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Chapter 12 Implications of a Solution for Individuals and Society

We are close to fulfilling a major human desire, a desire that probably is as old as human society itself--the wish of individuals to delay the effects of aging. Should we cheer and break out the champagne for a toast? For some individuals this breakthrough could be a true blessing—allowing them to delay both aging and death. If what comes from the breakthrough is longer, healthier lives, those who have them certainly should have something to cheer about. Some will make good use of their extra years, and contribute positively to the world during their added life. If everything goes well, they will be healthy and vigorous at 100 years of age, and look forward to another 50 years of life. They should have more time to relax, to appreciate life, and to share their growing wisdom. Their longer outlook might be good for a short-sighted world that seems to fumble all too often on long-term issues.

But, if a substantial delay in aging is available to many, we will experience some considerable disruptions not only in the environment but also in human interactions at many levels. I cannot hope to explore every possible contingency, since the details of how the breakthrough comes about, and whether and how quickly it is available to large numbers of individuals, will impact on how things unfold. But there are some results that are more general, or more likely to occur under a variety of scenarios, and I examine a few of these below. I do not yet have answers for the new problems likely to arise due to extended life expectancy, but outlining some of the problems can be helpful as a start.

What I will not deal with in detail here, since it was the subject of Chapter 8, is the risk of the treatment bringing about a segmental delay of aging, with only some aspects of aging slowed. Here we will address the implications of success in reducing the rate of aging, but realize that there are big assumptions involved.

The Environment

There are obvious, unavoidable implications for the environment if a breakthrough yields many individuals with considerably longer life expectancies. We already have a planet that is crowded with humans, with ecological damage and the loss of numerous species occurring. I will summarize some of the problems and consequences, including enhanced global warming and more rapid and complete loss of ecosystems—from rain forests to coral reefs, from the everglades to deciduous forests.

Even without any enhancement in longevity, we appear to be on a trajectory to increase human population by 50-100% during this new century. Reducing human senescence would only exacerbate the problem, with frightening implications for the state of the natural world.

Anyone looking at the number of endangered and recently extinct species in the world today would conclude that we already have a problem, but each of us experience a mere snapshot of time, 75-80 years, in a longer-term process that actually is worse than it first might appear. The rate at which we are losing species, and are projected to continue to do so, places us in the middle of one of the great extinction events on earth. If we take a longer perspective, namely the geological time frame that normally is used when looking at extinction events, the impact of the current human-caused alterations in the environment could be similar to the last major extinction event, thought to have been

caused by a meteor hitting Earth sixty-some-million-years ago. That event wiped out the dinosaurs and ultimately led to mammals, formerly a few smaller species scurrying underfoot of the dinosaurs, becoming a dominant order among animals. The fossil record now being recorded underfoot will likely show that, over a few hundred years, we will have caused or contributed to the extinction of a majority of the species now on Earth, and the additional damage likely to result from enhanced longevity in humans will only speed the demise of other species.

In the absence of enhanced longevity, the good news is that we now are moving in the direction of reducing the rate of population increase. As more nations become developed, and more women are educated, there has been a reduction in birth rates that has been spreading across the world. If this trend, reducing the number of offspring per adult, were to continue, projections show that we would plateau with a world population between 9 and 12 billion. However, any significant reduction in human aging would increase this population.

A precise estimate of time frame is difficult to give, because it would be heavily dependent on the nature and timing of the breakthrough and on how that breakthrough impacts on the timing and number of offspring that people have. In the simplest case, an instant doubling of average human life expectancy, with no other change occurring in how humans behave (clearly an oversimplification), would bring a doubling of the number of living humans, to 18-24 billion within less than a hundred years. In the most simplistic case, death rates would gradually drop to very low levels over a period of decades and remain low until the oldest individuals reached 130-plus years of age. However, this view fails to take into account the effects that the additional human population will have on resources and conflicts across the globe.

None of today's population growth models take into account the impact that a sudden, drastic drop in aging would have on death rates. Most projections have stressed variations in birth rates as contributing most of the uncertainty in future population size. Few have considered the major impact that a substantial reduction in death rates would have on population size, resource demands, and the environment. It is not clear that the world could stand the stress of so many individuals without radical changes. Indeed the numbers would not likely ever rise to the level of 20 billion because of changes brought about by the rising tide of humans—limitations in food resources, lack of fresh water, increased wars over rapidly depleting resources, etc. The risk of human death from non-aging causes probably would rise, due to lack of resources, including such basics as food and water, especially in less-developed countries, were the senescence-delaying treatment affordable. These deaths would add to the already unforgivable levels that exist in today's less-developed world.

Were the treatment only available to those with at least the income of the middle class in developed countries, these nations could see population densities reach unmanageable proportions. These developed nations already consume a disproportionate amount of natural resources--It is exactly those who are using the most resources today who are most likely to be able to afford whatever the life-extending treatments will cost.

Some developed nations, such as Italy and Japan, already are experiencing an inversion of the age pyramid. The addition of more elderly will produce a rapid depletion of the world's natural resources, and the end of abundant resources would come more quickly and impact on the entire world. The increased numbers of older individuals in

these countries would require rapid rethinking of work-spans—the time humans spend in careers or in other ways that are productive to society.

As human populations continue to grow beyond current projections, demand for food and living accommodations would diminish the land available for animals and plants not directly serving human needs. Pressures would grow to open the remaining parks, preserves, and reserves throughout the world, and public spaces would diminish. More and more effort on the part of most humans would be devoted to finding sufficient food and water, and today's battles over oil resources would seem minor in comparison to what could be ahead. Living longer might be no picnic.

Who Wants to Live Forever?

There are any number of risks with how the extended years play out. As was noted in Chapter 8, the “solution” to the problems of aging could produce uneven aging, with some organ systems continuing to show signs of aging while others don't. That would lead to increasing levels of disability during an extended life span. Another risk would be that the aging process gets quite extended in time—we would enjoy more good years, and our decline would be quite gradual. This sounds fine at first, but the negative outcome could be many years spent in increasing disability, since our period of decline would be lengthened. Much preferable would be an extension of healthy life without an extension of the period of morbidity. That is asking a lot, and it is hard to predict what is coming in this regard.

As things stand today, some of us already are experiencing morbidity extending over years. Would we really wish to have that extended over decades? More ideal might be the kind of collapse described in Holmes' poem *The One-Hoss Shay*, where, after 100 years, the decline is very rapid. Of course, if too rapid, survivors have to deal with the shock of a sudden death, with no time for adjustment. But the opposite extreme seems much more undesirable, and few of us would want to pay for a few decades of extra, healthy life with decades more of prolonged suffering and decline.

A desirable option would seem to be extended life expectancy with the end phase of real, serious decline no greater than currently experienced. Today, one can die quite suddenly of coronary artery disease, even in one's sleep, with little in the way of suffering. One also can have cancer, and die in a matter of weeks, months, or years, with some suffering, enduring the weakening effects of chemotherapy and the cancer itself, along the way. The decline associated with disorders such as late-onset Alzheimer's disease, the most common form, can occupy a decade or longer. Strokes can kill quickly or, with multiple episodes, cause declines that extend over a number years. Some of us today suffer long periods with chronic conditions, from arthritis to diabetes.

It is easy to conclude that the best way to go for the individual is rather quickly, after an extended, healthy life. Unfortunately, in terms of the kind of breakthrough in life expectancy we have been discussing, there are no assurances. If the breakthrough produces a decline in the initial mortality rate, and not an increase in MRDT, then we will maintain the same period of time in disability. If an increase in MRDT is involved, the decline in the slope of the mortality curve, which reflects rate of increase of aging, then a more gradual and extended period of decline would be expected. The first generation to try will give us the first feedback, and it could go any one of a number of ways. Indeed the uncertainty might limit the number of individuals who would be willing to try the

procedure. If things do not go well, the suicide rate among the extreme elderly could increase.

Retirement and Social Security

Without radical changes in retirement expectations, social programs, including social security and pensions, will be even more highly stressed, well beyond the impact of the baby boomers that is about to impact in the U.S. and birth rate declines being experienced in other developed countries. One might make the simple assumption that everyone works only from age 20 to 70. As the population re-stabilized, close to zero-population growth, so that we had equal numbers of individuals in each age category from age 1 to age 150, each working individual would be responsible for generating enough wealth to support two others, to cover all of those younger than 20 and older than 70—a substantial burden. You can imagine what would happen to tax rates for the workers. Much higher rates would be required to collect enough to cover the young and old under such a scenario. I doubt that such high tax rates would be acceptable, and there would be little justification for burdening the twenty-to-seventy-year olds when almost all of those over the age of 70 would be healthy and perfectly capable of working for decades more. It seems easy to conclude that people will be working longer.

What of health care costs? Costs for Medicare already is projected to be a growing burden on the economy. We have health care costs that are growing faster than inflation and increasing numbers of beneficiaries even without an increase in life expectancy. If individuals live longer, healthy lives, many major health care expenses could be delayed. If the first-draft solution is not perfect, rising morbidity rates could contribute to a train wreck of expenses.

So, a likely solution to the Social Security and Medicare issues would be much longer careers, perhaps with time-out for further education and more diverse workplace experiences during an extended lifetime. Present structures, such as the timing of Social Security and Medicare eligibility, would have to be entirely reformulated. In the 1930s, when social security was first started in the U.S., the retirement age was set near the limit of life expectancy. Today, the improved health has already given us the expectation of an extended time in retirement, but there is little justification of spending more than half of one's life on the dole! Already, we have raised the retirement age for "full" Social Security benefits in the U.S. beyond 65, but only a little. There likely would be more age raises to come.

To get just a small sense of how things might begin to change, consider fixed annuities and other more traditional income options for those living in retirement. As many employers eliminate more traditional, defined-benefit retirement plans, we have become dependent on defined contribution plans. Some retirees eventually convert these to annuities, which then become relatively defined income payments. But the returns for such annuity payments are based on average life expectancies at a person's starting age. A typical, fixed-payment annuity might have a payout of 6-or-so percent per year. That rate of payout would have to be greatly reduced were our life expectancy at age 65 to increase from about 15 years to 85 years. It would likely drop to no more than 4 percent per year, and that amount would only be able to be paid over such an extended time if the economy were to continue to grow and provide the kind of return on investment that is

presently experienced. Normal assumptions about stock returns and bond returns cannot be assumed, so simple calculations of how much to save before retirement become risky.

Of course, the stability of the overall economy is problematical given the new age structuring of society. It certainly would appear to be wise to plan to remain working for longer times. As the job force shrinks as a proportion of total population, there may well be calls for a minimum retirement age for everyone—a push towards forced employment to keep the economy rolling.

Human Efforts, Employment, and Creations

Among the areas that should benefit from increased life expectancy are the arts and sciences. If we have longer careers, some will use them to enhance their contributions. The combination of increased wisdom and lengthened work effort should pay large dividends, including contributing to the solutions to some of the very problems that will arise due to lengthened life expectancy. But, in addition, humankind should benefit from artists who continue to develop—imagine what a Picasso might have done with a few more decades of healthy life—and from scientists who continue at their prime, solving puzzles and bringing us better understanding of the world in which we live. This may be especially true of social scientists, and biologists. It is said that physicists do their best work when relatively young, and, to the extent that is true, it may remain a field for the young, but even an older physicist, if she feels that her most creative accomplishments in physics are behind her, could remain a teacher of physics to aid creative newcomers, or she could consider new areas of research in fields ranging from biology to economics, or a new career altogether. There would be plenty of time for study and further education.

For many, the work world seems to become somewhat routine and repetitive after 30 or more years, and for such individuals, mid-life retraining or continuing education should offer a way to renew, expand, or change careers. Job retraining could expand educational resources and contribute to an enlarged sphere of opportunities for many. The chance of using education, even later in life, to build from poverty to wealth, or at least comfort, could grow. For those who already enjoy financial comfort, new careers would not need to emphasize pay, and some would opt for work whose first purpose is to benefit others.

It is said that wisdom grows with age, and to the extent that this is true, the entire world should benefit from more and wiser elders. However, there could be some interesting issues that arise because of the nature of our brains and how information is stored. We often seem to look to the young for new, creative ideas and innovations. Will an increased number of elderly contribute to a more rigid and less flexible society, one less willing to try change? Or, will we find that old dogs can learn new tricks, especially if the old dogs are healthy old dogs?

Many individuals do seem to develop wisdom concerning human relationships as they mature and age. It could be hoped that some of that wisdom will be used to contribute to others and their development, to help the less fortunate in the world, or to work on the environmental problems life extension will only exaggerate. We will need to find new ways of doing old things as natural resources decline, and the long lived may well find the time to think through to solutions.

Extended life for many will bring with it a mix of economic and work changes, some favorable, some less so.

The Family

Today, it is normal to have three generations in a family alive at any time--grandparents, parents, and children. Occasionally, one is fortunate enough to have great-grandparents alive, but that has recently become somewhat less likely for many families as the average parental age at childbirth has increased. I can remember growing up with grandparents living nearby, and then moving in with us, and I was influenced by the closeness to my grandparents and the extra love and perspectives on life that they provided.

How many generations will have contact in the future, or will that contact be less as generation gaps grow? There are just too many uncertainties here to know for sure, but at least the opportunity will be there for multi-generational interactions, for love, support, and guidance to be available over a few more generations.

There are other considerations as well. Will enhanced life expectancy also bring delayed maturation or, at least, delayed menopause? If so, having offspring may be delayed even more so than we are seeing with today's trends. Will more extended families mean more extended pressures to conform? The social issues get very complex and difficult to predict.

As environmental damage grows and natural resources shrink, there may well be a call to limit the number of offspring that couples can have. On the other side, people will counter with the argument that more young people are needed to keep the economy rolling.

Wealth, Gifts, and Inheritances

With longer life expectancy for one's parents, most obviously, waiting for one's inheritance would not be the wisest way to spend a life, and, for those who accumulate wealth, there may well be some increases in gifting before death. Already we are seeing some wonderful examples of the establishment of family foundations supporting worthy causes that could become more common.

Today one is told that it is important to start saving for retirement early, and those who do experience tremendous growth in the value of their money as they age, because of the potential for exponential growth of their savings over time. The impacts that longer lives will have on our economy are far from clear, as pointed out above. However, were all else to stay the same, wealth could become very common for those who invest even modest amounts early in life. Stocks exhibit growth rates that, in the past, have averaged about 10% annually. Allowing for inflation, a reasonable expectation would be real growth in the range of 5% per year. That would mean that, for every \$1,000 one invests at age 25, one would have over \$11,000 by age 75, which is the kind of expectation that allows us to enjoy our retirements today. But if, with the expectation of longer life, that money were to continue to grow, it would be worth almost \$39,000 by age 100, over \$131,000 at age 125, and, at the end of a 150-year-life, one would have \$445,000 per thousand dollars invested at age 25, and this is after inflation! However, this only works if one is not drawing down the money, and it makes big assumptions about growth rates in a changing environment.

If everyone tries to retire at today's normal retirement ages, the economy will not hold, and these returns won't be earned. Something will give. This calculation does not take into account the changes in the economy that would occur were the workforce to be relatively small compared to total population. We won't all become super rich—there's no free lunch. As pointed out earlier, the economy will not easily be able to sustain a majority of all individuals in retirement, living off the efforts of a few, who are left to keep the economy going for the many. At least some, if not most, of the added years will be spent by most being employed in some useful way--perhaps eventually dropping to part-time, or part-year, but the efforts of most people will be necessary to sustain the economy.

Should Significant Life Extension Be a Goal?

Given the above considerations of impact on the environment, as well as the doubts and disruptions to be expected, should we try to extend human life? That is an open question, but there is a more basic driving force. Unless banned by law, and perhaps even if banned by law, a partial solution to aging, once available, will be used by many whether it a good thing or not. It would take a major, organized effort on the part of those who oppose life extension to stop what would appear to be an inevitable progression of current science toward a technological solution.

Once a solution is available, some, at least, will try it, just as there are those willing to try every snake-oil treatment that is offered today. Given the obvious deep desire among some, nay many, humans to delay aging, it will not be an easy task to stop the train from leaving the station. Some, at least, do not want to go gently into that good night. More will be tempted to try the solution if early returns are promising. Most will make the decision on the narrow issue of what is best for them as individuals, and not what might be best for society. The cautionary tales of many a science-fiction novel will not dissuade many.

Human Nature

Today, our knowledge of aging and death shapes us, contributing to our rushing through life and our urgency to complete activities and to move on. We are one of the few, if not the only animal that knows it will die. How will our sense of self be altered by having twice as long to live? Will some decide to take fewer risks, since there is more to lose in an accidental death? That seems unlikely given that the greatest risk takers today are younger males, not those closer to death with less to lose. Will we rethink our rush through life? Perhaps individuals will begin to pace themselves, with more family and vacation time and, perhaps, shorter weeks of work over more years.

The role of religion could change as death becomes more distant. One of the features that motivates some to become religious is fear of death. The promise of everlasting life is a central tenant of many religions. Will younger individuals see the need for religion as strongly when death appears significantly further away? Already, the promise of life-after-death is getting harder to support. We now know more than we used to about the role of the brain in generating our mental states and experiences. Scientific findings point to the functioning of the brain as being essential for mental activity—thoughts, memories, beliefs, feelings, sensations, perceptions, and consciousness. When death occurs, the brain ceases function and quickly decays. Our memories and thoughts

appear to end with the brain. Additionally, scientists are starting to study religion as an evolved human behavior, and their findings also could impact on the beliefs of some. Thus, the impact of longer life on religious views may not be as great as the impact that is coming from advances in other areas of science, such as the neurosciences.

And, Finally

Despite a balance toward gloom and doom in parts of this chapter, one should not lose sight of the good that a diminished rate of aging could bring. Most of us have a deep love of life, and a desire to live as long a healthy life as possible. We cherish the time we have, and as the days diminish to a precious few, we are thankful for each new dawn we greet. Some of us have lost loved ones to age-related diseases and would give anything to have had more years with that person.

This chapter has done little more than scratch the surface of a difficult set of issues relating to the impact of life span extension. Much more detail can be found in the book edited by Post and Binstock (2004).

There was an amusing article in the Onion (1997) with the title, “World Death Rate Holding Steady at 100%.” The title alone carries the message for all of us. No matter what we might do to delay aging, there is no foreseeable way to avoid death, ultimately. Each of us has a finite time in life. We should make the most of it, not by dwelling on the end, but by using our realization that death is coming, eventually, to make the best use of what time we have, be it 75 or 150 years. The needs of our world remain great. My dream would be that many will make good use of whatever extra time might be given by a breakthrough in the science of aging to advance humanity and our environment while taking some time to enjoy life. If I am right, perhaps a hundred years from now, people will be enjoying more healthy years and feeling a bit less stressed by the risk of early death. With luck some will use that extra time to make the world a better place for humans or to help more of nature to survive. Having the time to think beyond where the next meal was coming from probably helped to begin the development of human culture. Who knows what might result from having even more time to think, learn, and create?