

General Session III: Slowing The Aging Process Q&A

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Jean-Claude Menard: Thank you to the three speakers. It was an excellent presentation in each case. My question is to Dr. Olshansky. You mentioned in the conclusion that the largest disparity in life expectancy is between the highest-educated whites and lowest-educated blacks and you mentioned 17 years for males and 11 years for females. I expect that these numbers are at birth and if so, do you have the similar numbers but for at age 65. Thank you.

Jay Olshansky: Yes, actually we have the differentials by single year of age going all the way up so we're not going to publish all of them, you can only pick and choose which ones are going to appear in the manuscript, but we will make all of them available to you on the Internet once the manuscript is published, and the link will be in the paper itself.

Dave Sandberg: Two questions, one is on the study on education. I'm curious that it wasn't addressed specifically, but is education a transformative process, or is it just a selection criteria? Education just acts as a gate through which those with longevity will pass. Thus, would the mandating of more education make a difference? That's the first question. My second question deals with the aging process related to this question of where the research is being focused and I wonder if it's as stark as we might think. It would seem to me that one of the avenues for increasing longevity lies in the application of technology to the biological process of aging. And it's not a question of looking at a medical hormonal influence on cell replication, but it's at what point do technological functions like an eye or some of the kind of emerging technology we're seeing have on extending body functions. For example, a lecture given a couple of years ago (at a different seminar), focused on the idea of taking the developments in nanotechnology, thinking about the implications for replicating cellular functions through a technological solution, and that certainly, while it is a speculative process, at least has some plausibility as opposed to certainly the time travel reversal options that we might have considered. So I am curious to hear anyone's reactions to these two questions.

Leonard Hayflick: Of course, anything that you can do to increase physiological capacity of some major organ is good in respect to increasing life expectation, but the ability to do that to the extent that I think you're wanting it to be done is pretty remote. Even if it could be done, there's a limit to the length of time that a vital organ can function even when it undergoes major repairs and even replacement for that matter.

Dave Sandberg: And I don't disagree with that. The other broader question is that the research in cancer and the issues dealing with the implications of how cells grow and divide or go wrong will have, I think, the possibility of implications for the longevity process in general as opposed to just a specific disease issue.

Leonard Hayflick: Yes, of course. I mean it's an if/then clause. If something happens, then the result will be this. There's no argument with the logic, but we're talking about probabilities. My guess as to the probability is no better than anyone else's I'm sure, but my guess is that it's going to be remote for us to have any possibility of maintaining the function of a vital organ indefinitely or even twice or one third the time that we know that that organ will function today. So everything else is guess work and I'm not very good at that. Finally, if you can show me how to prevent aging in a far simpler entity such as your car, I will accept the notion that aging can be prevented in humans. The process is the same in each.

Jay Olshansky: So to answer the question on education, I would argue, and I think many have, that it's a transformative process going beyond high school that seems to have a profound influence. There are various theories suggesting that it's not just an indirect effect, but a direct effect. There's a whole literature by Meara and colleagues suggesting the direct effects, and there are various ways it can play itself out, one of which, is associated with stress reduction and the other is how one deals with treatments for specific diseases. There are plenty of examples in *Gerontology* from more highly educated individuals following the treatment protocols from their physicians versus less educated individuals who simply don't believe what their doctors tell them and they don't take their blood pressure medication. So it varies from physiological to

behavioral. It also implies by the way that risk factor modification isn't going to have nearly as much of an impact as encouraging life-long education across the life course.

Bob Pokorski: I have a question for Steve about marital status and social support. If I'm reading this correctly, it seems like you're disadvantaged if you're married at older ages and disadvantaged if you have a lot of social support. This is the exact opposite of what I would have expected.

Steven Prus: Yes, those were surprising results as well, and one thing just to keep in mind is that both of those factors are controlled for the others when we look at low social support, marital status is controlled for and vice versa. Indeed probably the marital status was the most poignant demographic factor that we observed. It was unexpected and it goes against the grain of being married as a health benefit. And then on the flip side also with social support is having low social support actually being an advantage. The data do conflict but it's something that we should look at a bit further.

Anna Rappaport: One thing that might be interesting is to see whether it would be feasible to do a parallel study using the HRS in the United States. I don't know if that would be possible and it certainly wouldn't span the same age groups, but it might get you to the elder age group.

Al Klein: I have two questions, the first one is for Len and the second one is for Jay or Steven, or I welcome anyone to answer all of them, but the first question is: I saw a recent article where the scientists said that they felt that the tortoise's organs never aged and that all the tortoises were dying from accidents rather than from old age. That's the first one. The second question is, I've struggled with education versus income as being the better determinant of mortality. I agree, education has a big impact, but if you take the few people who have low education but then somehow get high income versus those who are highly educated and end up with lower income, do we know which has a greater impact? Thanks.

Leonard Hayflick: Well, you put your finger on a very important subject that is rarely discussed, at least among people who are not directly concerned with the biology of aging, and that is the apparent fact that there is a large group of animals that either do not age at all or whose rate of aging is not detectable. In general these include the class of animals that do not reach a fixed size in adulthood so that they continue to grow over their entire lifetime. There are many examples of such animals. Probably the best examples (because they're becoming more recognized lately) are deep sea cold water fish, several of which are endangered because we are consuming them at a rate that can't be replaced. One of them turns up on restaurant menus as Chilean Sea Bass which you would not have eaten had you known that the original name was Patagonian Toothfish. Some marketing genius changed the name in order to make it more appealing. A dinner-size portion of that fish is close to 100 years old yet we know nothing about its biology. But getting back to the main point, this area of research on animals that either do not age or age imperceptibly is almost entirely neglected by the National Institute on Aging and even private funding sources. I've tried desperately to change this and have failed unless there are some folks here who know more about this recently than I do. But, these animals are not immortal because they have, let's say, an annual likelihood of dying as a result of predation, disease or accident so they don't live forever, but they live for an extremely long time. As a matter of fact, I think yesterday I heard on the news that a blue tuna was just caught that weighed 375 pounds: This is one of the largest animals of that ageless species ever caught and has been marketed in Japan for sushi. But, the point is we know very little why these animals live as long as they do or do not exhibit age changes. The probability is that their longevity determinants are damn near perfect in the way they operate. That is the synthesis of new molecules and repair of damaged molecules is near perfect so their repair shops, apparently, do not age either.

Jay Olshansky: Actually I hope you don't mind if I have a follow-up question to Al's for Len. Is there any chance that people who are making it out to extreme old age past 100 or 110 are aging more slowly than the rest of us?

Leonard Hayflick: Well, you could make that argument, but I think it would be based fundamentally on their more perfect repair, synthesis and turnover systems, which delay the manifestations of age changes. So, in that sense, yes. I would argue that the reason my mother is 105 years old is because her longevity-determining systems are better than average.

Jay Olshansky: Can I answer Al's question on education? There's a huge advantage to using education that appears on death certificates, and so I agree with you that income and education are correlated, but the biggest problem in this type of analysis is linking up the numerators and the denominators and it's not easy ensuring the population experiencing the event is drawn precisely from the population at risk. I agree with you. You can use survey data for income; you can use national vital statistics for education, and so I feel much more confident using those data.

Doug Andrews: Very short question for Steve. I know this wasn't the purpose of your study, but do you have information about how the self-rated health measures compare by the age groups at the different times, say 1994 and 2008, if there was any change in self-rated health by groups?

Steven Prus: Just to clarify your question, can you just specify what you mean by difference?

Doug Andrews: You started off, I forget the number, something like 95 percent and 86 and 44, that was for those age groups in 1994, but in 2008 I know it would be a different group of people, but how did they rate their health? Was it still 95 percent who self-rated that they were healthy?

Steven Prus: That's what I just wanted to clarify. That's what I had thought you were asking. What I can say is that I didn't look at the data in 2008 even though Stats Canada runs a sister survey that is cross-sectional, so we could have looked at, but I would expect that probably

the decline wouldn't be as steep, one of the reasons being is that seniors today relative to seniors in 1994 are healthier, all things considered equal. So I would assume that's a really good question, but that would be my take on it that simply you wouldn't see the decline the we saw in 1994, but there would still be a decline. That's the important issue, but good question.

Paul Sweeting: I also had a question for Steven. I was wondering to what extent you are able or to what extent you try to distinguish between causes and symptoms of good health in particular related to behavioral factors. So, for the elderly, does exercise mean that the healthy stay healthy? Is it only that the healthy elderly can exercise? For alcohol: does alcohol consumption provide any protected benefits, or older people aren't drinking, not drinking because they're on medication so they can't drink?

Steven Prus: Excellent question. We didn't look at the cause and effect. Even though we had longitudinal data, we could have. It wasn't the focus of the study but you're certainly right. Is it the fact that exercise causes good health or good health causes exercise? It's a question that the data suggests works both ways although we didn't look at it and that would be the case with alcohol as well. The research suggests that alcohol consumption influences disease and good health as much as disease and good health influence alcohol consumption. So I think it works in both ways. We didn't tease those out, but good points and good comments.

Dale Hagstrom: This was a closed panel of people being surveyed repeatedly longitudinally, right?

Steven Prus: Yes, that's right.

Dale Hagstrom: I was struck by the fact that the self-rated health of even the oldest folks in 1994 were better than the self-rated health of the younger people 14 years later when they were only starting to reach middle age. All three age groups' reported health statuses went down a lot and ended a lot lower than were all of them including the old ones that started, again self-

rating. What's going on, do you think?

Steven Prus: Okay, so I'll just pull up the chart that I think you're referencing. Is this the chart? So if you want to just...I was trying to figure out which chart.

Dale Hagstrom: In 1996 the very oldest of the three groups self-rated themselves at 80 percent, good shape. The folks that were younger thereafter aged only 12, 14 years. During the period of the surveys the youngest ones hardly reached middle age, didn't get far into the middle age range, and certainly didn't reach the old age range. But by the time these youngest ones were done answering these questions from the surveying entity, they viewed themselves as 75 percent in good shape. I guess 12 years of answering surveys has really worn them out. They now report themselves as being in worse shape than when the old folks first started.

Steven Prus: Right, it's a good observation certainly. I mean, I can't explain it other than how you've explained it. It might possibly be the result of a cumulative status of having ever felt in bad shape since the surveys started, not necessarily in bad shape during the current survey. It's a good point nevertheless, good observation and thanks for pointing that out.

Tom Liddle: This is a quick one for Jay. You mentioned that blacks with higher education had poorer health mortality than whites with higher education. Has there been any data available about family history in education and my question basically is, do the whites maybe have three generations of higher education going on and the black is the first one to have the higher education. Does that make a difference?

Jay Olshansky: That's a very good question; I don't know the answer. I've not followed the data. Have you seen this, Hiram? I don't know that anyone has looked at this. I mean the problem, of course, is getting the data across generations. It's an interesting hypothesis and it would make sense, but I haven't seen the data.

Tom Liddle: Okay, thank you.

Anna Rappaport: Thank you. We're out of time, but I'd like to ask each of the three paper presenters if they have something else that they'd like to say.

Leonard Hayflick: I have nothing new to say other than to emphasize the important point that I tried to make. Many of you here recognize it, and that is that if we're truly interested in extending human longevity then we're doing very little in respect to fundamental research to reach that goal. Anything that you can do to affect the decisions made by policy makers and decision-makers in your various venues, would be very helpful in this respect.

Jay Olshansky: So I actually want to go back to the question I asked Len a minute ago because I asked it for a very specific reason. My mother and my father are aging. My father is 95 or 96, something like that, and my mother is 90. So if they're aging more slowly than others in the population, is it possible that we can learn something from the genetics of these individuals that would enable the rest of us to age more slowly?

Leonard Hayflick: Well, it's difficult to say with certainty whether they're aging more slowly. It seems to be on the surface obvious, but it may be that their rate of aging continues at the same rate, so they are simply lasting longer by experiencing increasingly more age changes or more severe age changes. So, I don't know that you can necessarily demonstrate that their rate of aging has changed at all because one of the major problems in the field of the biology of aging is to determine biomarkers of aging. How do you measure aging? It's a very difficult question. It has been addressed by many scientific communities in this field over the years, but we have no markers of biological age rates. Of course, it's easy to determine chronological aging. Most of those kinds of studies are done by you folks here, but biologists are not that interested in chronological age. We're interested in biological age, but we have no good measurements for it and again that's an area that requires a great deal of attention.

Jay Olshansky: So part of the reason I asked that question, by the way, was for those of

us who look at mortality schedules I've argued for a long time that we just tend to look at a single mortality schedule for a population. But, the argument that my colleagues and I have been making is that the single mortality schedule is really not one mortality schedule, it's a series of mortality schedules for subgroups of the population that face varying mortality risks and they're grouped together to look like one, but it's possible to separate them out. If you're capable of successfully separating them out to see who's going to be to the right of that distribution, who's going to be to the left of that distribution, it's actually extremely valuable to those who deal with pension plans and insurance and the like.

Steven Prus: I'll just add quickly, I appreciate all of the comments and feedback on the data, such as the trends that I wasn't always aware of or you don't see right away in the data. So, if you have any further comments you can e-mail me. Some of the questions are interesting; the conflict in the data, the low social support, marital status conflict and the chicken or egg debate around alcohol consumption and exercise so I appreciate all those and if you have any further comments you can e-mail me. I really appreciate that.