Life Expectancies in Hawai'i: A Multi-ethnic Analysis of 2010 Life Tables

Yanyan Wu PhD; Kathryn Braun DrPH; Alvin T. Onaka PhD; Brian Y. Horiuchi MPH; Caryn J. Tottori MA; Lynne Wilkens DrPH

Abstract

The objective of this study is to examine longevity disparities in Hawai'i by race/ethnicity and gender based on age-specific death rates in 2010. Abridged life tables for Chinese, Japanese, Filipino, Hawaiians, and Caucasians in Hawai'i are presented for the age groups: <1, 1-4, every 5-year interval from 5-84, and 85+ years for the year of 2010. Death data were provided by the Hawai'i Department of Health Office of Health Status Monitoring, and population data were based on 2010 Census modified based on ethnicity estimates from the Hawai'i Health Survey. Life expectancy at birth in Hawai'i has increased consistently from 69.5 years in 1950 to 82.4 years in 2010. Longevity disparities seen in past decades continue to persist between the longest-living groups, Japanese and Chinese, and the shortest-living group, Native Hawaiians, with a gap of approximately 10 years. In addition, females lived 6 years longer than males on average. Racial/ethnic disparities in longevity can be partially explained by differences in socioeconomic status, health behaviors, health care access, and racism. Native Hawaiians continue to have the shortest life expectancy of the ethnic groups examined, requiring expanded efforts to address Native Hawaiian health across the life course. Our findings also support more ethnic-specific research to understand the health care needs and utilization patterns of each group.

Keywords

Life expectancy, life table, health disparities

Abbreviations

HHS: Hawai'i Health Survey
HBRFSS: Hawai'i Behavioral Risk Factor Surveillance System
ACE: Adverse Childhood Events

Introduction

Life expectancy at birth is widely used as an index of overall health and social conditions in different populations. Life expectancy at birth in the United States (US) has improved dramatically over the past century. Throughout the second half of the century, advances in medicine, along with healthier lifestyles and better access to health care, have yielded impressive improvements in life expectancy above age 65 years. Estimates published nationally suggest that life expectancy (at birth and at older ages) for African Americans has lagged behind Caucasians; national life expectancy estimates are not provided for smaller racial groups.[1]

Hawai'i is a multicultural state in which two-thirds of the population is Asian American or Pacific Islander. In 2010, the state's population was 1,360,301, and the ethnic distribution was estimated to be 21.3% Native Hawaiian, 22.7% Caucasian, 16.3% Japanese, 17.2% Filipino, 6.8% Chinese, and 15.7% others (Unpublished data: Cancer Research Center of Hawaii. Population estimates 2010). Although Hawai'i boasts the longest life expectancy of any state in the US,[2-4] life expectancy differences have been seen across these race/ethnic groups. Specifically, between 1950 and 2000, Japanese and Chinese residents had the highest life expectancy at birth, approximately 10 years longer than Native Hawaiians.[2,5]

In this paper, we present disaggregated life tables for the year 2010 for five major ethnic groups in Hawai'i—Native Hawaiian, Caucasian, Chinese, Japanese, and Filipino—by gender. Estimates were based on the following age groups: <1, 1-4, 5-year intervals from 5-84 and 85 years and above.

Data and Methods

Life tables can be estimated in two ways according to the length of the age interval in which data are presented. A complete life table contains data for every single year of age, while an abridged life table typically contains data by 5- or 10-year age intervals. The abridged life table method was used for US life tables estimated prior to 1997. The World Health Organization's Global Program on Evidence for Health Policy also uses the abridged method for the construction of life tables of their member states.[6] We apply the abridged method proposed by Chiang.[7] This method also was used in the estimation of the 1980, 1990 and 2000 series of life table reports for Hawai'i.[2,5]

Death record data were provided by the Hawai'i Department of Health. Numbers of death were calculated based on the mean number over a period of 3.5 years centering on April 1, 2010. Population estimates are based on the Hawaii Census 2010, adjusted by ethnicity estimates from the Hawai'i Health Survey (HHS), a random-sample telephone survey patterned after the National Health Interview Survey.[8]

The ethnic categorization schema of the HHS differs from that of the US Census. It is based on paternal ethnicity for mixed offspring, with exceptions for Caucasians and Native Hawaiians. When only one parent is Caucasian, the child takes the ethnicity of the non-Caucasian parent, and when one parent is Hawaiian or part-Hawaiian, the child is classified part-Hawaiian regardless of the other parent's ethnicity.[8] For this study, we combined pure Hawaiians and part Hawaiians (under the term "Native Hawaiian", indicating that the individual can trace his/her ancestry to pre-colonization), as the number of full-blood Hawaiians is small.[9] Because the HHS classification system is used for death records, HHS population estimates are a better match than US Census estimates in constructing life tables.

Results

Life Expectancy at Birth Increased by 12.9 Years in 60 Years in Hawai'i

Table 1 shows the life expectancy at birth for the overall population and the five ethnic groups (Chinese, Japanese, Filipino, Caucasian, and Native Hawaiian) in Hawai'i from 1950 to 2010, as well as the national life expectancy in the US for the total population and for Caucasians and African Americans. The life expectancy at birth in Hawai'i in 2010 was 82.4 years, 3.7 years higher than the national average for the total US population (78.7 years) and for Caucasians (78.9) and African Americans (75.1).[1] In the past six decades, life expectancy at birth in Hawai'i increased by 12.9 years, compared to a 10.5-year increase in the nation (9.8 years for Caucasians and 14.9 years for African Americans).[1]

Table 1 and Figure 1 show the trend of life expectancy at birth in Hawai'i for the overall population and the five ethnic groups. Filipinos had the largest increase in life expectancy between 2000 and 2010, at 3.4 years. Native Hawaiians had the lowest life expectancy of the five ethnic groups, with a consistent 10-year gap between the longest living ethnicities (Japanese from 1950 to1970 and Chinese thereafter). The longevity gap was 10.2 years in 1950 and 11.1 years in 2010 with a range from 8.6 years to 11.8 years. Looking more closely, the gap in life expectancy between Caucasians and Native Hawaiians in Hawai'i has decreased over time, from 6.7 years in 1950 to 4.0 years in 2010, while the gap between Caucasians and Japanese increased from 3.4 years in 1950 to 7.1 years in 2010, and the gap between Caucasian and Chinese increased from 0.5 years to 7.1 years. Due to limited sample size, the life tables for other Pacific Islanders such as Samoan orTongan were not calculated in this paper.

Comparing Hawai'i to national statistics, life expectancy estimates for African Americans over the same time period were 1.5 to 5.2 years below those for Native Hawaiians (Table 1). Similarly to the gap between Caucasians and Native Hawaiians in Hawai'i, the life expectancy gap between Caucasians and African Americans nationally has decreased over time, from 8.3 years in 1950 to 3.8 years in 2010.[1] Unfortunately, the US Census does not publish life expectance estimates for Asian Americans or Pacific Islanders.

Females Live about 6 Years Longer than Males

Life expectancy by gender for 2000 and 2010 are listed in Table 1. The life expectancy at birth in 2010 for females was 6.4 years longer than that of males in Hawai'i. The gender gap in Hawai'i was greater than the national difference, at 4.8 years for the total US population, but similar to the gender gap for African Americans (6.2 years).[1] The gender gap also varies by ethnicity in Hawai'i. Filipinos and Japanese had the largest difference (7.3 years and 6.8 years, respectively). The gender gaps in Chinese and Caucasians were below the population average (4.7 years and 5.1 years, respectively). The gender difference in Native Hawaiians was 5.5 years.

Life Expectancy and Mortality Differ across Ethnic Groups by Age Groups

Life expectancies for 2010 by gender, ethnicity, and age group are presented in Table 2. In general, the life expectancies in all the age groups are consistent with that of birth, except that the life expectancy for Filipino males exceeded Japanese males at age 80-84 years. Filipino females outlived Japanese females at age 75 and Chinese females at age 80.

Table 1. Life Expectancy at Birth by Ethnicity 1950 to 2010 and Gender Gap in 2000 and 2010

	US Population			Hawai'i population					
Year	Total	Caucasian	African American	Total	Chinese	Japanese	Filipino	Caucasian	Native Hawaiian
1950	*68.2*	*69.1*	*60.8*	*69.5*	69.7	72.6	69.1	69.2	62.5
1960	*69.7*	*70.6*	*63.6*	*72.4*	74.1	75.7	71.5	72.8	64.6
1970	*70.8*	*71.7*	*64.1*	*74.2*	76.1	77.4	72.6	73.2	67.6
1980	*73.7*	*74.4*	*68.1*	*77.9*	81.7	80.9	79.3	75.8	71.8
1990	*75.4*	*76.1*	*69.1*	*78.9*	82.9	82.1	78.9	75.5	74.3
2000	*76.8*	*77.3*	*71.8*	*80.5*	86.1	82.8	80.9	79.0	74.3
2010	*78.7*	*78.9*	*75.1*	*82.4*	87.7	84.7	84.3	80.6	76.6
2000									
Female	*79.3*	*79.9*	*75.1*	*83.6*	88.6	85.7	85.9	81.8	77.1
Male	*74.1*	*74.7*	*68.2*	*77.5*	83.5	79.7	78.0	76.7	71.5
Gender gap	*5.2*	*5.2*	*6.9*	*6.1*	5.1	6.0	7.9	5.1	5.6
2010									
Female	*81.0*	*81.3*	*78.0*	*85.6*	90.0	88.0	88.1	83.4	79.4
Male	*76.2*	*76.5*	*71.8*	*79.2*	85.3	81.2	80.8	78.3	73.9
Gender gap	*4.8*	*4.8*	*6.2*	*6.4*	4.7	6.8	7.3	5.1	5.5

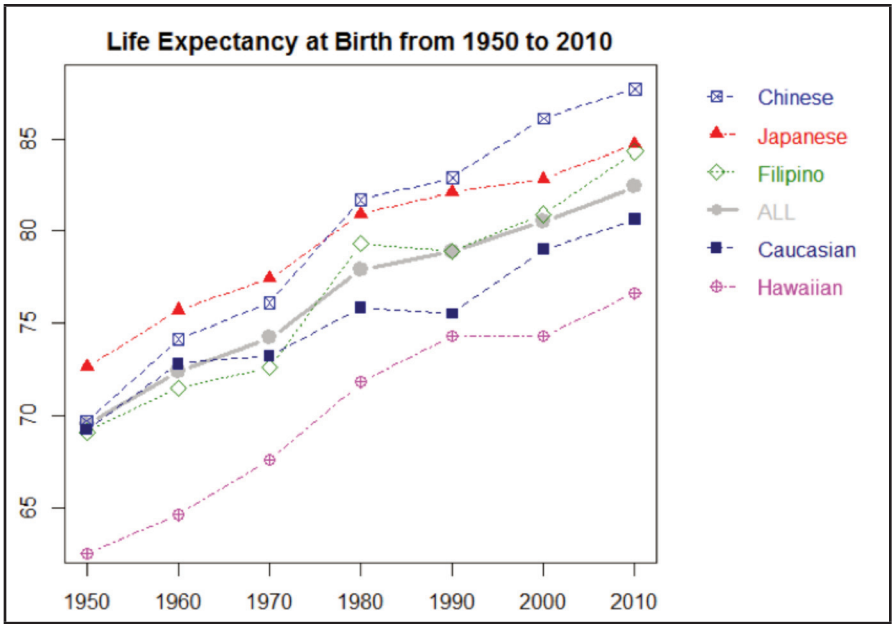

Figure1. Life Expectancy at Birth for Major Race/Ethnicities in Hawai'i from 1950 to 2010

Table 2. Life Expectancy for Hawai'i Population and Ethnic Groups by Gender and Age Groups in 2010

Age Group	All Ethnic groups			Chinese			Japanese			Filipino			Caucasian			Hawaiian		
	Over-all	M	F	Over-all	M	F	Over-all	M	F	Over-all	M	F	Over-all	M	F	Over-all	M	F
<1	82.4	79.2	85.6	87.8	85.3	90.0	84.7	81.2	88.0	84.3	80.8	88.1	80.6	78.3	83.4	76.6	73.9	79.4
1-4	81.8	78.7	85.1	87.0	84.5	89.3	84.2	80.7	87.6	83.8	80.3	87.5	79.9	77.6	82.6	76.2	73.5	79.0
5-9	77.9	74.7	81.1	83.0	80.5	85.3	80.3	76.8	83.6	79.8	76.4	83.6	75.9	73.7	78.6	72.3	69.5	75.1
10-14	72.9	69.8	76.2	78.0	75.6	80.3	75.4	71.9	78.7	74.8	71.4	78.6	71.0	68.7	73.8	67.3	64.6	70.1
15-20	68.0	64.8	71.2	73.0	70.6	75.3	70.4	66.9	73.7	69.8	66.4	73.6	66.0	63.7	68.8	62.3	59.6	65.1
20-25	63.1	60.0	66.3	68.1	65.6	70.3	65.5	62.0	68.8	65.0	61.5	68.7	61.2	59.0	63.9	57.5	54.9	60.2
25-30	58.3	55.3	61.4	63.1	60.7	65.4	60.7	57.2	63.9	60.1	56.8	63.8	56.4	54.2	59.1	52.8	50.2	55.4
30-35	53.5	50.5	56.5	58.2	55.7	60.5	55.7	52.3	58.9	55.3	52.1	58.9	51.6	49.5	54.2	48.0	45.6	50.4
35-40	48.7	45.8	51.6	53.3	50.9	55.5	50.9	47.5	54.0	50.5	47.3	54.0	46.9	44.8	49.4	43.3	40.9	45.6
40-45	44.0	41.2	46.8	48.4	46.0	50.6	46.0	42.7	49.2	45.7	42.6	49.2	42.2	40.1	44.5	38.7	36.4	40.9
45-50	39.4	36.6	42.1	43.5	41.1	45.7	41.3	38.0	44.3	41.0	38.0	44.4	37.6	35.6	39.8	34.2	32.1	36.2
50-55	34.9	32.3	37.5	38.8	36.5	40.9	36.7	33.6	39.6	36.4	33.5	39.7	33.2	31.4	35.3	29.8	27.9	31.8
55-60	30.6	28.1	33.0	34.1	31.9	36.1	32.2	29.2	34.9	31.9	29.0	35.0	28.9	27.2	30.8	25.8	24.0	27.6
60-65	26.4	24.1	28.6	29.5	27.4	31.4	27.8	24.9	30.4	27.6	24.8	30.6	24.8	23.3	26.5	21.9	20.3	23.4
65-70	22.3	20.2	24.3	25.0	23.0	26.8	23.6	20.9	25.9	23.3	20.7	26.2	20.7	19.4	22.2	18.3	16.8	19.6
70-75	18.5	16.6	20.3	20.7	18.9	22.4	19.6	17.1	21.6	19.4	16.9	22.1	16.9	15.7	18.1	15.1	13.9	16.1
75-80	15.0	13.2	16.5	16.9	15.2	18.3	15.8	13.5	17.7	15.7	13.5	18.1	13.4	12.4	14.3	12.1	11.1	12.9
80-85	11.9	10.3	13.2	13.3	11.8	14.5	12.4	10.2	14.1	12.5	10.5	14.9	10.4	9.6	11.0	9.5	8.7	10.1
85+	9.3	7.9	10.3	10.2	9.1	11.1	9.5	7.6	11.0	10.1	8.2	12.4	7.8	7.2	8.3	7.5	6.9	7.9

Figure 2 examines the mortality rate per 10,000 populations for the age groups (0-4, 5-19, 20-44, 45-64 and 65-84). Even though the life expectancy at birth for Caucasians was the second lowest, the average mortality rate from birth to 4 years for Caucasians was only second to the Chinese. The mortality rate between 5-19 years was the lowest but with the highest variation due to the small numbers of death. A consistent pattern of mortality rates for both females and males across the five ethnic groups is observed. The mortality rate for Chinese females was approximately 3 per 10,000 for those aged 20-44 years, 15 for those 45-64 years, and 127 for those 65-84 years. The corresponding death rate for Japanese and Filipinos was about 1.5 times higher for the three age groups, whereas Caucasians and Native Hawaiians were about 2 times and 3 times higher than Chinese respectively. There was a similar pattern in males, except the overall mortality rate is higher than that of females, and the ethnic gap is a little higher. Filipinos had lower mortality rates compared to Japanese in the older age-groups (65-84 for females, 45-64, and 65-84 for males).

Discussion

Life expectancy in Hawai'i increased steadily from 1950 to 2010 for all racial/ethnic groups. While the 10-year gap in longevity between Native Hawaiians and the longest-living ethnic groups (Japanese and Chinese) has remained constant over the past 60 years, the gap in life expectancy between Native Hawaiians and Caucasians in Hawai'i has decreased.

Differences in life expectancy have been linked to social and economic disparities.[10] Most recently, for example, an analysis of a merged tax-record-death-record database found that higher income was associated with greater longevity across the US.[10] In Hawai'i, the 2010 Hawai'i Behavioral Risk Factor Surveillance System (HBRFSS) data suggest that only 24% of Native Hawaiians have household incomes at $75,000 or higher, compared to Caucasians (43%), Chinese (43%), and Japanese (41%) residents. Similarly, only 20% of Native Hawaiians age 25+ have a 4-year-college degree or higher, compared to Chinese (53%), Japanese (45%), and Caucasian (45%) residents. However, socio-economic indicators do not appear to explain the increases in life expectancy seen in Filipino residents, of whom only 27% have college degrees and only 25% have household incomes of $75,000 or higher.

Disparities in life expectancy also have been linked to differences in health behavior. For example, the Honolulu Asia Aging Study (HAAS) found that avoidance of overweight, hyperglycemia, hypertension, smoking, and excessive alcohol consumption were associated with survival in Japanese males in Hawai'i.[11] Looking at 2010 HBRFSS data, both Native Hawaiians and Caucasians have a higher prevalence of lifetime smoking (100+ cigarettes), at 47.6% and 49.2%, respectively, compared to 24.4% of Chinese, 27.3% of Filipinos, and 36.2% of Japanese.[12] However, the percentage of current, everyday smokers was much higher among Native Hawaiians (20.6%) than among Caucasians (10.8%), Filipinos (7.7%), Japanese (7.2%), and Chinese (5.1%).[12] Similarly, the prevalence of obesity was much higher among Native Hawaiians (43.7%), compared to the other four ethnic groups (Chinese 14.7%, Japanese 13.9%, Filipino 19.9% and Caucasian 20.6%).[12] More effective tobacco cessation and weight control interventions may increase life expectancy for Native Hawaiians.

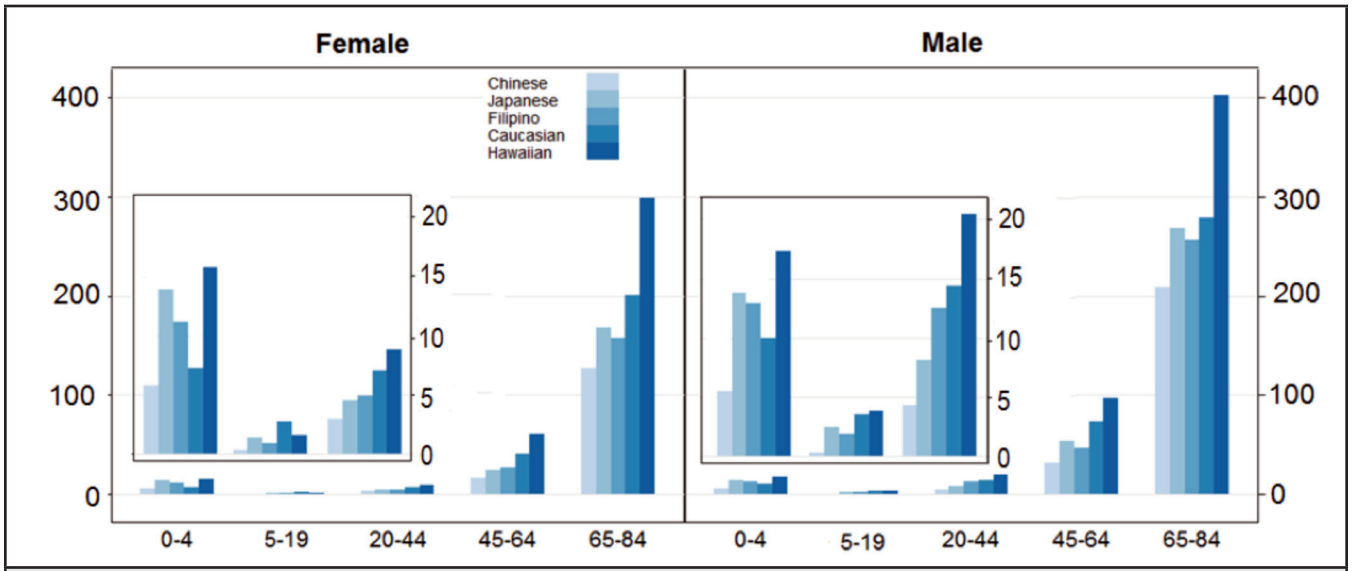

Figure 2. Death Rate Per 10,000 by Age Group for Five Ethnic Groups in 2010. The Vertical Axis is the Death Rate per 10,000 Population, whereas the Horizontal Axis is the Age Group. The Smaller Windows in the Figures Show the Enlarged Scale of Death Rates for Younger Age Groups.

Another culprit in health disparities is differential access to health care. HBRFSS 2010 data suggest that 9.2% of Filipinos had no health plan coverage, compared to an average of 5.4% for other ethnic groups.[12] Filipinos and Native Hawaiians had the highest percentage reporting that they did not see a doctor in the past 12 months because of cost (10.3% and 9.5%, respectively), compared to 7.3% of Caucasians, 3.4% of Japanese, and 2.5% of Chinese.[12]

A growing body of research shows that the experience of racial discrimination can negatively impact health, as it both decreases one's participation in health care and increases one's participation in risky health behaviors.[13-16] Work by Kaholokula and colleagues suggests that ethnic discrimination may be a chronic psychosocial stressor for Native Hawaiians and that strong perceptions of discrimination are associated with stress-related chronic diseases, such as hypertension and diabetes.[17,18] For example, a study of 143 adult Native Hawaiians found that those reporting a strong Hawaiian ethnic identity perceived more racism in their environment than those who identified less strongly, and that greater perceived racism was significantly associated with lower diurnal cortisol levels.[18] Chronically low cortisol levels have been associated with increased risk for stress-related disorders, such as atherosclerosis, hypertension, obesity, and diabetes.[19,20] More research is needed on the experience of racism by different ethnic groups in Hawai'i and the link between this experience and access to health care, engagement in risky behaviors, morbidity, and mortality.

Another relevant area of research is on adverse childhood events (ACEs). A number of papers have been published on the health of 17,337 adult members of the Kaiser Health Plan members who completed a survey about ACEs they may have experienced. As a whole, findings from this research show strong linkages between the experience of abuse, neglect, parent death, and poverty in childhood and increased risk for physical and mental health conditions in later life.[21] Findings from this dataset also suggest greater risk of premature death in families of health plan members who reported more ACEs, leading the authors to conclude that "adverse childhood experiences may be an indicator of a chaotic family environment".[22] In Hawai'i, questions from the CDC ACEs module were added to the BRFSS in 2010. Findings suggest that the prevalence of ACEs is inversely related to socio-economic status income and directly related to number of health conditions and risk behaviors.[23] Looking by ethnicity, the prevalence of ACEs is lowest for Chinese (40.3%) and Japanese (44.8%), intermediate for Filipinos (52.0%), and highest for Caucasian (63.8%) and Native Hawaiians (74.9%), inversely mirroring life expectancy ranking by ethnicity.[23] This supports the need for more research on ACEs and for interventions that can improve health and wellbeing across the life course.

Another factor that must be considered when interpreting these data is the fact that immigrants to Hawai'i may return to their home countries for end-of-life care. According to practitioners in Hawai'i's community health centers, which serve many of the state's new immigrant groups, it is very likely that older Filipinos return to the Philippines when they are sick and near death, taking advantage of strong family support systems and low medical costs in their natal homes. This may confound the true life expectancy of this population, which may in fact be artifactually lower than that calculated.

In most disparities research in the US, Caucasians serve as the "gold standard" against which other race/ethnic groups are compared. In Hawai'i, however, the Japanese and Chinese groups have the longest life expectancy and, by and large, the best socio-economic, health, and utilization statistics. When compared to Caucasians, the life expectancy gap between Native Hawaiians in Hawai'i is decreasing, similarly to the gap between Caucasian and African Americans nationally. What is increasing is the gap between both the Native Hawaiian and Caucasian groups and the Chinese and Japanese residents of Hawai'i. The data also show that mortality rates for Native Hawaiians and Caucasians are significantly higher than for Chinese in every age group, reinforcing the need for programs that address health disparities over the life course, not just in adulthood. Also of interest would be more research on the reasons for the successes of the Chinese and Japanese groups that can be applied to the shorter-living groups.

Limitations

Hawai'i is one of the smallest, yet most multicultural states in the US, with a population of 1.3 million. Thus, numbers of deaths by age-gender-ethnic group can be low and vary dramatically year to year. Therefore, mean numbers of deaths over a 3.5-year period and the abridged life table method with five-year-intervals were used to reduce potential variation, and the life tables for Koreans and other Pacific Islanders such as Samoans and Tongans were not calculated in this paper. Also, we used the established Hawai'i state algorithm for ethnicity classification. The classification schema has been used in Hawai'i since before statehood (1959), when mixed-ethnic marriages were less common. Although there are fewer multiracial subpopulations in older adults and new immigrants to Hawai'i, interracial marriages have become very common in Hawai'i; Hawai'i Department of Health data suggest that about 50% of babies born in the state in 2009 and 54.5% in 2015 were of mixed ethnicity.[24] This trend might complicate the established ethnic classification system in the future. At the same time, the number of immigrants and their children is growing, and the percentage of foreign-born immigrants in the state's population rose from 14.7% in 1990 to 17.6% in 2013.[25] We found limited research on the experience of racism by different ethnic groups in Hawai'i. Finally, socio-economic and health behavior data are not linked to the death record, restricting us from investigating predictors of life expectancy disparities.

Conclusion

Our gender-ethnic-age-specific life-table analysis revealed substantial longevity disparities among the five largest ethnic groups in Hawai'i. Although substantial variation in socioeconomic status, health behavior, and health care access exists

by ethnicity in Hawai‘i, these variations do not fully explain disparities in life expectancy. As Native Hawaiians continue to have the shortest life expectancy of the five groups, we recommend expanding efforts to improve Native Hawaiian health across the life course. Our findings also support more research to understand ethnic-specific health behaviors, health care needs, utilization patterns, and experiences of ACEs and racism.

Conflict of Interest

Authors declare no conflict of interests.

Authors' Affiliations:
- University of Hawai'i, Department of Public Health Sciences, Honolulu, HI (YW, KB)
- Hawai'i Department of Health, Honolulu, HI (ATO, BYH, CJT)
- University of Hawai'i Cancer Center, Honolulu, HI (LW)

Correspondence to:
Yanyan Wu PhD; 1960 East-West Rd., Biomed D104F,
Honolulu, HI 96822; Email: yywu@hawaii.edu

References

1. Arias E. *United States life tables, 2011. National vital statistics reports.* Hyattsvill, MD: National Center for Health Statistics2015.
2. Braun KL, Yang H, Onaka AT, Horiuchi BY. Life and death in Hawaii: ethnic variations in life expectancy and mortality, 1980 and 1990. *Hawaii Med J.* 1996;55(12):278-283, 302.
3. Wei R, Anderson RN, Curtin LR, Arias E. U.S. decennial life tables for 1999-2001: state life tables. *Natl Vital Stat Rep.* 2012;60(9):1-66.
4. Lewis K, Burd-Sharps S. *The measures of America 2013-2014, American Human Development Report.* : Social Science Research Council; 2013.
5. Park CB, Braun KL, Horiuchi BY, Tottori C, Onaka AT. Longevity disparities in multiethnic Hawaii: an analysis of 2000 life tables. *Public Health Rep.* 2009;124(4):579-584.
6. Mathers CD VT, Lopez AD, Salomon J, Ezzati M (ed.). National burden of disease studies: A practical guide. (Edition 2.0). Global Program on Evidence for Health Policy. 2001. http://www.who.int/healthinfo/nationalburdenofdiseasemanual.pdf.
7. Chiang CL. *The life table and its applications.* Original ed. Malabar, Fla.: R.E. Krieger Pub. Co.; 1984.
8. *Hawaii health survey.* Honolulu: Hawaii Department of Health;2010.
9. Look M, Braun KL. A mortality study of the Hawaiian people: 1910-1990. *Honolulu: The Queen's Health System.* 1995.
10. Chetty R, Stepner M, Abraham S, et al. The Association Between Income and Life Expectancy in the United States, 2001-2014. *JAMA.* 2016;315(16):1750-1766.
11. Willcox BJ, He Q, Chen R, et al. Midlife risk factors and healthy survival in men. *JAMA.* 2006;296(19):2343-2350.
12. State of Hawaii DoH, Hawaii Behavioral Risk Factor Surveillance System. http://health.hawaii.gov/brfss/files/2014/01/HBRFSS_2010results_12.pdf. Accessed September 15, 2016.
13. Gonzales KL, Harding AK, Lambert WE, Fu R, Henderson WG. Perceived experiences of discrimination in health care: a barrier for cancer screening among American Indian women with type 2 diabetes. *Womens Health Issues.* 2013;23(1):e61-67.
14. Weech-Maldonado R, Hall A, Bryant T, Jenkins KA, Elliott MN. The relationship between perceived discrimination and patient experiences with health care. *Med Care.* 2012;50(9 Suppl 2):S62-68.
15. Williams DR, Mohammed SA. Racism and Health I: Pathways and Scientific Evidence. *Am Behav Sci.* 2013;57(8):1152-1173.
16. Abraham CM. Unequal Aging: Lessons From Inequality's End Game. *Public Policy & Aging Report.* 2016;26(2):68-72.
17. Kaholokula JK, Nacapoy AH, Grandinetti A, Chang HK. Association between acculturation modes and type 2 diabetes among Native Hawaiians. *Diabetes Care.* 2008;31(4):698-700.
18. Kaholokula JK, Iwane MK, Nacapoy AH. Effects of perceived racism and acculturation on hypertension in Native Hawaiians. *Hawaii Med J.* 2010;69(5 Suppl 2):11-15.
19. Bjorntorp P, Holm G, Rosmond R. Hypothalamic arousal, insulin resistance and Type 2 diabetes mellitus. *Diabet Med.* 1999;16(5):373-383.
20. Cohen S, Schwartz JE, Epel E, Kirschbaum C, Sidney S, Seeman T. Socioeconomic status, race, and diurnal cortisol decline in the Coronary Artery Risk Development in Young Adults (CARDIA) Study. *Psychosom Med.* 2006;68(1):41-50.
21. Dube SR, Felitti VJ, Dong M, Giles WH, Anda RF. The impact of adverse childhood experiences on health problems: evidence from four birth cohorts dating back to 1900. *Prev Med.* 2003;37(3):268-277.
22. Anda RF, Dong M, Brown DW, et al. The relationship of adverse childhood experiences to a history of premature death of family members. *BMC Public Health.* 2009;9:106.
23. Ye D, Reyes-Salvail F. Adverse childhood experiences among Hawai'i adults: Findings from the 2010 Behavioral Risk Factor Survey. *Hawaii J Med Public Health.* 2014;73(6):181-190.
24. State of Hawaii DoHVS. http://health.hawaii.gov/vitalstatistics. Accessed September 15, 2016.
25. New Americans in Hawai'i: *The Political and Economic Power of Immigrants, Asians, and Latinos in the Aloha State.*: American Immigration Council;2015.