

# Pandemic Babies?

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The Fertility Response to the First Covid-19 Wave across European Regions

Natalie Nitsche, Aiva Jasilioniene, Jessica Nisen, Peng Li, Jonas Schöley, Maxi Kniffka, Gunnar Andersson, Christos Bagavos, Ann Berrington, Ivan Čipin, Susana Clemente, Lars Dommermuth, Peter Fallesen, Dovile Galdauskaite, Mathias Lerch, Cadhla McDonnell, Arno Muller, Karel Neels, Olga Pötzsch, Diego Ramiro, Bernhard Riederer, Saskia te Riele, Laura Szabó, Laurent Toulemon, Daniele Vignoli, Krystof Zeman, Tina Žnidaršič, Mikko Myrskylä



# **MOTIVATION & RELEVANCE**

- Investigating fertility response to pandemic so far focused on country level (e.g. Sobotka et al 2021, Aassve et al 2021)
- However, large sub-national variation in fertility well-documented (Kulu 2013, Klüsener et al. 2019, Campisi et al. 2020, Nisen et al. 2021)





NUTS-2 Regions (Nomenclature of Territorial Units for Statistics) across Europe



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- However, large sub-national variation in fertility well-documented (Kulu 2013, Klüsener et al. 2019, Campisi et al. 2020, Nisen et al. 2021)
- Fertility impact of prior 'local' disasters on fertility behaviors often localized (Davis 2017, Rodgers, John & Coleman 2005, Nobles et al. 2015, Ruther 2010),
- Even more spatially generalized crises, like recessions, have been sho
  heterogeneous effects on birth rates (Goldstein et al. 2013, Matysiak, Sobotka &

 $\rightarrow$  Sub-national variation in fertility response expected





# AIMS OF STUDY

- Document sub-national monthly birth rate changes in November 2020-April 2021 (first Covid-19 wave conceptions in February 2020-July 2020), by comparing observed to expected monthly birth rates ("excess births")
  - Sub-national heterogeneity in 'pandemic' birth rate changes?
  - Does country level mask sub-national disparities in fertility 'pandemic response'?
- 2. Assess 'significance' of observed changes light of expected monthly birth rates (forecasts) based on modeling prior trends
  - Observed birth rates outside of prediction interval?
- Explore association between NUTS2-level regions' "excess births" and their first wave Covid-19 affectedness



# **DATA: COLLECTED FROM NATIONAL REGISTERS**

- Births: Monthly NUTS-2 level birth counts from 2000-June 2021
- **Population**: women 15-49 (monthly, yearly)
- Covid-19 cases: monthly incidence rates on NUTS-2 level





#### Aiva Jasilioniene

Bagavos, Ann Berrington, Ivan Čipin, Susana Clemente, Lars Dommermuth, Peter Fallesen, Dovile Galdauskaite, Mathias Lerch, Cadhla McDonnell, Arno Muller, Karel Neels, Olga Pötzsch, Diego Ramiro, Bernhard Riederer, Saskia te Riele, Laura Szabó, Laurent Toulemon, Daniele Vignoli, Krystof Zeman, Tina Žnidaršič

Leaflet



Jessica Nisen **Register Based Fertility Network** 



## **METHOD**

- 1) Modeling of expected monthly births (forecast) for months 11/2020-April 2021
  - 12 overdispersed poisson regressions
  - Fit on 3, 5 or 7 years on previous birth data
  - All: Log-linear time trends, month-fixed effects (seasonality)
  - Some: Quadratic time trends
  - Models control for population (women aged 15-49)
  - Separate models for each NUTS-2 regions
  - Final estimates and prediction intervals averaged across all forecasting models (joint weighted sampling)
  - Difference between observed and expected monthly births ('excess births') plotted on maps (in percent)
  - 3) Maps indicate whether estimate for excess births lies within 10% prediction interval
  - 4) Correlate monthly 'excess births' with cumulative Covid-19 first wave cases Feb-Apr 2020

Code can be found here: <u>https://github.com/jschoeley/xfertility</u>



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# RESULTS: MONTHLY EXCESS BIRTHS, NOV. 2020 – APRIL 2021







@jschoeley



Percent excess births in Europe Nov 2020 through April 2021 (cumulative)

Covid-19 cases per 100.000 population during the first Covid-19 wave

(February to April 2020) in Europe





## **RESULTS: EXCESS BIRTHS AND COVID-19 CASES**

ISL

ITA •

LTU

NDL •

NOR

PRT

SVK

SVN

SWE

UK

• LVA

Percent Excess Births in January 2021 and Cases per 100.000 population during the first Covid-19 wave (February to April 2020)



# **RESULTS: EXCESS BIRTHS AND COVID-19 CASES**

AUT

BEL

CHE

CZE

DEU

DNK

ESP

EST

FIN

FRA

GRC

HRV

IRL

ISL

• ITA

LTU LVA

NDL

NOR

PRT

SVK

SVN SWE

UK



Percent Excess Births in March 2021 and Cases per 100.000 population during the first Covid-19 wave (February to April 2020)



# **RESULTS: CUMULATIVE EXCESS BIRTHS AND COV-19 CASES**

PRT

SVK

SVN



Percent Excess Births from November 2020 to April 2021 and Cases per 100.000 population during the first Covid-19 wave (February to April 2020)





# CONCLUSIONS

- Regional and monthly perspective important to fully assess fertility response to pandemic
- Only possible via teamwork, resource pooling, rigorous data collection effort
- Regional within-country heterogeneity, but small in Spain, Portugal, Finland, Norway, Netherlands
- Urban-rural differences, steepest cumulative birth declines and lower excess births in capital regions (except Stockholm)
- Positive correlation between higher first-wave Covid-19 case rates and birth declines in December and January births across regions
- No clear correlation between regional excess births and Covid-19 cases in 'catch-up' phase or cumulative excess births



#### OUTLOOK

- Formal variance measure to assess sub-national variation in pre- and post pandemic birth rates
- Formal testing of urban-rural differences in fertility response
- Formal testing of fertility-response & Covid-19 cases relationship
- Examine baby bust/baby boom relationship across regions, did the same regions catch up?
- Socio-economic predictors of sub-national response (follow up paper)



#### THANK YOU FOR YOUR ATTENTION

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