Human Demographics of Farmville, VA

Meagan St. John

Biology 251: Intro to Ecology and Evolution

28 March 2017

Word Count: 1,318

**Abstract**

Since the emergence of modern medicine around 1950, human life expectancy has sky-rocketed. To support this, data was collected on average age of males and females from gravestones in Westview Cemetery located in Farmville, VA. Results were categorized by three time intervals: Pre-1901, 1901-1950, and Post-1950. Survivorship curves for males and females that died Pre-1901 showed a trend of Type II, while the curve for males and females that died Post-1950 showed a trend of Type I. There was a significant difference in the average life span of males between Pre-1901 and Post-1950 (t=-7.196, p<0.001), resulting in a higher average life span in the Post-1950 males. There was a significant difference in the average life span of females between Pre-1901 and Post-1950 (t=-9.5085, p<0.001), resulting in a higher average life span in the Post-1950 females.

**Introduction**

During the past few hundreds of years, the rise of technology and modern medicine have increased the life-expectancy of people dramatically. In the time interval before the 1900’s, the U.S. was characterized by poor working conditions, war, and illness, caused by the Industrial Revolution and The Civil War. The average life expectancy during this time, specifically in 1870, was only 35 years old, but gradually increased to 45 years old by 1913 (Roser 2016).

An obvious shift in the life expectancy of humans was not noted until 1950. Even though the U.S. experienced hardships such as the Korean, Vietnam, and Gulf Wars, the average age at death was steadily rising. Over the past two centuries, the average life expectancy has exceedingly doubled in number, from 25 years old to 65 years old for men and 70 years old for women. The average age at death keeps rising, without signs of slowing down (Oeppen and Vaupel 2002). Some possibilities for this phenomenon can be explained by the explosion of advanced technology and modern medicine.

From this previous knowledge, a study was conducted to determine if the results will hold true to Farmville, VA by data collection at Westview Cemetery on three time intervals: Pre-1901, 1901-1950, and Post-1950. It is predicted that the lowest average age at death will be during the Pre-1901 interval, followed by 1901-1950, and the highest average being in the Post-1950 interval.

**Materials and Methods**

*Data Collection*

Data was collected on birth and death year of 374 females and 484 males. Several groups of two students were assigned to different sections of Westview Cemetery in Farmville, VA to collect data. The process was conducted by observing gravestones; starting at one end of the section and progressing horizontally through the gravestones, one by one. Once collection was complete on one row, the next row up was observed. This was repeated until 50 data points were collected for males and females, in each group of two students. If a gravestone was illegible or there was uncertainty of the gender of the individual, that gravestone was skipped. If the gravestone of an infant did not state the sex, half of one tally was placed in the male data and half of one tally was placed in the female data. After all groups completed the collection, the data was compiled together to analyze.

*Data analysis*

For each time interval, pre-1901, 1901-1950, and post-1950, average life span was calculated for males and females. Standard deviation and standard error were also calculated. Bar graphs were created for each sex on the effect of each time interval on average life span with standard error present.

Statistical analysis was utilized using R database. Two two-sample t-tests were conducted to compare mean differences of lifespan for Males Pre-1900s versus Males Post-1950 and Females Pre-1900s versus Females Post-1950 to analyze the differences in mean values.

Six life tables were constructed for males and females, with each sex having three tables for the three time intervals studied. These six life tables were used to construct survivorship curves for each interval for both sexes to display the proportion of individuals surviving over 10-year age classes.

**Results**

The average life span for males is shown to be lowest Pre-1901, followed by 1901-1950, and highest Post-1950, at 41, 54, and 67 years respectively. The average life span of males in the Post-1950-time frame was statistically significantly higher than the average life span of males in the Pre-1901-time frame (t=-7.196, p<0.001).

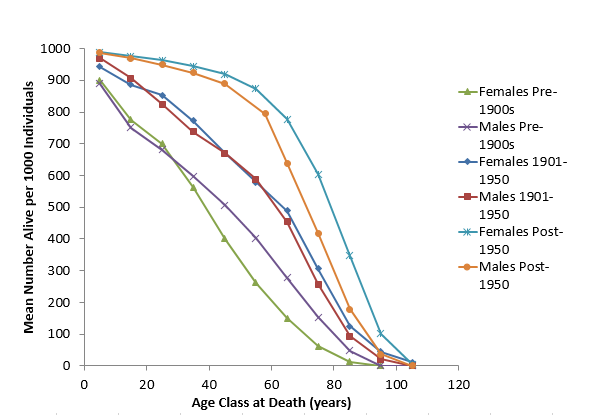
The average lifespan for females displays the same pattern as the males. The lowest average is 37 years during Pre-1901, followed by 56 years during 1901-1950, and highest at 74 years for Post-1950. The average lifespan of females in the Post-1950-time frame was statistically significantly higher than the average life span of females in the Pre-1901-time frame (t=-9.5085, p<0.001).

**Figure 1. The average life span of males based on three time intervals: Pre-1901, 1901-1950, and Post-1950.** The bars represent the standard error.

**Figure 2. The average life span of females based on three time intervals: Pre-1901, 1901-1950, and Post-1950.** The bars represent the standard error.

The group of males that died in the Post-1950 interval showed a relatively constant, low rate of survival until approximately age 60, then the proportion of surviving individuals dramatically declines, displaying a Type I survivorship curve. The group of males that died Pre-1900s displayed a Type II survivorship curve, with many individuals dying early in life and not many surviving to older age. The group of males that died from 1901-1950 displayed a survivorship curve in the middle, Type III, with a steady proportion of survival from birth until death.

The females that died Pre-1900s, 1901-1950, and Post-1950 mimicked the survivorship curves displayed by the males. The females that died Pre-1900s exhibited a Type I survivorship curve, a Type I survivorship curve for the females that died Post-1950, and a Type II survivorship curve for the females that died in between 1901 and 1950.



**Figure 3. The mean number alive per 1000 individuals based on age class at death for three time intervals, Pre-1900s, 1901-1950, and Post-1950, for males and females.**

**Discussion**

There was a statistically significant increase in average age at death between Pre-1901 and Post-1950 for males and females. The most notable account for these differences is the discovery of sulfa drugs and penicillin to treat illnesses. The trend continues to grow due to efforts in advanced medical care to treat chronic diseases (Sonnega 2006). It is predicted that by the year 2065, the average age at death will be 86 years old (Lee and Carter 1992). With more and more countries displaying the increase in life expectancy, people born in the year 2000 have the possibility to be able to see the turn of the next century on their 100th birthday (Vaupel 2010).

The survivorship curves for males and females for Pre-1901 mimic a Type II survivorship curve with an equal proportion of deaths per age interval over time. This steady rate of decline can be accounted for due to lack of modern technology and medicine to aid women when carrying offspring. The survivorship curves for males and females for Post-1950 mimic a Type I survivorship curve with high proportion of success in infants followed by a rapid decline far later in life. This curve accurately displays the Type I survivorship curve that humans still display today. Infants have such a high rate of success because we now have the modern technology to prevent complications in the womb and at birth. These results should hold true when looking at other survivorships curves for different time intervals at different locations across the United States.

The most prevalent reason for limited-nature of this data is due to inability to properly reflect the entire human population, or even Virginia. To properly display the demographics of Virginia, a study would have to be conducted on a large sample size of cemeteries in Virginia and an assumption would have to be made that there was no immigration or emigration of people, which cannot hold true.

From this study, we can distinctly see that the average life span of humans is steadily increasing. Due to this, there is a growing concern of how long humans will actually live to be and what burden this will have on the Social Security Administration to distribute pensions to the elderly along with inflated payroll taxes. We could utilize forecasts of life expectancy to determine these future social needs (Oeppen and Vaupel 2002).

**Acknowledgements**

This work was supported by Longwood University’s Department of Biological and Environmental Sciences and Dr. Henkanaththegedara.

**Literature Cited**

Lee R. and Carter L. 1992. Modeling and forecasting U.S. mortality. Journal of the American statistical association 87 (419): 659-671.

Oeppen J. and Vaupel J. 2002. Broken limits to life expectancy. Science’s Compass 296: 1029-1031.

Roser, M. 2016. Our world in data: Life expectancy. University of Oxford, Oxford. Available from <https://ourworldindata.org/life-expectancy/#the-rise-of-maximum-life-expectancy> (accessed March 2017).

Sonnega A. 2006. The future of human life expectancy: Have we reached the ceiling or is the sky the limit? Research highlights in the demography and economics of aging 8: 1-4.

Vaupel J. Biodemography of human aging. 2010. Nature: Insight review 464: 536-542.