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Racial Disparities in Nutritional Risk among Community-Dwelling Older Adults in Adult Day Health Care

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Abstract

Information regarding nutritional risk among users of American adult day health centers (ADHCs), 60% of whom are racial minorities, is scant. This study examined nutritional risk and associated factors in a diverse sample ADHC users aged 50+ using secondary cross-sectional analysis of data collected between 2013 and 2017. Risk was assessed using the DETERMINE checklist, and results were stratified by race. The majority of the sample (N = 188) was at moderate (45.2%) or high (38.5%) nutritional risk, with statistically significant racial differences. Blacks were at greater risk than any other group: 65% had high nutritional risk; 76.5% ate <5 servings of fruits, vegetables, or milk daily; 21% ate <2 meals daily, 48.5% reported involuntary weight loss/gain, and 41.2% had tooth loss/mouth pain. Older adults in ADHCs are at elevated risk of malnutrition, disproportionately so amongst blacks. Both routine nutrition screening and population-specific approaches are needed to attenuate risk.

Keywords

Chronic disease; community-based programs; diet; immigrants; nutrition screening

Introduction

Malnutrition among adults over 65 years old is associated with staggering health care costs that amount to $51.3 billion annually in the United States.[1] According to the World Health Organization, malnutrition refers to imbalances, either excess or deficiency, in individuals' nutrient consumption.[2] Overall, approximately one in two older adults is at risk of malnutrition,[3] but rates vary considerably by healthcare setting. However, despite the ubiquity of malnutrition, it remains largely underrecognized[4] and unaddressed[5] in older adults.

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In community-based settings, 25% of patients at nutritional risk do not receive any counseling or intervention.[6] Adult day health centers (ADHCs) are proliferating across the United States and service more than 260,000 community-dwelling chronically ill and functionally impaired individuals annually, the majority of whom are economically disadvantaged.[7] These centers, which are typically state-licensed and community-based,[8] are designed to provide social and health services (e.g., transportation, meals, activities, medication management, skilled nursing care, and assistance with activities of daily living) to adults who require supervised care during the day, including meals and nutrition.[7] ADHCs receive subsidies from the United States Department of Agriculture (USDA) Child and Adult Food Care Program (CACFP) to provide nutrition as part of clients' daily care.[9] While they provide meals and snacks in accordance with USDA nutrition standards, ADHCs are not required by the CACFP to conduct any form of nutritional screening or interventions on the 131,000 chronically ill adults served daily by the program.[10]

Background

ADHCs are well-positioned to recognize and address the biopsychosocial factors affecting malnutrition in diverse populations, such as access to health services, food insecurity and access to healthy foods, health literacy, and social isolation. Studies have shown that access to regular meals through the ADHC is a critical component of perceived health improvements among ethnically diverse ADHC users.[11] More broadly, disease-based interventions in congregate settings such as ADHCs have lower associated costs and higher levels of adherence among participants.[6]

ADHCs are becoming a preferred option for community-based long-term care for older adults with chronic health conditions, and they are more likely to service immigrants and minorities than other types of long-term care facilities are.[12] The diversity of ADHCs' clientele is particularly salient to issues surrounding malnutrition because racial and ethnic minority groups—defined here as Black or African American, Hispanic, Asian, and American Indian/Alaska natives—experience diet-related disparities and consequently tend to have poorer nutrient profiles and dietary behaviors and patterns relative to whites.[13] Moreover, there is tremendous variability in food choices and overall quality of diet among older adults, some of which can be attributed to ethnicity.[14]

Yet, efforts to address malnutrition in diverse community-dwelling older adults, especially ADHC users, are hindered by a lack of evidence regarding the prevalence of nutritional risk, which is needed to inform planning and intervention.[15] This study addresses these knowledge gaps. The aims of this study were to (1) identify the prevalence of nutritional risk and associated factors in an ethnically diverse population of older adult users of ADHCs; (2) stratify the differences in nutritional risk according to race; and (3) explore the associations between nutritional risk, chronic illness, and healthcare utilization in this population.

Methods

The Community-Based Health Home (CBHH) was originally designed and implemented by the California-based Alliance for Leadership and Education (ALE), the nonprofit research and development arm of the California Association for Adult Day Services. CBHH was

originally designed as a quality-improvement project to rapidly address a lack of integration among health and social services for frail community-dwelling older adults, which managed care organizations saw as contributing to unnecessary healthcare utilization. CBHH positioned ADHCs as a platform for intensive interdisciplinary care coordination and heightened surveillance of vulnerable, chronically ill adults. The study sites included twelve California ADHCs spanning the northern and southern parts of the state that were members of the California Association for Adult Day Services. Included among these sites were two ADHCs in rural locations. All of the sites were selected for inclusion in the CBHH because, based on multiple site visits, they were deemed to have well-functioning interdisciplinary teams and the appropriate infrastructure to implement CBHH.

An interdisciplinary team (consisting of registered nurses [RNs], social workers, and program administrators) selected ADHC clients at their center to participate in CBHH if they met the criteria listed in Table 1. These criteria were intended to identify those at risk of adverse health outcomes due to the combined effects of their health and social circumstances. All CBHH enrollees signed a written consent form. If they were deemed to have impaired decision-making capacity by their physician, then informed consent was obtained from their legal representative.

The findings presented here reflect a cross-sectional secondary analysis of deidentified quantitative data originally collected by RNs reflecting the participants' baseline nutritional status upon enrollment into CBHH. For this analysis, eligible participants were all CBHH enrollees older than 50 years. Data were collected between 2013 and 2017. The data were deidentified by ALE staff members in March 2017 and shared with the first author via a secure, encrypted database. The institutional review board (IRB) at the first author's institution deemed this secondary analysis to be exempt from IRB approval because no participant identifiers were used.

Measures

The participants provided demographic information upon enrollment into CBHH. They were questioned about traditional demographic components (e.g., race, marital status, living arrangements) and also asked to describe their proficiency with the English language. "Proficient" indicated the participant could communicate effectively when speaking English, "limited" indicated that the participant spoke broken English or only a few words in English, and "not proficient" indicated an inability to speak English. The RNs also obtained a detailed health history. Medical diagnoses were cross-validated using the participants' medical records. RNs questioned participants monthly regarding emergency department visits, hospitalizations, and readmissions. The RNs also measured participants' height and weight to calculate their body mass index (BMI). Underweight BMI was <18.5 and overweight was ≥25.0.

Nutritional risk was assessed at baseline using the Nutrition Screening Initiative's DETERMINE checklist. The checklist contains ten questions (see Appendix 1), the answers to which have different point values, with which to detect older adults at high risk of malnutrition. Normal nutritional status is reflected by an aggregate result of zero to two points, moderate risk of malnutrition is three to five points, and high risk of malnutrition is

reflected by an aggregate score greater than six.[16] The DETERMINE checklist identifies noninstitutionalized older persons at risk of low nutrient intake and subsequent health problems. It is the only standardized screening tool used to assess nutritional risk among recipients of Older Americans Act (OAA) meal programs, which include the Home Delivered Meals Program and Congregate Nutrition Program.[17] DETERMINE was selected to assess nutritional risk given the similar demographic characteristics of ADHC and OAA users.

The criterion validity for the DETERMINE checklist varies considerably, with sensitivities of 75%[18] and 91%[19] and specificities of 11%[18] and 54%[19] reported among community-dwelling adults. DETERMINE was administered in the participants' preferred language. Two adaptations to the checklist were made. First, the participants were not asked about their age. Their age was instead determined by reviewing their date of birth in their medical records. Second, the participants were asked about the number of alcoholic drinks they consumed daily during a separate comprehensive screening specific to substance abuse risk, not as part of the checklist.

Design and analysis

The results of the nutritional assessment using the DETERMINE checklist were entered into TOPS® (Tracking Outcomes for Program Success), a cloud-based HIPAA-compliant database. All data were ultimately merged into SPSS version 24.0 for cleaning and analysis. Univariate descriptive statistics were calculated to assess the participants' demographics and the prevalence of nutritional risk. The results were stratified by race to assess for statistically significant differences in nutritional risk among whites, non-Hispanics, Blacks, Hispanics, and Asians/Pacific Islanders. Those who identified as "other" or "mixed-race" were excluded due to their extremely small sample size. Statistical significance was set at $p < 0.05$. Thereafter, bivariate chi-squared tests were conducted to explore relationships between demographic characteristics and race, nutritional risk, and race adjusted for the presence of chronic disease as well as aspects of healthcare utilization (emergency department visits, hospitalization, and readmissions) and components of nutritional risk with race.

Results

Study sample

In total, 188 individuals participated in the study. Participant demographics are presented for the entire sample and by self-identified race in Table 2. The mean age of the sample was 77.37years (±10.15), with Asians and Hispanics being older than whites and Blacks. On average, each participant had nearly eight chronic conditions (7.92 ± 3.38). The sample was disproportionately Asian (39.9%) and female (67%) and lived in nonrural communities (78%). Overall, the participants were more likely to be widowed (41%) and live with others (62%). Asians and Hispanics had the lowest levels of educational attainment. While 37% of the overall sample was not proficient in English, this was the case for 69% of Asian Americans and 55% of Hispanics. With respect to the prevalence of elevated nutritional risk, the vast majority of the overall population was at moderate (45.2%) or high (38.5%) nutritional risk, with some strong racial differences. Nearly 65% of Blacks were at high

nutritional risk, compared to 39.5% of whites, 33.3% of Hispanics, and 29.30% of Asian Americans.

Table 3 presents the frequency of chronic conditions by race. The overwhelming majority of the sample (80.9%) was afflicted with hypertension. Nearly half of the sample had a formal diagnosis of hyperlipidemia (47.9%), type 2 diabetes (47.3%), dementia/Alzheimer's (46.8%), or depression (44.1%). The rates of these diseases, other than depression, were highest among nonwhites. Blacks had the highest rates of hypertension (88.2%) and stroke (44.1%). Hispanics had the highest rates of diabetes (50%), dementia (63.9%), and congestive heart failure (19.4%). The p-values in Table 2 reflect the statistical significance of the bivariate association between nutritional risk and race adjusted for each individual chronic condition/component of healthcare utilization. In addition, nutritional risk was associated with the racial categories adjusted for those with hypertension ($p < 0.05$), hyperlipidemia ($p < 0.04$), diabetes ($p = 0.05$), dementia ($p < 0.01$), depression ($p < 0.05$), and stroke ($p = 0.05$).

Nutritional risk and component parts

Nutritional risk was examined according to the DETERMINE checklist, and the findings are presented by race in Table 4. The components of nutritional risk that affected more than 50% of the overall population were changes in eating habits due to disease (56.9%), economic hardship (90.3%), use of multiple medications (94.1%), and needing assistance with self-care (85.2%). In addition, 43.6% of the sample were over the age of 80; 47.1% ate fewer than five servings of fruits, vegetables, and milk daily; and 39.6% reported reduced social contact despite being enrolled in an ADHC. Yet, some drivers of nutritional risk varied by race and often disproportionately affected Blacks. For example, among Blacks, 76.5% reported eating fewer than five servings of fruits, vegetables, and milk daily, compared to 39.5% of whites. Nearly 21% of Blacks also reported eating fewer than two meals a day, compared to approximately 2% of whites and Hispanics. Blacks (48.5%) were also more likely to report involuntary weight loss/gain compared to whites (23.3%) and had the highest prevalence of tooth loss/mouth pain compared to any other racial group at 41.2% despite being younger overall.

Discussion

In this study, we identified the prevalence of nutritional risk and its associated factors in a diverse population of older adult ADHC users. The findings paint a picture of ADHC users as an ethnically diverse, medically complex, and disproportionately socially disadvantaged group. This is consistent with studies finding that adult day services are a preferred source of long-term care for chronically ill/functionally impaired Medicaid-eligible immigrants and minorities, who face numerous barriers to accessing health care but wish to avoid institutional settings.[20] Participants in our sample experienced multiple chronic conditions and polypharmacy in addition to limited English proficiency and low educational attainment. All of these factors have been found to contribute to the multifactorial etiology of malnutrition.[21]

Within our findings were clinically significant racial differences in demographics, diagnoses, and nutritional risk factors. These findings suggest that targeted nutrition interventions must account for the racial and ethnic community being served by the ADHC. Blacks, in particular, fared the worst of all racial groups with respect to nutrition, with 64.7% at high risk. Blacks also had the highest prevalence of hypertension, hyperlipidemia, and stroke. While largely preventable, these are known to disproportionately affect African Americans at younger ages,[22] which was consistent with our findings. Nutritional risk among Blacks was disproportionately driven by low levels of fruit, vegetable, and dairy intake, which was consistent with other studies of middle-aged and older Blacks.[23] Blacks in our sample frequently reported eating fewer than two meals daily. This is a particularly salient finding because ADHCs provide at least one meal to these adults with CACFP subsidies[7]; thus, some Black older adults may utilize ADHCs as their primary food source. Blacks also had the highest frequency of emergency department visits over the course of twelve months. Some emerging evidence[23] shows that malnutrition is associated with emergency department use, and while not casual in nature, our study found that Blacks had both the highest frequency of emergency department visits and highest malnutrition risk, thus warranting further exploration.

Hispanics had the greatest frequency of diabetes and dementia, and just over one in three were at high risk of malnutrition, but they reported relatively low rates of living alone and reduced social contact. This is consistent with studies of older Hispanics finding that they prefer to live with family when facing physical or cognitive impairment and emphasize cultural values surrounding family caregiving.[24] Notably, 55% of Hispanics, more than any other group in our sample, were at moderate risk (as opposed to high risk) of malnutrition, suggesting an opportunity to intervene before risk becomes further elevated. Polypharmacy was the primary driver of Hispanics' nutritional risk. Treatment with multiple medications may contribute to poor nutritional status by causing loss of appetite, gastrointestinal problems, and other alterations in body function.[25] All of the Hispanics in our sample reported use of three or more medications, highlighting an important area for further exploration.

Asians made up a larger portion of our sample than any other ethnic group. Nutritional risk was driven by the fact that more than half of Asians were over the age of eighty, 88% required assistance with self-care, and 96% reported economic hardship. Asians were second only to whites in reporting reduced social contact. They suffered from high rates of hypertension, hyperlipidemia, and diabetes. Yet, they had the lowest rates of high nutritional risk and emergency department use. Protective factors included limited alcohol use, low rates of food insecurity, greater fruit and vegetable intake, and below-average rates of involuntary weight loss/gain. While not included in the DETERMINE checklist, acculturation may also play an important protective role with respect to nutrition for Asians. Nearly 70% of the Asians in the sample were not proficient in English, a commonly used index of acculturation.[26] While limited English proficiency and lower levels of acculturation are traditionally viewed as barriers to healthcare access for older immigrants,[27] they are also associated with healthier behaviors and more adherence to a healthful non-Western lifestyle.[23a] Thus, these adults may benefit from access to culturally appropriate foods at the ADHC to maintain a healthy lifestyle.

Whites had the highest levels of English proficiency and more educational attainment than any other racial group as well as the lowest levels of hypertension, diabetes, and hyperlipidemia. They were the least likely to report reduced fruit and vegetable intake, and only 2.3% reported eating fewer than two meals daily. Yet, they were the most likely to screen positively for severe depression, and their nutritional risk was driven more by reduced social contact and alcohol use than any other group. Evidence suggests social isolation is strongly negatively associated with physical and mental health in white elders.[28] Because the participants in our sample have regular access to an ADHC, they should report below-average levels of loneliness and social isolation. However, the data suggest that improving nutrition among whites may require more in-depth strategies to address social isolation.

We also explored broader associations among nutritional risk and chronic illness and healthcare utilization across our sample. We found that nutrition risk was associated with five major chronic illnesses (hypertension, hyperlipidemia, diabetes, depression, stroke, and dementia). This is consistent with findings from other prospective cohort studies that have found that (1) the frequency of fruit and vegetable intake is inversely associated with cardiovascular disease, diabetes, and all-cause mortality, even after adjusting for other behaviors[29] and (2) diet is correlated with the onset and progression of Alzheimer's disease and related dementias.[30] Given the likely effects of nutrition on various chronic illnesses, we posit that early nutritional intervention may hold promise in reducing chronic disease and delaying neurocognitive decline.

Finally, to our knowledge, this study is the first to identify the prevalence of malnutrition risk in ADHC users and its association with chronic disease and utilization. The overwhelming majority of our sample was at moderate or high risk, suggesting that older adults in ADHCs may face an underrecognized and therefore undertreated risk of malnutrition that threatens their overall health. Malnutrition rates differ across healthcare settings,[6] but malnutrition most often develops insidiously in the community, making it a key setting in which to screen for and address nutritional risk.[31] Furthermore, ADHCs that provide bilingual and culturally congruent services in addition to transportation to the center, meals, health education, and nursing supervision may be well-positioned to address the biopsychosocial health of these individuals, including their nutritional requirements.[11b]

Timely identification of malnutrition may be achieved with standardized screening, which ADHCs are not currently required to conduct. The Gerontological Society of America[1] has called on organizations to build malnutrition screening and intervention into practice and, organizationally, to establish systematic malnutrition screening and standards. In the case of the ADHC population, these standards should be embedded within CACFP guidelines. However, identification alone will not be reflected in outcome improvement unless an effective pathway exists to address malnutrition. Possible interventions in ADHCs based on our findings include (1) health education on nutrition and its association with chronic disease, (2) ensuring that ADHC users are productively engaged in activities within and outside the center, (3) connecting ADHC users to programs like the OAA Home Delivered Meals Programs, (4) subsidies and improved regulations under the CACFP that will allow participants to take food home from the ADHC, and (5) regular medication reconciliation by nurses and pharmacists to identify and reduce polypharmacy.

Limitations and future directions

This study was limited by a number of factors. First, our sample was limited to ADHC users in California, which is home to a more ethnically diverse population than may be the case in other states. Thus, the findings may not be broadly generalizable. Second, this study was not powered to allow for in-depth exploration into how drivers of malnutrition impacted the participants' overall health. Third, while endorsed by the Nutrition Screening Initiative, the DETERMINE checklist lacks anthropometric measures and has lower levels of sensitivity and specificity than the more widely used Mini Nutritional Assessment. It also does not account for other drivers of nutritional risk such as educational attainment or acculturation. However, the results suggest avenues for future research. First, the capacity of ADHCs to provide improved nutrition screening, assessment, and intervention must be explored more deeply. In particular, more research is necessary on how CACFP guidelines affect the ADHCs' ability to meet their participants' needs. Second, nutrition must be explored, not only in the context of race and ethnicity but also in the context of chronic disease. Nutrition interventions can and should be tailored to prevent or delay the onset and progression of chronic diseases disproportionately affecting ADHC users.

Conclusion

This study uniquely explored nutritional risk in a largely understudied setting that is well-positioned to provide targeted interventions that account for participants' unique needs. We found significant racial/ethnic disparities in nutritional risk in this ADHC population that, above all else, require the development of targeted screening and intervention programs. Second, we found that ADHC users across the board are vulnerable to poor nutrition, and nutrition may be associated with the onset of preventable conditions and unnecessary healthcare utilization. However, the factors driving nutritional risk are heterogeneous and affect racial communities differently. Given the heterogeneity of ADHC users with regard to drivers of nutritional risk, levels of social support, and chronic disease, efforts to optimize an intervention should be informed by an understanding of how specific modifiable risk factors for malnutrition contribute to specific communities served by the ADHC.

Appendix

Appendix 1.

DETERMINE checklist components.[17]

		Score for "Yes" Answer
Disease has changed eating habits (%)	Do you have an illness or condition that makes you change the kind and/or amount of food you eat?	2
Eating poorly	Do you eat few fruits, vegetables, or milk products?	3
	Do you eat fewer than 2 meals per day?	2
	Do you have 3 or more drinks of beer, liquor, or wine almost every day?	2
Tooth loss/mouth pain (%)	Do you have tooth or mouth pain that make it hard for you to eat?	2

		Score for "Yes" Answer
Economic hardship (%)	Do you sometimes have difficulty affording the food you need?	4
Reduced social contact (%)	Do you eat alone most of the time?	1
Multiple medications (%)	Do you take <3 prescribed or over-the-counter drugs a day	1
Involuntary weight loss/gain (%)	Have you lost or gained 10 lbs in the last 6 months without trying?	2
Needs assistance in self-care (%)	Are you sometimes physically not able to shop, cook, or feed yourself?	1
Elder years above 80 (%)	Are you over 80 years old?	1
0–2 Low risk.		
3–5 Moderate Risk.		
6+ High Nutritional Risk		

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Takeaway points

- ADHC users have an elevated risk of malnutrition, which is, especially, pronounced among Blacks.
- Malnutrition is associated with chronic disease and increased healthcare utilization among ADHC users, yet standardized nutritional screening is not required of ADHCs.
- The drivers of malnutrition vary significantly by racial/ethnic group, and community-specific approaches are needed to address risk factors that disproportionately affect individual ADHCs. Broader strategies should address polypharmacy, economic hardship, and a need for assistance with self-care, which seem to pose risks across all racial groups.
- Effective pathways to mitigating nutritional risk among ADHC users are needed, and users should be connected to professionals and services that can assist in correcting nutritional deficiencies.

Table 1.

General CBHH eligibility criteria.

18 Years or older AND assessed to qualify for community based adult services
AND
>1 Chronic physical or mental health or cognitive condition that last a year or more and require ongoing medical attention and/or limit ADLs AND/OR **Psychosocial conditions** that make the person vulnerable to fragmented systems of care (including communication difficulties, poverty, living alone, the need for conservatorship, poor or inadequate caregiving which may appear as a la lack of safety monitoring, lack of access to necessary medical interventions, or mismanagement of medications AND/OR **Recent institutionalization** (visits to the emergency department, medical hospitalizations, psychiatric hospitalization within the past year, a skilled nursing facility stay in the past
AND
Event(s) that trigger the need for increased support from RN or social worker (triggering events may include various changes in health or psychosocial status, which may be acute or progressive. Examples include falls, abuse, suicidal idea adequate support system, caregiver distress, inadequate nutrition, need for assistance with housing, or other changes in stable status)
AND
Be assessed as being able to benefit by additional intensive support from the CBHH through targeted goal focused interventions to be carried out by the RN Navigator in coordination with the ADHC interdisciplinary team

Table 2.

Demographics and clinical characteristics by race ($N = 188$).

		Race/ethnicity %				
	Total (*n* = 188)	**White, Non-Hispanic (*n* = 43)**	**Black (*n* = 34)**	**Hispanic (*n* = 36)**	**Asian Pacific Islander (*n* = 75)**	***p* Value**
Mean age in years (SD)	77.37 (10.15)	74.42 (10.28)	74.44 (10.97)	79.91 (8.90)	79.16 (9.69)	0.13
Mean # of chronic conditions (SD)	7.92 (3.38)	8.09 (3.72)	8.24 (2.69)	7.56 (4.42)	7.85 (2.91)	0.14
Mean # of medications (SD)	10.37 (4.7)	11.67 (5.97)	9.79 (3.78)	10.36 (4.60)	9.89 (4.25)	0.12
Race (%)						
White/non-Hispanic	22.90%					
Black	18.10%					
Asian/Pacific Islander	39.90%					
Hispanic/Latino	19.10%					
Language (%)						
English	46.80%					
Vietnamese	10.80%					
Chinese	17.70%					
Spanish	14.00%					
Tagalog	3.20%					
Farsi	1.60%					
Korean	1.60%					
Russian	2.20%					
Other	2.20%					
Location type (%)						0.00
Rural	21.30%	39.50%	5.90%	44.40%	6.70%	
Non-rural	78.70%	60.50%	94.10%	55.60%	93.30%	
Gender(%)						0.62
Female	67.00%	67.40%	73.50%	63.90%	65.30%	
Male	33.00%	32.60%	26.50%	36.10%	34.70%	
Marital status (%)						0.01
Single	15.80%	16.30%	26.70%	14.30%	12.00%	
Married or partnered	20.20%	13.90%	10.00%	25.70%	25.30%	
Separated or divorced	23.00%	34.90%	30.00%	22.80%	13.40%	
Widowed	41.00%	34.90%	33.30%	37.10%	49.30%	
Living arrangement (%)						0.00
Lives alone	38.00%	46.50%	32.40%	11.10%	48.60%	
Lives with others	62.00%	53.50%	67.60%	88.90%	51.40%	
Educational attainment (%)						0.01
None	3.20%	2.30%	0.00%	2.80%	5.30%	
Grade school	38.00%	26.10%	36.00%	52.70%	42.70%	
High school graduate	27.70%	31.00%	40.00%	33.30%	22.70%	

		Race/ethnicity %				
	Total (*n* = 188)	**White, Non-Hispanic (*n* = 43)**	**Black (*n* = 34)**	**Hispanic (*n* = 36)**	**Asian Pacific Islander (*n* = 75)**	***p* Value**
Some college	10.60%	14.30%	20.00%	5.60%	9.30%	
College graduate	13.80%	23.80%	4.00%	5.60%	17.30%	
Post-graduate	1.60%	2.40%	0.00%	0.00%	2.70%	
English proficiency (%)						0.00
Proficient in English	39.90%	75.60%	81.80%	25.00%	11.30%	
Limited English proficiency	19.10%	22.00%	18.20%	19.40%	19.70%	
	37.20%	2.40%	0%	55.60%	69.00%	
Not proficient in English						
BMI at enrollment (%)						
Above average	20.30%	23.30%	26.50%	33.30%	9.50%	0.01
Nutritional risk (%)						
Low nutritional risk	16.00%	23.30%	5.90%	11.10%	18.70%	0.007
Moderate nutritional risk	45.20%	37.20%	29.40%	55.60%	52.00%	
High nutritional risk	38.80%	39.50%	64.70%	33.30%	29.30%	

Table 3.

Association between race and overall nutritional risk adjusted for chronic conditions ($N = 188$).

		Race/ethnicity %				
	Total	**White, non-Hispanic**	**Black**	**Hispanic**	**Asian Pacific Islander**	***p* Value**
Hypertension (%)						
Low nutritional risk	14.5	24.1	3.3	6.9	18.8	0.02[a]
Moderate nutritional risk	46.7	37.9	33.3	55.2	53.1	
High nutritional risk	38.8	37.9	63.3	37.9	28.1	
Hyperlipidemia (%)						
Low nutritional risk	10.0	6.3	0	7.1	17.1	0.04[a]
Moderate nutritional risk	42.2	50.0	21.1	64.3	41.5	
High nutritional risk	47.8	43.8	78.9	28.6	41.5	
Diabetes (%)						
Low nutritional risk	10.1	6.3	0.0	11.1	15.0	0.05[a]
Moderate nutritional risk	48.3	50.0	20.0	55.6	55.0	
High nutritional risk	41.6	43.8	80.0	33.3	30.0	
Dementia/Alzheimer's (%)						
Low nutritional risk	13.6	35.3	10.0	0	14.3	0.00[a]
Moderate nutritional risk	47.4	29.4	25.0	65.2	60.7	
High nutritional risk	38.6	35.3	65.0	34.8	25.0	
Depression (%)						
Low nutritional risk	13.3	13.0	0.0	0.0	25.0	0.01[a]
Moderate nutritional risk	37.3	39.1	8.3	56.3	37.5	
High nutritional risk	49.4	47.8	91.7	43.8	37.5	
Osteoarthritis (%)						
Low nutritional risk	11.1	14.3	0.0	0.0	17.4	0.59[a]
Moderate nutritional risk	40.7	35.7	30.0	42.9	47.8	
High nutritional risk	48.1	50.0	70.0	57.1	34.8	
Stroke (%)						
Low nutritional risk	12.2	28.6	0	11.1	16.7	0.05[a]
Moderate nutritional risk	40.8	28.6	26.2	33.3	61.1	
High nutritional risk	46.9	42.9	73.3	55.6	22.2	
Osteoporosis (%)						
Low nutritional risk	22.7	30	0	16.7	26.1	0.73[a]
Moderate nutritional risk	40.9	40	40	66.7	34.8	
High nutritional risk	36.4	30	60	16.7	39.1	
Chronic kidney disease (%)						
Low nutritional risk	9.1	0	0	0	23.1	0.21[a]
Moderate nutritional risk	48.5	71.4	16.7	57.1	46.2	

		Race/ethnicity %				
	Total	**White, non-Hispanic**	**Black**	**Hispanic**	**Asian Pacific Islander**	***p* Value**
High nutritional risk	42.4	28.6	83.3	42.9	30.8	
Gastroesophageal reflux disease (GERD) (%)						
Low nutritional risk	12.1	16.7	0.0	0.0	16.7	0.22[a]
Moderate nutritional risk	42.4	41.7	0.0	75	50.0	
High nutritional risk	45.5	41.7	100	25	33.3	
Congestive heart failure (%)						
Low nutritional risk	4.3	0	0	14.3	0	0.23[a]
Moderate nutritional risk	47.8	80	20	57.1	33.3	
High nutritional risk	47.8	20	80	28.6	66.7	
COPD (%)						
Low nutritional risk	12	0	0	0	27.3	0.20[a]
Moderate nutritional risk	32	16.7	40	0	45.5	
High nutritional risk	56	83.3	60	100	27.3	
Emergency department visit in 12 months (%)						
Low nutritional risk	7.8	13	5.3	7.7	4.5	0.43[a]
Moderate nutritional risk	41.6	34.8	26.3	53.8	54.5	
High nutritional risk	50.6	52.2	68.4	38.5	40.9	
Hospital admission in 12 months (%)						
Low nutritional risk	12.1	12.5	7.7	0.0	19.2	0.20[a]
Moderate nutritional risk	43.9	37.5	23.1	54.5	53.8	
High nutritional risk	43.9	50	69.2	45.5	26.9	
Hospital readmission						
Low nutritional risk	9.5	25.0	0	0	0	0.61[a]
Moderate nutritional risk	28.6	12.5	20	50	50	
High nutritional risk	61.9	62.5	80	50	50	

[a]Fischer's exact test.

Table 4.

Components of risk by race and association with overall nutritional risk ($N = 187$).

			Race/ethnicity %				
	***n* =**	**Total**	**White, non-Hispanic**	**Black**	**Hispanic**	**Asian Pacific Islander**	***p* Value**
Disease has changed eating habits (%)	188	56.9	48.8	52.9	61.3	61.1	.53[a]
Eating <5 fruits, vegetables, or milk daily (%)	187	47.1	39.5	76.5	41.7	40.50	.00
Eating <2 meals daily (%)	188	8	2.3	20.6	13.9	2.70	.00[a]
>3 alcoholic drinks per day	166	10.2	17.1	9.1	12.9	4.9	.20[a]
Tooth loss/mouth pain (%)	188	28.2	34.9	41.2	22.2	21.3	.10
Economic Hardship (%)	186	90.3	81.4	88.2	91.2	96	.06[a]
Reduced social contact (%)	187	39.6	47.6	38.2	19.4	45.3	.04
Multiple medications (%)	187	94.1	93	97.0	100	90.7	.23[a]
Involuntary weight loss/gain (%)	184	24.5	23.3	48.5	26.5	13.5	.00
Needs assistance in self-care (%)	187	85.2	86	76.5	84	88.9	.46
Elder years above 80 (%)	188	43.6	34.9	32.4	50	50.7	.14

[a]Fischer's exact test.