Intergenerational Residence Patterns and Covid-19 Fatalities in Europe and the US

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Here I report on findings that were published in 3 recent publications by Ainhoa Aparicio & I

- "Intergenerational Residence Patterns and Covid-19 Fatalities in the EU and the US" *Economics and Human Biology,* 2020
- “Are COVID Fatalities in the US Higher than in the EU, and if so, why?” *Review of Economics of the Household*, forthcoming, 2021.
- “Later Onset, Fewer Deaths from COVID” *Pathogens and Global Health*, 2020

Summary

- We investigate whether deaths from COVID are a function of
  - a/ how common it is for young adults to co-reside with their parents,
  - b/ how soon a country or state was exposed to covid and had its first death due to covid,
  - c/ is state/country in Europe or the USA?
  - d/ what lockdown measures were implemented and how soon.

- We created a unique data set composed of
  - Most European countries (35 countries with data available on the variables we used)
  - All 50 US states
  - Total sample: 85 nations/states (This is the sample used in the forthcoming REHO article; EHB article only has 29 European countries, total number of areas: 79)

Main questions addressed here

1. Is intergenerational co-residence positively associated with Covid fatalities?
2. How beneficial is it that a country's pandemic started at a later date?
3. Was the US worse at preventing the spread of covid when compared to Europe?

I. Is intergenerational co-residence positively associated with Covid fatalities? Background

- Based on data for 24, mostly European, countries, Bayer and Kuhn (2020) reported positive correlations
- Some recent studies examining the question by comparing various regions of European countries have not established a positive association between intergenerational co-residence and fatalities from Covid (e.g. Belloc et al. 2020, Arpino et al. 2020).
- The following study finds that some infections of older adults can be explained by their exposure to younger relatives (Harris, J. E. (2020). Data From the COVID-19 Epidemic in Florida Suggest That Younger Cohorts Have Been Transmitting Their Infections to Less Socially Mobile Older Adults, *Review of Economics of the Household* 18:1019-1037.)

II.How beneficial is it that a country's pandemic started at a later date? Background

- Previous study compared death rates at 50 days after COVID-19's onset in 14 Western countries and found that the later a country first experienced at least 0.1 death per million inhabitants, the lower the death rate 50 days after onset.

Landoni G , Losi D, Fresilli S, Lazzari S, Nardelli P, Puglisi R & Zangrillo A (2020). Is time our ultimate ally in defying the pandemic? *Pathogens and Global Health*, DOI: 10.1080/20477724.2020.1785199

- We add to their study as follows: we examine the association between cumulative deaths at 60 and 100 days after onset of COVID-19 in a particular area based on

  - a larger sample: 35 European countries and 50 U.S. states
  - Statistical analysis that controls for many other factors (multivariate regressions)

III. Was the US worse at preventing the spread of covid than Europe? Background

- Research is increasingly showing that the Far East was better at fighting covid than Europe or the USA
- What if we just compare Europe and the USA?

DATA

We placed US states on same footing as European countries. Justifications:

1/ Size often similar: with the exception of the 7 largest European countries, all European countries have fewer inhabitants than California

Germany

Turkey (considered part of Europe)

France

United Kingdom

Italy

Spain

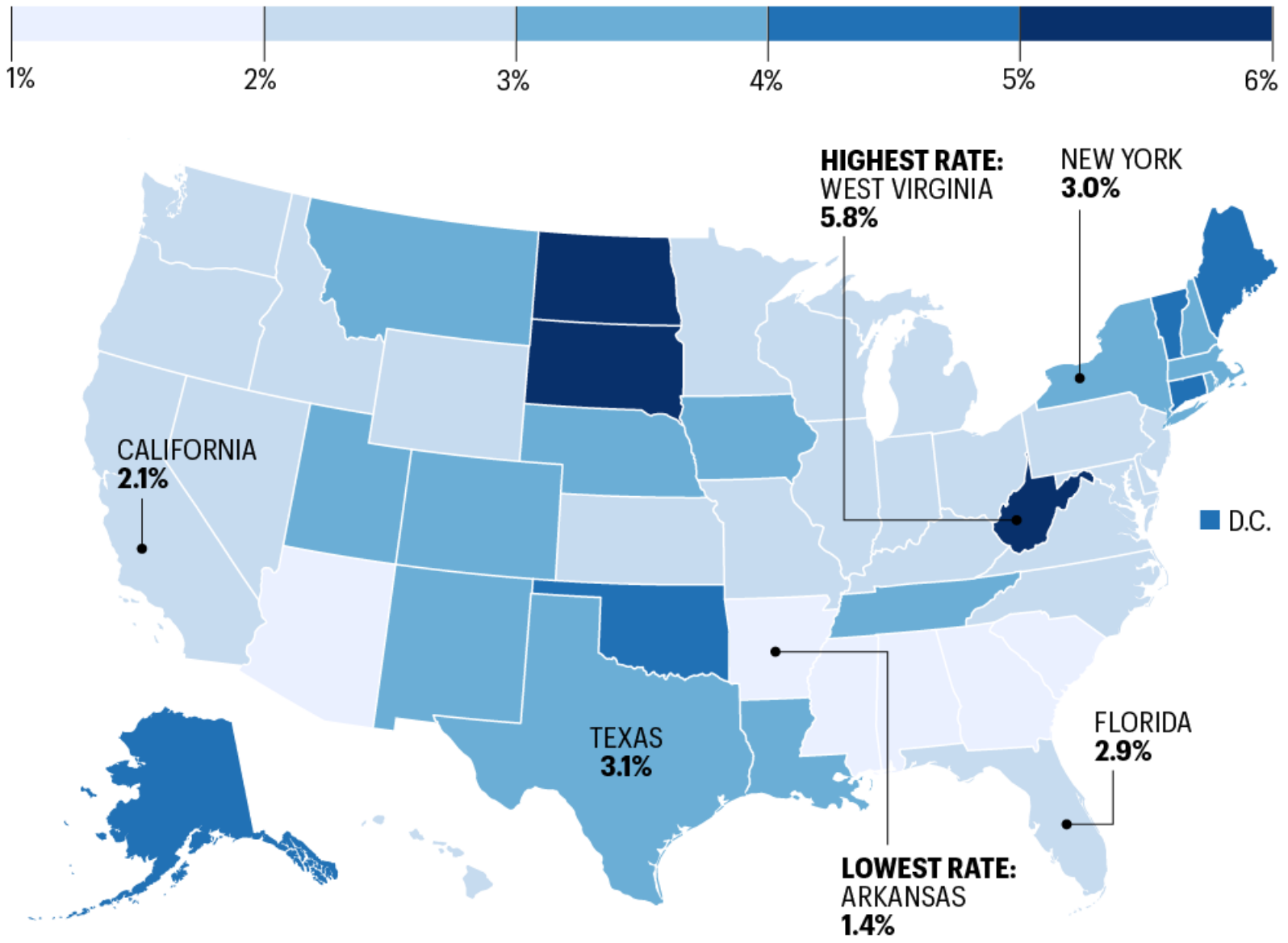
Poland

2/Similar degree of political autonomy

- US federal system gives states independence on many policy issues such as lockdowns and testing for viruses such as covid
- European union still leaves major decisions to separate countries, as in the case of lockdowns and testing for viruses
- By the way, as far as vaccinations go (which is not part of our study) European countries are currently behind Israel, the United Arab Emirates, West Virginia and Bahrain (as of Jan 13 2021, West VA 5.8% had a higher rate than Bahrain).

COVID-19 STATE VACCINE TRACKER

SHARE OF THE POPULATION THAT RECEIVED AT LEAST ONE SHOT



SOURCE: CENTERS FOR DISEASE CONTROL AND PREVENTION

DATA THROUGH 1/12/2021

FORTUNE

Why just Europe and the USA?

- First step, we hope our work will be expanded to include more areas around the world.
- That all areas in our data set are part of Western culture also acts as control for some cultural factors, such as the willingness to wear a mask or to follow curfew orders. When more countries are compared, there is more unaccounted for variation in cultural propensity to adopt preventative measures such as the wearing of masks.
- More on culture, within Germany (comparing Catholics and Protestants) e.g. here: Laliotis, I., Minos, D. (2020). Spreading the Disease: The Role of Culture (20/12). London, UK: Department of Economics, City, University of London. https://openaccess.city.ac.uk/id/eprint/24358/

To facilitate comparisons across geographic units our analysis

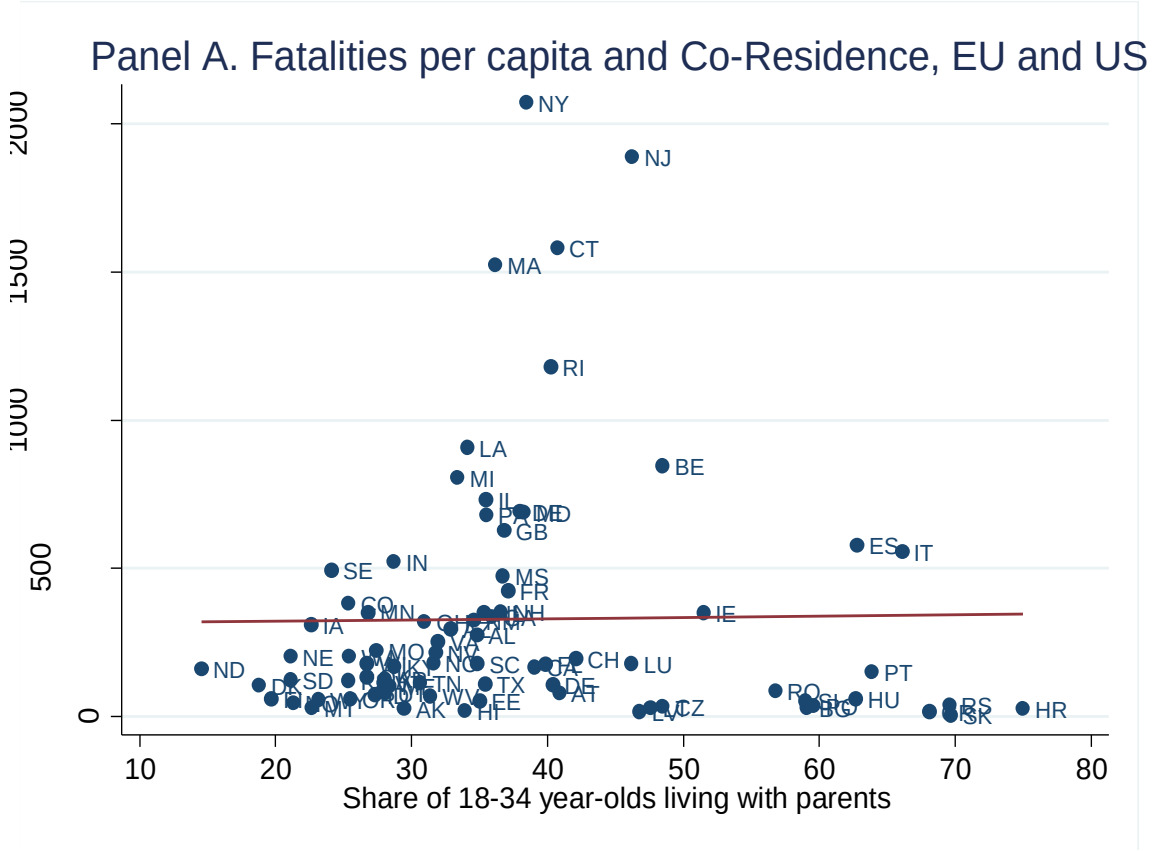
- Includes date of onset of covid in a particular unit, where onset is defined as date at which first death from covid was recorded.
- Our covid data are measured at 100 days from onset in that nation/state. Our study ends at 100 days after onset, which corresponded to May 25 in France and to July 22 in Wyoming.
- Next, a sense of the variation in deaths per capita. First countries/states with highest number of cumulative deaths per capita @100 days. Then some with the lowest numbers.

Worst states or countries in terms of deaths per capita at 100 days

Rank	Country/state	Deaths pc @100days	Reached 100 days on
1	New York	2072	22/06/2020
2	New Jersey	1888	18/06/2020
3	Connecticut	1580	26/06/2020
4	Massachusetts	1523	28/06/2020
5	Rhode Island	1181	06/07/2020
6	Louisiana	907	22/06/2020
7	Belgium	847	19/06/2020
8	Michigan	806	26/06/2020
9	Illinois	732	25/06/2020
10	Delaware	692	04/07/2020
11	Maryland	688	26/06/2020
12	Pennsylvania	679	26/06/2020
13	United Kingdom	627	15/06/2020
14	Spain	578	13/06/2020
15	Italy	555	02/06/2020

70	Serbia	39	29/06/2020
71	Poland	35	21/06/2020
72	Czechia	33	01/07/2020
73	Montana	29	05/07/2020
74	Iceland	28	28/06/2020
75	Lithuania	28	29/06/2020
76	Bulgaria	28	20/06/2020
77	Croatia	27	03/07/2020
78	Alaska	27	05/07/2020
79	Montenegro	23	05/07/2020
80	Cyprus	22	03/07/2020
81	Malta	18	18/07/2020
82	Hawaii	18	09/07/2020
83	Greece	18	20/06/2020
84	Latvia	16	13/07/2020
85	Slovakia	5	16/07/2020

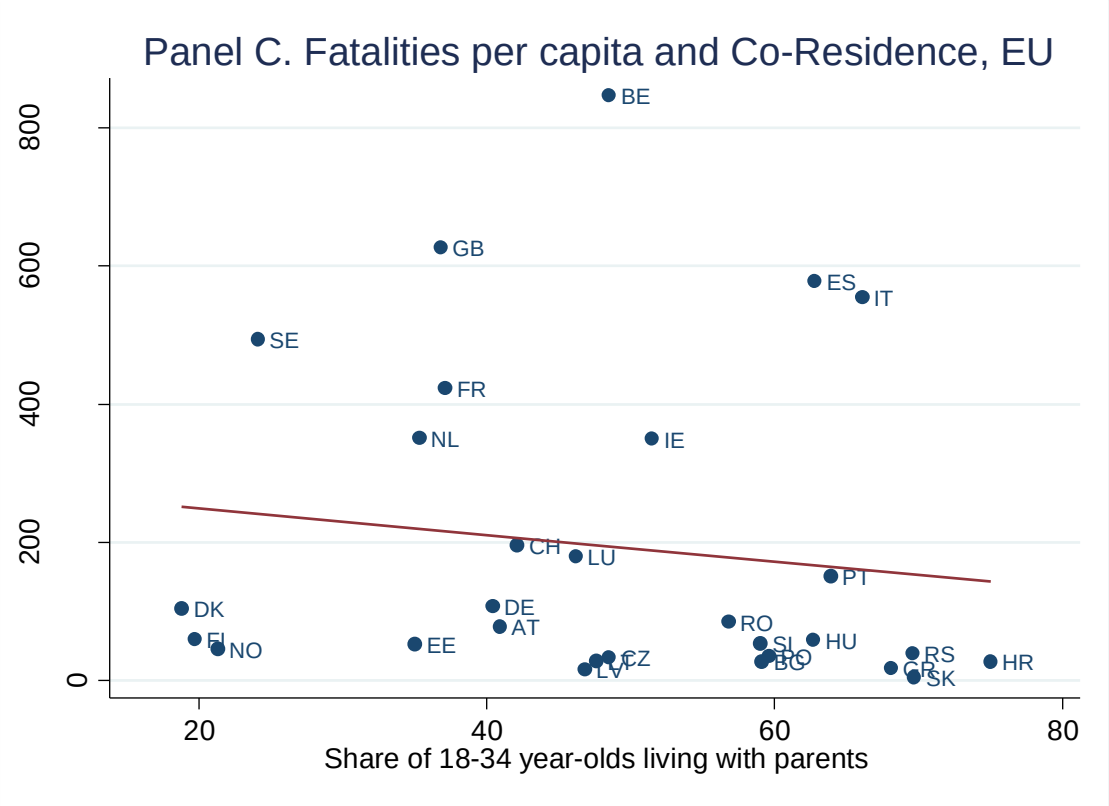
Simple correlations Re: Question I

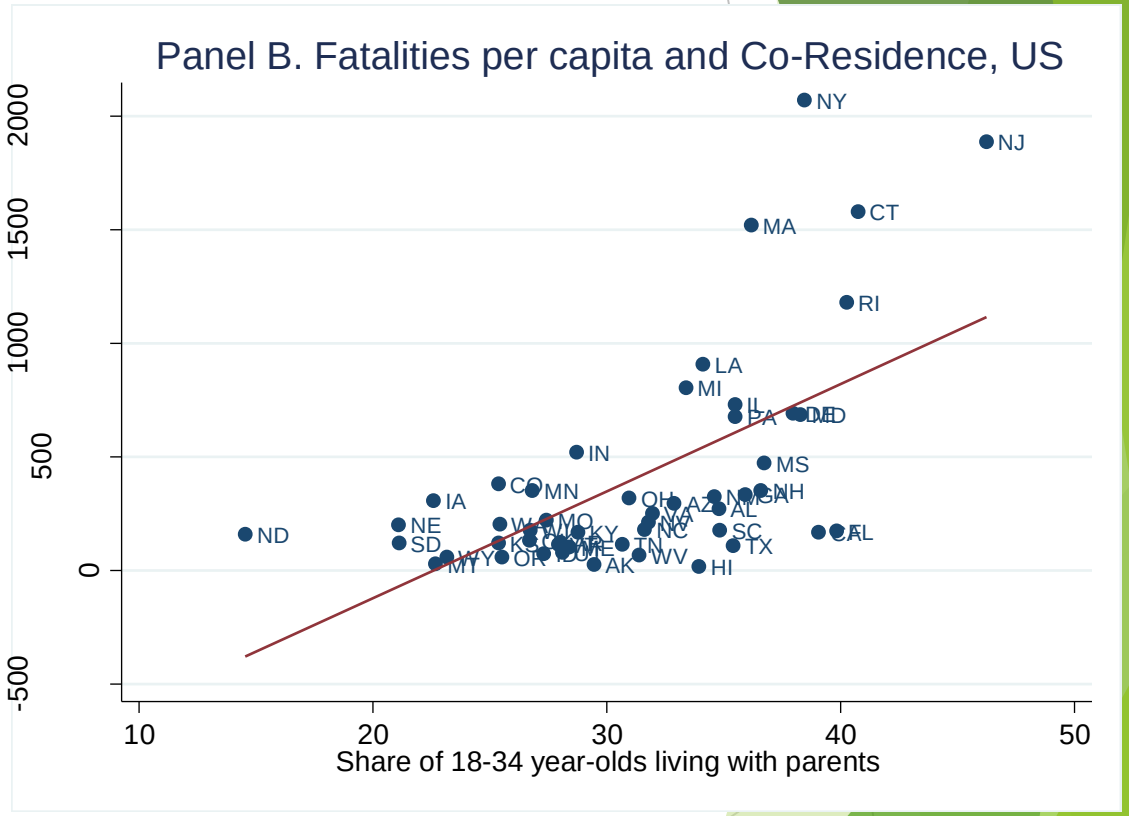


When 29 European countries and 50 US states are combined

Next: European countries and US states Separately

Deaths @ 100 days


Panel C. Fatalities per capita and Co-Residence, EU
0
200
400
600
800
20
40
60
80
Share of 18-34 year-olds living with parents
BE
GB
ES
IT
SE
FR
NL
IE
CH
LU
PT
DK
DE
AT
RO
FI
NO
EE
SI
HU
CZ
LV
RS
HR
SK


Panel B. Fatalities per capita and Co-Residence, US
-500
0
500
1000
1500
2000
10
20
30
40
50
Share of 18-34 year-olds living with parents
NY
NJ
CT
MA
RI
LA
MI
IN
MS
IA
MN
ND
NE
SD
AK
HI
TX
SC
AL
WV
NH

Methods

Regression equations

We estimate log-linear regressions of the log of cumulative number of deaths using a sample of 85 nations/states: 35 European countries and 50 US states. Logarithms allow us to interpret coefficients in percentage terms, which facilitates comparability across nations/states.
Simplest Model 1 defined as:

- (1) $y_r = \beta_0 + \beta_U U_r + \beta_P POP_r + \varepsilon_r,$

where *y* is the log of cumulative COVID-caused deaths 100 days after the first death in nation/state, *U* is a dummy for whether the nation/state is in the USA, *POP* stands for size of the population.

Next, we add

- intergenerational co-residence (measured as proportion of
- those aged 18 to 34 who live with their parents),
- percent of the population over 65,
- percent urban,
- economic variables (Gross Domestic or State Product per capita and rental prices). This gives equation 2

$$(2)\ y_r = \beta_0 + \beta_U U_r + \beta_P POP_r + \beta_1 X_{1r} + \varepsilon_r,$$

Rental prices may be a proxy for residential patterns and affect real income. The two equations were estimated. Results follow (skipping coefficients of missing values)

Then we add the following variables to the model:

- number of days since first death in France, (recorded on Feb 15 2020)
- the square value of this number,
- whether a government is left-leaning or not.
- a vector of social distance measures specifying whether a state or country instituted a full or partial lockdown and number of days it took to implement the measure after the onset of the pandemic in each nation/state.

The measures we consider: full lockdown (all-day but could allow citizens to buy essential items), night curfew or other partial lockdown (could apply only to part of the population), closed schools, closed shops and closed social events.

Results next:

Semi-Logarithmic Regressions of Deaths after 100 days; no controls for lockdown measures

VARIABLES	Model 1	Model 2
US	1.302***	**0.995****
	(0.374)	(0.497)
Population size	0.0810***	**0.0660*****
	(0.0130)	(0.0112)
Co-residence		**0.0314****
		(0.0152)
% over 65		0.787
		(10.28)
% urban		**0.0386*****
		(0.0137)
GDP pc		3.91e-06
		(1.33e-05)
Rental prices		**0.000533***
		(0.000308)
Constant	4.857***	0.180
	(0.340)	(2.792)
Observations	85	85
R-squared	0.415	0.621

Semi-Logarithmic Regressions of Deaths after 100 days; with controls for lockdown measures

Variables	
US	0.404
	(0.535)
Population size	0.0575***
	(0.0142)
% urban	0.0265*
	(0.0138)
Rental prices	0.000471*
	(0.802)
Days since Onset in France, squared	-.0028**
	(0.001)
Constant	0.0287
	(2.879)
Observations	85
R-squared	0.768

Finding Re Question I: Covid deaths and intergenerational co-residence

- We find a positive association between Covid deaths and intergenerational co-residence: one extra percentage point in the share of co-residence is associated with a 3.1 percent increase in cumulative deaths.
  - Across European countries weak and not significant statistically (consistent with analyses at the cross-country level, the European regional level or based on an analysis of Italian regions).
  - Considerably larger in the US than in Europe. In the USA, a one extra percentage point in the share of co-residence is associated with a 10.9 percent increase in cumulative deaths from Covid 100 days after the onset of the pandemic in that state.
- After we introduce social distance measures the US/Europe gap in mortality disappears (it becomes statistically insignificant in third model reported above).

Re Question II: How beneficial is it that a country's pandemic started at a later date?

- We find that the later the onset of the pandemic in a particular country/state, the fewer the cumulative deaths from covid.
- This finding is emphasized in our paper published in *Pathogens and Global Health*.
- When using an expanded data set of 85 countries/states, we find that if an area got one extra day to prepare for covid, cumulative deaths go down by **7.9% and 10%** (for deaths at 100 days, depending on the controls included in the model)

Re. Question III: were people more likely to die in the US than in Europe?

- **Yes, but only when only using demographic and economic explanatory variables in the regression**
- Specifically, at 100 days past onset the number of cumulative deaths in a US state is 100% higher than in a European country (.995), i.e. **double.**
- After we introduce social distance measures the US/Europe gap in mortality disappears (it becomes statistically insignificant). The following Europe/USA differences help explain the reduced mortality gap:
  - European countries took less time to close schools (on average, 12.1 days after onset, versus 24.9 days in the US) and
  - They took less time to impose full lockdowns in case of full lockdown (on average 3.5 days from onset versus 7.7 days in the US).
  - 100 days after onset in 14 percent of European countries shops were closed (versus in 6 percent of US states) and
  - in 9 percent of European countries there was a partial lockdown (versus zero percent in US states).

Other findings based on Model 2

- 1. The larger the population size, the more cumulative deaths
- 2. For every one extra percentage point increase in the percent urban there are 3.9 (almost 4%) more cumulative deaths after 100 days.
- 3. Every extra hundred dollar of rental price is associated with a 5.3% increase in cumulative deaths (more expensive for generations to live in separate dwellings)

Effectiveness of social distance etc measures

- After such measures are introduced (and the timing of those measures) US/Europe gap in Deaths @100 days is no longer statistically significant.
- Other characteristics of the countries/states are no longer statistically significant.
- Remaining: weak ‘effects’ of percent urban, rental prices, days since onset, squared.

By incorporating information on these social distancing measures

- We account for a large portion of the US/Europe gap: it appears that US states had more cumulative deaths because they tended to be less likely to institute measures reducing the spread of covid
- Or they introduced these measures at a later stage

Our results regarding the association between cumulative deaths and measures of social distance are consistent with those of

Li, Ruiyun, Bin Chen, Tao Zhang, Zhehao Ren, Yimeng Song, Yixiong Xiao, Lin Hou, Jun Cai, Bo Xu, Miao Li, Karen Kie Yan Chan, Ying Tu, Mu Yang, Jing Yang, Zhaoyang Liu, Chong Shen, Che Wang, Lei Xu, Qiyong Liu, Shuming Bao, Jianqin Zhang, Yuhai Bi, Yuqi Bai, Ke Deng, Wusheng Zhang, Wenyu Huang, Jason D. Whittington, Nils Chr. Stenseth, Dabo Guan, Peng Gong, and Bing Xu. 2020.
Global COVID-19 pandemic demands joint interventions for the suppression of future waves.
In
PNAS, October 20, 2020. 117 (42) 26151-26157;
https://doi.org/10.1073/pnas.2012002117.

Conclusions

At 100 days after onset of Covid, we find that

I. Covid deaths and intergenerational co-residence: one extra percentage point in the share of co-residence is associated with a 3.1 percent increase in cumulative deaths.

II. The later the onset of the pandemic in a particular country/state, the fewer the cumulative deaths from covid.

III. The number of cumulative deaths in a US state is 100% higher than in a European country.

After we control for a vector of social distance measures and their timing, only finding II remains statistically significant. This suggests that the major source for the Europe/US gap in mortality is the extent to which they implemented social distance measures.

Caveats and suggestions for further work

- Caveat: results depend on number of days since onset of the epidemic in a particular area.
  - For example, the association between intergenerational coresidence and cumulative deaths from covid (using logs of deaths) is somewhat stronger 40 days after onset than 100 days after onset. By then some countries/states may have been affected by a second wave of infections.

- Suggestions for further work:
  - Expand the data to include more countries (or states in the case of large countries)
  - Include additional variables that seem to matter based on previous studies, such as weather conditions.