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EVIDENCE BRIEF

Municipal and Community-level Interventions to Promote Sustainable Food Systems

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Key Messages

- Short supply chains (e.g., community supported agriculture, mobile markets) and urban gardens were associated with positive impacts on diet. Introducing a new grocery store in a community was not associated with improved fruit and vegetable intake.
- Urban agriculture was associated with increased perceived access to fruit and vegetables. Short supply chain markets and conventional markets (e.g., grocery stores) were associated with increased perceived access to food and/or to a place that sells food.

- Consumers and producers who participated in short supply chains or urban agriculture received social and economic benefits, such as food affordability, social capital, revenue/wages, jobs, and access to markets.

- Results must be interpreted with caution due to the heterogeneity and low quality of the included reviews. Nonetheless, there are various interventions applicable to local food systems that can impact diet, equity, food access, and food production.

Issue and Research Question

The Canadian diet is typically low in healthy foods, such as vegetables, fruit, whole grains, nuts and seeds, and high in processed foods.[1] Poor dietary intake is a leading cause of death and disability in Canada[2] and is estimated to contribute an economic burden of CAD$14 billion per year.[1] Diets are influenced by environmental factors, including physical, economic, and social environmental factors, many of which are components of food systems.[3] Sustainable food systems that promote healthy diets, humans, and environments[4] are an emerging focus in public health practice.[5]

Food systems include the factors and outcomes related to food production, processing, distribution, preparation, consumption and disposal.[6] There is an intricate and reciprocal relationship between the parts of the food system and dietary intake.[4] The types of foods, and the way food is produced, promoted and made available impact dietary intake which in turn reinforces food system practices.[4] Current food systems worldwide are associated with poor nutrition, and may disproportionately impact vulnerable populations such as children, people with low-income, and Indigenous peoples.[6] The High Level Panel of Experts (HLPE) on Food Security and Nutrition warns that current food systems lead to "human health, economic, social and environmental consequences of malnutrition [that] are crippling".[6(p.21)]

The recent Pan-Canadian Sustainable Food Systems Report Card highlighted a lack of sustainability in the Canadian food system, reporting decreases in food access and production and increases in food insecurity over time.[7] A global call for zero hunger, good health and well-being, and responsible consumption and production in the 2030 United Nations Sustainable Development Goals underscores the need for system-wide changes to diets and food systems.[8] The recent *EAT-Lancet* report calls for a "Great Food Transformation" that involves a "range of actions taken by all food system sectors across all levels that aim to normalize healthy diets from sustainable food systems".[9(p.450)]

A sustainable food system is "a food system that ensures food security and nutrition for all in such a way that the economic, social, and environmental bases to generate food security and nutrition for future generations are not compromised".[6(p.23)] In Canada, the movement towards more sustainable diets and food systems is growing. Notably, in 2019, the federal government launched the Food Policy for Canada, which aims to build and support a resilient, innovative, and sustainable food system with equitable access to safe, nutritious, and culturally diverse food.[10] The policy dedicated $50 million to fund local food infrastructure, and to give communities the opportunity to engage in innovative initiatives that will build sustainable food systems and increase access to healthy food.[10] The recent 2019 Canada's Food

Guide also acknowledges the impact of food in environmental sustainability, and recommends food choices with a lesser environmental footprint.[11]

The 2018 Ontario Public Health Standards include climate change and chronic disease prevention[12] – two public health issues to which sustainable diets and food systems are linked. Accordingly, many municipalities in Canada are increasingly undertaking food policy initiatives, including many in Ontario.[13] Supported through guidance like the 2016 Ontario Food and Nutrition Strategy,[14] municipalities are positioned to intervene in their local food system, and can enact policies and programs that build a culture around local food initiatives.[15] However, no comprehensive reviews of the evidence of effective food system interventions for local regions have been completed.

This evidence review aims to describe the state of peer-reviewed literature on interventions aimed to promote a sustainable food system and their impact on nutritional, environmental, economic, and social outcomes at the municipal- or community- level.

Methods

Two literature searches were conducted on September 9, 2019 and on November 8, 2019 by Public Health Ontario Library Services for articles published between 2009 and 2019. The search involved 5 databases including Ovid MEDLINE, Ovid Embase, EBSCOhost CIHNAHL Plus with Full Text, EBSCOhost SocINDEX with Full Text, EBSCOhost Environment Complete. The following search terms were included, but were not limited to: diet, food nutrition, food industry, food supply, food security, agriculture, communities, urban areas, cities, food system, healthy, sustainable. The full search strategy is available upon request from Public Health Ontario (PHO).

Articles were eligible for inclusion if they: reviewed primary studies; evaluated food system intervention(s) using outcome(s) relevant to health, diet, sustainability (economic, environmental, social); were relevant to municipal or regional jurisdictions; were relevant to the Canadian context. We excluded grey literature and reviews that focused on a special population (e.g., people with a chronic disease), zoonotic health, interventions not applicable to public health practice (e.g., agricultural interventions), outcomes not applicable to public health (e.g., biology, microbiology, biochemistry), or were not relevant to Canada.

Three reviewers independently screened titles and abstracts. Full text articles were retrieved, and reviewed by two reviewers. Consensus was achieved through discussion. Relevant information was extracted from each article by two reviewers.

Two reviewers independently conducted quality appraisal. The PHO Library Services Meta Quality Appraisal Tool (MetaQAT) was used to guide the selection of the appropriate tool for each included article based on study design. Health Evidence was used to assess the quality of reviews. Discrepancies in quality appraisal outcomes between the reviewers were resolved by consensus. More information on quality appraisal is available upon request.

The food supply chain[6] and the monitoring framework from the Milan Urban Food Policy Pact (MUFPP)[16] were used to guide decisions as to what interventions and outcomes were relevant for data extraction. Specifically, the food supply chain (food production, processing, distribution and availability, retail, waste) was used to identify the target area for interventions. Categories of indicators that represented municipal-level outcomes related to sustainable food systems from the MUFPP monitoring framework were used to categorize outcomes of interest from reviews including: food governance, sustainable diets and nutrition, social and economic equity, food production, food supply and distribution, and food waste.[16] These outcomes categories were identified by the MUFPP monitoring framework as desired areas of changes that can contribute to sustainable food systems.[16]

In some cases, the type of intervention and outcome overlap. For instance, food production can be both an intervention and an outcome when evaluating urban agriculture (intervention: urban agriculture; outcome: amount of food produced). Another example may be when interventions and outcomes both focus on food distribution and availability, such as the impact of increasing availability of grocery stores (intervention) on perceived food availability in a community (outcome). Brief descriptions of each intervention and outcome category are provided below:

Interventions (adapted from the HLPE on Food Security and Nutrition)[6]

- **Food production** refers to the way crops are cultivated, including factors such as crop diversity, quality, and availability
- **Food processing** refers to the process by which food is altered to extend shelf-life, increase bioavailability of nutrients, or improve sensory characteristics or functional food characteristics
- **Food distribution and availability** refers to the transportation and geographical reach of food, and includes various modes of food availability (e.g., grocery stores, markets, farm-to-institution programs)
- **Food retail** refers to the environments that sell foods directly to consumers and employ marketing strategies or programs to influence purchasing decisions
- **Food waste** refers to waste management, including the amount and method of food disposal

Outcomes (adapted from the MUFPP monitoring framework¹⁶)

- **Food governance** refers to personnel, resources, and infrastructure to support food policy as well as program planning, implementation, monitoring, and evaluation
- **Sustainable diets and nutrition** refers to dietary, nutrition, and consumer behaviour outcomes
- **Social and economic equity** refers to the social and economic impacts on population subgroups, including marginalized producers (e.g., ease of market entry for small/inexperienced farmers) and consumers (e.g., food access for consumers of low incomes)
- **Food production** refers to outputs associated with producing food locally or regionally

- **Food supply and distribution** refers to the availability of food to communities and general consumers (note: different than food access for marginalized populations in social and economic equity)
- **Food waste** refers to food losses and waste at any point in the food supply chain

Main Findings

The search identified 1,343 unique articles, from which 18 review-level articles met the inclusion criteria. Of the 18 included reviews, 11 were classified as weak quality, [17-26] six were moderate quality,[27-32] and one was high quality.[33] Reviews were rated lower quality due to non-transparency of methods and included studies, lack of critical appraisal, and limited discussion of potential biases. No articles were excluded due to quality to maintain a comprehensive review the evidence. Reviews included studies from Canada, the United States, United Kingdom, Australia, New Zealand and other developed countries.

The reviews included evaluated interventions related to only three categories of the food supply chain: food distribution and availability,[17,21,25,27-29,31,32] food production,[18,21,22,24,26,30,33] and food retail.[19,20,30,34] Outcomes evaluated were related to all but two categories of the MUFPP (food governance and food waste). The majority of reviews (n=13) reported on outcomes related to sustainable diets and nutrition.[18-21,24,25,27,28,30-34] Many reported on social and economic equity outcomes (n=8)[17-19,21,22,25,28,34] and food supply and distribution outcomes (n=6).[18-20,25,27,33] Few reviews reported on food production outcomes (n=3).[22,24,26] A summary of the interventions and outcomes identified in the 18 included articles are displayed in Figure 1.

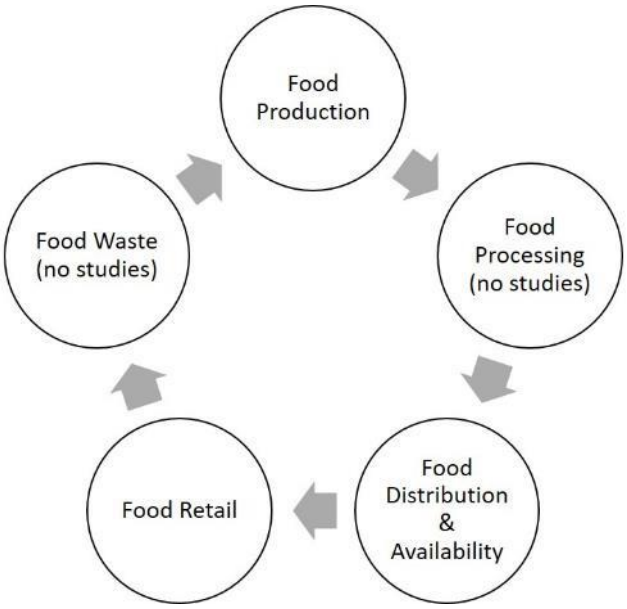
The findings are organized by intervention according to the phases of the food supply chain, with outcomes presented according to categories of MUFPP monitoring framework.

Food Production Interventions:

- Urban agriculture (gardens, forests, edible infrastructure, farming)

Outcomes:

- Food production: ability to produce food; amount of food produced
- Sustainable diets and nutrition: vegetable and fruit intake
- Social and economic equity: availability, access, affordability of food for marginalized populations; consumer/producer benefits
- Food supply and distribution: availability, access, affordability of food for general consumers



Food Retail Interventions:

- Farmers' markets coupon/delivery programs
- Small food store infrastructure and promotions
- Health food procurement policies for institutions

Outcomes:

- Sustainable diets and nutrition: vegetable and fruit intake; shopping behaviour; purchases
- Social and economic equity: food sales; producers' revenues
- Food supply and distribution: food availability in institutions and stores

Food Distribution Interventions:

- Short supply chains (CSA, MPM, Farmers' markets, farm-to-institution
- Convention supply chains (grocery store)

Outcomes:

- Sustainable diets and nutrition: vegetable and fruit intake; eating and shopping behaviours
- Social and economic equity: availability, access, affordability of for marginalized populations; producer revenue; consumer benefits
- Food supply and distribution: availability, access of food for general consumers

Figure 1: Summary of Sustainable Food System Interventions and Outcomes from 18 Reviews

Note: Food access, availability or affordability were not consistently defined, nor always differentiated between, by authors in included reviews. In this document, the term 'food access' refers to a population's ability to obtain food (often perceived). 'Food availability' referred to the existence of foods purchase or consumption (may be

regardless of access). 'Food affordability' refers to the cost of food (often perceived). Review authors may have used the terms differently. Nevertheless, the terms used by review authors were maintained in the findings to avoid inappropriately conflating these terms which may lead to misinterpretation. This review included findings on the availability, access or affordability of food for marginalized populations as an outcome of social and economic equity; findings on the availability, access or affordability of food for the general population is included as an outcome of food supply and distribution.

Food Distribution & Availability

Eight reviews looked at interventions targeting food distribution and availability which included short supply chains (direct-to-consumer and intermediated markets) and conventional supply chains.[17,21,25,27-29,31,32] Direct-to-consumer markets are those which link the consumer with the food producer,[17] such as farmers' markets, community supported agriculture (CSA), mobile markets, produce stands, or food hubs. Intermediated markets are shortened supply chains that also link producers and consumers but do so via "locally and regionally based food retail stores, schools, hospitals and other outlets".[17(p.14)] An example of an intermediated market is farm-to-institution program. Conventional supply chains are more traditional modes of distributing food (e.g., supermarkets, grocery stores) which are often characterized by "efficient, low-cost productions, and buyers and sellers [who] are largely indifferent towards others in the market".[17(p.5)]

The majority of reviews assessed the impact of food distribution and availability interventions on sustainable diets and nutrition (n=6) where fruit and/or vegetable intake was the most commonly used outcome.[21,25,27-29,31,32] The reviews included studies with a mix of methods to measure fruit and vegetable intake. Four reviews assessed social and economic equity outcomes, such as market entry, job creation, revenues for producers, food affordability for consumers, and access, and affordability of food for population sub-groups (e.g., low-income).[17,21,27,28] Finally, two reviews assessed food supply and distribution outcomes, specifically, the availability of healthy food to the general population.[25,27] Five of the reviews were of moderate quality[27-29,31,32] and three were weak quality.[17,21,25]

A. SHORT SUPPLY CHAINS

I. SUSTAINABLE DIETS & NUTRITION

Four short supply chains were evaluated for their impact on dietary outcomes: CSAs, mobile produce markets, farmers' markets, and farm-to-institution agreements. Most reviews included multiple forms of short supply chains;[21,25,28,32] only one review assessed the impacts of CSAs alone[31] and another review assessed the impact of mobile produce markets only.[29]

Community Supported Agriculture (CSAs)

Three reviews included studies on CSAs.[21,25,31] CSAs were associated with dietary improvements (increased fruit and vegetable intake, home-cooked meals, use of unfamiliar foods) in people who participated but results were mixed across studies with varying study designs and methods.[31] Results were more consistent with self-reported dietary changes measured using brief survey questions in weaker studies; impacts were lesser in studies with stronger designs and/or dietary intake measured through records, diaries or food frequency questionnaires.[31] Most CSA members self-reported that they

consumed more fruits and vegetables, including low-income families provided with a free CSA membership, but measured dietary changes were not always consistent with self-reported changes.[31] Velazquez et al. posits that the impact of CSA participation may depend on the type of consumer (e.g., higher consumers may not notice change in intake).[31] Noy et al. reported an increase in the amount and variety of vegetables consumed, as well as other positive shopping, cooking, and eating behaviours, among CSA members.[21] A third review of weak quality reviewed the impact of several types of short supply chains, including CSAs, farmers' markets, and farm-to-institution arrangements and reported that these supply chains were associated with increased fruit and vegetable intake in consumers.[25]

Mobile Produce Markets

Three moderate quality reviews assessed the impact of mobile produce markets on diet.[28,29,32] In all reviews, mobile produce markets were associated with improved fruit and vegetable intake.[28,29,32] Hsaio et al. included five peer-reviewed studies with weak designs that measured dietary intake through screeners or food frequency questions most often.[29] Hsaio et al. concluded that users of mobile produce markets generally, but not consistently, had increased fruit and vegetable intake compared to non-users across both adult and child populations.[29] Woodruff et al. assessed the introduction of new retailers, including mobile produce markets (in addition to farmers' markets and produce stands).[32] Across 15 studies published in 23 articles, Woodruff et al. found that positive results were found with weaker study designs and dietary measurement methods.[32] Hollis-Hansen found that the introduction of new mobile produce markets increased fruit and vegetable intake, arising from 15 peer-reviewed and grey literature sources with varying study design and mostly measured dietary intake through screeners, FFQ, and dietary recall.[28]

Farmers' markets

Four reviews (two moderate quality[28,32] and two weak quality[21,25]) assessed the impact of farmers' markets on diet. Hollis-Hansen suggests that there is insufficient evidence to make a conclusion about the impact of farmers' markets on fruit and vegetable intake.[28] As mentioned earlier, the introduction of new retailers, including farmers' markets, was associated with self-reported improvements in fruit and vegetable intake but not with measured intake.[32] On the other hand, Sitaker et al. and Noy et al. both reported that farmers' markets could increase fruit and vegetable,[25] and vegetable[21] intake in consumers; however, the quality of these reviews is weak.

Farm-to-institution

Only one weak quality review assessed the impact of farm-to-institution initiatives (combined with other short supply chains) on fruit and vegetable intake and concluded that they were associated with increased self-reported fruit and vegetable intake.[25]

II. SOCIAL AND ECONOMIC EQUITY

Four reviews discussed social and economic equity impacts of short supply chains (one moderate quality;[28] two weak[17,21,25]). Hollis-Hansen et al. found that introducing new mobile produce markets and farmers' markets were associated with increased perceived access to a market that sells fruit and

vegetables in low-income consumers, but that new mobile product markets had no impact on low-income consumers' perceived access to actual fruit and vegetables.[28] This review included studies and grey literature sources that had mixed study designs, however the results do not appear to differ by study type.[28] Hollis-Hansen et al. did not find any studies that evaluated the impact of farmers' markets on low-income consumers' perceived access to actual fruits and vegetables.[28] Unique food hubs (community food networks, mobile markets, food boxes) have been used to increase access for low-income[21,25] and rural populations,[25] and in food deserts.[25]

Sitaker et al. also summarized that short supply chains support producers and consumers.[25] Specifically, CSAs reportedly helped consumers save money and both CSAs and farmers' markets provided other benefits to consumers related to time, convenience, and social connection. [25] To varying degrees, all types of interventions (CSAs, farmers' markets, farm-to-institution programs, and food hubs) reviewed by Sitaker et al. were said to enhance local economies through job creation and revenue generation, and increased producers' incomes and profits.[25] Dimitri and Gardner explained that pricing of food in short supply chain retailers that is based on consumer values (e.g.,, sustainability, local) can support enhanced relationships with consumers (including institutions) and non-profit organizations.[17] Shared social and environmental values between producers, retailers, and consumers may enable producers to sell their product at a higher price and thus translate to higher revenues.[17] Collaborations with non-profit organizations may enhance resource availability and infrastructure for supply chains, and increase vulnerable populations' (racialized, low-income) access to food.[17] In particular, CSAs[25] and intermediated value-based supply chains (e.g., food hubs)[17] benefitted small- to medium-sized producers, or new/inexperienced producers.

III. FOOD SUPPLY AND DISTRIBUTION

Only one review, rated as weak, reviewed the impact of food distribution and availability on general food availability.[25] Sitaker et al. reported that farmers' markets, CSA, farm-to-institution programs, and food hubs increased the availability of healthy foods that were also affordable.[25]

B. CONVENTIONAL SUPPLY CHAINS

I. SUSTAINABLE DIETS AND NUTRITION

Three moderate quality reviews[27,28,32] assessed whether introducing new supermarkets (grocery stores) impacted dietary intake. Both Hollis-Hansen et al.[28] and Woodruff et al.[32] assessed new supermarkets in combination with short supply chains, but reported results separately. Only Abeykoon et al. assessed supermarkets alone.[27] Across all reviews, opening new supermarkets in areas was generally not associated with improved fruit and vegetable intake,[27,28,32] including among communities with low access to supermarkets,[27] and low-income communities.[28]

Hollis-Hansen et al. reported null or negative impacts of introducing a new supermarket on fruit and vegetable intake in a low-income community, measured through 24 hour recall or food frequency questionnaire in three out of four studies.[28] All studies, regardless of quality reviewed by Abeykoon et al. showed inconclusive results for opening a new grocery store on vegetable and fruit intake with most studies measuring diet using valid, reliable tools.[27] Weaker studies that evaluated impacts within

subgroups found that people who switched to the new grocery store, lived closer, had the best or worst diets, or received nutrition education were more likely to benefit more from the introduction of the new supermarket.[27] Woodruff et al. found no impact overall but suggested that individuals who use the new supermarket, rather than simply those who live near the new supermarket, may be more likely to benefit from a new supermarket.[32]

II. SOCIAL AND ECONOMIC EQUITY

In the single moderate quality review that assessed the impact of a new supermarket in a low-income community, Hollis-Hansen found that there was increased perceived access to all foods and decrease in the perceived cost of fruits and vegetables in the community.[28]

III. FOOD SUPPLY AND DISTRIBUTION

Abeykoon et al. found that the introduction of a new supermarket, measured by two studies, was associated with increased perceived access to food by community members and users of the new supermarket.[27]

Food Production

Eight studies looked at food production interventions within an urban setting.[18,21-24,26,30,33] Urban agriculture (UA) is a type of food production via farming and gardening in urban areas.[22] Peri-urban agriculture (PUA) is a type of food production undertaken on land surrounding cities and is sometimes included in definitions of UA.[22] The land on which PUA occurs is a transition space between urban and rural areas as it has a lower population density that urban centres but also less agricultural and natural space than rural areas.[22] Methods of UA and PUA are diverse and include gardens in communities, on school grounds, on rooftops, or in household yards, food forests, growing edible walls and roofs, as well as farms and agricultural holdings in or around cities.[22,24]

Three reviews evaluated the impacts of multiple modes of UA and PUA on outcomes related to food production, and social and economic equity.[22,24,26] One mode of UA, gardening, was evaluated in six reviews[18,21,23,24,30,33] on outcomes related to sustainable diets and nutrition, social and economic equity, and food supply and distribution.

I. FOOD PRODUCTION

Three weak quality reviews discussed the impacts of UA and PUA on food production.[22,24,26] The potential for UA and PUA to enhance food production was cited by all.[22,24,26] There are various urban food production systems with potential to increase the capacity of urban areas to produce food including urban forests, gardens (community, school, domestic), forest gardens (e.g., mix of tress, shrubs, and ground layer of herbs, vegetables, and flowers), and edible green roofs and walls.[24] Wilhelm et al. states that UA and PUA have multifunctional purposes including increased food availability, environmental benefits (supporting biodiversity, carbon sequestration, regulating temperature) and cultural benefits (preserving cultural traditions, increasing income).[26] UA and PUA support the same environmental benefits as green space (e.g., parks), with the added benefit of food provision,[26]

however, neither Russo et al.[24] nor Wilhelm et al.[26] were able to quantify the increase in food production attributable to UA and PUA initiatives. PUA is anticipated to be able to produce higher yields and more variety of products (cereals, vegetables, livestock products) than UA due to established professionals and systems for PUA over UA.[22]

II. SUSTAINABLE DIETS AND NUTRITION

Four reviews (two weak quality,[18,24] one moderate,[30] and one high[33]) found that urban gardens were associated with improved fruit and vegetable intake. Garcia et al. states that urban gardens show promise in increasing fruit and vegetable intake among participants.[33] Participation in urban gardens (household and community) was positively associated with increased amounts and varieties of fruits and/or vegetables consumed, based on low quality study designs, self-reported dietary changes, and unique study populations (e.g., patients).[33] A review of four studies by McCormack et al. found that community garden participants had higher intakes, frequency and variety of vegetables (and fruit in some cases) than non-participants, however these were all cross-sectional studies with various dietary measurement methods.[30] Draper et al. found that community gardens were associated with increased fruit and vegetable intake in garden participants' family members, across settings and populations.[18]

Four weak quality reviews found some evidence that combining nutrition education with gardening could have positive outcomes on fruit and vegetable intake.[18,21,23,24] Draper et al. and Robinson-O'Brien et al. both found that gardening programs were associated with improved vegetable[23], and vegetable and fruit intake[18,23] among youth. Russo et al. and Noy et al. found evidence that school gardens, in combination with other interventions (garden-based learning,[21,24] increased garden-vegetable availability in the school cafeteria,[24] cooking and social eating[21]), were associated with increased fruit and vegetable intake.

III. SOCIAL AND ECONOMIC EQUITY

Opitz et al. states that food access can be improved by UA, however, the research is mixed as to who benefits (lower or higher income households; white participants or participants of different racial backgrounds).[22] PUA may benefit people with higher income as producers may seek out restaurants or stores that serve this population.[22]

Only one weak quality study assessed the impacts of community gardens on social and economic outcomes.[18] Draper et al. stated that community gardens benefitted consumers (usually Caucasian adults) in general, but was not well-studied in marginalized populations. From a thematic analysis of 55 articles on community gardens in the United States, Draper et al. reported that community gardens increased access to produce (including that which is unavailable or unaffordable in stores), increased food sharing with vulnerable populations (e.g., seniors, homeless, low-income), increased social capital, community cohesion, and empowerment, and was a source of revenue or wages for individuals (e.g., at-risk, low-income youth), families, and communities.[18]

IV. FOOD SUPPLY AND DISTRIBUTION

Garcia et al. found that participation in urban gardens was positively associated with perceived access to fresh healthy foods (vegetables and fruit), harvest sharing, and reduced food costs.[33] As stated above, Draper et al. reported that community gardens increased access, affordability of fruit and vegetable for consumers in general.[18]

Food Retail

Food retail-based interventions were studied in four reviews[19,20,30,34] assessing the impact on sustainable diet and nutrition, social and economic equity, and food supply and distribution outcomes. The interventions in this section go beyond simply increasing food availability through CSAs, mobile produce markets, farmers' markets, grocery stores, etc. (see food distribution and availability above). The interventions in this section include supplemental interventions (e.g., policies, promotions, education) in a variety of retail settings to further increase food access, food intake, or producers' revenues, for example. Two reviews focused on farmers' markets,[30,34] one review focused on small food stores,[19] and one review focused on various institutions (schools, hospitals, workplaces, etc.) and remote communities.[20]

I. SUSTAINABLE DIETS AND NUTRITION

The impact of financial vouchers (e.g., coupons) and delivery programs for farmers' markets, including the Seniors Farmers Market Nutrition Program (SFMNP), were assessed in one weak[34] and one moderate[30] quality review. Vouchers and delivery programs for farmers' markets were associated with increased vegetable and/or fruit intake in both reviews,[30,34] and repeated visits to farmers' markets,[30] assessed through weak study designs with self-reported outcomes from brief questionnaires most often.

In small food stores, the impact of a variety of interventions which included supports for small food stores (e.g., infrastructure improvements, staff training) and consumers (e.g., communication, engagement, promotions, pricing) were evaluated on food availability, purchases, and food intake.[19] Gittelsohn et al. reported that small food store interventions were associated with a significantly greater frequency at which selected healthy foods (promoted foods) were purchased, and a greater amount of fruits, vegetables, and other promoted foods sold.[19]

In institutions, Nieblyski et al., a weak quality review, found that healthy food procurement policies in schools and workplaces were associated with improved intake and purchases of healthier foods (measured through food sales, 24 hour recalls, and other methods), especially when paired with education or healthy food promotion.[20] Nieblyski et al. also stated that programs and policies implemented in remote communities in Northern Canada (Healthy Foods North; Food Mail; other food retail interventions) that included changes to food availability, costs, promotion and nutrition education were associated with increased purchases of healthier foods.[20] Nieblyski et al. mentioned that logistics challenged the implementation of these interventions, change was slow, and that not all impacts were sustained.[20]

II. SOCIAL AND ECONOMIC EQUITY

Only one weak quality review assessed the impact of vouchers at farmers' markets as part of the SFMNP on producers' revenue.[34] O'Dare et al. reported that producers' revenues increased as food purchases at farmers' markets increased with the redemption of vouchers.[34]

Gittelsohn et al. reported that food sales of promoted foods in store intervention trials (which primarily targeted low-income and minority populations) significantly increased; sales of fresh produce reportedly increased by 25-50%.[19]

III. FOOD SUPPLY AND DISTRIBUTION

Nieblyski et al. found that in general, policies were effective in increasing the availability of healthy foods and decreasing the availability of unhealthy foods across settings (e.g., hospitals, schools), assessed through menu reviews.[20] In a weak quality review of small food store interventions, Gittelsohn et al. found that all trials reported that stores increased the availability and variety of selected healthy foods (promoted foods), including fresh produce.[19]

Discussion and Conclusions

Evidence suggests that interventions which target parts of the food system can impact food intake and food access. This review found that some food distribution and availability, and food production interventions, namely short supply chains and urban gardens, respectively, were associated with positive impacts on diet;[21,25,28,29,31,32] however results were less consistent when studies used stronger methods. On the other hand, introducing a new grocery store was not associated with improved fruit and vegetable intake.[21,25,28,29,31,32] Urban agriculture was associated with increase perceived access to fruits and vegetables by those who participated.[18,22,33] Short supply chain markets (e.g., CSAs, mobile markets)[17,21,25,28] and conventional markets (e.g., grocery stores)[27,28] were associated with increased perceived access to food in general and/or to a place that sells food, but were not necessarily associated with increased perceived access to fruits and vegetables.

The evidence that social and economic equity and food production can be impacted by food systems interventions is limited in this review. For marginalized populations (e.g., low-income, racialized), interventions that aimed to increase food production, or food distribution and availability were not consistently associated with increased perceived access to food.[17,18,21,22,25,28] Consumers and producers who participated in short supply chains or urban agriculture were stated to receive many social and economic benefits, such as improved food affordability, social capital, revenue, wages, jobs, and access to markets.[17,18,25] Urban agriculture is emphasized as an intervention that can generate food through a variety of means (gardens, forests, edible walls, roofs), but its impact on food production was not quantified in any reviews.[22,24,26]

The results of this evidence review highlight that interventions which focus on a single part of the food system can have impacts on various outcomes from diets to food access to equity. However, gaps in evidence remain on the impact of other food system interventions related to food processing and food waste. Furthermore, there are gaps on the impact of any food system intervention on outcomes

relevant to food governance and food waste. These gaps may have yielded from the search strategy or the fact that this review focused on outcomes rather than change processes, which may be more relevant to food governance.

Evidence also suggests that supplemental interventions (e.g., nutrition education, vouchers, delivery, infrastructure improvements, policies) that increased consumers' or producers' engagement with the food system were associated with positive outcomes on diet, producers' revenue, and food access and availability. Public health interventions with multiple reinforcing layers are often recommended to encourage optimal results,[35,36] however, the evidence reviewed here did not evaluate the impact of multifaceted interventions that crossed multiple or all parts of the food supply chain. As Noy et al. explains, many interventions are multi-dimensional, such as community gardens contributing to a farmers market.[21] Although the integrated nature of local food systems was not explicitly explored in the scientific literature reviewed, a full systems perspective may be necessary to comprehensively understand why or how food system interventions work.[3]

Noy et al. describes local food systems as "[including] local and regional community-initiated interventions as well as short supply systems such as food hubs and neighborhood networks….[which] contributes to a localised food supply, and connections between growers and eaters….often guided by values related to social and environmental capital – biodiversity, environmental sustainability, food sovereignty, food quality, and supporting local producers".[21(p.6)] The intricacies of local food systems, not only in the reciprocity between food system components and between consumers and producers, are contextual aspects that cannot be overlooked when understanding how or why interventions work. The findings from studies and reviews described here may not be generalizable to all local food systems in Ontario or Canada. Furthermore, macro-level factors related to regional, national, or global food systems layer onto local food systems. The context in which an intervention is implemented is an important factor in understanding the impact of the intervention,[37,38] unfortunately, the evidence reviewed here did not discuss contextual factors.

At the other end, it is necessary to understand how individuals interact with the environment in which they live.[38-42] There is still a gap in understanding how, for whom, and by what mechanism food environment interventions impact diets.[43] Nonetheless, participation by consumers and producers in interventions was discussed in many reviews. Participant responsiveness to an intervention can modify the fidelity of its implementation and thus its impact.[44] Many reviews highlighted that in order for an intervention to be impactful, people need to use it – e.g., visit the mobile market, not just know it exists; participate in a community garden, not just live near it – because those who do may be more likely to benefit. The success of an intervention partly depends whether it is relevant and accepted by intended users.[44]

Limitations

The findings of this evidence review are limited by factors associated with the quality of the scientific literature available. No grey literature was included which may limit the breadth of municipal- and community-level sustainable food system interventions identified. Further, scientific literature on food

systems is poorly indexed in peer-reviewed databases which may have impacted the completeness of our search. There may be more reviews of food retail interventions, for example, however no other reviews were captured with from our search focusing on food systems. Many of the reviews included were of weak quality and included a variety of heterogeneous interventions, outcomes, study designs and methods. Many reviews included studies with weak designs with limited causal inference. Due to heterogeneity across studies, many reviews were unable to quantify the impact of interventions on outcomes. Heterogeneity in methods is common in food environment research and contributes to variation in findings and limits strength of evidence.[1,2] Results must be interpreted with caution due to the weak quality of reviews, heterogeneity in interventions, outcomes, settings, and populations across all reviews, and potential gaps in search results.

Implications for Practice

The peer-reviewed review-level literature on interventions at the municipal- or community- level to promote sustainable food systems is diverse and limited. This review provides a broad picture of various interventions applicable to local food systems that can have multiple impacts across diet, equity, food availability, and food production. There are multiple points of intervention across the food supply chain; multifaceted interventions across may be synergistic, but no evidence was found on whole food system interventions. The impacts of food systems interventions are not well quantified and are often studied using weak study designs and a mix of evaluation methods. Monitoring and evaluating the impact of food systems interventions at the community level may be necessary to ensure community acceptance and engagement with the intervention and to contribute emerging understanding of effective food systems interventions.

Additional Resources

High Level Panel of Experts on Food Security and Nutrition (HLPE). Nutrition and food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security [Internet]. Rome: Food and Agricultural Organization of the United Nations; 2017 [cited 2020 May 17]. Available from: http://www.fao.org/3/a-i7846e.pdf

Food and Agriculture Organization of the United Nations. The Milan urban food policy pact monitoring framework indicators. Rome, Italy: Food and Agriculture Organization of the United Nations; 2019 [cited 2019 Nov 27]. Available from: http://www.milanurbanfoodpolicypact.org/milan-urban-food-policy-pact-monitoring-framework/

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Specifications and Limitations of Evidence Brief

The purpose of this Evidence Brief is to investigate a research question in a timely manner to help inform decision making. The Evidence Brief presents key findings, based on a systematic search of the best available evidence near the time of publication, as well as systematic screening and extraction of the data from that evidence. It does not report the same level of detail as a full systematic review. Every attempt has been made to incorporate the highest level of evidence on the topic. There may be relevant individual studies that are not included; however, it is important to consider at the time of use of this brief whether individual studies would alter the conclusions drawn from the document.

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