HHS Public Access
Author manuscript
J Nutr Health Aging. Author manuscript; available in PMC 2016 September 15.

Published in final edited form as:
J Nutr Health Aging. 2014 ; 18(6): 573–578. doi:10.1007/s12603-014-0010-x.

Fruit and vegetable consumption, ethnicity and risk of fatal ischemic heart disease

Sangita Sharma, PhD[1], **Shelly Vik, PhD**[1], and **Laurence N. Kolonel, MD, PhD**[2]

[1]Department of Medicine, University of Alberta, 5-10 University Terrace, 8303-112 Street, Edmonton, AB, T6G 2T4, Canada

[2]Epidemiology Program, Cancer Research Center of Hawaii, University of Hawaii, 1236 Lauhala Street, Honolulu, Hawaii, 96813, USA

Abstract

Objective—Mortality rates from ischemic heart disease vary among ethnic groups. Dietary intake of fruit and vegetables has been associated with a lower risk of ischemic heart disease, but ethnic-specific data are limited.

Design—Prospective cohort study.

Setting—Hawaii and Los Angeles County, between 1993 and 1996.

Participants—These analyses included 164,617 older adults age 45 to 75, representing five ethnic groups who were enrolled in the Multiethnic Cohort Study. Dietary data were collected at baseline using a validated food frequency questionnaire and fatal ischemic heart disease cases were identified up to December 31, 2001. Associations between fruit and vegetable consumption and fatal ischemic heart disease were examined using multivariate Cox proportional hazard models.

Results—The associations between fruit and vegetable intake and fatal ischemic heart disease were similar among the five ethnic groups. When data for the ethnic groups were combined, higher vegetable intake was associated with a protective effect against ischemic heart disease in men with all intake levels above 2.3 servings per day (over 6.6 servings per day: hazard ratio, 0.73; 95% confidence interval, 0.58–0.92), and for women with intakes levels between 3.4 and 6.6 servings per day (4.6 to 6.6 servings per day: hazard ratio, 0.77; 95% confidence interval, 0.59–0.99). There was no evidence of an association for fruit intake.

Corresponding author and requests for reprints: Sangita Sharma, PhD, Endowed Chair in Aboriginal Health, Professor of Aboriginal and Global Health, University of Alberta, Department of Medicine, 5-10 University Terrace, 8303 112 Street Edmonton, AB, T6G 2T4, Canada. Tel: (780) 492-3214; Fax: 780 492-3018. gita.sharma@ualberta.ca.

Conflict of Interest
Sangita Sharma declares she has no conflict of interest. Shelly Vik declares she has no conflict of interest. Laurence Kolonel declares he has no conflict of interest.
The work under consideration for publication: Sangita Sharma discloses that she received salary from Dr. Kolonel's grant from the National Institutes of Health.
Relevant financial activities outside the submitted work: Sangita Sharma received grant funding from the United States Department of Agriculture and National Institutes of Health during the 36 months prior to submission of this paper.
The work under consideration for publication: Laurence Kolonel discloses that this work was supported by grants from the National Institutes of Health, the American Heart Association of Hawaii, and the United States Department of Agriculture.

Conclusions—Associations between fruit and vegetable intake and ischemic heart disease do not appear to vary among ethnic groups. Additional research is needed to clarify associations for fruit versus vegetable intake and impact on cardiovascular outcomes.

Keywords

Diet; Myocardial Ischemia; Mortality; Ethnicity

Introduction

Ischemic heart disease (IHD) accounted for approximately 425,000 deaths in the United States in 2006 and the age-adjusted IHD mortality rate per 100,000 varied substantially by ethnic group; 161.6 in African Americans, 136.0 in non-Hispanic Caucasians, 106.4 in Latinos, 97.4 in American Indians or Alaska Natives, and 77.1 in Asians or Pacific Islanders, with higher rates among men than women (176.5 versus 103.1) (1). There are also distinct differences in the age-associated rate of increase of IHD mortality among the ethnic groups, particularly among women. For example, among African Americans there is a 6-fold increase in the IHD mortality rate between women aged 45 to 54 and those aged 65 to 74, compared to 7-, 12-, and 16-fold increases among White, Hispanic and Asian women, respectively (2).

Considering the aging population of the United States, the examination of potential non-invasive and cost-effective interventions such as dietary modification is becoming increasingly important. Census projections indicate that by 2050 approximately 20% of the United States population will be age 65 years or over, and that 42% of this older age group will be comprised of the ethnic minority groups, up from only 20% in 2010 (3). Fruit and vegetables have been shown to have a protective effect on risk of ischemic disease (4,5). Higher dietary intake of vegetables has been associated with increased life expectancy (6), while fruit and vegetable intake among older males has been associated with a 25% reduction in medicare costs due to cardiovascular disease (7). However, few studies have examined the potential beneficial effects of fruit and vegetables to improve cardiovascular outcomes among different ethnic groups. Further, the previous studies that examined these associations by race or ethnicity used very broad categories (e.g., White versus non-White) (8), were restricted to certain ethnic subgroups (9), were limited in sample size (8), or examined broader dietary patterns (10).

The objective of this study was to examine the associations between fruit and vegetable intake specifically, and the outcome of fatal ischemic heart disease, among a large cohort of older adults representing five ethnic groups participating in the Multiethnic Cohort (MEC) study in the United States.

Methods

The Multiethnic Cohort study was implemented to examine dietary risk factors for cancer and designed to include large representative samples of five ethnic groups in the United States; Caucasian, African American, Native Hawaiian, Japanese American, and Latino. Details of the study design and recruitment are reported elsewhere (11). Briefly, at baseline

(1993 to 1996) a comprehensive questionnaire, including a validated quantitative food frequency questionnaire (QFFQ) (12,13), was mailed to residents aged 45–75 years in the state of Hawaii and the Los Angeles County area of the United States. A total of 201,257 respondents from the five ethnic groups completed the questionnaire, with response rates varying from 20% among Latinos to 49% in Japanese-Americans. Participants with missing smoking information (n=6,080), implausible diets based on energy and macronutrient intakes as well as food group consumption (n=12,346), implausible or missing anthropometric information (n=3,251), and who reported a history of heart attack or angina (n=14,880), were excluded, leaving a total of 72,866 men and 91,751 women in the present analyses. Ethical approval for the study was received from the institutional review boards of the University of Hawaii and the University of Southern California.

Dietary assessment

The QFFQ was developed using three-day dietary records from 60 men and 60 women of each ethnic group which were used to select food items for the QFFQ (12). In addition to foods contributing at least 85% to the consumption of specific nutrients for each ethnic group, ethnic-specific foods, irrespective of their nutrient contribution, were included in the questionnaire. The QFFQ captured frequency of consumption over the past year, using 8–9 categories ranging from “Never or hardly ever” to “2 or more times a day,” as well as the amount consumed, using three portion sizes represented in both photographs and amounts.

A validation and calibration sub-study using 24-hour dietary recalls showed that the QFFQ captured intake relatively well (13). Average correlation coefficients for all nutrients ranged from 0.26 to 0.57 across ethnic-sex strata, while average correlations for nutrient densities ranged from 0.57 to 0.74.

A food composition table (FCT) was developed specifically for the MEC at the Cancer Research Center of Hawaii (12). The FCT includes a large recipe database and many ethnic-specific food items consumed by the multiethnic population. The food groupings were based on the USDA dietary guidelines and include vegetables (dark green, deep yellow, potato, starchy, tomato, and other vegetables), fruit (citrus, melons and berries, and other fruits), meat and meat alternatives (red meat, fish and poultry, organ meat, frankfurter/sausage/lunch meats, poultry, egg, nuts, dry beans, and peas), grains (whole grain and non-whole grain), and dairy products (milk, yogurt, and cheese) (14). The number of servings of each food group consumed was calculated for each participant by summing up the appropriate food items on the QFFQ. Mixed dishes were separated into their component ingredients. The mean daily servings of food groups consumed by each ethnic-sex group have been presented previously (15,16).

Identification of heart disease deaths

The MEC database was linked with state death files and the National Death Index. Death from IHD includes the following coding: ICD9 codes 410–414.9 or ICD10 codes I20–125.9. Follow-up was calculated from the date of cohort entry to the earliest of the following dates: the date of death or December 31st, 2001 (the closure date for this study).

Statistical Analysis

Cox proportional hazards models were used to determine the associations between consumption of fruit and vegetables and fatal IHD and to calculate hazard ratios (HRs) and 95% confidence intervals. For the ethnic-sex-specific analyses, exposure to dietary intake was categorized as quartiles due to the relatively small number of cases for some subgroups; quintiles were used for the pooled estimates for men and women overall. The quantile outpoints were based on combined data for the entire cohort. The models were adjusted for ethnicity when appropriate, time on study, years of education, energy intake, smoking, body mass index, physical activity, history of diabetes, alcohol intake and intake of other food groups (grains, meat, and dairy products). The models for women also included history of hormone replacement therapy. All analyses were performed using SAS statistical software, version 9.1 (SAS Institute Inc., Cary, NC, 2005).

Results

A total of 1,140 male and 811 female fatal IHD cases were identified in the MEC. Demographics of cases and the entire cohort are presented in Table 1. The mean number of pack-years of cigarette smoking was higher among cases than the entire cohort. A higher proportion of cases currently smoked, reported a history of diabetes and hypertension, and had ≤10 years of education compared to all participants. Cases were also less likely to be married, particularly among women.

Ethnic-specific results for men and women are presented in Table 2. Statistically significant ($p<0.05$) inverse effects were observed for the association between vegetable intake and risk for IHD mortality only among African American men and women, and Latino men who reported vegetable consumption in the third quartile. However, the point estimates for the association between vegetable intake and risk of IHD suggested a similar protective effect in most ethnic-sex groups. There were no significant associations or definitive trends observed between high intake of fruit and risk of fatal IHD among any ethnic-sex group. As there was little variation in the associations between fruit or vegetable intake among the various ethnic-sex groups (based on point estimates and confidence intervals), the pooled estimates for men and women are provided in Table 3, based on the quintile distribution of food intake. High vegetable consumption was associated with a significantly reduced risk of IHD among both men and women, (compared to the reference of <2.3 vegetable servings/day), and the trend was also statistically significant among men. There was no statistical evidence of any associations between fruit intake and risk of fatal IHD in either gender.

Discussion

Previous reports have found disparities in rates of IHD mortality (1) and food group consumption (15,16) among various ethnic groups. Given the growing burden of chronic conditions like IHD, population aging (3), and the increasing ethnic diversity in the Unites States (3) and other countries around the globe (17,18), evaluation of the impact of potential cost-effective interventions such as diet modification, that could be targeted at higher risk groups, are particularly salient. In the current study, we utilized data from a large multiethnic cohort to determine whether the effects of fruit and vegetable consumption on risk of fatal IHD varied among older adults in five ethnic groups in the United States.

The results of this study indicate that the associations between fruit and vegetable intake and risk of fatal IHD are not dissimilar among different ethnic groups. Previously, Nettleton et al. examined associations between broader dietary patterns (whole grain and fruit diet versus fats and processed meats) and several cardiovascular outcomes among four ethnic groups, and also reported that effect measures did not vary based on ethnicity (10). Results from an earlier study in 2002 that examined combined fruit and vegetable intake and risk for fatal IHD also suggest that dietary effects are similar among Whites and Nonwhites (8).

In the absence of any evidence of effect modification by ethnicity, the pooled results are also presented for men and women. Consistent with previous work (19), our results indicate that higher vegetable intake may mitigate the risk of adverse cardiovascular outcomes. Some studies have also reported a beneficial effect of vegetables and fruit combined (5,8), or for dietary patterns including fruit and vegetables (9). However, fruit and vegetables were examined separately in the current study, and we did not observe any evidence of an association between fruit intake and fatal IHD. There is some evidence regarding the mechanisms by which fruit and vegetables may impart a protective effect against adverse cardiovascular outcomes (20,21), but these findings are still controversial (22). Additional research to examine the associations between dietary intakes of vegetables versus fruit is needed to clarify if these two food groups, which are frequently combined in analyses, have different effects on fatal ischemic heart disease and other cardiovascular outcomes.

Literature on the effect of food group consumption on risk of fatal IHD among ethnic groups is limited. The MEC study, which included a large sample of five ethnic groups and used standardized food groupings, provided a unique opportunity to examine these associations. The MEC also used a common QFFQ including ethnic-specific foods and portion sizes to capture a wide variety of dietary exposures. The comprehensive questionnaire included data for several important covariates to allow for adjustment of possible confounders. In addition, with the exception of a slightly higher education among cohort participants, baseline characteristics were comparable with census data, supporting the generalisability of these results to the larger U.S. population (12).

Some limitations of the study also warrant mention. Although the MEC used a validated QFFQ (13), methodological research suggests that dietary assessments are prone to recall bias which could result in biasing the results towards a null effect (23). In addition, there were a relatively large number of exclusions, primarily due to missing dietary and smoking information. Both of these variables have been associated with IHD (24), and thus bias may have been introduced if the non-respondents differed with respect to these variables compared to the included participants. Although selection bias is a concern, with the considerable sample sizes that were still maintained in this analyses, considerable dietary variation would have to have occurred in order to impact these results. In addition, collection of dietary data over a relatively short time-frame may be reflective of life-time dietary habits, and may have resulted in attenuation of associations between diet and IHD mortality.

It should also be mentioned that the data used for this study were collected over 15 years ago, thus more recent data may be useful to substantiate the current findings.

Conclusions

Associations between fruit and vegetable intake and IHD do not appear to vary among ethnic groups. Additional research is needed to clarify associations for fruit versus vegetable intake and impact on cardiovascular outcomes. The findings of this study add to the evidence base for promoting a diet high in vegetable intake as a preventive measure to mitigate risk for IHD mortality among older adults.

Acknowledgments

Funding

This work was supported by the American Heart Association of Hawaii (Beginning Grant-in-Aid, grant number 0265287Z); the National Cancer Institute (grant number NCI R37 CA54821); and the United States Department of Agriculture (USDA-NRI New Investigator Award, grant number 2002-00793).

Reference List

1. Heron M, Hoyert D, Murphy S, Xu J, Kochanek K, Tejada-Vera B. Deaths: Final data for 2006. Natl Vital Stat Rep. 2013; 57:1–136.
2. National Institutes of Health. Morbidity & Mortality: 2012 Chart Book on Cardiovascular, Heart and Lung Diseases. 2012.
3. Vincent, GK.; Velkoff, VA. The older population in the United States: 2010–2050. U.S. Census Bureau; 2010.
4. Bazzano LA, He J, Ogden LG, Loria C, Vupputuri S, Myers L, Whelton PK. Legume consumption and risk of coronary heart disease in US men and women: NHANES I Epidemiologic Follow-up Study. Arch Intern Med. 2001; 161:2573–2578. [PubMed: 11718588]
5. Bingham S, Luben R, Welch A, Low YL, Khaw KT, Wareham N, Day N. Associations between dietary methods and biomarkers, and between fruits and vegetables and risk of ischaemic heart disease, in the EPIC Norfolk Cohort Study. Int J Epidemiol. 2008; 37:978–987. [PubMed: 18579574]
6. Seccareccia F, Alberti-Fidanza A, Fidanza F, Farchi G, Freeman KM, Mariotti S, Menotti A. Vegetable intake and long-term survival among middle-aged men in Italy. Ann Epidemiol. 2003; 13:424–440. [PubMed: 12875800]
7. Daviglus ML, Liu K, Pirzada A, et al. Relationship of fruit and vegetable consumption in middle-aged men to medicare expenditures in older age: the Chicago Western Electric Study. J Am Diet Assoc. 2005; 105:1735–1744. [PubMed: 16256757]
8. Bazzano LA, He J, Ogden LG, Loria CM, Vupputuri S, Myers L, Whelton PK. Fruit and vegetable intake and risk of cardiovascular disease in US adults: the first National Health and Nutrition Examination Survey Epidemiologic Follow-up Study. Am J Clin Nutr. 2002; 76:93–99. [PubMed: 12081821]
9. Lancaster KJ, Watts SO, Dixon LB. Dietary intake and risk of coronary heart disease differ among ethnic subgroups of black Americans. J Nutr. 2006; 136:446–451. [PubMed: 16424126]
10. Nettleton JA, Polak JF, Tracy R, Burke GL, Jacobs DR Jr. Dietary patterns and incident cardiovascular disease in the Multi-Ethnic Study of Atherosclerosis. Am J Clin Nutr. 2009; 90:647–654. [PubMed: 19625679]
11. Kolonel LN, Altshuler D, Henderson BE. The multiethnic cohort study: exploring genes, lifestyle and cancer risk. Nat Rev Cancer. 2004; 4:519–527. [PubMed: 15229477]

12. Kolonel LN, Henderson BE, Hankin JH, Nomura AM, Wilkens LR, Pike MC, Stram DO, Monroe KR, Earle ME, Nagamine FS. A multiethnic cohort in Hawaii and Los Angeles: baseline characteristics. Am J Epidemiol. 2000; 151:346–357. [PubMed: 10695593]
13. Stram DO, Hankin JH, Wilkens LR, et al. Calibration of the dietary questionnaire for a multiethnic cohort in Hawaii and Los Angeles. Am J Epidemiol. 2000; 151:358–370. [PubMed: 10695594]
14. U.S. Department of Agriculture. Dietary Guidelines for Americans. 5. U.S. Department of Health; 2000.
15. Sharma S, Murphy SP, Wilkens LR, Shen L, Hankin JH, Monroe KR, Henderson B, Kolonel LN. Adherence to the food guide pyramid recommendations among African Americans and Latinos: results from the Multiethnic Cohort. J Am Diet Assoc. 2004; 104:1873–1877. [PubMed: 15565084]
16. Sharma S, Murphy SP, Wilkens LR, Shen L, Hankin JH, Henderson B, Kolonel LN. Adherence to the Food Guide Pyramid recommendations among Japanese Americans, Native Hawaiians, and whites: results from the Multiethnic Cohort Study. J Am Diet Assoc. 2003; 103:1195–1198. [PubMed: 12963952]
17. Statistics Canada. Ethnic diversity and immigration. 2009.
18. Statistics New Zealand. Census snapshot: Cultural diversity. 2002.
19. Rastogi T, Reddy KS, Vaz M, Spiegelman D, Prabhakaran D, Willett WC, Stampfer MJ, Ascherio A. Diet and risk of ischemic heart disease in India. Am J Clin Nutr. 2004; 79:582–592. [PubMed: 15051601]
20. Trowell H. Ischemic heart disease and dietary fiber. Am J Clin Nutr. 1972; 25:926–32. [PubMed: 4559894]
21. Chattopadhyay A, Bandyopadhyay D. Vitamin E in the prevention of ischemic heart disease. Pharmacol Rep. 2006; 58:179–187. [PubMed: 16702619]
22. Law MR, Morris JK. By how much does fruit and vegetable consumption reduce the risk of ischemic heart disease? Eur J Clin Nutr. 1998; 52:549–556. [PubMed: 9725654]
23. Kipnis V, Midthune D, Freedman, Bingham S, Day NE, Riboli E, Ferrari P, Carroll RJ. Bias in dietary report instruments and its implications for nutritional epidemiology. Public Health Nutrition. 2002; 5:915–923. [PubMed: 12633516]
24. Danaei G, Ding EL, Mozaffarian D, Taylor B, Rehm J, Murray CJ, Ezzati M. The preventable causes of death in the United States: comparative risk assessment of dietary, lifestyle, and metabolic risk factors. PLoS Med. 2009; 6(4):e1000058. [PubMed: 19399161]

Table 1

Characteristics of cases of fatal ischemic heart disease and total participants*

Characteristics	Men		Women	
	Cases (n=1,140)	Total participants (n=72,866)	Cases (n=811)	Total participants (n=91,751)
Mean (SD)				
Age at cohort entry (years)	65.8 (7.7)	65.7 (7.6)	66.4 (7.1)	59.3 (8.8)
Energy intake (MJ)**	9.24 (4.30)	9.67 (4.08)	7.81 (3.94)	7.89 (3.49)
% energy from fat	31.6 (7.1)	30.3 (7.1)	30.5 (7.3)	29.7 (7.0)
% energy from saturated fat	9.6 (2.7)	9.0 (2.6)	9.1 (2.6)	8.7 (2.6)
% energy from alcohol	3.4 (7.5)	4.2 (7.4)	1.6 (5.8)	1.6 (4.7)
Hours in moderate or vigorous activity per day	1.0 (1.3)	1.3 (1.5)	0.8 (1.0)	1.1 (1.2)
Pack-years (number of cigarettes per day x years smoked / 20)	18.7 (19.0)	13.7 (16.4)	10.8 (15.2)	6.5 (12.0)
Ethnicity (%)				
Caucasian	23	26	19	26
African American	23	13	40	18
Hawaiian	9	7	8	7
Japanese	22	31	16	29
Latino	23	23	17	20
BMI (kg/m^2) (%)				
≤ 18.5	2	24	5	4
18.5 –25.0	41	28	35	48
25.1 – 30.0	42	22	31	30
> 30	15	26	28	18
Smoking status (%)				
Never smoked	24	32	45	57
Past smoker	50	50	30	29
Current smoker	26	18	25	14
Repeatedly consumed alcohol (%)	49	63	27	39
Medical history (%)				
History of Diabetes	30	11	37	10
History of Hypertension	58	38	69	36
Education (%)				
Graduated college	19	31	13	26
Grade 11/12-some college	56	53	61	58
≤10yrs education	25	16	26	16
Currently Married (%)	71	77	41	60

*Participants in the Multiethnic Cohort Study, recruited in Hawaii and Los Angeles from 1993–1996.

**1 MJ = 238.85 kcal

Table 2

Daily food group servings and risk of fatal ischemic heart disease, by sex and ethnicity*

Ethnicity:	**Caucasian**	**African American**	**Native Hawaiian**	**Japanese American**	**Latino**
Male Cases/non-cases:	258 / 18,774	267 / 9,290	99 / 4,830	247 / 22,292	269 / 16,540
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Vegetables					
Q1 (< 2.6)	1.00	1.00	1.00	1.00	1.00
Q2 (2.6– 4.0)	0.92 (0.65, 1.29)	0.84 (0.60, 1.17)	0.60 (0.31, 1.19)	1.06 (0.75, 1.52)	0.74 (0.52, 1.04)
Q3 (4.0–6.0)	0.76 (0.52, 1.10)	**0.58 (0.38, 0.89)**	1.25 (0.69, 2.27)	0.98 (0.66, 1.45)	**0.62 (0.42, 0.91)**
Q4 (>6.0)	0.73 (0.48, 1.13)	0.98 (0.64, 1.50)	1.18 (0.60, 2.31)	0.88 (0.55, 1.38)	0.71 (0.46, 1.08)
p_{trend}	0.13	0.87	0.27	0.45	0.19
Fruit					
Q1 (<1.3)	1.00	1.00	1.00	1.00	1.00
Q2 (1.3–2.4)	0.90 (0.64, 1.26)	1.28 (0.91, 1.81)	1.06 (0.61, 1.83)	0.90 (0.62, 1.30)	0.96 (0.67, 1.37)
Q3 (2.4–4.2)	0.73 (0.50, 1.05)	1.34 (0.93, 1.92)	0.82 (0.45, 1.51)	0.87 (0.59, 1.27)	0.91 (0.63, 1.31)
Q4 (>4.2)	0.83 (0.56, 1.23)	1.13 (0.75, 1.69)	1.13 (0.61, 2.10)	1.06 (0.70, 1.60)	0.81 (0.55, 1.19)
p_{trend}	0.38	0.81	0.75	0.60	0.25
Female Cases/ non-cases:	157 / 23,236	322 / 16,479	65 / 6,507	126 / 26,574	141 / 18,144
	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)
Vegetables					
Q1 (< 2.6)	1.00	1.00	1.00	1.00	1.00
Q2 (2.6– 4.0)	0.90 (0.58, 1.38)	0.79 (0.58, 1.10)	0.87 (0.40, 1.86)	0.84 (0.50, 1.43)	0.85 (0.50, 1.45)
Q3 (4.0–6.0)	0.69 (0.42, 1.14)	**0.68 (0.47, 0.98)**	0.43 (0.18, 1.06)	0.83 (0.48, 1.45)	0.99 (0.57, 1.70)
Q4 (>6.0)	0.88 (0.52, 1.52)	0.83 (0.56, 1.24)	0.65 (0.27, 1.57)	0.80 (0.42, 1.51)	1.06 (0.59, 1.92)
p_{trend}	0.63	0.45	0.38	0.57	0.69
Fruit					
Q1 (<1.5)	1.00	1.00	1.00	1.00	1.00
Q2 (1.5–2.8)	0.96 (0.61, 1.50)	0.99 (0.71, 1.39)	0.62 (0.29, 1.35)	0.88 (0.49, 1.58)	0.90 (0.52, 1.55)
Q3 (2.8–4.9)	0.88 (0.55, 1.41)	0.86 (0.60, 1.23)	0.56 (0.25, 1.27)	1.35 (0.78, 2.36)	1.30 (0.77, 2.21)

Ethnicity:	Caucasian	African American	Native Hawaiian	Japanese American	Latino
Q4 (>4.9)	0.90 (0.53, 1.55)	1.09 (0.75, 1.59)	1.05 (0.46, 2.36)	1.05(0.55, 1.99)	1.10 (0.61, 1.98)
p_{trend}	0.70	0.61	0.60	0.77	0.62

* Participants in the Multiethnic Cohort Study, recruited in Hawaii and Los Angeles from 1993–1996. Cox proportional hazards regression models with age as the time metric and adjusted for time on study, years of education, energy intake (logarithmically transformed), smoking behaviors (including current smoking, past smoking and pack-years), body mass index, physical activity (defined as average hours of moderate or vigorous physical activity per day), history of diabetes, and alcohol intake (grams per day). For women, additional adjustment for history of hormone replacement therapy.

Table 3

Daily food group servings and risk of fatal ischemic heart disease among men and women*

	Men	**Women**
Cases/non-cases	1,140 / 71,726	811 / 90,940
	HR (95% CI)	HR (95% CI)
Vegetables		
Q1 (<2.3)	1.00	1.00
Q2 (2.3–3.4)	0.93 (0.78, 1.11)	0.99 (0.80, 1.23)
Q3 (3.4–4.6)	**0.76 (0.63, 0.93)**	**0.76 (0.60, 0.97)**
Q4 (4.6–6.6)	**0.82 (0.67, 1.00)**	**0.77 (0.59, 0.99)**
Q5 (>6.6)	**0.73 (0.58, 0.92)**	0.95 (0.72, 1.24)
p_{trend}	***0.01***	*0.70*
Fruit		
Q1 (<1.0)	1.00	1.00
Q2 (1.0–1.9)	1.08 (0.90, 1.30)	1.02 (0.81, 1.28)
Q3 (1.9– 3.0)	0.94 (0.77, 1.14)	0.85 (0.66, 1.08)
Q4 (3.0–4.8)	1.01 (0.83, 1.23)	1.02 (0.80, 1.30)
Q5 (>4.8)	0.96 (0.77, 1.19)	0.96 (0.73, 1.26)
p_{trend}	*0.52*	*0.90*

*Participants in the Multiethnic Cohort Study, recruited in Hawaii and Los Angeles from 1993–1996. Cox proportional hazards regression models with age as the time metric and adjusted for ethnicity, time on study, years of education, energy intake (logarithmically transformed), smoking behaviors (including current smoking, past smoking and pack-years), body mass index, physical activity (defined as average hours of moderate or vigorous physical activity per day), history of diabetes, and alcohol intake (grams per day). For women, additional adjustment for history of hormone replacement therapy.