



Utilizing Finnish biobanks in Covid-19 research: Studies on personalized progression of COVID-19 in Finland

COVIDreg & COVIDprog– Nation-wide THL coordinated studies

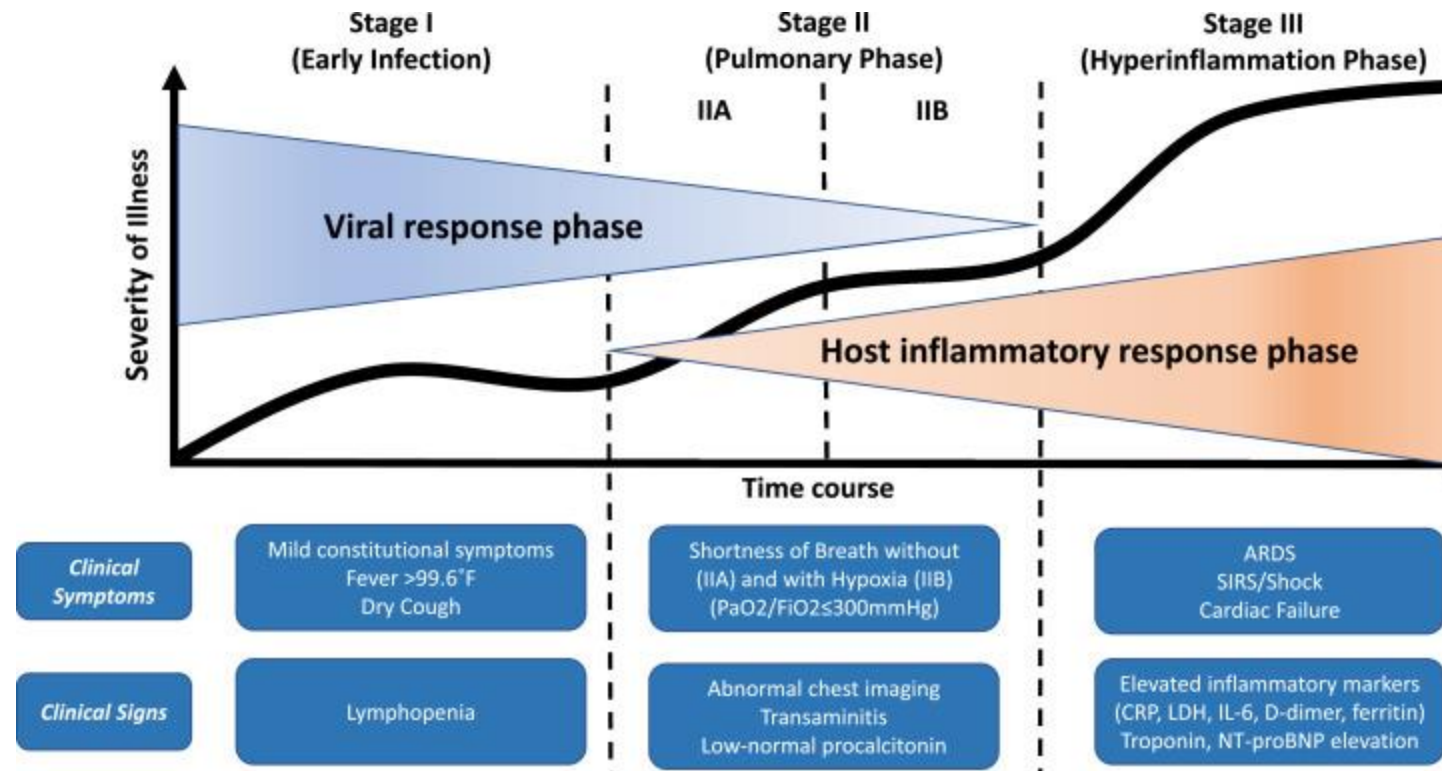
Markus Perola

Terveysten ja hyvinvoinnin laitos

COVID-19 progression

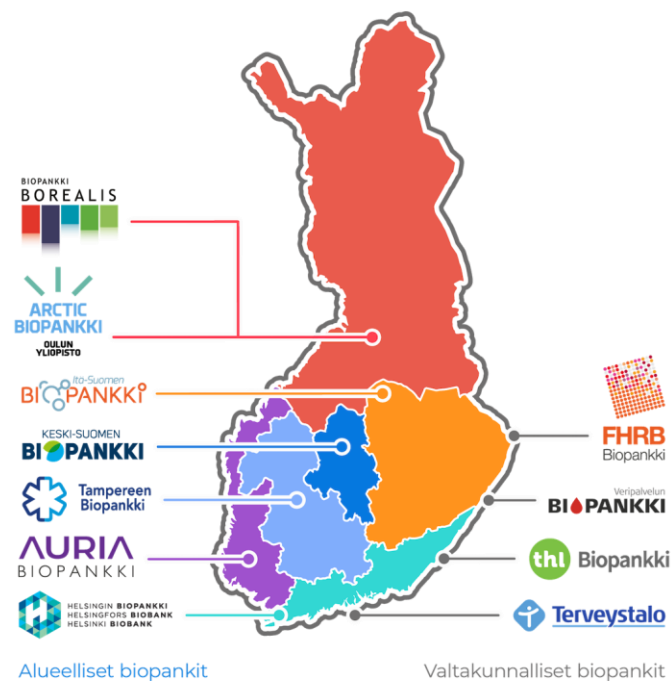
The majority stay here

Severe form of disease—>



Siddiqi HK, Mehra MR.

J Heart Lung Transplant. 2020 May;39(5):405-407



COVIDProg

COVIDreg

COVIDreg supports COVIDprog

- The COVIDreg-study is a registry-based study on:
 - Disease history, demographics and the risk of contracting COVID-19
 - Registry data and the complications and mortality for COVID-19.
- Includes all residents of Finland (having a social security number)

1. Digital and Population Data Services Agency: *Place and date of birth, municipality, language, age, sex, date of death, number and type of family members in same household.*

2. Care Register for Health Care: *Patients discharged from in- and outpatient care, ICD codes etc.*

3. Kanta Services Register: *Prescription centre, data repository and patient data management service, client data archive for social welfare services, My Kanta personal health record*

4. Registry on Reimbursements of Prescription Medicines: *ATC codes, costs, diseases etc.*

5. Statistics Finland: *Socioeconomic data, education, profession, field of work*

6. National vaccination register: *Vaccination status for various diseases*

7. Medical Birth Register: *Data on live births and on stillbirths as well as data on the mothers.*

8. Cancer Registry: *All cancer cases and types in Finland, the survival and mortality of the patients*

9. Causes of Death Register: *Main and contributing causes of deaths*

10. Register of Congenital malformations: *Congenital abnormalities.*

11. Intensive care treatment register: *Treatment details, adverse events, respiratory support, cost.*

12. National infectious disease register: *Selected diseases and microbes*

COVIDreg 1.4.2021, COVID + n=73599 (1.3%)/5 572 420

The first year of COVID: Who got COVID-19 in Finland?*

→ pandemic in mostly unvaccinated population

Kirsi Auro, Teemu Paajanen, Sami Koskelainen, Suvi Vaara, Minna Brunfeldt, Tuula Hannila-Handelberg,
Oskari Luomala, Matti Reinikainen, Otto Helve, Tuija Leino, Emmi Sarvikivi, Mika Salminen,
Kati Kristiansson ja Markus Perola

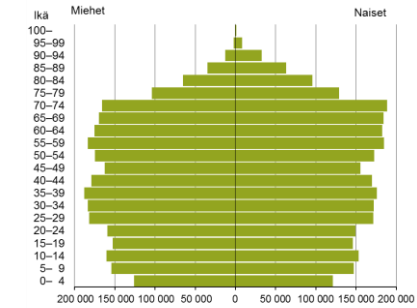
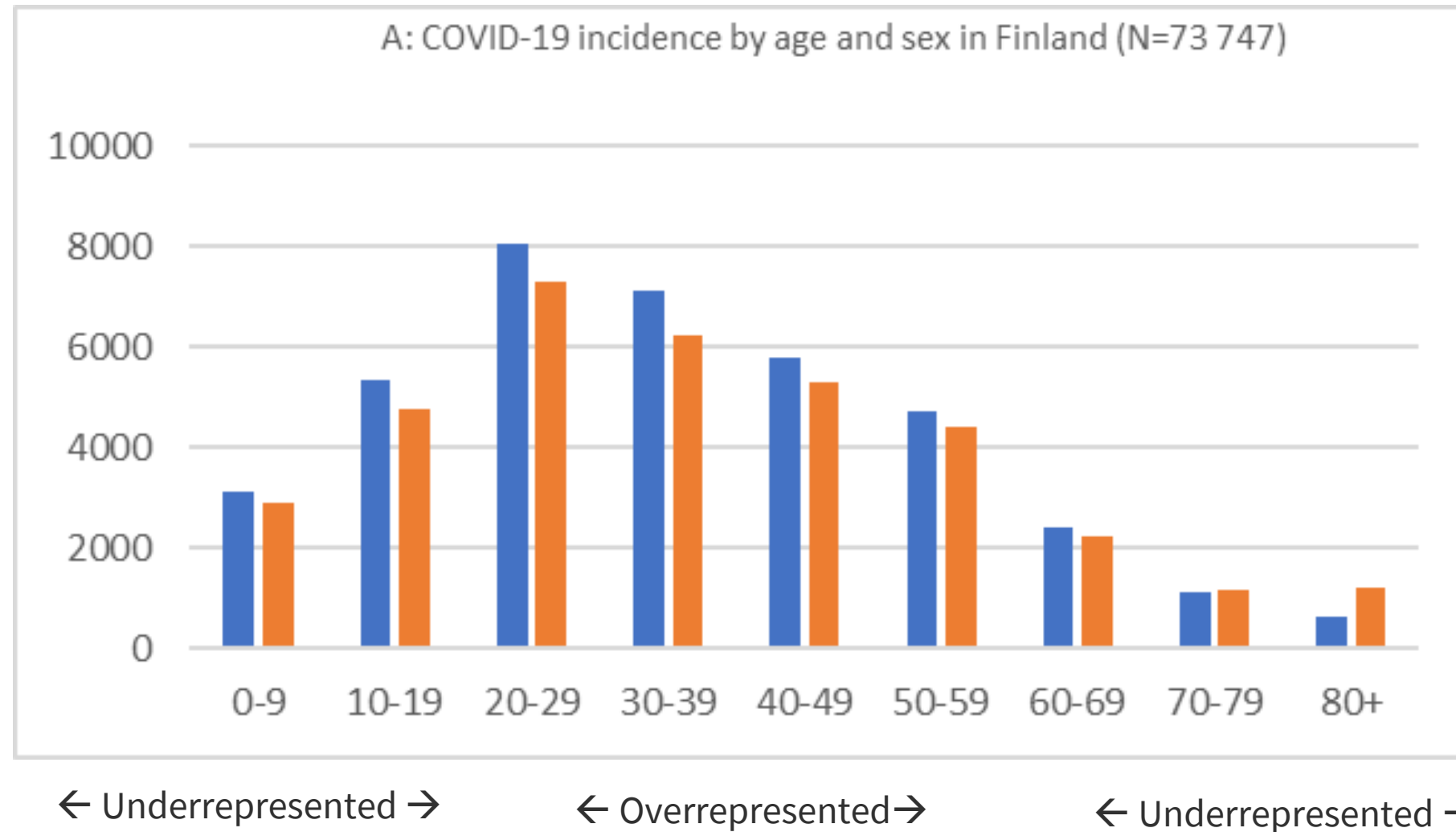
*positive PCR+ result

**COVID-19-pandemian tunnusluvut Suomessa:
ensimmäinen pandemiavuosi**

Males vs females

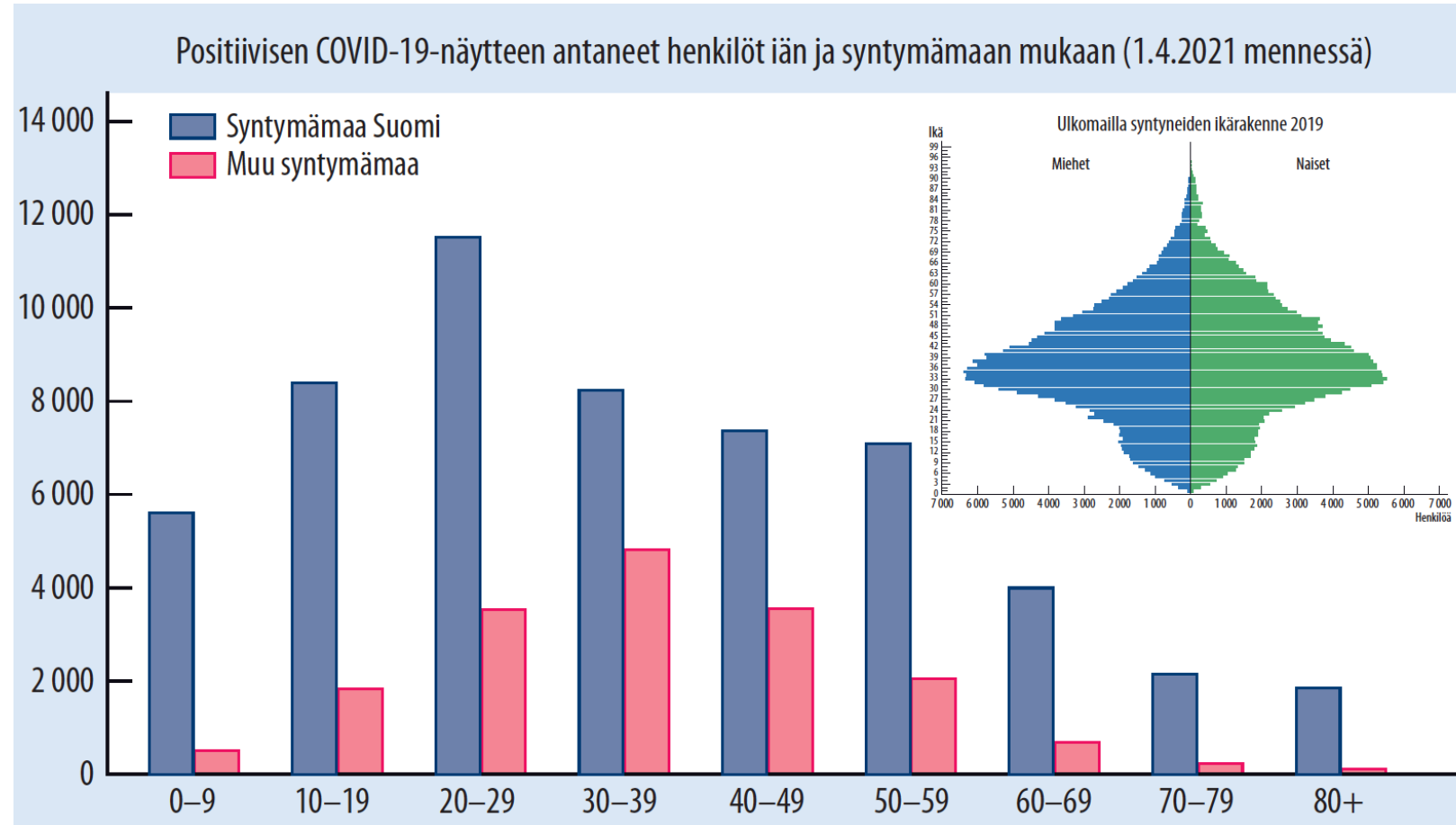
Young vs old

Male risk 1,04x



Statistics Finland / Population structure

Born in Finland / Born out-of-Finland



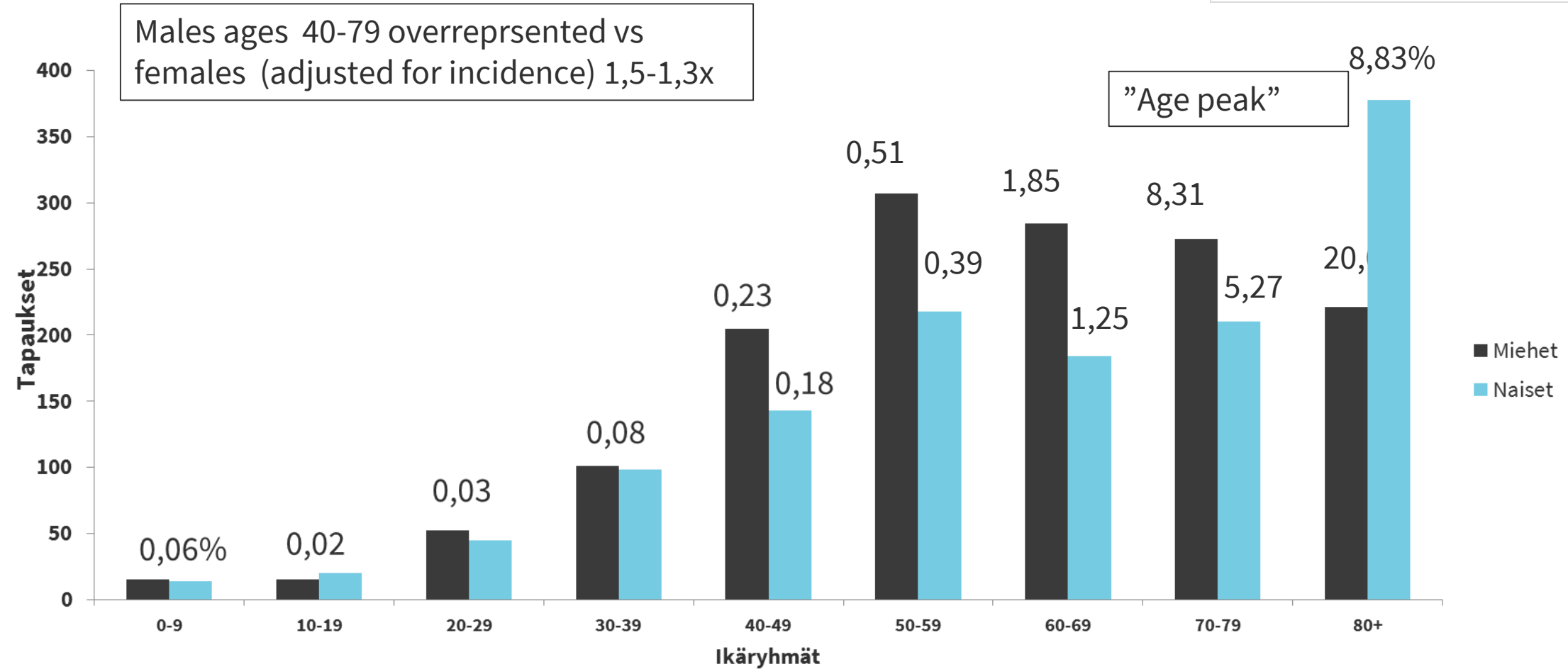
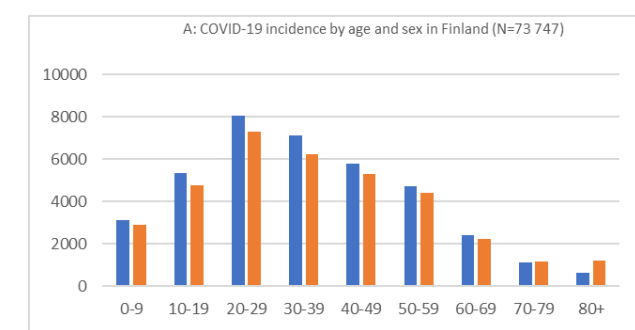
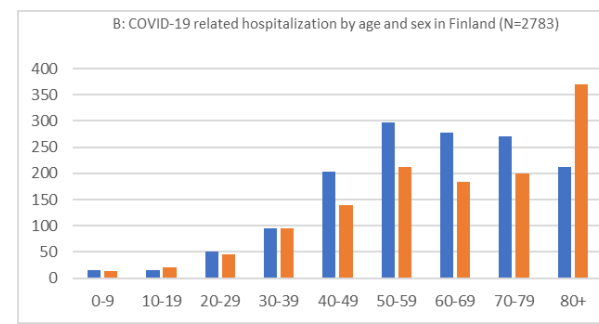
People who live in Finland but who are not born in Finland: 7,3% of the whole population

By March 2021: 23% of COVID-19 patients in Finland are born outside of Finland (OR 3.14)

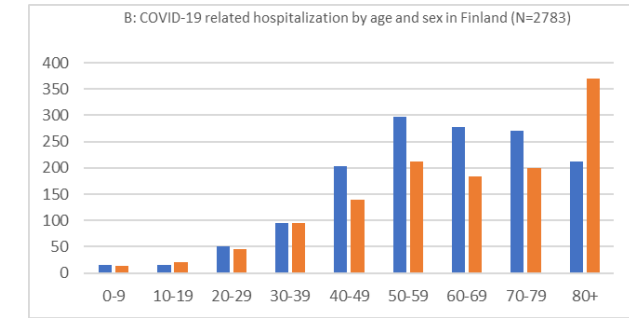
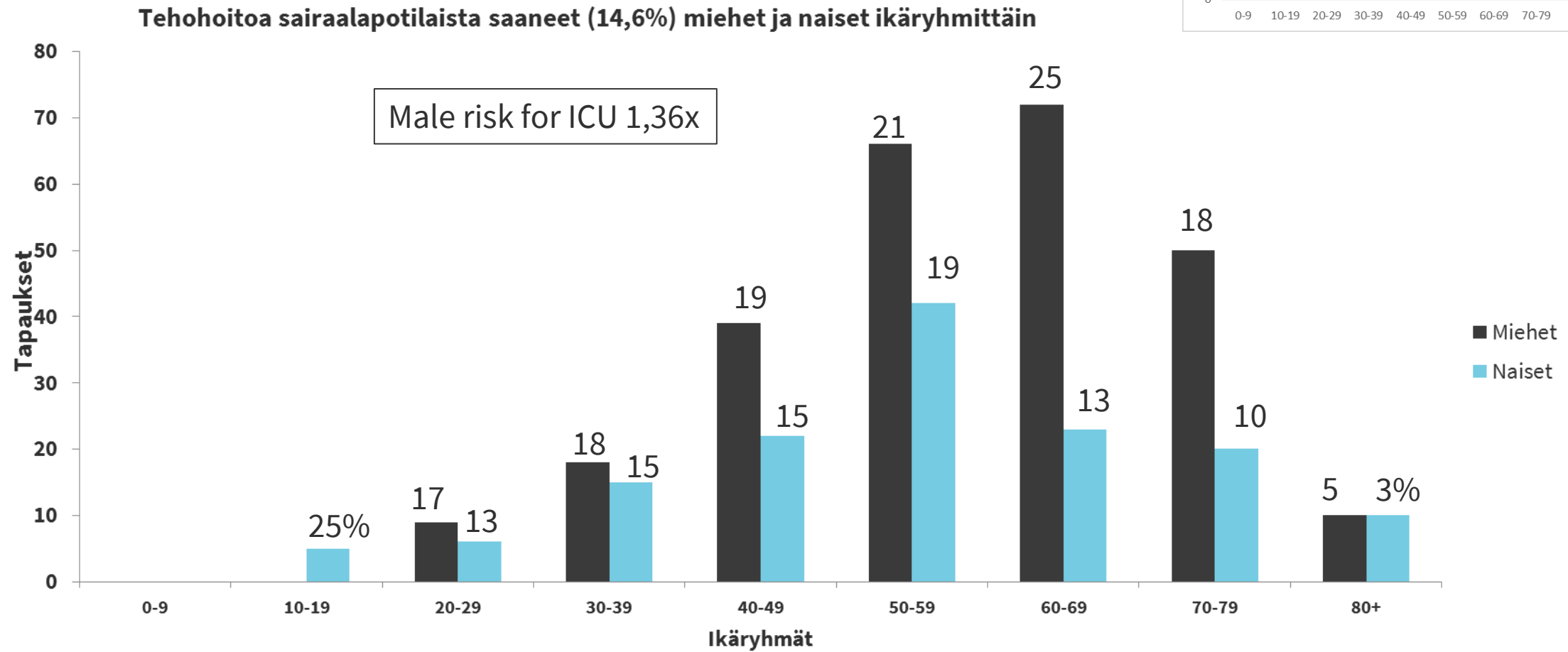
Who got severe COVID-19 in Finland 2020-21?*

*a positive PCR result + gets hospitalized and/or dies

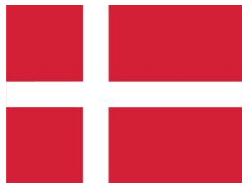
Hospitalization



Intensive care

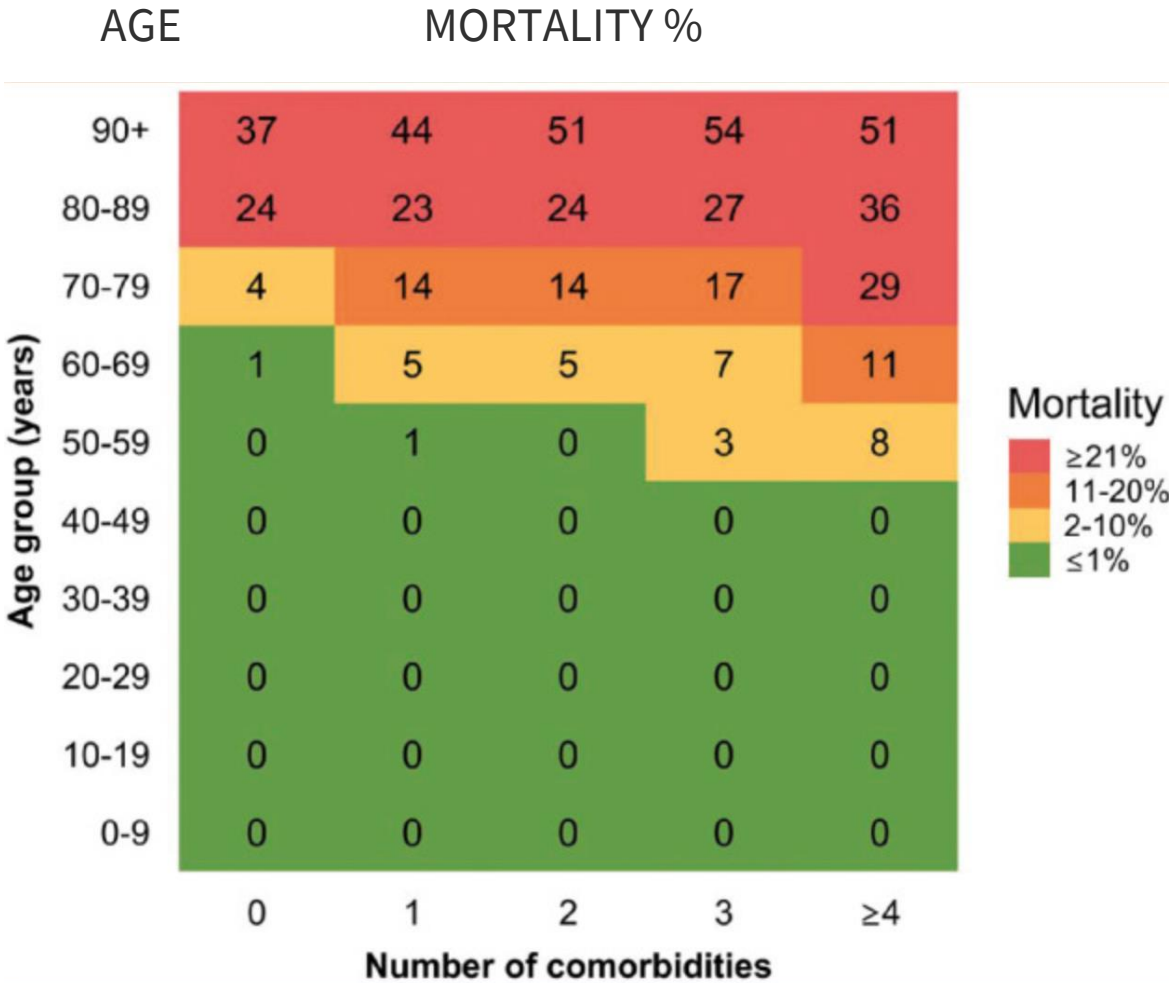


Co-morbidities and mortality



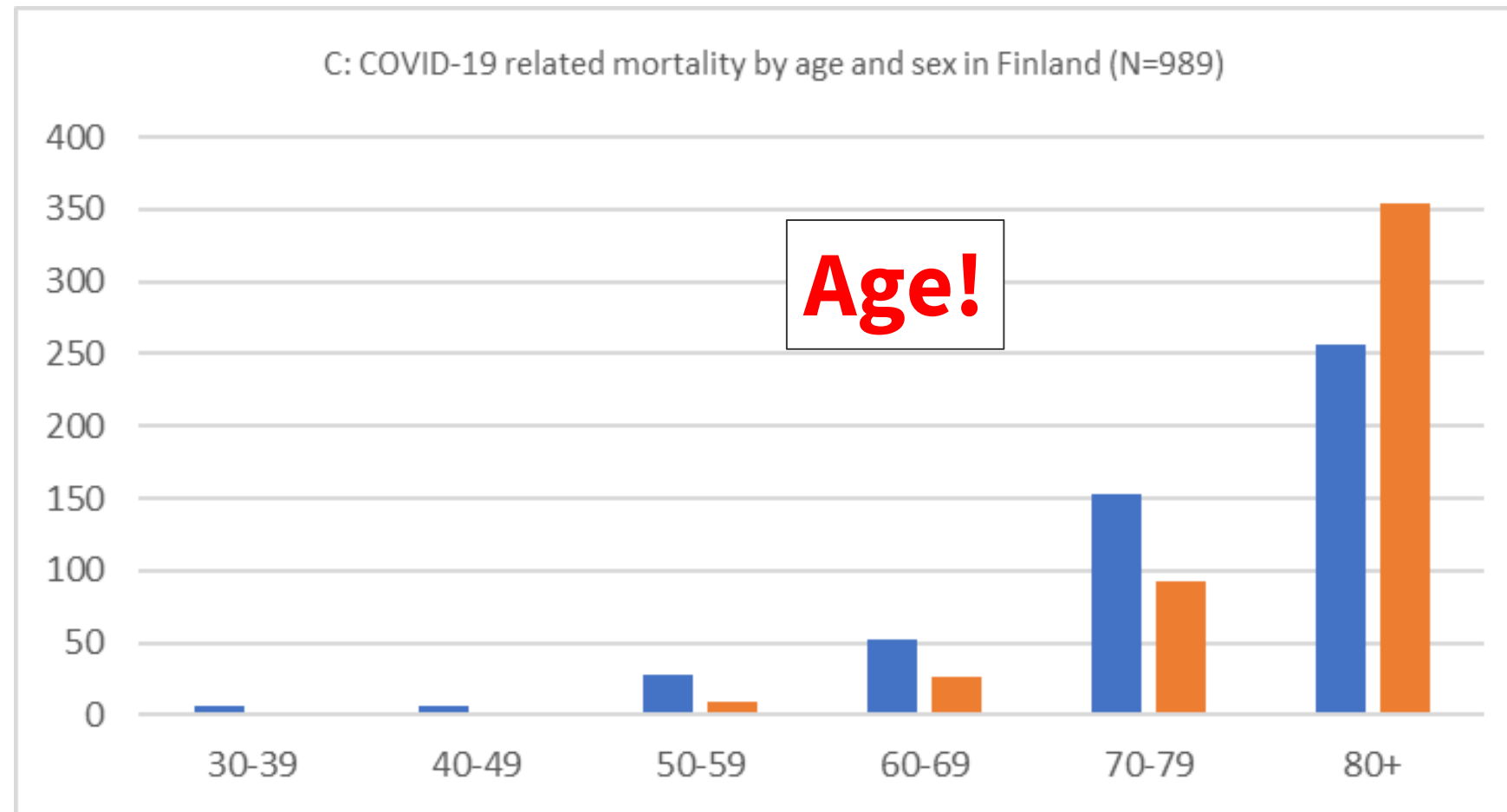
AGE	MORTALITY %			
80+	20,4	19,1	23,8	30,7
70-79	2,4	6,0	7,5	15,2
60-69	0,3	1,4	2,0	4,1
50-59	0,1	0,5	0,8	0,0
40-49	0,0	0,0	0,0	0,0
30-39	0,0	0,0	0,0	0,0
20-29	0,0	0,0	0,0	0,0
10-19	0,0	0,0	0,0	0,0
0-9	0,0	0,0	0,0	0,0
	0	1	2	≥3

Number of comorbidities



Reilev M, Kristensen KB, Pottegård A, Lund LC, Hallas J, Ernst MT, Christiansen CF, Sørensen HT, Johansen NB, Brun NC, Voldstedlund M, Støvring H, Thomsen MK, Christensen S, Gubbels S, Krause TG, Mølbak K, Thomsen RW. Characteristics and predictors of hospitalization and death in the first 11 122 cases with a positive RT-PCR test for SARS-CoV-2 in Denmark: a nationwide cohort. Int J Epidemiol. 2020 Oct 1;49(5):1468-1481.

COVID-19 related mortality



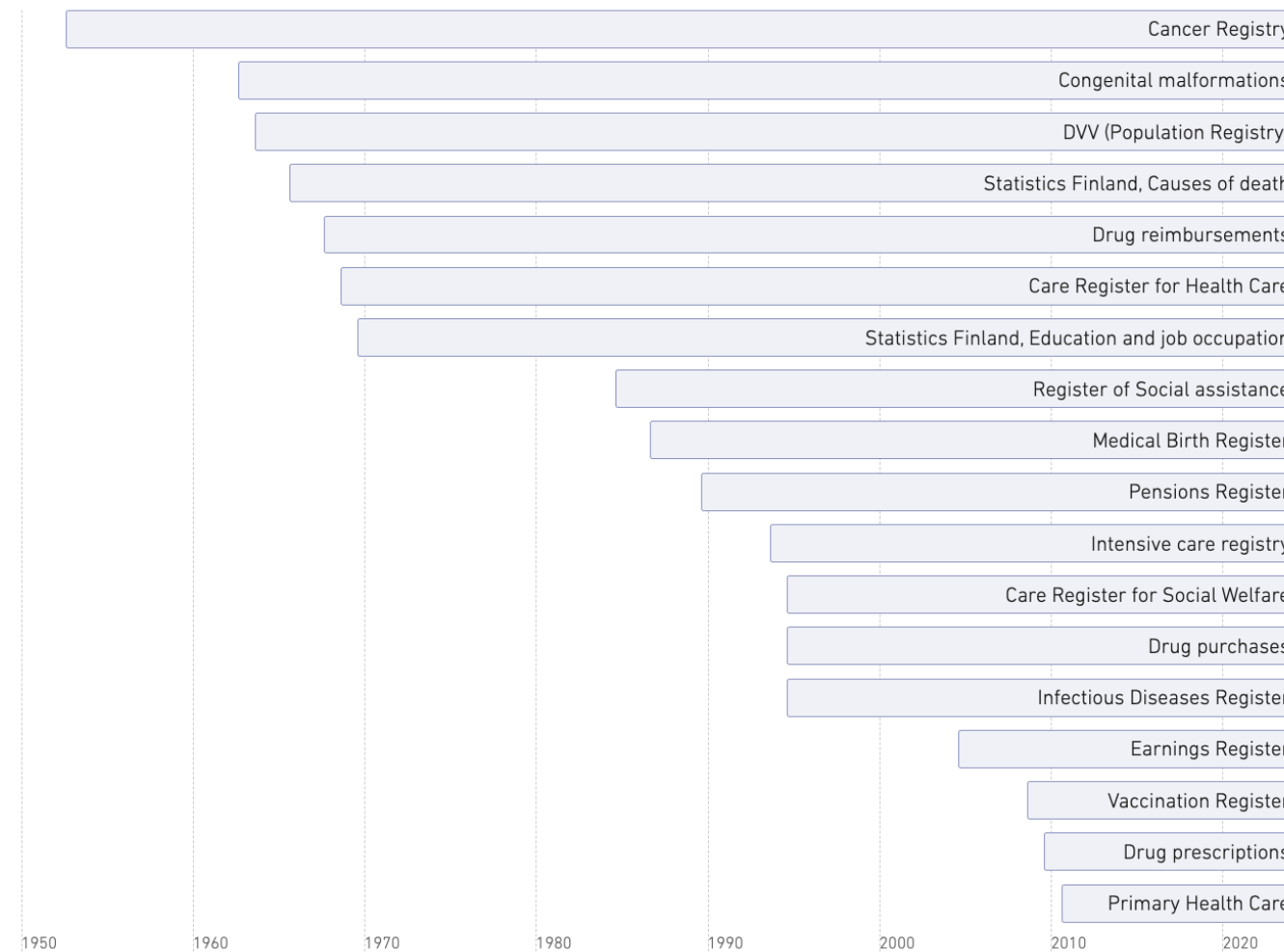
Age!

Almost 30%
mortality
>80-years

Conclusions

- The disease progression in Finland seems a lot like elsewhere in Western developed countries in the period without significant vaccination coverage
 - **Age**, sex, co-morbidities
 - Mortality lowish even vs other Western countries
 - Males (adjusted for age) had larger risk for ICU and death

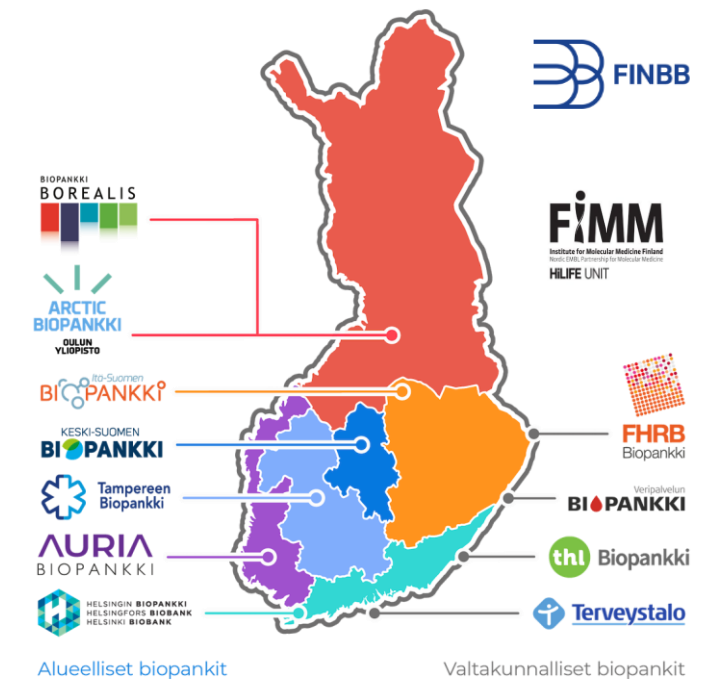
Future: FinRegistry



18 registers
7.1 million people
>4 billion rows of data
ML approach

COVIDprog: not "what" but "why?"!

- A THL-led study recruiting mostly hospitalized PCR+ COVID-19 patients and non-covid
- Controls:
 - hospital cared respiratory infection (SRIS)
 - Non-hospitalized
- Recruiting ended 31.12. 2021
- Analyses:
 - National registries
 - Clinical information from hospitals, questionnaires
 - Genomics, metabolomics, serology

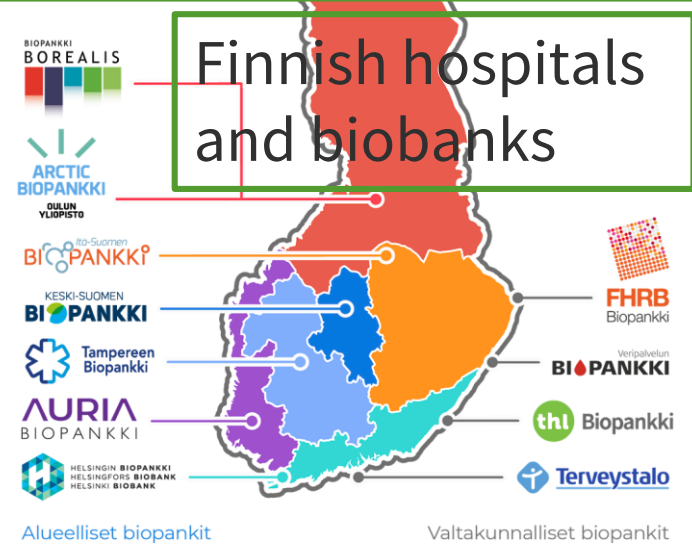


COVIDprog – initiation in 2020

- Request for action from THL General Director March 14th
- First contact to biobanks the same day
- Ethical positive statement March 25, 2020
- The first recruit in Tampere April 1st, 2020
 - The last biobank starts recruit in early fall 2020
- (Funding recieved fall 2020)



Consented COVID-19 patients & controls
Clinical and omics data



 **thl**
National
Health Registers
All residents of Finland

On-going



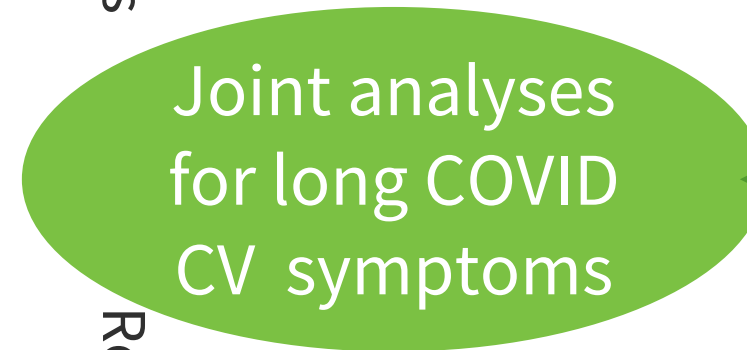
Linkage between the
studies by the unique
Finnish id code



2022→

Questionnaires

WP1: Long COVID
Case-Control
study



Registry analyses

WP3 Long COVID
Registry study

COVIDprog - participants

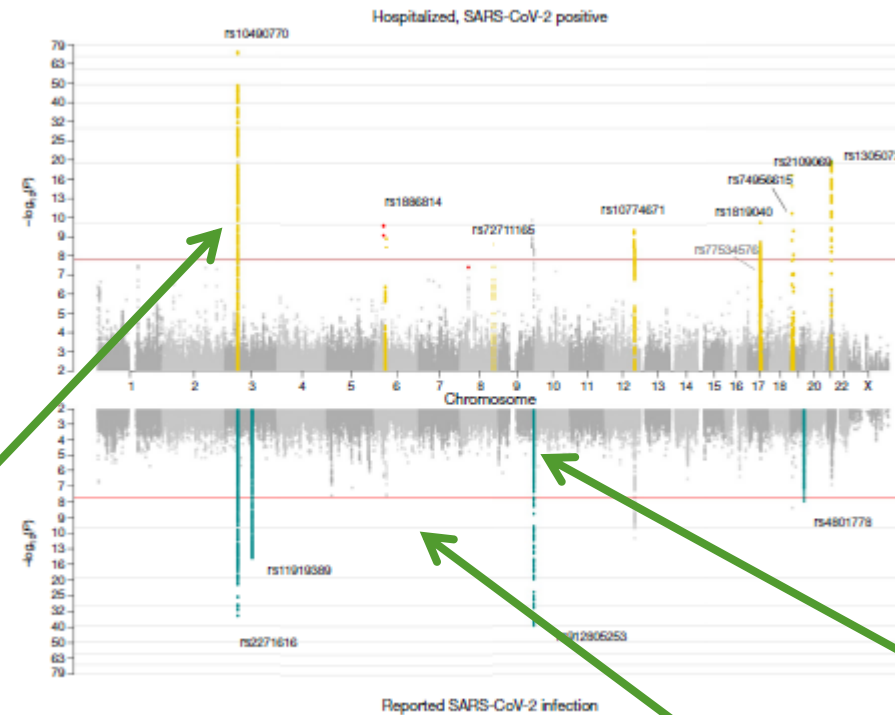
- 2389 consented participants (Males 949 / Females 1440)
- Average age 50.86 (M53.19/F49.33)
- Age COVID+ 49.10 (M51.87/F47.18)
- Age COVID- 53.93 (M55.70/F52.87)
- Deaths COVID+ 67.95 (M69.08/F65.86)
- Deaths COVID- 78.53 (M77.82/79.43)

COVID-HGI GWAS

COVID-19 Host Genetics Initiative. Mapping the human genetic architecture of COVID-19. Nature. 2021 Dec;600(7889):472-477.



Andrea Ganna / FIMM



Chr 3 peak also associates
with the severe form

Where is HLA?

ABO locus

2022 Further plans:

- Follow-up questionnaires
 - longCOVIDprog, longCOVIDreg
- Predisposition for not taking the vaccination (manuscript in circulation)
- Polygenic/omic scores for various COVID endpoints
- COVIDreg integration with COVIDprog data
 - Clinical variables, background information
- AI models for risk prediction (RIKEN)

Thanks!

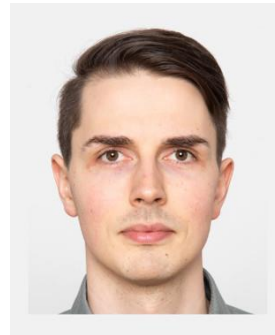
- COVIDprog-participants!
- Team (COVIDreg):



markus.perola@thl.fi



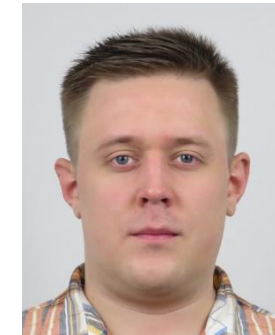
Kati Kristiansson



Sami Koskelainen



Kirsi Auro



Teemu Paajanen



Minna Brunfeldt

- COVIDprog: tens of biobankers, clinicians and other experts across Finland, RIKEN, BCPlatforms
- COVIDprog+reg-funding: Governmental/STM special funds