

Storekeeper perspectives on improving dietary intake in 12 rural remote western Alaska communities: the “Got Neqpiaq?” project

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ABSTRACT

Low intake of fruits and vegetables and high intake of sugar-sweetened beverages persists as a public health concern in rural remote Alaska Native (AN) communities. Conducting key informant interviews with 22 storekeepers in 12 communities in the Yukon-Kuskokwim region of Alaska, we explored potential factors impeding or facilitating dietary change towards healthier food choices. We selected these sites as part of a multi-level intervention aimed at introducing more traditional AN subsistence foods, increasing fruit and vegetable intake, and decreasing SSB consumption among young children enrolled in Head Start (preschool) programmes (Clinicaltrials.gov #NCT03601299). Storekeepers in these communities agreed that seasonality and flight schedules were primary factors determining commercial foods' availability. Several storekeepers noted that federal food assistance programmes that specify which food items may be purchased with funds received from the programme and community policies that set limits on less healthy items promote customer purchases of healthier products. The fact that storekeepers are comfortable enforcing government assistance programme guidelines, company policies, and tribal resolutions suggests an important role storekeepers play in improving nutritional intake in their communities.

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Rural remote Alaska Native (AN) communities have a unique food environment composed of hunted, fished and gathered subsistence foods traditionally prepared as well as commercial foods sold in local community stores. Research results support the protective effects of consuming traditional subsistence foods on diet quality and health [1–3]. Evidence on the impact of commercial foods in these AN communities is limited.


Most AN communities in these remote areas are located off the road system, posing tremendous challenges for the commercial food distribution system and leading to high food cost [4,5]. Commercial foods must be flown into communities in small planes lacking refrigeration. As a result, whole, fresh, and minimally processed foods may arrive at their final destination wilted, mouldy, or otherwise inedible. Foods that survive transit are usually highly processed and expensive, due to the cost of air shipment. Additionally, sugar sweetened beverages

(SSBs), including soda pop and powdered drinks, are especially popular with rural remote consumers, given their availability and long shelf life.

Availability of fruits, vegetables, and SSBs are important markers of diet quality. As early as 1988, health care providers, nutritionists, and public health professionals recommended people living in AN communities increase fruit and vegetable intake to healthier levels and decrease SSB consumption[6]. However, most dietary studies continue to document deficient fruit and vegetable intake and excessive SSB intake in these communities [7–12], linking SSB intake to obesity, dental caries, and other health conditions, which have become increasingly prevalent [1,7,10], even in young children [9,13–17].

The prevalence of childhood obesity is greater among American Indian and AN children than all other ethnic groups in the U.S.¹³[14], while one study noted AN and American Samoan children had the

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highest prevalence of obesity of all ethnic groups in the U.S. Pacific region[15], preschool age children in rural remote southwest Alaska communities specifically experience the highest prevalence of obesity in the state[16]. In addition to obesity, a 1991 publication reported 19% of the non-AN preschool children were presented with untreated decayed teeth, while the prevalence among AN preschool children was 66%[17]. The greatest prevalence of tooth decay among AN children in this age group was among children living in Alaska's southwest region. Recent studies indicate that these dental problems persist [9] and document the positive association between SSB intake and the extremely high incidence of dental caries requiring full-mouth reconstruction in preschoolers in rural remote southwest Alaska[10].

Given the critical role stores play in accessing fruits, vegetables, and SSBs, it is important to understand factors impeding or facilitating access to these foods and beverages. The goals of this study were to elicit storekeepers' perspectives on consumer food choices and inquire about access, specifically addressing availability, affordability, quality, quantity, and purchasing patterns for fresh, frozen, or canned produce. Similarly, we asked about beverages, including bottled water and SSBs. Storekeepers in these communities are primarily community members. Their perspective is not purely on the management level, but a unique blend of consumer, manager, and supplier, which could provide a broad view of barriers and facilitators to improve consumer food choices in these communities. We wanted to update and increase our understanding of why fruit and vegetable intake remains low and SSB consumption continues to be high despite years of recommended changes by health care providers, nutritionists, and public health professionals.

Materials and methods

The National Institute of Nursing Research and the National Institute of General Medical Sciences grant (R01NR015417) funded this Alaska Native Tribal Health Consortium (ANTHC) study, which the Alaska Area Institutional Review Board and Tribal Research Review Bodies at ANTHC and the Yukon–Kuskokwim Health Corporation approved. Additionally, each Tribal council granted the study team permission to conduct the study in their individual community. Researchers employed by ANTHC (responsible for statewide health services provided to AN people) partnered with the Rural Alaska Community Action Program, Inc., (RC) headquartered in Anchorage, Alaska and research staff located at the Yukon–Kuskokwim Health Corporation

(YKHC), which provides primary and secondary health care services in the Yukon-Kuskokwim (Y-K) region. The overall project is registered with Clinicaltrials.gov as NCT03601299. Co-investigators in an ongoing partner study funded through a U.S. Department of Agriculture National Institute of Food and Agriculture grant (2018–69001–27544) were invited to participate in the analysis of results, manuscript preparation, and results dissemination of this study.

This study will provide qualitative information needed to work with local stores, parents, community elders and members, and local Head Start programme staff in developing a large-scale multi-level intervention promoting healthy eating and physical activity habits in young children in these communities. Tribal leaders have requested researchers conduct studies that are community-based; participatory; respectful of AN people, communities, and culture and designed to improve AN health[18]. We used this formative study, in part, to meet the storekeepers, describe our overall plan for working within the community, and begin building rapport for working relationships with storekeepers as part of a community-based participatory research approach requested by Tribal leaders.

Setting

We conducted this study in the Y-K, Alaska region. Because of wide cultural, environmental, and geographical diversity between Alaska's regions, we confined our efforts to this one southwest Alaska region. Although the region is approximately the size of the U.S. state of Oregon, it is sparsely populated, with only about 22,000 mostly Alaskan Native people of Yup'ik origin. Of the 58 communities in the region, none are accessible by road from any outlying region, including the regional hub town of Bethel (pop. ~6,400). Ground transportation to communities beyond Bethel may exist by boat in the summer or in all-terrain vehicles in the winter when rivers freeze. Aside from these potential options, vast distances isolate communities with as few as 200 to 1,200 residents.

Twelve Y-K communities with Head Start programmes operated by RC agreed to participate in an intervention designed to improve diet quality for their preschool children. This study was part of a formative data collection for developing a multi-level family-based intervention to increase exposure of young children enrolled in Head Start programmes to healthy foods, including healthier store-bought foods and locally available subsistence (or "traditional") foods. Local tribal councils govern each community and most residents are of AN heritage. Each community has at

least one local store, with larger communities having two or three. We asked storekeepers about their experiences, ideas for change, and suggestions for how they might encourage community members, especially parents with young children, to make healthier food and beverage choices.

Community stores in the region are operated by several means. Some are community cooperatives affiliated with the Alaska Native Industries Cooperative Association (ANICA). Beginning shortly after the turn of the 20th century, the Bureau of Indian Affairs (BIA) delivered teachers and supplies to remote Alaska communities via ship [19]. These deliveries were limited to only the summer months when seas were navigable. During a period in the 1940s, shipments were interrupted by World War II. By this time, several non-native commercial products had become part of AN households. Formed by AN community leaders in 1947, the goal of the co-op was to supply AN stores in rural communities with commercial products independent of the BIA. Currently, company headquarters are in Seattle, WA.

Some stores are owned and operated by the Alaska Commercial Company (also referred to as AC Value Centers and locally as “the AC store”). AC stores have operated in rural remote Alaska communities under several organisations since 1867, the current one being owned by the North-West Company of Canada [20]. The remaining community stores are owned by a local tribal entity or are privately owned. All businesses in these communities fall under local tribal jurisdiction.

Population/recruitment

In each community, interviewers approached the store owner or manager about participating in a key informant interview. Many storekeepers in these communities are not only the primary suppliers of commercial foods, but consumers themselves with close family ties to other local community members. Interviewers were either study-trained or research personnel with previous interview experience who lived and/or worked in the Y-K region. All key informants verified they were either a store owner or manager and verbally agreed to a tape-recorded, in-person or phone interview that would not reveal personal information or identities. We have withheld the identities of these 12 communities in the interest of ensuring source confidentiality, which would not be possible with the small population size, especially if a community had only one store.

Data collection

Study investigators were interested in eliciting information in three main areas: inventory/supply decisions, fruit and vegetable availability/sales, and bottled water or other beverage availability/sales (see Supplemental Table). Study investigators scripted direct questions supplemented with prompts on paper forms. Questions included updates on information previously collected in other studies, primarily from local consumers and family members responsible for meal preparation in the home [4,6–8]. Community members indirectly contributed, as some questions and probes were derived from findings local consumers and family members responsible for meal preparation in the home provided in these earlier studies. Experienced interviewers among the study team conducted and taped all in-person interviews using two digital tape recorders; phone interviews used one recorder. With respect to the key informants’ time, investigators designed the interviews to take less than 60 minutes. Each key informant received a \$40 gift card at the conclusion of the interview. The study team uploaded digital recordings to a secure website managed by a professional transcription company and professional transcriptionists transcribed all interviews.

Analysis methods

Two researchers (KK and CF) individually reviewed each interview transcript, listening to the recordings to clarify transcripts as necessary. Using Microsoft Excel, each researcher independently created a brief summary of the responses for each question, then identified the key points emerging from each response using open coding. Once completed, the two researchers compared and contrasted their coding and upon reaching consensus, drafted a summative document of key points identified by multiple community storekeepers pertaining to the main areas explored. Unique points relevant to a specific community were noted separately to be considered in the intervention study plan and design.

Results

Interviewers conducted 22 interviews with storekeepers (11 in-person and 11 by phone) in 12 Y-K communities between September and December 2018. The average length of all the interviews was 26 minutes, ranging from 11.5 to 51.5 minutes. Phone interviews were slightly shorter (average 22.5 minutes) than in-person interviews (average 30.5 minutes), the latter of which

frequently involved the storekeeper walking store aisles with the interviewer, pointing out specific items.

Inventory/supply decisions

Storekeepers claimed primary responsibility for ordering and stocking store products. Many used guides, such as planograms (AC stores), shelf labels, and product sheets. Planograms appeared to be the most complex, with tracking of product sales monitored by AC corporate headquarters. While the AC storekeeper is responsible for orders, corporate management is responsible for filling orders of products that sell and deleting products from the planogram that do not sell. According to one AC storekeeper:

We have planograms that we follow per our corporate office ... Everything sells is like tracked ... we have a top 100 list, what's the best selling in our store and the bottom 100, what's the worst selling in our store ... some stuff will never come off of the list just because it's a grocery store and that's what we carry.

Storekeepers in the business for several years also relied on general knowledge of what did or did not sell in the community. AC and the ANICA co-op stores were limited to selections from catalogues provided by company vendors. Stores under private ownership or owned by the local Tribal corporation/entity were less restricted to specific vendors. Pacific Alaska Wholesale (PAW)[21], JB Gottstein[22], and "ANICA vendors" were the vendors most frequently cited, all three of which have warehouses or distribution centres located in Anchorage, Alaska. Two independent (privately- or tribal corporation-owned) community stores use additional vendors, such as Amazon (for hardware and non-food items) and Di Tomaso (for produce). While storekeepers assumed responsibility for store orders, the locus of control for businesses not independently owned fell to two main entities: Alaska Commercial Company and ANICA co-op boards of directors; each of these stores were managed by individuals hired by the company or selected by the co-op.

All storekeepers reportedly accepted requests for new or different products, some with more formal processes than others. The frequency of requests was highly variable between stores, from 3 times a week, to a couple times a month, to monthly. Most storekeepers were confident in their ability to meet requests, stating they encouraged requests, and described customer satisfaction as the basis for increasing profitability. In some stores, new items were only ordered if requested by more than one customer or if one customer was willing to purchase the entire minimum order

amount (e.g. a whole case). One storekeeper elaborated, "... if I know something that only a few people are going to use, I try to stick with only a case at a time. Other stuff that I'm not sure of, I'll try a case and if it sells good, I'll order more of it the next time". Additional constraints on placing new orders included store space or refrigeration limitations, perishability, catalogue limitations, and previous experience with saleability. Multiple storekeepers noted that community members were taking advantage of online free delivery services for food delivery and avoiding the local store completely.

Fruit and vegetable availability and sales

At least one store in every community sold fresh produce. In general, fresh produce sold well. However, food spoilage due to air shipping delays, primarily during winter months, was a challenge. Storekeepers reported profit losses of up to 50% due to food spoilage and the cost was assumed by the store and passed onto customers. One storekeeper lamented, "... there's times they come in ... too rotten from the travelling". Another stated, "You learn once it gets below a certain temperature outside, you learn not to even try getting certain items ... " While the majority of stores do not have trouble storing fresh produce, they order only enough to shelve when delivered and do not keep additional inventory.

Most stores sell frozen fruits and vegetables. In some locations, they reportedly sell faster than fresh. A few storekeepers mentioned that the WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) programme was an important reason to stock frozen foods: "Parents with kids that are on WIC, they do buy those". However, seasonality can be a limiting factor for frozen food purchases, "Right now, everybody's freezers are full with meat, fish and berries. They don't have any room to throw in any more frozen vegetables, frozen fruit". Storekeepers also reported that transportation can influence frozen product availability with half staling problems related to unpredictable air transportation. In summer months frozen foods can arrive thawed and need to be discarded.

All stores in the 12 communities carried canned fruits and vegetables and storekeepers reported no significant problems ordering, receiving, or storing the foods. Canned goods often sell better than frozen because they are less expensive. Storekeepers expressed concern that monitoring expiration dates and damaged cans is necessary, because customers ask about the safety of the product. Despite the damage to the cans and past-due dates, customers are willing to purchase

them at reduced prices. *"They (the previous generation) didn't have fresh produce and fresh vegetables. They came in a can. So that's what everybody grew up on. We have no problem selling canned vegetables, no problem selling canned fruits"*.

Among storekeepers who had been in business long term, the majority reported customers bought fruits and vegetables in any form more often now than five or 10 years ago. Some mentioned changes in supplemental food resources, such as WIC and SNAP (Supplemental Nutrition Assistance Program, formerly known as "food stamps") have played a role in what foods are available in the communities. Others observed *"[they sell] more because there's more variety"*.

Bottled water, other beverage availability, and sales

Most of the storekeepers interviewed carried bottled water, some with more brands, sizes, and flavours than others. According to storekeepers, sales varied from selling well to not selling at all. One storekeeper commented, *"It doesn't sell ... the majority of the people buying the bottled water is for infants"* while another stated *"It does good. I have to keep some in stock all the time"*. Several commented that tap water was just as good and cheaper: *"A whole case out there costs like \$40"*. Peak sales for most bottled water products occurred during school sports events and subsistence harvesting seasons. Others purchasing bottled water included teachers, out-of-towners, and workers living in quarters without piped water. The majority of storekeepers did not observe young kids drinking bottled water, but they mentioned their own children and/or grandchildren drank water at home. Of note, while schools and other larger facilities in the communities have piped water systems, not all private homes do.

All storekeepers carried various types of beverages, such as flavoured waters and juices in multiple categories. Storekeepers thought it's important to meet the WIC requirements and carry 100% fruit juice: *"Oh, we have to [carry it], because of WIC standards, we have to have those on stock. At least a variety of them, I think up to 100 on the shelf, so we have, we always have fruit juices"*. However, the juices in this category were more expensive, so *"Mainly, the WIC people buy those for their kids"* and another stated, *"That only goes when people use their WIC checks. Other than that, it does not sell"*.

Fruit-flavoured juices were popular and appealing to young children. One storekeeper related *"Like Capri Sun ... Yes, they sell, mostly children. They go fast, too"*. Another mentioned *"Those might be more popular than the 100% juices ..."* For older kids, sports drinks were

more popular and sold best in summer months and during sports seasons: *"... a lot of teenagers, yes ... Volleyball season, a lot of volleyball players were going in and getting Gatorade and yes, Powerade"*.

Powdered drinks were also popular, *"Kool-Aid and Tang, yes. They usually go. I think it's just like whole families buying them"*. Another concurred by listing the drinks sold in the store as *"Soda, Vitamin Water, the powdered Kool-Aid, powdered Tang"*. While flavoured additives, vitamin water, flavoured teas, and smoothies were available in several stores, they did not sell as well as soda/pop or the powdered drinks. Some storekeepers claimed price was a primary factor, while others felt it was because people bought what they were used to.

By far, the most well-stocked beverages in stores were sodas/pops. As one storekeeper put it, *"... Water, we can keep up with. Gatorade we can keep up with. Pop, we can't keep up with"*. When asked what people mostly drank, multiple storekeepers volunteered "soda" or "pop" as the beverage of choice. One storekeeper stated, *"... parents are role models for the children for drinking sodas, juice and that. They see it"*. Most storekeepers indicated that diet soda/pop was not a popular item. Alternative healthy drink options, such as teas and smoothies, are carried in stores, but reportedly do not sell well because they are more expensive.

Interviewers found energy drinks a contentious topic. Regarding an incident allegedly placed on social media, one storekeeper stated, *"there are people complaining that it was the store's fault because of their child had like the racing heart or whatever"*. Another storekeeper attested that *"The board let me quit ordering energy drinks, so that's been taken off..."*. Customers must go to the other store in town to purchase energy drinks in limited quantities. While almost all stores sell energy drinks, almost all have restrictions, the most common being age. Many community stores required the buyer to be 16 years or older (age 14 in one store and age 18 in another). According to one storekeeper *"Energy drink doesn't really have a written policy, but we know for the fact it's not really good for younger kids"*. Some stores also limited the quantity purchased per day by customer. At one store, the quantity restriction allowed the product to be sold to more than one buyer. For others, these limits protected customers' health, especially younger children, and also served to protect storeowners from liability. According to the majority of storekeepers, energy drinks are most popular with young adults.

Storekeeper ideas for encouraging healthier food/beverage choices

At the end of the interview, investigators asked storekeepers how they or their store can help parents and

families provide healthier alternatives. This question was met with a wide range of responses; however, two themes emerged as particularly salient. Storekeepers were aware of healthy options, but also knew these products were more expensive. Second, the storekeepers needed to satisfy their customer base and, in several cases, company management. According to one storekeeper "... everybody is going to buy, drink, and eat sugary fatty foods because it's cheap. And I don't see an end to it because the prices are not going to go down". Another was quoted saying, "Sales won't let me stop ordering soda. It's money. So I've got to go by what they say".

On a more hopeful note, storekeepers described ways they had promoted healthier products, including fruits and vegetables. AC storekeepers supported their company's Health Happy Initiative. One storekeeper claimed, "The AC stores did Health Happy Initiative last year and replaced some of our items with better items. The signage actually helped increase sales of the healthier products". Others recommended advertising the "healthier" products in-store and with flyers, offering discounts, distributing recipes on social media, or giving out recipes and in-store samples to customers.

Several storekeepers referred to WIC as a model programme. "The WIC programme is another programme that try and provide healthy foods for young kids. And that's a good programme". Several storekeepers were critical of "food stamps" (Supplemental Nutrition Assistance Program or SNAP), which provides customers with electronic benefit transfer (EBT) cards to purchase most foods available in the stores, including SSBs. One storekeeper expressed, "You want to have food stamps, you'd have to have certain food ... requirements for food stamps, like WIC requirements". Others felt it was not their place to advise customers about food choices. As one storekeeper stated, "I can't just ... say, 'you can't buy that it's not too good for you'. It's already on the floor and if they want to buy it they will buy it". Several storekeepers agreed that having policies in place assisted them in enforcing community sanctions; "... almost anything where you would tell a certain group of people that they can't buy, you get backlash from them ... we'll be the first ones that they attack ... especially on social media, but if you turn it around and put it into their courts, say "Well why don't you just pass a resolution".

Some storekeepers advocated subsistence practices. As one storekeeper stated "Because growing up, my parents, we hardly had store-bought ... it was mainly the subsistence gathering ... the greens, the berries ... And right now, I'm trying to introduce more of the subsistence greens into our families". While subsistence

hunting and gathering may reduce certain food purchases during summer and fall months, interviewers noted that SNAP recipients were able to purchase hunting and fishing equipment. This was not new to storekeepers; however, they did not see this in practice often. One storekeeper was adamant about working with Elders: "... before all of our Elders passed away, it would be good to learn what foods to eat ... wildly from around here because there's a lot ... we don't have the knowledge, but they do. [We] should be trying to learn to hand down to our kids because there's way more natural healthier stuff here for free than trying to buy it".

Discussion

Using key informant interviews with storekeepers to elicit their perspectives on the accessibility of healthy foods and beverages, and purchase patterns of local consumers in rural remote Y-K communities, we found that the main themes were very similar between communities. Storekeepers in the Y-K region stressed the importance of seasonality. While the 12 study communities have access to produce year-round, fresh produce quality is better during summer months when flights are more likely to arrive on schedule and decrease the likelihood of spoilage. In contrast, winter months are best for frozen produce because it is less likely to arrive thawed. Where a community falls in the flight path also contributes to the condition of the produce when it arrives. Those at the furthest destination of flights that included more than one stop were more likely to receive unattractive and unsellable produce. While changes to flight patterns may improve distribution, they are unlikely and all flights remain dependent upon weather conditions.

Even when fresh or frozen produce is available, many residents purchase canned fruits and vegetables. Storekeepers explained that canned products are especially preferred over frozen by those participating in subsistence practices during the summer and fall. Filled with fish and wild game, freezers are less likely to have sufficient space to store purchased frozen foods during these times. Considering the limited freezer space and the conditions in which some fresh or frozen produce may arrive, canned items are indeed an improvement and certainly adequate for meeting daily dietary recommendations. Given the role seasonality plays in fruit and vegetable access, storekeepers may benefit from rotating incentives for produce sales (fresh, frozen, or canned) based on seasonal availability.

While most stores carry a wide variety of beverages, soda/pop and sugar sweetened powdered drinks remain the most popular. Storekeepers agree that

healthy beverages should be promoted, but pleasing customers is the priority and none feels comfortable telling customers what they should or should not buy. However, purchasing policies that require healthy choices or limit unhealthy choices actually empower storekeepers with concrete actions they can enforce. For instance, the WIC programme requires stores to carry frozen and canned fruits and vegetables and 100% fruit juices. Those using the WIC supplement are limited to purchasing WIC-approved products. Another example is community policies limiting sales of energy drinks (e.g. 16 years or older, two cans per day). Several storekeepers expressed the need for SNAP benefits to include limits or guidelines for what can be purchased with this resource.

SNAP benefits do not place many restrictions or requirements on purchases. However, the federally funded SNAP-Ed programme administered by the State of Alaska provides nutrition education for low-income Alaskans. The program goal is to “improve the likelihood that persons eligible for SNAP will make healthy food choices within a limited budget and choose physically active lifestyles consistent with the current Dietary Guidelines for Americans and My Plate”[23]. Feedback from storekeepers points to the need for increased outreach, training, and culturally tailored education materials to equip stores and community members with guidance for making healthy food choices. Funding for SNAP educators to serve the Y-K communities can improve the delivery of this information.

Our finding that storekeepers can play an important role as agents of change in communities builds on information shared by researchers working in Alaska’s interior region [24]. Storekeepers in this region expressed concern about youth consumption of energy drinks and some stores in the region had sales restrictions in place. The authors acknowledged that while storeowners were interested in restricting energy drink sales to youth, they were operating a business and store profits were a major consideration. Collectively, these reported findings provide evidence that community-wide support of restrictive policies is needed for store owners to be successful. Storekeeper ideas to incentivise community members to make healthy food purchases portrays an interest in helping to improve nutritional intake and ultimately their overall health.

A new finding was the enthusiasm exhibited by storekeepers when asked for their ideas on promoting healthier food choices in their communities. Although they acknowledged customers purchase out of habit, which is why storekeepers were compelled to continue ordering specific products, they were eager to promote and incentivise healthy food choices. This readiness

suggests an important role for storekeepers in promoting healthy food choices such as fruits and vegetables and decreasing SSBs. Importantly, community support and policies would make promotion of healthier food items more acceptable to storekeepers and community members.

Various storekeepers remarked about the power and influence of social media in these AN communities. Energy drink concerns and subsequent restrictions were primarily the result of widespread community pressure expressed on social media. Storekeepers did not want their customers upset with them or have negative reviews shared on social media. At least one storekeeper suggested social media would be a good place to promote sales and distribute recipes and information about healthy food and beverage information.

This study has several strengths. Previous studies exploring accessibility and consumption of fruits and vegetables in rural Y-K communities were limited to examining dietary intake among community members with no delineation of roles in the community. This is the only known study that exclusively explores and reports concerns surrounding availability, affordability, quality, and quantity of foods and community purchasing patterns from rural remote community storekeeper’s perspectives in Alaska. Importantly, this study conducted interviews with storekeepers at each of the stores in all 12 communities (n = 22). While we cannot generalise our findings beyond these 12 communities, we can incorporate them into building, maintaining, and promoting nutrition programmes for young children in these communities. We suggest other communities consult their local storekeepers in gaining support as they plan and implement similar changes.

We recognise that our findings are specific to storekeepers’ perspectives. A limitation of this study is that half of the interviews were conducted via phone call, thus preventing interviewers from recording non-verbal behaviours or visualising the store size and layout. For this reason, we did not include observations recorded during the in-person interviews, which could introduce bias or influence interpretation of the transcripts. It is important to address the storekeepers’ concern over the decrease in subsistence knowledge and practices by supporting activities and education that promote continued traditional harvest practices. At the same time, it would be beneficial if storekeepers shared strategies and techniques for incentivising consumer purchases of healthy foods and bottled water, such as posting recipes, tabling samples, centrally locating the items closer to the cash register, or shelving items at eye-level. The perspectives of others in the supply chain are necessary for designing and implementing system-

wide changes to improve supply outcomes. Additional studies are needed to explore the perspectives of vendors, warehouse employees, airport employees managing food between flights, and airline pilots making the deliveries. Studies exploring the motivations and influences of advertising media and social media on customers' food choices will aid in understanding opportunities for promoting healthy foods.

In conclusion, storekeepers in rural Y-K Alaska communities acknowledge their role in acquiring healthy foods and beverages for their customers. They also realise important factors beyond their control that influence availability and cost of products (e.g. fresh or frozen produce). Primary among these factors are seasonality, geographic distance and location in flight schedules, and events that may interrupt flights (such as damage to airstrips, earthquakes, and disease outbreaks). Storekeepers also acknowledge the importance of learning about traditional food systems in the region and engaging in subsistence practices retaining traditional knowledge and maintain cultural ties to the land as well as improve nutritional intake. As community members and experts on local purchase patterns, storekeepers have a wealth of knowledge to contribute to setting community policies that promote sales of healthier food and beverage products. Storekeepers have demonstrated they are willing and able to fill the essential role of enforcing community and company policies on energy drink consumption and policies set by food assistance programmes. To continue to fulfil a role in promoting sales of healthier food and beverage options to customers, they must be empowered by community policies.

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References

- [1] Bersamin A, Luick BR, Ruppert E, et al. Diet quality among Yup'ik Eskimos living in rural communities is low: the Center for Alaska Native Health Research Pilot Study. *J Am Diet Assoc.* 2006;106(7):1055–1063.
- [2] Bersamin A, Zidenberg-Cherr S, Stern JS, et al. Nutrient intakes are associated with adherence to a traditional diet among Yupik Eskimos living in remote Alaska native communities: the CANHR study. *Int J Circumpolar Health.* 2007;66(1):62–70.
- [3] Bersamin A, Luick BR, King IB, et al. Westernizing diets influence fat intake, red blood cell fatty acid composition, and health in remote Alaskan Native communities in the center for Alaska Native health study. *J Am Diet Assoc.* 2008;108(2):266–273.
- [4] Meter K, Goldenberg MP. *Building food security in Alaska.* Commissioned by the Alaska Department of Health and Social Services, with collaboration from the Alaska Food Policy Council. Minneapolis, MN: Crossroads Resource Center. 2014.
- [5] Greenberg JA, Luick B, Alfred JM, et al. The Affordability of a Thrifty Food Plan-based Market Basket in the USA-affiliated Pacific Region. *Hawaii Journal of Health & Social Welfare.* 2020;79(7):217.
- [6] Nobmann ED, Byers T, Lanier AP, et al. The diet of Alaska Native adults: 1987–1988. *Am J Clin Nutr.* 1992;55(5):1024–1032.
- [7] Johnson JS, Nobmann ED, Asay E, et al. Dietary intake of Alaska Native people in two regions and implications for health: the Alaska Native Dietary and Subsistence Food Assessment Project. *Int J Circumpolar Health.* 2009;68(2):109–122.
- [8] Johnson J, Nobmann ED, Asay E. Factors related to fruit, vegetable and traditional food consumption which may affect health among Alaska Native People in Western Alaska. *Int J Circumpolar Health.* 2012;71(1):17345.
- [9] Chi DL. Reducing Alaska Native paediatric oral health disparities: a systematic review of oral health interventions and a case study on multilevel strategies to reduce sugar-sweetened beverage intake. *Int J Circumpolar Health.* 2013;72(1):21066.
- [10] Chi DL, Hopkins S, O'Brien D, et al. Association between added sugar intake and dental caries in Yup'ik children using a novel hair biomarker. *BMC Oral Health.* 2015;15(1):1–8.

- [11] Elwan D, Schweinitz P, Wojcicki JM. Beverage consumption in an Alaska Native village: a mixed-methods study of behaviour, attitudes and access. *Int J Circumpolar Health*. 2016;75(1):29905.
- [12] Hill CM, Paschall MJ, O'Brien DM, et al. Characterizing Vegetable and Fruit Intake in a Remote Alaska Native Community Using Reflection Spectroscopy and 24-Hour Recalls. *J Nutr Educ Behav*. 2021. DOI:10.1016/j.jneb.2021.02.002
- [13] Polhamus BDK, Mackintosh H, Smith B, et al. *Pediatric Nutrition Surveillance 2009 Report*. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. 2011.
- [14] Schell LM, Gallo MV. Overweight and obesity among North American Indian infants, children, and youth. *American Journal of Human Biology*. 2012;24(3):302–313.
- [15] Novotny R, Li F, Fialkowski MK, et al. Prevalence of obesity and acanthosis nigricans among young children in the children's healthy living program in the USA. *Affiliated Pacific. Medicine (Baltimore)*. 2016;95(37):37.
- [16] Boles M, Dent C, Fink K, et al. Obesity in K–7 Students—Anchorage, Alaska, 2003–04 to 2010–11 School Years. *MMWR Morb Mortal Wkly Rep*. 2013;62(21):426.
- [17] Jones D, Schlife C. An oral health survey of Head Start children in Alaska. In: *Arctic Medical Research*. 1991. Suppl: 659–661.
- [18] Cochran PA, Marshall CA, Garcia-Downing C, et al. Indigenous ways of knowing: implications for participatory research and community. *Am J Public Health*. 2008;98(1):22–27.
- [19] ANICA I. Alaska Native Industries Cooperative Association, About Us. <http://anicainc.com/?p=109>.
- [20] ACC. Alaska Commercial Co., Serving Alaska Since 1867 - About Us. <https://www.alaskacommercial.com/about-us>.
- [21] Wholesale PA. PAW - Home. <https://www.pacificalaska-wholesale.com/>.
- [22] Gottstein JB & Co. Alaskans Serving Alaskans - Our Mission. <https://jbgottstein.com/our-mission>.
- [23] State of Alaska Alaska Department of Health & Social Services. Supplemental Nutrition Program Education (SNAP-Ed). 2021; <http://dhss.alaska.gov/dpa/Pages/nutri/snap-ed.aspx>.
- [24] Wojcicki JM, De Schweinitz P. Store owners as potential agents of change: energy drinks in the interior of Alaska. *Int J Circumpolar Health*. 2017;76(1):1400362.