COVID-19 mortality in England and Wales

CODE

Based on the ONS data

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Disclaimer

As probably many of the data scientist, I wanted to ease my anxiety caused by the COVID-19. I decided to look at the data related to the pandemic. I decided not to look at the daily cases as John Burn-Murdoch (https://twitter.com/jburnmurdoch) from Financial Times (https://www.ft.com/coronavirus-latest) and the team Our World in Data (https://ourworldindata.org/the-covid-19-pandemic-slide-deck) are doing a great job. The reasons why I decided to look at deaths are explained in the Motivation section.

I am a **computational biologist** and all the plots I am making here are just *observations*. I am not claiming any conclusions, nor do I do any predictions. All the code is open source, and free for anyone to use, available on github (https://github.com/kzkedzierska/COVID-19_England_Wales).

Also, very warm thanks to Kaspar (https://kasparmartens.rbind.io/) for his help with decisions regarding color schemes and his helpful advice.

Motivation

I decided to look into the mortality rates because I wanted to put the numbers reported by the government in some context. My first question was whether the deaths reported as COVID-19 deaths were a subset of deaths one could expect to see this year? How much COVID-19 increases the death toll? And finally, how does the age distribution of fatalities look?

The data I plotted below shades a bit of light on those topics, but for a more in-depth answer, I am afraid we will have to wait for long. Nevertheless, I still think the following is quite interesting. If not for others, then for the sole reason of looking at the data in almost real-time.

Setup

Loading up the necessary packages (installing them if they are missing). Setting up defaults and tweaking the plotting defaults.

CODE

```
## [1] "Success! All packages loaded!"
```

CODE

Data

Data up to: 2020-07-10

Data is coming from Office for National Statistics, *Deaths registered weekly in England and Wales, provisional* dataset (https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresondeathsregisteredinenglandandwales). For now I am downloading the data manually into the `data` directory. It would be great to download it directly.

Weekly figures

Both 2020 and 2019 figures for comparison of the trend. The 2020 will be changed each week, while 2019 remains stable.

Note: Unfortunately due to formatting of the data the following code is not entirely reproducible as there are parts of it that would have to be adjusted with each reiteration of the spreadsheet. In theory the code should be backward compatible, but I haven't checked that in practice.

2019 baseline

Adding 2019 figures to establish a baseline comparison.

CODE

2015 flu outbreak

2015 added for comparison with big flu outbreak.

CODE

2020 current data

This spreadsheet is the one that changes the most and includes increasingly more information.

CODE

Here, I want to figure out the date of first COVID-19 related death in the UK.

CODE

Next, joining the 2020 data with 2019 baseline.

CODE

COVID-19 specific datasets

One of the important information in understanding the pandemic is to see where the deaths are localized.

CODE

The place of death dataset has information on place, country, number of death and whether the cause was related to COVID-19.

CODE

place <chr>
Care Home
Elsewhere
Hospital (acute or community, not psychiatric)
Home
Hospice

5 rows | 1-1 of 4 columns

CODE

CODE

CODE

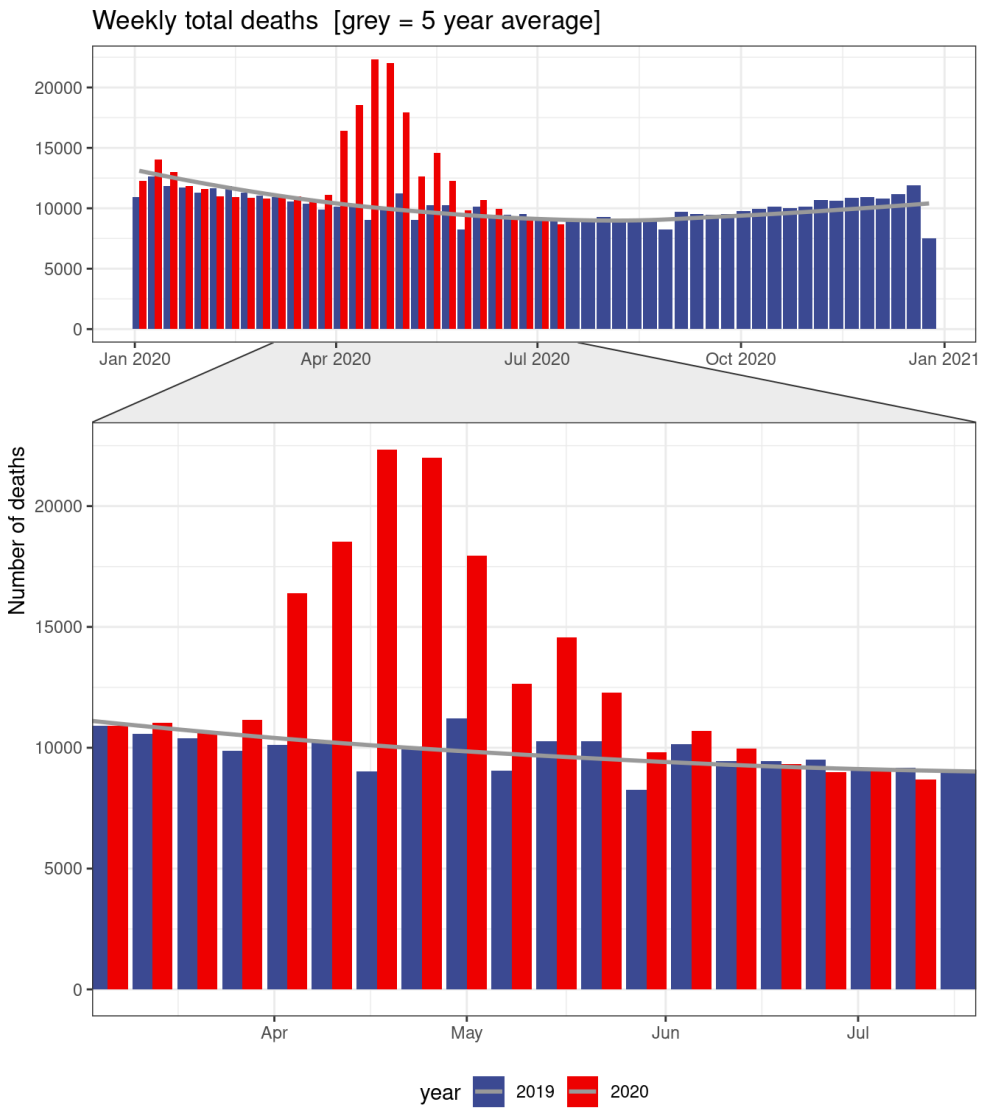
CODE

Mortality in the context of past years

All weekly deaths in England and Wales

It looks like the number of deaths came back to the 5-year average level. Really hopeful there will be no second wave.

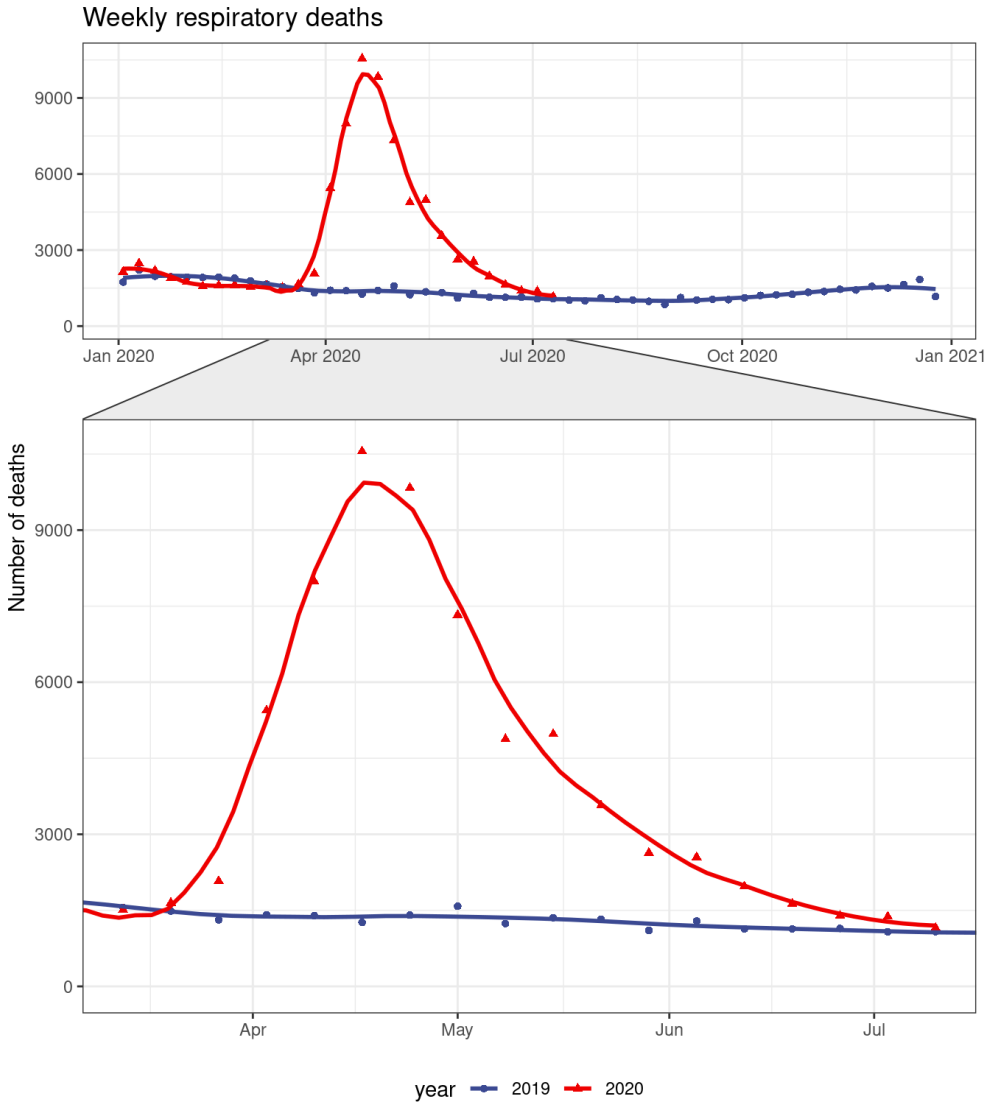
CODE



Respiratory deaths

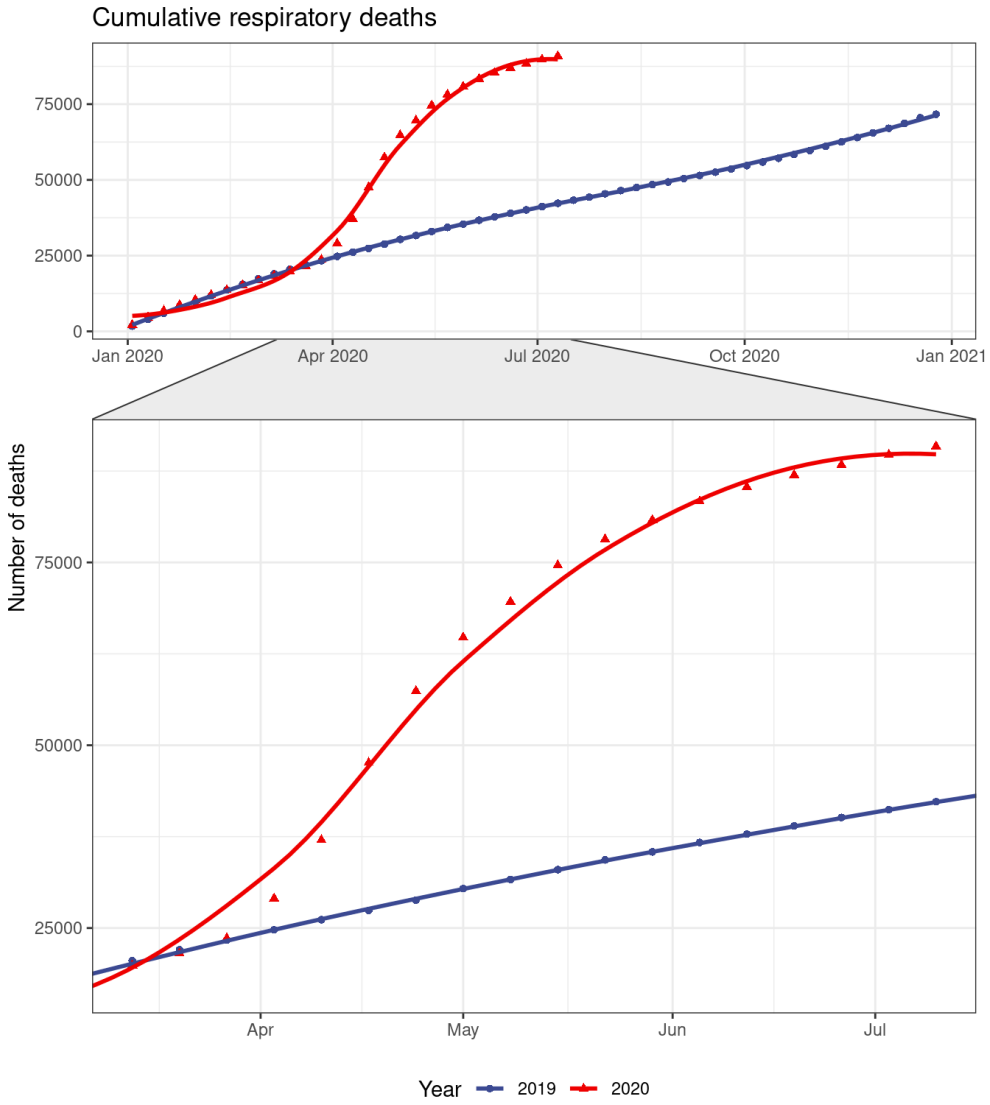
COVID-19 deaths - those with COVID-19 mentioned on the death certificate and those without, result in higher than last year numbers of respiratory deaths. Thankfully, at this time it looks like the first wave has passed.

CODE



However, the total number of COVID-19 deaths has already put the total number of respiratory deaths above the total 2019 respiratory deaths.

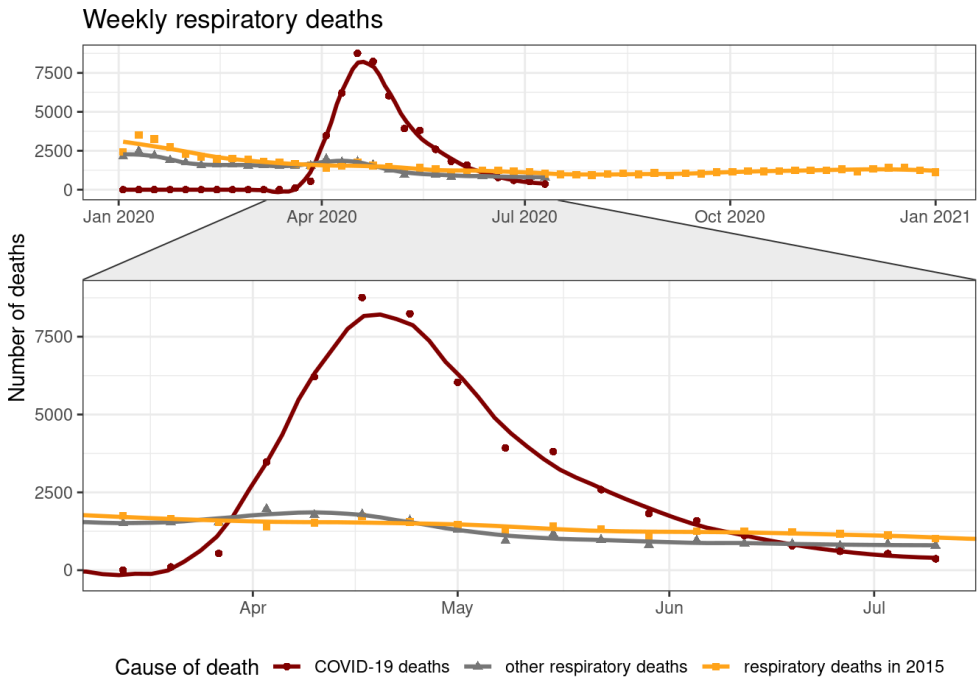
CODE



COVID-19 deaths increase exponentially, while the other respiratory deaths seem to be stable.

As per BBC plot (https://www.bbc.co.uk/news/health-52361519) I added the 2015 respiratory deaths, when the worst flu outbreak took place.

CODE



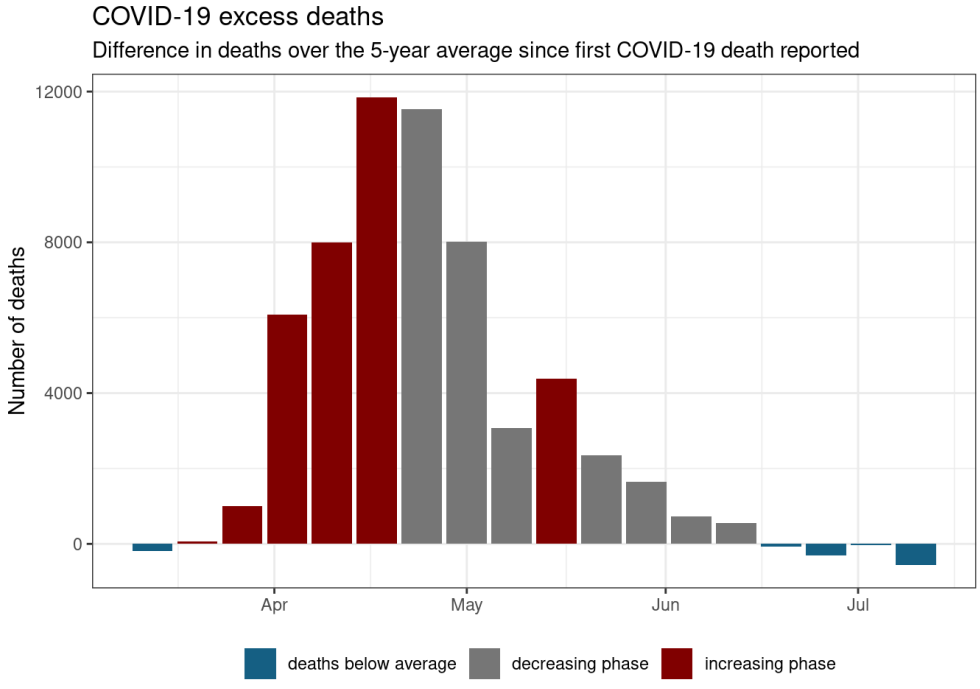
CODE

COVID-19 specific stats

Excess deaths - proxy for all COVID-19 related deaths

In this plot, I am looking at the difference in total number of deaths reported in the period since the first COVID-19 related death was reported and the 5-year average.

CODE



CODE

England & Wales has moved **past the peak**. Up to Jul, 10 at least **58 156 more people died** when compared to the 5 year average. This means that **16.5% of all deaths this year were directly, or indirectly caused by COVID-19** (taking the excess mortality over the 5 year average as best proxy for number of deaths as a result of pandemic).

Place of death

CODE

As of Jul, 10, majority of the deaths are reported in hospitals. However 37% of deaths occur outside of hospitals. Thankfully, all numbers seem to be going down, with hospital deaths dropping below the numbers from the beginning of the epidemic.

We saw increase in almost all places of death followed, thankfully by decrease.

My observations:

1. COVID-19 accounted only for some of the increase.

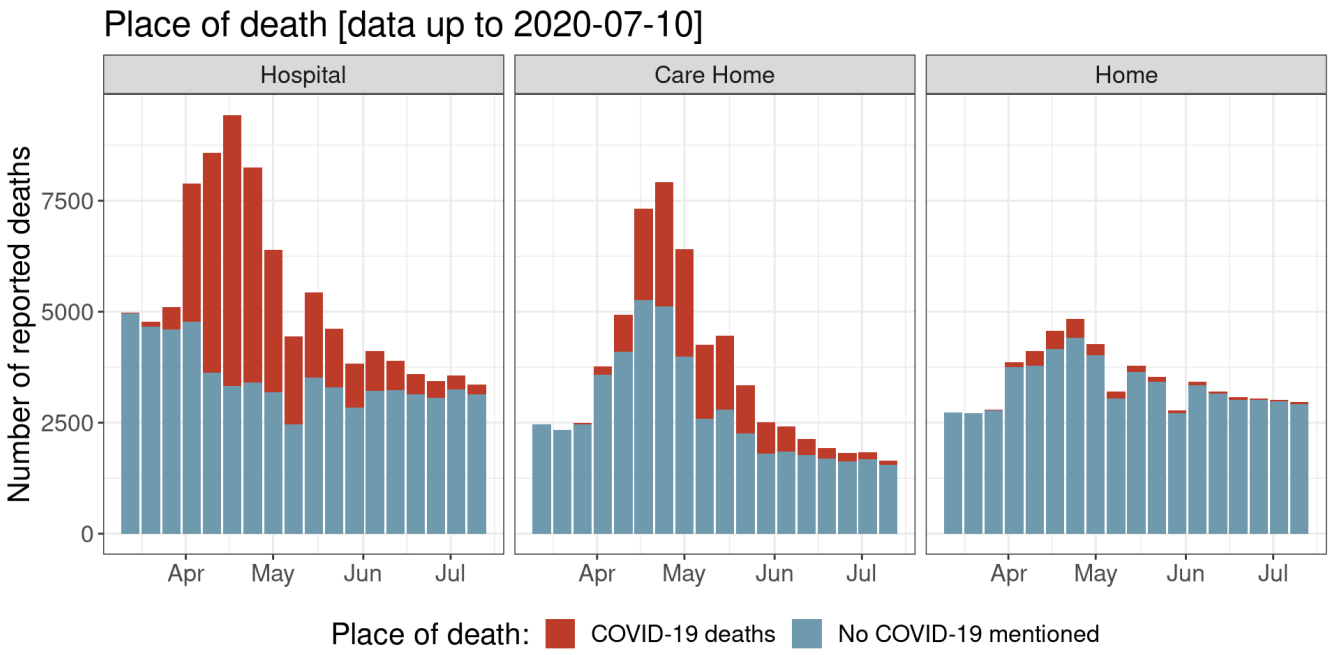
My speculation: Was that the case because no test was carried out? I find it unlikely, as the deaths reported to ONS don't have to be verified by testing to be classified as COVID-19 related. It might be, for example, because people are scared to go to the hospitals. (https://www.washingtonpost.com/health/patients-with-heart-attacks-strokes-and-even-appendicitis-vanish-from-hospitals/2020/04/19/9ca3ef24-7eb4-11ea-9040-68981f488eed_story.html)

Also, as have been already reported, the outbreak in care homes started later, hence we are seeing an increase in COVID-19 related deaths in those facilities.

2. We see that number of deaths with no mention of COVID-19 decreased in the hospitals and increased in recent weeks. I hypothesize it potentially can be explained by increase in deaths in other places, less road accidents and less scheduled medical interventions. And now, that lockdown has been lifted we potentially see the increase in accidents.

Note: *Many thanks to German (https://twitter.com/not_a_reptiloid) (and David Spiegelhalter plots (https://twitter.com/d_spiegel/status/1255148797333655552/photo/1)) for making me realise a mistake in the earlier iteration of the following plot!*

CODE

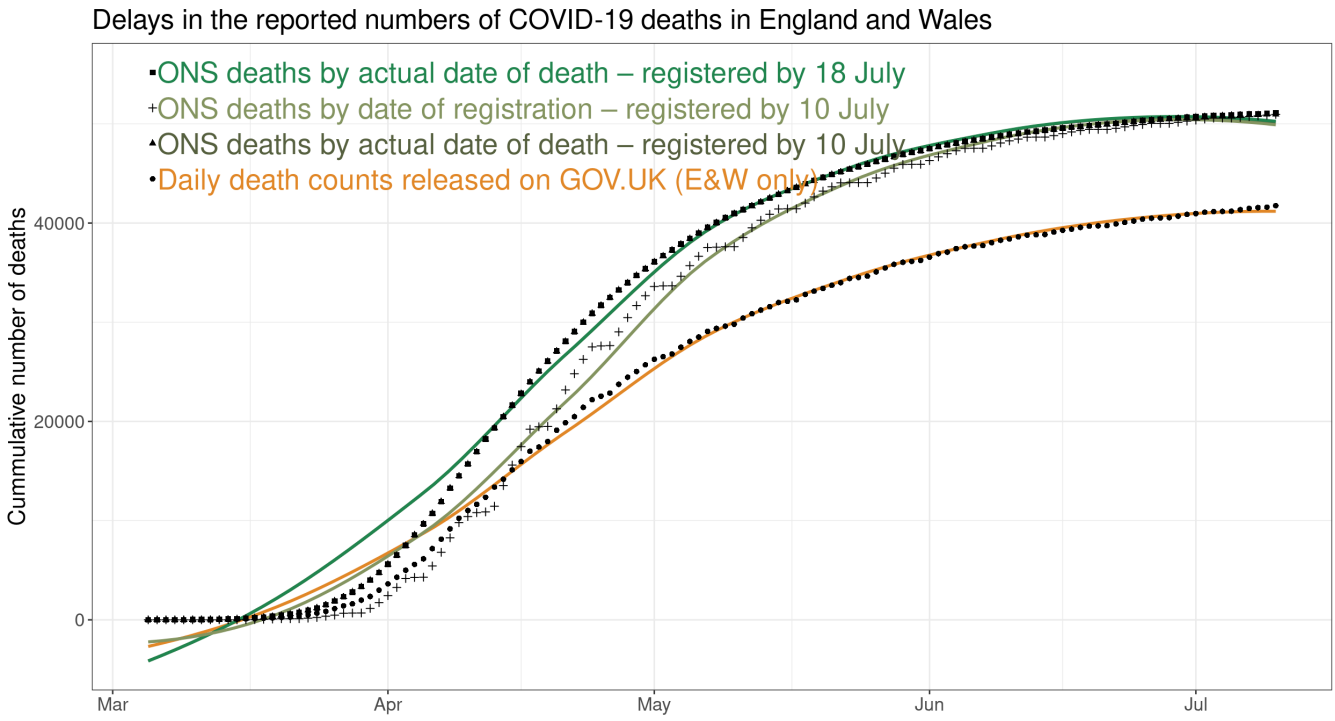


Differences between the reported numbers

The numbers reported by the government are lower than the actual number of deaths each day. Some of that comes from the delay in confirming the cause of death.

All the comparisons between previous years (in the earlier parts of this notebook) are done based on figures from **ONS deaths by date of registration – registered by 10 Jul** set for compatibility with earlier datasets.

CODE

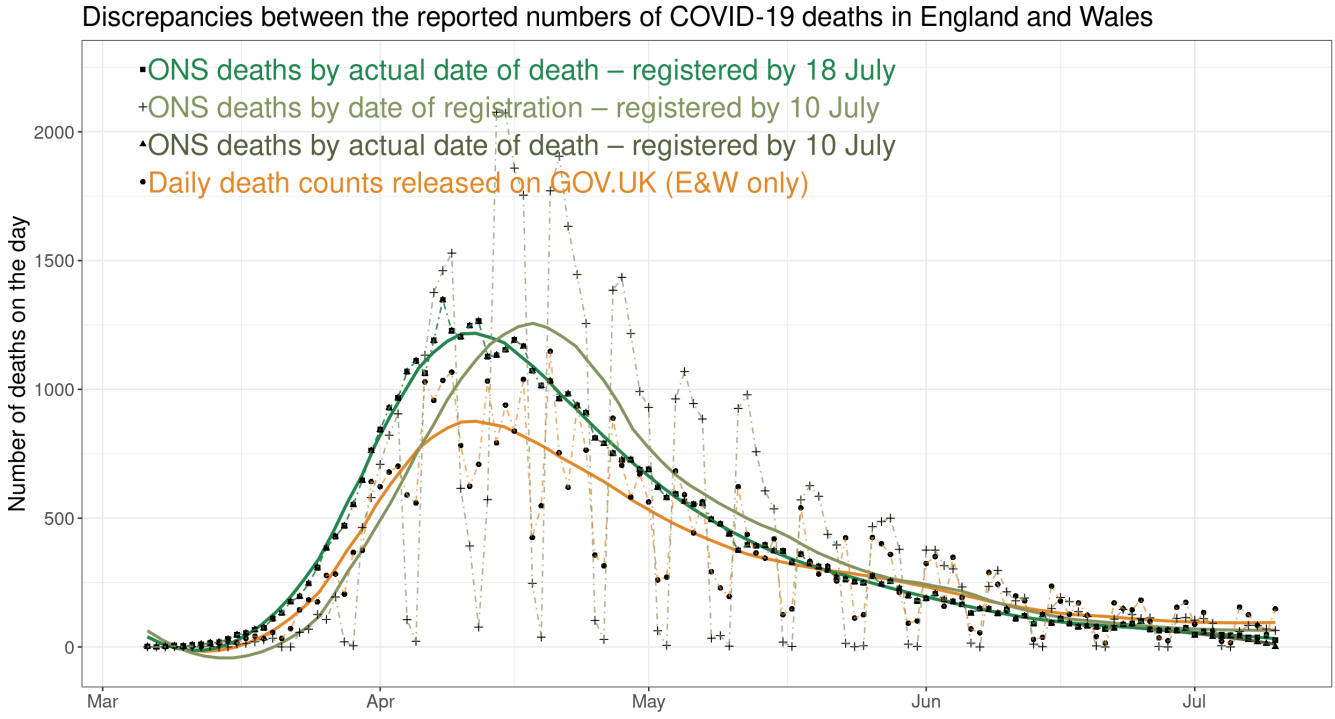


CODE

Looking at the daily death rates it becomes clear that (1) data is very noisy and (2) there is a significant lag in the data.

We see that ONS data is especially influenced by the weekends and bank holidays. The reported numbers drop on the weekends (March 21 & 22, 28 & 29, April 4 & 5, Easter weekend, and so on) and are higher in the next days.

CODE

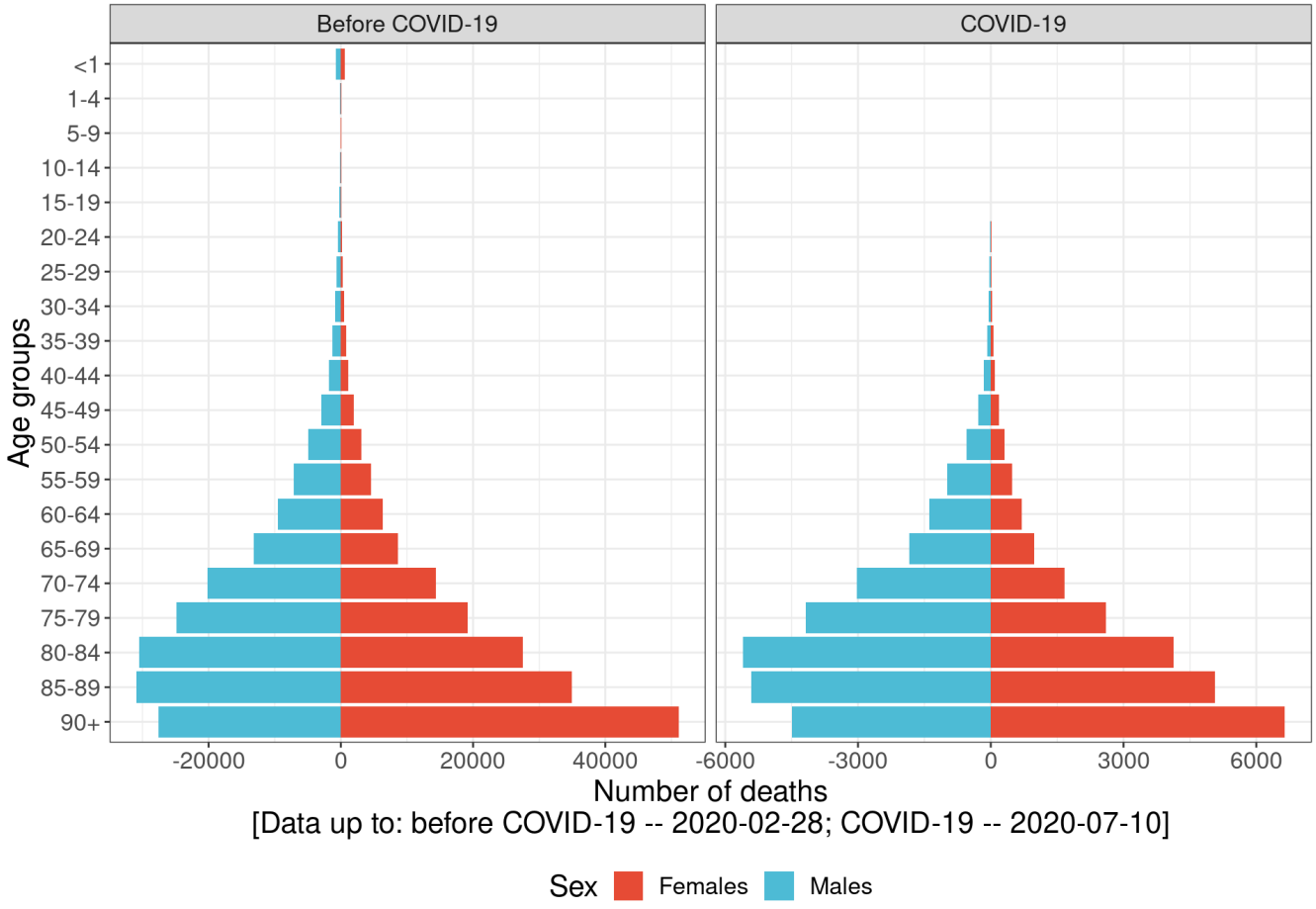


Age distribution

Looking at the deaths, Males are more affected than Females. How this plot looks like for cases? I.e. are men more susceptible?

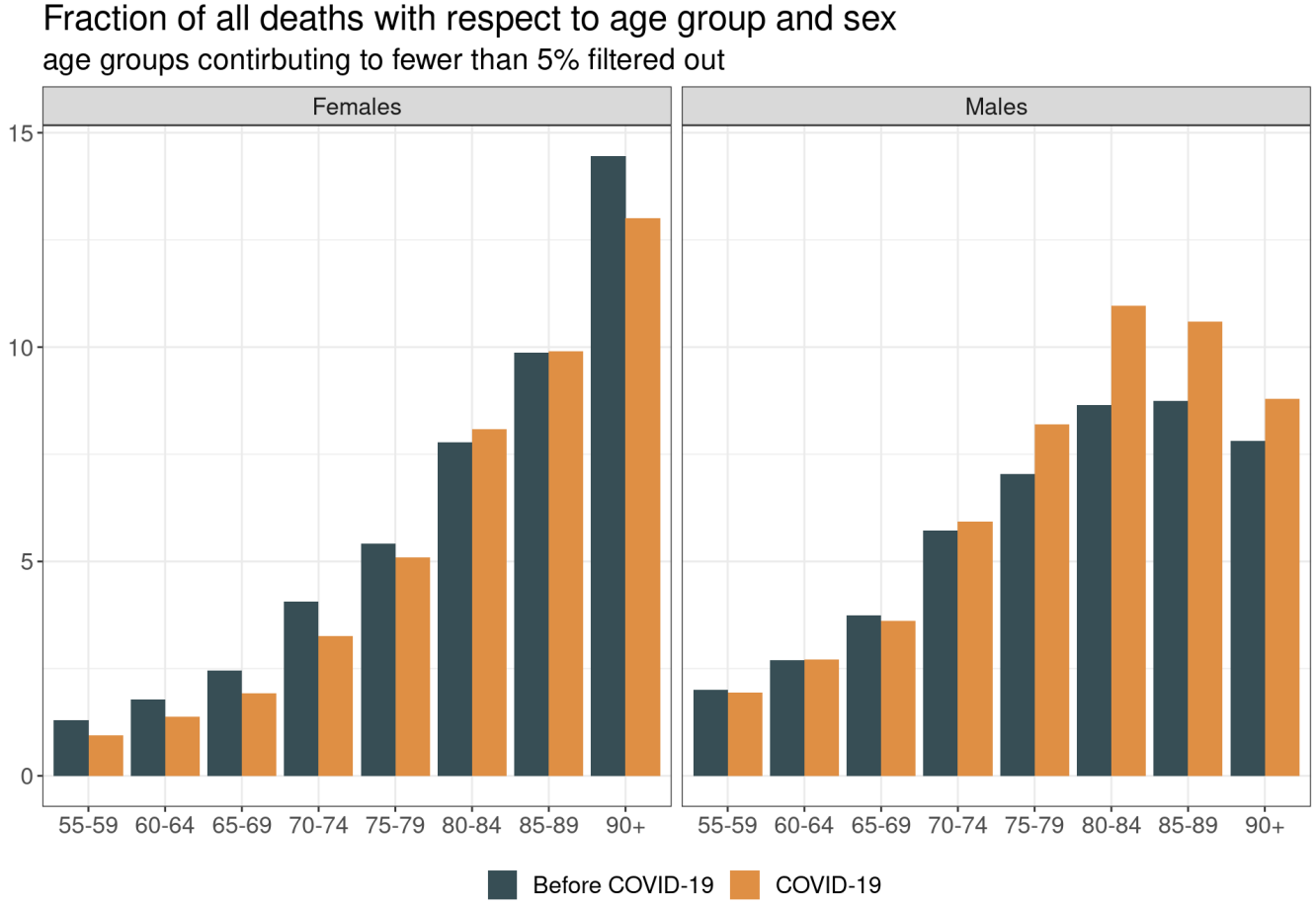
I also wanted to compare the COVID-19 age and sex distribution with the UK population structure. I ended up comparing it to even more adequate data - to the deaths occurring in UK this year, before COVID-19. This will allow to put the age structure of COVID-19 into context.

CODE



This is even more visible when we compare the fraction of all deaths in each age group and with respect to sex.

CODE


Fraction of all deaths with respect to age group and sex
age groups contirbuting to fewer than 5% filtered out
Females
Males
15
10
5
0
55-59
60-64
65-69
70-74
75-79
80-84
85-89
90+
Before COVID-19
COVID-19