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A matter of life and longer life

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ABSTRACT

While the major scientific discoveries that would extend the length and health of human lives are not yet here, the research that could create them is already underway. As prospects for a world in which extended and improved lives inches closer into reality, the discourse about what to consider as we move forward grows richer, with corporate executives, ideologues, scientists, theologians, ethicists, investigative journalists, and philosophers taking part in imagining and anticipating the rich array of humanity's possible futures. Drawing from in-depth interviews with key stakeholders ($n = 22$), we offer empirical insights into key values and beliefs animating the "longevity movement," including what constitutes an ideal human state, the imperative to intervene, and the role of individual liberty and concerns for equality. Emerging from these interviews are common concerns about reducing suffering, preserving diversity in visions of successful aging and how best to promote access to a future that may not remain hypothetical for long.

Introduction

Our knowledge of variables that influence exceptional longevity in humans continues to grow, from biological to genetic factors contributing to survival into extreme ages (Pradas et al., 2019; van den Berg et al., 2019), to advancements in prosthetics and artificial organs, skin, and muscle that stand poised to reduce or remove physiological human limitations (Acome et al., 2018; Grimmer, Riener, Walsh, & Seyfarth, 2019). These rapid advancements in biomedical and biotechnological innovation, coupled with the recently reinvigorated debate about the natural limits of human lifespans (Brown, Albers, & Ritchie, 2017; de Beer, Bardoutsos, & Janssen, 2017; Hughes & Hekimi, 2017; Lenart & Vaupel, 2017; Rozing, Kirkwood, & Westendorp, 2017), creates a renewed urgency to consider what we wish to prioritize in the context of our growing capacity to delay, stop, or even reverse aging. As part of this effort, we turn to key stakeholders in the "longevity movement" (Scott & DeFrancesco, 2015) to examine what they perceive to be the broader goals, values, and ethical imperatives shaping the pursuit of longer, healthier lives in light of modern approaches to human life extension. These are embedded in larger narratives about technology, aging, and death, and how we should prioritize today's resources in anticipation of an imagined—and sometimes idealized—future.

Background

Over fifteen years ago, Juengst et al. (Juengst, Binstock, Mehlman, & Post, 2003) called for better engagement of the public into conversations about aging. His appeal encouraged a number of inquiries into what is meant by "successful aging," which can be culturally or individually defined based on personal beliefs (Flatt, Jr, Ponsaran, & Fishman, 2013; Lamb, 2014), as well as lay attitudes toward life extension and its technologies. These works reveal general support (in Western culture) of life-extension and anti-aging research but enduring skepticism of technologies like genetic manipulation or human cloning as routes to enhanced longevity (e.g. Lucke & Hall, 2006, Partridge, Underwood, Lucke, Bartlett, & Hall, 2009, Shepherd et al., 2007). As our understandings of public opinions toward life extension and contemporary science continue to evolve, we must also weigh them against attitudes from experts within the field whose close (sometimes first-hand) proximity to emerging longevity research affords them intimate knowledge and a potentially heightened ability to gauge realistic potentials and consequences for individuals and societies.

The actors involved in this pursuit are central in modeling our understanding of the potential benefits and downsides to pursuing longevity research. Despite the influence and importance of these views, few empirical studies on stakeholder perspectives focus on the major social and ethical debates animating the field, and instead focus on internal divisions among longevity experts. Much of the empirical literature describing the viewpoints of these two groups gives evidence of the "boundary work" (Gieryn, 1983) by which classical aging researchers attempt to distinguish themselves from the non- or "pseudo"-scientific providers of therapies and commodities in the highly profitable anti-aging industry (Cardona, 2007, Fishman, Flatt, & Settersten Jr, 2015, Fishman, Settersten Jr, & Flatt, 2010, Mykytyn, 2006, Settersten Jr,

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Fishman, Lambrix, Flatt, & Binstock, 2009). Juengst (Juengst, Binstock, Mehlman, Post, & Whitehouse, 2003) has gone so far as to identify a "war on words" by which biogerontologists have sought to discredit what they judge to be fraudulent promises from anti-aging specialists to intervene in the aging process. This war is further fraught with persistent disagreement about what the very terms used in these debates refer to (e.g. "life extension," "aging intervention," "anti-aging," "longevity medicine," etc.) (Settersten Jr et al., 2009). The tension between them stems from historical differences in how each of these groups have taken the stage in today's "longevity situation" (Scott, 2017). Over time additional, more polarizing factions have joined this discourse, including transhumanists who endorse the use of technologies to improve and lengthen—even perfect—human lives and fundamentally alter the human condition (Bostrom, 2005a; Bostrom, 2005b). As a result, the conversation surrounding what constitutes legitimate science and who rightfully belongs at the fringe continues to intensify.

While an intractable part of the longevity discourse, this boundary work potentially distracts from a deeper engagement with how individuals and societies should address the potentials of this longevity movement with respect to agreed-upon values or ethical guideposts. An important exception is Settersten et al.'s (Settersten Jr, Flatt, & Ponsaran, 2008) study which goes beyond questions of professional identity and legitimacy to address perspectives of 43 biogerontologists on some of the primary criticisms of longevity research, including the misconception that a central goal is to achieve immortality rather than eliminate or "compress" (Fries, 2005) the period of age-related disease and decline. Their study also addresses objections related to interfering with the "natural processes" of aging (see also Callahan, 1995, Fukuyama, 2003, Kass, 2004), concerns about implications of enhanced longevity for fairness and distributive justice (Glannon, 2002; Mauron, 2005; Pijnenburg & Leget, 2007) and the utilitarian costs versus benefits of extended lifespans for individuals and society (e.g. Baron, 2006, Caplan, 2004, Post, 2004, Stock & Callahan, 2004).

Our study contributes an empirical view of these stakeholders' rationales for supporting or criticizing the pursuit of longevity research as a whole, drawing from interviews with major players in the contentious social world of longevity research (Binstock, 2004; Binstock, 2010; Mykytyn, 2006; Scott, 2017; Settersten Jr et al., 2008). Testimonies from our informants illuminate some of the predominant goals and values guiding research into human longevity, interrogate the assumptions behind social and ethical criticisms of pursuing extended life spans, and question which pursuits should be prioritized over others in the context of limited intellectual, economic, and sociopolitical capital. With technology progressing at an unrelenting pace, the impacts of enhanced longevity on our society are imminent (Lucke & Hall, 2006), urging us to understand how key actors in longevity and anti-aging are shifting the front lines of human life-extension.

Methods

Our interviews build on a preliminary content analysis (first research phase) of literature, media, and interviews with longevity researchers ($n = 15$) that identified major technologies and diseases in play in the "longevity movement" (Scott, 2017) and uncovered stakeholders for semi-structured interviews for the present study (second phase). Many of the candidates interviewed in this second phase of the project ($n = 22$, see Table 1) were identified using snowball sampling of contacts from the first round of interviewees, and included corporate executives, ideologues, scholars in philosophy and ethics, scientists, theologists, and authors. None of the interviewees from the second phase were the same as those interviewed in the first phase of this research. As illustrated in Table 2, interviewees were categorized by their primary role in the current longevity discourse.

While we heuristically make reference to critics of longevity research champions or "prolongevists" – a term coined by Gruman (Gruman, 1966) to describe those who belief longevity is both possible and desirable – in reality these two groups are not mutually exclusive, with many thinkers in the field acknowledging both positive and negative potentials for greater longevity, and spanning different roles outlines in Table 2. Similarly, we speak about enthusiasts of transhumanism referring to those who wish to move beyond current human capabilities through the use of enhancement technologies, some of which entail achievement of a radically longer human lifespan (Overall, 2003).

Table 1
Interviewees by category.

Interviewee type	Frequency
Executive	5
Ideologue	2
Philosopher/ethicist/scholar	10
Scientist/researcher	4
Theologian	2
Writer/author/journalist	1
Total # interviewees	22*

Note: * Frequencies do not sum to 22 because of role overlap for 2 respondents.

All interviewees were first contacted by the principle investigator (PI) via email, and interviews were conducted by the PI and/or two fellow researchers via a secure online meeting portal on a server through the host institution (Baylor College of Medicine). An interview guide was developed collaboratively among co-authors to explore key influences, aspirations, and values that propel longevity research, with special attention to questions probing the uncertainties, fears, and anticipated consequences of aging and longevity research. Questions explored how social actors interact and respond to one another in an effort to provide context for a "thick description" (Geertz, 2008) of values and beliefs implicated in the longevity situation (Scott, 2017).

Interviews were audio-recorded, transcribed verbatim, and analyzed using MAXQDA software (Kuckartz, 2014). A code book was developed collaboratively by the research team, all of whom participated in coding and analysis. The group completed three rounds of coding before reaching consensus about the "fit" of codes to the data. Thematic discourse analysis (Singer & Hunter, 1999; Taylor & Ussher, 2001) was used inductively (Frith & Gleeson, 2004) and iteratively (Polkinghorne, 2005) to identify and refine themes, defined as patterned responses or stated/implied meanings in relation to the research questions. Themes were identified qualitatively rather than quantitatively (e.g. prevalence).

Results

Pursuit of the "ideal" human state and reduction of human suffering

Most longevity advocates emphasized that they are not pushing for—nor do most believe in—immortality. Instead, they explained that their goal is to extend the health span—not just the life span—via anti-aging therapies, regenerative medicine, and curing diseases of old age like dementia and Alzheimer's. Proponents emphasized therapy over enhancement, viewing aging as a disease rather than a natural process solely governed by biology. In this way, they conceptualized the "fight against aging" as an initiative similar to the "fight against cancer," a natural target of biomedical research. Just as public health campaigns for causes like cancer or heart disease are imbued with a sense of moral obligation to take action, prolongevists argued that similar campaigns should raise awareness of the ethical imperative to combat aging. Furthermore, intervening in aging and regeneration could have positive, "trickle-down" benefits, bringing about a definitive shift in clinical paradigms where diseases are understood as part of a more holistic, interdependent system, rather than "silos" in which we research and treat one disease at a time, discretely. Supporters of longevity research

Table 2
Descriptions of interviewee categories.

Category	Definition
Executive	Executives include individuals who own or invest in private companies investigating longevity science, some with a background in basic science, research or other disciplines.
Ideologue	Ideologues are proponents and often leaders espousing an ideology related to longevity science (e.g. leaders of Transhumanist movement).
Philosopher/ethicist/scholar	Those principally engaged in the academic scholarship related to longevity and aging research, as well as of social or ethical criticism.
Scientist/researcher	Individuals conducting basic science research contributing to the advancement of longevity and/or anti-aging science.
Theologian	Individuals examining longevity, radical life extension and/or transhumanism from a theological perspective.
Writer/author/journalist	Individuals engaged in investigative journalism and authors of key texts about longevity, the longevity movement and its actors.

believe this approach holds great potential not only for preserving youth and fighting age-related disease, but also for reducing human suffering. A prominent executive and figure in anti-aging research said, "there is absolutely no question that aging causes more suffering than everything else put together." One theologian said, "I certainly hope that scientists […] reduce the amount of suffering and agony that elderly people have, even if they don't eliminate death." A life absent of suffering, with youth and agility preserved and death deferred, was viewed by prolongevists as an "ideal" state of being. As the executive and researcher noted above said, "All we're trying to do is preserve what young people already are, which is the ideal way to be human."

Some participants pointed out the need to acknowledge greater diversity in what constitutes "ideal." They did not share prolongevists' enthusiasm for treating age as a disease, prolonging the lifespan, or, in some cases enhancing human functioning. One philosopher with a focus on theology explained that his early reactions to the possibility of genetic manipulation were tainted by his recognition that:

> *…it always involve[s] instrumentalizing humans for the ends of particular traits. [It wouldn't matter] if there were people who were going to be hurt in this process. It [is] all about getting the hyper intelligence, or extending your own life, using people as mere means to an end.*

He and others worried that a movement proposing to abolish human suffering might inadvertently generate it if individual suffering (e.g. through experimentation with risky interventions) were seen as a necessary evil on the path to longevity. One policy advocate who has written extensively on the politics of human biotechnology warned of "temptations that might underlie advocacy of breeding and becoming better, improved humans." His perspective invoked historical arguments for eugenics, which are "about controlling the traits of future people, individuals, and populations." Others similarly suggested that focusing on an "ideal way of being human" risks imposing a singular, collective ideal upon others who may see value in diverse visions of successful aging, and even in death itself.

The value of agency and intervention vs. acceptance of traditional life cycles

"If we can, we *should*." This was a sentiment echoed by many respondents in favor of pursuing longevity. Others, such as one transhumanist ideologue, considered it nearly "criminal" to oppose longevity research, believing the potential for clinical and social benefits morally obligate us to act. One executive at a company investigating gene therapies insisted, "There are no heroes. There's only us. We have to *create* the world that we want to see." A number of interviewees stressed that opponents should get out of the way of those that would create such a world, cautioning against religious and political intervention to thwart progress in longevity.

However, while prolongevists commonly invoked the values of active intervention and agency in battling the forces of aging, critics appealed to acceptance, passivity, and even appreciation in the face of aging and death. Critics pointed out that our bodies and minds, along with our social and cultural institutions, were not built to withstand extended life spans. They implored us to imagine being married to the same person for 200 years, or being required to learn new skill sets every thirty years to continue participating in the workforce and contributing to society. They pointed out that, as part of the natural human life cycle, death has inherent value in that its imminence helps us to appreciate the lives we have and gives us urgency to make them as fulfilling as possible. One scholar who has written about longevity said that death humbles us, inspires awe, and invokes both spiritual and existential contemplations. "It's the ultimate bait and switch," he said, "but [death] also opens up a very beautiful vision of life's capability. The more we learn, the more awe we have." The insights bestowed by the knowledge of our own finitude amounts to what one scholar referred to as an "enlightened state," one that we must earn, and one that we must embrace rather than conquer.

Prolongevists, however, typically rejected the notion that death proffers a sense of urgency that gives life meaning and leads to existential and spiritual fulfillment. Some supporters pointed out that living longer lives, not the presence of a fatal deadline, allows us to have more accomplished, rewarding lives. One executive with a background as a research scientist and longevity advocate reflected on the unlimited possibility for personal reinvention in a future with potentially limitless lifespan, "Human experience is fractile in nature […] There's a comparable intricacy. If you want to be a musician or a diplomat or a competitive athlete or a chef, you could do different chapters of your life." A transhumanist ideologue spoke with similar excitement about a future with no deadline, noting that "It's not that I don't want to die, or something of that nature, it's that there's so much to see in life [.] The opportunity of the human being in the next century is staggering." He offered a vision of finding fulfillment in discovery of science or spirituality:

> *I think in an age where people don't work, getting your 5th or 6th PHD is perfect. I would like to see in society a people that are delving into science all day long, [and] not just science, [but also] you're getting into spirituality concepts. What can this human body become?*

Prolongevists further pointed out that acceptance of death and dying is likely to vary widely from person to person, based on age or religion or culture or other unidentified variables, and even for one person over the course of their lifespan. One scholar and policy expert cited the annulment of advanced directives as an example of how people change their minds about death when it is close upon them. "When you're younger and vigorous," he said, "you sign this kind of a will. And as you get older, you actually back away from it and get less interested in not *doing everything you can* to survive." Another philosopher suggested that accepting death as natural, good, or inevitable is age-related or otherwise conditional on death's imminence. She rejected the assumption that older individuals are more ready to accept death, reflecting that, "The longer I live, the more I'm rethinking a lot of my ideas [about death]." That same philosopher continued to criticize the error of the "naturalistic fallacy" by saying that people wrongfully assume that "because this is biologically what our bodies seem to be like under certain circumstances, it must be a good thing."

Critics offered the rebuttal that death has played a natural role in maintaining social order for millennia. One political philosophy scholar said:

There's actually a good reason why human beings die, and there's also a good reason why virtually every other biological organism dies: certain evolutionary adaptations can only take place if you have constant reproduction. With human beings, societies simply don't adapt as well if there's no generational turnover.

These thinkers urged us to consider how changes ushered in by new waves of longevity will affect entire populations and societies, potentially even the global community. For example, they ask: What are the social and economic consequences of five or more generations living side by side? Couldn't open-ended lifespans permit dictators and other despots of society to exert their influence indefinitely, thereby robbing younger generations of their chance to innovate and democratically move societies forward or govern according to their own ideas? "People just get more rigid as they get older," the political philosophy scholar added, "[g]enerational turnover [allows] new modes of thinking" to take hold. He and others suggested that limiting longevity will help to avoid what one writer described as "generational conflict like we've never seen" as well as "the potential of having really, really large divides between the haves and the have nots."

Longevity champions further argued for collective action. Advocates feel that political, commercial, and social institutions must be revamped to provide greater support for longevity science. One transhumanist ideologue argued for the need to ensure secular foundations of political decisions to support policies and funding for biotechnology research into longevity. Another executive and research scientist pointed out that the only way to shift the priority from curing individual diseases to tackling underlying causes of aging is to garner support from the general population through mainstream media campaigns that reframe how people think about death. This, he suggested, will motivate people to use their votes and purchasing power as leverage, thereby breaking down the "silos" in medicine and research to prioritize longevity research on a national level. Even more ambitious thinkers offered global solutions. One biologist suggested taking lessons from the Human Genome Project to attempt "a mega-project against aging" in which longevity-related research labs across the world would mutually ensure funding and collaboratively work toward solving "the aging problem." Others proposed regulatory solutions, including a second transhumanist ideologue who advocated for decentralizing regulation of longevity technologies to liberate innovation while simultaneously creating a kind of crowd-sourced or "blockchain" model to ensure scientific integrity and credibility of findings.

Individual liberty versus distributive justice

Increasing the life- and even health-span was often discussed in terms of collective responsibility but with a focus on individual—and not collective—benefit. While some prolongevists, including scholars, executives, and scientists, argued that society will experience "trickle-down" benefits in the form of more holistic approaches to treating disease, they did not often outline larger benefits to society as whole. For this reason, some critics believed that the enterprise of defeating death holds *exclusively* individual rather than collective value. One philosopher commented that it is no surprise that many private funders of longevity research "are very self-entitled rich guys. It makes sense," she said. "They have the idea that they should be able to get whatever they want, and they're going to use their money to get themselves some more years." Likewise, a different philosopher said, "The fantasy is that I could radically extend my life without really affecting anybody else in any kind of negative way." He elaborated on the unlikelihood that longevity could every truly be an individual endeavor: "either I've got to purchase this longevity technology for my family and loved ones, or my family and loved ones have to be chosen from people who have the wherewithal to make them live longer, too." He proposed that this scenario gives rise to a "gated community" of beneficiaries, whereby some people gain access to longer, healthier lives, and others do not.

Many thinkers in the field said that it is only a matter of time before the monetization of longevity will exacerbate existing social inequalities, whereby the most economically marginalized individuals of today will continue to be side-lined in a future where wealth is both a prerequisite and result of living longer. As one philosopher warned, "if it's only the top one percent or top percentile of one percent that gets this technology, then the problem becomes vast." What good does it do, asked another philosopher, to spend our society's resources on extending the lives of individuals who have already lived enriched, long lives? Critics argued that social resources would be better spent elsewhere, "It's not a question of keeping an 85 year-old alive for another three months," one scholar of political science said, "but [treating] some really debilitating disease that a 20-year-old would get who hasn't really had the chance to even get to that age." Another invoked global inequalities, pointing out that "Until we bring the benefits of industrial medicine to everybody, then we oughtn't be thinking about adding a few extra years to our own lives."

Further, when considering equal allocation of resources, critics point out that money is not the only scarce resource. Scientific talent and technological innovation are also "not going towards the things we know will extend people's lifespans and improve people's health: clean water, good food and basic health infrastructure," said one scholar and advocate for social justice in biotechnology research. She pointed out that we need to think carefully about how we allocate these limited resources in ways that reduce inequality for less privileged people. "It's not sexy," she added, "but it works." She observed the societal consequences of acting otherwise, noting:

If we are celebrating as heroes either the funders or the scientists whose goal is immortality, that has larger cultural and political effects on our support for social justice, on our sense of solidarity. It celebrates this very narcissistic, hyper-individualism that I think has larger political, negative consequences, even beyond the health and science fields.

However, some prolongevists feel that the key ethical issues invoked by the longevity debate concern personal liberty, not distributive justice. "It's about picking your own death," said one philosopher. Another philosopher compared longevity technology to assisted suicide in the sense that both the wish to die and the wish for longer life should be respected as individual choices. She advocated for "a context in which people's aspirations to live longer are respected, [as are] people's aspirations to end their lives at certain points where it no longer makes sense for them to go on living." These proponents believe that collective decisions about the usefulness of entire generational cohorts amount to unjust and even vulgar exercises of judgment. Instead, these decisions should be view as the realization of personal goals. She continued, "The aspirations that you have with respect to longevity are partly a function of the goals you see yourself having both individually and as part of a collectivity."

Thus, just as opponents cite distributive justice in arguments against longevity, advocates emphasize individual justice and personal freedom as paramount values. As one transhumanist ideologue stated simply, "We all have the universal right to live indefinitely." Another philosopher argued that "Some multi-billionaires would like to extend their lives instead of buying a second house, and their argument would be, well, why can't they spend their money on that if that's what they want." At the core of this argument is a Libertarian belief that individuals should have access to that which they can afford, with some interviewees pointing to the inevitable success of longevity as a function of a capitalist system. As one theologian offered, "People are going to sign up for those immortality institutes, and it's a free capitalist market system. That's part of science. I think science, capitalism, democracy all evolve together."

Discussion

Debating moral and social issues raised by longevity technologies

helps society actively work toward a desirable future and avoid or prepare for problems we cannot prevent (Harris, 2000). A primary point of agreement among stakeholders – including those who feel deeply passionate versus acutely critical of pursuing human longevity – is that we need to reach a consensus about priorities in the pursuit of life- and health-span technologies. Binstock (2004)) and Jeungst el al. (Juengst, Binstock, Mehlman, Post, & Whitehouse, 2003) have both argued for "open deliberations that anticipate, rather than react to, the social repercussions of new medical capabilities." Both sides support the reduction of human suffering as an overarching goal, and with the exception of a minority of radical life extensionists (De Grey et al., 2002, Harris, 2004, Horrobin, 2006, Kurzweil, 2010),both reject the pursuit of immortality as a mainstream priority for longevity research. Even critics of human immortality and anti-aging agree that extending the "health span" or even "compressing morbidity" by reducing the period of disease-related decline at the end of life (Fries, 2005) is a worthwhile aim, though they prefer to characterize this as a "slowing" rather than stopping or reversing of aging altogether (Olshansky, 2017).

One primary distinction between prolongevists and their critics is the idea that the reduction of human suffering can and *should* be ultimately achieved by pursing a healthy "ideal" state entailing the defeat of death by age-related causes. This sentiment echoes that of providers of anti-aging medicine who aim to help clients create an "optimal" or "vital" self (Partridge et al., 2009). Critics worry that the endorsement of such a state lacks appreciation of diversity, promotes ageism, and potentially instrumentalizes humans for collective ideals (Cardona & Neilson, 2011; Vincent, 2008). Further, they fear that a widespread pursuit of these technologies, intentionally or not, may shift the world's resources from a needy majority to a selective minority with greater financial leverage and social capital. This, in turn, may exacerbate existing disparities (Olshansky et al., 2012).

Two main questions are raised by these findings. The first is whether concentrating on an "ideal" human state leaves enough room for diversity in conceptualizations of "successful aging"? An argument can be made that individuals should have the liberty to decide for themselves what lifestyle factors constitute "successful" aging. Lamb (2014) has pointed out that the culturally-determined notion of successful aging is "at once a morality tale, a medical tale, a governmental tale, and an existential tale – enacting cultural norms for persons as healthy, active, independent, and long-living." In Western culture especially, notions of aging disproportionately focus on the biological aging process, including degeneration and decline (Vincent, 2008). Our prolongevists echo this focus on youth and vitality as central measures of successful aging. To achieve this, the self becomes a "project" upon which to exert individual agency and control, and to maintain productive activity, independence, and continuity with the self of one's earlier years. Prolongevist viewpoints emerging in our interviews similarly advanced the value of "doing something," "taking action," and "fighting" against aging. Cardona (2008) points out that, within this framework, one is expected to maintain an "optimal self" into older ages, often through consumption of anti-aging services. This scholarship highlights that Western notions of aging value the absence of disability and disease; high cognitive and physical functioning; and active, unassisted engagement with life (Rowe and Kahn, 1998). Simultaneously, they may also devalue alternative cultural constructions, for example those that focus on subjective psychosocial factors such as self-efficacy (Strawbridge, Wallhagen, & Cohen, 2002), spirituality (Crowther, Parker, Achenbaum, Larimore, & Koenig, 2002), or social relatedness (Douglas et al., 2017). Defining aging success homogenously risks imposing a set of standards and expectations that ignore significant variability in aging experiences across gender, ethnic, cultural and socioeconomic groups (Biggs, Estes, & Phillipson, 2003; Calasanti, 2004). Lamb and others (e.g. Holstein & Minkler, 2003) argue that this unrealistic conceptualization of aging construes the "inevitable" conditions of human transience and decline as "failures" and over-emphasizes the role of individual responsibility. Cardona (2008) argues that the model coincides with the priorities of a consumer society (staying productive by working and spending) and "renders invisible other possibilities of 'successful' aging within narratives of disability or illness" (p477). Not only does the individual responsibility model of aging overlook valid cultural or personal alternatives, it also overlooks serious hardships and inequalities faced by many older people that prohibit them from accessing the luxuries of anti-aging and longevity technologies (Katz & Calasanti, 2014). But the reality is simply that there is no singular correct way to age, and to impose a uniform idea of successful aging on a population – either naturalist, biomedically extended, or transhuman – is to disregard the self-determination and individualism both sides of the debate claim to champion.

To preserve and respect the choice to age successfully according to one's own conscience prompts the second question of whether steps must be taken to ensure that the benefits of longevity technology should be made widely available beyond those who can afford it. Indeed individual visions of "successful aging" may have significantly less to do with ideological support or opposition than with the practical ability to afford anti-aging commodities. Cardona (2007) points out that advocating a model of health and youthfulness as a personal project "shifts the burden of the state's responsibility toward its aging populations to individuals through narratives of personal empowerment, thus reconceptualizing individuals as autonomous actors who can choose behaviors, practices, and most importantly, products" (p223). Even while some individuals may subscribe to an individual responsibility model, widespread socioeconomic inequalities inhibit the consumption of typically expensive interventions against aging (Flatt et al., 2013). When anti-aging providers attempt in good faith to offer individuals the tools to *try* fighting the declines associated with aging using technologies available to them (Fishman, Binstock, & Lambrix, 2008), their clientele (and appeal of their advertising) is likely limited to those who can afford it (Cardona, 2008). The "If we can, we must" mentality of some of our interviewees must be understood within a reality in which telomere extension therapy is currently offered at $500/month and parabiosis (plasma transfusions) for $8000/l. If and when longevity technologies such as these become effective, evidence-based interventions, those with the means to access them could extend their lives and presumably amass wealth for longer periods of time, thereby exacerbating inequality to unforeseen levels. As Olshansky et al. (2012) have pointed out, we are already witnessing growing disparities in life spans due to race and educational differences that others (e.g. Bostrom & Roache, 2008) project may widen into an irreparable lacuna between an enhanced social elite and a biogenetic "underclass" with fewer resources and diminished political power. Others like Hughes (2006) and Fukuyama (2003) have similarly discussed how biotechnology is ushering in a new brand of "technopolitics." If realized, this sociopolitical reality could further ignite existing debates between groups in the United States (and elsewhere) who have vastly different beliefs about human rights, health care, and roles of the polity, and who are thus also likely to have different perspectives on the development, regulation, and accessibility of human enhancement and longevity technologies.

When someone like de Grey (2005), the well-known proponent and researcher of rejuvenation medicine, argues for characterizing life extension as a human right, he does not meaningfully address availability and access. Rather than ensuring equal access to longevity technologies as a human right, de Grey seems to mean that researchers have a right to continue pursuing the keys to longevity because humankind *as a whole* has a right to pursue it. Similarly, when Thiel (2009) and other billionaire funders of longevity research talk about "rights," they are largely talking about their own right to intervene as they wish in their own health and their own lives, and to put their personal earnings (or private solicitations for funding) into these self-selected pursuits. This individualistic stance is that society should not be able to tell anyone when it is "okay" to die. To impose eventual frailty on the human body, says Bostrom (2008) is to constrain an individual's freedom to live life

to the fullest. Even to impose the *expectation* of frailty in old age is to constrain one's ability to imagine alternative possibilities, he says. Harris (2004) argues in graver terms that failing to support life extending therapies whenever and however we can effectively renders us responsible for every resulting death, a position that was also heard in our interviews. These prolongevists typically ignore or reject any discussion of a moral obligation to equally distribute opportunities for longevity to *individuals* as a "right to access." They see themselves as in the business of generating longevity opportunities for humanity as a whole, not of distributing them equally which, they believe, is a separate concern.

Given this distinction between the "producers" of longevity technologies and those who potentially consume them, we may ask who should fund research into longevity, and by extension, be its rightful beneficiaries. If funding for longevity research were largely public, a stronger case may be made for ensured and equal access. However, Olshansky (Olshansky, Perry, Miller, & Butler, 2006) has drawn attention to the "meager investment" of public funding for research into the biology of aging and how it predisposes us to a suite of costly diseases and age-related disorders (less than 0.1% of the National Institutes of Health at the time of his writing). If equal access is indeed the desired outcome, an argument may be made for allocating more public funds to research. There is some support, however, for leaving the realm of longevity research to the private investors currently dominating the space (Scott & DeFrancesco, 2015). Whether this would justify distributing the commodities resulting from this research on a "pay-to-play" basis depends in part, on one's political perspective. While conservatives or Libertarians may find this perfectly acceptable, those who advocate for broad accessibility and distribution of technologies as a function of need may still characterize greater access among the wealthy to life-extending interventions (and their long-term socio-economic or biogenetic consequences) as unjust, arguing for some form of redistribution.

How we decide to approach access depends a great deal on how we characterize these interventions. If we think of them as commodities, we require a different paradigm than if we consider them as health care interventions. Our society currently does not endorse any obligation to equally distribute commodities. Even in the realm of healthcare, unless considered a "standard of care" and included as a covered benefit in an insurance plan or a life-saving intervention distributed on the basis of urgency of need (e.g. heart transplant), most elective clinical interventions are distributed on a pay-to-play basis. In this way, longevity technologies are no different than existing clinical interventions that extend the health span or potentially even the lifespan. It is unclear, then, why they are treated differently in philosophic debates about distributive justice. They certainly are not treated any differently by the FDA (Food and Drug Administration, 2019).

Conclusion

The questions of preserving personal choice and expanding access are important because anticipating the worst outcomes can help us to avoid potential problems and maximize potential benefit. Avoiding bleak but remote futures, however, cannot come at the expense of important innovation today, and scientific advancement cannot be held hostage at the altar of equality. Perhaps a challenge that transcends neat or elegant solutions is whether we can avoid unwise expenditures (both public and private) on unrealistic or extraordinary visions of the future of human aging. Fearful, dystopian imaginings may prompt an overabundance of precaution, chill research, and discourage investment; grandly utopian futures promote false hope, squander resources, and dash expectations when the slow drumbeat of science is finally revealed. So far, we cannot predict with certainty what the future of aging will hold.

As policy-making becomes more imminent in response to increasing advancements in longevity research, the values and beliefs identified above will guide attempts to prioritize our societies' resources and, surely, incite more debate. While a full consensus about everything we value with respect to living, aging, and dying is unlikely, we cannot meaningfully harness longevity technologies without recognizing common ground where these clines of value and opinion overlap. Our research exposes a common goal of maximizing an individual's right to age how they see fit – be it a naturalistic vision of our current life course or a radically-longer-lived and technologically-supported transhuman form. It also highlights the universal importance of self-determination, and, by extension, the appropriate modes of access to that which makes that self-determination possible. Far from inhibiting us from creating a world we want to share, these varying articulations of the ideal human form, urgency of action, and individual versus collective goals interweave to help society consider appropriate levels of intervention and caution in the present. Progress will depend on our ability to honor differing ideals of successful aging while making the pursuit of them a realistic possibility.

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