Sources of vegetables, fruits, and vitamins A, C and E among five ethnic groups: Results from the Multiethnic Cohort Study

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ABSTRACT

Objectives: Data are limited on how dietary sources of food and nutrients differ among ethnic groups. The objective of this study was to determine the main sources of fruit, vegetables, and vitamins A, C, and E for five ethnic groups.

Methods: Dietary data were collected using a validated quantitative food frequency questionnaire from participants in the Multiethnic Cohort in Hawaii and Los Angeles County between 1993 and 1996. Data were analyzed for 186,916 participants representing five ethnic groups; African Americans, Japanese Americans, Native Hawaiians, Latinos, and Caucasians.

Results: Lettuce was the most consumed vegetable (6.0%-9.9%) in all ethnic-sex groups, except African American women and Mexican-born Latino men and women. Oranges and bananas contributed more than one quarter to total fruit intake among all groups. Overall, more ethnic variation in food choices was observed for the top ten vegetables than fruit. The top sources for vitamins A, C and E were carrots, orange/grapefruit/pomelo and combined dishes, respectively. Between micronutrients studied, the greatest ethnic variation in foods consumed was observed among the top ten food sources of vitamin A.

Conclusions: This is the first study providing data on the main types of fruit and vegetables consumed and the major sources of vitamins A, C, and E among these ethnic groups in the U.S. Such data are valuable for developing and implementing public health strategies to meet the USDA dietary recommendations and guiding ethnic-specific nutrition education and intervention programs.

Key words: Dietary sources, vitamin A, vitamin C, vitamin E, ethnicity

INTRODUCTION

Dietary guidelines from the United States Department of Agriculture (USDA), American Heart Association (AHA), National Cancer Institute, and American Diabetes Association recommend increasing the consumption of fruit and vegetables within a certain energy intake level to decrease risk for chronic disease (1-5). Previous research from the Multi-Ethnic Cohort (MEC) study found that adherence with these dietary recommendations varied across ethnic groups and energy intake levels, with less than half of participants meeting the minimum requirements among some ethnic-sex groups (6,7). Increasing the intake of antioxidant rich fruit and vegetables while simultaneously limiting energy intake is challenging as many dishes, such as salads and casseroles, may have additional energy-dense ingredients, for example, added sugars, dressings, margarine, or butter. To meet this goal, it is necessary to characterize the sources of fruit, vegetables, and antioxidants.

Furthermore, substantial evidence suggests that diet is a modifiable risk factor for chronic diseases (8) and improving diet, especially by increasing fruit and vegetable consumption, as well as antioxidant vitamins (A,C,E), could result in a decrease in the incidence and mortality from cardiovascular disease, cancer, and other chronic diseases (9-17). For example, risk of coronary heart disease decreased by 4% and 7% with the daily intake of each additional portion of fruit and vegetable combined and fruit alone, respectively (11). This effect may be due to their antioxidant vitamins A, C and E, which have been shown to decrease the risk of heart disease (17). Cancer, cardiovascular disease and diabetes were responsible for approximately 60% of all deaths in the U.S. in 2005 (18). In addition, rates of these chronic conditions vary by ethnic group. In 2005, age-adjusted cancer mortality rates for men and women, respectively, were 294 and 178 for African Americans, 227 and 159 for Caucasians, 153 and 102 for Latinos, and 133 and 95 for Asians and Pacific Islanders, per 100,000 population (18). In the same year, age-adjusted mortality rates of heart disease were 330 and 228 for African American, 262 and 170 for Caucasians, 192 and 129 for Latinos, and 141 and 92 for Asians and Pacific Islanders per 100,000 men and women, respectively (18). With the increasing proportion of ethnic minority groups in the U.S. (19), and growing burden of chronic diseases, there is a need for ethnic-specific health data related to cost-effective interventions such as diet modification.

To our knowledge, there have been no studies on the intake of antioxidant rich fruit and vegetables among ethnic groups in the U.S. using the USDA standardized food grouping approach and food composition tables. Such data are necessary to show how the consumption of fruit and vegetables vary in different ethnic groups, but are also important in determining which specific fruit, vegetables and nutrients should be targeted when implementing ethnic-specific interventions. A well-balanced diet incorporating all food groups is paramount to optimal health. Data on food sources for the USDA major food groups and of specific nutrients among participants in the MEC is being examined in a series of analyses (20,21). The focus of this study was to determine the main types of fruit and vegetables and the major ten dietary sources of vitamins A, C, and E in five ethnic groups in the U.S.

METHODS

The Multiethnic Cohort (MEC) was established in Hawaii and Los Angeles, California, to investigate lifestyle exposures in relation to disease outcomes. Study design, recruitment procedures, and baseline characteristics have been reported elsewhere (22). In brief, 201,257 men and women aged 45 to 75 years representing five ethnic groups (African Americans (AfAm), Japanese Americans (JpAm), Native Hawaiians (NH), Latinos (born in Mexico and Central/South America: Latino-Mexico; born in the U.S.: Latino-US), and Caucasians) were enrolled into the study between 1993 and 1996. Ethnicity was self-defined. Response rates varied from 20% in Latinos to 49% in JpAm.

Data were collected using a self-administered, mailed questionnaire including a 17-page quantitative food frequency questionnaire (QFFQ) which collected data on consumption of 180 food items over the past year (22). The QFFQ was based on a modified version of an extensively used interview method that was validated in multiethnic populations (23). The self-administered version used in this study was developed using three-day measured dietary records from 60 men and 60 women of each of the five ethnic groups. Ethnic-specific foods (35 items) were also included irrespective of their contribution to the diet. The QFFQ inquired about the amount of food consumed based on a choice of three portion sizes specific to each food item listed, which were also shown in representative photographs, and the usual intake frequency based on the categories ranging from ‘never or hardly ever’ to ‘two or more times a day.’ A substudy was conducted to validate and calibrate the QFFQ using three repeated 24-hour dietary recalls collected in each ethnic-sex group (23). Average correlation coefficients for all nutrients ranged from 0.57 in Caucasian men to 0.26 in AfAm women. For nutrient densities, average correlations were about twice as high, with a range from 0.74 to 0.57 across ethnic-sex strata.

For the current analyses, those with extreme energy intake (< 500 kcal/day or > 5000 kcal/day; 4% of respondents) were excluded. Latino-Mexico (i.e., born in Mexico or Central/South America) (n=21,083) were separated from Latino-US (i.e., born in the U.S.) (n=21,868); Latinos born in the Caribbean were also excluded due to the small number of participants. The exclusions across the ethnic groups were; 3,255 (9.3%) AfAm, 342 (2.4%) NH, 5,673 (10.0%) JpAm, 4,487 (9.5%) Latino, and 2,123 (4.3%) Caucasians, leaving a total of 186,916 participants in this analysis.

The standardized food grouping scheme developed by the USDA was applied to our data for quantifying intakes in terms of servings (24). All food items were categorized into the five food groups and their corresponding subgroups: vegetables (dark green, deep yellow, potato, starchy, tomato, other vegetables), fruit (citrus, melons and berries, other fruits), meat and meat alternatives (all meat, fish and poultry, organ meat, frankfurter/sausage/lunch meats, poultry, egg, nuts, dry beans and peas), grains (whole grain, non-whole grain), and dairy products (milk, yogurt, cheese). One serving of vegetable was ½ cup raw or cooked vegetable, 1 cup raw leafy vegetable, or ½ cup vegetable juice (2). The percent contribution of each food item to total consumption of vegetables, fruits, vitamins A, C and E was also determined. Because mixed dishes have been shown to be an important source of vegetables and fruit (25), all mixed dishes were disaggregated into their component parts and allocated to servings of each food group. Total serving intakes for fruit and vegetables were computed for each individual by summing the servings across the appropriate food items on the QFFQ. The mean daily serving intakes of fruit and vegetables among the five ethnic groups in the MEC have been previously reported (6,7). Nutrient intakes were analyzed based on a unique food composition table which was extended and adapted from USDA food composition database (26). Graphical presentations were prepared using Stata (StataCorp. 2003. *Stata Statistical Software: Release 8*. College Station, TX: StataCorp LP.). The study protocol was approved by the Institutional Review Boards of the University of Hawaii and the University of Southern California.

RESULTS

Demographic information for the 186,916 participants included in this study is presented in Table 1. Mean ages for men ranged from 57 years (NH) to 62 years (AfAm) across the five ethnic groups; for women, mean ages were from 56 years (NH) to 61 years (AfAm and JpAm). NH men and women had the highest mean daily energy intake (2,760 kcal and 2,370 kcal, respectively), while NH men and AfAm women had the highest average body mass index (28.5 kg/m^2 and 28.4 kg/m^2, respectively) among all groups. There was more variation in daily fruit and vegetable intake between ethnic groups than between men and women. The average number of servings for vegetable intake was highest among Native Hawaiians and Latino-Mexicans, and lowest among African Americans. For both sexes, the average fruit intake was comparable among most ethnic groups, but was slightly higher among the Latino-Mexicans. Adherence with dietary recommendations for vegetable intake ranged from 43% (AfAm) to 62% (Latino-Mexico) among men, and from 51% (AfAm) to 69% (NH) among women. In each sex group, NH men and women had the lowest adherence levels with fruit intake recommendations (36%

and 48%, respectively), while Latino-Mexican men and women exhibited the highest levels of adherence (54% and 66%, respectively). Adherence with dietary recommendations for both vegetable and fruit intake was higher among women in all cases when compared within the same ethnic group.

Lettuce (dark and light green), the greatest contributor to total vegetable intake across all ethnic groups except Latino-Mexico, accounted for combined 9.7% (AfAm men) to 19.0% (JpAm women) of total intake (Figure 1). The largest ethnic variation in percent contribution to vegetable intake was for lettuce. The percent contribution to vegetable intake for other commonly consumed foods (carrots, tomatoes, broccoli) was more consistent, ranging by only 2% to 3% across ethnic groups. Among Latino-Mexico men and women, tomato/vegetable soup was a greater contributor compared to other ethnic groups. Latino-Mexican men were also the only group for whom dried bean/pea soups and Mexican meat soup/stews were top contributors. Stir fries and cabbage were among the top 10 contributors for JpAm of both sexes, while poi (fermented taro root) was among the top 10 for NH only (5.0% each for NH men and women). Dark leafy greens were among the top 10 for only three ethnic groups; JpAm, NH and AfAm, and the pattern of percent contribution for this food item was similar for both sexes in each of these ethnic groups. Starchy vegetables (e.g., carrots and corn) and potatoes were top sources of vegetables across most ethnic-sex groups, especially among Caucasian women, Caucasian men and AfAm men for whom baked/boiled white potatoes alone contributed 4.8%, 4.6% and 4.0%, respectively, to total intake. Chili and olives were among the top sources only for Latino-Mexico men and Latino-US men and women. Deep yellow vegetables contributed less than 11% to total vegetable intake across all ethnic-sex groups. Dark green vegetables varied in their rank as top source between ethnic groups, with Latino groups (Latino-Mexico and Latino-US) reporting the least and JpAm and Caucasians the most (6.3%-22.6%).

The top ten sources of fruits contributed up to 85% (AfAm) to total fruit intake for all ethnic groups (Figure 2). Among the top three major sources of fruits across all ethnic-sex groups, oranges and bananas accounted for more than one quarter (26.4-32.9%) of total fruit consumed. Tangerines/mandarin oranges were also an important contributor for all groups, except Caucasian women. Fruit juice (i.e., orange/grapefruit juice and other fruit juice/drinks) contributed the most to NH men and women at 18.4% and 16.0% of total fruit intake and the least to Latino-Mexico men and women at 8.7% and 7.7%, respectively. Mangos were among the top 10 fruit sources for JpAm and NH only (of both sexes); papaya was also a major contributor to these two ethnic groups as well as Caucasians. Pears were among the top 10 for men and women in both Latino groups, as well as African American men.

The percent contribution for the main sources of Vitamin A was relatively consistent across ethnic groups (Figure 2). Carrots were the primary source of vitamin A, accounting for 17.0-34.5% of total intake across all ethnic-sex groups. Cereals and dark greens were also among the major sources of vitamin A for all groups, except Latino-Mexico men and women for whom dark greens contributed 4.0% and 3.7%, respectively. Combined meat-vegetable dishes were among the top contributors to vitamin A among all groups, except Latino-Mexico women. Of all the ethnic-sex groups, fruit and vegetables sources of vitamin A contributed the least to Latino-Mexico men (35.9%) and most to JpAm women (60.8%).

Orange/grapefruit/pomelo contributed from 25.1% (Latino-Mexico women) to 34.1% (AfAm men) to total vitamin C intake for all ethnic-sex groups (Figure 3). Tropical fruits were also an important source of vitamin C across all groups, especially for JpAm men and women (15.7% and 17.9%, respectively). Fruit juice was a top-five source of vitamin C for all groups, percent contribution ranged from 7.6% and 7.0% for Caucasian men and women, respectively, to 10.8% and 9.9% for NH men and women, respectively. Broccoli/cauliflower was the greatest vegetable source of vitamin C for all ethnic-sex groups, contributing the least among NH and the most among AfAm and Caucasians. Salsa was among the top 10 vitamin C contributors for Latino-Mexicans only, while cabbage/coleslaw was included in the top 10 for JpAm only.

Accounting for 10.2% (Latino-Mexico men) to 23.7% (Latino-Mexico women) of total intake, cereals emerged as the top source of vitamin E across all ethnic-sex groups (Figure 5). Fruit and vegetable sources provided less than 13% of total vitamin E intake for all groups. Highest percentage contribution was observed among JpAm men and women, for whom fruits and vegetables contributed 9.1% and 12.7% of vitamin E; by comparison, Latino-US men and women who had the lowest contribution from fruits and vegetables at 3.2% and 6.1%, respectively (data not shown). Peanuts/other nuts were a major source of vitamin E for all groups except Latino-Mexico. Other sources were less variable across ethnic-sex groups and include regular salad dressing, fish and chicken/turkey. Several food items appeared in the top 10 vitamin E sources for Latino-Mexicans only, including crackers/chips/popcorn, taco salad, and sweets (muffins/doughnuts, cookies/cake, tarts/pies).

DISCUSSION

The percentage of the U.S. population from non-Caucasian ethnic backgrounds is increasing (27, 28). Ethnic minority groups in the U.S. are experiencing a change from their traditional diet to a more "westernized" diet (29). Previous studies showed lower than recommended intakes of fruit and vegetables among the Multiethnic Cohort population (6,7), and up to 73% of this population did not meet the recommendation for vitamin E intake (30). The percentage of the MEC population meeting the reference levels for vitamin C and A intake was relatively high (approximately 90%) among supplement users, but among the majority who were not taking supplements (77%), the proportion of participants meeting nutrient adequacy for vitamins A and C was considerably lower (64% and 77%, respectively) (30). High antioxidant intake has consistently been linked to reduced cancer risk and longitudinal analyses, which included adjustment for energy intake, have demonstrated that MEC participants with higher dietary intake of fruits and vegetables have lower cancer mortality rates (31). Regarding nutrient intake, a study examining racial differences in dietary intake of antioxidant nutrients (vitamin C, vitamin E and carotenoids) found that African-Americans reported lower intakes of most antioxidants, and also had lower plasma antioxidant concentrations of vitamin E and carotenoids suggesting that these findings may be contributing factors to the disproportionately higher risk of cancer among African-Americans (32). Fruit and vegetables were the main dietary sources of vitamins A, C, and E for each ethnic group in this study. These results allow us to identify, target and promote specific antioxidant-rich fruit and vegetables which are most preferred by different ethnic populations.

Of interest, very few dishes identified as the top sources for vegetable and fruit intake were found among the top dishes for energy intake reported in previous MEC findings (20). Only pasta dishes with tomato/cheese sauce, stir fried meat and vegetables, orange/grapefruit/pomelo, and bananas were listed among the top ten food sources of energy intake, and the contribution of these foods/dishes to total energy (reported in the previous study) was relatively small in all cases ($\leq$5%). These findings suggest that fruits and vegetables are not frequently incorporated into dishes contributing to energy intake. Thus, dietary interventions to promote addition of healthy fruits and vegetables into dishes that contribute more to energy intake among all ethnic groups, such as meat dishes (20), may serve to address deficiencies observed in recommended intake levels.

The dietary guidelines of ADA, USDA, NCI and AHA are created to help the U.S. population make healthful food choices to improve dietary adequacy and reduce the risk of chronic disease (1-5). For example, the USDA Dietary Guidelines recommend eating more than five servings of fruit and vegetables per day. However, these guidelines need to consider the ethnic-specific preferences in food consumption to make culturally appropriate recommendations. The results from this study indicate that sources of fruits, vegetables, and nutrients can vary across ethnic groups, but are very comparable for sexes within the ethnic groups. For the main sources of fruits and vegetables, the ethnic variation in percent contribution was most apparent for vegetable intake. As expected, some ethnic preferences for specific foods were also identified based on the top 10 food sources for vegetables and fruits. For example, tomato/vegetable soup was the top source of vegetable intake among Latino-Mex men, starchy vegetables were the top source among AfAm, and cabbage and stir fries appeared frequently for the JpAm group. The dietary sources of vegetable consumption also differed among Latinos by birthplace, and the results suggest that there are some ethnic-specific preferences for fruit intake. The observation of several high energy food sources for Vitamin E intake among Latino-Mexicans also indicates that some ethnic groups may be susceptible to poorer food choices. Knowledge of such food choices could provide clinicians with an effective means to improve adherence with dietary recommendations by promoting specific preferred foods among ethnic groups and facilitate tailoring of dietary interventions. These findings demonstrate a need for dietitians, nutrition researchers and educators to incorporate the cultural identities and culinary customs into ethnic-specific public health messages when promoting fruit and vegetable consumption.

There are several strengths of this study. It is the first study comparing dietary sources of fruit, vegetable and vitamins A, C, and E among these specific ethnic groups in the U.S; the MEC includes a large representative sample size of each of these five ethnic groups. Although NHANES III had a large sample of AfAms and Latinos born in Mexico (33), it did not include NH or JpAm. The Continuing Surveys of Food Intakes by Individuals (CSFII) 1994-96 collected dietary intake data from 16,103 adults (34), which included AfAm and Latinos; however, the samples of these two populations were relatively small. A validated QFFQ developed specifically for the multiethnic population was used to ensure standardized data collection among the five ethnic groups. Furthermore, a standard method for grouping fruit and vegetables for all ethnic groups based on national recommendations was used (35). Lastly, the disaggregation of composite dishes into their respective fruit and vegetable components allowed a precise assessment of fruit and vegetable intake between groups (24). O'Brien *et al.* (2003) reported that failure to include composite foods when estimating fruit and vegetable intake may result in bias

(25). Certain ethnic groups in the current study, such as Latinos, consumed vegetables mostly as part of soups, and, therefore, exclusion of these composite dishes would underestimate overall intake for this ethnic group.

Several potential limitations also warrant discussion. Recall bias may have impacted the results if specific foods were preferentially documented during collection of the baseline dietary data for the MEC study. Measurement error may also be a concern if certain foods were not captured on the QFFQ, or due to inaccuracies in recording of portion sizes. Previous findings also indicate that the validity of FFQs is higher among women (36), or could vary by food group (37), and thus it is possible that ethnicity influenced reporting. Although the results from calibration study were similar across ethnic groups and the QFFQ used in the MEC appears to capture total intake relatively well (22,23), alternative methods such as food diaries, 24-hour dietary recalls, or addition of open-ended responses for food choices on the questionnaire may have reduced the likelihood of these potential biases. In addition, there were a relatively large number of exclusions due to missing data, and the proportion of excluded participants did vary somewhat for across ethnic groups, ranging from 2.4% among NH participants to 10% for the JpAm group. Although it is possible these differences in response rates may have introduced selection bias, with the large sample sizes that were still maintained in these analyses, considerable dietary variation would have had to occurred in order to have influenced the results. Variation in food consumption patterns may also have been diminished as a result of the availability of ethnic food choices to all of the U.S. population, as well as westernization of diets for persons from the various ethnic backgrounds. As the data for this study was collected over 15 years ago, more recent data would be useful to determine if the dietary patterns observed in this study are generalizable to the current population and if the consumption patterns of various ethnic groups have changed over time.

CONCLUSION

We have provided for the first time comparable data on the dietary sources of fruit, vegetables, antioxidant vitamins A, C and E in a large representative sample of five ethnic groups using a standardized grouping approach. Such data are valuable for developing and implementing public health strategies to meet the national dietary recommendation, as well as guiding nutrition education and intervention programs to reduce risk of cancer and other chronic diseases in these high-risk populations.

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Figure Legends

Figure 1. Ten major sources of vegetables and the percent contribution of each item, by sex and ethnicity

O	African American	Δ	Caucasian
+	Japanese American	□	Latino-Mexico
◇	Latino-US	X	Native Hawaiian

Figure 2. Ten major sources of fruits and the percent contribution of each item, by sex and ethnicity

O	African American	Δ	Caucasian
+	Japanese American	□	Latino-Mexico
◇	Latino-US	X	Native Hawaiian

Figure 3. Ten major sources of Vitamin A and the percent contribution of each item, by sex and ethnicity

O	African American	Δ	Caucasian
+	Japanese American	□	Latino-Mexico
◇	Latino-US	X	Native Hawaiian

Figure 4. Ten major sources of Vitamin C and the percent contribution of each item, by sex and ethnicity

O	African American	Δ	Caucasian
+	Japanese American	□	Latino-Mexico
◇	Latino-US	X	Native Hawaiian

Figure 5. Ten major sources of Vitamin E and the percent contribution of each item, by sex and ethnicity

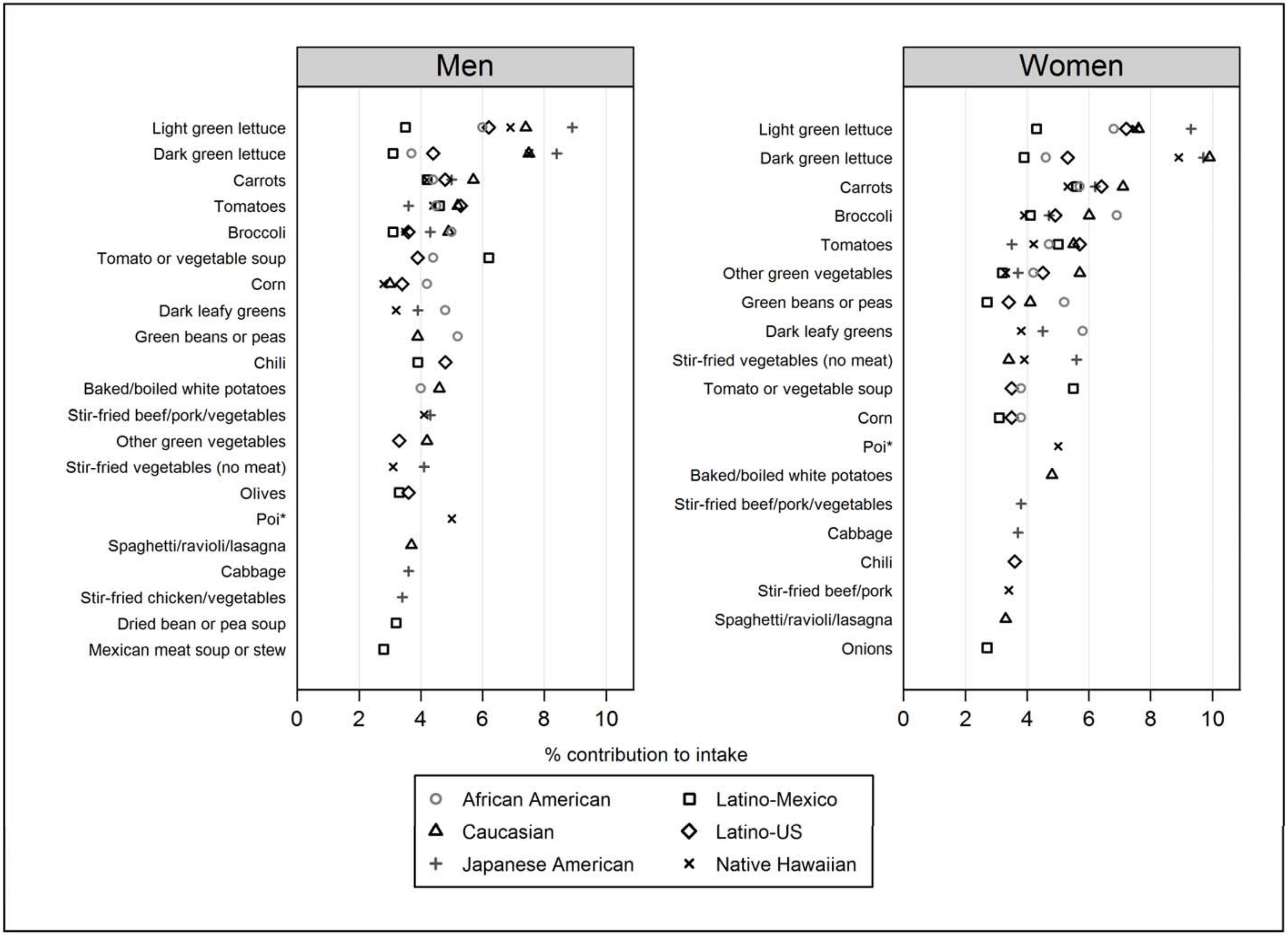
O	African American	Δ	Caucasian
+	Japanese American	□	Latino-Mexico
◇	Latino-US	X	Native Hawaiian

Table 1. Demographic information of the participants

	African American	Native Hawaiian	Japanese American	Latinos-Mexico	Latinos-US	Caucasian
Men						
Number (n)	11,722	5,979	25,893	10,180	10,613	21,933
Age (years)	62 ± 8.9	57 ± 8.7	61 ± 9.2	59 ± 7.7	61 ± 7.6	59 ± 9.1
Body Mass Index (kg/m^2)	26.7 ± 4.3	28.5 ± 5.1	24.7 ± 3.3	26.7 ± 3.7	26.7 ± 4.1	26.0 ± 4.0
Energy (kcal)	2,194 ± 1,166	2,760 ± 1,311	2,255 ± 833	2,716 ± 1,401	2,468 ± 1,261	2,283 ± 899
Vegetable Intake*	4.0 ± 2.9	5.5 ± 3.9	4.6 ± 2.8	5.6 ± 3.9	4.4 ± 3.0	4.7 ± 2.8
Fruit Intake*	3.2 ± 3.2	3.2 ± 3.2	2.8 ± 2.5	4.2 ± 4.0	3.4 ± 3.4	3.1 ± 2.6
% Adherent - Vegetables*	43	61	58	62	49	61
% Adherent – Fruit*	46	36	37	54	47	41
Women						
Number (n)	20,130	7,650	25,355	10,903	11,255	25,303
Age (years)	61 ± 9.0	56 ± 8.7	61 ± 8.9	58 ± 7.6	60 ± 7.9	59 ± 9.0
Body Mass Index (kg/m^2)	28.4 ± 5.8	28.0 ± 6.1	23.1 ± 3.8	27.0 ± 4.8	27.6 ± 5.4	25.2 ± 5.2
Energy (kcal)	1,879 ± 993	2,370 ± 1,263	1,808 ± 678	2,316 ± 1,238	2,056 ± 1,104	1,805 ± 703
Vegetable Intake*	4.2 ± 3.1	5.9 ± 4.4	4.7 ± 2.8	5.7 ± 4.2	4.4 ± 3.2	4.7 ± 2.9
Fruit Intake*	3.7 ± 3.6	3.9 ± 4.0	3.5 ± 2.8	4.9 ± 4.4	3.8 ± 3.7	3.3 ± 2.7
% Adherent - Vegetables*	51	69	66	68	55	65
% Adherent – Fruit*	58	48	54	66	57	52

* The Food Guide Pyramid recommendations are based on daily energy intake: <1,600 kcal, 1,601-2,200 kcal, 2,201-2,800 kcal, and >2,800 kcal per day are 3, 3, 4, and 5 servings per day for vegetables; 2, 3, 3, and 4 servings per day for fruit, respectively; '% Adherent' refers the proportion meeting these recommendations for each ethnic-sex group.

Figure 1. Ten major sources of vegetables and the percent contribution of each item, by sex and ethnicity



*poi: fermented taro root

Figure 2. Ten major sources of fruits and the percent contribution of each item, by sex and ethnicity

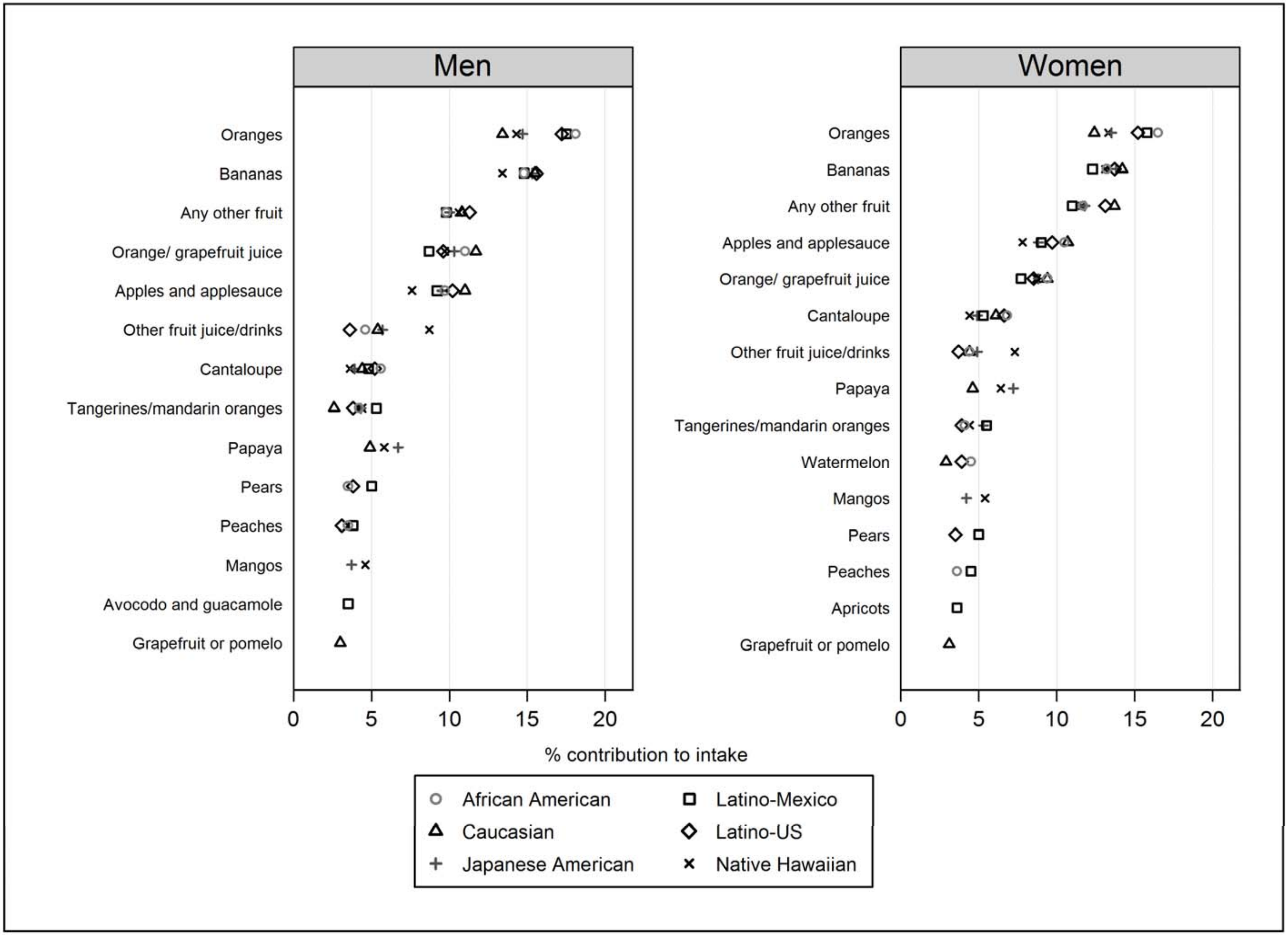
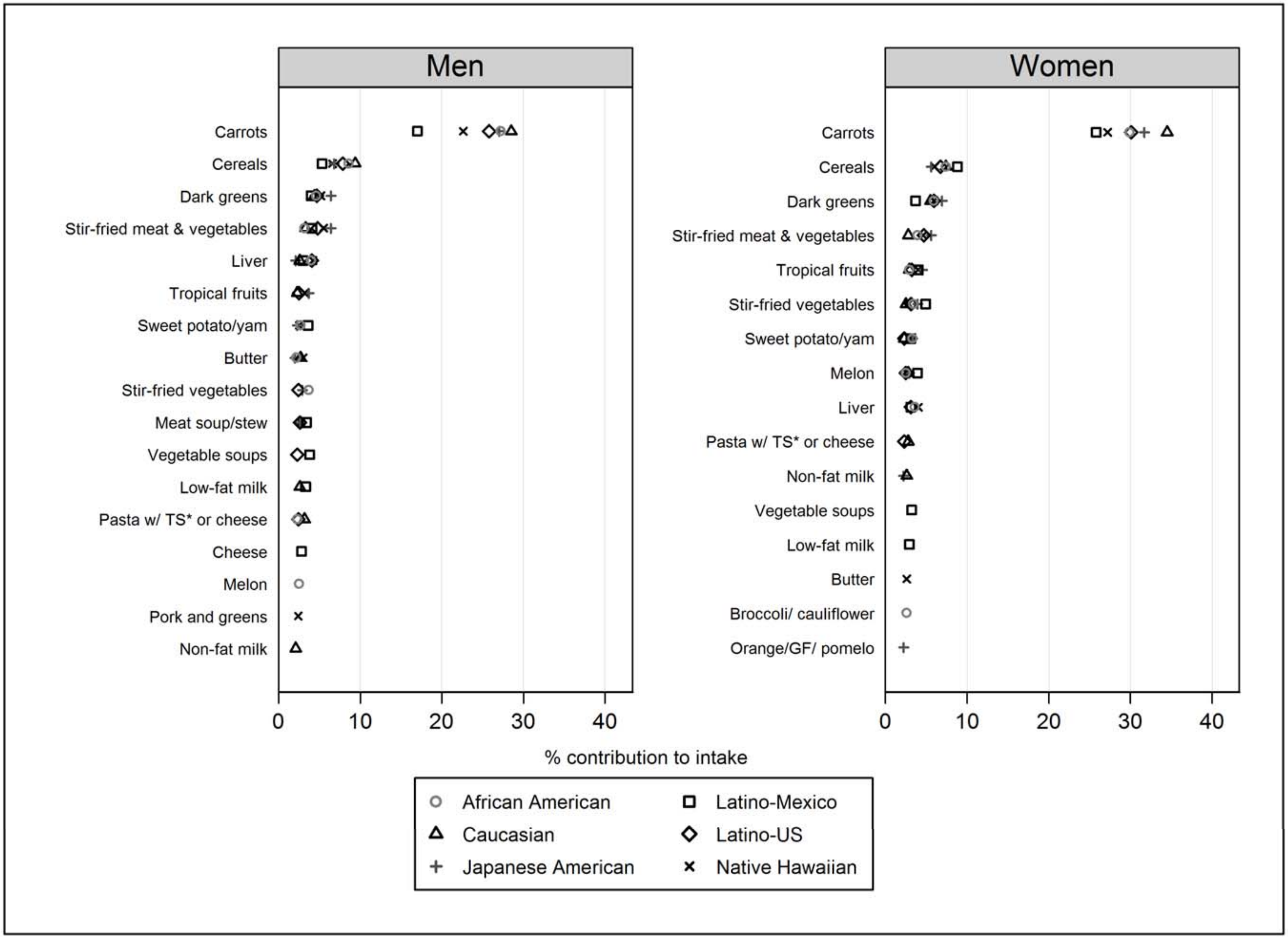
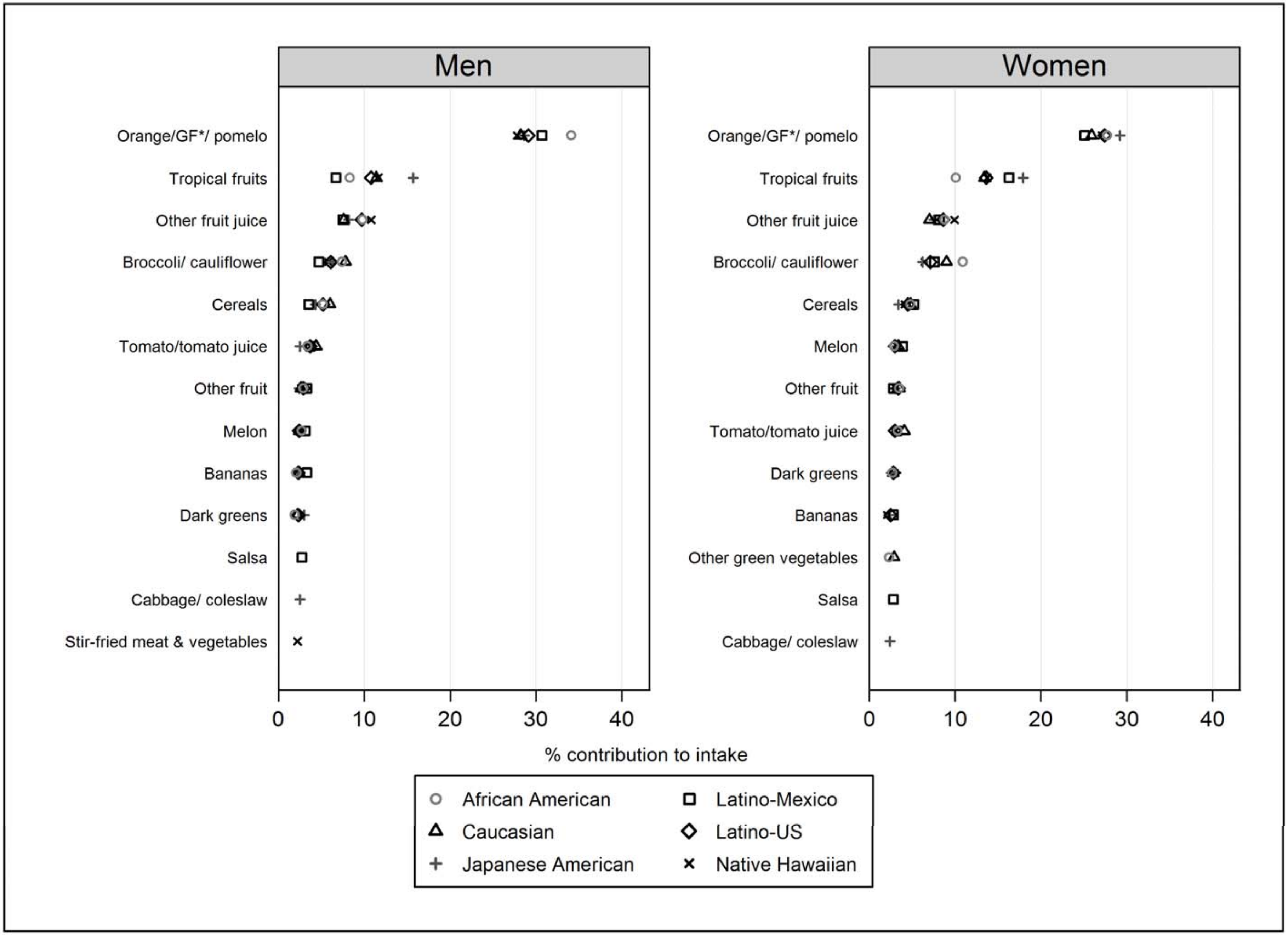


Figure 3. Ten major sources of Vitamin A and the percent contribution of each item, by sex and ethnicity



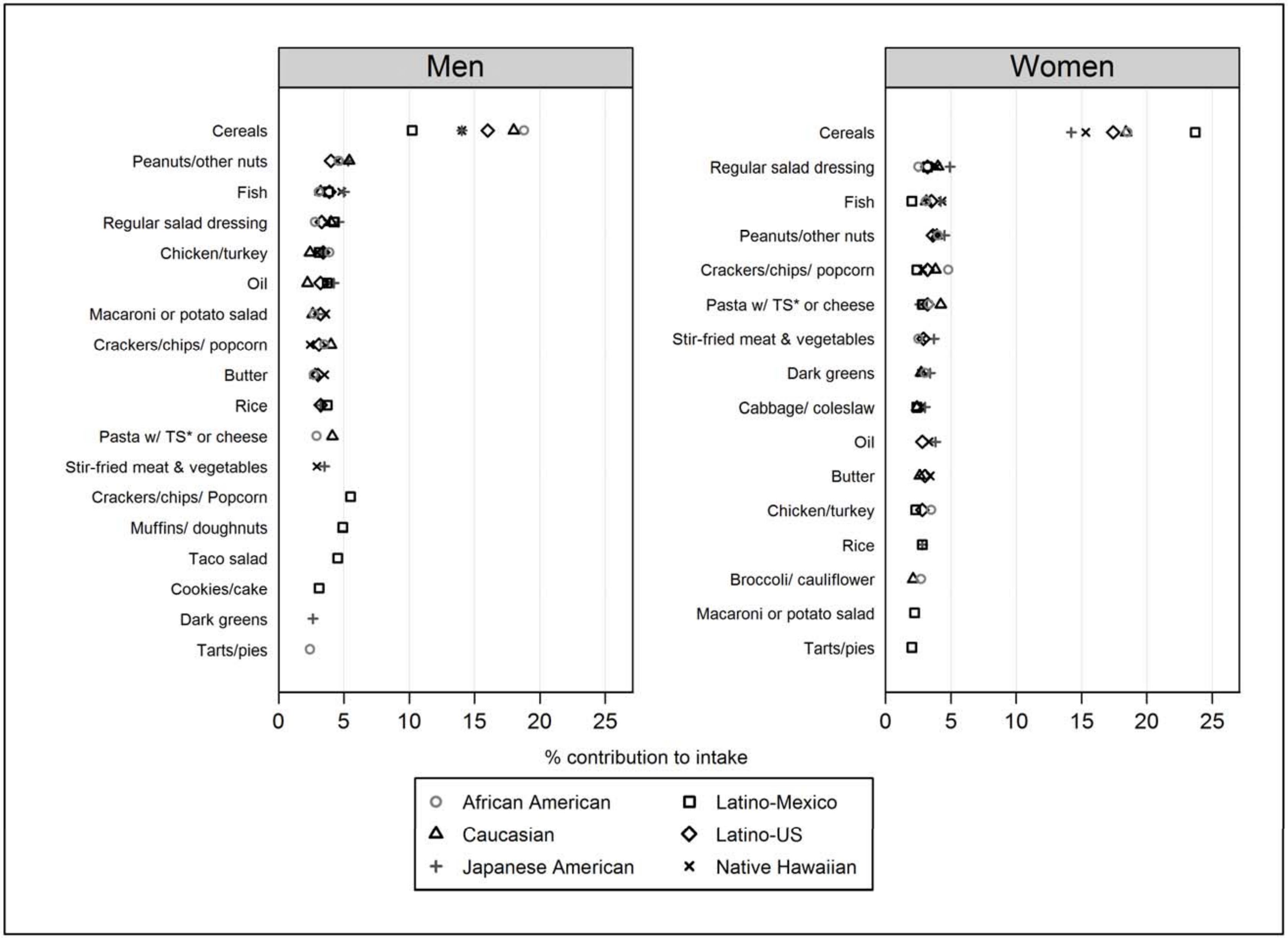
*TS: Tomato sauce

Figure 4. Ten major sources of Vitamin C and the percent contribution of each item, by sex and ethnicity



*GF: Grapefruit

Figure 5. Ten major sources of Vitamin E and the percent contribution of each item, by sex and ethnicity



*TS: Tomato sauce