

Timing Matters - The Impact of Response Measures on COVID-19-Related Hospitalization and Death Rates in GER and CH

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Aim: Analysis of the impact of lockdown timing and intensity on COVID-19-related hospitalization and death rates during the first wave

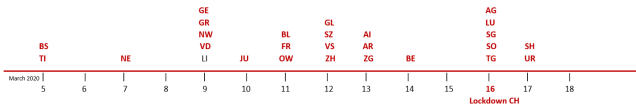
Data: Data on confirmed COVID-19 cases, COVID-19-related hospitalization and death rates in the 26 Swiss cantons, Liechtenstein and 413 German counties and districts from early March to late April 2020

General Setup:

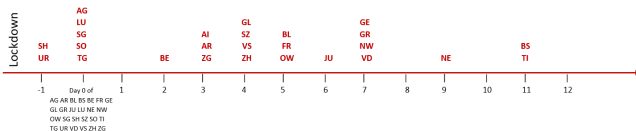
- Analysis of Impact of Lockdown Timing (CH/LI & GER):
 - region-specific start date of the epidemic: day when rate of infections first reached or exceeded 1 infection per 10,000 inhabitants
 - comparison of cumulative COVID-19-related hospitalization & death rates between regions with different lockdown timing (rel. to region-specific Day 0), control for covariates (regional characteristics, initial pandemic trends & COVID-19 response measures)
- Analysis of Impact of Curfew vs. Gathering Bans (GER):
 - comparison of cumulative COVID-19-related death rates between German federal states that have introduced a curfew and those that have banned groups of more than 2 individuals

Methodology

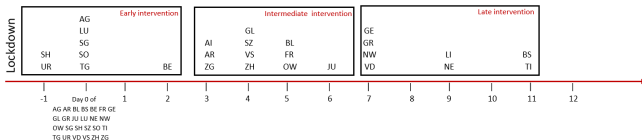
Impact of Lockdown Timing - Setup illustrated by the example of Switzerland:



Day when infection rate first reached/exceeded 1 per 10,000 inhabitants in the respective canton (= canton-specific Day 0). E.g.: In Basel, the threshold of 1 infection per 10,000 was reached on March 5th while in Uri it was exceeded on March 17th



Canton-specific day when lockdown was implemented



Cantons/counties split into 3 groups depending on lockdown exposure rel. to region-specific Day 0

Impact of Lockdown Timing - Econometric Approach

● OLS Approach (CH/LI & GER)

- OLS regression with treatment indicators for belonging to intermediate and late exposure group and potential confounders
- estimation of difference in cumulative death rates (GER & CH/LI) and hospitalization rates (only CH/LI), between each of the two treatment groups and early exposure group (=reference group)

● Doubly Robust Approach (GER)

- 1 estimation of logit model for treatment probability as function of covariates and a linear model for outcome as function of treatment and covariates
- 2 estimation of treatment effects with estimators from (1) as plug-in parameters

● Synthetic Control Approach (CH/LI)

- comparison of cumulative hospitalization and fatality rates in specific canton with late lockdown exposure to rates in a synthetically created counterfactual canton (created from 11 cantons with relatively early lockdown exposure)

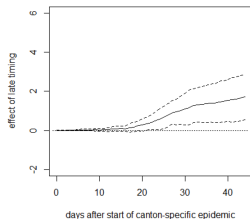
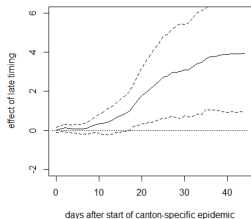
Impact of Curfews vs. Gathering Bans - Econometric Approach

● OLS & Doubly Robust Approach (GER)

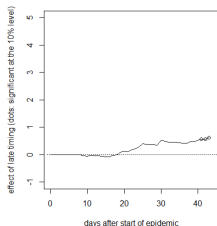
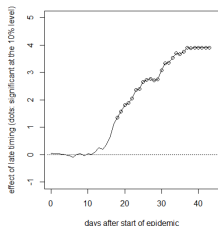
- OLS regression and Doubly Robust estimation with binary treatment indicator for curfews while controlling for several control variables

Findings on Impact of Lockdown Timing (CH/LI)

OLS Estimation: Impact of lockdown timing on cumulative COVID-19-related death and hospitalization rates (late vs. early lockdown exposure)



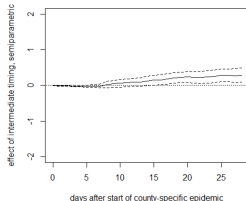
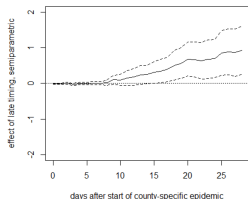
Synthetic Control Approach: Effect of the late lockdown timing in Neuchâtel on cumulative COVID-19-related hospitalization and death rate



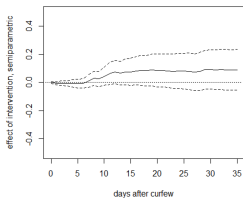
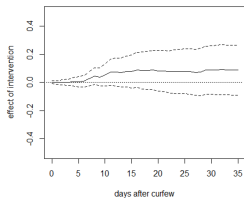
⇒ the earlier lockdown measures are implemented the more effective they are

Findings on Impact of Lockdown Timing & Curfews vs. Gathering Bans (GER)

DR Estimation: Impact of lockdown timing on cumulative COVID-19-related death rates



Results of OLS and DR Approach: Effect of curfews on cumulative COVID-19-related death rates



⇒ **Back-of-the-Envelope Calculation:** With 27% of Germans living in counties with late lockdown exposure, **1283 COVID-19-related deaths** (OLS estimate; 2080 when using DR results) **could have been prevented over first 4 weeks** if counties with late timing had implemented lockdown earlier

⇒ **no evidence of curfews being more effective than bans on gatherings (additionally to other lockdown measures)**