

Stat 405 Final

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Introduction

Spoiler Warning Masaki Kobayashi's *Harakiri* (1962) is a Japanese film about a samurai who asks to commit ritual suicide at a lord's palace. Throughout the film, the audience learns the story of what brings the samurai to the palace. At the palace, the samurai argues with and disrespects the lord's samurais, in revenge for past wrongs. These layers of disrespect lead to conflict and the main samurai kills many of the lord's in combat. The film ends with the lord's history where the events of the film are manipulated and recorded incorrectly to preserve honor. Contrastingly, when a person dies in the modern United States, their causes of death and characteristics are meticulously recorded with substantial effort put in to accuracy — not for honor — but for statistics. We are here to do those statistics. Cue [epic](#) music.

Primary Dataset

The National Bureau of Economic Research creates and distributes a dataset of US mortality for every year since 1959. This dataset is unique for both its breadth and depth. Each row in the dataset represents a single death, and each column represents a different demographic characteristic of the deceased. The information is derived from death certificates filed by medical professionals in the 50 states plus Washington DC. We made the decision to use

the 2019 edition of the dataset since we did not want to focus on COVID-19. Notable information the dataset contains is education, sex, age classification, day of month, place of death, weekday, manner of death, cause of death, and different risk factors that the deceased had. In 2019, there were 2,861,523 deaths total. The following are the 20 most common groups split up by race, age, education, and sex

count	race	age	education	sex
91215	White	85-89 years	High school graduate or GED	F
88045	White	90-94 years	High school graduate or GED	F
76221	White	80-84 years	High school graduate or GED	F
60991	White	75-79 years	High school graduate or GED	F
60949	White	80-84 years	High school graduate or GED	M
60003	White	75-79 years	High school graduate or GED	M
57183	White	85-89 years	High school graduate or GED	M
53685	White	70-74 years	High school graduate or GED	M
50128	White	65-69 years	High school graduate or GED	M
48356	White	70-74 years	High school graduate or GED	F

Secondary Dataset

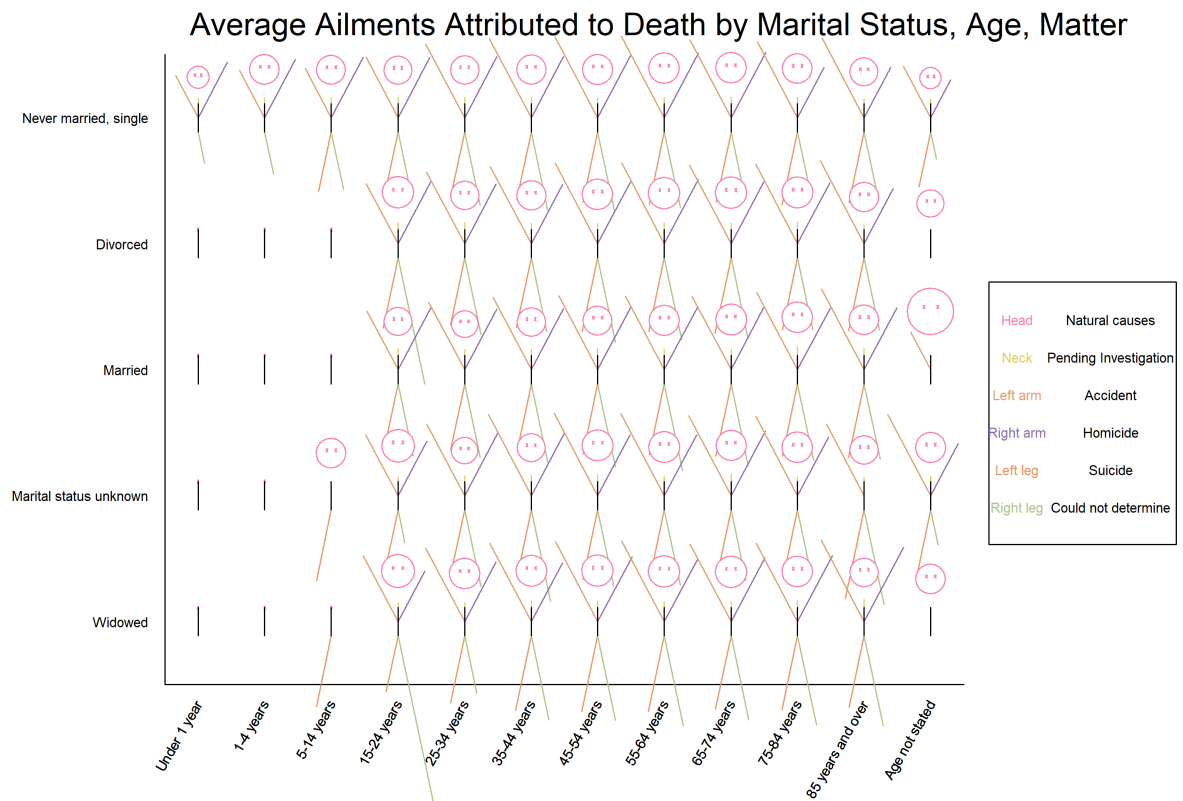
For our secondary dataset, we are using the Behavioral Risk Factor Surveillance System Survey. This survey includes different free text survey questions from across the United States and territories with responses broken out by subgroup. There is also information on sample size, percent affirmative response, and confidence interval bounds. We combine the secondary dataset by matching up subgroups between the death dataset and the risk factor dataset and trying to use aggregate statistics to analyze how risk factors can be matched with causes of death.

Questions

We are interested in what different factors are correlated with higher death rates. Depending on the different causes, different policies can be recommended. Moreover, we can break down the different causes of death by demographics such as race, age, and sex to determine where resources should specifically be directed.

Killer Plot

This plot demonstrates the most common manners of death among people in different cross sections of age and marriage. Head scale is determined by natural causes. Neck scale is determined by pending investigation. Left arm scale is determined by accident. Right arm scale is determined by homicide. Left leg scale is determined by suicide. Right leg scale is determined by could not determine.



Middle aged people have on average the most records.

Age	N	Average Record Count
Under 1 year	21012	2.181
1-4 years	3701	2.781
5-14 years	5541	2.826
15-24 years	29979	3.010
25-34 years	59543	3.304
35-44 years	83472	3.295
45-54 years	161212	3.219
55-64 years	376411	3.195
65-74 years	557075	3.200

Age	N	Average Record Count
75-84 years	689088	3.149
85 years and over	874198	2.982
Age not stated	291	2.577

Not many large differences

Marital Status	N	Average Record Count
Divorced	478548	3.214
Married	1038238	3.134
Never married, single	403235	3.137
Marital status unknown	23155	3.257
Widowed	918347	3.031

Accidents have by far the most records and pending investigation by far the least

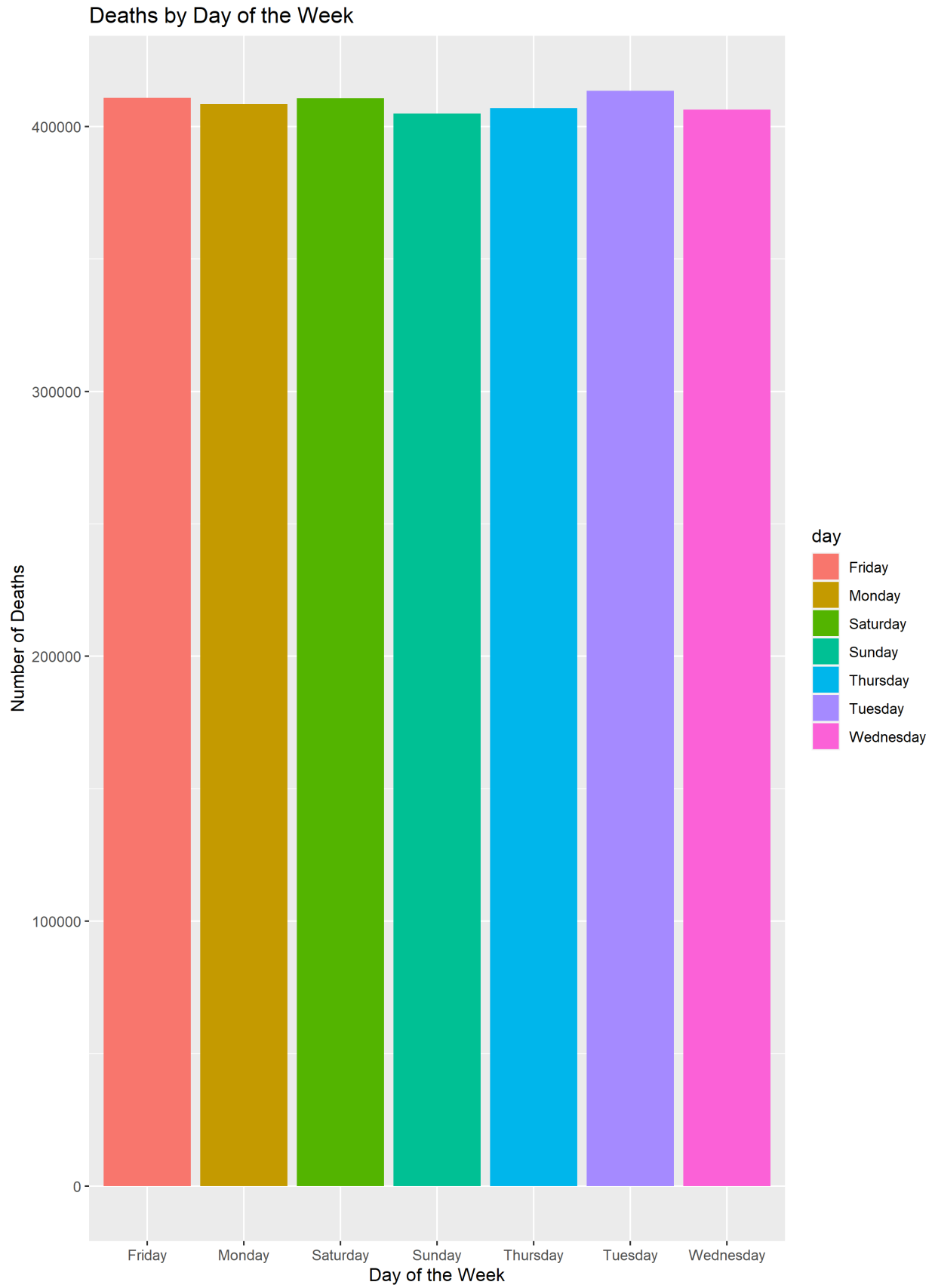
Manner	N	Average Record Count
Accident	173608	4.005
Suicide	47764	2.930
Homicide	20310	3.236
Pending Investigation	4484	1.311
Could Not Determine	11800	2.884
Natural	2327811	3.028
Not Specified	275746	3.358

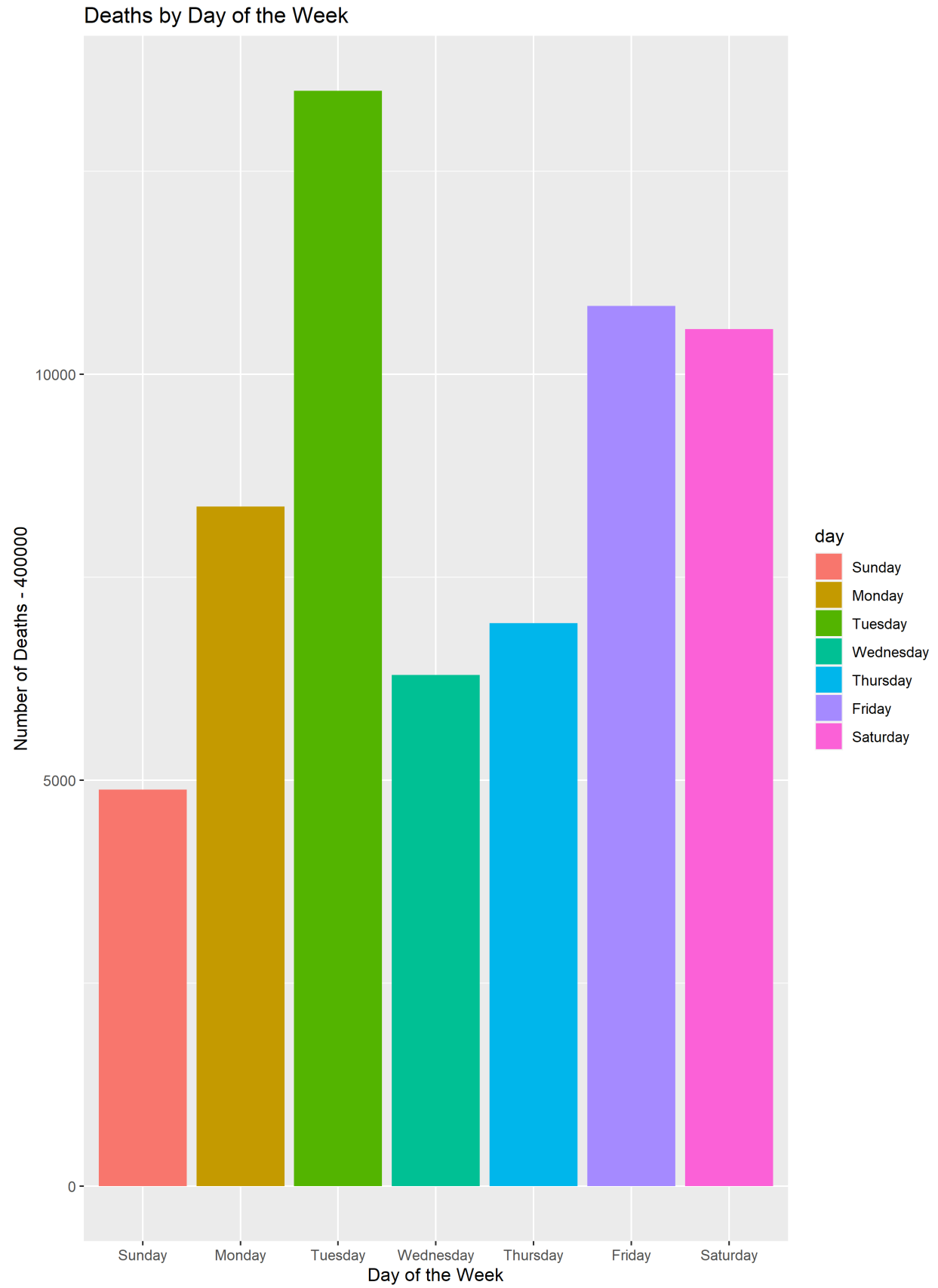
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Exploration

Deaths by Weekday

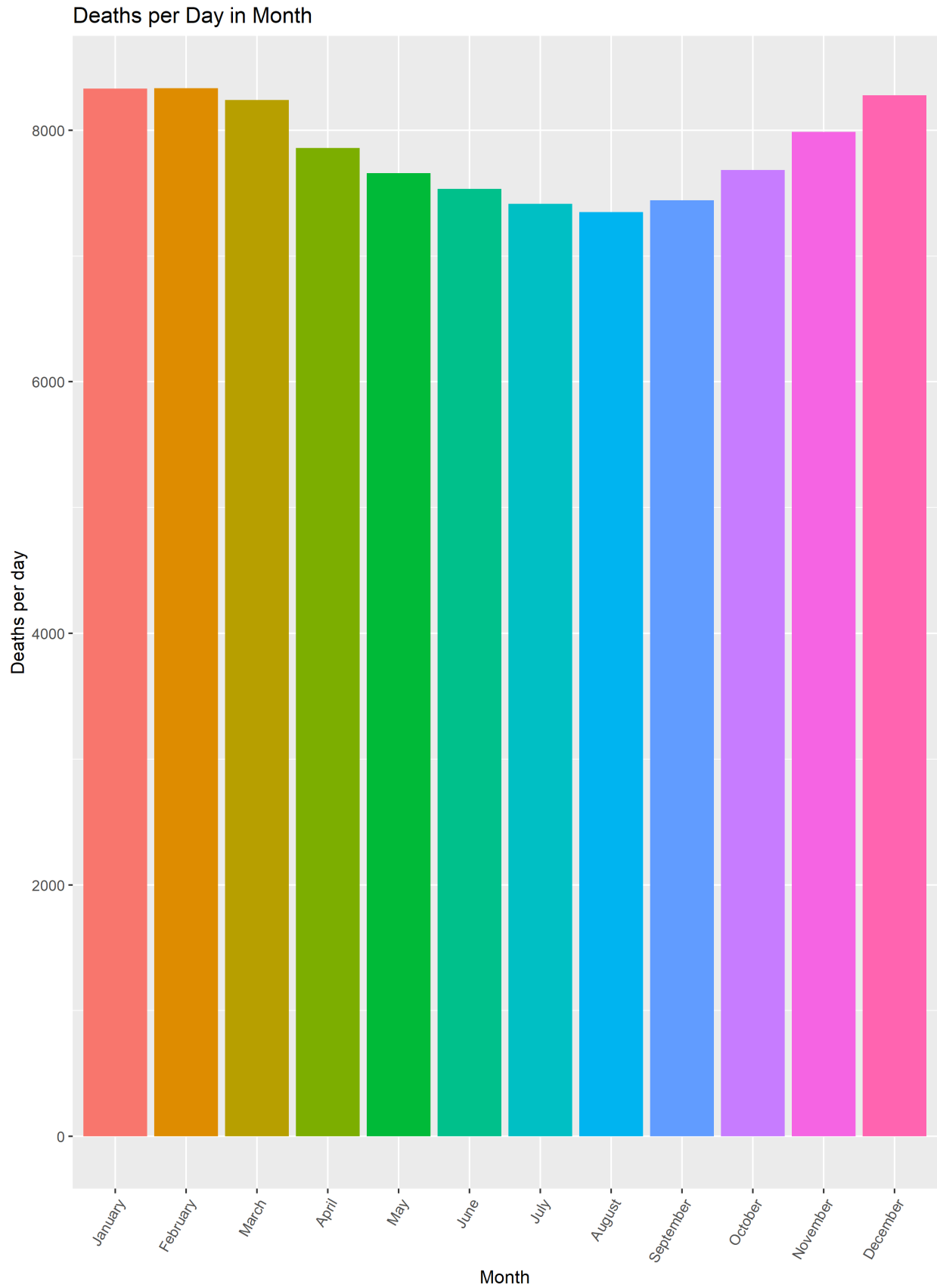
First, we plotted weekday of death versus death counts. There were the most deaths on Tuesday. However, days have an average of 7839.789 deaths and 2019 had an extra Tuesday so adjusting for that, the most deaths were on Fridays.





Deaths by Month

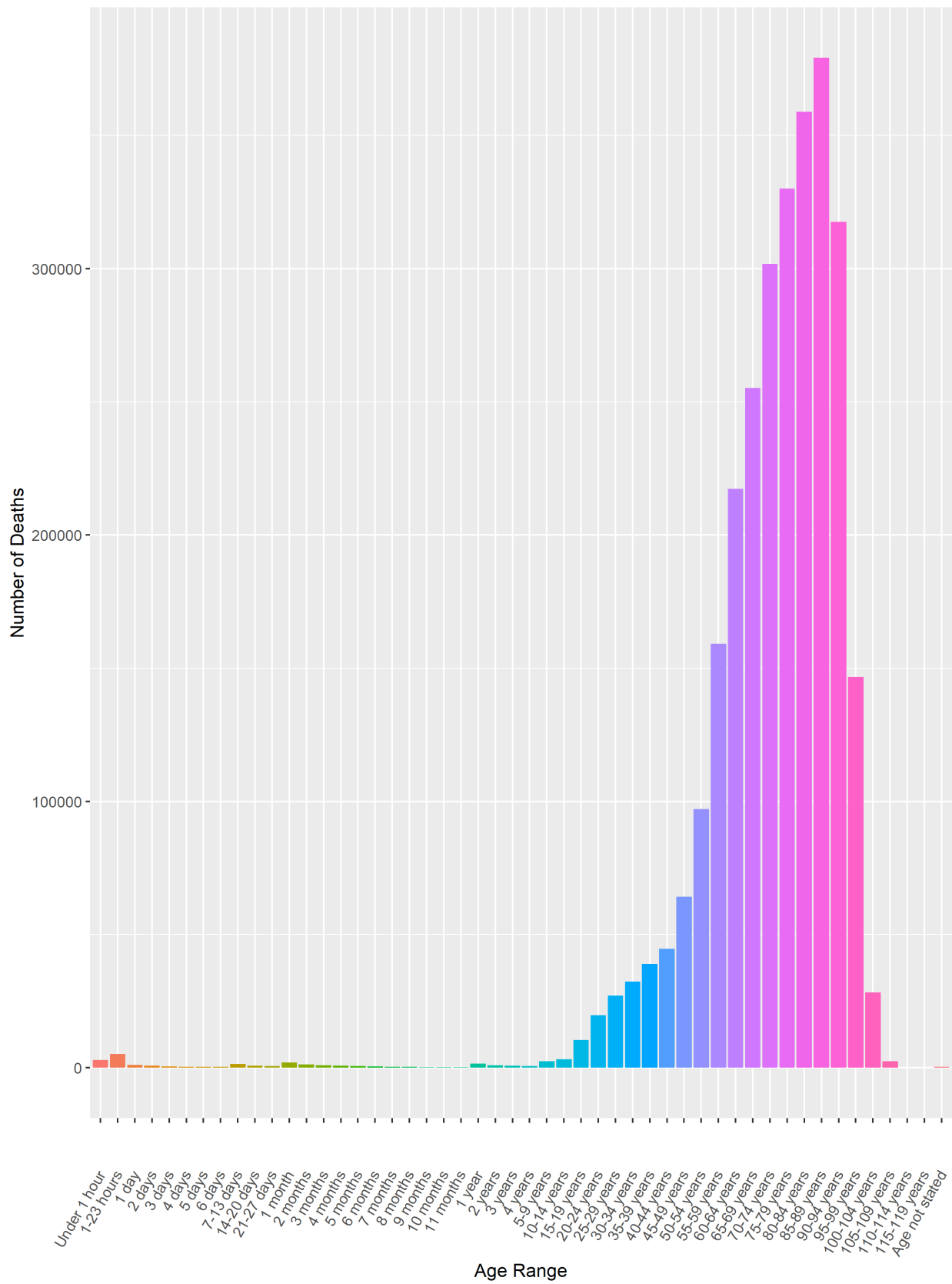
The most deaths occur in the coldest and darkest months of the year which are February, January, December, and March. Summer months have lower deaths by around 10-11%.



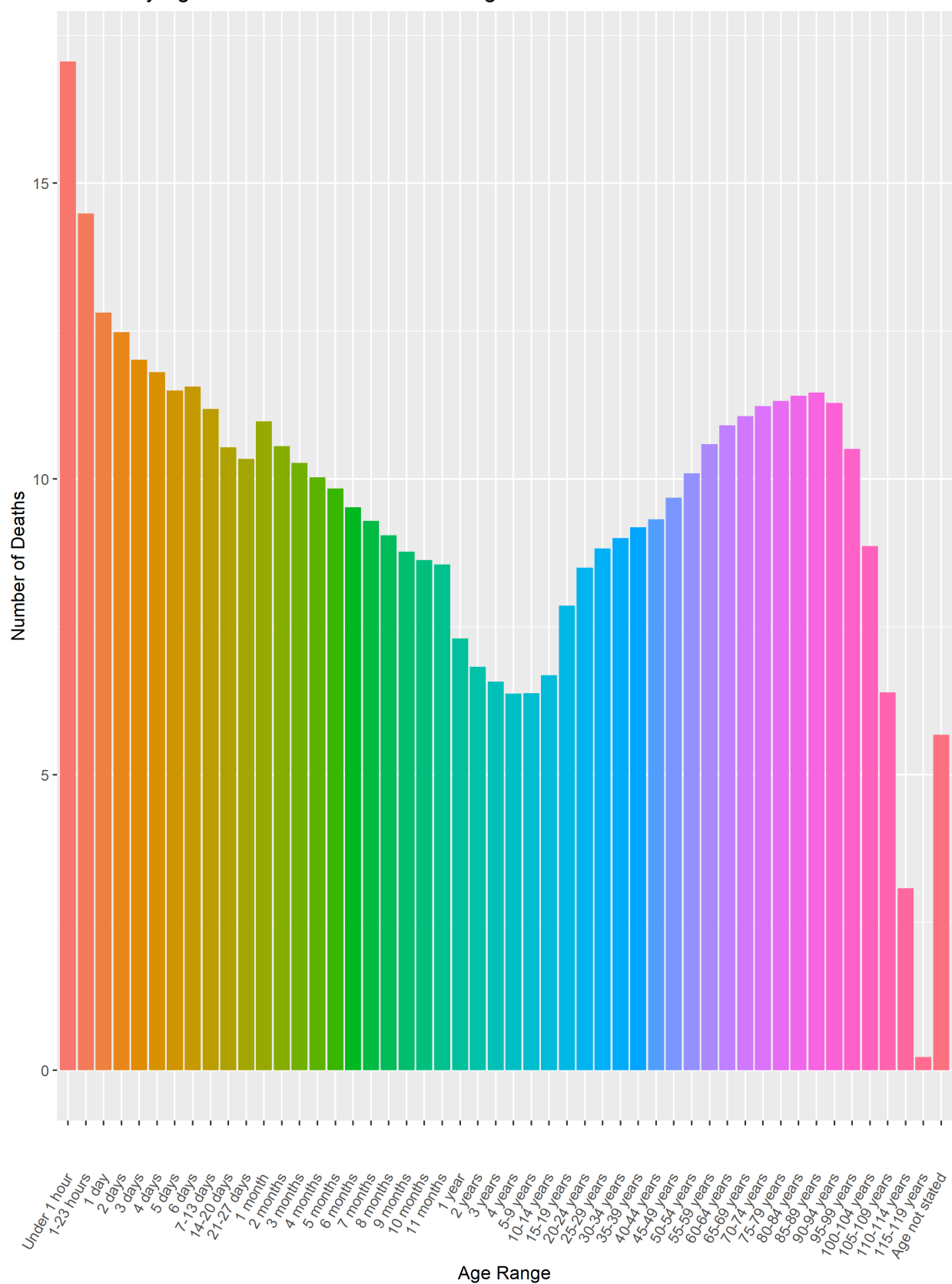
Deaths by Age

Next, we plotted age versus death counts. Deaths were most prevalent among older age groups such as those between 70 and 84, although deaths start increasing more quickly at age 60. There is also a spike in those less than 1 day old. However, those greater than 1 day old do not frequently die. We also created a version of the plot scaled to bucket size. For privacy reasons, the NBER does not release ages of deaths but rather different buckets that the ages fall into. These bucket are of different lengths of time so we created a rescaled version. This plot was then put on a log scale to better showcase the data.

Deaths by Age



Deaths by Age Scaled to Bucket Size on Log Scale



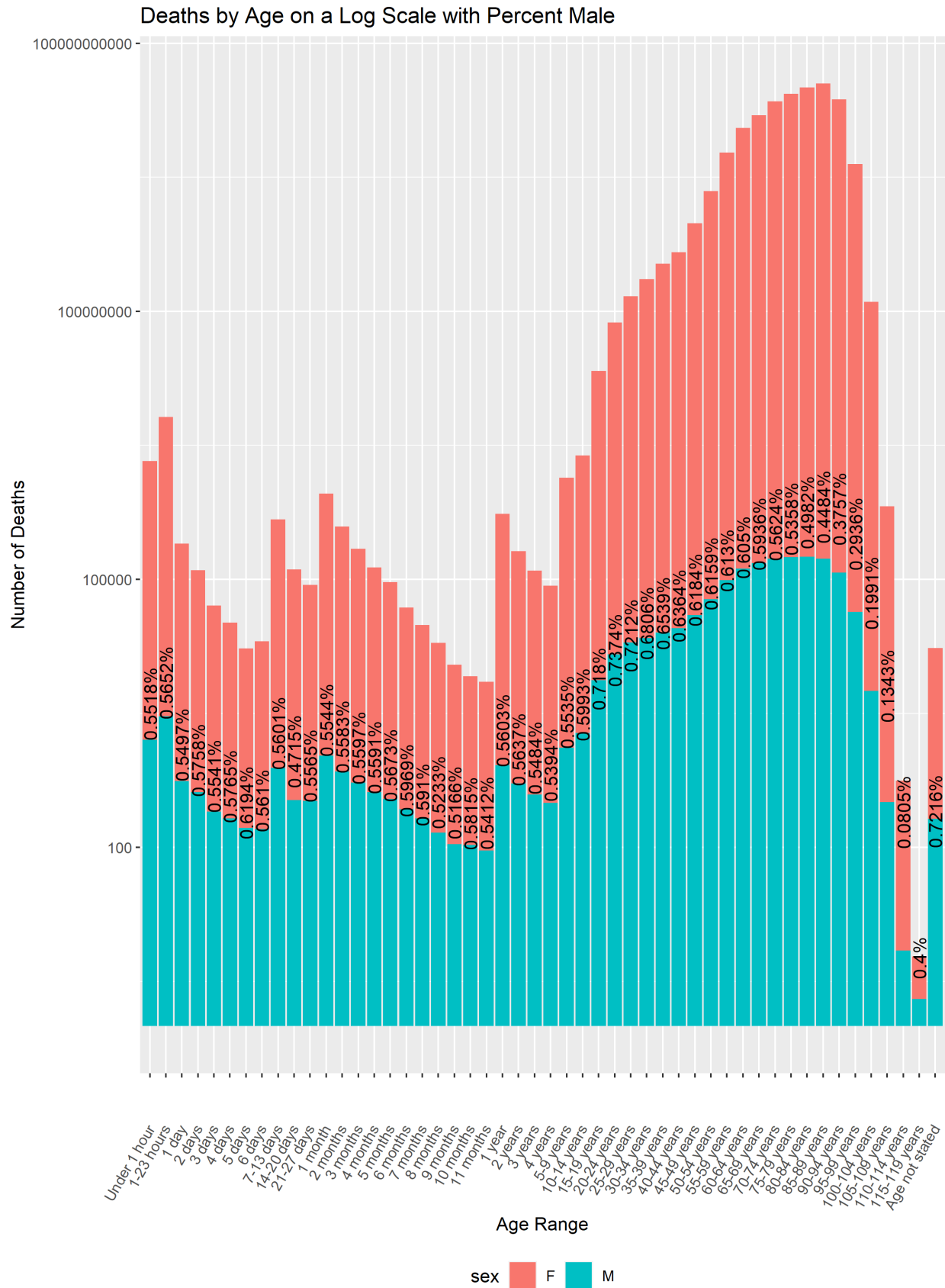
Deaths by Manner

Here, we plotted the manner of death versus age and counted how many people of a certain aged died based on a certain manner of death. A few key finding of this analysis shows that the majority of people die from natural causes, especially those aged 60+ and less than 1 day old, and accidental causes, spanning across all age groups. What this plot may help to inform us about is the behavior and activities that people in a general age group may commonly engage in that may have lead to their manner of passing. By being observant of the manners of death based on age group, preventative methods can be used to decrease the number of accidental related deaths if we are able to determine commonly engaged activities for age groups. Using this plot will help us answer the cause of death among the different age groups, and further promote research in what actual activities people are participating in that lead to their manner of death.

Under 1 hour
1-2 hours
3-5 days
6-10 days
11-20 days
21-30 days
1-3 months
3-6 months
6-12 months
12-18 months
18-24 months
24-36 months
36-48 months
48-60 months
60-72 months
72-84 months
84-96 months
96-108 months
108-120 months
120-132 months
132-144 months
144-156 months
156-168 months
168-180 months
180-192 months
192-204 months
204-216 months
216-228 months
228-240 months
240-252 months
252-264 months
264-276 months
276-288 months
288-300 months
300-312 months
312-324 months
324-336 months
336-348 months
348-360 months
360-372 months
372-384 months
384-396 months
396-408 months
408-420 months
420-432 months
432-444 months
444-456 months
456-468 months
468-480 months
480-492 months
492-504 months
504-516 months
516-528 months
528-540 months
540-552 months
552-564 months
564-576 months
576-588 months
588-600 months
600-612 months
612-624 months
624-636 months
636-648 months
648-660 months
660-672 months
672-684 months
684-696 months
696-708 months
708-720 months
720-732 months
732-744 months
744-756 months
756-768 months
768-780 months
780-792 months
792-804 months
804-816 months
816-828 months
828-840 months
840-852 months
852-864 months
864-876 months
876-888 months
888-900 months
900-912 months
912-924 months
924-936 months
936-948 months
948-960 months
960-972 months
972-984 months
984-996 months
1000 months
Age not stated

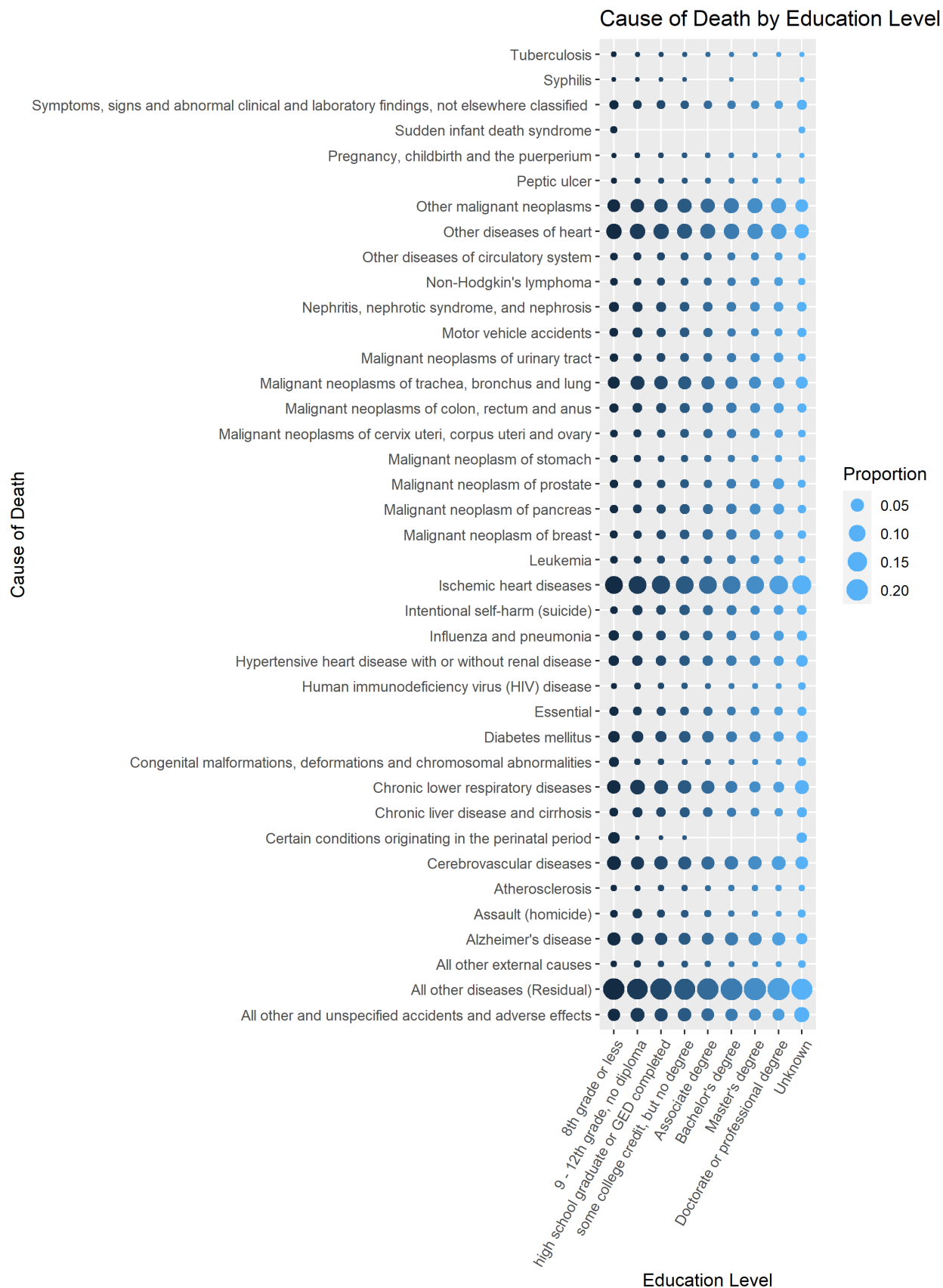
Deaths by Age and Gender

In this plot, we plotted the number of deaths versus age ranges while demonstrating how many men compared to women passed away in each age category. In each of the bars, the red fill represents the amount of women who passed away in that particular age range while the blue accounts for the amount of men. The percentage seen in each bar represents the proportion of men in a given age range that passed away. This analysis shows that the majority of people under the age of 80 who pass away tend to be men, as nearly every bar from ages 0-80 shows the proportion of male deaths to be above 50%. This proportion of male deaths goes down after 80 years of age, and is likely because women who are of an older age tend to live to a complete life expectancy. What this plot may help to inform us about is the differences in male and females lives and life expectancies. Further research into differences in lifestyle choices for men versus women as a whole may help better explain why women tend to live longer than men. Furthermore, this plot accompanied with a plot on cause of death by gender, may assist in determining what kind of, potentially more risky, behaviors men may partake in during their lifetimes that lead to an earlier death than women.



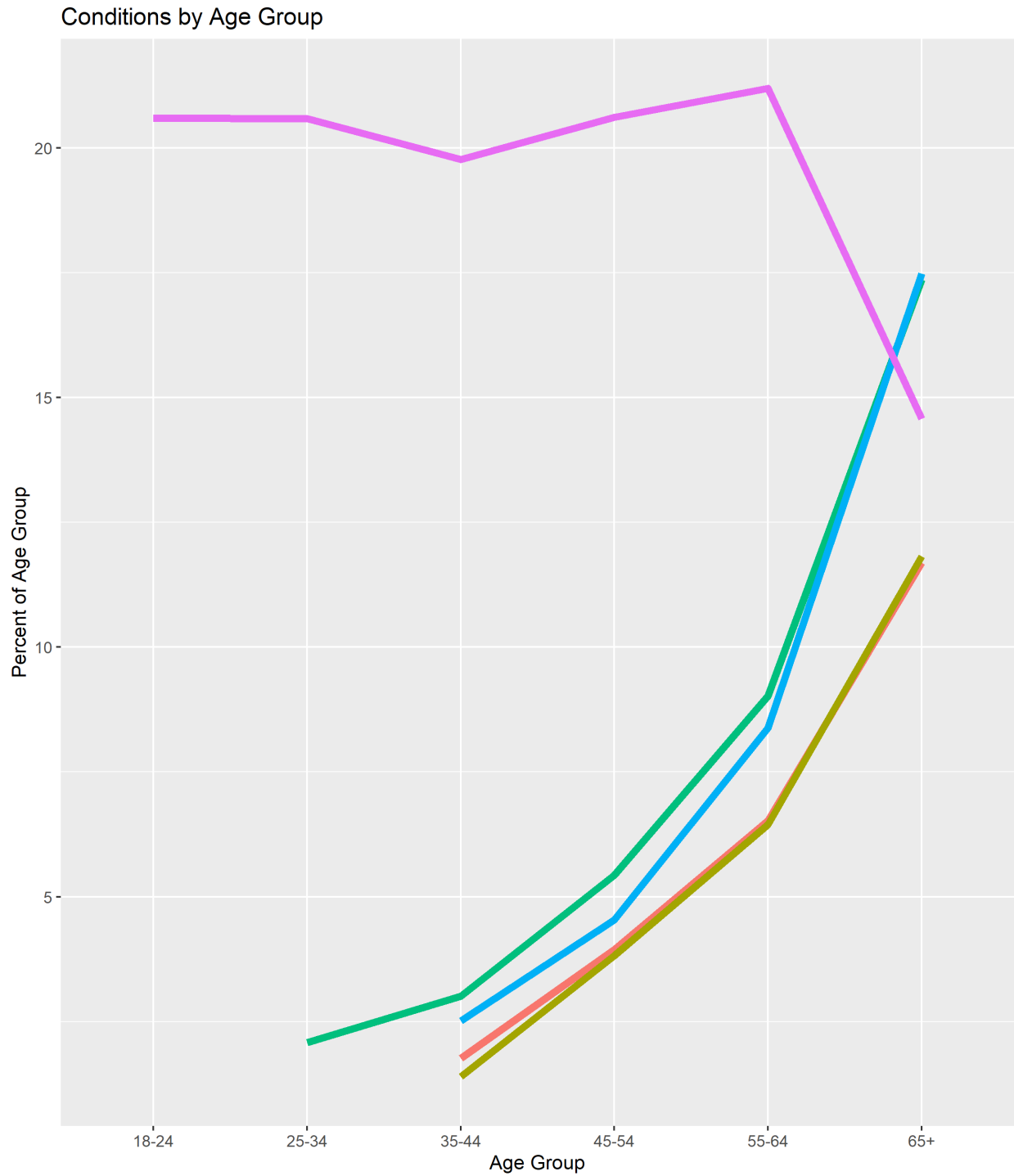
Cause of Death by Education

For most causes of death, level of education does not have an impact on what proportion of people have that cause of death. The largest difference belongs to “Certain conditions originating in the perinatal period” with high occurrences in those with 8th grade or less education and those with unknown education and nearly no occurrences in all others. Another large proportion difference is in “Congenital malformations” where 8th grade or less has a much higher mortality proportion than other education levels. For causes of death that are not highly tied to conditions at birth, “Syphilis” and “Assault (homicide)” have the highest differing proportions. “Syphilis” has a quite small sample size but unknown education has the highest mortality proportion. For “Assault (homicide)”, 9 - 12th grade, no diploma has the highest mortality proportion.



Free Text Analysis: Selected Health Conditions by Age Group

Using regular expressions, we polled the BRFSS data set for questions related to heart conditions, cancer, and depression, while grouping by the age of respondents. Furthermore, we restricted entries to those where participants responded positively, indicating that they did have those conditions. Interestingly, all age groups except 65+ had a high incidence of depression, hovering around the 20% mark. This dips significantly to 15% for the 65+ age group, perhaps because mental health was more stigmatized during their lives and psychological diagnoses were less readily available. In addition, the orange and olive green lines (for heart attack and coronary heart disease, respectively) have a significant degree of overlap, which makes sense, given the conditions. The green line (corresponding to non-skin cancer), is slightly higher than the blue line (corresponding to skin cancer) for all age groups. Furthermore, both cancer have positive slopes, indicating that as your age increases, you become more likely to be diagnosed with cancer.



Question

- Ever told you had a heart attack (myocardial infarction)?
- Ever told you had angina or coronary heart disease?
- Ever told you had any other types of cancer?
- Ever told you had skin cancer?
- Ever told you that you have a form of depression?