

► **What Makes a Good Life?**

RAY MERRILL



Perhaps all of us have asked this question.

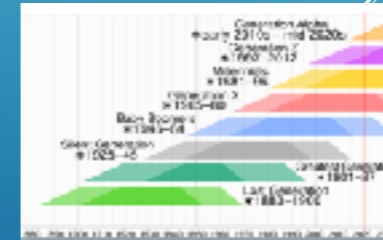
- ▶ If you were to invest now in your future best self, where would you put your time and energy?

**WHAT MAKES A GOOD LIFE?**

- ▶ Fame
- ▶ Wealth
- ▶ High Achievement



## WHAT MAKES A GOOD LIFE?



Perhaps your future desire is to have fame, wealth, high achievement. If these are your goals, you are not alone.

A large scale study published in the Journal of Personality and Social Psychology found that “recent generations are less likely to embrace community mindedness and are focusing more on money, image and fame.”

In the American Freshman survey, the proportion of students who said being wealthy was very important to them increased from 45 percent for baby boomers (surveyed between 1966 and 1978) to 70 percent for Generation Xers (surveyed between 1979 and 1999) and 75 percent for millennials (surveyed between 2000 and 2009).

[Recent generations focus more on fame, money than giving back \(apa.org\)](https://www.apa.org)

Full-time employed females in the U.S. work an average of 8.33 hours per day, while full-time employed males work an average of 9.09 hours per day.

U.S. workers work an average 435 more hours per year than German workers, 400 more hours per year than United Kingdom (UK) workers, 365 more hours per year than French workers, and 169 more hours per year than Japanese workers.

[The U.S. is the Most Overworked Nation in the World \(20somethingfinance.com\)](https://20somethingfinance.com)

- ▶ **People** who regularly spend about a quarter of their hours each day with family and friends are **12 times as likely to report feeling joyful rather than feeling stressed or anxious**. Gallup Poll
- ▶ Those who **fare the best** are those who value relationships with family, with friends, with community. Harvard Study of Adult Development

## WHAT MAKES A GOOD LIFE?

On the other hand, research has found that ...

Spending more time with family, friends, or community may require less screen time, reaching out to an old friend, forgiving someone. Holding grudges can be toxic.

I like this quote by Angela Buttimer, a psychotherapist: "When we hold onto grudges and resentment, it's like drinking poison and expecting the other person to get sick."

- ▶ The 75-year-old study on adult development by Harvard tracked the lives of 724 men.
- ▶ The study provides an unprecedented set of data on true happiness; what makes a good life.



**WHAT MAKES A GOOD LIFE?**

### 1. Harvard Cohort - Grant Study

- ▶ The participants for this study were chosen when they were around 19 years old. It is a group of **268 Caucasian men from Harvard (sophomores in 1938)**.

### 2. Boston Cohort - Glueck Study

- ▶ **456 Caucasian males from the neighborhoods of Boston** were selected at ages between 11-16 by Harvard Law School professors Sheldon and Eleanor Glueck.

▶

THE SAMPLE CONSISTS OF TWO UNIQUE GROUPS OF MEN RECRUITED IN THE 1930'S AND 1940'S:



The study involved asking year after year about their life, their home life, their health, their work, and so on, not knowing how their life would turn out. Less than 60 of these men are still alive. Since 1938 (sophomores at Harvard, group of boys from Boston's poorest neighborhoods). When started they received medical exams and families interviewed. Some climbed the social ladder from the bottom to the top, and others went in the other direction.

The Grant cohort study included four members who ran for the U.S. Senate. One served in a presidential Cabinet, and one served as President (John F. Kennedy). There was also a bestselling author.

16% dropped out.



1. **Questionnaires:** Every 2 years
2. **Health Information:** Every five years
3. **Interviews:** Every 5-10

## INFORMATION GATHERED

**Questionnaires:** Every 2 years, both the Grant and Glueck men completed questionnaires asking about their physical and mental health, marital quality, career or retirement enjoyment, and many other aspects of their lives.

**Health Information:** Every five years, health information was collected from the men and their physicians to assess their physical health.

**Interviews:** Many of the men from both groups have been interviewed every 5-10 years to document more in-depth information about their relationships, their careers, and their adjustment to aging.

▶ **Good Relationships Keep Us Happier and Healthier**

▶ **Three big lessons about relationships:**

1. **Social connections** are really good for us; loneliness kills.
2. **Quality of close relationships matter.** Those most satisfied in their relationship at age 50 were the healthiest at age 80. Good close relationships buffer us from the slings and arrows of getting old.
3. **Good relationships not only protect our bodies but protect our brains.** People in relationships who feel like they can't count on the other one have earlier memory decline.

## LESSONS LEARNED?



Lessons learned from the tens of thousands of pages of data generated on their lives are not about wealth, fame or working harder and harder, but about relationships.

Those more socially connected to family, to friends, to community, are happier, physically healthier, and live longer than those who are not socially connected.

People who are more isolated than they want to be from others are less happy, their health declines earlier in midlife, their brain functioning declines and they live shorter lives than people who are not lonely. More than three in five Americans **are lonely**, with more and more **people** reporting feeling like they are left out, poorly understood and lacking companionship. Living in the midst of conflict is really bad for our health.

Gathered information about the men at age 50. It wasn't their cholesterol at age 50 that predicted how they were going to grow old but how satisfied they were in their relationships. Those people in a relationship who feel like they can really count on their partner have memories that stay sharper, longer.

So, good relationships keep us happier and healthier.



- ▶ **Happiness is broad and it describes a wide range of positive emotions.**
  - ▶ **Contentment**
  - ▶ **Joy**
  - ▶ **Satisfaction**



**HAPPINESS AND HEALTH GO HAND IN HAND**

- ▶ Historically, health was defined as the absence of illness such as plague, cholera, and tuberculosis.
- ▶ In 1948 the World Health Organization definition of health

## HEALTH

Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.



- ▶ **Physical** – ability of the human body to function properly
- ▶ **Social** – Ability to have satisfying relationships
- ▶ **Mental** – Ability to think clearly, reason objectively, and act properly
- ▶ **Emotional** – Ability to cope, adjust, and adapt
- ▶ **Spiritual** – Something that comes from within like empathy, compassion, and love
- ▶ **Environmental** – The surroundings or conditions in which a person lives or operates



**MORE RECENTLY, HEALTH HAS BEEN  
DEFINED ACCORDING TO SIX DIMENSIONS**

Social connections really good for us (loneliness kills). The Harvard Study of Adult Development linked social health with other dimensions of health (e.g., physical, mental, and emotional).  
Good social relationships associated with better health; Buffers against poor health.  
Good social relationships protective against cognitive decline.

► Selected papers



**HARVARD STUDY OF ADULT DEVELOPMENT**

- ▶ We have considerable control over what contributes to healthy aging:
  - ▶ Weight
  - ▶ Exercise
  - ▶ Education
  - ▶ Abuse of cigarettes and alcohol destructive to relationships and health
  - ▶ “With hard work and/or therapy, our relationship with our spouse and our coping styles can be modified.”

## **SUCCESSFUL AGING**

HARVARD STUDY OF ADULT DEVELOPMENT

**Independent predictor variables (assessed before age 50)**

1. **Smoking: in pack years from 15-50**
2. **Alcohol abuse**
3. **Body mass index**
4. **Years of education (used only for core-city men)**
5. **Some regular exercise (college men only)**
6. **Stable marriage**
7. **Maturity of defenses**
8. **Depression**
9. **Parental social class**
10. **Warmth of childhood**
11. **Ancestral longevity**
12. **Stable childhood temperament**
13. **Objective disability**

- ▶ **Alcoholism is a disorder of great destructive power.**
  - ▶ Alcoholism was the **main cause of divorce** between the men and their wives.
  - ▶ Alcoholism **strongly correlates with neurosis and depression**, which tend to follow alcohol abuse, rather than precede it.
  - ▶ Alcoholism and associated cigarette smoking, was the single greatest **contributor to their early morbidity and death**.

**HARVARD STUDY OF ADULT DEVELOPMENT**

- ▶ Marital satisfaction **protects** older adults' happiness from daily fluctuations in perceived physical health.
- ▶ Social connections **promotes happiness** in older adults.

WHAT'S LOVE GOT TO DO WITH IT? SOCIAL FUNCTIONING, PERCEIVED HEALTH, AND DAILY HAPPINESS IN MARRIED OCTOGENERIANS

HARVARD STUDY OF ADULT DEVELOPMENT

Octogenarians – person in their 80s



- ▶ **More adaptive defenses in midlife were associated with better physical health at ages 70, 75, and 80.**
- ▶ **More adaptive defense mechanisms support the development of better relationships and social experiences, which in turn contributes to lasting health.**
- ▶ **Supports theory that defense maturity is important for building social relationships, which in turn contributes to better late-life physical health.**

### ADAPTIVE MIDLIFE DEFENSE MECHANISMS AND LATE-LIFE HEALTH

HARVARD STUDY OF ADULT DEVELOPMENT

Mature defenses (sublimation, suppression, anticipation, altruism, humor); intermediate/neurotic defenses (displacement, repression, reaction formation); or immature defenses (projection, passive aggression, acting out, denial).

Sublimation – Example of sublimation. Consider what might happen if you are overcome with anger. An emotional blow-up is one way of dealing with these feelings, but such expressions of emotion can be harmful. For instance, you might find yourself with damaged relationships and a reputation as a hothead.

Rather than fly off in a fit of rage, what if you channeled those angry emotions into some type of physical activity, such as cleaning your house? You might spend a few hours angrily scrubbing down your kitchen and bathrooms.

Once your feelings of frustration eventually subside, you are left with a positive result—a sparkling clean house. This is one example of how sublimation can transform negative impulses into behaviors that are less damaging and even productive.

Suppression - the conscious intentional exclusion from consciousness of a thought or feeling

Anticipation – Imagining how unexpected events may affect our plans. Anticipatory thinking lets us recognize and prepare for difficult challenges.

Altruism – Forgoing things that may bring personal benefits if they create costs for others. Helping someone despite personal costs or risks. Sharing resources even in the face of scarcity. Showing concern for someone else's well-being.

Humor – focusing on funny aspects of a painful situation

Displacement - Displacement is a defense mechanism that involves an individual transferring negative feelings from one person or thing to another. For example, a person who is angry at their boss may “take out” their anger on a family member by shouting at them.

Repression – Repression is the unconscious blocking of unpleasant emotions, impulses, memories, and thoughts from your conscious mind.

Reaction formation is a defense mechanism in which people express the opposite of their true feelings, sometimes to an exaggerated extent. A classic example is a young boy who bullies a young girl because, on a subconscious level, he's attracted to her.

Projection – A common example is a cheating spouse who suspects their partner is being unfaithful.

Passive aggression -Passive-aggressive behavior is a pattern of indirectly expressing negative feelings instead of openly addressing them. There's a disconnect between what a person who exhibits passive-aggressive behavior says and what he or she does.

Denial - ignoring the reality of a situation to avoid anxiety.

SST

Older adults have been found to preferentially pay attention to and recall positive stimuli and events. This positive bias is believed to help regulate the affective states of elderly individuals and is linked to better mood.

The literature says that older adults may actively use cognitive controls to spend less time than younger adults dwelling on negative information.

With regard to episodic memory, there is evidence that older adults remember a higher proportion of positive stimuli and a lower proportion of negative stimuli than younger adults.

- ▶ Less frequent use of avoidant defenses earlier in life corresponded with **better memory** later in life.
- ▶ More frequent engaging defenses in midlife predicted greater **life satisfaction** in older age (suggesting that facing life's uncomfortable aspects more squarely may enhance one's appreciation of life rather than detract from it).

FACING THE MUSIC OR BURYING OUR HEADS IN THE SAND?:  
ADAPTIVE EMOTION REGULATION IN MIDLIFE AND LATE LIFE

HARVARD STUDY OF ADULT DEVELOPMENT

- ▶ Secure and stable childhood positively correlated with perceived health at later ages
- ▶ Neuroticism at age 21 was negatively linked with perceived health at later ages
- ▶ Quality of childhood experience associated with neuroticism in adulthood AND with objective health in later life

**CHILDHOOD ENVIRONMENT AS A PREDICTOR OF PERCEIVED HEALTH STATUS IN LATE LIFE**

HARVARD STUDY OF ADULT DEVELOPMENT

Neuroticism is the trait **disposition to experience negative affects, including anger, anxiety, self-consciousness, irritability, emotional instability, and depression**

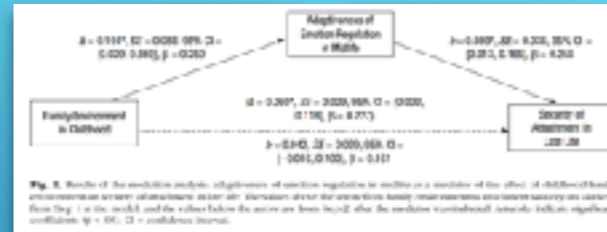
Quality of childhood experience associated with neuroticism in adulthood AND with objective health in later life. Beyond that, childhood environment positively correlated with perceived health in later life.

- ▶ Childhood adversity, operationalized as harsh parenting and/or lower social class, had a negative impact on positive aging.
- ▶ The inverse relation between childhood adversity and positive aging was partially mediated by the achievement of generativity in midlife.
- ▶ Generativity moderated the relation between childhood adversity and positive aging. Specifically, for men who did not achieve generativity in midlife, childhood adversity had an enduring inverse effect on positive aging, whereas generative older men were unaffected by childhood adversity

**CHILDHOOD ADVERSITY, MIDLIFE  
GENERATIVITY, AND LATER LIFE WELL-BEING**  
HARVARD STUDY OF ADULT DEVELOPMENT

Generativity means caring for and contributing to the life of the next generation. ... Generativity includes any activity that contributes to the development of others and to the life of the generations. **Caring for your children by guiding them through life** is an example of generativity. Volunteering, mentoring, engaging in community activism, and fostering other people's growth at work are additional examples of generativity.

- ▶ Links were found among quality of family environment in childhood, emotion-regulation strategies in midlife, and security of attachment in late life



**THE LONG REACH OF NURTURING FAMILY ENVIRONMENTS:  
LINKS WITH MIDLIFE EMOTION-REGULATORY STYLES AND  
LATE-LIFE SECURITY IN INTIMATE RELATIONSHIPS**

**HARVARD STUDY OF ADULT DEVELOPMENT**

Reliable, responsive parenting is thought to enable children to develop secure attachment, which is characterized by comfort with closeness and willingness to depend on other people. By contrast, unresponsive or inconsistent caregiving is thought to foster insecure attachment, which is manifested in anxiety about abandonment or avoidance of closeness.

Pathway: early experiences -> emotional regulation -> security of attachment (intimate relationships) later in life.

- ▶ Other Results
- ▶ The warmth of childhood relationship with mothers matters long into adulthood:
  - ▶ Men who had "warm" childhood relationships with their mothers **earned an average of \$87,000 more** a year than men whose mothers were uncaring.
  - ▶ Men who had poor childhood relationships with their mothers were much more likely to develop **dementia** when old.
  - ▶ Late in their professional lives, the men's boyhood relationships with their mothers—but not with their fathers—were associated with **effectiveness at work**.
- ▶ The warmth of childhood relationship with fathers correlated with:
  - ▶ Lower rates of adult **anxiety**.
  - ▶ Greater enjoyment on **vacations**.
  - ▶ Increased **"life satisfaction"** at age 75.
- ▶ Financial success depends on **warmth of relationships** and, above a certain level, not on intelligence.
  - ▶ Those who scored highest on measurements of "warm relationships" earned an average of \$141,000 a year more at their peak salaries (usually between ages 55 and 60).

## THE HARVARD STUDY OF ADULT DEVELOPMENT

- ▶ **Life Span** – theoretical limit on length of life
  - ▶ 115-120 years
- ▶ **Life Expectancy** – number of years an individual can expect to live
  - ▶ Can be calculated for any age
  - ▶ Based on year of birth and other factors
  - ▶ U.S. 2020 = 78.9 years



## LIVING LONG AND WELL

Gerontologists (people who study aging) generally consider 115 to 120 years to be the maximum limit of human life. However, most live about 2/3 of this. Why?





## FACTORS INFLUENCING LONGEVITY

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What factors influence longevity

From the Blue Zones Research: We learn most of the answers lie within their lifestyle and environment (The Danish Twin Study established that only about 20% of how long the average person lives is determined by genes).

## THE BLUE ZONES



PLACES WHERE PEOPLE LIVE THE LONGEST, AND ARE HEALTHIEST

Seventh Day Adventists highly concentrated in Loma Linda. They live 10 years longer than their North American counterparts.

- ▶ **Just move**
- ▶ **Purpose**
- ▶ **Downshift**
- ▶ **80% rule**
- ▶ **Eat mostly plants**
- ▶ **Wine at 5**
- ▶ **Belong**
- ▶ **Put loved ones first**
- ▶ **Hang with the right tribe**

## **POWER 9 – BLUE ZONES' LESSONS**

Just move – Several benefits of being physically active

Purpose – Building relationships gives purpose

Downshift – Be calm. Stress leads to chronic inflammation, which is related to every major age-related disease; find stress shedding strategies. Forgiveness, let things go ... Hawaii has the highest life expectancy.

80% rule – Stop eating when your stomach is 80% full. Difference between losing and gaining weight.

Eat mostly plants – Consider foods rich in antioxidants

Wine at 5 – Alternatives: pomegranate juice, cranberry juice, red or white grape juice, apple juice, lemon juice

Belong – faith-based community. Research shows that attending faith-based services four times per month will add 4-14 years of life expectancy

Put loved ones first. Take care of elderly parents, grandparents; commit to a life partner, etc. Being in a committed relationship adds up to 3 years of life expectancy.

Hang with the right tribe – be in social circles that favorably shape health behaviors. Framingham studies show that smoking, obesity, happiness, and even loneliness are contagious.

Demographic Research – Volume 30, Article 1

Demographic Abstract

**Life Expectancy among LDS and Non-LDS in Utah**

Ray M. Merrill<sup>1</sup>

**Abstract**

This paper compares life expectancy between members of the Church of Jesus Christ of Latter-day Saints (LDS or Mormons) and non-LDS in Utah. It examines the extent to which tobacco-related deaths explain variation in life expectancy between LDS and non-LDS.

Complete life table estimates were derived using conventional methods and cross-sectional data for white males and females from 1994–1995. Life expectancy was 77.0 for LDS males, 70.0 for non-LDS males, 82.0 for LDS females, and 76.0 for non-LDS females. For those alive at age 95, the remaining years of life expected were 3.2 for LDS males, 8.3 for non-LDS males, 11.3 for LDS females, and 7.1 for non-LDS females. Years of life expected increased more so among non-LDS after we removed deaths associated with tobacco use from the life table.

A comparison between LDS and non-LDS of the squared life expectancy estimates indicates that although differential tobacco use explains some of the higher life expectancy in LDS, it only accounts for about 1.2 years of the 7.0 year difference for males and 1.2 years of the 5.6 year difference for females. Higher life expectancy experienced among LDS not explained by tobacco-related deaths may be due to factors associated with religious activity in general, such as better physical health, better social support, and healthier lifestyle behaviors. Religious activity may also have an independent protective effect against mortality.

Comparative Study | [PubMed](#) | DOI: 10.1196/jepid.2004.10.011

**Cancer incidence among Mormons and non-Mormons in Utah (United States) 1995–1999**

Ray M. Merrill<sup>1</sup>, Joseph L. Lyon

Affiliations: [+ expand](#)

PMID: 15749115 | DOI: 10.1196/jepid.2004.10.011

**Abstract**

**Background:** Population-based Utah Cancer Registry data were linked with Letter to the Saint (LDS or Mormon) Church membership records to obtain site-specific cancer incidence for LDS and non-LDS populations in Utah during 1995–1999.

**Methods:** Analyses were based on 27,631 incident cases of cancer identified among whites. Restrictions to whites were made because of the small number of nonwhites (approximately 5% in the state during the study period). The direct method was used to age-adjust the rates to the 2000 US standard population.

**Results:** Significantly lower cancer incidence rates per 100,000 were observed among LDS compared with non-LDS males (257.2 vs. 321.0) and females (247.7 vs. 341.0). The lower rates are primarily explained by smoking-related cancers and female breast cancer. If the overall cancer incidence rate in LDS had occurred in the non-LDS population, 27% or 421 fewer cases would have occurred among males and 67% or 1,025 fewer cases would have occurred among females during the study period.

**Conclusions:** Given our current knowledge of risk factors for cancer, differences between LDS and non-LDS in smoking for males and smoking and sexual and reproductive behaviors in females primarily explain the lower risk of cancer in LDS populations.

## RELIGION AND HEALTH

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More on belonging. We see in these studies that belonging to a religious group extends life.

**RELIGION AND SOCIAL CIRCLES IMPACT  
SEVERAL FACTORS RELATED TO HEALTH**



- ▶ **The primary way to prevent death in the United States**
- ▶ **Men lose 13.2 years. Women lose 14.5 years.**
- ▶ **In older people, smoking:**
  - ▶ ↓ **bone density in postmenopausal women**
  - ▶ ↑ **risk of hip fractures**
  - ▶ ↑ **risk of cataracts**
  - ▶ ↑ **risk of COPD**
- ▶ **Quitting smoking decreases the risks of certain chronic diseases**
  - ▶ **65-year old smoker who quits gains two years of life expectancy**

## **CIGARETTE SMOKING**

The Word of Wisdom says that Tobacco is not for the body, or the belly.

- ▶ **Light consumption (1-2 drinks/day)**
  - ▶ May be associated with cardiovascular benefits
- ▶ **Heavy drinking (3+ drinks/day)**
  - ▶ Associated with reduced life expectancy
- ▶ **However, potential negative social impact of alcohol abuse: family, domestic and sexual violence, homicide, victimization, risky behavior and criminal activity.**
  - ▶ In 2016, 22% of Australians had ever been verbally or physically abused by, or put in fear by someone, under the influence of alcohol.



## ALCOHOL USE

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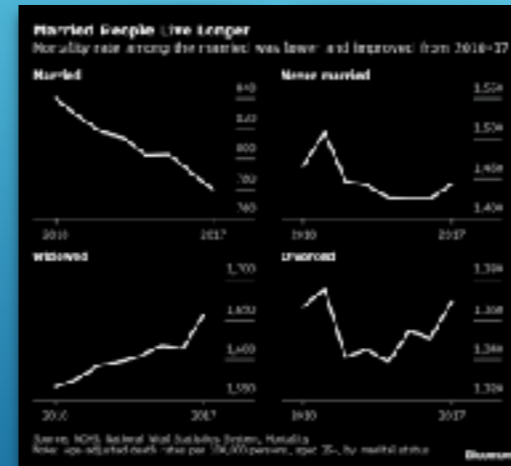
Religiously active Latter-day Saints do not drink alcohol.

Nevertheless, if you're in good shape, moderate drinking makes you 25% to 40% less likely to have a heart attack, stroke, or hardened arteries. This may be in part because small amounts of alcohol can raise your HDL ("good" cholesterol) levels. Heavy drinking, on the other hand, increases your risk of heart disease.

Similar benefits drinking pomegranate juice or cranberry juice

- ▶ People married at the time of their deaths lived longer than those widowed or divorced
- ▶ Marriage may promote longevity:
  - ▶ Support & reduction of stress
  - ▶ Promotes healthful habits

## MARITAL STATUS



The church promotes marriage and family.



- ▶ Weight gain
  - ▶ Losing weight also increases HDL.
  - ▶ Exercise works to eliminate the dangerous, fatty LDL cholesterol by increasing HDL cholesterol.
- ▶ Obesity
- ▶ Imbalance
- ▶ Falls
- ▶ Muscle decline
- ▶ Cognitive decline
- ▶ Hypertension
- ▶ Peripheral vascular disease
- ▶ Type 2 Diabetes
- ▶ Osteoporosis (porous bones)
- ▶ Arthritis
- ▶ Respiratory Diseases
- ▶ Low back pain
- ▶ Depression



## PHYSICAL ACTIVITY

We are taught that our bodies are temples and that we should take care of them.

High level of physical activity associated with low death rates from all causes.

Exercise strengthens the heart, decreases the likelihood of obesity, increases the good cholesterol in the blood.

Back pain is one of the most common medical problems, affecting **8 out of 10 people at some point during their lives**.

Exercise has some direct stress-busting benefits. It pumps up your **endorphins** (brain's feel-good neurotransmitters).

Reduces stress. Chronic exposure to stressors causes endocrine and immune system dysfunction that contributes to sustained low-grade inflammation

- ▶ **Personality traits may influence longevity**
  - ▶ **Negative personality**
    - ▶ **High blood pressure**
    - ▶ **May also chose life-shortening behaviors**
  - ▶ **A calm person may live longer (Harvard Study of Adult Development)**
- ▶ **Personality may affect hormones, immune function, cholesterol level, etc.**

## **PSYCHOLOGICAL FACTORS**

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The Latter-day Saint Church teaches that we should have faith, not fear, that we should forgive, and that we should trust in God.

May help to engage in meditation, eat foods that modify stress pathways (e.g., CBD gummies, walnuts), physical activity (e.g., simple walking helps to relieve stress and fosters calm by releasing helpful chemicals in your brain), put life in perspective (do not focus on need to succeed; accept life as it comes).

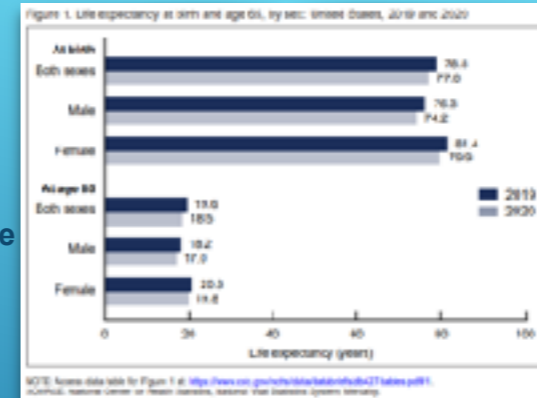
- ▶ High education and occupation level are correlated with long life
  - ▶ People in middle & upper classes live longer
  - ▶ More income, more money spent on health, better living conditions
  - ▶ Higher education may mean more healthful habits

## SOCIAL CLASS: EDUCATION, INCOME, AND OCCUPATION

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The Latter-day Saint Church teaches that education is an important part of our Heavenly Father's plan to help us become more like Him. Obtaining an education **provides understanding and skills that can help us develop self-reliance, provide for our future families, and be of greater service to the Church and the world.**

- ▶ Females live longer than males
  - ▶ Average life expectancy in the U.S.
  - ▶ 5.7-year difference between male and female
  - ▶ 1.8-year at age 65
- ▶ Males participate in more risky behavior
- ▶ X Chromosome
- ▶ Hormonal influences
  - ▶ Example – estrogen protective against heart disease.



## SEX

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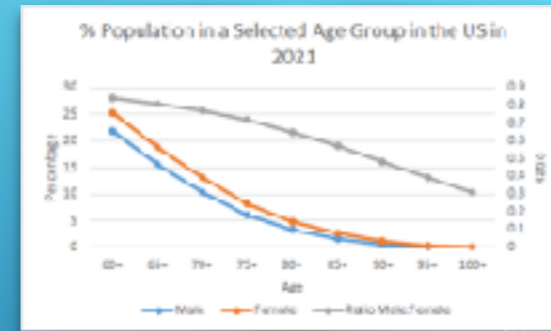
**Most Latter-day Saints are aware of the responsibility to care for elderly loved ones** and the blessings that accompany such service. There tends to be more elderly women because ...

Females live longer than males. The X chromosome (females have two, males have one) carries important genes for immune system functioning and possibly genes that repair damage within the cell. Females may produce more antioxidant chemicals that inactivate harmful free radicals, reducing damage to genetic material.

The X chromosome also directs the production of sex hormones, namely estrogens, which affect cholesterol levels or other factors.

Testosterone – produced in male testes and in the adrenal glands in both sexes. Males with lower testosterone have higher mortality rates.

▶ Year	Pop 65+	Male	Female	Sex Ratio
▶ 1980	11.3%	9.4%	13.1%	0.68
▶ 2000	12.4%	10.4%	14.3%	0.70
▶ 2020	16.9%	15.3%	18.4%	0.81
▶ 2040	21.6%	19.7%	23.5%	0.82
▶ 2060	23.4%	21.7%	25.1%	0.86



## UNITED STATES DATA

- ▶ **Clean air**
- ▶ **Stable climate**
- ▶ **Adequate water**
- ▶ **Sanitation and hygiene**
- ▶ **Safe use of chemicals**
- ▶ **Protection from radiation**
- ▶ **Healthy and safe workplaces**
- ▶ **Sound agricultural practices**
- ▶ **Health-supportive cities and built environments**
- ▶ **Preserved nature**

## THE ENVIRONMENT AND HEALTH

God has made us accountable for the care and preservation of the earth and the wise use of its resources (see Doctrine and Covenants 104:13–15).

- ▶ Scientists believe that aging may be related to a tiny cap on the tips of the chromosomes called telomeres.
- ▶ Most of the studies support the association of shorter telomere length with air pollution.
- ▶ Air pollution inversely related to longevity
- ▶ The World Health Organization estimates 1/3 of deaths from stroke, lung cancer and heart disease due are to air pollution
- ▶ Our environment will be more polluted in the future and have a greater effect on longevity

## CLEAN AIR



**Ionizing radiation even in low doses can cause direct DNA damage and generate free radicals, leading to DNA, protein, and lipid membrane damage.**

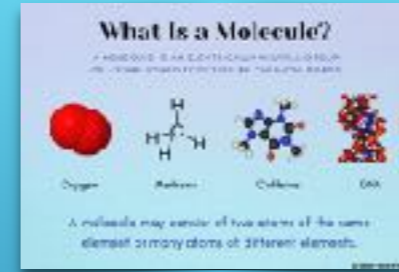
**This cell damage can lead to cell death, congenital malformations in an embryo or fetus, or the initiation of cancer.**

## **RADIATION**



- ▶ Free radicals can damage cells, causing illness and aging.
- ▶ Free radicals are linked to aging and a host of diseases.
- ▶ Some vitamins and minerals, such as vitamin E, C, A, and selenium, help to inactivate free radicals.

## FREE RADICAL THEORY



- Oxidation Factors:**
- Poor Diet
  - Pollution
  - Drugs
  - Radiation
  - Stress
  - Injury
  - Aging
  - Infection
- Disease Risks:**
- Cancer
  - Heart Disease
  - Arthritis
  - Autoimmune Disease
  - ... and over 90 other Diseases

Oxidation – transfer of electrons.

Free radicals are oxygen-containing molecules with an uneven number of electrons.

The uneven number allows them to easily react with other molecules.

- ▶ Free radicals – unstable atoms. To become stable they take electrons from other atoms, damaging cells.
- ▶ This may cause signs of aging.
- ▶ Antioxidants (have extra electrons) are molecules (group of atoms) that fights this by giving up some of their own electrons; vitamin E, vitamin C, Zinc, Selenium

## ANTIOXIDANTS



The Word of Wisdom emphasizes a plant based diet, with these foods rich in antioxidants.

- ▶ **So what makes for a good life?**
  - ▶ Having quality, safe and trusting relationships
  - ▶ Having mature defenses
  - ▶ Being physically and mentally active
  - ▶ Being calm and forgiving
  - ▶ Having a plant based diet
  - ▶ Having a sense of purpose and belonging
  - ▶ Keeping aging parents and grandparents nearby or in the home
  - ▶ Associating with those who favorably promote health and happiness

## **SUMMARY**

