Germany's 'coronavirus anomaly': Statistical evidence that early mass testing leads to low mortality rates

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Abstract

In this note, we present a statistical analysis of the mortality rates of COVID-19 for several selected European countries. We compare the countries' mortality rates with their respective number of tests as a function of the time since the first death. Our analysis shows that countries that either delayed mass testing, such as Italy, or have not fully adopted it, such as France and the UK, have had much higher mortality rates than Germany, which has adopted a policy of wide and early testing. Conversely, countries that have followed Germany's example, such as Portugal, have so far had comparatively low mortality rates.

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Introduction

As of April 17, Germany's mortality rates of COVID-19 remain considerably lower than those of other European countries such as Italy, France, and the UK, among others. At present, Germany's crude death rate (CDR), corresponding to the number of deaths per 100,000 inhabitants, and case fatality rate (CFR), defined as the percentage of deaths relative to the number of confirmed cases, stand respectively at (5.2, 3.1%) [1]; in sharp contrast to the corresponding rates for Italy [(37.6, 13.1%)], France [(27.9,12.5%)],

and the UK [(22.0,13.3%)]. The possible origins of the low mortality rates in Germany have sparked considerable debate ever since this "anomaly" was first noticed in mid-March, 2020 [2, 3]. It was suggested for example that Germany's comparatively low CFR might be a statistical artifact, owing to the high number of tests it has been undertaking (which tends to lower the CFR), and that the early estimates were premature and were expected to increase as the epidemic progressed [2, 3].

Data

The mortality data used here were taken from the Johns Hopkins Coronavirus Resource Center [1], as updated on Friday, April 17, 2020 at 08:52 PM EDT. The data for the number of tests for COVID-19 have been obtained from the website Our World In Data [4] As explained in Ref. [4], "some countries report tests performed, while others report the number of individuals tested." Here however we make no distinction between these units, for we believe that regardless of their differences these test numbers represent a reasonable criteria for measuring the countries's testing policies.

Results and Discussion

Germany's mortality rates have been steadily growing since the onset of the outbreak, but, somewhat surprisingly, with a lower acceleration than most European countries, thus rendering Germany's anomaly a persistent effect. The widening of this mortality rate gap is particularly striking in the case of Italy, which is now testing at a rate comparable to Germany's [4]. However, one important difference between the two countries' approaches to testing is illustrated in Fig. 1, where we plot the total number of tests per thousand inhabitants for some selected European countries, as a function of days since the first death. From this figure, one sees that only after more than 30 days since the first death did Italy reach the level of 5 tests per thousand—a mark that Germany already had 10 days after the first death. Similarly, only after more than 50 days since the first death did France cross this mark, while only now—over 40 days after the first death—has the UK passed it.

The same slower rate of testing applies to other countries that have high mortality rates, such as Belgium [(45.2,14.3%)], Netherlands [(20.1,11.3%)], and Sweden [(13.7,10.6%)]; see Fig. 1. The case of Switzerland [(15.6,4.9%)]

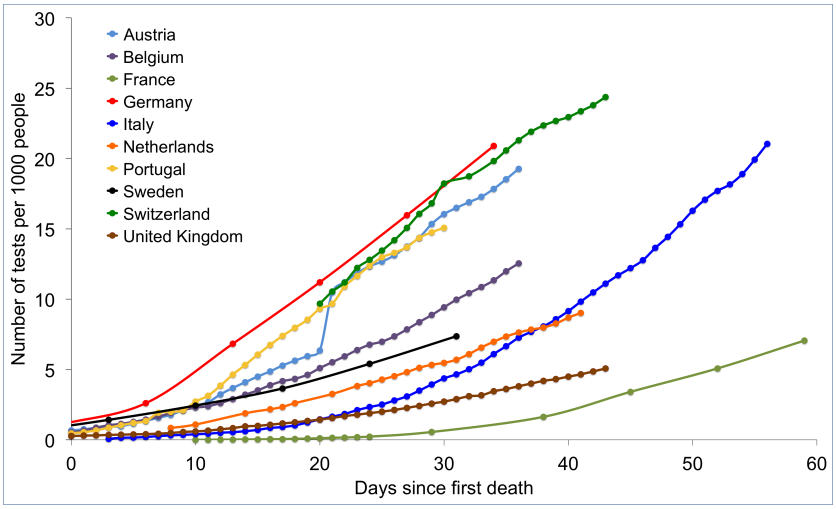

Figure 1: Number of total tests per thousand people as a function of days since the first death. Data taken from Ref. [4] as of April 17, 2020.

is also of particular interest, as this country is now testing at a higher proportion than Germany. Switzerland, however, implemented mass testing only at a much later stage, as shown in Fig. 1. It is thus fair to assume that Switzerland's delayed mass testing probably contributed to it having comparatively higher mortality rates than Germany. On the other end of the testing spectrum, countries that have followed Germany's example of wide and early testing, such as Portugal [(6.4, 3.5%)] and Austria [(4.9, 3.0%)], have so far had comparatively low mortality rates. The above analysis thus suggests that countries have to "go hard and go early" with testing to avoid high mortality rates from COVID-19. This is in line with recent mathematical evidence [5] that the window of opportunity for non-pharmacological intervention is indeed rather narrow.

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