# How to Survive to 100

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## Outline

- What is aging
- Should you try to live to 100?  
- Genetic Factors  
- Environmental Factors  
- Lifestyle Factors  
- Interventions

## Theories of Aging

- Stochastic-aging is accumulated damage, oxidative stress (free radicals), glycation  
- Developmental-Genetic-aging is pre-programmed, telomere length  
- Maximum Lifespan Potential vs. Life Expectancy

## Is it reasonable to live to 100?

- Societally
  
- Individually
### Societally
- Inferno (Dan Brown)
- Logan’s Run
- Soylent Green
- Star Trek – Episode # 72

### Individually
- Ezekiel Emanuel
- Uwe Reinhardt
- Anecdotal evidence
- Hawaiian Lifespan study

### Hawaiian Lifespan Study
- 1292 Hawaiian men of Japanese ancestry, start age 71-82 with 21 year follow-up
- 77% survived to age 85 (34% healthy)
- 24% survived to age 95 (<1% healthy)
  - Bell et. Al. JAGS 62:880, 2014

### Correlates with Survival and Health
- ABI, BP, inflammatory markers,
- Education, cognitive score, marital status
- BMI, smoking, activity level, alcohol use
### Probability

<table>
<thead>
<tr>
<th></th>
<th>Risk factor -0</th>
<th>Risk factor 5 +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survive to 95</td>
<td>27%</td>
<td>7%</td>
</tr>
<tr>
<td>Survive to 100</td>
<td>4%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Healthy survival to 90</td>
<td>4%</td>
<td>0.01%</td>
</tr>
<tr>
<td>Healthy survival to 100</td>
<td>0.002%</td>
<td></td>
</tr>
</tbody>
</table>

### Early Hawaii Heart Program

Survival/ health predictors 45-68 yo
- High grip strength,
- normal weight, no smoking, modest alcohol
- normal glucose, normal TG, normal BP,
- high education, marriage

»Wilcox et al. JAMA 296:2343, 2006

### General Influences in Aging (Successful or not)

- Genetics
- Environment
- Lifestyle choices
- Medical Interventions

### Genetic Effects on Aging

- Longevity genes
- Shortevity genes
### Danish Twin study
- Evaluated 2872 pairs of same sex Danish twins
- Estimated 25% longevity (23-26) explained by genetics
  - Herskind et al. Human Genetics
  - 97:319 March 1996

### Longevity Genes
- FOX03A3
  - Hawaii, Italy, Germany, Dutch
- Apo E
- X Chromosome

### Genetics
Long lived populations develop:
CV disease, DM, dementia 10+ years after average groups

### Shortgevity genes
- Li-Fraumeni
- LPA gene
- Down’s
- Progeria
Genetics – Other Factors

- Attractive people live longer
- Tall people die sooner

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Environmental

- May explain 25-30% of variation in longevity
- Common predictors of successful aging:
  - Female gender
  - High SE status, married
  - being happy, good cognitive function
  - not smoking, exercise

British Civil Service (Whitehall) Study

- People in lowest levels of British Civil Service: have double the morbidity, triple the CV death of those in highest grades.
**Environmental Factors- Minimally Modifiable**

- Richest 1%
- Win Oscar, Nobel, Olympic medal
- Marry someone younger
- Breast-feed
- If male, have a daughter

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**Sleep and Longevity**

- 85+ yo compared with 20-30, 60-70 yo
- Have more WASO, shorter sleep, less efficiency, better standardized sleep and wake times, awaken earlier
- Have better lipid profiles
  
  »D. Mazotti et. al., Front Aging Neuroscience
  6:134 June 2014

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**Metabolic Rate**

- IDEAL aging in BLSA associated with significantly lower resting metabolic rate


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**General Influence in Aging**

Stephen Koesters, MD
Clinical Assistant Professor
Division of General Internal Medicine
The Ohio State University Wexner Medical Center
**General Influences in Aging**

- Genetics
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**Aging – Slowing the Process**

Mikhail V Blagosklonny - Why human lifespan is rapidly increasing: solving "longevity riddle" with "revealed-slow-aging hypothesis" Aging April 2010

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**Lifestyle Choices**

- Tobacco Use
- Weight/Obesity
- Diet
- Exercise/Activity
- Alcohol Use
- Vitamins & Supplements
- Cognitive/Psychological Strategies

**Tobacco Use**

- It’s just bad for you
- Life may be shortened by 11-28 minutes per cigarette.
- May impact longevity by as much as 10 years
- Quitting smoking appears to help at any age
- Not starting helps the most.
Weight - Calorie Restriction

- Studies in the 1930’s on rats
  - 20-40% increase in life expectancy.
- Primate models
  - Improved cholesterol levels, blood pressure, insulin levels.
- Biosphere 2 participants
  - 2 years in a controlled environment.
  - Biomarker findings similar to rats and primates

- Minnesota Starvation Experiment - 1940’s
  - Explore the effects of famine, 40-50% calorie deficit
  - Improvement in some biomarkers, but also depression, preoccupation with food, social isolation, poor concentration.

Weight - “Obesity Paradox”

- Multiple studies over the past decade have shown that there may be a survival benefit to a higher weight.
  - Diabetes Care August 2013 vol. 36 no. Supplement 2 S276-S281
- Systematic review that appeared in JAMA in 2013 concluded that all-cause mortality was not higher in overweight (BMI 25 to <30) and grade I obesity (BMI 30 to <35)
- Lowest risk around BMI of 25, and highest risk at either extreme of BMI.

Weight - Conclusions

- Calorie restriction without malnutrition may have some survival benefit in humans.
- Obesity at higher levels (BMI 35+) consistently associated with higher mortality
- “IDEAL” patients – Insight into Determinants of Exceptional Aging and Longevity patients in the Baltimore Longitudinal Study on Aging.
  - IDEAL patients had lower resting metabolic rate (RMR)
  - Lower RMR correlates with longevity.
  - Being fully functional and free of disease (except controlled HTN) correlates better with RMR than body composition
### Exercise
- Does not have to be daily
- 150 minutes or more each week is optimal
  - Aerobic activity
    - moderate intensity (enough to raise heart rate)
    - 50% of total time (75 minutes/week)
  - Muscle strengthening activity
    - working all major muscle groups
    - 2 more days a week
- Correlates with lower resting heart rate
- Improves cholesterol profiles
- Maintains muscle mass
- Reduces risk of some cancers (colon cancer, breast cancer, possibly others).
- Improves mental health/mood
- Improves sleep
- Independent of above effects may extend life by 6 months


### Diet/Nutrition
- Few studies that examine diet over prolonged period of time, especially in isolation from other lifestyle interventions.
- Most conclusions based on observations of populations and analysis of dietary habits of groups with known longevity (Sardinia - Italy, Okinawa - Japan, Loma Linda - California)
- Mediterranean Diet
  - One of the better researched
  - Appears to reduce risk of heart disease
  - Difficult to exclude effects of other lifestyle interventions
- Portion size matters
- More vegetables/fruits
- Less meats, especially processed meats
- Legumes/Nuts
- Whole grains/fiber
- Fish
- Low added sugar/salt
- High anti-oxidant foods – coffee
- Alcohol
Alcohol

• “Moderation”
  – Up to 1 drink/day for women and men > 65 years of age
  – Up to 2 drinks/day for all other men
  – Heavier use appears to tip scale toward more harm/less benefit (head & neck cancer, breast cancer)

• Benefits of “moderation”
  – Raises HDL level
  – Improves sensitivity to insulin
  – Decreases blood clotting (in a beneficial way)

Vitamin & Supplements

• Lots of claims, little data.
• Iowa Women’s Health Study published 2011 in JAMA suggested increased mortality risk of some common supplements, most notably iron.

• 2012 Cochrane review of common antioxidants found no benefit in prevention, and likely increased mortality with beta carotene, vitamin E and possibly vitamin A supplementation.
  » Cochrane Database of Systematic Reviews 2012, Issue 3. Art. No.: CD007176. DOI:

Vitamins/Supplements - Conclusions

• Malnutrition is harmful - correction of deficiencies is important.
• Optimization of vitamins/micronutrients likely beneficial. Still working on determining optimal levels of some vitamins.
• Excess supplements/Mega doses offer no clear benefit and might cause harm

Tobacco, Exercise, Diet, Alcohol

• Those who are unfavorable in all categories
  – At age 40:
    • May reduce life by 17 years (man) or 14 year (woman).
  – At age 75:
    • the 10 year mortality rate is nearly double
• Tobacco use appear to be dominant risk factor
• Other appear to be more equal in effect
Cognitive/Psychological Strategies

• Educate yourself
  – Strong benefit through at least high school
  – Additional benefit to college or beyond
• Continue to learn new skills
• Stay informed
• Continue intellectual stimulation into retirement

“100 Ways to Live to 100” www.huffingtonpost.com 09/23/2013

Positive Affect
Adults who scored highest for a positive affect had a death rate 50% lower than those who scored lowest over 5 years. Steptoe et al, PNAS 108(45) 18244-8, 2011

Smile
Bigger smiles, longer life?

“100 Ways to Live to 100” www.huffingtonpost.com 09/23/2013

Cognitive and Psychological Strategies

Laugh
Found to be a key indicator of well being in older adults
Think well of yourself
People who rate their health as good have lower risk of death.

“100 Ways to Live to 100” www.huffingtonpost.com 09/23/2013

Cognitive and Psychological Strategies

• Be Conscientious
  – Think about death
  – Choose healthy habits,
  – Prioritize own health
  – “Pessimistic enough to care”

“100 Ways to Live to 100” www.huffingtonpost.com 09/23/2013
Cognitive and Psychological Strategies

- Deal with Stress
  - Be resilient
  - Meditate
  - Exercise
  - Take Vacations
  - Have a pet

“100 Ways to Live to 100” www.huffingtonpost.com 09/23/2013

Find a Purpose

- Have a reason to live
- Have a spiritual life
- Volunteer
- Mentor younger individuals
- Turn off the TV

“100 Ways to Live to 100” www.huffingtonpost.com 09/23/2013

Fun Family Facts

- Get married
- But don’t argue
- And don’t stay in bad marriage
- Have kids
- But stop at 2
- Dads - have a daughter
- Moms - have twins

“100 Ways to Live to 100” www.huffingtonpost.com 09/23/2013

Other “Fun” ways to live longer

- Shop a bit more
  - People who shop frequently live longer
- Move to Hawaii
  - Or North Dakota
  - Or to the mountains
- Take a siesta
- Live in a blue state
- Get Busy
  - Men who have sex more often have a lower rate of CAD
  - Women who enjoy sex may live up to 8 years longer

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Aging – Medical Intervention

Mikhail V Blagosklonny - Why human lifespan is rapidly increasing: solving "longevity riddle" with "revealed-slow-aging hypothesis" Aging April 2010

Primary Care Considerations

- Counseling and education on Lifestyle measure previously discussed (Tobacco, Exercise, etc)
- Immunizations
- Screening Tests
  - Extensive guidelines from US Preventive Services Task Force
  - Aimed at preventing or detecting conditions early

Managing Conditions

- Conditions easy to detect through physical exam or lab screening
- HTN, Hyperlipidemia, Diabetes management
- Clear guidelines based on studies/data and calculated overall risk
- Studies support reduction in mortality when managed well
Medical Procedures

- Cardiac Interventions – angioplasty, stents, bypass grafts, valve replacement surgery.
- Dialysis for end stage renal disease, kidney transplants
- Cancer Treatments
- Surgery – appendectomies, gall bladder removal.

Effects on Life Expectancy

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Target Population</th>
<th>Gain in Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccines</td>
<td>Infant/Child/Adolescent</td>
<td>0.7 months</td>
</tr>
<tr>
<td>Moderate Exercise</td>
<td>Adults</td>
<td>6.2 months</td>
</tr>
<tr>
<td>Quitting Smoking</td>
<td>Adults</td>
<td>28-34 months</td>
</tr>
<tr>
<td>Pap Smears</td>
<td>Adult Women</td>
<td>3.2 months</td>
</tr>
<tr>
<td>Mammograms</td>
<td>Adult Women</td>
<td>0.8-3.1 months</td>
</tr>
<tr>
<td>Colon Cancer Screening</td>
<td>Adults &gt; age 50</td>
<td>2.5 months</td>
</tr>
</tbody>
</table>

Wright et al. NEJM: 339(6) 380-386, 1998

Negative Impacts of Medical Care

- Adverse outcomes that shorten life
- Medical Errors
- Adverse drug reactions
- Nosocomial infections
- Surgical Complications

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<tr>
<td>Treat HTN</td>
<td>DBP &gt; 105</td>
<td>66 months</td>
</tr>
<tr>
<td>Treat high cholesterol</td>
<td>Total cholesterol &gt; 300</td>
<td>50-76 months</td>
</tr>
<tr>
<td>Cardiac stent placement</td>
<td>Diagnosed CAD</td>
<td>1-14 months</td>
</tr>
<tr>
<td>Defibrillator placement</td>
<td>Recurrent ventricular arrhythmias</td>
<td>28-34 months</td>
</tr>
<tr>
<td>Prophylactic Mastectomy</td>
<td>BRCA-1 or 2 positive</td>
<td>36-46 months</td>
</tr>
<tr>
<td>Appendectomy</td>
<td>Suspected appendicitis</td>
<td>9-31 months</td>
</tr>
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Wright et al. NEJM: 339(6) 380-386, 1998
### Summary of Impact on Life Expectancy

<table>
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<th>Event</th>
<th>Description</th>
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<tbody>
<tr>
<td>• Difficult to determine precise impact of medical care.</td>
<td></td>
</tr>
<tr>
<td>• Gain of 23 years in life expectancy in first half of 20th century largely attributed to 'mastery of infection'.</td>
<td>J Lederberg, International Herald Tribune, 1996</td>
</tr>
<tr>
<td>• Gain of 7.5 years in life expectancy in second half of 20th century. Estimated that about 50% of that due to improved medical care, such as gains from better management of chronic disease that is amenable to treatment.</td>
<td>JP Bunker, J Roy Coll Physicians 1995; 29:105-12</td>
</tr>
<tr>
<td>• Some of the most significant gains are in quality of life (e.g. treatment of cataracts)</td>
<td></td>
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### Aging – Medical Intervention

![Diagram](image)

Mikhail V Blagosklonny - Why human lifespan is rapidly increasing: solving "longevity riddle" with "revealed-slow-aging hypothesis" Aging April 2010

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"We have to age, but we can, to some extent, add years to life, and to a far greater extent, add life to years”

- David Katz, M.D.