

Increases in the rate of growth of non-reproductive population subsets vs global pandemic timing.

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Carrying capacity: the maximum population (as of deer) that an area will support without undergoing deterioration.

--Merriam-Webster Dictionary

The constant conditions which are maintained in the body might be termed equilibria. That word, however, has come to have fairly exact meaning as applied to relatively simple physico-chemical states, in closed systems, where known forces are balanced. The coordinated physiological processes which maintain most of the steady states in the organism are so complex and so peculiar to living beings— involving, as they may, the brain and nerves, the heart, lungs, kidneys and spleen, all working cooperatively—that I have suggested a special designation for these states, homeostasis. The word does not imply something set and immobile, a stagnation. It means a condition—a condition which may vary, but which is relatively constant.

--Walter Bradford Cannon --In *The Wisdom of the Body* (1932), 24.

On a perfect planet such as might be acceptable to a physicist, one might predict that from its origin the diversity of life would grow exponentially until the carrying capacity, however defined, was reached. The fossil record on Earth, however, tells a very different story.

--Simon Conway Morris --In 'The Evolution of Diversity in Ancient Ecosystems: a Review', *Philosophical Transactions of the Royal Society B* (28 Feb 1998), 353, No. 1366, 327.

The key to understanding overpopulation is not population density but the numbers of people in an area relative to its resources and the capacity of the environment to sustain human activities; that is, to the area's carrying capacity. When is an area overpopulated? When its population can't be maintained without rapidly depleting nonrenewable resources.... By this standard, the entire planet and virtually every nation is already vastly overpopulated.

--Paul R. Ehrlich --In *The Population Explosion* (1990), 39.

Obviously, correlation does not equal causation, however there appears to be an interesting relationship or association between the timing of events that cause large increases in the rate of growth of non-reproductive population subsets (sharp increase in life expectancy or dramatic drop in birth rates) to the timing or occurrence of major global pandemic events. Now it is also understood that at any given moment there are virus outbreak and of one form or another all over the globe and that a sample size as small as two major events is far from statistically significant, however perhaps this set of observations can spur others to dig further into the historical data to attempt to gain a better understanding of what might just be triggers of such painful events and thus in theory to hopefully predict or prevent them or at least improve preparation or lead time for them. Also, with such a small sample size it is obvious that the likely timing of these or similar events is of a random nature however we can speculate if not anthropomorphize an alternate or algorithmic "carry capacity" or "equilibrium seeking" cause as well.

We may consider Nature (i.e. aggregate life on planet Earth) as having billions of years of trial-and-error "memory" or "algorithmic experience." Regardless, humans, all too often, still fail to ever question our superiority over the world be it alive or not. Naturally, it is inherently difficult to know the "unknown unknowns," but humanity still increases our risks if we blindly do not consider alternate possibilities regarding the abilities and threats of life and Nature in terms of the events in the world around us. Examples to consider are the apparent parallels in the natural world to concepts in human economics - beyond the similarity of mathematical equations seen in all dynamic systems.

Now while Nature, with its billions of years of "memory" seems like the slowest of "slow boats that turn," it, nonetheless, does turn. Now while Nature may (or may not) abhor a vacuum, it certainly has always lusted for equilibrium or homeostasis within any and all ecosystems and gene pools. Thus, humanity seems to patently ignore the possibility that the actions of humanity, be they direct effects or indirect side effects, that have destabilized the global ecosystem (deforestation, species extinctions, air, water, chemical and radiation pollution amongst others), could possibly face any resistance or backlash from a global ecosystem even with so many examples in our natural world of homeostasis. Humanity might be blind to theoretical "circuit breakers" that Nature may have at its disposal (e.g. viruses like E-Bola, Marburg, and anthrax, plagues, parasites, mutations and illnesses like cancer, and epigenetic and cellular messengers) as well as theoretical threats that, whether part of Nature's or life's arsenal or not, are definitely threats and exogenous shocks that occur in our greater reality from storms to volcanoes, earthquakes, and tsunamis to even ice ages, solar flares, galactic procession asteroid and comet strikes, and even gamma ray bursts. The very structure and scale of the "clock" used by Nature, that makes it seem so hidden and powerless, is the very same mechanism that makes its "memory" and "arsenal" so vast.

In Nature there is billions of years of evidence that it "balances its books." Intelligent humans, for the most part, however, cannot "see beyond our yard" and our immediate wants and needs. In theory, we could even be a first beta-run (or even a failed) attempt at general intelligence when considering humans, or life on Earth, in a geologic timescale. One could claim that humans simply cannot co-exist within their planetary eco-system and that we are blind to the inherent "costs" in a Universe "built" with them in its very foundations - akin to a yin and yang reality. Humans have come so close to understanding the "depth of the ocean" of reality, but it is perhaps our ignorance of its breadth that could potentially lead to our downfall.

So why might now be any different? Perhaps because, up until the recent past, human life was not a threat to the net existence of life, or the existence of the majority of life, on the planet. Now, however, given the rate of species extinctions, we are literally pushing against the "fundamental algorithms" that drive all life - survival via both fecundity and variety. To be clear, the existence of humans could be considered as anathema to, if not a threat to, the aggregate existence of natural DNA-based life on planet Earth. This current situation could, in theory, be a harbinger of the "wrath of Nature."

Now mass extinctions have happened in the past, but these were due to sudden "exogenous shock" events - asteroid or comet strikes, gamma ray bursts, super volcanoes, ice ages, etc.... But any internal threat on this planet to aggregate life (i.e. that Nature can eliminate or avoid) Nature has demonstrated that inherently it will. To survive, via the avoidance or elimination of threats, is part of life's simple and core cellular automata-like program. It can take decades or centuries, but life or Nature will do it - if possible.

Thus, we should consider, when analyzing events like coronavirus outbreaks, if humanity might not have "crossed a line" in regard to our existence in our planetary ecosystem. Note this is not asking us to consider life or Nature as akin to a magic "mother Earth" entity but, rather, to accept the impact of humanity on the equilibrium and homeostasis of our planetary ecosystem that life, with its basic "selfish gene" drives, strives so very hard to maintain. The extinction of humanity could even be akin to an aggregate DNA gene pool simply dumping a "failed strategy" akin to the removal of a leg with gangrene. If Nature has literally "turned against" human life, then obviously we might have a very big problem with potentially the coronavirus equivalent to the tip of the proverbial iceberg.

Nature has genetic "memory" as well as "algorithmic intelligence" from billions of years of brute force and distributed trial-and-error activity. We can posit that life on Earth (Nature) is the epitome of "distributed intelligence." Nature may not be very fast, but it is near-optimal in terms of "hedging bets" for the aggregate survival of life or for the survival of a given gene pool. If Nature has pivoted to "consider" or react to the human species or gene pool as an aggregate existential threat to all life, then it cannot be considered impossible that the covid19 coronavirus is an environmental "circuit breaker," like a speed limit warning, for either the size of the human population (indicating that humans have actually reached the

planet's carrying capacity for human beings) or even a "shot across the bow" indicative of a system falling out of equilibrium and possibly now bouncing back.

If we consider life on Earth as a form of distributed intelligence (e.g. consider how photosynthesis uses quantum entanglement to optimize energy efficiency) then, given Nature's vast trove of resources and its ability to handle randomness and to "be patient," the prospects of humanity do not bold well regardless of our level of intelligence or nobility. While the coronavirus is possibly a circuit-breaking mechanism against human population sprawl (to avoid carrying capacity ecosystem resource depletion vis a vis E-bola virus as an analogous "warning" to humans that we have gone too far "into the jungle" akin to Nature's forge (consider Tolkien's dwarves that dug too deep and lost everything to the Balrog)), there still remains the possibility, if not existential fear, that this is only the beginning of a natural "correction."

As we continue this thought experiment, considering life on Earth, or Nature, as a distributed intelligence, at the very least, if not an arbiter or accountant of experience itself, then there is, however, another perspective completely opposite of that of the coronavirus as population carrying capacity circuit breaker.

In the last decade, the growth rate of human populations on every continent has become negative. Now while our overall population is still increasing above the current 7.8 billion humans in the year 2020, the birth rates on every continent are all declining and doing so sharply. From the perspective of the human gene pool, this is a very "bad" thing. Note also, that the demographic "shape" of the societies of many countries is sub-optimal from a tax base and resource allocation perspective as, for all intents and purposes, these populations are too "top heavy" with too many elderly people as resource consumers but not as reproducing (baby-making) agents. The "selfish gene" human gene pool, again considered as a distributed intelligence, "hates this" - and, arguably, the world economy might also not be able to afford it. Thus, it is not beyond our imagination to consider that Nature, regarding human life, might be reacting in an opposite manner - literally trying to rid the human population of elderly humans, which it could "consider" as not "useful" (all the gene pool cares about again is an organism's ability to reproduce and to do so with variety) and even harmful to the gene pool as it considers sick or old organisms as potentially utilizing precious resources that could be used to assist its goals of sustaining and reproducing new human life, and thus there is an anthropomorphized possible "logic" implied to the nature of the virus targeting the elderly, weak, and/or sick that are all (from the perspective of the "selfish gene pool") a drain on critical reproductive resources.

As Caitlin Cheadle noted in 2016:

So here we are now, with a global fertility rate of just 2.5 - roughly half of what it was 50 years ago. Today, 46% of the world's population lives in countries that are below the average global replacement rate of 2.1 children per woman. Because these countries (59 to be exact, including BRIC nations Brazil, Russia, and China) are not repopulating quickly enough to sustain their current populations, we are beginning to see a substantial imbalance in the ratio of elderly dependents to working-age people, which will only intensify over the coming decades. By 2100, the U.N. predicts that nearly 30% of the population will be made of people 60 years and older. Life expectancy also continues to increase steadily, which means those dependents will be living even longer. Between 2000 and 2015 the average global life expectancy at birth increased by around 5 years, reaching an average of 73.8 years for females and 69.1 years for males.

Again, if we view our human gene pool as part of an ecosystem with our own "selfish gene" pool "wanting" to maximize reproductive fecundity and variety then, perhaps, we may see global pandemics as possible gene pool or Nature ecosystem circuit-breakers that are triggered if the growth rate of non-reproducing subset of the population cross a certain level or reaches a maximum - especially if a gene pool becomes too "top heavy" - similar to the demographic age pyramid (see Figures 1-7 below) with elderly and non-reproducing organisms.

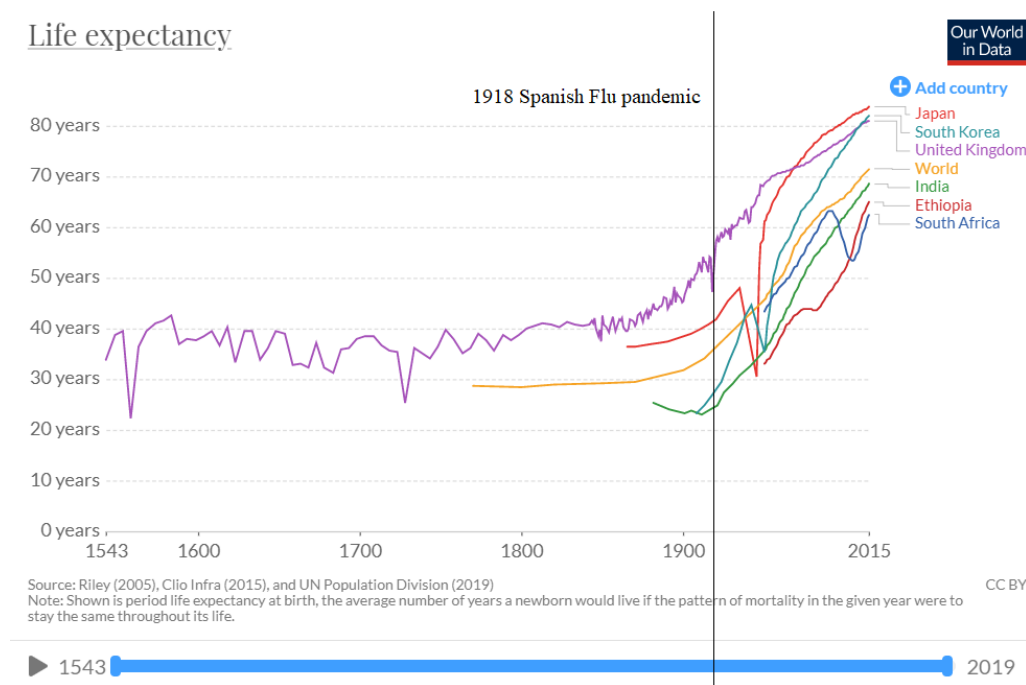
Obviously human beings recognize the value of human life and the wisdom and skills of humans of advanced age, but it is very likely that the gene pool does not! Now, of course for this argument our sample size involves only examining two global pandemics but consider how in 1918 there was a global spike in life expectancy, then in the last few years approaching 2019, birth rates have plummeted globally. Changes in either will increase the percentage of non-reproducing populations. In each event, it appears as if Nature has "thrown" a pandemic virus that removes a significant amount of the elderly and weak populations as if

Nature was acting to “push the system” back toward a sustainable equilibrium with a specific range or the largest percentage of the aggregate population being healthy reproducing organisms.

The speculation here is not meant to panic any individual or family. The point is that large scale systems (comprised of many smaller units) tend to behave certain ways "over time" and that natural (i.e. living) systems likely have “carrying capacity” circuit-breaker mechanisms that likely kick-in if the "rate of change" (not total size per se) of an ecosystem population subset becomes too out too askew or dramatic. Again, without examining dozens of pandemics, this is in no way a statistically valid analysis, but rather an interesting apparent correlation and thus, given the lower birth rates (which otherwise would have led to the real Malthusian Crisis of overpopulation in 20-50 years) we likely are headed toward much "smoother waters” in the long term and this century.

Now it is tricky to compare Nature to an “algorithmic system” as, often, it does not have system controls and we risk over-analyzing what are actually just random exogenous shock events. Otherwise, one could even consider this a positive model from a certain perspective. In a sense, Nature, as a system, really does not care or target the young and weak, it just does not want too many non-reproducing organisms that could consume too many resources from the pool available for its critical younger subset thus breaking Nature's (the human gene pool's) fundamental algorithm to reproduce and to reproduce with an optimal quantity, turnover rate (why humans die on average at age 68) and level of variety to optimize our gene pool's ability to handle any and all external threats.

Figure 1.
Dramatic increase in global life expectancy correlating with start of 1918 Spanish Flu pandemic.



Rose, M., Ortiz-Ospina, E. & Ritchie, H. (2020). Life Expectancy. *Published online at OurWorldInData.org*. Retrieved from: <https://ourworldindata.org/life-expectancy>

Figure 2.

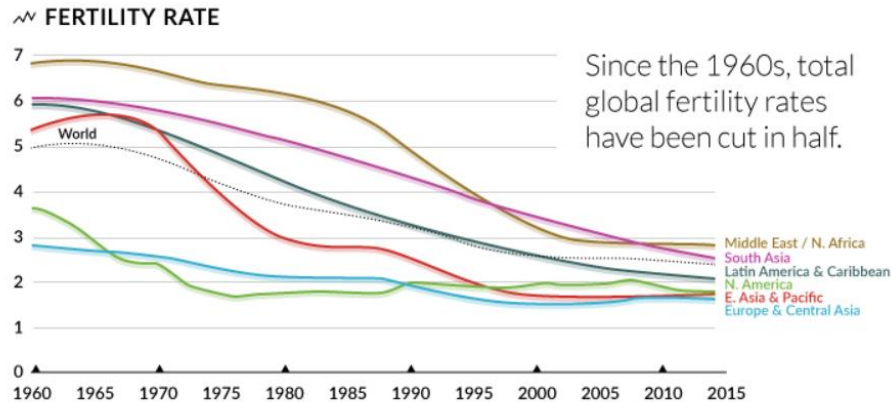
World birth (fertility rate) drops to 2.5% in 2013.

	Population	Males	Females	Age 0-14	Age 15-24	Age 25-64	Age 65+	Fertility Rate
WORLD (2013)	7,162,119,434	50.4%	49.6%	26.0%	16.3%	49.5%	8.2%	2.50

Beltrán-Sánchez, H., Finch, C.E., & Crimmins, E. M. (2015, July). Twentieth century surge of excess male mortality. *Proceedings of the National Academy of Sciences*, 112 (29) 8993-8998; DOI: 10.1073/pnas.1421942112. Retrieved from: <https://www.pnas.org/content/112/29/8993>

Figure 3.

World Bank statistics show dramatic decline in global birth rates in the last few decades.



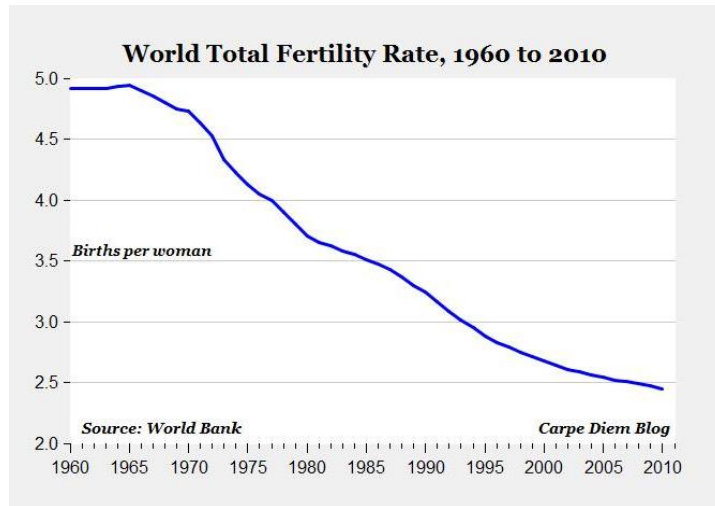
Source: World Bank, 2016

visualcapitalist.com



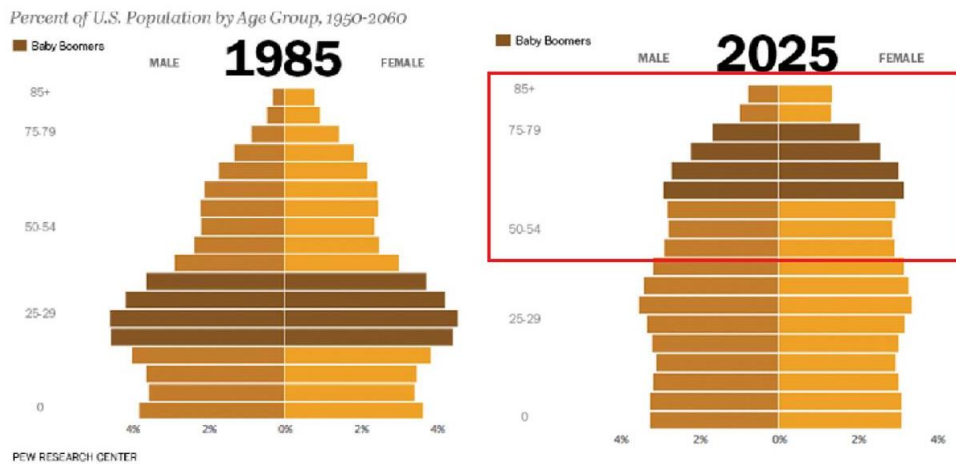
Cheadle, Caitlin (2016, November 25). Fertility Rates Keep Dropping, and it's Going to Hit the Economy Hard. *Published online at VisualCapitalist.com*. Retrieved from: <https://www.visualcapitalist.com/fertility-rates-dropping-economy/>

Figure 4.
Statistics show dramatic decline in global birth rates in the last few decades.



Perry, Mark J. (2013, May 14). Population Bomb? No, there's been a massive global drop in human fertility that has gone largely unnoticed by the media [Blog post]. Retrieved from <https://www.aei.org/carpe-diem/population-bomb-no-theres-been-a-massive-global-drop-in-human-fertility-that-has-gone-largely-unnoticed-by-the-media/>

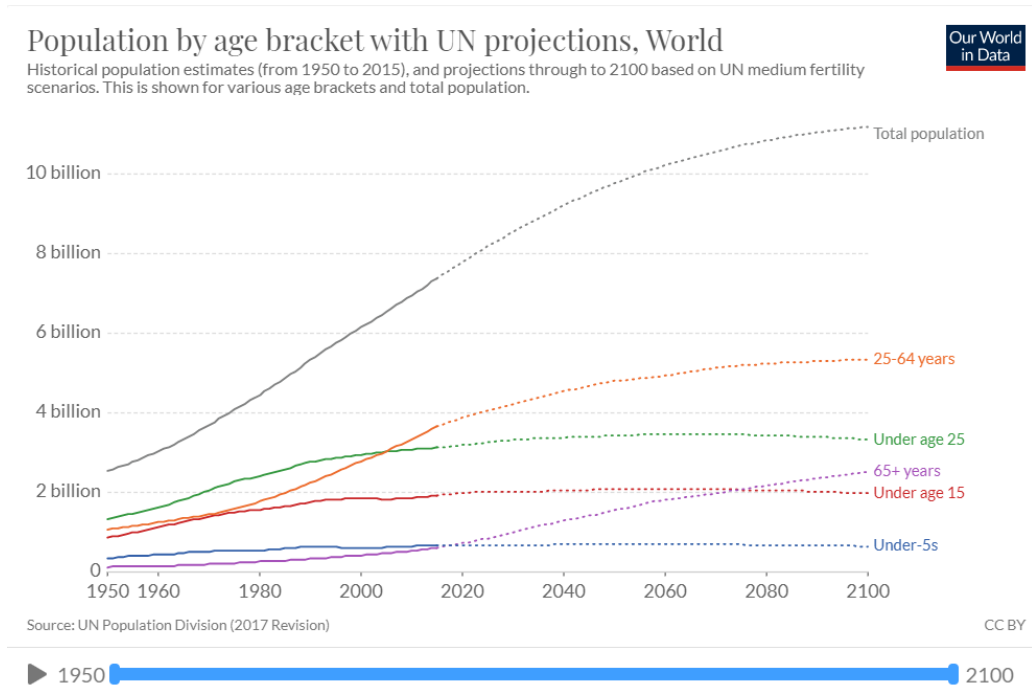
Figure 5.
Demographic age pyramid showing a "top heavy" modern world.



Yoo, D., Bell, P, et al. (2014, December 29). Our favorite Pew Research Center data visualizations from 2014. Retrieved from <https://www.pewresearch.org/fact-tank/2014/12/29/our-favorite-pew-research-center-data-visualizations-from-2014/>

Figure 6.

UN stats show the growth rate of older non-reproductive segment crossing younger segment at 2015.



Ritchie, H. and Roser, M. (2020). Age Structure. *Published online at OurWorldInData.org.*
Retrieved from: <https://ourworldindata.org/age-structure>

Figure 7.

Both an increase in life expectancy or a decrease in birth rates can cause an equivalent maximum growth rate of non-reproducing segment of a population, theoretically triggering and ecosystem induced equilibrium-returning pandemic.

