

SYNOPSIS

06/09/2020

Review of “Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe”

Article citation: Flaxman S, Mishra S, Gandy A, Unwin HJT, Mellan TA, Coupland H, et al. Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe. *Nature*. 2020 Jun 8 [Epub ahead of print]. Available from: <https://doi.org/10.1038/s41586-020-2405-7>

One-Minute Summary

- The authors modelled and assessed the **impact of non-pharmaceutical interventions (NPIs) on Coronavirus Disease 2019 (COVID-19) transmission in 11 European countries** (Austria, Belgium, Denmark, France, Germany, Italy, Norway, Spain, Sweden, Switzerland, United Kingdom).
- As of May 4, 2020, in 11 countries with NPIs, **the estimated number of people infected was 12-15 million or 3.2-4.0% of the population.**
 - **Highest estimated attack rates (i.e., percent of total population infected as of May 4):** Belgium (8.0%, 95% credible interval [CrI]: 6.1-11.1), Spain (5.5%, 95% CrI: 4.4-7.0) and the United Kingdom (5.1%, 95% CrI: 4.0-6.5)
 - **Lowest estimated attack rates:** Norway (0.46%, 95% CrI: 0.34-0.61), Austria (0.76%, 95% CrI: 0.59-0.98) and Germany (0.85%, 95% CrI: 0.66-1.1)
 - The authors conclude that there are fewer COVID-19 cases detected than estimated, likely due to the presence of asymptomatic or mild cases (testing focused on hospitalized patients), lack of testing capacity and changes in testing policies.
- Prior to NPIs, the **estimated reproduction number over time (R_t) for all countries combined was 3.8 (95% CrI: 2.4-5.6).**
 - After NPIs, the estimates for mean R_t were lowest in Norway (0.44, 95% CrI: 0.26-0.61) and highest in Belgium (0.82, 95% CrI: 0.73-0.93)
 - After NPIs, the average R_t for all countries was 0.66, which corresponds to a 82% reduction when compared to pre-intervention values
 - The authors conclude that current NPIs have achieved epidemic control and have driven R_t below 1 (probability $R_t < 1.0 = 99.9%$ across all countries)
- **Lockdown had the greatest impact on transmission reduction**, estimated at 81% (95% CrI: 75-87) and was significantly different from all other interventions. As other intervention strategies (i.e., encouragement of social distancing, case-based self-isolation, school closure ordered and public events banned) were implemented at points close in time, the effect of other individual interventions was not able to be estimated.
- As of May 4, **NPIs have averted an estimated 3,100,000 (95% CrI: 2,800,000-3,500,000) deaths.**
 - The countries that averted the most deaths were France (690,000 deaths), Italy (630,000) and Germany (560,000)

- The estimated deaths in all countries was 130,000 (95% CI: 120,000-140,000); however, in a counterfactual model with no NPIs, the estimated number of deaths was 3,200,000 (2,900,000-3,600,000)

Additional Information

- The authors back-calculated infections from the number of observed deaths and used a Bayesian mechanistic model to estimate total populations infected (attack rates) and R_t .
- **Model outcomes were:** **1)** proportion of population infected, **2)** estimates of R_t following interventions, **3)** reduction in R_t due to various interventions and **4)** number of deaths averted as a result of interventions.
- When the estimated R_t was below 1, the authors deemed the intervention successful. NPIs were initiated at different times in different countries, ranging from March 2-29. Easing of NPIs started on May 4.
- The estimate of R_t is informed by the choice of generation interval distribution and initial growth rate of observed deaths (i.e., a shorter generation time corresponds to a lower starting reproduction number).
- See [Supplementary Information](#) for time-lapsed videos of attack rates over time.
- The authors acknowledge several limitations to modelling using death data: 1) deaths early in the epidemic might have been missed, 2) reporting of deaths varies by country and time, 3) underreporting of deaths outside hospitals, and 4) reporting delays.

PHO Reviewer's Comments

- None

Citation

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