Impact of non-pharmaceutical interventions against COVID-19 in Europe: a quasi-experimental study

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This study aimed to determine the impact of different forms of social distancing interventions on COVID-19 cases and deaths across 30 European countries.

QUESTION The PICO of the study is as follows;

P – the general population of 30 European countries

I – social distancing interventions including;

- Mass gathering restrictions
- Initial mandatory closure of some businesses (primarily bars and restaurants)
- (More) non-essential businesses ordered to close (typically retail stores and services such as hairdressers)
- Education facilities closure
- Stay at home orders (travel for essential purposes only)
- Face coverings (these were evaluated but the findings may not be reliable due to the recent introduction of the measure and heterogeneity in implementation)

C – no implementation of the intervention, and the period prior to the intervention

O – COVID-19 cases and deaths up to the 24th April

METHODS The data used in the study was obtained from publicly available sources and was analysed using complex hierarchical probabilistic models. Publicly available data on the implementation and dates of introduction of the various interventions was obtained from the Institute of Health Metrics and Evaluation Data, and data on daily COVID-19 cases and deaths from the European Centre for Disease Control. Two modelling approaches were used to analyse the data, adjusting for the number of tests performed and taking into account the different countries population size.

RESULTS The study reported that 3 of the interventions were associated with reduced incidence; closure of educational facilities, prohibited mass gatherings and initial mandatory closure of some businesses. Figure 1 and 2 of the manuscript show the effects of these intervention over time (log risk ratio of 0 = no change in cases or deaths) with these interventions having a decreasing effect on cases and deaths (confidence interval well below 0 suggesting significant effect beyond chance). The effects of more business closure, stay at home orders and face coverings were not associated with any independent additional impact.

DISCUSSION Interpretation of the results of this study is challenging and limited by the presence of collinearity - the interventions were implemented at very similar times making it difficult to tease out the effect of each, and most countries implemented many of the interventions around the same time. The lag effect of the interventions (7-14 days before the effects of the intervention become apparent) was also not acknowledged. Further, there was large variation in the ways the interventions were implemented and compliance with interventions is unknown.

The effect of mask usage was surprising – at 7-14 days after the start of the intervention (when the intervention would be expected to be having an effect) cases are increasing. This may be explained by confounding by other interventions, but may potentially also be due to individuals relaxation with other measures (owing to the feeling of protection provided by the mask wearing). The effects of stay-at home measures seems counter-intuitive, but may also be the result of collinearity within the model.; when other out of home activities are restricted, staying at home doesn't really make any difference (and in this case appears adverse).

Variation in the log risk ratio scales in Figure 1 obscures to some extent the relative effect of the interventions. Had the same scale been used, the small effect of non-essential business closure relative to the large effect of mass gathering restrictions and education facilities closures would have been clearer.

OVERALL SUMMARY. This was considered to be an important study for informing of the effects of social distancing measures, finding that closure of education facilities, prohibiting mass gatherings and closure of some non-essential businesses reduced incidence. However, the key limitation – collinearity, casts an important caveat over the results and their interpretation. Similar studies have been conducted in China, Australia and Hong Kong, but the variation in implementation across the European countries allows a more informative investigation of the relative effects of these measures on COVID-19 cases and deaths.