Danish Covid19 Policies Reduced Overall Mortality

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Behavioral changes and restrictive public policies have reduced the toll of deaths from covid19 in Denmark—and, in addition, have averted deaths from other causes. The first death from covid19 was reported in week 11 (which started on March 9) (1). Cumulative deaths attributed to covid19 totaled 602 by June 21, the end of week 25 (2). We estimated over this period the net overall impact on mortality of the corona virus combined with the effects of public policies and behavioral changes. Our conclusion is that by the middle of June the cumulative result was not the loss of lives but probably the saving of some lives. As shown in the Figure, Denmark managed to keep deaths from all causes at roughly normal levels during the pandemic.

What is important is that Denmark probably reduced the cumulative toll of deaths to zero and went on to save some lives. The reason is that policies to avert deaths from covid19 also altered mortality from other causes. Deaths from other infectious diseases (3) as well as perhaps traffic and work accidents (4-6), premature birth (7) and other causes declined. Offsetting the lives saved are deaths resulting from the diversion of medical resources to treating covid19 cases and maybe lack of exercise, the stress of isolation and other factors (8). Furthermore, some deaths due to covid19 were misreported as being due to other causes (9). Net excess mortality attributable to covid19 and policies to control it is the difference between the lives lost to covid19 and the net lives saved or lost from other causes of death.

We estimate that in Denmark the net cumulative outcome by the middle of June was the saving of some lives. This, we stress, is an estimate not a precise number, but it seems likely that, on balance, changes in behavior and restrictive public policies in Denmark transformed the corona crisis from a substantial loss of lives, as in Sweden, to some saving of lives.

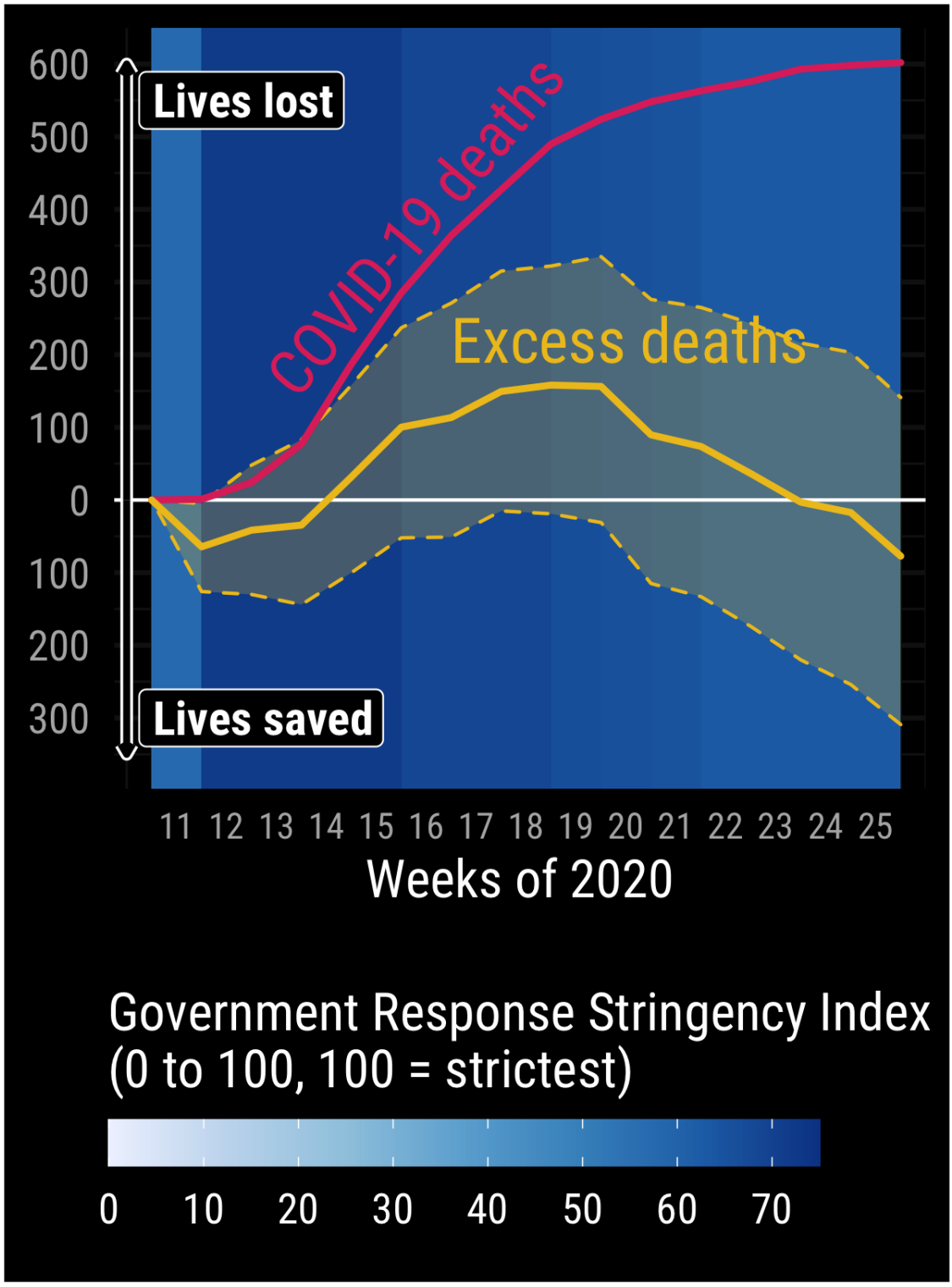

***Figure**: Cumulative deaths attributed to COVID-19 (red line) and cumulative excess deaths (yellow line) in Denmark through the COVID-19 pandemic weeks, 11–25; yellow shaded area between the dashed lines is 95% prediction interval estimate. Excess deaths are defined as total observed deaths by week minus the number of deaths expected at the baseline level of mortality in Denmark. The coloring of the plot background represents the stringency of the national policy in response to the COVID-19 pandemic.*

As shown in the Figure, in late March and April covid19 deaths rose rapidly in Denmark and then started to increase more slowly. Excess deaths peaked in Denmark the end of April and then gradually declined to zero by early June.

Highly accurate reports of numbers of deaths by age and sex are rapidly released in Denmark (10). Reports of deaths from covid19 are also published within a few days but have larger errors.

No direct information is available about the number of deaths that would have occurred in the absence of covid19 and policies to control it. Data are available about death rates by age, sex and season in previous years and up to the date when the coronary pandemic and policies to address it started. Data are also available on the numbers of males and females in different age categories. Using such data, it is possible to forecast the number of deaths that would have occurred if the pandemic had not struck. Subtracting the forecast number from the actual number of deaths gives the excess number of deaths due to covid19 and policy changes (11).

Such policy interventions in Denmark included closing schools, restricting meetings, limiting visits to hospitals and to older people, and other measures to reduce physical interactions. Other initiatives disseminated information about the effectiveness of behavioral changes, such as the two-meter rule and vigorous hand washing. Wearing gloves and face masks was much less widespread in Denmark than in some other countries. Testing people to determine if they had or had had covid19 was also limited.

Using data on Danish death rates by age, sex and week in previous years and up to 9 March 2020, and using information about how many males and females are of different ages, powerful methods can be harnessed to forecast mortality if covid19 had not struck. We forecast covid-free numbers of deaths by age, sex and week, from 9 March until 21 June 2020. The observed numbers of deaths minus the expected numbers give the excess mortality, the net number of lives lost or saved as a result of covid19, policy interventions and behavioral changes.

Excess mortality is a more basic measure than deaths from covid19 because it captures mortality from all causes (11). Both measures are problematic.

Whether a death is caused by covid19 requires medical judgment; criteria may differ from country to country and physician to physician and can be influenced by politicians.

Excess deaths are not observed: their numbers have to be estimated. Care is required to minimize misestimation. We relied on state-of-the-art epidemiological methods. We augmented them by using forecasts of death rates and population sizes to estimate numbers of deaths rather than, as is usually done, extrapolating numbers of deaths from recent years (12). Progress in reducing death rates and changes in population age-structure, e.g., due to the aging of the baby boom, can lead to errors in the usual approach that are larger than the errors in our approach.

Our conclusion is that the loss of life to covid19 was more than counterbalanced in Denmark by averting deaths from other causes. Learning which causes of death were most reduced could inform public-health efforts to save lives.

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Further information: Please see the Supplementary Material. Read more about the research project and our results at

https://www.sdu.dk/en/forskning/forskningsenheder/samf/cpop/excessdeath.

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