Physical Activity, Fruit and Vegetable Intake, and Health-Related Quality of Life Among Older Chinese, Hispanics, and Blacks in New York City

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Objectives. We explored the relationship between health-related quality of life (HRQOL) and adequate physical activity (PA) and fruit and vegetable (F&V) intake among racial/ethnic minority groups aged 60 years or older living in New York City (NYC).

Methods. Survey data from 2009 to 2012 targeted minority groups in NYC ethnic enclaves; we analyzed 3594 individuals (Blacks, Hispanics, and Chinese) aged 60 years or older. Descriptive statistics were run; unadjusted and adjusted logistic regression evaluated the relationship of HRQOL with PA and F&V intake.

Results. Hispanics were most likely to engage in sufficient PA and eat recommended F&Vs and had significantly worse HRQOL. After multivariable adjustment, significant associations were found between PA and self-reported health, activity limitation and physical health days for all groups, and PA and mental health days for Hispanics. Significant associations were found between F&V intake and physical health days for Hispanics and F&V intake and self-reported health for Chinese.

Conclusions. Findings indicated variations between HRQOL and PA by racial/ethnic subgroup. Despite being highly insured, recommendations for PA and F&V intake were not met. There is a need to promote healthy living behaviors among aging NYC racial/ethnic populations. (*Am J Public Health.* 2015;105:S544–S552. doi:10.2105/AJPH.2015.302653)

The older population in the United States is rapidly growing, and it is projected that the number of persons aged 65 years or older will nearly double by 2050 and account for approximately 21% of the population.[1] The US Census Bureau projects that racial/ethnic minorities will constitute 57% of the population in 2060.[2] The population aged 65 years or older will also become more racially and ethnically diverse over the next 4 decades, as the older minority population is projected to increase from 20.7% in 2012 to 39.1% in 2050.[1] Healthy aging strategies, designed to "optimize the health of older adults" rather than focus on treatment and management of existing conditions,[3(p5S)] include multilevel interventions.[4,5] For example, community-level interventions may address neighborhood influences on diet and physical activity (PA).[4] Understanding the needs of older populations within distinct racial/ethnic communities is essential to successful healthy aging strategies.

Health-related quality of life (HRQOL) is a health-focused quality-of-life measure of self-reported physical health, mental health, and social functioning used to understand the health status of a population.[5] PA and diet are modifiable behaviors that contribute to healthier lifestyles and better quality of life, while simultaneously helping to prevent and manage chronic conditions.[6,7] Even later in life, positive changes in PA and diet can improve healthy aging.[8] Improving HRQOL and well-being, increasing PA, and improving diet are a few of the Healthy People 2020 national health initiative's goals for all persons in the United States.[9] HRQOL is especially important for older adults; Healthy People has been modified to include a focus on quality of life, including lives that are free from preventable diseases, disabilities, and injuries.[10]

HRQOL has been found to differ by racial/ethnic group, with Blacks and Hispanics reporting worse health than Whites and Asians.[11–13] In addition, among older adults, there are worse perceived health outcomes among racial/ethnic minority groups compared with Whites.[14,15] Moreover, lifestyle behaviors such as healthy diet and PA are key factors of healthy aging and important modifiable risk factors in the prevention of chronic diseases.[16] Few studies, however, have examined HRQOL and its relationship with dietary measures and PA among older adults,[17–20] especially among specific racial/ethnic minority populations.[21]

Research suggests that food intake declines as age advances.[22] In addition, older persons, especially older minorities, are less likely to meet PA recommendations.[23] Patterns of PA and fruit and vegetable (F&V) intake are dually influenced by individuals' personal preferences and their broader social ecology. Immigrant enclaves within New York City (NYC) exemplify how social, political, economic, and cultural forces influence health practices. These neighborhoods are typically characterized by their large concentration of new immigrants and fewer socioeconomic resources.[24] Neighborhood characteristics may also play an important role in healthy eating and PA by providing easy access to fresh F&Vs[25,26] and parks and recreational areas.[27]

In NYC, Asian Americans represent 13% of the population, and Chinese Americans constitute 47% of the Asian population, the largest ethnic Chinese population outside of Asia.[28] Similarly, Hispanics represent 29% of the NYC population, with the largest subgroups being Puerto Rican (31.0%), Dominican (24.7%), and Mexican (13.7%).[29] Blacks represent 26% of the NYC population.[30] Heterogeneity exists

within race/ethnicity with respect to health behaviors,[31–33] and these differences are important when studying and interpreting health disparities.[34]

Given the rapid growth of racial/ethnic minority older adults, findings from this study can help inform strategies and policies to promote effective healthy aging and add to the knowledge base on how best to optimize health for growing older populations. The goal of this study was to describe relationships between HRQOL and PA and F&V intake across racial/ethnic groups (non-Hispanic Blacks, Hispanics, and non-Hispanic Chinese) among older adults living in 3 distinct racial/ethnic NYC neighborhoods. An enriched understanding of the relationship between HRQOL and modifiable lifestyle factors can better inform our efforts to improve health outcomes, allowing for increased opportunities for independent living among the aging population.

METHODS

Racial and Ethnic Approaches to Health Across the United States (REACH US) is a program of the Centers for Disease Control and Prevention (CDC) that mobilizes and equips local communities and institutions to plan, implement, and evaluate community-based strategies to eliminate health disparities within racial/ethnic populations in the United States.[35] The REACH US Risk Factor Survey was conducted annually in 28 grantee communities as part of evaluation activities. This study examined 4 years of aggregated survey data (2009–2012). An address-based sampling method was used to target census tracts with racial/ethnic minority populations that matched each grantee community. One NYC grantee community targeted Asian Americans, while 2 communities targeted Blacks and Hispanics. The survey was conducted using in-person interviews (year 1 only), telephone interviews, and self-administered questionnaires. Household eligibility screening was performed for all telephone interviews, and up to 2 eligible adults per household were selected to participate. A complete description of survey methods can be found elsewhere.[36]

Analyses were limited to individuals identifying as Hispanic, non-Hispanic Black, or non-Hispanic Chinese living in ethnic enclaves or areas in NYC characterized by high racial/ethnic concentrations. These areas included the Lower East Side of Manhattan, Flushing in Queens, East Harlem in Manhattan, and Southwest Bronx. Respondents in this sample completed the survey in English, Chinese (Mandarin or Cantonese), or Spanish. A total of 3594 individuals were included in analyses.

Study Measures

All survey items were adapted from the Behavioral Risk Factor Surveillance System (BRFSS) interview, a previously validated survey.[37] Weekly PA was based on recommendations by the US Department of Health and Human Services that all adults, regardless of age, should perform at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity aerobic PA, or an equivalent combination, per week.[7] The survey assessed days per week and amount of time per day that an individual engaged in vigorous and moderate PA. Vigorous activity was multiplied by 2 and combined with moderate activity. Once summed, a new PA variable represented no PA, insufficient PA (<150 minutes/week), and sufficient PA (≥ 150 minutes/week).

F&V intake was determined using a 6-item food frequency screener. Respondents reported the number of times per day, week, month, or year they consumed

1. fruit juice,
2. fruit,
3. green salad,
4. potatoes (not counting fried potatoes or potato chips),
5. carrots, and
6. other vegetables.

Daily F&V intake was calculated from summed responses; weekly frequencies were divided by 7, monthly frequencies by 30, and yearly frequencies by 365. A new F&V consumption variable was created: 5 or more, 3 to fewer than 5, and fewer than 3 times daily. The BRFSS F&V module has been reported to be easily incorporated into surveillance system surveys to track intake at the population level and show differences by subgroup.[6]

Four HRQOL measures have been developed by the CDC and are validated.[5,38,39] These measures include self-reported general health, days of poor physical health in the past month, days of poor mental health in the past month, and days of limited activities because of poor physical or mental health in the past month. General health was categorized as excellent/very good/good and fair/poor. Days of poor health within the past 30 days (physical, mental, and limited activity days) were categorized as 14 or more and fewer than 14 to reflect those with and without substantial impairment, respectively.[21]

Sociodemographic variables include gender, age, neighborhood, education, annual household income, nativity status, health insurance, last regular checkup, body mass index, smoking status, hypertension, and diabetes diagnosis.

Statistical Analyses

Descriptive statistics were run for the entire sample and across racial/ethnic groups. Percentages and standard errors were presented for categorical variables, and means and SEs were presented for continuous variables. Chi-square and t tests were run for categorical and continuous variables, respectively, across race, and P values were presented.

We further explored relationships between HRQOL and PA and F&V intake, stratifying by race/ethnicity. The χ^2 test compared differences in HRQOL categories by F&V intake and PA categories according to groups. Unadjusted and adjusted logistic regression models further examined the associations among groups. Hosmer–Lemeshow goodness-of-fit tests were conducted to test model fit. SAS-Callable SUDAAN version 11.0 (RTI, Research Triangle Park, NC), was used to account for the complex survey design; each sample was weighted to reflect the probability of selection, the number of eligible family members, and the age–gender population size of the surveyed population.

RESULTS

Table 1 presents the sociodemographic and health characteristics of the sample—both overall and by race/ethnicity. Most individuals had health insurance (93%) and had received a routine checkup in the past year (88%). Significant differences by race/ethnicity were found for education, income, country of birth, current smoking habits, and diabetes and high blood pressure diagnoses. Chinese and

TABLE 1—Adults Aged > 60 Years Old by Race and Ethnicity

Variable	Overall (n = 3594), % (SE) or Mean ±SD	Chinese (n = 1046), % (SE) or Mean ±SD	Blacks (n = 1012), % (SE) or Mean ±SD	Hispanics (n = 1536), % (SE) or Mean ±SD	*P*
Female	55.9 (2.0)	53.6 (2.4)	61.5 (2.3)	54.4 (3.5)	.086
Age, y					.311
60–64	34.0 (2.3)	35.0 (2.2)	33.6 (2.1)	33.5 (4.4)	
65–69	18.3 (0.8)	16.8 (1.2)	19.4 (1.4)	18.7 (1.3)	
70–74	19.3 (1.3)	16.9 (0.9)	18.9 (1.2)	21.4 (2.1)	
75–79	13.8 (0.9)	15.1 (1.2)	12.7 (0.7)	13.5 (1.5)	
≥ 80	14.6 (1.0)	16.2 (1.3)	15.4 (1.8)	12.9 (1.7)	
Location					.061
East Harlem, Manhattan	38.4 (15.7)	0 (0.0)	45.2 (19.6)	63.0 (17.9)	
Southwest Bronx	29.5 (13.7)	0.6 (0.2)	54.2 (19.6)	36.4 (17.8)	
Lower East Side, Manhattan	22.0 (9.9)	68.5 (1.2)	0 (0.0)	0.4 (0.3)	
Flushing, Queens	10.1 (4.6)	30.9 (1.0)	0.6 (0.5)	0.2 (0.2)	
Education					.009
< high school	52.3 (1.6)	58.5 (1.4)	28.2 (1.4)	62.0 (1.2)	
High school	36.7 (2.0)	27.7 (0.7)	57.0 (1.2)	31.2 (1.8)	
College graduate	11.0 (0.9)	13.8 (1.3)	14.8 (1.1)	6.8 (0.8)	
Income, $					.038
< 25 000	68.4 (1.3)	68.0 (0.6)	60.3 (0.9)	73.3 (1.8)	
25 000–49 999	16.5 (0.9)	15.0 (0.2)	22.8 (1.2)	14.0 (1.2)	
≥ 50 000	6.5 (0.6)	7.3 (1.1)	9.1 (1.1)	4.4 (0.5)	
Don't know/refused	8.6 (0.6)	9.7 (0.7)	7.8 (0.9)	8.2 (1.2)	
Has health insurance	92.9 (0.6)	92.0 (0.9)	93.5 (0.3)	93.2 (0.9)	.405
Checkup in past year	87.5 (0.6)	88.4 (0.4)	88.3 (0.6)	86.3 (1.0)	.186
Born in the United States	33.6 (6.9)	2.5 (0.3)	83.7 (3.0)	26.9 (2.9)	.002
Body mass index					.05
Normal/underweight	38.9 (5.7)	64.8 (2.1)	26.8 (0.6)	26.5 (1.5)	
Overweight	33.9 (1.3)	29.3 (1.9)	34.3 (1.2)	37.3 (1.3)	
Obese	27.2 (4.7)	5.9 (0.5)	38.9 (1.4)	36.2 (1.9)	
Current smoker	12.0 (1.2)	7.3 (0.9)	15.9 (1.3)	13.2 (1.1)	.019
Diabetes diagnosis	32.2 (2.2)	23.7 (1.3)	33.8 (1.3)	37.6 (1.5)	.024
High blood pressure diagnosis	66.4 (2.6)	54.8 (1.4)	75.4 (1.1)	69.6 (1.3)	.011
General health					.015
Excellent/very good/good	45.4 (1.3)	42.2 (2.8)	57.4 (2.0)	40.7 (1.4)	
Fair/poor	54.6 (1.3)	57.8 (2.8)	42.6 (2.0)	59.3 (1.4)	
Poor physical health d in past mo					.009
Mean (SD)	6.9 ±0.5	5.0 ±0.4	6.8 ±0.4	8.5 ±0.2	
≥ 14 d	22.7 (1.7)	15.7 (2.0)	21.5 (1.6)	28.5 (0.9)	
Poor mental health d in past mo					.011
Mean (SD)	4.0 ±0.3	2.8 ±0.1	4.0 ±0.3	5.0 ±0.2	
≥ 14 d	12.9 (1.0)	9.0 (0.8)	12.7 (1.4)	16.0 (0.7)	
Limited activity d in past mo					.004
Mean (SD)	3.7 ±0.4	2.0 ±0.2	3.7 ±0.3	5.0 ±0.2	
≥ 14 d	11.7 (1.4)	5.7 (0.7)	12.2 (1.2)	16.0 (0.9)	
Vigorous exercise min/wk, mean (SD)	47.9 ±4.9	30.2 ±5.7	60.3 ±10.2	54.1 ±4.8	.003
Moderate exercise min/wk, mean (SD)	184.0 ±10.3	157.6 ±9.1	181.7 ±16.7	205.9 ±14.1	.027
Total exercise[a] min/wk, mean (SD)	261.3 ±15.0	207.7 ±17.6	281.1 ±23.5	289.7 ±9.4	.003

Continued

TABLE 1—*Continued*

Recommended exercise					.072
Does not exercise	40.6 (1.2)	43.6 (1.2)	40.8 (1.3)	38.3 (2.0)	
< sufficient	22.6 (0.8)	22.1 (0.9)	27.2 (1.7)	20.2 (0.9)	
≥ sufficient	36.8 (0.9)	34.3 (1.0)	32.0 (1.1)	41.5 (2.1)	
Total fruits/d, mean (SD)	1.8 ±0.1	1.4 ±0.1	1.9 ±0.1	2.1 ±0.0	< .001
Fruit juice/d, mean (SD)	0.8 ±0.1	0.3 ±0.0	0.9 ±0.1	1.1 ±0.0	< .001
Fruit/d, mean (SD)	1.1 ±0.0	1.2 ±0.0	1.0 ±0.0	1.1 ±0.0	.001
Total vegetables/d, mean (SD)	2.3 ±0.1	2.3 ±0.0	2.3 ±0.1	2.2 ±0.1	.317
Green salad/d, mean (SD)	0.6 ±0.1	0.3 ±0.1	0.6 ±0.0	0.7 ±0.0	< .001
Potato/d, mean (SD)	0.3 ±0.0	0.1 ±0.0	0.3 ±0.0	0.4 ±0.0	< .001
Carrots/d, mean (SD)	0.3 ±0.0	0.2 ±0.0	0.3 ±0.0	0.4 ±0.0	< .001
Other vegetables/d, mean (SD)	1.2 ±0.1	1.7 ±0.0	1.2 ±0.0	0.8 ±0.0	< .001
Total fruits and vegetables/d, mean (SD)	4.0 ±0.1	3.7 ±0.1	4.1 ±0.1	4.2 ±0.1	< .001
Fruits and vegetables/d					.062
< 3 times	38.2 (1.2)	33.7 (1.3)	38.7 (1.4)	41.3 (0.7)	
3 to < 5 times	35.4 (2.5)	46.1 (2.3)	31.1 (1.5)	29.7 (1.2)	
≥ 5 times	26.5 (1.6)	20.2 (1.3)	30.2 (1.5)	29.0 (1.4)	

[a]Total exercise = 2 times vigorous + moderate.

Hispanics were more likely than Blacks to have less than a high school education (58.5% and 62.0% vs 28.2%, respectively), and most Chinese were born outside the United States (98%). Blacks were more likely to be smokers compared with Chinese. Smoking prevalence, however, significantly differed by gender within race/ethnicity, and women had lower smoking prevalence than men (not shown); the

TABLE 2—Association of Health-Related Quality of Life With Recommended Level of Physical Activity by Race and Ethnicity

	Blacks—PA Level[a]			Hispanics—PA Level[a]			Chinese—PA Level[a]		
Variable	I	II	III	I	II	III	I	II	III
≥ 14 unhealthy d (mental)									
Unadjusted proportion (SE)	15.3 (2.2)	10.6 (1.6)	11.4 (1.7)	21.0 (1.2)	12.9 (2.6)	13.2 (1.3)	9.7 (1.8)	9.4 (3.5)	8.2 (0.6)
Crude OR (95% CI)	1.41 (0.92, 2.16)	0.91 (0.64, 1.30)	1.00 (Ref)	1.73 (1.38, 2.18)	0.97 (0.50, 1.89)	1.00 (Ref)	1.18 (0.82, 1.70)	1.18 (0.43, 3.26)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	1.37 (0.82, 2.28)	0.89 (0.64, 1.24)	1.00 (Ref)	1.70 (1.42, 2.03)	0.91 (0.50, 1.66)	1.00 (Ref)	1.47 (1.01, 2.13)	1.30 (0.45, 3.77)	1.00 (Ref)
≥ 14 unhealthy d (physical)									
Unadjusted proportion (SE)	27.9 (2.0)	18.7 (1.5)	16.5 (2.6)	35.9 (1.5)	23.6 (1.5)	25.6 (1.4)	18.1 (2.4)	12.5 (3.3)	14.8 (1.8)
Crude OR (95% CI)	1.95 (1.30, 2.94)	1.16 (0.91, 1.47)	1.00 (Ref)	1.64 (1.43, 1.88)	0.91 (0.69, 1.20)	1.00 (Ref)	1.23 (0.80, 1.88)	0.83 (0.43, 1.60)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	1.72 (1.05, 2.83)	1.18 (0.84, 1.66)	1.00 (Ref)	1.62 (1.39, 1.88)	0.93 (0.71, 1.23)	1.00 (Ref)	1.24 (0.85, 1.81)	0.84 (0.43, 1.63)	1.00 (Ref)
≥ 14 activity limitation d									
Unadjusted proportion (SE)	17.0 (1.9)	8.8 (1.8)	9.3 (1.3)	22.7 (2.3)	14.0 (2.7)	11.4 (1.0)	7.3 (1.2)	3.2 (0.9)	5.3 (0.6)
Crude OR (95% CI)	2.02 (1.23, 3.31)	0.93 (0.56, 1.54)	1.00 (Ref)	2.26 (1.69, 3.02)	1.26 (0.67, 2.39)	1.00 (Ref)	1.37 (0.92, 2.05)	0.59 (0.28, 1.25)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	1.68 (0.88, 3.22	0.93 (0.48, 1.79)	1.00 (Ref)	2.41 (1.71, 3.39)	1.24 (0.69, 2.23)	1.00 (Ref)	0.94 (0.51, 1.73)	0.47 (0.22, 1.00)	1.00 (Ref)
Fair/poor self-reported health									
Unadjusted proportion (SE)	51.8 (3.5)	33.3 (3.3)	38.8 (2.4)	67.5 (1.3)	60.3 (4.1)	51.5 (1.6)	64.8 (3.8)	55.1 (4.6)	50.0 (1.5)
Crude OR (95% CI)	1.73 (1.32, 2.28)	0.79 (0.54, 1.17)	1.00 (Ref)	1.96 (1.74, 2.20)	1.45 (1.06, 1.99)	1.00 (Ref)	1.83 (1.38, 2.43)	1.22 (0.89, 1.65)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	1.56 (1.22, 2.00)	0.78 (0.52, 1.18)	1.00 (Ref)	1.72 (1.48, 1.99)	1.34 (0.92, 1.97)	1.00 (Ref)	1.70 (1.27, 2.28)	1.33 (0.77, 2.27)	1.00 (Ref)

Note. CI = confidence interval; OR = odds ratio.
[a]Physical activity (PA) level: I = none, II = insufficient, and III = ≥ sufficient.
[b]Adjusted for age, gender, neighborhood, education, smoking status, body mass index, and diabetes diagnosis.

prevalence among Chinese men (15%) was similar to that of Black (19%) and Hispanic men (17%), whereas Chinese women had the lowest prevalence (1%) compared with Black (14%) and Hispanic women (10%).

Significant differences by race/ethnicity were seen for all HRQOL measures. Hispanics and Chinese were most likely to self-report their health as fair or poor, and Hispanics reported the greatest number of mental health, physical health, and limited activity days in the past month.

Mean minutes per week of vigorous, moderate, and total exercise differed significantly among groups, with Chinese reporting the fewest minutes in each category. Overall, 41% of individuals reported no PA, and 37% received at least sufficient weekly PA. Chinese were most likely to report no PA (44%), and Hispanics were most likely to report at least sufficient PA (42%). Significant differences were seen among groups and individual food items. Table 1 details the mean of each F&V group by race/ethnicity. Twenty-seven percent of individuals consumed F&Vs 5 or more times a day; Blacks were most likely to consume F&Vs 5 or more times per day, followed by Hispanics and Chinese (30%, 29%, and 20%, respectively).

Physical Activity

To examine the association between PA and HRQOL, we estimated the odds of 14 or more unhealthy days (mental, physical, and activity limitation) and the odds of fair or poor self-reported health across PA group for each race/ethnicity, while adjusting for age, gender, neighborhood, education, smoking status, body mass index, and previous diabetes diagnosis (Table 2). Older adults receiving no PA were more likely to report 14 or more unhealthy days compared with older adults receiving sufficient PA; these associations were significant for Hispanics (mental, physical, and limited activity days), Chinese (mental days), and Blacks (physical days). For example, the relative odds of having 14 or more unhealthy days (physical) for Hispanics receiving no PA was 1.62 (95% CI = 1.39, 1.88) times that of Hispanics receiving sufficient PA. Older adults receiving no PA were also more likely to report fair or poor health compared with older adults receiving sufficient PA; these associations were significant across racial/ethnic groups.

Additional analyses examining correlations between log-transformed moderate and vigorous PA variables and HRQOL found that excellent/very good/good versus fair/poor self-reported health was significantly associated with moderate and vigorous PA; no association was found between unhealthy days (mental, physical, and activity limitation) and moderate or vigorous PA.

Fruit and Vegetable Intake

To examine the association between F&V intake and HRQOL, we estimated the odds of 14 or more unhealthy days (mental, physical, and activity limitation) and the odds of fair or poor self-reported health across the F&V group for each race/ethnicity, while adjusting for age, gender, neighborhood, education, smoking status, body mass index, and previous diabetes diagnosis (Table 3). In general, across racial/ethnic groups, older individuals consuming F&Vs fewer than 3 times a day reported the highest proportion of unhealthy days (mental, physical, and activity limitation), but the relationships were not significant after adjusting for other variables. We found, however, that the relative odds of having 14 or more

TABLE 3—Association of Health-Related Quality of Life With Recommended Daily Fruits and Vegetables by Race and Ethnicity

Variable	Blacks–F&V Intake[a]			Hispanics–F&V Intake[a]			Chinese–F&V Intake[a]		
	I	II	III	I	II	III	I	II	III
≥ 14 unhealthy d (mental)									
Unadjusted proportion (SE)	13.3 (2.6)	10.9 (1.6)	14.2 (2.7)	18.0 (2.4)	13.6 (1.2)	16.8 (0.8)	9.2 (0.8)	9.2 (1.8)	7.1 (1.2)
Crude OR (95% CI)	0.94 (0.58, 1.50)	0.74 (0.36, 1.54)	1.00 (Ref)	1.08 (0.73, 1.60)	0.78 (0.61, 0.99)	1.00 (Ref)	1.29 (0.92, 1.81)	1.32 (0.91, 1.90)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	0.81 (0.44, 1.48)	0.67 (0.30, 1.47)	1.00 (Ref)	1.05 (0.71, 1.56)	0.82 (0.62, 1.10)	1.00 (Ref)	1.46 (0.91, 2.34)	1.50 (0.98, 2.28)	1.00 (Ref)
≥ 14 unhealthy d (physical)									
Unadjusted proportion (SE)	23.6 (1.7)	22.2 (2.5)	18.9 (2.6)	31.6 (2.4)	29.0 (1.5)	26.2 (1.7)	14.3 (3.5)	17.0 (2.3)	14.4 (3.4)
Crude OR (95% CI)	1.34 (0.98, 1.83)	1.19 (0.76, 1.87)	1.00 (Ref)	1.33 (1.02, 1.73)	1.16 (0.87, 1.55)	1.00 (Ref)	1.01 (0.38, 2.72)	1.25 (0.71, 2.20)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	1.37 (0.95, 1.97)	1.27 (0.79, 2.05)	1.00 (Ref)	1.40 (1.06, 1.86)	1.27 (0.91, 1.77)	1.00 (Ref)	1.02 (0.35, 2.97)	1.43 (0.70, 2.95)	1.00 (Ref)
≥ 14 activity limitation d									
Unadjusted proportion (SE)	15.5 (2.5)	10.0 (1.6)	11.0 (1.8)	17.7 (1.4)	15.9 (0.9)	16.0 (1.4)	5.5 (1.9)	5.3 (1.3)	6.3 (2.0)
Crude OR (95% CI)	1.49 (0.83, 2.69)	0.90 (0.58, 1.42)	1.00 (Ref)	1.13 (0.86, 1.49)	1.00 (0.75, 1.33)	1.00 (Ref)	0.87 (0.25, 3.09)	0.80 (0.40, 1.63)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	1.45 (0.76, 2.77)	0.96 (0.51, 1.83)	1.00 (Ref)	1.03 (0.78, 1.35)	1.01 (0.77, 1.32)	1.00 (Ref)	0.81 (0.15, 4.32)	1.01 (0.41, 2.49)	1.00 (Ref)
Fair/poor self-reported health									
Unadjusted proportion (SE)	45.0 (3.4)	43.4 (3.7)	39.3 (3.9)	62.3 (2.7)	58.8 (2.4)	56.0 (2.6)	62.1 (5.2)	59.1 (2.2)	46.6 (2.0)
Crude OR (95% CI)	1.30 (0.76, 2.24)	1.18 (0.84, 1.66)	1.00 (Ref)	1.30 (0.90, 1.88)	1.09 (0.83, 1.44)	1.00 (Ref)	1.91 (1.30, 2.82)	1.66 (1.46, 1.88)	1.00 (Ref)
Adjusted OR,[b] (95% CI)	1.34 (0.78, 2.30)	1.13 (0.78, 1.65)	1.00 (Ref)	1.32 (0.93, 1.89)	1.11 (0.80, 1.54)	1.00 (Ref)	1.84 (1.13, 3.01)	1.61 (1.27, 2.04)	1.00 (Ref)

Note. CI = confidence interval; OR = odds ratio.
[a]Fruit and vegetable (F&V) daily intake: I = <3 times, II = 3 to < 5 times, and III = ≥ 5 times.
[b]Adjusted for age, gender, neighborhood, education, smoking status, body mass index, and diabetes diagnosis.

unhealthy days (physical) for Hispanics consuming F&Vs fewer than 3 times a day was 1.40 (95% CI = 1.06, 1.86) times that of Hispanics consuming F&Vs 5 or more times a day, and the relative odds of fair or poor self-reported health for Chinese consuming F&Vs fewer than 3 times a day was 1.84 (95% CI = 1.13, 3.01) times that of Chinese consuming F&Vs 5 or more times a day. Additional analyses examined the relationship between HRQOL and individual F&V items. We found that among Hispanics, limited green salad consumption was related to more physically unhealthy days and fair/poor self-reported health, and among Chinese, limited consumption of green salad, potato, fruit, and fruit juice were each related to fair/poor self-reported health (data not shown). No additional relationships between HRQOL and F&V intake were significant.

DISCUSSION

The primary purpose of this study was to examine HRQOL by racial/ethnic group among older adults living in NYC ethnic enclaves and to describe the interrelationships between HRQOL and PA and F&V intake within each racial/ethnic group. HRQOL and well-being are both objectives of Healthy People 2020, as is increasing the proportion of adults reporting good mental and physical health.[9] In general, participants perceived their health to be poor; more than half (55%) rated their health as fair or poor, compared with 25% of older adults in the United States and 40% of older adults in NYC in 2012.[40,41] Hispanics were most likely to report 14 or more days of poor health (physical, mental, and limited activity days), as well as fair/poor health.

Results suggested that receiving sufficient PA is associated with better HRQOL. This association was most apparent among Hispanics; significance was seen across all HRQOL measures in adjusted analyses. Previous studies have shown a relationship between PA and HRQOL,[21,42] as well as studies conducted among older adults.[17,19,20] A longitudinal study in Australia found that HRQOL increased as total PA and walking increased among older women.[19] In addition, a British study found that higher HRQOL was seen among older women without obesity or chronic diseases.[43] National BRFSS data indicate that approximately half of adults aged 65 years or older performed sufficient PA,[44] and NYC data found that 38% of adults aged 65 years or older performed sufficient PA.[45] Hispanics in our sample reported having the highest prevalence of sufficient PA (41%).

The relationship between F&V intake and HRQOL was less apparent; however, an overall dose–response relationship was seen for the unadjusted proportions, and individuals eating F&Vs fewer times per day reported poorer HRQOL. In adjusted analyses, Hispanic individuals eating fewer than 3 F&Vs daily were significantly more likely than Hispanic individuals eating 5 or more F&Vs daily to experience 14 or more physically unhealthy days, and Chinese individuals eating fewer than 3 F&Vs daily were significantly more likely than Chinese individuals eating 5 or more F&Vs daily to self-report their health as fair or poor; no other relationships were significant. Overall, we found that older individuals in our sample had low F&V intake, with 20% of Chinese eating F&Vs 5 or more times daily, compared with 28% of adults aged 65 years or older nationally[46] and 11% of adults aged 65 years or older in NYC eating recommended daily F&Vs.[45] These data suggest that, in general, older racial/ethnic adults in NYC are less likely than older adults nationally to eat daily recommended F&Vs.

The CDC recommends that the BRFSS F&V module not be used to estimate the percentage of the population that meets dietary requirements but rather to track population-level consumption of F&V and to rank individuals.[6] There is a growing literature regarding the variability of existing F&V intake assessments, often by racial/ethnic subgroup, in accurately assessing intake.[47] Studies have reported that respondents often misunderstood definitions of F&Vs and what constitutes F&V intake.[48–50] Furthermore, ethnic and cultural differences influenced how questions were interpreted[49] and how F&Vs were categorized, including a finding that nearly 20% of racial/ethnic minority respondents categorized rice as a vegetable.[50] Thus, although a lack of a strong association between HRQOL and F&V intake was found in our study, this should not be taken as evidence that F&Vs are unrelated to HRQOL; findings should be interpreted cautiously, as they suggest what kind of influence F&Vs may have. Further research should examine particular F&V items and how racial/ethnic groups report them.

Although access to care was high (93% were insured and 88% had received a regular checkup in the past year), meeting PA and F&V recommendations was still low. We were unable to address quality of health care and insurance type; however, given the reported incomes of our sample it is likely that most individuals utilize public health insurance (Medicaid or Medicare) or receive health care through the NYC Health and Hospital Corporation, which provides health care access on a sliding scale, regardless of immigration status.[51]

Study Limitations

These findings are subject to several limitations. The cross-sectional nature of the data precludes inferences about cause and effect, including the link between limited PA and mobility. Limited mobility could directly influence an older adult's ability to engage in PA and access F&V and therefore lead to lower HRQOL.[52] Older, lower-income individuals often rely on home delivery services, food stamps, or food pantries for meals, which may provide limited access to F&V. In addition, the BRFSS scale may be less valid than longer food intake scales, overestimating or underestimating the total daily intake.[53] Moreover, as discussed previously, racial/ethnic differences may exist in the interpretation and understanding of F&V intake scales.[47–50] Furthermore, predictor variables, such as health insurance and time since last routine checkup, had high prevalence and could not be used in adjusted analyses. Data collection limitations precluded us from examining additional factors such as US residency length and insurance type; our sample was largely foreign-born (66.4%), and differences have previously been shown for insurance type by racial/ethnic subgroup.[54–56] In addition, whereas data for specific Asian subethnicity were collected, equivalent data for Black and Hispanic subgroups were not. Given that 73.1% of Hispanics and 16.3% of Blacks in our sample were foreign-born, this inability to disaggregate findings may mask ethnic and cultural

differences; previous studies have identified subethnic differences in HRQOL among Hispanics.[57,58] Finally, study results may not be generalizable to other US areas, especially smaller regions with fewer older racial/ethnic groups.

Implications for Practice

As US racial/ethnic minority older adult populations continue expanding, this study adds to the limited body of literature that examines the relationship of HRQOL with PA and F&V intake of older Blacks, Hispanics, and Chinese who reside in largely ethnic enclaves. Findings suggest that differences exist among groups. Previous research indicates that Chinese and Hispanics who live in immigrant enclaves may have healthier diets but participate in less weekly PA than individuals who do not.[59] Our Hispanic and Black participants, however, came from neighborhoods with very low socioeconomic status compared with our Chinese participants; this may reflect some differences found in HRQOL.

Future research should develop a better understanding of HRQOL and the determinants that influence PA and F&V intake among older racial/ethnic adults. Neighborhood-level characteristics may be particularly important for older adults who spend more time in their neighborhood of residence and may be more sensitive to factors such as safety, the built environment, access to recreational areas and nutrition assistance programs, and socioeconomic status.[60–62] Neighborhood walking may be influenced by concerns about safety, poor walking surfaces, and inadequate lighting, as well as neighborhood surroundings and the presence of other people.[63–65] Cultural barriers, such as a desire for leisure activity later in life or family priorities such as caregiving taking precedence over healthy practices, may also influence PA decisions.[66–68] In addition, immigrant and racial/ethnic groups may not fully understand that PA can involve nondeliberate activities, such as house cleaning or walking to the store.[66] Future data collection should also allow for the disaggregation of all racial/ethnic subgroups and include ethnically and culturally relevant measures of F&V intake and PA.

Community-based programs and systems-level policies that support healthy aging are important to provide appropriate care and services and should be tailored to the sociocultural context of aging racial/ethnic populations. PA and F&V intake are modifiable and can influence HRQOL and chronic disease risk factors. Understanding these unique factors within specific racial/ethnic groups can provide public health practitioners with much-needed information to promote good health. Community-based, culturally tailored programs, such as those funded under the REACH program that incorporate local community engagement and partnerships, have provided beneficial results among racial/ethnic communities[69–73] and may be particularly salient for older, more marginalized racial/ethnic minority adults.[74,75]

In summary, we found that PA was strongly associated with HRQOL and that a relationship between F&V intake and HRQOL was suggested. Overall, the prevalence of recommended weekly PA and daily F&V intake was low among this older population, highlighting the need for a better understanding of the behaviors of racial/ethnic minority groups as well as how to develop strategies to improve the health and well-being of the growing older population. ■

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Contributors

S. C. Kwon and L. C. Wyatt created the study concept and design. S. C. Kwon acquired the data. S. C. Kwon and L. C. Wyatt analyzed and interpreted the data. L. C. Wyatt and J. A. Kranick performed the statistical analysis. All authors contributed to the intellectual content and provided critical review on all drafts. S. C. Kwon had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Human Participant Protection

The NYU School of Medicine institutional review board (IRB) policy indicates this research study did not involve human participants and IRB review was not required.

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