**Use of historical death certificates as a tool to study the changing dynamics of human populations**

**Example of death certificate analysis**

**Study of survivorship and mortality of Japanese individuals deceased in an internment camp during World War II in Yuma, Arizona**

**Introduction:** After the Japanese attacked Pearl Harbor, President Theodore Roosevelt issued an order for all Japanese Americans to be forced-relocated and incarcerated in internment camps, mostly in US Western states. Over 110,000 Japanese Americans were placed in 10 internment camps between 1942 and 1946. Two of these camps were located in Arizona, one in Yuma County (Poston) and another in Pinal County (Gila River). Overcrowding and unsanitary conditions were common in these facilities.

**Research questions:** Did Japanese Americans in internment camps experience lower survivorship and higher mortality than the general population?

Did causes of death differ between the Japanese population in these camps and the general population?

**Methods:** The death certificate data below were collected by students by accessing the Arizona Genealogical Birth and Death certificate database (<http://genealogy.az.gov/index.htm>). Students focused their data collection on death certificates issued between 1943 and 1945 in Yuma County, Arizona, where the Poston Internment Camp was located. Students collected data from two groups: deceased individuals with Japanese last names that died in Poston and a general population of individuals with non-Japanese names from Yuma County.

**Table 1. Death certificate data of the general population (non-Japanese) who died in Yuma County, Arizona (1942-1945)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Age** | **Gender** | **Month of Death** | **Cause of Death** | **Age** | **Gender** | **Month of Death** | **Cause of Death** |
| 20 | Male | April | Accident | 36 | Male | July | Heat Stress |
| 46 | Male | April | Accident | 53 | Male | July | Heat Stress |
| 48 | Male | April | Cardiovascular ds. | 72 | Female | July | Heat Stress |
| 54 | Male | April | Cardiovascular ds. | 55 | Male | July | Heat Stress |
| <1 | Male | April | Premature birth | 76 | Male | July | Hemorrhage |
| 63 | Male | August | Cardiovascular ds. | 75 | Female | July | Natural causes |
| 40 | Male | August | Gastric problems | 32 | Male | July | Neurological ds. |
| 46 | Male | August | Hemorrhage | 19 | Male | June | Accident |
| <1 | Female | August | Premature birth | 31 | Male | June | Accident |
| <1 | Female | August | Premature birth | 52 | Male | June | Cardiovascular ds. |
| 84 | Male | August | Pneumonia | 53 | Male | June | Cardiovascular ds. |
| 50 | Male | December | Cancer | 53 | Male | June | Pneumonia |
| 57 | Female | December | Cancer | <1 | Male | June | Hemorrhage |
| 37 | Female | December | Cardiovascular ds. | 37 | Male | June | Pneumonia |
| 73 | Male | December | Cardiovascular ds. | 23 | Female | March | Accident |
| 78 | Male | December | Cardiovascular ds. | 31 | Male | March | Accident |
| 68 | Male | December | Cardiovascular ds. | 46 | Male | March | Cardiovascular ds. |
| 85 | Male | December | Hemorrhage | 55 | Male | March | Cardiovascular ds. |
| 43 | Female | December | Neurological ds | <1 | Male | March | Premature birth |
| <1 | Female | December | Pneumonia | 17 | Male | May | Burns |
| <1 | Female | December | Pneumonia | 21 | Male | May | Dehydration |
| <1 | Male | December | Pneumonia | 89 | Female | May | Natural causes |
| 24 | Male | February | Accident | <1 | Male | May | Premature birth |
| 2 | Male | February | Cancer | 71 | Male | May | Tuberculosis |
| 9 | Male | February | Cardiovascular ds. | 20 | Male | November | Accident |
| 63 | Male | February | Cardiovascular ds. | 36 | Male | November | Accident |
| 69 | Male | February | Cardiovascular ds. | 38 | Male | November | Accident |
| 72 | Male | February | Cardiovascular ds. | 43 | Female | November | Cardiovascular ds. |
| 74 | Male | February | Cardiovascular ds. | 23 | Male | November | Congenital disease |
| 75 | Male | February | Cardiovascular ds. | 49 | Female | November | Hemorrhage |
| 86 | Male | February | Cardiovascular ds. | 57 | Male | November | Hemorrhage |
| 62 | Male | February | Cardiovascular ds. | 58 | Male | November | Hemorrhage |
| <1 | Male | February | Infection | 4 | Female | November | Pneumonia |
| 43 | Male | February | Tuberculosis | 40 | Female | November | Tuberculosis |
| <1 | Female | February | Pneumonia | <1 | Male | November | Pneumonia |
| 48 | Male | January | Accident | 31 | Male | October | Accident |
| <1 | Female | January | Accident | 39 | Male | October | Cancer |
| 56 | Female | January | Cancer | 40 | Female | October | Cardiovascular ds. |
| 27 | Male | January | Cardiovascular ds. | 46 | Female | October | Cardiovascular ds. |
| 42 | Male | January | Cardiovascular ds. | 86 | Female | October | Cardiovascular ds. |
| 42 | Male | January | Cardiovascular ds. | 22 | Female | October | Hemorrhage |
| 58 | Male | January | Cardiovascular ds. | <1 | Male | October | Premature birth  |
| 58 | Male | January | Cardiovascular ds. | <1 | n/a | October | Premature birth |
| 59 | Female | January | Infection | 21 | Male | September | Accident |
| <1 | Male | January | Malnutrition | 7 | Male | September | Cancer |
| 59 | Female | January | N/A | 48 | Female | September | Cardiovascular ds. |
| <1 | Female | January | Premature birth | <1 | Female | September | Gastric problems |
| 21 | Male | July | Accident | <1 | Female | September | Premature birth |
| 42 | Male | July | Accident | <1 | Female | September | Tuberculosis |
| 55 | Male | July | Cardiovascular ds. | 65 | Female | n/a | Cardiovascular ds. |

**Table 2. Death certificate data of Japanese individuals who died in Poston, Yuma County, Arizona (1942-1945)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Age** | **Gender** | **Month of Death** | **Cause of Death** | **Age** | **Gender** | **Month of Death** | **Cause of Death** |
| 59 | Female | April | Cancer | <1 | Female | July  | Premature birth |
| 59 | Male | April | Cancer | <1 | Male | July  | Tetanus |
| 51 | Female | April | Hemorrhage | <1 | Male | July  | Premature birth |
| 55 | Male | April | Kidney ds. | 12 | Male | July  | Tuberculosis |
| <1 | Female | April | Premature birth | 61 | Male | July  | Tuberculosis |
| 50 | Male | April | Respiratory failure | 66 | Male | July  | Unknown ds. |
| 50 | Male | April | Respiratory failure | 64 | Male | June | Cancer |
| 60 | Male | April | Tuberculosis | 70 | Male | June | Cancer |
| 77 | Male | April | Pneumonia | 71 | Female | June | Cardiovascular ds.  |
| 24 | Male | April | Accident | 65 | Male | June | Cardiovascular ds.  |
| 51 | Female | August  | Accident | 53 | Female | June | Hemorrhage |
| 30 | Male | August  | Cancer | 54 | Female | June | Hemorrhage |
| 73 | Male | August  | Cancer | 62 | Male | March | Cancer |
| 66 | Female | August  | Cardiovascular ds.  | 67 | Male | March | Cancer |
| 44 | Male | August  | Cardiovascular ds. | 67 | Male | March | Cancer |
| 65 | Male | August  | Cardiovascular ds.  | 59 | Female | March | Cardiovascular ds.  |
| 68 | Male | August  | Cardiovascular ds.  | 69 | Male | March | Cardiovascular ds.  |
| 30 | Female | August  | Gastric problems | 49 | Female | March | Hemorrhage |
| 72 | Female | August  | Hemorrhage | 53 | Male | March | Syphilis |
| 22 | Male | August  | Respiratory failure | 21 | Female | May | Cardiovascular ds.  |
| 48 | Female | August  | Tuberculosis | 64 | Male | May | Cardiovascular ds.  |
| 46 | Female | December | Cardiovascular ds.  | 41 | Female | May | Kidney ds. |
| 59 | Male | December | Cardiovascular ds.  | 66 | Male | May | Kidney ds. |
| 63 | Male | December | Cardiovascular ds.  | 21 | Male | May | Kidney ds. |
| 65 | Male | December | Hemorrhage | <1 | Female | May | Premature birth |
| 74 | Male | December | Natural causes | 8 | Male | May | Suicide |
| 62 | Male | February | Cancer | 63 | Male | November | Cancer |
| 65 | Male | February | Cancer | 66 | Male | November | Cardiovascular ds.  |
| 70 | Male | February | Cancer | 66 | Male | November | Cardiovascular ds.  |
| 23 | Female | February | Cardiovascular ds.  | 67 | Male | November | Hemorrhage |
| 15 | Male | February | Cardiovascular ds.  | <1 | Male | November | Premature birth |
| 51 | Male | February | Cardiovascular ds.  | 13 | Female | October | Cancer |
| <1 | Male | February | Premature death  | 49 | Male | October | Cancer |
| 2 | Male | February | Neurological ds. | 65 | Male | October | Gastric problems |
| 15 | Female | February | Tuberculosis | <1 | Male | October | Premature birth |
| <1 | Male | February | Pneumonia | 45 | Male | October | Tuberculosis |
| 68 | Male | January | Cancer | 48 | Male | October | Tuberculosis |
| 70 | Male | January | Cancer | 28 | Male | October | Accident |
| 62 | Male | January | Hemorrhage | 57 | Male | October | Cancer |
| 53 | Male | January | Tuberculosis | 60 | Male | September | Cancer |
| 44 | Female | January  | Cardiovascular ds.  | 62 | Male | September | Cancer |
| 24 | Male | January  | Cardiovascular ds.  | 69 | Male | September | Cancer |
| 65 | Male | January  | Cardiovascular ds.  | 69 | Male | September | Cancer |
| 70 | Male | January  | Cardiovascular ds.  | 48 | Female | September | Cardiovascular ds.  |
| 55 | Male | July | Heat stress | 48 | Female | September | Cardiovascular ds.  |
| 67 | Female | July  | Cancer  | 47 | Female | September | Hemorrhage |
| 89 | Female | July  | Cardiovascular ds.  | 85 | Male | September | Respiratory failure |
| 65 | Male | July  | Cardiovascular ds.  | 19 | Female | September | Tuberculosis |
| 56 | Female | July  | Hemorrhage | 75 | Male | September | Tuberculosis |
| 6 | Male | July  | Infection | 24 | Female | September | Homicide |

**Table 3. Summary and survivorship data, general population (1942-1945)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Column A** | **Column B** | **Column C** | **Column D** | **Column E** |
| **Age Interval (years)** | **# individuals dying at each age interval** | **# of individuals surviving to next age interval** | **Proportion of original cohort surviving to age interval (Survivorship)** | **Proportion of original cohort dying during age interval (Mortality)** |
| 0-9 | 24 | 100 | 1.00 | 0.24 |
| 10-19 | 3 | 76 | 0.76 | 0.04 |
| 20-29 | 10 | 73 | 0.73 | 0.14 |
| 30-39 | 10 | 63 | 0.63 | 0.16 |
| 40-49 | 17 | 53 | 0.53 | 0.32 |
| 50-59 | 16 | 36 | 0.36 | 0.44 |
| 60-69 | 6 | 20 | 0.2 | 0.30 |
| 70-79 | 9 | 14 | 0.14 | 0.64 |
| 80-89 | 5 | 5 | 0.04 | 1.00 |
| 90-99 | 0 | 0 | 0.00 | - |

**Table 4. Summary and survivorship data, Japanese population (1942-1945)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Column A** | **Column B** | **Column C** | **Column D** | **Column E** |
| **Age Interval (years)** | **# individuals dying at each age interval** | **# of individuals surviving to next age interval** | **Proportion of original cohort surviving to age interval (Survivorship)** | **Proportion of original cohort dying during age interval (Mortality)** |
| 0-9 | 12 | 100 | 1.00 | 0.12 |
| 10-19 | 5 | 88 | 0.88 | 0.06 |
| 20-29 | 8 | 83 | 0.83 | 0.10 |
| 30-39 | 2 | 75 | 0.75 | 0.03 |
| 40-49 | 12 | 73 | 0.73 | 0.16 |
| 50-59 | 17 | 61 | 0.61 | 0.28 |
| 60-69 | 32 | 44 | 0.44 | 0.73 |
| 70-79 | 10 | 12 | 0.12 | 0.83 |
| 80-89 | 2 | 2 | 0.02 | 1.00 |
| 90-99 | 0 | 0 | 0.00 | - |

**Figure 1. Survivorship analysis of Japanese and general populations, Yuma County, Arizona (1943-1945)**

**Table 5. Causes of death in Japanese and general populations, Yuma County (1942-1945)**

|  |  |  |
| --- | --- | --- |
| **Causes of death** | **% Japanese pop.** | **% general pop.** |
| Accident | 3 | 17 |
| Cancer | 23 | 6 |
| Cardiovascular Disease | 26 | 31 |
| Congenital Disease | 1 | 1 |
| Dehydration | 0 | 1 |
| Gastric Problems | 2 | 2 |
| Heat Stress | 1 | 4 |
| Hemorrhage | 10 | 8 |
| Homicide | 1 | 0 |
| Infectious disease | 15 | 15 |
| Kidney disease | 4 | 0 |
| Malnutrition | 0 | 1 |
| Natural Causes | 1 | 2 |
| Neurological Disease | 1 | 2 |
| Premature birth | 7 | 9 |
| Respiratory failure | 4 | 0 |
| Suicide | 1 | 0 |

**Figure 2. Causes of death of Japanese and general populations, Yuma County, Arizona (1943-1945)**

**Table 6. Temporal distribution of deaths in Japanese and general populations in Yuma County, Arizona (1943-1945).**

|  |  |  |
| --- | --- | --- |
| **Month of Death** | **% Japanese pop.** | **% General pop.** |
| January | 8 | 12 |
| February | 10 | 13 |
| March | 7 | 5 |
| April | 10 | 5 |
| May | 7 | 5 |
| June | 6 | 7 |
| July | 12 | 11 |
| August | 11 | 6 |
| September | 11 | 6 |
| October | 8 | 8 |
| November | 5 | 11 |
| December | 5 | 11 |

**Figure 3. Temporal distribution of deaths in Japanese and general populations in Yuma County, Arizona (1943-1945).**