COVID-19. Scenarios of a super*flu*ous crisis

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Abstract:
Purpose: This article highlights the critical role case fatality rates (CFR) have played in the emergence and the management of particularly the early phases of the current coronavirus crisis.
Design/methodology/approach: The article presents a contrastive map of CFR for the coronavirus (SARS-CoV-2) and influenza (H1N1 and H2N2).
Findings: The mapped data shows that current CFR of SARS-CoV-2 are considerably lower than, or similar to those, of hospitalized patients in the UK, Spain, Germany, or international samples. We therefore infer a possible risk that the virulence of the coronavirus is considerably overestimated due to sampling biases, and that increased testing might reduce the general CFR of SARS-CoV-2 to rates similar to, or lower than, of the common seasonal influenza.
Originality: We conclude that governments, health corporations, and health researchers must prepare for scenarios in which the affected populations cease to believe in the statistical foundations of the current coronavirus crisis and interventions.

Keywords: COVID-19; coronavirus; influenza; case fatality rates; scenarios.

Introduction

The outbreak of the 2020 “World War” (Sangale 2020) on the virus SARS-CoV-2 has prompted the most rapid and radical social and cultural changes in decades. Liberal market societies have turned into war economies, emergency decrees are replacing parliamentary legislation, and, as of 24.03.2020, an estimated 20% of the global population are under “coronavirus lockdown”. These measures seem commensurate with the scale and scope of a global pandemic that has infected 462,684 and killed 20,834 (WHO COVID-19 Situation Report 66), with both counts constantly rising as we write. While the case fatality rates (CFR) vary significantly between regions and over time, the disaster alert triggered by the detection of a disease with an average global “death rate” of 4.5% remains behind the momentous assessment “that this is not the common flu”. Whereas “for seasonal influenza, mortality is usually well below 0.1%” (WHO COVID-19 Situation Report 46), the CFR of the coronavirus has been confused with its infection fatality rates (IFR) so persistently that some of the most

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drastic decisions in generations have been taken in oblivion of the fact that the new virus has to date been detected mainly in those patients with the most severe symptoms and medical conditions. For obvious reasons, however, we should be very cautious of comparisons of SARS-CoV-2 CFR in samples with severe conditions against those with influenza IFR, and more so if the CFR of a newly discovered virus are compared with those of a well-researched one (Lipstich et al 2015). Note that the CFR is the rate of documented deaths per confirmed, "tested" cases of infection. This rate must not be confused with the infection fatality rate (IFR), i.e. the rate of deaths in relation to the estimated number of all coronavirtus infections. Several recent studies have suggested that the actual IFR for the coronavirus is considerably lower than currently believed (Kobayashi et al., 2020; Nishiura, et al., 2020; Wilson et al. 2020) and might range between 0.3% and 0.6%—which is close to IFR of more severe influenza pandemics (Nishiura et al, 2020).

In this study, we therefore develop a comparative map of the CFR of the coronavirus (SARS-CoV-2) and influenza (H1N1 and H2N2). The mapped data shows that current CFR of SARS-CoV-2 are considerably lower than, or similar to those, of hospitalized patients in the UK, Spain, Germany, or international samples. By abductive inference, we confirm that increased testing might reduce current clinical bias and thus the general CFR of SARS-CoV-2 to rates similar to, or lower than, those of the common seasonal influenza. We conclude that governments, health corporations, and health researchers must prepare for scenarios in which considerable parts of the population challenge the statistical foundations of the current COVID-19 crisis and interventions.

Corona versus influenza case fatality rates. A mapping approach

CFR have been most critical in the emergence and management of the current COVID-19 crisis, as the dreadful conviction that "this is not the common flu" has been based on comparisons of coronavirus CFR with death rates of seasonal influenza. Such crude comparisons have certainly been inspired by statements such as in the later-deleted paragraph in the World Health Organization *Coronavirus disease 2019 (COVID-19) Situation Report–46* published on 20.03.2020:

> "Mortality for COVID-19 appears higher than for influenza, especially seasonal influenza. While the true mortality of COVID-19 will take some time to fully understand, the data we have so far indicate that the crude mortality ratio (the number of reported deaths divided by the reported cases) is between 3-4%, the infection mortality rate (the number of reported deaths divided by the number of infections) will be lower. For seasonal influenza, mortality is usually well below 0.1%. However, mortality is to a large extent determined by access to and quality of health care."

Though neither wrong nor necessarily misleading, the comparison of a fatality rate of 3-4% with one of "well below 0.1%" in this and similar earlier and subsequent statements has spawned a flood of disturbing headlines such as "WHO says coronavirus death rate is 3.4% globally, higher than previously thought" (CNBC, 03.03.2020), "Trump calls WHO's global death rate from coronavirus 'a false number'" (The Guardian, 05.03.2020), "People have been trying to underplay this: Why the coronavirus is different from the flu" (NBCNEWS, 13.03.2020), or "Coronavirus: 10% mortality and frightening caregiver infection possible in Africa" (Le Monde, 20.03.2020).[1]

[1] "Coronavirus: Mortalité possible de 10 % et infection effrayante des soignants en Afrique".

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In these and countless other instances, the coronavirus CFR have been either mistaken for coronavirus IFR, or the fact that comparisons of the CFR of one disease with the IFR of another are mostly useless has been ignored or downplayed. In “Coronavirus: The hammer and the dance” and “Coronavirus: Why You Must Act Now”, articles that have been downloaded more than 50 million times, Tomas Pueyo (2020a; b), too, treats coronavirus CFR as if they were IFR, thus raising the spectre of high absolute death figures and hence the imperative and urgency to implement or support whatever measures are necessary to contain the virus. A similar confusion is evident in a statement by The Spanish Diabetes Society: ”The [COVID] fatality rate varies, but we know that it is around 0.9% and 3% […] For diabetes sufferers, this rises to 7.3%, which multiplies the chance of dying from Covid-19 by two, in the best of cases, and by eight, in the worst” (El Pais, 25.3.2020)

Only during the final weeks of March 2020 have the major media outlets and political messaging changed reporting from CFR to counting of occurred and expected case fatalities, and some have adopted measurements of death rates. The New York Post (28.03.2020) stated that “the death rate from coronavirus [is] sharply accelerating in the Big Apple, with one person dying every 9.5 minutes in the last 24 hours”. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases in the US, stated with regard to the estimated infection fatalities that “the 100,000-to-200,000 death figure is a middle-of-the-road estimate, much lower than worse-case-scenario predictions.” (NPR, 29.03.2020). Such numbers imply a known or calculated IFR to assess possible scenarios. “Coronavirus: There is total underinformation in the field of mortality, not only in France” (Le Monde, 28.03.2020)[2]. Few public bodies have disclosed their modelling of CFR and IFR to the public.

CFR in general and comparisons between coronavirus and influenza fatality rates in particular do have substantial impact on our coronavirus-related risk assessment. Figure 1 is a comparative map of CFR for coronavirus (SARS-CoV-2) and influenza (H1N1 and H2N2).

The World Health Organization (WHO 2017) places the global case fatality rates (CFR) for *influenza* at 2-3% (H1N1) and <0.2% (H2N2), respectively, and the global infection fatality rate (IFR) of “seasonal influenza (…) well below 0.1%” (WHO-46). Van Weijden et al. (2013) and Wong et al. (2013) report CFR ranging from 0.0% to 9.9% or 13.5%, respectively, for larger clinical risk- and age-stratified international samples. CFR for hospitalised influenza patients in Germany average between 2.1% for all age groups and 3.4% for persons older than 60 years as reported by the Robert Koch Institute (RKI, 2019). CFR for hospitalised patients in the UK range from 0.04% for young patients without clinical risks to 42.8% for patients older than 65 who belong to a clinical risk group (Cromer et al, 2014, p. 368). The CFR in this sample for patients older than 65 not belonging to a risk group is 18.5%, whereas the CFR for risk group patients of all age groups is 23.2%. For Spain, San-Román-Montero et al. (2019) report an average CFR of hospitalised influenza patients of 5.3%, with the rate being considerably higher for patients with severe infections (12.1%) in general and patients older than 65 with severe infections in particular (18.1%).

As of 26.03.2020, the WHO (WHO-66) reported a global CFR for the coronavirus of 4.5% as well as considerable differences between national CFR, which range between well below 0.1% for Germany to 10.1% for Italy. Other CFR reported that day were 4.5% for China, 4.9% for the UK, and 7.2% for Spain. For the period between 12.02.2020 and 16.03.2020, the Centers

[2] “Coronavirus: Dans le champ de la mortalité, la sous-information est totale, pas seulement en France”.

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for Disease Control and Prevention estimated the average CFR for the USA to range from 1.8% to 3.4%, with estimates varying from 0.0% for the youngest to 27.3% for the oldest age groups (CDC, 2020). Early IFR estimates for Wuhan City ranged from 0.04-0.12% (Mizumoto et al., 2020).

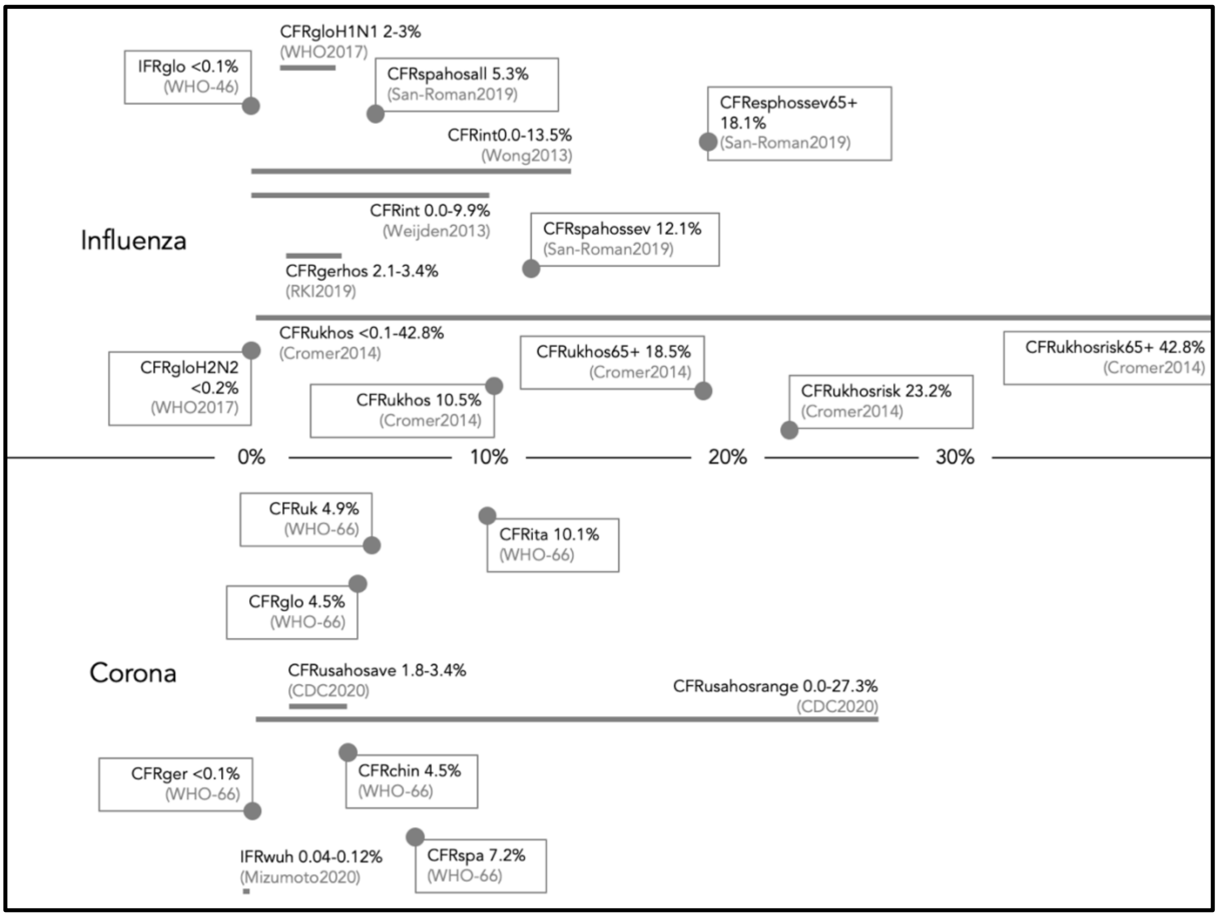

Figure 1: Map of coronavirus (SARS-CoV-2) and influenza (H1N1 and H2N2) case fatality rates *[CFR: case fatality rate; IFR: infection fatality rate; glo: global; int: international; chin: China; ger: Germany; ita: Italy; spa: Spain; uk: United Kingdom; hos: hospitalised; whu: Wuhan City; sev: severe infections; risk: clinical risk group; 65+: age group of 65+ years]*

Data not displayed in Figure 1 include the aggregated CFR of a sample of hospitalised severe cases of H1N1 influenza patients in nine European countries, which Snacken et al. (2012) report to be 15.6% for the season 2010-2011. The combined fatality rate for coronavirus patients in these countries was 5.7% (WHO-66), again with considerable variance between the individual countries: Austria (0.6%), Finland (0.3%), France (5.3%), Ireland (0.6%), Malta (0.0%), Portugal (1.44%), Romania (1.43%), Slovenia (0.8%), and Spain (7.2%). In the meantime, “A systematic review and meta-analysis of published research data on COVID-19 infection-fatality rates” (Meyerowitz-Katz & Merone, 2020) published on the preprint server medRxiv on 27. May 2020 has reported an estimated coronavirus IFR of 0.64% (0.50-78%), whereas US County-specific IFR estimates based on data through 20 April 2020 varied from 0.5 to 3.6% (Basu, 2020). By contrast, the world-famous “Heinsberg study” (Streeck et al., 2020) reported an estimated IFR of 0.36%. Note that the latter study is entitled “Infection fatality rate of SARS-CoV-2 infection in a German *community with a super-spreading event*” (emphasis by the authors), and that IFR *estimates* can hardly be compared with *count*-based CFR.

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An abductive argument on the virulence of corona and influenza

Figure 1 depicts a March 2020 snapshot of a highly dynamic and still hard-to-predict process, and it is certainly too early to draw deductive conclusions from the compiled, or any other (Ioannidis, 2020), data. The present situation of uncertainty, risk, and unclear information, therefore, requires an exploratory rather than an explanatory approach to the available data. In this section, we therefore engage in an abductive reading of Figure 1.

In his 1903 "Harvard Lectures on Pragmatism", Charles Sanders Peirce (1998[1903], p. 231) proposed the following method of abductive inference:

"The surprising fact, *C*, is observed;
But if *A* were true, *C* would be a matter of course.
Hence, there is reason to suspect that A is true".

Abduction always starts with surprise. A surprising fact observed in our figure is that data provided by the WHO suggests that the German coronavirus CFR is in the range or not far from of the global CFR of H2N2 or the global IFR for "seasonal influenza". Also surprising is the similarity between the range of the average CFR of hospitalised coronavirus patients in the USA on the one hand and both the global CFR of hospitalised H1N1 patients and the German CFR of hospitalised influenza patients on the other hand.

Moreover, whereas the global and national coronavirus CFR appear astonishingly high compared with those of influenza, it is also surprising that the corona CFR have remained within the international ranges of influenza CFR among hospitalised patients as identified by Wong et al. (2013) and Weijden et al. (2013). The one exception is Italy, whose CFR at the time of writing is by 0.2% above the maximum value of Weijden et al. (2013). Note, however, that the meta-analysis of Wong et al. (2013, p. 2) "excluded studies that reported only estimates in hospitalized patients or in population subgroups such as pregnant women or those at higher risk of severe illness if infected (e.g. persons with chronic health conditions)", whereas the particularly high Italian CFR may be explained as follows: "Italy's number of confirmed cases is 'not representative of the entire infected population', said Dr. Massimo Galli, head of the infectious disease unit at Sacco Hospital in Milan. The real figure was 'much much more'. Only the most severe cases are being tested, added Galli, and not the entire population—which in turn, skews the death rate" (Di Donato et al, 2020; see also Backhaus, 2020; Tondo & Giuffrida, 2020). On 26.03.2020, the Italian National Institute of Health (2020, p. 3) published data on 710 cases of coronavirus patients who had died in Italian hospitals, reporting "that only 2.1% of the sample presented with (…) no comorbidities, 21.3% with a single comorbidity, 25.9% with 2, and 50.7% with 3 or more".

In applying the abductive method and observing the surprising fact C (the shocking coronavirus CFR), we could now still insist that if A (the coronavirus has a higher virulence) is true, then C would be a matter of course. This is the reason why so many people suspect that the coronavirus is more dangerous than the "common flu".

The data presented in Figure 1, however, we are also amendable to alternative hypotheses for A. If coronavirus tests were performed mainly on samples of symptomatic and hospitalised cases, for example, then the comparably high coronavirus CFR would be a matter of course and no longer shocking. And in fact, there is evidence that "(p)atients who have been tested for SARS-CoV-2 patients are disproportionately those with severe symptoms and bad outcomes"

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(Ioannidis, 2020) and that there is a negative association between coronavirus CFR and test rate (Durcharme & Wolfson, 2020). The latter also would explain another surprising observation in Figure 1: the low German coronavirus CFR, which seems to be approaching both the global IFR of influenza and the surprisingly low coronavirus IFR estimates for the assumed epicentre of the crisis, Wuhan City.

Consequently, there is good reason to suspect that the high coronavirus CFR and other—and hence the public impression of a killer virus that requires the most draconian restrictions of public and private life in decades—result from substantial sampling biases.

Admittedly, the figures presented in Figure 1 are from March 2020, and the situation has constantly evolved as we have been revising this manuscript during the review process. We nonetheless opted for keeping Figure 1 unchanged as it maps knowledge available for decision-making as per March 2020, and rather decided to complement Figure 1 by the subsequent table, which provides an overview of key vectors of comparison between "the coronavirus" and influenza:

	Coronavirus (SARS-CoV-2)	**Influenza (H1N1 and H2N2)**
Virulence (CFR)	Wang et al. (2020) 4.3% (in-hospital CFR, Wuhan, n=138) Wu et al. (2020) 1.4 (0.9-2.1%) sCFR (symptomatic CFR) Abid et al (2020) For Pakistan, CFR 1.4% Rossi et al. (2020) For Italy, 7.2-20.4 % Lau et al. (2020) Crude case-fatality risk (cCFR) 0.22% (Germany) – 8.95% (Italy). Lombardi et al. (2020) Estimated Case fatality rate: 0.4% - 2.9%	Viasus et al. (2012) 10.3% (in-hospital mortality) Huzly et al. (2015) 11%/5% (in-hospital mortality 2012-13/2013-14)
Incubation (days)	Baecker et al (2020) 6.4 (2.1-11) Lauer et al (2020) 5.1 Linton et al. (2020) 5.0 Li et al. (2020) 5.2 (4.1-7.0) Huang et al. (2020) 3-6 Muniz-R. et al. (2020) 3.6-6.4	Lesser et al. (2009) 1.4 Influenza A 0.6 Influenza B

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	Lombardi et al (2020) 3-5 days	
Epidemic doubling time (days)	Park et al. (2020) 2.9-7.4 (meta) Li et al. (2020) 7.4 Sanche (2020) 2.3-3.3	Merler et al. (2011) 4.9
R	Li et al. (2020) 2.2 (1.4 to 3.9) Riou and Althaus (2020) 2.2 (1-4 to 3.8) Sanche et al. (2020) 5.7 (3.8-8.9) Hamid et al (2020) 2.9 Lombardi et al (2020) 3.28	Ferguson et al. (2006) 1.4-2.0 (Pademic 1918) Chowell et al. (2008) 0.9-2.1 (Seasonal) Mills et al. (2004) 2.0-3.0
Treatment demands		
Length Hospitalisation (days)	Wang et al. (2020) 10 (7-14) survivors Guan et al. (2020) 12 (10-14) all 13 (11.5-17) severe Zhou et al. (2020) 11 (7-14) all 12 (9-15) survivors 7.5 (5-11) nonsurvivors	Estenssoro et al (2010) 17 (8-29) all 23 (16-36) survivors 9 (4-17) nonsurvivors Alvarez-Lerma et al. (2017) 14 (8-25) all Viasus et al. (2012) 7 (5-12) all
ICU admission (%)	Wang et al. (2020) 26% Huang et al. (2020) 32% Zhou et al. (2020) 26% Guan et al. (2020) 5% Lombardi et al. (2020) Estimated 5%	Viasus et al. (2012) 22.6% Huzly et al. (2015) 26% (2012-13) 20% (2013-14)

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	Nicola et al. (2020) 20-30%	
Length ICU	Zhou et al. (2020) 8 (4-12) all 7 (2-9) survivors 8 (4-12) nonsurvivors	Estenssoro et al (2010) 12 (6-20) all 15 (9-22) survivors 9 (4-15) nonsurvivors Alvarez-Lerma et al. (2017) 8 (4-17) all
%mechanical ventilation	Guan et al. (2020) 6.1% all 38.7% severe Zhou et al. (2020) 21% nasal 14% non-invasive 17% invasive Nicola et al. (2020) “3% (n = 41,029) of currently infected patients are seriously (requiring oxygen therapy) or critically unwell (requiring mechanical ventilation).”	Viasus et al. (2012) 18.7%
Length mechanical ventilation (days)		Estenssoro et al (2010) 10 (5-16) all 11 (7-18) survivors 4 (1-9) nonsurvivors Alvarez-Lerma et al. (2017) 8 (3-15) all

Table 1: Key vectors of coronavirus and influenza comparisons

Table 1 presents a contrastive overview of incubation periods, epidemic doubling times, R-factors, treatment demands as well as additional CFR for both the 2019 coronavirus and influenza. As most of the data presented in Table 1 does not pertain to our key topic, CFR, we leave it to the readers to make sense of it—not, however, without noting that much of it had been or could have been at the hands of decision-makers back in March 2020.

Conclusion: Scenarios of sampling biases

Decades of forecasting, foresight, and futures studies have been exploring the future as a plural. The data presented in this article point have therefore not been compiled in order to advocate a particular version of a future with or after “corona”. The data make clear, however, that we face a considerable risk that the risk associated with the coronavirus has been dramatically overestimated. This risk has been exacerbated—and its proper assessment and management of complicated if not rendered impossible—by the prevailing communication strategy, which is “to flood media with fast, accurate, and consistent information” (Johns Hopkins Center for Health Security, 2019). This information typically presents high-risk and worst-case scenarios in the hope of increasing the public’s compliance with containment measures and, thus, decreasing infection and fatality rates.

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So far, COVID-19 crisis management seems to be based on scenarios where relevant groups of the population do *not* challenge the official numbers and thus the statistical foundations of the crisis. Yet, scenarios are useful primarily for the anticipation of actually surprising events (van Notten et al., 2005). Consequently, researchers in forecasting, foresight, and futures studies must not stop, at or start only from, singular visions of the future. Rather, we need to prepare decision-makers for the not-entirely-impossible case that the coronavirus figures will ultimately prove the drastic crisis management measures to have been disproportionate, incorrect, and perhaps even productive of worse outcomes than if they had never been instituted. We therefore need to anticipate scenarios where the COVID-19 crisis turned out as an unnecessary crisis that could have been avoided had the media and decision-makers only been more careful and informed about the true meaning of the early coronavirus CFR in particular.

In these scenarios, people will certainly *not* just wait for the end of their confinement, crawl out of their homes, applaud their governments and health staff, sweep up the mess, and build a warmer, greener, and healthier society. In other words, if there is a risk that the most severe crisis in decades has been caused by statistical biases, then this risk should be managed immediately and, if possible, tested away as swiftly as any possible, before we engage in a more clearer-headed discussion on how to better manage the absolute death rates of both the coronavirus and influenza.

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