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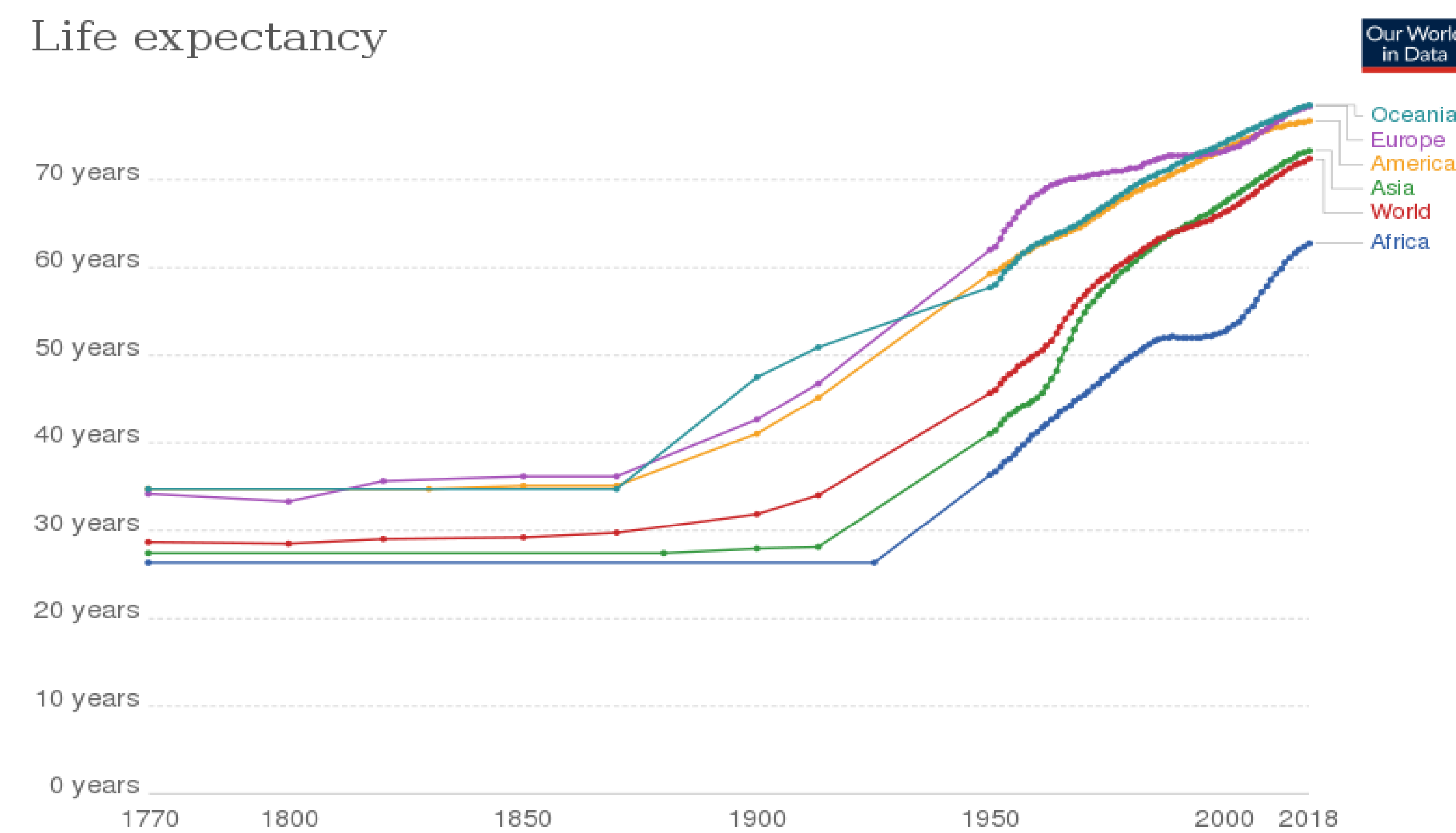
## LIFE-EXTENSION TECHNOLOGY

### Human Invention, Changing Societal Conditions Have Ballooned Average Life Expectancy

- Steep incline of average life-expectancy over last 200 years
- Agriculture, public hygiene, diet, microbiology
- Average in life expectancy, not maximum human lifespan
- *Symptoms* of age vs aging itself
- Increases in human lifespan and “healthspan” on the horizon

### Breakthroughs in Life-Extension Biotechnology Could Revolutionize Length, Quality of Life

- **Rapalogs** (i.e. rapamycin) target mTOR & regulate cell growth and survival
- Evidence of success on a cellular level
- **Telomerase** repairs telomeres in animals with long lifespans
- Mice lifespans increased by 24%, less likely to develop cancer
- **Stem cells** have diverse application
- “Refreshing” stem cell insertions a popular topic of research
- **Senolytics** target and kill senescent and inflamed cells
- Improvement in age-related illness in mice
- **Epigenetics** is the study of the factors related to gene expression
- Modification of *sirtuins* allow aged mice to run and life longer and more comfortably than younger mice
- **Wearable Health Technology** allow early disease detection and regular health monitoring
- Unlikely to affect maximum life expectancy itself, but may allow for individualized medicine
- **Fertility** research can allow families an increased range of options
- Female fertility likely to benefit from aforementioned advances

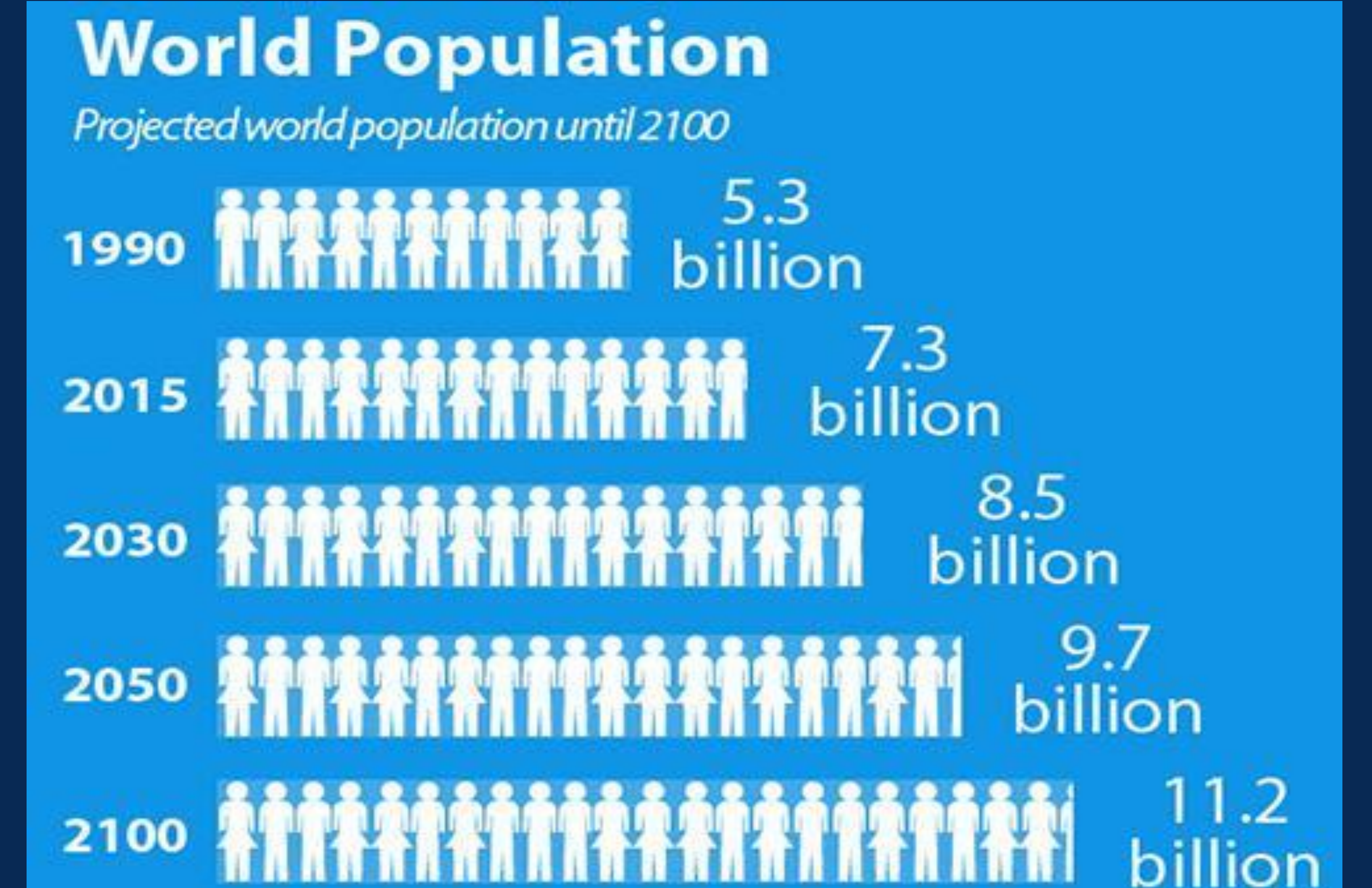
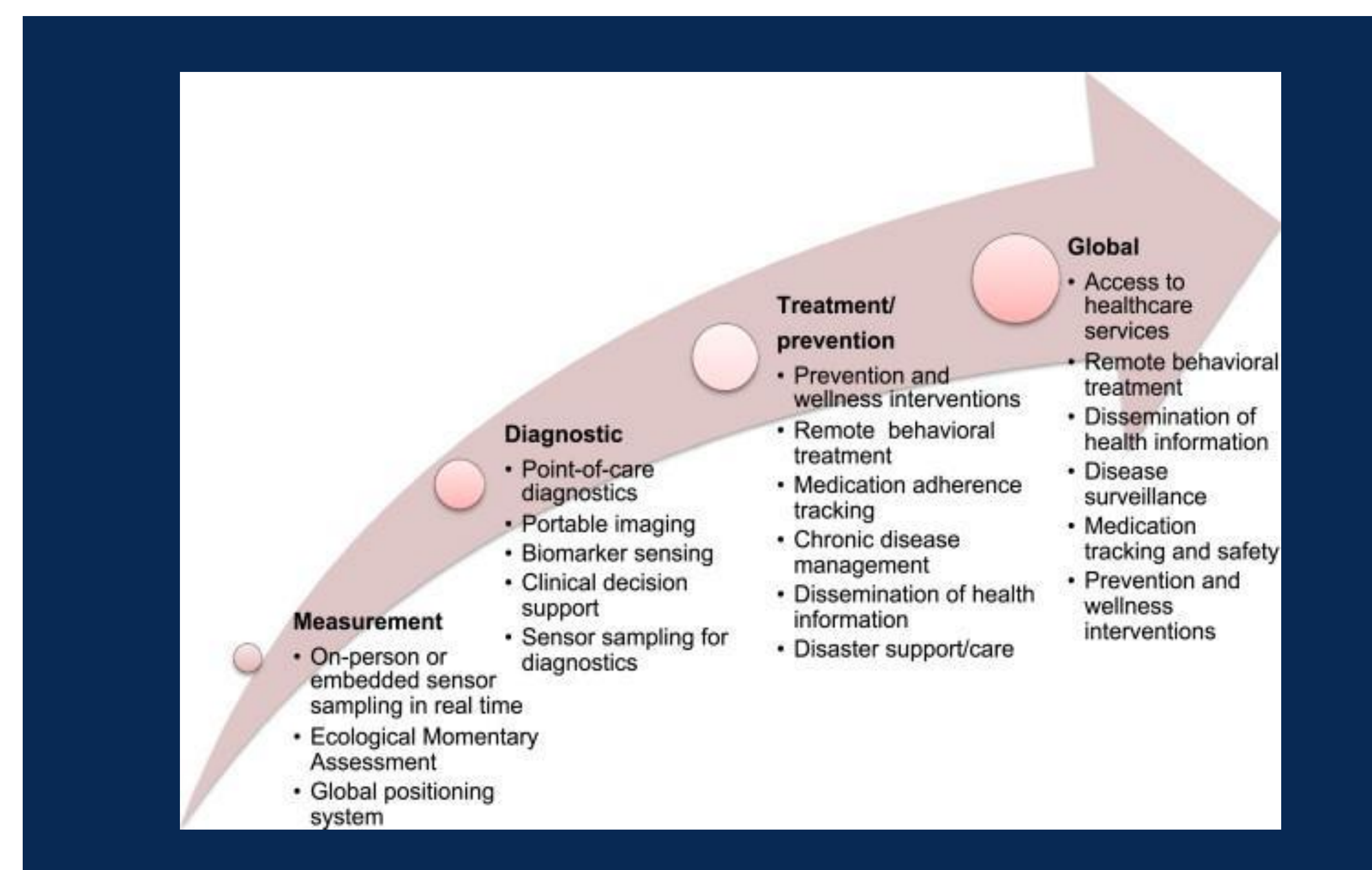


Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019)  
Note: Shown is period life expectancy at birth, the average number of years a newborn would live if the pattern of mortality in the given year were to stay the same throughout its life.

## SOCIETAL IMPACT

### Consequences of Life-Extension Tech

- **Deepened social inequality** as wealthy individuals and countries continue to gain access to healthcare and biotechnology earlier than others
- **Incarceration** in the US will likely need to evolve
- Compounding with existing racial inequality in the justice system, increased healthspan in more privileged convicts will require readjustment of sentencing tradition
- **Overpopulation** will become more of an issue, especially if the current climate crisis is not addressed
- Changes in **workforce** and in **Social Security** are sure to follow, as individuals are able to work for longer but also retire for a larger portion of their life
- Increased lifespan of **policy makers** will be of serious concern as global and national leaders become entrenched in positions of power
- **New ethical dilemmas** will certainly arise as the meaning of a human life gains value
- Physician-assisted suicide, as an example, will likely reenter discussion as other causes of natural death decline



Source: United Nations Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2015 Revision*  
Produced by: United Nations Department of Public Information

## ACTION NEEDED

### Mitigating Disruption by Inspiring Resilience and Resurgence

- First, individuals in power must **take seriously and support life-extension technology research**.
- Attempts to prevent this progress would be unwise. It would be better to support its continuance in order to more fully manage consequences.
- Policymakers should consider **more inclusive healthcare** plans. If healthcare is more affordable, the rift between the wealthy and those unable to access new advancements will shrink.
- Active participation in **climate change reduction efforts** is a must, or this change in the human experience may never even come to pass.
- Especially if resources for an increase human population are not well-regulated and protected.
- **Flexible Social Security** policies should be on the minds of US leaders.
- It is unlikely that Social Security and other welfare programs will survive for long, even without an increase in the amount of time each citizen may draw from the program. Policymakers should be ready and able to adjust programs as the situation evolves.
- **Term limits** for policymakers are a must.
- Age is not a danger to democracy, but resistance to change and growth is. As leadership ages at the same rate as its constituents, for both parties to have basically no natural age limit due to death or illness is to ensure that power remains with the original generation.
- **Participation** in political processes by the upcoming generation is a valuable resource, and one more likely to be garnered if thought is given to limiting political terms.

