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Is Covid-19 a dread risk? The death toll of the pandemic year 2020 in long-term and transnational perspective

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ABSTRACT

"Dread risks" are threats that can have catastrophic consequences. To analyse this issue we use excess mortality and corresponding life years lost as simple measures of the severity of pandemic events. As such, they are more robust than figures from models and testing procedures that usually inform public responses. We analyse data from OECD countries that are already fully available for the whole of 2020. To assess the severity of the pandemic, we compare with historical demographic events since 1880. Results show that reports of high excess mortality during peak periods and local outbreaks should not be taken as representative. Six countries saw a somewhat more increased percentage of life years lost (over 7%), nine countries show mild figures (0–7%), while seven countries had life year gains of up to 7%. So, by historical standards, Covid-19 is worse than regular flu, but a far cry from the Spanish Flu, which has become the predominant frame of reference for the current pandemic. Even though the demographic impact is modest, psychological aspects of the pandemic can still lead to transformative futures, as the reactions of East Asian societies to SARS I in 2003 showed.

1. Introduction

Futures are moulded by our perception of opportunities and risks. Risk researchers traditionally look to the past and try to analyse the probability of negative events occurring and the distribution of associated losses. They often conclude that the probability of everyday risks such as car or household accidents is much higher than that of more rare events such as nuclear accidents or terrorist attacks, which attract much more public attention. They argue that avoiding such events can cause much more damage than the event itself. In this vein, Cass Sunstein (2003) and Gerd Gigerenzer (2004) argued that after Nine Eleven, many people in the US avoided aeroplanes and instead drove cars – a panic-induced side effect that, according to the authors, led to a higher death toll than the original victims of the hijacked planes. In this way, risk researchers have often claimed that excessive vigilance can be dangerous and called for more public calm.

Against this view, Paul Slovic (1987) introduced the concept of "dread risk" in a famous article in "Science". According to this, dread risks have two dimensions: First, the causal mechanism is new and unobservable to the public or even the experts. Second, the potential damage is quite high and could be destructive for larger parts of society. In this sense, nuclear accidents such as the meltdowns in Harrisburg, Chernobyl and Fukushima are classified as "dread risks". If neither the probability nor the maximum damage can be determined, the public pursuit of precaution does not necessarily qualify as "irrational", as more traditional risk researchers have
More recently, this controversy has been reigned with regard to the interpretation of the current pandemic. While Cass Sunstein and Gerd Gigerenzer again argued against panic in the face of a low probability risk, Arkadiusz Sieroń (2020) pointed to the possibility of a desastruous “dread risk”, namely the exponential growth of a pandemic. But as Sieroń himself acknowledges, exponential growth occurs only in the first phase of an epidemic wave and is followed by stagnation and decline in infection numbers (this is a general feature of infection dynamics, see Kermack & McKendrick, 1927). In his article at the beginning of the pandemic (published in June 2020), Sieroń was right to claim that there was a lot of uncertainty at play in view of reports about exploding infections in many parts of the world. Now, in summer 2021, many countries have experienced three or four epidemic waves, marked by a dynamic development not only of phases of spread, but also of standstill and decrease of contagion. The question of the pandemic’s “dread” must therefore be raised again.

As usual in risk debates, the assessment of hazards depends on the choice of perspective: Reports that respond immediately to horrific events naturally follow the spatial spread radius and temporal spread dynamics of these events. Since infections and deaths in Covid-19, as in other epidemics, occurred in limited periods and places, such a perspective is inherently prone to a negative bias. Due to media attention economy, extreme and negative events receive more prominence than non-events or slow change towards the positive (Sandman, 1994; Ungar, 1998). Media coverage of the Covid-19 pandemic was accordingly dominated by alarmist news, while reports of mild courses and declining infections resonated much less (Sacerdote et al., 2020).

In contrast, assessments that are to be sustained over the longer term need to adopt a more systematic and explicitly comparative framework. To date, most systematically oriented assessments have compared Covid-19 with other diseases or other harmful events in the recent past. They conclude that Covid-19 is more harmful than common, seasonal influenza (sceptics of the current risk had equated the two), but not as serious as many other threats to our lives (Arolas et al., 2021). We propose here to focus on the severity of Covid-19 in a long-term perspective: How does the death toll from the current pandemic compare to historical events such as the heat wave of 2003, the Hong Kong flu of 1968, the post-World War II famine, World War II, the Great Recession of 1929, the Spanish flu of 1919, etc.?

In addressing the general public, this long-term perspective was also invoked when Covid-19 was (and still is) portrayed as a prominent societal event which stands out from the past and relates to a strong impact on imagined futures. The German Chancellor, Angela Merkel, spoke of the “Greatest challenge since World War II” (Merkel, 2020). The leaders of the United States, the United Kingdom, and France spoke in rather similar wordings of “a war against the virus” (Benziman, 2020). Prominent scientists, such as Neil Ferguson and colleagues from Imperial College London, also stepped in the “collective battle” narrative using far reaching historical comparisons: “The global impact of COVID-19 has been profound, and the public health threat it represents is the most serious seen in a respiratory virus since the 1918 H1N1 influenza pandemic.” (Ferguson et al., 2020, p.1).

This reference to the Spanish Flu is a common approach to characterise the current Covid-19 pandemic. With that frame, and similarly with the war analogies mentioned, the actual situation is defined as a state of emergency. A state of emergency in general declares the present as extraordinary hardship but promises that social life will switch back to normalcy after a certain amount of time. Thus, contrary to what some propagate (e.g. Schwab & Malleret, 2020) and others criticize (Roth, 2021), at least officially the episode is not conceived as transition or regime change. The future will again be like the recent past – that is the implicit message.

In this article, we will see that the death toll from the 2020 pandemic was not that high compared to the Spanish Flu, even in countries where counter-measures against the spread of the disease reportedly had been taken in a rather loose or inconsistent way – as in the UK, the USA, Switzerland, Sweden, Poland and Czechia. Thus, the historically outstanding severity of the counter-measures in many countries cannot be explained in hindsight by the dreadfulness of observed demographic facts. In the discussion we will show that even a much lesser harmful event such as SARS I in 2003 has initiated strong societal reactions in East Asian Countries, and that the Spanish Flu, the demographically most harmful event since at least 1850, has gone more or less unnoticed by the contemporaries in the aftermath of the First World War. We come to the conclusion that the social construction of the current pandemic seems to be driven not by a systematic view on reliable demographic observations but by highly speculative imaginaries. Or to put it in the wording of the Special Issue: by dissimulations rather than by realistic simulations.

The article is structured as follows: In the next part (II), we describe the current state of the art regarding methods and results of assessing the severity of the pandemic. In Part III, we explain our choice of data and methods. Part IV presents the results, while Part V discusses caveats, summarises the main findings and places them in the broader context of possible future changes. The paper ends in Part VI with a brief conclusion.

2. The severity of Covid-19: methods and current scientific knowledge

In the public, day to day representations of the pandemic dynamics were guided mainly by two elements: one is daily case and death counts, and the other iconographic images of local hotspots. Daily case and death figures are reported from the local authorities to national accounts and from there they are sampled by Johns Hopkins university, among others, and distributed globally. Media again represent the figures often selectively in rather alarming contexts (Sacerdote et al., 2020). Reports are often accompanied by images of stacked coffins or intensive care units bathed in a pale light. In this way, confirmed cases are equated with disease and disease is equated with death. Population surveys show that respondents vastly overestimate infection and mortality risks. For example, in a June 2020 survey, respondents in six OECD countries overestimated the risk of infection by a factor of 4–46 and the mortality risk by a factor of 100–300 (KEKST 2020, p. 24).

Yet, many scientific metrics and expert tools for compiling and interpreting the daily reported figures are of limited informational value. Computer models, which may predict extremely high numbers of cases and deaths, are based on rudimentary and often
unrealistic assumptions (Alberti & Faranda, 2020; Ioannidis et al., 2020; Loveridge, 2016). The daily reported number of new infections is based on tests whose sensitivity and specificity are questionable (Ai et al., 2020; Mina et al., 2021). More important than the reliability of the tests themselves, however, is the question of who is being tested at all. Due to the fact that the infection often remains asymptomatic or with a diffuse clinical picture of the common cold, many cases are never detected. The number of unreported cases is correspondingly high and the true incidence is estimated to be four to ten times higher based on extrapolation from antibody studies. Due to the underestimated number of infections, the mortality risk, measured as "infection fatality rate", is rather insecure and scientific estimations differ between 0.1% and 1.0%, i.e. by a factor of 10 (Ioannidis, 2021; Levin et al., 2020). Accordingly, with simulations of epidemic outcomes based on such weak evidence, many questions regarding the severity of the disease and the proportionality of countermeasures remain controversial (cf. Saltelli & Giampietro, 2017).

For lay people in the past, the severity of a disaster was experienced in neighbours, friends and family falling ill and dying. Yet a more sensitive and systematic approach became available with the measure of excess mortality (EM). It has been introduced as early as the 1840s by William Farr at the General Register Office in Great Britain (Honigsbaum, 2020), and still represents a robust statistical tool in epidemiological and demographic research to this day. The concept is quite simple: the average number of deaths during non-epidemic seasons is subtracted from the number of deaths observed during an epidemic. Since it constitutes the only instrument to measure the severity of an infectious episode in a reasonably reliable way it is commonly employed until today; for instance, to assess outbreaks of seasonal influenza. Public Health specialists Thomas Beaneey and colleagues (2020) discuss it even as the “gold standard” in determining the severity of Covid-19, although in wealthier countries Covid tests are widely available to detect the illness among persons dying with pertinent symptoms.

Regarding the aim to avoid dissimulation, the excess mortality method has a number of advantages over the common approach, which is based on virus detection. Death is an indisputable fact that can be easily grasped and ascertained even by laypersons, whereas recourse to causes of disease and disease patterns always presupposes expert knowledge and instruments (cf. Bremer, 2017) for similar problems with climate change research). Death counts are thus comparable over large historical time spans and between poor and rich countries. They provide an independent source of information against possible confirmation bias and group think of those who set the alarm bells ringing (Craig, 2018). Moreover, the measure of excess mortality always includes a comparative benchmark – namely, the number of people who normally die. Psychologically, singular death is conceived as extraordinary and threatening, whereas statistical, demographic death is viewed from a much more detached and calm perspective (cf. Grothe-Hammer & Roth, 2021). Without a frame of comparison, any death message sounds alarming, even when statisticians are reporting deficit mortality.

According to the respective literature (Beaney et al., 2020; Karlinsky & Kobak, 2021; Michelozzi et al., 2020) and websites (EuroMomo; OVID; DeStatis, EuroStat), excess mortality measures in combination with Covid death data can particularly settle arguments concerning underreporting or overreporting of these deaths. While underreporting may occur when and where test availability is limited, overreporting is particularly probable for cases of frail patients who would have died anyway in the same time frame for other reasons. At this point, an even more nuanced picture may be produced if not only the number but also the age of the deceased is taken into account. Within the concept of "life years lost" (LYL) – sometimes also called "years of life lost" (YoLL) – the further life expectancy at the respective age as indicated in the mortality tables is used as a multiplier (e.g. Goldstein & Lee, 2020). This measurement gives more weight to those who die at younger age and is more sensitive to the higher demographic salience and dread associated with deaths in the still active population.

Now to the current knowledge on excess mortality (EM) and life years lost (LYL). The Centre for Evidence-Based Medicine at Oxford University, using the same database and similar age standardisation methods as in this article, estimates the EM of 2020 in OECD countries ranging from minus 4.3% in Denmark to plus 14.4% in Poland (Parrilà et al., 2021). The United States, as the most populous nation in the sample, has an EM of 12.9%. Negative results (as in Denmark) were interpreted as positive side effects of countermeasures, e.g. lower deaths from common flu or car accidents. High positive outcomes (as in Poland) may also include negative side effects such as a failure to seek medical treatment for other diseases, e.g. heart attacks as a result of fear of hospital infections with Covid-19 (Wengler et al., 2021).

However, these numbers become more interpretable when they are put into perspective. To do this, Arolas et al. (2021) compare the LYL burden of Covid-19 in 81 countries with other common causes of death. They conclude that, on average, Covid-19 has a slightly higher LYL-burden than traffic accidents (a factor 1.2), a similar burden to strong seasonal influenza waves (a factor 1.0), and a much lower burden (a factor of 0.16) than heart disease. However, these average results differ greatly between the Global North, where Covid-19 impacts (or their measurement) were generally higher than in most countries from the Global South (with the exception of Latin America). The difference is interpreted mainly as consequence of the fact that in many countries from the Global South, up to the point of measurement (January 6, 2021), the epidemic had not yet spread so far or been registered to the same extend as in countries of the Global North. Moreover, LYL from Covid-19 accounts only for 30% of LYL from all cause mortality in the countries for which these statistics are available. Given the preliminary nature, heterogeneity and partly modest quality of the data, the reported results can be considered interesting, but should not be given too much weight.

Another article, written by demographers Samuel Preston and Yana Vierboom (2021) and prominently published in PNAS, uses only US and European data and can therefore be considered more valid. It describes how life expectancy in the US has deteriorated compared to Europe over the last twenty years, mainly due to an increase in mortality rates in younger age groups. For example, in 2017, the US faces approximately 400,000 excess deaths and 13 million LYL when compared to age-specific mortality rates in Europe. These 400,000 excess deaths are roughly equivalent to the 377,000 deaths that US authorities attribute to Covid-19 in 2020. However, the Covid-19 deaths, due to advanced age, have a lost life expectancy of 11.7 years, compared to 32.5 years for the "normal" excess deaths (resulting from the comparison with Europe). Therefore, Preston and Vierboom conclude that the sum of years of life lost due to generally restricted living conditions in the USA is three times higher than the corresponding losses due to Covid-19.
Beyond the articles reviewed, the scientific literature attempting to measure the demographic of Covid-19 fatalities in a comprehensive and systematic way is rather rare. Until now (late summer 2021), the picture has been dominated mainly by consideration of the hotspots. Blangiardo et al. (2020), for example, document excess mortality peaks of up to 200 per cent for a few days during the first wave and for a few selected locations in northern Italy. While public and scientific reporting in immediate response to the first events focused on individual weeks and localised outbreaks, more comprehensive publications are now appearing. They are expected to show a more differentiated and less alarming picture.

3. Data and methods used in this article

We base our analysis on the Human Mortality Database (HMD). HMD provides official demographic data in its historical archive going back as far as possible, in the case of Sweden even to 1750. For more recent years, especially for 2019 and 2020, we have taken the mortality figures and death rates from HMD’s Short-term Mortality Fluctuations (STMF) data series. With regard to data quality, four basic limitations should be noted, especially with regard to the quality of the STMF data.1

- The number of reported deaths is preliminary and possibly somewhat too low, as subsequent reports are to be expected. In order to combine both data sets – the historical HMD and the current STMF – we have corrected the current data to bring it in line with the historical (probably more reliable and complete) records.2
- The age groups in the STMF are only roughly divided into five levels (0–14, 15–64, 65–74, 75–84, 85 and older). Since some of the source data are aggregated differently, the entries in the STMF are partly based on estimates.
- The calculations of mortality rates are based on forecasts of population figures. These are already quite uncertain at the level of the national statistical offices and differ even more at the level of the various international databases (EuroStat, OECD, World Bank, HMD data).

We have included in our analysis those OECD countries for which, at the time of writing (August 2021), the general death statistics for the whole of 2020 were already fully available. These data allow us to examine countries with allegedly very low or very high covid death rates – Norway, Finland, South Korea, Taiwan, Australia and New Zealand are found on the low side, while Italy, Spain, the USA, the UK, Switzerland and Sweden have often been attributed to the high side in many reports.

A controversial problem is the choice of calculation method for the baseline of the ”expected mortality”. Concerning the latter, there is no consensus among experts – e.g. the German expected value for 2020 ranges from 936,000 to 992,000 according to different sources – see DeStatix3 for the lowest and Höhle (2021) for the highest figure. There exist mainly three different calculation methods in the literature:

1) Multivariate regression methods may be used including an entire series of variables to control for seasonal and exceptional influences. In this way, a rather low baseline is obtained, so that even normal flu and heat deaths appear as excess mortality while deficit mortality practically never occurs (e.g. Nielsen et al., 2019; for a critical discussion see Aaron et al., 2020). Islam et al. (2021) for example, who use this baseline estimation method, report on average about 50 per cent higher EM figures for OECD countries in 2020 than Parildar et al. (2021) and we do here (see below, Fig. 3). We reject these procedures as inappropriate because the baseline thus obtained is not useful for assessing pandemic excess mortality and the impact of related interventions. In our view, the appropriateness of the declared emergency should be evaluated in relation to the normal state, i.e. the mortality level that is generally accepted as “normal” in the respective societies. In other words: Normative positions on the acceptable number of deaths should come from the societies concerned and should not be introduced through the back door via arbitrarily chosen control variables.

2) Another, much simpler method is used by Eurostat and the German statistical office DeStatix: The mean of the mortality figures of the previous four or five years is used as the expected value for the following year. In contrast to the above-mentioned regressions with a rather opaque arsenal of control variables, this approach is very transparent and appropriate in terms of its relation to normality. A disadvantage is that population change and in particular the process of demographic ageing are not taken into account. If the proportion of older people in a population increases over the years, a higher number of deaths is to be expected.

1 See description in the so called ’STMF note’: Short-term Mortality Fluctuations data series of HMD https://www.mortality.org/Public/STMF_DOC/STMFNote.pdf [last visit on April 7, 2021]
2 The correction offset for the years covered solely in the STMF was derived from the difference between the two data series in the last overlapping year. In addition, we replaced obvious outliers (1000-fold increased values) with values from the previous week and removed the 53rd week in leap years by multiplying the mean value over all weeks of the year by 52.
3 https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Sterbefaelle-Lebenserwartung/sterbefallzahlen.html;jsessionid=70A84744C58AF28AB4C52F2CB7235CE6.live711 [last access 25th of August 2021]
To address the latter problem, the possible statistical solution is to use an age-stratified model (see e.g. Höhle, 2021; Stang et al., 2020; Kowall et al., 2021; Parildar et al., 2021). This means that one does not take the average of the absolute mortality figures, but instead uses the average of the mortality rates (i.e. deaths per inhabitant) of different age groups in previous years and multiplies these averages by the population size (“exposure”) of the respective age groups in the focal year. For the whole time series, this means that the moving average of the last five years is used to calculate the expected value for the focused year. Thus we obtain expected values for all years (minus the earliest five in the national time series).

For example, for the year 2020, the estimation procedure runs as follows:

\( \text{ExpectedDeaths}(AG_g, 2020) = \text{DeathRate}(AG_g, \text{average2015} - 2019) \times \text{Exposure}(AG_g, 2020) \) (1)

One obtains the Expected deaths of the whole population of the country in the focussed year by adding the results of the five age groups \( (AG_{10} \text{ to } AG_{95}) \) from Eq. 1:

\( \text{ExpectedDeaths}(2020) = \sum_{g=1}^{5} \text{ExpectedDeaths}(AG_g, 2020) \) (2)

Excess mortality is expressed then as percentage to make values comparable between times and countries:

\( \text{ExcessMortality(\text{percent}, 2020}) = \left( \frac{\text{ObservedDeaths}(2020) - \text{ExpectedDeaths}(2020)}{\text{ExpectedDeaths}(2020)} \right) \times 100 \) (3)

To calculate the life years lost (LYL), we multiply the age-stratified deaths by their further life expectancy (Goldstein & Lee, 2020; Preston & Vierboom, 2021). The further life expectancy was extracted from the life tables in the HMD, where they are, however, only available in a finer-grained form. We estimated weighted averages for the coarser-grained age groups in the STMF by adding up all the life years lost of the relevant fine-grained groups and dividing by the number of all deaths in these groups. The formula used was:

\( \text{LifeExpectancy}(AG_g, \text{Year}) = \sum_{x=1}^{n} d_x(\text{Year}) \times e_x(\text{Year}) \div \sum_{x=1}^{n} dx(\text{Year}) \) (4)

\( AG_g \) denote the five coarser-grained age groups of the adult population in the STMF (0–14, 15–64, 65–74, 75–84, 85 plus). For each of them, \( x_1 \) to \( x_n \) denotes the respective more fine grained age groups from the HMD, "e" stands for the further life expectancy and "d" stands for the number of deaths in the fine grained age groups.

The calculation of absolute LYL is then derived again in age stratified form from excess deaths calculation and multiplication with the further life expectancy:

\( \text{ExcessDeaths}(AG_g, 2020) = \text{ObservedDeaths}(AG_g, 2020) - \text{ExpectedDeaths}(AG_g, 2020) \) (5)

\( \text{LYL}(AG_g, 2020) = \text{ExcessDeaths}(AG_g, 2020) \times \text{LifeExpectancy}(AG_g, 2020) \) (6)

To calculate LYL for the whole population of the country for that year we have to add the results for the five age groups:

\( \text{LYL}(2020) = \sum_{g=1}^{5} \text{LYL}(AG_g, 2020) \) (7)

But the result is the absolute number of LYL which is barely comparable among times and countries. To express LYL from excess deaths as a percentage of LYL from expected deaths we have to calculate the latter again in age stratified form:

\( \text{ExpectedLYL}(AG_g, 2020) = \text{ExpectedDeaths}(AG_g, 2020) \times \text{LifeExpectancy}(AG_g, 2020) \) (8)

And sum up the results:

\( \text{ExpectedLYL}(2020) = \sum_{g=1}^{5} \text{ExpectedLYL}(AG_g, 2020) \) (9)

Now, LYL from excess deaths can be expressed as percentage of LYL from expected deaths. 

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4 When considering longer periods of crisis – WW I and the Spanish flu from 1914 to 1920 and WW II and the depression thereafter from 1939 to 1947 – a fixed 5-year period before that was taken as the baseline (1909–1913 and 1934–1938). Otherwise, the crisis periods themselves would have been included in the expected values and would have distorted the latter upwards.

5 We are aware that those who die from Covid-19 are often a risk group whose remaining life expectancy is shorter than the average life expectancy of a person of the same age. But even with comparable events (hunger, other epidemics, etc.), it may be that the weaker are affected more often than the stronger in the same age group (cf. Arolas et al., 2021).

6 This means that we apportion the LYL in the same way to normal years. Each death in each year is multiplied by the life expectancy of that age. We are aware that this is in a sense paradoxical: if, according to the mortality tables, everyone had a few years to live at each age, no one would ever die. But since this paradox is in both the numerator and the denominator, its effect is cancelled out. This calculation procedure can also be seen as a remedy to the common criticism that Covid 19 deaths more often affect frail people in the respective age group (see footnote 5). Since this is true for most deaths in affluent societies, the percentage calculation makes the over-optimistic attribution disappear that results from the criticised use of mortality tables.
6. Results

First, we look at the overall historical mortality perspective in Fig. 1, aggregated across all countries included in our panel. We find that the average mortality rate of the population has declined since the 1880s from about 2.3 per cent annually to 0.85 per cent in 2010, and then increased again slightly to 0.9 per cent in the years before 2020. We also find that the annual fluctuation of the curve was larger in the past and, except for single catastrophic events, became smoother over the years. These observations are quite consistent with the theory of demographic transition. In the past, mortality rates due to natural events such as epidemics and starvation were high and fluctuating; they declined with industrial development (McKeown, 1979; Preston, 1980). More recently, a second demographic transition is taking place in more developed countries (cf. Lesthaeghe, 2014): with a low birth rate and high life expectancy, the population is ageing. This means, among other things, that with larger cohorts reaching an older age, the overall mortality rate slowly rises again.

Now let’s look at individual historical events in the 20th century of this curve. First, a sharp increase between 1915 and 1920 is noticeable, caused by the First World War and the Spanish flu in the following years. Adult mortality jumps from 1.7 per cent in 1914–2.7 per cent in 1918. World War II also shows a notable peak, but compared to 1918 the casualty rates are much lower—latter is due to the structure of our sample: Russia, Eastern European countries and Germany were not included in our panel during these years. The Great Depression around 1929, the Asian Flu around 1958, the Hong Kong Flu around 1968 and the heatwave of 2003 do not stand out particularly from other events of their time. The Covid-19 peak at the end of the curve at 1.0 per cent is clearly visible, but can also be seen partly in line with the general upward trend of the second demographic transition. Measured against the trend of that transition, mortality increases in 2020 by around 8 per cent (1.0/0.93 = 0.08).

The dashed black line in Fig. 1a shows the increasing number of countries in our panel, as additional mortality statistics become historically available. Fig. 1b enlarges the last twenty years, with the orange trend line indicating the development of mortality rates without Covid-19. The difference between the solid blue line and the dashed orange line8 can be interpreted as excess mortality.

This assessment— that mortality in 2020 is only moderately increased by historical standards— is reinforced when considering the rate of life years lost relative to the excess mortality rate. Fig. 2 compares excess mortality (EM) and life years lost (LYL) in relation to the demographically impactful events of the 20th and 21st centuries. The two world wars and the Spanish flu mainly affected the younger population, while excess mortality from Covid-19 deaths was distributed rather evenly other all age groups.9 In terms of years

\[ \text{LYL(\text{percent}, 2020)} = \left( \frac{\text{LYL(2020)}}{\text{Expected LYL(2020)}} \right) \times 100 \]  

\[ (10) \]

7 The countries have different starting points in the panel: SWE, FRA, DNK, GBR_ENW, NOR, NLD, GBRSCO, ITA, CHE and FIN are included since 1880. Later came in: ESP 1908, BEL 1919, AUS 1921, GBR_NIR 1922, USA 1933, AUT 1947, NZL 1948, CZE 1950, POL 1958, TWN 1970, DEU 1990, KOR 2003. Country codes are those from ISO 3166 ALPH A-3. United Kingdom is represented by three subunits in the HMD: ENW stands for England and Wales, SCO for Scotland, NIR for Northern Ireland.

8 The baseline of normal mortality is regressed here as a polynomial trend of total annual deaths, confirming our results derived from the more sophisticated age-stratified method which we described above in the methods section.

9 Although absolutely, most Covid-19 deaths occurred in the oldest cohort, the relative increase in mortality in this group compared to the previous years was not greater than in the other adult age groups.

Fig. 1a and 1b. Yearly mortality rates of all countries included in our panel.7
of life years lost, Covid-19 therefore appears even less significant, although our estimation method for LYL excess in the year 1918 is rather conservative.

The relatively low excess mortality of Covid-19 is probably at least in part the result of countermeasures taken by governments. However, as mentioned at the beginning of this article, these measures were in some cases stricter and in other cases less strict and were followed by the citizens in some cases more and in others less. Therefore, in Fig. 3 we analyse the differences in LYL and EM between the countries for the year 2020.

The results for LYL from excess deaths range from 15 per cent for the USA to minus 7 per cent for New Zealand. The USA are followed by Italy, Poland, Spain, England and Wales, and Scotland with LYL above 7%. The Czech Republic, Belgium, North Ireland, Austria, France, Switzerland, the Netherlands, Germany and Sweden have a LYL increase below 7%. In Finland, Denmark, South Korea, Norway, Australia, Taiwan and New Zealand there was no loss but a gain in life years compared to normal conditions. Excess mortality of life years lost, Covid-19 therefore appears even less significant, although our estimation method for LYL excess in the year 1918 is rather conservative.

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10 The first and foremost reason is, that the age group of 15–64 years is very broad. Since most deaths within this age group are to be found at the older age end, the average of the further life expectancy of this group and in this time lies around 24 years only. In contrast, more exact demographic analysis of the Spanish Flu mortality shows that most victims were between 20 and 35 years old (Gagnon et al., 2013, Fig. 1), and would have had a further life expectancy of around 40 years. The second reason is, that many Covid-19 deaths occurred under condition of comorbidities. This implies that the deceased would probably not have lived up to the normal life expectancy of their age (Ioannidis, 2020).

11 For the historical comparison in Fig. 2, age group 0–14 years was excluded because child deaths did not play a significant role in the historical crisis periods under discussion. Conversely, however, the youngest age group was rather large and child mortality was consistently quite high in earlier times. Their inclusion would therefore distort the historical comparison. Values including kids would be: EM 1918: 54% (70%). LYL 1918: 61% (107%). EM 1940: 13% (15%). LYL 1940: 11% (19%). EM 2020: 8.3% (8.4%). LYL 2020: 8.6% (9.4%). Values in brackets show the numbers without children as used in Fig. 2.

12 Here and in Fig. 4, country codes are those from ISO 3166 ALPHA-3. United Kingdom is represented by three subunits in the HMD: ENW stands for England and Wales, SCO for Scotland, NIR for Northern Ireland.
8

and LYL are strongly correlated, but there are some notable divergences from each other: The USA stands out as having a higher LYL than EM; this is because many of the excess deaths occurred in younger age groups – in particular, the 15–64 age group had quite an elevated mortality rate. In most other countries with excess mortality, mainly the older age groups were concerned; therefore LYL was lower there than EM. This was especially the case in Sweden, where there was almost no LYL (0.5%), mainly due to the concentration of EM in the oldest age group and the unexpected gain of life years in the 15–64 age group.

In many public and professional accounts, these differences are attributed to the stringency of government prevention measures. Lower than expected mortality rates are often seen in this context as positive side effects of sanitation and lockdown measures (fewer infectious diseases overall, fewer traffic accidents, less pollution). To now test the assumed correlation with empirical data, we rely on the Oxford COVID-19 Government Response Tracker (Hale et al., 2021), which is continuously updated as a panel and accessible online. Fig. 4 shows “stringency” of government responses based on nine response indicators, including school closures, job closures and travel bans, aggregated over the whole of 2020. As we can see, the countries with the higher LYL scores tend to be on the side of higher restrictiveness and not – as expected – on the side of looser measures. The correlation between LYL and stringency is positive and quite strong: Pairwise correlation coefficient $= 0.625$ with $p = 0.0019$. We address this counter-intuitive observation later in the discussion.

5. Limitations, summary of results and discussion

At the outset, we should point out some limitations of our study. For reasons of data availability, the study is limited to the year 2020 and to OECD countries. However, it is unlikely that 2021 will be more catastrophic, at least not in OECD countries where vaccines have been administered with relative success since spring. The limitation to OECD countries implies that the picture could be different in other parts of the world – more severe demographic consequences seem to be emerging in Latin America, less so in Africa, but this is difficult to assess at present (cf. Arolas et al., 2021).

The mortality data for 2019 and 2020 are provisional and post-reporting of deaths is to be expected, but we have adjusted their levels upwards using historical data. Therefore, they should be realistic unless there are particular glitches in demographic reporting due to Covid-19 in 2020 that could affect the statistics in novel ways. In general, it should be noted that even historical demographic data can vary by a few percentage points depending on the source (EuroStat, OECD, World Bank, HMD), depending on how they are collected, estimated, delineated and aggregated. Since HMD is often used as a data basis in similar work on excess mortality, our results are widely comparable at least in this respect.

Moreover, excess mortality estimates are sensitive to the choice of estimation methods. Accordingly, the derived mortality expectation may diverge. For example, in Germany, where we have followed the debate closely, EM estimates thus vary between minus 1 and plus 5 per cent. In this article, our estimate for Germany is around 1.6 per cent (see Fig. 3). It is obvious that age-stratified estimation methods in ageing societies usually yield higher baselines and thus lower EM estimations (Schöley, 2021). Nevertheless, age-standardised methods are generally recommended by the WHO (Ahmad et al., 2001) for epidemiological and demographic estimations, and we therefore consider that we have chosen a defensible method.

A further limitation lies in the fact that we only see aggregated numbers of death, but not their causes. To some extent this could be remediated by disaggregating the analysis into more differentiated age and gender groups as well as time units. This for example would

![Fig. 4. Relationship between the Stringency of government preventive measures and life years lost (LYL). The metric for the stringency of the measures comes from the Oxford COVID-19 Government Response Index; we cumulated the daily values from the data source for the entire year 2020. Higher values mean more restrictiveness, lower values less strict countermeasures. The dashed red line marks the upward trend.](https://ourworldindata.org/grapher/covid-stringency-index [last access on 23th of August 2021]).
allow to investigate to what extent deficit mortality is due to prevention of infections – mitigating deaths among the elderly – or to other side effects, e.g. road accidents that hit the population more equally. But even this exercise has its limitations, as we can often only speculate about the various side effects of prevention measures, and to which extent the positive and negative effects may cancel each other out. A more accurate assessment will therefore only be possible when cause of death statistics become available.

Now to the main findings: The first year of the pandemic (2020) was rather modest in all observed countries, when compared with historical events. Even the US with the highest LYL from excess deaths (15%) in our sample are far from the death toll of the Spanish flu pandemic, particularly if the excess of life years lost would be taken into account (109%). While with the Spanish flu the median age of the victims was in their twenties (Gagnon et al., 2013), the Covid-19 deaths median age is in the eighties (Williamson et al., 2020). If the death toll of Covid-19 would be comparable to the Spanish flu, we could ignore all complicate methodological arguments about data base, baseline estimation and “cancel out” effects, such as reduced car accidents or reduced normal flu mortality.

The second key point is that we see remarkable contrasts between countries with excess mortality and those with deficit mortality. The public often tends to associate “low numbers” with “effective policies” and conversely “high numbers” with “irresponsible policies”. This view is also supported by scientific modelling studies such as that of Flaxman et al. (2020), which attribute large numbers of lives saved to lockdown measures and other severe restrictions. However, the objection to such modelling approaches is that the results are based on prior assumptions about the effectivness of measures rather than empirical data – in other words, they are based on circular reasoning (Kuhbandner and Homburg, 2020). In contrast, our correlation study between EM statistics and the Oxford Government Response Index (see Fig. 4 and 5) shows a counter-intuitive result: we observe higher EM in countries with stricter policies and vice versa.

That there is not the intuitively assumed correlation between public measures and infection rates has already been shown sporadically in the literature (Bjørnskov, 2021; Bendavid et al., 2021). However, this observation should not be interpreted to mean that countermeasures are always ineffective or even counterproductive. Two key points should be noted. First, the swelling and subsiding of waves of infection is obviously not solely dependent on government intervention, but also on many other social and physical factors whose interactions are poorly understood even by experts – model-based predictions during the pandemic were vague and often enough wrong. For example, when England lifted its restrictions on 19 July 2021 (“Freedom Day”), this was accompanied by loud expert warnings of a surge in infections – while the opposite occurred. Second, due to the growth dynamics of infections, effectiveness depends on the early start of interventions. However, serious impairments of public life are difficult to enforce in democratic societies until serious consequences have become visible (Sebhatu et al., 2020). Accordingly, the observed correlation between high EM and high restrictiveness is likely an effect of reverse causality: drastic measures were taken when EM was skyrocketing and governments felt obliged to communicate to the public that they were "doing something”.

Now, to return to the first and most important point: EM and especially LYL have not assumed historically outstanding proportions, even not in countries whose governments have been accused of lax or contradictory policies, such as the US, the UK, Sweden and Switzerland. Why did the formerly liberal OECD countries impose such incisive emergency measures against a demographically rather modest event?

To make the problem even more puzzling, we should draw attention to two other observations beyond Covid-19. The one is the resonance of Spanish Flu narratives: Until the 1980s, it had barely been mentioned, as library catalogues and other archives show. That changed in the 1990s; with the end of the Cold War, officials and citizens became more sensitized for pandemic fears (Hitzler, 2021; Thießen, 2014). Only against this backdrop, it became catchy to name the Spanish flu “the Great One” (Cohn, 2012). And all Spanish Flu narratives got an exploring resonance, when in 2020 Covid-19 made us obsessive to one unique threat, as if no other worries could matter for our survival and thriving. Seen in the perspective of collective memorization, “the 1918 pandemic’s time is now”, as Marc Honigsbaum (2018), a prominent Spanish Flu historian, put it. The demographic wounds that the Spanish flu may have torn are long healed and forgotten. But its resonance happens now to guide our expectations and fears for the near future (cf. Kaiwo-aja et al., 2004).

The second striking observation is the response of East Asian societies to the SARS I pandemic that occurred in 2002 and 2003. From a demographic point of view, SARS I was an insignificant event, with about 8000 deaths worldwide. While it was more or less ignored in most Western countries, it had truly transformative consequences for many East Asian societies (Mason, 2016; Voelkner, 2019): urban planning and architecture were geared towards preventing contagion, public health services were reoriented towards surveillance and rapid intervention, and last but not least, the population was re-educated to constant self-monitoring and to be vigilant towards fellow citizens. The self and the others thus, in the first place, became potential virus spreaders.

How was it possible that the demographically incisive event of 1919 had no major social consequences, while the demographically negligible event 84 years later was so transformative? This question goes beyond the empirical scope of this article, but in order to formulate at least an idea, one probably has to distinguish between two sides: On the one hand, today’s affluent and ageing societies obviously conceive of death differently from less affluent societies where death, and especially early death, was and still is a much more common feature of daily life (Ariès, 1975; Norris & Inglehart, 2011). While less affluent societies and religious groups tend to resort to metaphysical consolation, “modern” secular societies break down the inevitable problem of death into many diseases, all of which are “in principle” curable through medical intervention (cf. Bauman, 1992). Death thus becomes a scandal and is politically attributed, at least when it occurs in clusters. The countless deaths of the Spanish flu were probably considered “natural” in their time, the comparatively significantly lower number of deaths of SARS I and SARS II are now regarded as “political” in large parts of affluent societies.

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14 See e.g. The Times, August 07 2021: https://www.thetimes.co.uk/article/even-johnson-didnt-believe-relaxing-the-rules-could-go-so-well-d9j8v310r [access on 24.08.2021]
societies.

On the other hand, pandemics seem to be a kind of particularly heightened "dread risk". As mentioned in the introduction, dread risks consist of two dimensions, namely the potential physical impairment of lives and infrastructures on the one side and the uncertainty about future developments on the other (Slovic, 1987). In the first phase of the pandemic, both dimensions coincided in the uncertainty about the potential for disruption. Later, at least the experts could see that Covid-19’s disruptive potential was limited. But for the public, the threat remained opaque or even terrifying in the face of never-ending alerts.

It is a common feature of dread risk debates that experts disagree. But most other examples of "dread risks" have limited political impact for two reasons. Often the catastrophic potential lies in a more or less indeterminate future – as with climate change, mad cow disease or genetic engineering. Or a catastrophic event has actually occurred – like the reactor explosion in Fukushima or the terrorist attack of September Eleven. But such events are then completed for the time being, and if nothing happens for a while, they fade from memory.

Pandemics are different: people die now and in the future because new virus variants can appear in ever new waves. Or new pandemics emerge: Influenza, for example, spreads in new variants every year, and accordingly the alarm bells keep ringing in the WHO offices (Caduff, 2014; Chien, 2013; Nerlich & Halliday, 2007). Since it is better to respond to exponentially growing risks sooner rather than later, there is always a sense of urgency. Pandemics have all these incentives for alarmism – actual deaths, future deaths and exponential growth potential. This is what makes them so explosive in sensitised societies as "dread risks" – quite apart from their observable physical impact.

Alarmism can always be legitimised by referring to the "prophet’s dilemma": The fact that nothing worse has happened is taken as proof of the justification of the alarm and the effectiveness of the measures taken in response. Since waves and outbreaks of infection repeatedly appear and disappear again, and heterogeneous countermeasures are frantically deployed here and stopped there, no clear feedback loop between intervention and effect can be established. This opens up a situation that is rather undetermined by indisputable facts. The situation allows governmental authorities, media outlets and medical industries to expand their influence – especially in societies prone to authoritarianism.

6. Short conclusion

Measured by its catastrophic potential (and as far as we can see at present), Covid-19 is not a "dread risk". Its demographic impact is far from being a disaster, at least in historical perspective. But it obviously has enormous psychological potential to shake the institutions and daily routines of sensitised – affluent and ageing – societies. It remains to be seen whether or not Covid-19 (or new pandemics that might follow due to our heightened awareness) will trigger major societal transformations: in which societies will pandemic-related changes occur, and to what extent? Academic libraries are full of bookshelves on the "modern society", but the social theory of the "pandemic society" has not yet been written.

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