

# Availability of Locally Produced Foods in the Children's Healthy Living Center's Food Cost Survey for the United States Affiliated Region

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## Abstract

The Children's Healthy Living Center of Excellence (CHL Center) conducted a food cost survey (CHL FCS) in the United States Affiliated Pacific Region (USAPR) that was modified from the United States Department of Agriculture Community Food Security Assessment Toolkit (CFSAT). The CFSAT is based on the 1999 United States Department of Agriculture (USDA) Thrifty Food Plan (TFP). The TFP estimates the cost of consuming a healthy, cost-conscious diet at home and is based on food cost, nutrients in food, nutrition guidance and What We Eat in America (WWEIA). The USAPR is not included in the WWEIA survey. The CFSAT's 87 food items were included in the CHL FCS. The purpose of this study is to describe the availability of the food items in stores within the USAPR and what items were locally produced. In March 2021, food cost data were collected from 92 stores in the jurisdictions of Alaska, American Samoa, Commonwealth of the Northern Mariana Islands, Guam, and Hawai'i. Most CHL FCS food items were available in at least 1 store in each jurisdiction with a range from 0 to 14 items missing from all stores. The presence of local food items was limited across jurisdictions, ranging from 8 to 27 items. Geographic isolation and small populations affect the availability of food items. Inclusion of the region's cultural and dietary practices in national nutritional guidance is crucial in preserving local food cultures, and the production and consumption of local foods.

## Keywords

Food cost survey; local food availability; United States Affiliated Pacific Region

## Abbreviations and Acronyms

CACFP = Child and Adult Care Food Program  
CFSAT = USDA Community Food Security Assessment Toolkit  
CHL = Children's Healthy Living Program  
CHL Center = Children's Healthy Living Program Center of Excellence  
CHL FCS = Children's Healthy Living Program Food Cost Survey  
CNMI = Commonwealth of the Northern Mariana Islands  
FCS = Food Cost Survey  
FSM = Federated States of Micronesia  
NHANES = United States National Health and Nutrition Examination Survey  
NSLP = National School Lunch Program  
RMI = Republic of the Marshall Islands  
SNAP = Supplemental Nutrition Assistance Program  
TFP = Thrifty Food Plan  
US = United States  
USAPR = United States Affiliated Pacific Region  
USDA = United States Department of Agriculture  
WWEIA = What We Eat in America  
WIC = Special Supplemental Nutrition Program for Women, Infants and Children

## Introduction

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, the Commonwealth of the Northern Mariana Islands (CNMI), the Republic of Palau, the Federated States of Micronesia (FSM: Chuuk, Kosrae, Pohnpei, Yap), the Republic of the Marshall Islands (RMI) and Guam, collectively referred to as jurisdictions. The region is characterized as vast and isolated, with Indigenous populations that are culturally and biologically distinct with native languages, customs, and fragile biodiverse ecosystems that remain important for achieving sustainable healthy living and prevention of obesity.<sup>1-3</sup> The region is not in the US National Health and Nutrition Examination Survey (NHANES) and has limited human nutrition intake data. NHANES collects data on the health and nutritional status of the contiguous US population.<sup>4</sup> The exclusion from NHANES means that the region's unique dietary patterns are not reflected in national statistics. Further the foods consumed in the region are not well known and therefore not prioritized for analysis of their nutrient value, and not available in dietary assessment tools. Thus, the nutritional assessments of the population require substitutions with best matches. NHANES data is foundational in the formulation of the Thrifty Food Plan (TFP), ensuring that it is nutritionally adequate, cost-effective, and reflective of current dietary patterns.<sup>5</sup>

The TFP is a model diet plan created by the US Department of Agriculture (USDA) that represents the cost of groceries needed to provide a healthy, balanced diet on a minimal budget. The TFP consists of types and quantities of foods that can be bought by individuals or families to achieve a nutritious diet on a limited food budget, as defined under 7 US Code § 2012 of the Food and Nutrition Act of 2008.<sup>5</sup> The cost of the TFP is used to set maximum Supplemental Nutrition Assistance Program (SNAP) allotments.<sup>6</sup> SNAP food benefits supplement households' food budgets to reduce poverty and food insecurity.

The Children's Healthy Living Program (CHL) was established in 2011 and is a partnership among the remote Pacific jurisdictions of American Samoa, the Commonwealth of the Northern

Mariana Islands (CNMI), the Republic of Palau, the Federated States of Micronesia (FSM: Chuuk, Kosrae, Pohnpei, Yap), the Republic of the Marshall Islands (RMI), Guam, Alaska, and Hawai'i. CHL's aim is to build social/cultural, physical/built, and political/economic environments that will promote active play and intake of healthy food to prevent young child obesity in the USAPR. As the region has no US National Nutrition monitoring (eg, NHANES), CHL collected child, household and community level data to help guide future children's obesity prevention programs and policies.<sup>7</sup>

CHL conducted a community randomized environmental intervention trial, from 2013 - 2015 to address childhood obesity through affecting the food and physical activity environment. The intervention trial consisted of 4 matched pair communities in American Samoa, CNMI, Guam, and Hawai'i and 2 matched-pair communities in Alaska. The communities were selected based on these criteria: a population of over 1000 people, at least 25% of the population being of Indigenous/native descent (or 15% in Alaska because no area with over 1000 people had more than 25% Indigenous/native), and at least 10% of the population being under 10 years old.<sup>7</sup>

As part of the data collection, CHL initially conducted an initial Food Cost Survey (FCS) in the CHL jurisdictions in 2014. The CHL FCS was based on the USDA TFP list found in the USDA Community Food Security Assessment Toolkit (CFSAT),<sup>8</sup> which contains 87 food items in 8 food categories. The CHL FCS found food cost in the CHL jurisdictions to be 1.3 to 2.1 times higher than food cost in Portland, Oregon.<sup>9</sup> Weekly food costs for a family of 4 ranged from \$286 in Rota, CNMI, to \$174 in Anchorage, Alaska, with a mean of \$216, as compared to \$142 for Portland, Oregon. Food price variation was greatest among dairy foods while fruits varied the least. Dairy comprised less than 7% of the total food costs for Hawai'i and Alaska but greater than 11% of the weekly food costs in the additional CHL jurisdictions. For several CHL jurisdictions, certain TFP items were unavailable (eg, bagels) or exceptionally expensive (eg, 1% milk, \$17.76/gal in CNMI). The price for missing items was estimated by taking the Anchorage, Alaska price and adjusting it based on the difference between the median prices of all TFP menu items in the jurisdiction and Anchorage.<sup>9</sup>

In March 2021, as part of the CHL Center of Excellence grant, a second round of the CHL FCS was conducted. The 2021 CHL FCS added questions about whether food items were locally produced. "Locally produced" was defined as items grown, harvested, and/or produced in the jurisdiction.

To better understand the impact of the TFP, which reflects dietary patterns of the contiguous US rather than the region's unique dietary patterns, this study described the availability of CHL FCS food items and the number of locally produced food items in selected CHL jurisdiction stores in 2021. To accomplish this, this study examined: the number of CHL FCS items available and the number of CHL FCS items that were locally produced.

## Methods

In March 2021, CHL collected food cost data using the CHL FCS in Alaska, American Samoa, CNMI, Guam, and Hawai'i. An inventory of food stores was developed for selected communities in each CHL jurisdiction. Store selection criteria included: (1) at least 1 store was located in a low-income neighborhood and (2) stores were full service (grocery stores or supermarkets) with exceptions for convenience stores if conventional food stores were unavailable and fruits and vegetables were offered. From the inventory, 3 stores meeting the selection criteria were selected for each community. If less than 3 stores met the selection criteria in a community, all eligible stores were surveyed. Stores were selected by the CHL jurisdiction team lead.

The CFSAT food store survey instruments and materials have been part of past food costs surveys conducted by the University of Alaska Fairbanks Cooperative Extension Service. The CHL FCS adopted the same survey protocol under the guidance of the University of Alaska Fairbanks researchers.<sup>9</sup> The CHL FCS collected data on item availability, weight, unit of measure (ie, ounces), price, and if it was locally produced. If a locally produced option was available for the item, an additional question was asked to determine whether the locally produced item was selected.

CHL jurisdiction staff collected the data and were required to attend an online training prior to the March 2021 CHL FCS data collection. The food cost data was collected using the iOS application, Ninox.<sup>10</sup> Food cost data was recorded for 87 items in 8 food group categories (**Supplemental Table 1**).<sup>8</sup> If the food item was not present in the store at the time of the data collection, the food item was marked as "missing". Notes were added to the data collection form if there was shelf space for the item but the item was not present.

If a locally produced choice for the food item was available, the data collector recorded the food item as having a locally produced item available. The price of the locally produced item was included in the cost analysis if it was the best match for the food item according to the CFSAT protocol. The CFSAT protocol requires the food item to be a specific size, and if more than 1 type of food item is available at the specified size, then the lowest priced item is to be selected.

For example, if a store has locally produced bananas and imported bananas then the food item would be recorded as having a locally produced food item available. The specific size for bananas would be price per pound. As both the imported and local bananas were priced per pound the lower cost item would be selected. In this example, locally produced bananas are \$1.50/lb. and the imported bananas are \$0.99/lb. The imported banana price would be recorded, as the price is lower. The data collectors would record that the reason the locally produced bananas were not selected was due to the higher cost per pound.

Supplemental Table 1. Children's Healthy Living Food Cost Survey  
Food Items by Food Category

Food Category	Food Item
Fruits & Vegetables, fresh	Apples any variety (bagged or loose) Bananas Grapes (green or red) Melon (specify type) Oranges, any variety (bagged or loose) Carrots, unpeeled (bagged or loose) Celery, bunch Green pepper Lettuce, leaf (green or red) Onions, yellow (bagged or loose) Tomatoes, any variety Potatoes, any variety
Fruits & Vegetables, canned / frozen	Oranges, mandarin (juice or light syrup) Peaches, any variety (light syrup) Mushrooms, pieces, canned Spaghetti sauce, any variety Tomato sauce, any variety Orange juice, frozen concentrate Broccoli, chopped, frozen Green beans, any variety, frozen Green peas, any variety, frozen French fries, any variety, frozen Grains Bread, white, enriched Bread, whole wheat Hamburger buns, enriched Rolls, dinner, enriched French or Italian Bread, enriched Bagels, plain, enriched Bread crumbs, plain Ready-to-eat cereal, Corn Flakes Ready-to-eat cereal, Toasted Oats Flour, white, all-purpose, enriched Macaroni, elbow-style, enriched Noodles, yolk-free, enriched Popcorn, microwave, any variety Rice, white, long-grain, enriched Spaghetti noodles, any variety, enriched
Dairy	Milk, 1% milk fat Milk, whole Cheese, cheddar, mild or medium Cheese, cottage, any variety Cheese, mozzarella, whole Evaporated milk, any variety
Meats	Beef, ground, lean (16 to 23% fat) Chicken, fryer, cut-up or whole Chicken, thighs Turkey, ground Pork, ground Turkey breast Eggs, grade A, large Fish, flounder, cod, tilapia or similar, frozen Tuna fish, chunk-style, water packed Beans, garbonzo, canned (chick peas) Beans, kidney, canned Beans, baked, vegetarian, canned

Fats & Oils

Margarine, stick  
Shortening, vegetable  
Mayonnaise, regular  
Vegetable oil, any type

Sugars

Sugar, brown (dark or light)  
Sugar, powdered  
Sugar, white, granulated  
Jelly, grape  
Molasses, any type  
Pancake syrup, any type  
Chocolate chips, semi-sweet  
Fruit drink, refrigerated, any flavor  
Fudgsicles, ice milk

Spices and Condiments

Baking powder  
Baking soda  
Chili powder  
Cinnamon  
Cumin  
Onion powder  
Garlic powder  
Italian herb seasoning  
Oregano  
Paprika  
Black pepper, ground  
Salt, any type  
Vanilla, any type  
Chicken bouillon, reduced-sodium, cubes  
Catsup, any type  
Soy sauce, reduced-sodium  
Lemon juice, bottled  
Gelatin, powdered, unflavored  
Chocolate drink powder

CHL FCS data was collected using Ninox software (Ninox Software GmbH, Berlin, Germany). Ninox compiled the data into a spreadsheet. Discrepancies and implausible data were identified and resolved following an established protocol developed by the CHL data workgroup. The food items were sorted by food group and counts per food group using SAS 9.4 (SAS Institute Inc., Cary, NC). Human studies approval for the CHL study was obtained from the Committee on Human Studies at the University of Hawai‘i at Mānoa (#18915) and the Institutional Review Board (IRB) at the University of Guam (#IRB-22-34). The authors collected the food cost data or were responsible for its collection.

Results

CHL FCS data were collected in 92 stores across the jurisdictions (Alaska = 12, American Samoa =16, CNMI = 21, Guam = 19, and Hawai‘i = 24) in March 2021. When looking at items by individual store, all jurisdictions had some missing food items, with low-sodium chicken bouillon cubes as the most common missing item (Table 1). Communities in American Samoa, CNMI, and Guam were found to have more missing items when compared to Alaska and Hawai‘i (Table 1).

When looking at locally produced items across all stores surveyed in the jurisdiction, Hawai‘i had the most locally produced items available (27 out of 87 items) and American Samoa had the fewest locally produced items available (N=8). When comparing the food item categories across the jurisdictions, the grain group category had the most locally produced food items compared to the other food categories with an average of 5 (range 4 to 6) of the 15 items. None of the jurisdictions had locally produced fats & oils category items (Table 2).

When a locally produced food was available, the item was chosen as the “best” option the majority of the time, with CNMI having all the locally produced items chosen and Alaska with the least (7 out of 12 items) (Table 2). The most common reason for not selecting the locally produced food item was due to higher cost for 9 out of 12 of those items. The other reason for not selecting the locally produced item was that it was the wrong sized item (Table 3).

Table 1. Top 15 Missing Food Items by Jurisdiction, the Children's Healthy Living Food Cost Survey (March 2021)						
Food	Alaska (N=4) <sup>a</sup>	American Samoa (N=6) <sup>a</sup>	CNMI (N=6) <sup>a</sup>	Guam (N=5) <sup>a</sup>	Hawai‘i (N=5) <sup>a</sup>	Total (N=26) <sup>a</sup>
	N <sup>b</sup> (%)	N <sup>b</sup> (%)	N <sup>b</sup> (%)	N <sup>b</sup> (%)	N <sup>b</sup> (%)	N <sup>b</sup> (%)
Chicken bouillon cubes (low sodium)	3 (75)	6 (100)	6 (100)	4 (80)	1 (20)	20 (77)
Beef, ground	0 (0)	6 (100)	6 (100)	3 (60)	0 (0)	15 (58)
Gelatin	0 (0)	5 (83)	3 (50)	5 (100)	1 (20)	14 (54)
Beans, baked	0 (0)	6 (100)	4 (67)	3 (60)	1 (20)	14 (54)
Cheese cottage	0 (0)	6 (100)	5 (83)	3 (60)	0 (0)	14 (54)
Molasses	0 (0)	6 (100)	6 (100)	2 (40)	0 (0)	14 (54)
Turkey breast	0 (0)	6 (100)	5 (83)	2 (40)	1 (20)	14 (54)
Turkey, ground	0 (0)	5 (83)	6 (100)	2 (40)	1 (20)	14 (54)
French or Italian bread	0 (0)	6 (100)	3 (50)	3 (60)	1 (20)	13 (50)
Fudgsicles	0 (0)	4 (67)	6 (100)	3 (60)	0 (0)	13 (50)
Noodles, yolk-free	0 (0)	6 (100)	4 (67)	2 (40)	1 (20)	13 (50)
Bagels	0 (0)	6 (100)	2 (22)	2 (40)	1 (20)	11 (42)
Frozen orange juice	0 (0)	5 (83)	4 (67)	2 (40)	0 (0)	11 (42)
Cheese mozzarella	0 (0)	6 (100)	3 (50)	1 (20)	0 (0)	10 (38)
Dinner rolls	0 (0)	3 (50)	4 (67)	2 (40)	0 (0)	9 (35)

<sup>a</sup> number of communities surveyed in each jurisdiction; <sup>b</sup> number of communities in jurisdiction with missing food item

Table 2. Locally Produced Available<sup>a</sup> and Chosen<sup>b</sup> for Survey by Food Group Category Across Jurisdictions, the Children's Healthy Living Food Cost Survey (March 2021)

Food Group Category	Alaska		American Samoa		CNMI		Guam		Hawai'i	
	Locally Produced	Chosen	Locally Produced	Chosen	Locally Produced	Chosen	Locally Produced	Chosen	Locally Produced	Chosen
	N	N	N	N	N	N	N	N	N	N
Fruits (N=8)	0	0	1	1	2	2	1	1	2	2
Vegetables (N=14)	2	2	2	1	5	5	1	1	4	3
Grains (N=15)	6	5	4	4	5	5	5	5	6	6
Dairy (N=6)	2	0	0	0	0	0	2	0	2	2
Meats (N=12)	2	0	1	1	0	0	0	0	6	5
Fats & Oils (N=4)	0	0	0	0	0	0	0	0	0	0
Sugars (N=9)	0	0	0	0	0	0	0	0	4	3
Spices (N=19)	0	0	0	0	0	0	0	0	3	2
Total (N=87)	12	7	8	7	12	12	9	7	27	23

<sup>a</sup> number of locally produced items available; <sup>b</sup> number of available locally produced items chosen as best option

Table 3. Locally Produced Survey Food Items Not Selected and Reason for Not Selecting, by Jurisdiction, the Children's Healthy Living Food Cost Survey (March 2021)

Jurisdiction	Cost <sup>a</sup> (Higher Price)	Wrong Size <sup>b</sup>
Alaska (N=5)	4	1
American Samoa (N=1)	Reason not provided	Reason not provided
CNMI (N=0)	0	0
Guam (N=2)	2	0
Hawai'i (N=4)	3	1
Total (N=12)	9	2

<sup>a</sup> locally produced item cost was higher than another available item; <sup>b</sup> locally produced item did not meet the specific size stated in the CFSAT protocol

## Discussion

The variation in the number of missing food items across stores in the CHL jurisdictions can be attributed to several factors, including long food supply chains, shipping challenges, and population size.<sup>1-3</sup> Alaska and Hawai'i had the least number of missing items and have the largest populations and closest distance to the contiguous US.<sup>1,3</sup> Whereas, American Samoa, Guam, and CNMI are geographically further from the contiguous US and have considerably smaller populations.<sup>1</sup> Food items must be transported by sea or air over considerable distances which can lead to delays and increased costs. Perishable goods, in particular, may suffer from spoilage during transit. This could cause logistical challenges, higher shipping costs, and limited access to reliable transportation options which may further hinder the timely delivery of food items.<sup>11</sup> Specific characteristics of some of the food items (eg, low-sodium chicken bouillon cubes) on the CHL FCS were not commonly available in the jurisdictions.

Food items in the CHL FCS reflect what was commonly consumed in the contiguous US based on the 1999 USDA TFP.<sup>9</sup> The USAPR populations have unique cultures and dietary preferences<sup>12</sup> with specific culinary traditions that may not match the CHL FCS food items. In addition, the USAPR's dietary patterns were not reflected in the formulation of the TFP;<sup>4</sup> therefore, the CHL FCS may not be applicable in the context of culturally diverse USAPR. As the TFP estimates the cost of a healthy, budget-conscious diet, a TFP tailored specifically to the jurisdictions in USAPR could provide more accurate and relevant findings.

Additionally, a tailored TFP that incorporates locally produced food items would provide a more complete assessment of what is available in these jurisdictions. The current CHL FCS may not fully reflect local food availability, as the survey was designed based on the food systems of another region. For example, the tropical climate in American Samoa, CNMI, Guam, and Hawai'i and the short growing season in Alaska, limit the



cultivation of certain fresh food items included in the CHL FCS (eg, apples, peaches and other temperate climate foods), while other locally grown fruits and vegetables better suited to the region's environment are not recognized.<sup>1</sup> Other food items require manufacturing capabilities that are limited in the region. The region's geographic isolation, limited manufacturing capabilities, scarce production materials, and high production costs influence the production of local foods.<sup>13</sup> Transportation challenges also affect the movement of goods from various sources including farms and ports to food outlets. These challenges stem from the unique geography and infrastructure limitations of the region.<sup>1</sup> Additionally, the food items do not reflect the dietary patterns of the specific population groups in the region.<sup>12,14</sup> The inclusion of traditional and locally grown food items in nutritional guidance would allow for local food substitution reducing the amount of imports and the dependency on global supply chains, which can be disrupted by natural disasters, political instability, or pandemics.<sup>15</sup>

Food preferences are shaped by a variety of factors, including consumer demand, which is influenced by convenience foods, assimilated tastes, cultural and social norms, and food item costs.<sup>16</sup> One result of the lack of nutritional data in the region is the lack of nutrient information for local foods, which may prevent these locally produced foods from being eligible for inclusion in federal food assistance programs, such as the Special Supplemental Nutrition Program for Women, Infants and Children (WIC).<sup>12</sup> The eligibility of food items in these programs influence the types of food items available in stores. Retailers that participate in WIC programs must meet specific criteria, prioritizing shelf space for WIC-approved foods, such as dairy products and whole grains, which have limited production in the region.<sup>17</sup> This leaves less shelf space for locally produced items.

Due to the high prevalence of household food insecurity<sup>18</sup> and lower quality of food outlets in the region,<sup>19</sup> documenting the availability of local foods and describing factors influencing food access can lead to the creation of a more equitable, sustainable, and culturally relevant food system. A culturally relevant food system would strengthen food security by preserving traditional food practices which are adapted to local ecosystems and more resilient to climate change.<sup>20</sup> Additionally, it would enhance community health and identity by providing culturally familiar and nutritious foods fostering a deeper connection to heritage and place.<sup>21</sup>

This study has several limitations that should be considered when interpreting its findings. Firstly, the CHL FCS was based on the CFSAT, which contains similar foods to those utilized in the USDA's 1999 TFP, which may not accurately reflect contemporary dietary patterns and food prices. USDA recently updated the TFP food items in 2021.<sup>6,22</sup> However, the updated TFP does not include food consumption data from the USAPR. Secondly, the study was conducted in March and seasonality could have influenced the availability and cost of certain food items, potentially leading to variations in the data throughout the year. Additionally, the type of stores where data was collected may not represent the entire spectrum of food sources in the studied communities. Locally produced foods may be accessed through farmers markets/stands, family farms, or produce grown at home. Thus, the CHL FCS may not have captured the availability of some locally produced food items. Finally, the data was only collected in selected communities and variations in food access and availability may exist in other areas not included in the study, potentially affecting the overall representativeness of the findings.

## Conclusion

The geographic isolation and relatively small populations of the USAPR affects the availability of CHL FCS food items and may not capture locally produced foods in the region. The food items surveyed by CHL were based on contiguous US food items and may not reflect food items purchased and consumed in the USAPR potentially impacting the accuracy of the results of this study. The inclusion of the region's cultural and dietary practices in nutritional guidance is crucial in preserving local food cultures, the production and consumption of local foods and the understanding of their benefits to the health of the USAPR population.

## Conflict of Interest

None of the authors identify a conflict of interest.

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