

Interview with Ariel Karlinsky, the creator of the World Mortality Dataset and member of the WHO COVID-19 Mortality Assessment Groups

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Ariel Karlinsky is a graduate student in economics at the Hebrew University whose primary research interests are labor economics, data science, economics of conflict, health economics, economics of Israel and economic history. He is also the creator and maintainer of the World Mortality Dataset, specializing in all-cause mortality, excess mortality and vital registration.

In March 2021 he joined the World Health Organization's (WHO) COVID-19 Mortality Assessment Groups, established by the international health organization and the United Nations Department of Economic and Social Affairs to "focus on methods and data for estimating total number of deaths attributable to COVID-19 and for assessing the direct and indirect impacts of the pandemic on mortality by age and sex at the national, regional, and global levels."

The interview was conducted on April 24, 2022 and is published after the WHO released its long-awaited report on excess deaths associated with COVID-19, which found there were almost 15 million excess deaths through 2021, a figure 2.75 times higher than officially reported global COVID deaths.

Benjamin Mateus [BM]: Good morning. Thank you for taking the interview.

Ariel Karlinsky [AK]: Of course. Thank you.

BM: As a way of beginning, could you introduce yourself and tell us the work you are involved in?

AK: I'm an economist and a statistician. I have degrees in economics and statistics from the Hebrew University. When I started working on this project [COVID-19 and World Mortality Dataset], I was a master's student. And now I'm a PhD student in economics.

I was interested in the question whether COVID was causing excess mortality and by how much. After looking at the original data from the US, the UK and Italy when the first COVID wave came through, people acknowledged that COVID was certainly causing excess mortality. But I wasn't keen on how this was being reported and compared.

For instance, they would say that when the US reports there were 2,000 COVID deaths then it's like there were 2,000 excess mortalities. And when Egypt reports 2,000 COVID deaths, they said it is also 2,000 excess mortalities.

[According to *Our World in Data*, "Excess mortality is a term used in epidemiology and public health that refers to the number of deaths from all causes during a crisis above and beyond what we would have expected to see under normal conditions. In this case, we are interested in how the number of deaths during the COVID-19 pandemic compares to the deaths we would have expected had the pandemic not occurred—a crucial quantity that cannot be known but can be estimated in several ways."

They add, "Excess mortality is a more comprehensive measure of the total impact of the pandemic on deaths than the confirmed COVID-19 death count alone. It captures not only the confirmed deaths, but also COVID-19 deaths that were not correctly diagnosed or reported as well as deaths from other causes that are attributable to the overall crisis conditions."

And that seemed just wrong, because I do a lot of international comparisons and I know that all countries are different, especially on the development scale, and I wasn't sure that you can make such straightforward comparisons. There were a lot of epidemiological anomalies in much of that data that weren't being considered from many countries like Belarus that were reporting cases or deaths.

For instance, the COVID fatality rate being reported out of Egypt was 30 percent because they were reporting so few cases.

So, I started looking for the data. I hoped it would be published by the World Health Organization (WHO) or the World Bank, but I realized they were publishing these statistics only annually. So, for 2020, this was no good. I then turned to searching the internet looking at websites of national statistics offices, vital registries, and ministries of health all over the world and found a lot of this data hidden in plain sight. I decided to begin compiling the dataset, which was non-existent.

I then started working with my colleague, Dr. [Dmitry] Kobak from Germany, and we put the data publicly on GitHub and the paper on a preprint and then we sent it to eLife. They peer-reviewed the paper and published it. And now I'm working as part of the expert working group of the WHO hoping in the next week or two to finally publish the WHO excess mortality estimate at least up to December of 2021. [Karlinsky is one of the authors of the report and his dataset was a primary source for the analysis.]

[Note 1: Dr. Dmitry Kobak is a research scientist at Tübingen University (Berens lab) who has used his skills to examine the accuracy of COVID-19 death reporting by various countries. His report on undercounting of COVID deaths is linked here for reader's review.]

[Note 2: Dispute over the WHO's methodology and figures for excess COVID deaths in India has stalled an upcoming report on global excess deaths through December 2021. The international health agency estimated that almost 15 million people had died in the period since the pandemic was first declared, which is two-and-half times more than the reported tally. Of the additional nine million deaths, more than one-third have occurred in India. Some say this may be due to the government of Prime Minister Narendra Modi attempting to suppress this analysis because of political calculations.

The New York Times wrote, "The release of the staggering

estimate—the result of more than a year of research and analysis by experts around the world and the most comprehensive look at the lethality of the pandemic to date—has been delayed for months because of objections from India, which disputes the calculation of how many of its citizens died and has tried to keep it from becoming public.”]

BM: You touched on some of the initial questions I had for you. But to continue in this vein, there was an obvious need for the “World Mortality Database” that you built, because there was no international real-time dataset that could provide these figures.

What logistical issues did you face creating it? What hurdles remain and what are the long-term goals for the project?

AK: That’s a very good question.

Again, I’m an economist and I have dealt with some health economics, but that wasn’t really my field. My hopes and goals are that starting from now, just as countries report their GDP and unemployment figures regularly to the IMF (International Monetary Fund) and similar organizations, hopefully all-cause mortality will be reported to the WHO in a timely and consistent manner. Many countries already do, but most of them are highly developed.

But that leaves tons of gaps ... Maybe I should say there are two major issues playing here. There are countries, many in Africa, but also places in the Pacific and Southeast Asia, where there are essentially no vital registries. Maybe 100 people die but only one death gets counted in their national statistics. It is similar but less so for births. And these are very highly correlated with economic development. This is also true within countries, such as in rural regions. For instance, in rural areas of Latin America, the chances that a death will be registered are much lower than in urban areas.

So, there are countries where the data doesn’t exist. There’s simply none.

We noted this in our paper as well. We had this very frank response from Liberia when we asked for this data and they said, “We just don’t have it. We are currently working very hard on modernizing and improving our vital registration system, but there’s no data. It’s not coming out soon. It just doesn’t exist.”

And, under the auspices of WHO and the World Bank, what they have are these national household surveys conducted every five or 10 years where they ask about births and deaths, which are only estimates of fertility and mortality. It’s better than nothing, but it’s not very good when you think about an issue like excess mortality or if you have a large crisis such as the COVID pandemic or some other natural disaster or conflict for that matter.

Of note, Latin American countries—Peru, Bolivia, Ecuador and others—have been undergoing, in the last five years, significant improvements in their vital registries. Had COVID-19 happened five years ago, our knowledge about excess mortality in Latin America, which has been really disheartening and massive, would have been much less.

The second issue is that there are countries where this information exists, but they’re not keen on sharing it. I think probably the best example is Pakistan, where they recently had a considerable improvement in vital registration ... supposedly, or at least that is what they reported to the WHO.

But that data is completely opaque. Not annually, not monthly, not nothing. Every couple of years they may report something like, “We registered eight million deaths when we would have expected maybe nine million.” And the vital registration is almost full, but they are not sharing any data. I’ve approached them and I have had my colleagues approach them but they’re not sharing their data because they don’t want to.

And then there are countries where the data used to be shared, but now they’re not sharing it because I think they are afraid it exposes the fact that the real toll of COVID has been much heavier than they had reported. These include countries like Turkey, El Salvador and Belarus.

This is a very hot political issue and I try not to get involved in the politics. But one of the fields that I’m very interested in is political economy. And I do think that in a sense, this large difference between excess mortality and COVID mortality that we saw in many countries is especially pronounced in authoritarian countries. It’s even sort of a measure of obfuscation or information manipulation.

When I tell people that Russia fudged their COVID numbers everybody says, “Of course, what’s new?” But I think it’s very telling that you see this again and again, and mostly from authoritarian countries, regardless of their level of development.

BM: But the US Centers for Disease Control and Prevention (CDC) has been fudging its numbers too. In March they slashed their pediatric COVID-19 deaths by almost a quarter and eliminated more than 70,000 deaths previously attributed to COVID. Now they are trying to say people died *with* COVID and not *from* COVID. The CDC is politicizing these statistics.

AK: The US ... and this is not in the research I’m doing with the WHO, but like other research that I’m currently doing focused on 2020 ... the US and Brazil under Trump and Bolsonaro are very clear examples of countries where the leaders would have loved to say that “COVID was over, there’s no COVID, let’s get on with it, there are no deaths, it’s inflated, it’s manipulated ...” They made public speeches about this; they’re not hiding the fact that they’re trying to hide it, in a sense.

But because democracies are still strong and the institutions are still independent, there may be some undercounting, but it isn’t Russia level, it isn’t Uzbekistan levels. It’s nowhere near these levels.

Like I told you in my email, I’m a capitalist and I lean very conservative, but between Trump and Clinton, I’m with Clinton because she’s more of a conservative. And between Biden and Trump, I was pro-Biden. But it saddens me that it seems like under Biden there may be somehow more cohesion between the institutions of the US when suddenly it is okay to downplay COVID. But it isn’t on the level in authoritarian countries. It’s a whole other scale. [*Excess deaths versus COVID deaths: United States—1.13 million vs. 966,308; Russia—1.21 million vs. 369,064; Brazil—764,000 vs. 659,000. Source: World Mortality Dataset*]

It’s true that in the US and Spain, in these two developed countries the gaps between excess deaths and COVID deaths are the highest. It is significant. It is 20 to 30 percent, which means tens of thousands of deaths higher. But it isn’t five times or 10 times or 20 times higher. In Tajikistan it is 100 times higher.

BM: To clarify, when you say there is an undercounting of COVID deaths you are looking at the ratio of excess deaths to reported COVID deaths? That is the ratio you are referencing when you say 20 to 30 percent above COVID deaths? And in Russia ...

AK: Yes. And in Russia that is at 3.5 times higher. [*1.21 million/0.369 million = 3.28*]. In Uzbekistan it is 30 times higher and Tajikistan it is 100 times, as I mentioned previously. Yeah, that’s what I am referring to.

In the US, we have good evidence that some of the excess mortality is strictly non-COVID. There is increasing homicide, increasing traffic accident deaths. But in most countries, that’s not the case. In most countries, homicides, even in very violent countries such as Latin America and South Africa, homicides were lower than previous years for 2020. Traffic accidents, the same again, were down due to lockdowns and other social restriction measures.

In this regard, the US is an outlier. This also goes with alcohol-induced deaths and opioid overdoses. This is true for Canada.

So, [*excluding the US and Canada*] if you just look at deaths say at slightly younger ages, which you can do mostly just in developed countries because the data does not exist for less developed countries ... If you look at deaths between 25 to 44 or 44 to 60, and so on, people that supposedly shouldn’t be dying of COVID in large amounts, you can see

that excess mortality tracks COVID reported mortality for these ages almost completely.

So, what I think is going on there is that these countries have some vulnerabilities among younger ages. For instance, a 50-year-old in India that has COVID has a much higher chance of dying from it than if it was in the UK. We have a lot of evidence to that effect. [*Ariel Karlinsky didn't specify if these vulnerabilities were intrinsic to the health of the individual or extrinsic, related to the socioeconomic factors such as access to health care systems.*]

There is probably some increase in self destructive or violent behavior during the pandemic in the US. I'm not certain that 100 percent of excess deaths are attributable to COVID [*in the younger ages*]. But in most other countries it's very close to 100 percent. We find no evidence of lockdown deaths or deaths of despair and or even indirect COVID deaths.

[*The Pew Research Center found that the US murder rate rose 30 percent between 2019 and 2020, jumping from six to 7.8 homicides for every 100,000 people. The CDC reports that during a 12-month period ending April 2021, drug overdose deaths had climbed over 100,000, an almost 30 percent increase from the prior year.*]

When people died from cardiac arrest, they would say that's not COVID because COVID is a respiratory disease. But we did see that COVID has exacerbated the mortality even in countries which are significantly deflating their COVID numbers like Nicaragua. In Nicaragua there is a large increase in cardiovascular deaths, because COVID, unfortunately, basically attacks everything—the brain, the heart, the immune system and not just the respiratory systems.

BM: Before moving on to the issues surrounding the World Health Organization and their soon-to-be-published report on excess deaths, could you speak about the excess homicide rates in the US.

AK: I haven't looked at them recently, but in 2020 I think it was around a 30 percent increase, which I think was the largest annual increase since the seventies. The US had been on a decreasing trend in homicide rates up to 2014 or 2015 after which it began to increase a bit. But then in 2020 we saw a significant increase. And 2021 has stayed on the same trend as 2020.

The absolute increase in numbers is not very big, but every one of these is a tragedy, especially because it is usually very young people involved in these deaths. Before COVID, if I recall the numbers correctly, about 50,000 to 65,000 people died each week from all causes, depending on the season. But during COVID, weekly deaths were numbering from 70,000 to 90,000 each week.

So, if you look at all homicides it is an increase of about 6,000, which brings the total to about 26,000 for the year. The excess homicide rate for the year is barely 10 percent of all excess deaths in just one week. Homicides are important to track but they don't account for a huge shift in the numbers.

As you had previously mentioned, maybe 70 percent of the excess deaths are COVID and 30 percent other causes. But this doesn't mean that if there are 10,000 excess deaths, 7,000 are from COVID and 3,000 deaths are unrelated to COVID. A lot of these deaths that you didn't code as COVID could very well be.

I gave testimony to the Texas legislature some months back on the power outage in February 2021 [*during winter storm Uri*]. And you can see there in Texas, during the power outage, excess mortality peaks. The number that Texas authorities said that had died from the cold weather and the power outage was around 200 people. But my estimate and other independent estimates placed that figure closer to 1,000.

BM: That is a huge number.

AK: it is astronomical, and I do hope that the Texas legislators ... the issue should be completely disconnected from politics. The question again is then what do you do about it? There may be a lot more leftist solution or there may be right-wing solutions, but first we need to get to

understand what the hell happened.

And Puerto Rico did that with Hurricane Maria. There were initial claims that only 64 people had died. But that figure increased massively following an official report back in 2018. I did a short testimony then and I believe the excess deaths figure was around 3,000. [*Analysis by several independent institutions placed excess mortality due to the hurricane between 3,000 and 5,000.*]

Excess mortality can convincingly show you, by zooming in on a time window and looking at the pattern of deaths, what happened. And what we find is not what right-wing media is saying, that the 30 percent rise in excess deaths during COVID was due to lockdowns. That is simply not true. We found a similar gap in Florida during 2021 with zero lockdown. These excess deaths are, by all accounts, related to COVID, which are not counted, just as much as the excess deaths during the power outage and in Puerto Rico due to the impact of the hurricane were not counted.

BM: Thank you for these clarifications and interesting points.

Can you speak on your work with the WHO? I understand that they are putting together this excess death report, but it's been on hold primarily because India is challenging the methodology of the study. Maybe if you could speak if other countries challenged the report?

AK: I'm not sure about other countries. There are probably other countries there. Not every country said, "Okay, this is great." Many countries have not responded. But, yes, India is a very vocal opponent.

Our excess mortality estimates for India place it somewhere in the middle. They're not the best and they're not the worst. They're a large country with over a billion people. Our estimates placed excess deaths during COVID at several million. However, when you look at the figures on a per capita basis then you see they are somewhere in the middle.

India finds itself in a peculiar position. It's not like the US and it's not like Peru where the data is completely out there, official national level data showing deaths by day, week, or month, which you can have a very good estimate for how many deaths you would expect. And then how many deaths actually occurred and then calculate a very sound estimate of excess mortality.

For India, what you have is a huge federation with many states and union territories which are essentially like states and each one of them has its own vital registration systems and they differ very widely in just the number of deaths they are able to register. The more developed states can register 100 percent of deaths like in developed countries while less developed states register a third or 50 percent of total deaths.

All this means that for India we don't have national level data from 2020 onwards. We have state level data, but from a lot of states. I think by now we have covered 60 to 70 percent of the total deaths in the Indian population. It's not from some small village.

We have data from multiple large states and from cities like Calcutta and Chennai and Delhi and Mumbai. A lot of excess mortality has been observed just in these regions. And if you look just at these states and cities it already surpasses the official reported COVID deaths by a large amount.

We do some sort of projection to other states where we also have a lot of other evidence from other disparate systems or surveys that Indian researchers have done. The findings note that excess mortality is very high in India, higher than reported. I can't give you an exact number until we publish, but it's much higher than reported.

India finds itself in this sort of peculiar position because neighboring Pakistan, which—we have very preliminary evidence from journalists about this—also has excess mortality at much higher levels than reported COVID-19 mortality. But in Pakistan we have access to zero data.

The Indian officials are irate that they are not being treated like a developed country with a full, complete vital registration database. But they are also irate that they aren't being treated like countries with zero data like Pakistan.

The evidence for India in terms of certainty, it is less certain than the US but it's much more certain than Pakistan. And they kept throwing these pretty nonsensical arguments but none of them were very convincing. [Press coverage of the subject has alluded to major Indian state elections that took place in February and March as a factor in these disputes with the WHO.]

BM: I understand that there are independent scientists that are upset with the WHO for conceding to India's stall tactics. And they are saying that if the report isn't published by April that they will move to publish it without the WHO's endorsement. This places them in a difficult position.

AK: We, the researchers are uncomfortable with this, but we are giving it a few more days. It was supposed to be released on May 2, 2022, but it would conflict with Eid al-Fitr (Muslim holiday). So, it keeps getting pushed back for other mundane reasons.

The previous delays have been helpful to get the model better, to improve the write-up, time to respond to critiques, which ultimately means our research is better. But we have completed all the corrective actions and could have had it published by the end of April. Everything's in order.

BM: To avoid the confusion behind what defines a COVID death, why doesn't the WHO provide a clear definition for it so that everybody uses the same metric? That would help standardize some of the reporting by various countries.

AK: It did. And there are standard guidelines. But again, you must remember that in many countries a lot of people die at home. The doctors never even see them, or they aren't well equipped or well-trained. And in many countries, there is political pressure to downplay the number of deaths.

In Moscow, for example, which again has all the equipment, has all the development level, there was this guideline which I'm not sure if it's still in place or not. But it said that you certify a COVID death only if after an autopsy it is beyond any doubt that this is the primary cause of death.

And you can imagine, what are the chances of doing autopsies for thousands of people dying en masse? The chance is zero, meaning you can downplay COVID by supposedly being much more thorough and saying, "No, we're going to get to the bottom of each and every death." The WHO definition is broader because the pathogen is a new contagion and we're trying to understand how it spreads, understand how to fight it. We're going to err on the other side. Maybe even if COVID is just a contributory factor you list it and not just if it's the primary factor.

So, the standard guidelines exist. The issue is that a lot of countries either can't or don't want to follow them. It's not an issue of devising regulations and then it's done. In a lot of countries like India or Egypt, even before COVID, there are tons of garbage codes in death certifications that people don't know what they died from, but they know that they died. A stricter guideline, that's not the issue here.

BM: Is the methodology of the WHO report different than that used by the *Economist* or IHME? And to what extent is this report more comprehensive?

AK: The main difference I think is data. We collected even more data and data is much better than estimates. If you would have asked me, for example, if I didn't have Belarussian data, you would have asked me and I would have said they are probably undercounting by 50 or 100 percent similar to countries like Ukraine or Poland, similar countries that have similar ethnicity and economies and are nearby.

But then you get actual data from the Belarussian government, and you see that it's 12 times higher. The data defies imagination in the sense which a model by its nature would aim for like a mean, or median, or ratio as observed in other countries.

The fact that we have more data from states in India, from Jakarta in Indonesia, from China, from Turkey, etc., it makes the model better just because more data is better in the sense that the models are more

transparent.

We have also made the data more accessible by having an interactive web application where anyone can look at the estimates and plot them and see where they go, how they go, meaning it's not just going to be some report in a scientific journal that's very opaque.

It is a complicated model because the data quality varies greatly. You need to treat each data point in a bit of a different way. It depends on the quality. The main methodological issue is similar across all these methods. You need to figure out what would be the number of deaths in that country in the absence of COVID and then you have the observed number of deaths and excess death is simply subtracting the two numbers.

So, there is some uncertainty there. But, unfortunately, in many countries, the signal, the increase in mortality, is so large, it doesn't really matter if you account for this trend or that trend. It changes some of the numbers, but it won't lead you to conclude that excess mortality has been null, it's not like a statistical exercise.

In that sense, I'm glad that the IHME and the *Economist* estimates are there. They were able to put it out very quickly. But they didn't have to go through a committee and have every revision go through all these people, which slows down stuff considerably.

But then WHO can say with pride, and there's truth in that, that we did the estimates. They went through several iterations between a large panel of experts. Countries responded to these estimates. Then some countries also found or gave more data, which was very helpful. So, it was more like a holistic process. But it causes it to be delayed, even if there was no political pressure.

BM: You are speaking about the peer-review process.

AK: It certainly takes longer and we are all doing it in our spare time. We are not WHO employees. We are researchers in academia and that's just one of our many academia things that we do.

BM: There was a study that came up that was done by Professor Patrick Heuveline from UCLA titled "Global and national declines in life expectancy: An end-of-2021 assessment." He noted that global life expectancy fell 0.92 years between 2019 and 2020, and then 0.72 years between 2020 and 2021. In the 70 years that the UN has tracked such figures it is the first time we'd seen these kinds of declines. Do you care to comment on what this means to society, to the globe? What's the implication of having this kind of massive decline in life expectancy?

AK: I'm not an expert on life expectancy. I just know that it's an unfortunate term. It gives a sense that at my age now I have maybe 50 more years to live.

In countries where we are very certain of the data and there are good estimates of the age/sex deaths, life expectancy went down in 2020 in some countries. It went down even further in 2021. In some countries it bounced back up.

Patrick's research and some other researchers in this area, they take data like mine on total deaths, and it has a very strong relationship with changes in life expectancy. And then from that, even if they don't have the specific age/sex data, for example, for Bolivia, from this relationship you can estimate the changes in life expectancy in a country like Bolivia. And their life expectancy went down even further.

Again, I'm not an expert on how life expectancy looks across time and explain what that means. I can tell you that during World War I and II, life expectancy dropped because a lot of mostly young men died, especially as soldiers. But then it went completely back on trend.

A lot of people look at that and they say it means nothing really happened. Of course, things happened. People died; many people died. When things go back on trend, it doesn't mean that nothing happened. But I'm not sure what reverberating implications these will have. I have a colleague in Copenhagen you can speak with who does a lot of work in this field.

He's been doing a lot of work on life expectancy during COVID and

what life expectancy means on a societal level and on a global level. But yes, COVID-19 has caused a decrease in life expectancy and that's like the first time, absent some wars like in the Balkans, where we have observed that.

BM: With the introduction of the vaccines in early 2021, Israel rapidly moved to vaccinate its population. It then shifted to a vaccine-only strategy which has been adopted by almost every country but has proved problematic—in September 2021 and then February 2022, Israel faced Delta and Omicron. Maybe for someone who has lived there, you can share your perspective.

AK: Israel was close to eliminating COVID circulation several times. Unfortunately, it did not and besides the first lockdown in March-April 2020, it didn't really stick to an elimination strategy, which has proven very good and doable in my opinion.

This lack of certainty and commitment made it harder to achieve elimination each passing day, eventually probably making it next to impossible. It might very well be that Israel's will to try to balance fighting COVID with other aspects of normal life activities made us suffer on both ends, more so than eliminating COVID would have. In Hebrew we have a saying, "Half coffee and half tea," meaning that in theory if you can't decide you can mix and balance. But in practice the result is much worse than sticking to either one.

I do fault my own discipline (economics) here. Economics is all about trade-offs and that's a very correct analytic method normally, but unsuitable (at least at the start) for pandemics or wars, where more of a war mentality I think is in order.

BM: We are well into the third year of the pandemic. Long COVID is affecting millions and it will have a detrimental impact on the quality of life for the populations of many countries. What are you expecting to see from the database as you continue with it?

I raise the question because in the UK we saw a trend to higher levels of excess deaths though there wasn't much COVID community transmission. Some are attributing these deaths to the impact COVID has had on population health.

Data now indicates that even those who suffered only mild symptoms can expect a rise in their all-cause mortality.

AK: That's a major issue that the UN's World Population Prospects is dealing with right now. They do these projections on total deaths, total births, five years further, 20 years further ... and they're struggling with a lack of good data. And then it depends on assumptions. Again, I'm not a demographer but I've managed to learn a lot from my demography colleagues ...

Consider a situation in the US, for example, where two million people die annually. Most of them are old, as is the case in other countries. Then say some pandemic hits and it kills most of the elderly. Assume then excess mortality in 2020 was 5 million people. Something massive and horrible.

You would be inclined to say, "Okay, but you can only die once, and these people will not die in the next year." So, in the next year you would have like a deficit mortality in a sense because all the people that should have died in 2021, 2022, 2023 and on so on already died in 2020. On the other hand, like you said, if the fact that you contracted COVID means that you are more handicapped right now and your health went down, it might lead to higher mortality in the future.

And the direction right now is not clear.

There are countries where there was a large wave of infections and deaths such as Ireland in January and February 2021. But the mortality following that in the same year was lower than you would expect. So, I think that in Ireland, it's clear. Probably a lot of the people that died of COVID were people that were close to dying regardless, in a sense.

But in most countries, 2021 mortality was even higher than 2020. There are some countries where they had very little excess mortality in 2020 and

2021, and then in 2022 a huge uptick, like Hong Kong.

It's a huge question and the estimates of excess mortality are like the tip of the iceberg because we can't account for all deaths. It's easy to count deaths. You know when someone has died. Many people know when someone has died, even if it's in a very rural area. But a lot of people don't even know that they caught COVID.

They may know it like in five years from now. And that also depends on the exact strain that they caught. I am very careful with predictions and forecasting because it's very hard. I really don't know.

I think that if the COVID deniers were correct, what you would have seen is a large uptick in mortality in the start of 2020 in the US and the UK. But then mortality would have been much lower for the rest of the year. And then in 2021, you would see a rise in life expectancy. It didn't happen.

Both in 2020 and in 2021 we saw very significant excess mortality. Possibly, some years from now, we might see mortality be lower, but that doesn't mean that something good happened. Again, all the people that died in the world war did not die 80 years after that. So, mortality 80 years after it may be a bit lower, but that's not a good thing. They died prematurely, very prematurely.

Even expert demographers are debating this because it depends on a lot of assumptions and data which is now quite scant. We can't really say something convincing now as these studies are usually done decades later.

BM: Ariel Karlinsky, thank you for all your time. I look forward to reading the report when it is finally out.

AK: It was my pleasure. Please let me know if any questions come up.



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