

Food sovereignty, health, and produce prescription programs: A case study in two rural tribal communities

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Abstract

Structural inequities contribute to food systems in which tribal communities in the U.S. are more likely to experience barriers to healthy food access, including financial barriers, lack of geographic proximity, or both. Food sovereignty movements improve food access by shifting power to local people to build food systems that support cultural, social, economic, and environmental needs. Finan-

cial incentive programs, including produce prescription programs, have emerged as a promising intervention to improve food access and support

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food sovereignty. This case study describes the implementation of two federally funded produce prescription programs (Produce Prescription Projects or PPR) under the U.S. Department of Agriculture (USDA) Gus Schumacher Nutrition Incentive Program (GusNIP) in two rural tribal communities: the Yukon Kuskokwim Delta region in Alaska, and the Navajo Nation, which spans parts of New Mexico, Arizona, and Utah. We illustrate how PPR can be tailored to accommodate local and diverse cultures, strengthen community power, and be uniquely suited for the challenges of increasing access to nutritious food in rural tribal communities. We also highlight recommendations and future areas of research that may be useful for other rural tribal communities implementing PPR.

Keywords

Food Sovereignty, Food Security, Food Access, Nutrition Assistance, Produce Prescription, Case Study, GusNIP, American Indian/Alaska Native, Financial Incentives, Fruits and Vegetables

Introduction

From 2001 to 2021, in each year at least 10% of U.S. households experienced food insecurity (USDA, 2021). Food insecurity occurs when households do not have or cannot acquire enough

food to meet their needs due to insufficient money or other resources for obtaining food (Berkowitz et al., 2018). Food insecurity rates are consistently higher for rural households, households with children, and households with low incomes (i.e., incomes below 185% of the federal poverty threshold) (Coleman-Jensen et al., 2021). Due to the COVID-19 pandemic, rates of food insecurity are estimated to have risen to nearly 42% for households with children and 30% for households without children (Schanzenbach & Pitts, 2020).

While the USDA reports on variations in food insecurity rates among different racial and ethnic groups, there is no regular federal reporting of food insecurity among American Indian or Alaska Native (AI/AN) populations (Jernigan, Wetherill et al., 2017). A study conducted in Oklahoma, New Mexico, and Montana determined that between 2000 and 2010, 25% of AI households remained consistently food insecure and were twice as likely to be food insecure than their white counterparts (Jernigan, Wetherill et al., 2017). Studies in specific AI communities have found even starker rates: for example, 40% of families surveyed ($N=432$) on the Pine Ridge Reservation in South Dakota and approximately 77% of those surveyed ($N=276$) on

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Navajo Nation screened positive for food insecurity, the highest reported prevalence rate in the U.S. (Bauer et al., 2012; Pardilla et al., 2014).

Many AI/AN populations live in tribal areas that are classified as rural and which face structural inequities that exacerbate barriers to accessing healthy food when compared to other communities (Jernigan, Huyser et al., 2017; Kaufman et al., 2014). For example, a study demonstrated that 26% of all tribal area populations were one mile or less from a supermarket,¹ compared with 59% of the U.S. population (Kaufman et al., 2014). A number of studies across urban, rural, and reservation AI/AN communities suggest structural and environmental barriers to obtaining and consuming fruits and vegetables (FVs), including limited availability and higher cost of fresh produce and lower redemption rates for federal nutrition programs, such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (Jernigan, Huyser et al., 2017). The Federal Distribution Program on Indian Reservations (FDPIR), a federal nutrition program, has attempted to better support AI/AN food security through the distribution of government supplied food, but it has historically provided foods relatively low in nutrient value and cultural appropriateness (Byker Shanks et al., 2016; Mucioki et al., 2018).

The U.S. has dismantled Indigenous food systems through seizure and privatization of traditional Indigenous lands, forced displacement of Indigenous peoples from ancestral homelands to reservations, and has imposed other economic, political, and environmental disruptions. These have resulted in disparities in food security, chronic disease rates, and dietary intake that persist today (Basiotis et al., 1999; Compher, 2006). There is a well-established relationship between food insecurity and chronic disease among adults in the U.S.

(Gregory & Coleman-Jensen, 2017; Jernigan, Huyser et al., 2017; Morales & Berkowitz, 2016). With the disproportionate rates of food insecurity experienced by AI/AN communities, it is unsurprising that these communities experience significant health disparities compared to their non-Hispanic white counterparts, particularly higher rates of cardiovascular disease, obesity, type 2 diabetes, and metabolic syndrome (Hutchinson & Shin, 2014). COVID-19 incidence among AI/AN populations—3.5 times higher when compared to white Americans—exemplifies such disparities and is hypothesized to reflect structural inequities that facilitate community transmission (e.g., crowded living conditions, reliance on shared transportation, limited access to running water) (Hatcher et al., 2020; Sequist, 2020).

Food sovereignty² movements across AI/AN communities have increased in recent years, helping to shift power back to local communities to restore Indigenous food systems, improve food security, and reduce diet and health disparities (Grey & Patel, 2015). Within AI/AN communities as well as elsewhere, financial incentive programs have emerged as a promising model that supports local organizations working to bolster access to FVs for individuals experiencing food insecurity. These organizations, including community-based organizations, healthcare providers, farmers markets, food pantries, grocers, and local governments, have piloted and tailored such programs to meet cultural, social, economic, and environmental needs of the local community and to support local food systems (Jones et al., 2020; Ridberg et al., 2019; Sundberg et al., 2020; Swartz, 2018). Many financial incentive programs are now supported by the U.S. Congress through the USDA's National Institute of Food and Agriculture (NIFA) Gus Schumacher Nutrition Incentive Program (GusNIP)

¹ In the U.S., low-income areas with limited access to nutrient-dense or healthy foods (e.g., fresh fruits and vegetables) are often referred to as 'food deserts.' The USDA Economic Research Service uses the term "low-income and low-access" to designate areas with limited access to healthy foods (Economic Research Service, 2021, para. 2).

² The National Congress of American Indians Tribal Food Sovereignty Advancement Initiative (TFSAI) defines food sovereignty as the right and ability of tribal nations and people to "freely develop and implement self-determined definitions of food sovereignty; cultivate, access, and secure nutritious, culturally essential food produced through ecologically sound and sustainable methods; and design and maintain food systems and enact policies that advance tribal priorities for ensuring that tribal citizens have the sustenance they need to thrive physically, mentally, socially, and culturally not just today, but for the generations to come" (National Congress of American Indians, n.d., para. 3).

(Agriculture Improvement Act, 2018) which funds produce prescription projects or PPRs. Although they vary greatly in design and implementation, a typical PPR consists of a healthcare provider identifying eligible patients by a diagnosed diet-related health condition (e.g., type 2 diabetes), a qualifying income level, and/or a positive screen for food insecurity. The healthcare provider then offers a “prescription” in the form of vouchers, loyalty cards, tokens, or coupons for the purchase of FVs from participating food retailers. To support long-term dietary change, programs often last 4–6 months, and participants receive monthly allotments (valued US\$20–80) which are coupled with nutrition education resources and/or classes. PPRs are now being implemented at local, regional, and statewide levels and on tribal lands, providing a widespread platform to demonstrate the impact and raise awareness of the model. GusNIP program goals include improving dietary health through the increased purchase and consumption of FVs, reducing individual and household food insecurity, and reducing healthcare use and associated costs (USDA, 2019).

Despite current federal support and the program guidelines outlined by USDA NIFA, it is important to note that GusNIP programs, including PPR, are competitive, grant-funded programs that leverage, but are distinctly separate from, other USDA nutrition assistance programs, most notably FDPIR and the Supplemental Nutrition Assistance Program (SNAP). This may be a particularly valuable distinction for implementation in rural tribal communities, as some food sovereignty experts have concluded that federal nutrition assistance programs contribute to historical and present-day colonization by imposing western diets on Native peoples and a system of dependency that directly undermines food sovereignty efforts (Hawk et al., 2015).

This case study examines the experiences of two 2019 GusNIP PPR grantees from rural tribal communities, in the Yukon-Kuskokwim Delta

region of Alaska and the in Navajo Nation, which spans New Mexico, Arizona, and Utah. Learning from the experiences of these two grantees, we explore how PPRs can be tailored to accommodate diverse cultures, strengthen community power, and ultimately increase access to and consumption of FVs in rural tribal communities. We also highlight recommendations and future areas of research that may be useful for other rural tribal communities implementing PPR.

Methods

Using a case study approach, we used observational data collected during annual site visits (2020), project narratives, notes, peer-reviewed literature, and website reviews (Crowe et al., 2011). We triangulated and member-checked our case study descriptions by conducting multiple video conference calls (August–December 2020) with program directors (Shin, Jones Chung) from the two GusNIP-funded projects highlighted in this paper. Multiple co-authors serve as program directors or staff for the Navajo Fruit and Vegetable Prescription (Navajo FVRx) Program (Shin, George, Thomas) and the Yukon-Kuskokwim Health Corporation (YKHC)’s Prescription Produce Program (Jones Chung, Lowe), thus ensuring trustworthiness (i.e., validity) of descriptions, reflections, and recommendations (Crowe et al., 2011). We did not conduct interviews or collect any other data from PPR beneficiaries or other collaborators; therefore, this case study was not considered human subjects research³. This manuscript was approved by the YKHC Human Studies Committee and the Navajo Nation Human Research Review Board (NNHRRB).

Case Study 1: The Yukon-Kuskokwim Health Corporation Prescription Produce Program in Bethel, Alaska

Overview

The PPR developed by the Yukon-Kuskokwim Health Corporation (YKHC) in Bethel, Alaska, is

³ The human subjects data collected in this project (not reported herein) for YKHC Prescription Produce Grant Evaluation is approved by YKHC Human Studies Committee #20.06.04 and Alaska Area Institutional Review Board #1577682. The human subjects data collected in this project (not reported herein) for Navajo FVRx Program is approved by the Navajo Nation Human Research Review Board (NNHRRB) #NNP-21.707.

the first GusNIP PPR to be implemented in a remote tribal community in a subarctic region of the U.S. YKHC is one of 12 tribal healthcare delivery systems in Alaska, serving 58 remote villages and over 23,000 individuals through the main Yukon-Kuskokwim (YK) Delta Regional Hospital in Bethel, as well as five subregional clinics and 41 village clinics located throughout the 75,000-square mile area (YKHC, 2018a). Average poverty and SNAP utilization rates (31% and 43%, respectively) are extremely high across the three areas (Kusilvak, Bethel, and Yukon-Koyukuk) serviced by YKHC (Food Research & Action Center & Ohri-Vachaspati, 2019; U.S. Census Bureau, 2021). Store-bought food items, especially fresh FVs, cost much more than the same foods in the lower 48 states (Greenberg et al., 2020). A 2018 report by the First Nations Development Institute found that a hypothetical ‘food basket’ containing milk, bread, eggs, chicken, ground beef, apples, tomatoes, regular coffee and decaffeinated coffee cost US\$59.12 in Alaska, and the national average cost is US\$23.28. AI/AN residents, who make up 82% of the population served by YKHC (U.S. Census Bureau, 2021), are at higher risk for chronic diseases, such as type 2 diabetes, compared to non-Hispanic white Americans (Espey et al., 2014). The high cost of food, persistent poverty, high rates of chronic disease, little to no commercial food production in the area, and overall low food access underscore the important role a PPR can serve for the region’s AN residents. The aim of the YKHC PPR is to simultaneously reduce the costs of FVs and incentivize primary and preventive care visits, thus improving dietary quality and clinical outcomes (e.g., HbA1c), reducing food insecurity, and improving healthcare utilization and costs.

Since 2019, the YKHC Diabetes Prevention and Control (DP&C) department has enrolled approximately 150 patients with a diagnosis of pre-diabetes, diabetes, and/or gestational diabetes and with Medicaid insurance. Participants receive three one-month prescription vouchers at a time, each redeemable for up to US\$45 worth of fresh, frozen, or canned FVs that do not have added salt or sugar. Participants can receive up to 24 vouchers over the length of the program, worth US\$1,080 toward the purchase of FVs over two years. FV

vouchers can be redeemed in nine participating village grocery stores and through direct-delivery produce boxes from a farm in Bethel. In addition to the PPR, participants receive culturally appropriate recipes utilizing fresh, canned, or frozen FVs, as well as online cooking demonstrations. YKHC’s PPR serves individuals from eight communities in the Yukon-Kuskokwim service area (Figure 1) (Yukon-Kuskokwim Health Corporation, 2016).

Considerations for Program Implementation

The remoteness, extreme weather and severe growing environment, traditional foodways, and the Indian Health System (IHS)-operated healthcare delivery system present unique considerations for the implementation and success of YKHC’s PPR. The YK Delta is a vast river delta, rivaled in size only by the Mississippi Delta region, and surrounded by wetlands and tundra, where the Yukon and Kuskokwim rivers empty westward into the Bering Sea (YKHC, 2018a). The YK Delta and surrounding ecosystem provide an abundant supply of protein-rich subsistence foods throughout the year, including salmon, halibut, herring, whitefish, crabs, oysters, beluga, seal, caribou, muskox, moose, and geese (U.S. Fish & Wildlife Service, 2021). There is no official road system (thus, the area is referred to as “Bush”), but when the YK river freezes in winter months, residents use snow machines or automobiles to travel a plowed “ice road” up to 350 miles to travel between villages; road length fluctuates based on seasonal temperatures and weather patterns (Shallenberger, 2020). In the summer months, barges bring nonperishable staples to the region; however, most food available for purchase is flown in by airplane from Anchorage, 400 miles away, or the lower 48 states. Subsistence foods (also called “traditional,” “country,” or “wild foods”) contribute up to 50% of average daily calories for many AN residents and are essential to preserving traditional foodways and enhancing food sovereignty (Walch et al., 2018). However, limited access to transportation, logistical complications, limited agricultural production, and overall high cost of living generate unusually high food costs, which threaten residents’ food security, dietary adequacy and diversity, and overall health.

Unique Challenges for FV Access

While challenges to FV access related to weather are commonplace in Arctic regions, a few unique barriers inherent to this setting are worth considering when implementing a PPR. As Bethel and surrounding villages are Bush villages, perishable food must be flown in by plane. Unpredictable weather creates a backlog of freight. As passenger planes serve dual purposes of transporting passengers and freight, space for perishable foods is limited. Space reserved for medications, medical products, and U.S. Postal Service Priority Mail is also prioritized over food. Upon delivery to villages, food is stored in non-climate-controlled warehouses or offloaded directly on a gravel runway, for those villages that do not have an airport, and thus is subject to freezing in winter and spoiling in summer. Finally, because food suppliers set minimum purchasing requirements, retailers in villages risk product expi-

ration and money loss if the perishable products they order are not sold, which can deter further procurement of foods like FVs. These obstacles, combined with overall high shipping costs, severely limit the quality and quantity of fresh FVs in Bethel and surrounding villages.

Climate change presents another unique challenge to FV access in the YK Delta region, which has seen an average winter temperature increase of 6° F. over the past 60 years (Chapin et al., 2014). One deleterious effect is that the river that serves as an ice road in colder months has not frozen consistently in recent years (A. Jones Chung, personal communication, March 9, 2020), making it difficult to predict when travel is safe and subsequently impeding the food supply to remote villages along the river. On the other hand, warmer overall temperatures have also extended the growing season for produce:

Figure 1. Yukon-Kuskokwim Health Corporation (YKHC) Service Area



The long-term average temperature for Bethel for an entire year had been 29 degrees, but in 2014 it was nearly 35 degrees ... It's significant because now it's right above freezing, which allows more things to grow outside. (Eaton, 2015, para. 11)

Unique Challenges for Program Delivery

As with FV access barriers, challenges related to program delivery are persistent and difficult to overcome. Even when the river is frozen, snow drifts can render the ice roads impassable and create barriers to in-person program recruitment, enrollment, education and outreach. Online education forums are generally not feasible due to limited internet connectivity. Before the onset of COVID-19, patients could attend video teleconferences at their local health clinic if they could not attend educational classes in person. YKHC's PPR Program Director explained, "Access is one of the largest issues we face. Whether it's trying to physically get to a community or connecting with participants from afar, we face many challenges when it comes to connecting with and providing services to our participants" (A. Jones Chung, personal communication, March 9, 2021).

Challenges Due to the COVID-19 Pandemic

The onset of the COVID-19 pandemic in March-April 2020 dramatically reduced food access and PPR delivery in the YK Delta region, compounding food insecurity and underscoring the need for continued support of PPR. The urgency of preventing widescale COVID-19 transmission necessitated cancelling all in-person nutrition education activities in clinics, especially activities catering to patients immunocompromised or with chronic diseases. PPR enrollment was hindered by community stay-at-home orders: potential participants were unable to sign program enrollment paperwork in the clinics and unable to access mail regularly, sign enrollment forms, and retrieve produce boxes. State-wide travel restrictions led to the bankruptcy of the main freight and mail airline serving the region, further restricting the supply of food, and especially FVs and other perishable items to Bethel and surrounding villages (Treinen, 2020). For several months, retailers were unable to stock their

usual quantity and variety of FVs. Other airlines eventually took over the mail and freight services and even increased their own plane fleets to fill the gap left by the bankruptcy; however, food shipment services remained slower than usual for several months.

With emerging coronavirus variants, education and telehealth appointments are still conducted over telephone or video chat, but are sporadic because of regional connectivity issues. In-person clinical visits have been restricted to reduce stress on the healthcare system and potential COVID-19 exposure. For example, HbA1c blood tests, which measure average blood sugar over three months, are now measured instead every six months for patients with diabetes.

Unique Opportunities for FV Access

In the U.S., PPRs have traditionally focused on farm-direct settings serving as primary redemption sites (e.g., farmers markets, farm stands, mobile markets) and qualifying FVs have been limited to fresh and/or local produce. Barring the innate complexities of supplying fresh FVs to areas such as the YK Delta, the flexibility of the YKHC PPR allows for unique opportunities and facilitators to emerge. First, prescriptions can be redeemed for canned and frozen FVs with no added sugar, salt, or fat, allowing participation in the most remote areas by village stores that may not have the ability to stock fresh FVs. The DP&C has partnered with a food wholesaler that distributes to some of the village grocery stores to supply a greater variety of canned and frozen FVs.

Second, DP&C has partnered with Meyers Farm, a farm in Bethel, that delivers produce boxes year-round to participants in 47 communities throughout the YK Delta. DP&C covers both shipping and produce expenses so that there is no cost to PPR participants. Meyers Farm uses innovative and sustainable farming practices to grow produce not otherwise available to residents (e.g., strawberries, zucchini, carrots, tomatoes, potatoes, broccoli, winter squash). The family-operated farm grows produce two to three feet above the permafrost in virgin tundra. The long hours of sunlight in the summer (in the middle of June, sunlight peaks at 21.5 hours per day) heats the ground and contrib-

utes to faster growing speeds (Kloosterman, 2019). In the cooler months, high tunnels (i.e., hoop houses) extend the growing season. The greatest innovation for extending the freshness of Meyers Farm's produce may be the farm's homebuilt root cellar, located in the permafrost (Figure 2). The interior temperature of the storage bunker consistently stays at 34°F, extending the storage time of produce (a typical refrigerator temperature is 40°F).

Unique Opportunities for Program Delivery

Housed in an IHS facility, the YKHC PPR is committed to cultural appropriateness, integrity, support, and respect for AN ways of life. The Board of Directors, the main policy-making body of the healthcare system, is elected by the community members within each of the 58 federally recognized Tribes in the YKHC service area, and consists of tribal community leaders and members who are also users of the healthcare system (YKHC,

2018b). YKHC's vision—"Through Native self-determination and culturally relevant health systems, we strive to be the healthiest people"—embodies an ethos of Native cultural preservation and food sovereignty. This vision is woven into day-to-day operations of the DP&C department and is a foundational aspect of PPR activities. To further exemplify the commitment of the PPR to cultural appropriateness, recipe cards provided to program participants encourage the use of subsistence foods with FVs and include modified versions of traditional recipes. For example, current recipe cards include moose soup, muskox burgers, salmon chowder, berry water, and salmon fried rice (Figure 3). Cooking classes and online instructional videos reinforce utilization of subsistence foods and FVs, in efforts to synergistically increase the consumption of both types of foods.

Another powerful asset of YKHC infrastructure is the use of satellite village clinics, telemedi-

Figure 2. Produce Storage Bunker at Meyers Farm



Figure 3. Salmon Fried Rice Recipe Card



Salmon Fried Rice

Ingredients

- 1 Cup rice (brown rice is healthier option)
- 1 Can mixed vegetables
- 1 Tablespoon oil
- 2 Tablespoon soy sauce
- 1 Cup jarred or leftover baked salmon

Preparation:

1. Cook rice according to instructions on packaging.
2. In large frying pan heat oil over medium heat.
3. While pan is heating up, drain the can of vegetables and wash under water to remove excess added salt.
4. Add vegetables to frying pan and heat for 3-5 minutes.
5. Add Cooked rice, salmon, and soy sauce.
6. Continue cooking for 5-10 minutes.

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icine, and community health aides (CHAs) in each village, which range from 50 to 1250 residents, where the bulk of medical care is provided. CHAs, most of whom are residents, are referred to as the “eyes and ears” of the remote health system and must have a high school education and complete numerous trainings and certifications. CHAs communicate with other YKHC healthcare providers via telemedicine, telephone, and detailed electronic health records (EHRs). For example, an EHR can be edited by the CHA at the village clinic and viewed at YKHC headquarters in Bethel in real time to foster continuity of care. CHAs have deep contextual knowledge of cultural nuances in villages, likely knowing or related to the people they treat. In addition, CHAs already provide chronic disease prevention and health promotion, so PPR implementation can be integrated into the existing workflow. All YKHC satellite clinics use a single EHR system, Cerner, so PPR referrals, clinical markers, and healthcare utilization data can be eas-

ily extracted for impact evaluation. Because DP&C is responsible for diabetes outreach education and preventive services, DP&C providers can verify patient eligibility (diagnosis of diabetes, pre-diabetic, or gestational diabetes; use of Medicaid) in Cerner to recruit program participants, which enhances program reach.

Case Study 2: The Navajo Fruit and Vegetable Prescription (FVRx) Program in Navajo Nation

Overview

The rate of food insecurity among Navajo households is among the highest reported in the U.S., and is linked to high unemployment, geographic isolation, and sparsity of grocery stores (Mullany et al., 2013; Pardilla et al., 2014). Long-standing policies, including military destruction of local Native food sources, military and industrial pollution of water and land, and diversion of water sources,

have undermined traditional agricultural practices (Centers for Disease Control and Prevention, 2020). Vast area and limited infrastructure (78% of public roads are unpaved) pose formidable barriers to food access (Pardilla et al., 2014). Navajo Nation is the largest reservation in the U.S. but has only 13 grocery stores (Mullany et al., 2013). It is common for Navajo residents to drive 400 miles round-trip to buy food (Diné Policy Institute, 2014).

These constraints result in greater reliance on affordable, energy-dense, nutrient-poor foods with longer shelf lives and contribute to severe rates of obesity, type 2 diabetes, and cardiovascular disease (Gittelsohn et al., 2013; Pardilla et al., 2014; U.S. Census Bureau, 2019). Compared to 10.5% of the U.S. adult population, one in five Navajo adults (approximately 25,000 individuals) has diabetes, and another 75,000 have pre-diabetes (CDC, 2020; Healthy Diné Nation Act of 2014). Consistent access to affordable healthy food is critical to addressing nutrition-related chronic disease (Gucciardi et al., 2014), particularly for Navajo youth, who are facing some of the highest rates of type 2 diabetes in the country (Dabelea et al., 2009). This is of particular salience as 50% of the population of Navajo Nation is under 29, and 20% are between 10 and 19, representing the largest age group (MacKenzie et al., 2019).

Community Outreach and Patient Engagement (COPE), a Native-controlled, community-based nonprofit organization, is a 2019 GusNIP PPR grantee that works with community partners to address food insecurity issues affecting Navajo residents. COPE identified PPR as a promising model because it could address three important community priorities:

1. Improve health outcomes among low-income Navajo families;
2. Directly stimulate Navajo food economies, especially through stores and growers;
3. Increase community-level food access by increasing healthy produce options at small stores.

Started in 2014 as the first PPR in a rural Native community, COPE partners with 15 healthcare facilities, two tribal health programs, one community-based health organization, five early child education centers, 26 food retail stores, and two farmers markets. COPE operates as a train-the-trainer model: COPE trains teams consisting of healthcare providers and support staff from participating healthcare facilities to implement programs tailored for the specific needs of the population served. Eligibility requirements vary per clinic site, but generally include expecting and pediatric patients at risk for or diagnosed with a chronic disease and/or who screen for household food insecurity. Participants are enrolled by healthcare providers and attend monthly health coaching sessions at the clinic, community center, at home, or virtually. Session attendance is required to receive FV paper vouchers of US\$1 per household member per day, with a maximum of US\$4/day per household. Vouchers are redeemed at participating food retailers for eligible FVs, including fresh FVs, frozen FVs without additives, and dried traditional FVs such as dried blue corn and chil chin berries (i.e., wild edible red berries from the sumac shrub). Program duration is six months for pediatric cohorts and nine months for maternal cohorts; however, some families may be enrolled for multiple cycles. Prior to completion of the Navajo FVRx program, all families are encouraged to enroll in other benefits such as WIC and SNAP if not already participating.

In developing the program, COPE built on existing formal agreements with Navajo Area IHS, approaching clinical sites to explore their interest in offering PPR to Navajo families and forming provider teams to implement the program. To date, COPE has recruited and trained 17 teams, expanding to include tribal health programs and home visitation programs. Wholesome Wave,⁴ a national organization founded by the late Gus Schumacher, the late Michael Batterberry, and Chef Michael Nischan that has been instrumental in the creation of GusNIP, provides technical assistance to COPE for program implementation.

⁴ Wholesome Wave is a U.S. nonprofit organization that employs partnership-based program models, such as financial incentive programs, to improve healthy food access and food choices among populations in underresourced communities throughout the U.S. (Wholesome Wave, n.d.).

Considerations for Program Implementation

The fact that Navajo Nation is the largest AI/AN reservation in the U.S. presents unique opportunities and challenges for COPE's PPR implementation. The reservation land base extends into three states (New Mexico, Arizona, and Utah) and covers approximately 27,000 square miles (Navajo Division of Health & Navajo Epidemiology Center, 2013). According to 2010 U.S. Census data, 332,129 residents identify as Navajo alone or in combination, with approximately 47% living within the Navajo Nation reservation (The Healthy Diné Nation Act of 2014, 2014). The land is sovereign to the Navajo people and is governed by a three-branch system with legislative representation from 110 chapters/communities that make up the Nation (Navajo Division of Health & Navajo Epidemiology Center, 2013).

In response to the public health threats faced by this community—food insecurity, a lack of healthy food access, and disproportionate rates of diet-related chronic disease—there has been momentum among leaders and community advocates to strengthen food systems, as well as a movement to promote health and wellness. COPE has received supporting resolutions from all five Agency Councils to increase healthy food and beverage access across Navajo Nation (Rajashekara, 2014).

Unique Challenges for FV Access

Several features of Navajo Nation and the COPE service area present challenges for FV access. First, due to the vast and primarily rural nature of this area, food stores are limited (Kumar et al., 2016). From 2012 to 2014, COPE and Navajo Community Health Representatives conducted qualitative and survey research to determine barriers to healthy food access and influences on food choices (Rajashekara, 2014). Findings revealed that most households traveled more than one hour to purchase groceries and more than a quarter of households made one shopping trip per month, due, in part, to the time and expense of travel to a grocery store (Rajashekara, 2014). Furthermore, over half of households indicated they were unable to access enough FVs, citing high costs and difficulty keeping produce fresh as major barriers (Eldridge et al., 2015).

A particular challenge to promoting healthy foods in Navajo Nation is overcoming the implications of colonization (e.g., forced removal from native lands, loss of access to traditional food acquisition practices) that have led to forced reliance on unhealthy, but affordable, foods (Jones et al., 2020; Kumar et al., 2016). This reliance on energy-dense, nutrient-poor foods has substantially contributed to disproportionately high rates of food insecurity in Native communities (Bauer et al., 2012; Jernigan, Huyser et al., 2017; Mullany et al., 2013).

A final challenge has been promoting local growers. While COPE highly values and has worked with several local producers, barriers in these efforts remain. Organizing farmers markets with produce supplied by local growers is complicated due to a myriad of geopolitical and environmental justice factors. Water access inequalities, pollution, and climate change cause shortened growing seasons, limited resources for growing (e.g., irrigation), and unpredictable yield (Belfer et al., 2017; Bray, 2021; Nania et al., 2014; Wilson et al., 2021). As a result, the incorporation of more local producers and farmers markets has been one of the weaker and slower aspects of COPE's PPR.

Unique Challenges for Program Delivery

Among the unique challenges for program delivery is many small stores lacking the capacity and/or systems to process electronic vouchers (e-vouchers). In keeping with the equity-based approach central to COPE's work, COPE does not want to give larger (or chain grocery) stores a competitive advantage over smaller stores simply because they have the technological infrastructure to process e-vouchers. To ensure equity and to support tribally owned stores, it is of great importance to COPE that smaller stores and the households who utilize them are equally, if not advantageously, supported. COPE therefore must balance the mission to give equal or enhanced opportunity to retailers who have lower capacity with the need to grow the program to include more retailers overall, with the latter program goal most easily achieved by onboarding large-scale retailers.

Although paper voucher systems can be efficient and can help ensure equitable program access,

they are cumbersome to track and process across various distribution, redemption, and reimbursement mechanisms. COPE is exploring incorporation of e-vouchers to receive and redeem incentive prescriptions, but limited internet connectivity and cell phone coverage across Navajo Nation compromises use and reliability of web-based platforms for PPR incentive delivery and redemption.

PPR Challenges Due to the COVID-19 Pandemic

As with the YKHC PPR, COPE adapted to provide safeguards to participants and staff during the pandemic. At the onset of COVID-19, 17 distinct programs were running concurrently across Navajo Nation. Prioritization was placed on providing FV vouchers to families most in need, as the PPR served as a buffer to food insecurity and provided families access to healthy foods. COPE also relaxed program protocols and allowed flexibility in delivery, extending program duration and eliminating voucher expiration dates, so that families had more opportunities to participate. Patient enrollment was conducted over the phone, in-person clinic visits were replaced with telehealth meetings via Zoom, and prescription vouchers were mailed to homes. COPE delivered FV boxes in lieu of in-person shopping at stores and developed COVID-19-related educational materials for store partners and participants. Drop-off destinations were coordinated with families, and multi-product care packages were disinfected and delivered.

School and early education center closures forced the interruption of voucher distribution to some families. Approximately 13 clinics delayed program enrollment and voucher distribution as healthcare providers were diverted to assist with COVID-19-related response efforts. Travel limitations due to reservation-wide curfews and social distancing protocols created delays in onboarding food retail sites. Delivering health education sessions was challenging, as most education and coaching transitioned to virtual formats. Other education materials were distributed to patients while they waited in vehicles for food box pick-up.

COPE reported that overall participant, clinic, and firm numbers temporarily decreased by half because of the pandemic.

Unique Opportunities for FV Access

Previous community need and asset assessments within Navajo Nation demonstrated a need for healthy food access within closer proximities (e.g., on reservation land); these assessments revealed that the need was greatest among COPE's priority subpopulations of pregnant mothers and children (Rajashekara, 2014; Sundberg et al., 2020). Furthermore, assessments demonstrated interest and willingness among small food retailers to expand their healthy food offerings to better align with community demand. In an Epi-AID⁵ report authored by the Navajo Nation and the CDC, 91% of store managers surveyed were interested in offering more healthy foods (Kumar et al., 2016). Prioritizing local food retailers as valuable assets in the Navajo food system can be profound drivers of positive change, because they are often the only convenient food source and are often community members themselves.

Another factor that facilitates the supply of more nutrient-dense foods in food stores on Navajo Nation is the Healthy Diné Nation Act. First authorized in 2014, this policy placed a 2% tax on non-nutrient-dense foods and beverages, such as sugar-sweetened beverages and convenience foods, and exempted tax for nutrient-dense foods, such as FVs, on Navajo Nation (Yazzie et al., 2020). Together, COPE's PPR and the Healthy Diné Nation Act provide synergistic support and increased capacity to existing food retailers to supply healthier foods and beverages in their stores.

Unique Opportunities for Program Delivery

COPE's infrastructure and strong partnerships are an asset for PPR delivery. COPE is closely connected with the community and healthcare and retail partners, having operated their PPR since 2014. Because ongoing and authentic community engagement is essential to their success, COPE formally elicits community feedback in a variety of

⁵ Epi-AIDs are investigations of urgent public health problems, such as infectious or non-communicable disease, unexplained illnesses, or natural or manmade disasters (Centers for Disease Control and Prevention, 2018).

ways. In 2014, COPE was awarded a competitive grant from the CDC, ‘Racial and Ethnic Approaches to Community Health (REACH),’ a national program that seeks to remove barriers related to the social determinants of health. COPE’s REACH Coalition is comprised of healthcare providers, tribal and IHS program directors, community advocates, local growers, and Navajo youth. Monthly REACH Coalition meetings are facilitated by COPE and the Diné Food Sovereignty Alliance with the objective of implementing cross-sectorial initiatives to strengthen food systems and promote health equity. In addition, the Navajo FVRx Provider Network was established in 2017, as COPE recognized the need to strengthen the network of regional collaborating PPR healthcare providers to support the ultimate goal of transferring ownership of the PPR to the providers themselves. COPE hosts Navajo FVRx Provider Network meetings quarterly that allow providers to share best practices, provide feedback on program modifications and evaluation findings, and receive regular program updates.

COPE’s long-term collaboration with Wholesome Wave has also contributed to their mutual success (Wholesome Wave, n.d.), together developing a provider manual for sites interested in implementing PPR, with specific requirements that include: a team of dedicated healthcare providers, including women’s health, pediatric, and health promotion specialists, to provide referrals, produce prescriptions, and track clinical outcomes; department or leadership approval to operate the program; a team charter agreement to follow through with the program for a minimum of one six- or nine-month program cycle; integration of traditional foods and cultural teachings into program designs; and commitment to initial and ongoing training with COPE. Although these requirements are robust, COPE provides sites with the autonomy and flexibility to design their specific programming, such as determining a priority population(s), eligibility criteria, recruitment and enrollment processes, and nutrition education opportunities.

Concurrent with the implementation of the first year of PPR in 2014, the Healthy Navajo Stores Initiative synergistically bolsters the success

and sustainability of PPR and other local food system efforts. Since few models existed for healthy store initiatives in rural tribal communities, COPE developed a Healthy Navajo Stores Toolkit, drawing from evidence-based programs across the U.S. but also adapting materials and approaches to local conditions. Since 2014, COPE has helped increase the stock and sales of FVs and traditional Navajo foods in 30 stores. COPE works with retailers (grocery stores, chain and independently owned convenience stores, trading posts, farmers markets) to make store improvements by researching distributors, making layout changes, training staff on produce handling and PPR redemption, and providing marketing materials (Figure 4). One trading post manager in Lukachukai, Arizona, explained, “The benefits of good health start here! When we put veggies out, they sell. My mom never gave us fruit, but it’s coming back with my generation. When we don’t have fruits and vegetables, people will ask, ‘When are you going to get more of those fruit bowls?’ I enjoy being part of this process. The motivation is here, and the drive is here.” The success of the Healthy Navajo Stores Initiative, combined with the PPR, provides a strong model of public-private partnerships that can be replicated across Navajo Nation and other rural tribal communities.

A unique strength of COPE’s PPR is its integration with the Resource and Patient Management System (RPMS) of the IHS, a decentralized, integrated electronic health record (EHR) for managing clinical and administrative information in tribal facilities (Indian Health Service, 2020). A strength of RPMS is its ability to tailor data to a particular clinical group; users can define a cohort (e.g., enrolled PPR participants at a particular site) and extract variables relevant for precisely that cohort. RPMS shares a single EHR across tribal healthcare facilities across Navajo Nation that enables widespread use of referral templates and data abstraction protocols. These shared workflows contribute to improved patient care and success of clinical-community partnerships, including the COPE PPR.

Discussion

This case study describes successes and challenges of implementing PPR in two rural tribal communi-

Figure 4. Produce Display with Signage at Teec Nos Pos Trading Post on Navajo Nation

ties, the Yukon-Kuskokwim Delta region in Alaska and Navajo Nation in New Mexico, Arizona, and Utah. These communities are disproportionately burdened by high rates of food insecurity and chronic disease, and are classified as low-income and low-food access areas, i.e., food deserts (USDA, 2020). While some experiences may be similar between communities, rural tribal communities are heterogeneous, with different needs depending on culture, geography, history, size, and resources. Nevertheless, general challenges are consistent across both programs, including lack of dependable or accessible transportation systems, fewer food retail sites and which span large geographical distances, increased costs of food procurement for retailers due to geographic distance, inadequate supply chain logistics to optimally store perishable food items in transit, and limited broadband (i.e., high-speed) internet that impacts telehealth opportunities.

Despite these obstacles, implementation of PPR in these two communities also offers unique opportunities, including local and cultural tailoring of program design, messaging, and education. Locally developed messaging can also

communicate pride of place, rather than communicate the stigma sometimes associated with a chronic disease or receiving federal benefits. Promoting traditional foods is also strategic in terms of providing opportunities for economic development for growers who are interested in generating income. In fact, beneficiaries of PPR efforts are three-fold; while patients and their households are the direct beneficiaries, the program provides economic support to participating stores and growers, and indirectly benefits the thousands of community members also served by local food retailers in remote communities.

Unlike federal nutrition assistance programs, PPR provides local programs the flexibility and adaptability to identify where “prescriptions” can be redeemed, thus promoting the local control aspect of food sovereignty. For example, these programs may accommodate small stores and trading posts as well as grocery stores, expanding options for participants. In addition, both PPRs were designed to encourage the use of traditional foods (Sundberg et al., 2020), an important departure from historical federal nutrition policies and interventions such as SNAP which were not

designed to support Native ecological, food, and agricultural practices, and have led to reliance on nontraditional foods and declines in dietary quality.

PPR implementation in healthcare settings can also be strategic for some rural tribal communities. Connections to healthcare providers expand the accountability of healthcare systems to addressing social needs. Health clinics may be among a limited number of sites through which a large proportion of the community can be reached. In addition, infrastructure for telehealth and telemedicine, already established in many rural communities, may be leveraged for the peer-to-peer or professional support and education that augments PPR, particularly when in-person appointments or educational sessions are unavailable. Both communities featured in this case study use a single EHR, which

may allow for continuity of care, effective communication between prescribing healthcare providers, and streamlined EHR data extraction for purposes of program evaluation. Best practices gleaned from these two programs are presented as recommended strategies for implementing PPR in rural tribal communities (Figure 5).

Because PPRs in rural tribal communities are relatively new (since 2014), research is needed to assess implementation strategies that help overcome structural barriers inherent on tribal lands to healthy food access. Such research could include employing recommended strategies outlined in this case study. Implementation research is needed in other rural tribal communities, as barriers and facilitators to program delivery and uptake will vary across

Figure 5. Recommendations for Produce Prescription Programs in Rural Tribal Communities

- *Engage community partners.* Gaining buy-in from community members, healthcare partners, and retailers is a significant component of facilitating an effective PPR. Rural tribal communities often have high levels of social cohesion, which can facilitate program delivery, community acceptance, and development of partnerships with individuals and organizations for PPR incentive issuance and redemption.
- *Actively promote food sovereignty.* PPR can be an opportunity to boost food sovereignty through increased availability and access to locally grown, culturally appropriate fruits and vegetables (FVs) that can be combined with traditional foods to create healthful meals. Emphasis on food sovereignty through local messaging may help to reduce stigma oftentimes associated with federal nutrition assistance programs.
- *Embrace creativity and flexibility in program implementation.* The digital divide in rural tribal areas creates challenges for PPR providers and food retailers. Flexibility and innovation with enrollment and implementation, incentive delivery (e.g., physical tokens rather than electronic), allowable purchases (e.g., frozen/canned/dried FV versus only fresh), educational opportunities, and auxiliary services (e.g., transportation assistance) are needed.
- *Utilize GusNIP funding to elevate unique or 'out of the box' PPRs.* GusNIP is an excellent entry point for nascent PPRs that do not have an urban infrastructure (e.g., rural, rural tribal) and for grantees that may have limited capacity (e.g., staff, space) and limited financial resources. Rural tribal grantees or prospective grantees can use GusNIP as an opportunity to test crucial facilitators (e.g., implementation strategies) that can ensure program success. For example, a PPR can test transportation opportunities (e.g., grocery delivery, food box delivery, ride share vouchers), locally tailored nutrition education, incorporation of traditional foodways, and community engagement.
- *Seek synergistic funding opportunities.* Rural and tribal-based programs may be able to establish funding from multiple federal and local agencies to synergistically support GusNIP activities. For example, CDC's Racial and Ethnic Approaches to Community Health (REACH) program funds grantees seeking to remove barriers related to social determinants of health, strengthen food systems, and promote health equity. Complementary funding opportunities may help provide the basis to launch, implement, and/or sustain a PPR.
- *Leverage the ability to collect electronic health records data.* Tribal-based programs, specifically those working with healthcare partners utilizing the Resource and Patient Management System (RPMS), are uniquely suited to establish the 'business case' for sustained federal funding (e.g., through Indian Health Service), as data on clinical metrics, healthcare utilization, and costs can be easily extracted.

regions and tribal populations. Qualitative research could assess barriers and facilitators in evaluating PRR in rural tribal communities, as many of the issues presented in this paper with regards to program delivery (e.g., connectivity and transportation barriers) will also affect the ability to conduct evaluation. Finally, research is needed to understand program impacts on food access, food behaviors, and health in rural tribal areas, as PPRs gain momentum across the U.S.

Federal food and agriculture policy has rippling health and economic effects on local communities. The 2018 Farm Bill received bipartisan support to expand funding to GusNIP programs, including PPRs. The rural tribal communities in this case study demonstrate how GusNIP grantees can implement PPR in partnership with local organizations to provide critical food resources to commu-

nities that lack access to healthy food, experience high rates of food insecurity, and strive to strengthen food sovereignty. Both cases developed local solutions to persistent food system issues based upon assets, challenges, and needs unique to the community. GusNIP offers tremendous potential to enhance autonomy by providing culturally appropriate resources that contribute to equitable food access across all communities. 

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