## Is your number always going to be up beyond age 115 ? The death of death. April 2018. ${ }^{\circ} 109$.

"For men of science death is not an inevitable destiny, but merely a technical problem... Our best minds are not wasting their time trying to give meaning to death... We're now at the point where we can be frank about it. The leading project of the scientific revolution is to give humankind eternal life. Even if killing death seems a distant goal we have already achieved things that were inconceivable a few centuries ago... A few serious scholars suggest that by 2050 some humans will become a-mortal... in the absence of serious trauma their lives could be extended indefinitely..." Sapiens: A Brief History of Humankind, page 298. 2014. Yubal Noah Harari.

## Theme of the month. The mystery of the supercentenarians deepens.

## The current situation

Average life expectancy continues to increase even in countries where men and women live longer than 80 years. There are more octogenarians, nonagenarians and centenarians than ever before in human history, both in absolute numbers and in percentages.

However, the maximum life
 expectancy is not going up. The longest-lived person in the history of humanity is Jeanne Calment. She died aged 122 in 1997. This April the oldest person in the world, who was 111, passed away. Given that the oldest woman alive today is 'only' 116 years old, this means that it will still take at least seven years before the longest-ever lifespan is exceeded.

More generally, the number of supercentenarians, i.e. people aged 110 and over, remains extremely low and the average survival time of these exceptional people is very short; less than a year. The likelihood of
someone aged 100 attaining 110 seems today even less than at the end of the 20th century.

The fact that the average lifespan is increasing but the maximum lifespan is stagnating means that increasingly we are seeing a 'rectangularisation' of the death curves, which are becoming concentrated in a fairly narrow age range. For women in France, the age at the end of life will, in most cases, be 85 to 100 . For men, it will be three or four years earlier, after 80 up to around age 95 . It is remarkable that this concentration of the age of death is global. It is in poor countries where average life expectancy is short that life expectancy growth is fastest (especially in sub-Saharan African countries) and it is in the richest countries where life expectancy is longer that growth is slowest with signs of stagnation. From this point of view, the world has never been more egalitarian.

March 2013. A first letter on this theme, entitled The mystery of the supercentenarians was published. Five years later, a scientific and media controversy breaks out following the publication in 2016 of an article in Nature relating to an observed limit to life expectancy of around 115 years. That article aims to establish that there is an extreme age limit to lifespan around that age. The idea was contested by certain longevists and appreciated by certain bioconservatives. In both cases the commentators generally fail to cite a short but important phrase in the article which clarifies that this limit seems to be absolute in the absence of medical advances.

How is it that all the medical advances of this century and the end of the last century, all the technological accelerations, are failing to extend the lifespan of our oldest fellow citizens? We analyze the genetic heritage of millions of people and understand more and more of the human being's complexity, we recover more and more often from cancer, mortality from cardiovascular diseases is decreasing... but to be a supercentenarian today is something as exceptional as being a centenarian in ancient Greece or the earliest Chinese empires. Why?

## Possible explanations not linked to the state of health as such

Until a certain age, many people seek to be perceived as young. But for the oldest people, it is often the opposite, they pretend to be older than they are.

Claims about very long lives of 130 years and more are almost certainly false. In fact, as the risk of mortality at age 110 is at least $50 \%$ per year statistically there is a less than a one in a million chance of a 110-year-old reaching age 130 . But there are only a few hundred people aged 110 and over in the world.

It is almost certain that most of the so-called supercentenarians of the past were younger people who "aged themselves" so as to seem wiser or so as to benefit from material advantages (to escape conscription, receive a pension etc). It should also be noted that extreme claims often concern men. However more than $80 \%$ of centenarians are women and the oldest man in the world today is only 112.

Extreme longevity was therefore exaggerated in the past, but this does not explain the stagnation observed by the Gerontology Research Group (GRG). For the past thirty years or so, this group has been counting supercentenarians by checking proof of dates of birth. 'Made up' claims are therefore ruled out. What is more, all other things being equal, logically we should find a more than proportional growth in the number of supercentenarians, given that the administration of 110 years ago (attesting to living supercentenarians today) was generally better than that of 130 years ago (attesting to supercentenarians living 20 years ago). It is not the case, even if the average age of death of 'verified' supercentenarians is slowly increasing.

Some speak of a 'statistical accident'. Jeanne Calment, they say, was just an isolated phenomenon and supercentenarians are not numerous enough to be able to draw conclusions. This explanation becomes less and less defensible as the number of centenarians grows while the number of supercentenarians stagnates. Thus, in France there were 8,063 centenarians in 2000 and 16,255 in 2018. The number of supercentenarians verified by the Ecole Polytechnique's Management

Research Centre went from eight in 2000 to only three in 2014 (the real number of supercentenarians is probably higher).

## Explanations related to health conditions

That which does not kill you only makes you stronger is a saying that is sometimes heard in the fields of psychology and health. If this idea is true then, it is conceivable that people becoming supercentenarians in recent decades have been less subjected to difficult episodes strengthening them and therefore are less resistant to extreme old age.

On the other hand, it is conceivable that the people who died in the last century were privileged for all or part of their lives compared to the supercentenarians born later. This could have a positive impact on their lifespan.

In both cases, it must first be established which chronologically specific circumstances are to be taken into account, bearing in mind that it cannot relate to a geographically limited event since the 'drying up' phenomenon occurs from Japan to France via the USA and Russia.

As far as the hypothesis of reinforcement by difficult circumstances is concerned, it seems rather that very hard life conditions well before reaching old age decrease life expectancy rather than increasing it.

As far as the hypothesis of circumstances having deteriorated in relation to the past is concerned, it seems improbable because the 20th century as a whole was much more characterized by progression than by regression. But there is one area where change has included important negative aspects, and that is pollution, particularly air pollution, and especially fine particles.

Pollution has not appeared recently, very far from it. But many sources of pollution, including fine particles and nuclear radiation, are newer and are present around the world to varying degrees.

If these kinds of pollution are harmful to health in a cumulative way over a lifetime, this could explain the phenomenon in question.

This very worrying line of reasoning has at least two weaknesses:

- It does not explain how pollution would have a very negative impact on supercentenarians but not on centenarians.
- It does not seem to be confirmed by examining the origin of supercentenarian populations. Japan and France, for example, which have many supercentenarians, are not particularly lacking in air pollution.


## An unknown disease?

There remains the hypothesis of a condition especially affecting the very elderly. In support of this concept, it should be noted that many centenarians and supercentenarians die from a little-known condition, senile transthyretin amyloidosis, a disease characterized by the accumulation of a certain type of protein (transthyretin) in the heart. Here too, it remains to be explained:

- Why would this disease have more lethal consequences today than yesterday?
- Why this disease would have greater negative consequences for those reaching the oldest ages but less for the 'mere' centenarians?


## The solution to the mystery lies with the researchers

The temporary conclusion of this letter is that the scientific community does not yet know why the number and maximum age of supercentenarians are stagnating or even decreasing.

Imagine if the buildings of our cities deteriorated less and less quickly during a century then started to deteriorate more quickly - that would probably have a greater impact on public opinion than the situation described in this letter.

It is true that a well-maintained 100, 120 or 150 -year-old building may be like new.

What we can be almost certain of is that it will take considerable and ground-breaking medical progress to break through the glass ceiling of

115 years. Just 'renovating the facade', just using traditional medicine, will not be enough. The 'rectangularisation of the death curve' which was mentioned at the beginning of this article means that this progress will be useful to more and more citizens.

## Good News of the Month: More and more public health data sharing for research purposes

On 16 April 16, 2018, the European Commission announced that 13 European countries have signed a declaration to allow cross-border access to their genomic information. This is a very important step in sharing genomic data useful for medical research.

In France, following a wide-ranging debate on the use of artificial intelligence, President Macron, presenting to the College of France a report entitled Giving meaning to artificial intelligence: a national and European strategy, announced the creation of a health data hub stating notably that We have a real advantage: we have a highly centralized health system with exceptionally rich databases. They are among the largest in the world and bring major scientific discoveries within our reach.

This realization by the public authorities in the European Union of the usefulness for medical research of pooling citizens' data (while preserving anonymity) is a considerable step forward for medical research against senescence.

## For more information :

- In general, see: heales.org, sens.org, longevityalliance.org and longecity.org
- Photo source

