

# Clinical and Translational Science Informatics and Technology - Pre-Interview Report

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30 August, 2021

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# A Problem with Presidents; a data to information challenge

## 1 Purpose

A total of 46 presidents have served as the President of the United States during its 245 years of flourishing independence, beginning with George Washington's inauguration in 1789 and ending with Joe Biden, who has been in office since 2021. The distribution of American presidents' life expectancies is the focus of the given problem.

## 2 Source Code

Execute the Python code in the file "solution\_Venkat.ipynb" using Jupyter Notebook to visualize the Pandas Dataframes as individual tables. The screenshots included in the later sections of the report are taken from the code.

## 3 Approach and Observations

### Approach

The NaN and NaT values in the raw data were cleaned up by first populating the cells which had NaN values in the "LOCATION OF DEATH" column with a value 'Living', for computational ease. The "DEATH DATE" for these data points was then set to the current date and time so as to compute the age of each individual President as of today.

All data manipulations and calculations are performed using numPy and Pandas in Python.

### 3.1 Top 10 Longest-Lived Presidents

President Jimmy Carter is the oldest living president at 97.9 years of age as of today, with George Bush being the deceased longest-lived president at an age of 94.4 years. The table below shows the list of top 10 presidents who lived the longest.

	PRESIDENT	BIRTH DATE	BIRTH PLACE	DEATH DATE	LOCATION OF DEATH	lived_days	lived_months	lived_years
37	Jimmy Carter	1924-10-01	Plains, Georgia	2022-08-30	Living	35762.454854	1174.971309	97.914276
39	George Bush	1924-06-12	Milton, Mass.	2018-11-30	Houston, Texas	34504.000000	1133.624920	94.468743
36	Gerald Ford	1913-07-14	Omaha, Nebraska	2006-12-26	Rancho Mirage, Cal.	34133.000000	1121.435758	93.452980
38	Ronald Reagan	1911-02-06	Tampico, Illinois	2004-06-05	Los Angeles, Cal.	34088.000000	1119.957289	93.329774
1	John Adams	1735-10-30	Quincy, Mass.	1826-07-04	Quincy, Mass.	33119.000000	1088.120906	90.676742
29	Herbert Hoover	1874-08-10	West Branch, Iowa	1964-10-20	New York, New York	32943.000000	1082.338446	90.194871
31	Harry S. Truman	1884-05-08	Lamar, Missouri	1972-12-26	Kansas City, Missouri	32373.000000	1063.611162	88.634264
3	James Madison	1751-03-16	Port Conway, Va.	1836-06-28	Orange Co., Va.	31150.000000	1023.429639	85.285803
2	Thomas Jefferson	1743-04-13	Albemarle Co., Va.	1826-07-04	Albemarle Co., Va.	30397.000000	998.689911	83.224159
35	Richard Nixon	1913-01-09	Yorba Linda, Cal.	1994-04-22	New York, New York	29688.000000	975.395799	81.282983

Figure 1: Top 10 Presidents of the United States by age lived, longest-lived first

### 3.2 Top 10 Shortest-Lived Presidents

President John F. Kennedy is the shortest living president, who was assassinated at a young age of 46.4 years, with Barack Obama being the only living president to make it to the list with an age of 61 years. The table below shows the list of top 10 presidents who lived the shortest.

	PRESIDENT	BIRTH DATE	BIRTH PLACE	DEATH DATE	LOCATION OF DEATH	lived_days	lived_months	lived_years
33	John F. Kennedy	1917-05-29	Brookline, Mass.	1963-11-22	Dallas, Texas	16978.000000	557.810222	46.484185
19	James A. Garfield	1831-11-19	Cuyahoga Co., Ohio	1881-09-19	Elberon, New Jersey	18202.000000	598.024600	49.835383
10	James K. Polk	1795-11-02	Mecklenburg Co., N.C.	1849-06-15	Nashville, Tennessee	19583.000000	643.397195	53.616433
15	Abraham Lincoln	1809-02-12	LaRue Co., Kentucky	1865-04-15	Washington, D.C.	20516.000000	674.050802	56.170900
20	Chester Arthur	1829-10-05	Fairfield, Vermont	1886-11-18	New York, New York	20863.000000	685.451447	57.120954
27	Warren G. Harding	1865-11-02	Morrow County, Ohio	1923-08-02	San Francisco, Cal.	21091.000000	692.942360	57.745197
23	William McKinley	1843-01-29	Niles, Ohio	1901-09-14	Buffalo, New York	21412.000000	703.488778	58.624065
24	Theodore Roosevelt	1858-10-27	New York, New York	1919-01-06	Oyster Bay, New York	21985.000000	722.314627	60.192886
28	Calvin Coolidge	1872-07-04	Plymouth, Vermont	1933-01-05	Northampton, Mass.	22099.000000	726.060083	60.505007
42	Barack Obama	1961-08-04	Honolulu, Hawaii	2022-08-30	Living	22306.454854	732.875989	61.072999

Figure 2: Top 10 Presidents of the United States by age lived, shortest-lived first

### 3.3 Statistical Analysis and Insights

	Statistic	Value(days)	Value(years)
0	mean	26409	72.354455
1	weighted_mean	26229	71.861838
2	median	26227	71.854795
3	mode	16978	46.515068
4	max	35762	97.980790
5	min	16978	46.515068
6	std_dev	4582	12.556000

Figure 3: Top 10 Presidents of the United States by age lived, shortest-lived first

All the required statistical distributions were calculated over the "days\_lived" column. For calculating the weighted average, random weights in  $[0, 1]$  were initialized and assigned to the ages of individual presidents. All these statistics have been plotted in Figure 4, showing the standard deviation on either sides of the mean age.

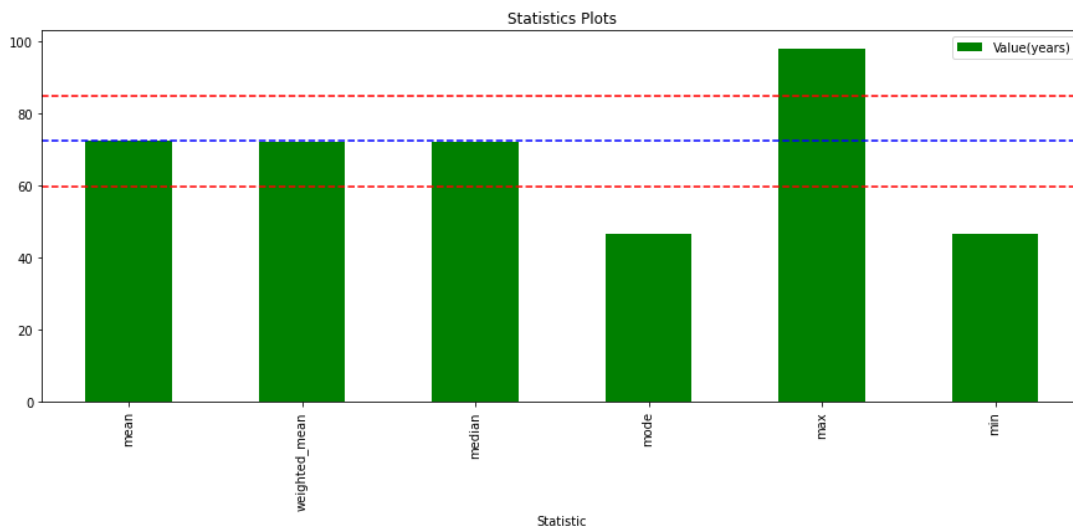


Figure 4: Top 10 Presidents of the United States by age lived, shortest-lived first

As an insight, Figure 5 captures the age of all the deceased US Presidents compared to the 2021 average life expectancy in the United States. We can observe that as the life expectancy grew over the past few decades, the age of the corresponding presidents did not follow a similar trend.

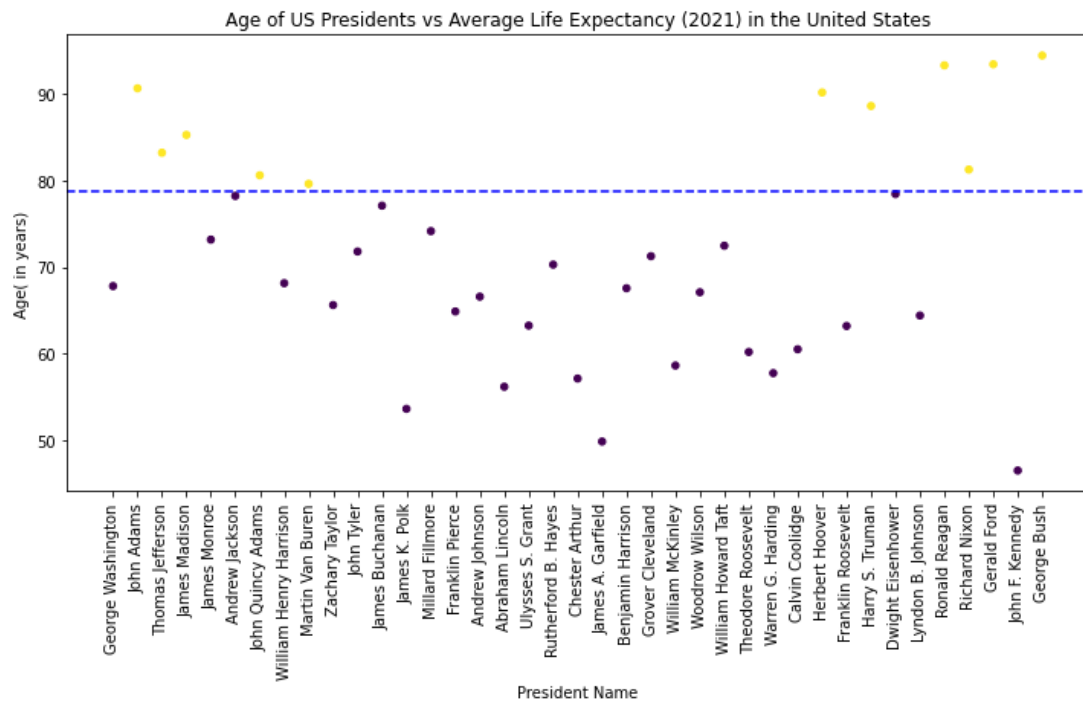


Figure 5: Age of US Presidents compared to the average life expectancy in the US

## 4 Conclusion

We examine the trends in the life expectancy of Presidents in this report, using the analysis of the provided data that was done above. The age range is wide, between 46 to 97. The average life expectancy of a president is 72 years old, which is slightly shorter than the average male life expectancy in the United States, which was 78.79 years in 2021. The majority of Presidents have lived above the age of 60, and the median age closely reflects this tendency.