Informal Discussion Transcript

Session 3C – Data Sources and Projection Methods for Successfully Supporting the Needs of the Senior Market

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Session 3C – Data Sources and Projection Methods for Successfully Supporting the Needs of the Senior Market

JEAN-MARC FIX: This is a panel, so we're expecting a fair bit from you guys as far as asking questions. Please go to the microphone to ask your questions, but we really have a varied and distinguished panel, so you should make the most of that opportunity.

On my far left, we have Jean-Marie Robine, who is a research director at INSERM, the French National Institute of Health & Medical Research, Unit 710, in Montpellier, France. He heads the research team, biodemography of longevity and vitality. He's the project leader of the Joint Action European Life and Health Expectancy Information System, which provides analysis of disability-free life expectancies in the European Union. He is co-responsible for the deployment of the International Database on Longevity, I'm sure a number of you are familiar with that, in association with the Max Planck Institute for Demographic Research in Rostock and INED [Institut National d'Etudes Demographiques] in Paris. He's one of the principal investigators of the Genetics of Healthy Aging Project, and the project leader of the healthy longevity project granted by AXA research fund, the Five-Country Oldest Old Project or 5-COOP.

To his right is Dr. Kingkade. Dr. Ward Kingkade is a statistician at the U.S. Census Bureau. He's a demographer by training. In '82 to '83, he was a post-doctoral fellow

on the demography of aging at the Andrus Gerontology Center at the University of Southern California. And from 1984 on he has been with the Census Bureau, first as a statistician in their international program center, responsible for estimates and projection of the population of the former Soviet countries, Russia, Ukraine and so on, and providing technical assistance to statistics administration of former Soviet countries, serving as adviser and census preparation to the statistic ministry of Armenia. From 2002 to 2008, he was a statistician still at the Census Bureau, but in the population division, and he was responsible for projection of U.S. fertility and mortality in the U.S. for use in U.S. national projections. And from 2009 to the present, he's still a statistician at the Census Bureau, but in the social economic and housing statistics division, and he is responsible for overseeing the quality control review for census 2010 in the outlying areas of the U.S., as well as for the linkage of U.S. national real estate databases with American housing surveys. He also made pilot estimates of implicit rent to U.S. single-family homeowners in 2009, and conducted analysis of differences between self-reported home value and local country government estimates of the same. Currently, he is extending the linkage and analysis to cover the more recent years of 2006 to 2010 and the real estate crash that was in that period. Throughout his career

he had an interest in old age mortality, and the social and economic circumstances of the elderly and the effects of age on social and economic phenomenon. He's also a member of the organizing committee and, as Jean-Marie has, participated in all five symposiums so far.

Finally, Louis Adam is an associate professor at the School of Actuarial Sciences at Laval University since 1993. He has served as the undergraduate program director from 2002 to 2010. He teaches courses at the undergraduate and graduate levels, mainly mathematics, finance, actual math, pension plans design and pension plan funding. Apart from his involvement in research on Canadian pensioners mortality, his other research interests include questions pertaining to the funding and modeling of risks for pension plans, and he has previously been actively involved in the pedagogic cues of information technology. He graduated from Laval University with a degree in actuarial science, and he's a fellow of both the Society of Actuaries and the Canadian Institute of Actuaries, on which he served on the board from 2009 to 2012. He participates actively in a number of task work forces and joint task forces between the SOA and the CIA, and he's chair of the CIA communications—or he was chair of the CIA communications committee until June of '09. He is a member of the CIA pension experience subcommittee of the research committee,

and in April of ’09, he published a study for the CIA on this mortality of participants in the Quebec and Canada pension plans or retirement plans, and he’s also a CIA silver volunteer award [recipient], soon to be SOA silver volunteer award [recipient] if we had such a thing.

So, welcome to the panelists. I will start the discussion by asking them a couple of questions, but it’s a fairly small and intimate forum, so I would suggest that you take advantage of the specialists, the experts that we have, and ask your questions.

So, first from left to right, can you tell us what you’re working currently on that relates to mortality at the older ages? Currently or recently?

JEAN-MARIE ROBINE: Yes. I think talking about data source is related to the work I’m doing with INED and the Max Planck Institute on the limits of the human longevity and on the supercentenarians, people surviving and dying after the age of 110. It’s really an addition to the Human Mortality Database (HMD).

WARD KINGKADE: On the U.S. projections, one of my major concerns was the behavior and trajectories of mortality at late age. At the Census Bureau, we’re required to project in a given ethnic detail and data for the different ethnic groups are highly varied. There are phenomenon at late age that cause us to question some of the data and dictate

specific approaches. In the work I'm doing right now, I can assure you that the opinion of how much your house is worth varies by age, and may be highly discrepant from what the local government thinks, and this has to do a lot with the life cycle and aging, and so that is involved in the work I'm currently doing, and it's a variable that I look at.

LOUIS ADAM: Hi. I am a pension consultant by training, and I did that for 12 years before going back at Laval University as a professor. I teach things in the retirement area, how to do a plan valuation and things like that at the undergrad and graduate level. One of the reasons why I got involved with mortality studies was almost against my will, so to speak. I was surprised to see the extent to which we use American data in terms of what we use as a Canadian standard for all of our pension plan valuations. So I thought, well, that's an interesting question. Where is the real or true Canadian mortality? Is it below, just on par with the RP 94 or the GAM83 or any other U.S. mortality table? Is it over? Is it under? Is there a way to measure mortality of Canadian pensioners in a not too complicated way that could be precise? I had one intelligent idea at one time, that was to contact CPP actuaries and QPP actuaries. Oh sorry, I will say CPP is for Canada Pension Plan and QPP is the Quebec Pension Plan. When you add the two together, it's something similar to

the old age security in the United States. So by combining CPP and QPP data together, I am able to have a picture of what is the mortality of retirees in Canada. The nice thing about the data source I use is that it's not census-based, it's more an administrative base. Actually, I have all the information about all pensions that were paid to retirees from 1967 up to 2007, and these are dates of birth, date of retirement, date of death and amount of pension, which allow me to measure in a consistent fashion mortality by age, by gender, by calendar year, by data source and by that I mean Quebec Pension Plan, Canada Pension Plan or the both of them together to have a Canadian measure of mortality. The interesting thing also was to measure mortality by income using the pension income available. What happened in the past year is that I published these results in two relatively larger, 200-pages reports. The first one being on the level of mortality for the most recent 2005–2007 period, and the second one was on the observed mortality improvement rates. So these are issues we might discuss or you might be interested in, because I think what I observed from the Canadian perspective could be of interest in another national context. So maybe it's too long.

JEAN-MARC FIX: OK. So we have seen that all of you use data in some sort and acquired that data. What is the issue that

you faced regarding data quality, especially for the older ages as we know and we've heard from some of the other presenters are specific challenges? What are those challenges in your own specialty and how do you go about addressing them?

JEAN-MARIE ROBINE: Yes. I think everybody understands that we need to have accurate data. When we are looking at the death of very old people, here we are talking people older than 110, everybody will understand that we really need to collect the birth certificate, the death certificate, and to confirm the length of life and the age at death of the person. This is not really the main issue. The main issue, and many people are not understanding that, in fact, what is most tricky for us is to have incomplete data. We do not need to get all the data for all the deaths occurring in France or in the United States above the age of 110, but we need to have a well-defined list of deaths (or a representative sample of it). For example, it could be a list of persons born in the United States and died after the age of 110, and then we really need to collect all information. Because if we are missing some information, this is not random. We are not missing the death certificate or the information about a death above the age of 110 by chance randomly. In fact, the older the people, the higher the probability this case is a false case.

We have the following problems. If we know all supercentenarians, including a big part of mistakes and wrong cases, we can collect and check birth certificates and death reports. But if we don't know all supercentenarians, there is a very high risk to miss a good proportion of the people dying at the age 110 or 111 years. According to the countries, we can miss close to 50 percent of them, because they are no longer so exceptional and families are protecting them. In some countries, we know them through media because the press is following them. In some countries it's close to 100 percent but in some other countries, the press know only a small proportion of them, and they know very little about a person approaching 110 or 111, but when the guy is reaching 114, it's too much for the nursing home or the families to keep the information secret, so they have to talk with the press, with the media. You can understand that when we compute the probability of dying or the probability of surviving with such data, the accuracy may not be so good because missing cases are not independent of age. This is the most tricky, and this is very difficult for people understanding. People understand why we need to know exactly at what age the people died, but they are not understanding why we have to define clearly on which population we are working, and for this population we need to get all the cases (or a

representative sample). It's why generally we cannot work with the public cases known by the press or collected by several groups and listed on the Internet. It is why each time we need to have a scientific collaboration with a national statistical institute or a similar institution collecting all death information for one country, and for that we have to go through many committees, privacy committees, ethical committees and other scientific committees. This is making the research progressing slowly. Compared to 10 years ago, it's more and more time consuming to get all these permissions. These are the kind of issues we are facing.

JEAN-MARC FIX: Ward, do you want to—I know that Census [Bureau] has especially difficult issues gathering data, because it's the country level.

WARD KINGKADE: Yes. Let me first start out by setting up a straw man, and I'm going to indicate what ideal data to me would be, and these data would be accurate, they wouldn't contain errors, they would be complete, which is to say that they would cover the population universe that they are supposed to refer to. They would be in sufficient detail. I think in making mortality tables, we like to see single year, age detail, sometimes actually monthly age detail has been used in infancy in some countries, and the data would be available for the needed population categories. For

example, we face a bunch of mandatory requirements on what subpopulations we need to project. For example, specific racial categories, and the data needed to be available in that detail, and then finally the series need to be consistent over time, enough to permit statistical modeling for the purpose of projecting these data into the future. Well, these are the specs of ideal data. We don't get anything of the kind. I haven't seen this in my career for a whole variety of reasons that I could go into. Should I talk about that now or leave it for later?

JEAN-MARC FIX: No, go ahead.

WARD KINGKADE: For one thing, the United States doesn't have a central statistical administration. We don't have a Stats Canada in the U.S. Different government agencies are involved in collecting demographic data, and there's some redundancy to it. The National Center for Health Statistics is responsible for collecting birth and death statistics. The Census Bureau conducts the census of population. The Social Security Administration has an administrative database of people who have been on the Medicare roles, and that's sometimes used to estimate mortality, when a person is deleted from the roles as a result of death. So there are a number of different data sources, and none of them basically follow the same set of definitions. We're constrained by a 1997 ruling of the Office of Management

and Budget that says that data have to be collected by multiple race. What does this mean? We used to give a question in the census of what is your race, and we gave them a bunch of boxes, check one box. Well, now we let them, starting in census 2000, they're allowed to check as many boxes as they like. We did not include in the census a comparison question saying if you had to choose one box, what would you choose. So we didn't do that. Now, we did produce the population in multirace detail, so you have people who are white only, white and black, white and Asian, etc. There are basically 32 categories that we are working with. This is what we produce the census in. The denominators of the death rates start from this kind of data. The National Center for Health Statistics has the unenviable job of trying to get data that are produced in localities and then percolate up through counties and states. Their job is to try to get all the states to follow a consistent set of rules, and that's quite difficult. We do not now have every state aboard the multiple race definition, and the NCHS has constructed what they call bridging, which allows you to take multiple race data and get back uni-racial data based on some survey, and that involves a whole lot of assumptions, including the notion that the proportions in that survey remain constant. Another thing that I've seen is we're required to, as a

separate item from race, we have Hispanic and non-Hispanic origin, and that can apply to any race. You can be Asian, Hispanic or Asian, non-Hispanic. We've needed to have Hispanic detail since the 1980s, and we've had this in the census, and states have been slow to come aboard. It wasn't until 1997 that the last state came aboard having a question on deaths by Hispanic origin, and this created a lot of problems for making a time series of Hispanic mortality, and defining other categories. So there has been a lot of work that I have had to do to impute what would be the Hispanic mortality rates if I had them for all states. This involves assumptions and errors of all sorts. It also creates problems for population projection methods, but we'll talk later.

LOUIS ADAM: Well, the notion of accurate data has been mentioned, and also I will again speak from a Canadian perspective and from a Canadian Pension Plan perspective, just to give you an idea how narrow minded I am. So if I want to have a good proxy of what is the mortality of Canadian pensioners, and I want to design, let's say, a mortality table that would become the new standard that all pension plans could use, I have a problem. Do I go and inquire about each pension plan in Canada and force them to give me their data? Which is impossible and would be quite time consuming. It would be a horrendous task trying just

to make sure all the data fits and can be coalesced together. I would also have another problem, because since the coverage ratio of pension plans evolves over time, I could have people that I do not have now that could be in the future members of the pension plan. So, for instance, if only 33 percent of the people are a member of a DB [defined benefit] plan or a DC [defined contribution] plan in Canada, maybe I'm trying to measure the mortality of a subgroup of all the total Canadian population that could be a member of pension plans if we modified the design of pension plans or modified the laws or something like that. So that is one type of a problem.

I mentioned, or we all mentioned accurate data. I will be more specific. I'd like to have accurate data where it is material. From a Canadian perspective, you don't really need accurate data about mortality below age 55 or 60. The reason for that is that the way the Canadian Pension Plan works. In case of death or withdrawal before retirement, we give you the present value of your pension, and if you survive we also give you the present value of your pension. So in a way it is less critical for pension plan valuation purposes to know exactly what happens in terms of mortality, let's say, at age 25, 30 or 35. Yes, it would be nice to have some info over age 50 for early retirement adjustment purposes, but that's another issue. It's very

difficult to have that kind of information. The interesting thing about having CPP and QPP data from these two administrative organizations is that they have accurate dates and accurate pension amounts, but they only provide pensions over age 60, so I have information over age 60, and I can live with that, but when I said that to people, they told me it would be nice to have information below age 60. I know, but it's not available, so what can you do? Again, it would be nice to have information maybe until age 110, but due to the particular—the way the CPP and QPP plan were—They have an inception date of 1966, and the first pensions were paid at age 70 in 1967. So there is no information, let's say, about mortality over age 85 in 1970 because there were nobody receiving a pension from CPP, QPP. So information at older ages is evolving and gradually building up, so I can say a few things about mortality over age 100, but let's say not for the past 20 years, maybe only the past 10 years or so.

So that's the kind of limits you have to live with. Also, these pensions are paid up to a maximum, what we call in Canada their yearly maximum pensionable earnings (YMP). So kind of maximum earnings to which you will contribute and receive a pension. It's approximately $52,000 now in 2014, and for the average Canadian in 2012, it was about $48,000. So there's a relationship between the YMP and the

average salary in Canada where the YMP is just a little bit over the salary. So if people ask me what is the mortality of those who earn, let's say, $150,000 or twice the YMP or three times the YMP, I don't know. They're all bundled up together into the maximum pension category, but still you can live with that, I think. So it's nice to have—If you want to design a Canadian mortality table for pensioners, I would say the nice thing would be to have Canadian data instead of American data or from somewhere else. It's nice to have recent data compared to older data. It's nice to have accurate data where you need them. So from age 60 to age 95, because it's quite critical in that age range, and if possible to have information about certain characteristics such as age, gender and income. An example of things I do not have, I don't know the smoker or nonsmoker status, or any kind of underwriting characteristics because they are not—When they provide the pension from the CPP or QPP, there is no underwriting, so we are not measuring for morbidity, we are not measuring the quality of life, we can only measure the quantity of life, so to speak, but from a pension perspective where we'll pay you a pension for life, in a way it doesn't matter if you're disabled or not, you just are alive, so to speak, and the CPP and QPP needs to pay the pension, which is approximately the same contract that a private pension

fund will have to do. So it's a good proxy for that kind of mortality, but you could have a different reason to look into mortality, and the three of us have different, let's say, angles to look at that problem.

JEAN-MARC FIX: You wanted to interject on something?

JEAN-MARIE ROBINE: Yes, I wanted to add something because you said I'm also responsible for the calculation of disability-free life expectancy in Europe. We have issues a little bit similar to the one you have with race in the United States. We have huge political pressure to produce life table and disability-free life expectancy by social economic status. So it's an issue of providing detailed data. This is extremely difficult to do because we have this big issue of estimating mortality by social economic status but the pressure is really huge, so Eurostat, which is the European statistical bureau, is really trying to provide life table by social economic status, using a cross sectional approach. To do that, Eurostat is using some surveys, distributing disability by social economic status, and some information provided at the death of the people when the family, or the hospital or the nursing home is reporting the death of the people. Report of past job in such a situation is very vague and should not be used to estimate social economic status. There is a proper way to estimate mortality by socio-economic status, which is after

each census to follow a sample of the population for five or 10 years to get some mortality estimates by level of education and/or (past) job. It's expensive and complicated organizing such mortality census follow-up. I think that less than five countries are doing that today in Europe. U.K. is doing that, France is doing that. In France, it is what we call the demographic permanent sample. It is one person of the population, and this one person is the people born in April 1, 2, 3, 4. They don't know but these people are followed all their life, from census to census, level of education, jobs, family life and survival. It is not a huge sample of people, so we have to follow them at least five years to get some accurate estimates of mortality by social economic status. We are in between the annual period approach and the cohort approach. For example, it's like that we know in France that school teachers, at age of 35 years, have a life expectancy by seven years longer than blue collar, and this since the '50s. This gap is not really closing. Social inequalities in mortality are remaining almost the same. Everybody's living longer. But we have much less blue collar today in France than in the past and much more school professors and well-educated people.

JEAN-MARC FIX: That brings to the point that I think what Ward also was mentioning. All of us use mortality tables

for purpose and for an audience. Depending on the audience, what color you know, the results of the mortality tables and the assumptions you're going to make, and one of the issues is also the kind of errors that you find are acceptable as Louis alluded to versus unacceptable depending on the audience. Can you—one of you want to volunteer for that question?

WARD KINGKADE: Well, one of the characteristics of American mortality data is what is called the black/white crossover. What happens there is that the death rates for the African-American population—this doesn't mean migrants from Africa, although they would be included if they had become permanent residents of the United States—but in any event the death rates at young ages for black men or women are higher than those of their white counterparts, and at some late age—I think it's around 85 for men—the rates cut under. They don't rise as fast as the rates for whites, and so you have a lower apparent mortality for African-Americans than you do for the white population. Now, there are people at this conference, who have done work that shows that if you have unobserved frailty that's heterogeneous in the population, you can get such a result. In other words, when mortality is higher in youth, you weed out the weaker part of population and then at late age you have only the hearty survivors. The late Ansley Coale

pointed out that the problem with that argument is you can always make it and never disprove it, because if it's unobserved frailty, it's unobserved, and there are possibly other explanations that might and should be entertained, such as people lacking a good idea of what their age is. When you're talking about elderly African-American men, at least up to some recent point, you were talking about people born in rural areas in the South of the United States and may not have had a birth certificate, or at least not have had one made in a timely manner, and therefore, have some confusion about their age. Another thing that I've noticed in my own work is that the trajectory of mortality at a late age for African-American males goes up and down, and it's something that I just have balked at accepting. Maybe you can make a heterogeneous frailty argument to support that, but I think that's a very steep hill to climb, and that's one of the problems we face. How we've handled the projections, we haven't been able to get rid of it. We've made an arbitrary assumption that the mortality rates for all of the ethnic groups that we distinguish converge to those of the white, non-Hispanic population.

FROM THE FLOOR: At what age?

WARD KINGKADE: At all ages in fact, but that eliminates the crossover at late age.

JEAN-MARC FIX: That brings the point, that we—when we discussed this panel yesterday is that it is very dangerous to use a mortality table for a purpose that it wasn't intended for, and especially when we, as actuaries, try to use population tables that were derived for different purposes, apply them in a different context to make assumptions like in Louis' case, from the U.S. population there were the U.S.—where ever it was gotten. I'm not a pension actuary. So it's really important to understand the methodological caveat and assumptions even using U.S. population mortality. I think, Ward, you mentioned that there's several units of the government that produce mortality table for the U.S., which different—Can you expand a bit on that?

WARD KINGKADE: Well, in our projections we have to make mortality tables for these groups, but the Census Bureau is not charged with making official life tables for the United States. This is the domain of the National Center for Health Statistics. Now, the Office of the Actuary in the Social Security Administration is also in the business of projections, and also makes its own series, and in order to make a projection you have to have life tables. So they have theirs and all of these differ from one another. The official life tables made by the National Center for Health Statistics have systematically avoided distinguishing

Hispanics because they don't regard the data as trustworthy, and there are a variety of explanations for that that are out there, but one is called the salmon bias in which migrants come into the United States from Latin America, make their money, and then return back to the old country to die, and this then makes Hispanic mortality appear lower than it actually is.

JEAN-MARC FIX: We're going to talk now about projections, but are there any questions from the audience? Now is a good time. OK. Yes?

DOUG DOLL: Just a brief question. I am curious. How does the Canadian pension mortality compare with the U.S.?

LOUIS ADAM: After a long series of study, I can tell you that a Canadian dies too. No, that was the easy answer. Yes, we do experience mortality, but actually I thought it would be a simple answer, but when we compared the UP94 table, which is a de facto standard to the experience in Canada—

DOUG DOLL: I know UP94 was American derived.

LOUIS ADAM: Yes, American derived, and it was on insured pensioners from the 1980s or so, projected using the Social Security with Civil Service Retirement System from the United States to derive the AA scale. So we projected that thing up to 2006, which was the central year of the period, 2005—2007 that was the level of mortality, and it would

have been easy for me to tell you it's always lower or it's always below, but that's not the case. Actually the shape of mortality is not the same. So somewhere between age 75 and 85, the two curves cross each over. So in a way that's a problem. It could be nice to say we just have to take the old mortality table and use a rule of 3 and multiply it by a factor of, let's say, .97 or 1.10, and just shift the curve up or down, but that's not the case. So the slope of the mortality curve was not the same. So actually Canadians did not know they were supposed to die according to a U.S. mortality table. They just decided to die the way they wanted to die, and did not follow any actuary's advice to do that. So when we measure mortality, we observe a different pattern. This pattern, it so happens that if you measure either life expectancies or present value of annuity, it's almost close. So you could say well, it's not that bad, but for females the mortality was much lower than expected. So there was a discrepancy that was more evident for females. So that's maybe a partial answer.

The big thing for me is that when I measured that by income level, those at a higher income level, as you might expect, had the lower mortality, so that means higher present values. So people would say, well, we know that, because everybody says that socio-economic information tells us that if you have more income, maybe more

education, maybe you will take care more of your health, maybe exercise more, have a better diet or go to your doctor more frequently, or any combination of these things. So we don't know why, but there seems to be a correlation between income and mortality. OK. So that's what I measured, and I could see that it was quite a major factor. When I think about QX—Are there nonactuaries? If I say QX, it's the probability of death in the next year. So if I measure the probability of death for the total population, and I measure that by income level, for the higher income population you could have, let's say, a multiplied factor of 80 percent or so. So you could diminish your mortality by 20 percent for all ages. So this is around age 65. If you are around age 75, 85 or 90, then it decreases and tapers off to zero. So there is less an income factor at older ages, but there is still something which is significant.

The thing that I found in my second phase of my study was when I studied mortality improvement. Not only those with high income have lower mortality, but they have higher mortality improvement rates. So on your side if you have two curves, they are diverging over time, and I don't know how long this factor will still apply, but it's interesting in a way or worrying if you're a pension plan actuary who has higher income people to see that not only do they have

lower mortality, but they have higher improvement rates, which means that their mortality rates will decrease faster and faster. So maybe I diverge and did not answer your question.

DOUG DOLL: You did, but you raised another question. I always wished there was some good mortality data in the U.S. by income, but I've yet to see any. It was interesting, you said the mortality differentials by income have been diverging, but apparently in France they've stayed similar. I've seen a couple of studies in the U.S. that show mortality by such things as educational achievement have been widening over the years, which would indicate the mortality by income probably is widening too. I was wondering if you had any comments on that?

SARA GOLDBERG: I have a comment on education.

JEAN-MARC FIX: Can you go to the microphone, please?

SARA GOLDBERG: In this study by the SOA, education, which was used as a proxy for socio-economic status, that was by, I think, high school level, and my opinion is that it's been diverging, because—not necessarily because of diverging socio-economic status, which also may be the case, but that education—I mean more people are receiving a high school diploma as well as a bachelor's degree. So the remaining are relatively poorer off. So I think that's maybe not the purest way of doing it, but income would be

better, but not available.

WARD KINGKADE: That's an issue that's also important. When you look at those averages, one of the things is that the denominator changes over time, and it's dangerous to make comparisons when you have a homogenous group and all groups are homogenous as the distribution changes over time.

LOUIS ADAM: There's something I wanted to add. It shows it was on my mind when I spoke about mortality differential. One of the reasons why I wanted to analyze mortality by income level is that when you say to someone I'm using Social Security data or the equivalent in Canada using Canada Pension Plan and Quebec Pension Plan data, people have a tendency to say, well, it's not that good because there are so many low income pensions, it just corrupts, so to speak, the level of mortality that we should expect for higher income people in a private pension plan. So in a way, one of the reasons I use that is that the pension amount on retirement onset is something that you can see in the data file, and you can work that back to the equivalent of a salary or average salary over the career of that person. So in a way there's a direct connection between your initial pension amount, because the way the formula works for the Canada Pension Plan is that it's 25 percent of your index salary over your lifetime, with some exceptions, up to the maximum salary, which is considered

the maximum YMP, yearly maximum pensionable earnings. So in a way it's a kind of a final average salary indexed over all of your career. So if over all your life you have a lower salary, you will have a lower pension, and if you have a higher salary, you will have a higher pension. So there's a direct link between maybe why—Actually we don't know why or how you earn your money, but we know that if you have a higher pension, you probably did something good over your career lifetime to be able to earn that money. The interesting thing is that from a private pension plan purpose, that's something you can observe. When you hire someone, you have an idea about his salary, and you can make maybe a projection of what will be his final average salary, or how much he will earn with respect to CPP and QPP. So what I did was to divide that in three categories, low, middle and high pension, class 1, class 2, class 3, and then combined that together and try to measure a pension and mortality.

JEAN-MARC FIX: One of the issues presented has created a fair bit of debate in social policy circles about the regressive nature of pension plans. As the lower income dies quicker with less salary, less pension to start with, so it's kind of a double whammy effect here. Ward, you had something to add?

WARD KINGKADE: In the United States, there have been a lot

of studies of the effect of socio-economic status, which is sort of a common factor when you put together income, education, occupation. I've heard lots of people say this is the strongest predictor of longevity and mortality in the United States today, and I think the argument as to whether it's diverging or converging is less important as the fact that these differentials tend to hang in there. They may converge a little bit, but there's a differentiation in these groups that's consistent over time. That's also been observed and written to my knowledge, and also characterizes other countries.

LOUIS ADAM: Something I might add. Sometimes people ask me why is it the case, and I have to tell them I see the data, I collect the data, I can measure mortality, but it's difficult afterwards to say why do men die more than females. There are medical explanations maybe for that. How come people at age 80 die more than those at age 65? Maybe there's an explanation. Why is there a difference in mortality between QPP and CPP? Is it because a person in Quebec eats differently at a different genetic background or they work in different fashion? Is it a kind of location? Is it because of the cold? It could be different factors, but the fact is we can measure it, and then we can wonder. One of the things I'll mention afterwards will be things about the improvement rates, how they vary, but

there are differences. Some people ask me why is there a difference? Well, at least I'll measure it if we want to wonder afterwards. Is it because of the salary difference? Is it because of income? Of education? Because they have more access to doctors or hospitals? The answer is, I don't know. The only thing I can tell you is I can measure mortality and there is something different.

GARY MOONEY: We have improving mortality and that's continued for many, many years. If you could divide the populations you work with into relatively unhealthy people and relatively healthy people, so those two classes, would you expect or would you find that the percentage improvement in mortality is greater for relatively unhealthy people or relatively healthy people?

JEAN-MARIE ROBINE: Good point. I think your point is a very good point, because this is a question of compression of morbidity or expansion of morbidity, and if survival of healthy people is improving more than the survival of unhealthy people, we can expect having a compression of morbidity or disability, but if it is the opposite, if we are improving more the survival of unhealthy people, we would just increase the number of years lived with morbidity or with disability. So to be more specific in answering your question, we have to compute and to compare at the same time the change in life expectancy and the

change in disability-free life expectancy.

JEAN-MARC FIX: That has key social implications as we discussed. Anybody else want to comment?

GARY MOONEY: One reason why the mortality of unhealthy people might improve faster than healthy people would be improvements in public health in a particular country.

JEAN-MARIE ROBINE: Yes, and it could be easier, but this is really one of the main questions we have. It could be easier to keep alive sick people than preventing healthy people or keeping healthy people in good health. In fact, what medical doctors know to do is to take care of sick people, and they are more and more efficient there: slowing down, preventing the occurrence of the most severe forms of the disease, and the onset of disability, and mortality. In fact, we know so much in taking care of sick people and we are spending so much money on that, and comparatively we are so poor in prevention, preventing diseases, keeping people in good health, promoting good health behavior, and we put so few money on that, but it is not because we are silly, it's just because we don't know what to do.

GARY MOONEY: A good example of how this works is a campaign to get people to stop smoking. So the smokers are presumably relatively unhealthier, so by getting them to stop smoking, you're, in fact, improving the mortality of that unhealthier group.

JEAN-MARIE ROBINE: Yes, but in here it is possibly easier to have a smoker quitting smoking, but somewhere already the health is damaged, so after that we are keeping them longer alive with decreased health. It's preventing young, healthy people to start smoking. It's really at the beginning.

WARD KINGKADE: I have a comment that bears on a presentation yesterday that was done on computing risks. Essentially it's been shown that if cancer were eliminated as cause of death, you wouldn't really get that much of an improvement in life expectancy, because mortality from other causes could rise. The people would remain at risk. You'd just have more people at risk of dying from some other cause, and those death rates might actually rise. So there's that factor to be considered, but I think it's fairly obvious that smoking is terribly destructive and by getting people to stop, you certainly do reduce mortality.

SARA GOLDBERG: So this session was entitled, or part of the description was, practical implications, you know, projection methods, and I think it's easier, practically speaking, to use information, like a known smoking ban or smoking sensation efforts. Maybe the U.S. isn't the best example, but recent smoking bans in other countries, and making decisions based on that in the future. Health status, it poses questions around policy decision. We all

know that health care reform is fickle. And other decisions about the future on whether there would be widening differences in health status or not, it's difficult to make decisions on that, I think. So smoking is easier information to use for projection than making decisions about how policy could move in the future, or also the economy, which drives decisions around how much money to pour into cures for cancers, etc.

I have a separate questions for Dr. Kingkade. Back to your comment earlier on what you called the salmon bias. That's a huge issue, not just in the U.S., but other small countries like Hong Kong and Singapore, where you have a huge migrant population. So going home to die and quantifying that and making your data clean for that, have you just noticed the effects and know that that could be a problem in the Hispanic mortality, or have you tried to address that?

WARD KINGKADE: In the assumptions about international migration made in the most recent series of post-census 2010 projections for the United States, they did a lot of work on estimating migration and dealing with the fact that you miss people who come into the United States and then leave during the intercensus period, and they made an estimate of mortality that accounts for that. That's not exactly the same thing as the salmon bias. The salmon bias

arose as an explanation for why Hispanic death rates at late age are as low as they are, because I believe they're the lowest—It's possible that among males, the black non-Hispanic mortality may be slightly lower at some extreme late age, but in general the Hispanic mortality at late age has been surprisingly low, and Hispanics as a group have registered surprisingly high life expectancies, and that's what the salmon bias argument was based on. But, yeah, we've tried to take into account at least some of that in our projections, basically having to do with the migration assumption, and less having to do with mortality. We haven't connected that to mortality.

JEAN-MARC FIX: My next question: Would you care to venture a guess or an educated guess on mortality improvement in your respective areas of expertise, and make sure you caveat what that area is at the older ages? I think there were some surprising numbers that I've heard about. Historically, actuaries have tended to limit the mortality improvement at the old ages to very small amounts, less than a half percent and heading to zero. Would you care to comment on that?

LOUIS ADAM: Well, I have a lot to say, so I'll defer to my colleagues first.

JEAN-MARIE ROBINE. I can start. We are getting big numbers of centenarians now everywhere. And what James Vaupel said

yesterday: In Europe on average the number is multiplied by two every 10 years. So it's going very, very fast. At the beginning the number is small, you know, when you are moving from 200 to 400, 800, but quickly you are in the big numbers, but here we are not converging between us. We are really getting these old people at different paces, and we don't have a good explanation for that. But there are some trends. The pace of increase is much faster in the south of Europe, in Spain, in Italy, in France and Switzerland than in the north. The pace of centenarian increase is much lower in Denmark and in Sweden. This is accompanied in Sweden by what James Vaupel said in his talk, showing that the rate of mortality at age 100 was almost stagnating in Sweden since about 40 or 50 years. But in France the mortality rate of centenarians was really decreasing over time and in Japanese it was collapsing. We don't have good explanation for these divergences. In some advanced countries, the mortality among the older individuals is strongly decreasing, for instance above the age of 100. Everywhere 30, 40 years ago the mortality rate at age 100 was about 50 percent per year. Now in Japan it is clearly below 30 percent, and so it's really a huge decline, and in these countries, the south of Europe or Japan we are not observing a slow down in this decrease, when in some other countries, Denmark, Sweden, the mortality trend at age 100

is totally flat. We have no good explanation for this phenomenon.

WARD KINGKADE: Well, certainly in the United States there's a dramatic rise in the population at late age. That category is growing extremely fast. As to mortality rates, in our projections, we essentially assume that the rates for all groups converge towards those projected for the white non-Hispanic population, and that can create a situation where mortality among blacks, for example, at late age, may rise at a different rate from that of the white non-Hispanic population. So the information is a little bit confounded in that respect, but it's clear that death rates are going down with late age.

LOUIS ADAM: Again, one of the things I learned working with this kind of data is humility. When people ask you to project mortality, you have to say, OK, IF you just want to project the past tendencies into the future, you cannot do that for a long time period. So you have to say we don't know what will happen in 40 years or so. So if we mirror image what will happen the next 15 years and say it should be approximately like the past 15 years, then maybe you can make some statement. That's my first caveat.

The second one is that especially if you're trying to measure mortality improvement rate, you have to be quite certain that the measurement of mortality in each calendar

year or calendar period has been done in a consistent fashion, because if you measure mortality, let's say, in 1992 and 2007 and all the years in between using, let's say, census data and there have been changes in methodology or changes in budgets or changes in data that has not been explained, maybe what you're measuring is not a mortality improvement rate, but an improvement rate in the methodology used to measure mortality. So you have to be wary.

Using data such as those I've got with the CPP and QPP, I was able to measure the mortality improvement rate, because mortality was measured in the same fashion, be it in year 1977, up to 2007. So that was a 30-year period. I divided that into two 15-year periods, 1977 to 1992, 1992 to 2007. Actually I measured five, 10, 15, 20, 25, 30 years, and divided that. So the first thing to note is that the rate of mortality improvement in what I would call the past, 1977 to 1992, we experienced mortality improvement rates around 1, 1.5 percent for Canadian pensioners, but what happened in the past 15 years from 1992 up to 2007, it was not 1.5. At age 65, it's around 3.2 percent, or 3 percent over the past 15 years, and if you take a 10-year period ending in 2007, it's more like 3.2 percent. So the shorter the period you measure it, ending in 2007, the higher you observe mortality improvement rates.

So on your side what it means is that mortality is decreasing at a steeper slope. So if you're trying to say OK, we'll take a 30-year period, because with more data we will have a more precise answer. Actually you're making an average of a past situation and a new situation, where mortality is not evolving at a constant rate. So there's something going on now, and it's quite annoying for pension actuaries, because if mortality is decreasing faster than expected, people live longer, liabilities and normal costs increase, and then the end answer for your client is that it will cost more, and then they're unhappy towards their actuaries, who suddenly is changing his mortality table, and by default you're the lightning rod for his bad humor, OK, it's the fault of actuaries, now it costs more in my pension plan, and again you have to explain to them that it's not actuaries who decide when people die, it's more something we observe.

So what I see from Canadian data is quite a large improvement rate, 3.2 percent at age 65. You might say, well, OK, it's temporary, we won't see something like that. What I found is that when I measured mortality improvement rates by region, QPP data compared to CPP data, it's a little bit more horrific. For instance, I could measure mortality improvement rate at age 65 of 4.8 percent for Canadian males at the higher income level. So 4.8 percent

improvement rates, and this has been going on at rates over 3 percent for age 65 up to age 80. What it means is that gradually the Quebec population—As a term of mortality, in the past they used to have higher mortality than the rest of Canada, but now they are not only approaching, but actually the mortality curves are crossing each over, so Quebec population might have lower mortality than the rest of Canada, and if that rate of improvement continues for five, 10, 15 years in the future, there could be higher discrepancy.

So the end message is that improvement rates are tricky to measure, you need lots of accurate data. You should look at the confidence interval of what you're trying to measure to see if it makes sense, and what I did also is to measure the R squared value to say I can measure an average improvement rate, but does it mean something? And yes, it means something up to age 80, 85, 90, but over 90, the R square value drops down to 10 or 20 percent. So it's almost as if mortality was doing a kind of random walk. So over age 95, I cannot say with certainty that mortality is improving based on the data I've got. So that's something. It doesn't mean that there's no mortality improvement, it's just that on average it's tricky to measure and the confidence interval is so wide that if you get at age 100 a rather negative improvement rate, it will

be maybe plus or minus 1 or 2 percent. So you can't really say with certainty. So mortality improvement rates, they do vary by age. They vary by gender. They vary by income. They also vary by the length of the period over which you measure them and the end of the period. So there's not a simple, one-size-fits-all answer. That's why also I speak about humility. These are factors you can observe, but if people ask you afterwards will they continue? Well, they've been varying in the past, so they might quite well continue varying. Again, I don't know why.

JEAN-MARC FIX: And I think the order of magnitude, I think was what struck me. We're talking about 4, 5 percent cumulative annual improvement for several years, if not a decade.

GARY MOONEY: Gary Mooney again. Regarding this accelerating rate of improvement, could this not simply be or one of the major factors be the dividend from the reduced smoking in the population in total?

LOUIS ADAM: That is probably one of the main factors, along with maybe a change in diet. So the way people eat is maybe not the same as they did 20 or 30 years ago. Maybe people are more health conscious, and you could add to that the obesity or nonobesity factor is of the same. I think it could be a big factor in the United States according to what we see, because there's a link with obesity and other

diseases such as cardiovascular disease, diabetes and things like that. It's not good for your health when you're at age 80.

GARY MOONEY: It would seem to me though there's enough information about the effects of stopping smoking in terms of improved mortality that you could reverse out that particular effect. In other words, remove the smoking dividend effect, leaving you with let's say somewhat reduced improvements in mortality, which will then obviously need their own explanations.

LOUIS ADAM: Well, with humility I've not done it, and maybe someone else has looked at that factor, and I'm quite sure there could be kind of a partial explanation factor, but I've not looked at that issue.

JEAN-MARIE ROBINE: I would like to say something about smoking. I know in the three main countries where in the '70s or the '80s we observe a very slow increase in life expectancy, the main factors was smoking. For the United States, for Denmark or for the Netherlands it was, I guess, extremely important to find an explanation why the life expectancy was increasing so slowly compared to the other countries. So smoking is an explanation, but I don't think it is the right explanation.

I really suggest if you are interested by this topic, don't look at your country, let's say, the United States

compared to another one, let's say, Japan. Look at 12 countries at the same time. Put into your graph U.K. or put Denmark, but put also Sweden, and put many countries, and you will see it's much more complex, and you will not understand why these three countries have this very particular trajectories. What is interesting, if you do that, you will see that in fact there is no big difference among all these countries, let's say the OECD [Organisation for Economic Co-operation and Development] countries if you look at the change in life expectancy for the males, and in fact, about everywhere we observe the same change in the life expectancy of the males. Whatever in these countries, people stopped smoking or did not stop smoking, or keep smoking like in Japan. It seems that this had no impact at all on the change in the life expectancies of the male, which are extremely close between OECD countries, and changing over time in the same way, but we got huge divergence only for women. I have no explanation here. I'm just saying I'm not buying the common explanation.

FROM THE FLOOR: My question to Louis Adam is on the long-term mortality improvement. I'm just trying to understand the methodology used.

LOUIS ADAM: Well, in the paper on mortality improvement, I proposed something that was simple, because I was told it would be easier if there were only one mortality

improvement rate, and I told them we can't do that because there are such high improvement rates in the recent past, I don't think that these values will occur for a long period of time. So you need something, which is for the near future, and for the long term, I don't know, and with humility I said I will use a combined average of the mortality improvement rates used by CPP actuaries and QPP actuaries. So that's why they are strange figures. It's a kind of average of CPP weighted 75 percent and QPP weighted 25 percent because it's approximately the mix that you find.

So that was why I had the long-term mortality improvement scale that was on that. These are lower values, and these values come from the best-educated guess of CPP and QPP actuaries combined together, and quite frankly before someone in Canada can say I have a better idea or a better guess about long-term mortality improvement than these two bodies, it's maybe a little bit pretentious. You might be right, but you might be wrong, and they spend a lot of time designing these long-term assumptions taking into account information that they had about other OECD countries, etc. So whatever the reason they come up with, they have these long-term assumptions, and I was not there to second guess their long term, because quite frankly I don't know more than they do.

So this is why you have to make a transition from high improvement rates in the short term to lower mortality improvement rates in the long-term future, and by that time in 2040, 2050, 2060. So how do you make that kind of transition? Initially what I did was to have a short-term, mid-term, long-term, but it's quite easy also to do it on a continuous basis, and linear interpolation or p-splines or anything like that. Just to be simple, I used three levels, and after that we did a—for the pension experience subcommittee new proposal in July 2013.

I had a kind of plateau for the first short-term improvement rate, which was constant from 2006–2011. It was the constant improvement rate for five years and decreasing linearly up to 2031, and then attaining the constant mortality improvement rate, ultimate improvement rate in 2031.

So this is the way it was designed. Is it the right answer? Honestly, I don't know, but at least it conserves the same pattern that in the short term it should be not too far from the recent past, and 3.2 percent at age 65 was approximately the 10-year average from 1997 to 2007, and it's the same for all Asia. There was some smoothing used for that, and we had lots of discussions. Recent discussions were about should we change deaths now that the CPP and QPP actuaries have just released their 2012

actuarial report, so there will be some adjustment maybe.

Did I answer your question to why is it lower? It's because CPP and QPP actuaries use lower long-term assumptions. Why do they use lower assumptions? Well, they get pressure to have higher increase. The current thinking seems to be that mortality rates should improve by a little bit below 1 percent in Canada, and some people say, well, in the U.K. they use something more than 1 percent. That may be right, but they do start at a different level in terms of mortality. So you have to combine not only the mortality improvement rate, but also your initial situation. So it's easy to import the U.K. long-term improvement rate, without looking at the big picture from the Canadian perspective.

JEAN-MARC FIX: The flip side is also that dealing with different constituencies you have mandates that force you to make assumption either by government mandate or by your clients that force you to do assumptions that may be against your grain, but still are reasonable, and when there's no real data to prove one way or the other, you have to go with that.

JEAN-MARIE ROBINE: I would like to add something like that. The last two or three years, I think, France and U.K. made a special effort to forecast the number of centenarians in France and in U.K. They did that independently, but they

did that about the same year, I think it's two or three years ago, and in U.K. they went further than in France, but in France the horizon of the projection was in 2060, and so in U.K. I think it's going to 2080 or whatever. It's also going to 2060. So we can compare the situation of U.K. now and in fact, both started in 2010. In 2010, the number of centenarian in U.K. was 12,000 and 15,000 in France, or a little bit more. Life expectancy at age 65 is a little bit higher in France than in U.K., size of the population is about the same, and in both case the methodology used was just the central scenario for mortality, for fertility, for migration. So trends observed during the last 50 years were kept going for the coming 50 years. The answer is 200,000 centenarians in France in 2060, and I think about 380,000, close to 400,000 in U.K.

How is it possible that two of the most well-known statistical bureaus in Europe, using exactly the same methodology, are ending with so different numbers? Looking carefully at that, we can see that U.K. strictly applied the methodology and the past trends. We can check and observe that the number of centenarian is still doubling about every 10 years from now to 2060. In France, the forecasted numbers were just so big, close to 600,000, the statisticians considered that they cannot publish [such] big numbers. So there were writings, they were applying the

central scenario projection, and they were, in fact, curving just to be able to say, well, we'll have 200,000 centenarians. Just think people will not trust them and will think their work is bad because the numbers are not trustable. It's very interesting.

This is really what James Vaupel said yesterday. He had examples showing that the decrease in mortality was actually faster than what the experts were currently projecting. In his presentation, he gave a huge number of references showing that each time people were doing that, it was wrong.

WARD KINGKADE: I just want to raise a point of clarification here because one factor doesn't seem to have entered into the discussion, which is the difference in the birth series for the United Kingdom and France. You can get very different results as a result of the fact that the age structure at younger ages than late age has different features. In my prior incarnation as a demographer of the former Soviet Union, when we're dealing with a population whose age structure essentially looked like a bed post—it had all sorts of kinks and dips and booms and busts in it—and I think the one possible explanation would be a difference in the birth series, or an age structure at younger ages that might be observable. I don't know that that's the case. I mean you presume you checked into that.

JEAN-MARIE ROBINE: It was not the case. It was really the French statisticians to say that no, we cannot give a big number.

JEAN-MARC FIX: In the last 10 years, has there been a different trend of improvement, based on your judgment, than we have seen in the past for older age?

LOUIS ADAM: The answer is yes. For Canadian pensioners, at least the past 10 or 15 years are quite different from the previous 15 years.

JEAN-MARC FIX: Which involves a lot of difficulty when you model using time series that go way back.

LOUIS ADAM: Yes, because if you assume that the future will be like the past, you have to wonder which past. Is it in the most recent 15 years, or the afterwards? This is where again, I will repeat, that you have to be humble. There's not only one answer to that question.

WARD KINGKADE: I want to make a comment on methodology that's relevant here. In the symposia we've heard a lot about the Lee-Carter model and probabilistic projects. What Lee and Carter did was take mortality over the 20th century. They ran time series analysis on it, got some results that indicated that it was a ARIMA model which included autoregressive and a moving average component. [We] dismissed the moving average component because it was inelegant and assume you had a random walk with drift,

which is essentially an expediential pattern. Now, one of the things that we did in the projections that I've been involved in, one of the things we tried were to apply time series methodology, but we were dealing with much more confined series. With the Hispanics not having data since 1980, this greatly reduced the length of the time series that we had to work with, and we got out of the Lee-Carter type model a lot of undulations which we needed to take care of, and we did it by imposing a certain standard form on it, but the period that you're talking about makes a huge difference to what you're projecting, and practical constraints on official agencies or companies that are forced by law to distinguish certain things can greatly affect what you're projecting and how hard it is to do that.

JEAN-MARC FIX: One of the consideration of that is we all know that mortality for African-Americans and for whites is different in this country, yet for insurance company purposes it's illegal to do so, and therefore, we don't do it, but the different share of the population, the changing mix is not projected, and therefore, there might be other effects that are hidden in there and hopefully the fact that we adjust the mortality table every 10 years helps us correct the course, but it makes long-term projections very difficult when you don't really have all the underlying

variables like we've illustrated here.

LOUIS ADAM: If there is a message maybe for some of those who could be attempting to do Lee-Carter projection with their own block of business or things like that, just be wary of what is the past data you're using to calibrate your model, because if you're using the past 15 years, the past 30 years or the past five years to devise the average rate of improvement over time, you could have big surprises. Actually there were some people who use mortality until 1992 to project future mortality, and what happened from 1992 to now, since we experienced really much higher improvement rates, the results we got were quite outside the kind of cone of confidence interval that were planned by the Lee-Carter application. So don't believe a model just because it is there. There could be error in the application of the model. So again be humble.

JEAN-MARC FIX: I think the sensory testing of the model, the calibration period is key, and I've done similar work for cancer rates and projections and it's really important to see when you start, where you get off.

LOUIS ADAM: And what is conservative or aggressive or optimistic or pessimistic for what you're trying to do for your line of business. Is it better for you to have higher mortality rates or lower mortality rates? Which will be toughest to explain to your boss or your client or your

colleagues, or the government?

JEAN-MARIE ROBINE: I'm disturbed by what you are saying here. In France, what actuaries are doing or what we are learning at school is when you are forecasting, you cannot choose what you like, like choosing 15, 20 or 30 years. You are supposed to apply some kind of rules. We can discuss what are your rules. Are we sharing the same rules? In actuarial schools in France, people say you have to mirror projection. So if you want to project 20 years, you use 20 years in the past. If you want to project 10 years, you use 10 years to balance the horizon of your forecast. It's sensible to expect that the coming 10 years would be similar to the past 10 years. You will not take 10 years to project 50 years. So I don't know whether you are applying the same rules, but I think if you do that, these rules are independent of you, so you cannot choose.

JEAN-MARC FIX: Yeah, but independent of you doesn't mean it's right. So I think there's a problem when we're having a discontinuity like we're having, I think myself now. If you project from before—No, if you're going to project 200 years, are you going to use mortality 200 years ago when it hasn't changed for 100 of those 200 years? Those are all the difficulties that we're all facing, and there's no good answers to those. If you have an arbitrary rule, at least you remove your own bias, which is, I think, the point

there, and if you're going to make a big change, you might as well do it for a smaller period, and have a buffer of a longer period of calibrations.

JEAN-MARIE ROBINE: Yeah, this is my point. I think we have to apply rules to remove individual bias, but I don't know whether we have good rules.

JEAN-MARC FIX: Right. I'm a partisan of bias. I like to look at the curve and judge the inflection.

Go ahead, and that I think will be the last question.

SARA GOLDBERG: You actually partially answered my question. I've heard that rule. I've heard a couple of rules. I'm curious, first of all, as to where that rule was developed. I mean, it sounds sensible as any. They're all subjective as far as I know, so to remove that expert opinion that we're talking about, I mean, it's sensible to have some rule. I'm curious if the Census Bureau has any sort of rule of thumb around that. And then, another thing, if you're on the edge of when this census actually took place, depending on which data you're taking, and there can be upwards, downward provisions, and if you're on the cusp of that, you can get skewed results. That's more common.

WARD KINGKADE: First of all, the Census Bureau doesn't have the mirror rule. We use all available data. Now, I've mentioned before that's in the context of the scarcity of available data, so we don't have that long time series.

For your second question, it has been demonstrated in the past that one of the predictors of projected population is the actual date that the projection was done, and one of the good features about population projections is that they get updated. So if you've made a drastic mistake in your assumptions, which does happen, in five years from then, you'll get a chance to update it and get rid of that. You may make another mistake. Taking long-range projections has historically always been an error, no matter what we miss, and historically I think we've been underestimating population growth in general. The current series of post 2010 U.S. population projections are, I think, projecting lower numbers than the 2008 series, but those are both very recent projections. Over long range, their definition is going to be updated.

JEAN-MARK FIX: OK. Well, I think we're going to conclude. I don't think we have time unless you have a very quick question. I would like to thank our panelists for their time and their willingness to answer, and that's the end of this session. Thank you very much. (APPLAUSE)

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