Health and Food Security in Western North Carolina: Summary and Recommendations

By

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Executive Summary

Food systems are complex and include several elements: food security and nutrition, livelihoods of food system workers, and environmental sustainability (OECD, 2021). While each of these elements may impact health and wellness, food security and nutrition are a persistent and well-studied area known to impact health outcomes across the lifespan.

Prior to 2023, Dogwood Health Trust (DHT), a charitable trust established in 2018 to serve Western North Carolina, responded generously to food-related needs through programming in the context of the coronavirus disease (COVID-19) pandemic. However, in 2023, the Health and Wellness Community Investment team at DHT identified four new funding priority areas – child welfare, maternal and child health, substance use recovery, and mental health – that did not explicitly include food system funding. The purpose of this recommendation statement is to describe the intersections between food security and the DHT Health and Wellness funding priority areas in order to support future funding decisions.

Using primary literature, secondary databases, and food system partner interviews, data were collected to better understand food security in health. The overarching finding was that programs to support food security will likely enhance all programs serving the DHT Health and Wellness priority areas. However, place-based data are lacking, and DHT should also support evaluative efforts that lead to better evidence-based decision making in and for the region. Primary literature overwhelmingly supports the relationship between food security and health, and in the wake of several policy changes that will exacerbate food insecurity in the coming months and years, DHT should consider ways of naming food system funding as a regional priority.

Background

Food Systems and Food Security

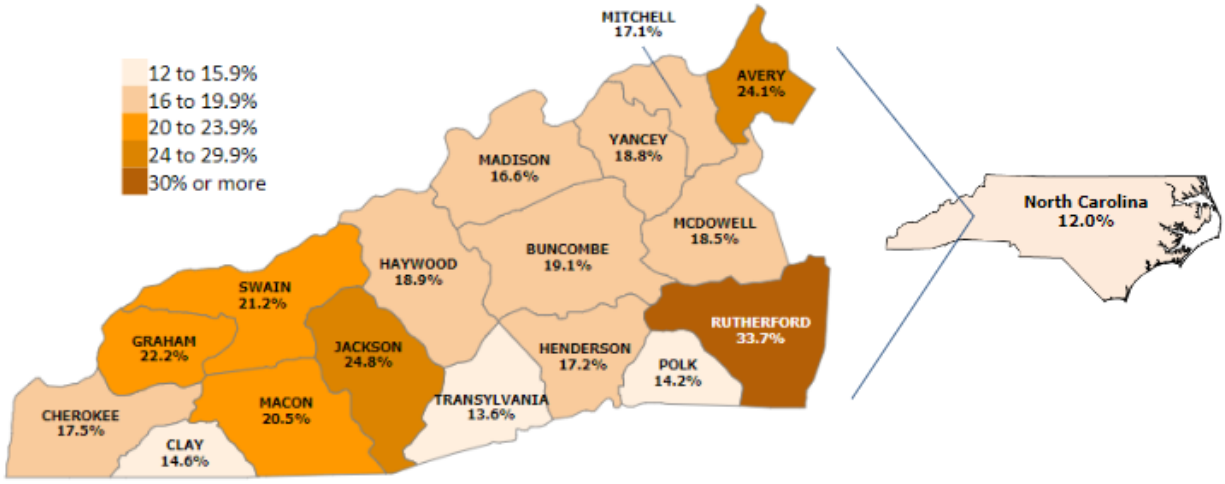
Food systems are broad and complex structures that include all steps of the food supply chain and the policies and cultural factors impacting these elements. Understanding of these systems requires profound exploration of three intersecting challenges: food security and nutrition, livelihoods of food system workers, and environmental sustainability (OECD, 2021). The United States Department of Agriculture (USDA) defines food insecurity "as the lack of consistent access to enough food for an active, healthy life" (*What Is Food Insecurity?*, 2023), and has been studied on global, national and regional scales (*Food Security in the U.S.*, 2023). In the United States (US), food security is defined to varying degrees (*USDA*, 2022), as summarized in Table 1.

Table 1. USDA Definitions of Food Security (*USDA*, 2022)

Level of Food Security		**Definition**
"Food Secure"	**Food Secure**	No indications of food access problems.
	Marginal Food Security	One or two reported indications of possible food insufficiency, typically anxiety over shortage of food.
"Food Insecure"	**Low Food Security** *(previously known as "Food Insecurity without Hunger")*	Reported reduction in food quality, variety or desirability with little or no indication of reduced intake.
	Very Low Food Security *(previously known as "Food Insecurity with Hunger")*	Multiple indications of disrupted eating patterns and reduced food intake.

The burden of reduced food security reaches worldwide where 2 billion people do not have reliable access to nutritious food (OECD, 2021). An estimated 14 million households in the US experienced low or very low food security in 2020 (Coleman-Jensen et al., 2020a). Concerningly, children in the US experience lower food security compared to the overall population, with annual low and very low food security levels in the overall population being 12.9% compared to 17.9% for children. In North Carolina, trends in low and very low food security are similar, where the prevalence of overall food insecurity in 2020 was 12.0% and in children 17.1% (*Map the Meal Gap*, 2023). Regionally, the 18 westernmost counties in North Carolina have slightly higher rates of low and very low food security (Figure 1), with 14.9% of the overall population considered food insecure, and 18.1% of children (*Map the Meal Gap*, 2023). In fact, child enrollment in free and reduced school lunch in these counties ranges from 49% in the most populous counties (Buncombe, Henderson) to 99% in Rutherford County (*Children Eligible for Free or Reduced Price Lunch: North Carolina*, 2023).

Figure 1. Prevalence of Food Insecurity is higher in Western North Carolina



In addition to higher levels of low and very low food security in children, disparities in food security exist according to race and ethnicity as well as in rural compared to urban counties (Hake et al., 2021). In 2019, approximately 8.1% of non-Hispanic white individuals lived in food insecure households (Coleman-Jensen et al., 2020b). The prevalence of reduced food security in Latino individuals was nearly two times that of non-Hispanic white individuals (15.8%), and in Native American individuals, nearly three times as high (23.5%) (Coleman-Jensen et al., 2020b). About a one in five (19.3%) non-Hispanic Black individuals lived in households with reduced food security (Coleman-Jensen et al., 2020b). While the proportion of people living in rural and urban counties experiencing low or very low food security has similarly oscillated between 2019 and 2021, rates have been persistently higher in rural communities compared to urban (14.4% in rural communities and 13.1% in urban communities in 2020) (Hake et al., 2021).

Western North Carolina, while mostly rural, encompasses urban Asheville in which the legacy of segregation and urban renewal still impact wealth and social determinants of health. Displacement of Black Ashevillians during urban renewal beginning in the 1970s destabilized Black wealth accumulation potential, contributing to economic inequities that persist in the city today. The region is also home to the Qualla Boundary, a small area of the ancestral territory of the Anikituwagi, also known as the Cherokee, and modern-day home of the Eastern Band of Cherokee Indians. The Eastern Band escaped forced removal from the region in the 1830s, and as a result is also affected by intergenerational trauma. In the more rural communities in Western North Carolina, data that are disaggregated by race and ethnicity are often not available, and when it is, it may be suppressed due to small numbers. All of this history along

with the lack of data indicate the special attention that must be given to racial, ethnic, and socioeconomic equity in any food systems-related transformation efforts.

Access to and consumption of food is ultimately a manifestation of structural food system inequities. As Klassen and Murphy (2020) state, variations in food security both "reflect and reinforce inequities." Black, Latino and Indigenous people are more likely to experience low or very low food security (Hake et al., 2021), which is rooted in structural racism (Singleton, 2022). Particularly in urban areas, neighborhood factors such as access to large food retailers, high density of convenience stores and limited availability of food and hunger relief services reflect the downstream impacts of historically racist policies such as redlining and disinvestments in neighborhoods (Singleton, 2022). Several factors continue to exist as impediments to creating more just and equitable food systems including housing, policing practices, and violence, and some of these factors are also linked to reduced food access (Singleton, 2022).

As with many systems worldwide, the delicate balance of food production, distribution, consumption and waste was aggravated by the onset of the coronavirus disease (COVID-19) pandemic that started in 2020, resulting in reduced access to food. In the early days of the pandemic, US households experienced a one-third increase in food insecurity, with 35% of those households classified as newly food insecure (Niles et al., 2020). The proportion of families reporting moderate to severe food insecurity similarly increased from 6% to 8% from March 2020 to June 2020, including 11% of parents reporting worsening food insecurity (Patrick et al., 2020). Due to swift responses from governmental and philanthropic organizations, nationwide food insecurity had decreased to 5.7% in the final month of 2020 (Coleman-Jensen

et al., 2020a). However, these data exclude the experience of households experiencing marginal food security, for which results of previous studies suggest the implications of reduced food access are more similar to low or very low food secure households, rather than those with high food security (Jt et al., 2013).

The COVID-19 pandemic also exposed the disproportionate impact of disease resulting from food inequities. Hundreds of millions of people across the US lost their livelihoods and access to basic human needs such as housing, sanitation and food. These impacts were more significant for individuals already disproportionately impacted by reduced food access (Klassen & Murphy, 2020). In the setting of the COVID-19 pandemic, the effect was increased hospitalizations and death from the virus for those most impacted by these changes in food access (Klassen & Murphy, 2020).

The health and wellness implications of insufficient access to food are far-reaching, with demonstrated impact on both physical and mental health issues. Reduced food access has broadly been linked to increased obesity (Tc & Es, 2007), depression (Reeder et al., 2022), cognitive dysfunction (Skalicky et al., 2006; Tamargo et al., 2021), and poor developmental trajectories in children (Jyoti et al., 2005; Rose-Jacobs et al., 2008). Indeed, mental health concerns such as anxiety may present as an indicator of reduced food security, as defined by the USDA (*USDA*, 2022). While data connecting Western North Carolinians' experience of low or very low food security to specific health outcomes are not publicly available, research from other areas and across the US suggest that the high and increasing regional rates of obesity and overall poor mental health (*WNC Data*, n.d.) may be influenced by access to food.

A Brief History of Food Systems and Inequities in Western North Carolina

Agriculture has been a significant part of Western North Carolina's food history, going back to its indigenous roots. The food systems of the Anikituwagi, also known as the Cherokee, the first inhabitants of the region, depended on hunting, gathering and growing food, with the primary form of grown food being squash, corn, and beans, often referred to as the Three Sisters (Mizell, 2014). Corn in particular, called selu, was the center of many ceremonies and festivals. By the time European colonizers arrived, these staple crops were grown in and around Cherokee settlements, supplemented by hunted and gathered food.

During ongoing colonization and the forced displacement of the Cherokee in the 1830s, agriculture was not a mainstay of the Western North Carolina economy (Inscoe, 1995). Due to the rugged terrain, substantial cash crop production in the region was not as efficient and lucrative for colonizers as in other parts of the state (Inscoe, 1995). In the antebellum area, business owners in the region were observed to "give only divided attention to farming" (Inscoe, 1995).

In more recent history, the Western North Carolina region of Appalachia became heavily reliant on burley tobacco production until its sharp decline in sales in the mid-1990s (C. Jackson & Perrett, 2018). As a result, a group of local farmers and citizens in the region launched a local food campaign in 2000 (C. Jackson & Perrett, 2018). This campaign and the macroeconomic factors around tobacco at the time ultimately resulted in the dramatic loss of farms in the region, but also ushered in the increased production of produce for local markets, including vegetables, melons, potatoes and sweet potatoes (C. Jackson & Perrett, 2018), products that still today remain relevant to Western North Carolina food systems. Indeed, the history of

agriculture and its contributors in Western North Carolina is rich and complex, and this description represents a very brief summary.

Relevance to Dogwood Health Trust

Dogwood Health Trust (DHT) is a charitable trust established in 2018 that exists to "dramatically improve the health and well-being of all people and communities in Western North Carolina." (*Frequently Asked Questions*, n.d.). As a new funding agency in the wake of the COVID-19 pandemic, DHT focused their funding on the immediate needs of the community including allocating many resources to projects and programs addressing decreased food security. In fact, since December 2020, the DHT Community Investment Team focused in Health and Wellness funded 24 grants related to food access, totaling $1.7 million (M. Gonzalez, personal communication, January 12, 2023).

As the pandemic eased and the DHT grew, four strategic priorities for community investments were identified: Housing, Education, Economic Opportunity, and Health and Wellness (*Strategic Priorities*, n.d.). Within the Health and Wellness strategic priority area, which has been the primary funding arm for food systems-related programs, four funding priority areas were identified for 2023: Child Welfare, Maternal and Child Health, Substance Use Recovery, and Mental Health; food systems were not explicitly named as a priority area. However, given the presumed bidirectional relationship between food access and each of these funding priority areas, food system funding is expected to continue in support of these priority areas.

The purpose of this recommendation statement is to clearly describe the intersections between food security and the DHT Health and Wellness funding priority areas to support future funding decisions. Notably, food security is deeply interconnected with the other DHT strategic priority areas – housing, education, and economic opportunity – however, to maintain focus, the scope of this statement will be limited to the DHT Health and Wellness funding priority areas.

Methods

Data were synthesized from three different sources to inform the recommendations for this statement: primary literature, secondary databases, and Western North Carolina regional food system partner interviews.

Primary literature

Literature searches were completed to identify primary literature sources describing the relationships between food security and each of the DHT Health and Wellness funding priority areas: child welfare, maternal and child health, substance use recovery, and mental health. The purpose of the literature searches was not to be a comprehensive literature review, but rather to understand the broad connections between food security and health and wellness. Literature search strategies are described in Appendix A.

Secondary Databases

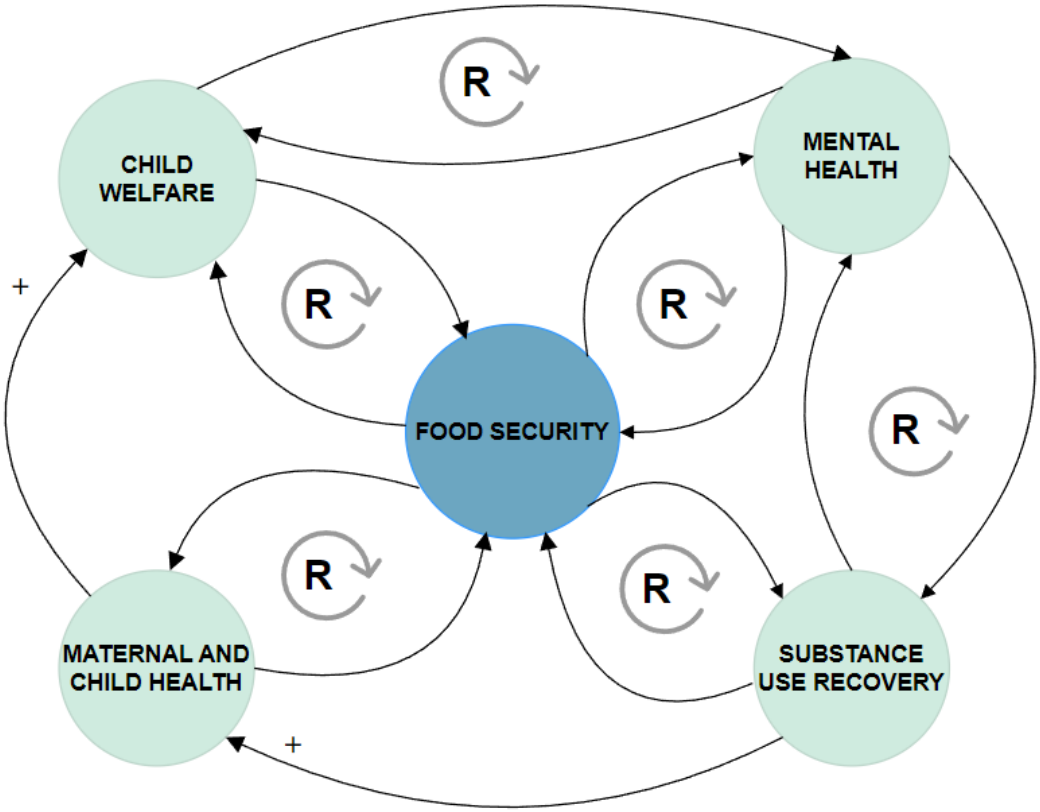
Several regional, secondary data sources have been compiled by food system partners. An in-depth review of these data sources was completed to better understand food security needs specific to Western North Carolina. The purpose of the secondary data analysis was to understand the levels and types of food security in the region and provide place-based context for the connections identified in the literature search.

Informal Partner Interviews

In order to provide additional depth and context to the primary and secondary data sources, several interested parties working within food systems were identified and interviewed. These parties were identified as a convenience sample of established DHT partners. Each partner group was interviewed for approximately one hour. Interviews were conversational in nature, with the goal of understanding the scale and scope of their work in the region and any of their perceived challenges and needs as an organization.

Food Security and Dogwood Health and Wellness Priority Areas

Figure 2. Causal Loop Diagram: Food Security and Health



General Findings and Recommendations

The body of literature described in the following sections does not illuminate the place-based context essential to addressing food systems transformation in Western North Carolina. DHT's importance in the region cannot be understated, as some community partners lamented the loss of other foundation funding given DHT's large presence in the region. Further, the unique history and likely different needs of each of the communities in Western North Carolina

requires place-based assessments to best develop the transformational systems changes that DHT seeks to support.

In addition to this local context, other, macroeconomic factors may soon drastically impact the status of food security for Western North Carolina residents. For example, inflation has impacted North Carolina more significantly than many other parts of the country (Payne, 2022), including a 13.5% increase in food costs since 2021 (*Annual Report 2021-22*, n.d.). COVID-19 relief programs geared toward food access support will end in March 2023 (*Extra Federal Food Benefits Due to COVID-19 Will End in March*, 2023). As described by one partner, Patrick Baron, PhD, MsPH, "More people are falling below the threshold [for government assistance programs] while programs are experiencing [budget] cuts." Consideration of the impact of these changes are necessary in funding decisions.

Considering food security from a variety of standpoints is essential to adequately addressing the regional needs. Against the backdrop of the COVID-19 pandemic, DHT has engaged more heavily in emergency assistance to food system organizations. As DHT establishes new strategic priorities to "drastically improve health and well-being" (*Frequently Asked Questions*, n.d.) in the region, interventions targeting upstream causes of reduced food access should be considered. These factors may include housing, economic support including living wages, increasing the reach of federal assistance programs such as the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) and the Supplemental Nutrition Assistance Program (SNAP), and addressing systemic racism. Appalachian residents themselves have even identified the multi-level factors influencing their dietary and nutritional

choices, including their individual knowledge and the influence of their communities, schools, policy and media (Swanson et al., 2013).

Recommendations:

1. Consider a "food in all policies" approach, in which food access is considered in most, if not all, funding decisions. Increased food security is likely to positively impact each of the funding priority areas.
2. Support a multi-level, multi-sector approach, including policy change, addressing existing food insecurity and reducing risk of experiencing food insecurity. Systems-level change will be necessary to comprehensively and sustainably affect long-term improvements in food insecurity in the region.
3. Engage in regional/local community food assessments. Specifically, be present as an active and interested party in stakeholder and information sharing meetings for the newly initiated community food assessment and economic evaluation taking place in Jackson, Swain, and Macon counties, led by MountainWise. Stakeholder meetings are likely to begin in Spring 2023.
4. Support evaluation and assessment programs that will ultimately inform evidence-based funding and policy decisions. Given the paucity of region-specific data and the complex connections between other social determinants of health and food security, funding to support evaluation is necessary to understand needs and monitor progress.

Child Welfare

Child welfare typically refers to the services available to children and families to help ensure children are safe and successfully cared for (*What Is Child Welfare? A Guide for Educators*, 2018). Services focus on preventing child abuse and neglect and supporting children through family reunification or foster care when appropriate (*What Is Child Welfare? A Guide for Educators*, 2018). Emphasis on food security within the child welfare system is not explicit; however, the trend of lower food security in children compared to overall populations indicates food security is an important aspect of child welfare.

Intersection with food security

Food security affects children in a variety of ways. Most broadly, there is demonstrated impact on the overall health of children who experience low food security. Overall health may include general aspects of health behaviors such as overall nutrition and physical activity (Fram et al., 2015) or reported poor health (Cook et al., 2008). In fact, food insecurity has been associated with risk of developing overweight or obesity (Casey et al., 2006), and children experiencing food insecurity do less moderate and vigorous activity compared to children in food secure households (To et al., 2014). However, as food security decreases, more specific and alarming measures of health are affected, including increased hospitalizations (Cook et al., 2008). Childhood food insecurity is also associated with specific conditions such as iron deficiency anemia which has been identified as an important indicator in cognitive development (Skalicky et al., 2006).

Findings of malnutrition including iron deficiency anemia, short stature and failure to thrive (Szilagyi, 1998; Tooley et al., 2016) have also been demonstrated in children in foster care placements. Despite risk factors that might make children in foster care settings more likely to develop malnutrition, there are limited studies describing the health status of children entering or leaving foster care environments.

Specific to psychosocial indicators, reduced food security has been associated with negative mental health outcomes across a range of child development stages. As early as infancy and toddlerhood, food insecurity is associated with poor developmental trajectory (Jyoti et al., 2005; Rose-Jacobs et al., 2008). In school-age children, academic performance and school readiness is negatively impacted by food insecurity, even before the onset of the COVID-19 pandemic (Alaimo et al., 2001; D. B. Jackson et al., 2021). Alarmingly, in adolescents, food insecurity is associated with depression and suicidal ideation (Alaimo et al., 2002).

Structural factors play a substantial role in the overall well-being of children in the face of reduced food security. For example, neighborhood structural factors including living in a food desert tract, described by the authors to be a "symptom of poverty," was associated with increased risk of substantiated child maltreatment in New Mexico (Barboza-Salerno, 2020). Some factors may protect children from reduced food security, including the receipt of benefits from WIC (Wetherill et al., 2021). SNAP has also been found to reduce food insecurity and decrease risk of poor health in infants and toddlers (Ettinger de Cuba et al., 2019). Understanding the benefits of these programs illuminates opportunities to improve child welfare through systematically improving food access.

Gaps, barriers and challenges

Perhaps the broadest barrier in understanding the impacts of low and very low food security in the US is the delay and lack of real-time data available regarding the prevalence and burden of reduced food access. In the US, the prevalence of food security is reported annually; however, the data regarding the agricultural system that is intricately linked with availability of nutritious foods are only collected every five years with a two-year lag in publication of data. This mismatch in data availability makes it quite difficult to assess the real-time causes of inadequate food security.

Even with concurrent data sources, an overarching challenge in food security-related data is the lack of established directionality of relationships between food and health outcomes. For example, as outlined above, low and very low food security has been associated with a variety of potential health concerns in children and adolescents; however, it is unclear if those health concerns contribute to low food access, if low and very low food security contribute to those health concerns or both. The data sources also do not illuminate possible mediators and moderators of the relationship, such as socioeconomic status or educational attainment. Despite this lack of clarity, the general lack of autonomy, wage-earning potential and household decision-making power of children could lead one to speculate that children are more likely to be impacted by food security concerns rather than cause them.

In addition to food access, the impact of the nutritional quality of food on child welfare and educational attainment have not been well-established in the medical literature. The National School Lunch Program (NSLP) was instituted in 1946 to provide meals to students at low or no cost to address food access in children (*National School Lunch Program*, n.d.);

however, the nutritional quality of foods provided by the NSLP has been critiqued (McNeill, 2021). This program serves a high number of low-income students, especially in Western North Carolina where half or more students in each county qualify for free or reduced lunch (*Children Eligible for Free or Reduced Price Lunch: North Carolina*, 2023). Therefore, understanding the impact of nutrition on health and education is relevant to the region and could identify opportunities to address a structural inequity.

A major program in Western North Carolina supporting nutrition in schools is the Farm to School program. A challenge identified by administrators of this program in schools has been difficulty adhering to Good Agricultural Practice regulations and procurement of food from local farms (WNC Food Justice Planning Initiative & WNC Health Network, 2020). Indeed, other partners echoed administrative challenges for farmers in the wholesale of product and the lack of resources to increase the efficiency of food systems organizations.

As described above, SNAP has been associated with reduced food insecurity in infants and toddlers, and as such, programs supporting increased SNAP access may support food security in children in Western North Carolina. However, programs such as the Appalachian Sustainable Agriculture Project (ASAP) Double SNAP program is limited in its reach by funding. Double SNAP increases the amount of money available to beneficiaries to use particularly on fruits and vegetables at participating farmers markets (*SNAP at Farmers Markets*, 2023), and its reach is directly impacted by the availability of funds.

Recommendations

1. Support programs that improve food security in households with children. Given the broad associations between food insecurity and a variety of childhood health and wellness concerns (e.g. reduced physical activity, overweight and obesity, reduced school-readiness, depression and suicidal ideation, hospitalizations, and anemia), any programs that support food security in households with children will likely improve child welfare.
2. Support organizations and programs that increase access to food access-related governmental benefits. Evidence suggests that programs supporting increased access to programs such as WIC and SNAP may improve food security among children.
3. Consider support for resources to lessen or help address administrative burdens and improve organization efficiency (e.g. funding for additional staff, funding for professional development within organizational staff). Secondary data and partner comments suggest that administrative burdens decrease the effectiveness of programs. Resources may indirectly support food security in families by supporting program capacity.

Maternal and Child Health

Maternal and child health refers to the health and wellness of people who give birth, and the health and well-being of their children, generally through age five (*Global Health - Maternal and Child Health*, 2014). Maternal and child health may be measured and reported in a variety of ways including maternal morbidity and mortality, infant mortality, and measures of

other birth outcomes. Given the overlap between maternal and child health and child welfare, this section will focus on maternal and infant (birth through one year) health.

Intersection with food security

Some literature describes the possible associations of food insecurity with both maternal and infant outcomes. For example, county level food insecurity in North Carolina is positively associated with increased infant mortality rates (Cassidy-Vu et al., 2022). Conversely, the impact of fruit and vegetable vouchers for WIC recipients, while appearing to be beneficial for children, had conflicting effects on maternal and infant outcomes suggesting further study is needed (Wang et al., 2022).

Several studies support the association between food security and overall maternal health. Food security status has been strongly linked with several maternal hardships that could jeopardize maternal and/or infant health (Laraia et al., 2022), and low and very low food security has been associated with worse mental health outcomes in mothers (Liebe et al., 2022). Cessation of breastfeeding has been associated with low and very low food security (Gallo et al., 2019). However, positive associations have been made between culinary nutrition education during pregnancy and post-partum and improvement in a variety of health-related outcomes (Taylor et al., 2021), underscoring the importance of nutrition education in addition to supporting food access. One partner, Jessica Mrugala, MPH with EmPOWERing Mountain Food Systems, described the impact of cooking classes in their Harvest Health Produce Prescription Program similarly: “Building confidence in the kitchen is an assets-based, interactive community program… and sets the patient up for success in applying improved

nutrition in the home, resulting in generational, lasting change. Supporting the whole human through education and access is crucial to making any impactful changes, and we've seen it succeed."

Gaps, barriers and challenges

As in the case of the literature regarding child welfare, the population-based data available describing the relationship between maternal and child health and food security also do not establish a causal relationship. Given the extremely complex nature of food systems, pregnancy itself, and observational level data, it is difficult to discern the direction(s) of the relationship between food security and maternal and child health.

Another significant gap in the literature is the lack of exploration of the effect of race and ethnicity on food security and maternal and child health. There are well-established disparities in maternal and infant health outcomes by race. It is conceivable that food security status might further exacerbate and/or partially explain these disparities. Additional studies examining the intersections of race, food security and maternal and child health are essential to equitably applying solutions for this population.

Recommendations

1. Encourage food programs to include components specifically for people who are pregnant. Given the broad association between food security and maternal and child health outcomes, food programs should include support for people who are pregnant.

2. Support organizations and programs that increase access to food access-related governmental benefits. Programs that support people who are pregnant and post-partum accessing government benefits such as SNAP and WIC may improve overall food security in this population.
3. Consider supporting culinary nutrition and education programs with people who are pregnant and post-partum as a potentially promising way to support long-term healthy eating habits.

Substance Use Recovery

Substance use, while often equated with opioid use disorders, is a broad term encompassing use of other legal or illicit substances including alcohol use, marijuana use, methamphetamine use or non-medical use of prescription medications. In Western North Carolina, as in other parts of the country, the impact of opioid use disorders specifically has been substantial. Recovery from substance use is the process of adopting positive changes in substance use patterns to improve overall health and wellness (*Recovery*, 2017).

Intersection with food security

The body of literature supports an association between food insecurity and substance use disorders in a variety of populations. Several studies describe the impact of reduced food security on substance use by young people. Reduced food security has been associated with problematic patterns of alcohol consumption in young adults (Nagata, Whittle, et al., 2021). Similarly, reduced food security was associated with greater odds of marijuana use,

methamphetamine use, and non-medical use of prescription opioids, sedatives and stimulants in young men and women (Nagata, Palar, et al., 2021). Specific to high school students, low and very low household food security was associated with lifetime prescription opioid misuse and lifetime use of illicit drugs (Turner et al., 2022).

In regards to geographic region, a high prevalence of inadequate food access was found in people who inject drugs in rural Appalachia, specifically West Virginia (Rouhani et al., 2021). Specific populations such as women with or at high risk of acquiring human immunodeficiency virus (HIV) were at higher odds of illicit substance use (Whittle et al., 2019), and alcohol abuse in men and women experiencing homelessness was also associated with higher odds of experience reduced food access (Reitzel et al., 2020).

The high overlapping prevalence of reduced food access and substance use disorders may be explained in part by the use of substances as a coping mechanism for hunger (Raja et al., 2022). The importance of food access is underscored by a study completed by Stopka et al. (2022) in which jail-referred medication for opioid use disorder programs found that reduced food access was a barrier to treatment, indicating that successful opioid use recovery programs should address food security.

Gaps, barriers and challenges

More than other funding priority areas, studies returned in this literature search examined very specific populations. In particular, many studies focused on people living with HIV. The generalizability of the impact of inadequate food access in people living with HIV and

substance use disorders is not established, reducing the evidence base on which to formulate recommendations.

Similarly, many studies in the literature search addressed other confounding factors in addition to food security, such as experiencing homelessness or poverty. These other factors in the literature highlight the importance of housing and economic opportunity as intersecting factors in food security and substance use recovery. For the purposes of this statement, these other factors also cloud the complex relationship between food security and substance use recovery.

Recommendations

1. Consider food security when evaluating substance use recovery programs. Food security appears to have a bidirectional relationship with substance use patterns in both adults and young people, and should be considered in recovery programs.
2. Encourage substance use recovery programs to include food access components to increase continued participation in these programs. As food security has been identified as an important factor in continuity of substance use recovery programs, these programs should consider including food access support in their program designs.
3. Explore food access in comprehensive HIV prevention strategies. As many studies included people living with HIV, addressing food security may be an important factor in HIV prevention.

Mental Health

Mental health concerns can be broad. In fact, elements of psychological distress, specifically anxiety, are named in food security definitions provided by the USDA (*USDA*, 2022), suggesting a powerful link between mental health and food security.

Intersection with food security

A large body of evidence was found supporting a relationship between food security and mental health conditions. One literature review revealed that food insecurity is significantly, positively associated with psychological distress (Myers, 2020), especially depression where adults reporting very low food security experienced depression at five times the rate of fully food secure individuals (Reeder et al., 2022). Most studies in another systematic review found that in families, low and very low food security was associated with depression and anxiety in parents, and depression, behavior difficulties, and hyperactivity in children (Cain et al., 2022). In a scoping review, there was evidence of an association between food insecurity and mental health concerns in people experiencing homelessness (Loftus et al., 2021). In high school students, reduced food security has been consistently associated with mental health concerns and suicidal behaviors (Brown et al., 2022). Furthermore, reduced food security has been associated with cognitive impairment (Tamargo et al., 2021).

Literature search results also supported an association between stress from inadequate food access and eating patterns that may exacerbate obesity. Participants in one study examining eating patterns at a time of stress found that stress not only increases consumption but also shifts food choices from lower fat to higher fat foods (Zellner et al., 2006). Some have

postulated that the increasing prevalence of obesity may be exacerbated by the synergistic effects of chronic stress and food restriction on the “reward value of highly palatable food” (Tc & Es, 2007).

Gaps, barriers and challenges

Similar to other domains, the relationship between food security and mental health does not have a clear directionality in the literature, despite having a large evidence base to examine. Longitudinal studies suggest a bidirectional relationship in which poor mental health exacerbates reduced access to food and reduced access to food worsens mental health (Maynard et al., 2018). Another study that showed food security was particularly affected by work-limited disabilities and disabling mental health conditions (Coleman-Jensen, 2020) support a bidirectional relationship as well.

Another major challenge in understanding the relationship between food security and mental health is the variety of mental health conditions by which people may be affected. Different mental health concerns present at a variety of severity levels, and therefore, the bidirectionality proposed by some authors may only apply to certain mental health conditions. It is certainly plausible that some mental health concerns, including depression and anxiety, may be the direct effect of experiencing low or very low food security.

Recommendations

1. Support both mental health and food access programs for possible synergistic, positive effects. Given the presumed bidirectional nature of the relationship between food

security and mental health conditions, programs supporting both mental health and food security may have compounded, synergistic benefits.

2. Support food access programs directly to support mental health. Consider that, in some cases, the relationship between food insecurity and mental health concerns may be causal, and supporting food access may directly improve mental health.

Intersections within priority areas

As visualized in the simplified causal loop diagram (page 14), each of the four funding priority areas interact with each other in addition to food security. Maternal and child health are closely linked to child welfare, and mental health is nearly inextricably linked with each of the other funding priority areas. The data sources and literature reviewed here do not differentiate between the impact of different types of food security interventions such as emergency food assistance, access to federal programs, or economic or other preventive approaches. As such, it is quite difficult, using the available body of evidence, to distinguish how food security might impact each of these areas separately. Therefore, the recommendations for all of these funding priority areas may be summarized to say: increased food security is likely to positively impact each of the funding priority areas, and therefore should be considered in most, if not all, funding decisions.

Summary of Recommendations

General Recommendations

1. Consider a "food in all policies" approach, in which food access is considered in most, if not all, funding decisions. Increased food security is likely to positively impact each of the funding priority areas.
2. Support a multi-level, multi-sector approach, including policy change, addressing existing food insecurity and reducing risk of experiencing food insecurity. Systems-level change will be necessary to comprehensively and sustainably affect long-term improvements in food insecurity in the region.
3. Engage in regional/local community food assessments. Specifically, be present as an active and interested party in stakeholder and information sharing meetings for the newly initiated community food assessment and economic evaluation taking place in Jackson, Swain, and Macon counties, led by MountainWise. Stakeholder meetings are likely to begin in Spring 2023.
4. Support evaluation and assessment programs that will ultimately inform evidence-based funding and policy decisions. Given the paucity of region-specific data and the complex connections between other social determinants of health and food security, funding to support evaluation is necessary to understand needs and monitor progress.

Child Welfare

1. Support programs that improve food security in households with children. Given the broad associations between food insecurity and a variety of childhood health and wellness concerns (e.g. reduced physical activity, overweight and obesity, reduced school-readiness, depression and suicidal ideation, hospitalizations, and anemia), any programs that support food security in households with children will likely improve child welfare.
2. Support organizations and programs that increase access to food access-related governmental benefits. Evidence suggests that programs supporting increased access to programs such as WIC and SNAP may improve food security among children.
3. Consider support for resources to lessen or help address administrative burdens and improve organization efficiency (e.g. funding for additional staff, funding for professional development within organizational staff). Secondary data and partner comments suggest that administrative burdens decrease the effectiveness of programs. Resources may indirectly support food security in families by supporting program capacity.

Maternal and Child Health

1. Encourage food programs to include components specifically for people who are pregnant. Given the broad association between food security and maternal and child health outcomes, food programs should include support for people who are pregnant.
2. Support organizations and programs that increase access to food access-related governmental benefits. Programs that support people who are pregnant and post-

partum accessing government benefits such as SNAP and WIC may improve overall food security in this population.

3. Consider supporting culinary nutrition and education programs with people who are pregnant and post-partum as a potentially promising way to support long-term healthy eating habits.

Substance Use Recovery

1. Consider food security when evaluating substance use recovery programs. Food security appears to have a bidirectional relationship with substance use patterns in both adults and young people, and should be considered in recovery programs.
2. Encourage substance use recovery programs to include food access components to increase continued participation in these programs. As food security has been identified as an important factor in continuity of substance use recovery programs, these programs should consider including food access support in their program designs.
3. Explore food access in comprehensive HIV prevention strategies. As many studies included people living with HIV, addressing food security may be an important factor in HIV prevention.

Mental Health

1. Support both mental health and food access programs for possible synergistic, positive effects. Given the presumed bidirectional nature of the relationship between food security and mental health conditions, programs supporting both mental health and food security may have compounded, synergistic benefits.

2. Support food access programs directly to support mental health. Consider that, in some cases, the relationship between food insecurity and mental health concerns may be causal, and supporting food access may directly improve mental health.

Limitations

Most recommendations made in this statement are intentionally broad given the lack of cohesive, real-time, place-based data available to describe the intersections between each of the DHT Health and Wellness funding priority areas and food security. Most notably, the literature searches produced studies looking at a variety of populations and subpopulations in very different regions than that of rural, Western North Carolina. With the understanding that food systems, and in particular the experience of low and very low food security, is complex and affected by a variety of factors, more detailed and specific local and regional data are necessary to make evidence-informed funding and policy decisions.

In the absence of detailed local and regional data, community partners were engaged in informal interviews to incorporate place-based perspectives. However, only a small number partners relative to the large system of food partners in the region were included. The partners included had all been engaged with DHT. As existing partners, they might have been influenced by the recent, perceived deprioritization of food systems funding with the creation of DHT Health and Wellness's four funding priority areas. Further, the voices of smaller food systems players not already engaged with DHT may well be very different, yet are not represented in this statement.

Key Takeaways

Literature searches, secondary data, and conversations with food systems partners in the region revealed detrimental effects of reduced food access on each of the DHT Health and Wellness funding priority areas: Child Welfare, Maternal and Child Health, Substance Use Recovery, and Mental Health. While many studies were specific to other regions or included specific populations, the overarching finding is clear: food security affects all aspects of health and wellness.

A major limitation of this statement is that the literature discussed is neither granular enough nor place-based enough to meaningfully apply to Western North Carolina. As such, DHT should seek to be a present and active stakeholder in community food assessments in the region. Support of other place-based evaluations that will inform evidence-based funding and policy is also needed. Evaluations should be designed to better understand how food security intersects with not only each of the DHT Health and Wellness funding priority areas, but across all DHT strategic priorities: Housing, Education, Economic Opportunity, and Health and Wellness.

Finally, given the incredible importance of food to health and wellness and all of DHT's strategic priority areas, DHT may consider ways to name food as a regional priority.

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Appendix A. Literature Search Strategies

1. Literature search strategies in PubMed
    a. Child welfare
        i. ((("Food Insecurity"[Mesh]) OR "Access to Healthy Foods"[Mesh] OR "food security" OR "access to health food*" OR "access to nutritious food*" OR "adequate food*") AND ("United States"[Mesh] OR "united states" OR "United states of america")) AND ("Child Welfare"[Mesh] OR "child welfare" OR "foster home care")
        ii. 23 abstracts returned
2. Maternal and child health
    a. ((("Food Insecurity"[Mesh]) OR "Access to Healthy Foods"[Mesh] OR "food security" OR "access to health food*" OR "access to nutritious food*" OR "adequate food*") AND ("United States"[Mesh] OR "united states" OR "United states of america")) AND (((("Maternal Health"[Mesh]) OR "Child Health"[Mesh]) OR "Infant Mortality"[Mesh]) OR "Infant Health"[Mesh]) OR "Infant Welfare"[Mesh] OR "maternal health" OR "infant mortality" OR "infant health" OR "infant welfare")
    b. 45 abstracts returned
3. Substance use recovery
    a. ((("Food Insecurity"[Mesh]) OR "Access to Healthy Foods"[Mesh] OR "food security" OR "access to health food*" OR "access to nutritious food*" OR "adequate food*") AND ("United States"[Mesh] OR "united states" OR "United

states of america")) AND (((((("Substance-Related Disorders"[Mesh]) OR "Opioid Epidemic"[Mesh]) OR "Opiate Substitution Treatment"[Mesh]) OR "Opiate Overdose"[Mesh]) OR "Methadone"[Mesh]) OR ("Buprenorphine"[Mesh] OR "Buprenorphine, Naloxone Drug Combination"[Mesh])) OR "Mental Health Recovery"[Mesh] OR "substance-related disorder*" OR "substance use" OR "substance misuse" OR "substance abuse" OR "opioid epidemic" OR "opiate substitution treatment" OR "opiate overdose" OR methadone OR buprenorphine OR naloxone OR naltrexone OR "mental health recovery" OR "substance use recovery")

b. 47 abstracts returned

4. Mental Health

a. (("Food Insecurity"[Mesh]) OR "Access to Healthy Foods"[Mesh] OR "food security" OR "access to health food*" OR "access to nutritious food*" OR "adequate food*") AND ("United States"[Mesh] OR "united states" OR "United states of america")) AND ("Mental Health"[Mesh] OR "mental health")

b. 209 abstracts returned

Appendix B. Lessons Learned

My practicum experience was focused in an area with which I was already quite familiar – gender-affirming health care. For my culminating experience, I wanted to do something drastically different, not only to expand my skillset but also to develop a more well-rounded understanding of public health issues in Western North Carolina. Studying food security in the region with the help of regional partners was an incredibly enriching experience in which I learned about food systems and grantmaking philosophies.

Food systems is a very broad topic to broach without much prior experience. I quickly learned that food systems are incredibly complex and extend far beyond just food security, the aspect with which I was most familiar. The ability to learn more about food systems in the region under the guidance of Dogwood Health Trust (DHT) was particularly illuminating, as it helped me to make connections between food security and all of DHT's strategic priority areas – Housing, Education, Economic Opportunity, and Health and Wellness. While my culminating experience paper ultimately focused on Health and Wellness, an key realization from my work is that food affects and is affected by each of DHT's strategic priority areas.

I also embarked on this work at a time when some food system partners perceived a "deprioritization" of food system funding by DHT, which led to some very stimulating conversations with these partners. The larger context of the role that food access plays in health was a common thread in partner conversations, with some debate about whether or not food should be explicitly named as a priority for DHT. Some partners also noted that, through no fault of their own, DHT's presence seems to have reduced funding to the region from other, large foundations and trusts. These conversations seemed representative of how important

high-level decisions can be to the survivability of non-profit, grant-funded organizations. In this example, the sale of Mission Hospital led to the creation of DHT which effectively reduced available funding from sources outside the region. This example highlights the complicated power dynamics DHT must navigate to support equitable funding in the region.

Overwhelmingly, my experience has been positive and enlightening. In addition to learning a great deal about food systems and grantmaking, I was inspired by meeting food system partners who are in the community doing meaningful work.