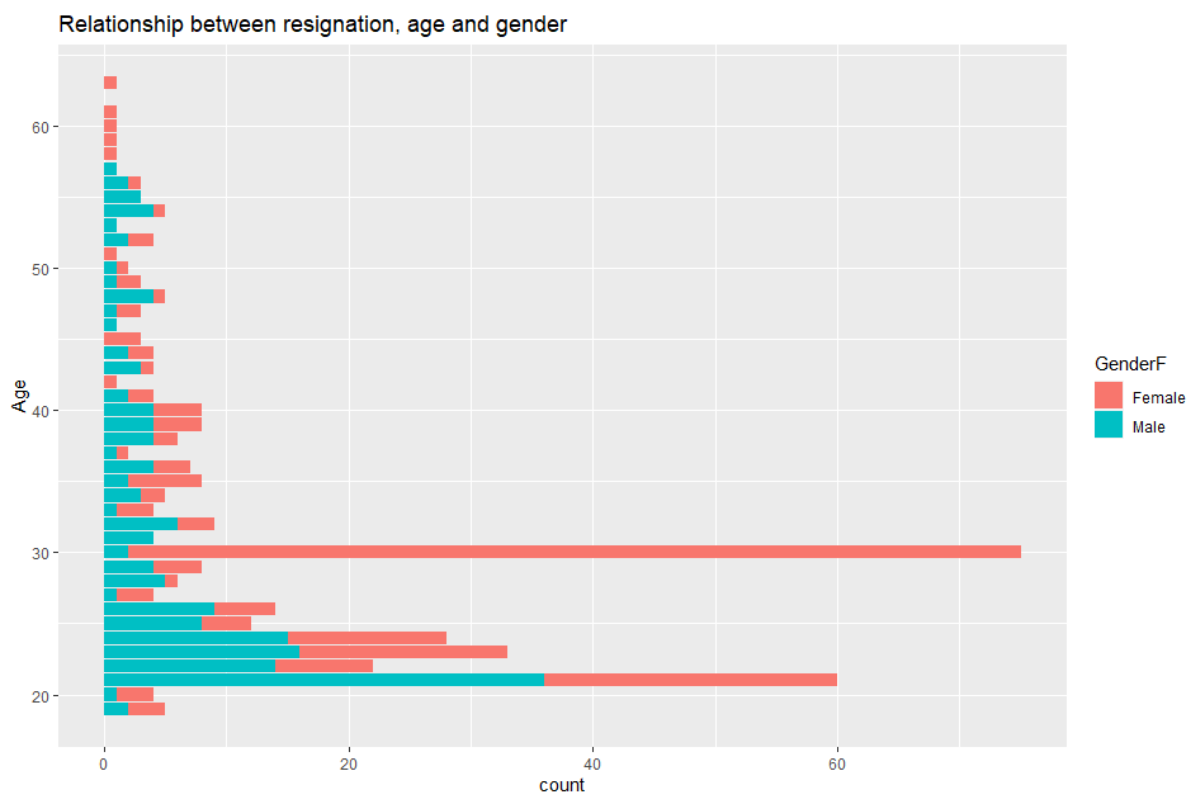
Figure 31: Relationship between resignation, age and gender

Explanation

From the above graph we could observe that there is a trend for female to resign in age 30, male at age 21. Besides that, there might be a problem in the dataset where there is only female who resign after age 57. If the resignation rate is too high in an age, the company might one day find that many important places is empty and there is no worker to replace. To improve on this situation, the company may consider:

1. Recognize and reward employees

   Every worker needs recognition and appreciation. Research done by Walden University proof that happy worker is 12% more productive than unhappy worker (Walden University, 2021). When worker do something above and beyond what their job require

them to do, the company should reward them so they continue the effort and other worker will fight harder to get the reward.

2. Encourage a healthy work-life balance

   57% of people report that benefits and perks were one of their top considerations before accepting a job (Glassdoor Team, 2016). An easy way to achieve healthy work-life balance is to offer flexible work schedule and environment.

Analysis 4: What is the average age for marriage in Canada?
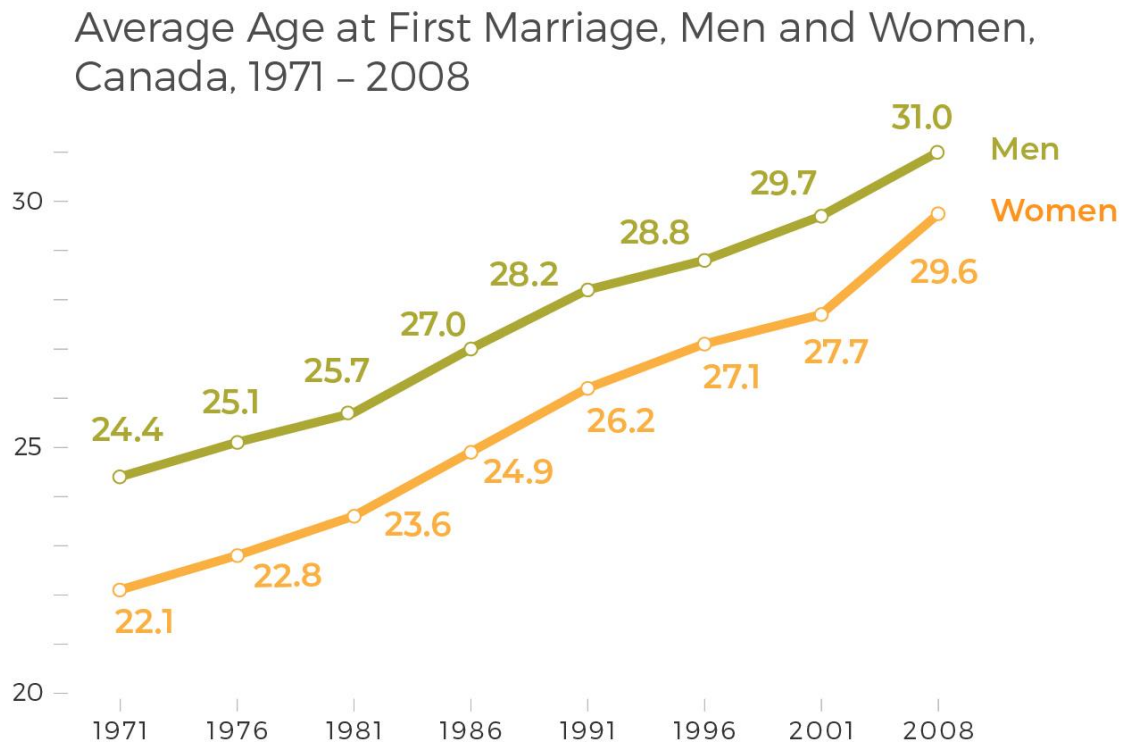
Figure 32: Average age at first marriage, men and women, Canada, 1971 - 2008

(Cardus, 2020)

Explanation

Above graph is the closest data that I could find online that indicate the average marriage time in Canada. From the graph we could observe that the marriage age for female in Canada is about 30 which proofs that one of the reason that female in Canada retire in age of 30 is because of getting marry. Beside from that, data from Statics Canada the average first birth is 29.2 years old (Canada.ca, n.d.). From these data we could conclude that one of the reason that female in Canada resigns at age of 30 is because of childcare issue.

To prevent female from resign after having child, company could (Zimmerman, 2017):

1. Have a generous maternity leave policy

    Even though 6 weeks is the standard amount of time for short-term disability and pregnancy leave, the company should allow some more time when there is a need (Haley Longman, 2022).

2. Make it financially worth to return

   Financial problem is one of the problems that causes female to not return to their original job to seek for a job with better income as the amount of money needed for households will increase after having a child. Thus, the company may consider raising their salary to make them harder to quit.

3. Be understanding in the transition

   One of the ways that company can help new mother to adapt to their new life with children is to adjust policy to account for individual scenarios. For example, giving new mother some more time for the assignment given to them and lighter job.

4. Do not derail her career growth

   Many moms in workplace are trying to be the master of everything, but they often fail to do so. Thus, the company should help in this situation by giving option in working condition to relieve this pressure. If their job quality and speed become less great before they have a child, the company should not blame on them, as needing to manage job and family at the same time is a hard thing to do for new mother.

5. Offer her a flexible work schedule

   This is another way to relief pressure from pregnant women. By giving them flexible time schedule will allow them to have an ample of time to be managed to better cope with both work and family.

6. Help with childcare

   One easy way that company can do this by providing childcare subsidies. One of the ways to provide childcare subsidies is direct payment where the company pay to employee with child and worker can allocate the money according to their own will. The other way to do this is by the company partially subsidize childcare with select care centre or childcare worker. With this way, the employee will share the cost of childcare with company (Roddy, n.d.).

Analysis 5: What is the relationship between resignation and store?

```
#A5 Relationship between resignation and store?
ggplot(Terminated %>% filter(Termination_Reason == "Resignation"), aes(x = Store)) + geom_bar() +
  labs(title = "Relationship between resignation and store")
```

Figure 33: Source code for figure 34

Explanation

The code function by plotting a bar chat with the title "Relationship between resignation and store" by filtering in line with termination reason as resignation and x axis as store.
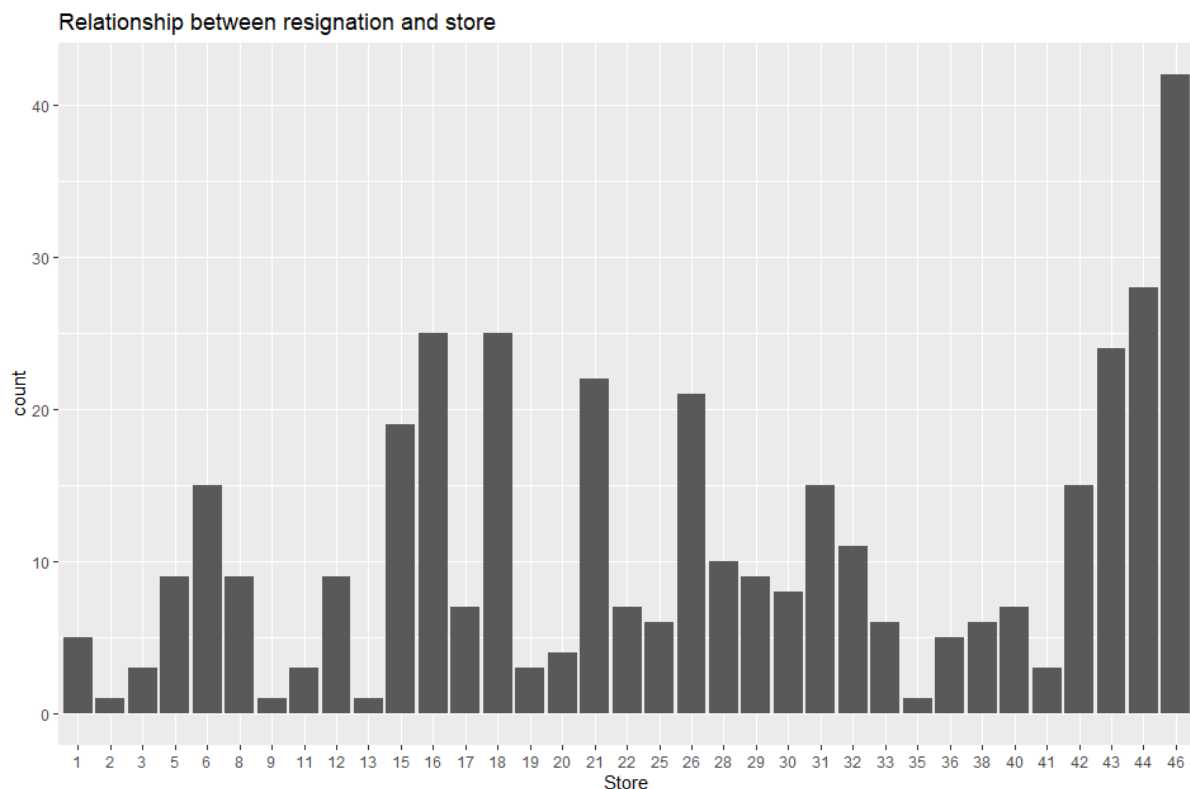
Figure 34: Relationship between resignation and store

Explanation

From above graph we could observe that there is a high rate for resignation in store 46. There might some problem in store 46 such as poor working condition, employee does not get respect, poor welfare and more. To investigate further, we will be investigating further into job distribution in store 46.

Analysis 6: Distribution of job in store 46

```
#A6 Distribution of job in store 46
Terminated %>% filter(Termination_Reason == "Resignation", Store == 46) %>% ggplot(aes(fct_rev(fct_infreq(Job)), fill = Job))+geom_bar() + xlab("Job") + coord_flip() +
  labs(title = "Distribution of resignation for each job")
```

Figure 35: Source code for figure 36

Explanation

The code function by first filter in line with Resignation as termination reason and with 46 as the store. Then draw a bar chat with the title "Distribution of resignation for each job" with job as y axis which is done by flipping the graph using function coord_flip. Also, x axis had to be renamed or else the name for x axis will be fct_rev(fct_infreq(Job).
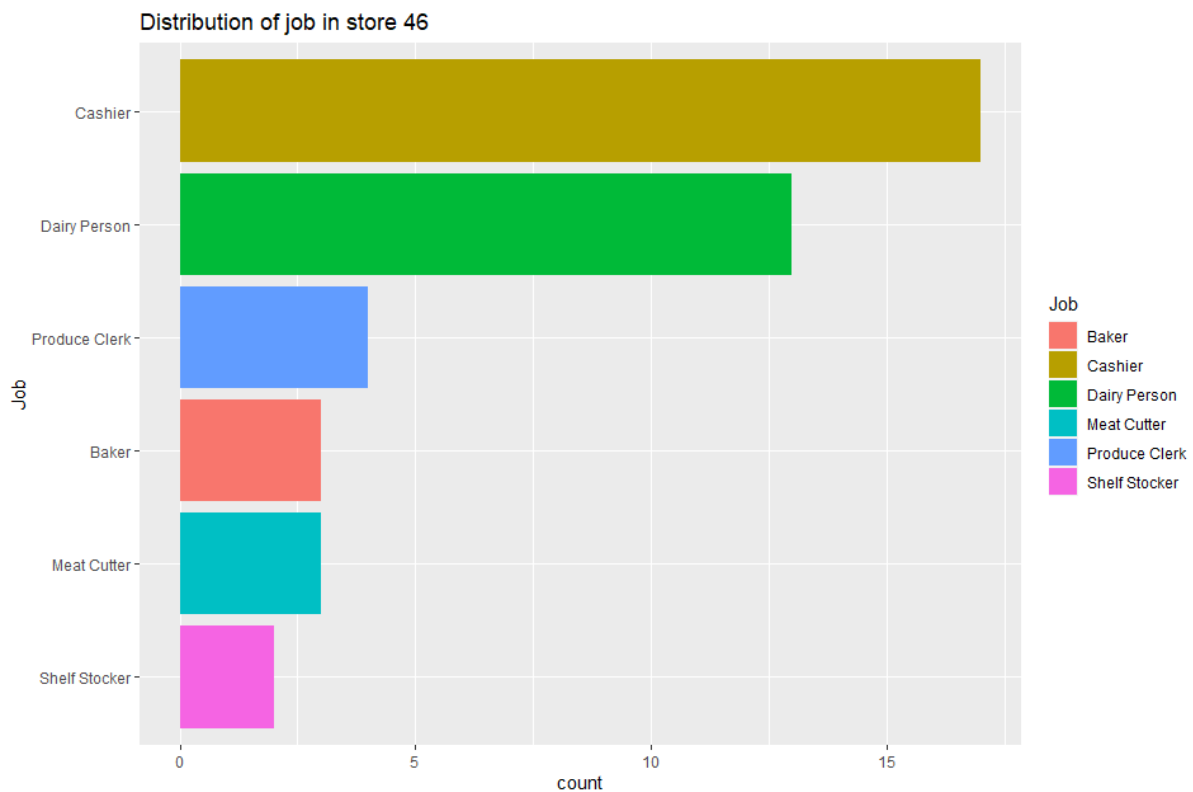
Figure 36: Distribution of job in store 46

Explanation

From what we could observe from figure 36, cashier has the highest rate of resignation follow by dairy person. The reason that only these two jobs is point out is due to the higher frequency that they have compared to other job. If the resignation rate for cashier and dairy person continues to be high in store 46, company would have to continuously hire new cashier and dairy person. The disadvantage of continuously hire new employee are:

1. The resignation rate will continue to be high

   This is because new employee will most of the time be trying new job thus, they will be resigning without second though if they do not like the job.

2. Training new worker is time consuming

   Even though training cashier only need about few week (Indeed, n.d.) and training a dairy person maybe require a few months, but if the company has to continuously train new employee, it would be a endless loop of hire new employee, training new employee, employee resign and hire new employee. Thus, it is not a good practice to do so.

How to prevent hire new employee:

1. For cashier, the company may try to reduce the people who come to physical store to shop by opening online store where customer can shop and pay online and grab their goods when they pass by the shop. By doing so, the need for cashier will be lower in the shop and the online store itself do not need much care and in the long run may even be more beneficial than physical store as online shopping has been increasingly popular to kick off the online shop, company may even offer discount and voucher code to attract customer to use online shop.

2. For both cashier and dairy person, to prevent them from losing motivation on work due to repetitive job, job rotation could be implemented. Job rotation refers to temporarily change position of worker to reduce boredom among employees (Indeed, n.d.). But most importantly this also stand as a chance to identify potential worker for other position.

Conclusion (Question 2)

Based on the 5 analysis that have been done in question 2. We are able to conclude the factor and reason that worker tend to resign at age of 21 and 30.

The first reason is their job. Where worker with job with lower income such as cashier have higher rate of resign. The other reason aside from salary is their job is highly repeatable and do not have any opportunity for advancement. This reason applies for both female and women as both genders will face the same problem when it comes to job.

The second reason is childcare problem. As what can be observe in analysis 3 there is a trend for female to resign at age of 30. And based on the fining in analysis 4, we could conclude that female at Canada merry at average of age 30. Thus, childcare problem is one of the factors that causes them to resign.

From analysis 5, we can observe a weird trend where there more workers resign from store 46. The reason is unknow from the graph and unable to be locate with the dataset given. But there are a few possibilities that causes this situation. They are, poor working condition, employee does not get respect, poor welfare and more.

With all the finding in question 2, we can locate the worker that most likely going to resign soon by using code below.

```
#Find out: Who are the worker that most likely gonna to resign soon?
MightResign <- Mdata %>%
  select("ID", "Record_Date", "DOB", "Hired_Date", "Age", "Service_Length", "City", "Department", "Job", "Store", "GenderS", "GenderF", "Status_Year", "Status", "Unit") %>%
  filter(Job == "Cashier", Age == "21"|Age == "30", Store == "46", Status_Year == 2015)
```

Figure 35: Source code for figure 36

And below is the list of the worker that most likely going to be resigning soon found by using the code.

	ID	Record_Date	DOB	Hired_Date	Age	Service_Length	City	Department	Job	Store	GenderS	GenderF	Status_Year	Status	Unit
1	8234	2015-12-31	1994-03-11	2013-07-08	21	2	Victoria	Customer Service	Cashier	46	F	Female	2015	ACTIVE	STORES
2	8235	2015-12-31	1994-03-13	2013-07-09	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES
3	8240	2015-12-31	1994-03-25	2013-07-16	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES
4	8252	2015-12-31	1994-05-10	2013-08-09	21	2	Victoria	Customer Service	Cashier	46	F	Female	2015	ACTIVE	STORES
5	8254	2015-12-31	1994-05-17	2013-08-13	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES
6	8259	2015-12-31	1994-05-28	2013-08-19	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES
7	8268	2015-12-31	1994-06-17	2013-08-29	21	2	Victoria	Customer Service	Cashier	46	F	Female	2015	ACTIVE	STORES
8	8287	2015-12-31	1994-08-17	2013-09-30	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES
9	8290	2015-12-31	1994-08-27	2013-10-06	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES
10	8291	2015-12-31	1994-08-30	2013-10-07	21	2	Victoria	Customer Service	Cashier	46	F	Female	2015	ACTIVE	STORES
11	8301	2015-12-31	1994-09-21	2013-10-19	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES
12	8319	2015-12-31	1994-11-22	2013-11-21	21	2	Victoria	Customer Service	Cashier	46	M	Male	2015	ACTIVE	STORES

Figure 37: Worker that most likely going to be resigning soon

Question 3: Why did people layoff?

Analysis 1: What is the relationship between layoff and year?

```
#A1 what is the relationship between layoff and Year?
ggplot(Terminated %>% filter(Termination_Reason == "Layoff"), aes(x = Status_Year, fill = Status_Year)) + geom_bar() +
  labs(title = "Relationship between layoff and Year")
```

Figure 38: Source code for figure 38

Explanation

The code function by plotting a bar chat with the title "Relationship between layoff and year" with Status_Year as x axis and colour the bar according to the Status_Year.
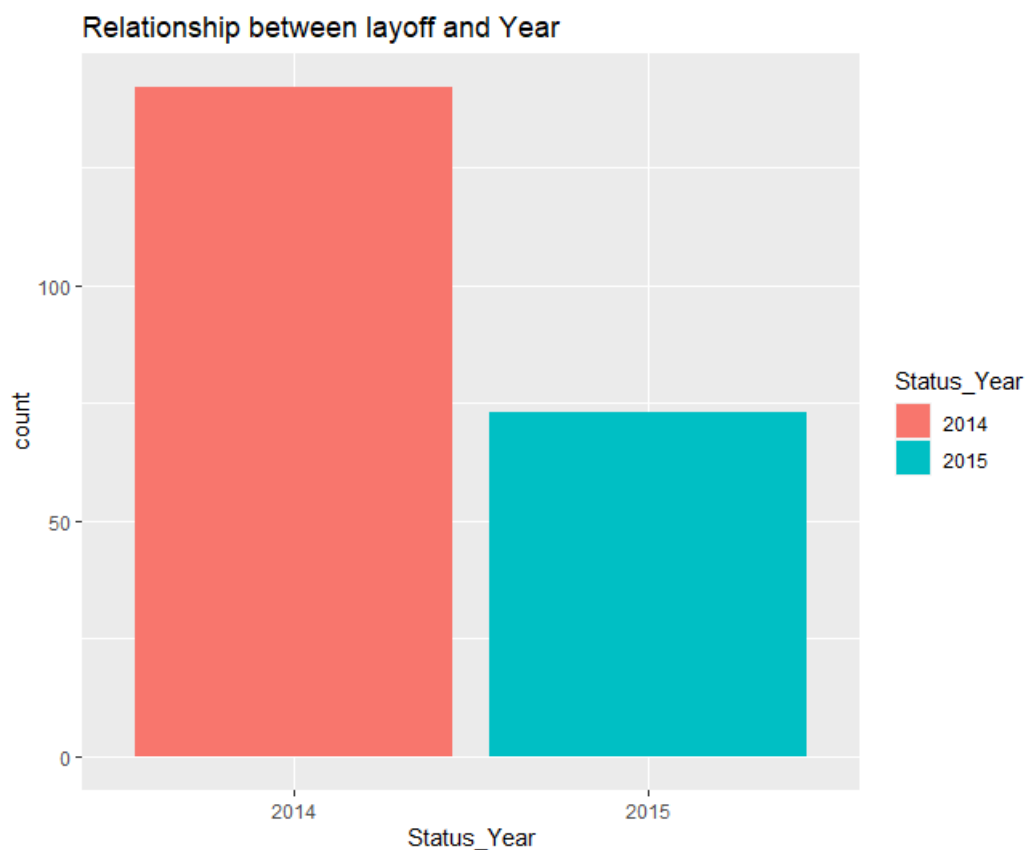
Figure 39: Relationship between layoff and year

Explanation

The above graph show that people only get layoff in year 2014 and 2015. The reason is because there is an economy problem in year 2014 and 2015.
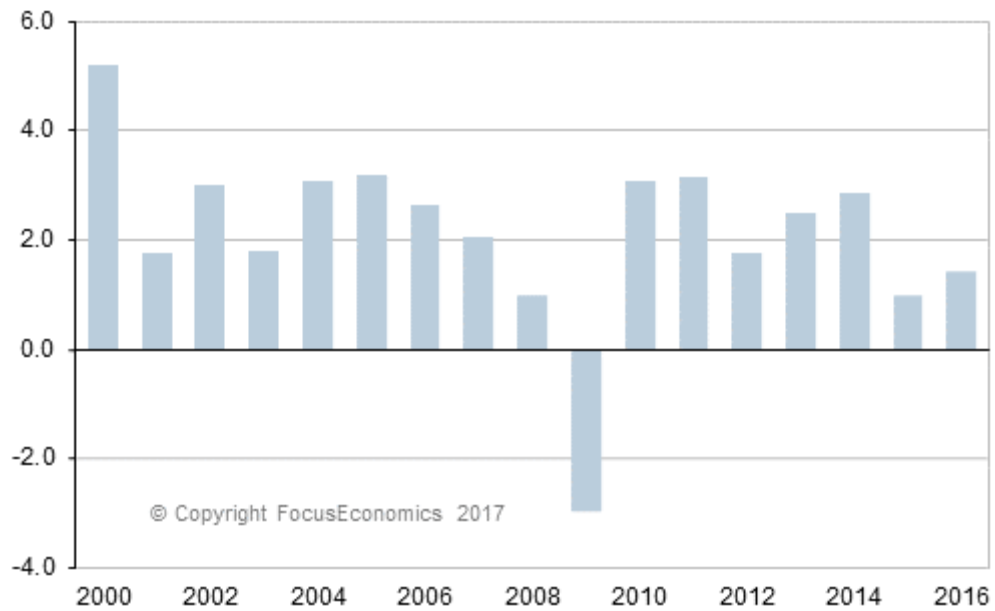
Figure 40: Canada's GDP from year 2000 to year 2016

(FocusEconomics, n.d.)

This observation could be proved by the graph above where we can observe that there is a drop in Canada's GDP in year 2014 to year 2015. This might be the cause for the amount of worker that are layoff in year 2014 and 2015.

Analysis 2: What is the amount of worker that got layoff from each job?

```
#A2 what is the amount worker that got layoff from each job?
Terminated %>% filter(Termination_Reason == "Layoff") %>% ggplot(aes(fct_rev(fct_infreq(Job)), fill = Job))+geom_bar() + xlab("Job") + coord_flip() +
  labs(title = "Distribution of layoff for each job")
```

Figure 41: Source code for figure 41

Explanation

The code function by drawing a bar chat with the title "Distribution of layoff for each job" with Job as the x axis and then flip the graph by using the function coord_flip.
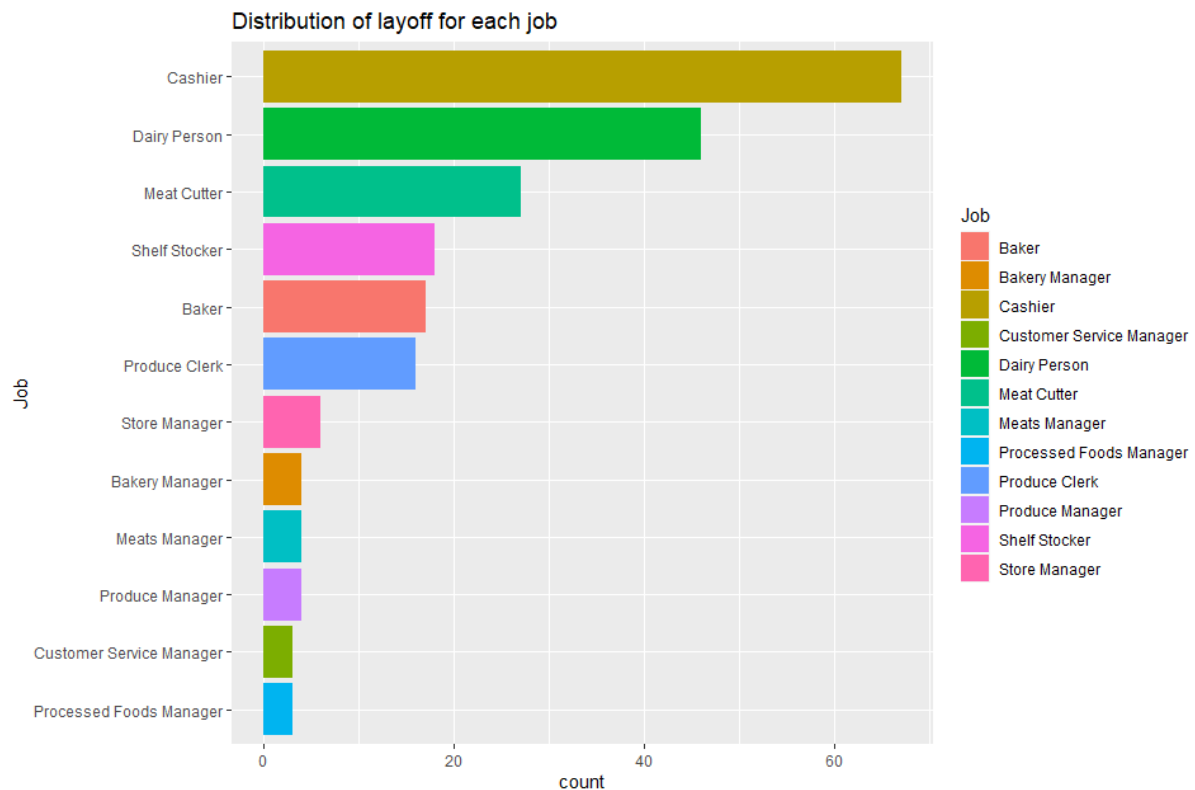
Figure 42: Distribution of layoff for each job

Explanation

From the above graph we could observe that cashier is the job that got the most layoff which is about 70 people. One of the reasons that cause this situation is the time took to train a cashier it only requires about one to four weeks and the only problem that will be cause when there is a lack of cashier is the customer had to wait for a bit longer (Indeed Editorial Team, 2019).

Analysis 3: What is the relationship between layoff and service length?

```
#A3 What is the relationship between layoff and service length?
ggplot(Terminated %>% filter(Termination_Reason == "Layoff"), aes(x = Service_Length)) + geom_bar() +
  labs(title = "Relationship between layoff and service length")
```

Figure 43: Source code for figure 43

Explanation

The code function by drawing a bar chat with the title "Relationship between layoff and service length" and filter in line with layoff as termination reason, x axis of the graph will be service length.
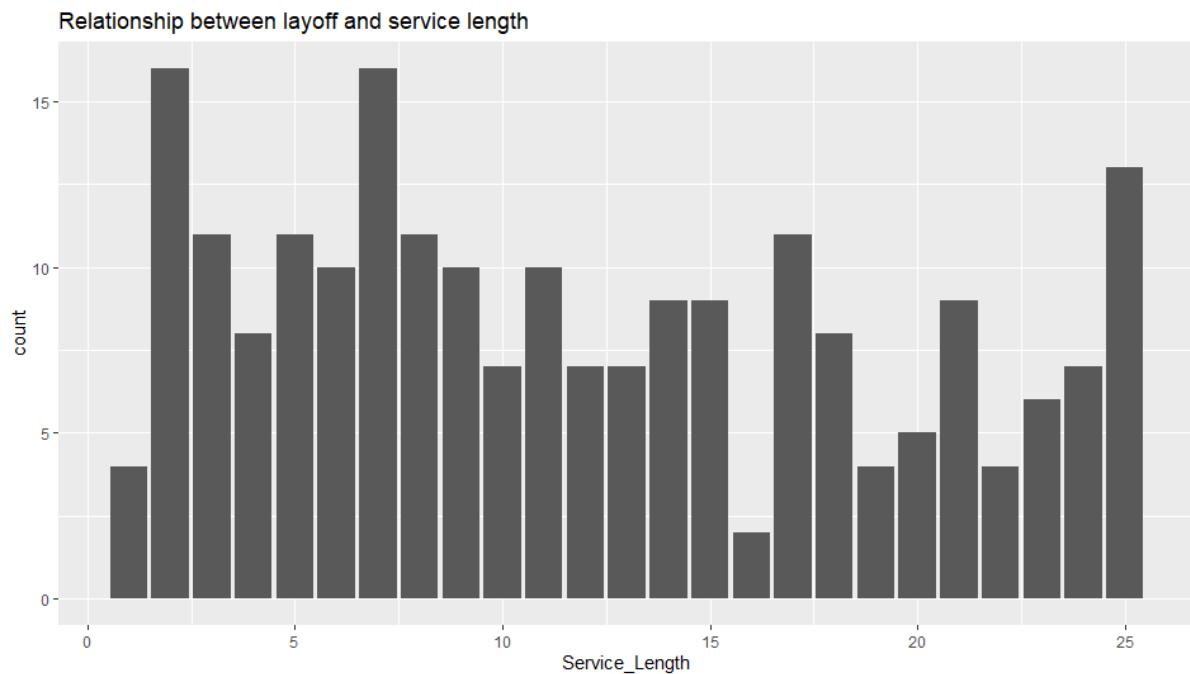
Figure 44: Relationship between layoff and service length

Explanation

From the above graph we could observe that there is a trend that people get layoff starting from 2 year of service and 7 years, the value decrease when it comes to year 15 and beyond. The reason that people from 2 to 7 years of service get fire mainly is because they are low in experience. Meanwhile for people that get fire from 15 years of service might because they are high in age, this will be further investigate in the next analysis.

Analysis 4: What is the average age for each year of service?

```
#A5 What is the average of age for each years of service?
Terminated %>% filter(Termination_Reason == "Layoff") %>% group_by(Service_Length) %>%
  summarise(Average_age = mean(Age)) %>% View()
```

Figure 45: Source code for figure 45

Explanation

The code function by create a table from the dataset Terminated and filter in line with layoff as termination reason and group the dataset by service length. After that add a new column named Average_age by finding mean age for each service length.

	Service_Length	Average_age
1	1	20.50000
2	2	21.87500
3	3	24.09091
4	4	25.62500
5	5	28.09091
6	6	29.70000
7	7	31.43750
8	8	33.36364
9	9	35.50000
10	10	37.00000
11	11	39.10000
12	12	41.28571
13	13	43.14286
14	14	44.88889
15	15	47.11111
16	16	49.00000
17	17	50.36364
18	18	52.37500
19	19	54.25000
20	20	55.80000
21	21	58.00000
22	22	59.00000
23	23	61.50000
24	24	63.57143
25	25	64.00000

Figure 46: Average age for each length of service

Explanation

With this table we could observe a rise in age with the service length, which is normal. But if we look at this graph side by side with the graph from analysis 3, we could come out with a finding where the company only fire worker with low experience and high age. And the average age of layoff is from 20.5 to 64. This finding also proves that worker who got layoff beyond 15 years of service are people who are higher in age. The benefit from keeping young and experience worker that the company will miss are:

1. Older workers are more skilled and experience (Columbia University Mailman School of Public Health, 2022)
   Older workers have more working experience hence they are equipped with level of experience, critical thinking and sheer knowledge that they discover through work. For new worker to learn this technical skill without being taught by older worker, it may take decades or longer for them to eventually learn those skill.

2. Younger workers bring in new energy and perspective (Jose, 2019)
   Young worker often has perspective that are different on the way that things are done at the current time. Most young worker are eager to earn, build experience and they are also wished to apply their skill in the workplace. The energy that bought in by young blood comes in useful when the company want to target millennial market as these guys know exactly the way to attract their peers.

3. Young workers learn fast and adapt easily (Reddy, 2020)
   The reason to say so is that young worker that just leave their colleges and studies still had the enthusiasm to learn compared to older worker that have been fighting in work for years. Aside from that, their ability to adapt is also higher as they have more energy to work for long hours compared to older employers.

Conclusion (Question 3)

Based on the finding from 4 analysis that have been performed for this question, we can conclude that the main reason the company have layoff lots of worker in year 2014 and 2015. The reason is because there is an economy problem for Canada, thus the company in Canada may have to layoff some worker to conserve cost. Beside this discovery, we had also discussed the advantage of keeping young worker with less experience and older worker with more experience.

The reason that causes the economy problem in Canada is price drop in crude oil price. Which decrease by 9.59 U.S dollars per barrel from year 2013 to 2014 and decrease by 46.45 U.S dollars per barrel from year 2014 to 2015 (Statista, 2022).

Some of the consideration that came into which worker that are going to be layoff are job, age, and service length. Where for job cashier has the highest possibility for getting layoff followed by dairy person, meat cutter and shelf stocker. The reason is all of these jobs require little to no training which make them highly replaceable. For age in the other hand, worker from the average age of 20.5 to 64 are more likely to get layoff. Service length wise, worker from 2 to 7 years is more likely to get layoff.

From all of the factor that we got from the analysis. We could find the data for all the potential people that will get fire in the future time by filtering their job, age, service length according to the finding in question 1. Where the code will be as following:

```
#Find out: Who are the people that might be layoff in the upcoming time?
MightLayoff <- Mdata %>% filter(Job == "Cashier"|Job == "Dairy Person"|Job == "Meat Cutter"|Job == "Shelf Stocker"|Job == "Baker"|Job == "Produce Clerk", Status == "ACTIVE", Status_Year == 2015)
MightLayoff %>%
  select("ID", "Record_Date", "DOB", "Hired_Date", "Age", "Service_Length", "City", "Department", "Job", "Store", "GenderS", "GenderF", "Status_Year", "Status", "Unit") %>%
  filter(between(Age,20,64), between(Service_Length, 2,7))
```

Figure 47: Source code for figure 47

And based on this code a list of 1198 worker would be obtain.

	ID	Record_Date	DOB	Hired_Date	Termination_Date	Age	Service_Length	City	Department	Job	Store	GenderS	GenderF	Termination_Reason	Termination_Type	Status_Year	Status	Unit
1	1706	2015-12-31	1951-01-20	1990-09-27	NA	64	25	Kelowna	Meats	Meat Cutter	16	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
2	1716	2015-12-31	1951-01-31	1990-10-03	NA	64	25	Kamloops	Meats	Meat Cutter	15	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
3	1717	2015-12-31	1951-02-02	1990-10-04	NA	64	25	Cranbrook	Meats	Meat Cutter	8	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
4	1718	2015-12-31	1951-02-08	1990-10-07	NA	64	25	Vernon	Meats	Meat Cutter	36	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
5	1720	2015-12-31	1951-02-17	1990-10-12	NA	64	25	Kamloops	Meats	Meat Cutter	15	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
6	1721	2015-12-31	1951-02-23	1990-10-15	NA	64	25	Cranbrook	Meats	Meat Cutter	8	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
7	1726	2015-12-31	1951-03-06	1990-10-21	NA	64	25	Vancouver	Dairy	Dairy Person	43	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
8	1733	2015-12-31	1951-03-13	1990-10-25	NA	64	25	Nanaimo	Meats	Meat Cutter	18	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
9	1739	2015-12-31	1951-03-29	1990-11-02	NA	64	25	Kamloops	Meats	Meat Cutter	15	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
10	1743	2015-12-31	1951-04-05	1990-11-06	NA	64	25	Nanaimo	Meats	Meat Cutter	18	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES

Figure 48: List of workers that might layoff soon

Refer to appendix for longer table.

Question 4: What is the other problem that might be face?

Analysis 1: Is the company facing gender diversion problem?

```
#A1 Is the company facing gender discrimination?
Terminated %>% ggplot(aes(fct_rev(fct_infreq(Job)), fill = GenderF))+geom_bar() + xlab("Job") + coord_flip() +
  labs(title = "Distribution for each gender in every job")
```

Figure 49: Source code for figure 49

Explanation

The code function by plotting a bar chat with the title "Distribution for each gender in every job" by colouring the bar according to the gender and arrange the bar chat in ascending. X axis had to be renamed to "Job" as if not do so the system will name the x axis as fct_rec(fct_infreq(Job)).
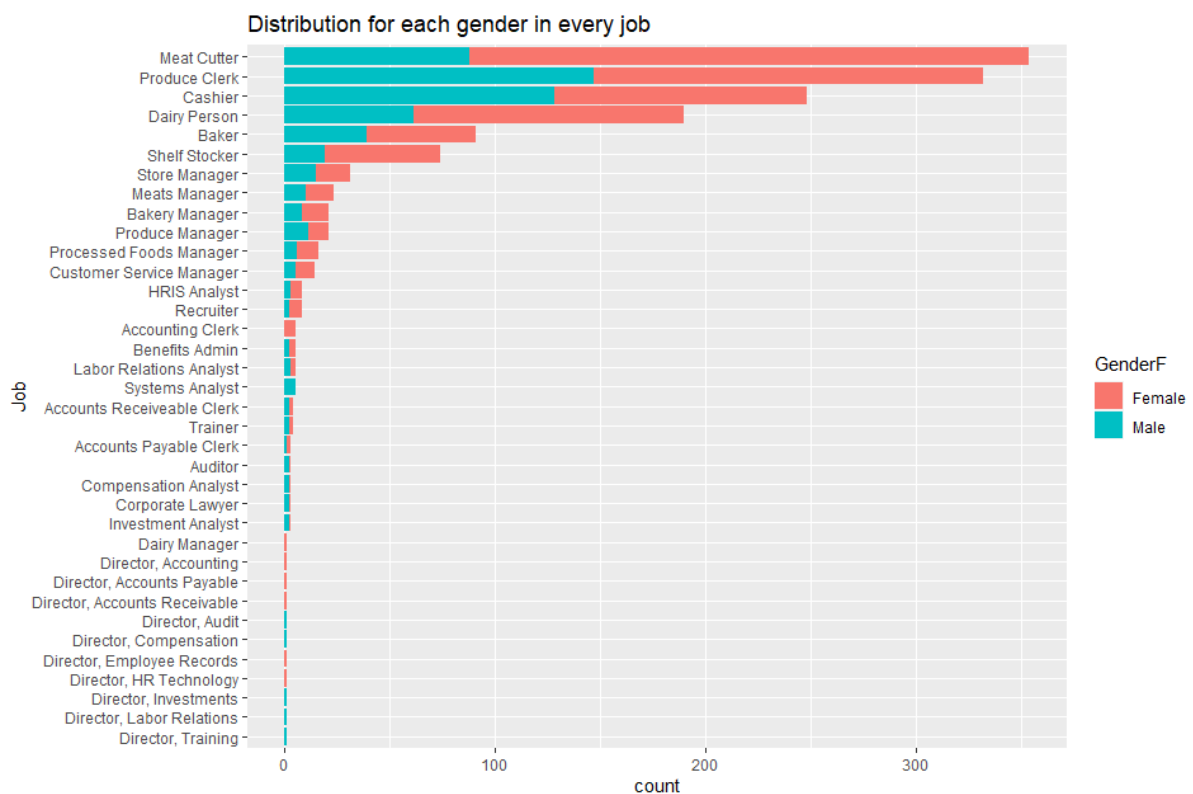
Figure 50: Distribution for each gender in every job

Explanation

This graph indicates the distribution of each gender in every job by representing male with blue and female as red. And from the graph we could observe that there is quite amount of job that do not have balance gender distribution. They are meat cutter, produce clerk, dairy person and shelf stocker. To create an equal diversity of gender, the company could (Schooley, 2022):

1. Focus on diversity during recruitment process so that equal amount of worker would be hire for both genders.

2. Create a fair compensation and promotion procedures so that both gender of worker will not feel unfair.

3. Offering flexible work time for worker to reduce stress.

Analysis 2: Is the company facing ageing staff problem?

```
#A2 Is the company facing age discrimination?
ggplot(Terminated, aes(Age)) +
  geom_histogram(aes(y = ..density.., fill = Status_Year)) +
  geom_density(fill = "#66FF66", alpha = 0.6) +
  facet_wrap(~Status_Year) +
  labs(
    title = "Distribution of age for each year"
  )
```

Figure 51: Source code for figure 51

Explanation

The code function by drawing a histogram with the title "Distribution of age for each year" with density with age as the x axis and colour the bar chat according to the year.
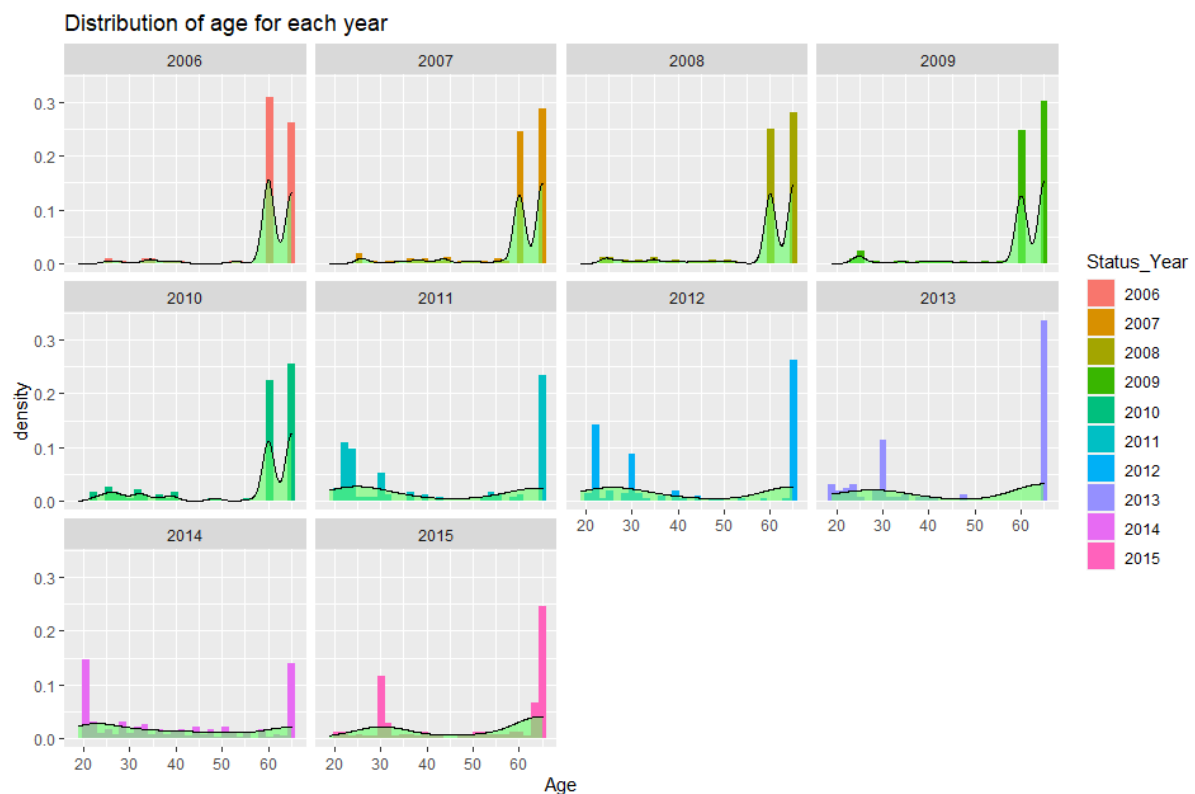
Figure 52: Distribution of age for each year

Explanation

Above graph indicated the distribution of age of worker for each year. From the graph we could observe that from year 2006 to year 2010, there is two huge spikes at around age 60 to 65 which indicated that there is a huge amount of older worker at those year. But this problem is not that obvious starting from year 2011 as there is no huge spike at any age but smooth wave, but there is still a huge amount of older worker at year 2011, 2012 and 2013. In year 2014 the company might have a huge recruitment as the amount of age 20 worker increase. Overall, the company age diversion is getting better from year to year.

Analysis 3: Is the worker running low?

```
#A3 Is the worker running low?
ggplot(Mdata, aes(y = Status_Year)) + geom_bar() +
  ylab("Year") +
  labs(title = "Number of workers in every year")
```

Figure 53: Source code for figure 53

Explanation

The code function by drawing a bar chat with the title "Number of workers in every year" with Year as y axis.
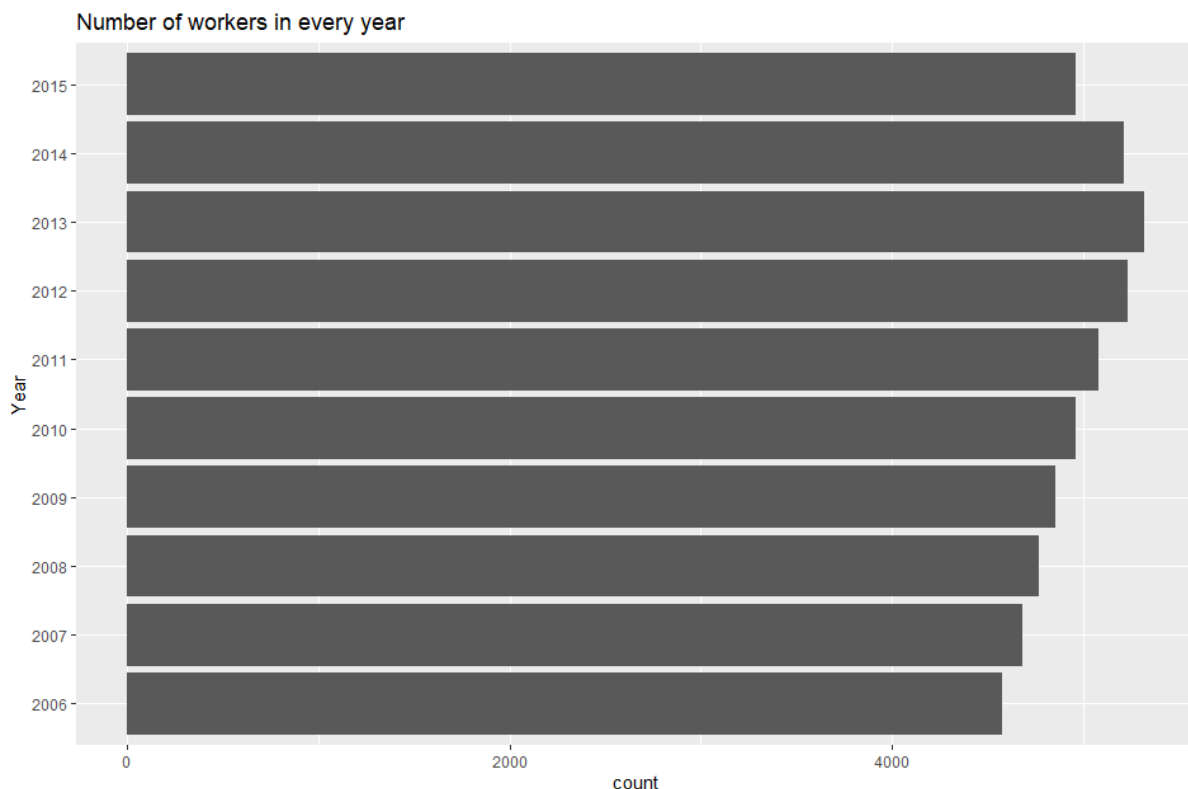
Figure 54: Number of workers in every year

Explanation

Above graph indicated the number of workers the company had for each year. And from the graph we could see that the amount of worker reaches its peak at year 2013 and after that start dropping. But it is not a problem for the company as economy happen at year 2014 and 2015 as discussed in question 3, analysis 1. Thus, there is no problem for human resource for the company if the company hire some worker to replace those that are layoff in year 2014 and 2015 when the economy is stable again.

Analysis 4: Is the company facing shortage in worker for any department?

```
#A4 Is the company facing shortage in worker for any job?
Mdata %>% group_by(Department) %>%
  summarise(Worker_2006 = sum(ID[Status_Year == 2006]),
            Worker_2007 = sum(ID[Status_Year == 2007]),
            Worker_2008 = sum(ID[Status_Year == 2008]),
            Worker_2009 = sum(ID[Status_Year == 2009]),
            Worker_2010 = sum(ID[Status_Year == 2010]),
            Worker_2011 = sum(ID[Status_Year == 2011]),
            Worker_2012 = sum(ID[Status_Year == 2012]),
            Worker_2013 = sum(ID[Status_Year == 2013]),
            Worker_2014 = sum(ID[Status_Year == 2014]),
            Worker_2015 = sum(ID[Status_Year == 2015])) %>%
  view()
```

Figure 55: Source code for figure 55

Explanation

The code function by first group data in dataset, Mdata according to department. Then add new column and summarise worker for each year for each department.

	Department	Worker_2006	Worker_2007	Worker_2008	Worker_2009	Worker_2010	Worker_2011	Worker_2012	Worker_2013	Worker_2014	Worker_2015
1	Accounting	9287	9287	9287	9287	9287	9287	9287	9287	9287	7914
2	Accounts Payable	6001	6001	6001	6001	6001	4451	4451	4451	4451	3081
3	Accounts Receiveable	7481	7481	7481	7481	7481	4417	4417	4417	4417	3057
4	Audit	6057	6057	6057	6057	4685	1560	1560	1560	1560	1560
5	Bakery	4159257	4183684	4188990	4107815	4301641	4309406	4279756	4210500	4132262	4033246
6	Compensation	5907	5907	5907	5907	4556	1516	1516	1516	1516	1516
7	Customer Service	1541083	2053037	2419821	2847562	3780739	4830614	6124186	7495992	7330758	6593158
8	Dairy	3778951	4271860	4633745	4895952	4937093	5324509	5397260	5451936	5366517	5210763
9	Employee Records	8815	8815	8815	8815	5841	5841	5841	5841	5841	0
10	Executive	11924	13242	13242	13242	13242	13242	13242	13242	13242	13242
11	HR Technology	13157	13157	11673	11673	8717	8717	8717	8717	8717	0
12	Information Technology	7014	7014	7014	7014	0	0	0	0	0	0
13	Investment	6167	6167	6167	6167	4791	1598	1598	1598	1598	1598
14	Labor Relations	8596	8596	8596	8596	2902	2902	2902	2902	2902	0
15	Legal	4064	4064	4064	4064	1352	1352	1352	1352	1352	0
16	Meats	3617283	3440919	3425725	3429142	3338580	3242423	3192434	3093332	3009559	2910359
17	Processed Foods	1725173	2194339	2839006	3437661	3919825	4147980	4440152	4369641	4305340	4172098
18	Produce	4226780	4028318	3774409	3678979	3639677	3509712	3379667	3235577	3091112	3009108
19	Recruitment	12440	12440	12440	12440	9663	9663	9663	9663	9663	1335
20	Store Management	54360	54360	54360	54360	40366	38724	38724	37359	37359	20368
21	Training	6955	6955	6955	6955	2806	2806	2806	2806	2806	0

Figure 56: List of number of workers in each department in each year

Explanation

Above graph indicates the amount of worker the company have for each department from year to year. From the graph we could find out that the department that are facing shortage in human resource are employee record, HR technology, labor relations, legal, recruitment and training. The reason to said so is that these department have significant lower amount of worker in year 2015 compared to year 2014 and the reason that some department is with 0 amount of worker but not on the list is because I suspect that the company might have shut down the department thus did not include them on the list. The negative that the company may receive from lacking worker in some departments are:

1. High-stress workplace

    To put it simple, being understaff means that the rest of the worker had to work harder to made up for the job that is done by the other staff that is now gone. If this situation continues, the employee will suffer from high level of stress. As the result, worker will be lacking energy to continue work as they feels like having a never-ending list of task and deadlines to meet. And this situation, according to research done, 63% of worker are ready to quit their job due to stress (Heckman, 2022).

2. Increasing resign rate

    Another negative effect from understaff are resign rate. As states in the first effect, employee is ready to quit their job if they feel too much stress. This could be a never-ending problem as it will costs 6 to 9 months' salary on average every time a salaried employee is replace (Charaba, 2022). And when company waste too much resource on replacing worker, the company will have shortage on money and they will layoff worker to conserve resource and the loop continue by stress out worker resign, company are forced to hire new worker to replace them.

Conclusion (Question 4)

From the analysis done in question 4, we have revealed that job such as meat cutter, production clerk, dairy person and shelf stocker are facing gender diversion problem. Ways to overcome gender diversion problem has been suggested in analysis 1.

In analysis 2, we have check on if there is any ageing staff problem in the company. And through the analysis we find out that although there is a huge amount of older worker from year 2006 to 2010, but the problem has been fixed by the company after year 2010 which is proof by the smoothness of the graph plotted in analysis 2.

In analysis 3, we also have discussed on if the company is running low on number of workers by looking at the graph of total number of workers from year to year. And from the graph we have conclude that the reason for lower amount of worker in year 2014 and 2015 is because of the company is forced to layoff some worker due to economy problem that happened in year 2014 and 2015 as mentioned in question 3 analysis 1.

In analysis 4, we have look into the number of workers in each department for each year to check for shortage of worker in any department. And through the analysis we had found that employee record, HR technology, labor relations, legal, recruitment and training are facing shortage in worker as the number of the worker has decreased significantly compared to the few years before year 2015.

Extra Features

Extra Feature 1: fct_infreq( )

fct_infreq( ), a function from forcats package. This function will reorder the data according to the frequency. By using this function, the readability and the cleanliness of the graph which in resulting in us able to make better observation. Below is the difference of using this function in graph.

Without the function:
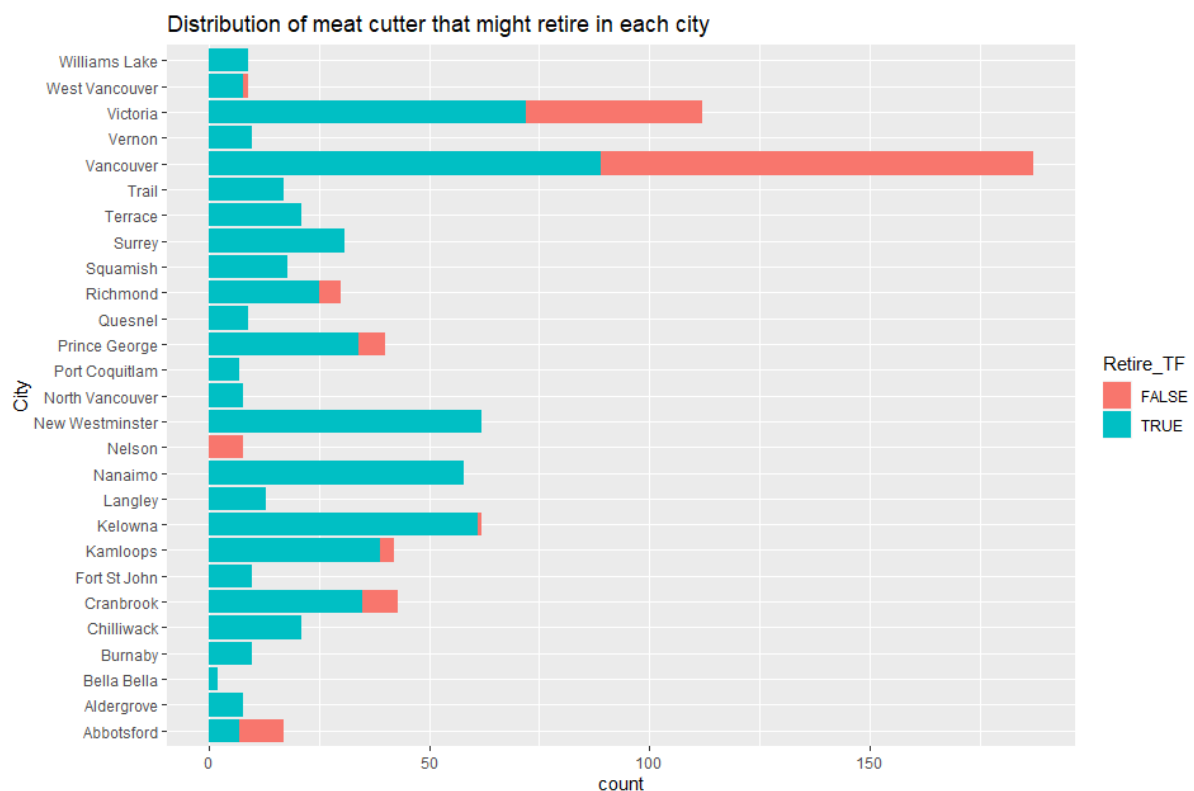
Figure 57: Without using fct_infreq( )

From above graph we could observe that the data is messy and hard to determine the ranking. For example, number of meat cutter in New Westminster and Kelowna looks the same when they are separated.

With the function:

Distribution of meat cutter that might retire in each city
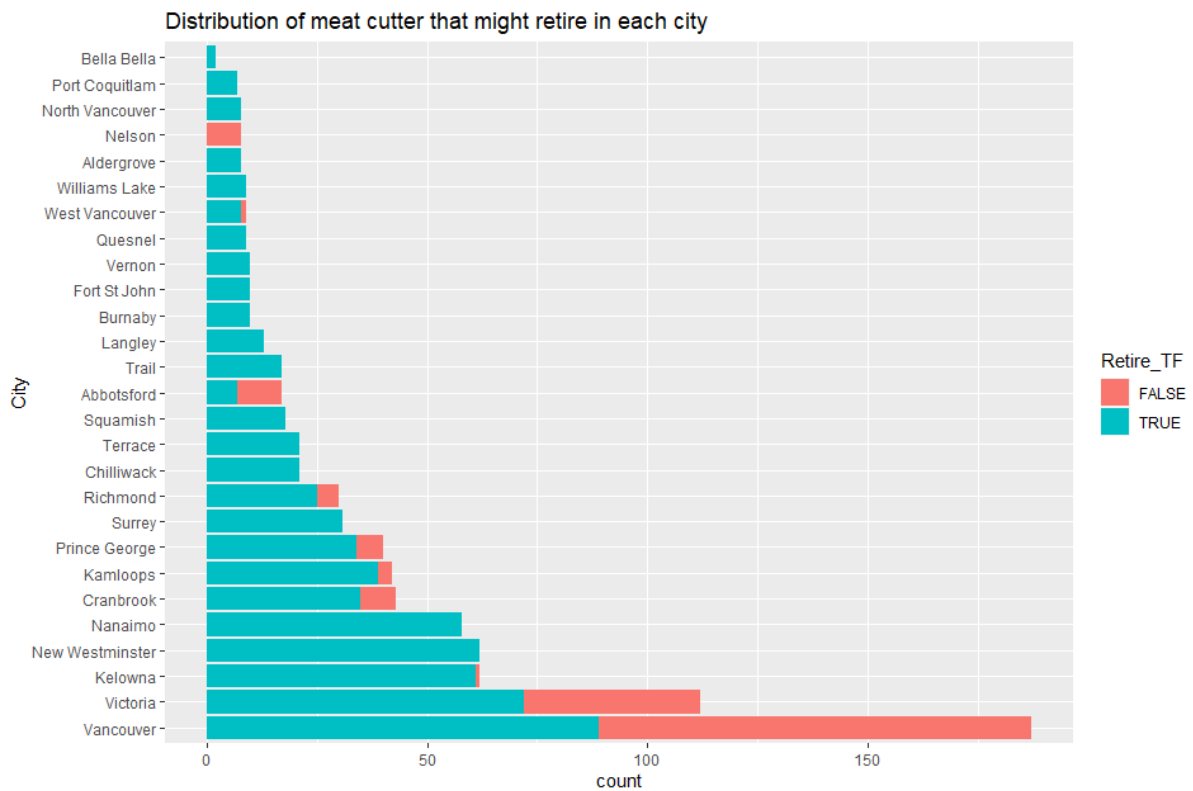
Figure 58: With fct_infreq( )

From above graph we could observe that by using the function, the data is arranged according to the frequency. This could significantly increase the readability of the graph as we can now see the ranking of the graph immediately. Aside from that we could also made up that New Westminster and Kelowna actually did have the same amount of meat cutter now that they are aside.

Extra Feature 2: fct_rev( )

fct_rev( ) is a function from forcats that reverse the order of the factor levels. Below is the difference of using this function in graph.

Without the function:
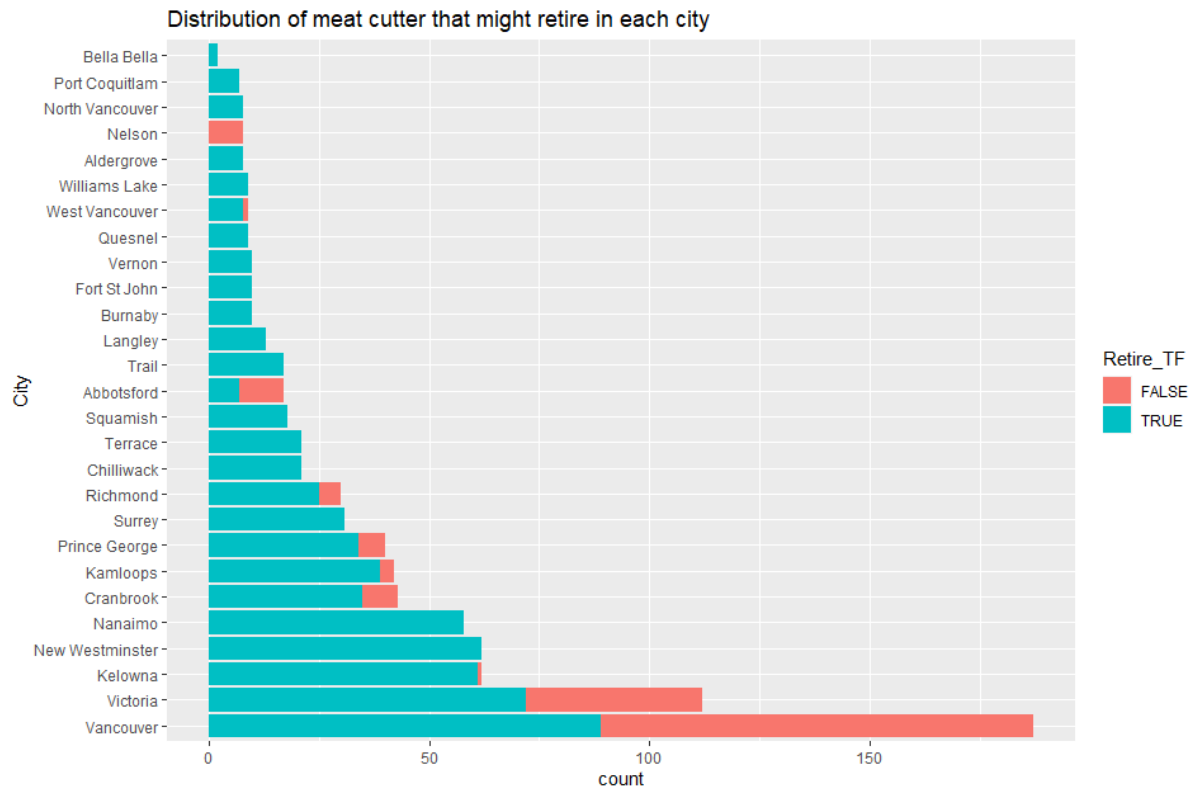
Figure 59: Without using fct_rev( )

We could observe that the graph is from low frequency to high frequency (read from high to low). Which is correct if we wish to observe the data with the lowest frequency, but in our case, we wish to observe the data with the highest frequency.

With the function:

Distribution of meat cutter that might retire in each city
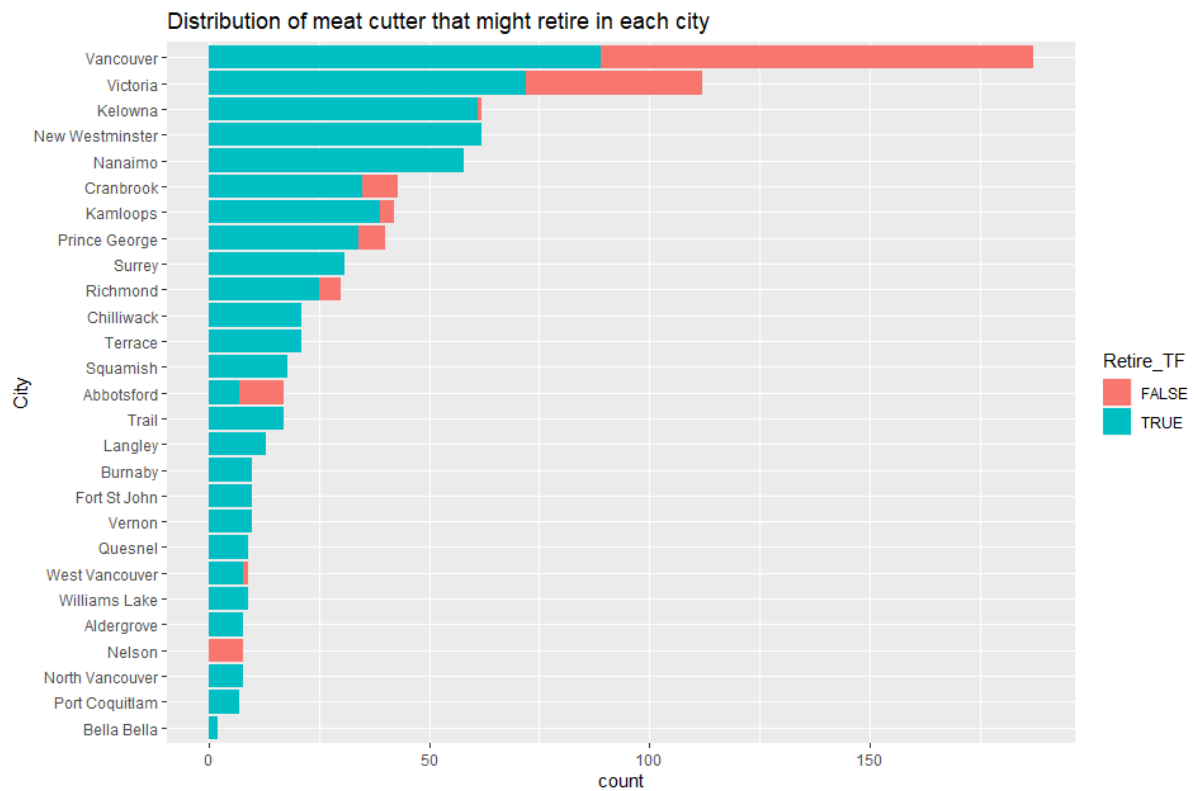
Figure 60: With fct_rev( )

Above is the graph when fct_rev( ) is used. The graph is reorder from high frequency to low frequency, which is a more suitable graph for our case.

Conclusion

The purpose of this assignment is to reveal any potential problem in the dataset provide through data science with RStudio. Throughout the process of question and analysis, problem such as human resource has been reveal and the reason that worker retire, resign and layoff has been discussed. Some suggestions are also provided for the company to consider. Anyways, this is a beneficial assignment as it gives me experience on data analysis.

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Some%2520studies%2520predict%2520that%2520every,in%2520recruiting%2520an

d%2520training%2520expenses

Appendix

List of workers that might retire:

	ID	Record_Date	DOB	Hired_Date	Age	Service_Length	City	Department	Job	Store	GenderS	GenderF	Status_Year	Status	Unit	Retire_TF
1	1318	2015-12-31	1954-01-03	1989-08-28	61	26	Vancouver	Executive	CEO	35	M	Male	2015	ACTIVE	HEADOFFICE	TRUE
2	1319	2015-12-31	1957-01-03	1989-08-28	58	26	Vancouver	Executive	VP Stores	35	F	Female	2015	ACTIVE	HEADOFFICE	TRUE
3	1320	2015-12-31	1955-01-02	1989-08-28	60	26	Vancouver	Executive	Legal Counsel	35	F	Female	2015	ACTIVE	HEADOFFICE	TRUE
4	1321	2015-12-31	1959-01-02	1989-08-28	56	26	Vancouver	Executive	VP Human Resources	35	M	Male	2015	ACTIVE	HEADOFFICE	TRUE
5	1322	2015-12-31	1958-01-09	1989-08-31	57	26	Vancouver	Executive	VP Finance	35	M	Male	2015	ACTIVE	HEADOFFICE	TRUE
6	1323	2015-12-31	1962-01-09	1989-08-31	53	26	Vancouver	Executive	Exec Assistant, VP Stores	35	M	Male	2015	ACTIVE	HEADOFFICE	FALSE
7	1325	2015-12-31	1964-01-13	1989-09-02	51	26	Vancouver	Executive	Exec Assistant, Legal Counsel	35	F	Female	2015	ACTIVE	HEADOFFICE	FALSE
8	1328	2015-12-31	1956-01-17	1989-09-05	59	26	Vancouver	Executive	CHief Information Officer	35	F	Female	2015	ACTIVE	HEADOFFICE	TRUE
9	1329	2015-12-31	1967-01-23	1989-09-08	48	26	Terrace	Store Management	Store Manager	32	F	Female	2015	ACTIVE	STORES	FALSE
10	1330	2015-12-31	1967-01-25	1989-09-09	48	26	Terrace	Meats	Meats Manager	32	F	Female	2015	ACTIVE	STORES	FALSE
11	1331	2015-12-31	1965-01-28	1989-09-10	50	26	Nanaimo	Store Management	Store Manager	18	F	Female	2015	ACTIVE	STORES	FALSE
12	1332	2015-12-31	1955-02-05	1989-09-15	60	26	Vancouver	Executive	Exec Assistant, Human Resources	35	F	Female	2015	ACTIVE	HEADOFFICE	TRUE
13	1334	2015-12-31	1961-02-06	1989-09-15	54	26	Vancouver	Executive	Exec Assistant, Finance	35	M	Male	2015	ACTIVE	HEADOFFICE	FALSE
14	1335	2015-12-31	1962-02-07	1989-09-16	53	26	Vancouver	Recruitment	Director, Recruitment	35	F	Female	2015	ACTIVE	HEADOFFICE	FALSE
15	1703	2015-12-31	1951-01-13	1990-09-23	64	25	Vancouver	Meats	Meats Manager	43	F	Female	2015	ACTIVE	STORES	TRUE
16	1705	2015-12-31	1951-01-15	1990-09-24	64	25	Vancouver	Meats	Meats Manager	29	M	Male	2015	ACTIVE	STORES	TRUE
17	1706	2015-12-31	1951-01-20	1990-09-27	64	25	Kelowna	Meats	Meat Cutter	16	M	Male	2015	ACTIVE	STORES	TRUE
18	1710	2015-12-31	1951-01-24	1990-09-29	64	25	Prince George	Customer Service	Customer Service Manager	26	M	Male	2015	ACTIVE	STORES	TRUE
19	1713	2015-12-31	1951-01-27	1990-10-01	64	25	Vancouver	Produce	Produce Manager	43	F	Female	2015	ACTIVE	STORES	TRUE
20	1715	2015-12-31	1951-01-31	1990-10-03	64	25	Richmond	Produce	Produce Manager	29	F	Female	2015	ACTIVE	STORES	TRUE
21	1716	2015-12-31	1951-01-31	1990-10-03	64	25	Kamloops	Meats	Meat Cutter	15	M	Male	2015	ACTIVE	STORES	TRUE
22	1717	2015-12-31	1951-02-02	1990-10-04	64	25	Cranbrook	Meats	Meat Cutter	8	F	Female	2015	ACTIVE	STORES	TRUE
23	1718	2015-12-31	1951-02-08	1990-10-07	64	25	Vernon	Meats	Meat Cutter	36	F	Female	2015	ACTIVE	STORES	TRUE
24	1719	2015-12-31	1951-02-11	1990-10-09	64	25	Vancouver	Bakery	Bakery Manager	43	M	Male	2015	ACTIVE	STORES	TRUE
25	1720	2015-12-31	1951-02-17	1990-10-12	64	25	Kamloops	Meats	Meat Cutter	15	F	Female	2015	ACTIVE	STORES	TRUE
26	1721	2015-12-31	1951-02-23	1990-10-15	64	25	Cranbrook	Meats	Meat Cutter	8	M	Male	2015	ACTIVE	STORES	TRUE
27	1726	2015-12-31	1951-03-06	1990-10-21	64	25	Vancouver	Dairy	Dairy Person	43	M	Male	2015	ACTIVE	STORES	TRUE
28	1728	2015-12-31	1951-03-06	1990-10-21	64	25	Vancouver	Processed Foods	Processed Foods Manager	43	F	Female	2015	ACTIVE	STORES	TRUE
29	1732	2015-12-31	1951-03-11	1990-10-24	64	25	West Vancouver	Meats	Meats Manager	38	M	Male	2015	ACTIVE	STORES	TRUE
30	1733	2015-12-31	1951-03-13	1990-10-25	64	25	Nanaimo	Meats	Meat Cutter	18	M	Male	2015	ACTIVE	STORES	TRUE
31	1734	2015-12-31	1951-03-13	1990-10-25	64	25	Vancouver	Customer Service	Customer Service Manager	43	F	Female	2015	ACTIVE	STORES	TRUE
32	1735	2015-12-31	1951-03-15	1990-10-26	64	25	New Westminster	Customer Service	Customer Service Manager	21	M	Male	2015	ACTIVE	STORES	TRUE
33	1736	2015-12-31	1951-03-23	1990-10-30	64	25	Vancouver	Store Management	Store Manager	44	M	Male	2015	ACTIVE	STORES	TRUE
34	1739	2015-12-31	1951-03-29	1990-11-02	64	25	Kamloops	Meats	Meat Cutter	15	M	Male	2015	ACTIVE	STORES	TRUE
35	1740	2015-12-31	1951-03-30	1990-11-03	64	25	Burnaby	Bakery	Bakery Manager	5	M	Male	2015	ACTIVE	STORES	TRUE
36	1741	2015-12-31	1951-04-03	1990-11-05	64	25	Vancouver	Meats	Meats Manager	44	M	Male	2015	ACTIVE	STORES	TRUE
37	1743	2015-12-31	1951-04-05	1990-11-06	64	25	Nanaimo	Meats	Meat Cutter	18	F	Female	2015	ACTIVE	STORES	TRUE
38	1744	2015-12-31	1951-04-08	1990-11-07	64	25	Richmond	Dairy	Dairy Person	29	F	Female	2015	ACTIVE	STORES	TRUE
39	1745	2015-12-31	1951-04-11	1990-11-09	64	25	Vancouver	Produce	Produce Manager	44	M	Male	2015	ACTIVE	STORES	TRUE
40	1750	2015-12-31	1951-04-20	1990-11-14	64	25	Kamloops	Meats	Meat Cutter	15	F	Female	2015	ACTIVE	STORES	TRUE
41	1754	2015-12-31	1951-05-02	1990-11-20	64	25	Prince George	Meats	Meat Cutter	26	M	Male	2015	ACTIVE	STORES	TRUE
42	1755	2015-12-31	1951-05-04	1990-11-21	64	25	New Westminster	Meats	Meat Cutter	21	M	Male	2015	ACTIVE	STORES	TRUE
43	1757	2015-12-31	1951-05-05	1990-11-22	64	25	Nanaimo	Meats	Meat Cutter	18	F	Female	2015	ACTIVE	STORES	TRUE
44	1758	2015-12-31	1951-05-12	1990-11-25	64	25	Port Coquitlam	Meats	Meats Manager	25	F	Female	2015	ACTIVE	STORES	TRUE
45	1762	2015-12-31	1951-05-18	1990-11-28	64	25	Kelowna	Meats	Meat Cutter	16	F	Female	2015	ACTIVE	STORES	TRUE
46	1763	2015-12-31	1951-05-21	1990-11-30	64	25	Port Coquitlam	Produce	Produce Manager	25	M	Male	2015	ACTIVE	STORES	TRUE
47	1767	2015-12-31	1951-06-02	1990-12-06	64	25	Vancouver	Bakery	Bakery Manager	44	M	Male	2015	ACTIVE	STORES	TRUE
48	1768	2015-12-31	1951-06-03	1990-12-07	64	25	Langley	Store Management	Store Manager	17	M	Male	2015	ACTIVE	STORES	TRUE
49	1769	2015-12-31	1951-06-04	1990-12-07	64	25	Quesnel	Processed Foods	Processed Foods Manager	28	M	Male	2015	ACTIVE	STORES	TRUE
50	1770	2015-12-31	1951-06-05	1990-12-08	64	25	Vancouver	Dairy	Dairy Person	44	M	Male	2015	ACTIVE	STORES	TRUE
51	1771	2015-12-31	1951-06-06	1990-12-08	64	25	Abbotsford	Meats	Meats Manager	1	M	Male	2015	ACTIVE	STORES	TRUE
52	1773	2015-12-31	1951-06-12	1990-12-12	64	25	Cranbrook	Meats	Meat Cutter	8	M	Male	2015	ACTIVE	STORES	TRUE
53	1774	2015-12-31	1951-06-14	1990-12-13	64	25	Squamish	Processed Foods	Processed Foods Manager	30	M	Male	2015	ACTIVE	STORES	TRUE
54	1775	2015-12-31	1951-06-15	1990-12-13	64	25	Vancouver	Processed Foods	Processed Foods Manager	44	M	Male	2015	ACTIVE	STORES	TRUE
55	1776	2015-12-31	1951-06-18	1990-12-15	64	25	Vancouver	Customer Service	Customer Service Manager	44	M	Male	2015	ACTIVE	STORES	TRUE
56	1777	2015-12-31	1951-06-18	1990-12-15	64	25	Kelowna	Meats	Meat Cutter	16	F	Female	2015	ACTIVE	STORES	TRUE
57	1779	2015-12-31	1951-06-27	1990-12-20	64	25	Burnaby	Dairy	Dairy Person	5	F	Female	2015	ACTIVE	STORES	TRUE
58	1786	2015-12-31	1951-07-07	1990-12-25	64	25	West Vancouver	Produce	Produce Manager	38	F	Female	2015	ACTIVE	STORES	TRUE
59	1790	2015-12-31	1951-07-17	1990-12-30	64	25	Nanaimo	Meats	Meat Cutter	18	F	Female	2015	ACTIVE	STORES	TRUE
60	1791	2015-12-31	1951-07-17	1990-12-30	64	25	Terrace	Meats	Meat Cutter	32	M	Male	2015	ACTIVE	STORES	TRUE

#																
61	1793	2015-12-31	1951-07-19	1990-12-31	64	25	Aldergrove	Produce	Produce Manager	2	M	Male	2015	ACTIVE	STORES	TRUE
62	1794	2015-12-31	1951-07-21	1991-01-01	64	24	Squamish	Customer Service	Customer Service Manager	30	M	Male	2015	ACTIVE	STORES	TRUE
63	1800	2015-12-31	1951-08-04	1991-01-09	64	24	Prince George	Meats	Meat Cutter	26	F	Female	2015	ACTIVE	STORES	TRUE
64	1801	2015-12-31	1951-08-12	1991-01-13	64	24	North Vancouver	Meats	Meats Manager	22	F	Female	2015	ACTIVE	STORES	TRUE
65	1802	2015-12-31	1951-08-16	1991-01-15	64	24	Surrey	Processed Foods	Processed Foods Manager	31	F	Female	2015	ACTIVE	STORES	TRUE
66	1803	2015-12-31	1951-08-17	1991-01-15	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	2015	ACTIVE	STORES	TRUE
67	1804	2015-12-31	1951-08-20	1991-01-17	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	2015	ACTIVE	STORES	TRUE
68	1806	2015-12-31	1951-08-23	1991-01-19	64	24	Surrey	Customer Service	Customer Service Manager	31	F	Female	2015	ACTIVE	STORES	TRUE
69	1808	2015-12-31	1951-08-25	1991-01-20	64	24	Nanaimo	Meats	Meat Cutter	18	F	Female	2015	ACTIVE	STORES	TRUE
70	1810	2015-12-31	1951-08-28	1991-01-21	64	24	Kelowna	Meats	Meat Cutter	16	F	Female	2015	ACTIVE	STORES	TRUE
71	1811	2015-12-31	1951-09-01	1991-01-23	64	24	Terrace	Meats	Meat Cutter	32	M	Male	2015	ACTIVE	STORES	TRUE
72	1812	2015-12-31	1951-09-02	1991-01-24	64	24	Squamish	Meats	Meat Cutter	30	F	Female	2015	ACTIVE	STORES	TRUE
73	1814	2015-12-31	1951-09-09	1991-01-28	64	24	Surrey	Meats	Meat Cutter	31	F	Female	2015	ACTIVE	STORES	TRUE
74	1816	2015-12-31	1951-09-17	1991-02-01	64	24	Kelowna	Meats	Meat Cutter	16	M	Male	2015	ACTIVE	STORES	TRUE
75	1817	2015-12-31	1951-09-19	1991-02-02	64	24	Abbotsford	Produce	Produce Manager	1	M	Male	2015	ACTIVE	STORES	TRUE
76	1820	2015-12-31	1951-09-25	1991-02-05	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	2015	ACTIVE	STORES	TRUE
77	1825	2015-12-31	1951-10-09	1991-02-12	64	24	Cranbrook	Meats	Meat Cutter	8	F	Female	2015	ACTIVE	STORES	TRUE
78	1827	2015-12-31	1951-10-12	1991-02-14	64	24	Langley	Meats	Meats Manager	17	F	Female	2015	ACTIVE	STORES	TRUE
79	1829	2015-12-31	1951-10-13	1991-02-15	64	24	Burnaby	Processed Foods	Processed Foods Manager	5	M	Male	2015	ACTIVE	STORES	TRUE
80	1830	2015-12-31	1951-10-13	1991-02-15	64	24	Nanaimo	Meats	Meat Cutter	18	M	Male	2015	ACTIVE	STORES	TRUE
81	1831	2015-12-31	1951-10-15	1991-02-16	64	24	Kelowna	Meats	Meat Cutter	16	M	Male	2015	ACTIVE	STORES	TRUE
82	1834	2015-12-31	1951-10-28	1991-02-23	64	24	Chilliwack	Meats	Meats Manager	6	M	Male	2015	ACTIVE	STORES	TRUE
83	1835	2015-12-31	1951-10-30	1991-02-24	64	24	New Westminster	Meats	Meat Cutter	21	M	Male	2015	ACTIVE	STORES	TRUE
84	1836	2015-12-31	1951-10-30	1991-02-24	64	24	Victoria	Meats	Meat Cutter	46	M	Male	2015	ACTIVE	STORES	TRUE
85	1839	2015-12-31	1951-11-04	1991-02-26	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	2015	ACTIVE	STORES	TRUE
86	1840	2015-12-31	1951-11-03	1991-02-26	64	24	Vancouver	Meats	Meat Cutter	41	M	Male	2015	ACTIVE	STORES	TRUE
87	1841	2015-12-31	1951-11-06	1991-02-27	64	24	Kamloops	Meats	Meat Cutter	15	F	Female	2015	ACTIVE	STORES	TRUE
88	1844	2015-12-31	1951-11-11	1991-03-02	64	24	Cranbrook	Meats	Meat Cutter	8	F	Female	2015	ACTIVE	STORES	TRUE
89	1845	2015-12-31	1951-11-14	1991-03-03	64	24	Vancouver	Meats	Meat Cutter	41	M	Male	2015	ACTIVE	STORES	TRUE
90	1846	2015-12-31	1951-11-14	1991-03-03	64	24	Victoria	Meats	Meat Cutter	46	M	Male	2015	ACTIVE	STORES	TRUE
91	1848	2015-12-31	1951-11-18	1991-03-06	64	24	Squamish	Meats	Meat Cutter	30	M	Male	2015	ACTIVE	STORES	TRUE
92	1849	2015-12-31	1951-11-23	1991-03-08	64	24	Squamish	Meats	Meat Cutter	30	F	Female	2015	ACTIVE	STORES	TRUE
93	1850	2015-12-31	1951-11-25	1991-03-09	64	24	Vancouver	Meats	Meat Cutter	41	M	Male	2015	ACTIVE	STORES	TRUE
94	1851	2015-12-31	1951-11-24	1991-03-09	64	24	Surrey	Meats	Meat Cutter	31	M	Male	2015	ACTIVE	STORES	TRUE
95	1852	2015-12-31	1951-11-26	1991-03-10	64	24	Burnaby	Customer Service	Customer Service Manager	5	M	Male	2015	ACTIVE	STORES	TRUE
96	1853	2015-12-31	1951-11-26	1991-03-10	64	24	New Westminster	Meats	Meat Cutter	21	F	Female	2015	ACTIVE	STORES	TRUE
97	1855	2015-12-31	1951-12-03	1991-03-14	64	24	Victoria	Meats	Meat Cutter	46	F	Female	2015	ACTIVE	STORES	TRUE
98	1856	2015-12-31	1951-12-07	1991-03-16	64	24	Cranbrook	Meats	Meat Cutter	8	F	Female	2015	ACTIVE	STORES	TRUE
99	1857	2015-12-31	1951-12-08	1991-03-16	64	24	West Vancouver	Dairy	Dairy Person	38	F	Female	2015	ACTIVE	STORES	TRUE
100	1858	2015-12-31	1951-12-10	1991-03-17	64	24	Nanaimo	Meats	Meat Cutter	18	M	Male	2015	ACTIVE	STORES	TRUE

List of workers that might layoff:

ID	Record_Date	DOB	Hired_Date	Termination_Date	Age	Service_Length	City	Department	Job	Store	GenderS	GenderF	Termination_Reason	Termination_Type	Status_Year	Status	Unit
1	1706	2015-12-31	1951-01-20	1990-09-27	NA	64	25	Kelowna	Meats	Meat Cutter	16	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
2	1716	2015-12-31	1951-01-31	1990-10-03	NA	64	25	Kamloops	Meats	Meat Cutter	15	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
3	1717	2015-12-31	1951-02-02	1990-10-04	NA	64	25	Cranbrook	Meats	Meat Cutter	8	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
4	1718	2015-12-31	1951-02-08	1990-10-07	NA	64	25	Vernon	Meats	Meat Cutter	36	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
5	1720	2015-12-31	1951-02-17	1990-10-12	NA	64	25	Kamloops	Meats	Meat Cutter	15	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
6	1721	2015-12-31	1951-02-23	1990-10-15	NA	64	25	Cranbrook	Meats	Meat Cutter	8	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
7	1726	2015-12-31	1951-03-06	1990-10-21	NA	64	25	Vancouver	Dairy	Dairy Person	43	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
8	1733	2015-12-31	1951-03-13	1990-10-25	NA	64	25	Nanaimo	Meats	Meat Cutter	18	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
9	1739	2015-12-31	1951-03-29	1990-11-02	NA	64	25	Kamloops	Meats	Meat Cutter	15	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
10	1743	2015-12-31	1951-04-05	1990-11-06	NA	64	25	Nanaimo	Meats	Meat Cutter	18	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
11	1744	2015-12-31	1951-04-08	1990-11-07	NA	64	25	Richmond	Dairy	Dairy Person	29	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
12	1750	2015-12-31	1951-04-20	1990-11-14	NA	64	25	Kamloops	Meats	Meat Cutter	15	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
13	1754	2015-12-31	1951-05-02	1990-11-20	NA	64	25	Prince George	Meats	Meat Cutter	26	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
14	1755	2015-12-31	1951-05-04	1990-11-21	NA	64	25	New Westminster	Meats	Meat Cutter	21	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
15	1757	2015-12-31	1951-05-05	1990-11-22	NA	64	25	Nanaimo	Meats	Meat Cutter	18	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
16	1762	2015-12-31	1951-05-18	1990-11-28	NA	64	25	Kelowna	Meats	Meat Cutter	16	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
17	1770	2015-12-31	1951-06-05	1990-12-08	NA	64	25	Vancouver	Dairy	Dairy Person	44	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
18	1773	2015-12-31	1951-06-12	1990-12-12	NA	64	25	Cranbrook	Meats	Meat Cutter	8	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
19	1777	2015-12-31	1951-06-18	1990-12-15	NA	64	25	Kelowna	Meats	Meat Cutter	16	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
20	1779	2015-12-31	1951-06-27	1990-12-20	NA	64	25	Burnaby	Dairy	Dairy Person	5	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
21	1790	2015-12-31	1951-07-17	1990-12-30	NA	64	25	Nanaimo	Meats	Meat Cutter	18	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
22	1791	2015-12-31	1951-07-17	1990-12-30	NA	64	25	Terrace	Meats	Meat Cutter	32	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
23	1800	2015-12-31	1951-08-04	1991-01-09	NA	64	24	Prince George	Meats	Meat Cutter	26	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
24	1803	2015-12-31	1951-08-17	1991-01-15	NA	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
25	1804	2015-12-31	1951-08-20	1991-01-17	NA	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
26	1808	2015-12-31	1951-08-25	1991-01-20	NA	64	24	Nanaimo	Meats	Meat Cutter	18	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
27	1810	2015-12-31	1951-08-28	1991-01-21	NA	64	24	Kelowna	Meats	Meat Cutter	16	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
28	1811	2015-12-31	1951-09-01	1991-01-23	NA	64	24	Terrace	Meats	Meat Cutter	32	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
29	1812	2015-12-31	1951-09-02	1991-01-24	NA	64	24	Squamish	Meats	Meat Cutter	30	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
30	1814	2015-12-31	1951-09-09	1991-01-28	NA	64	24	Surrey	Meats	Meat Cutter	31	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
31	1816	2015-12-31	1951-09-17	1991-02-01	NA	64	24	Kelowna	Meats	Meat Cutter	16	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
32	1820	2015-12-31	1951-09-25	1991-02-05	NA	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
33	1825	2015-12-31	1951-10-09	1991-02-12	NA	64	24	Cranbrook	Meats	Meat Cutter	8	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
34	1830	2015-12-31	1951-10-13	1991-02-15	NA	64	24	Nanaimo	Meats	Meat Cutter	18	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
35	1831	2015-12-31	1951-10-15	1991-02-16	NA	64	24	Kelowna	Meats	Meat Cutter	16	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
36	1835	2015-12-31	1951-10-30	1991-02-24	NA	64	24	New Westminster	Meats	Meat Cutter	21	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
37	1836	2015-12-31	1951-10-30	1991-02-24	NA	64	24	Victoria	Meats	Meat Cutter	46	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
38	1839	2015-12-31	1951-11-04	1991-02-26	NA	64	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
39	1840	2015-12-31	1951-11-03	1991-02-26	NA	64	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
40	1841	2015-12-31	1951-11-06	1991-02-27	NA	64	24	Kamloops	Meats	Meat Cutter	15	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
41	1844	2015-12-31	1951-11-11	1991-03-02	NA	64	24	Cranbrook	Meats	Meat Cutter	8	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
42	1845	2015-12-31	1951-11-14	1991-03-03	NA	64	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
43	1846	2015-12-31	1951-11-14	1991-03-03	NA	64	24	Victoria	Meats	Meat Cutter	46	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
44	1848	2015-12-31	1951-11-18	1991-03-06	NA	64	24	Squamish	Meats	Meat Cutter	30	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
45	1849	2015-12-31	1951-11-23	1991-03-08	NA	64	24	Squamish	Meats	Meat Cutter	30	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
46	1850	2015-12-31	1951-11-25	1991-03-09	NA	64	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
47	1851	2015-12-31	1951-11-24	1991-03-09	NA	64	24	Surrey	Meats	Meat Cutter	31	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
48	1853	2015-12-31	1951-11-26	1991-03-10	NA	64	24	New Westminster	Meats	Meat Cutter	21	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
49	1855	2015-12-31	1951-12-03	1991-03-14	NA	64	24	Victoria	Meats	Meat Cutter	46	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
50	1856	2015-12-31	1951-12-07	1991-03-16	NA	64	24	Cranbrook	Meats	Meat Cutter	8	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
51	1857	2015-12-31	1951-12-08	1991-03-16	NA	64	24	West Vancouver	Dairy	Dairy Person	38	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
52	1858	2015-12-31	1951-12-10	1991-03-17	NA	64	24	Nanaimo	Meats	Meat Cutter	18	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
53	1860	2015-12-31	1951-12-15	1991-03-20	NA	64	24	Cranbrook	Meats	Meat Cutter	8	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
54	1862	2015-12-31	1951-12-20	1991-03-22	NA	64	24	Surrey	Meats	Meat Cutter	31	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
55	1864	2015-12-31	1951-12-23	1991-03-24	NA	64	24	Cranbrook	Meats	Meat Cutter	8	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
56	1865	2015-12-31	1951-12-24	1991-03-25	NA	64	24	Victoria	Meats	Meat Cutter	46	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
57	1866	2015-12-31	1951-12-25	1991-03-25	NA	64	24	Squamish	Meats	Meat Cutter	30	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
58	1868	2015-12-31	1951-12-29	1991-03-27	NA	64	24	Cranbrook	Meats	Meat Cutter	8	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
59	1870	2015-12-31	1952-01-01	1991-03-29	NA	63	24	Kamloops	Meats	Meat Cutter	15	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
60	1871	2015-12-31	1952-01-07	1991-04-01	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
61	1875	2015-12-31	1952-01-20	1991-04-08	NA	63	24	New Westminster	Meats	Meat Cutter	21	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
62	1876	2015-12-31	1952-01-26	1991-04-11	NA	63	24	Kelowna	Meats	Meat Cutter	16	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
63	1877	2015-12-31	1952-01-27	1991-04-12	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
64	1878	2015-12-31	1952-01-27	1991-04-12	NA	63	24	Terrace	Meats	Meat Cutter	32	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
65	1879	2015-12-31	1952-01-27	1991-04-12	NA	63	24	New Westminster	Meats	Meat Cutter	21	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
66	1880	2015-12-31	1952-02-01	1991-04-14	NA	63	24	Surrey	Meats	Meat Cutter	31	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
67	1881	2015-12-31	1952-01-31	1991-04-14	NA	63	24	New Westminster	Meats	Meat Cutter	21	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
68	1882	2015-12-31	1952-02-03	1991-04-15	NA	63	24	Vernon	Meats	Meat Cutter	36	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
69	1884	2015-12-31	1952-02-06	1991-04-17	NA	63	24	Terrace	Meats	Meat Cutter	32	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
70	1888	2015-12-31	1952-02-12	1991-04-20	NA	63	24	Prince George	Meats	Meat Cutter	26	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
71	1892	2015-12-31	1952-02-26	1991-04-27	NA	63	24	Prince George	Meats	Meat Cutter	26	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
72	1895	2015-12-31	1952-03-01	1991-04-29	NA	63	24	Burnaby	Meats	Meat Cutter	5	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
73	1896	2015-12-31	1952-03-01	1991-04-29	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
74	1900	2015-12-31	1952-03-12	1991-05-05	NA	63	24	Kelowna	Meats	Meat Cutter	16	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
75	1901	2015-12-31	1952-03-15	1991-05-06	NA	63	24	Prince George	Meats	Meat Cutter	26	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
76	1902	2015-12-31	1952-03-16	1991-05-07	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
77	1905	2015-12-31	1952-03-19	1991-05-08	NA	63	24	Trail	Meats	Meat Cutter	33	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
78	1906	2015-12-31	1952-03-20	1991-05-09	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
79	1907	2015-12-31	1952-03-21	1991-05-10	NA	63	24	Surrey	Meats	Meat Cutter	31	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
80	1909	2015-12-31	1952-03-24	1991-05-11	NA	63	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES

81	1911	2015-12-31	1952-03-28	1991-05-13	NA	63	24	Abbotsford	Dairy	Dairy Person	1	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
82	1915	2015-12-31	1952-04-03	1991-05-16	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
83	1916	2015-12-31	1952-04-02	1991-05-16	NA	63	24	Surrey	Meats	Meat Cutter	31	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
84	1919	2015-12-31	1952-04-13	1991-05-22	NA	63	24	New Westminster	Meats	Meat Cutter	21	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
85	1921	2015-12-31	1952-04-21	1991-05-26	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
86	1922	2015-12-31	1952-04-26	1991-05-29	NA	63	24	Trail	Meats	Meat Cutter	33	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
87	1923	2015-12-31	1952-04-26	1991-05-29	NA	63	24	Aldergrove	Dairy	Dairy Person	2	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
88	1926	2015-12-31	1952-04-30	1991-05-31	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
89	1927	2015-12-31	1952-05-02	1991-06-01	NA	63	24	Bella Bella	Meats	Meat Cutter	3	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
90	1928	2015-12-31	1952-05-05	1991-06-02	NA	63	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
91	1929	2015-12-31	1952-05-09	1991-06-04	NA	63	24	New Westminster	Meats	Meat Cutter	21	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
92	1931	2015-12-31	1952-05-10	1991-06-05	NA	63	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
93	1932	2015-12-31	1952-05-10	1991-06-05	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
94	1934	2015-12-31	1952-05-13	1991-06-07	NA	63	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
95	1937	2015-12-31	1952-05-24	1991-06-12	NA	63	24	Nanaimo	Meats	Meat Cutter	18	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
96	1938	2015-12-31	1952-05-23	1991-06-12	NA	63	24	Vancouver	Meats	Meat Cutter	41	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
97	1944	2015-12-31	1952-06-05	1991-06-19	NA	63	24	Victoria	Meats	Meat Cutter	46	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
98	1945	2015-12-31	1952-06-10	1991-06-21	NA	63	24	Surrey	Meats	Meat Cutter	31	F	Female	Not Applicable	Not Applicable	2015	ACTIVE	STORES
99	1946	2015-12-31	1952-06-14	1991-06-23	NA	63	24	Vancouver	Meats	Meat Cutter	41	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES
100	1948	2015-12-31	1952-07-01	1991-07-02	NA	63	24	Kamloops	Meats	Meat Cutter	15	M	Male	Not Applicable	Not Applicable	2015	ACTIVE	STORES