Project 1 Covid-19

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Introduction

The Covid-19 pandemic has been impacting the United States and the World for two years with over 900,000 people having died in the U.S. alone. Some Covid-19 data will explored and analyzed to illustrate this impact and answer a series of common questions:

- Is Covid-19 comparable to the flu?
- In general, how does Covid-19 affect different age and gender groups?
- Should we still be concerned about Covid-19 in Arizona?

Methods/Dataset

The publicly available Provisional_COVID-19_Deaths_by_Sex_and_Age data set will be used and is provided by the National Center for Health Statstics from the CDC website: https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-by-Sex-and-Age/9bhg-hcku
The United States COVID-19 Cases and Deaths by State over Time data set will also be used and is provided by the CDC Case Task Force from the website: https://data.cdc.gov/Case-Surveillance/United-States-COVID-19-Cases-and-Deaths-by-State-o/9mfq-cb36

The first data set includes Covid-19 mortality data for specific age groups for the entire U.S. and by individual State from January 2020 to the present day and is updated weekly. The data set also includes mortality data for Influenza and Pneumonia.
The second data set includes Covid-19 mortality and case data for the U.S. and States.

Because of delays or absence in reporting, some of the mortality columns have N/A values, It will be assumed that any deaths during this reporting period would be included in the next, so all N/A values in the mortality columns will be converted to zeros.
The first data set is difficult to manipulate with the current column titles so those will be modified as well.

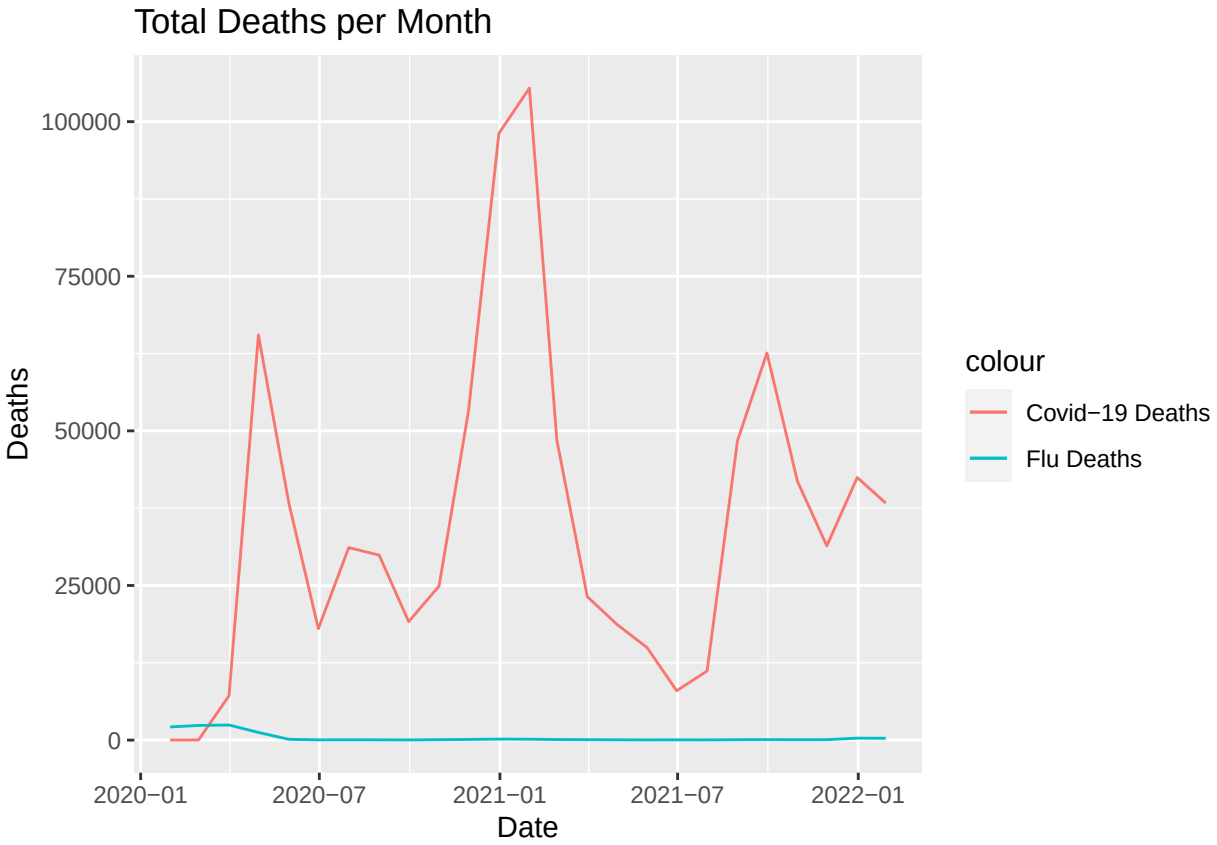
Results

Is Covid-19 comparable to the flu?

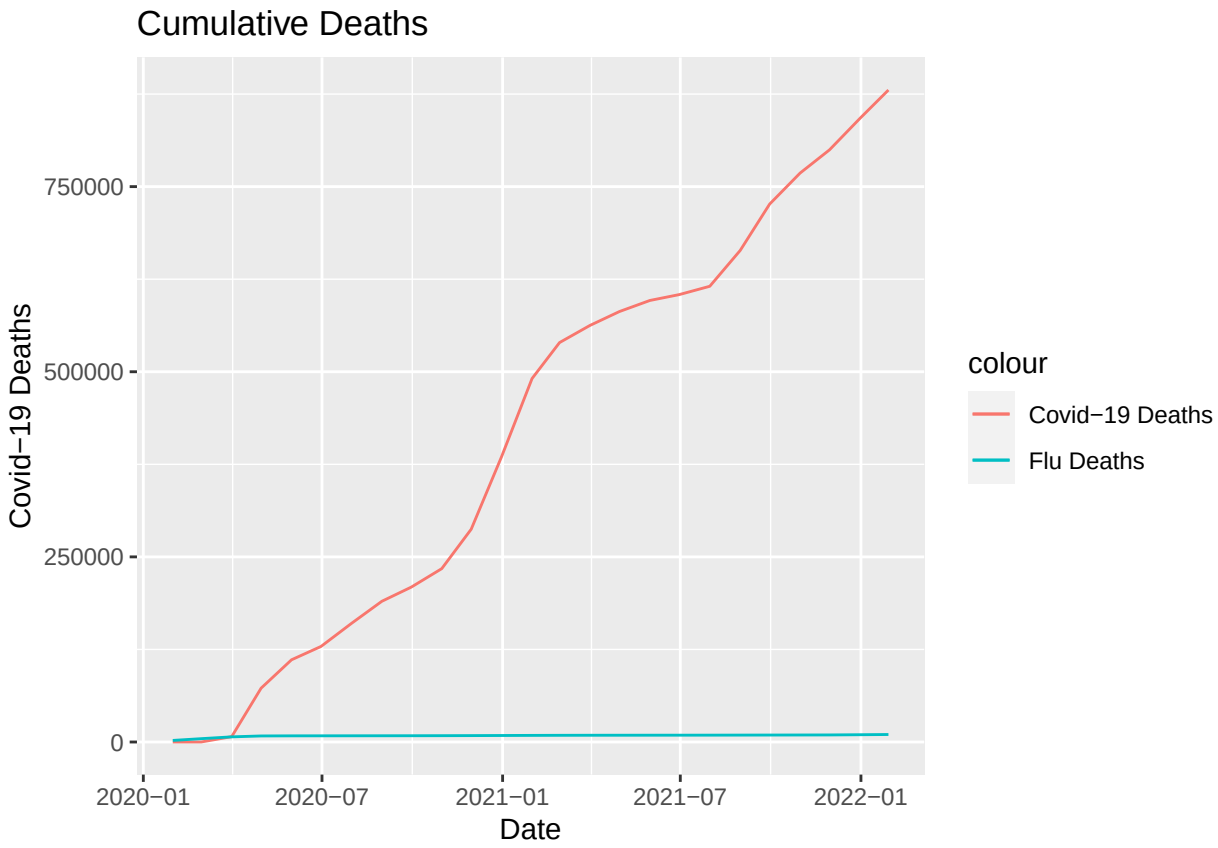
First a time graph of monthly deaths for Covid-19 and Influenza will be explored.

```
## [1] 880487
```

```
## [1] 10119
```



With reporting from the beginning of the Covid-19 Pandemic to today, there have been a total of 10,119 Influenza deaths and 880,487 Covid-19 deaths. It could be argued for instance that because Covid-19 is more infectious, overall the death rate may be the same. This data set does not contain the appropriate observations to support or deny this claim. However, it is clear that Covid-19 has caused far more total deaths that Influenza, and thus is considerably more detrimental to communities.



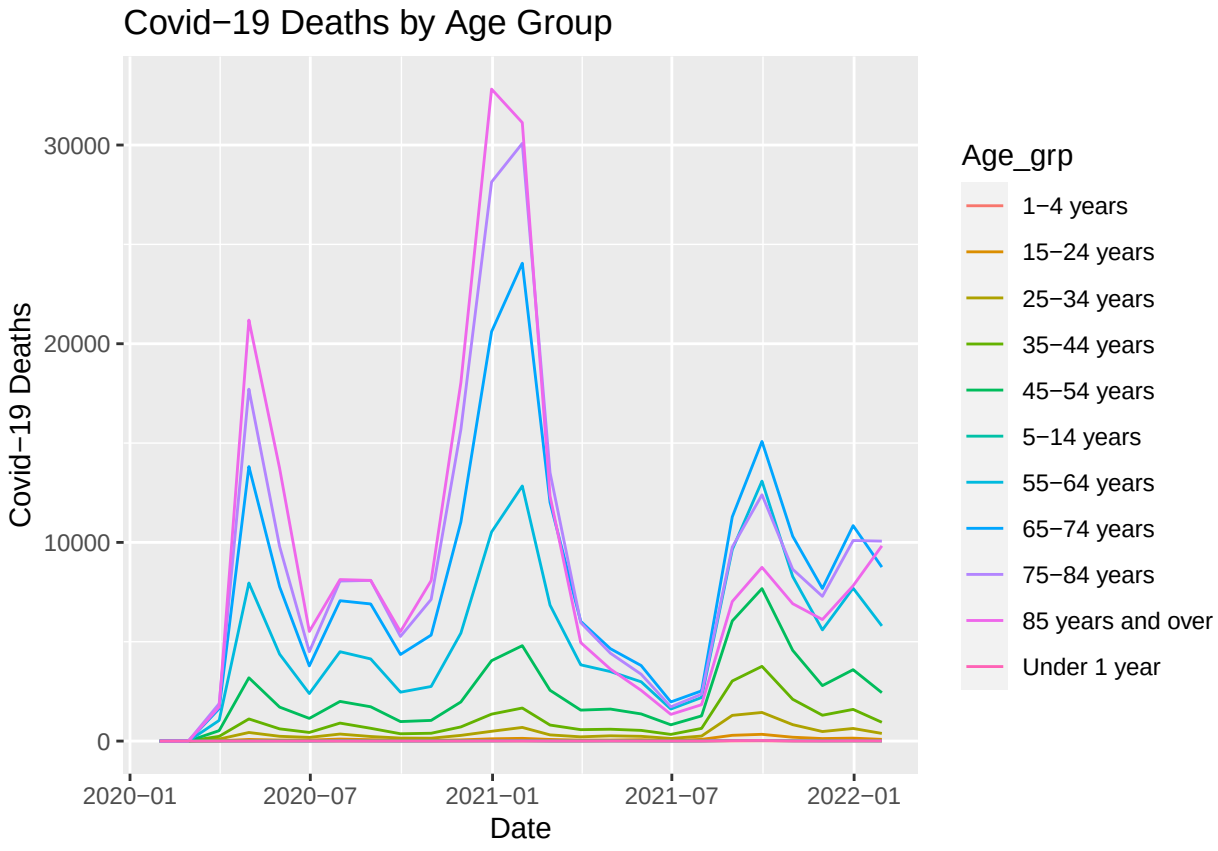
Now to answer the first question: Is Covid-19 comparable to the flu? No, it is very clear from the data plotted above that Covid-19 is not comparable to the Flu. There are 800 times the number of Covid-19 deaths compared to Influenza deaths.

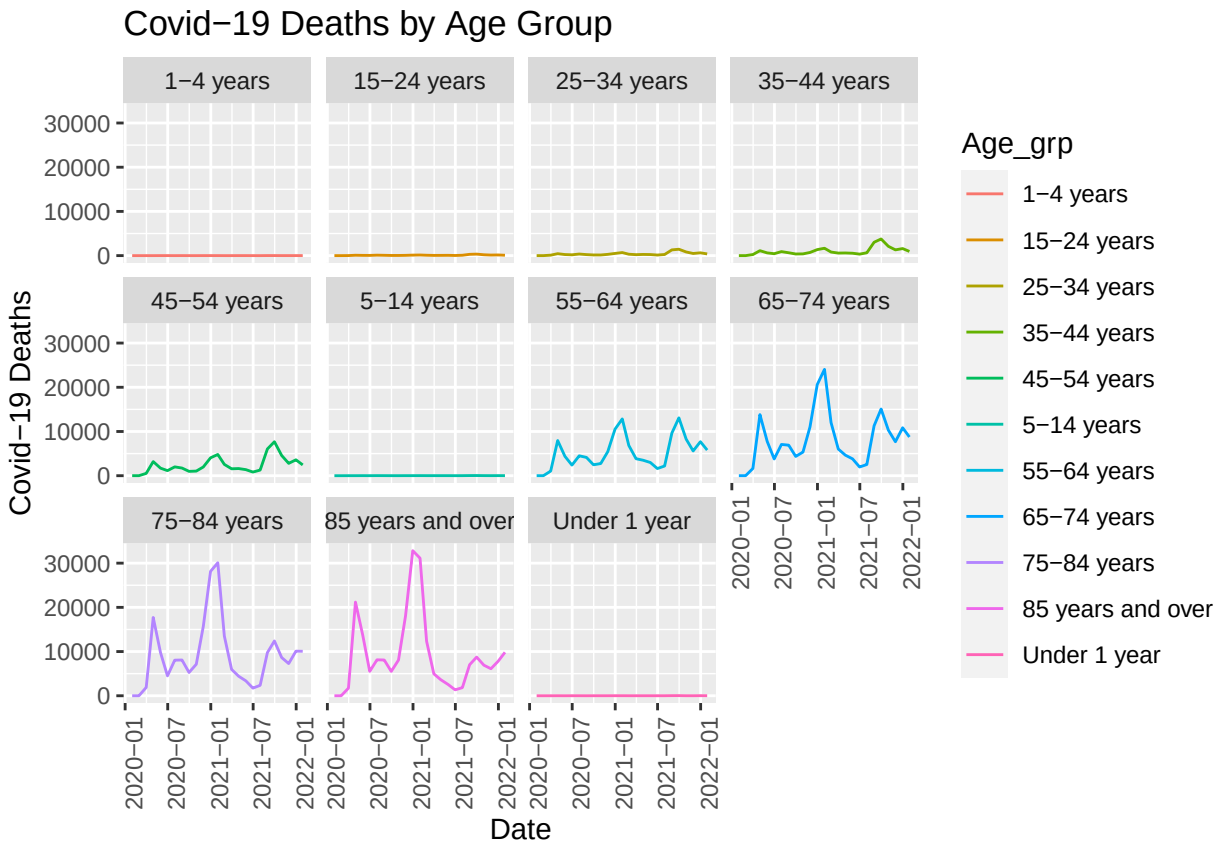
In general, how does Covid-19 affect different age and gender groups?

Age

```
##              Age_grp C19_deaths
## 1          1-4 years         87
## 11      Under 1 year        200
## 6         5-14 years        235
## 2        15-24 years       2301
## 3        25-34 years       9789
## 4        35-44 years      24673
## 5        45-54 years      59422
## 7        55-64 years     129476
## 8        65-74 years     201292
## 9        75-84 years     225952
## 10 85 years and over     227060
```

Covid-19 does appear to affect age groups differently, deaths increasing by higher age groups. However, there is some inconsistency. The ordered data frame gives total deaths by age group. The Under 1 year group does not quite follow the increasing deaths by age group that we would expect. It is particularly stunning because the group only spans one year of age instead of several like the others yet still has a higher number of deaths than the 1-4 year age group. It is possible that this is because of their not yet fully functioning immune systems.

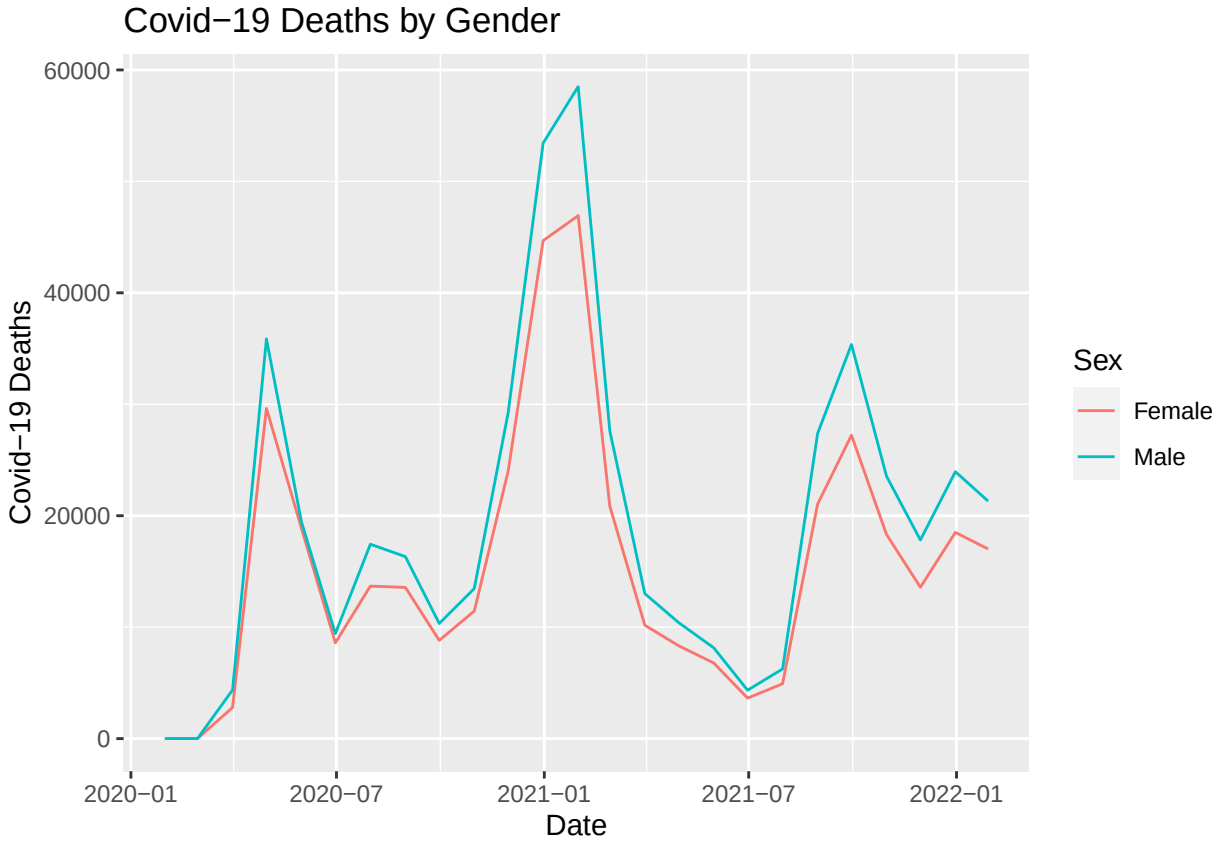




As shown in the plots above, the higher the age group, the more deaths there are in that respective group. However, in the last 6 months of the graph (the third wave), the age groups with the most deaths do not align with the first two peaks. Here, the group with the most total deaths is in the 55-64 age group, with the second highest being the next highest age group and so forth until the 85+ age group. The ones below the 55-64 age group still trend in the same respective order as the last two peaks, except that the number of deaths appear to be higher overall. Vaccination and Covid-19 variants may be influencing this change, however, there is not sufficient data from this data set to offer a conclusion as to why this change is happening.

Gender

```
##          Sex C19_deaths
## 1     Female     393445
## 2       Male     487042
## 3 Difference      93597
```



As illustrated in the graph and data frame above, there does appear to be a difference in the number of deaths between males and females.

To test if this difference is statistically significant, a students t-test was preformed.
H_0 : The population means of Covid-19 deaths are the same for males and females
H_a : The population means of Covid-19 deaths are different for males and females

```
##
##  Welch Two Sample t-test
##
## data:  C19_deaths by Sex
## t = -0.9749, df = 46.021, p-value = 0.3347
## alternative hypothesis: true difference in means between group Female and group Male is not equal to
## 95 percent confidence interval:
##  -11473.813   3986.053
## sample estimates:
## mean in group Female   mean in group Male
##             15737.80             19481.68
```

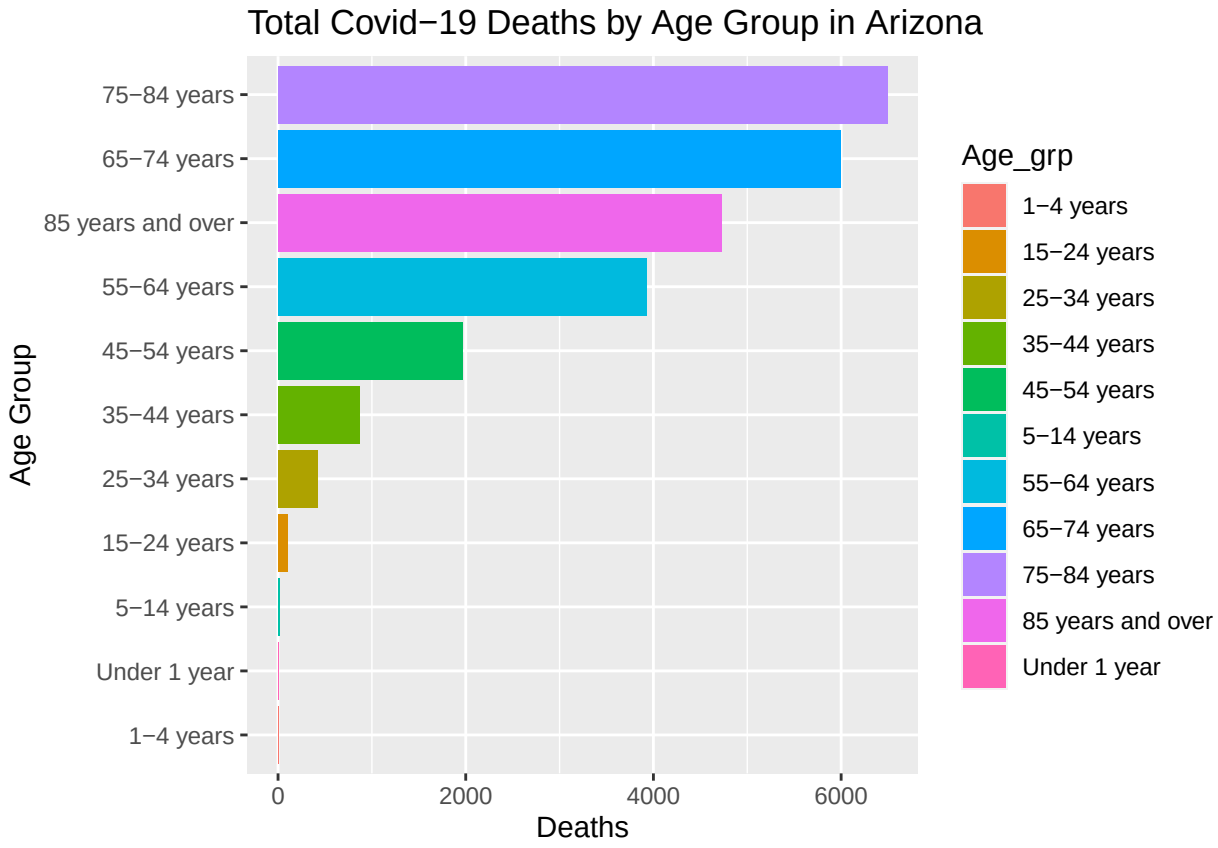
The resulting p value was 0.3347 and the t value was -0.9749. Therefore, we cannot reject the null hypothesis that the means are the same and there is not a statistically significant difference between them.

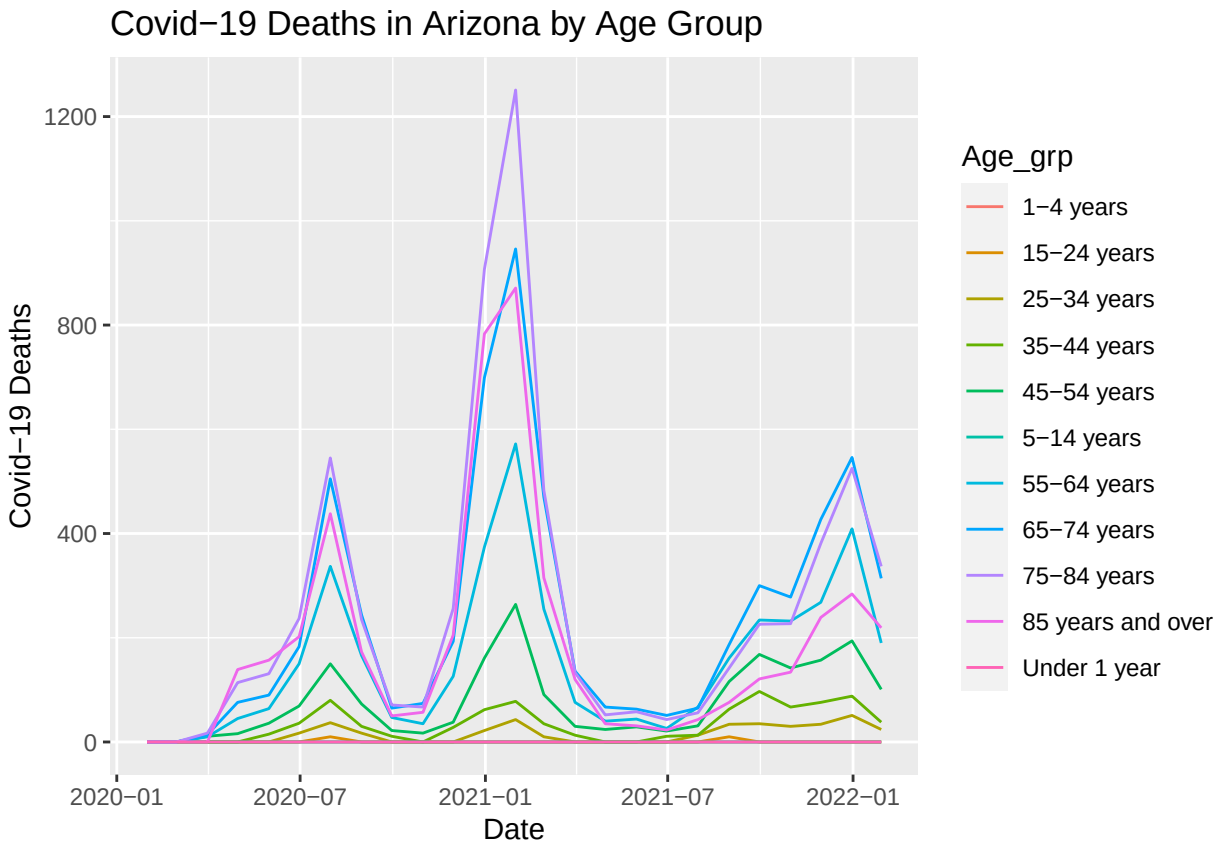
So in general, How does Covid-19 affect different age and gender groups?

- The number of deaths trends upwards with increasing age group, with one exception being infants under 1 year old. However, even though other younger age groups have lower total deaths, it is still an unprecedented amount that is considerably higher than Influenza deaths. There is not sufficient evidence to provide a conclusion as to why age groups are affected differently.
- There is not a statistically significant difference in the number of deaths between males and females.

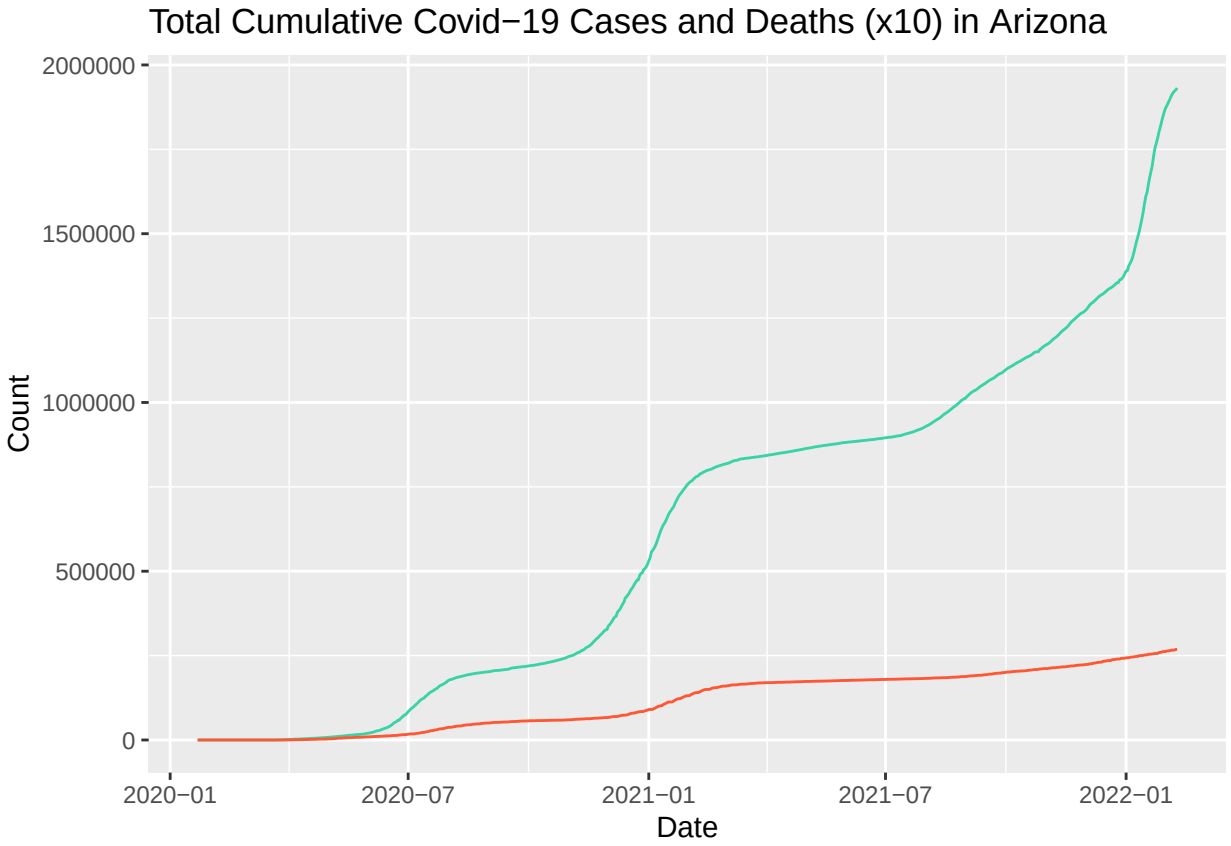
Should we still be concerned about Covid-19 in Arizona?

```
##              Age_grp C19_deaths
## 1        75-84 years       6494
## 2        65-74 years       5993
## 3  85 years and over       4724
## 4        55-64 years       3928
## 5        45-54 years       1961
## 6        35-44 years        873
## 7        25-34 years        416
## 8        15-24 years        102
## 9         5-14 years         13
## 10         1-4 years          0
## 11      Under 1 year          0
```





As seen in the 2nd plot above, the 3rd 'wave' in Arizona is comparable to the first wave except in who is dying. In the first and second surges, death totals increased by age group but it is a little more mixed with the 65-74, 75-84, and 55-64 being the top three respectfully. During the second surge, vaccines were just beginning to become publicly available, it can be assumed that vaccination has helped to curb the number of deaths yet it is still concerning that the rates are so high.



Note: Deaths were increased by a factor of ten for the purpose of better illustrating the trend.

Looking at the graph for Total Cumulative Covid-19 Cases and Deaths (x10) in Arizona, it is shown that cases shot up exponentially at the beggining of January 2022. This again is a cause for concern as deaths lag behind cases by 1-3 weeks.

With this data, an answer can be provided for the third question: Should we still be concerned about Covid-19 in Arizona?

Yes, we should still be concerned. The huge increase in cases in Arizona, even with the death rate being lower will only continue to stretch the already overwhelmed hospitals. Not only will this add to healthcare worker's burdens, there is still the concern of long Covid for those that do not die.

Conclusion

By analyzing the two CDC data sets, we have ascertained answers to our questions:
- Is Covid-19 comparable to the flu?
- In general, how does Covid-19 affect different age and gender groups?
- Should we still be concerned about Covid-19 in Arizona?

Covid-19 is not comparable to the flu. It is in fact considerably more transmissible and has killed 800 times more people in the U.S during the span of the Pandemic. Covid-19 does affect age groups differentially, with older age groups more likely to die than younger ones, however the rate of newborns dying of Covid-19 is considerably higher than children of older age groups. The Covid-19 Pandemic has and still is affecting the Country and the Arizona community. It is premature to lower our guard and this data highlights the importance of protecting the most vulnerable in our community by focusing on how to make gathering spaces safer through vaccination, masking and addressing ventilation issues to avoid excess deaths and disability from Covid-19.