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5 Mar · 30 tweets · [ikashnitsky/status/1367856010476613632](https://twitter.com/ikashnitsky/status/1367856010476613632)

Demography 101

🔥 WHAT IS LIFE EXPECTANCY ? 🔥

and (even more important)

✗ what it isn't ✗

Join in for the most topical demography primer

🧵 THREAD 1/x

Unlike many statistics and quantities of general use that we tend to see regularly, life expectancy is not observed directly. It's an output of a *mathematical model* called life table.

So, why can't we do without a model?

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Consider a seemingly simple task: you want to know how long people live. What can be easier? Let's just see how many years lived those who died recently.

Why not?

Such a metric would be massively driven by population age structure

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For the most of the recent history human populations were rapidly growing, which means that each next generation was bigger than the previous one. Relative differences in the size of generations affect the age composition of those dying.

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Okay. Then why don't we simply take a group of people born in the same year (demographers call such groups cohorts) and see how long on average they live?

We could. But it takes remarkably long to wait until the last one dies. And we want to know what's happening **now**

5/

Okay okay you irritating Dr Limitation. How can we learn what's happening now?

Well, for that we need a mathematical model. But as any model it comes with certain assumptions and limitations*

I take them, tell me!

**that we should not forget once the precious results appear*

6/

So, period life table

(as one can guess there's also a cohort life table, but for the data requirements outlined above it's not an option to explore what's happening with mortality now)

The idea is simple: take those dying now and divide them by the size of their age groups

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This yields age-specific death rates – the key input for the life table needed to calculate life expectancy

Now, let's take an imaginary cohort and see how long would they live on average if they experience these observed age-specific death rates

8/

The imaginary population is known as a synthetic cohort. And here comes the main assumption of the life table:

The model assumes that the observed age-specific death rates stay *unchanged* throughout the hypothetical lives of the hypothetical people in the synthetic cohort

9/

This big assumption almost never holds in real life!

Mortality in human populations keeps improving beyond the most optimistic expectations. For decades the best demographers were systematically underestimating the progress in mortality reduction 🙄

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If there is just one take-home message from this thread let it be

✓ Life expectancy is a snapshot of the *current* mortality

✗ It's not a projection/forecast of the actual experience of the newborn cohorts

11/

So why do we talk about "expectancy"?

According to [@therealrchung](#) 🙄 this originates in the "expected value" meaning that

came from statistics

A very unfortunate name for the concept that became so crucial in public discussions on human development

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Let me re-iterate:

👉 Life expectancy is a summary measure of the *current* mortality 👉

Here is a brilliant analogy by Robert Chung elaborating on the *current* nature of period life expectancy

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The most popular error in public perception of period life expectancy forgets about the heavy assumption of the synthetic cohort (constant age-specific death rates throughout their hypothetical lives anchored in current year) and talks about the future of kids being born now

14/

In normal years this large interpretation error is somewhat masked by the gradual and often close to linear improvements in mortality. A rule of thumb is to simply add ~6 years to period life expectancy to obtain a reasonable cohort estimate 👉

15/

Mortality shocks like 2020 are a different story though. Here the "forward looking" (mis)interpretation of period life expectancy projects the *shock levels of mortality* into the future. Of course this doesn't happen. Shocks are called shocks because they are temporal

16/

A notable example of this false reasoning went far and wide last week published in [@statnews](\"http://@statnews\"). Departing from the wrong interpretation of life expectancy, the op-ed estimated c19 years of life lost per person 🧑

A rabbit hole RT 🐇 for you to explore

17/

Demographers tried to explain and mocked this piece a lot 🙄, but I'm afraid the harm is done and we are going to hear "pfff just five days" for many months to come

The seemingly easy life expectancy interpretation trap clearly demonstrated

18/

Take hurricane Katrina w/ estimated damage of 70 billion. Let's apply your logic. The average US worker earns ~100k per year and works for 40 years. With ~300m in 2005 that gives about 1200 trillion lifetime earnings. Katrina costed the avg person roughly 0.006% lifetime earnings

7:30 AM · Feb 26, 2021

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Another detail that often misses public attention is that life expectancy is not a single value – it can be estimated for every age

Most often and by default life expectancy is reported "at birth". But we can estimate remaining life expectancy for various ages

19/

And here comes another popular misunderstanding of life expectancy. I bet each of you has heard something like this 🗨️ at least several times in your life

20/

True, there were times when life expectancy at birth was about 30 years even in the most developed now countries. This doesn't mean though that those who outlived this threshold age were getting old at young (by our current standards) ages

Let me illustrate

21/

Let's take Italian male population in 1872, the first available year in [@HMDDatabase](#). Have a look at the survival of this synthetic cohort – the proportion of the initial cohort that is still alive by certain age

Half of the synthetic cohort died by age 15!

22/

And here is how remaining period life expectancy looked by age

Infant and child mortality was sooo high that those escaping early deaths had higher remaining life expectancy

At age 34 remaining life expectancy was the same as at birth

Only, it applied to the 41% survivors

23/

And I guess the perception of age was not radically different among those survivors. It was all about selection and luck getting there

BTW, this links to another popular demographic myth of everybody having lots of kids in the past. No, people used to have lots of births

24/

On this sad note I will wrap up my life expectancy primer. Feeling relieved to let out the idea that was occupying the back of my mind for months now

Next, I challenge [@jm_aburto](#) 😊 to discuss lifespan inequality

25/

And a couple of bonus links and RTs for those interested in diving deeper

Have a look at the beautiful explanation by [@CSchmert](#) in reply to the discussion initiated by [@VictimOfMaths](#)

26/

A very deep and interesting discussion of life expectancy was recently published by demographers from Vienna and brought to me by [@MarkusSauerberg](#) 🙌

27/

Fresh out from [@PNASNews](#) – a paper by [@jwvaupel](#) [@VillavicencioFG](#) and

[@bergeron_mp](#) that outlines the exciting story of human mortality development

28/

Should you wish to read a demography book to learn the nuances consider getting a copy of our discipline's Bible – Demography by Sam Preston, Patrick Heuveline, and Michel Guillot

29/

Let me finish with a RT of our most recent work that estimates life expectancy drops in 2020. I hope this thread would add to a better understanding of these results.

Open to questions and discussion 🐦

30/30

josé manuel aburto
@jm_aburto

Recent Gains in Life Expectancy Reversed by the COVID-19 Pandemic

New preprint provides life expectancy estimates for 26 countries in 2020. We found that the COVID-19 pandemic halted longevity improvements and mortality reductions mainly at older ages.

doi.org/10.1101/2021.0...

Fig 1. Life expectancy at birth (age 0, left panel) and at age 60 (right panel) by country and sex, in 2015, 2019, and 2020. Note: Estimates for females (red), males (blue), 2015 (|), 2019 (+), 2020 (●). Countries are sorted from highest to lowest levels of female life expectancy at birth in 2019. *Estimates for Chile and Germany were available from 2016.

8:21 PM · Mar 3, 2021

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