Modeling Poverty and Health for Native Hawaiian and Pacific Islander and Asian Ethnic Populations

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Abstract

This study examined differences in poverty and health among Native Hawaiians and Pacific Islanders (NHPI) and 6 disaggregated Asian ethnic subgroups and an aggregated Other Asian category. Participants were followed longitudinally for 2 years using data from 2009 to 2019 from the Current Population Survey, a monthly survey conducted by the Census Bureau. Having 2 years of data enabled the study to assess both prevalence of poverty and fair/poor health in only 1 of the 2 years and in both years. For NHPI, 13.5% were in poverty 1 of the 2 years and 7.1% in both years. Asian ethnicities showed high variability ranging from a low of 6.4% for 1 year and 1.9% for 2 years among Asian Indians to 16.0% for 1 year and 6.3% for 2 years among Vietnamese. Fair/ poor health also showed ethnic variability, made most apparent after age-sex adjustment in regression models. For poverty, after adjustment, Asian Indians, Filipinos and Japanese had significantly lower odds of being in poverty at least 1 year than NHPI. For having fair/poor health, Asian Indians and Japanese experienced lower odds than NHPI for both 1 and 2 years and Filipinos for 1 year, after age/sex adjustment. The results emphasize the diversity of Asian and Pacific Islander populations, the variability of poverty over time, and the importance of using disaggregated data to understand ethnic differences in poverty and health. These findings can be used to inform future modeling of social determinants on poverty and health among NHPI and Asian subgroups.

Keywords

Poverty; Self-reported health; Native Hawaiian and Pacific Islander; Ethnic disaggregation

Abbreviations

CPS = Current Population Survey
NHPI = Native Hawaiians and Pacific Islanders
OMB = Office of Management and Budget

Introduction

Native Hawaiians and Pacific Islanders (NHPI) and Asians are often aggregated into a single group, rendering understanding of health and poverty for a single ethnicity impossible. In 1997, the Office of Management and Budget (OMB) recommended disaggregating the Asian or Pacific Islander category into 2 categories: Asians and NHPI.[1] In 2000 the Census first separated Asians and NHPI in data reports in line with the recommendation issued in 1997.[2] In 2003, the Secretary of the Department of Health and Human services approved the separation of Asian race category from the NHPI race category and added 6 Asian subcategories on the US death and birth certificates and reports.[3-5] These 6 ethnic groups comprise a majority of the Asian Americans reporting a single race.[6] The Asian groups vary in socioeconomics and language abilities, with Asian Indians, Filipinos, and Japanese in the higher socioeconomic tier and Koreans, Vietnamese, and Chinese in the lower tier.

Past failure to disaggregate data by race and ethnicity has limited the ability to understand risks of racial and ethnic minority groups.[7] States have often excluded Asian Americans, Native Hawaiians, and Pacific Islanders from health department metrics, or include them infrequently.[8] When data are available, populations often contrast substantially. As an example, a study of a Filipino population reported that Filipinos differed from other Asians and NHPI populations in prevalence across 10 social and 4 health related variables, as well as having greater employment in health care and service industries.[9] A second study of major COVID-19 stressors, discrimination, and mental health reported variation across South Asian, East Asian, and Southeast Asian participants.[10]

Native Hawaiians and Asians have led the call to disaggregate data to inform programs and policy efforts to address health disparities.[11-13] Disaggregated data are essential for policy and resource allocation.[14] A key informant interview of leaders of national databases identified a number of issues affecting disaggregation: (1) lack of sufficient funding, (2) small numbers of minority members in some populations, (3) Asian Americans and NHPI lack of identity with the OMB racial/ethnic categories, and (4) difference in state laws governing data collection practices.[15]

The COVID-19 pandemic emphasized the consequences of not disaggregating health data. For example, failure to gather disaggregated data led to delays (nationally and locally) in recognizing the impacts of COVID-19 on the NHPI community.[16-18] Leaders in the Native Hawaiian and Asian communities have come together to advocate to end the practice of data aggregation by public health agencies and health-related researchers. For NHPI, successful programs respect the history and culture; they are community-based, engaging the community in all phases from the start.[8]

A study of 1.4 million patients in Kaiser Permanente Northern California compared health behavior and chronic diseases among Asian ethnicities and NHPI.[18] Results were reported for all Asians and all NHPI combined, and findings suggested that NHPI had greater prevalence of smoking, obesity, hypertension, diabetes, and coronary artery disease, and the risks of chronic diseases for NHPI were consistent with other studies reporting that NHPI have a high prevalence of cardiometabolic

disease and a high risk of mortality.[19-21] Therefore, the authors recommended that NHPI should not be grouped with Asians in determining prevalence. Also, when Asian ethnic subgroups were disaggregated, Filipinos had a greater burden than the combined all Asian reference group for smoking, hypertension, diabetes, and coronary artery disease, but not for hypertension.

Poverty is a major determinant of health disparities among ethnic groups.[22] Poverty affects food supply, housing, employment, and health care. Poverty creates disparities across measures of health status, morbidity, and mortality.[23] Measurement of differences in poverty and health gaps between ethnicities can help identify opportunities for tailored interventions.[24]

This study followed NHPI and 6 Asian subgroups and an Other Asian category longitudinally, examining poverty as a critical social determinant of health and self-reported health as a global indicator of health. The study uses disaggregated data for NHPI and Asian subgroups to explore differences in poverty and associations between poverty and health. The objective was to examine ethnic differences among NHPI and Asians to quantitatively document the importance of disaggregating individual ethnicities for research, health planning, and policy. The hypothesis was that being in poverty in 1 or both years would affect the likelihood of being in poor/fair health in the second year.

Methods

Study Design and Population

Using data from the Current Population Survey (CPS), the study used a longitudinal study design to examine racial/ethnic differences in the prevalence and persistence of both poverty and self-reported health. The CPS is a monthly survey conducted by the Bureau of the Census. On average, 60 000 households are surveyed each month, with the primary purpose of providing data on employment and unemployment and workforce participation. The CPS uses a multistage probability-based sample of households designed to represent the civilian noninstitutional population of all 50 states and the District of Columbia. The sample is made up of addresses, and the interviewer verifies the eligibility of the household in person (eg, the address is not a vacant lot). One person, 15 years and older, per household is chosen as the head of the household. The head of the household is the person who primarily provides information on everyone living at the address. Participants are in the CPS for 16 months, with data collected for 4 months, not collected for 8 months, then collected again for a final 4 months (a 4-8-4 design). Thus, longitudinal data are available on participants who participated in the annual Social and Economic Supplement 2 times, a year apart. Additional information on social determinants was collected in the supplement. **Figure 1** illustrates the 4-8-4 design, which provides overlapping cohorts to replenish the study population.

Response rates for this survey average 75%. Interviewers administer the CPS questionnaire across the country through both in-person and telephone interviews. The first interview is always in-person to verify eligibility. Subsequent interviews have the option to be be conducted by telephone.

The CPS data were extracted using Integrated Public Use Microdata Series Current Population Survey (IPUMS CPS) Version 10.0 (University of Minnesota, Minneapolis, MN) a publicly available data extraction tool.[25] For poverty, the study used an amount that approximates 185% of the poverty threshold for a household the size of the respondent's household. This amount changes depending on when the interview was conducted, because poverty thresholds are revised annually by the US Census Bureau. This threshold is the income-eligibility threshold for food and nutrition assistance programs. Respondents are asked if their household income is greater or less than a given amount based on the size of the respondent's household.

The CPS disaggregates NHPI and 6 Asian ethnicities: Chinese, Japanese, Korean, Vietnamese, Filipinos, Asian Indians, and includes an Other Asian category. The study population included participants in the CPS enrolled between the years 2010 and 2019 who were age 15 years and older, and who identified themselves as NHPI or Asian ethnicity (Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese or Other Asian). Data on NHPI was included from 2010. Disaggregated data on Asian populations were available from 2013. Individual participants contributed 2 consecutive years of data as illustrated for a hypothetical participant in **Figure 1**.

Institutional Review Board Approval was not sought for this study as it involved analysis of de-identified, publicly available data.

Figure 1. Example of Data Collection for an Individual Participant
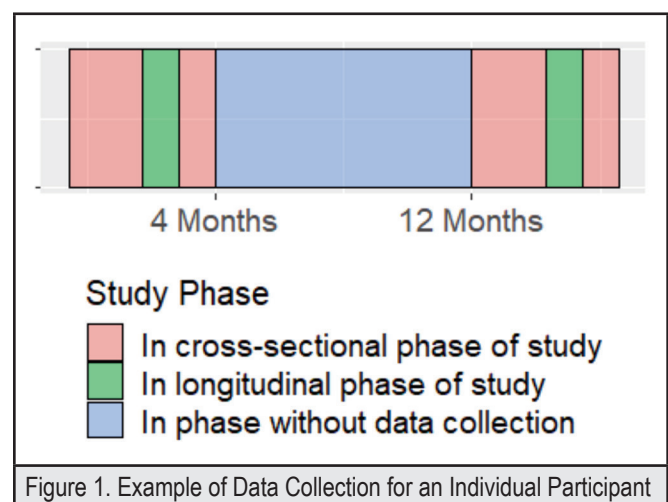
Study Variables

Ethnicities were 6 disaggregated Asian ethnicities and an aggregated Other Asian category, and combined NHPI category, as the NH and PI subgroups were not disaggregated. Poverty was based on all respondents who live in a family collectively and based on a comparison of the total income for the previous year to the poverty threshold. All members of each family unit were assigned the same value. For each participant, poverty was categorized as being in poverty 0 years, 1year, or 2 years. Self-reported health was assessed by a 5-category question (excellent, very good, good, fair, and poor) and collapsed into 2 categories. Thus, participants could be in fair/poor health (vs. excellent, very good, or good) in 0 years, in 1 year, or in 2 years. Transitory effects were defined as being in poverty or having fair/poor health during 1 of the 2 years; more chronic effects were defined as being in poverty or having fair/poor health 2 years. Age at enrollment was analyzed as 4 age groups (18 to 24, 25 to 39, 40 to 64, and 65 years or older). Sex was categorized as male and female.

Data Analysis

An initial descriptive analysis provided the number of participants by age group and sex. The percent of participants in poverty 0 years, 1 year, or 2 years were examined by ethnicity. Similarly, the percent of participants in fair/poor health 0 years, 1 year, or 2 years were summarized by ethnicity. To gain a better understanding of ethnic difference in poverty and health, multinomial logistic regression models were created. The reference categories were not being in poverty either year (0 years) and not having fair/poor health in either year (0 years). The reference ethnicity was NHPI. In addition, logistic regression models were created to examine the extent that poverty for 1 or 2 years was associated with having fair/poor health in the second year. Ethnicity was not included in an initial model because adjusting for ethnicity could obscure the association between poverty and health. A second model included ethnicity. Analyses were conducted using R version 4.2.1 (R Foundation for Statistical Computing, Vienna, Austria) with the R survey packages,[26] and two-tailed $P < .05$ was considered statistically significant.

Results

The number of participants by ethnicity varied ranging from 1174 Chinese to 432 Koreans (**Table 1**). The age distributions were fairly diverse. For example, the percent under age 40 years ranged from 22.5% for Japanese and 26.4% for Filipinos to 48.9% for Asian Indians and 48.5% for NHPIs.

Among specific ethnicities, Asian Indians were least likely to be in poverty for either 1 or 2 years (6.4% and 1.9%, respectively) followed by Japanese (7.8% and 1.4%, respectively) (**Figure 2**). By contrast, Vietnamese, Chinese, and NHPI were the most likely to experience poverty (16.0% and 6.3% for Vietnamese, 13.1% and 7.6% for Chinese, and 13.5% and 7.1% for NHPI for 1 and 2 years).

Asian Indians reported the best health, with only 8.1% in fair or poor heath for 1 year and 1.8% for 2 years (**Figure 3**). Without adjusting for age, the poorest health was reported among Japanese and NHPI (15.2% for 1 year and 4.7% for 2 years and 15.0% for 1 year and 5.1% for 2 years, respectively).

The descriptive results for poverty and fair/poor health could be misleading since the ethnic groups differed by and age and sex. To look for independent effects, models were fit adjusting for age groups and sex. **Table 2** compares unadjusted and adjusted regression models, with years in poverty as the outcome. Asian Indians and Japanese were less likely to be in poverty for either 1 or both years compared to NHPI, with odds that were half or less. Odds ratios were especially low for 2 years of poverty. Asian Indians and Japanese were approximately a third less likely than NHPI to remain in poverty for 2 consecutive years. Filipinos had lower odds than NHIPI for two years in poverty. The odds ratios for Chinese relative to NHPI were closest to 1, suggesting fairly similar risks of poverty for Chinese and NHPI. The odds ratios for Vietnamese and Other Asians were greater than 1, but not statistically significant.

In unadjusted models, only Asian Indians showed a statistically significant difference from NHPI for being in poor or fair health (**Table 3**). Adjustment for age and sex uncovered other ethnic differences for health status. In the adjusted models, the Chinese, Asian Indians, Filipinos, and Japanese all had lower odds of fair or poor health than NHPIs. The Chinese only showed differences with having 1 year of poor health, whereas the Asian Indians, Filipinos, and Japanese showed differences for 1 of the years and both years. Koreans, Vietnamese, and Other Asians did not differ significantly in health from NHPI.

Being in poverty for 1 or both years was significantly related to being in fair/poor health in the second year, after adjusting for age and sex (**Table 4**). The increased odds of fair/poor health for someone with 2 years of poverty was more than 3 times as large as the odds for someone not in poverty either year. After adjusting for NHPI and Asian ethnic groups in addition to age and sex the odd ratios decreased to 1.93 (95% CI=1.93, 2.61) for 1 year of poverty and 2.67 (95% CI=1.83, 3.90) for 2 years of poverty.

Table 1. Distributions of Age and Sex Among Native Hawaiians and Pacific Islanders and disaggregated Asian subgroups, CPS 2010-2019							
Ethnicity	**N**	**Age Group in Years**				**Sex**	
		18 to 24	25 to 39	40 to 64	65 plus	Male	Female
Chinese	1174	8.7%	29.1%	42.4%	19.8%	54.0%	46.0%
Asian Indian	972	4.5%	44.4%	42.2%	8.8%	73.3%	26.7%
Filipino	857	3.0%	23.4%	52.6%	21.0%	47.0%	53.0%
Japanese	623	2.1%	20.4%	46.2%	31.4%	55.0%	45.0%
Korean	432	5.1%	32.2%	47.1%	15.6%	53.4%	46.6%
Vietnamese	462	7.2%	27.2%	49.8%	15.8%	60.6%	39.4%
Other Asian	792	8.4%	38.0%	43.0%	10.5%	59.6%	40.4%
NHPI	643	4.6%	43.7%	41.7%	10.0%	56.4%	43.6%

CPS = Current Population Survey and NHPI =Native Hawaiians and Pacific Islanders. N's are unweighted; percentages are weighted percentages.
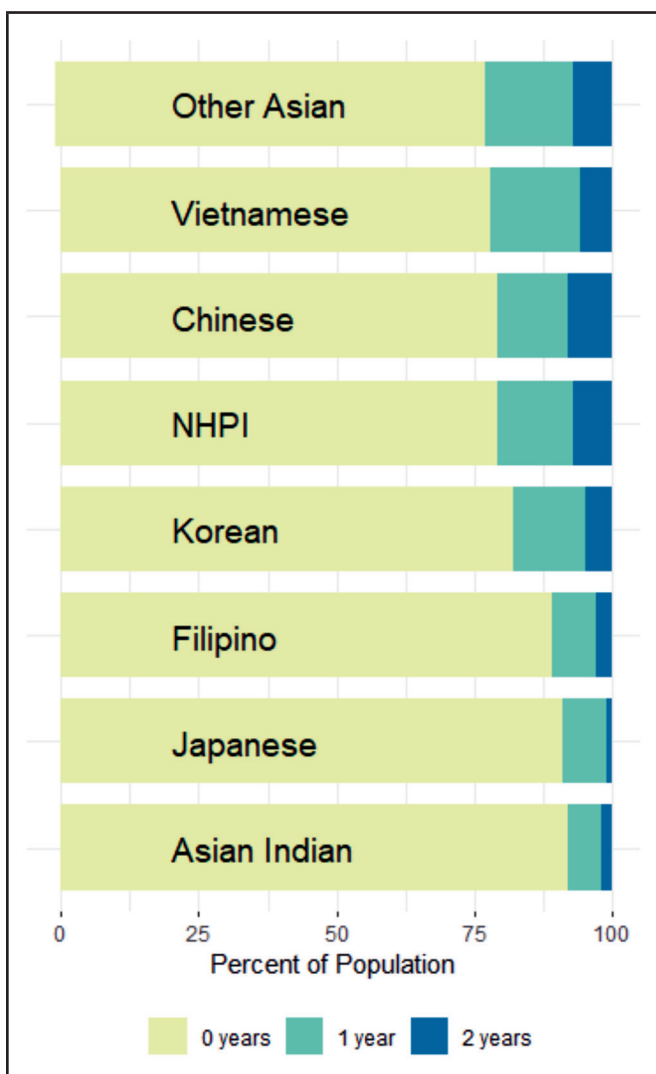

Figure 2. In Poverty 0 Years, 1 Year, or 2 Years by Native Hawaiian/ Pacific Islander (NHPI) and Asian Ethnicities Current Population Survey (2010-2019)
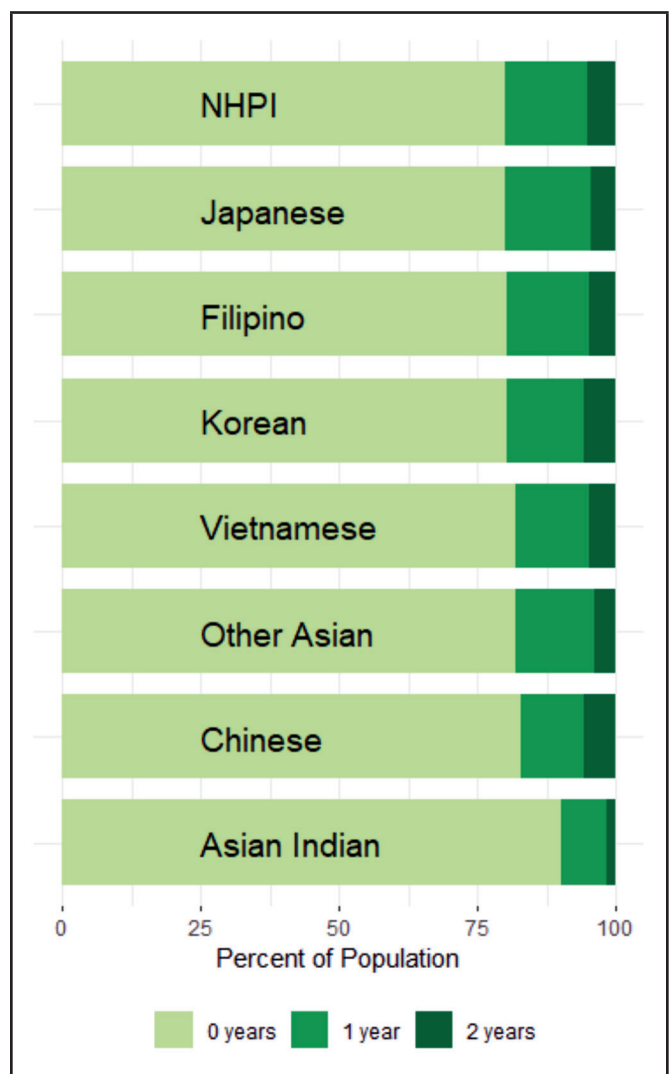

Figure 3. Native Hawaiian/Pacific Islander (NHPI) and Asian Ethnicities in Fair/Poor Health 0 Years, 1 year, or 2 years Current Population Survey (2010-2019)

Table 2. Odds Ratios Relative to Native Hawaiians and Pacific Islanders for Reporting Being in Poverty by Asian Ethnicities, CPS, 2010-2019								
Ethnicity	**Years in poverty**	**N**	**Unadjusted Results**			**Age-, Sex-adjusted Results**		
			Odds Ratio	**95% CI**	**P value**	**Odds Ratio**	**95% CI**	**P value**
Chinese	1 year	151	0.97	(0.65, 1.46)	.90	0.87	(0.58, 1.33)	.53
	2 years	84	1.08	(0.64, 1.81)	.77	0.91	(0.54, 1.53)	.71
Asian Indian	1 year	64	0.41	(0.26, 0.65)	< .001	0.45	(0.28, 0.71)	.001
	2 years	21	0.24	(0.12, 0.46)	< .001	0.27	(0.13, 0.53)	< .001
Filipino	1 year	68	0.54	(0.34, 0.86)	.01	0.50	(0.31, 0.82)	.005
	2 years	25	0.37	(0.19, 0.73)	.004	0.33	(0.16, 0.68)	.002
Japanese	1 year	54	0.51	(0.30, 0.85)	.01	0.47	(0.27, 0.80)	.005
	2 years	7	0.18	(0.05, 0.58)	.004	0.16	(0.05, 0.52)	.002
Korean	1 year	50	0.92	(0.55, 1.52)	.73	0.88	(0.52, 1.48)	.63
	2 years	21	0.71	(0.34, 1.47)	.35	0.67	(0.32, 1.41)	.29
Vietnamese	1 year	61	1.21	(0.72, 2.04)	.47	1.20	(0.72, 1.99)	.49
	2 years	33	0.91	(0.51, 1.64)	.77	0.87	(0.47, 1.63)	.67
Other Asian	1 year	110	1.18	(0.77, 1.81)	.45	1.14	(0.74, 1.78)	.56
	2 years	45	0.98	(0.54, 1.78)	.96	0.93	(0.51, 1.68)	.80

CPS = Current Population Survey and CI = Confidence Interval.
Participants were followed for 2 years. Outcome categories were being in poverty 1 or 2 of the years relative to neither year (0 years). Odds ratios give the odds of Asian ethnicities relative to Native Hawaiians and Pacific Islanders for 1 or 2 years of poverty relative to being in poverty neither year. As example, among participants of the same age and sex Asian Indians have 0.41 the odds of poverty compared to Native Hawaiians in 1 of the 2 years and 0.24 the odds of being in poverty both years.

Table 3. Odds Ratios Relative to Native Hawaiians and Pacific Islanders for Reporting Being in Fair/Poor Health by Asian Ethnicities, CPS 2010-2019.								
Ethnicity	**Years in Fair/ poor Health**	**N**	**Unadjusted Results**			**Age-, Sex-adjusted Results**		
			Odds Ratio	**95% CI**	**P value**	**Odds Ratio**	**95% CI**	**P value**
Chinese	1 year	148	0.74	(0.52, 1.04)	.08	0.56	(0.39, 0.81)	.002
	2 years	68	1.09	(0.53, 2.22)	.82	0.69	(0.32, 1.48)	.34
Asian Indian	1 year	86	0.47	(0.32, 0.68)	< .001	0.48	(0.33, 0.71)	< 0.001
	2 years	20	0.30	(0.13, 0.67)	.003	0.31	(0.13, 0.71)	.006
Filipino	1 year	142	0.98	(0.69, 1.40)	.91	0.67	(0.46, 0.98)	.04
	2 years	49	0.96	(0.45, 2.04)	.91	0.52	(0.23, 1.17)	.11
Japanese	1 year	101	0.98	(0.65, 1.48)	.92	0.59	(0.38, 0.91)	.02
	2 years	36	0.89	(0.38, 2.07)	.78	0.38	(0.16, 0.94)	.04
Korean	1 year	64	0.90	(0.59, 1.37)	.62	0.75	(0.48, 1.16)	.29
	2 years	32	1.17	(0.53, 2.56)	.70	0.84	(0.37, 1.93)	.68
Vietnamese	1 year	73	0.86	(0.57, 1.28)	.45	0.71	(0.47, 1.08)	.11
	2 years	24	0.99	(0.44, 2.21)	.98	0.67	(0.29, 1.54)	.34
Other Asian	1 year	111	0.90	(0.62, 1.31)	.58	0.88	(0.60, 1.31)	.54
	2 years	42	0.77	(0.36, 1.64)	.50	0.73	(0.33, 1.62)	.44

CPS = Current Population Survey and CI = Confidence Interval.
Participants were followed for 2 years. Outcome categories were being in fair or poor health 1 or 2 of the years relative to neither year (0 years). Odds ratios give the odds of fair/poor health of Asian Ethnicities relative to Native Hawaiians and Pacific Islanders. As example, among participants of the same age and sex Asian Indians have 0.47 the odds of being in fair/poor health compared to Native Hawaiians in 1 of the 2 years and 0.30 the odds of being in poverty both years.

Table 4. Relation of Living in Poverty with Fair/Poor Health in the Second Year, Adjusted for Age and Sex, CPS 2010-2019					
Variable	Category	Odds Ratio (95% confidence interval)			
		Odds Ratio	Lower CI	Upper CI	*P* value
Sex	Male	1			
	Female	1.35	1.15	1.59	< .001
Age	28-24 years	1			
	25-34 years	1.83	0.92	3.67	.09
	35-54 years	5.55	2.84	10.85	< .001
	65 years and older	17.27	8.83	33.77	< .001
Poverty	In poverty 0 years	1			
	In poverty 1 year	1.95	1.54	2.46	< .001
	In poverty both study years	3.28	2.44	4.39	< .001

CPS = Current Population Survey and CI = Confidence Interval.

Discussion

The results showed with longitudinal data the percentage of Asian and NHPI who lived in poverty for 1 or 2 of the study years. The proportion in poverty for 1or both years differed greatly among Asian subgroups. Chinese had poverty rates similar to NHPI, which were considerably higher than those of Japanese and Asian Indians. Poverty rates for Filipinos fell in between the 2 groups. NHPI experienced high levels of poverty both for 1 of the 2 years observed, as well as sustained poverty across the 2 study years. For both Chinese and NHPI, poverty persisted over 2 years for over 7% of the population.

The unadjusted proportions reflect the levels of poverty and fair/poor health in the community. Asian ethnicities differed both in levels of poverty and in health status. Prevalence, however, may differ by the age distribution of the populations. Disparities are better measured after age/sex-adjustment. NHPI differed from most Asian ethnicities before and after age-sex adjustment. For fair/poor health, significant results comparing Korean and Japanese to NHPI were only apparent after age-sex adjustment. The results underscore why disaggregated data is critical to understand ethnic differences in poverty and health. These data are important for health planning, such as knowing how many health facilities are needed.

Previous studies have highlighted the heterogeneity in risks of Asian ethnicities. A 2017 study by the National Bureau of Economic Research examining race and income inequality reported the income distribution of among Asians is bimodal: Asian ethnicities were at both the top and bottom 10% of income.[27] A study of Asians in California reported heterogeneity in the health risks across Asian subgroups.[28] Vietnamese had the poorest self-reported health; Filipinos had the most disparities, and every Asian subgroup had at least 1 disparity that was masked by aggregation. A study of the neighborhoods of Chinese and Vietnamese immigrants reported they tend to live in ethnic enclaves; and that poverty was high whereas health literacy was low. Age and health adjustment in regression models helped uncover differences in health.[29] A study of older Chinese immigrants observed that the migrants reported difficulty in reading health information and low health literacy overall.[30] These results emphasize the importance of disaggregating NHPI and Asian ethnic subgroups.

Limitations and Strengths

A primary limitation of this study is the aggregation of NHPI. Further disaggregation would have enhanced the specificity of the results for Asian and Pacific Islander subgroups. A second limitation of the study is that health is self-reported and not assessed clinically, although self-reported health has strong associations with health, ranging from functional status to cardiovascular disease to mortality.[31-35] Selection bias could occur for a variety of reasons: the head of the household might not provide equally accurate information on all household members; participation in the follow-up survey could be biased from self-selection; and information reported might be selective in some instances. Certain analyses are limited and might be extended in future analyses. Subgroups could be studied such as people living in different geographical regions and ethnic subgroups could be stratified by social determinants to study the strength of relationships between poverty and health.

The CPS is the national standard on levels of poverty, and using poverty data from the CPS as an outcome is a strength. The 2 years of follow-up is a strength, but more years would be better to examine how frequently people may experience spells of poverty as opposed to experiencing poverty long-term. The same consideration applies to understanding bouts of fair/poor health as opposed to more chronic health conditions.

Conclusion

NHPI and 6 Asian ethnicities and an Other Asian category varied by both levels of poverty and self-reported health. Persistent poverty had a greater effect on health than a single year of poverty. Shifts in and out of poverty might occur for people living close to the poverty lines, or due to acute events such as a job loss. Future studies should consider the duration of poverty when examining social determinants of health. Of the Asian ethnicities, Asian Indians, Filipinos, and Japanese were significantly less likely to be in poverty than NHPI whereas Chinese, Vietnamese, and Koreans were not. The results emphasize the substantial differences among NPHI and disaggregated Asian ethncities and stress the importance of having disaggregated ethnic results for research, health planning, and policy.

Conflict of Interest

None of the authors identify a conflict of interest.

Acknowledgement

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References

1. Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity. Accessed October 6, 2022. www.govinfo.gov/content/pkg/FR-2. 1997-10-30/pdf/97-28653.pdf
2. Hixon L, Hepler BB, Kim M, Shahid H. The Native Hawaiian and other pacific islander population: 2010 census brief. U.S. Census Bureau. 2012. Accessed October 6, 2022. www.census.gov/history/pdf/2010nhopi-122016.pdf.
3. Division of Vital Statistics, National Center for Health Statistics. Report of the panel to evaluate the U.S. standard certificates. Published April 2000. Accessed October 6, 2022. www.cdc.gov/nchs/data/dvs/panelreport_acc.pdf 2001.
4. Hoeffel, E., Rastogi, P., Kim, M. O., & Shahid, H. The Asian population: 2010. 2010 censusbriefs. Washington, D.C.: United States Census Bureau; 2012. Accessed October 6, 2022. www.census.gov/history/pdf/2010asian-122016.pdf.
5. Holland AT, Palaniappan LP. Problems with the collection and interpretation of Asian-American health data: omission, aggregation, and extrapolation. Ann Epidemiol. Jun 2012;22(6):397-405.
6. Budiman A, Ruiz NG. Key facts about Asian origin groups in the U.S. Accessed October 6, 2022. www.pewresearch.org/fact-tank/2021/04/29/key-facts-about-asian-origin-groups-in-the-u-s/.
7. Kaholokua JK, Yee BWK, Okamoto SK.. Special issue introduction: Advancing Native Hawaiian and Other Pacific Islander. Asian American Journal of Psychology. 2021; 10:197-205,
8. Wang Kong C, Green J, Hamity C, Jackson A. Health disparity measurement among Asian American, Native Hawaiian, and Pacific Islander populations across the United States. Health Equity. 2022 Jul 19;6(1):533-539. doi: 10.1089/heq.2022.0051. PMID: 36186616; PMCID: PMC9518797.
9. Monto MA, Marquez J. Data disaggregation reveals disproportionate levels of COVID-19 risk among Filipinxs in the USA. J Racial Ethn Health Disparities. 2022 May 19:1–5. doi: 10.1007/s40615-022-01325-3. PMID: 35587861; PMCID: PMC9118811.
10. Okazaki S, Lee CS, Prasai A, Chang DF, Yoo G. Disaggregating the data: Diversity of COVID-19 stressors, discrimination, and mental health among Asian American communities. Front Public Health. 2022 Oct 19;10:956076. doi: 10.3389/fpubh.2022.956076. PMID: 36339147; PMCID: PMC9627279.
11. Kaholokula JK, AuYoung M, Chau M, Sambamoorthi U, Carson S, Thao C, et al. Unified in our diversity to address health disparities among Asian Americans, Native Hawaiians, and Pacific Islanders. Health Equity. 2022 Jul 20;6(1):540-545. doi:
12. Kamaka ML, Watkins-Victorino L, Lee A, et al. Addressing Native Hawaiian and Pacific Islander Data deficiencies through a community-based collaborative response to the COVID-19 pandemic. Hawaii J Health Soc Welf. Oct 2021;80(10 Suppl 2):36-45.
13. Young JL, Cho MK. The invisibility of Asian Americans in COVID-19 data, reporting, and relief. Am J Bioeth. 2021 Mar;21(3):100-102. doi: 10.1080/15265161.2020.1870767. PMID: 33616487.
14. Kauh TJ, Read JG, Scheitler AJ. The critical role of racial/ethnic data disaggregation for health equity. Popul Res Policy Rev. 2021;40(1):1-7. doi: 10.1007/s11113-020-09631-6. Epub 2021 Jan 8. PMID: 33437108; PMCID: PMC7791160.
15. Shimkhada R, Scheitler AJ, Ponce NA. Capturing racial/ethnic diversity in population-based surveys: Data disaggregation of health data for Asian American, Native Hawaiian, and Pacific Islanders (AANHPIs). Popula ResPolicy Rev. 2021;40:81–102 https://doi.org/10.1007/s11113-020-09634-3
16. Raine S, Liu A, Mintz J, Wahood W, Huntley K, Haffizulla F. Racial and ethnic disparities in COVID-19 outcomes: Social determination of health. Int J Environ Res Public Health. Nov 3 2020;17(21).
17. Penaia CS, Morey BN, Thomas KB, et al. Disparities in Native Hawaiian and Pacific Islander COVID-19 mortality: A community-driven data response. Am J PublicHealth 2021;11: S49-S52.
18. Gordon NP, Lin TY, Rau J, Lo JC. Aggregation of Asian-American subgroups masks meaningful differences in health and health risks among Asian ethnicities: an electronic health record based cohort study. BMC Public Health. Nov 25 2019;19(1):1551.
19. Panapasa SV, Mau MK, Williams DR, McNally JW. Mortality patterns of Native Hawaiians across their lifespan: 1990-2000. Am J Public Health. Nov 2010;100(11):2304-2310.
20. Aluli NE, Reyes PW, Brady SK, et al. All-cause and CVD mortality in Native Hawaiians. Diabetes Res Clin Pract. Jul 2010;89(1):65-71.
21. Mau MK, Sinclair K, Saito EP, Baumhofer KN, Kaholokula JK. Cardiometabolic health disparities in native Hawaiians and other Pacific Islanders. Epidemiol Rev. 2009;31:113-129.
22. Beech BM, Ford C, Thorpe RJ, Jr., Bruce MA, Norris KC. Poverty, racism, and the public health crisis in America. Front Public Health. 2021;9:699049.
23. Fiscella K, Williams DR. Health disparities based on socioeconomic inequities: implications for urban health care. Acad Med. Dec 2004;79(12):1139-1147.
24. Bor J, Cohen GH, Galea S. Population health in an era of rising income inequality: USA, 1980-2015. Lancet. Apr 8 2017;389(10077):1475-1490.
25. Ruggles S, Flood S, Goeken R, Schouweiler M, Sobek M. IPUMS USA: Version 12.0 [Current Population Survey]. Minneapolis, MN: IPUMS, 2022. https://doi.org/10.18128/D010.V12.0
26. Lumley T. survey: analysis of complex survey samples. R package version 4.1; 2022.
27. Akee R, Jones MR, Porter SR. Race Matters: Income shares, income inequality, and income mobility for all U.S. races. Demography. Jun 2019;56(3):999-1021.
28. Adia AC, Nazareno J, Operario D, Ponce NA. Health conditions, outcomes, and service access among Filipino, Vietnamese, Chinese, Japanese, and Korean adults in California, 2011-2017. Am J Public Health. 2020 Apr;110(4):520-526. doi: 10.2105/AJPH.2019.305523. Epub 2020 Feb 20. PMID: 32078359; PMCID: PMC7067106.
29. Guan A, Kim-Mozeleski JE, Vyas P, Stewart SL, Gildengorin G, Burke NJ, et al. Neighborhood ethnic composition and self-rated health among Chinese and Vietnamese American immigrants. J Immigr Minor Health. 2021 Jun;23(3):574-582. doi: 10.1007/s10903-020-01041-2. PMID: 32617753; PMCID: PMC8208464.
30. Tsoh JY, Sentell T, Gildengorin G, Le GM, Chan E, Fung LC, et al. Healthcare communication barriers and self-rated health in older Chinese American immigrants. J Community Health. 2016 Aug;41(4):741-52. doi: 10.1007/s10900-015-0148-4. PMID: 26746205; PMCID: PMC4930414.
31. Benjamins MR, Hummer RA, Eberstein IW, Nam CB. Self-reported health and adult mortality risk: an analysis of cause-specific mortality. Soc Sci Med. Sep 2004;59(6):1297-1306.
32. Lorem G, Cook S, Leon DA, Emaus N, Schirmer H. Self-reported health as a predictor of mortality: A cohort study of its relation to other health measurements and observation time. Sci Rep. Mar 17 2020;10(1):4886.
33. Brenowitz WD, Hubbard RA, Crane PK, Gray SL, Zaslavsky O, Larson EB. Longitudinal associations between self-rated health and performance based physical function in a population-based cohort of older adults. PLoS One. 2014;9(11), e111761. doi: 10.1371/journal.pone.0111761.
34. Banerjee D, Perry M, Tran D, Arafat R. Self reported health, functional status, and chronic disease in community dwelling older adults: Untangling the role of demographics. J Community Health. 2010;35(2):135–141.
35. Møller L, Kristensen TS, Hallnagel H. Self-rated health as a predictor of coronary heart disease in Copenhagen, Denmark. J Epidemiol Community Health. 1996;50(4):423–428.