

**General Session IV: Predictors of Exceptional Longevity  
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The paper by Gavrilov and Gavrilova rests entirely on the quality of the data given for the ages of the people studied.

The quality of centenarian age data, especially in the United States, has been studied extensively, with results that vary from unreliable to the belief by these authors that their data is reliable. The uncertainty of centenarian age claims in the United States occurs because of the dependence for data on the census and Social Security sources.

The census data are based on the statements of those interviewed, none of who had, or were required to have, substantiating documentation. Furthermore, a significant proportion of the population was immigrants whose facility with the English language has led to many misunderstandings. The reliability of Social Security data is equally suspect because at the time of its enactment, the reliability of the ages of participants also depended on verbal declarations or questionable documentation.

In response to my question posed a few weeks ago to the U.S. Bureau of the Census asking how age claims were verified, Rebecca Kraus of the History Staff replied, “The census records the information provided by the respondents.” Thus, there is no official attempt to validate any age claims.

Few, if any, of the databases used by Gavrilov and Gavrilova provide convincing documentation that would validate age claims especially for those who claim to be centenarians or older.

The indisputable fact is that until we have a way to link the unique genome of a person to a specific moment in space-time, the accuracy of all birth and death records are suspect.

I will not belabor this point, but I will pose this question: Why rely on chronological age as a desirable end point rather than the much more meaningful biological age of an individual? Of course, chronological time is a useless measure of biological age. We all know of 60-year-olds who look and behave more like 40-year-olds and the reciprocal. Despite this reality, biogerontologists continue to suffer enormously from our inability to measure biological age in humans.

In respect to the influence of maternal or paternal chronological age on the chronological age of their children, a more important study would be to examine the quality of life or health span of parents and their children rather than the parents’ chronological ages at death. If children born to parents who become centenarians and who also suffer from decades of serious physical and/or mental disabilities know they are likely to suffer the same fate, how pleased should they

be? Is not quality of life a better measure of what we should desire rather than chronological old age?

In this respect, the most telling study has yet to be done. That is a study which determines whether or not the biological ages of parents influence the biological ages of their children in which, not death, but the quality of life or health span is the end point.

As for the Gavrilovs finding that people born from September to November in the Northern hemisphere had a greater chance of becoming centenarians, that findings observation is similar to the same finding made 10 years earlier by Doblhammer and Vaupel, who made more than 1 million observations. They found a similar pattern in Denmark and Austria but that this pattern is shifted by half a year in Australia. British immigrants to Australia are similar to that of Austrians and Danes and significantly different from that of Australians, leading Doblhammer and Vaupel to conclude that what is important are factors that arise *in utero* or early in infancy and that increase susceptibility to diseases later in life. Their results are consistent with the finding that, at the turn of the 20th century, infants born in autumn had higher birth weights than those born in other seasons. Furthermore, differences in adult lifespan by month of birth have decreased over time and are significantly smaller in more recent cohorts, which benefited from substantial improvements in maternal and infant health.

Contrary to these findings are those reported two months ago by Young and Coles, who studied their collection of the 200 longest-lived individuals of all time by month of birth. They find that those born in March are the longest lived followed by November and August. Most died during the winter months.

Compared to the soft centenarian data used by Gavrilov and Gavrilova, the study by Perls and Sebastiani offers much more reliable data. Here, a resolute effort to validate all of the age claims has been made. Perls and Sebastiani's work is also impressive because they interpret what they have found as derivative of the genetics of those older than 100. No mention is made of the process of aging. I am in complete agreement with this view because these authors are measuring factors that influence the determinants of longevity not the rate of age changes.

The authors make the important distinction between two phenomena, as I do—aging and longevity determinants. And the results and interpretation of their findings about centenarians, semi-supercentenarians and supercentenarians shows why making this distinction has revealed some surprising results.

Their studies show that the increasing body of demographic, genetic and medical data from studies of centenarians suggests an increasingly greater genetic contribution to the ability to survive to ages beyond 100. These genetic components are, in my view, those that govern the

repair, maintenance and synthetic machinery of the cell. All of these systems are under genetic control and consequently are not stochastically determined as are age changes. Perls and Sebastiani also recognize the complexity of longevity determinants when they conclude that there are many gene-gene and gene-environment interactions as determinants.

In brief, it is not a change in the rate of aging that determines who will become a centenarian but the genetics of their longevity determinants.

Further evidence for this concept is seen in other findings by Perls and Sebastiani, such as their observation and those of other studies in Okinawa and Holland revealing that siblings of centenarians have an increased likelihood of exceptional longevity relative to the average survival of their birth cohort. This also suggests that longevity determinants are under genetic control.

Perls and Sebastiani also recognize that family members can, and often do, have more in common than just genetic factors – they can also have behavioral-environmental factors in common, a property that they call “familiality.”

It is gratifying to see the concordance between the findings of Perls and Sebastiani and those of Jarry, Bourbeau and Gagnon.

Not only have they confirmed that “siblings of centenarians experienced greater longevity than their birth cohort,” but they have demonstrated that there is ..” a survival benefit for spouses of centenarians compared to the general population, suggesting that longevity is also due to a shared environment in adulthood.”

Again, these authors avoid concluding that their findings bear on modifications of the rate of aging. Like Perls and Sabatini, they emphasize the explanation that greater longevity is dependent upon the efficacy of the genetic determinants of longevity.

Furthermore, Jarry, Bourbeau and Gagnon also report that an important part of longevity comes from familial influences through shared environmental and social conditions during childhood where both men and women benefit from the longevity of their spouses.

They pose the question, “Do siblings and spouses of centenarians age more successfully than the general population?” An excellent question, but what do they mean by aging successfully? The increasing popularity of this term is undeniable but its definition is often too soft to be meaningful.

Like Perls and Sebastiani, Jarry, Bourbeau and Gagnon also find a survival advantage for the spouses of centenarians.

Like the earlier finding of Perls group, and those of Wilcox, Jarry, Bourbeau and Gagnon report that having a centenarian sibling is proving to be a powerful predictor of survival after age 40 for both men and women.

Thus, for people reaching very old ages, the genetics component of any equation has been shown by more and more studies to play the leading role in determining longevity.

Jarry, Bourbeau and Gagnon go on to say that, “Our results show a significant survival benefit for husbands of centenarians compared to the general population, suggesting that a shared common environment in adulthood affects their longevity. ...”

They observe also that a husband and a wife who share the same household will tend to have similar life duration “and that the longer the marriage is, the greater the similarity of ages at death ... suggesting a cumulative effect of the common marital environment.”

I have reached the following conclusions from these three studies. If you want to become a centenarian, your odds are increased by obeying the following guidelines:

First, whether you are male or female, make sure that at least one of your parents is a centenarian—even if they can’t prove it or even if they lied about it.

Second, if you live in the Northern Hemisphere, make certain that you are conceived in December, January or February. If you live in the Southern Hemisphere, then the best months for you to be conceived would be June through August.

Third, if you can’t comply with these requirements, then try to find a family that has at least one centenarian head of household and ask if they will adopt you. The earlier in your life you do this, the better are your chances.

Fourth, if the family refuses to adopt you, then ask whether you can rent a room in their house.

Fifth, if you fail in all of these attempts, then marry a centenarian widow or widower.

Finally, if you are a male and all of these options fail, then consider a sex change operation.

Of course, by exercising any of these extraordinary options, it can only mean the quantity of your life is more important to you than its quality.

Personally, I have met only one of these guidelines. My mother is 105, and, as defined by Perls, she is a semi-supercentenarian. My mother objects to this name because she refuses to be a half of anything. It is all or nothing for her.

So the odds are pretty good that I will live long enough to present at a future Society of Actuaries' Symposium called "Living to 105."