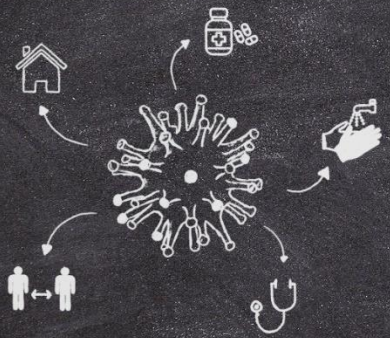


From the first to the second wave: sex- and age-specific disparities in COVID-19 infections in Europe

Tomáš Sobotka, Zuzanna Brzozowska, Raya Muttarak, Kryštof Zeman, and Vanessa di Lego

Wittgenstein Centre Conference 2020
Demographic Aspects of COVID-19 (1 December 2020)

Wittgenstein Centre
FOR DEMOGRAPHY AND GLOBAL HUMAN CAPITAL

Background: the importance of considering age and sex dimension in understanding COVID-19 dynamics

Basic demographic dimensions of key importance *(Dowd et al. 2020, Wenham et al. 2020, Sculy et al, 2020)*

- The severity, hospitalisations, mortality & fatality of covid-19 infections vary strongly by sex and age
- Two key dimensions: 1) age & sex composition of the population and 2) age and sex pattern of infection rates
- The age & sex pattern in covid-19 mortality (or excess mortality) confirmed in different studies, but limited research on age- and sex-pattern in covid-19 infection rates
- Gender equal pattern in infections? (*Global Health 5050*)
- Or does it vary with women's employment, occupation?

The challenges of studying covid-19 infection rates

The "true" underlying infection rates are unknown

- Can be estimated with *seroprevalence studies* – often limited in scope or do not allow more detailed split
- Reported covid-19 infections ("*confirmed cases*") affected by frequency of testing and selectivity of the tested population by age, sex, occupation, racial and ethnic groups
- *Targeted testing* in specific population groups, regions & occupations
- The *selectivity* can change over time as testing patterns, frequency and strategies shift: *limited testing in Spring during the 1st wave, much more frequent testing in Autumn during the 2nd wave*

Confirmed cumulative cases vs. Estimated seroprevalence: 1st wave

Spain – early May (1st round)

- Reported cumulative cases 11 May: 231 765 (0.49%)
- Seroprevalence study, 1st round (27 April – 11 May, N=60,983: 5.0%)

Spain – mid-June (3rd round)

- Reported cumulative cases 15 June: 253 282 (0.53%)
- Seroprevalence study, 3rd round (mid-June, 5.2%)

Sweden – early May

- Reported cumulative cases, Week 21 (24 May 2020): 34600 (0.33%)
- Seroprevalence study, Week 21 (18-24 May, N=1,200: 6.3%, CI 4.8-8.2%)

Focus: trends in age- and sex differences in reported COVID-19 cases in Europe

Questions:

(1) Are men more likely to get infected than women?

(2) Does the gender profile of infections vary by age?

(3) Which age groups are more likely to get infected?

(4) Are these patterns similar across countries?

(5) How are these patterns changing over time?

(6) Are our findings further supported by testing and seroprevalence data?

Assumptions: Relative measure of M/F ratio limits the problem of cross-country differences in testing policies and the data incomparability; similar trends & patterns across countries suggesting a “real” underlying trend

Terminology: infections, reported (registered) infections, confirmed cases

Data

- Reported COVID-19 cases by age, month and sex in European countries as of mid-November, individual data (ID) and national reports (NR)
- Population by age and sex in 2019 or 2020 (Eurostat and NSO)
- 10-year age groups (0-9 up to 90+ or 80+)
- Different formats of the monthly data: not fully following calendar months in countries where reconstructed from weekly data or irregular reports (Spain, Italy, England)
- November data incomplete, mostly covering cases up to mid-November

Countries: Belgium (ID), Czechia (ID), Italy (NR), Netherlands (ID), Spain (NR), Switzerland (ID), UK (England, NR))

Data

	Population (million, 2019)	Total cases mill, mid-Nov 2020	Total cases (% population)	M/F ratio (of all cases)
Belgium	11.5	0.547	4.78	0.81
Czechia	10.6	0.469	4.41	0.91
Italy	60.4	0.980	1.60	0.97
Netherlands	17.3	0.484	2.80	0.84
Spain	46.9	1.539	3.28	0.88
Switzerland	8.5	0.290	3.40	0.93
UK (England)	56.3	1.194	2.12	0.86
Total	**211.5**	**5.503**	**3.20**	**0.89**

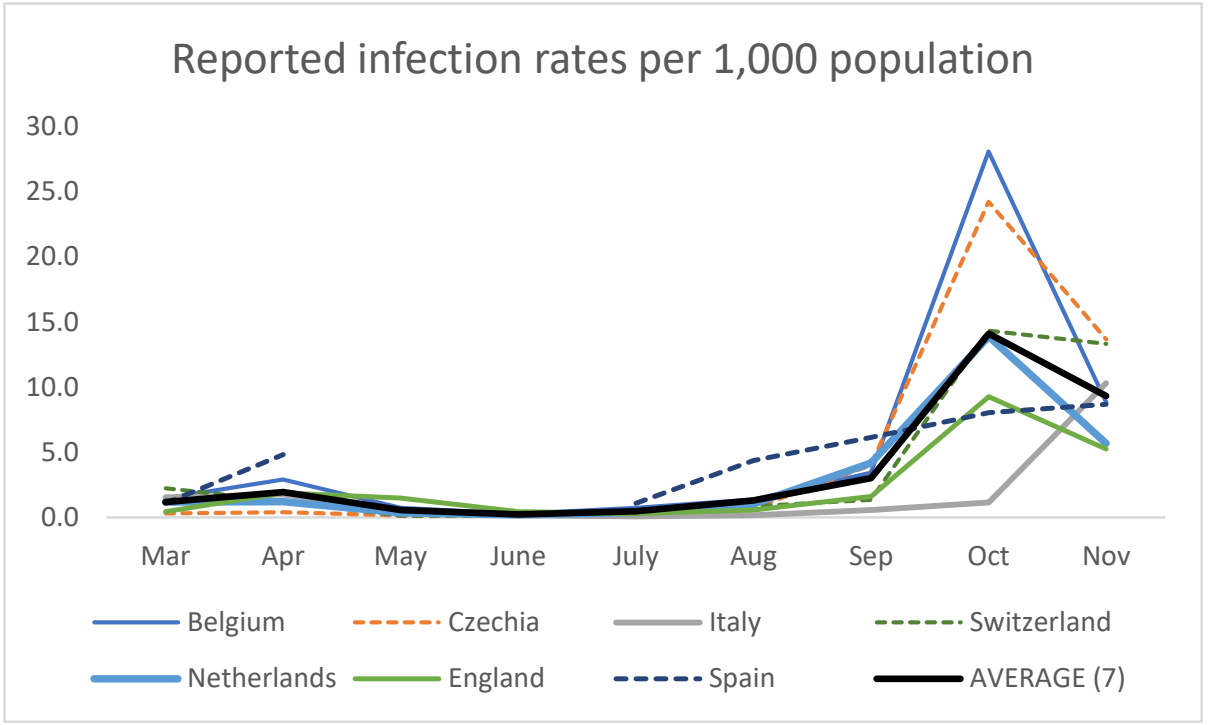
Key indicators and measures

Sex and age differences in reported COVID-19 in 7 countries in March- mid-November

- Reported infection rates per 1,000 population by age, sex and month (*IR per 1,000*)
- Relative M/F ratios by age and month (*M/F ratio*)
- Relative ratios in rates by age (relative to total infection rates, *RR ratio*)
- Changing age profile and vulnerability (distribution by age, mean age, vulnerability index)
- *Heatmaps* showing trends in age and sex profiles by month

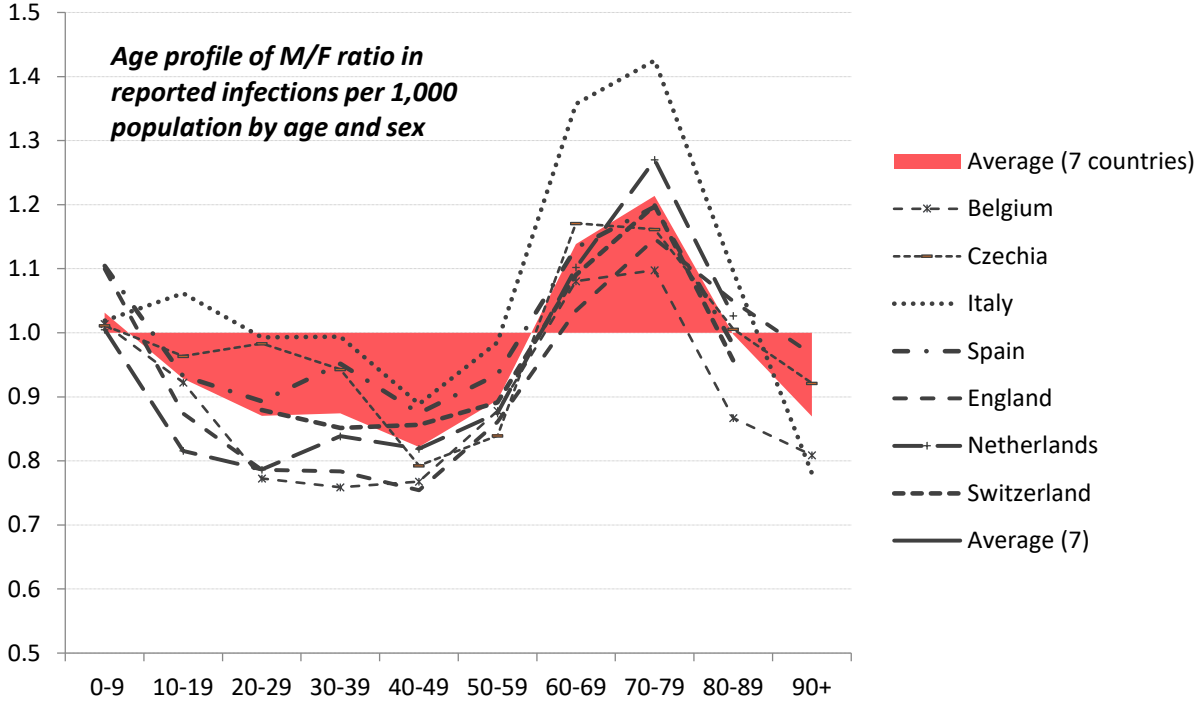
Assumptions: Relative measure of M/F ratio limits the problem of cross-country differences in testing policies and the data incomparability; similar trends & patterns across countries suggesting a “real” underlying trend

Data


Reported infection rates per 1,000 population
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Mar
Apr
May
June
July
Aug
Sep
Oct
Nov
Belgium
Czechia
Italy
Switzerland
Netherlands
England
Spain
AVERAGE (7)

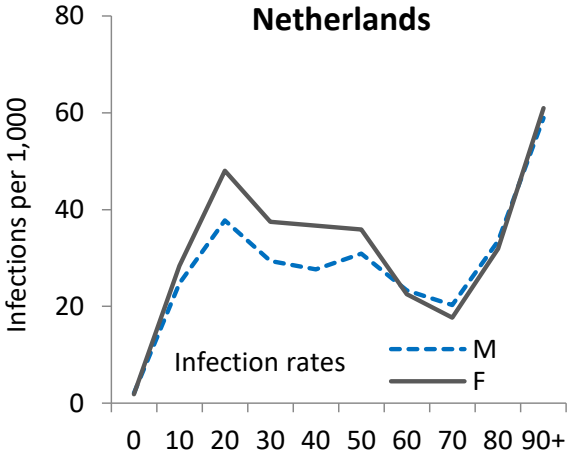
Results

(1) Are men more likely to get infected than women?
(2) Does the gender profile of infections vary by age?

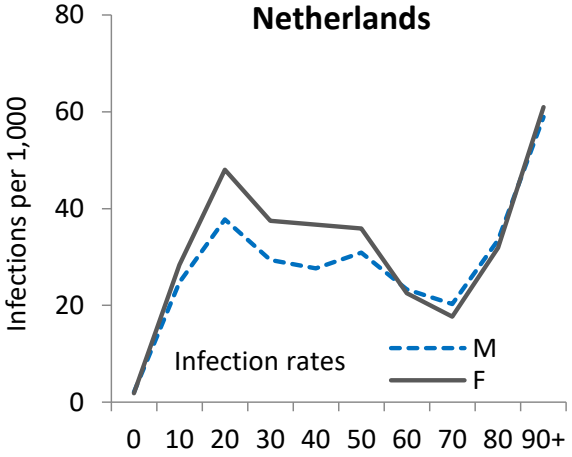


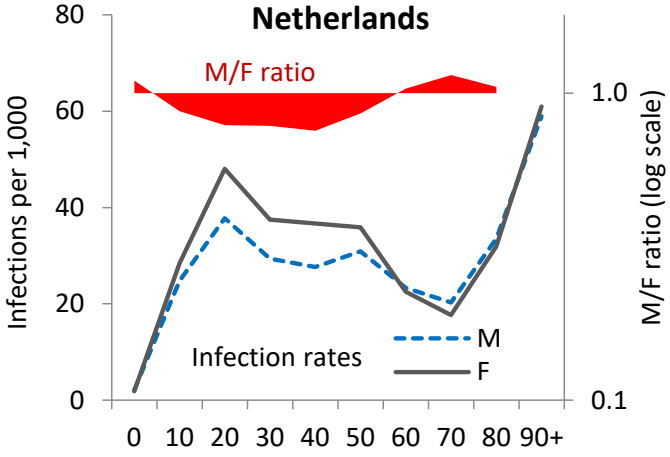
→ *Female dominance except ages 60-79; cross-over at around age 60*

Infection rates and M/F ratio: the Netherlands



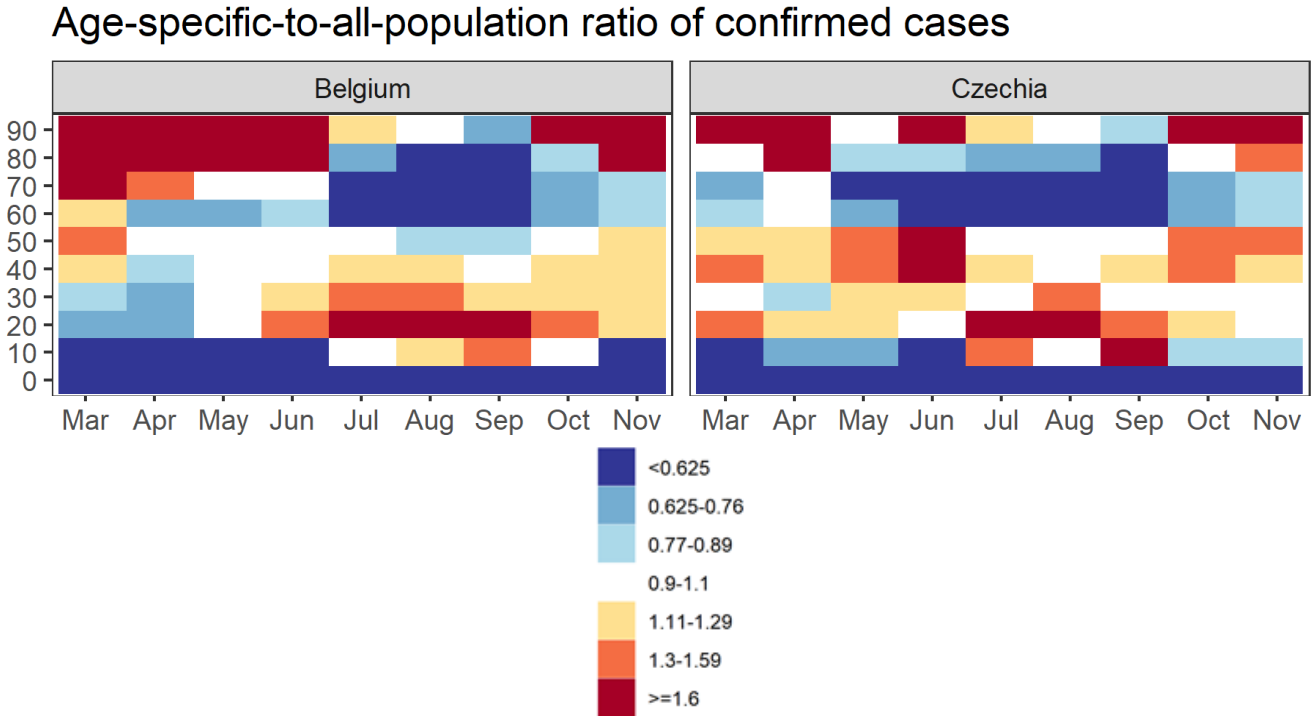
Infection rates and M/F ratio: the Netherlands





(3) Which age groups are more likely to get infected?

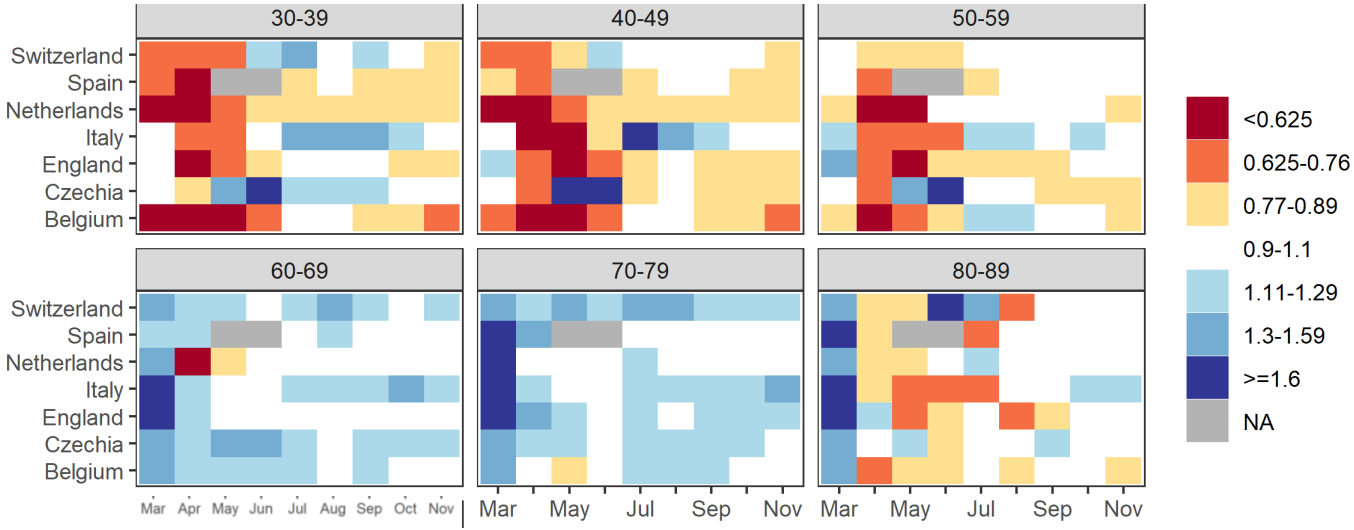
- *No consistent answer; age profiles changing over time; also affected by testing patterns*
- *But consistent and similar trends over time*



(4) *Are these patterns similar across countries?*

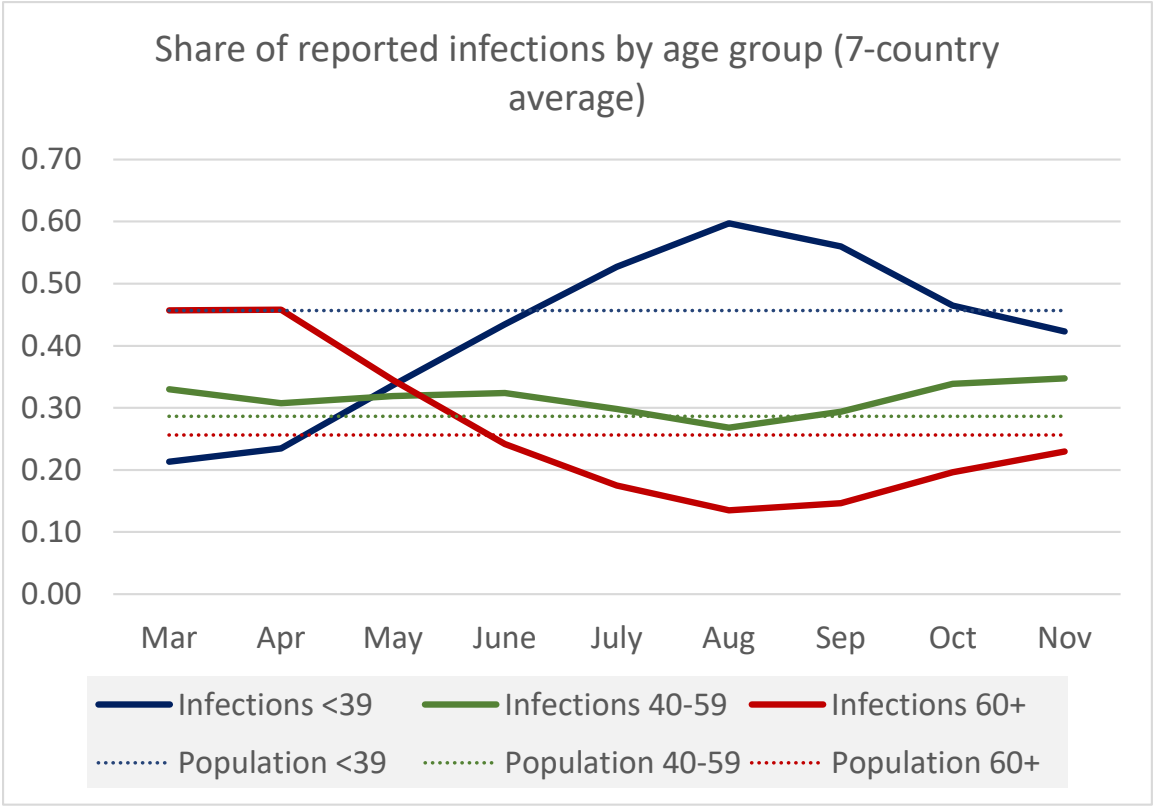
- *Sex differences by age (M/F profile): YES*
- *Age patterns: not consistently, but YES over time*

M/F ratio in confirmed infections (rates per 1,000)



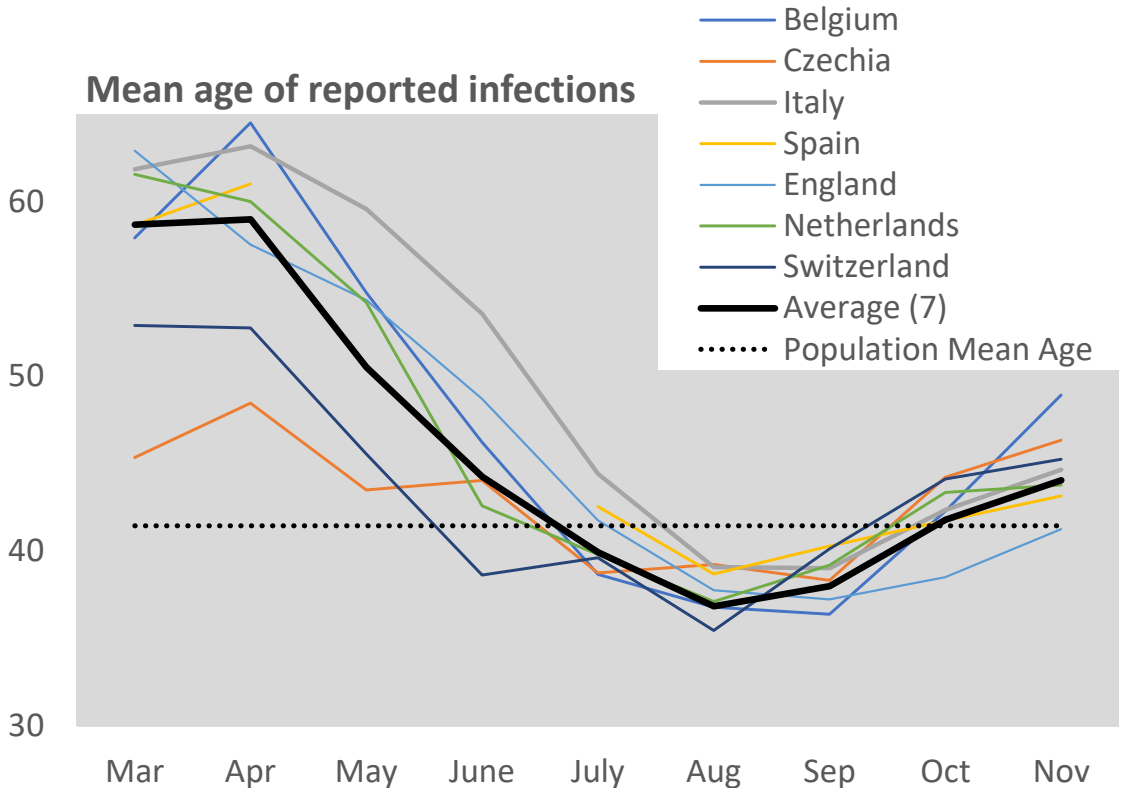
(5) How *are these patterns changing over time*?

- *Strong shifts in the age distribution between waves*
- *Milder shifts in the gender profile of reported infections*



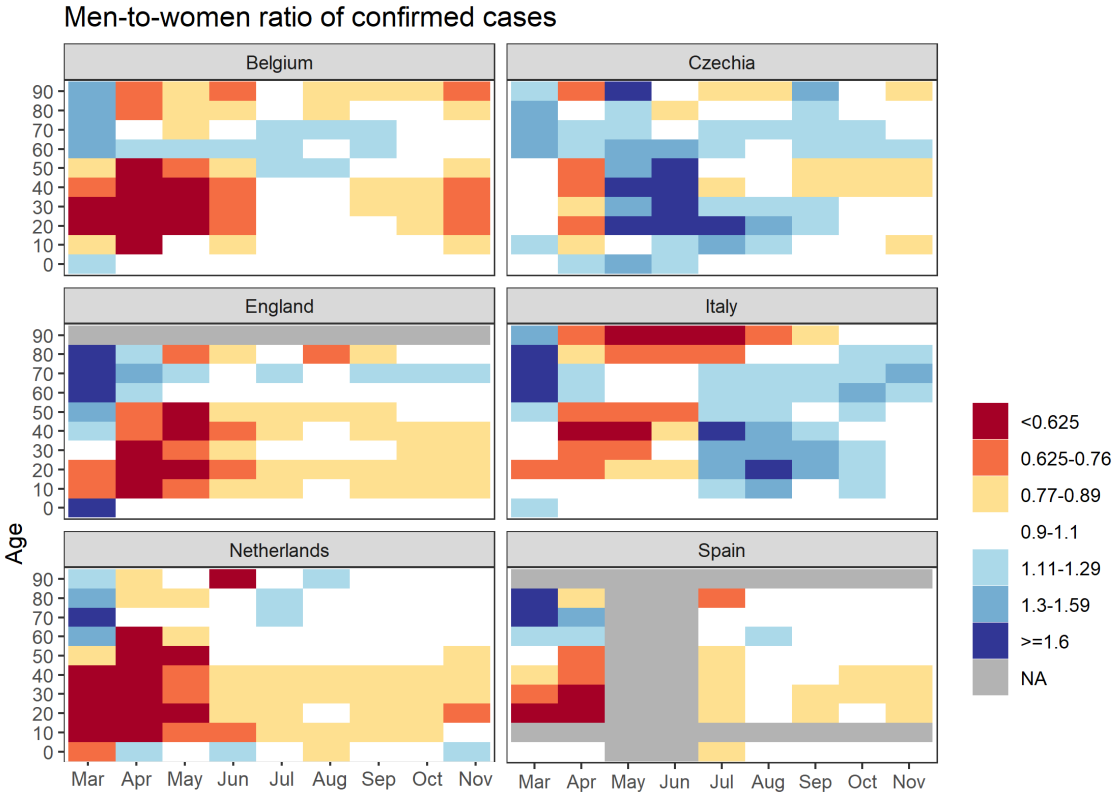
(5) How *are these patterns changing over time*?

- *An "ageing" of infections as the second wave progresses*

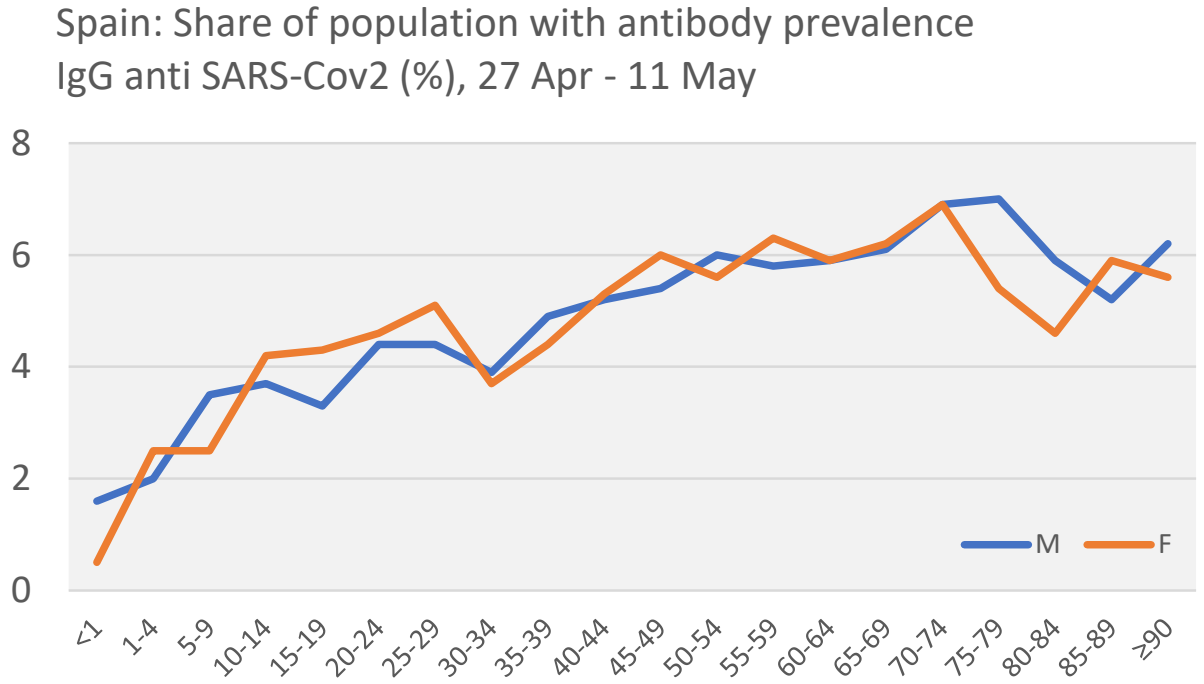


(5) How *are these patterns changing over time*?

- *A shift to less female-dominated pattern during the summer*



(6) Are our findings further supported by testing and seroprevalence data?



(6) Are our findings further supported by testing and seroprevalence data?

Testing statistics for England and the Netherlands:

- higher frequency of testing among women than among men aged 20-59
- BUT: lower test positivity rate among women

➔ *Inconclusive about the observed gender patterns in reported infection rates*

Summary and discussion

Summary (1): Gendered pattern of the COVID-19 outbreak?

Consistent age-sex profile of reported infections across the analysed countries in Europe

- More cases & higher infection rates reported among women (ex. Italy)
- Women dominate reported cases at working ages, 20-59, with a cross-over around age 60

Working ages (20-59)

- Likely linked with female employment and occupation; high female employment rates in most of Europe
- Women strongly engaged in healthcare and social care, accounting for 75-85% professionals (Eurostat, Barbieri et al 2020, Wenham et al. 2020)

Older ages (60+): disparities might be related to higher severity in infections among older males – severe cases more likely to be detected

Summary (2):
Age pattern of the COVID-19 outbreak

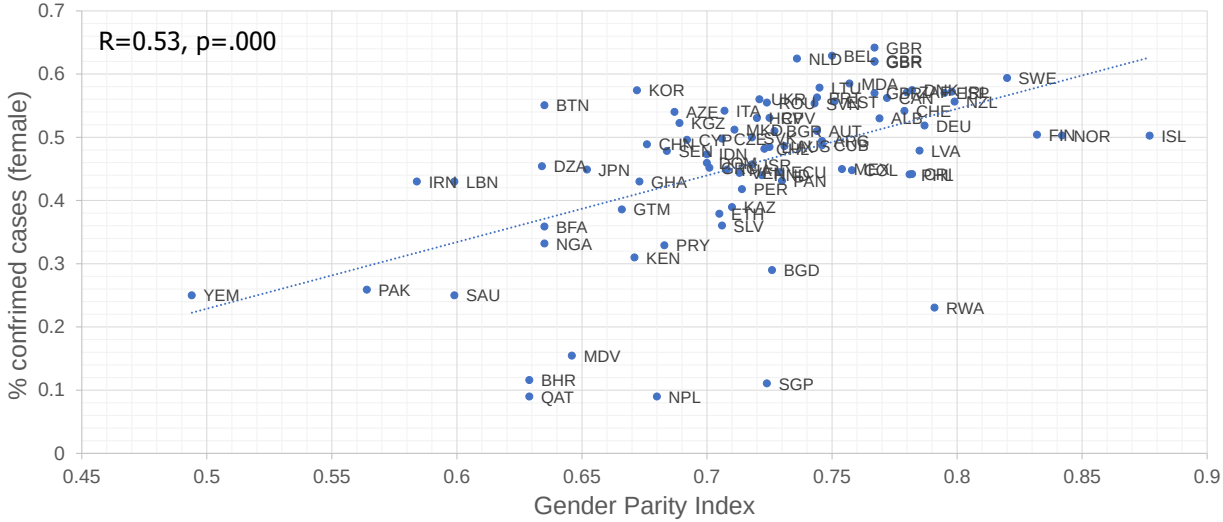
Shifts between the 1st and 2nd wave

- Likely to reflect the real changes in the age profile: consistent changes over time across all the analysed countries
- Vulnerable population of the elderly disproportionally affected in Spring (but limited testing among younger ages groups)
- Renewed shift to older ages in all countries since September – likely real and contributing to the surge in COVID-19 deaths

>>> countries not successful in protecting vulnerable groups // outbreaks in hospitals and care establishments

Belgium: cumulated infection rates among population aged 90+: F 15.0%, M 12.1% (vs. 4.3% (M) and 5.2% (F) for total population)

Gender equality, representation vs. confirmed cases



Sources: Global Health 5050 and Global Gender Gap Report 2020, World Economic Forum

Future outlook

- Further evidence needed on whether the observed age and sex differences in reported infections are reflecting well the “real” underlying patterns

Paper on the Spring (first) wave: T Sobotka, Z Brzozowska, R Muttarak, K Zeman, V di Lego. 2020. Age, gender and COVID-19 infection. *medRxiv* preprint, 25 May 2020. doi: https://doi.org/10.1101/2020.05.24.20111765

IIASA Nexus Blogpost: T Sobotka. The female face of COVID-19 infections. 5 June 2020. Available at https://blog.iiasa.ac.at/2020/06/05/the-female-face-of-covid-19-infections-in-europe/?csrt=15027419326674616547