# A New Estimate of the Hawaiian Population for 1778, the Year of First European Contact

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A high level of uncertainty surrounds the size of the Hawaiian population at the time of first European contact in 1778. Estimates range from 200,000 to 1,000,000. While some estimates have more of an empirical base than others, none of them takes advantage of the high level of momentum found in demographic processes, something that is done in this paper using "backcasting," a demographic forecasting method run in reverse from known data. Using a commonly used technique for this purpose, the 1910 count of Native Hawaiians by age in Hawai'i is taken back to 1770 in decennial cycles. Interpolating between the 1780 and 1770 estimates yields an estimated 683,200 Hawaiians in 1778. Another finding is that the population reaches stability (a constant relative age structure over time) by 1820.

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## Introduction

The future is unknown in terms of many individual events. For example, I cannot be certain whether or not I will live another ten years. However, while many individual events are unpredictable, patterns often emerge when individual events are aggregated. For example, based on the aggregated data found in an applicable life table, I can gauge the probability of whether I will live another ten years. The field of demography is characterized by these patterns. The momentum of demographic processes creates patterns that link the past with the present and the present with the future (Smith, Tayman, & Swanson, 2013, p. 2). By using this momentum, the future can be glimpsed, as can the distant past.

This paper represents an exercise in the application of demographic momentum to the distant past. It follows the idea that the past has something to say, not only about the present but also about the future—and in some cases what the past has to say may be important for the present and the future. For example, what would be the expected rate of mortality if a highly infectious and deadly disease, such as Ebola, were suddenly to appear in the United States? To answer this question, good predictive models are needed, and it is the past that can help provide guidance. One such example is provided by the population of Hawaiʻi in 1778, the year of first European contact. Unlike the small number of English sailors who initially encountered them, the Hawaiians were quickly devastated by a constellation of diseases against which they had no immunity. However, the level of devastation is not well understood, because we do not have a good picture of the Hawaiian population in 1778—one that leverages demographic momentum and is based on a transparent method that can be replicated.

Documented estimates of the population of Hawaiʻi at the time of first European contact in 1778 are summarized in Exhibit 1. The wide range of estimates reflects a wide range of "methods," none of which is transparent, replicable, and based on demographic momentum.[1]

**EXHIBIT 1.** Sample range of estimates of the total population of Hawai'i in 1778*

| Estimated population | Source | Citation |
|---|---|---|
| 200,000 | Dixon, visit of 1787 | Schmitt (1968, p. 20) |
| 242,200 | Bligh, with Cook, first visit, 1778 | Schmitt (1968, p. 20) |
| 200,000–250,000 | Schmitt, 1971 | Schmitt (1971) |
| 300,000 | Schmitt & Zane, 1977 | Nordyke (1989, p. 173) |
| 400,000 | King, with Cook, second visit, 1779 | Adams (1937, p. 1) |
| 450,000 | Hommon, 2008 | Hommon (2008, p. 53) |
| 500,000 | Officers with Cook, first visit, 1778 (Narrative completed in 1779 by King following Cook's death) | Schmitt (1968, p. 19) |
| 525,000 | Hommon 2013 | Hommon (2013, p. 12) |
| 800,000–1,000,000 | Stannard, 1989 | Stannard (1989, p. 50) |

*There are more estimates, often expressed as opinions concerning the initial estimates by Bligh, Dixon, King, and other British naval officers, but most are in the range shown above (see, e.g., Schmitt, 1968, pp. 18–23).

It is not surprising that uncertainty would surround the number of Hawaiians, a preliterate population, at the time of first European contact in 1778. No known census of the Hawaiian population at that time exists. Without a full count, the only recourse is to estimate the size of the population. The retrospective estimates by Schmitt and Stannard, as well as some of those provided by the first Europeans known to have made contact with Hawaiians, are informed by methods; others are much more speculative (Schmitt, 1968, pp. 18–22). As can be seen in Exhibit 1, the estimates range from 200,000 to 1,000,000.

Estimates for which methodological descriptions are available represent attempts to reconstruct the Hawaiian population in 1778 using information available at the time of European contact or earlier. These estimates include the use of counts of houses in villages visited or observed by Europeans, their estimates of average household size, and extrapolation of these estimates to all of Hawai'i. In addition, Europeans estimated the size of the population by multiplying estimates of the land area of Hawai'i by assumed levels of population density, a technique also applied retrospectively. Sometimes a variation of this method was used, by multiplying estimates of cultivated land at the time of first contact by assumed levels of population supported by the cultivated areas (Cordy, 2007; Hommon, 2008, 2013;

Kirch & Rallu, 2007; Rallu, 2007; Schmitt, 1968, 1971; Stannard, 1989). A review of these estimates shows that no attempt has been made to leverage demographic momentum to estimate the Hawaiian population in 1778. That is, no attempt has been made to use postcontact data in the form of a "backcast"—a retrospective extrapolation of nineteenth- and twentieth-century census data. Thus, this study is unique in that is the first to leverage demographic momentum in the form of a backcast to estimate the Hawaiian population of 1778. The estimate provided by this study is therefore "new," not only in the sense of its being different from preceding estimates but also in terms of the data and method used to obtain it.

## Data and Methods

The postcontact information used in this study is in the form of US Census Bureau counts of the Native Hawaiian population in Hawaiʻi by age (and sex) in 1910, 1920, and 1930 (US Census Bureau, 1913, 1922, 1932). The standard forecasting technique employed (in reverse) is known in demographic circles as the Hamilton-Perry method (Smith, Tayman, & Swanson, 2013, pp. 176–179). The Hamilton-Perry method forms a ratio of an age cohort in one census (e.g., the population aged 5–9 years in 2000) and the same cohort in the successive census (e.g., the population aged 15–19 years in 2010). This is known as a cohort change ratio (CCR). The CCRs are then applied to a population by age (e.g., the 2010 population of Hawaiʻi) to carry it forward in time as a forecast (e.g., to 2020).

When using the Hamilton-Perry method for forecasting, adjustments are made to the definition of a CCR to accommodate those born subsequent to the initial census but counted in the subsequent one (e.g., those aged 0–4 and 5–9 in the 2010 census were born subsequent to the 2000 census). A minor adjustment is also made to the definition of a CCR to deal with the "terminal open-ended age group" (e.g., the population aged 90 years and older in the subsequent census is the cohort aged 80 and older in the preceding census). Descriptions and examples of these adjustments can be found in Smith et al. (2013, pp. 176–179).

When the Hamilton-Perry method is used for backcasting rather than forecasting, the CCRs are run in reverse. A reverse cohort change ratio (RCCR) is the reciprocal of the corresponding CCR (Swanson & Tayman, 2012, pp. 340–353). That is, if the CCR for those aged 0–4 years in 2000 relative to those aged 10–14 years in 2010 is .858458, then the corresponding RCCR for those aged 10–14 in 2010 relative to those aged 0–4 in 2000 is 1/.858458 = 1.164878.

There is no adjustment needed for those aged 0–4 and 5–9 in an RCCR, because the people in these age cohorts were aged 10–14 and 15–19 in the subsequent census (i.e., those aged 0–4 in 2000 were aged 10–14 in 2010). However, there is an adjustment needed for the terminal open-ended age group to avoid the fact that every ten years (in the US Census context) this group would be ten years younger and, as such, successively providing less information about the age structure of the population in question. For example, if one takes the ratio of the population aged 80+ in the 2000 census to the population aged 90+ in the 2010 census and applies this to the population aged 90+ in 2000, the population aged 80+ is backcasted for the year 1990. This is now the "new" terminal open-ended age group, so an RCCR for 80+/70+ must be applied to this age group, which, in turn, generates the population 70+ for the year 1980. By the time the backcasting process reached 1910, the only age information would be for the population aged 0+, and 1910 would be the terminal point of the backcast. Thus, proportions of the "closed" age groups that make up a given open-ended age group are calculated and applied to the backcasted number in the terminal open-ended age group. For example, in the 2010 census one can redefine the terminal open-ended age group not only as 90+ but also as 80+, and the latter would have three associated age groups: 80–84, 85–89, and 90+. These proportions can be used to maintain a constant definition of the terminal open-ended age group as the backcast proceeds. That is, as soon as one has backcasted the 80+ population for the year 2000 from the population aged 90+ in 2010, the proportions can be applied to the backcasted 80+ population so that the 2000 population aged 80–84, 85–89, and 90+ can be estimated.

In the backcast for the Native Hawaiian population, the 1920 and 1910 US Census data are used to define the RCCRs using five-year age groups (e.g., 0–4, 5–9, 10–14...70–74), with a terminal open-ended age group of 75+. This means the ratio of the population aged 65+ in 1910 to the population aged 75+ in 1920 is used to generate the terminal open-ended age group of 65+, with the latter having 65–69, 70–74, and 75+ as its three associated age groups. The proportions for these three age groups were found by averaging the respective proportions found in the 1930, 1920, and 1910 Census counts for Native Hawaiians in Hawai'i.

The RCCRs and the adjustments were initially applied to the 1910 Census by age to generate a set of backcasted 1900 estimates by age for the Native Hawaiian population in Hawai‘i. The same RCCRs were then applied to the 1900 estimates by age to generate a set of backcasted 1890 estimates by age. This process was repeated until the 1770 population of Native Hawaiians by age was generated for Hawai‘i. The backcasting proceeded in decennial cycles from 1900 to 1770.

## Results

The Native Hawaiian population in 1778 is estimated to be 683,200. Using the methodology just described, the estimated totals for 1780 and 1770 are interpolated to obtain the 1778 estimate. The interpolation is found by identifying the rate of change between 1770 and 1780 and then applying that rate of change to the 1770 figure: $683{,}200 = 803{,}302 * e^{r*8}$, where $r = -0.0292 = [\ln(644{,}383/863{,}302)]/10$.

As shown in table 1, the total population estimates of Native Hawaiians track well with the 1900 Census, the count done by the Kingdom of Hawai‘i in 1860, and the 1850 estimate constructed by Adams. Comparing the estimate of 683,200 for 1778 with the estimate of 644,383 for 1780 reveals a decline of 5.7 percent. By 1800, the decline from the 1778 population is 47.5 percent, by 1820 it is 70.7 percent, and by 1840 it is 83.8 percent. These declines are consistent with the newly introduced diseases and related factors that affected the Native Hawaiian population from the time of first contact to 1840 (Cordy, 2007; Kirch & Rallu, 2007; Rallu, 2007; Schmitt, 1970a, 1970b; Schmitt & Nordyke, 2001).

From 1840 to 1860, the Native Hawaiian population declined by 44.2 percent, by 1880 the decline from 1840 was 64.2 percent, and by 1900 the estimated Native Hawaiian population had declined by 73.7 percent. Again, these declines are consistent with the introduced diseases and related factors that affected the Native Hawaiian population from 1840 to 1900 (Cordy, 2007; Rallu, 2007; Schmitt, 1968, 1970a, 1970b; Schmitt & Nordyke, 2001).

**TABLE 1.** Total population of Native Hawaiians (in Hawai'i): 1900 to 1770

| YEAR | ESTIMATED | CENSUS COUNT* |
|---|---:|---:|
| 1900 | 29,336 | 29,799 |
| 1890 | 33,457 | 34,436 |
| 1880 | 39,711 | N/A |
| 1870 | 48,579 | N/A |
| 1860 | 61,931 | 67,084** |
| 1850 | 80,574 | 82,035*** |
| 1840 | 110,948 | N/A |
| 1830 | 149,297 | N/A |
| 1820 | 200,018 | N/A |
| 1810 | 267,971 | N/A |
| 1800 | 359,010 | N/A |
| 1790 | 480,978 | N/A |
| 1780 | 644,383 | N/A |
| 1778**** | 683,200 | N/A |
| 1770 | 863,302 | N/A |

* Source: Schmitt (1968).
** The 1860 census included Chinese living in Honolulu and Part-Hawaiians (Schmitt, 1968, p. 74).
*** The 1850 number is an estimate by Adams (Schmitt, 1968, p. 43).
**** 683,200 = 863,302*($e^{r*8}$), where r = -0.02925 = [ln(644,383/863,302)]/10

## Limitations

While the estimates found in table 1 are not subject to the limitations found in estimates made using information assembled at or around the time of first contact (Cordy, 2007; Kirch & Rallu, 2007; Rallu, 2007; Schmitt, 1968, 1971; Stannard, 1989), they are subject to other limitations. The major limitation is the validity of using a constant set of RCCRs to generate a set of decennial population estimates 130 years into the past from a launch year of 1910. However, this approach is supported by the fact that the estimates track well with the available 1900 US Census count and the kingdom's counts of 1890, 1860, and 1850.

In addition to tracking well with the census counts, it is important to note that the RCCRs are all in excess of 1.00. This means that their corresponding reciprocals, the respective CCRs, are all less than 1.00. This makes sense for Native Hawaiians since there is virtually no in-migration into Hawai'i of this population, which means that the CCRs are generated only by out-migration and mortality. Evidence suggests that while out-migration did occur, it was not extensive among Native Hawaiians, and to the extent that any appreciable out-migration occurred, it was largely confined to young adult males (see, e.g., Adams, Livesay, & Van Winkle, 1925, pp. 10–12; Kana'iaupuni & Malone, 2006; Schmitt, 1968, pp. 38–40; Schmitt, 1977, pp. 90–91; Schmitt & Nordyke, 2001, p. 5).[3] Thus, the CCRs can largely be viewed as survival rates combined with limited out-migration.

Because many of the RCCRs are well in excess of 1.00, the corresponding CCRs are well below 1.00, which indicates high levels of mortality in the Native Hawaiian population in the early part of the twentieth century. In this regard, the CCRs are consistent with survival rates that can be generated from the life tables constructed for Native Hawaiians in the early part of the twentieth century by Park, Gardner, and Nordyke, who estimate Native Hawaiian male and female life expectancy at birth in 1920 as 34.21 and 32.90 years, respectively (Park, Gardner, & Nordyke, 1979, p. 14). In turn, these life expectancy values at birth circa 1920 are slightly above the estimated life expectancy at birth for both sexes combined of around thirty years prior to Cook's arrival (Gardner & Schmitt, 1978, p. 297). Given the estimated life expectancy of 30 years by Gardner and Schmitt, the estimated number of Hawaiians at the time of Cook's arrival found using the RCCRs may be too low.[4]

The RCCRs used in the backcast, and their corresponding CCRs, can be viewed in table 2.

**TABLE 2.** RCCRs used in the backcast and their corresponding CCRs

| 1920 | 1920–10 | 1910–20 | 1910 |
|---|---|---|---|
| **age** | **Reverse CCR** | **Forward CCR** | **age** |
| 10–14 | 1.16487762988407 | 0.858459270180612 | 0–4 |
| 15–19 | 1.14513920584208 | 0.873256277401355 | 5–9 |
| 20–24 | 1.18130841121495 | 0.846518987341772 | 10–14 |
| 25–29 | 1.31534653465347 | 0.76025592773805 | 15–19 |
| 30–34 | 1.42668344870988 | 0.700926334362594 | 20–24 |
| 35–39 | 1.22535991140642 | 0.816086760054225 | 25–29 |
| 40–44 | 1.38940809968847 | 0.719730941704036 | 30–34 |
| 45–49 | 1.28867924528302 | 0.775988286969253 | 35–39 |
| 50–54 | 1.4949083503055 | 0.668937329700273 | 40–44 |
| 55–59 | 1.4949083503055 | 0.551746031746032 | 45–49 |
| 60–64 | 1.62778505897772 | 0.614331723027375 | 50–54 |
| 65–69 | 1.79316239316239 | 0.55767397521449 | 55–59 |
| 70–74 | 2.7125 | 0.368663594470046 | 60–64 |
| | 0.345454545454545 | N/A | 65–69 |
| | 0.257575757575758 | N/A | 70–74 |
| | 0.396969696969697 | N/A | 75+ |
| 75+ | 3.96396396396396 | 0.252272727272727 | 65+ |

As an example of the high level of mortality experienced by Native Hawaiians in the early twentieth century, the CCR for Native Hawaiians aged 0–4 in 1910 and 10–14 in 1920 is 0.8584593, which indicates that only about 86 percent of those aged 0–4 in 1910 survived ten years. Similarly, only about 87 percent of Native Hawaiians aged 5–9 in 1910 survived ten years, while about 84 percent aged 10–14 in 1910 survived ten years. However, even these levels of mortality may be too low, given the precontact life expectancy estimated by Gardner and Schmitt (1978, p. 297).

In addition to the use of this constant set of RCCRs over a long period of time, there are other cautions with regard to the RCCR method. For the estimates presented in this article, whatever errors are present in the 1930, 1920, and 1910 US Census counts are incorporated into the RCCRs, along with the ways in which census enumerators and respondents determined a resident to be a Native Hawaiian (or not). These and other issues, in turn, are embedded in the decennial estimates of age from 1900 to 1770. Also, there are unknown levels of error in the 1900 US Census and the kingdom's census counts of 1890, 1860, and 1850, against which comparisons of the estimates are made. Similar issues would affect the use of the RCCR method in other backcasts and would affect CCRs used for forecasts. Finally, while the backcast to 1770 is consistent with available information (e.g., the census counts of 1900, 1890, 1860, and 1850), this is not likely to be the case beyond 1770. Dye (1994) provides evidence that the population of Hawai'i reached a peak in the seventeenth century and then remained constant or declined slightly until the time of first contact. As such, the RCCRs used in the backcast to 1770 would need modifications to reflect a plateau in the eighteenth century that was preceded by centuries of growth from a small initial resident population most likely established sometime between AD 800 and AD 1200 (Dye, 1994; Rallu, 2007). Hommon (2008) presents an empirically supported, well-researched argument for a plateau reached around 1550 with a Hawaiian population of 500,000, which, by 1778, had declined by 10 percent to 450,000.[5]

## Discussion

Once a domain of work subject largely to academic discussion (Adams, 1937; Adams et al., 1925; Cordy, 2007; Daws, 1968; Dye, 1994; Gardner & Nordyke, 1974; Kirch & Rallu, 2007; McArthur, 1970; Nordyke, 1989; Rallu, 2007; Schmitt, 1968, 1970a, 1970b, 1971; Stannard, 1989, 1992; Thornton, 1987), discourse about the size of precontact indigenous populations in the Americas and in the Pacific Basin has spilled over into the public domain, and not without contentious dimensions (Churchill & Venne, 2005; Stannard, 2000). As such, it is not likely that any estimate, no matter how transparent and methodologically sound, will ever satisfy all parties. However, estimates generated from data and methods that can be replicated may at least serve to keep the academic debate away from the speculative sphere. This is important because having a reasonable estimate of the number of Hawaiians at the time of first European contact has implications for situations that may affect the human race in the future. As mentioned at the outset, one such situation is the expected rate of population decline caused by the sudden appearance of a highly infectious and deadly disease. In this regard, the starting point for good predictive models is good historical data. The sudden appearance of a constellation of such diseases in 1778 may have caused a decline of nearly 6 percent in the population of Native Hawaiians within a two-year period—that is, about one in every seventeen Hawaiians alive in 1778 may have been dead by 1780.

This case study of Hawai‘i also contributes to the area of research on the effects of European exploration and colonization on the indigenous populations in the Western Hemisphere and parts of the Pacific Basin. It supports arguments by Stannard (1992), Thornton (1987), and Wright (1992), for example, that the indigenous populations were larger than previously thought, as was the devastation caused by European contact.

Following the work of Swanson, Tedrow, and Baker (2016) with regard to using CCRs as an approach to stable population theory, the application of a constant set of RCCRs (those shown in table 2) should also yield a stable population at some point in time. As discussed by Swanson, Tedrow, and Baker (2016), when this index reaches zero, a population is stable (i.e., the relative size of the population's age distribution over time is constant). Data from this analysis show that the Native Hawaiian population in Hawai‘i reached stability by 1820. As can be seen in figure 1, the Stability Index reaches zero in 1820 and remains there.

Also consistent with stable population theory (to be precise, the ergodicity theorem, which holds that the initial age structure is "forgotten" over time) is the fact that the initial 1910 age structure of the Native Hawaiian population is "forgotten" over time such that the age structure, when stability is reached in 1820, is different than the 1900 age structure. The "reverse" path to stability is found in figure 1, which shows the Stability Index (vertical axis) by year (horizontal axis). Figure 2 shows the age distribution in 1900, and figure 3 shows the age distribution at stability (1820). The "bumpiness" of the 1900 age structure shown in figure 2 reflects the effects of the components of change, which are primarily due to prior levels of fertility and, especially, mortality. The bumpiness of the age structure at stability shown in figure 3 reflects the effects of the 1920–1910 RCCRs, which also reflect the effects of the components of change and are primarily due to prior levels of fertility and, again, especially, mortality. The decennial estimates of the Native Hawaiian population in Hawai‘i by age, from 1900 to 1770, are provided in the appendix.

**FIGURE 1.** The reverse path to stability: The stability index for the Native Hawaiian population of Hawai‘i, 1900 to 1770

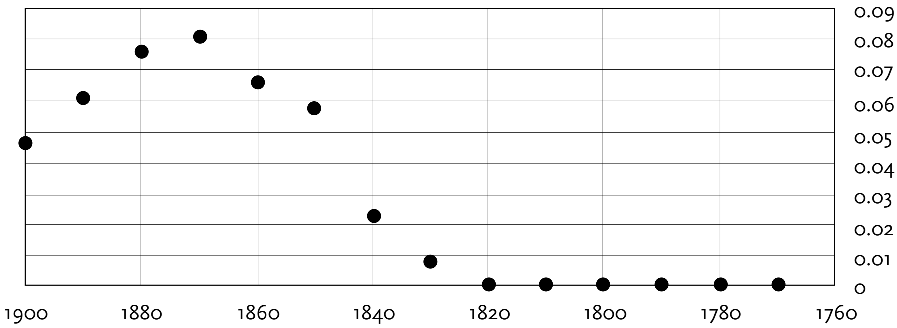



**FIGURE 2.** Age distribution of the Native Hawaiian population in 1900

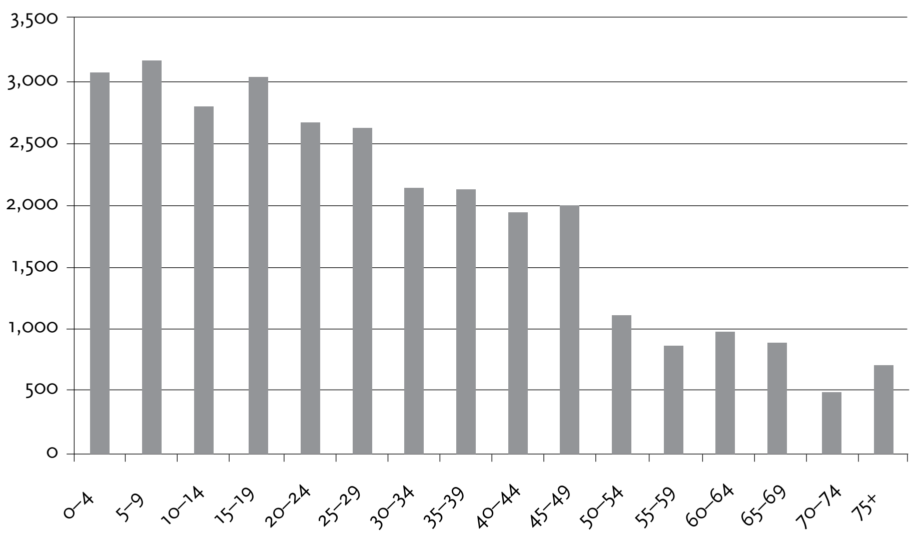
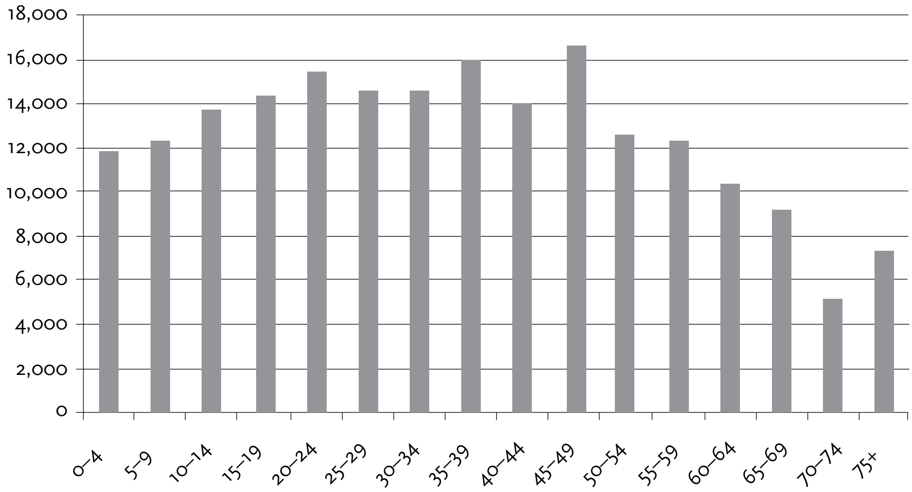


**FIGURE 3.** Age distribution of the Native Hawaiian population at stability (1820)



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### About the Author

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## Notes

1 Although there are arguments that the Spanish visited Hawai'i in the sixteenth century, most evidence suggests that the English were the first Europeans to do so, with the arrival of Cook in 1778 (Nordyke, 1989, pp. 15–18). This paper follows the argument that the English contact in 1778 was the first.

2 The 1910–20 RCCRs are provided in table 2, and the decennial estimates by age group from 1900 to 1770 are found in the Appendix.

3 In addition to the migration from these cited sources, there was a small contingent of Native Hawaiians who became Mormons and moved in the latter part of the nineteenth century to Utah, where they founded a small settlement. However, the settlement never took hold and was abandoned within thirty years, and the remaining settlers returned to Hawai'i (Kester, 2013).

4 Using a method described by Swanson and Tedrow (2012), a set of alternative RCCRs was used to generate an alternative estimate of the Hawaiian population in 1778. In the first step, the 1910–20 CCRs were used to develop an estimate of life expectancy at birth (e0) for the Native Hawaiian population during this same period. The idea here was to make a comparison with the e0 estimates developed by Park et al. (1979, p. 14), both for the Native Hawaiian population circa 1920 and at the time of first European contact. The e0 estimate derived from the 1910–20 CCRs was 39.15 years, which is higher than both of the e0 estimates for males (34.21) and females (32.90) in 1920, respectively. It also is higher than the e0 estimate of 30 years developed by Park et al. (1979) for the Hawaiian population at the time of first European contact. In the second step, an iterative process was used to find a constant scalar that would produce a set of revised 1920–10 RCCRs that was consistent with the average (33.56) of the 1920 e0 estimates by sex developed by Park et al. (1979). The revised RCCRs were then used in a third step, in which the backcasting process was employed to generate an alternative estimate of 749,102 for the Hawaiian population at time of first European contact. This alternative estimate is approximately 9.7 percent higher than the estimate of 683,200, which is based on the 1920–10 RCCRs consistent with e0 = 39.15. Given the data and available evidence, it does not appear likely that e0 for the Hawaiian population circa 1920 was higher than 40. This, in turn, suggests that the Hawaiian population in 1778 was not less than 683,200, but it could have been as high as 749,102. The data (and methods) used to generate these results are available from the author in the form of MS Excel workbooks.

In a similar analysis, the population by age in 1780 generated by the RCCRs was controlled to a total population of 300,000 and brought forward in time using the RCCR reciprocals to 1900. This process resulted in a total population of Native Hawaiians numbering 8,851, which is far below the 29,799 counted in the 1900 US Census of Hawai'i. Given that the starting relative age structure is reasonably close to what it actually was in 1780, this result suggests that an estimate of 300,000 Native Hawaiians at the time of first European contact is too low. Another scenario using a starting population of 400,000 in 1780 also was examined, which resulted in a total of 11,802 Native Hawaiians in 1900. This also is far below the 29,799 counted in the 1900 US Census, which suggests that a population of 400,000 at the time of first European contact also is too low.

5 In subsequent work, Hommon (2013, p. 12) provides an alternative estimate of 525,000 Native Hawaiians at the time of first European contact. This is based on assumptions concerning the establishment and timing of a specific agricultural regime (Hommon 2013, pp. 229–234).

**APPENDIX** Decennial estimates of the Native Hawaiian population in Hawai'i by age group from 1900 to 1770

| Age | 1900 | 1890 | 1880 | 1870 | 1860 | 1850 | 1840 | 1830 | 1820 | 1810 | 1800 | 1790 | 1780 | 1770 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0–4 | 3,076 | 3,120 | 3,502 | 4,004 | 5,065 | 4,321 | 6,122 | 8,857 | 11,866 | 15,898 | 21,299 | 28,535 | 38,229 | 51,217 |
| 5–9 | 3,178 | 3,333 | 3,782 | 3,746 | 4,522 | 3,525 | 6,827 | 9,146 | 12,254 | 16,416 | 21,994 | 29,466 | 39,476 | 52,888 |
| 10–14 | 2,797 | 3,007 | 3,438 | 4,348 | 3,709 | 5,255 | 7,604 | 10,187 | 13,648 | 18,284 | 24,496 | 32,818 | 43,967 | 58,905 |
| 15–19 | 3,040 | 3,303 | 3,271 | 3,949 | 3,078 | 5,962 | 7,987 | 10,700 | 14,336 | 19,206 | 25,731 | 34,473 | 46,184 | 61,875 |
| 20–24 | 2,658 | 2,910 | 3,680 | 3,140 | 4,449 | 6,437 | 8,623 | 11,553 | 15,478 | 20,736 | 27,781 | 37,219 | 49,864 | 66,804 |
| 25–29 | 2,622 | 2,487 | 3,002 | 2,340 | 4,532 | 6,072 | 8,135 | 10,899 | 14,602 | 19,562 | 26,208 | 35,112 | 47,041 | 63,022 |
| 30–34 | 2,130 | 2,580 | 2,201 | 3,118 | 4,512 | 6,044 | 8,098 | 10,849 | 14,535 | 19,472 | 26,088 | 34,951 | 46,825 | 62,733 |
| 35–39 | 2,120 | 2,450 | 1,910 | 3,699 | 4,955 | 6,639 | 8,894 | 11,916 | 15,964 | 21,388 | 28,654 | 38,389 | 51,432 | 68,905 |
| 40–44 | 1,939 | 1,584 | 2,244 | 3,247 | 4,350 | 5,828 | 7,808 | 10,461 | 14,015 | 18,776 | 25,155 | 33,701 | 45,151 | 60,490 |
| 45–49 | 1,986 | 1,482 | 2,870 | 3,845 | 5,152 | 6,902 | 9,247 | 12,388 | 16,597 | 22,236 | 29,790 | 39,910 | 53,469 | 71,635 |
| 50–54 | 1,107 | 1,501 | 2,172 | 2,910 | 3,899 | 5,223 | 6,998 | 9,375 | 12,560 | 16,827 | 22,544 | 30,203 | 40,464 | 54,211 |
| 55–59 | 854 | 1,584 | 2,122 | 2,842 | 3,808 | 5,102 | 6,835 | 9,157 | 12,268 | 16,436 | 22,020 | 29,501 | 39,524 | 52,952 |
| 60–64 | 963 | 1,334 | 1,788 | 2,395 | 3,209 | 4,299 | 5,759 | 7,716 | 10,338 | 13,850 | 18,555 | 24,858 | 33,304 | 44,618 |
| 65–69 | 883 | 1,183 | 1,585 | 2,124 | 2,845 | 3,812 | 5,107 | 6,842 | 9,166 | 12,280 | 16,452 | 22,042 | 29,530 | 39,562 |
| 70–74 | 492 | 659 | 883 | 1,183 | 1,585 | 2,123 | 2,845 | 3,811 | 5,106 | 6,840 | 9,164 | 12,278 | 16,449 | 22,037 |
| 75+ | 702 | 941 | 1,260 | 1,688 | 2,262 | 3,030 | 4,059 | 5,439 | 7,286 | 9,762 | 13,078 | 17,521 | 23,473 | 31,448 |
| TOTAL | 30,546 | 33,457 | 39,711 | 48,579 | 61,931 | 80,574 | 110,948 | 149,297 | 200,018 | 267,971 | 359,010 | 480,978 | 644,383 | 863,302 |