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Summary

Some commentators argue for a fairly general release from COVID-19 lockdown. That has a troubling flaw. It ignores the fatality risks that will then be faced by citizens in midlife and older. This paper provides information on the strong age pattern in the risk of death from three countries (China, Italy and the UK). If politicians want an imminent removal of the lockdown, the safest approach, in our judgment, would be a rolling age-release strategy combined with the current principle of social distancing. But even if that is not the policy adopted, citizens need to be shown graphs of the kind in this paper. Honest guidance ought to be given to those in midlife and beyond. Governments have to allow people to understand their personal risk after any release from lockdown.

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Key words: coronavirus; labor market; recession; COVID-19.

We would like to acknowledge the advice of Amanda H Goodall of Cass Business School. She suggested the idea of a government-sponsored website where people could get an estimate of their personal coronavirus risk (based on their age, gender, BMI, etc). The first author also acknowledges the assistance of the CAGE research centre at Warwick.

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Introduction

In the search for an optimal response to the COVID-19 crisis, many nations' politicians have locked down their societies. There is fierce dispute about what should happen next. This includes protests by Americans cradling rifles in Michigan town squares and Conservative politicians in the UK pressing for building firms to be allowed to construct new houses. There is currently no vaccine, and little immediate chance of one. Economic pressures are mounting. It is only natural that many people talk -- especially by emphasising the supposedly helpful possibility of testing and tracing -- of going back to a more normal life. However, we think it is conceivable that there may be confusion in society about the difference between mere accurate testing for the virus and an actual cure for the virus. The former is not the same as a vaccination.[1]

How can a safe 'exit strategy' be designed? The main scientific feature of COVID-19 is the risk it poses for those who are middle-aged or older. That is a worrying aspect for many of our citizens, but it also points to a potential way forward for a constructive and fairly safe 'exit strategy'. Governments could now use what might be called a rolling age-release strategy in which cohorts are released sequentially by age. Social distancing could be maintained as an added protection.

The paper's main contribution is empirical. It presents age-risk graphs for three countries that have been significantly affected by coronavirus. The data convey the stark facts. In any general release from lockdown it is probable that fatalities among 50-year olds would be twenty times more than among 20-year olds, and that among 60-year olds the fatalities would be approximately fifty times as great as among those in their early 20s. Therefore any lockdown release policy that does not design itself around the extreme 'age gradient' in human coronavirus risk is likely to have dangerous consequences for citizens. We cannot be sure why this point is missing from much of the media discussion. Perhaps it is not understood; perhaps it is inconvenient. The current paper is an attempt to help it be communicated to those with a hand in national COVID-19 strategy. We hope the information will also be useful for citizens.

In our view, the key advantages of *a rolling age-release strategy, which would begin with the youngest adult age-groups and then work gradually and sequentially up the age range*, are that:

It recognises that we cannot wait indefinitely to reopen the economy;

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[1] Some newspaper discussion has seemed to imply that testing and contact-tracing could somehow replace the need for a vaccine. It is not clear to us how that could be correct. Even the most effective virus test is not a medical solution to the virus.

It is the safest way to do that before a vaccine is available;

Crucially, it is the least likely strategy to require that people will have later to be painfully recalled into further rounds of lockdown (because in principle the young should be able to stay out once released);

It usefully plays for time as researchers work on a vaccine;

It targets the group currently the hardest-hit financially.

Even if politicians do not want to follow our idea of a sequential release of younger-to-older cohorts, they ought to explain to the public the risks associated with being older. *Death-risk graphs of the kind given later in the paper should also be made clear in government briefings and on television*. The information would help citizens to make their own choices about what to do and what not to do.

Estimating the consequences of a general release of the population in England and Wales

To fix ideas, we start with an illustration of a deliberately extreme worst-case scenario. What might happen in England and Wales in the very long run under a general release from lockdown if no vaccine is discovered and all employees and self-employed people were allowed to go back to some form of work? This is not a prediction of the most likely future. Nevertheless, it allows a focus upon the relative risks across different age-groups.

Consider a deliberate outer benchmark as in Figure 1. This diagram plots the potential long-run deaths in each of the different age-groups up to the age of 70 (approximately the age where the great majority of workers have ceased employment). The calculation adopts especially pessimistic assumptions, so we do not propose it as a literal or exact prediction of what will happen if the government pursues a broad-ranged release policy. It would also be fair to stress that this graph assumes, in particular, the dark case in which no vaccine is discovered. The age-group dispersion in Figure 1 is meant as a representation of the approximate distribution of fatalities that can be expected across different ages.

It is not possible to be certain about the details of what would happen in each of the presently-mooted wide variety of broader kinds of releases from lockdown in which a considerable range of age-groups were allowed to leave the lockdown. However, using the data from Ferguson et al. (2020), and applying the fatality risk ratios to England and Wales, gives us the death estimates in Figure 1. The graph reveals that if the nation went back to work and life in the usual way it is the older citizens who could be expected, in the long run, to suffer very high fatality rates.

Figure 1 is extreme. It makes the almost certainly incorrect assumption that everyone might eventually contract the virus. It should be mentioned that the diagram omits all the age-groups that are in older age categories, where, as is known, there would be severe rates of premature death. That is because in this paper we wish to concentrate on the health risks among workers who would

return under an exit strategy. Like nearly all other commentators, we would not encourage a release from lockdown of society's very oldest citizens.

Age-risk evidence: graphs for three countries

To understand further the argument for rolling age-releases it is appropriate to examine international data.

Figures 2-4 are illustrations. They use data from China, Italy, and the United Kingdom. These three countries make useful examples in a statistical sense because, sadly, they have had substantial numbers of deaths by the standards of most countries in the world. Hence the large size of statistical sample implies that the patterns revealed in the three Figures are almost certainly reliable.

The useful thing to be learned from the three figures is the shape of the relationship that links risk to age. It slopes powerfully upwards and does so in an accelerating way (it should be noted that the figures use a logarithmic scale). The background reason in terms of human biology is that men and women have a strong immune-system response to a virus when they are young. Although the nature of COVID-19 is still not currently understood as fully as could be hoped, to our knowledge there is essentially no scientific dispute about the general shape of the risk curves in Figures 2-4.

Figure 2 depicts data from China. Here the graph shows the infection fatality rate. In this case the denominator in the variable is the number of people who had been confirmed as having the disease (i.e. those who were known to be infected). It can be seen in the graph that the risk of death is 0.03 for those aged between 20 and 30, is just over five times as great as that (at 0.16) among people in their 40s, and is twenty times as high (at 0.60) among those in their 50s.

Figure 3 is for England and Wales. This is not formatted in exactly the same way as the previous graph for China. That is because there are currently no data (at least publicly available to us) that allow precisely the same calculation to be done as for the Chinese numbers. In this case the Figure 3 graph shows fatalities from COVID-19 in the particular age-group divided by the total number of all COVID-19 deaths. However, the same general relative-risk shape is clear and can valuably be compared with the pattern in Figure 2. As before, risk rises markedly once we get to ages beyond the mid-30s.

Figure 4 is the equivalent diagram for Italy. Once again the graph shows the fatality rate, which is calculated as coronavirus deaths in each age-group divided by total coronavirus deaths in all age-groups combined. The same kind of accelerating[2] shape is visible.

[2] Accelerating because it is approximately linear in the log space depicted in the diagram.

Sequential releases of younger cohorts

We have previously proposed a release of the particularly young adult cohort (say 20-30 years old) who do not live with any older citizens – Oswald and Powdthavee 2020a. Those young individuals:

- are, as a statistical matter, likely to be the safest among us
- can help restart the economy and increase their own prosperity
- can ensure movement and support the rest of society
- may become troublesome in the longer run (particularly some of the men) if cooped up
- may in the long run not reliably abide by the lockdown restrictions anyway
- are likely, especially if jobless, to feel frustration that may spill over into domestic abuse (Anderberg et al. 2016)
- and other potential reasons, including offering a leadership role to the young in a moment of crisis, and giving a generalised sense of hope to the remaining adult population.[3]

This principle of sending out the younger citizens first can be extended to slightly older cohorts. There could be sequential *rolling releases*: first those aged 20-30, then those in the next decade of life, and so on. We continue to think this form of age-related policy is a natural part of a rational response to COVID-19. It has the potential to offer an appropriate balance between epidemiology and economics. Older workers in the economy, who are not yet released, might share in the interim in the added prosperity. We believe they could act -- electronically through sources such as Skype, Zoom and Facetime -- as supervisors and mentors.

Possible concerns

How would an age-based release rule be enforced? Presumably police officers would have to be given the right to fine those caught breaking the age rule. As we have explained elsewhere, the vast majority of citizens in the UK carry driving licenses that would allow a police officer to check their date of birth. Most nations have something similar.

A release of younger people might, we appreciate, cause resentment among those older than the age-group released. Nevertheless, to reassure them, the

[3] If a so-called antibody test is developed in the meantime, our proposal might be combined with a staged release of older people who have successfully recovered. There remains considerable doubt about this.

older groups could be told when their turn would eventually arrive, and they could be encouraged to check a government-sponsored website detailing the exact risk-by-age pattern of the virus. There might be a Calculate Your Own Risk app, that would be based on the best available epidemiological evidence. This would give people an estimate of their personal risk (based on their age, gender, BMI, etc) if they wished to have such an estimate either before or after their personal date of release.

Conclusions

One of the characteristics of COVID-19 is that younger people are far, far safer. Yet much of the worldwide discussion of an 'exit strategy' does not exploit this fundamental, and potentially pivotal, piece of knowledge. We hope the paper's age-risk graphs might be valuable both to those who are working on an exit strategy and to citizens in the community who are deciding how to behave.

Figures 1-4 suggest to us that the natural approach would be to create a societal release from lockdown that begins with the 20-30 year olds, and then later moves on to the group in the age bracket up to 40, and so on after that. In this way, society would learn, and garner extra evidence, as it went along. A further reason for an exit strategy with this kind of design is that the younger generation are the ones being most harshly affected in an economic sense (Institute for Fiscal Studies, 2020). A rolling age-release strategy would also play for time while the world hunts for a workable vaccine. It would offer a balance -- one that gives weight to the concerns of economists and of epidemiologists -- between the understandable calls to get at least some of the economy restarted and the understandable calls to keep deaths as low as possible. So there is a straightforward multi-pronged logic to the approach. By contrast, a more general exit strategy that sent out our older citizens would, even among those who feel they are in midlife, create further illness[4] and death.

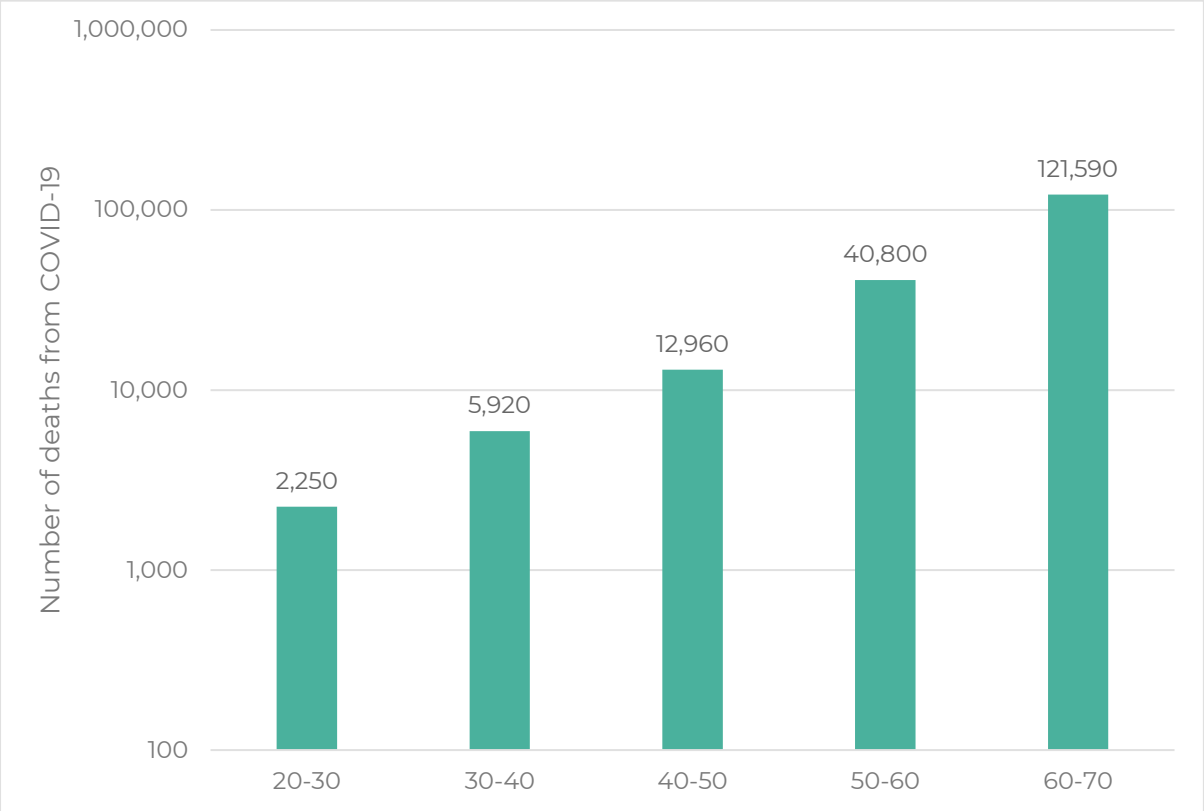
We believe that all citizens who are contemplating leaving the lockdown have the right to be shown the age-risk information in this paper's graphs. Governments should be honest about these patterns.

[4] Of course if social distancing is usefully kept up then all deaths, regardless of age, will emerge more slowly, but it is hard to see how fatalities can be avoided in the long run (unless a vaccine emerges extremely speedily).

FIGURE 1

ONE EXTREME WORST-CASE SCENARIO: PREDICTED LONG-RUN DEATHS FROM COVID-19 BY AGE IN ENGLAND AND WALES UNDER A VERY GENERAL RELEASE FROM LOCKDOWN

Note: Log scale on the vertical axis. Age-groups are on the horizontal axis.



Notes: It is essential to understand that this is an illustrative extreme case and not a literal prediction of what is most likely to happen. The key point to be taken away from the diagram is the relative risk of people in different age-groups.

The graph uses risk estimates from the Chinese experience and then applies those death-to-infection probabilities to the nations of England and Wales. It makes the worst-case assumptions and thus assumes that (i) no vaccine is discovered and that (ii) eventually (perhaps after many years) everyone is exposed to the virus. The graphs draw upon ONS data on the underlying population sizes in each age band.

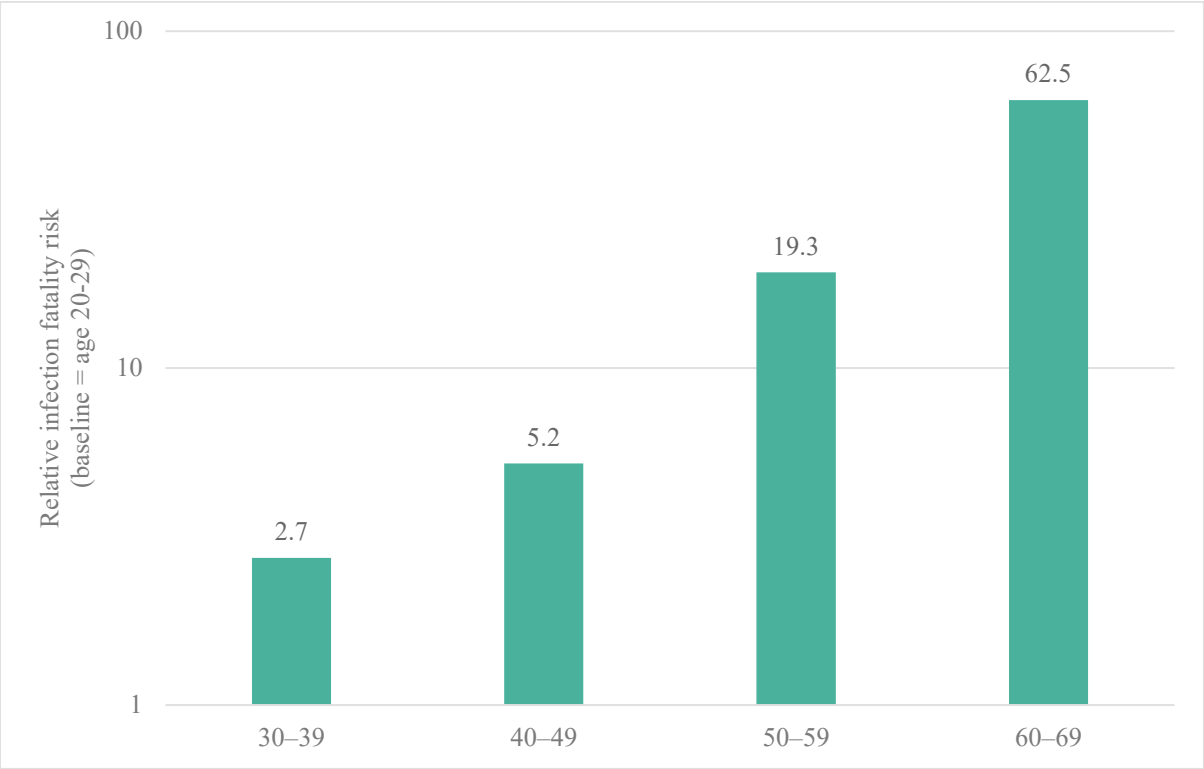
Higher age-groups are omitted because the analysis focuses here on what might happen to the standard working-age population if released under an exit strategy.

FIGURE 2: AGE-GROUP RISK ESTIMATES FROM COVID USING CHINESE DATA

Infection fatality rate (%) = (Number of deaths ÷ Number of infected) × 100 – China

Age is on the horizontal axis.

Log risk scale on the vertical axis.



Source: Verity, Robert, et al. "Estimates of the severity of coronavirus disease 2019: a model-based analysis." *The Lancet Infectious Diseases* (2020).

Notes:

Here the vertical axis is necessarily constructed in a different way from that used in Figure 1.

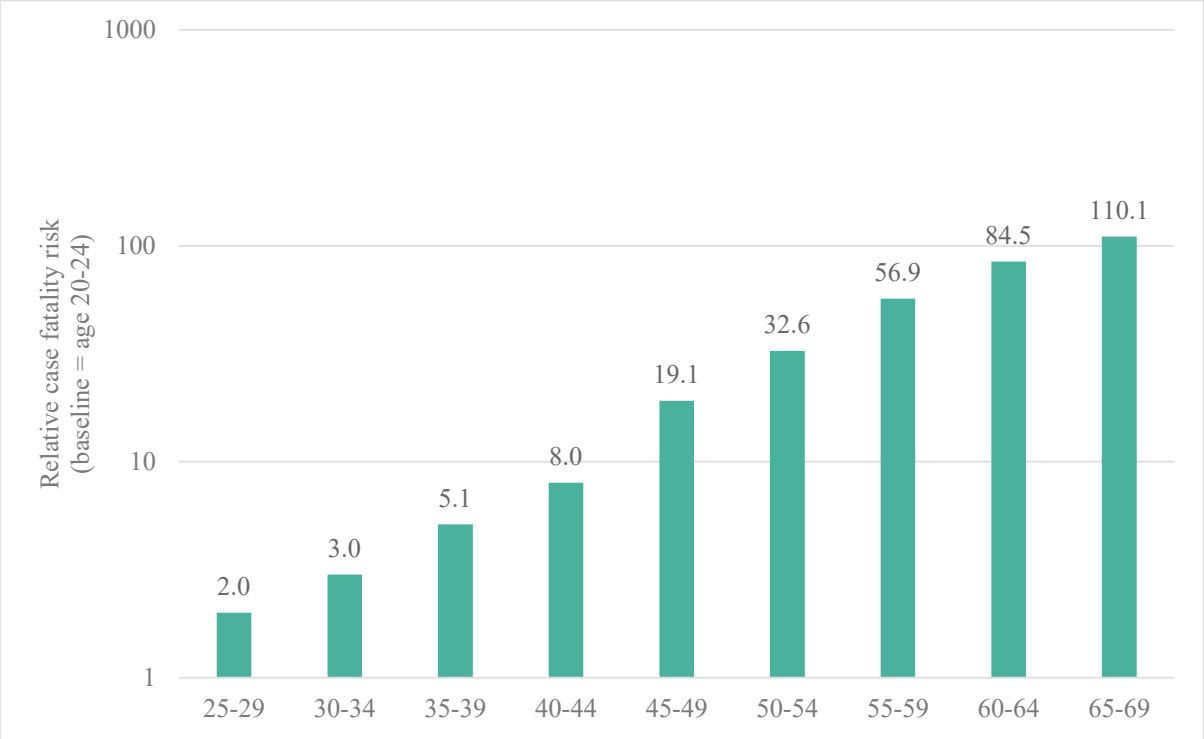
These vertical bars depict relative risks. They are measured relative to the age-group 20-29 which is set to 1.0.

FIGURE 3: AGE-GROUP RISK ESTIMATES FROM COVID USING UK DATA

Case fatality rate (%) = Number of deaths by COVID-19 in that age-group/Total number of all deaths by COVID-19: England and Wales as of 10th April 2020

Age is on the horizontal axis.

Log risk scale on the vertical axis.



Notes: Total number of deaths by COVID-19 as of 17th April 2020 = 13,121.

Here the vertical axis is necessarily constructed in a different way from that used in Figure 1.

These vertical bars depict relative risks. Here they are measured relative to the age-group 20-24 which is set to 1.0.

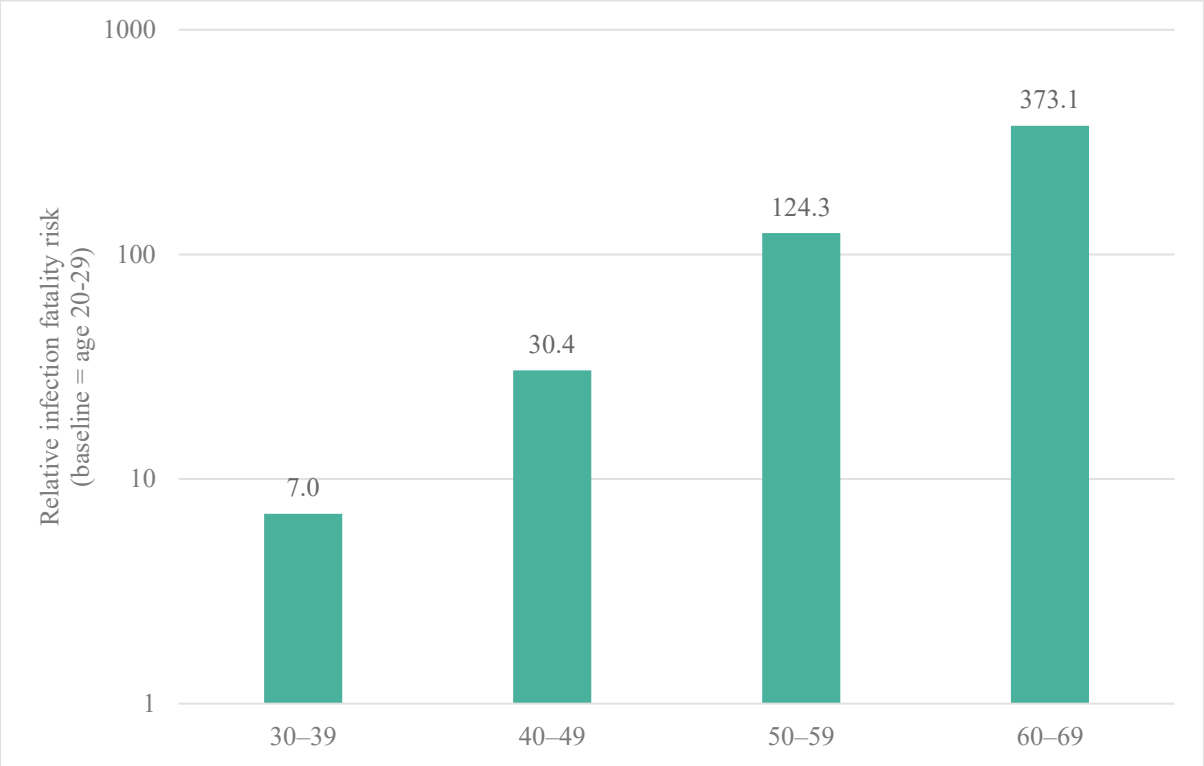
Source:
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/weeklyprovisionalfiguresondeathsregisteredinenglandandwales

FIGURE 4: AGE-GROUP RISK ESTIMATES FROM COVID USING ITALIAN DATA

Case fatality rate (%) = (Number of deaths in that age-group due to COVID-19 ÷ Total number of deaths due to COVID-19) × 100 – Italy as of 24th April 2020

Age is on the horizontal axis.

Log risk scale on the vertical axis.



Notes: Total number of deaths from COVID-19 = 23,576.

Here the vertical axis is necessarily constructed in a different way from that used in Figure 1.

These vertical bars depict relative risks. They are measured relative to the age-group 20-29 which is set to 1.0.

Source: https://www.statista.com/statistics/1105061/coronavirus-deaths-by-region-in-italy/https://www.statista.com/statistics/1105061/coronavirus-deaths-by-region-in-italy/

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