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High Rates of Native Hawaiian and Older Japanese Patients Hospitalized with Dementia in Hawai'i

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Abstract

Limited data exist on dementia in Native Hawaiians and many Asian subgroups in the United States. Inpatients with dementia have higher costs, longer stays, and higher mortality compared to those without dementia. This study compared the rates of inpatients with a dementia diagnosis for disaggregated Asian and Pacific Islanders (Native Hawaiian, Chinese, Japanese, Filipino) vs. White by age group (18-59, 60-69, 70-79, 80-89 and 90+ years) for all adult patients hospitalized in Hawai'i between December 2006 and December 2010. A total of 13,465 in patients with a dementia diagnosis were identified by ICD-9 codes. Rates were calculated using population size denominators derived from the US Census. Across all age categories, Native Hawaiians had the

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highest unadjusted rates of inpatients with dementia and were hospitalized with a dementia diagnosis at younger ages than other racial/ethnic groups. In adjusted models compared to Whites (controlling for gender, residence location, and insurer), Native Hawaiians had significantly higher rates of inpatients with dementia among those 18-59 years (aRR:1.50;95%CI:0.84-2.69), 60-69 years (aRR:2.53;95%CI:1.74-3.68), 70-79 years(aRR:2.19;95%CI:1.78-2.69) and 80-89 years (aRR:2.53;95%CI:1.24-1.71) as did Japanese aged 70-79 years (aRR:1.30;95%CI:1.01-1.67), 80-89 years (aRR:1.29;95%CI:1.05-1.57) and 90+ years (aRR:1.51;95%CI:1.24-1.85). Japanese aged 18-59 years had significantly lower rates than Whites (aRR:0.40; 95%CI:0.17-0.94). These patterns have important public health and clinical care implications for Native Hawaiians and older Japanese populations. Future studies should consider if preventable medical risk, care giving, socio-economic conditions, genetic disposition, or a combination of these factors are responsible for these findings.

Keywords

Asian American; Dementia; Health Disparities; Hospitalizations; Native Hawaiian; Pacific Islander

Introduction

Dementia is a substantial, and growing, public health problem (1). Roughly 25 million people worldwide (2) and at least 3.4 million individuals in the United States (US) have dementia (1). By 2040, the number of dementia cases worldwide is estimated to increase to 80-110 million (2).

Hospitalizations among those with dementia are a particularly important area for study as they are both notably expensive to the health care system and highly impactful on individuals with dementia, their caregivers, and their families (3-6). Patients hospitalized with a dementia diagnosis have adverse outcomes, including higher cost, longer stays, and higher mortality, compared to those without dementia even within similar co-existing disease categories (7-9). Post-discharge for patients with dementia can also be challenging because compliance with medication instructions and chronic care management can be difficult, and the hospitalization itself can exacerbate the patient's mental health condition or distress (5-9).

Specifically understanding patterns of patients hospitalized with dementia across vulnerable populations is important to identify particular areas of clinical need and opportunities to improve health care equity, quality, and cost (10). Previous research has found that the relationship between dementia and the use and costs of health services varies by race/ethnicity, with African Americans showing higher rates of expensive inpatient care compared to Whites (10). Native Hawaiians and Asian Americans comprise two of the fastest growing racial/ethnic groups in the US (11), yet the majority of the work on racial/ethnic disparities in dementia in the US has focused on African Americans and Latinos (12). Very little is known about the prevalence, correlates, and consequences of dementia in Native Hawaiians and many Asian American subgroups. Existing work that does include Asian Americans and Pacific Islanders often combines heterogeneous Asian subgroups (12)

or focuses only on one specific subgroup (13-14). To our knowledge, there has been no previous research on hospitalizations of Native Hawaiians and Asian Americans with dementia, despite the importance of this issue to policy and clinical care. Native Hawaiians might be particularly vulnerable to dementia-related health disparities due to their notably high rates of cardiovascular disease, obesity, and diabetes (15), which are all identified risk factors for dementia (12).

To address these research gaps, our study goal was to compare the rates of hospitalized patients with a dementia diagnosis among understudied Native Hawaiian and Asian American populations. Because of the higher prevalence of cardiovascular disease, obesity, and diabetes among Native Hawaiians (15), we hypothesized that Native Hawaiians would be more likely to have hospitalizations with a dementia diagnosis compared to other racial/ethnic populations. We performed our study in Hawai'i because over 40% of the state's population identifies as Asian American and at least 25% identify as Native Hawaiian or other Pacific Islander (16).

Methods

Hawai'i Health Information Corporation (HHIC) Database

HHIC compiles detailed patient-level inpatient discharge data from hospitals for all payers in the state of Hawai'i. Data elements include patient race/ethnicity, age, gender, insurer, and primary and secondary International Classification of Diseases – 9th revision – Clinical Modification (ICD-9) diagnostic codes (17). ICD-9 codes are available for 1 primary and up to 19 secondary categories. HHIC data comprise the Hawai'i data source for the major national inpatient database (18), indicating the high quality of this data.

Sample

All Hawai'i hospitalizations among those aged 18 years from December 2006 to December 2010 were initially considered. Hospitalizations with Department of Defense (DOD) as payer were excluded as the major DOD hospital did not report race/ethnicity data (n=49,232). After DOD exclusion, hospitalizations lacking valid race/ethnicity data (n=9,975) or not reporting Japanese, Chinese, Native Hawaiian, Filipino or White race/ethnicity (n=68,270) were also excluded. Individuals were excluded if they were not Hawai'i residents (n=11,542), as population figures for Hawai'i residents were used as rate denominators. After exclusions, the total number of eligible hospitalizations was 303,621.

Individuals with multiple hospitalizations could complicate inferences of disparities. HHIC data contains a unique patient identifier that identifies individuals across all hospitalizations in Hawai'i. We used this variable to identify the 174,240 unique patients in the data set. These were the final unit of analysis for this study. When individuals had multiple hospitalizations, characteristics at the first visit were used for analyses.

Dementia

Dementia diagnoses were identified by ICD-9 codes at discharge (Appendix). Drug-induced dementia was excluded as a diagnostic classification as it has distinct correlates and

outcomes beyond the scope of this study. A dementia diagnosis could be listed as a primary or secondary diagnosis following previous research (7-8).

Race/Ethnicity

The race/ethnicity variable was created from race/ethnicity categories available consistently across all hospitals in Hawai'i from December 2006- December 2010. One primary race was reported from patient self-report at registration. Mixed race individuals were categorized by their primary self-reported racial/ethnic identity. The quality of the HHIC racial/ethnic data is assured through multiple methods. In 2006 (prior to the study period), HHIC performed community-wide training to ensure that the racial/ethnic data were uniformly collected across all Hawai'i hospitals. HHIC also performs extensive ongoing quality assurance to confirm that racial/ethnic data are comparable across hospitals, including clear data specifications, monthly reports to identify discrepancies coupled with hospital follow-up if discrepancies are identified, and regular HHIC-provider stakeholder meetings to discuss data issues and to clarify reporting/submission procedures.

Rate Denominators

To obtain the appropriate denominators to match the racial/ethnic composition of our numerators identifying only one primary race, the following procedures were followed. First, racial/ethnic population totals were obtained from published population size estimates from the 2010 US Census in each age category (19). The 2010 US Census allowed individuals to choose either one race or multiple races. Those who identified with multiple races could choose all of these races to describe their racial/ethnic identity, without selecting a primary race. When all those who identified with one or more races were counted for all their relevant constituent races, the racial/ethnic population counts would be inflated (>100%). The Office of Management and Budget (OMB) has described several "bridging" methods that can be used to assign multiracial responders to single race categories (20) in two broad types: 1) whole allocation methods, which reassign each multiracial response into one of the single-race groups selected, and 2) fractional allocation methods, which assign multiple-race response partially into each single-race groups selected. We used a fractional allocation approach to bridge multiple races into single race by systematically distributing those who reported mixed race into primary races based on population prevalence, while keeping the total population sum matching the total census population number for Hawai'i (=100%). Not assuming to know which single race/ethnicity a person of mixed race/ethnicity would choose, the fractional allocation methods are preferable in a multicultural population like Hawai'i.

Control Variables

In multivariable models, we adjusted for *gender* (male/female), *payer* (percentage of public insurance, including Medicare and Medicaid, vs. other insurance options) and *location of residence* (percentage of those living in the island of Oahu, vs. not). Location of residence was included because health care access varies between Oahu and the more rural neighboring islands.

Statistical Methods

Descriptive statistics for patients hospitalized with dementia were summarized by race/ethnicity. Demographic and clinical variables across racial/ethnic groups were compared using Chi-squared tests for categorical variables and analysis of variance (ANOVA) for continuous variables. Annual rates of hospitalizations including a dementia diagnosis were calculated, stratified by race/ethnicity for different age categories (18-59, 60-69, 70-79, 80-89, and 90+ years). These age categories were chosen a priori, based on the age data available, to best reveal racial/ethnic disparities in patients hospitalized with dementia due to the increased, but non-monotonic, risk of dementia by age (21) coupled with known difference in longevity of Native Hawaiians and Asian subgroups in Hawai'i (22). Rate ratios (RRs) were then obtained for each racial/ethnic group relative to Whites, with 95% confidence intervals (95% CI). Multivariable negative binomial regression models were used to derive adjusted RRs(aRRs) and their 95% CIs, controlling for gender, payer, and Oahu residence. Whites were used as the comparison group to provide comparability to other studies. All analyses were conducted using SAS 9.3 (Cary, NC, 2011).

Results

Dementia diagnoses were recorded for 13,465 inpatients, almost 8% of all eligible patients. As expected from previous research (7-8), only a small number of dementia diagnoses (3%) were from the primary diagnostic field. Descriptive results for all inpatients with a dementia diagnosis within each racial/ethnic group are summarized in Table 1. Significant differences were seen across racial/ethnic groups for gender, age, payer, and Oahu residence. Notably, Native Hawaiians were hospitalized with dementia at younger ages than other groups; 13.3% of Native Hawaiian inpatients with a dementia diagnosis were <70 years old, compared to 8.4% of Whites, 6.6% of Filipinos, 3.0% of Chinese, and 3.0% of Japanese.

Figure 1 shows the unadjusted annual rates for inpatients with dementia by age categories across race/ethnicity groups. Rates increased substantially with age. Unadjusted rates for Native Hawaiians were highest in all age group categories across all racial/ethnic groups except for the oldest age group. Native Hawaiians were also the only group consistently above Whites in all rates. However, Japanese showed rates equal to or higher than Whites in all age categories except for 18-59 years, and had the highest unadjusted rates in the oldest age group. Filipinos showed lower rates than Whites across all age categories except for 90+ years, where they had higher rates than Whites, but lower than Japanese and Native Hawaiians. Chinese showed lower rates than Whites in all age categories.

Table 2 shows the unadjusted and adjusted model results for inpatients with dementia. In the multivariable model, Native Hawaiians had significantly higher rates of inpatients with dementia compared to Whites among those 18-59 years (aRR:1.50;95%CI:0.84-2.69), 60-69 years (aRR:2.53;95%CI:1.74-3.68), 70-79 years (aRR:2.19;95%CI:1.78-2.69) and 80-89 years (aRR:2.53;95%CI:1.24-1.71). Japanese also had significantly higher rates of inpatients with dementia compared to Whites among those aged 70-79 years (aRR:1.30;95%CI:1.01-1.67), 80-89 years (aRR:1.29;95%CI:1.05-1.57) and 90+ years (aRR:1.51;95%CI:1.24-1.85). However, Japanese aged 18-59 years (aRR:0.40;95%CI:0.17-0.94) had significantly lower rates of inpatients with dementia compared to Whites. Rates of inpatients

with dementia did not differ significantly from Whites in adjusted models for Chinese and Filipinos. Other significant variables were age categories and living in Oahu.

Discussion

In our study's first key finding, as expected from our study hypotheses, we found substantially higher rates of Native Hawaiians inpatients with dementia across all age categories compared to other racial/ethnic groups. These findings held in multivariable models for all age categories except for those 90+ years.

This has important clinical and public health implications. Native Hawaiians, a population group known to have health disparities across a variety of health outcomes (15), including higher preventable hospitalizations for chronic conditions (23), are disproportionately more likely than other racial/ethnic groups to have hospitalizations including a dementia diagnosis across multiple age groups. Hospitalizations that include dementia have poorer outcomes, higher costs, and more challenging discharge issues (5-8). Hospitalizations are also particularly impactful on dementia patients, associated with higher risk of delirium, falls, and restraints (6).

The higher rates of inpatients with dementia among Native Hawaiians are also coupled with younger ages for those hospitalizations. Latinos and African Americans have earlier onset of Alzheimer's disease, even after accounting for education, gender and geography (24). Stroke and head injuries are predictors of dementia, which has been one possible explanation for the higher rates of dementia seen in some ethnic minority groups (12). While this has not been well studied in Native Hawaiians, hospitalizations for stroke do occur at younger ages for Native Hawaiians compared to other racial/ethnic groups in Hawai'i (25). A recent study found that early-onset Alzheimer disease (i.e., occurring before 65 years of age) occurs more frequently in Native Hawaiians (26). Another reason for these findings of early ages for Native Hawaiian inpatients with dementia, and possibly one reason that the disparities in hospitalizations with dementia seen at younger ages did not hold for Native Hawaiians at older ages (90+ years) in multivariable models, is that Native Hawaiians have a shorter life expectancy compared to other racial/ethnic groups in Hawai'i and thus have smaller numbers of those of very old age (22).

As dementia among Native Hawaiians is extremely understudied, it is not clear if these higher rates of patients hospitalized with dementia are related to higher underlying dementia risk or to different health care access, cultural or caregiving factors, and/or other explanatory factors. The higher rates of dementia at an earlier age range (60-69 years) might be related to the higher rates of cardiovascular disease, obesity, and diabetes among Native Hawaiians (15). These are modifiable risk factors and treatment of these risk factors could potentially decrease the dementia burden in Native Hawaiians.

Culture and expectations about family caregiving also play important roles in dementia care (12,27). In some cultures, dementia can be seen as something private, even shameful, and individuals or families might not ask for help until dementia or related complications are severe, possibly indicating a higher need for hospitalization (12). Factors outside of family

caregivers, including preferences for hospitalization and access to needed medical care, could also be important. For instance, in studies in other populations, minorities are more likely to live in care facilities lacking both special dementia care services and dementia care units (28). How relevant these are to the Native Hawaiian context is not well known and are important areas for future study. Further study should consider if preventable medical risk, caregiving, socio-economic conditions, genetic disposition, or a combination of these factors are responsible for these health disparities in hospitalizations with dementia among Native Hawaiians.

Our second key finding was unexpected. In multivariable models, Japanese had significantly higher rates of patients hospitalized with dementia compared to Whites from ages 70 to 90+ years. Japanese tend to have strong health profiles compared to other racial/ethnic groups in Hawai'i and have a longer life expectancy than most other groups (22). Studies have found, however, that Japanese Americans have a higher risk of hemorrhagic stroke (29) compared to Whites and there is also some evidence of increased hypertension risk among Japanese (30). The reasons for the higher rates of patients hospitalized with dementia in this group are not clear, nor is it clear if they are due to similar or different reasons as the high rates in Native Hawaiians. The sheer numbers of elderly Japanese hospitalized with a dementia diagnosis (~6,000 during the study period) is of note and important to consider in clinical care.

Our research suggests clinical and policy solutions. Among Native Hawaiians and older Japanese, in particular, it could be particularly important to identify dementia early during hospitalization to improve patient care and reduce costs (7). Because acute care settings are so impactful for patients with dementia, interventions focused on better care for individuals with dementia in ambulatory care settings to reduce these acute hospitalizations are ideal (7). As the number of individuals with dementia is expected to increase with the aging population in both outpatient and acute care settings, we need new methods and sufficient training for health care practitioners to improve person-centered care for patients with dementia (5). Culturally-focused care for diverse Asian and Pacific Islander groups in this context is important.

These findings provide new insight into risk for Native Hawaiian and older Japanese for adverse hospitalization outcomes to consider in quality and cost assessments. Understanding the scope and patterns of these hospitalizations among those with dementia are critical as much of the higher Medicare expenditures for those diagnosed with dementia are due to hospitalizations (4) and because individuals with dementia have higher rates of hospitalizations compared to those without dementia (3). Our study also adds to the large literature underscoring the need to disaggregate Native Hawaiian, Asian American, and other Pacific Islanders population groups to fully understand health disparities across these diverse groups (15). This study finds that Native Hawaiians have a different profile for hospitalizations including dementia compared to Asian groups.

While the study has many strengths, it also has some limitations. One issue is the reweighting of the Census data to provide the denominators. We used the US Census 2010 data as it provided published detail by race/ethnicity into older age groups, which was

extremely relevant for research in dementia. This information cannot be obtained from other Hawai'i-specific health surveillance survey data, as these studies lack the sample sizes to consider this level of detail. The US Census, as it is based on a complete population count, allows for this information. We felt these reasons justified the use of the Census data, which necessitated the reweighting process. We followed an established, systematic empirical method to perform this reweighting, but it is possible that some individuals were misclassified into a primary race/ethnicity.

The lack of population-level dementia prevalence estimates across racial/ethnic categories was also a limitation. While strong evidence exists about dementia prevalence in Japanese-Americans in Hawai'i (13), other Asian American subgroups are understudied and, to our knowledge, there are no population-level prevalence studies on dementia for Native Hawaiians. A better understanding of dementia prevalence across various racial/ethnic groups would help us identify the role of disease prevalence compared to caregiving/health care access/cultural factors in explaining increased rates of hospitalizations for dementia by race/ethnicity.

Besides underlying prevalence data as noted above, we also lack data on socioeconomic status, caregivers, and other factors potentially relevant in explaining these differences (12). Hospitalization among those with dementia might be related to factors such as caregivers and poverty. Also, we used administrative data, which is known to be under-coded for dementia in the hospital setting. Additionally, dementia diagnoses were based on ICD-9 codes, and there is the possibility of misclassification bias. Finally, the heterogeneity the diagnoses included in this study as "dementia" may also be a limitation as distinct diagnoses may suggest different clinical decisions and/or associated factors.

Conclusions

We found significant higher rates of Native Hawaiians inpatients with dementia in Hawai'i and Native Hawaiians were hospitalized with dementia at younger ages. Older Japanese groups also had high rates of inpatients with dementia. Hospitalizations in individuals with dementia have poorer clinical and quality-related outcomes, and are expensive and challenging for both patients and families (3-9). As we seek to reduce health disparities burdens, we should consider these findings in clinical care and policy. Also, this research should help encourage further research into reasons for these differential rates and ages by race/ethnicity, particularly for vulnerable racial/ethnic groups such as Native Hawaiians.

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Appendix

ICD-9 Codes Indicating Dementia and Study Frequencies*

	Total frequency	Percent
331.0- Alzheimer's disease	3335	24.8%
290.4- Vascular dementia	0	0.0%
290.40 - Vascular dementia uncomplicated	968	7.2%
290.41- Vascular dementia with delirium	123	0.9%
290.42- Vascular dementia with delusions	20	0.1%
290.43- Vascular dementia with depressed mood	34	0.3%
094.1- General paresis	0	0.0%
290.0- Senile dementia uncomplicated (also called dementia NOS)	968	7.2%
290.1- Presenile dementia	0	0.0%
290.2- Senile dementia with delusional or depressive features	0	0.0%
290.20- Senile dementia with delusional features	<10	0.0%
290.21- Senile dementia with depressive features	<10	0.1%
290.3- Senile dementia with delirium	124	0.9%
290.9- Unspecified senile psychotic condition	92	0.7%
290.10- Presenile dementia uncomplicated	14	0.1%
290.11-Presenile dementia with delirium	10	0.1%
290.12- Presenile dementia, paranoid type	<10	0.0%
290.13 - Presenile dementia with depressive features	0	0.0%
294.8- Other specified senile psychotic conditions; dementia	7413	55.1%
294.10- Dementia in conditions classified elsewhere without behavioral disturbance	60	0.4%
294.11- Dementia in conditions classified elsewhere with behavioral disturbance	62	0.5%
294.2- Dementia, unspecified	0	0.0%
294.20- Dementia, unspecified, without behavioral disturbance	0	0.0%
331.11- Pick's disease	0	0.0%
331.19- Other frontotemporal dementia	16	0.1%
331.82- Dementia with lewy bodies	211	1.6%
Total	13,465	100.0%

*Frequencies <10 cannot be reported due to data privacy rules.

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Figure 1.
Annual Unadjusted Rates of Patients Hospitalized with Dementia by Race/Ethnicity and Age Categories in Hawaii Health Information Corporation Inpatient Data in Study Sample, December 2006-December 2012.

Table 1
Demographic Information for all Adult Patients (18+ years) Hospitalized with a Dementia Diagnosis from Hawai'i Health Information Corporation Data Meeting Study Criteria, December 2006-December 2010

	Chinese	Filipino	Japanese	Native Hawaiian	White	p-value
Individuals	1015	1673	6125	1224	3428	
	n (%)	n (%)	n (%)	n (%)	n (%)	
Age Group						
18-59 years	<10 *	36 (2.15)	19 (0.31)	44 (3.59)	86 (2.51)	<.0001
60-69 years	19 (1.87)	74 (4.42)	134 (2.19)	119 (9.72)	203 (5.92)	<.0001
70-79 years	135 (13.30)	346 (20.68)	742 (12.11)	397 (32.43)	678 (19.78)	<.0001
80-89 years	509 (50.15)	846 (50.57)	3363 (54.91)	537 (43.87)	1764 (51.46)	<.0001
90+ years	344 (33.89)	371 (22.18)	1867 (30.48)	127 (10.38)	697 (20.33)	<.0001
Gender						
Female	606 (59.70)	845 (50.51)	3719 (60.72)	750 (61.27)	1967 (57.38)	<.0001
Male	409 (40.30)	828 (49.49)	2406 (39.28)	474 (38.73)	1461 (42.62)	
Payer						
Medicaid	<10 *	19 (1.14)	14 (0.23)	31 (2.53)	60 (1.75)	<.0001
Medicare	970 (95.57)	1544 (92.29)	5929 (96.80)	1115 (91.09)	3150 (91.89)	<.0001
Other	<10 *	16 (0.96)	15 (0.24)	10 (0.82)	23 (0.67)	<.0001
Private	35 (3.45)	94 (5.62)	167 (2.73)	68 (5.56)	195 (5.69)	<.0001
Living on Oahu						
Yes	966 (95.17)	1275 (76.21)	4950 (80.82)	821 (67.08)	2256 (65.81)	<.0001
No	49 (4.83)	398 (23.79)	1175 (19.18)	403 (32.92)	1172 (34.19)	

* Cell sizes under 10 cannot be reported due to privacy reasons.

Table 2
Unadjusted and Adjusted Rate Ratios (RRs) for Patients Hospitalized with Dementia by Age Categories within Each Racial/Ethnic Group (Compared to Whites) from HHIC Inpatient Data, December 2006-December 2010*

	Unadjusted				Adjusted			
	Chinese	Filipino	Japanese	Native Hawaiian	Chinese	Filipino	Japanese	Native Hawaiian
	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	aRR (95% CI)	aRR (95% CI)	aRR (95% CI)	aRR (95% CI)
18-59	NA	0.75 (0.51, 1.11)	0.49 (0.30, 0.80)	1.47 (1.03, 2.12)	0.55 (0.17, 1.84)	0.63 (0.30, 1.30)	0.40 (0.17, 0.94)	1.50 (0.84, 2.69)
60-69	0.42 (0.26, 0.67)	0.80 (0.61, 1.05)	1.04 (0.84, 1.30)	2.47 (1.97, 3.10)	0.67 (0.28, 1.62)	0.88 (0.54, 1.44)	1.46 (0.91, 2.34)	2.53 (1.74, 3.68)
70-79	0.63 (0.52, 0.75)	0.78 (0.69, 0.89)	1.01 (0.91, 1.13)	2.07 (1.82, 2.34)	0.89 (0.56, 1.41)	0.94 (0.72, 1.24)	1.30 (1.01, 1.67)	2.19 (1.78, 2.69)
80-89	0.66 (0.60, 0.73)	0.82 (0.76, 0.89)	1.03 (0.97, 1.09)	1.38 (1.25, 1.52)	0.99 (0.67, 1.46)	0.94 (0.78, 1.12)	1.29 (1.05, 1.57)	1.45 (1.24, 1.71)
90+	0.97 (0.85, 1.10)	1.08 (0.95, 1.22)	1.24 (1.14, 1.35)	1.11 (0.92, 1.34)	1.36 (0.95, 1.94)	1.16 (0.94, 1.43)	1.51 (1.24, 1.85)	1.06 (0.78, 1.44)

* Multivariable negative binomial models were used to estimate rate ratios adjusting for age (p-value<0.01), gender (p-value = 0.16), percentage of public payer insurance (p-value=0.11), and percentage living on Oahu (p-value=0.04). Whites were used as the racial/ethnic reference group.