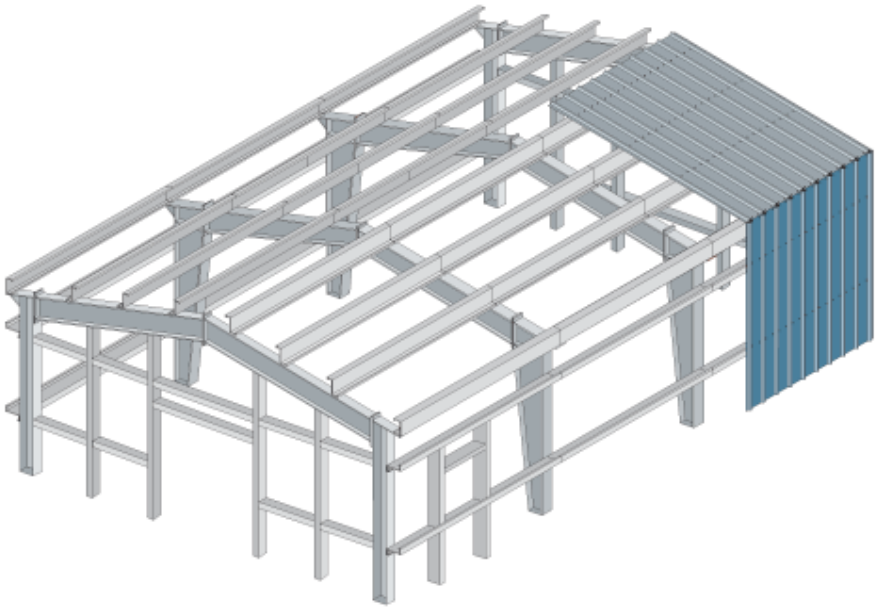
Future Framework



Domain: The Futures of Human Health Treatments (2025)

I. Definition

Domain includes both the assessment of future need and future solutions in pursuit of enhancing human health, mostly constrained within the western medical science traditions and aligned industries of biochemistry, pharmaceuticals and biotechnology.

It does not deal with the organizational, political and economic issues related to the delivery and access to the treatment available, besides the occasional focus on likely demand sources for certain treatments. As such, most of the external constraints to the proposed scenarios are in the technology domain, and the social aspect of diffusion of innovation.

Due to the data identified in the future need section, domain does not include future treatments for accidents and injuries, as well as infections.

II. Time Horizon

This document sets out a view on the future of the domain in the next 16 years (by 2025)

III. Summary

A short description of major findings of the study, focusing on interesting or important aspects of the future that the research uncovered. (Not a traditional abstract that merely abbreviates the report.)

In the future, most health treatments will focus on treatment of chronic diseases, partly motivated by increasing proportion of older population, and partly by desire for eternal life. These approaches will use biotechnology, mainly genetics, in order to achieve increasingly impressive results. Increasing costs and risks of these technologies will require an adequate government response, which might or might not be adequate, leading to the first key uncertainty relating to the extent and success of regulation or control the risk and maximize benefits for wide population. Second uncertainty is related to the clash between two visions for humanity: naturally healthy or transhumanist, emphasizing self-development through technology. Latter uncertainty will not be solved by 2025, but trend will be set.

IV. Current Assessment (review to the present)

Current conditions

An overview of how the domain is structured and how it operates

Key quantities that characterize the domain

- Leading global cause of death (4) is currently chronic disease (58.6% of all deaths), with infections second (32.3%) and injury (accident, war, etc) distant third (9.1%) (WTO)
- Non-communicable diseases already accounted for 44% of disease burden in developing countries (World Bank)
- Most impactful chronic diseases are cardiovascular disease (29% of all deaths) and cancer (12%) (WHO)
- Basic sanitation added 25 years to human lifespan, whole of western medicine 10 years (Nestle)
- Sequencing a complete human genome is becoming exponentially more affordable – from 100 million USD in 2003 to 10 000 USD currently, and is falling by a factor of 10 every year (The Economist)
- Health and electronics sector already account for 80% of new nanotechnology patents in the US (Horizon Scanning)
- According to OECD data, developed countries invest between 2% and 15% of their total R&D expenditure into biotechnology, and number of biotechnology patents increased on an average rate of 10% per year.

Stakeholders

The major actors in the domain (individuals and organizations) along with their values, political interests and relationships with one another

Stakeholders	***Interests, goals, values, fears, positions***
1. Government	Provision of public good (health) Support for R&D expenses (grants) Maintainence of public stability and fair access to medicine Regulation in insurance of treatment safety
2. NGOs	Lobbying for their specific causes in terms of R&D priorities Lobbying for their specific constitiuncies in terms of treatment access Lobbying for fairness and greater public provision of services, limiting the market mechanism (or, conversely, governemnt intervention)
3. Individuals	Fear of death Fear of hardship Desire for risky activities without risks Beauty and youth
4. Hospitals	Effective provision of services Profitability Ethical provision of services Long-term sustainability & growth
5. Doctors	Desire to help people Personal gain (monetary and success) Achievement of mastery Conquering disease
6. Biotech companies	Profit Helping people Conquering disease
7. Ill people (and their families)	Conquering disease or having more time Increasing quality of life Altruism (helping others not go through what they are going through) Hope

Doctors, hospitals and government try to balance the costs and benefits, with biotech companies, NGOs and ill people trying to tip the scales towards increased progress and funding, and population as a whole acting as a counterweight in terms of other budgetary and ethical priorities.

Past events

Recent events within the domain that have created the current conditions and stakeholders with particular attention to recent discontinuities that began and define the current era

Historical discountinuities

Previous era *That was then*	***Current era*** *This is now*
Medicine as a fledging science on par with religion, astrology, etc...	*Medicine as statistically effective science mesurabely increasing life expectancy*
Reliance on naturally occuring substances	*Synthesis and mass production of naturally occuring substances, creation of new substances*
Reliance on visual and verbal reports	*Reliance on scanning equipment*
Focus on reactive medicine	*Focus on preventive medicine (at least possibility of such a focus), e.g. vaccines*
Chronic conditions could only be slowed down	*Chronic conditions actively managed*
Unthinking embrace of new lifestyles	*Health movement among the general population*
Private access to medicine	*Public access to medicine*

Recent discontinuities

- old age as inevitable vs. old age as a disease
- quantity of life vs. quality of life
- sanctity of patent laws vs. low-cost medicine for developing world
- public initiative vs. private initiative
- focus on healing vs. focus on prevention
- measuring risk exposure vs. measuring lifestyle

V. Baseline Forecast

	Conditions or quantities that are expected not to change before the time horizon
Constants	• Birth rate in developed countries (WHO) • Death rate in developed countries (WHO) • Age-specific fertility (WTO) • Male/female birth ratio (WHO) • Incidence of infectious diseases (WHO)
Cycles	Quantities or changes in the domain that recur, where quantities are in the cycle at present. *Can always say "And again…"* Developing countries tend to reduce birth rates and death rates and reach stability of population, and thus follow a set pattern
Trends, extrapolations	Quantities or changes that move incrementally in a specific direction over a long period of time; the value of the quantity and its rate of change (if known)…Forecasts of specific quantities and their value at some specific time in the future. *Can always say "More" or "Less," or "Increasing" or "Decreasing…"*
Projections	• Health care spending in the US has risen about 2.4 percentage points faster than GDP since 1970 according to Medicare data • Population growth slowing down (declining 2.20% per annum) (UN) • Sequencing a complete human genome is becoming exponentially more affordable – from 100 million USD in 2003 to 10 000 USD currently, and is falling by a factor of 10 every year (The Economist) • It is estimated that by 2050 proportion of over 65's will double to 15% of global population (United Nations) • By 2030 we can expect that the majority of developing countries will state chronic disease as the most likely cause of death among their populations, around 54% of the total (World Bank) • United Nations Population Division assumes that average life expectancy in the US will reach 86 years by 2075 • By the year 2025, 26 countries are forecast to have a life expectancy at birth of above 80 years (WHO)

Plans, goals

Ray Kurzweil – intending to live forever

Craig Venter – intending to use genetic sciences as basis of future health treatments and energy production

Aubrey de Gray – intending to double mice life span by 2014

Expected future, baseline forecast

The result of the cycles, trends and plans in the expected or mostly likely future…A description of the most likely future at a specific time, focusing on the important differences from the present and the implications of those differences for the stakeholders in the domain

The extrapolated value of important quantities in the future if constants, cycles, trends and plans continue as expected

- Human population starting to stabilize
- Decrease in number of deaths caused by infectious diseases
- Increasing proportion of population over 65
- Increasing incidence of chronic conditions
- Affordable and widespread genetic testing
- Widespread use of biotechnology, especially stem cells

Implications for stakeholders;

Biotech companies: increasing size, relevance and revenue

Government: complex regulations, inability to afford equal treatment for all, attempts to offer adequate coverage for developing countries failing

NGOs: fight for public funding and access to treatments for various diseases, as well as for various populations, increases

Hospitals: increasing expectations, increasing abilities, more commercially minded out of necessity (more expensive treatments)

Doctors: crucial ethical dilemma- denying available treatment

due to cost.

Ill people: increased hope but potential social exclusion issues due to inaccessibility. Promise of eternal life for super-wealthy.

VI. Alternative Forecast

Trend reversals	Trends that go on for a while, but then they *unexpectedly* stop or go in the opposite direction. See your entries under Trends above. • Global GDP drop and rising instability in the world lead to reduction of public expenditure for health care • Instability and war lead to worsening economic conditions and reversal of country demographics: global population growth rate increases, developing countries further behind • Genetic data remains prohibitively expensive due to unexpected small variations which make current methods cost-effective but unreliable
Unfulfilled intentions, plans	Intentions or plans that may not be realized or accomplished. See your entries under Plans and Goals above. • Attempts to prolong lives in experimental animals unsuccessful, secret of ageing remains locked • Ray Kurzweil dies of heart attack • Genetic industry faces problems with mass producing their products: mutations occur at an alarming rate

Potential events, wildcards

Expected or unexpected events and wildcards that would disrupt, change and potentially end the current era. *Can always appear as a headline in a news source.*

- AIDS becomes transmitted by air, global economy in standstill
- Genetically engineered cells have a 60% more chance of becoming malignant, stem cell research stopped
- Psychological problems in individuals who are kept alive in old age due to medical advances; long life does not lead good life
- Pakistan and India start a nuclear war, diverting treatment resources to radiation sickness and away from chronic conditions
- Genetic experiments accidentally release a self-propagating genetic vector which quickly leads to a ban on future research

Issues, conflicts, controversies, dilemmas, choices

Issues that are currently being discussed and those that could become important (emerging) along with the various ways they could be resolved and the implications of each of those ways. *Can always "Should we…" or "Should they…"*

- Are humans psychologically equipped to live forever? Does death give meaning to life?
- Can humans completely improve on nature?
- Can we control the dangers inherent in the technologies we are developing?
- Should we accept privatization of medicine and inequality that follows?
- Should doctors deny access to proven treatments due to costs?
- Can state regulate biotech industry effectively?
- How much risk should we accept?

New ideas, images, perspectives

People and their ideas that present a new or insightful look at the domain, particularly about its structure, types and rates of change and plausible futures. *Something really new or novel, even if unusual.*

Ray Kurzweil;

- Idea of downloading a brain in a computer (mind as a software), or, alternatively, spending our lives in virtual reality
- Idea of having nanobots in ones blood as a superior enhancer of our immune, cardiovascular and musculoskeletal systems
- Exponential growth of biotechnology – knowledge and capabilities doubling every year
- Cryogenics as preservation until science can cure us all – Mike Darwin
- Ageing as a set of seven cellular processes that can be stopped – Aubrey De Gray
- Idea of entropy as unavoidable law of nature – ageing can not be stopped – Preston Estep
- Idea of desire for eternal life as a characteristic of juvenile character – Leon Kass

Key uncertainties

The quantities, potential events, issues and ideas that would have the greatest impact on the future, yet which are least predictable (ie most uncertain) *(The key uncertainties are a **selection** of the most important items from events, issues and ideas above. Key Uncertainties do not contain any new elements that are not listed above.)*

- Instability and war lead to worsening economic conditions and reversal of country demographics: global population growth rate increases, developing countries further behind

- Attempts to prolong lives in experimental animals unsuccessful, secret of ageing remains locked
- Psychological problems in individuals who are kept alive in old age due to medical advances; long life does not lead good life
- Genetic experiments accidentally release a self-propagating genetic vector which quickly leads to a ban on future research
- Can humans completely improve on nature?
- Can we control the dangers inherent in the technologies we are developing?
- Can state regulate biotech industry effectively?

Alternative futures, scenarios

Scenarios that represent the most important and different plausible alternative futures of this domain that result from the uncertainties, including major differences from the present, the value of key quantities, and implications for stakeholders

First uncertainty is the distinction between nature and technology – will our future health treatments emphasise prevention, natural living and leveraging existing wisdom of nature,or will we start designing our own bodies? As baseline scenario indicated, this is a distinction between biotechnology and nanotechnology, and this might lead us to believe that by 2025 we will remain firmly on the path of natural solutions. However, this is not the case, as developments in the next 15 years will firmly set the stage for the coming decades in terms of both research direction and market (and regulatory) preference.

Second uncertainty is related to the driver behind development of new medical treatments. If we continue with current model, we will see medical research within an ethical and legal framework of government policy, heavily standardized and regulated. Second option is deregulation of large parts of medical technology, possibly in only some locations, which would allow for independent research benefiting the elites that can afford it.

Leading indicators

Quantities or events that *would signal that a key uncertainty is being resolved* in one way or another or that one or other scenario is more or less likely to occur

(for each uncertainty identified)

- GDP growth, percentage of deaths caused by chronic diseases in developing countries
- Methusalem foundation prize state
- State of activity and motivation of people first exposed to longevity treatments (might not be representative)
- No new infectious diseases among humans, animals or plants
- Success of genetically designed cells that do not have natural counterpart. Success measured both in terms of viability, fitness of purpose and lack of side-effect in the longer term.
- Avoidance of new biological weapons appearing
- Cost-effective biotech solutions applicable in public hospitals and developing countries

VII. Information Sources

Texts	Singularity is Near, Transcend, Ending Aging: The Rejuvenation Breakthroughs that Could Reverse Human Aging in Our Lifetime, Fantastic Voyage: The Science Behind Radical Life Extension, Life Extension. A Practical Scientific Approach, The Long Tomorrow, Merchants of Immortality
Periodicals	Nature Biotechnology, Hplusmagazine, Clinical Interventions in Aging, Rejuvenation Research
Organizations	Methuselah foundation, Singularity University, Alcor, Life-extension Foundation, WHO, UN, American Academy of Anti-ageing medicine, Sanger Institute

Experts	Ray Kurzweil, Aubred De Gray, Andrew Weil , Roy L. Walford, Deepak Chopra, Craig Venter

Web sites

http://www.whyweage.com/

http://www.thebls.org/

http://www.sanger.ac.uk/

http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml

http://www.kurzweilai.net/index.html?flash=1

http://www.hplusmagazine.com/

http://www.alcor.org/

http://www.jcvi.org/

http://www.nature.com/nbt/index.html

FUTURE OF HUMAN HEALTH TREATMENTS (2025)

Baseline

Setting the Scene

Advancements of human civilization have increased the average lifespan from 45 to 70 years (1) in the span of 160 years, therefore increasing life expectancy for more than two months every year. It is estimated that by 2050 proportion of over 65's will double to 15% of global population (2). Centenarians now constitute the fastest-growing segment of the U.S. population, increasing in number from 3,700 in 1940 to roughly 61,000 today (3). Of course, part of these effects are due to reducing birth rates (moderated with reducing child mortality), and some researchers claim that longer lives tend to lead to better family planning, connecting the two trends (Hans Rosling, Gapminder).

Increasing affluence and life expectancy in most parts of the world has lead to increased incidence of noncommunicable disease - living longer leads to increased prevalence of chronic conditions and mild disability that requires significant medical resources to be managed.

Indeed, leading global cause of death (4) is currently chronic disease (58.6% of all deaths), with infections second (32.3%) and injury (accident, war, etc) distant third (9.1%). In the US, 2/3 of all patients receiving hospice care are over 75 years old, indicating current limits in coping with age-related illnesses (7).

This pattern represents a fundamental shift in epidemiology. Firstly, relatively low incidence of injury-related deaths could be argued as the major impact of civilization on human health up to the modernity. Increased life span in modernity seems to have been primarily achieved through controlling the infectious diseases (and this is the scope of future change in developing countries through increased control and prevention, in order to approach the life expectancy of developed countries) (6). Some researchers claim that basic sanitation added 25 years to life expectancy, while whole of the rest of modern medicine added another 10 years (CTO of Nestle, European Futurist Conference, Luzerne, 2007). As developing countries adopt strict control and vaccination programs, combined with basic sanitation, their life expectancy tends to reach levels similar to developed countries.

Because of this process, chronic diseases are currently the most likely cause of death (and likely to increase in importance) in every region of the world, including Africa. Indeed, no longer can these diseases be termed "diseases of affluence" - non-communicable diseases already accounted for 44% of disease burden in developing countries (5).

Most impactful chronic diseases are cardiovascular disease (29% of all deaths) and cancer (12%) (4). While these diseases have a clear genetic and age-related component, it is also clear they are related to lifestyle, as there are plenty of modifiable risk factors (tobacco, alcohol, obesity, sunlight, unhealthy diet, lack of exercise, stress, depression), many of which are related to (relative) affluence.

Furthermore, spread of affluence is often combined with spread of western cultural aspirations, including emphasis on youthful behavior and appearance. Therefore, absence of disease is not sufficient, but public demands reduction of typical symptoms of old age, making age into a disease to be managed. Indeed, living longer is not of much use if one is severely disabled due to advanced age.

Future challenge of medicine is therefore treating chronic conditions, including the chronic condition of old age itself, and its holy grail is pursuit of permanent youth, and, even, immortality. While this goals is extremely unlikely to be reached by 2025, even experimentally, it remains an approximation of the likely direction of future medical science.

Baseline assumptions

Baseline scenario is based on the continuation of current identified trends. Firstly, it is likely that life expectancy will continue to rise at the present rate. United Nations Population Division assumes that average life expectancy in the US will reach 86 years by 2075, which is well beyond the scope of this report (3). By the year 2025, 26 countries are forecast to have a life expectancy at birth of above 80 years (WHO).

It is also likely developing countries will continue to reduce deaths from infectious diseases (6), eventually reaching parity and demographic picture of developed countries, before their economies do so (as is the case in Eastern Europe today). By 2030 we can expect that the majority of developing countries will state chronic disease as the most likely cause of death among their populations, around 54% of the total (5).

Finally, we can assume that health care costs will continue their growth as a proportion of overall public spending (health care spending has risen about 2.4 percentage points faster than GDP since 1970 according to Medicare data) and that global GDP will continue to rise.

Mixture of these trends will ensure that there is both a need for better management of chronic disease and the fund available for future development. So, what will these funds be invested in?

Treatment Overview

Over the past two hundred years, medical treatments have moved from a visual and self-report science to usage of sophisticated scanning equipment, from basic surgery (cutting out) to advanced surgery (reconnecting and reshaping, including transplants) and from herbal medicine to synthetic drugs. All of these were based on a materials science, namely physics and molecular biology.

Next step in development of technology will be the ability to design living things, either through biotechnology or nanotechnology. In both cases we have decentralized myriads of agents that learn and grow, making nature fully mercurial and on par with computer software (8). Both approaches claim to learn from nature, but nanotechnology also assuming that human cognition can go beyond nature and provide new solutions. According to proponents of this perspective, evolution missed the wheel, black leaves on plants (increased absorption of sunlight) and many other useful ideas (9). While these developments are estimated to be well outside the scope of the present timeframe, both industries are heavily invested in and have a great likelihood of reaching more modest goals, identified in other parts of this report.

To give an example of the level of investment, from 1997 to 2004, the average annual rate of growth in Canadian expenditures on biotechnology was 19%, with almost the whole amount (95%) directed towards R&D activities (10). More than half of this funding was directed towards human health biotechnology, and, in the period mentioned, revenues of all biotechnology firms quadrupled. According to OECD data, developed countries invest between 2% and 15% of their total R&D expenditure into biotechnology, and number of biotechnology patents increased on an average rate of 10% per year.

Similarly, by 2012 it is estimated that health sector will account for 16% of all nanotechnology sales, estimated at up to 1 trillion USD(11). Health and electronics sector already account for 80% of new nanotechnology patents in the US.

Most mature areas in application of biotechnology to human health are genetics and stem cells. Both approaches use existing natural designs which are manipulated for further patient benefit. Stem cells have a potential to treat cancer, cardiovascular disorders and neurodegenerative disorders, i.e. exactly the chronic conditions that will be the future focus of treatment efforts (12). Recent advances in stem cell technology allow for better identification (all human tissues are now known to contain stem cells), extraction and replication, and, along with new regulatory framework in the US, allows for rapid study of stem cell mechanisms. Already, the applications of stem cells in reconstructive surgery (Kurzweil notes that injection of stem cells into damaged knee made it stronger than the normal knee), along with experimental approaches in neurodegenerative disorders seem to indicate a rapidly approaching era of effective treatments.

In terms of genetics, there are currently genetic tests for 1200 genetic conditions, up from 300 in 1995 (13). Sequencing a complete human genome is becoming exponentially more affordable – from 100 million USD in 2003 to 10 000 USD currently, and is falling by a factor of 10 every year (14). Besides allowing for testing of risk factors (and hence guiding prevention), genetic testing allows personalized medicine, as there are a number of medicines that do not work on overall population, but are effective for certain subgroups (for example Bi-Dil). Personalization also helps with targeting and dosing of medicines. While it is unlikely that fully personalized drugs might be developed in a cost-efficient manner, mass customization is definitely a possibility. Of course, any such data have to be carefully protected, as it affords a deep insight into human personality and is a potential ground for discrimination.

When we put both genetics and stem cells together, we achieve an already workable solution. For example, a German patient was able to stop taking AIDS drugs after receiving stem cell transplant from a donor with AIDS resistant gene (15). Therefore, even in absence of design ability we can use genetics and stem cells to change our bodies using existing natural solutions. In the future that is beyond the scope of this report, we will be able to actively manipulate and design our genetic material to ensure best possible resilience to disease and degradation (this is currently accomplished through usage of viruses to change existing genetic material, and in the future usage of synthetic carriers is likely) and effectively reprogram our genes.

According to Tufts University study, the average cost of developing a new prescription drug has more than doubled in the last decade, and only 1 in 5,000 drugs that pharmaceutical companies test on animals reaches the market. Genetic engineering will allow companies to use more targeted testing and produce drugs cheaper (Genetech made its name through producing insulin by genetically engineering Escherichia coli bacteria).

In terms of nanotechnology, researchers are currently developing smart pills and machines that can be used for diagnostics and targeted delivery of drugs (especially important for drugs that use advanced biotechnology), with the final aim of creating a microscopic diagnostic/immune system that will be programmable and act in repairing and providing anti-virus support to the body. While this goals is also outside the scope of this report, micro technology is already applied in creating computers that can help with sight, hearing and smell for disabled patients, as well as locomotion. It is assumed that by 2015 these machines will rival capabilities of normal human systems, and surpass them by 2025 (Kurzweil).

Finally, information technology will continue to improve medical research, allowing a number of separate advancements to be slowly realised over the next two decades, emulating already achieved similar advances in other fields;
- faster dissemination of knowledge and research among practitioners
- easier cooperation between institutions and countries
- digitization of medical errors, significantly reducing medical expenses (16) and medical error (14), as well as allowing better feedback on medicine trends and impacts
- faster management of vast research databases and complex medical simulations
- cheap and fast diagnostic systems delivered on distance and in real-time
- early warning virus systems to enable rapid response and rapid detection of new potentiall pandemics (Larry Brilliant presentation on TED)
- creation of community based discussion board to share best practices and provide input for medical community – patients know their chronic disease best (14).

Summary of treatments available in 2025

By 2025, we can expect a fully digitalized medicine which has been increasingly operational for at least 15 years and has allowed for exponential growth of medical knowledge. Genetic testing will be affordable and widespread, and chemical drugs will be created and produced much more cheaply, allowing for mass customization of drugs and their wide-spread use in developing countries. Data harvested from our genes and linked to resistance to certain diseases will enable doctors to spread them more widely through the population, even though costs will ensure such procedures are limited to high-risk populations in developed countries. Stem cells will also be used to enhance activity of bodily systems and prevent or reverse their degradation, and will be available to the same privileged population. Nanotechnology will only start to develop, but success in creating artificial sensory and locomotion systems will be impressive and widespread in developed countries, as well as use of smart pills for diagnostics and targeted drug delivery.

1. **Oeppen J, Vaupel JW. Broken Limits to Life Expectancy. *Science*. 2002;296;1029-1031.**
2. United Nations Department of Economic and Social Affairs, Population Division. *World Population Prospects. The 2004 Revision*. New York: United Nations, 2005.
3. National Institute of Ageing, Report No. 8, 2006.
4. WHO, *Leading Causes of Mortality Throughout the World*, 2002.
5. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL, eds. *Global Burden of Disease and Risk Factors*. Washington, DC: The World Bank Group, 2006.
6. WHO, *World Cancer Report*, 2008.
7. NHPCO Facts and Figures: Hospice Care in America, 2008
8. One Half a Manifesto, Jerome Lanier, Wired.
9. Our Biotech Future, Freeman Dyson, The New York Review of Books, Vol. 54, No. 12
10. Canadian Trends in Biotechnology, 2nd Edition, Government of Canada.
11. Trends in Nanotechnology, Horizon Scanning Intelligence Group.
12. Emerging trends in biotechnology – stem cells, Current Science, Vol. 83, No. 3.
13. BIOWORLD'S FUTURE OF BIOTECH: THE 2010 GUIDE
14. The Economist Special Report on Health Care and Technology, Number 8627.
15. http://www.bloomberg.com/apps/news?pid=20601124&sid=ac9.rZCRCs8Y&refer=home, Retrieved February 15th 2009.
16. Digitizing Health systems, RAND Corporation, 2005.

FUTURE OF HUMAN HEALTH TREATMENTS (2025)

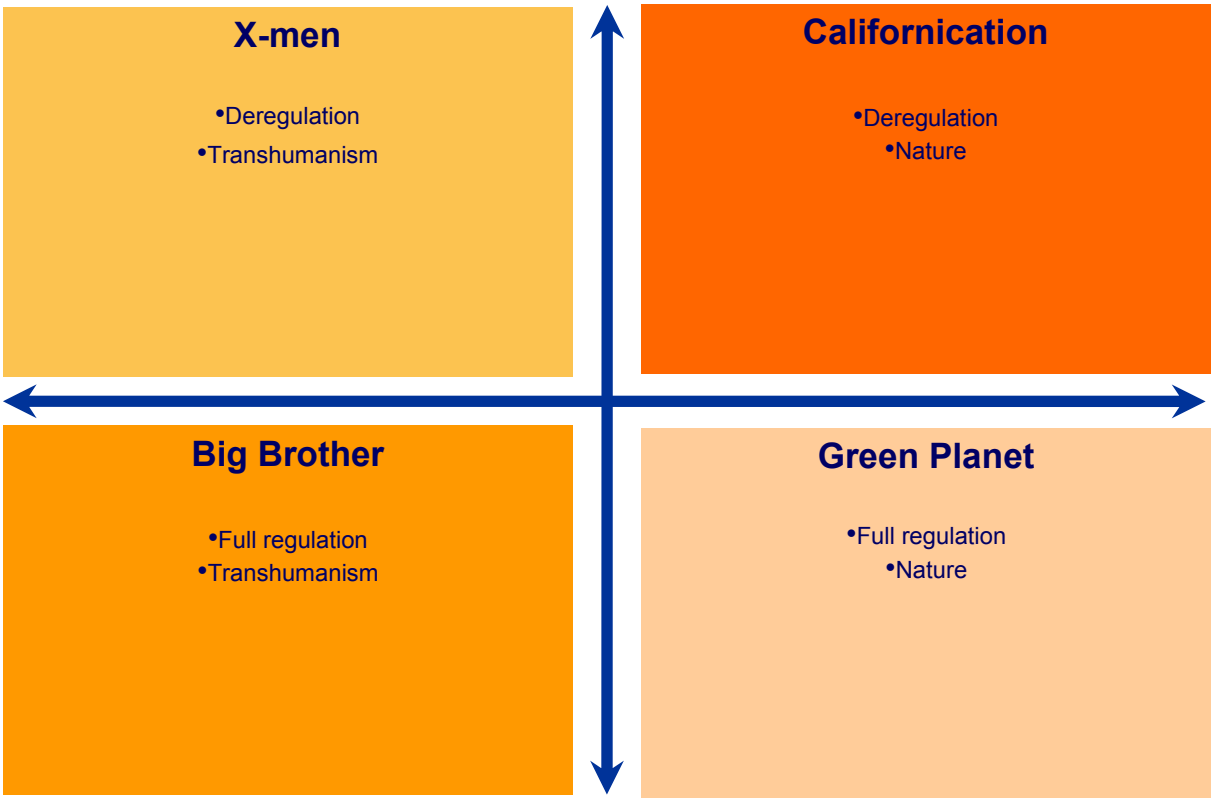
Alternatives

Setting the Scene

When surveying the expected future of health treatments, there are two main dynamics that remain uncertain.

First uncertainty is the distinction between nature and technology – will our future health treatments emphasise prevention, natural living and leveraging existing wisdom of nature, or will we start designing our own bodies? As baseline scenario indicated, this is a distinction between biotechnology and nanotechnology, and this might lead us to believe that by 2025 we will remain firmly on the path of natural solutions. However, this is not the case, as developments in the next 15 years will firmly set the stage for the coming decades in terms of both research direction and market (and regulatory) preference.

Second uncertainty is related to the driver behind development of new medical treatments. If we continue with current model, we will see medical research within an ethical and legal framework of government policy, heavily standardized and regulated. Second option is de-regulation of large parts of medical technology, possibly in only some locations, which would allow for independent research benefiting the elites that can afford it.



Californication

News today

- Genes from Mark Jolie-Pitt, son of Angelina Jolie and Brad Pitt, have been put in wide circulation on the black markets across the world, with thousands of parents reportedly selecting the genes relating to appearance and demeanor for the insertion in their offspring. Most parents have spent their significant sum of money making this investment, although it is currently unsure how much time value they will be able to gain with so many competitors.

- Polish entrepreneur Mikhail Lawitznchuk, wealthiest man in the world, has donated 170 billion dollars to programs aimed at identifying genetic disorders in new born children in South Africa. Mikhail briefly commented; "I have given a new generation to the country". All of the children will have embedded the AIDS resistance gene, disease that has devastated this country. Pope John III has voiced concern over increasing stigma of imperfect individuals in the time and age where God`s grace should be extended to all of creation.

- Baby boomers still control the economy; helped with medical advances, these old men and women appear in their sixties, and maintain control as the captains of the industry across the western world. Average age of CEO among Fortune 500 companies has risen to 62.

- NATO Veterans of the Second Iranian War continued their protest in government head-quarters asking for better access to stem cell techniques that hold the promise of giving them back their quality of life. Western governments have typically resisted calls to include basic procedures in health insurance citing on-going research and approval as well as ram-pant costs.

- Researchers in Jakarta Medical Hospital have announced they were able to create a fully functioning eye and optic nerve from donor stem cells. It is expected that the technology will become widespread in the next 15 years.

Green Planet

EU common market directive, March 2025

High Committee on Ethical Cloning has reviewed the report from European Genome Project, and concluded that 99% of EU citizens have had their full genome sequenced. Data remain stored on secure servers located in a neutral territory of Strasbourg, under jurisdiction of European Court of Human Rights. This Committee wishes to reiterate its support for legal provision contained within "Parliament Act 2019 on confidentiality, transmission and use of genetic material", and henceforth issues the following statement for the general public;

- effective January 2026, all pregnant women will be required to undergo full genetic testing on their offspring, in order to rectify any genetic diseases and increase general immunity. No other interventions will be allowed.
- it is expected that "Generation 2026" project will cost 4% of EU GDP, but will save increasing amounts of health care costs for the future.
- this initiative is coupled with a set of tax incentives contained within "Tax provisions for new families" program, allowing for tax-free spent on the child and family home.
- This Committee is of the opinion that calls from religious communities asking for a ban on aforementioned policies are misguided and shortsighted. Committee has been assured that human diversity will remain intact, and that genetic data will not be used as a new and separate source of discrimination.
- Committee is currently drafting proposals for "Disability Act 2029" which would provide free access to sensory and locomotory equipment for the disabled.

Big Brother

Dear Mom and Dad,

We had an army visit today in school – they are sooo snaz! Seargent that talked to my class looked just like SuperJack from the movies.....he was able to do all this doof stuff, like open and close doors, access computer and internet just by thinking about it, and had distance and night vision. He could also jump four meter high, and hold the whole class on top of him! He said it did not hurt at all when they put the stuff on him, and that he has grown to love it – he can beat almost any "natural" athlete in almost any sport! Army guys told us that we have to study hard and take good care of our bodies so that we could apply to the program. They take only two thousand soldiers a year.....

I really really want to get in, but there is also a genetic test required to make sure we are "the right stuff". I am not sure what they mean, but dad, you were not always so fat, were you? I am not fat at all, and run almost the fastest in my class. Can I do something to change my genes, do you know? I have asked my biology teacher, but she laughed and said that we do have some ability to change genes that cause disease, but that no one yet knows much about it, so best to leave it alone for now. She said that if I really want it, I will work hard and get in, but my friend Agip thinks this is stupid, as army will give us machines anyhow, so why train?

X-men

A: So, can you let us know how much all of this cost?
John: Well, it is hard to put a specific sum to it, but I would say around 17 million dollars.....and that was only because I shopped around.
A: And has it been worth it?
John: Definitely, I can now read and write much faster than before, my memory has much improved, there is colour back into my life and I can move independently.
A: How old are you, John?
John: I will be 69 this year. And, having fully recovered, I now do job of two men half my age, and run my company while making sure I have time for skiing and other activities!
A: What made you take this step?
John: I know very well how controversial "designing-up" is, and how few people do it. It is expensive, uncertain and I would not recommend it for everyone. But, all my life I have worked hard, and I believe it is unfair that, now that I can enjoy it, I have lost all ability to do so. It was a small price really- now I can experience playing with my grandchildren in ways which would have been only a sad memory beforehand.
A: And what would you say to people who claim this is an unfair advanatge? Do you feel that?
John: Well, unfair advantage...is it unfair that I was born in Switzerland, that I went to the best schools, and had parents that invested in me? I am lucky, I know, and that luck has enabled me to embark upon this course. I know that I am now able to do some things better that people half my age, but that was not really my goal- I just wanted my normal life back. I know they told me I will be able to have x-ray vision and all that stuff, but I am not sure if I want to....I just want normality...
A: But, what would you say regarding the recent case of a spy with superior memory that worked in national Security Archives....surely you realise these techniques are game-changing?
John: I never had the intention of becoming a poster child for anything! All technology is dangerous, and perhaps there are paths we should not take...but, I have my life back, and this is what I wanted. I fully agree this technology should be regulated, but I believe media focus too much on the negatives. Maybe it is even jelaousy- look, people, if I can do this now in 15 years many people will be able to afford it...and then you will want the option of doing this!
A: And, what do you say about the legal case brought against you?
John: There is no case, government contradicts itself. It is my body, and as such I am legally allowed to use it in any way I can . Case will be dropped, I am sure.
A: Thank you John
John: Thank you to for offering me a chance to share my view....

FUTURE OF HUMAN HEALTH TREATMENTS (2025)

Preferred

Initial Thoughts

There is an inherent contradiction in human agency – how smart are we exactly? We can ask if human mind is smart enough to understand itself, and we can equally ask if human being is smart enough to design itself.

Rate of technological change is much faster then rate of social change, which is why we still read Aristotle`s Politics, but ignore Physics. Our technologies develop before we can build ethical and practical understanding on how they should be used.

We are now on cusp of serious advancements, the ability to design life. It could be argued that humanity is moving closer to approximating its own platonic conception of its creator, and it is us who are becoming creators of the worlds.

Bio and nano technologies are dangerous because they are self-replicating, which means that one mistaken application is sufficient. Human race has proven very resilient in the past, but our most serious threat, besides perhaps ourselves, were certainly viruses. Indeed, we have been able to eradicate only one virus in the history of humanity – smallpox. These then are the risk of the technologies we might soon develop.

However, I also accept Kurzweil's argument, that avoiding a certain technology only ensures that those with ethics are left outside the arms race sufficiently long so that the others can develop advanced technologies and use them for their own ends. Indeed, as in many areas in life, offence seems to be the best defence.

So, how are we to chart our incentives so that we maximize the possibilities and minimize the risks?

Values

My approach will assume the following values;
- Irrationality: awareness of human irrationality and emotional basis of decision, healthy distrust in formal models and predictions
- Diversity: only difference can deal with difference
- Wisdom: long-term view is effective and efficient in short-term too
- Experience: human experience is embodied and it is what makes us human

Approach

Technology which is in the service of enhancing our humanity is necessary, we need to start from respecting ourselves. Human beings are embodied and emotional, and having a body defines our experience and therefore ourselves. Human being is not mercurial, a disembodied mind that can be rearranged and designed as it pleases us, without changing who and what we are.

Modern man is already different, changed by technology that we adapt to, and this is but a small taste of what is possible. Of course, promises of new technology are great, and it has the potential to significantly enhance our experience. But, we must first be clear on what that experience is, what we are seeking to enhance.

Vision

Biotechnology in the service of mankind, used to repair injury and disability, eliminate excessive hardship while preserving diversity and different ways of being. Technology that can be used to enhance and explore our experience instead of dissociating us from our bodies and lived experience. Technology that will not be used for manipulation and creation of new divides, and technology that will not try to replace nature with a man's artifice, creating our own personal well controlled zoo.

There should be clear ethical and practical guidelines on controlling biotechnology and its applications, and allowance of diversity in approaches to this issue without igniting an "arms race" between nations. How can we achieve this?

Practical Steps

I. Use positive psychology to define universal human experience to be protected and nurtured, and enter it into Universal Declaration of Human Rights
II. Ensure consensus on possible direction of progress in terms of enhancing this experience, individually and collectively
III. Engage two scientific cultures of humanities and engineering to create a joint position on future directions of research, funding and guidelines
IV. Test all outcomes in regards to practical experiential effects of adopting them
V. Provide a viewpoint on likely emotional, cultural and social impacts of longer productive lives and their celebration or mitigation

VI. Engage in ambitious global implementation project, for example “no disability plan”
VII. Provide focused exploration of enhancing human performance and likely impacts on experience and identity, and create cost/benefit analysis

Stakeholder Impact

Successful implementation of above-mentioned initiatives would ensure that we are following a more integral vision, and hence empower a number of different stakeholders.

Government
Interest: provision of public health, lowering costs, reducing risks, gaining votes

Proposed approach would create a new political debate that would touch almost the whole population. Likely result is more holistic provision of public health and reduction of risks, but also increased costs.

NGOs
Interest: furthering their own specific agenda

Platform of this size and scope is likely to divide people and revitalize the NGO scene, and give them a context within which to lobby. However, it could also create further divisions and strife, and radicalize opinions.

Individuals
Interest: good life, long life

There will be a trade-off, as increased regulation will probably mean slower progress, but also reduced risk. Disabled and ill people would probably welcome faster resolution, as would the elderly, while others are more likely to have a desire to take their time.

Medical community
Interests: helping others, success, profit

Regulation could be viewed as impeding progress, but also as a marketing tool for new services. Doctors themselves need to balance health with profit, and are likely to welcome any approach which achieves that to a reasonable degree.