TAUB CENTER
FOR SOCIAL POLICY STUDIES IN ISRAEL

# Anticipating the Total Mortality Impact of Coronavirus in Israel

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VIRAL ECONOMICS* MARCH, 2020

## INTRODUCTION

**There is considerable uncertainty** about the overall mortality impact of coronavirus in Israel. That uncertainty largely arises from unknown levels of infection with the coronavirus, and unknown levels of mortality among those infected. However, a full accounting of the mortality effects of coronavirus also needs to address the possible indirect effects of the virus on other types of mortality as an increasing share of already overstretched medical resources in Israel are diverted toward the "war" against this epidemic.

Our goal in this brief report is to provide a simple delineation of these potential direct and indirect mortality effects of coronavirus on the population of Israel. We present rough estimates of the number of people that could die under a number of scenarios, drawing on estimated case-fatality rates (CFRs) associated with the coronavirus in China and Italy. We then discuss the potential indirect mortality effects, drawing on Israeli Ministry of Health and European Union data on cause-specific mortality.

It is important to note that even though coronavirus mortality estimates have been prepared in some other countries, they are not always made public. This is the case in the US, where the CDC's projections have been withheld in an effort to spare the public panic (Fink, 2020). It also appears to be the case in Israel: a report to the Israeli Ministry of Health that has reportedly been instrumental in shaping Israel's aggressive policy response to the epidemic is not in public circulation (Linder and Apelberg, 2020).

We prefer a more transparent approach to these issues, in which there is open discussion of underlying assumptions, especially those related to our two foci here: anticipated age-specific fatality rates for coronavirus, and to whether the projected scenarios incorporate shifts in other causes of mortality. This type of approach plays to one of Israel's relative advantages in medical infrastructure, which is having a nimble public health system with excellent community-based primary care and preparedness for emergency situations. Yet it also forces policy makers to openly confront one of the system's core disadvantages, which is that even before the current epidemic, the acute care medical infrastructure had very little slack (we expand on this below).

We emphasize that our estimates are forecasts based on the best currently-available information, not predictions. They describe a variety of scenarios, each juggling a hypothesized infection rate with one of three age-specific coronavirus CFRs. We expect actual mortality from coronavirus in Israel over the next several months to be much closer to the lower bound of our estimates: not exceeding the low hundreds. However, there is a lot of public discussion in Israel, and in developed countries in general, about conditions associated with higher estimates, so we present those too.

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** Viral Economics is an ongoing Taub Center response to the coronavirus (COVID-19) crisis.*

Overall, despite uncertainty about our estimates of coronavirus mortality — driven in turn by uncertainty about how high infection rates in Israel will climb, and how low we can push CFRs among those infected — and uncertainty about how much other causes of mortality will be influenced by interventions directed against coronavirus, the estimates and ideas presented here are useful, even necessary, for prudent public policy.

## METHODS

The distinct age-pattern of coronavirus case-fatality rates (CFRs) has been clear since the early stages of the pandemic: they are very low at younger ages, and increase with age. Yet in generating reliable and robust estimates of these CFRs, all researchers have had to confront two key methodological problems, each of which shifts estimates in a different direction. The first is a denominator problem: since a large proportion of people who test positive for coronavirus are asymptomatic,[1] rates based on number of deaths per confirmed symptomatic case exaggerate the actual mortality impact. The second problem is a right-censoring issue: not following symptomatic cases long enough may lead to underestimates of mortality.[2]

On March 3, a study appeared with formal estimates of age-specific CFRs, based on data from Hubei Province, China, covering January and parts of February 2020 (Riou et al., 2020). The authors, a team of epidemiologists at the University of Bern, are open about the danger of trying to estimate CFRs during an emerging epidemic, an acknowledged problem in this area of research (e.g., Lipsitch et al., 2015). But they make careful adjustments for both the denominator and right-censoring issues mentioned above, thereby providing the first robust age-specific estimates of COVID-19 CFRs.

**Table 1. Estimated or assumed case-fatality rate for coronavirus (% dying), by age**

| Age | Hubei-crude[1] | Italy-crude[2] | Hubei-adjusted[1] |
|---|---|---|---|
| | (1) | (2) | (3) |
| 0-9 | 0 | 0 | 0.0094 |
| 10-19 | 0.25 | 0 | 0.022 |
| 20-29 | 0.22 | 0 | 0.091 |
| 30-39 | 0.26 | 0.1 | 0.18 |
| 40-49 | 0.48 | 0.1 | 0.40 |
| 50-59 | 1.4 | 0.6 | 1.3 |
| 60-69 | 3.8 | 2.7 | 4.6 |
| 70-79 | 8.5 | 9.6 | 9.8 |
| 80+ | 15.0 | 17.0 | 18.0 |

Note: 1. Riou, et al. (2020): Table 1. 2. Estimates from ISS (2020): Table 1.
Source: Alex Weinreb and Dov Chernichovsky, Taub Center

The crude and the adjusted CFRs from this study are shown in columns 1 and 3 of Table 1, respectively. For the sake of comparison, column 2 presents the crude CFRs from Italy (ISS, 2020). Note that these Italian rates are significantly lower than the Hubei rates up to age 70, but then exceed them by around 15% from age 70 and up. Given the high percentage of elderly in Italy's population, the net result of these shifts in age-specific CFRs is that Italy's overall crude fatality rate from coronavirus (5.8%) is more than twice as high as Hubei's (2.4%) — we revisit this below.

Our initial estimates apply the adjusted Hubei CFRs in column 3 to Israel's current population, allowing us to project the number of coronavirus deaths in Israel under a number of scenarios:

1 Testing, then following, passengers on the Diamond Princess cruise-ship showed that 49% of infected people are symptomatic. This figure assumes that the likelihood of being symptomatic is homogeneous across age-groups. Experiences in similar epidemics imply that this likely exaggerates the percentage symptomatic at younger ages.

2 There is some variation in data on duration from illness to death. In one study tracking infection paths in Hubei Province, researchers identified 3 people who died (out of their sample 228 people with known outcomes). All three occurred 35-44 days from symptom onset and 27-33 days from clinical confirmation of those symptoms (Bi et al. 2020). An earlier study with a larger sample of deaths estimated a mean of 19.9 days from illness to death, with high variance (95% CI: 14.9, 29.0) (Jung et al., 2020).

Infection rates that range from 0.1% to 30% of the population as a whole.[3] To put this range of possible infection rates in perspective, the CDC estimates (as of late March 7, 2020) were that 36 million Americans were infected with flu in the 2019-20 season — around 11% of the US population — leading to 370,000 hospitalizations and 22,000 deaths (CDC, 2020). Evidence thus far suggests that coronavirus is almost twice as contagious. Its reproductive rate, R0, is in the 2.0-2.5 range, almost twice as high as the R0 of a standard influenza (e.g., H1N1) which lies in the 1.2-1.4 range. These are presumably the reasons that the generally unflappable Chancellor Merkel warned of the possibility of 70% infection rates in Germany. Our models assume that current Israeli policy of "social distancing" — a range of practices whose goal is to minimize close contact, and therefore viral transmission, between people — will ensure that rates will not come close to those high levels. For this reason, we set 30% as the absolute high bar for cumulative infections across the life cycle to the epidemic.

Coronavirus CFRs that range from the same as the adjusted rates in Hubei Province — column 3 in Table 1 — to 50% and 75% reductions in those rates. These reductions capture anticipated improvements in the ability of the Israeli medical system to treat symptomatic cases, due to a combination of reducing the number of incoming patients by "flattening the infection curve," and by greater clinical success in reducing mortality from the acute respiratory distress that is the main cause of death for people from coronavirus. Recent estimates from Italy, discussed above in relation to column 2 of Table 1, suggest that our approach is pointing in the right direction. Among patients below age 70, CFRs appear to have fallen by between 30-75%. However, among patients aged more than 70, CFRs in Italy have increased by around 15%. Assuming a 75% reduction in CFR in Israel across all ages would certainly be a massive improvement over Italy's performance.[4] Likewise, research on the Chinese epidemic also points to the importance of flattening the curve in order to reduce CFRs: in areas with low coronavirus infection rates, the risk of death from coronavirus for infected individuals was approximately 1/12$^{th}$ of the risk at the epicenter of the epidemic (Mizumoto and Chowell, 2020). In the authors' words: "the risk for death from COVID-19 is probably associated with a breakdown of the healthcare system."

Note that Israel's young age structure, that is, having a larger portion of the population under age 65, and especially under age 30, means it will inevitably have a lower crude (i.e, non age-standardized) CFR than China and, especially, Italy.

A second set of estimates, less formal, describes the potential effects of coronavirus on other types of mortality. We assume that these will arise from diverting increasingly scarce medical resources toward the fight against this virus.

## Coronavirus mortality

Specific numeric results are presented in Table 2. There are 8 panels labeled a-h. Each contains the estimated number of deaths by age, infection scenario and mortality scenario. The eight infection scenarios assume 0.1%, 0.5%, 1%, 2%, 5%, 10%, 20% and 30% infection rates at the population level: in other words, they range from a low of 9,300 to 2.79 million infected individuals. Three case-fatality scenarios assume the same as those estimated in Hubei Province and 50% and 75% reductions.

More general patterns are shown in Figure 1. Each of the three panels contains results for one of the three case-fatality scenarios, with variation in anticipated mortality by infection level.

3 For the sake of simplicity, we assume there is no age gradient in likelihood of infection. This is consistent with Bi et al. (2020), who suggest that children are at similar risk of infection, though more evidence is needed.

4 In the absence of a vaccine, we assume that the overall improvement in mortality rates across all age groups will not be significantly greater than 75 percent, but will be limited by the flattening slope of extreme values in a logistic function.

## Table 2. Expected numbers of deaths from coronavirus by age, and by infection and mortality (CFR) scenarios

### a. 0.1% Infection rate

| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 0 | 0 | 0 |
| 10-19 | 0 | 0 | 0 |
| 20-29 | 1 | 1 | 0 |
| 30-39 | 2 | 1 | 1 |
| 40-49 | 4 | 2 | 1 |
| 50-59 | 11 | 6 | 3 |
| 60-69 | 34 | 17 | 9 |
| 70-79 | 49 | 24 | 12 |
| 80+ | 52 | 26 | 13 |
| Total | 154 | 77 | 39 |

### b. 0.5% Infection rate

| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 1 | 0 | 0 |
| 10-19 | 2 | 1 | 0 |
| 20-29 | 6 | 3 | 1 |
| 30-39 | 11 | 5 | 3 |
| 40-49 | 22 | 11 | 5 |
| 50-59 | 55 | 28 | 14 |
| 60-69 | 171 | 85 | 43 |
| 70-79 | 245 | 122 | 61 |
| 80+ | 260 | 130 | 65 |
| Total | 771 | 386 | 193 |

### c. 1.0% Infection rate

| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 2 | 1 | 0 |
| 10-19 | 3 | 2 | 1 |
| 20-29 | 12 | 6 | 3 |
| 30-39 | 22 | 11 | 5 |
| 40-49 | 44 | 22 | 11 |
| 50-59 | 111 | 55 | 28 |
| 60-69 | 341 | 171 | 85 |
| 70-79 | 489 | 245 | 122 |
| 80+ | 519 | 260 | 130 |
| Total | 1,543 | 771 | 386 |

### b. 2.0% Infection rate

| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 3 | 2 | 1 |
| 10-19 | 7 | 3 | 2 |
| 20-29 | 24 | 12 | 6 |
| 30-39 | 43 | 22 | 11 |
| 40-49 | 88 | 44 | 22 |
| 50-59 | 222 | 111 | 55 |
| 60-69 | 682 | 341 | 171 |
| 70-79 | 979 | 489 | 245 |
| 80+ | 1,038 | 519 | 260 |
| Total | 3,086 | 1,543 | 771 |

### e. 5.0% Infection rate

| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 9 | 4 | 2 |
| 10-19 | 17 | 8 | 4 |
| 20-29 | 59 | 30 | 15 |
| 30-39 | 108 | 54 | 27 |
| 40-49 | 219 | 110 | 55 |
| 50-59 | 555 | 277 | 139 |
| 60-69 | 1,705 | 853 | 426 |
| 70-79 | 2,447 | 1,223 | 612 |
| 80+ | 2,596 | 1,298 | 649 |
| Total | 7,714 | 3,857 | 1,929 |

### f. 10.0% Infection rate

| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 17 | 9 | 4 |
| 10-19 | 34 | 17 | 8 |
| 20-29 | 119 | 59 | 30 |
| 30-39 | 216 | 108 | 54 |
| 40-49 | 439 | 219 | 110 |
| 50-59 | 1110 | 555 | 277 |
| 60-69 | 3410 | 1705 | 853 |
| 70-79 | 4893 | 2447 | 1223 |
| 80+ | 5191 | 2596 | 1298 |
| Total | 15429 | 7714 | 3857 |

### g. 20.0% Infection rate

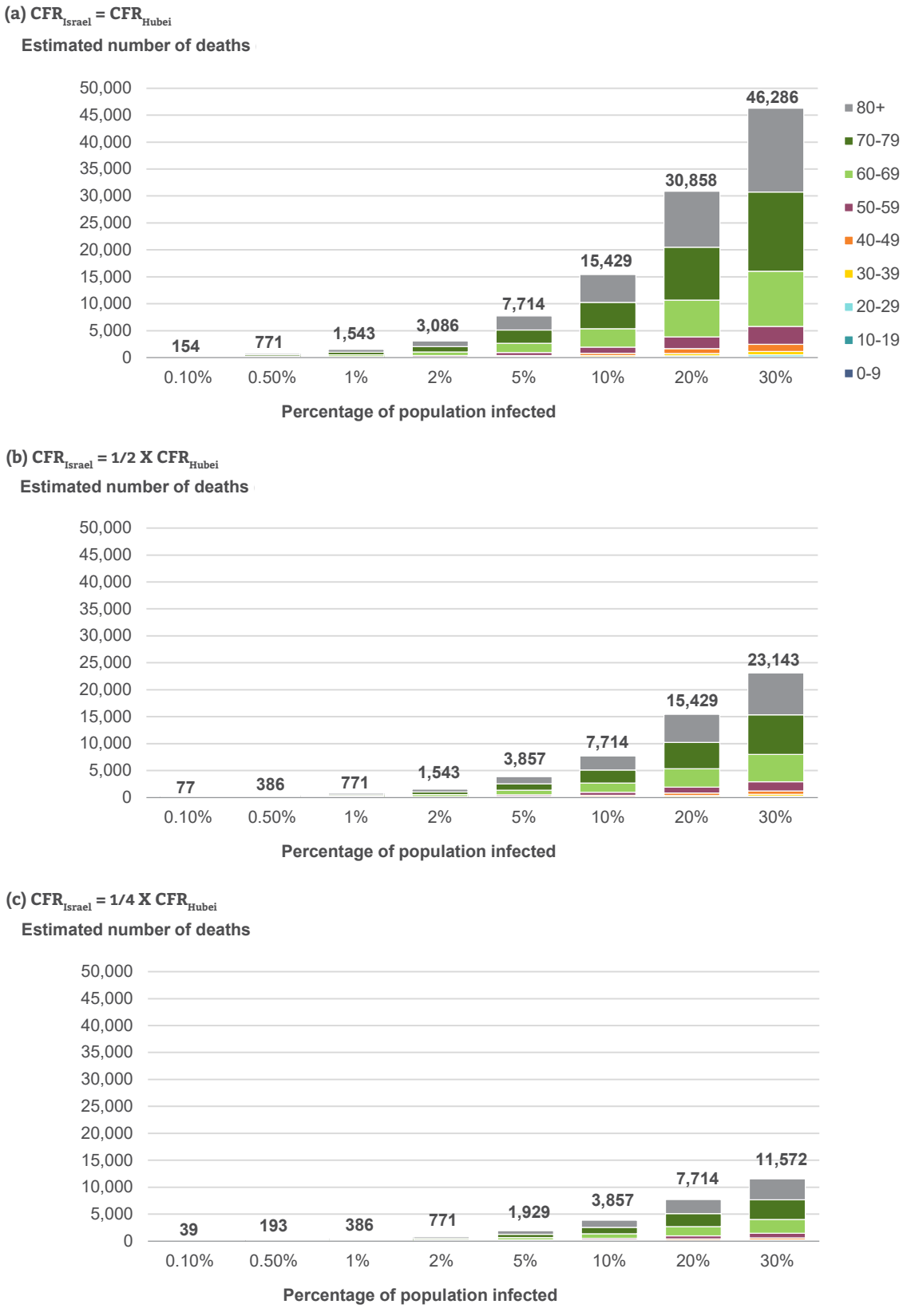
| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 34 | 17 | 9 |
| 10-19 | 68 | 34 | 17 |
| 20-29 | 237 | 119 | 59 |
| 30-39 | 431 | 216 | 108 |
| 40-49 | 878 | 439 | 219 |
| 50-59 | 2,219 | 1110 | 555 |
| 60-69 | 6,821 | 3,410 | 1,705 |
| 70-79 | 9,786 | 4,893 | 2,447 |
| 80+ | 10,383 | 5,191 | 2,596 |
| Total | 30,858 | 15,429 | 7,714 |

### h. 30.0% Infection rate

| | Percent of Hubei CFR | | |
|---|---|---|---|
| Age | 100% | 50% | 25% |
| 0-9 | 52 | 26 | 13 |
| 10-19 | 102 | 51 | 25 |
| 20-29 | 356 | 178 | 89 |
| 30-39 | 647 | 323 | 162 |
| 40-49 | 1,317 | 658 | 329 |
| 50-59 | 3,329 | 1,664 | 832 |
| 60-69 | 10,231 | 5,116 | 2,558 |
| 70-79 | 14,679 | 7,340 | 3,670 |
| 80+ | 15,574 | 7,787 | 3,894 |
| Total | 46,286 | 23,143 | 11,572 |

Source: Alex Weinreb and Dov Chernichovsky, Taub Center

**Figure 1. Expected numbers of deaths from coronavirus by age, and by infection and mortality (CFR) scenarios**




Source: Alex Weinreb and Dov Chernichovsky, Taub Center

Panel a in Table 2 implies that with an infection rate of 0.1 percent, given the same CFR as Hubei, Israel could expect zero deaths in the under 20 age-group, and around 100 in the age 70+ brackets. Across all ages, there would be a little more than 150 deaths in Israel. As infection rates rise across the panels, so too does the expected number of deaths. For example, at 0.5 percent infected (panel b) — again assuming the same CFR as in Hubei — the expected number of deaths is 771. If infection rates in Israel reach 10% (panel f) — again, assuming the same CFR as in Hubei — the expected number of deaths is around 15,400. And if infection rates reach 30% (panel h)—still well below what Chancellor Merkel has suggested is possible in Germany—the expected number of deaths would exceed 46,000.

In each of these cases, substantial medical success in reducing CFRs to 25% of the observed Hubei level would still lead to an anticipated 39 deaths where infection rates are 0.1%, 386 deaths where infection rates are 1%, 3,857 where infection rates are 10%, and more than 11,500 if infection rates hit 30%.

To put these numbers in perspective, it is helpful to compare them to the number of deaths from other causes. In Israel in 2016, the number of deaths from all causes, across all ages, was 43,964. Of these, around 11,100 and 6,800 people, respectively, died from the two most common causes of death, malignant neoplasms (i.e., cancer) and heart disease (Goldberger et al., 2019). A number of the estimates presented in Table 1 approach or even exceed these estimates, implying that in a worst-case scenario, coronavirus could become the leading cause of mortality in Israel.[5]

## Mortality from "standard" causes

The direct effects of coronavirus on mortality almost certainly underestimate the total mortality effect of this pandemic. There are two main reasons. The first relates to the relatively dismal state of Israel's hospital system. In Israel, there are 2.2 beds for general care per 1,000 residents, relative to 3.6 in the OECD in general, and 4.1 in states that, like Israel, provide health services through health funds (Belgium, Germany, Holland, France, Switzerland). Even after adjusting for Israel's relatively young age structure, the number of beds is 2.5 per 1,000, only 60% of the average in peer countries (i.e., those with (Health Funds). The bed occupancy rates within Israeli hospitals is around 94%, relative to an average of 75% in the OECD. And hospital stays are relatively short — 5.2 days in Israel, relative to 6.7 days in the OECD, and 6.2 days in other countries with health funds (Chernichovsky and Kfir, 2019a). In addition, the number of visits to hospital emergency rooms in Israel is about 36 per 1,000 individuals, twice as high as in the peer countries. All this pressure on the general hospital system — even on good days — is a result of the low price of hospitalization, as set by the government, which incentivizes the health funds and nursing homes to send the sick to hospitals instead of caring for them in the community or in other institutions (Chernichovsky and Kfir, 2019b).

In other words, until the emergence of the coronavirus, Israel's acute care hospitals worked at full capacity, with little or no slack for emergencies, and certainly less slack than is available in most developed countries. In addition, alternative care options, whether in the community or in nursing homes — all of which are critical in the current circumstances — were not developed, and may even have degenerated.

The second reason that measuring the direct effects of coronavirus on mortality almost certainly underestimates the total mortality effect of this pandemic is related to medical personnel. Their numbers have been reduced by infection and isolation. As of March 12, 2020, there were 2,479 medical staff in isolation, around two-thirds of them doctors and nurses (Bat Or Yas'ur, 2020). By March 28, that number had risen to 3,637 medical personnel (Myasnikov, 2020), an increase of around 1,200 people in two weeks. Current trends, therefore, point toward an increase in the number of medical personnel requiring quarantine, even as the number of coronavirus patients continues to rise.

Inevitably, these two trends will mean that scarce medical resources that would have been devoted to other acute conditions will have to be diverted to coronavirus. How long will it be before the treatment of coronavirus reduces medical resources directed at other life-saving interventions — especially in the

5 For the sake of simplicity, we ignore the fact that some proportion of people who would die from coronavirus, especially among the old and frail, may well have died in the same period from some other cause, that is, in the absence of coronavirus. Once this epidemic is behind us, it will be useful to quantify this mortality displacement.

medium term — like cancer screenings and heart catheterization? There are already signs of delays in operations (Koretz, 2020), and closures of, or restrictions on, other departments after the quarantining of too many medical staff (e.g., urology at Ichilov Hospital). In Italy it is clear that the heavy demand on hospitals has increased mortality from other critical conditions. The UK has already declared that "millions of operations" will be postponed because of growing pressure on the system (Campbell, 2020).

Until this epidemic is past, it will not be possible to say with any certainty how many extra "collateral" deaths were caused by this diversion of medical resources to coronavirus. An analysis of that type would also need to take into account different time-lags (e.g., heart-catheterizations or colonoscopies rescheduled during the corona epidemic that failed to avoid fatal heart or colon cancer in post-coronavirus years). Any diversion of medical resources is also not likely to be uniform across leading causes of death. Overall, however, our expectation is that a prolonged epidemic will increase the number of deaths from cancer, heart disease, and kidney disease. It may also increase the already very high levels of septicemia among other hospital patients, as well as deaths associated with hypertension or diabetes.[6]

To be fair, there may also be a couple of positive mortality effects, but only in relation to causes of death that are much less affected by access to medical resources. This includes accidents — on the road or at work. In total, however, given that accidents account for only 3 percent of all deaths per year in Israel, the total net effect of coronavirus on other types of mortality will likely be to increase the number of deaths, over and above any directly ascribed to coronavirus.

Applying these ideas to 2016 data, Table 3 presents some crude estimates of the monthly, semi-annual and annual growth in the number of deaths in Israel that could arise from the diversion of medical resources to handling the coronavirus cases. For the sake of simplicity, we ignore displaced mortality timing (e.g., the catheterization/heart attack example mentioned above). Table 3 suggests that even a moderate 2% increase in other mortality would increase the number of deaths in a 6-month period by around 458, 1% of the total annual mortality.

**Table 3. Monthly, semi-annual, and annual additions to "regular" number of deaths, by percent growth in underlying mortality rate.**

| | Number of additional deaths | | |
|---|---|---|---|
| % increase in regular mortality | Monthly | Semi-annually | Annually |
| 1% | 38 | 229 | 458 |
| 2% | 76 | 458 | 917 |
| 5% | 191 | 1,148 | 2,296 |
| 10% | 383 | 2,296 | 4,591 |
| 15% | 574 | 3,444 | 6,887 |
| 20% | 765 | 4,592 | 9,183 |
| 25% | 957 | 5,740 | 11,479 |

Source: Alex Weinreb and Dov Chernichovsky, Taub Center | Data: Goldberger, Aburbeh, Haklai (2019)

Assuming a more prolonged epidemic, with increasing numbers of medical personnel quarantining for periods of time, other medical resources being diverted towards the epidemic, and rising poverty rates pushing people into making a range of unhealthy behavioral choices, it seems reasonable to expect more pronounced effects on mortality. For example, if we increased Israel's cause-specific mortality rates to those of the EU-15 for malignancies, cardio- and cerebrovascular disease, liver disease, while also increasing mortality from diabetes, kidney disease and septicemia by 10%, and reducing mortality from accidents by 10 percent, Israel's total mortality — in terms of age-standardized number of deaths per 100,000 people — would increase

6 Septicimia is already the Achilles heel of the Israeli medical system. Israel has the highest rates of septicemia in the OECD, and these are unlikely to improve given overcrowding associated with coronavirus. We also assume that the incidence and severity of hypertension will increase as the adverse economic effects of combating the virus unfold.

by 18% (calculations based on Goldberger et al., 2019, available from authors). Note that even with this increase, these levels of "other mortality" would still be 7% less in Israel than they are in the US.

Applying this to Table 3 shows that a 15% and 20% increase in other types of mortality would lead to an increase of 3,444 and 4,592 deaths, respectively, in a 6-month period. The implicit assumption here is that the virus would run its course within 6 months. If it continued for longer, the effects on other mortality would shift in parallel to the left-hand column: increases of 917 deaths for a 2% annual rise in other mortality, 7,000 deaths for a 15% annual increase in other mortality, and 9,200 for a 20% annual increase in other mortality.

## The challenge

There is still a lot of uncertainty around these estimates. Some of this uncertainty is related to not knowing what the overall infection rate is going to be, or whether it also has an age-gradient (see footnote 3). Another important source of uncertainty is related to the original CFRs — those from Hubei or Italy — or to their application to Israel. Will Israel be able to lower them by 75% across all ages, or by even more than 75%? Thus far, things are looking hopeful, but only one month has passed since the first confirmed cases in Israel, which is close to the mean duration between infection and death in China. So there is a long path ahead.

A final type of uncertainty relates to how the diversion of medical resources to the fight against coronavirus, especially in the hospital system, will affect other types of mortality. The numbers we present may sound too speculative. But, as we suggested above, we think it important to provide some estimates that should be factored into the policy discussion. They are a necessary part of any informed assessment about what a public health triumph against coronavirus should look like.

Say, for example, Israeli policy makers and society could keep infection rates to between 0.1% and 0.5% of the population — which we think is the most likely scenario in these models given the steps taken in Israel thus far — and the Israeli medical system could reduce the Hubei CFRs by 75%. We would then expect total direct coronavirus deaths of 39-193 people (Table 2, panels a and b). If that relatively low level of coronavirus mortality was achieved with minimal increase in other types of mortality, that would be a clear victory in terms of public health. However, if it was achieved at the cost of a 5% increase in other mortality for even 6 months, then the total mortality increase due to coronavirus would be 1,341 deaths 193+1,148), a more tarnished victory. The same exercise with 2% infection rates would generate 1,919 extra deaths, 771 directly from coronavirus, and 1,148 from the 5% increase in other causes. Lengthening the period of increased mortality from other causes to a year — plausible in the event of a prolonged epidemic — would likewise increase the total mortality cost of coronavirus under these 1% and 2% infection scenarios to 2,682 and 3,067 deaths, respectively.

Worse still, if the current policies of social distancing failed, raising coronavirus infection rates to 10%, and leading to an even greater diversion of medical resources to the fight that, as described above, gave Israel the same age-standardized mortality rates as the EU-15 on key causes of death like malignancies and cardio- and cerebrovascular disease, we could face the prospect of high direct and indirect mortality effects of coronavirus on the Israeli population. This is the worst-case scenario. For example, in the case of 10% infection rates (from coronavirus) and a 75% reduction in Hubei CFR, alongside a 10% increase in deaths from other causes over a 6-month period, we would expect 6,153 extra deaths (3,857+2,296). That would represent about a 13% jump in the annual number of deaths. Increase the percentages in Tables 2 and 3 accordingly, which is what would likely happen if the epidemic became truly anchored in Israeli society, and the jump in the annual number of deaths would even more massive. Given the trajectory of infection and coronavirus mortality in Israel thus far, these are very unlikely outcomes, but they are plausible.

## Conclusion

The anticipated sharp rise in number of deaths as infection rates increase — presented in Table 2 and Figure 1 — provide strong support for current policies that emphasize "social distancing." These should reduce the rate of transmission and "flatten the curve", that is, maintain infection rates at a lower level over a longer period of time. In the short-term, this is certainly the best way to reduce the burden of coronavirus on the acute care hospital system, give medical professionals more time to learn from their own — and others' — clinical experiences, while also allowing time for rapid 'China style' capacity-building. Together, these benefits should keep overall infection levels much closer to the 0.1-0.5% level, and also reduce the age-specific CFR from coronavirus to a fraction of the observed level in the epidemic's epicenter in Hubei Province, China.

Simultaneously, though, Israel must also focus on protecting vulnerable populations where other types of mortality are concentrated: patients currently confronting cancer, cardio- and cerebrovascular conditions, diabetes, depression, hypertension. This is especially important in addressing the health needs of Israel's growing elderly population, many of whom already wrestle with heightened levels of financial insecurity and isolation, both of which will likely be exacerbated by coronavirus. Reducing coronavirus mortality at the cost of increasing "collateral" mortality seems like a false economy, if not economically — an issue that we have intentionally not addressed here — then certainly morally. If nothing else, this type of mortality displacement merits public discussion and debate. There was some discussion of this type in the UK, following the government's initial decision to impose complete closure on all people aged 70+ and other vulnerable subpopulations, restricting them to their homes for several months, while allowing the virus to circulate freely in the rest of the population. That original British approach demonstrated a readiness to trade higher mortality from the virus for the potential for reduced collateral mortality, and for fewer restrictions on everyday economic activity — a sensitive issue in post-Brexit era. Some observers referred to this as a classic British approach to such problems, evoking the "callous" utilitarianism of other public policy decisions made by British leaders over the last century (Edgerton 2020).

Being at war with this virus, a favored linguistic register for this conflict among leaders in Israel and abroad, does not necessarily mean a narrowly focused "total war," in which we mobilize every societal resource for the fight, irrespective of cost. Openly discussing the type of issues raised here is also intended to prevent political leaders and other public servants — who have neglected the medical system from more than a decade — from bragging about how successfully Israel prevented coronavirus deaths without also taking responsibility for the price paid for that hoped-for triumph: an increase in otherwise preventable types of mortality.

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The Taub Center was established in 1982 under the leadership and vision of Herbert M. Singer, Henry Taub, and the American Jewish Joint Distribution Committee. The Center is funded by a permanent endowment created by the Henry and Marilyn Taub Foundation, the Herbert M. and Nell Singer Foundation, Jane and John Colman, the Kolker-Saxon-Hallock Family Foundation, the Milton A. and Roslyn Z. Wolf Family Foundation, and the American Jewish Joint Distribution Committee.