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## **Longevity Extension from a Socioeconomic Perspective: Plausibility, Misconceptions, and Potential Outcomes**

Eric Ralph

### **Introduction**

In the last several decades, a significant amount of progress has been made in pursuits to better understand the process of aging and subsequently gain some level of control over it. Current theories of aging are admittedly lacking, but this has not prevented biogerontologists from drastically increasing the longevity of yeast, drosophilae, worms, and mice (Vaiserman, Moskalev, & Pasyukova 2015; Tosato, Zamboni et al. 2007; Riera & Dillin 2015). Wide-ranging successes with gene therapy and increased comprehension of the genetic components of aging have also recently culminated in numerous successes in extending the longevity of animals and the first human trial of a gene therapy to extend life through telomerase manipulation is already underway, albeit on a small scale (Mendell et al. 2015; Bernardes de Jesus et al. 2012; Konovalenko 2014). In light of these recent accomplishments, bioethicists, sociologists, and philosophers have published a great deal of research on the subject, offering badly needed critiques, examinations, and discussions of the many potential positive, negative, and uncertain outcomes longevity extension could well necessitate. Their discussions are admirable and sorely needed, but the path to an even understanding of the potential consequences of longevity extension has lately become strewn with obstacles in the form of misplaced assumptions and a great deal of overtly emotional or instinctive rhetoric.

Consequently, I intend to parse through this research as best I can and separate valuable insights and conclusions from more dubious propositions, claims, and assumptions. I will initially cover some crucial distinctions that must be made when considering human longevity

extension, while also taking care to dismantle some faulty assumptions and claims made about longevity extension in modern dialogue. I will follow this by briefly covering in greater detail some of the progress made in recent biogerontological efforts to extend longevity, and will lastly explore some of the most significant socioeconomic consequences that are likely to arise if or when human lives begin to be extended. In general, I also seek to incorporate relevant sociological perspectives within my analysis of the many potential impacts of longevity extension. The root goal of this paper is thus to act as a bridge for further research into these subjects and the perspectives they entail, while also supplying several new and valuable insights and important distinctions surrounding longevity extension and its many critics and proponents.

### **Important Distinctions for Human Longevity Extension**

The first crucial distinction that must be made is a refutation of assumptions made by critics of longevity extension that longevity extension itself can be equated to the simple extension of current experiences of old age. This assumption is far from accurate in any sense. Beginning, a great deal of research has been done in the last century on human lifespans and life expectancies throughout our species' history, offering detailed examinations of the causes of many drastic changes in life expectancy over the last 300 to several thousand years. Significantly, a great deal of research strongly suggests that changes in life expectancy are likely causally linked to early life (>5 years) mortality, which itself mainly derives from exposure to infection and poor nutrition (Beltrán-Sánchez, Crimmins, & Finch 2012). This is crucial to any understanding of human longevity because it suggests that apparent gains in average life expectancy over time can largely be attributed to rudimentary developments or technologies, such as improved awareness of the value of sanitation and better access to nutritious foods.

Stemming from this approximation is the notion that, in at least some minimal manner, society has always had to partially support and conform to the existence of many individuals expressing significant longevity consistent with general life expectancy today. Put more concisely, humanity appears to have a relatively stable *lifespan ceiling* and has always had to deal with the elderly to an extent. Relatively modern individuals are much less likely die “early”, creating the subsequent illusion that, by way of increases in life *expectancy*, modern individuals are *capable* of living longer than those that came before them. This also partially entails the mistaken creation of a correlation between the apparent extension of life and increased suffering in the form of age-onset diseases and general physical deterioration, likely the main underpinning of dubious equations of longevity extension to an extended period of elderhood or infirmity. The reality of aging, illustrated in part by Beltrán-Sánchez, Crimmins, & Finch and further expressed in several other papers, is that the *capability* to live long lives (typically 60 to 80 years) seems biologically consistent, while basic improvements in sanitation, nutrition, and medicine (albeit to a smaller extent) have simply removed obstacles preventing many people from making it to what is considered “old age” (Griffin 2008; Gurven & Kaplan 2007; Beltrán-Sánchez, Crimmins, & Finch 2012). Imperatively, any acknowledgment of the notions discussed above necessitates an understanding of longevity extension as *intrinsically separate* from all current societal and medical interventions in human health and their subsequent effects on human life expectancy. While those societal and medical tools inherently work to remove obstacles preventing humanity from reaching the apparent – albeit relative or partially dynamic – ingrained ceiling of human longevity, efforts to significantly extend human longevity essentially seek to stretch or extend (possibly indefinitely) the path to death while still facing obstacles that will need to be tackled. As such, longevity extension is a radical and significant departure from current interventions in

human health and should be firmly acknowledged as such in any discussion in which it plays a central role.

Recent polls conducted in the U.S. and abroad on the topics like longevity extension are another solid illustration of a second major issue with current discussions of longevity extension. This issue deals with the subject of universal availability and the supposed consequences of only a minority of the human population having access to or taking advantage of longevity extension. Taken with a large grain of salt, given the inherent issues with equating polls to predictive utilities, polls conducted in several countries indicate that a small majority at most would want to extend their lives if the means to do so were readily available to all who had a desire to do so (Lugo et al. 2013). Given the polarizing nature of longevity extension and its numerous potentially overwhelming social implications, this should come as no surprise. Radically extended life does not in any sense appear to be a desire that most people have, and this should serve to partially deflate worries that socioeconomic inequalities would be drastically worsened or further cemented in place. As an inherently niche product, longevity extension must at least initially be assumed to have a generally small impact. One might liken the near future of a world with radical longevity extension to past societies where only the elite were able to consistently and functionally reach their 70s, 80s, and 90s. In any society which allows "have-nots" to exist in any form, such inequality appears to be the norm and an unavoidable one at that, barring broad, drastic changes to the very fabric of the societies in question. In any system of society or economy that allows socioeconomic inequality to exist at all or does not tirelessly endeavor to control for or eradicate it, technology will always inherently exist as a subordinate to that socioeconomic inequality. It can certainly exacerbate inequality, but it is not any less capable of reducing inequality, just as is it is even more likely to exist somewhere in between those two

extremes. Peter Derkx summarizes the consequences of this reality by stating that “the existence of social injustice can never normally be a valid reason to object morally to any improvement in the fate of human beings who do not belong to the most underprivileged ones” (2009, 185). Furthermore, it is dubious at best to operate on the assumption that socioeconomic inequality can arise solely from the introduction of technologies. This line of thinking essentially implicates technological development as a scapegoat for more deeply ingrained social, societal, and economic sources of inequality. To argue that a specific, nonexistent technology should not be developed or should not be adopted where possible in order to avoid *potential* exacerbation of existing issues nearly presumes the argument that novel developments of any kind need necessarily be avoided or delayed until all possible implications or consequences have been understood and controlled for. This of course itself operates on the fallacious assumption that efficacious prediction of future outcomes is at all possible, in any consequential regard, while also brushing aside a vast history of humanity and society's relationship with technology - a history firmly implicating the consistent unpredictability of the vast effects technologies often have (Derkx 2009, 185-187). These examples include the automobile, the transistor, the Internet, the mobile phone, and many, many others. In essence, the consequences of introducing new technologies into society can rarely be accurately predicted. At best, the impact of past similar technologies can be examined when they exist, but comprehension of the consequences of past technologies should never be equated to comprehension of the consequences of future technologies.

### **Specific Types and Methods of Longevity Extension**

Before discussing the consequences of longevity extension, its plausibility and the methods through which it might be achieved must first be recognized, as doing so serves to emphasize the probable imminence of the application of longevity extension to humans and the consequent necessity that its many ramifications be thoroughly considered. First and foremost, it is important to distinguish between the several different types of longevity extension, which can be compacted into four categories (Derkx 2009, 178-180). These are *extended morbidity*, which is essentially already practiced and can be characterized as the extension of the best current methods of caring for the elderly; *compressed morbidity*, or the compression of the period between healthy life and death; *decelerated senescence*, the general slowing of the aging process; and *arrested senescence*, the complete control of the aging process and ability to fully halt and likely reverse it. My discussion of longevity extension applies only to decelerated and arrested senescence, as should most, because they are the most feasible methods through which longevity might actually be extended (Derkx 2009, 179). Compressed morbidity is omitted because those actually working to extend life have argued that increasing healthy life within a fixed ceiling of lifespan is comparatively difficult, if not impossible, when compared with other forms longevity extension (Derkx 2009, 178). While on the subject of important differences between the four separate types of longevity extension, it is useful to examine the methods that critics of longevity extension often subscribe to. Dumas and Turner, themselves critics, illustrate well the consistent adherence to critiques of *extended morbidity* by critics of longevity extension, consequently falling prey to the strawman fallacy by framing extended morbidity as representative of all potential efforts to extend longevity (2015, 11-12). This is quite a common occurrence among both laymen and scholarly critics and is a surprising conceptual misstep that many examining longevity extension make.

Focusing on the specific aspects, a wide array of recent advancements and greatly improved understanding of aging have occurred in the fields related to aging and longevity extension, also known as gerontology and biogerontology. A relatively comprehensive and concise review of those advancements is admirably undertaken by Sethe and Magalhães in their article *Ethical Perspectives in Biogerontology*. While they recognize the reality that even the most modern theories of aging are far from comprehensive, they illustrate the relative insignificance of this lack of understanding through a tour of many impressive laboratory accomplishments, specifically highlighting extension of the healthy lifespans of mice by approximately 50% through the manipulation of a single gene. Given recent progress in the comprehension of both the genetic components of aging in humans and the ability to manipulate human genomes in vivo, the gravity of such an accomplishment must not be overlooked (Broer & Duijn 2015; Argon & Gidalevitz 2015; Larsimont & Blanpain 2015; MacLaren et al. 2014; Gori et al. 2015; Su et al. 2015). Aside from the promising research being done on decelerated senescence, partial progress has also been made on methodologies for approaching arrested senescence, although much of it is necessarily theoretical and actual experimental efforts to fully stop aging are not likely to occur for some time (Sethe and Magalhães 2013, 177). Still, the long road to success faced by arrested senescence need not take away from the great advancements made with decelerated senescence and the technologies and knowledge associated with its potential application to humans.

### **Potential Socioeconomic Consequences**

As I enter into an examination of the socioeconomic consequences of longevity extension, let me summarize briefly the points discussed above. First and foremost, I will avoid



any discussion of the issues that universal adoption might pose, given the inherent implausibility of such an outcome. Universal adoption may *eventually* become the norm, but it seems likely to take a great deal of time for it to occur. As such, I will only operate under an assumption that a minority of the population of any given society will choose to extend their lives, an eventuality that is far more likely to occur in the near future. Second, longevity extension must necessarily be viewed as a radical departure from current health interventions, which have simply attempted to allow people to reach an apparent biological lifespan ceiling of approximately 70 to 90 years, with something like 50 to 70 years of “healthy life” within those ranges of lifespans. Longevity extension as it is currently conceived of and pursued seeks to significantly extend that period of healthy life, thus raising (potentially indefinitely) both the biological and healthy lifespan ceilings. Lastly, it is clear that the viability of longevity extension and its applicability to humans cannot coherently be denied, given the array of research on the subject and recent experimental successes.

With these notions firmly in place, the socioeconomic consequences of longevity extension can be more reasonably approached. Recent rises in both life expectancy and the number of people reaching “old age” provides a valuable test-run of the social consequences of supporting greater and greater numbers of elderly people. The stresses this creates can readily be found in present discussions of the potential impending insolvency of social security and welfare funds (Neilson 2009; Cardona & Neilson 2009; Morrison 2015; Lloyd 2014). However, it is likely unrealistic and improvident to examine the consequences of longevity extension through a lens that would seek to frame it as identical to or as a continuation of problems already prevalent in modern governments and societies and their subsequent systems of health care. Such thought experiments make the implausible assumption that longevity extension would simply increase

the amount of time alive for those who had retired or withdrawn from the functional aspects of society, thus increasing the burden upon systems intended to support them. The real intent of actual efforts to extend human lives is to lengthen *healthy* human lives, resulting in many significantly different conclusions when examined in the context of relationships, welfare, and medicine, and economy (Davis 2015; Moody 2013; Cardona & Neilson 2009; Davis 2004).

Beginning with the effects of extended healthy lives on relationships, consideration must be given to sociomedical several analyses of the experiences of the elderly. This research frames the last stages of aging as an extremely unpleasant experience in most cases, further illustrating the immense value of remaining able-bodied at old ages (Klinenberg 2001; House, Landis, and Umberson 1988). Longevity extension (decelerated senescence) certainly would not *prevent* the most unpleasant period of aging, but it would necessarily offer individuals a way to lessen the proportion of their lives spent in the worst throes of old age. The extension of healthy life in general acts to allow for greater potential breadth of life experience, as it literally gives individuals more healthy time to live. However, when longevity extension is considered from the more dystopian perspective of an exclusive minority choosing to or being able to take advantage of the technology, many darker possibilities arise. One can imagine a lone person choosing to extend their life and then watching their family, friends, and possibly even their children die before they do, consequently leaving that individual to not only eventually die alone, but to also live a large portion of the end of their healthy life grief-stricken and unintentionally abandoned (Holland 2015, 15). Such possibilities cannot be denied or ignored in the consideration of longevity extension. The repercussions of choosing to try to live significantly longer than even the healthiest untreated individual are far-reaching in both their potentially beneficial and harmful consequences. Such a reality further strengthens a view of longevity extension in any

form as a product that is only applicable and desirable to narrow group of people at present, irrespective of any socioeconomic status, race, religion, or any other traits that might be implicated in discrimination.

In the context of medical sociology, discussions of relatively minor and even somewhat significant longevity extension mesh well with current examinations of the relationship between the elderly and systems of government, welfare, and health care. As illustrated by Sharon Kaufman, modern “extensions” of life up to the relative biological ceiling already have drastically changed the public’s relationship with death (2009). Widespread medicalization, gilded perceptions of medicine, and rising life expectancies have all contributed partially to the shunning and ignoring of death and age-related disease, as well as the creation of an end-of-life state in which one might well be able to choose to continue living well past the point of functionality (Kaufman 2009, 2-3). This analysis of perspectives surrounding death and dying illustrates the significant differences and potential benefits that radical longevity extension could offer, both to alleviate current issues related to death and to create entirely new opportunities of life. Given the possibility of significantly extended healthy lives, the potential social consequences are rather immense. Minor benefits begin with the inherent reality that an extended period of health would result in less stress being placed upon systems of welfare, combined with a proportionally greater quantity of resources drawn from those with extended healthy lives, given the increased proportion of time spent as a healthy person versus time spent in the last stages of life. While existing within socioeconomic systems designed for those living to the typical average ceiling of 80s and 90s, those with extended healthy lives would also be able to exploit retirement plans assuming a far smaller proportion of their life spent working, resulting in drastically larger capital available upon retirement. This assumes partially decelerated aging with

the period following healthy life being identical or similar to those without extended healthy lives, something deemed to be a reasonable assumption by Sethe and Magalhães (2013).

While rather speculative, it is also worth rationally considering for a moment the consequences of widespread, indefinite longevity extension, often perceived with veritable horror and a sense of pure dystopia by many critics and even by some proponents of milder forms of longevity extension (Arber 2007, 187). Assuming possession of the necessary knowhow to arrest aging entirely at any point of life, it is easy to imagine a future in which the average “immortal” would be a far more efficient consumer of health care than an average person today. This is naught more than a logical consequence of avoidance of the period of life in which the elderly require significantly greater resources, regardless of the source of those resources (Morrison 2015). During the last decade or two of the average American life, healthcare expenditures can be seen to not only double, but eventually even triple, with annual individual spending on the order of \$15,000 to \$35,000 after age 65 (Morrison 2015). Assuming aging was ‘paused’ sometime before middle age in a society with mass adoption of arrested senescence, it can be easily imagined that cost of a treatment itself would be smaller than – if not dwarfed by – the alternative year-over-year expenditures incurred during an otherwise average 80 to 90 year life in the U.S., assuming the cost of such a treatment was somewhere on the order of several hundred thousand dollars. Morality of indefinite longevity extension aside, the plausibility of a functional society of undying citizens cannot be ignored and serves as a temper to the often emotional and instinctive responses most individuals fall back upon when considering longevity extension and “immortality”.

The notions discussed above are of course partially economic in nature, but some further economic consequences can be drawn from the adoption of decelerated aging on any scale.

These consequences begin to necessitate the examination of certain existential questions surrounding what exactly or even broadly the purpose(s) or value(s) of life is/are, as well as the nature of typical or assumed life courses and why they exist as they are. First, the modern life course can be relatively easily condensed into four categories, which themselves each contain several distinct stages. The four main stages are childhood, early adulthood, middle adulthood, and late adulthood. Ignoring a vast array of social occurrences, both childhood and early adulthood are mainly characterized by a generally high quality of health, at least for a clear majority of people. Middle adulthood begins to be associated with some deterioration in health, beginning slowly and becoming more and more noticeable and disruptive as one nears late adulthood. After entering the late adulthood stage, health becomes a much more central focus of life, as major age-related diseases become more and more likely and risks to autonomy grow; logically culminating in death. The fact alone that separate “stages” of life can be labelled with any confidence whatsoever is indicative of the pervasive authority of social construction in even the broadest and intuitively innate aspects of human life (Kohli & Meyer 1986; Rowe 1983). While daunting, the social construction of life stages demonstrates that those constructions can undoubtedly be altered, be it by gradual change over time or a concerted effort of the majority. Given the historical fluidity of life-courses resulting from the variability of average life span and expectancy over the course of human history, there is even less of a reason to argue that societies would not be able to safely and effectively conform to the new constructions of life and death that would be necessitated by rapidly increased longevity. In this context, it is safe to begin considering potentially drastic departures from the modern accepted social constructions of life-course, like the four steps examined previously (Gorvett 2014, 19). For example, if longevity extension was capable of essentially doubling or tripling healthy lifespan, a future can be

imagined where a small part of society might choose to live several different middle-adulthoods, in which they might work a career, retire, choose a different career, retire, and so on and so forth (Gorvett 2014, 20). These visions are of course made drastically myopic by the power of present social constructions of life, and the reality of future societies able to extend their longevity so radically is likely difficult or impossible to accurately imagine, something I previously acknowledged in this paper.

### **Conclusion**

From any perspective, the examination of longevity extension consistently raises fascinating and revealing questions and offers up a great deal of interesting information surrounding the nature of human existence, experience, and the nature of life itself. By way of my efforts to clear away some mistaken assumptions surrounding longevity extension, I have attempted to provide a brief summary of its many potential socioeconomic and cultural consequences while also striving to acknowledge and explain many of the misconceptions that run rampant in popular discussions, media coverage, and academic work focused on longevity extension. A brief overview of technical progress being made in biogerontology further serves to emphasize this paper's timeliness and the general need for further analyses of the specific socioeconomic consequences of the adoption of longevity extension, as well as the need for further analyses of the most feasible and likely types of longevity extension to appear, particularly in the context of actual biogerontological research that has been and is currently being undertaken. A carefully informed awareness of the technical aspects of any technological development is crucial to keep discussions of the implications of its potential outcomes properly focused.

Ultimately, this paper argues that future considerations of longevity extension in a social, economic, cultural, or medical context must presume decelerated senescence to be the form longevity extension takes, as it is by far the most viable. With this argument in place, a picture can be reasonably painted of a future with minority adoption of longevity extension that is far less problematic than often pictured and possibly even beneficial and desirable in many ways.

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