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 Econ 309

Week 2: Covid Policy Versus Cost-Benefit Analysis

- I. Contagious Disease and Health Externalities
 - A. Contagious disease has obvious negative externalities: Taking actions that make you sick risk making strangers sick.
 - B. Fighting contagious disease has obvious positive externalities: Taking actions that make you less likely to be sick also make strangers less likely to be sick.
 - C. Until 2020, contagious disease received only a small share of government health funding. During Covid, however, things dramatically changed.
 - D. The US government spending trillions of dollars “fighting Covid” – almost all of it for Covid relief rather than disease control, vaccines, etc.
 1. About \$5T on relief.
 2. About \$30B on vaccines total.
 3. Operation Warp Speed cost: \$12B.
- II. Covid and the Value of Life
 - A. Key fact about Covid: the steep age pattern of death (and severe symptoms generally).
 - B. Relative Infection Fatality Rates (IFR) by age, via the CDC:

Age group rate ratios compared to ages 18 to 29 years¹

Rate compared to 18-29 years old ¹	0-4 years old	5-17 years old	18-29 years old	30-39 years old	40-49 years old	50-64 years old	65-74 years old	75-84 years old	85+ years old
Cases ²	0.5x	0.7x	Reference group	1x	0.9x	0.8x	0.6x	0.6x	0.7x
Hospitalization ³	0.6x	0.2x	Reference group	1.5x	1.9x	3.1x	4.8x	8.6x	15x
Death ⁴	0.2x	0.1x	Reference group	3.5x	10x	25x	60x	140x	350x

- C. Thus, an 85+ year-old has about 2000x the IFR of a 0-4 year-old.
- D. The older you are, obviously, the fewer life-years you lose. Life expectancy at birth is almost 80. Life expectancy at 85 is 6-7 years.
- E. Pre-existing health problems are a strong independent predictor of death. If you split people into “some pre-existing problems” and

“none,” you multiply the probability of death about 4x for the former category.

1. People with pre-existing problems already have reduced life expectancy, so simple averages overstate the loss of life-years.

- F. Estimates of years of life lost from Covid based on these patterns: about 14 million years for the U.S. as of January, 2022.

Excess Deaths and Life Years Lost During the COVID pandemic

One million excess deaths account for a total of 13.5 million life years lost.
56% of life years lost were from people who were younger than 65 years old when they died.

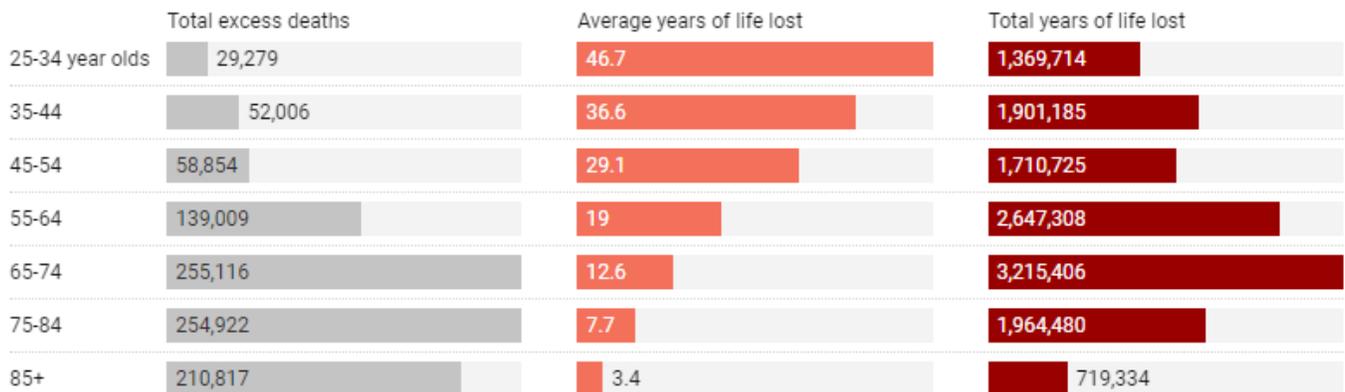


Chart: Analysis by Reif, Heun-Johnson, Tysinger & Lakdawalla. Original data sources: CDC and CMS • Created with [Datawrapper](#)

- G. Assuming the relationship between deaths and life-years is constant, 13.5 million until January 30 translates to 15.9 million for March 15, 2020 to September 15, 2022 (the first 2.5 years).
 - H. What if we adjust life-years lost for quality? Harder, but still vital for CBA. For example, you could try counting all years from 25-54 equally, then discount each subsequent bracket by 20%, to get: 11.8M prime life-years lost.
 - I. Of course, you’d also want to adjust for suffering while sick, plus any long-term problems for survivors. (But note: “There is vigorous debate over whether this is a real entity with a biologic basis or whether it is psychosomatic.” *American Journal of Medicine*)
 - J. Additional factor to think about: How much survivors miss the victims, as a function of age.
- III. The Value of Life: Quantity Versus Quality
- A. Without CBA, you might conclude that this loss of life-years is an overwhelming argument in favor of radical action.
 1. At minimum, for all the actions taken.
 2. Probably for doing a lot more.
 - B. With CBA, however, adding up life-years lost is only the beginning.
 - C. Next, you have to estimate how many life-years were *saved* by the adopted measures – and how many additional life-years could have been saved with additional measures.

- D. Finally, you have to consider the cost of these measures.
 - E. Crucial point: Cost isn't just fiscal cost! You also have to consider the cost in terms of *quality of life*.
 - F. How can we do this? Simplest approach: For any anti-Covid measure, ask: How many months of regular life is a year under this anti-Covid measure worth?
 - G. Example: How many months of normal life is a year of solitary confinement worth? Many people in assisted living endured something very close to solitary confinement.
 - H. Similarly: How many months of normal life was the first year of Covid worth to you?
 - I. Suppose the average answer for Americans is "10 months." The U.S. population was 330 million in 2020, so the first year of anti-Covid measures cost *55 million* life-years in terms of reduced quality of life.
 - 1. As you relax prevention measures, of course, the additional cost per person falls. But if the next ten months were at 95% value, that's still an additional loss of another 14 million life-years.
- IV. NMIs, Private Precaution, and Covid Prevention
- A. Until vaccines were released, virtually the sole anti-Covid measures adopted by governments were mandatory behavioral changes or "Non-Medical Interventions" (NMIs).
 - 1. Lockdowns
 - 2. Banning social events
 - 3. Mandatory masking
 - 4. Mandatory distancing
 - B. During the first few weeks of Covid, there is little evidence that these NMIs changed behavior. Why not? Because people were initially extremely cautious whether or not the government mandated caution.
 - C. Before long, however, fatigue set in. In places with stricter government policies and enforcement, behavior stayed different for longer.
 - D. This raises two separate questions:
 - 1. How much did NMIs change caution?
 - 2. How much does caution matter?
 - E. Public debate usually focused on the second question. Questions like "Do masks work?"
 - F. Researchers focused more on the first question: "Do mask mandates change masking?"
 - G. If you're assessing the value of NMIs using CBA, you have to *multiply* the answers!
- V. Crunching the Numbers

- A. We'd have to spend months reading papers to do a top-notch CBA of Covid restrictions. But we can get a ballpark estimate quite easily.
 - B. Step 1: Get a properly-weighted estimate of life-years actually lost from Covid.
 - C. Step 2: Estimate how much higher the loss would have been counter-factually.
 - D. Step 3: Compare the answer to the loss of life-years due to reduced quality of life.
 - E. Step 4: Multiply by standard value of a life-year, if necessary.
 - F. Exercise #1: What if the U.S. had adopted stricter Canadian measures instead?
 - G. Assume this would have given the U.S. the Canadian death rate: 1275 per million instead of 3345 per million, with proportional change in life-years lost.
 - H. Next question: How many months was a year of Covid time worth in Canada versus the U.S? Restrictions were lower and shorter in the U.S., so say 10.5 months versus 11 months per year for a period of 2.5 years.
 - 1. Multiply it out: The extra cost in life-years would have been 34 million.
 - 2. Unadjusted for age, that saves $(15.9-6.1)=9.7$ million life years. Adjusted for age, about $(11.8-4.5)=7.3$ million life years.
 - 3. Net destruction: About 27 million life years!
 - 4. Adjusting further for demographic differences between the U.S. and Canada makes the gain even smaller.
 - I. Exercise #2: What if the U.S. had done nothing – not even extra personal precaution?
 - J. Assume this would have given the U.S. the same death rate as Peru, the world's worst performer: 6481 per million instead of 3345 per million.
 - K. Multiply it out:
 - 1. The quality of life gain is 1 month per year for a period of 2.5 years for the whole population: 69 million life-years.
 - 2. Unadjusted for age, that costs an extra 14.9 million life-years. Adjusted for age, 11 million life-years.
 - 3. Net destruction: 58 million life-years!
 - 4. What if doing nothing gave us double the Peruvian death rate? Age-adjusted, that's still only 34 million life-years saved versus 69 million life-years destroyed.
 - L. Don't like the assumptions? Tell me what to change and we'll re-do the arithmetic.
- VI. Focused Protection
- A. This doesn't mean that no anti-Covid measures passed a CB test, only that what we did was worse than nothing.

- B. An alternate proposal, made famous by the “Great Barrington Declaration,” was called “focused protection.” Basic idea: Strive to protect the old and sick, while letting the rest of the population live more-or-less normally.
 - C. This clearly helps the CBA of Covid prevention. If 90% of people live normally, only 33 million people endure lower quality of life instead of 330 million people.
 - D. However, it plausibly also raises infection and mortality. After all, there is no way to totally isolate the old and sick. Many, if not most, live with younger and healthier people – even in assisted living.
 - 1. Counter-argument: Ignoring most of the population lets us concentrate our resources and mental effort on the old and sick. See bizarre nursing home policies during the initial hysteria.
 - E. Suppose we compare focused protection to doing nothing, assuming:
 - 1. Average quality of life falls to 11.95 months per year.
 - 2. Mortality of older Americans goes from the Peruvian level to 30% higher than actually happened.
 - 3. Quality of life lost due to focused protection: 3.4 million life-years.
 - 4. Age-adjusted quantity of life saved due to focus protection: $(11-4-7.1)=4.3$ million life-years.
 - 5. CBA: Focused protection > nothing.
- VII. Operation Warp Speed, Human Challenge Trials, Market Pricing, and Vaccines
- A. Regulation normally delays the introduction of new drugs for years. The CBA is pretty clear: If a drug saves 10,000 life-years per year, and you delay it for 5 years, regulation destroyed 50,000 life-years.
 - B. CB rationale? Regulation (a) prevents bad drugs from killing people, and (b) encourages use of good drugs by reassuring the public.
 - 1. Think about the math, though. How many bad drugs would actually be released, how bad would they be, and how much does regulation reassure us, anyway?
 - C. During Covid, the government greatly expedited its drug approval process and heavily subsidized pharmaceutical companies, all parts of a policy called “Operation Warp Speed.”
 - D. A standard estimate is that vaccination reduces the risk of death by 90%. If we use \$100,000 per year of life, and figure 4 million age-adjusted life-years lost per year without vaccines, then speeding up approval by just one year is worth \$360B (versus \$30B spent on vaccines total).
 - E. Was there any way to speed approval even further? During the process, officials sometimes adjourned for a week or two due to standard operating procedure.

1. CBA: These breaks costs many billions of dollars worth of human life.
- F. Policy analyst favorite: Human Challenge Trials. Instead of just testing the vaccine and waiting months to see who gets sick, try to *deliberately* infect experimental subjects after they're vaccinated. This could easily have proven vaccines' effectiveness months earlier.
1. "But it's unethical!" Why? The test subjects are volunteers – and when people volunteer for dangerous missions to help others we usually call them heroes and thank them.
- G. Defenders of Operation Warp Speed often argued that ordinary profits wouldn't sufficiently incentivize rapid delivery. A key premise, though, was that vaccine prices would be tightly capped!
- H. Imagine if companies could have charged millions of dollars for the first few weeks, then gradually cut the price.
1. CBA?