The Journal of Nutrition, Health & Aging©
Volume 18, Number 6, 2014

FRUIT AND VEGETABLE CONSUMPTION, ETHNICITY AND RISK OF FATAL ISCHEMIC HEART DISEASE

S. SHARMA[1], S. VIK[2], L.N. KOLONEL[3]

1. Affiliation at time of research: Epidemiology Program, Cancer Center, University of Hawaii, 1236 Lauhala Street, Honolulu, Hawaii, 96813, USA, Current affiliation: Department of Medicine, University of Alberta, 5-10 University Terrace, 8303 112 Street, Edmonton, Alberta, T6G 2T4, Canada; 2. University of Alberta, Department of Medicine, 5-10 University Terrace, 8303 112 Street, Edmonton, AB T6G 2E1, Canada; 3. Epidemiology Program, Cancer Center, University of Hawaii, 1236 Lauhala Street, Honolulu, Hawaii, 96813, USA. Corresponding author: 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, Alberta, T6G 2T4, Canada. Tel: 780 492 3214; Fax: 780 492 3018. Email: gita.sharma@ualberta.ca

Abstract: *Objective:* Mortality rates from ischemic heart disease vary among ethnic groups. Dietary intake of fruits 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 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 3.4 servings per day (over 6.6 servings per day: hazard ratio, 0.73; 95% confidence interval, 0.58-0.92). Inconsistent results were observed for women, where the protective association was observed only at mid-level vegetable intake levels, but not among women with the highest level of vegetable intake. There was no evidence of an association for fruit intake. *Conclusions:* Associations between fruit and vegetable intake and fatal 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.

Key words: 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). Fruits 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). Although studies have shown that intake of fruits and vegetables vary by ethnicity (8, 9), few studies have examined if the potential beneficial effects of fruit and vegetables to improve cardiovascular outcomes vary 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) (10), were restricted to certain ethnic sub-groups (11), were limited in sample size (10), or examined broader dietary patterns (12).

Recent data from the MEC study suggests that risk of fatal IHD is lower among persons who are adherent with dietary recommendations for fruit and vegetable intake (13). The objective of the current study was to examine the associations between fruit and vegetable intake levels and the outcome of fatal ischemic heart disease, among a large cohort of middle-aged to 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,

Received July 10, 2013
Accepted for publication October 14, 2013

Japanese American, and Latino. Details of the study design and recruitment are reported elsewhere (14). Briefly, at baseline (1993 to 1996) a comprehensive questionnaire, including a validated quantitative food frequency questionnaire (QFFQ) (15, 16), 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. Response rates ranged 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 (15). 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 (16). 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 (15). 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) (17). 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 (8, 9).

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 (study closure date).

Statistical Analysis

Cox proportional hazards models were used to determine the associations between consumption of fruits 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 cutpoints 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. Comparisons between cases and non-cases yielded similar results due to the relatively small number of cases and very large sample.

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 among African American men and women, and Latino men who reported vegetable consumption in the third quartile. There were no significant associations or definitive trends observed between fruit intake 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 fatal IHD among men for all levels of vegetable intake over 3.4 servings when compared to the reference of <2.3 vegetable servings/day. The trend was also statistically significant among men. Results for women were inconsistent, with significant protective associations only among those with vegetable intake between 3.4 and 6.6 servings per day, but not among women with the highest level of vegetable intake (>6.6 servings). There was no statistical evidence of any associations between fruit intake and risk of fatal IHD for men or women.

Discussion

Previous reports have found disparities in rates of IHD mortality (1) and food group consumption (8, 9) 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 (18, 19), 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 multi-ethnic cohort to determine whether the effects of fruit and vegetable consumption on risk of fatal IHD varied among 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 and are consistent with previous MEC analyses focused on adherence with dietary guidelines and IHD mortality (13). Nettleton et al. examined associations between broader dietary patterns (whole grain and fruit diet versus fats and processed meats) and several

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)
ptrend	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)
ptrend	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)
ptrend	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)
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)
ptrend	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.

cardiovascular outcomes among four ethnic groups, and also reported that effect measures did not vary based on ethnicity (12). 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 (10).

The cumulative and consistent findings of this and previous studies suggest that diet has a similar impact on cardiovascular outcomes regardless of ethnicity. Previous MEC studies suggest that, although some differences in food sources exist among these ethnic groups, there are many similarities in the dietary consumption patterns across the ethnic groups represented in the MEC. In addition, the MEC participants were recruited primarily from residents living in two specific geographic areas of the United States, and approximately 80% of the cohort was American-born (15). These factors may have diminished any differences in consumption patterns among the ethnic groups, and may explain the observed results if the mechanisms by which vegetables impart a protective effect are similar among ethnic groups.

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 (13, 20), 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, 10), or for dietary patterns including fruits and vegetables (11). However, fruits 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. Phytochemicals, including fiber, contained in both fruit and vegetables have been shown to reduce hyperlipidemia and the reabsorption of bile salts (21), and vitamins E and C are particularly beneficial in the prevention of inflammation in atherosclerotic plaque development and endothelial dysfunction, respectively (22, 24).

The Journal of Nutrition, Health & Aging©
Volume 18, Number 6, 2014

However, the specific components in fruit and vegetables responsible for the protective effects are still controversial (23). Additional research to examine the associations between dietary intake of vegetables versus fruits 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.

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)
ptrend	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)
ptrend	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.

The findings of this study support promotion of a diet high in vegetables as a potential preventive measure against risk for fatal IHD in middle age to older adults. Although results for women were inconsistent, significant reductions in the risk for fatal IHD were observed among men, despite dietary assessment for only a short time-frame, which may not be representative of long-term dietary habits. Further, dietary recommendations for intake levels of vegetables range from 3 to 5 servings per day, depending on caloric intake (17). The risk reductions for IHD mortality based only on number of servings observed in the current study were similar to that in the previous MEC analyses that examined adherence with dietary recommendations with adjusted serving sizes (13), and suggest that exceeding even the serving size recommended for the lower caloric intake levels (3 servings for 2,200 kcal) is beneficial.

Literature on the effect of food group consumption on risk of fatal IHD among ethnic groups is limited. The MEC study included large representative samples of five ethnic groups and used standardized food groupings, which facilitated detailed analyses of associations between diet and fatal IHD among the different ethnic groups. 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 (15).

Some limitations of the study also warrant mention. Although the MEC used a validated QFFQ (16), methodological research suggests that dietary assessments are prone to recall bias which could result in biasing the results towards a null effect (25). 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 (26), 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, large sample sizes were still maintained in these analyses, and unless the exclusions differed considerably from those included, it is unlikely this would have a major impact on the results. For example, although smoking is associated with a higher risk of IHD fatality, the risk differences for current and past smokers compared to 'never smokers' in this study were less than 1%. As mentioned previously, collection of dietary data over a relatively short time-frame may not be reflective of life-time dietary habits, and may have resulted in attenuation of associations between diet and IHD mortality. In addition, the relatively low number of fatal IHD cases likely limited the statistical power to detect significant differences. 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 fatal 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 middle aged and older adults.

Funding Acknowledgment: 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).

References

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 Nov 26;161:2573-8.
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 Oct;37:978-87.
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 Jul;13:424-30.
7. Daviglus ML, Liu K, Pirzada A, Yan LL, Garside DB, Wang R, Van HL, Manning WG, Manheim LM, 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 Nov;105:1735-44.
8. 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 Dec;104:1873-7.
9. 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 Sep;103:1195-8.
10. 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 Jul;76:93-9.
11. Lancaster KJ, Watts SO, Dixon LB. Dietary intake and risk of coronary heart disease differ among ethnic subgroups of black Americans. J Nutr. 2006 Feb;136:446-51.
12. 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 Sep;90:647-54.
13. Sharma S., Vik S.A., Pakseresht M., Kolonel L.N. Adherence to recommendations for fruit and vegetable intake, ethnicity and ischemic heart disease mortality. Nutrition, Metabolism & Cardovascular Diseases. 2013;in press.
14. Kolonel LN, Altshuler D, Henderson BE. The multiethnic cohort study: exploring genes, lifestyle and cancer risk. Nat Rev Cancer. 2004 Jul;4:519-27.
15. 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 Feb 15;151:346-57.
16. Stram DO, Hankin JH, Wilkens LR, Pike MC, Monroe KR, Park S, Henderson BE, Nomura AM, Earle ME, et al. Calibration of the dietary questionnaire for a multiethnic cohort in Hawaii and Los Angeles. Am J Epidemiol. 2000 Feb 15;151:358-70.
17. U.S.Department of Agriculture. Dietary Guidelines for Americans. 5th Edition ed. U.S. Department of Health; 2000.
18. Statistics Canada. Ethnic diversity and immigration. 2009.
19. Statistics New Zealand. Census snapshot: Cultural diversity. 2002.
20. 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 Apr;79:582-92.
21. Trowell H. Ischemic heart disease and dietary fiber. Am J Clin Nutr. 1972 Sep;25:926-32.
22. Chattopadhyay A, Bandyopadhyay D. Vitamin E in the prevention of ischemic heart disease. Pharmacol Rep. 2006;58:179-87.
23. Law MR, Morris JK. By how much does fruit and vegetable consumption reduce the risk of ischemic heart disease? Eur J Clin Nutr. 1998;52:549-56.
24. Wannamethee SG, Lowe GD, Rumley A, Bruckdorfer KR, Whincup PH. Associations of vitamin C status, fruit and vegetable intakes, and markers of inflammation and hemostasis. Am J Clin Nutr. 2006 Mar;83:567-74.
25. Kipnis V., Midthune D, Freedman, Bingham S, Day N.E., Riboli E., FerrariP., Carroll R.J. Bias in dietary report instruments and its implications for nutritional epidemiology. Public Health Nutrition. 2002;5:915-23.
26. 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 Apr 28;6:e1000058.