The Economic Pandemic

Aggressive Testing Is Vital to Controlling the Spread of COVID19 and Saving Europe's Economy

By Duane Schulthess, Gergana Koleva, Anja Schiel, Harry P. Bowen, and Luca Pani

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For the last month, a debate has raged over which approach to managing the spread of COVID-19 is correct. One aspect of this debate is about the efficacy of widespread testing.

South Korea and Germany have pursued aggressive testing. The Netherlands, Sweden, and the UK – at least initially – limited testing and instead sought to create herd immunity by letting the virus run its course. Which approach is better?
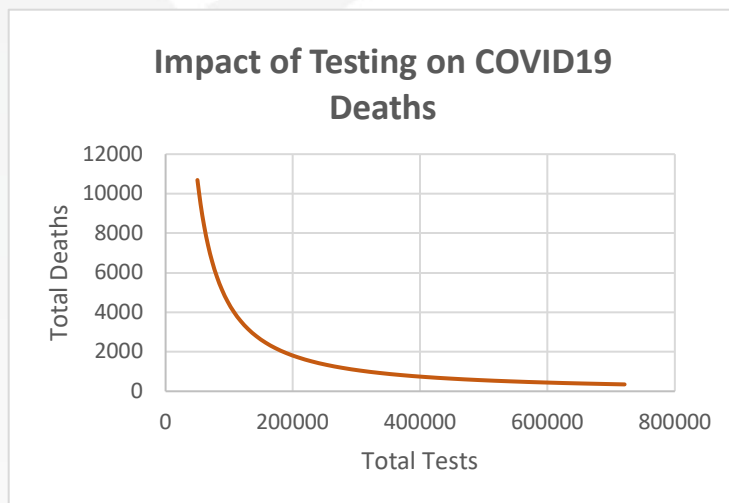
Given the implications of getting the choice wrong, opinions towards both approaches have been strong and vociferous.

Adding to the confusion, experts disagree about which of many variables are more important for explaining higher rates of morbidity from COVID19. These include the percent of a population over 65 years of age, the case fatality rate, the population density of a region, the availability of hospital beds and ventilators per 1000 population, rates of tourism, usage of public transport, and number of university students in a given area to name a few.

Figure 1 - Regression Model Output Explaining Impact of Testing on Natural Log of Total Deaths, p < 0.0001

Vital Transformation ran a series of statistical regressions (See Appendix) using these variables to uncover the impact each has on deaths from COVID19, weighted for population. The estimated relationship explained 86% of the variability in deaths, with three variables showing high statistical significance: 'Number of Tests' (p < 0.0001), total 'Confirmed Cases' (p < 0.0001), and 'Population Density per Km2' (p < 0.0001). [1,2]

To assess the impact of each variable, our model was re-estimated with the key variables measured by their natural logarithm (Figure 1). In doing so, the coefficient on each variable will indicate the percentage change in deaths for each 1% increase or decrease in value. For example, by increasing the number of tests by 1%, we find a decrease in deaths by 0.56%. This implies that those countries which proactively test and isolate identified carriers of COVID19 will better manage their case fatality rate (CFR), i.e. deaths per number of confirmed cases.

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[1] Full dataset is available for download at this link: https://1drv.ms/x/s!AlGuTWbx7xz9-gtAIBzdcJDv2SKD?e=9cMI6M

[2] Population Density per KM[2] is only responsible for answering 9% of the model's variability; 'Number of Tests' and 'Confirmed Cases' answer 66% of the variability of our population weighted model and 82% in our Log Natural model.

As of April 1st, Germany's CFR is 1.1% and South Korea's is 1.8%. Both countries committed early to aggressive testing regimes and both are viewed as successfully managing the spread of COVID19.

In contrast, Italy's CFR is 12.6% and Spain's is 9.4%. Neither country has, until recently, aggressively promoted testing. Similarly, the Netherlands has maintained a policy to not aggressively test nor lock down its population; its CFR is 8.2%, gaining 1 percentage point over the last 6 days.

The False Economy of Not Testing

Many governments have opted to close borders, shutter schools and restrict travel, but have not committed to investing in robust testing for active COVID19 or its antibodies showing previous exposure. According to the International Monetary Fund, "Nonessential services closed by government decree account for about one-third of output. This means that each month these sectors remain closed translates into a 3 percent drop in annual GDP."[3]

This translates into roughly €50 billions of lost GDP per month in both Spain and Italy, or €1.75 billion per day.

From a health economics standpoint, assuming €40,000 per Quality Adjusted Life Year (QALY), this means that Italy's current strategy is costing €50 billion a month to 'buy' 16,847 QALY and "gain" €675 million. This, frankly, is unsustainable.

Shutting substantial portions of the global economy to reduce the spread of COVID19 will only work if we invest heavily to increase our ability to manage the disease and open up our economies as soon as is possible.

Germany is testing 500,000 people a week.[4] Assuming a cost of $45 (€40) per test and that our statistical model is robust, Germany will save roughly 2,500 lives per week at a total cost of € 20 mil. If Germany's testing regime contains the economic impact of COVID19 to 1% of GDP, as opposed to 3% of GDP as cited by the IMF, they will not only be saving lives but also tens of billions of euros in GDP per month.

Until recently, Italy was only testing those who presented symptoms, but has since ramped up its testing to play catch-up with the rate of infection. This decision was made in part due to the positive result of a pilot study in the city of Vo initiated on March 6th, whereby the Red Cross successfully tested and segmented the city's entire population, eradicating COVID19 in 14 days.[5]

This Italian experiment validates the approach taken by Germany, showing that mass testing and focused isolation of confirmed COVID19 cases to be a more effective strategy than large-scale quarantine to manage both COVID19 spread, as well as its economic impact. Conversely, those with a lax testing regime can expect both substantially higher fatalities and larger negative impact to their GDP.

[3] https://blogs.imf.org/2020/03/30/europes-covid-19-crisis-and-the-funds-response/
[4] https://www.euronews.com/2020/03/27/germany-increases-its-covid-19-tests-to-500-000-per-week
[5] https://www.theguardian.com/commentisfree/2020/mar/20/eradicated-coronavirus-mass-testing-covid-19-italy-vo

Biography

Duane Schulthess, MBA, is the Managing Director of the consultancy Vital Transformation. Previously, he was the EMEA Head of Corporate Development of The Wall Street Journal, and Commercial Director of Science|Business. He is a Senior Associate of the UK's Royal Society of Medicine.

Gergana Koleva is a Project Manager at Vital Transformation and a senior writer for Cardiology2.0. She holds a M.Sc. in health policy and management from the Harvard T. H. Chan School of Public Health and an M.A. in journalism from New York University. She has served as an advisor at the World Health Organization.

Dr. Anja Schiel is the Senior Advisor and Statistician for Norwegian Medicines Agency. She holds a PhD from the Free University Amsterdam and is the European Medicines Agency's Chair of the Biostatistics Working Party.

Dr. Harry P. Bowen is Professor of Economics and International Business, and W.R. Holland Chair of International Business and Finance, at the McColl School of Business at Queens University of Charlotte (USA).

Dr. Luca Pani is a Professor of Psychiatry at the University of Miami and a Professor of Pharmacology at the University of Modena and Reggio Emilia, Italy. He served as Director General of the Italian Medicines Agency from 2011 to 2016. He was also previously a member of the Scientific Advice Working Party of the European Medicines Agency.

Appendix:

Model 1

Fit

N	53
Mean of Y	7,865058E+02

Equation	Deaths 4/1 = -151.1 - 0.01573 Number of Tests 4/1 + 0.1546 Confirmed Cases 4/1 - 0.2983 Population Density Km2 + 0.004832 Hospital Beds - 1.158e-05 Tourists Per Year (mil) + 0.0001845 University Students + 0.0005726 # > 65
Weight	Population

R²	0,864
R² adjusted	0,842
RMSE	1,349999E+06

| Parameter	Estimate	95% CI	SE	t	p-value	VIF
Constant	-151,1	-594,1 to 292,0	219,97	-0,69	0,4957 [2]	-
Number of Tests 4/1	-0,01573	-0,02279 to -0,008663	3,5076E-03	-4,48	<0.0001 [1]	10,79
Confirmed Cases 4/1	0,1546	0,1328 to 0,1764	0,010833	14,27	<0.0001 [1]	2,06
Population Density Km2	-0,2983	-0,4119 to -0,1847	0,056395	-5,29	<0.0001 [1]	1,93
Hospital Beds	0,004832	-0,004419 to 0,01408	4,5927E-03	1,05	0,2984 [2]	6,28
Tourists Per Year	-1,158E-05	-3,100E-05 to 7,838E-06	9,6414E-06	-1,20	0,2360 [2]	3,14
University Students	1,845E-04	-0,001289 to 0,001658	7,3167E-04	0,25	0,8020 [2]	3,58
# > 65	5,726E-04	-7,213E-05 to 0,001217	3,2011E-04	1,79	0,0804 [2]	11,04

H0: β = 0
The parameter is equal to 0.
H1: β ≠ 0
The parameter is not equal to 0.
[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.
[2] Do not reject the null hypothesis at the 5% significance level.

Effect of the Model
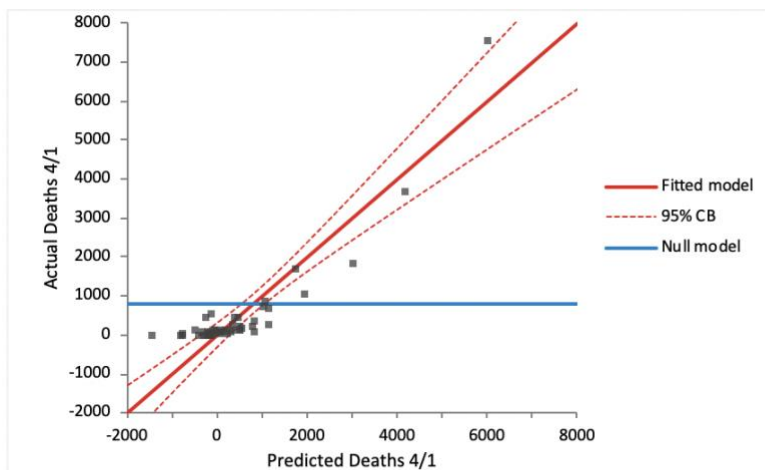
Source	SS	DF	MS	F	p-value
Difference	5,195575E+14	7	7,422250E+13	40,73	<0.0001 [1]
Error	8,201240E+13	45	1,822498E+12		
Null model	6,015699E+14	52	1,156865E+13		

H0: E(Y | X=x) = μ
The model is no better than a null model Y=μ.
H1: E(Y | X=x) = β0 + β1x1 + β2x2 + …
The model is better than the null model.
[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

Model 2 Log Natural

Fit

N	54
Mean of Y	4,727478749

Equation	LN_Deaths = -7.385 - 0.5572 ln_Number of Tests + 1.339 ln_Cases + 1.223 ln_Pop Density - 0.1032 ln_Pop Density2 + 1.36 ln_#>65 - 1.063 ln_Hospital Beds

R²	0,867
R² adjusted	0,850
RMSE	0,651875228

| Parameter	Estimate	95% CI	SE	t	p-value	VIF
Constant	-7,385	-11,50 to -3,271	2,0448	-3,61	0,0007 [1]	-
ln_Number of Tests	-0,5572	-0,8414 to -0,2730	0,14129	-3,94	0,0003 [1]	4,82
ln_Cases	1,339	1,122 to 1,556	0,10786	12,41	<0.0001 [1]	2,89
ln_Pop Density	1,223	0,2371 to 2,209	0,49000	2,50	0,0161 [1]	51,13
ln_Pop Density2	-0,1032	-0,1835 to -0,02291	0,039913	-2,59	0,0129 [1]	50,10
ln_#>65	1,360	0,1564 to 2,564	0,59842	2,27	0,0276 [1]	9,50
ln_Hospital Beds	-1,063	-2,060 to -0,06486	0,49596	-2,14	0,0374 [1]	9,18

H0: $\beta = 0$
The parameter is equal to 0.
H1: $\beta \neq 0$
The parameter is not equal to 0.
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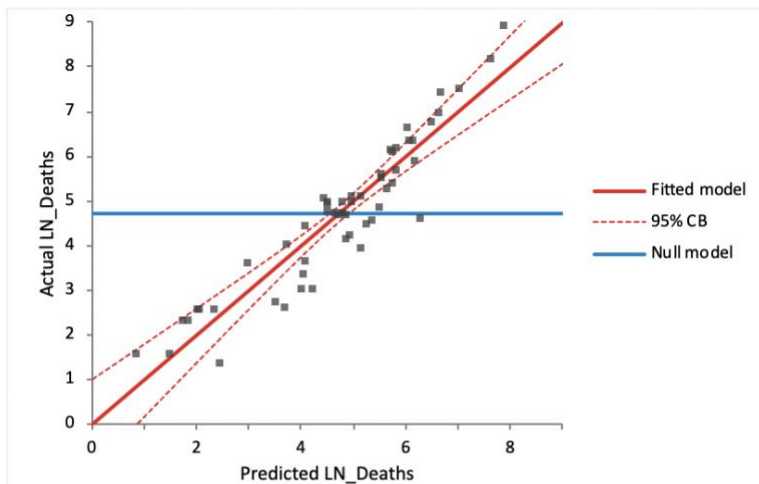
Source	SS	DF	MS	F	p-value
Difference	130,4910656	6	21,748510933	51,18	<0.0001 [1]
Error	19,9722417	47	0,424941313		
Null model	150,4633073	53	2,838930326		

H0: $E(Y|X=x) = \mu$
The model is no better than a null model Y=μ.
H1: $E(Y|X=x) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots$
The model is better than the null model.
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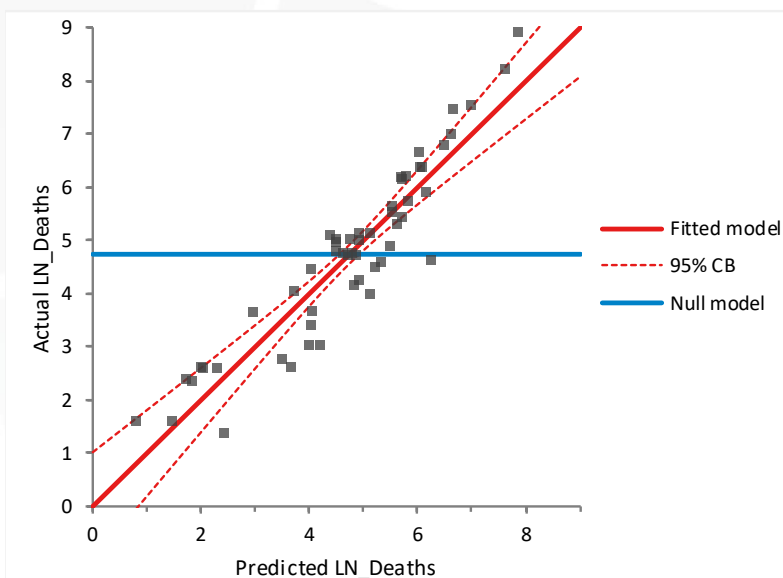| Parameter	Estimate	95% CI	SE	t	p-value	VIF
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ln_Hospital Beds	-1.063	-2.060 to -0.06486	0.49596	-2.14	0.0374 [1]	9.18

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