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Theories of Longevity

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This is a transcript of S. Jay Olshansky's discussion of the Siegel and Gavrilova et. al papers presented in Session 3 of the symposium.

MR. OLSHANSKY: I want to thank the Society of Actuaries for having me here. It is really a great privilege. I would like to take a moment to say something about the actuarial profession. My first exposure to the science of aging was a set of papers published in a British actuarial journal in the late 19th century. It was a wonderful publication in which a scientist would write a manuscript that would then be sent out to a number of other people. They would all come to a gathering place and give a five-minute commentary on the manuscript, which would then be published along with the paper itself.

I remember reading this publication and thinking to myself that this is science at its best. This is the best way in which researchers should be presenting their work, and I consider the actuarial sciences the noblest of professions. I was fortunate enough to be in London earlier this year at one of these very meetings. I couldn't resist the opportunity to get up and make my own five-minute commentary on a paper that had been given by somebody. It was a great privilege to do that.

I want to start by discussing the paper by Natalia Gavrilova and Leonid Gavrilov. Ever since scientists began working in the field of aging, it has been known that only a very small portion of the population live exceptionally long lives. These outliers have always drawn the interest of scientists and the lay population. The Italian noble Luigi Cornaro and the British scientist Roger Bacon held the belief that everyone has the potential to live a long life, and the only reason most of us don't live that long is because of the acquisition of increasingly more decadent lifestyles. Natalia and Leonid have set out, as have many others, to discover why such disparities in

longevity exist. The value of their work should be obvious, for the only way to know anything about centenarians of the present and the past is to use historical records. The usual problem, of course, is that often such records are of dubious quality.

What the Gavrilovs have developed and used in this case is a valuable computerized genealogical database as a source for evaluating exceptional longevity. The obvious problem they faced when using this data was the uncertain quality. The Gavrilovs went through the process of careful age verification, resulting in more than 75 percent of the cases being reliably verified. They also linked this data to the Social Security Administration's (SSA) data file as a way to evaluate issues associated with exceptional longevity such as birth order and early life conditions. In my view, this work is the Gavrilovs doing what they do best, and it's this kind of work that attracted me to their research in the first place. I completely agree with the Gavrilovs that computerized genealogy is an extremely valuable resource that needs to be further mined to address issues associated with exceptional longevity.

Both of these researchers bring with them the kind of experience in this area that, in my view, is worthy of additional support and funding. I'll await further analysis before commenting on the validity of their claims that birth order and parental age at conception influenced the subsequent probability of becoming a centenarian. However, there is certainly both theoretical and past empirical evidence to support that hypothesis, and I think their work should continue and be supported. I'm one of their supporters.

Regarding the paper by Jacob Siegel, it's a bit difficult for me to provide a commentary on this paper because I am part of the debate that is the topic of the paper. So I have to be honest with you. I cannot present an objective view, so I'm going to present my personal view. It is the best summary I have ever seen on this topic, and I would encourage you to pick up this paper and read it carefully. He captures the essence of both arguments, I think, better than anyone else that I have ever seen.

Why is it that we are all so interested in this issue of exceptional longevity? Why are we all so interested in this issue of life expectancy? The answer should be obvious. This is an example of a prediction of the number of people who would be drawing benefits from the Social Security program. This prediction was made by actuaries in 1935. The view at the time was that there would never be more than about 20 million people drawing benefits from the Social Security program. The observed reality very quickly got out of hand, and the number of people over the age of 65 drawing benefits from Social Security increased rapidly. However, it does not matter who is right on this issue. In either case, there is going to be a very rapid and dramatic increase in the number of people who will draw benefits from Social Security in the coming decades. If my opponents happen to be right, things will escalate rapidly in a very short time period beginning within the next decade or so. So we do need to plan for that if, indeed, that is going to happen.

The trajectory of the forecasts of life expectancy at birth made by the SSA, based on a 2002 publication, always point in one direction. They always point up. Whether it's the low, medium or high assumption, they always go in the same direction.

A technical panel advised the SSA as recently as 2003 to not just forecast increases in life expectancy at older ages, but to raise those forecasts to anticipate that life expectancy will rise even faster than it has in recent years. What is the rationale supporting that assumption? Four pieces of evidence were provided: increases in the maximum life span in Sweden from the late 19th century, mortality declines in G7 nations during the latter half of the 20th century, a steadily rising record life expectancy at birth for the last 160 years, and the engineering of negligible senescence for humans in the 21st century. For those of you who aren't familiar with the concept of negligible senescence, there are a couple of species in which the older members of the population have the same basic physiological attributes as younger members of the same species. The researchers who study some of these animals suggest that they don't age, and they call that negligible senescence. These researchers have said that we are going to biologically engineer this phenomenon of level mortality at all ages for humans in this century. That is the only biological justification that they provide for why we're going to see these large increases in life expectancy. That's a particularly important conclusion.

There is a prediction that life expectancy at birth is going to rise to 100 years by the year 2060. However, the projection is made for the United States based on life expectancy data for other countries. I have a number of problems with this line of reasoning, one of which is, of course, that this is a composite record life expectancy. The United States isn't included in the data. How is it possible to make a forecast for any single country that isn't represented? There are a number of other problems associated with this line of reasoning. The first, of course, is the assumption that the future will be like the past. That's the basis, of course, for these straight-line forecasts. The fact is that the mortality declines that led to the first longevity revolution can only be accomplished once in a low-mortality population. That means the only way another large increase in life expectancy can occur is if the future is different from the past, not if it is the same.

The proponents of this line of reasoning argue that new advances in biomedical sciences will drive down old-age mortality, and indeed that is where all the action will have to be. We've added a lot of person years back into the life table by saving infants and children. The only way to achieve another quantum leap in life expectancy is to add person years at middle and older ages. This will require the elimination of today's major fatal diseases, and that is just for life expectancy to 100. In addition, it will require the development of ways to slow aging, plus the widespread distribution of such non-existent technologies to enough people to influence a population measure such as life expectancy. This is required; it is not theoretical. Such large declines will have to occur in order to reach a life expectancy of 100 years or higher.

One would assume that when the historical trend and a particular variable associated with life

expectancy favors a projected increase, as in the case of creating a composite record life expectancy, then the presumption is that the future will be like the past. However, when the historical record in a particular variable associated with life expectancy favors a projected decline in life expectancy, as in the case of measurable increases in the risk of death from diabetes, obesity and infectious diseases, Vaupel and others invoke the anticipated development of hypothetical advances in biomedical technologies to fix the problems. If the historical record of health and longevity is going to be used to inform forecasts of life expectancy, it should not be invoked selectively to favor one particular viewpoint, which is the viewpoint that things are always going to go up. If we're going to rely on the historical record, we need to rely on the historical record as it exists for populations alive today.

I'm going to give you the bottom line of our next manuscript, which will be published in mid-March. My general view of this linear forecast of life expectancy is that it is equivalent to a person standing on the shoreline in Florida looking out at the weather pattern, seeing sunny skies, and making a weather forecast for the next week by opening up a book and looking at the history of the weather pattern for the next week in every city other than the one that they're in.

My colleagues and I choose not to look in a history book to forecast life expectancy. We look out over the horizon and see a storm approaching, and that storm is obesity. What we see on the horizon is something that is very dangerous and that will influence life expectancy in the coming years. The title of our new manuscript, which will be published in the *New England Journal of Medicine* in March, is "A Possible Decline in Life Expectancy in the United States in the 21st Century." I'm not going to go into detail except to say that this is something that we can observe today among younger cohorts in the United States. There is a dramatic escalation in obesity among people at younger and middle ages.

Just in the last 30 years, there has been anywhere from a two- to a fivefold increase in obesity among children. These children will carry with them an elevated risk of diabetes and obesity-related disorders throughout their lives unless an intervention is developed. For boys age 12 to 17, and especially among Hispanics, the prevalence of obesity has increased from 7 percent to over 27 percent, and this is observed within just the last 30 years. The relationship between mortality and life expectancy that we're observing today is based on the past. Higher death rates associated with the rise in obesity among today's younger generation have yet to be realized. This is what we're saying will influence future levels of mortality and life expectancy in the United States, and it's not just the United States.

It is, in fact, a global problem. Japan has been mentioned as the longest-lived subgroup of the population. In fact, in Okinawa where female life expectancy is over 85, they have actually had a rather dramatic change in their mortality rates and life expectancy in recent years as a result of the obesity epidemic. So, indeed, obesity is already having a negative effect on life expectancy in some parts of the world.

The New York Times recently had a story about the future of life expectancy. A number of demographers said we have been underestimating life expectancy for a long time, and things have always improved much more than we thought possible at the time. For the first 50 years after the inception of Social Security, that is correct. The SSA consistently underestimated the rise in life expectancy at age 65. The SSA forecasters simply did not believe the data that was in front of them indicating that an upward trajectory in their forecasts was warranted based on the historical record. In 1952, 1966 and 1974, they forecasted a leveling-off of life expectancy at age 65. They were wrong every single time. Life expectancy continued to escalate more rapidly than they had anticipated.

About the time they found religion in 1981 and decided to follow the historical record, life expectancy at age 65 for U.S. females began to level off. In fact, contrary to what some demographers have said, the SSA has been overestimating life expectancy at age 65 for the last quarter century. Right around 1990, life expectancy at age 65 was about 19 for U.S. females. It hasn't changed very much since then. All of the SSA's forecasts since then have grossly overestimated life expectancy at age 65. In the latest trustee's report from 2003, they raised their forecast of life expectancy at age 65 in spite of 20 years of evidence indicating that there was a leveling-off of mortality at age 65.

My colleagues and I argue that there is sufficient evidence among populations alive today in the United States that support the conclusion that, unless broad-scale public health measures are enacted to address the obesity epidemic alone, life expectancy could decline in the United States in this century. The first declines we anticipate will be among minority populations, because it is this subgroup of the population where obesity has risen most rapidly, and because they have the least access to health care.