What’s the difference between Life Expectancy and Lifespan

- **Life expectancy**
  - Average number of years individuals in a specific population are expected to live
  - Increased dramatically over the twentieth century

- **Lifespan**
  - Span of time between birth and death for an individual
  - Modest gains in lifespan over the last century
The Aging U.S. Population

- During the next 25 years, the population of Americans 65 years or older will double
  - Longer lifespans
  - Aging baby boomers
Life expectancy in US increased dramatically in 20\textsuperscript{th} century

*Primarily due to decreased infant mortality
More modest gains in life expectancy since 1900 for those surviving to adulthood

– 9 additional years for women
– 5 additional years for men

• If an individual lives to age 65 current expected life expectancy beyond that age:
  – Women 20.5 years
  – Men 18 years

• Major factors responsible:
  – Decrease in prevalence of smoking
  – Improved medical care

Widening Gap in U.S. Life Expectancy

https://directorsblog.nih.gov/2017/05/16/widening-gap-in-u-s-life-expectancy/
Life expectancy, 2015
Shown is period life expectancy at birth. This corresponds to an estimate of the average number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

Source: Clio-Infra estimates until 1949; UN Population Division from 1950 to 2015
OurWorldInData.org/life-expectancy • CC BY
The Frenchwoman Jeanne Louise Calment lived to a verified age of 122. She was famous for her sense of humor and her love of eating chocolate. She died in 1997.
World Life Expectancy

How long can we expect to live?

https://www.bmj.com/content/346/bmj.f331
For this table, the period life expectancy at a given age is the average remaining number of years expected prior to death for a person at that exact age, born on January 1, using the mortality rates for 2016 over the course of his or her remaining life.

Period Life Table, 2016

<table>
<thead>
<tr>
<th>Exact age</th>
<th>Male Life expectancy</th>
<th>Female Life expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>11.18</td>
<td>12.97</td>
</tr>
<tr>
<td>76</td>
<td>10.58</td>
<td>12.29</td>
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<tr>
<td>77</td>
<td>10.00</td>
<td>11.62</td>
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<tr>
<td>78</td>
<td>9.43</td>
<td>10.98</td>
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<td>79</td>
<td>8.88</td>
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<td>80</td>
<td>8.34</td>
<td>9.74</td>
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<tr>
<td>81</td>
<td>7.82</td>
<td>9.15</td>
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<tr>
<td>82</td>
<td>7.32</td>
<td>8.58</td>
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<tr>
<td>83</td>
<td>6.84</td>
<td>8.04</td>
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<td>84</td>
<td>6.38</td>
<td>7.51</td>
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<td>85</td>
<td>5.94</td>
<td>7.01</td>
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<tr>
<td>86</td>
<td>5.52</td>
<td>6.53</td>
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<tr>
<td>87</td>
<td>5.12</td>
<td>6.07</td>
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<tr>
<td>88</td>
<td>4.75</td>
<td>5.64</td>
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<tr>
<td>89</td>
<td>4.40</td>
<td>5.23</td>
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<td>90</td>
<td>4.08</td>
<td>4.85</td>
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<td>91</td>
<td>3.78</td>
<td>4.50</td>
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<td>92</td>
<td>3.50</td>
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<td>93</td>
<td>3.25</td>
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<td>94</td>
<td>3.03</td>
<td>3.61</td>
</tr>
<tr>
<td>95</td>
<td>2.83</td>
<td>3.37</td>
</tr>
</tbody>
</table>

https://www.ssa.gov/oact/STATS/table4c6.html
Factors That Influence Lifespan

• Disease
  – Heart disease
  – Cancer
  – Diabetes

• Subtle influences
  – Education
  – Race
  – Socioeconomic status
Blue Zones

- Areas with increased longevity
  - Have a higher number of individuals who live to be at least 100 years old
  - Many are isolated island or mountain communities where age-old customs remain intact and where migration into and out of the area is rare
NEW YORK TIMES BESTSELLER

“A must-read if you want to stay young!”
—MEMHET C. OZ, M.D.

THE
Blue Zones
SECOND EDITION

9 POWER LESSONS FOR LIVING LONGER
from the people who’ve lived the longest

DAN BUETTNER
Author of Thrive

BONUS: Action Plan Included

https://www.bluezones.com/
Loma Linda, CA: Clues for Longevity from Studying the Adventist Lifestyle

- Live longer on average
- Men: 7 additional years       Women: 4½ additional years
## Expected Length of Life

### Expected Length of Life at Birth and at the Age of 65 Years
(California Adventists Compared with International Population)

<table>
<thead>
<tr>
<th>Country (Year)</th>
<th>Length of Life (Years)</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At Birth</td>
<td>At Age 65</td>
<td>At Birth</td>
</tr>
<tr>
<td>Australia (1990)</td>
<td>73.9</td>
<td>15.2</td>
<td>80.0</td>
</tr>
<tr>
<td>Canada (1985–1987)</td>
<td>73.0</td>
<td>14.9</td>
<td>79.7</td>
</tr>
<tr>
<td>Denmark (1989–1990)</td>
<td>72.0</td>
<td>14.1</td>
<td>77.7</td>
</tr>
<tr>
<td>Finland (1989)</td>
<td>70.9</td>
<td>13.8</td>
<td>78.9</td>
</tr>
<tr>
<td>Iceland (1989–1990)</td>
<td>75.7</td>
<td>16.1</td>
<td>80.3</td>
</tr>
<tr>
<td>Japan (1990)</td>
<td>75.9</td>
<td>16.2</td>
<td>81.3</td>
</tr>
<tr>
<td>New Zealand (1987–1989)</td>
<td>71.6</td>
<td>14.1</td>
<td>77.6</td>
</tr>
<tr>
<td>Norway (1990)</td>
<td>73.4</td>
<td>14.6</td>
<td>79.8</td>
</tr>
<tr>
<td>United Kingdom (1985–1987)</td>
<td>71.9</td>
<td>13.4</td>
<td>77.6</td>
</tr>
<tr>
<td>United States (1990)</td>
<td>73.0</td>
<td>14.9</td>
<td>79.7</td>
</tr>
<tr>
<td>Vegetarians</td>
<td>78.5</td>
<td>19.1</td>
<td>82.3</td>
</tr>
</tbody>
</table>

*Hazards for those aged 0–29 years are those from California State data, as data for these ages are not available for Adventists. Non-Adventist data are taken from international longevity comparisons (1992).

Infographic G.11
Seventh-Day Adventist Communities
Several key behaviors and lifestyle choices

- Physically active
- Have a healthy weight
- They don’t smoke

- They rarely drink alcohol
- Many are vegetarians or vegans
  - Consume nuts regularly
Blue Zone Secrets

- Nutrition
  - Legumes and nuts
- Activity
- Psychosocial factors
  - Social connectedness
  - Having a plan or purpose
POWER 9
Nine healthy lifestyle habits shared by people who've lived the longest.
90+ Study

- [http://www.mind.uci.edu/research-studies/90plus-study/](http://www.mind.uci.edu/research-studies/90plus-study/)
- Initiated in 2003 to study the oldest-old, the fastest growing age group in the United States
- One of the largest studies of the oldest-old in the world
- More than 1,600 people have enrolled
- Because little is known about people who achieve this milestone, the remarkable increase in the number of oldest-old presents a public health priority to promote the quality as well as the quantity of life.
Goals of the 90+ Study

• Determine factors associated with longevity: What makes people live to age 90 and beyond? What types of food, activities or lifestyles are associated with living longer?

• Examine the epidemiology of dementia in the oldest-old: How many people aged 90 and older have dementia? How many become demented each year? What are ways to remain dementia-free into your 90s?

• Examine rates of cognitive and functional decline in the oldest-old: How do memory loss and disability affect those in their 90s? How can people prevent memory loss and disability at this age?

• Examine clinical pathological correlations in the oldest-old: Do the brains of people in their 90s show evidence of memory loss and dementia? Do people with dementia have differences in their brains that can be detected and treated? Determining Modifiable Risk Factors for Mortality and Dementia: What kinds of things can people change in their lives to live longer? Can people change their risk of dementia through diet, exercise or supplements?
Major Findings of the 90+ Study

- Researchers from *The 90+ Study* have published many scientific papers in premier journals. Some of the major findings are:
  - People who drank moderate amounts of alcohol or coffee lived longer than those who abstained.
  - People who were overweight in their 70s lived longer than normal or underweight people did.
  - Over 40% of people aged 90 and older suffer from dementia while almost 80% are disabled. Both are more common in women than men.
  - About half of people with dementia over age 90 do not have sufficient neuropathology in their brain to explain their cognitive loss.
  - People aged 90 and older with an APOE2 gene are less likely to have clinical Alzheimer’s dementia, but are much more likely to have Alzheimer’s neuropathology in their brains.
“My belly is a vital part of my 401(k) plan. I may have to live off this fat when I retire!”
Energy Needs and Physical Activity

• Energy needs decrease with aging
  – Older adults are less physically active
    • Reduced activity leads to sarcopenia
    • Physical activity can offset losses in muscle mass
• Other nutrient needs remain similar to those of younger adults
  – Need more nutrient-dense foods
Challenges to Healthy Aging

- Various obstacles may impair older adults’ ability to meet nutrient requirements
You've got to save for retirement and get more calcium into your diet. I've got to make time for merriment, get more kicks, and forget about my diet.
Common Nutrition-Related Conditions in Older Adults

**Age-related macular degeneration:** Leading cause of vision loss with aging. Consuming a high-dose supplement containing vitamins C and E, zinc, copper, and the phytochemicals lutein and zeaxanthin can slow its progression.

**Sarcopenia:** Involuntary loss of lean body mass in the elderly typically caused by reduced levels of physical activity; less than optimal protein intake may also be a contributing factor.

**Bacterial overgrowth:** Decreased gastrointestinal tract motility and hydrochloric acid production increase the bacterial population in the small intestine and may increase GI symptoms and reduce the absorption of some nutrients.

**Osteoporosis:** Lack of adequate weight-bearing exercise and inadequate intake of vitamin D and calcium lead to a loss of bone mass, increasing the risk of bone breakage.

**Dementia:** High-fat diets and obesity may increase the risk of dementia. Plant-based diets high in a variety of phytochemicals appear to reduce the risk. Adequate intake of vitamins B6, B12, and folate has been found to reduce age-related cognitive decline in some studies.

**Impaired immune function:** Aging causes a natural decline in immune function that may be exacerbated by protein, zinc, or vitamin D deficiencies; increased susceptibility to foodborne illnesses.

**Atrophic gastritis:** Caused by an autoimmune disorder that destroys cells in the stomach that produce gastric acid and intrinsic factor needed for absorption of vitamin B12. Adequate gastric acid is also necessary for the efficient absorption of several minerals.

**Diverticulosis:** May affect 50% of adults older than 60. Develops when tiny pockets are formed when the lining of the colon protrudes outward through weak spots in the colon wall.


Photo credit: STEEX/Getty Images
Nutrient Recommendations for Seniors

- **Protein**
  - Consumption of plant proteins emphasized

- **Fluids**
  - Added emphasis on getting enough

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*Infographic G.6*
Adults over 65 benefit from slightly higher protein intake

• Protein intake of 1.2 g/kg of body weight/day is beneficial
  • Reduce loss of lean body mass
  • Improve functionality
  • Reduce risk of disability and death
  • Particularly when combined with resistance training program
  • Maximized with emphasis on plant-based foods
Nutrient Recommendations for Seniors: Micronutrients

**Calcium**
Decreased hydrochloric acid production decreases calcium absorption. To promote bone health, the RDA for calcium increases from 1000 mg/day at age 51 for women and age 71 for men.

**Vitamin D**
Because individuals often get outside less often as they age and the conversion of cholesterol to vitamin D is less efficient, the RDA for vitamin D increases 33% for both men and women at age 71.

Nutrient Recommendations for Seniors: B Vitamins

**Vitamin B6**
The RDA for vitamin B6 increases at age 51. Low vitamin B6 status in the elderly is associated with an increased risk of cognitive decline and depression.

**Vitamin B12**
Reduced production of gastric acid is common in the elderly, which decreases the absorption of naturally occurring vitamin B12. It is recommended that adults older than 60 years of age meet their needs for vitamin B12 through fortified foods or supplements, which do not depend on gastric acid for absorption.

Other Nutrient Recommendations for Seniors

• Omega-3 fatty acids
  – May reduce symptoms of rheumatoid arthritis
  – May slow the progression of age-related macular degeneration
  – May reduce the risk of Alzheimer disease

Infographic G.6

Different Vitamin and Mineral Recommendations for People Over 50 (2015)

- The Dietary Guidelines for Americans, 2015-2020 recommend how much of each vitamin and mineral men and women of different ages need. Sometimes, too much of a vitamin or mineral can be harmful. Most, if not all, of your daily vitamins and minerals should come from food.

**Vitamin B12**—2.4 mcg (micrograms) each day. If you are taking medicine for acid reflux, you might need a different form, which your healthcare provider can give you.

**Calcium**—Women over age 50 need 1,200 mg (milligrams) each day. Men need 1,000 mg between age 51 and 70 and 1,200 mg after 70, but not more than 2,000 mg a day.

**Vitamin D**—600 IU (International Units) for people age 51 to 70 and 800 IU for those over 70, but not more than 4,000 IU each day.

**Vitamin B6**—1.7 mg for men and 1.5 mg for women each day.

When thinking about whether you need more of a vitamin or mineral, think about how much of each nutrient you get from food and drinks, as well as from any supplements you take. Check with a doctor or dietitian to learn whether you need to supplement your diet.
Examples Multivitamin-mineral supplements for age 50+

### Supplement Facts

<table>
<thead>
<tr>
<th>Serving Size 1 Tablet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amount Per Serving</strong></td>
</tr>
<tr>
<td>Vitamin A 3,500 IU</td>
</tr>
<tr>
<td>(29% as Beta-Carotene)</td>
</tr>
<tr>
<td>Vitamin C 120 mg</td>
</tr>
<tr>
<td>Vitamin D 1,000 IU</td>
</tr>
<tr>
<td>Vitamin E 60 IU</td>
</tr>
<tr>
<td>Vitamin K 60 mcg</td>
</tr>
<tr>
<td>Thiamin 1.5 mg</td>
</tr>
<tr>
<td>Riboflavin 1.7 mg</td>
</tr>
<tr>
<td>Niacin 20 mg</td>
</tr>
<tr>
<td>Vitamin B6 6 mg</td>
</tr>
<tr>
<td>Folic Acid 300 mcg</td>
</tr>
<tr>
<td>Vitamin B12 100 mcg</td>
</tr>
<tr>
<td>Biotin 30 mcg</td>
</tr>
<tr>
<td>Pantothenic Acid 10 mg</td>
</tr>
<tr>
<td>Calcium 210 mg</td>
</tr>
<tr>
<td>Phosphorus 20 mg</td>
</tr>
<tr>
<td>Iodine 150 mcg</td>
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<tr>
<td>Magnesium 75 mg</td>
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<td>Zinc 15 mg</td>
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<tr>
<td>Selenium 21 mcg</td>
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<tr>
<td>Copper 0.5 mg</td>
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<tr>
<td>Manganese 4 mg</td>
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<tr>
<td>Chromium 60 mcg</td>
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<tr>
<td>Molybdenum 50 mcg</td>
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<tr>
<td>Chloride 72 mg</td>
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<tr>
<td>Potassium 80 mg</td>
</tr>
<tr>
<td>Nickel 5 mcg</td>
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<tr>
<td>Silicon 2 mg</td>
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<tr>
<td>Vanadium 10 mcg</td>
</tr>
<tr>
<td>Lutein 300 mcg</td>
</tr>
<tr>
<td>Lycopene 600 mcg</td>
</tr>
</tbody>
</table>

*Daily Value (DV) not established.

**Ingredients:** Calcium Carbonate, Potassium Chloride, Dicalcium Phosphate, Magnesium Oxide, Ascorbic Acid (Vitamin C), d-Alphatocopherol Acetate (Vitamin E), Zinc Sucrose (as Zinc), Copper Oxide, Sodium Methylsilicate (as Sodium, Magnesium, Manganese, Iron, Zinc, Calcium, Molybdenum), Folic Acid, Niacinamide, Calcium Pantothenate, Vitamin B12, Choline Bitartrate, Pyridoxine HCl (as Vitamin B6), Thiamine Mononitrate (as Vitamin B1), Riboflavin, Pantothenic Acid, Manganese Sulfate, Magnesium Stearate, Polyethylene Glycol, Pectin, Hydroxypropyl cellulose (as N. F. B. I.), Thiopanate Methyl (as N. F. B. I.), Medium chain triglycerides, and silicon dioxide.
Best Diet to Delay Age-Related Disease

- Sufficient but not excessive calories
- Low in saturated fat
- High in whole-grain cereals, legumes, fruits, and vegetables
What's so bad about preservatives in food? At my age I need all the preservatives I can get!
Staying active and maintaining adequate skeletal muscle mass crucial for health

During periods of stress, amino acids are released as muscle proteins are broken down.

These amino acids are used by other cells and organs to synthesize proteins that are required for life-sustaining functions.

Adequate skeletal muscle reduces the risk of various chronic diseases.
- Improved glucose uptake — Reduced risk of type 2 diabetes
- Improved exercise capacity — Reduced risk of osteoporosis
- Increased energy expenditure — Reduced risk of obesity

Photo: MJTH/Shutterstock
Infographic G.9
“At the age of 105, the French amateur cyclist and world-record holder Robert Marchand is more aerobically fit than most 50-year-olds — and appears to be getting even fitter as he ages....”

- https://www.nytimes.com/2017/02/08/well/move/lessons-on-aging-well-from-a-105-year-old-cyclist.html?_r=0
Active Aging

EXERCISE OPPORTUNITIES FOR SENIORS

Leisure Time Fun
- Walking
- Dancing
- Gardening
- Hiking
- Swimming
- Sports
- Exercise classes

Transportation
- Walking

Domestic
- Household chores
- Yard work
- Child care

BENEFITS OF EXERCISE FOR SENIORS

Improved Overall Functioning
- Lower risk of falling
- Reduced risk of physical limitations and role limitations

Lower Rates of All-Cause Mortality
- Healthier body mass and composition
- Higher cardiorespiratory and muscular fitness
- Reduced risk of type 2 diabetes
- Enhanced bone health

Mental Health Improvements
- Better cognitive function


Photo credits (top to bottom): Tom Wang/Shutterstock, Monkey Business Images/Shutterstock, Monkey Business Images/Shutterstock
MyPlate for Older Adults

Fruits & Vegetables
Whole fruits and vegetables are rich in important nutrients and fiber. Choose fruits and vegetables with deeply colored flesh. Choose canned varieties that are packed in their own juices or low-sodium.

Healthy Oils
Liquid vegetable oils and soft margarines provide important fatty acids and some fat-soluble vitamins.

Herbs & Spices
Use a variety of herbs and spices to enhance flavor of foods and reduce the need to add salt.

Fluids
Drink plenty of fluids. Fluids can come from water, tea, coffee, soups, and fruits and vegetables.

Grains
Whole grain and fortified foods are good sources of fiber and B vitamins.

Dairy
Fat-free and low-fat milk, cheeses and yogurts provide protein, calcium and other important nutrients.

Protein
Protein rich foods provide many important nutrients. Choose a variety including nuts, beans, fish, lean meat and poultry.

Remember to Stay Active!
Additional Resources Nutrition and Aging

• ChooseMyPlate.gov
  – https://www.choosemyplate.gov/older-adults
  – https://hnrcat acompanies tufts.edu/myplate/

• Academy of Nutrition and Dietetics
  – https://www.eatright.org/health/wellness/healthy-aging/special-nutrient-needs-of-older-adults
  – https://www.eatright.org/health/wellness/healthy-aging/memory-boosting-foods
  – https://www.eatright.org/health/wellness/healthy-aging/nutrition-for-older-men

• National Institute on Aging
  – https://www.nia.nih.gov/health/healthy-eating
  – https://go4life.nia.nih.gov/stay-on-track/

• World Health Organization (WHO)
  – https://www.who.int/nutrition/topics/ageing/en/
Longevity and diet research and questions

• Healthy aging: The ultimate preventative medicine
• Macronutrients and caloric intake in health and longevity
• Promoting health and longevity through diet: from model organisms to humans
• What are the roles of calorie restriction and diet quality in promoting healthy longevity?
• Epigenetic linkage of aging, cancer and nutrition
Nutrition newsletters (you can trust)

• Nutrition Action Healthletter – Center for Science in Public Interest
  – https://cspinet.org/nutrition-action-healthletter

• Environmental Nutrition
  – https://universityhealthnews.com/subscription-offers/environmental-nutrition/

• Harvard School of Public Health
  – https://www.hsph.harvard.edu/nutritionsource/

• Tufts University Nutrition and Health Letter
  – https://www.nutritionletter.tufts.edu/
AnalyzeMyDiet diet and activity tracker

- [https://store.macmillanlearning.com/us/product/LaunchPad-Solo-for-AnalyzeMyDiet-Twelve-Months-Access/p/1319253857?searchText=launchpad%26%2323x20%3bsolo](https://store.macmillanlearning.com/us/product/LaunchPad-Solo-for-AnalyzeMyDiet-Twelve-Months-Access/p/1319253857?searchText=launchpad%26%2323x20%3bsolo)
- $15.99 for 12 month access
- Set up profile for personalized dietary recommendations
- Database of over 50,000 USDA and brand-name foods
- Generates reports comparing intake to recommended levels