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NEW AGE THINKING: ALTERNATIVE WAYS OF MEASURING AGE, THEIR RELATIONSHIP TO LABOR FORCE PARTICIPATION, GOVERMENT POLICIES AND GDP

John B. Shoven

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ABSTRACT

The current practice of measuring age as years-since-birth, both in common practice and in the law, rather than alternative measures reflecting a person's stage in the lifecycle distorts important behavior such as retirement, saving, and the discussion of dependency ratios. Two alternative measures of age are explored: mortality risk and remaining life expectancy. With these alternative measures, the huge wave of elderly forecast for the first half of this century doesn't look like a huge wave at all. By conventional 65+ standards, the fraction of the population that is elderly will grow by about 66 percent. However, the fraction of the population that is above a mortality rate that corresponds to 65+ today will grow by only 20 percent. Needless to say, the aging of the society is a lot less dramatic with the alternative mortality-based age measures. In a separate application of age measurement, I examine the consequences of stabilizing labor force participation by age with alternative age definitions. If labor force participation were to remain as it is today with respect to remaining life expectancy (i.e. if the length of retirement stayed where it is today) rather than labor force participation remaining fixed by conventionally-defined age, then there would be 9.6 percent more total labor supply by 2050 in the U.S. This additional labor supply could help finance entitlement programs amongst other things. GDP would be between seven and ten percent higher by 2050 if retirement lengths stabilize. Several policies are examined that would encourage longer work careers.

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This paper is not about what you think it is. It is about how to measure age. I argue that there are better alternatives to the standard measure of years-since-birth. In fact, I claim that public policy would be better if age were more appropriately specified in the law. A particularly simple alternative to years since birth would be a measure of age based on mortality risk. Groups whose mortality risk is high would be considered old, those with low mortality risk would be classified as young and those with the same mortality risk would be considered to be the same age. Another closely related approach would be to measure age from the other end of life, at least in expected terms. That is, remaining life expectancy (RLE) would be the measure of age and those with a short RLE would be considered elderly and those with a long RLE would be considered young. One advantage of the RLE approach is that it is measured in years, units that are widely understood unlike mortality risk which is measured in the percentage chance of dying within a year.

Even at a point in time, there are differences between the various ways of measuring age. For instance, RLE and mortality risk would reflect that a man at conventionally defined age of 65 is the roughly the same age as a woman of age 70. The real differences, between the proposed mortality based measures and the conventional years since birth measure comes when comparing populations at different points in time, such as comparing the 1965 population with the 2007 population or the projected 2050 population. The different measures will, for instance, give a very different answer to how many elderly people there will be in 2050. Later in the paper we will look at how these

various ways of measuring age would apply to labor force participation and also how different old-age dependency ratios might look under the alternative approaches.

To the best of my knowledge, there isn't a large existing literature on alternative ways of measuring age. The paper that contains ideas most similar to mine was written by my Stanford colleague Victor Fuchs (1984). In his paper, Victor discusses using remaining life expectancy as a better measure of age and noted that when Social Security was designed in 1935, the gender-blended remaining life expectancy at age 65 was 12.5 years. By 1984, those who had 12.5 years of remaining life expectancy were 72 years of age. Victor went on to say that if 65 was the appropriate entry age for being categorized as elderly in 1935, then the entry age for that status should have been 72 in 1984. Victor, thus, already had the idea of an alternative measure of age and suggested that "nominal ages" could or perhaps should be adjusted to "real ages" based on mortality or remaining life expectancy.

Another paper that is closely related is Cutler and Sheiner (2001). The authors are concerned with the impact of demographic changes on medical spending both in the past and in future projections. They note that for acute care and nursing home care, demand is more a function of remaining life expectancy than it is of age. They also note the high medical costs associated with the last year of life and that, on average, the last year of life has been occurring at older and older ages. They don't quite reach the conclusion that I have – namely that age itself could be defined as something other than years-since-birth – but their analysis suggests the need for a new measure of age.

In order to get started, Figures 1 and 2 introduce the concept of mortality milestones, the first age at which men and women reach one, two, and four percent mortality risk. Figure 1 shows that in the year 2000, men first reached a mortality risk of

one percent at age 58, they first reached a two percent mortality risk at age 65 and they reached the four percent milestone at age 73. The corresponding ages in 1970 were 51, 59, and 68. The figure says that 51 year-olds in 1970 and 58 year-olds in 2000 had the same mortality risk (1%), 59 year-olds in 1970 and 65 year-olds in 2000 similarly had the same mortality (2%), and 68 year-olds in 1970 had the same mortality risk as 73 year-olds in 2000. In just the thirty years between 1970 and 2000, the age at which one percent mortality is reached advanced seven years, the age at which two percent mortality risk is reached advanced six years and the age at which four percent is reached advanced five years. Any way you look at it, there was remarkable progress in age-specific mortality. A mortality-based age system would suggest that 59 year-old men in 1970 and 65 year-old men in 2000 were the same age.

Figure 2 has the corresponding information for women. Two things are immediately apparent. First, women at the same number of years since birth are effectively younger than men of the same conventionally defined age. In 2000, women first reach a one percent mortality risk at age 63 (compared with 58 for men), a two percent mortality risk at 70 (compared with 65 for men) and a four percent mortality risk at age 78 (compared with 73 for men). The mortality risk approach to measuring age would have 70 year old women in 2000, 65 year old men in 2000, and 59 year old men in 1970 as all being the same age.

Figure 1
Age of Mortality Milestones for Men, 1940-2000
65 Year Olds in 2000 Had the Same Mortaility Risks as 59 Year Olds in 1970

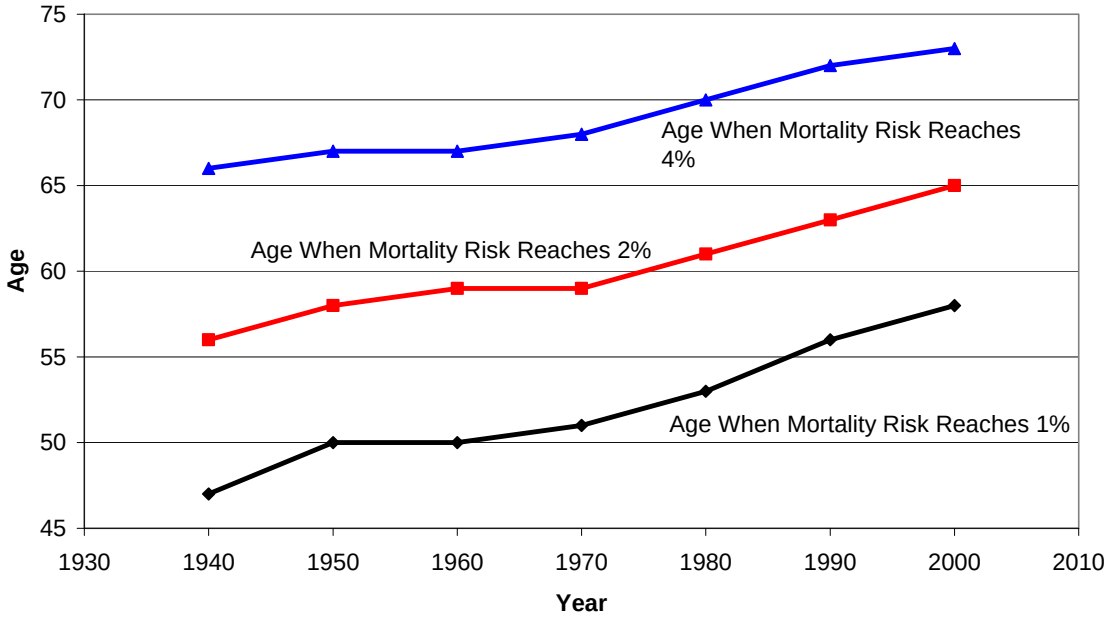
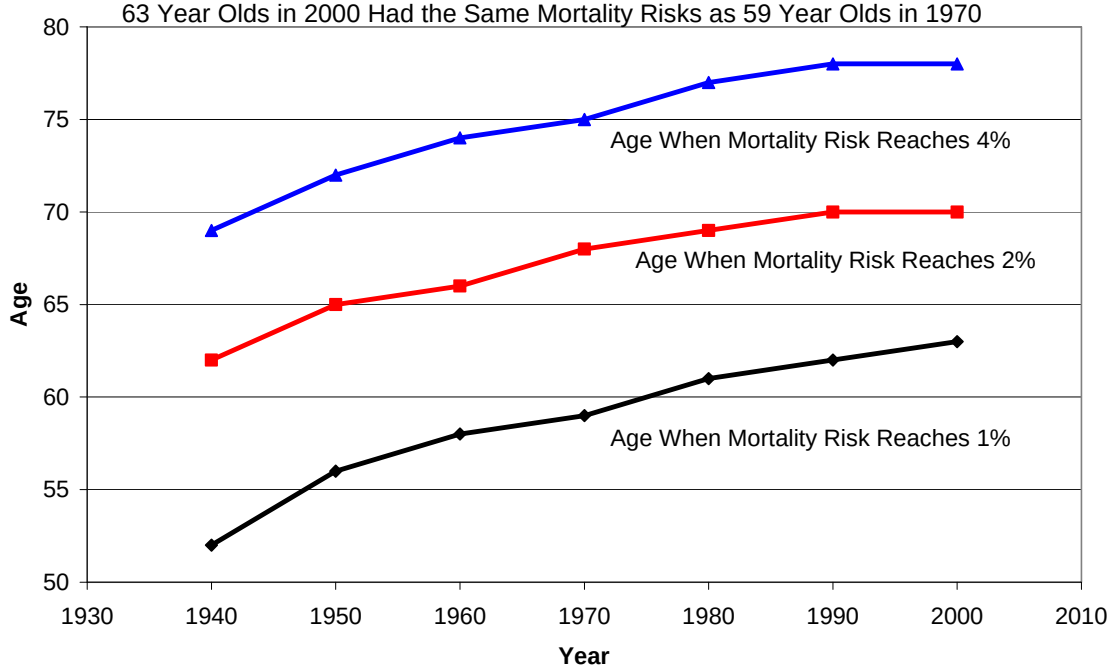


Figure 2
Age of Mortality Milestones for Women, 1940-2000
63 Year Olds in 2000 Had the Same Mortality Risks as 59 Year Olds in 1970



The measurement of age with different measures is not like choosing between measuring temperature on a Fahrenheit or Centigrade scale. The connection between the two temperature measures is linear and constant through time. In a very real sense, it doesn't matter which scale you use. However, the relationships between the different ways of measuring human age change over time and some apparently important phenomenon are primarily due to a particular method of age measurement. For instance, it is reasonably well known that Medicare spends more on men than it does on women of the same age. The difference (being of the order of thirty percent) isn't small. But, this result is a function of how age is measured. Medicare spends roughly the same amount on men and women with the same mortality risk or with the same remaining life expectancy (Shoven, 2004). Of course, the fact that reconciles these observations is that 75-year old women are younger than 75-year old men, at least according to an age system based mortality risk or remaining life expectancy.

Figures 1 and 2 also show that the rate of mortality progress was somewhat slower for women than for men, at least for the last thirty years of the twentieth century. The age at which women first reach a one percent mortality risk went up four years between 1970 and 2000 (vs. seven yeas for men), the age at which mortality risk reaches two percent advanced two years for women (vs. six for men) and the age where four percent mortality is "achieved" advanced three years for women (vs. five years for men).

Figures 3 and 4 illustrate the same phenomenon slightly differently. They show mortality risk by years-since-birth for men and women in 1965 and 2005. Once again, we see that there was more mortality progress for men than women over this period. One way to look at it is the amount you would have to shift the 1965 curve to the right in order for it to overlap the 2005 curve. If you do it so that the curves match at roughly 3.5

percent for men (about at age 65 in 1965), then the required shift is about 7 years. This is similar to the fact we saw in Figure 1, but here we learn that 72 year-old men in 2005 had about the same mortality risk as 65 year-olds in 1965. The mortality curve for women would need to shift to the right far less to coincide between 1965 and 2005. The mortality risk of 65 year old women in 1965 was about 1.75 percent, roughly the same as 69 year old women in 2005. So, at these ages we see that men in 2005 are effectively seven years younger than someone of the same age in 1965, whereas women are effectively about four years younger.

There are plenty of other demographic statistics we could look at regarding the measurement of age, but I will simply present one more relationship, the relationship between remaining life expectancy and mortality risk for men and women. The data are plotted in Figures 5 and 6. You might have thought that the relationship between mortality risk and remaining life expectancy would be pretty stable across time (I did), since they are alternative mortality-related measures of age. However, the figures show that the relationship has changed considerably in the forty years between 1965 and 2005. The basic pattern has a positive interpretation. The charts are drawn for people between age 55 and 79, just like for Figures 3 and 4. At least for this age range, for any given remaining life expectancy, people had a lower mortality risk in 2005 than they did in 1965. For instance, men with a 15-year remaining life expectancy in 1965 had about a 3.00 mortality risk, whereas such a man in 2005 had about a 2.45 percent mortality risk. For women with 15 years of expected remaining life, the corresponding mortality risks were 2.45 percent in 1965 and 2.15 percent in 2005. At least to me, this suggests that even with the same remaining life expectancy people are healthier in 2005 than they were

Figure 3
Male Mortality Risk by Age in 1965 and 2005, Age 55 thru 79

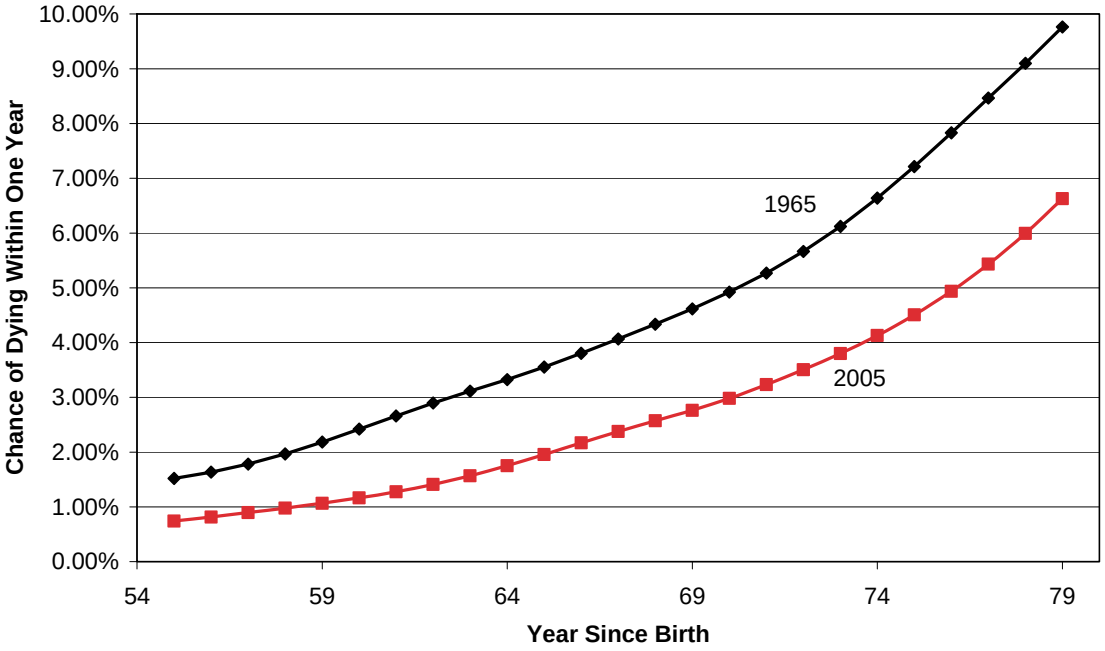


Figure 4
Female Mortality by Age in 1965 and 2005, Age 55 thru 79

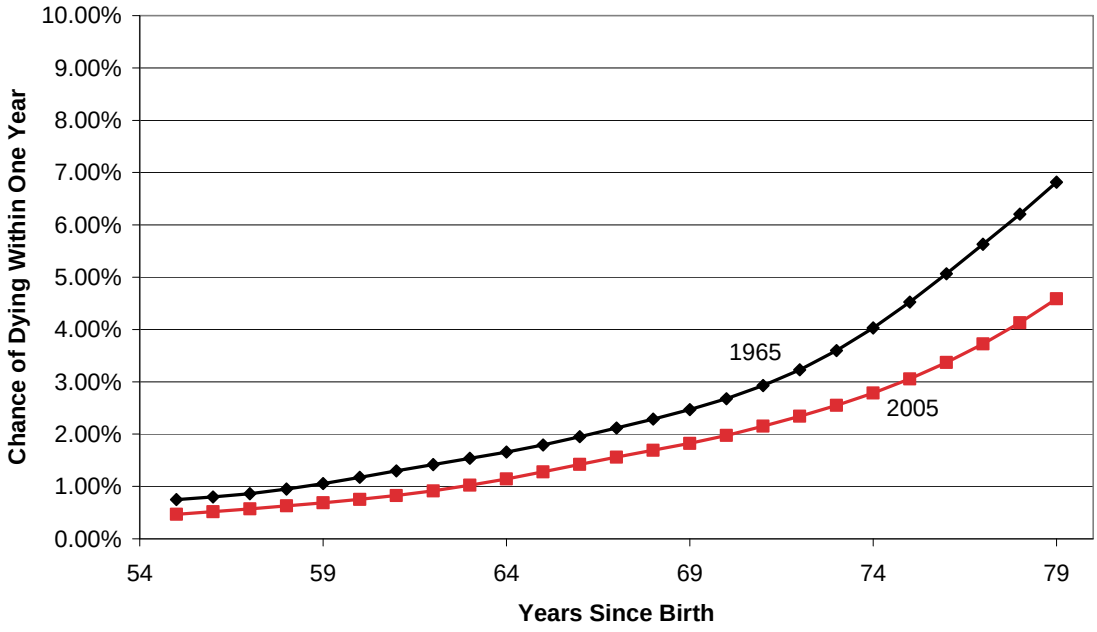


Figure 5
Remaining Life Expectancy by Mortality Risk for Males

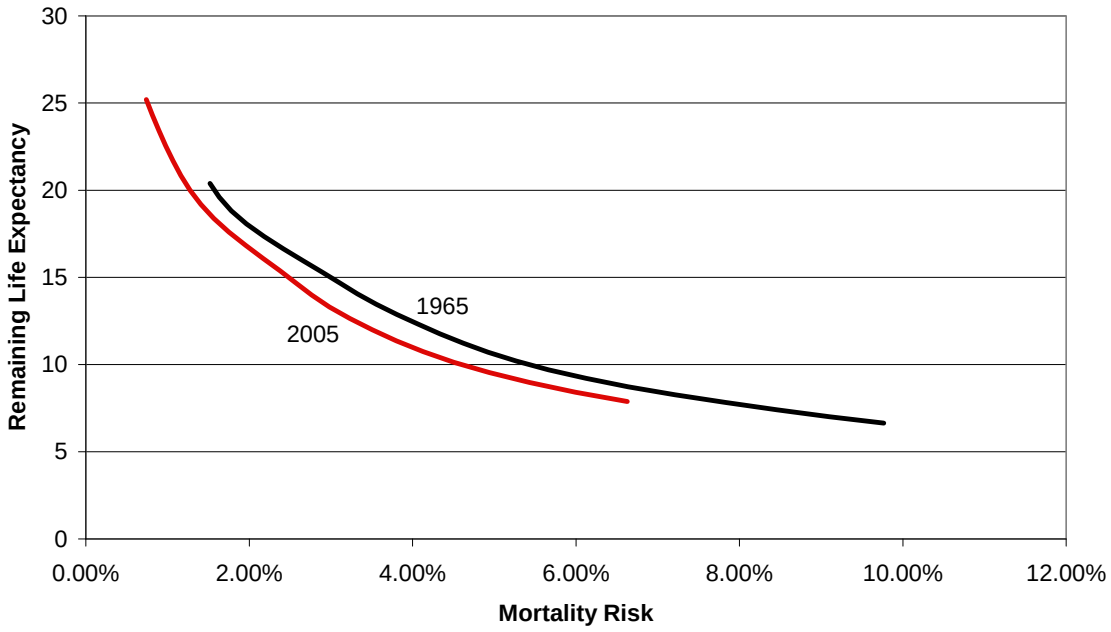
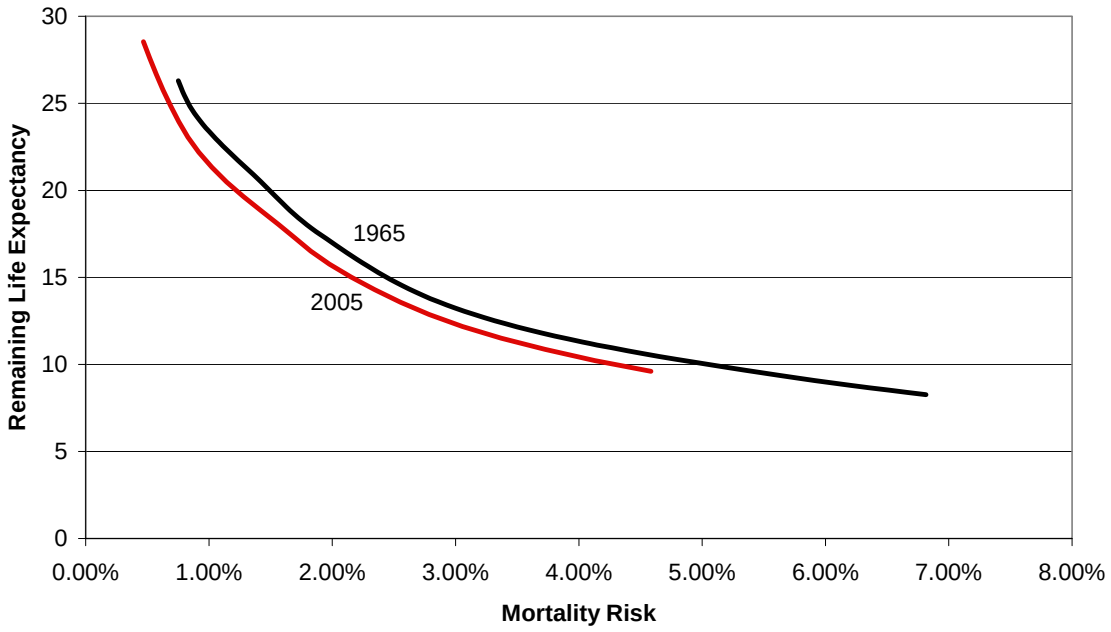


Figure 6
Remaining Life Expectancy by Mortality Risk for Females



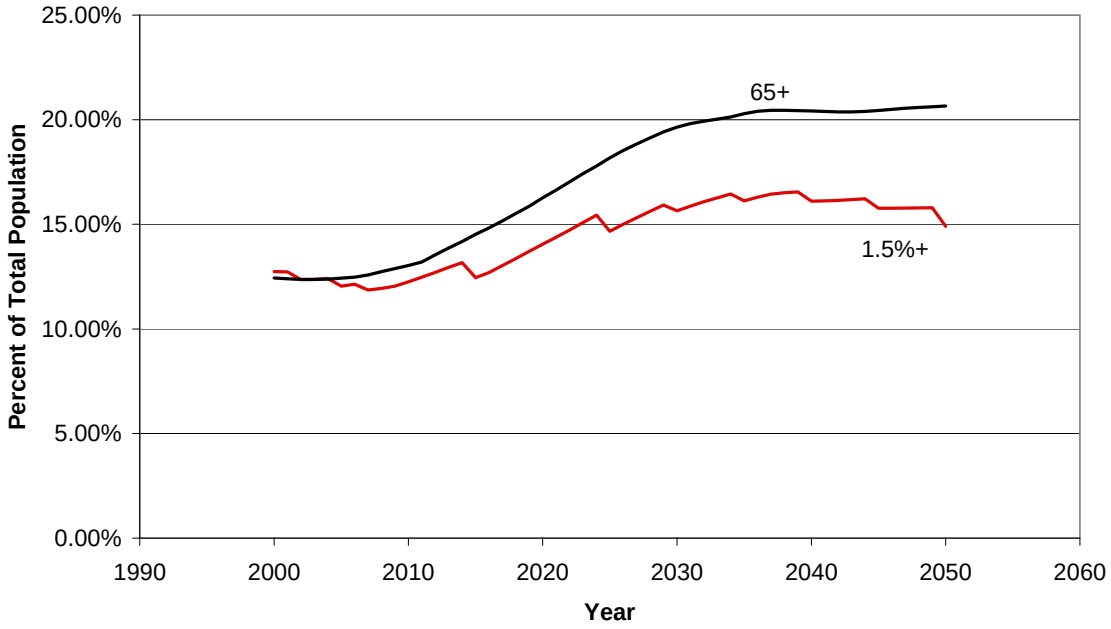
in 1965. This is consistent with a mild squaring of the survival curves and a concentration of high mortality in the last years of life.

How Much Aging Will Occur in the U.S. Population Between Now and 2050?

There probably is as much attention paid to the anticipated aging of the U.S. population and how the economy will adjust to it as any demographic fact. Some of the predictions of the aging of the population are simply due to the use of the conventional years-since-birth measure of age. Consider two alternative definitions of who is elderly in the population, those who are currently 65 or older and those who have a mortality risk of 1.5 percent or worse. Today, at least on a gender blended basis, the two definitions of elderly are equivalent, since the average mortality risk faced by 65 year-olds is 1.5 percent. However, going forward being 65+ and having a mortality risk of 1.5%+ will not be equivalent. Figure 7 tells the story. The Census Department predicts that the 65+ population will increase from about 12.5 percent of the population today to about 20.5 percent between 2035 to 2050. In 2050, Census predicts that the percent of the population that is elderly will continue to gradually increase. On the other hand, the percent of the population with mortality risks higher than 1.5 percent (currently also 12.5 percent of the population) never gets above 16.5 percent and is projected to be just slightly below 15 percent and declining by 2050. With the 65+ criterion, the fraction of the population that is classified as elderly is projected to grow by approximately 66 percent by 2050; whereas with the 1.5 percent and above mortality criterion, the fraction of the population classified as elderly is projected to grow by only 20 percent. The point is the great aging of our society is partly a straightforward consequence of how we measure age. Another interpretation of Figure 7 is that by 2050 there will be approximately six percent of the population that are over 65 years of age but who are young enough to have a mortality risk of less than 1.5 percent. By the standard criterion used today they would be classified as elderly but by any mortality based definition of

who is elderly they would not. This naturally leads to the topic of labor force participation by age.

Figure 7
Elderly as a Percent of the U.S. Population, 2000 to 2050



Labor Force Participation

There have been significant changes in labor force participation by age over the past 40 years. I am going to concentrate on male labor force participation because the dramatic increase of women in the workforce masks to some degree what is going on in the retirement behavior of women. The conventional graph of male labor force participation by age is shown in Figure 8. There was a dramatic decrease in labor force participation by age between 1965 and 1985 with the labor force participation at age 62 falling from 79 percent to 51 percent and at age 65 falling from 56 percent to 30 percent. The change between 1985 and 2005 was less dramatic with labor force falling slightly

from ages 55 to 61, but rising somewhat from 62 thru 70. On average, men were retiring almost three years earlier in 2005 than they were in 1965.

If we look at male labor force participation by age with one of the two mortality based definitions of age, we get a somewhat different picture. Figures 9 and 10 plot male labor force participation by mortality risk and by remaining life expectancy, respectively. First, the figures show that with either mortality-based age measure, the fact that men are working more at older ages essentially disappears. In Figure 9, we see that men of a given mortality risk have dramatically lower labor force participation in 2005 than in 1965, and that the shift from 1985 to 2005 was generally towards lower labor force participation. Figure 10 perhaps is the most revealing. While the conventional chart (Figure 8) shows that men are retiring 2.5 to 3 years earlier than they did in 1965, Figure10 displays the more interesting fact that men are living roughly six years longer in

Figure 8
Male Labor Force Participation by Age, 55 to 70

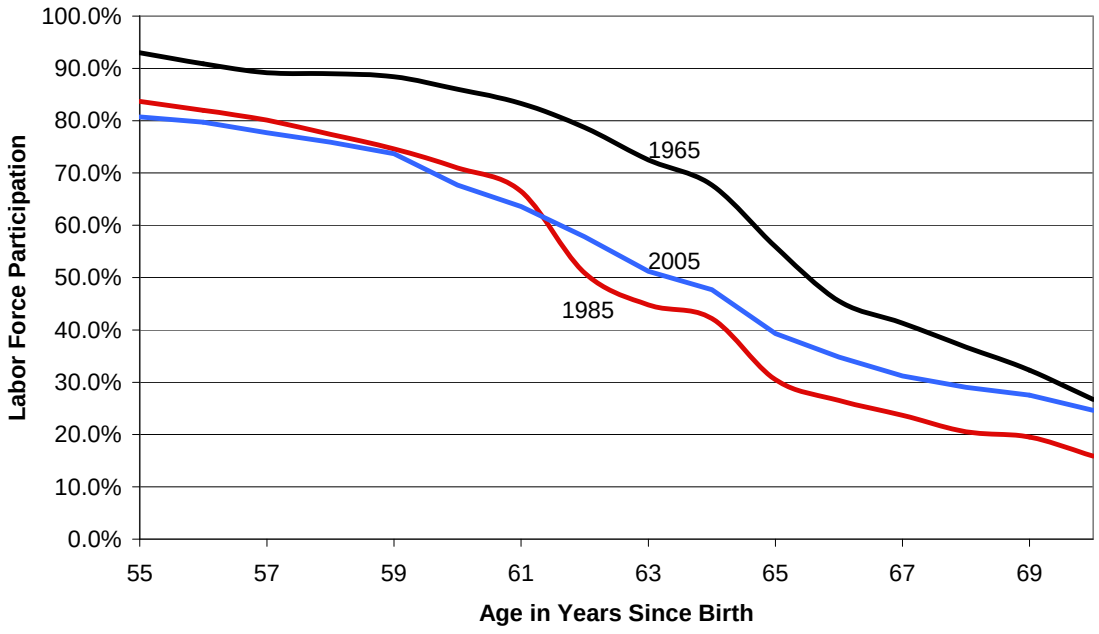


Figure 9
Male Labor Force Participation by Mortality Risk

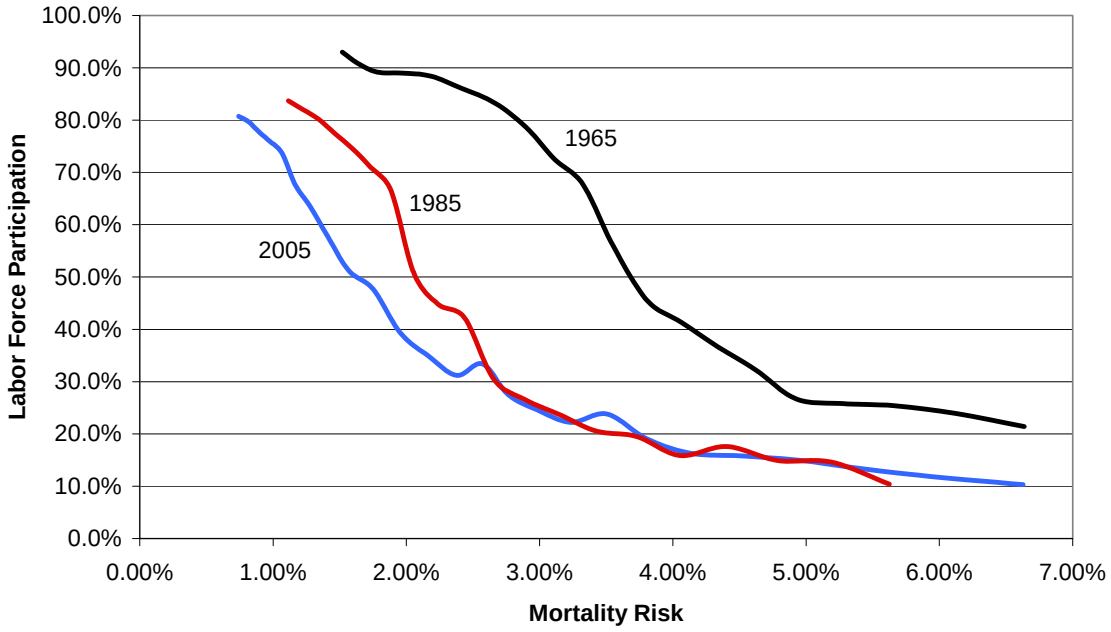
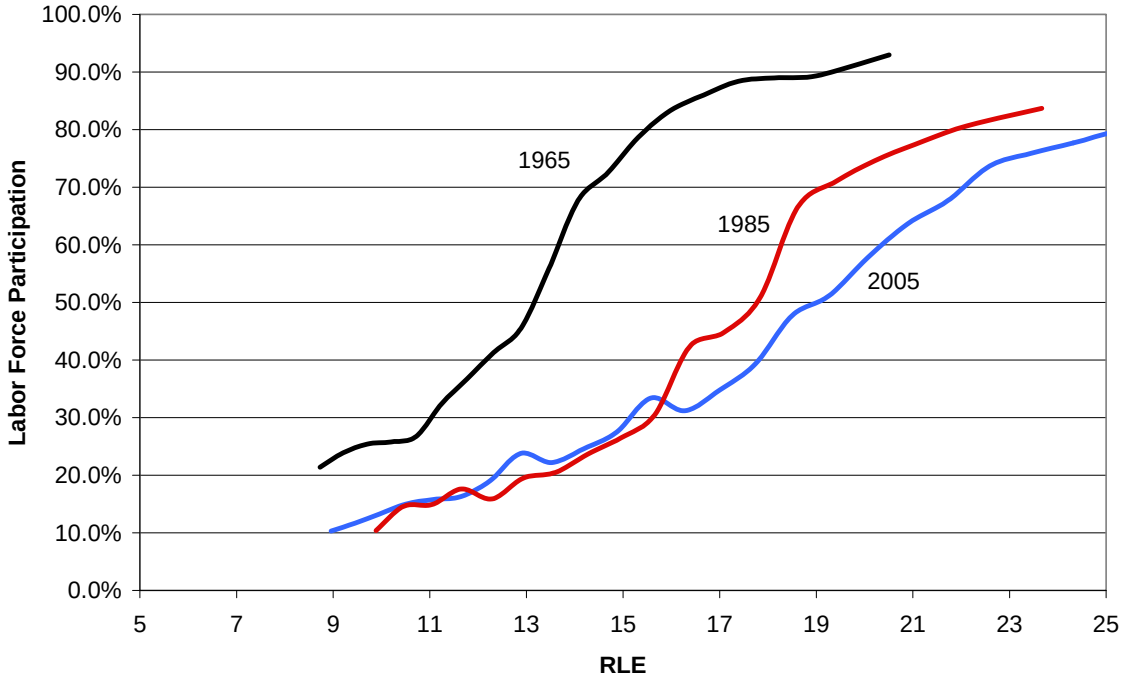


Figure 10
Male Labor Force Participation by Remaining Life Expectancy



retirement than they did in 1965, The six year figure comes from noting that labor force participation was 50 percent in 1965 for men with a RLE of 13 years, but in 2005 it was 50 percent for men with a RLE of 19 years. Those that exit the labor force relatively early are leaving with even more than six extra years of remaining life relative to their counterparts in 1965, whereas those that exit relatively late are leaving with an extra five years of life expectancy. The overall average is that the RLE of male retirees increased six years over the forty years between 1965 and 2005 for an overall increase in the expected length of male retirement of nearly fifty percent. This percentage increase in the length of male retirement is right in the data, but it is not a well known fact. Such a dramatic increase in the length of the average retirement has quite a bit to do with the financial strains faced by Social Security and defined benefit pension plans. Providing for a 19 or 20-year retirement with a 35 or 40-year career is much more difficult than providing for a 13-year retirement. Unless retirement ages begin to adjust with RLE, today's young people could spend forty percent of their adult life out of the workforce.

All of the increase in life expectancy of adult men in the twentieth century was taken as retirement and not work. The expected length of retirement of men increased from approximately two years in 1900 to about 19 years in 2000. It appears to be financially impossible that the same allocation of increased life expectancy to continue in the 21st century. However, pension laws and programs feature lots of conventionally defined ages that have not been adjusted for improvements in mortality and life expectancy. For instance, the 59.5 age after which money can be withdrawn from tax deferred retirement accounts hasn't changed since it was introduced decades ago. Similarly, the age of early eligibility for Social Security (62), the age of Medicare entitlement (65), and the age that one must begin withdrawing from tax deferred saving

accounts (70.5) haven't changed in at least the past forty years, if ever. These critical ages will likely need to be adjusted if we expect much of the increase in life expectancy in the 21st century to be devoted to work instead of retirement.

In a book I am writing with George Shultz, we calculate the difference in the total labor supply in the U.S. in 2050 between two scenarios: (1) people retire in the same pattern as they do today by conventionally defined ages, and (2) people retire with the same lengths of retirement as they do today, that is with the same remaining life expectancy at the time of retirement. Obviously, the difference between retiring at the same ages and retiring with the same retirement lengths depends on the amount of mortality progress between now and 2050. If we use the official Census forecast for mortality improvement, then the total labor supply (in aggregate hours of work) would be about 9.6 percent higher if labor force participation stayed constant relative to remaining life expectancy (that is, the 2050 graph in Figure 10 looks like the 2005 one) than it would be if labor force participation stays constant in terms of age (if the 2050 curve in Figure 8 were to look like the 2005 one). We don't think of this 9.6 percent number as precisely estimated by any means – it might be eight percent or it might be ten percent. On the other hand, 9.6 percent is our best estimate and we think that an increase in the size of the labor force by such a magnitude is rather enormous. The estimate takes account not only the change in the labor force participation by age under the two scenarios, but also takes account of the number of hours worked per week at different stages of the lifecycle. One way to think about it is that in one scenario, all labor force behavior (both work week and retirement) remains constant as a function of years since birth between now and 2050 and in the other scenario, all labor force behavior remains constant as a function of age, but in the second scenario, age is defined as remaining life

expectancy. A simple Cobb-Douglas aggregate production function would suggest that 9.6 percent more labor would result in about seven percent more GDP, even if the extra labor was not accompanied with a larger capital stock. If investment were correspondingly higher so that the capital stock was also 9.6 percent higher in 2050 under the second scenario, then GDP could also be 9.6 percent higher. These figures of an extra seven to ten percent of GDP are worth pursuing, particularly given the forecasts of how much more we will be spending as a society on health care by 2050. The question is how to encourage people to balance work and retirement relative to their age and guide them on how to think of age.

There are lots of policies within Social Security, Medicare and the tax law that actually discourage long careers. In a paper co-authored with Gopi Shah Goda and Sita Nataraj (2006), I analyzed three changes in Social Security that would level the playing field with respect to career length. Currently, Social Security counts only the highest 35 years of indexed earnings in computing the initial monthly benefit for someone commencing benefits. With each year of work for the first 35 years, the year's earnings replace a zero in the benefit calculation. Once an individual has worked for 35 years, additional years either replace earlier non-zero indexed earnings or they don't count at all, because they are lower than the previous best 35. In all cases, the 36th, 37th, and 38th years (etc.) count far less than the 33rd, 34th and 35th years of work. The modal age at which men reach 35 years of covered service in Social Security is 52. That is an incredibly young age to reduce or eliminate the connection between additional work and contributions and higher benefits. So, one possible reform would be to raise the 35 years that go into the benefit formula to 40 years and then index the number of years for improvements in life expectancy. A second reform would be to create a new category of

workers, those that are "paid up" in terms of Social Security and Medicare contributions. After completing the years that count (40 under reform one plus whatever increase comes from further increases in life expectancy), workers would achieve this new paid up status. They would be exempt from all payroll taxes if they choose to work further. Today, most of these workers face a pure tax with no increase in benefits to offset the additional payroll taxes that they face for working. Under this reform, they would neither pay taxes nor improve their benefits from further work. The third reform we examined was to have all of the years that count (40), count the same. Currently, short careers are favored relative to long careers. For instance, someone who works for 17.5 years instead of 35 years at the same real indexed wage rate will get significantly more than half the benefits of the full career. Social Security uses the same formula to achieve progressivity that it uses to treat people with different career lengths. Effectively, those with less than full careers are treated as if they are lower income and benefit from the progressivity of the system. There is a relatively simple fix for confounding these two effects. Progressivity can be set in terms of the average salary earned over the years worked. If one works a full career (35 years under current law, 40 under the first reform we examine), then the progressive formula would be used to calculate monthly benefits. However, if one works less than a full career, benefits would be reduced proportionately. A twenty year career would generate half of the benefits of a forty year career under the proposed reform. All of these proposals could be implemented in such a way as to preserve average benefits at today's levels.

The impact of the three proposals would be a rather dramatic change in the net payroll tax from continued work. The current law has long-career people facing a 10.4 percent payroll tax, whereas short career people actually face a Social Security wage

subsidy. What is going on is that Social Security is a net subsidy (the extra benefits are worth more than the extra payroll taxes) as long as you remain on the first segment (the 90 percent segment) of the PIA-AIME formula. When you work enough to "graduate" onto the second segment of the PIA formula (the 32 percent section), you face an immediate 10 percentage point jump in marginal tax rates. Those relatively high income people who work long careers and "graduate" to the third segment of the PIA formula (the 15 percent segment) face yet another 3 percent jump in marginal tax rates. Finally, once the additional work stops qualifying in the "high 35" aspect of the PIA formula, the payroll tax becomes simply a tax with no offsetting benefit increases. All of these facts are shown on the left hand graph in Figure 11. Our concern is that those with long careers face high marginal tax rates while those with short careers are subsidized. The three relatively simple reforms that we examine change everything in terms of work incentives, as shown on the right hand side of the graph. All of the jumps are eliminated as is the predominate fact of increasing marginal tax rates for those with longer careers. To us, it makes sense to try to level the playing field for those with long careers.

Figure 11

Current Law **Proposed Law**

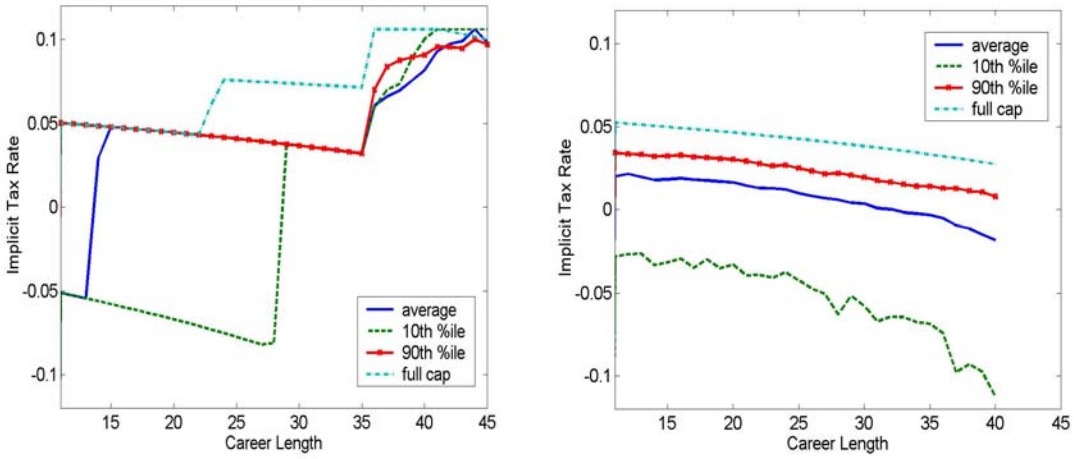
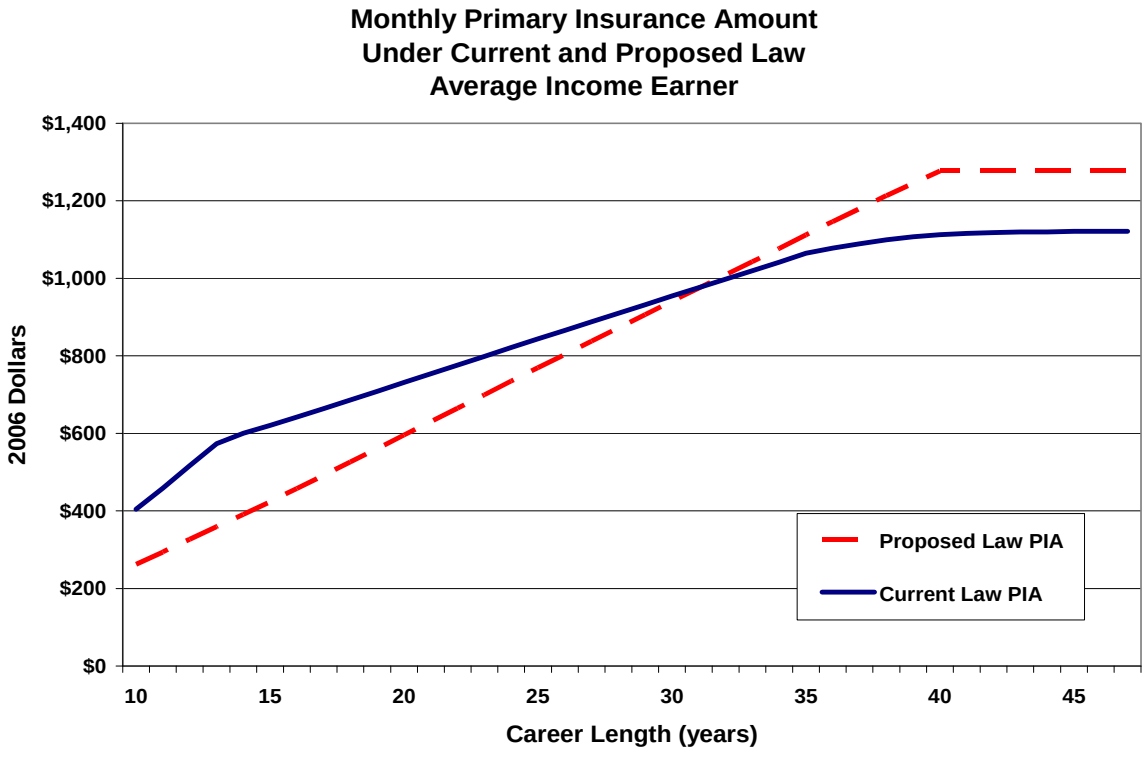


Figure 12 is another way to look at the three reforms. It shows the benefit levels for a person with average earnings for different career lengths under current law and under the three alternative benefit rules. What should be clear is that under the revised rules, each of the first 40 years has the same marginal improvement of benefits. The current system has lower and declining marginal benefits (the flat region corresponds to the 32 percent bracket in the PIA formula) from lengthening a career. The net impact of the three rule changes would be to offer lower benefits for those with careers shorter than30 years and higher benefits for those who work longer than 30 years. Given the improvements in life expectancy, these changes in incentives seem appropriate.

Figure 12



Conclusion

The current practice of measuring age as years-since-birth, both in common practice and in the law, rather than alternative measures reflecting a person's stage in the lifecycle distorts important behavior such as retirement, saving, and the discussion of dependency ratios. Two alternative measures of age have been explored, mortality risk and remaining life expectancy. With these alternative measures, the huge wave of elderly forecast for the first half of this century doesn't look like a huge wave at all. By conventional 65+ standards, the fraction of the population that is elderly will grow by about 66 percent. However, the fraction of the population that is above a mortality rate that corresponds to 65+ today will grow by only 20 percent. Needless to say, the aging of the society is a lot less dramatic with the alternative mortality-based age measures.

In a separate application of age measurement, I examined the consequences of stabilizing labor force participation by age with alternative age definitions. If labor force participation were to remain as it is today with respect to remaining life expectancy (i.e. if the length of retirement stayed where it is today) rather than labor force participation remaining fixed by conventionally-defined age, then there would be 9.6 percent more total labor supply by 2050 in the United States. This additional labor supply would be very helpful in terms of meeting the challenges of financing entitlement programs among other things. GDP might be almost ten percent higher by 2050 if retirement lengths stabilize. Several policies were examined that would encourage longer work careers.

It is my opinion that the allocation of the extra lifetime in the 21st century cannot and will not continue the pattern of the 20th century – namely all extra adult lifetime is taken as retirement. Even average retirement ages today look like early retirement when age is measured by remaining life expectancy or mortality risk. In order to allow people

to choose when to retire without encouraging an early departure from the workforce, many ages in the laws should be indexed for demographic changes. It is time to consider a new way to measure age.

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