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Food access and cost in American Indian communities in Washington State

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Abstract

Limited access to foods that make up a nutritious diet at minimal cost may influence eating behaviors and ultimately obesity. This study examined the number and type of food stores (convenience, grocery, supermarket) on federal reservations in Washington State, and the availability and cost of foods in the United States Department of Agriculture (USDA) Community Food Security Assessment Toolkit market basket, to describe the food environment of American Indians. Stores were identified by telephone survey of tribal headquarters, a commercial database, and on-site visitation. Foods were assessed using a standardized instrument containing 68 items in seven major food groups during April and May 2009. Store type and availability, and cost of foods, were recorded on a checklist. Fifty stores were identified on 22 American Indian reservations, including 25 convenience, 16 grocery, and nine supermarkets. Across all stores, about 38% of checklist items were available, with supermarkets having the most and convenience stores the fewest. Foods from the dairy and sugars/sweets groups were the most prevalent, while fresh fruits/vegetables were the least. Cost of the most commonly available items was lowest in supermarkets. Seventeen reservations did not have a supermarket on their reservation, and the nearest off-reservation supermarket was about 10 miles from the tribe's headquarters, which was used as the standard for distance calculations. These results demonstrate that American Indians living on federal reservations in Washington State may have limited access to foods that make up a nutritious diet at minimal cost.

Keywords

Food access; Obesity; American Indians; Health disparities

Introduction

The benefits of eating a healthy diet are well established, yet long-term dietary changes in the population remain elusive. Food cost and availability influence dietary behaviors (1),

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particularly for individuals of low-income, members of minority groups, and those living in rural settings (2-4). Furthermore, energy-dense foods are less expensive on a per calorie basis than low-calorie, nutritious foods (5). This suggests that individuals with limited financial resources may choose to purchase cheaper energy-dense foods to maximize their spending power.

Addressing food availability and cost in low-income minority communities, which suffer disproportionately from chronic diseases, could influence eating habits and ultimately health. Epidemic rates of obesity and type 2 diabetes among American Indian communities have been documented (6-8), and poverty among this group is widespread (9). American Indians have undergone a “nutrition transition” over the past several decades, characterized by a loss of traditional food practices and reduced physical activity supplanted by abundant energy-dense foods and sedentary lifestyles (10). Similar to reports in other low-income minority groups, evidence suggests that the nutrition environment on American Indian reservations is characterized by few supermarkets and many gas station-type stores, moderate availability of fresh produce, and a reliance on off-reservation stores for regular or bulk shopping (11).

The purpose of this short report was to characterize the nutrition environment of American Indian reservations in Washington State using the U.S. Department of Agriculture (USDA) Food Security Assessment Toolkit, Food Store Survey Instrument market basket (12). For each reservation, 1) the number, type, and location of food stores was determined; 2) the availability and cost of the market basket was determined; and, 3) the availability and cost of the market basket on reservation and nearby off-reservation supermarkets was compared to each other and the market basket reference price. Finally, using geographic information systems (GIS) data, the distance from each tribe's headquarters to the nearest on-reservation or off-reservation supermarket was estimated.

Methods

Setting

All food stores on all federally recognized American Indian tribes with reservation lands in Washington State (13) were assessed during April and May 2009. Reservation boundaries were defined using geospatial data. There are 29 federally recognized tribes in Washington State, seven of which are landless, leaving 22 eligible tribes. Before collecting data, the researchers mailed a letter to each tribe's headquarters that described the study, provided the researcher's contact information, and asked the tribe to contact the researcher with any concerns or questions. Tribal approval was assumed unless the tribe requested not to be included in the analysis. This strategy was discussed with faculty from the Native American Law Center at the University of Washington, and the study was considered exempt by the local Institutional Review Board.

Data Collection

The lead author collected data using standardized measurement tools and procedures (12); two research assistants aided the investigator on one large reservation. Food stores on each reservation were visited to document the type (convenience, grocery, or supermarket), identifying information (name, location), and availability and cost of the market basket. The USDA Food Store Survey Instrument (12) was used as the benchmark for characterizing the nutrition environment because it is based on the Thrifty Food Plan (TFP), which serves as the national standard for a minimally nutritious diet at minimal cost (14). The market basket used for assessing food availability and cost contains 68 individual food items categorized into seven major food groups (e.g., Bananas [Fruit and Vegetables-fresh]; Milk, 1% low fat

[Dairy]; Jelly, grape [Sugars and Sweets], etc.). It also contains the TFP shopping list commonly used in assessments because it provides a useful framework for studying the cost of a minimally nutritious diet, based on foods that provide a weeks' worth of recipes and menus for a reference family of four. Optional food items such as spices and condiments are listed under the “Other Food Items” category and are not included in the analysis. Item cost was the lowest price listed for the specified size; sale items were listed as the discounted rather than regular price.

Measures

The type, number, and location of food stores were assessed, along with the availability and cost of the TFP market basket. All convenience, grocery, and supermarket type stores located on each reservation were included. For tribes lacking a supermarket, the supermarket located at the shortest straight-line distance from the tribe's headquarters was determined. This was only done for reservations lacking a supermarket because it was assumed that people living on reservations with a supermarket could get most of the market basket items in that store. On-reservation food stores were first identified through a telephone survey of tribal headquarters and a commercial database (ReferenceUSA®, Omaha, NE). For the telephone survey, each tribe's headquarters was contacted and an administrator was asked to enumerate the number of convenience, grocery, and supermarket stores on the reservation. Next, the commercial database was searched for all businesses with North American Industry Classification System codes 447110, 445120, and 445110 that were located in or adjacent to the zip code of each tribe's headquarters within the reservation boundaries. Convenience stores were defined as businesses with code 447110 (establishments engaged in retailing automotive fuels in combination with convenience store or food mart items) or 445120 (establishments known as convenience stores or food marts, except those with fuel pumps, primarily engaged in retailing a limited line of goods), grocery stores using code 445110 and annual sales less than $2.5 million, and supermarkets using code 445110 and annual sales of at least $2.5 million.

Remotely collected data (i.e., phone survey and database search) for on-reservation stores were verified through site visitation. The latitude, longitude, and street address of stores found through “ground-truth” methods were determined using a handheld global positioning system (GPS) device.

The nearest off-reservation supermarket was identified using the ReferenceUSA® database and GIS mapping, or by using the handheld GPS device, for each of the 17 tribes lacking a supermarket on their reservation.

Analysis

Each store type was identified in terms of total number, proportion, and weighted mean density, the later using 2000 census data for each tribe's reservation to establish population estimates. The second aim included the count and price of each market basket item. The number and percentage of available items, overall and by category, was calculated and stratified by store type, along with the mean and median prices for each item across all reservations, and the percentage of reservations on which each item was available in at least one store. Availability and cost of items by store type were compared using a 1-way analysis-of-variance with Tukey's post-hoc test. For aim three, we computed and compared average market basket cost in all on-reservation stores and the closest supermarket (either on or off-reservation) using an independent samples t-test. This cost was also compared to the national market basket reference price over the period of data collection, again using an independent samples t-test. If an item required a cost per pound but was sold on a per item basis, price was estimated from the per item price using the average weight for a medium

size of the item as listed in the USDA National Nutrient Database. Some items – specifically white and wheat bread, bread crumbs, toasted oats, Grade A eggs and tuna fish – were not readily available in supermarkets in the specified size, so standard alternative sizes were included in the analysis for these items. Analyses were performed using Statistical Analysis Systems software (version 9.2, SAS Institute, Cary, NC). Significance was established at $P < 0.05$ *a priori*, with Bonferroni adjustment for multiple comparisons leading to an adjusted level of $P < 0.006$ as the threshold for statistical significance.

Results and Discussion

Food Stores

The telephone survey identified 36 convenience, 11 grocery, and three supermarket stores across all reservations. The database search identified 13 convenience, 16 grocery, and eight supermarket stores. During on-site data collection, all stores found in the database search were located; however, one convenience and one grocery store were out of business. An additional 13 convenience, one grocery, and one supermarket store were identified during on-site data collection not found in the database. A total of 50 food stores, consisting of 25 convenience, 16 grocery, and nine supermarket type stores were identified. Although the total number of stores identified through the phone survey and on-site data collection were identical ($N = 50$), the distribution by type differed considerably. Discrepancies were resolved using the definitions provided in the USDA Food Security Assessment Toolkit (12).

Seventeen reservations lacked a supermarket, and of these 15 also lacked a grocery store but had a convenience store. Five others lacked any on-reservation food stores, while eight of the 16 grocery stores and five of the nine supermarkets were all on one large reservation. Convenience stores were thus the most and supermarkets the least common on the reservations studied, with a weighted mean density per 10,000 residents of 2.2 and 0.8, respectively.

On-reservation Food Availability and Cost

Data were collected from 47 of the 50 identified on-reservation stores (24 convenience, 14 grocery, and nine supermarket stores). One convenience store and one supermarket did not allow the investigators to complete the market basket checklist in their store, and an additional grocery store was never open for business when visited by study staff.

Across all store types, on-reservation stores had about 33 of the 68 items (49%) on the survey checklist. Convenience stores had the fewest number of total items (mean 14.7 of 68 items, 22%), while supermarkets had the most (58.1 of 68 items, 86%) and grocery stores an intermediate number of items (24.2 of 68, 36%). Availability of individual items by food group and for the market basket in total was greater in supermarkets than in both convenience and grocery stores ($P < 0.006$). In addition, items in the fresh fruits/vegetables, canned or frozen fruits/vegetables, and fats/oils were more available in grocery than convenience stores ($P < 0.006$). In general, items from the dairy and sugars/sweets group were the most prevalent, while items in the meat/protein and fresh fruits/vegetables groups were the least across all stores.

Availability and cost of representative items by food group are listed in Table 1. Overall, eggs, white bread, and whole milk were the most consistently available items among all visited stores. The most common item in convenience stores was eggs, and granulated sugar in grocery stores. All nine of the supermarkets had apples and oranges, the availability of which was higher than in both convenience and grocery stores ($P < 0.006$). In addition, all nine supermarkets had frozen French fries, white bread, whole milk, and granulated sugar,

while eight of the nine also had eggs and margarine. The cost of white bread, whole milk, and granulated sugar were higher in both convenience and grocery stores than supermarkets ($P < 0.006$).

Thus, American Indians living on reservations in Washington State have limited access to foods represented in the TFP market basket. Convenience stores dominated over both grocery stores and supermarkets on the reservations studied. Moreover, multiple grocery stores and supermarkets were located on a single reservation while others had no food stores, suggesting that disparities in access to the TFP market basket exist even among tribes living on reservation lands.

These results are troubling because the most common store found on the reservations surveyed, convenience stores, carried less than one-quarter of all items in the market basket. The largest percentage of available items in convenience stores were in the dairy and sugars/sweets groups, yet this only represented 36% and 29% of the total items in each group. Among the stores, supermarkets had the largest selection of individual items and at a lower cost than other types.

Comparative Food Availability and Cost

In addition to the stores site-visited, the nearest off-reservation supermarket for each of the 17 tribes that did not have one on their reservation was surveyed. Compared to on-reservation supermarkets, off-reservation supermarkets had slightly more items from each of the food groups, although this difference was not significant ($P > 0.006$; Table 2). Off-reservation supermarkets had about 94% while on-reservation supermarkets had roughly 86% of all market basket items ($P > 0.006$).

No supermarket visited had all items in the market basket (items were missing at random). However, an average cost for each survey item was constructed from the available data. This information was used to estimate an average cost for a “representative” market basket for the on-reservation supermarkets to compare against the average cost for the off-reservation supermarkets. The average total cost of the market basket was $158.36 among the nine on-reservation supermarkets and $159.39 among the 15 closest off-reservation supermarkets ($P > 0.006$). Some of the tribes shared a common store as the closest off-reservation supermarket. Thus, there were 15 instead of 17 stores classified as the “closest off-reservation supermarket”. Among the various food groups, the largest difference in cost between on- and off-reservation supermarkets was for the meat/protein group, with a difference about $4 lower in on-reservation compared to off-reservation supermarkets, although this was not significant ($P > 0.006$).

A single TFP market basket cost was then constructed based on the average of all nearest off-reservation supermarkets for each of the tribes in the study; this analysis ignored the fact that some tribes had a supermarket on the reservation and instead considered the nearest off-reservation supermarket. This average cost was actually based on 19 supermarkets because one supermarket represented the nearest supermarket for three different tribes. The average cost of the TFP market basket for the nearest off-reservation supermarkets was $144.52. In contrast, the USDA reference cost of the same TFP market basket was $135.10.

Although no single on-reservation supermarket had all of the market basket items, and they carried fewer total items than did off-reservation supermarkets, when available these items had a cost similar to the off-reservation supermarkets. Nonetheless, the average market basket cost for off-reservation supermarkets was about 7% higher (~$9.00) than the national reference cost. Thus, the average TFP market basket would cost tribal members of these communities who shop at their nearest local supermarket ~$36 more per month than a

consumer purchasing the same market basket at reference cost. Spices and condiments were not included in the cost calculation because they are considered optional, so the actual TFP market basket cost would be even higher than calculated here.

Similar to the findings in the present study, many food stores in low-income communities in Boston lacked foods recommended by both the USDA TFP and a similar, healthier diet based on updated dietary guidelines (2). The cost of the healthier diet was also significantly higher than the TFP (2). Similarly, a comparison between low and high-income neighborhoods in Seattle demonstrated decreased availability of market basket items in the low-income community (15). Together, these studies suggest that disparities in access to and cost of foods comprising the TFP exist within a narrowly defined geographic region.

Distance to Supermarket

The average distance from tribal headquarters to the nearest on-reservation supermarket for tribes who had one within their boundary was 5.3 miles (range 1.1 – 14.0 miles), whereas the average distance to the nearest off-reservation supermarket for those tribes without one on their land was 11.1 miles (range 0.4 – 44.4 miles). Although the distance to the nearest off-reservation supermarket was calculated from the tribe's headquarters, because it served as a consistent benchmark, the actual distance to the store from an individual's home could be considerably higher (lower) depending where on the reservation they lived and its overall size. Thus, many American Indians living on reservations may face long distances to supermarkets to buy foods required for the TFP. If they lack resources for such travel, they may instead choose to buy relatively less healthy and more costly items in convenience stores that are easily accessible to their home.

This report has a few noteworthy limitations. First, a telephone survey, a commercial database, and an in-person visit were used to identify on-reservation food stores. Even so, not every on-reservation food store may have been identified because reservation boundaries are often unclear. Second, among the stores visited, the checklist was not completed in three stores on three different reservations. Nevertheless, these stores appeared to have little in common, and their absence from the sample likely did not bias our results. Third, intra- or inter-rater reliability for the three staff members who conducted the checklist was not conducted because this was a small pilot study, which may have introduce measurement bias. However, this potential bias would be limited to the one large reservation in which the primary researcher was aided by the assistants. Fourth, several food sources were not assessed because they are transient in nature, including mobile or roadside vendors, or were purchased from fast food or family-style restaurants. Finally, off-reservation supermarkets were selected based on straight-line distances from tribal headquarters. However, these supermarkets may not be the closest for individual tribal members, nor were they necessarily the supermarkets where residents actually shopped. In the future, it would be helpful to survey tribal members on where they actually shop. In addition, it would be helpful to survey tribal communities outside of Washington State to determine if regional differences in store types and market basket cost and availability exist among American Indians in general, similar to recent data demonstrating substantial regional differences in healthy food availability even in the same store type (i.e., convenience stores) across four large urban regions (16).

Conclusions

American Indians living on reservations in Washington State may have limited access to foods comprising the TFP market basket, and access to such foods is thought to provide the basis for a minimally nutritious diet. Indeed, studies that have examined the relationship between store access and dietary intake find that better access to a supermarket or large

grocery store is associated with healthier food intakes (17, 18). Improving access to and affordability of low-cost, minimally nutritious foods may be one strategy to promote healthy eating behaviors and reverse health disparities among American Indians. These issues could be addressed through community-led efforts and policy changes, such as setting one standard price across the U.S. for the USDA TFP market basket.

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Table 1

Availability and cost of selected market basket[a] food items by food store type among 22 federally recognized American Indian tribes in Washington State.

	Convenience N = 24		Grocery N = 14		Supermarket N = 9	
Food Group: Item	**n (%) with Item**	**Mean Price[b]**	**n (%) with Item**	**Mean Price[b]**	**n (%) with Item**	**Mean Price[b]**
Fresh Fruits & Vegetables: Apples	7 (29)†	$1.69	6 (43)‡	$1.16	9 (100)	$1.09
Fresh Fruits & Vegetables: Oranges	6 (25)†	$2.07	7 (50)‡	$1.17	9 (100)	$0.81
Canned or Frozen Fruits / Vegetables: French Fries	10 (42)	$4.07	8 (57)	$3.68	9 (100)	$3.22
Breads, Cereals & Other Grains: White Bread	15 (63)	$1.99†	10 (71)	$2.20‡	9 (100)	$1.16
Dairy: Whole Milk	17 (71)	$4.18†	8 (57)	$3.91‡	9 (100)	$3.00
Meats & Protein: Eggs	18 (75)	$2.47	9 (64)	$2.03	8 (89)	$1.99
Fats & Oils: Margarine	10 (42)	$1.77	8 (57)	$1.84	8 (89)	$1.23
Sugars& Sweets: Granulated Sugar	12 (50)	$4.24†	11 (79)	$4.13‡	9 (100)	$3.04

[a] Based on the US Department of Agriculture Food Store Survey Instrument market basket;

[b] Price of suggested size in survey, using data collected April and May 2009.

Statistical differences between groups noted using the following symbols:

* convenience vs. grocery;

† convenience vs. supermarket; and,

‡ grocery vs. supermarket. Multiple comparisons were adjusted using the Bonferroni correction method; all statistical tests are significant at $P < 0.006$.

Table 2

Availability and cost of individual market basket[a] items by food group for on- vs. off-reservation supermarkets in 22 federally recognized American Indian tribes in Washington State.

	On-reservation (N = 9)			Off-reservation (N = 15)		
Food Group (total items in each food group)	**No.[b] (%)**	**Range**	**Cost[b]**	**No.[b] (%)**	**Range**	**Cost[b]**
Fresh Fruit and Vegetables (12)	11.2 (94)	9 – 12	$18.40	12.0 (100)	12 – 12	$18.43
Canned or Frozen Fruit and Vegetables (10)	9.0 (86)	5 – 10	$16.32	9.0 (90)	8 – 10	$15.96
Breads, Cereals and Other Grains (15)	12.7 (84)	6 – 15	$37.97	14.1 (94)	12 – 15	$36.40
Dairy (6)	5.6 (93)	4 – 6	$17.12	6.0 (100)	6 – 6	$17.57
Meat & Protein (12)	8.4 (71)	5 – 11	$30.23	10.2 (85)	8 – 11	$34.37
Fats and Oils (4)	3.6 (89)	1 – 4	$13.34	4 (100)	4 – 4	$13.39
Sugars and Sweets (9)	8.2 (91)	4 – 9	$24.98	8.8 (98)	8 – 9	$23.27
Total (68)	58.3 (86)	34 – 65	$158.36	64.1 (94)	61 – 66	$159.39

[a] Based on the US Department of Agriculture Food Store Survey Instrument market basket;

[b] Data presented as mean number (percentage) and mean cost, using data collected April and May 2009.

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