RESEARCH CENTRE FOR DEMOGRAPHIC ANALYSIS, MODELS, AND METHODS

CHARLES UNIVERSITY
Faculty of Science

CZECH RECOVERY PLAN

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Inequalities in Prevention and its Mortality Manifestation: Case Study Using Nationwide COVID-19 Database

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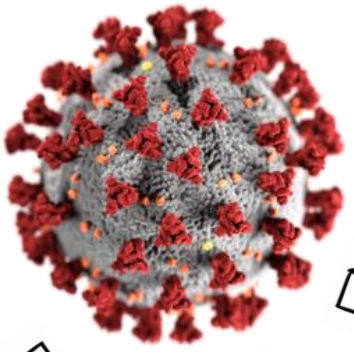
Background



Opening up data, enriching available databases, unique research opportunities

New questions

Preventive measures, vaccination

Increased mortality, worsening health, lockdowns, burden on the healthcare system, economic impacts

Pictures: https://cs.wikipedia.org/wiki/Covid-19; https://www.istockphoto.com/cs/fotky/anti-vaccination-protest

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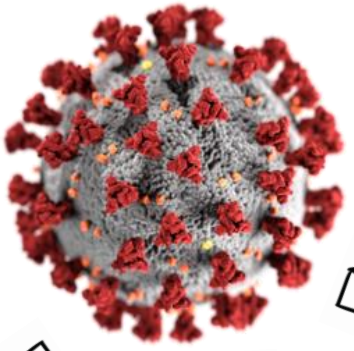

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Determinants – review of literature

Environmental factors

Access barriers (financial, geographic)

Level of perceived risk of the disease

Lack of information, misinformation

Personal factors

Socioeconomic level (income, education, occupation)

Individual beliefs – „natural immunity“, alternative medicine

Risk perception, risky behavior

Trust in health care providers and experts, in prevention

Previous experiences

Social factors

Social networks

Media and information sources

Historical consequences

Safety and Vaccine-related factors

Safety concerns

Vaccine efficacy, ingredients, development process (speed, testing)

Personal fears – fear of needles

Vaccine-specific concerns

Goje, O., & Kapoor, A. (2024).; Xie, W., Shi, L., Liu, M. *et al.* (2024); Toshkov D. (2023)…

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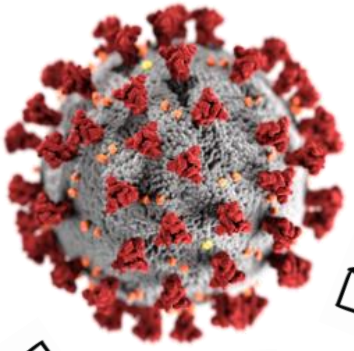

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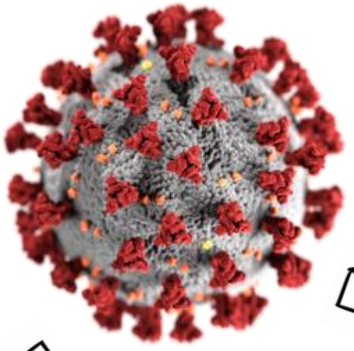

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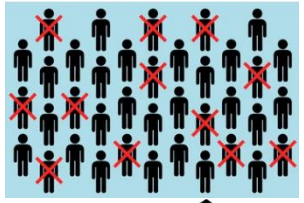
Preventive behavior



Pictures: https://cs.wikipedia.org/wiki/Covid-19; https://www.istockphoto.com/cs/fotky/anti-vaccination-protest; https://cepr.org/voxeu/columns/how-nudge-covid-19-vaccination-while-respecting-autonomous-decision-making; https://www.shutterstock.com/cs/image-vector/death-rate-mortality-part-population-dead-1653286681?dd_referrer=https%3A%2F%2Fwww.google.com%2F

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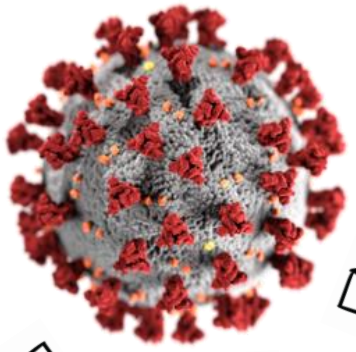


Opening up data, enriching available databases, unique research opportunities

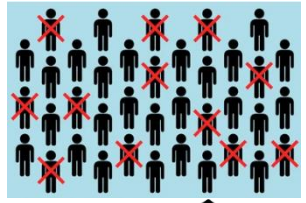
New questions

Are there differences in mortality levels according to vaccination status and what factors may stand behind?

Increased mortality, worsening health, lockdowns, burden on the healthcare system, economic impacts

Preventive measures, vaccination

Preventive behavior



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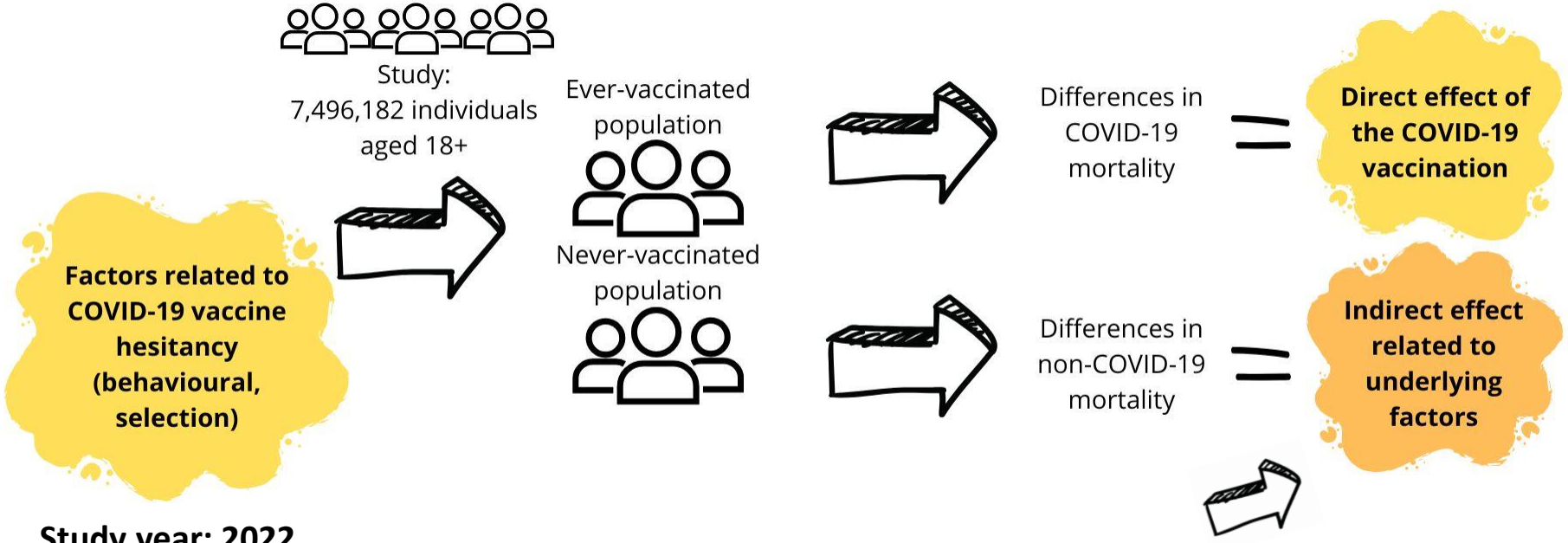
Vaccine resistant population – general characteristics from previous research

- Lower trust in health system, experts, health campaign, or prevention
- Less likely adopt preventive measures or participate in health programs
- Riskier health behaviors – more often smokers, unhealthy diets, insufficient dental hygiene
- Perception of lower risk – feel less vulnerable
- Higher level of agreement with populist political parties
- More likely to be influenced by misinformation, conspiracy theories
- Less sensitive to disease severity

Inam et al. 2023; Rountree, Prentice 2022; Houser, Meier 2023; Neymotin 2021; Bracerra, Bracerra 2022; Murphy et al. 2001; Remschmidt et al. 2015; Shrank et al. 2011

Pictures: https://edition.cnn.com/2022/01/16/europe/europe-covid-unvaccinated-society-cmd-intl

Study design



Study year: 2022
All adults had the possibility to be fully vaccinated

Method: Cause- and sex-specific Cox models assessed mortality risk by vaccination status, age group, and prior registered COVID-19 infections. Five competing causes were included: circulatory diseases, malignant neoplasms, infectious diseases, external causes, and all other causes.

Not effect of vaccination it-self but indirectly of factors related to vaccination decisions

Data sources: the Institute of Health Information and Statistics; Czech Statistical Office

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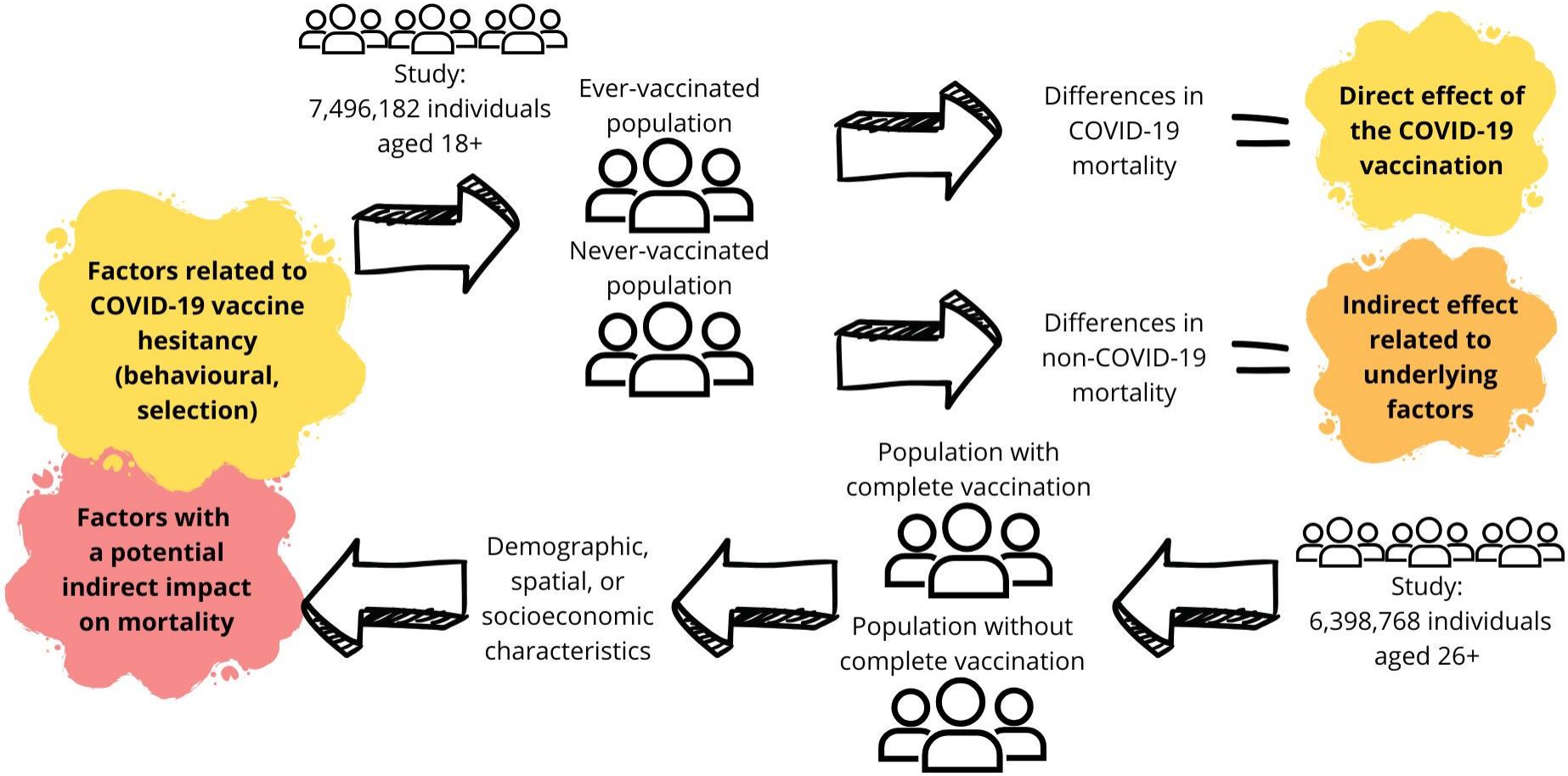
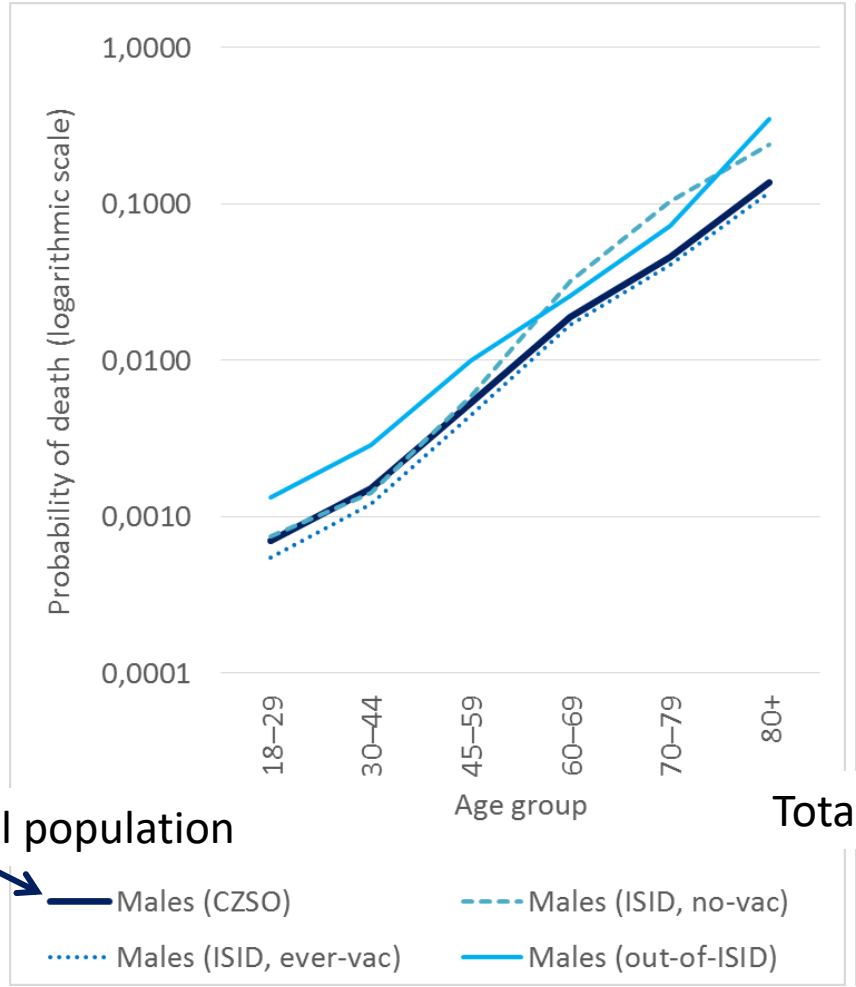


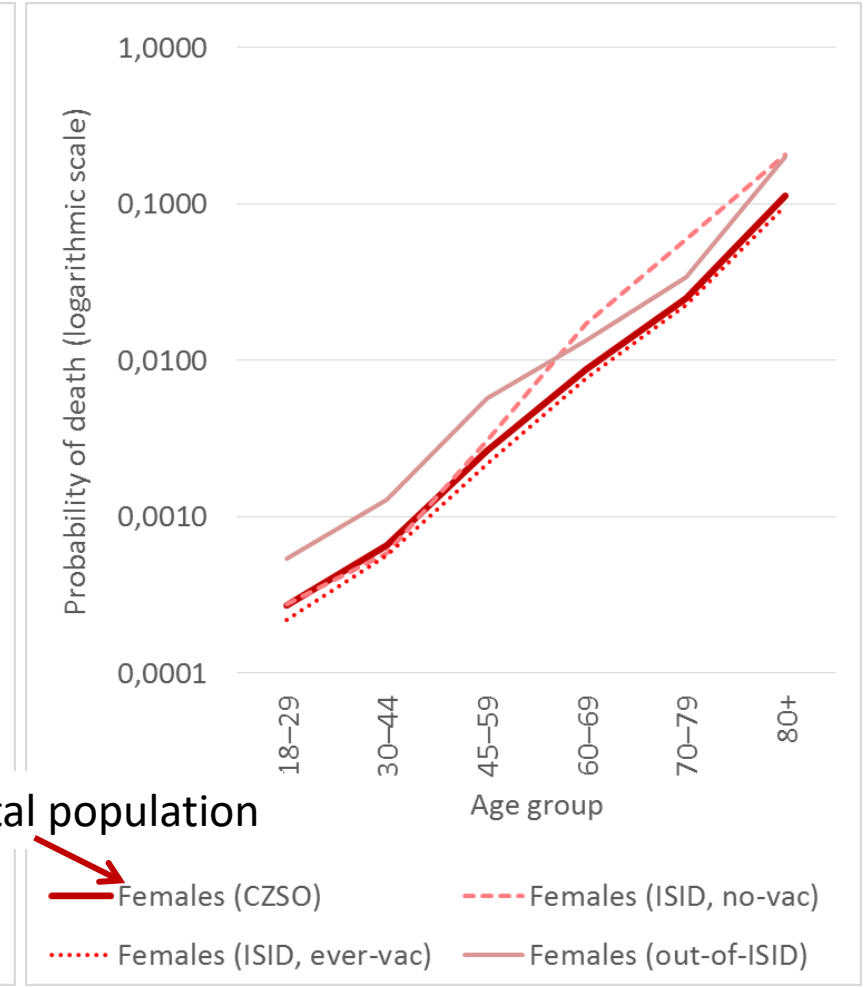
Method: Logistic regression

Data sources: the Institute of Health Information and Statistics; Czech Statistical Office

Step 1: mortality differences (2022)



Total population



Total population

ISID, no-vac = never-vaccinated but tested at least once

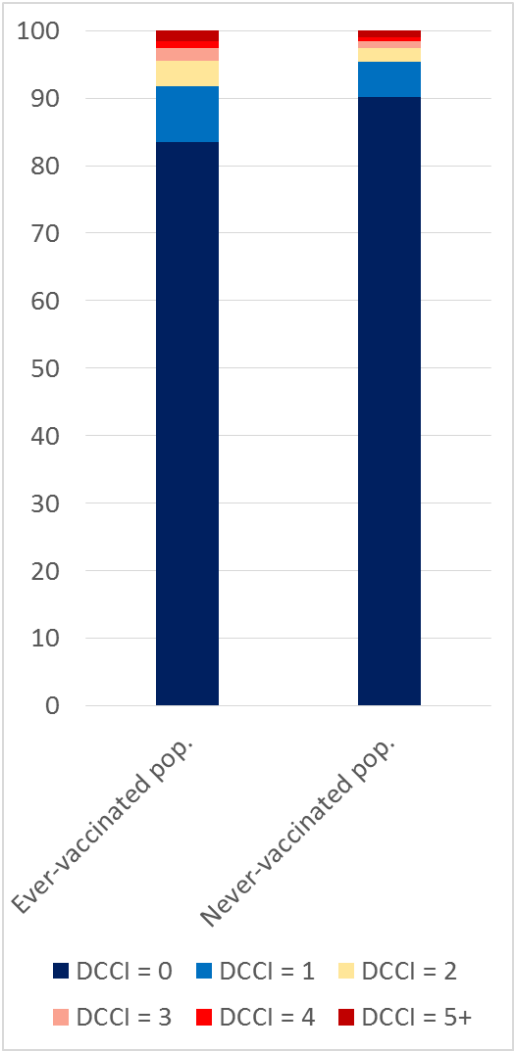
Out-of-ISID = never vaccinated, never tested („out of system“)

ISID: Czech National Information System of Infectious Diseases

Step 1: mortality differences (2022)

Health differences?

- Healthy vaccinee bias (vaccinated population is on average healthier)
- Vaccination targets already at-risk groups (e.g., older, fragile, or those with multiple comorbidities; confounding by indication)
- Any severe illness or crucial health condition preventing vaccination would be reflected in the observed mortality differences in the first weeks and months after the vaccination process (2022 = on average one year after vaccination)

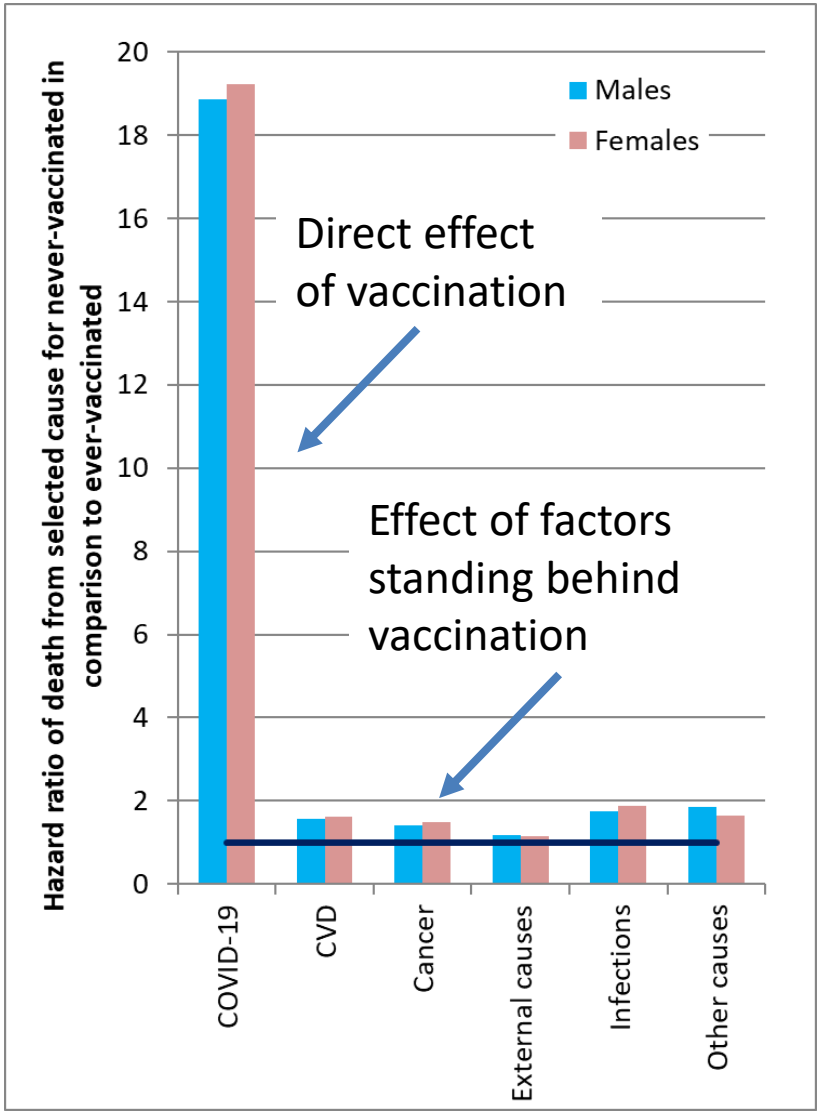


The **Deyo-Charlson Comorbidity Index (DCCI)** is an adaptation of the Charlson Comorbidity Index designed specifically for use with administrative data, where a score of **0** indicates no comorbid conditions and higher scores reflect greater comorbidity burden and associated risk of adverse health outcomes.

Step 2: mortality differences according causes of death

- Unvaccinated individuals had a 1.6 times higher risk of death from non-COVID causes (for COVID-19, the risk was 18.9 times higher for unvaccinated males and 19.2 times higher for unvaccinated females).
- This confirms a substantial direct effect of vaccination; however, a weaker but significant indirect (selection, behavioural) effect on other causes.
- Vaccinated and unvaccinated populations differ
- **Behavioural or selection factors** (lack of significant health disparities + differences also in external causes)

Hazard ratios adjusted for age groups and any registered COVID-19 infection until the end of 2021



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- Unvaccinated individuals had a 1.6 times higher risk of death from non-COVID causes (for COVID-19, the risk was 18.9 times higher for unvaccinated males and 19.2 times higher for unvaccinated females).
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- **Behavioural or selection factors**

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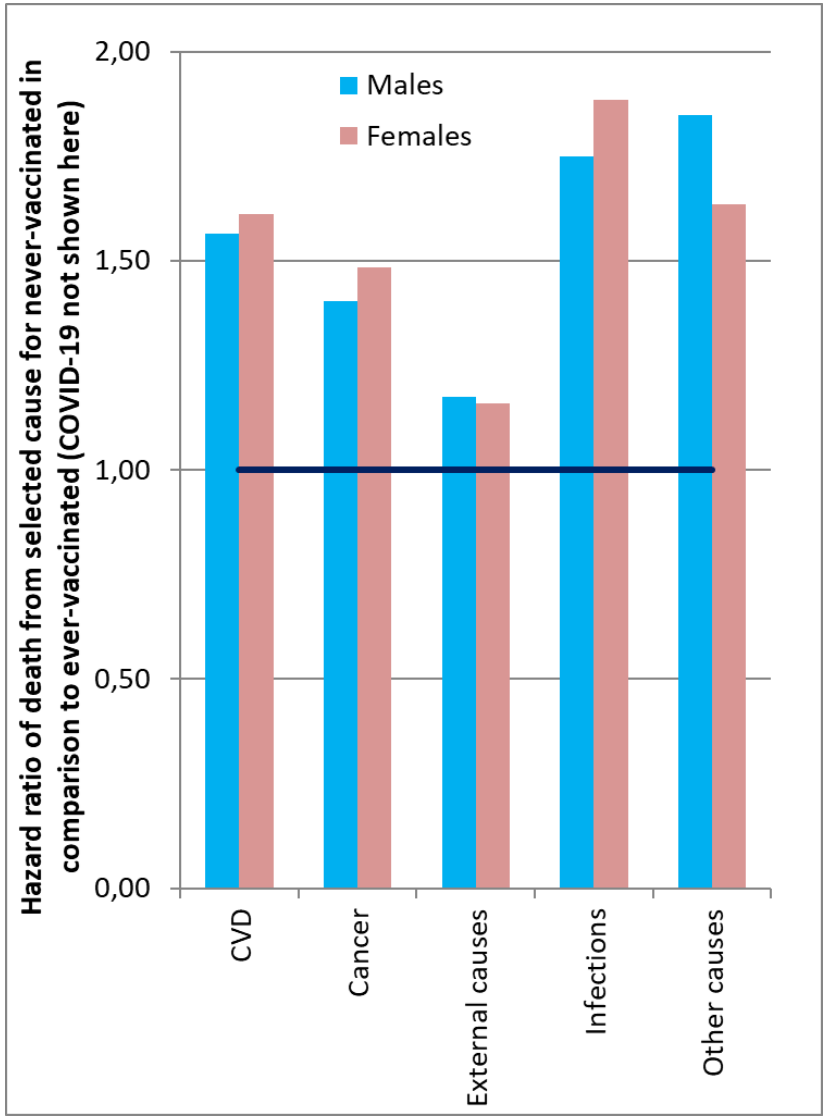

Step 3: predictors of COVID-19 (un)vaccination status

Binary logistic regression was used to test the relationship between vaccination status (0 = completed vaccinated, vs. 1 = not vaccinated until the end of 2023) and selected predictors:

- **Age, sex, and place of permanent residence** (at the end of 2023); level of the Czech districts (N=77) was used
- **Socioeconomic status (SES)** – derived from the database of the Ministry of Labour and Social Affairs.
  - **Income** (average during 2019-2023) – converted into an annual income percentiles. Persons at the **lowest quintile was further according to receiving** one of the **social benefits** for persons in a difficult social situation for at least six months in 2019-2023.
  - **Unemployment** was included as a dichotomous variable. The 'exposed' = individuals who experienced unemployment, defined as being registered with the Labour Office for at least six months between 2019 and 2023.
- **Health status**
  - **Registration with a general practitioner**
  - **Deyo-Charlson Comorbidity Index (DCCI)**

Step 3: predictors of COVID-19 (un)vaccination status

		Adj OR*	95 % CI	
Sex (Ref. = Women)	Men	1.16	1.15	1.16
Health characteristics				
Comorbidity index (Ref. = 0)	DCCI=1	0.81	0.80	0.81
	DCCI=2	0.73	0.72	0.74
	DCCI=3+	0.67	0.66	0.67
Registration with GP (Ref. = Yes)	No	1.25	1.23	1.26
Socioeconomic characteristics				
Socioeconomic status (Ref. = 6 = highest SES)	5	1.43	1.42	1.44
	4	1.79	1.78	1.80
	3	2.12	2.10	2.13
	2	2.52	2.51	2.54
	1=lowest	3.89	3.84	3.93
Unemployment (Ref. = No)	Yes	1.52	1.50	1.53

Risk of vaccine resistance decreases with the number of comorbidities

Socioeconomic status = the most important predictor (lowest group – prevalence of unvaccinated status around 40%)

Without registration with GP, the risk of vaccine resistance increases

Unemployment = higher chances of remaining unvaccinated

** Adjusted for age, place of residence, and all variables in the model*

Summary

- Around **20% of the Czech adult population without vaccination**
  - Above all younger people with lower SES, job seekers, not registered with GP and on average healthy
- Beyond the **direct effects** of COVID-19 vaccination in reducing mortality risk from the disease, **indirect effects** are evident in differing mortality rates from other causes.
  - These differences are influenced by **factors affecting vaccination decisions as well as lifestyle and behavior** – socioeconomic status, unemployment, and access to healthcare (e.g., registration with a general practitioner).
- Targeting these groups through health and information campaigns could improve their lifestyle and healthcare access, potentially reducing overall mortality risk or inequalities in the society
- It could be supposer, that these individuals also tend to underutilize preventive measures, both during the pandemic and in general health programs

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NextGenerationEU
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SYRI NÁRODNÍ INSTITUT
CZECH RECOVERY PLAN

Thank you

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Prepared studies:

- Dzúrová D., Benešová K., Bernard J., Hulíková Tesárková K., Jarkovský J., Kahoun L., Kšiňanová G., Mužík J., Netrdová P., Szabo D., Bobák M. Predictors of COVID-19 vaccination status: a nationwide linkage study in Czechia. [under review]
- Hulíková Tesárková K., Dzúrová D. COVID-19 Vaccination Status and General Mortality Risk: A Comprehensive Analysis of Competing Causes of Death [in process]