The Affordability of a Thrifty Food Plan-based Market Basket in the United States-affiliated Pacific Region

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Abstract

In an effort to characterize food costs in the United States (US)-affiliated Pacific Region, a first-time food cost survey was conducted in March 2014. A market basket survey was developed using an adaptation of the US Department of Agriculture Thrifty Food Plan. Surveys were conducted in the states of Alaska and Hawai'i; Portland, Oregon; the US-affiliated Pacific Islands of American Samoa (American Samoa); Commonwealth of the Northern Mariana Islands; the island of Pohnpei within the Federated States of Micronesia; Guam; Republic of the Marshall Islands; and Republic of Palau. Urban and rural communities were included. Multiple stores in multiple communities were surveyed in each jurisdiction. Food retailers (N = 74) ranged from convenience markets to supermarkets. Not all foods in the market basket survey were available in each of the communities. Inspection of available income data also showed that food costs represented a higher percentage of household income for American Samoa than those of Alaska, Hawai'i, and Portland. Thrifty Food Plan weighted weekly totals for the region ranged from $181.90 to $264.30. Weighting was based on the amount of the item converted to grams required for the Thrifty Food Plan menu. These food costs are significantly higher than those of Portland ($142.00) for the survey period. Protein foods, grains, vegetables, fruit, and dairy were the 5 most costly components, in descending order. Food affordability was assessed by comparing food costs across jurisdictions and examining estimated food costs to reported average jurisdiction incomes. The survey is intended to help inform public health policy and educational programs in the region. A locally adapted food survey would benefit future analyses, regional policy, and educational efforts.

Keywords

obesity, food security, food costs, Thrifty Food Plan, food environment, US-affiliated Pacific Region

Abbreivations

CFSAT = USDA Community Food Security Assessment Toolkit
CHL = Children's Healthy Living Program
TFP = Thrifty Food Plan
USAPR = US-affiliated Pacific Region
USDA = United States Department of Agriculture
WWEIA = What We Eat in America

Introduction

An increased prevalence of overweight and obesity among all age groups is associated with food insecurity.[1-3] The link between food security, diet, and young children's health has been well established.[4-7] Multiple environmental factors can affect family food security and food insufficiency including food costs.[8] Food prices may be a barrier to consumption of fruits and vegetables, which are nutrient-dense foods important to a healthy diet.[9,10]

The United States-affiliated Pacific Region (USAPR) is an expansive and diverse region that includes the states of Alaska and Hawai'i, and the US-affiliated Pacific Islands of American Samoa (American Samoa), the Commonwealth of the Northern Mariana Islands (CNMI), the Republic of Palau, Pohnpei State in the Federated States of Micronesia (FSM), the Republic of the Marshall Islands (RMI), and Guam (collectively referred to here as jurisdictions). The Children's Healthy Living Program (CHL) is a partnership among land-grant colleges in the USAPR jurisdictions, sponsored by the US Department of Agriculture (USDA). CHL's mission is to build the region's capacity for establishing healthy food and physical environments.[11] Little documentation exists for food costs throughout most of this region, making it difficult to identify recommendations for budget meal planning, which involves making choices that meet nutritional needs while constraining costs.

One of the most widely used tools for assessing healthy food environments is the USDA Thrifty Food Plan (TFP), which is the basis for USDA food assistance programs such as the Supplemental Nutrition Assistance Program (SNAP) and other similar programs.[12,13] The TFP is 1 of 4 official USDA food plans maintained by the USDA Center for Nutrition Policy and Promotion that were designed to meet national nutritional guidelines for various segments of the US population.[13] The TFP is classified as the low-cost option, satisfying nutritional requirements for a healthy diet at minimal cost. The TFP is menu-based, and all meals are presumed to be prepared at home under the assumption that households have time available to prepare meals from the menu ingredients. The USDA Community Food Security Assessment Toolkit (CFSAT) was "…developed through a collaborative process that was initiated at the Economic Research Service/USDA Food Security Assessment Conference in June 1999."[14] It provides a variety of tools that have been used to evaluate food security in several populations and includes a survey protocol that approximates the TFP weekly cost of food for a family of 4.[14-16] The surveyed food items represent the ingredients of the TFP meals, with individual ingredient costs adjusted by the amount required by

the weekly menu. We sought to determine the affordability of retail foods based on relative food costs among USAPR communities and that of the mainland US city of Portland, Oregon. The computed TFP costs for a family of 4 for Portland ($142.00) was similar to that of the US national average ($148.40)[17] as estimated by USDA in March 2014**,** supporting the relevance of this Pacific Northwest city as a mainland US reference community for comparison with the USAPR jurisdictions. Portland also has been part of past food costs surveys conducted by the University of Alaska Fairbanks Cooperative Extension Service using the same survey protocol used in this study.

Affordability was assessed by examining the estimated food cost to reported average community income in selected communities based on data availability. The survey is part of a community food affordability assessment and used in the CHL project as a first step to help revise federal food assistance programs and develop public policy and educational programs to promote public health in USAPR communities.

Methods

Study Design and Sample

The USAPR survey protocol was taken from the CFSAT. The CFSAT includes a food list (Table 1) and also has detailed instructions for surveyors, including preferred package sizes for pricing.[14] The CFSAT foods were further organized into 12 What We Eat in America (WWEIA) categories.[18] The advantage of this organization is that it provides a summary of foods and beverages by food category.

Surveyors entered stores with approval from store managers and recorded food prices for each available CFSAT survey item, or its alternate. No price was taken if an item, or its predetermined alternate, was unavailable. Food prices were collected in Portland by a contracted surveyor, for comparative purposes. Surveyors were CHL project employees from each jurisdiction and an audio training was provided, which included conducting pilot surveys with a follow-up debriefing. The survey manual included instructions for jurisdiction food cost coordinators and step-by-step instructions for surveyors. Food cost surveys were completed in at least 3 stores when possible in each of the 27 selected USAPR communities during a 2-week period in March 2014.[19] Food stores were selected to best reflect the cost of food for a low-income family of 4 with children ages 6-11 years. The selection criteria included that the store best met the selection of food items included in the CFSAT menu, that at least 1 store per jurisdiction was located in a low-income neighborhood, if available, and that stores be full service. Convenience stores were included only if conventional food stores were unavailable. Convenience stores that did not offer fruits and vegetables were excluded. The store classifications were based on the state of California Communities of Excellence (CX^3) food market survey protocol that defines a small market as selling vegetables and meats and having 3 or fewer cash registers and fewer than 20 employees; a supermarket is defined as being part of a chain and having 4 or more cash registers and more than 20 employees.[20]

All completed surveys were returned to the jurisdictional food cost coordinator, entered into a provided Excel spreadsheet, and reviewed for survey and data entry errors. The original surveys and the Excel spreadsheets were sent to the CHL project food cost coordinator at the University of Alaska Fairbanks for additional review and verification. The CFSAT-based weekly cost of food was derived from a total of 87 weighted food prices (weighting was based on the amount of the item converted to grams required for the TFP menu). An imputed price was calculated for missing items. The imputed item price was calculated as the corresponding Anchorage, Alaska price adjusted by the ratio of the median price of all TFP menu items for the jurisdiction to that of Anchorage. National census data was used for population estimates and income data.[21]

Table 1. Number and Percentage of Stores and Food Retail Environments Surveyed in USAPR Jurisdictions by Community and Store Types–March 2014.

		Store Type N (%)				
Jurisdiction	Communities (N)	Super-market	Large grocery	Small market	Convenience	Total
Alaska	4	12 (100%)				12
American Samoa	3			9 (100%)		9
CNMI	6		1 (6%)	17 (94%)		18
FSM	1			3 (100%)		
Guam	5	2 (14%)	3 (21%)	9 (64%)		14
Hawai'i	4	7 (58%)	2 (17%)	1 (8%)	2	12
Palau	1	1 (33%)	2 (67%)			3
Pohnpei	1			3 (100%)		3
Marshall Islands	3		2 (67%)		1	3
Total	27	22 (30%)	10 (10%)	39 (53%)	3 (4%)	74

USAPR = US-affiliated Pacific Region, CNMI = Commonwealth of the Northern Mariana Islands, FSM = Federated States of Micronesia

Statistical Analysis

Prices are expressed as dollars per pound ($/lb), while cost, in dollars per week ($/wk), is the sum of menu ingredients' prices times their associated weights (lbs) as specified in the CFSAT protocol for a family of 4 with school-aged children. The use of pounds rather than grams in the statistical analysis, as previously referenced in the calculation of survey weighted food prices, was to ease interpretation of results. All foods were priced by the unit as sold (eg, dozen for eggs, volume for milk, weight for flour), but converted to unit weight ($/lb) for ease of comparison.[22] The average weighted community-level prices (N = 87) were summed to provide weekly community food costs. Jurisdiction-level weekly food costs were then calculated as the average of the food costs of the communities within that jurisdiction.

Summary statistics were calculated using JMP 12 for Windows (SAS Corporation, Cary, NC). Food prices and weekly food costs were tested for normality with the Kolmogorov-Smirnov Goodness-of-Fit test for normality, with normality rejected for $P < .05$. Prices and costs were log-transformed for analyses. Equality of multiple medians was determined using the Kruskal-Wallis test, with a chi-square test for homogeneity of distributions. Medians are presented with interquartile range. Logarithmically-transformed food prices within WWEIA groupings and jurisdiction-level weekly weighted totals were compared by ANOVA, with Tukey-Kramer adjustments for multiple comparisons.

Results

Three stores or markets were surveyed in participating communities per jurisdiction, with the exception of Santa Rita, Guam, which had only 2 available stores, and the RMI, which had 1 store surveyed in each of 3 communities, for a total of 74 stores surveyed among 27 communities (Table 1). Supermarkets (N = 27) were available at each location in Alaska, and in varying numbers in the remaining jurisdictions. All 3 stores surveyed in Portland were supermarkets. The preponderance of stores available for survey were small markets (N = 39) and supermarkets.

Food Availability

For some locations, the choice of food outlets was limited and many of the 87 CFSAT food items were unavailable. The range of missing items was 0%-8% at the retailer level. In jurisdictions where supermarkets were available, no missing food items were reported. Small market stores had many unavailable items. When aggregated at the community level, missing items occurred in 6% of cases. Missing food items were reported 28 times in CNMI, 22 times in American Samoa, 20 times in Guam, 3 times in Palau, 2 times in RMI, and 1 time in FSM and Hawai'i. All items were available in Alaska and Portland (data not shown).

Food Prices and Costs

Food prices for each of the 87 items of the CFSAT protocol were averaged at the community level. In this way, food prices reflected the mix of stores surveyed within a community and accessed by shoppers. The median unit price and the estimated weighted weekly cost of food based on the CFSAT protocol are shown in Table 2 for each USAPR jurisdictions and Portland. The jurisdiction-level price medians ranged from $2.50 (Alaska) to $2.86 (RMI). By comparison, the median price in Portland was $1.70. The minimum reported price was $0.16/lb (refrigerated fruit drink, Hawai'i), while the maximum was $130.11/lb (oregano, Alaska). Food prices did not differ by store type after adjusting for jurisdiction.

Weighted jurisdiction-level food costs (calculated from the price multiplied by the CFSAT weekly purchase quantity) were computed as the average weighted cost of each food within a community. The weighted food costs across all USAPR communities ranged from $0.00/wk (pepper, American Samoa) to $28.44/wk (ground beef, Guam), with a median cost across all USAPR jurisdictions of the 87 food items of $1.15/wk (N = 2174). The weekly totals of weighted food costs ranged from $180.72/wk (Alaska) to $261.91/wk (FSM), in comparison to $142.37/wk in Portland. These weekly food costs (log transformed) differed significantly between each USAPR jurisdiction (ANOVA $P < .05$) except FSM and Palau, which were the jurisdictions with the highest estimated weekly food costs (Table 2). The costs of the 87 foods at the USAPR level are included in the supplemental materials.

Also shown in Table 2, is the jurisdictional weekly median household income (where available) and the cost of food relative to household income. The shopping basket is more expensive as a percentage of income in American Samoa than in Alaska and Hawai'i. For example, in CNMI, the shopping basket costs 51.6% of weekly per capita income, while 13.5% of weekly per capita income would be required to purchase the TFP equivalent in Alaska. Weekly CFSAT-based food costs are also shown in relationship to Portland, which range from 127% (Alaska) to 184% (FSM).

What We Eat In America

Mean food costs across USAPR jurisdictions were grouped according to the WWEIA categories (Supplemental Table 1). Ranked by median cost in the USAPR, protein foods were the leading contributors to the weekly cost total (28.4%) followed by grains (16%). Fruits and vegetables (11% each) were third and fourth, but combined would be ranked second. Together, protein foods (led by lean ground beef) were significantly greater contributors to weekly cost ($P < .01$) than grains, the next highest cost contributor. Fruit drinks and orange juice were found to commonly be among the most expensive items in the weekly food cost menu for most of American Samoa.

The costs of protein foods in each jurisdiction are shown in Table 3. The variability in costs between jurisdictions is reflected in the differing column heights within a group. For protein foods, American Samoa had the lowest weekly protein food sum ($35.53), while FSM had the highest ($51.56).

Table 2. Food and Average Household Income Values for USAPR Jurisdictions and Portland, Oregon–March 2014*.

Jurisdiction	Towns surveyed (N)	Median food price ($)**	Average weekly (wk) cost of food ($/wk)***	Average weekly costs as percent of Portland (%)	Averageweekly income ($)	Average food cost as a percent of income (%)
Alaska	4	2.50 (2.91)	181.9 (13.2)	127	1344	13.5
American Samoa	3	2.22 (2.75)	198.42 (15.2)	139	496	40
CNMI	6	2.24 (2.63)	213.58 (10.8)	150	414	51.6
FSM	2	2.80 (3.54)	264.37 (26.4)	185	.	.
Guam	6	2.66 (3.17)	236.73 (11.8)	166	1002	23.6
Hawai'i	4	2.66 (3.43)	217.27 (13.2)	152	1183	18.4
Palau	1	2.68 (3.74)	260.13 (26.4)	182	.	.
Marshall Islands	1	2.86 (2.48)	245.32 (26.4)	172	.	.
Portland	1	1.70 (2.46)	142.37 (26.4)	100	1013	14.1

USAPR = US-affiliated Pacific Region, CNMI = Commonwealth of the Northern Mariana Islands, FSM = Federated States of Micronesia
* Income data unavailable for some jurisdictions.
** Median (interquartile range) using Kruskai-Walis ($P < .01$).
*** Means (standard deviation) using ANOVA ($P < .05$). Mean does not include Portland.
Sources. Alaska, Hawai'i, and Portland median household income, 2009-2013 American Community Survey 5-Year estimates, US Census Bureau, US Department of Commerce. America Samoa, CNMI, and Guam median household income, 2010 Census, US Census Bureau, US Department of Commerce [inflation adjusted by the Consumer Price Index For All Urban Consumers (CPI-U) to 2013 dollars)].

Table 3. Foods by What We Eat In America Weighted Protein Categories in Summed Weighted Median Prices based on the Food Cost Survey across USAPR Jurisdictions and Portland, Oregon–March 2014.

	USAPR Jurisdiction								
WWEIA Food	Alaska ($)	American Samoa ($)	CNMI ($)	FSM ($)	Guam ($)	Hawai'i ($)	Portland ($)	Palau ($)	Marshall Islands ($)
Beans, peas, legumes	1.73	1.83	2.07	2.21	1.91	2.78	1.75	1.92	2.44
Chicken, whole pieces	4.31	2.78	4.57	4.85	5.77	4.01	3.19	3.56	4.08
Cold cuts and cured meats	3.43	2.68	2.20	2.14	4.49	3.54	2.40	3.06	2.71
Eggs and omelets	3.45	3.43	4.17	5.90	4.08	4.97	2.98	4.53	4.92
Fish	8.32	4.21	4.16	4.63	5.27	9.80	6.40	5.29	5.02
Ground beef	16.10	11.49	17.04	20.86	19.63	14.82	14.37	22.30	16.86
Pork	5.58	5.74	4.86	6.10	4.70	6.76	4.40	6.30	6.20
Turkey, duck, other poultry	3.82	3.36	3.08	4.88	3.19	3.78	3.33	3.10	4.49

WWEIA = What We Eat In America, USAPR = US-affiliated Pacific Region, CNMI = Commonwealth of the Northern Mariana Islands, FSM = Federated States of Micronesia

Supplemental Table 1. Survey Foods, Weekly Weightings, and Prices Organized by What We Eat In America Categories–March 2014.[a,b]

WWEIA Category	Weekly Weighting Value (lb)	Mean Price ($/lb)[c]	Mean Weighted Price ($/lb/wk)
Beverages			
Fruit drink, refrigerated	7.89	0.73 (0.43)	0.43 (5.63)
Orange juice concentrate	5.18	3.15 (0.97)	0.97 (15.71)
Condiments & Sauces			
Catsup	0.07	1.62 (0.34)	0.34 (0.11)
Lemon juice	0.03	2.25 (0.82)	0.82 (0.07)
Soy sauce	0.14	4.02 (1.28)	1.28 (0.56)
Spaghetti sauce	1.6	1.73 (0.7)	0.7 (2.77)
Tomato sauce	0.49	1.5 (0.41)	0.41 (0.74)
Dairy			
Cheese, cheddar	0.12	6.14 (1.55)	1.55 (0.76)
Cheese, cottage	0.43	4.03 (1.46)	1.46 (1.39)

Cheese, mozzarella	0.06	6.41 (1.6)	1.6 (0.39)
Milk, 1%	17.76	0.86 (0.38)	0.38 (15.01)
33Milk, evaporated	0.25	2.17 (0.28)	0.28 (0.54)
Milk, whole	7.89	0.85 (0.36)	0.36 (6.76)
Fats & Oils			
Margarine	0.93	2.59 (1.2)	1.2 (2.4)
Mayonnaise	0.31	3.05 (0.91)	0.91 (0.94)
Shortening	0.25	2.65 (0.62)	0.62 (0.65)
Vegetable oil	0.49	1.77 (0.44)	0.44 (0.87)
Fruit			
Apples	1.23	1.88 (0.48)	0.48 (2.32)
Bananas	2.71	1.27 (0.35)	0.35 (3.26)
Grapes	1.48	3.32 (0.7)	0.7 (4.91)
Melon	0.99	1.59 (0.32)	0.32 (1.63)
Oranges	4.69	1.63 (0.41)	0.41 (7.63)
Oranges, mandarin	0.8	2.38 (1.4)	1.4 (1.91)
Peaches, canned	1.6	2 (0.54)	0.54 (3.2)
Grains			
Bagels	1.97	4.47 (1.76)	1.76 (8.56)
Bread, French or Italian	0.25	2.78 (1.1)	1.1 (0.7)
Bread, white	1.97	2.09 (0.8)	0.8 (4.12)
Bread, whole wheat	0.99	2.47 (0.69)	0.69 (2.44)
Cereal, Corn Flakes	0.06	4.96 (2.24)	2.24 (0.3)
Cereal, Toasted Oats	0.62	5.56 (2.76)	2.76 (3.43)
Hamburger buns	0.8	5.76 (7.96)	7.96 (4.5)
Macaroni	1.3	1.96 (0.48)	0.48 (2.54)
Noodles	1.11	2.96 (1.14)	1.14 (3.25)
Rice, white	3.08	0.97 (0.17)	0.17 (3)
Rolls, dinner	0.25	7.49 (6.95)	6.95 (1.85)
Spaghetti noodles	0.68	1.83 (0.47)	0.47 (1.24)
Mixed Dishes			
Bread crumbs	0.19	3.06 (1.72)	1.72 (0.57)
Other			
Baking powder	0	4.47 (0.93)	0.93 (0.01)
Baking soda	0.01	1.56 (0.48)	0.48 (0.02)
Black pepper	0	0 (0)	0 (0)
Bouillon, chicken	0.04	12.07 (7.76)	7.76 (0.51)
Chili powder	0.05	15.04 (5.87)	5.87 (0.74)
Chocolate drink powder	0.09	4.61 (1.59)	1.59 (0.43)
Cinnamon*	0	18.11 (6.78)	6.78 (0.09)
Cumin	0	35.84 (18.01)	18.01 (0.11)
Flour, white	1.42	0.8 (0.18)	0.18 (1.14)
Garlic powder	0	13.84 (2.82)	2.82 (0.03)
Gelatin, powdered	0.14	24.45 (13.07)	13.07 (3.46)
Italian herb	0	69.28 (31.57)	31.57 (0.12)
Onion powder	0.01	17.02 (8.1)	8.1 (0.23)
Oregano	0.01	67.1 (30.93)	30.93 (0.73)
Paprika	0.01	21.73 (8.85)	8.85 (0.15)
Salt	0.01	0.75 (0.19)	0.19 (0.01)
Vanilla	0.03	20.76 (17.58)	17.58 (0.64)
Protein			
Beans Garbonzo, canned	0.94	2.12 (1.93)	1.93 (1.98)
Beans, baked, vegetarian, canned	1.54	1.83 (0.49)	0.49 (2.88)
Beans, kidney, canned	0.93	1.53 (0.35)	0.35 (1.39)
Beef, ground, lean	3.89	4.26 (1.03)	1.03 (16.74)
Chicken, fryer	1.79	1.95 (0.68)	0.68 (3.5)
Chicken, thighs	2.71	1.96 (0.77)	0.77 (5.33)
Eggs	1.85	2.26 (0.4)	0.4 (4.19)
Fish, white	1.97	4.37 (2.75)	2.75 (8.63)
Pork, ground	1.42	3.85 (0.97)	0.97 (5.51)
Tuna fish	0.74	4.7 (1.25)	1.25 (3.48)
Turkey ham	0.68	4.42 (2.12)	2.12 (3.18)
Turkey, ground	0.99	3.3 (1.05)	1.05 (3.5)
Snacks & Sweets			
Chocolate chips, semi-sweet	0.12	4.55 (1.17)	1.17 (0.54)
Fudgsicles, ice milk	0.74	3.52 (1.87)	1.87 (2.58)
Popcorn	0.19	4.28 (1.39)	1.39 (0.79)
Sugars			
Jelly, grape	0.49	2.76 (1.05)	1.05 (1.36)
Molasses	0.06	5.56 (0.77)	0.77 (0.34)
Pancake syrup	0.12	2.65 (0.74)	0.74 (0.33)
Sugar, brown	0.06	1.66 (0.43)	0.43 (0.1)
Sugar, powdered	0.19	1.78 (0.36)	0.36 (0.33)
Sugar, white	0.56	0.95 (0.55)	0.55 (0.53)
Vegetables			
Broccoli, frozen	0.37	2.31 (0.69)	0.69 (0.86)
Carrots	0.99	1.28 (0.29)	0.29 (1.26)
Celery	0.31	1.55 (0.43)	0.43 (0.48)
French fries, frozen	0.68	1.74 (0.64)	0.64 (1.16)
Green beans, frozen	1.42	2.51 (1.53)	1.53 (3.56)
Green pepper	0.25	2.98 (1.47)	1.47 (0.73)
Lettuce, leaf	0.56	2.14 (0.61)	0.61 (1.19)
Mushrooms, canned	0.25	4.61 (1.61)	1.61 (1.14)
Onions, yellow	1.23	1.16 (0.31)	0.31 (1.43)
Peas, frozen	0.93	2.19 (1.14)	1.14 (2.03)
Potatoes	10.36	1 (0.35)	0.35 (10.33)
Tomatoes	0.37	1.85 (0.52)	0.52 (0.7)

WWEIA = What We Eat In America. [a] Weekly weightings in pounds (lbs) and prices represent mean and standard deviation (SD). [b] 2Includes Alaska, American Samoa, Commonwealth of Northern Marianas Islands, Guam, Federated States of Micronesia, Hawai'i, Palau, and the Republic of Marshall Islands. [c] Pricing and weighting based on the Community Food Security Assessment Toolkit protocol (Cohen BE. Community food security assessment toolkit. Washington, DC: US Department of Agriculture, Economic Research Service; July 2002).

Discussion

Food prices were compared throughout the USAPR as part of the CHL project following the USDA CFSAT approach. Food prices were weighted to generate an estimate of the weekly cost of food for a family of 4 with school-aged children. Weekly food cost varied throughout the surveyed jurisdictions by a factor of less than 1.5, which was unexpected given the vast geographic range of the USAPR region. However, the variation in weekly food cost as percentage of median household income was considerably greater, ranging from 13.5% in Alaska to 51.6% of median income in CNMI.

The weekly food costs across the USAPR jurisdictions exceed those of Portland in all cases. Pronounced differences in food costs relative to income were observed across jurisdictions. Alaska and Hawai'i had relatively high average household incomes in relation to food costs. For example, food costs as a percentage of income were lower in Alaska, and only slightly higher in Hawai'i, than in Portland. On the other hand, in CNMI, weekly food costs for a family of 4 represented more than half of the median weekly family income (55.5%). This outcome is particularly significant to policy makers when designing food assistance programs. For example, USDA has evaluated the feasibility of extending the SNAP program to CNMI.[23] The food environment and food costs are important considerations in determining changes such as this to food assistance programs in the USAPR.

The largest component of total cost was protein foods when grouped by WWEIA categories. Fruits and vegetables were also important contributors to the total weekly cost, as were non-dairy beverages. Although the source of the foods and wholesale prices were not determined in the present study, the majority of retail foods in Alaska, Hawai'i, Guam, and CNMI come from the US mainland; for instance, a recent survey of stores in Guam revealed about 58% of products came from the US mainland.[24]

Study Limitations

There are a variety of limitations to this study. The CFSAT may not reflect the dietary patterns of the people in the USAPR region well for several reasons. Foods such as bagels and oranges were contributors to the food plan, but less expensive and/or local alternatives may be preferred. Also, bagels were among the missing items in jurisdictions not having large retailers. Furthermore, diets in the USAPR vary across jurisdictions and in American Samoa, in particular, combine elements of local foods with those from the US, Europe, and Japan. Similarly, the WWEIA food categories, which relied on grouping foods, may not be appropriate to diets that significantly differ from those of the US mainland.

The types of stores surveyed varied across jurisdictions, reflective of the local food environments. In Alaska communities, only supermarkets were surveyed, while the survey in American Samoa, CNMI, and FSM was reliant on prices collected from small grocery stores. For some jurisdictions, several different food store types were surveyed. Furthermore, convenience stores were excluded if conventional food stores were available. Selection of food store may bias reported food costs.

The USDA TFP based CFSAT is among many tools used to survey the food environment.[12] The relevance of the TFP has come under criticism in recent years based on consumer preferences and the assumption that households have time available to prepare meals from ingredients.[25-27] In addition, the CFSAT protocol is based on a diet plan published in 1999.[28] Families at all income levels in the US now consume fewer meals prepared at home from ingredients, and purchase more meals outside the home, either fully or partially prepared.[29,30] Changing the foods within the survey may increase local relevance, but those changes would necessarily affect comparability among jurisdictions. Missing foods occurred in smaller communities. Many households in the USAPR rely on food sources such as gardens, roadside stands, farmers markets, and subsistence harvests that may lower food costs, and the desire to buy foods on the CFSAT. This may be particularly true in those jurisdictions where store-purchased food is relatively expensive in comparison to income.

Implications for Practice and Research

The TFP may not reflect diets in the USAPR completely. Yet, this tool serves as a reference for comparison. Further, the TFP is used to determine levels of food assistance for food programs such as the Supplemental Nutrition Assistance Program Education, also known as SNAP-ED, in the region. This study shows the very high food cost in the USAPR, which deserves consideration in determining benefits for food assistance programs. Although food prices are an important part of household economics, lower prices may not result in higher diet quality or reduced obesity rates.[31,32] Furthermore, higher income provides limited protection against low diet quality.[32,33] Nevertheless, in economic analyses, increased price does correspond to reduced sugar-sweetened beverage intake and price increases for certain foods may be a useful tool for disease prevention.[34,35] Beverages were a significant household expense (9% of CFSAT costs) in the current analysis and may constitute a reasonable intervention target. Of great benefit to the region would be research to develop a CFSAT equivalent that uses local food substitutes and a weighting that identifies and factors in local dietary preferences to meet a family's nutritional needs in most economical way possible.

The CHL food cost survey provided a snapshot of food costs across USAPR jurisdictions. A systematic tracking of food costs and documentation of local diets will be important for improved estimation of community food costs in those jurisdictions. It is a first step in understanding regional food costs and food environments.

Conflict of Interest

None of the authors identify a conflict of interest.

Acknowledgements

The authors would like to acknowledge the financial support of the CHL program by the AFRI Initiative (grant no. 2011-68001-303335), USDA National institute of Food and Agriculture.

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