

Nutrition Services, Population and Public Health Strategy
Food Insecurity in Healthcare Settings Recommendations

Identification of Food Insecurity in Healthcare Settings

Recommendations for Nutrition Services,
Alberta Health Services

March 2022, revised June 2022

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Executive Summary

Background

- Household food insecurity (HFI) is an income-based determinant of health that impacts physical, mental, and social well-being.
- Healthcare providers are likely to encounter patients in food-insecure households in the course of their practice, either knowingly or unknowingly.
- Considerations for screening to improve the health of individuals in the Canadian health and social system context is an important question.

This Report

- Summarizes current published evidence on HFI screening tools.
- Critically reviews the evidence for the effectiveness of HFI screening in identifying and addressing HFI.
- Presents the option of screening for poverty as an alternative to screening for HFI.

Key Findings

The question of screening for HFI in healthcare settings is much more complex than determining whether valid and reliable tools exist for healthcare setting specific identification of HFI.

Screen for poverty to identify this income-related issue, rather than specifically screening for HFI.

While long, short, and brief tools exist to identify HFI, the predominant action HFI screening leads to is food program referral, which is not an effective or recommended screening action.

Screening needs to lead to actions to address financial strain.

Recommendations

- Ensure screening tools and approaches are:
 - Consistent with the Canadian social context that addresses HFI with income policy versus food provision policy.
 - Based on research that establishes financial strain and inadequate income as the root cause of HFI.
 - Aligned with Canadian and Albertan actions on screening for and addressing poverty in healthcare settings.
 - Based on the understanding that screening is only one component of incorporating social determinants of health (SDOH) into client care processes.
 - Based on the concept of SDOH as a structural issue.
- If asked for guidance regarding HFI screening:
 - Recommend screening for poverty vs. screening for HFI.
 - Rationale: A poverty screen approach supports the identification, discussion and interventions around issues that are rooted in financial strain, including HFI, and are best addressed by income approaches.
- If asked for guidance regarding screening tools:
 - Recommend screening for poverty using the [1-item tool](#) currently in use in Canada and Alberta.
- Critically assess the preparedness of the team to screen for and effectively intervene to identify and mitigate threats to individual health posed by social conditions.
- Continue to provide an evidence-based lens to the HFI and SDOH screening healthcare discussions.

Introduction

Nutrition Services (NS), Alberta Health Services (AHS) managers and staff are frequently consulted about the most accurate and appropriate ways to identify the risk of HFI in patient populations. This report summarizes current published evidence on HFI screening tools and critically reviews the evidence for the effectiveness of these tools in identifying and addressing HFI. The option of screening for poverty as an alternative to screening for HFI is also presented. Considerations for screening to improve the health of individuals in the Canadian health and social system context are provided.

Background

HFI is an income-based determinant of health that impacts the physical, mental, and social well-being of Canadians. Health care providers are likely to encounter patients living in food-insecure households in the course of their practice, either knowingly or unknowingly. Available Canadian¹⁻⁴ and US⁵⁻⁹ data suggest a high prevalence of HFI in patients accessing emergency care⁵⁻⁸ and other healthcare services.¹⁻⁴ Interventions that address income-related HFI, in addition to clinical factors, may be needed to successfully manage disease conditions for vulnerable patients.¹⁰⁻¹² However, research also indicates that health care professionals lack sufficient knowledge regarding the impact HFI can have on patient health and their ability to address this issue with patients.^{13,14}

Key Findings

Screening for poverty is suggested to identify this income-related issue, rather than specifically screening for household food insecurity.

While long, short, and brief tools exist to identify HFI, the predominant action HFI screening leads to is food program referral, which is not an effective or recommended screening action.

What is Meant by HFI?

While food security is often broadly conceptualized to encompass a range of issues from the food supply to consistent, adequate, and nutritious food to meet dietary needs and preferences, the measure of HFI does not encapsulate all of these issues.¹⁵ Rather, HFI is described as “self-reports of uncertain, insufficient or inadequate food access, availability and utilization due to limited financial resources, and the compromised eating patterns and food consumption that may result.”*

* Health Canada Office of Nutrition Policy and Promotion. Canadian Community Health Survey Cycle 2.2, Nutrition (2004): Income-related household food insecurity in Canada. Ottawa, ON; 2007. Page 8

HFI is measured using a validated population-monitoring tool. A household determined to be food secure using this tool has the financial ability to access adequate food,¹⁶ whereas a household that is food insecure has **inadequate or insecure access to food due to financial constraints**.¹⁶ This measure of HFI captures experiences in the past 12 months and these may be episodic or chronic. A household that is food insecure can be further categorized as experiencing marginal, moderate or severe HFI.¹⁵

The distinction of what is measured is important since the cross-sectional and research data that links HFI to adverse health outcomes is specifically focused on income-related HFI and not on other issues such as geographical and community-specific food access and food preparation considerations including mobility and cognitive challenges.

Relationship between HFI and Health

All levels of HFI – marginal, moderate, and severe – are associated with adverse health outcomes. HFI is linked with an increased risk of poor mental health and a range of chronic diseases and conditions, including diabetes, heart disease, hypertension, asthma, and arthritis.^{17–21} Food insecurity in Canada is associated with poorer self-reported health,²¹ poorer mental health,²² higher health care costs,^{3,23} and greater utilization of health services, particularly mental health services.⁴ Adults in food-insecure households experience higher mortality rates; this is especially true for those in the severe food insecure category.²⁴

Research also reveals food insecurity poses barriers to chronic disease management.^{25,26} Mobility impairments and chronic physical and mental health conditions, in turn, increase the risk of HFI.^{20,27} Severe HFI is associated with the most detrimental health outcomes and greater health care utilization.⁴ However, HFI, even at marginal levels, is associated with adverse health outcomes and for children, impacts on their behavioural, academic, and emotional status.²⁸

HFI Identification in Healthcare Settings

Interest in HFI screening, using a brief identification tool, in healthcare settings has grown in the last decade. In Canada, research on the acceptability and feasibility of screening for HFI in healthcare settings has been primarily conducted among patients with diabetes.^{29,30} Most research and advocacy for identification of HFI in healthcare settings has emerged from the US, where medical and health associations have released statements and position papers

Levels of HFI

Marginal food insecurity:

Worry about running out of food and/or limited food selection due to a lack of money for food.

Moderate food insecurity:

Compromise in quality and/or quantity of food due to a lack of money for food.

Severe food insecurity:

Miss meals, reduce food intake, and at the most extreme go day(s) without food.

For more information visit:

www.proof.utoronto.ca

calling for clinicians and programs to screen for HFI, particularly among pediatric, Medicare, and Medicaid beneficiary populations.^{31–36} Most of these groups recommend that members screen patients for food insecurity using a 2-item tool called the Hunger Vital Sign™ and promote connecting patients to US federal nutrition assistance programs (e.g food coupon programs, school meals) as well as to local food provision programs such as food banks, community gardens, medically tailored meals, and food prescription or grocery delivery programs. See [Appendix A](#).

Methodology

This report presents findings and Canadian context considerations for common questions received related to the issue of screening for HFI in healthcare settings.

The original scope of this review was to understand the HFI screening tools available, validated and used in healthcare settings. However, the finding of HFI identification leading to predominately food provision referrals required an additional search for reviews on poverty and social determinant of health (SDOH) identification in healthcare settings.

A large body of Canadian research does not support food provision as an effective response to HFI in Canada.

Evidence Used in This Review

In November 2019, we conducted an extensive, nonsystematic review of the literature with the aid of a librarian with Knowledge Resource Services, AHS. The search was repeated in February 2021. We searched MEDLINE (via Ovid), CINAHL, and TRIP. Articles retrieved from previous scoping review work completed in 2015 were also considered.

The evidence search focused on “Screening for household or individual HFI and poverty in healthcare environments.” A search strategy concept document was developed to identify multiple keywords related to 3 key concepts: HFI/poverty, screening, and healthcare setting(s).

An additional search was conducted in June 2021 for reviews on SDOH screening in healthcare setting(s). Scanning reference lists, relevant list serves and discussions with experts also contributed to the evidence base. All study design types were considered. Articles were obtained for full-text retrieval and considered for inclusion if they:

- were English language and high-income countries,
- reported on HFI or SDOH screening in healthcare settings,
- described tool validity, reliability, or modality, and
- described implementation, feasibility, acceptability, or effectiveness, from the care provider or patient perspective.

Findings

A summary of the evidence is organized under the following 5 questions:

- Have population-level HFI monitoring tools been used in healthcare settings? If yes, what tools have been used and what are the limitations and benefits of their use with patient populations?
- What brief screening tools have been validated for the identification of HFI in healthcare settings?
- Is there an advantage of using a brief screening tool versus short or long versions of the USDA Household Food Security Survey Module (HFSSM) in healthcare settings?
- What treatment or interventions does screening for HFI in healthcare settings lead to, and is there evidence that screening leads to improved HFI and improved health outcomes?
- What evidence exists for poverty and SDOH screening in healthcare settings?

Have population-level HFI monitoring tools been used in healthcare settings? If yes, what tools have been used and what are the limitations and benefits of their use with patient populations?

Population-Level HFI Monitoring Tools

Since 2005 the Canadian Community Health Survey (CCHS) has been used as a standardized method to measure the prevalence of HFI, both nationally and provincially among various populations.^{16,37} The CCHS is administered by Statistics Canada and is a national, cross-sectional survey that collects health status, health care utilization, and health determinant information on a large sample of Canadians every two years.³⁸ The tool used by CCHS to measure HFI is the Household Food Security Survey Module (HFSSM). The module consists of 18 questions on the experiences of food insecurity in a household over the previous 12 months. The HFSSM was originally developed by the US Department of Agriculture (USDA) for use in the United States. It has been used annually in the US since 1995,³⁹ and more recently, for a wide range of research and monitoring activities in the US, Canada, and internationally. While Canada and the US both use the HFSSM tool, Health Canada analyzes the results with a different classification system that more accurately reflects the true prevalence of HFI among children.¹⁵

Information on how the HFSSM data is collected, analyzed, and interpreted in the Canadian context is detailed in the Health Canada 2007 report, [Canadian Community Health Survey Cycle 2.2, Nutrition \(2004\): Income-Related Household Food Insecurity in Canada](#).

The USDA has three other versions of the full 18-item HFSSM that are sometimes used for population-level monitoring or in research settings. These include a 10-item “Adult” HFSSM (adult-referenced questions from the full 18-item HFSSM); a six-item “short” form; and a self-administered HFSSM for youth ages 12 and older.⁴⁰ [Appendix B](#) provides a short description of each of these four USDA HFSSM tools: the 18-item HFSSM, the 10-item “Adult HFSSM, the 6-item HFSSM and the “youth” HFSSM.

A further guide to measurement, interpretation, and use of HFI data in accurate and meaningful ways is articulated in the PROOF report [Household Food Insecurity in Canada: A Guide to Measurement and Interpretation](#).

Use of HFSSM Tools in Healthcare Settings Research

Articles were reviewed to identify research studies conducted in healthcare settings that used any of the four versions of HFSSM with patient populations. Eight studies were identified: three studies used the 18-item (full scale) HFSSM,^{41–43} two used the 10-item (adult scale) HFSSM^{1,44} and three used the 6-item version of the HFSSM.^{14,45,46}

The 10-item tool was used in a Canadian study to determine the prevalence of HFI among a diabetes clinic population.¹ The 6-item short version was used in three studies conducted in the US, one each with care providers of young children in community child wellness clinics,⁴⁵ uninsured patients accessing student-run wellness clinics¹⁴ and patients receiving cancer care.⁴⁶ The study by Bottino⁴⁵ embedded the 6-item HFSSM short form into a web-based self-administered assessment tool, in the US, called The Online Advocate. See [Appendix C](#).

None of the research articles conducted in healthcare settings that used the 10-item¹ or 6-item HFSSM tools^{14,45} described care provider or respondent burden with their use. The Canadian study commented the use of the 10-item tool was time-effective for clinicians (2–5 minutes) and allowed comparison with national survey data.¹ No articles were found that explored how the detection of marginal, moderate, or severe food insecurity was related to improved patient outcomes.

Summary Statement

The 10-item adult-referenced HFSSM and the 6-item HFSSM have been used in a limited number of research studies conducted in healthcare settings. The 6-item tool has also been embedded in a self-administered assessment tool. The theoretical advantage of the 10-item and 18-item tools is their ability to determine the severity of HFI and to compare clinical level HFI to population-level HFI prevalence data. To date, no guidance exists regarding how a determination of marginal, moderate, or severe HFI would be used to enhance patient counselling and outcomes in healthcare settings.

What brief screening tools have been validated for identification of HFI in healthcare settings?

A total of 12 studies were identified that examined the validity of brief (1-, 2-, and 3-item) HFI screening tools. All brief screening tools were derived from the USDA HFSSM. Validation studies for brief (1-, 2-, and 3-item) screening tools were either conducted using population-level surveillance data or with a small number of select patient groups.

Validation Studies Using Population Surveillance Data (n=2)

- Two validation studies used data from population-level survey data.^{47,48}
 - A US study by Gundersen⁴⁷ used US national HFI prevalence data.
 - A Canadian study by Urke⁴⁸ used Canadian Inuit population data.
- Both studies tested a variety of two question combinations from the full 18-item USDA HFSSM to see which question combination resulted in the best sensitivity and specificity performance. Gundersen⁴⁷ also provided accuracy results.
- Gundersen⁴⁷ reported high sensitivity (>97%) and adequate specificity (>70%) of each 2-item combination tested when compared with the 18-item HFSSM. This acceptable sensitivity and specificity was found both for the general US population and US demographic groups at high risk for HFI. The high-risk groups identified by the authors included racialized populations, seniors, and those with incomes below the Federal poverty line.
- Gundersen⁴⁷ further emphasized that if a brief HFI screening tool is used in healthcare settings, clinicians should use question items 1 and 2 from the core HFSSM, with no modifications to the language in either the questions or response options.⁴⁷ See [Appendix D](#).

Sensitivity: the ability of the screening test to identify people with the condition as positive.

Specificity: the ability of the screening test to identify healthy people as negative.

Accuracy: the probability that an individual will be correctly classified by a test.

In the US, universal screening for HFI in the clinical setting has been recommended by prominent groups such as the American Academy of Pediatrics³¹ and the American Association of Retired Persons.³² Promotion of it has expanded to other prominent health associations in the US and was a stated impetus for the validation study by Gundersen.⁴⁷ The concern was that the brief HFI screening tools being advocated by these groups were based on small validation studies with select population groups. In recommending specific questions for a 2-item screening tool, Gundersen and colleagues⁴⁷ were attempting to provide options agreeable to this movement. Noted disadvantages of using a short screening tool were the inability to allow assessment of the severity of HFI and all aspects of the complex experience of HFI.⁴⁷

Validation Studies Conducted in Healthcare Settings (n=10)

- Ten validation studies were conducted in healthcare settings, each with a small number of patients.^{49–58}
- The majority of the patient population groups were care providers of young children (n=7).^{49–55} One study each was conducted with youth,⁵⁸ patients with HIV,⁵⁶ and adults.⁵⁷
- Eight studies took place in the U.S; 2 studies took place in Australia.^{49,56}
- Two different approaches were used to test validity:
 - Approach 1:** Nine studies examined the performance of the brief screening tool against one or more of the four USDA HFSSM versions.^{37–41,43,45,59} Only four studies used the full 18-item HFSSM as the gold standard tool for assessing validity.^{37–40} The less accurate 6-item version was used in four studies,^{41,43,44,59} and one study used different versions of the HFSSM, either the 18-item, 10-item, or adolescent tool, depending on the age of the patient and whether or not they had children.⁴⁵
 - Approach 2:** One study tested different two-question combinations to see which of the two-question combination resulted in the best performance. The questions tested were derived from the HFSSM plus two other non-HFSSM tools.³⁶
- Of the 10 validation studies, four of them altered the wording from the original HFSSM tool in either the question, the response, or both.^{49,50,53,55}
- None of the 10 validation studies occurred in clinical settings with adult patients experiencing a chronic health condition, except for one study of patients with HIV.⁵⁶
- [Appendix E](#) provides details of the country, study participants, validity results presented, and approach to validity testing.

Use of Brief HFI Screening Tools in Healthcare Setting Research

Research studies conducted in healthcare settings report using brief screening tools to identify HFI amongst study participants. A total of 21 healthcare settings research studies^{30,60–79} were identified that reported using a ‘validated’ HFI screening tool. However, none of these studies conducted validity testing, nor was validity testing the purpose of these studies.

The methods section of each of these 21 research articles was reviewed to determine what validated brief screening tool was used or referenced. The most commonly named or cited tool was from the Hager et al⁵² validation study (n=18 articles).^{60–69,71,73–79} However, upon closer review, only four of these studies^{68,73,75,76} used the tool in its validated form, i.e. using the precise questions, responses, and wording as in the original Hager et al (2010) validation and reliability study. ([Appendix F](#), Table F2)

This was a surprising finding, since modifying a validated screening tool by altering the tool questions, changing response options, adjusting the reference period of an instrument or making other changes to the tool are to be avoided, as these changes invalidate the tool.⁸⁰ A study by Makelarski and colleagues⁵⁷ further demonstrates why making alterations to a validated brief HFI screening tool is problematic. Makelarski⁵⁷

explored the diagnostic accuracy of two brief 2-item HFI screening tools, both commonly used in US healthcare settings. The tools tested in this healthcare setting study used the identical language for the question component of the screening tool but applied different response options. The 2-item screening tool that used a “yes-no” response option instead of “often true, sometimes true, never true” response choices was found to greatly under-report HFI, missing nearly one-quarter of HFI adults.

Summary Statement

Different versions of brief HFI screening tools, predominantly 2-item question tools, have been tested in a few validation studies conducted with small study populations, predominately care providers of young children, in a healthcare setting context. Validation in clinical settings with adult patients experiencing a chronic health condition is absent, except for one study of patients with HIV.

Brief HFI screening tools have also been used in healthcare setting research studies to identify the food insecurity prevalence of the study population. These studies often altered the screening question and/or response options so that the tool used in the study differed from that used in the validation study.

Overall, Gundersen and colleagues⁴⁷ employed the most rigorous validation testing of brief screening tool options that represent both the general population and demographic groups at higher risk for HFI in the US (racialized populations, seniors, those with incomes below the Federal poverty line). If a brief 2-item HFI screening tool is used in AHS healthcare settings, the tool questions and response options presented in the study by Gundersen and colleagues⁴⁷ is the preferred choice. ([Appendix D](#))

Is there an advantage of using a brief screening tool versus short or long versions of the USDA HFSSM in healthcare settings?

No articles were found that explicitly explored the question of whether there is an advantage of using a brief screening tool for HFI in healthcare settings over either the short (6-item) or long (10- or 18-item) versions of the validated HFSSM.

All retrieved articles were reviewed for any discussion on the acceptability of different HFI identification tools in healthcare settings. Although authors frequently stated that longer tools are impractical to use in health environments, none of the articles provided any evidence to support these claims or tested the acceptability of the HFSSM short or long version versus brief screening tools in healthcare settings.

Administration Time

A systematic scoping review⁸¹ reported that observational studies suggest HFI screening adds minimal time burden to clinical encounters. The length of any tool can be expected to impact time burden; however, no studies appear to have compared the time burden of the longer HFSSM tools with built-in stages (i.e. the 10-item and 18-item HFSSM) versus the 6-item HFFSM or a 2-item tool. The built-in stages of the 18-item and 10-item HFSSM tools mean that the actual administration length of these tools ranges between 1–4 minutes, depending on the severity of HFI.³⁹ Most respondents, who are those living in food-secure households, will only be asked a total of three questions, with an estimated administration time of fewer than 30 seconds.

Both the 10-item and 18-item tools progress through the questions using a 3-staged approach. If there is a positive response to one of the three questions in the first stage, additional questions are asked in stage 2 to determine marginal or moderate levels of food insecurity. If there is a positive response to a question in stage 2, additional questions will be asked in stage 3 to determine moderate or severe food insecurity.

Ability to Identify Marginal, Moderate and Severe HFI

A noted limitation of a brief HFI screening tool is the inability of the tool to differentiate whether a patient is experiencing marginal, moderate or severe food insecurity and to identify those at risk for marginal HFI.⁴⁷ Patients experiencing marginal HFI are under-reported with the use of any tool shorter than the full 18-item, including both the 6-item short form HFSSM and a brief 2-item HFI screening tool. This limitation could lead clinicians to overlook the significance of this issue among patients who face higher health risks due to marginal food insecurity.

Marginal, moderate, and severe levels of HFI (all levels related to poor health outcomes) can be determined from the full 18-item and the 10-item adult HFSSM. The full 18-item tool provides the most comprehensive data for the food security situation of households, as it includes the experiences of the adults and children in the household. The 10-item adult module can be used both for households with and without children, allowing for comparability of findings between households with and without children and among households with children in different age ranges. A benefit of the 10-item tool can be that it avoids asking specific questions about children's food security, which can be a sensitive issue to disclose in some healthcare settings.⁴⁰ However, this is also a limitation, as it does not provide specific information to assess the food insecurity experiences of child members of a household.⁴⁰ It is worth noting the unique experiences of HFI among adults and children in a household. Evidence on the allocation of scarce resources indicate that child members of a household are usually the most protected from the quantity impact of HFI; it is common for adult household members to endure greater levels of deprivation (compromises in food quality and quantity) in order to maximize the food availability for child household members.^{37,39}

The 6-item short form version of the HFSSM can determine moderate and severe but not marginal HFI status. The 6-item short form is less precise and reliable, does not measure the most severe forms of HFI^{40,82} and does not ask about conditions of children in the household.⁴⁰ In addition, it is uncertain how valid the 6-item short form is against the coding by Statistics Canada in the CCHS data.

As noted in the background section of this report, studies on the health impact of HFI suggest that marginal and moderate HFI should not be ignored. However, whether the healthcare system should identify and intervene, and what the actions should be in the Canadian health and social context are unclear.

Mode of Administration

The standard mode of administration for the HFSSM is face-to-face. However, there is emerging evidence that written or tablet-based options may be worth exploring.^{62,67} An RCT of English-speaking adult caregivers of pediatric patients found that among respondents that used an electronic tablet to complete a 2-item HFI screen had a higher disclosure rate compared with respondents who were verbally interviewed. Moreover, self-administration by electronic means was the participants' preferred screening method.⁶² Similarly, in an interrupted time-series study in a US pediatric primary care clinic where parents/guardians were screened for HFI, changing to a written questionnaire was associated with a significant increase in FI disclosure rates.⁶⁷ Mode of administration was not explored in the validity articles and research studies reviewed for this report.

Summary Statement

A brief HFI screening tool has the capacity to identify HFI among individuals living in households experiencing HFI when accessing health services but does not have the ability to distinguish between marginal, moderate, or severe food insecurity. Moderate and severe HFI can be determined by the 6-item HFSSM tool. The 10-item version of the HFSSM is the shortest version that will not under-report marginal HFI. None of these tools measures the experiences of child members of the household.

Although the common assumption is that a brief screening tool will be most acceptable to patients and care providers in healthcare settings, this review found no studies that tested this assumption. In addition, the built-in stages of the long-form HFSSM, and the reduction in respondent burden these provide, do not appear to have been considered in this discourse. Emerging evidence indicates non-verbal modes of administration may support increased disclosure when FI is determined using a brief screening tool.

What treatment or interventions does screening for HFI in healthcare settings lead to, and is there evidence screening leads to improved HFI or health outcomes?

The World Health Organization (WHO) defines the purpose of screening as “to identify people in a healthy population who are at higher risk of a health problem or a condition so that an early treatment or intervention can be offered. This, in turn, may lead to better health outcomes for some of the screened individuals.”* In a recently published report on screening, the WHO identifies that in too many screening initiatives, a clear evidence base for effectiveness is missing. The WHO report stresses the need to examine the evidence for screening effectiveness, as well as potential harms of screening, the cost and burden on the health system, and the need for strong monitoring and evaluation.⁸³

* World Health Organization. Screening programmes: a short guide. Increase effectiveness, maximize benefits and minimize harm. Page 3.

Treatments and Interventions Taken by Care Providers Post Screening

Food Provision Referrals

A 2019 systematic review by De Marchis of 23 primary research studies found that when patients were identified as food insecure using a brief HFI screen in healthcare settings, predominant actions of care providers were a provision of food-related resource interventions (food vouchers/food) and referrals to food and other assistance interventions.⁸⁴

All 12 validation articles included in this report^{47,48,57,58,49–56} were reviewed for any discussion of the type of actions HFI screening elicited from care providers. ([Appendix F](#)) Similar to the findings reported by De Marchis and colleagues in their systematic review, the most frequently mentioned actions were referral to US Federal Supplemental Nutrition Assistance Programs and emergency food (food banks, food hampers), followed by linking families to other social services.⁸⁴

Few articles explored whether food assistance or social worker referrals were desired or effective. One Australian study⁴⁹ found that a positive HFI screen does not necessarily indicate a family’s desire for further food assistance or referral to a social worker. When patients were asked if they would like to speak to a social worker, only 3% of food-insecure respondents requested this.⁴⁹

Clinical Management Alterations

Only one of the 12 validation articles reviewed in this report identified the need for care providers to alter clinical management as a result of HFI screening.⁴⁷ The concept of HFI screening to assist care providers in more effectively directing patient care and support was also a recommendation of a Canadian study conducted with patients living with diabetes and their care providers.³⁰ This qualitative research study identified potential benefits of screening in healthcare settings to help prevent care providers from falsely assuming that a patient is food secure; to enable care providers to tailor nutrition recommendations for disease management to be more appropriate, realistic and safe for food-insecure patients; and to surface/evoke rich responses that reveal how HFI affects patients' self-management and overall health.³⁰

Effectiveness of Referral Actions on Use of Food Provision Programs

The question of whether referral to a food program was effective for patients who screened as food insecure was the objective of one evaluation study conducted with patients attending a diabetes program.⁸⁵ The authors found that although screening revealed that the prevalence of HFI was high (60%) among this program population, the provision of food resource information (written or verbal) was largely ineffective in improving food access. Most patients had not used food resources a month after the in-clinic referral. Program enrollment guided by clinic staff and high accessibility of program services had a positive impact on referral outcomes. The most common barriers to connecting with food resources (based on study participant interviews) were accessibility barriers such as transportation, program hours (conflicting with work schedules), long wait times, and mobility challenges.⁸⁵

Effectiveness of HFI Screening on HFI Status and Health Outcomes

One validation study⁵³ assessed whether HFI screening in healthcare settings may lead to improved HFI and/or other health outcomes. Although a clinic's use of a brief HFI screen often increased referrals to services, including USDA food and nutrition programs, systematic screening was not associated with increased food security (decreased HFI) among participating households.⁵³

A systematic review that explored healthcare-based interventions designed to reduce HFI measured the impact of their interventions and their effectiveness.⁸¹ Very few studies included in the systematic review were found to evaluate health outcomes and none of these were able to determine if a change in HFI status mediated health outcomes. Most studies evaluated patient referrals to food programs and resource use. While a few studies were found to report a positive change in fruit/vegetable intake with the implementation of a food provision or food voucher program, individual studies revealed mixed findings, while pooled results (combined results of the different studies) revealed no impact. No studies that reported on a change in patient health outcomes were able to determine if a change in HFI status mediated health outcomes.⁸¹ A

systematic scoping review of food prescription programs administered by a healthcare provider revealed similar findings.⁸⁶ While some studies reported improved fruit and vegetable consumption, evidence for impacts on diet-related health outcomes was limited and mixed, and numerous barriers to program utilization were identified.⁸⁶

Summary Statement

Overall, the research reveals that HFI screening predominantly leads care providers to refer patients to food programs, irrespective of the appropriateness of these actions for the patients. This finding is of concern for the consideration of HFI screening in AHS. A screening approach that leads to food charity, food assistance programs, and/or nutrition education is not a desired outcome, both due to the ineffectiveness of these programs in addressing HFI^{87,88} and the evidence demonstrating the low uptake of these programs by patients experiencing HFI.⁸⁵ These actions align with the food-based activities that form the basis of responses to HFI in the US,^{31–34,89} a notably different approach than the root-cause, income-based response that is recommended in Canada.^{87,90–93}

What evidence exists for poverty and SDOH screening in healthcare settings?

A total of four articles^{94–97} were initially retrieved that explored brief screening for poverty and/or SDOH in healthcare settings. An additional two recently published review articles^{98,99} were identified that together provide an evidence-based summary of the current state. The evidence base in this area continues to expand with key discourses from both Canada⁹⁸ and the US^{53,94–97} on the evolving area of screening for social risks and social care integration into primary healthcare and other healthcare settings.

Poverty Screening Tools

The validity and accuracy of brief screens for identifying SDOH in healthcare settings was explored in Canada in a pilot study by Brcic and colleagues.⁹⁴ Their research tested nine potential SDOH questions in both urban and rural primary healthcare settings in Canada. The question that had the best validity results (sensitivity of 98%) was “Do you (ever) have difficulty making ends meet at the end of the month?”

SDOH screening

Five reviews investigated the use of SDOH screening in a healthcare setting. The scoping reviews by Andermann⁹⁵ and Parry⁹⁹ each explored a number of questions regarding screening for SDOH in clinical practice, including which tools are available to help identify social risk. The purpose of the systematic review by O’Brien was to identify what screening tools for SDOH have been used in research and clinical practice.⁹⁶ An integrative review by Morone⁹⁷ was undertaken to identify and evaluate available pediatric SDOH screening tools. Finally, an evidence analysis by Bloch explored how

patients' social needs can be identified and acted on to support individual well-being, self-management and empowerment.⁹⁸

Andermann and colleagues⁹⁵ highlighted the range of tools that exist, concluding that most tools assess a single SDOH domain (such as food insecurity or violence). The study by Parry⁹⁹ mapped the tools used to identify patients' economic needs, describe key types of primary care-based interventions, and examine implementation barriers and facilitators. The systematic review by O'Brien and colleagues⁹⁶ focused on the US environment, identifying 43 studies that utilized SDOH screening tools in healthcare settings. Most tools included multiple SDOH domains such as housing instability, food insecurity, transportation needs, utilities, and interpersonal safety.⁹⁶ The pediatric-specific review by Morone⁹⁷ limited articles to those conducted with pediatric populations in the US. Their synthesis revealed a lack of high-quality, multidimensional tools and a challenge with choosing a tool, even if effective, that focuses on a single individual domain, such as food insecurity.⁹⁷

Andermann⁹⁵ and Parry,⁹⁹ as well as a review of social interventions in primary care by Bloch⁹⁸ specifically mentioned the 1-question Poverty Tool by Brcic and colleagues⁹⁴ as a single-question screen for income security. More comprehensive screens and other approaches noted in these papers included surveys to identify unmet social needs and more detailed social history taking in clinical settings. Bloch⁹⁸ further commented on how health teams can actively address drivers of health inequity within the operations of their teams and services.

Discussion

This report summarizes published evidence on HFI screening tools and reviewed the evidence for the effectiveness of these tools in identifying and addressing HFI in health care settings. As HFI is an issue in which access to adequate food is limited by inadequate income, the question of what approach is currently taken in Canada and Alberta for screening for poverty was also explored.

This report has shown that the question of screening for HFI in healthcare settings is much more complex than determining whether valid and reliable tools exist for healthcare settings specific identification of HFI.

HFI screening tools that could be used in healthcare settings

If the evidence is viewed solely from the perspective of, ‘do validated HFI identification tools exist, that have been used and/or tested in healthcare settings?’ the answer is yes. There are three prospective options for this use, all three of which are derived from the full 18-item HFSSM tool. All three tools require less than four minutes to complete. This meets the maximum time requirement of fewer than 10 minutes that is considered an acceptable time length in other screening work.⁸⁰

The 10- or 18-item versions of the HFSSM are preferred options due to the capacity for these tools to determine HFI severity (marginal, moderate, and severe). If clinical interventions are identified and implemented that have proven efficacy to impact health outcomes based on HFI status, these tools can theoretically provide more information to guide appropriate issue identification and actions to improve health outcomes.

In terms of brief screening tools, this review identified several versions of brief 2-item screening tools tested in small validation studies with a narrow range of population groups (care providers of young children, patients positive for HIV). Gundersen and colleagues⁴⁷ explored the test characteristics (sensitivity, specificity and accuracy) of the most popular of these tools against US population survey data for the general population and subgroups at high risk for HFI. The two recommended items had sensitivity across high-risk population subgroups of $\geq 97\%$ and a specificity of $\geq 74\%$ for food insecurity. These items queried how often the household ‘worried whether food would run out before we got money to buy more’ and how often ‘the food that we bought just didn’t last and we didn’t have money to get more’.

If a brief 2-item HFI screening tool is used in AHS healthcare settings, the tool questions and response options presented in the study by Gundersen and colleagues,⁴⁷ without any amendments, is the preferred choice.

Is HFI screening a desirable and effective action for healthcare settings to implement in the Canadian context?

The broader and more important question is whether HFI screening is a desirable and effective action for healthcare settings to implement in Canada, and if and how HFI screening aligns with Canadian healthcare and social policy contexts. As much of the research and discourse on HFI screening in healthcare settings has emerged from the US, it is important to note some of the distinctions between the two countries on this issue and how this may influence potential actions.

The prevalence rate of HFI in the US is more than double that in Canada.¹⁰⁰ The percentage of the population living in households with the inadequacy of food intake and disrupted eating patterns (severe HFI) is also lower in Canada.¹⁰⁰ The US relies on nationally funded food assistance programs (e.g. Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women Infants and Children (WIC), school breakfast and lunch meal programs and other means-tested food assistance programs) as a cornerstone of government social policy, whereas Canada focuses on national and provincial income-based transfer programs.

The research indicates a lack of evidence for HFI screening effectiveness in healthcare settings and calls into question assumptions that the overall benefits of HFI screening outweigh the harms. Canadian health organizations have not yet released statements on HFI screening, however, an argument against screening for HFI in healthcare settings has been advanced by some noteworthy Canadian researchers.²⁹ Concerns of HFI screening go beyond the tool chosen or the availability of a validated tool, to concerns regarding care provider actions resulting from HFI screening.

A potential key risk of embedding an HFI screen tool into health care practice is an unintended reinforcement with care providers that HFI is a food issue versus a poverty issue, with care provider action being predominately focused on charitable food and food program referrals. HFI screening, regardless of the tool chosen, that results primarily in patient referrals to food charity, other forms of food provision programs and/or nutrition education is not recommended.

Recent qualitative research¹⁰¹ conducted in Scotland with health professionals' experiences and perspectives on food insecurity and long-term conditions raises further concerns about whether screening for food insecurity is a good idea. Douglas and colleagues¹⁰¹ raise the issue that the justification for screening rests on what improvements to clinical management would follow screening and notes this is currently unclear. The need for the development of respectful, effective approaches to support patients living with HFI is recommended, conducted in partnership with people directly affected by HFI.¹⁰¹

For further discourse regarding on ethical and effectiveness discussion of food-based programs and HFI in the Canadian context see:

- [PROOF. Food Insecurity Policy Research](#)
- [Addressing Household Food Insecurity in Canada: Position Statement & Recommendations](#)
- [Ontario Dietitians in Public Health Position Statement on Responses to Food Insecurity](#)
- [Nutrition Services, Alberta Health Services: Evidence Review. Household Food Insecurity: Lived Experiences and Strategy Effectiveness.](#)
- [Debate. Should Canadian health promoters support a food stamp-style program to address food insecurity?](#)

A consideration of poverty screening versus HFI screening

It is unclear what added patient care benefit is expected through the implementation of an HFI screening tool in place of, or in addition to, a poverty screening tool. While it was beyond the scope of this report to study poverty screening, it is critical to raise this as an option in the context of the limitations of HFI screening. Actions currently underway in Alberta and AHS to incorporate poverty screening into patient care strengthen the case for this approach.

Poverty screening adjusts a patient's risk by factoring poverty into clinical decision-making.^{94,98} Patients who screen positive for poverty risk are linked by their health care providers to income-related assistance, with the goal of ensuring patients are aware of and can access all the income, health benefits, resources and services to which they are entitled. Identification of poverty in a healthcare setting can also increase awareness among health professionals and sensitize providers to their responsibility to address social conditions that create health inequities.⁹⁸

A potential key benefit of a poverty screening approach is a close alignment with the understanding of HFI as an income or financial constraint issue, best addressed through poverty reduction and income benefit interventions. Reported benefits to screening for poverty include an opportunity to target interventions to reduce the effects of poverty and risks of adverse health outcomes in lower-income patients.⁹⁴ Canadian research has demonstrated that HFI is directly correlated to income. While HFI can be experienced across all income levels, the relationship between income and HFI is graded, with increased income associated with lower odds of HFI.¹⁰² The relationship between HFI and health in Canada is also graded, with a greater likelihood of negative health outcomes with more severe HFI.^{17,24}

In 2016, the College of Family Physicians of Canada (CFPC) in collaboration with the Centre for Effective Practice (CEP), launched a resource called Poverty: A Clinical Tools for Primary Care Providers to assist family physicians in identifying and responding to poverty concerns in patient encounters. An Alberta-individualized form of the tool was developed, and endorsed by the CFPC and the Alberta provincial chapter of the Alberta College of Family Physicians.¹⁰³ A number of AHS projects have recently taken action towards identifying poverty in client interactions using the 1-item poverty screen tool validated by Brcic et al;⁹⁴ these include:

- [Connect Care](#) - Social Determinants of Health
- [Reducing the Impacts of Financial Strain \(RIFS\) project](#), which is piloting the use of poverty screening in primary care sites, in collaboration with community partners
- [Prenatal Nutrition Tool](#), Nutrition Services
- COMmunity-based nutrition RISK screening in older adults (COMRISK), Nutrition Services (in progress).

The adoption of a single poverty screen tool in AHS has the potential additional benefits such as:

- leading to more consistent responses and messages by programs across AHS
- consistent incorporation of the impact of poverty on health into clinical decision making and patient care plans.
- increased awareness of the impact of poverty on health and the ability of patients to manage their health conditions.

Additional Screening Considerations

It is beyond the scope of this report to detail all considerations when initiating SDOH screening in healthcare settings, be it HFI, poverty or other. Considerations suggested by researchers include: the development of screening criteria, staff education and training, interdisciplinary collaboration, and standards for informed choice and patient confidentiality.⁸³ Implementation success is noted to be positively influenced by: dedicated staff to “champion” effective responses, collaborative health care team responses, connections to community, and monitoring the benefits and risks of screening.^{53,98,99,104} The poverty screening tool has some of these supports in place, accessible through the [Centre for Effective Practice resources](#).

In Alberta Health Services, health care providers are supported to increase their knowledge and skills through the [Identifying Financial Strain and Addressing Financial Barriers to Health Care](#) modules. This series of modules are also available through MyLearningLink for AHS staff. The modules cover core foundational SDOH concepts, guidance on how to talk to clients about financial strain, and an exploration of income replacement and benefit programs.

Conclusions

Brief, short, and long version validated tools exist that can identify HFI in healthcare settings. However, given that screening for HFI in healthcare settings leads to health care provider actions that are ineffective in addressing HFI,^{87,88} are not used by patients experiencing HFI,⁸⁵ and position the issue as a food versus an income issue,^{87,90–93} screening for HFI is not recommended.

In view of financial strain and inadequate income being a root cause of both HFI and poverty, it is recommended to use a poverty screening approach instead of implementing a separate screen for HFI. At this point, poverty screening is better positioned to support identification, counselling and interventions that address HFI as an issue of financial strain.⁹⁸ In addition, it is hoped that a poverty screening approach would allow for SDOH to be regarded as a structural versus an individual choice issue.⁹⁸

The most appropriate choice for a poverty screening tool at this time is the Canadian Poverty Screen Tool, as it has been endorsed in Alberta by the Alberta College of Family Physicians and is already being used in several AHS programs and initiatives. The implementation of the Poverty Screen tool is supported by a variety of care provider resources (recommended actions, toolkits, videos, etc.) through the Centre for Effective Practice, whereas Canadian specific resources are lacking for an HFI specific screening tool.

Recommendations

- Ensure screening tools and approaches are:
 - Consistent with the Canadian social context that addresses HFI with income policy versus food provision policy
 - Based on research that establishes financial strain and inadequate income as the root cause of HFI
 - Aligned with Canadian and Albertan actions on screening for and addressing poverty in healthcare settings
 - Based on the understanding that screening is only one component of incorporating SDOH into client care processes
 - Based on the concept of SDOH as a structural issue
- If asked for guidance regarding HFI screening in healthcare settings:
 - Recommend screening for poverty versus screening for HFI.
 - Provide the following rationale for this recommendation:
A poverty screen approach supports the identification, discussion and interventions around issues that are rooted in financial strain, including HFI, and are therefore best addressed by income approaches.
- If asked for guidance regarding screening tools:
 - Recommend screening for poverty using the 1-item tool currently in use in Canada, Alberta, and some programs in Alberta Health Services.
- If programs are committed to adding brief HFI screening tools to their program screening activities, and cannot be dissuaded, recommend the use of the 2-item food insecurity screening tool, with the exact questions and response wording as recommended by Gundersen, without amendments.⁴⁷ ([Appendix D](#))
- Critically assess the preparedness of the health care team to screen for and effectively intervene to identify and mitigate threats to individual health posed by social conditions.
- Given the ongoing evolution of research in this area, continue to provide an evidence-based lens to the HFI and SDOH screening healthcare discussions.

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Appendices

Appendix A: US Medical and Health Organizations Recommending HFI Screening

Organization	Statement Type & Date	Statement Title and Publication Date	Screening Recommended	Key Action(s) Recommended
American Academy of Family Physicians (AAFP) ³⁶	Position Paper April 2019	Advancing Health Equity by Addressing the Social Determinants of Health in Family Medicine	Yes Tool- Broad SDOH Screening, includes 2-Item HFI Screen	A broad variety of social services, downstream, midstream and upstream actions. The EveryONE Project and Toolkit
American Academy of Pediatrics (AAP) ³¹	National Policy Statement Nov 2015	Promoting Food Security for All Children	Yes. Tool - Hunger Vital Sign™	Connect patients to federal nutrition programs and resources
American Association of Retired Persons (AARP) ³²	Issue Brief Sept 2016	Addressing Food Insecurity in Primary Care. Models for Patient Screening and Referral	Yes Tool – 2-Item Screen (Hager et al, 2010)	Referral to food and other local resources
American Diabetes Association ³⁵	Standard of Care Jan 2020	Standards of Medical Care in Diabetes	Yes Tool – 2-Item Screen (Hager et al, 2010)	Mitigate increased risk for hypoglycemia and hyperglycemia; seek local food resources
American Nurses Association ³³	Code of Ethics 2015	Code of Ethics for Nurses	Yes. Tool - Hunger Vital Sign™	Recommend federal/local resources for food, community food and education programs.
Academy of Nutrition and Dietetics ³⁴	Position Statement Dec 2017	Position of the Academy of Nutrition and Dietetics in the United States	Yes Tool – 2-Item Screen (Hager et al, 2010)	Connecting households to food (charitable, food assistance), providing nutrition education, address underlying causes of HFI.

Appendix B: USDA HFSSM Tools

USDA Household Food Security Survey Module Tools			
Tool Name	Description	Advantages	Limitations
US Household Food Security Survey Module 18-Items	<ul style="list-style-type: none"> • A 3-stage design with screeners. • Screening keeps respondent burden to the minimum needed to get reliable data. • Most households in a general population survey are asked only 3 questions (5 if there are children in the household). 	<ul style="list-style-type: none"> • Limited respondent burden. • Allows for comparability of food security statistics with provincial and national prevalence data. • Time allocation for survey administration is 1 – 4 minutes. • Allows for determination of marginal, moderate and severe HFI. 	<ul style="list-style-type: none"> • Perceived time burden. Time allocation for survey administration is 1 – 4 minutes. • Challenge of inclusion of 18 questions in any patient survey.
US Adult Food Security Survey Module 10-Items	<ul style="list-style-type: none"> • A 3-stage design with screeners. • Screening keeps respondent burden to the minimum needed to get reliable data. • Most households in a general population survey are asked only 3 questions. 	<ul style="list-style-type: none"> • Less respondent burden. • Improves comparability of food security statistics between households with and without children and among households with children in different age ranges. • Avoids asking questions about children's food security, which can be sensitive in some survey contexts. 	<ul style="list-style-type: none"> • Does not provide specific information on food security of children.
Six-Item Short Form of the Food Security Survey Module 6-Items	The six-item survey uses a subset of the standard 18 items.	<ul style="list-style-type: none"> • Less respondent burden for food-insecure households. • Prevalence estimates of food insecurity and very low food security are only minimally biased relative to those based on 18-item or 10-item modules. • A standard short form with a known relationship to a full module. 	<ul style="list-style-type: none"> • Less precise and somewhat less reliable than the 18-item measure. • Does not measure the most severe levels of food insecurity. • Does not ask directly about the conditions of children in the household.
Self-Administered Food Security Survey Module for Youth Ages 12 and Older 9-Items	Adapted from the US Household Food Security Survey Module for self-administration by children ages 12 and older.		<ul style="list-style-type: none"> • Limited validation work. • Validation was conducted in a sample of children from a school in Mississippi. • Further validation assessment is required.

Appendix C: Versions of HFSSM used in Research Conducted in Healthcare Settings

A total of eight studies* were retrieved that used any of the four versions of HFSSM with patient populations. Three studies used the 18-item (full scale) HFSSM,^{41–43} (two used the 10-item (adult scale) HFSSM^{1,44} and three used the 6-item version of the HFSSM.^{14,45,46}

The full 18-item HFSSM was used with patients attending hemodialysis clinics,⁴² cancer clinics,⁴³ and emergency departments.⁴¹ The 10-item tool was used in a Canadian study to determine the prevalence of HFI among a diabetes clinic population¹ and outpatients with severe mental illness.⁴⁴ The 6-item short version was used in three studies conducted in the US, one each with care providers of young children in community child wellness clinics,⁴⁵ uninsured patients accessing student-run wellness clinics¹⁴ and patients receiving cancer care.⁴⁶ The study by Bottino⁴⁵ embedded the 6-item HFSSM short form into a web-based self-administered assessment tool called The Online Advocate. See Table C below for additional information.

* Two studies retrieved from previous scoping review work Nutrition Services was involved with. Modified from: McIntyre L, Musto R, Basualdo-Hammond C, Fleisch V, Farmer A, Galesloot S, Lorenzetti D, Tyminski S, Willows N. Scoping Review: Addressing Food Insecurity in Health Settings. Public Health 2015 (Canadian Public Health Association Annual Conference), Vancouver, BC, May 25-28, 2015

Table C: HFSSM Tool Versions used in Research conducted in Healthcare Settings					
Article	Population	Target Populations	Study Purpose	HFI Prevalence	Comments
18-Item (Full Scale) HFSSM					
Wilson et al, 2006	Dialysis Clinics (n=3)	Patients on hemodialysis	To demine whether a relationship exists between nutrition status and HFI of patients on hemodialysis.	16.3% Total HFI	Authors refer to the 16-item HFSSM (assume this is the 18-item HFSSM and a typo). Suggest a need for questions related to the ability to obtain foods for health/manage chronic conditions.
Sullivan et al, 2010	Emergency Departments (n=4)	General patient population (18 years and older)	To examine HFI prevalence and its association with health problems & medication expenditures in emergency department patients.	13.0 % Total HFI	
Gany et al, 2014	Cancer clinics. (New York)	Underserved oncology patients.	To assess prevalence and predictors of food insecurity among a cohort of	HFI is nearly 5 times the state average. 18% Very low	76% reported having less money to spend on food since starting treatment (cost of transportation, work impact, more

Table C: HFSSM Tool Versions used in Research conducted in Healthcare Settings

Article	Population	Target Populations	Study Purpose	HFI Prevalence	Comments
			underserved cancer patients.	38% Low 17% Marginal 27% High	expensive diet, cost of cancer medication)
10-Item (adult scale) HFSSM					
Galesloot et al, 2012	Outpatient diabetes clinic	Outpatients (adults) receiving diabetes care	To determine the prevalence of food insecurity.	15% Total HFI 6.7% severe HFI	
Mangurian et al, 2013	Urban community mental health clinic	Outpatients (adults) with severe mental illness	To determine the prevalence of food security & association between FI and psychiatric emergency service utilization.	71% Total HFI 44% Severe	
6-Item (short form) HFSSM					
Simmons et al, 2006	University Cancer Centre	Convenience sample of active cancer patients receiving care.	To examine the construct and correlates of food insecurity in a sample of cancer patients.	17.4% Total HFI 7.8% Food Insecurity with Hunger	55% of FI patients reported not taking a prescribed medication and 40% reported taking less medication because they could not afford it. More FI patients reported borrowing money (80.9%) or paying bills late (75%) to pay for treatment.
Bottino et al, 2017	Well-child care clinics.	Caregivers of children aged 3 – 10 years	1) To describe a clinic approach for HFI screening incorporating a menu for offering food assistance referral 2) to examine relationships between HFI and referral selection	31.2% Total HFI	HFI status was correlated to referrals for food assistance. 14.4% reported FI but selected no referrals; 14.7% did not report HFI and selected 1 or more referrals; 16.8% reported both HFI and selecting 1 or more food referrals.
Smith et al, 2017	Student-run Free Clinics	Patients who are uninsured and unable to access care through the health care safety-net.	To document screening rate, HFI prevalence and food resource utilization.	74.0% 30.7% very low food security	The prevalence of HFI in this population was remarkably high yet largely unknown until this program was implemented.

Appendix D: 2-item Food Insecurity Screen

Widespread calls in the US for food insecurity screening in healthcare settings, using 1- and 2-item food insecurity screens, led to an examination of the sensitivity, specificity, and accuracy of various two-item combinations of questions assessing food insecurity in the general population and high-risk population sub-groups.⁴⁷

If a 2-item screen is used, the context, intent, and wording of the questions are critical.

- Question items one and two from the HFSS are the recommended combination of questions.
- A response of “sometimes” or “often” true to either question is necessary.
 - Changing the responses to the question is inappropriate.
 - For example, responses of “yes” or “no” are inappropriate substitutions.
- Changing the question wording is inappropriate.

Recommended questions and wording if a 2-item food insecurity screen is used:⁴⁷

Preamble:

Now I’m going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months – that is since last (name of current month).

Questions:

The first statement is “We worried whether (my/our) food would run out before (I/we) got money to buy more.”

- Was that “often true”, “sometimes true”, or “never true” for (you/your household) in the last 12 months?

The second statement is “The food (I/we) bought just didn’t last and (I/we) didn’t have money to get more.”

- Was that “often true”, “sometimes true”, or “never true” for (you/your household) in the last 12 months?

Appendix E: Brief HFI Screening Tools: Validity Research

A total of 14 articles: two reviews^{84,96} and 12 validation studies examined the validity or accuracy of brief screening tools for identifying HFI in health care settings.^{47,49,58,50-57}

Review articles (n=2)

The systematic scoping review by De Marchis⁸⁴ was limited to US studies published prior to June 2017, including only four^{50,52,53,58} of the 12 validation articles retrieved in our search. Likewise, the systematic review of SDOH screening tools⁹⁶ included a total of three relevant HFI Screening validation articles.^{50,56,58} Due to the incompleteness of these reviews to this evidence review question, original validation studies were retrieved and reported on.

Validation Studies conducted in healthcare settings (n=10)

- Country: The majority (n=8)^{49-55,57,58} were conducted in the US; two studies were conducted in Australia.^{49,56}
- Participants: All studies were conducted with a small number of patients accessing primary care settings. The majority were conducted with care providers of young children (n=7)⁴⁹⁻⁵⁵ one study was with youth,⁵⁸ one with adult HIV patients,⁵⁶ and one with adults, but not specifically identifying as parents or caregivers of young children.⁵⁷
- Approach to Validity Testing:
Testing the brief screen performance against a “Gold Standard” Tool
Ten studies used one of the four versions of the USDA HFSSM to test validity. Details of the studies are summarized in Table E1.
 - Studies that used the full 18-item USDA HFSSM for validity testing (n=4)
Four articles used the full 18-item USDA Household Food Security Survey (HFSS) was used as the gold standard for validity testing.⁵⁰⁻⁵³
 - Studies that used the short 6-item USDA HFSSM for validity testing (n=4)
Three articles used the 6-item form of the HFSS, (validated by Blumberg et al in 1999),⁸² as the gold standard for validity testing.⁵⁴⁻⁵⁶
One study⁵⁷ tested the diagnostic accuracy of two HFI screening tools in common use in the US against each other and against the USDA 6-item HFSSM. The tools tested in the study used the identical 2 questions but used different response options.
 - Studies that used different forms of the USDA HFSSM based on age and parental status (n=1)
One article⁵⁸ based the choice of the gold standard tool used on the age and parental status of the study participant. All three tool choices were a version of the USDA HFSS. The 18-item HFSSM was used for any participant who self-identified as being a parent; the 10-item Adult HFSSM was used for those aged 18 - 25 who did not identify as being a parent and the 9-item HFSSM for youth was used with participants aged 15-17.

- Testing a variety of 2-item question combinations
 - One study by Kerz 49 studied the best 2-item combinations for a small sample size of 148 caregivers.
- One study⁴⁹ assessed the sensitivity and specificity of 26 question combinations of the 18-item HFSS questions, the HVS tool and the 8-item FAQ-FIES tool. In their small convenience sample of care providers accessing care in an Australian pediatric outpatient hospital clinic, they identified the 2-question combination with the highest specificity and sensitivity.

Table E1: Articles exploring Validity of Brief (1, 2 or 3-item) Food Insecurity Screens

Article	Population	Respondents	Other outcomes	Specific Questions	Other	Validity Results
Kleinman et al, 2007 1-Item	Neighbourhood health centre, inner city.	Parents; inner city, primarily Hispanic background.	Food program participation	In the past month, was there any day when you or anyone in your family went hungry because you did not have enough money for food? 1. Yes 2. No	The question was developed after a review of existing hunger surveys and consultation with experts in the field of hunger assessment.	Sensitivity: 83% Specificity: 88% Time-to-time reliability: 77% Against 18-item HFSS classification of hungry/not hungry.
Young et al, 2009 2-Item	Clinic setting; HIV1 infected patients.	HIV infected individuals; variety of SES backgrounds	Demographics symptoms, malnutrition, CV & DM risk, depression, oral health	Please read the following 2 statements and indicate whether the statement was OFTEN, SOMETIMES or NEVER true for you or other members of your household in the last 12 months. 1. The food I/we bought just didn't last, and I/we didn't have money to get more. Never true; Sometimes true; Often true 2. I/we couldn't afford to eat balanced meals. Never true; Sometimes true; Often true	The 2 questions were taken directly from the 6-item HFSS. Scoring was the same as the 6-item. E.G. Food Security, food insecurity without hunger & food insecurity with hunger	Sensitivity: 100% Specificity: 78% Negative predictive value – 100% Against 6-item screen

Table E1: Articles exploring Validity of Brief (1, 2 or 3-item) Food Insecurity Screens

Article	Population	Respondents	Other outcomes	Specific Questions	Other	Validity Results
Hager et al, 2010 2-Item	Urban; uninsured from acute care clinics and ERs	Caregivers of children 36 months and younger; predominantly non-Hispanic Black and Hispanic. Urban emergency and primary care settings.	Health status, maternal depression, hospital records, child development screen	1. Within the past 12 months, the food we bought just didn't last, and we didn't have money to get more 2. Within the past 12 months, we worried whether our food would run out before we could get more	2 items can identify families that have the same risks that are documented to co-occur with FI in the literature.	Sensitivity: 97% Specificity: 83% Against 18-item HFFSM Convergent Validity: associations with fair/poor child health; fair/poor adult health; >hospital admissions; >likely to be at development risk.
Swindle et al, 2013 2-Item	Rural and Urban; Head Start	Caregivers of children aged 3 to 5 years	Basic Needs, Physical Health, Environmental Safety, Caregiver Mental Health, Discipline, Family Stress	1. Within the past 12 months, the food we bought just didn't last, and we didn't have money to get more. 2. Within the past 12 months, you or others in your household cut the size of your meals or skipped meals because there wasn't enough money for food?	The 2-items used in the study were embedded in the context of the Family Map Interview. The study did not validate the use of a stand-alone, 2-item screen but the use of a 2-item screen within an interview context (<i>at best</i>).	Sensitivity: 78.6% Specificity: 98.4% Against 6-item screen Convergent Validity: Against associations with basic needs, physical health, environmental safety; parenting stress
Lane et al, 2014 1-Item	Pediatric Resident Continuity Clinic serving urban low income families	Parents of children; under age 6.	Participation in Supplemental Nutrition Assistance Program (SNAP). Other questions part of a larger study (SEEK Parent Screening Questionnaire)	"In the last year, did you worry that your food would run out before you got money or food stamps to buy more?" <i>Yes or NO response.</i>	The single items was selected after a review of validated screening measures (Article referenced Kleinman, 2007; and Hager 2010).	Sensitivity - 59% Specificity - 87% Positive Predictive Value (PPV): 70%; Negative Predictive Value (NPV): 81%

Table E1: Articles exploring Validity of Brief (1, 2 or 3-item) Food Insecurity Screens

Article	Population	Respondents	Other outcomes	Specific Questions	Other	Validity Results
Baer et al, 2015 2-Items	Urban Adolescent Clinic	Adolescents and young adults (youth); aged 15 – 25.	Screened for six additional health-related social domains: Health care access; education; housing; income security; substance use; intimate partner violence.	1. Within the past 12 months, we worried whether our food would run out before we could get more. 2. Within the past 12 months, the food we bought just didn't last, and we didn't have money to get more.	Chi-square and Fisher's exact test evaluated association between food security classification and demographics, as well as the association with each health-related social problem domain.	Sensitivity: 88.5% Specificity: 84.1% Positive predictive value (PPV): 72.8% Negative predictive value (NPV): 93.8% Hager 2-item screen vs. Full 18-item HFSSM; 10-adult referenced HFSSM (youth with no children); 9-item Adolescent HFSSM (Youth aged 15-17)
Makelarski et al, 2017 2-items	Adult and Pediatric Emergency Departments	Adults > 18 years. Patients and other adults (parents, other caregivers, family members, friends of patients)		Every questionnaire included 3 screening tools, all using a 12-month recall period: (1) the gold standard 6-item HFSSM, (2) the 2-item Hunger Vital Sign (HVS) (3 response categories), and (3) the 2-item American Academy of Pediatrics (AAP) tool (yes-or-no response categories).	The AAP tool missed nearly a quarter of food-insecure adults screened in the hospital; the HVS screening tool was more sensitive.	AAP Tool: Sensitivity: 76% (12-month recall); 72% (30-day recall) HVS Tool: Sensitivity: 94% (12 month recall); 92% (30 day recall). Statistically higher than the AAP Tool.
Radandt et al, 2018 2-Items	Urban Adolescent Clinic	Parents/ Caregivers of children brought to a dental appointment. (Age not defined)	32-item questionnaire; 7 FI related questions. Other questions on household demographics, about children with special care needs, nutrition assistance program use.	1. The food we bought just didn't last, and we didn't have money to get more. 2. We worried whether our food would run out before we could get more. <i>Response choices:</i> often true, sometimes true, never true in the last 12 months, or don't know.	The 7 HFI questions were the 2-item screen question and 5 of the 6 items of the six-item screen. Author Comment: Question 2 also forms part of the six-item FI screen and was not asked a second time.	Sensitivity: 88.5% Specificity: 84.1% Positive predictive value (PPV): 72.8% Negative predictive value (NPV): 93.8% First 2 USDA HFSSM questions vs. Full 18-item HFSSM

Table E1: Articles exploring Validity of Brief (1, 2 or 3-item) Food Insecurity Screens

Article	Population	Respondents	Other outcomes	Specific Questions	Other	Validity Results
Gattu et al, 2019 2-Items	Emergency Departments and Primary Care	Caregivers of children younger than 48 months.	Caregivers' perception of child health; report of hospitalization developmental risk.	1) "Within the past 12 months we worried whether our food would run out before we got money to buy more" 2) "Within the past 12 months the food we bought just didn't last and we didn't have money to get more." <i>Response choices:</i> often true, sometimes true, never true in the last 12 months, or don't know.	Higher rates of food insecurity based on the HVS, compared to the HFSSM, occur because children classified as living in marginal food secure households on the HFSSM are classified as food insecure using the HVS.	Sensitivity: 96.7% Specificity: 84.1% Positive predictive value (PPV): 65.7% Negative predictive value (NPV): 99.0% Against 18-item HFFSM
Kerz et al, 2020	Hospital Pediatric Outpatient Clinics	Caregivers of children. Median child age 6.4 years (range 2.1 – 11.3 years)	Care-giver reported child health; adult health.	HFSSM questions 2 and 3 provided the best sensitivity, specificity and correlation. The researchers selected these 2 questions to make up a new HFI screener, with often/sometimes/never responses. These questions were "Have you ever worried that food will run out before you are able to buy more?" and "Have you run out of food and not had enough money to buy more?"	The most frequently endorsed questions for caregivers who were classified as food insecure by the HFSSM were questions 2, 3, 4 and 5 from the HFSSM, both questions from the HVS™ and questions 1 and 3 from the FAO-FIES. 2-question combinations with each of these questions were explored.	HFSSM Questions 2 and 3. Specificity: 96.0% Sensitivity: 90.3% Tetrachoric correlation analysis: $r = .979$

Table E2: Key findings of articles examining validity or accuracy of brief food insecurity screens

Country	Year	Author	Population	Health Care Setting	Number of Questions	Questions or response options modified**	Sensitivity at or above 80%
Australia	2009	Young	Adults with HIV	Clinic	2	No	Yes
US	2007	Kleinman	Caregivers*	Health centre	1	Yes	Yes
US	2010	Hager	Caregivers* of children, ≤ 36 months	Acute care clinic or Emergency Room	2	No	Yes
US	2013	Lane	Caregivers* of children < 6 years	Clinic	1	Yes	No
US	2013	Swindle	Caregivers* of children, aged 3 to 6	Head Start Program	2	Yes	No
US.	2015	Baer	Youth aged 15 to 25	Clinic	2	No	Yes
US	2018	Radandt	Caregivers* of children, age not specified	Dental office	2	No	Yes
US	2019	Gattu	Caregivers* of children ≤ 48 months	Primary care or Emergency Room	2	No	Yes
Australia	2020	Kerz	Caregivers* of children, age range 2 – 12 years	Paediatric outpatient clinic	2	Yes	Yes

*Parents or caregivers

** Four studies appear to have altered the wording for either the survey question to the response option. This is **not recommended**.

Validation studies using population surveillance data (n=2)

Two studies^{47,48} took the approach of examining the test performance of various 2-item question combinations of the full 18-item HFSSM, using population-level surveillance data versus specific testing of a tool with a specific population in health care settings.

Country and Population represented: One US⁴⁷ (Gundersen et al., 2017) and one Canadian⁴⁸ study. The US study by Gundersen⁴⁷ used data from the US Current Population Survey; data is collected from 60,000 nationally representative households. The Canadian study by Urke⁴⁸ utilized Canadian Inuit population data from 2007-2008.

Validity results presented: Validity results presented for both studies included sensitivity, specificity, and accuracy of various 2-item combinations of questions from the HFSSM.

Approach to Validity Testing: Gundersen⁴⁷ used tested seven of the core 18 HFSSM items against US national prevalence data. Urke⁴⁸ tested the performance of both adult and child-focused questions of the 18 HFSSM items against Canadian Inuit population data.

Table E3 provides a summary of the 2-item combinations recommended. While all authors state they used questions from the HFSSM with the best test performance (highest sensitivity and specificity), it appears that only Gundersen⁴⁷ used the validated wording of the HFSSM.

Table E3: 2-item combination results					
Study Author	Item #	Item Question	Specificity	Sensitivity	Comments
Gundersen, 2017 ⁴⁷	HH2	Within the past 12 months, we worried whether our food would run out before we could get more.	73.7% - 94.4%	96.6%- 98.7%	Gundersen tested seven Core Food Security Module items (household stage items only) as 2-item combinations
	and HH3	Within the past 12 months, the food we bought just didn't last, and we didn't have money to get more.			
Urke, 2014 ⁴⁸	HH2	In the past 12 months, were there times when the food for you and your family just did not last and there was no money to buy more?	93.0%	93.2%	Household stage; question altered.
	CH2	In the past 12 months, were there times when it was not possible to feed the children a healthy meal because there was not enough money?	92.3%	97.3%	Child-referenced question; question altered

Appendix F: Brief HFI Screening Tools used in Research Conducted in Healthcare Settings

Lundeen and colleagues⁷⁷ reported on a landscape assessment they conducted of US healthcare entity-based programs that screen patients for food insecurity (and connect them with food resources). Of a total of 22 programs who participated in the survey, nearly two-thirds (n = 14), reported conducting food insecurity screening using the Hunger Vital Sign™ screener questions. The remaining programs reported using screening questions developed specifically for the program or other metrics.

These findings are similar to the types of tools that are reported in published literature articles that discuss food insecurity screening actions in a variety of health care settings, predominantly pediatric clinics and emergency departments, regarding implementation, feasibility, acceptability and prevalence. Out of 21 published articles^{14,30,45,60-67,69-79} that stated using food insecurity screening questions, 85% (n=18)^{60-67,69-79} stated using a 2-item tool, referencing validation and reliability testing conducted by Hager et al, 2010,⁵² and seven^{62-64,67,68,76,77} referring to the tool as the Hunger Vital Sign™. However, out of the 18 articles that stated using a validated 2-item tool, only four articles^{68,73,75,77} appeared to use the same question wording and answer options as the original Hager et al⁵² validation and reliability testing study.

The other three studies reported using either: a single question “drawn from the Nutrition Health Screener of the Nutrition Screening initiative (for seniors)⁷⁰ or three screening questions that “originated from the USDA HFSSM” (18-item survey).^{30,72} The two studies that used three questions are the only Canadian studies, conducted with adult³⁰ and pediatric⁷² clinic populations. See Table F1 for additional details.

Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
Burkhardt et al, 2012	Primary Care Clinics	1) Patients accessing primary care clinics 2) Second year pediatric residents	1) to use quality-improvement methods to increase identification of HFI by the second-year pediatric residents working in the Pediatric Primary Care Center 2) To increase the proportion of second-year pediatric residents identifying food insecurity.	“A Published 2-question screen” 1) Do you worry that your food will run out before you get money or food stamps to get more? 2) Did the food you buy not last and you didn't have money to get more? Response choices: Yes, No Implementation: The 2 questions and the yes/no response choices were embedded into the Electronic Medical Record	The article reference for the screen questions (Figure 2, Nutritional screening questions in the EMR) - is the Hunger Vital Sign (Hager et al, 2010) 2-item screen. BUT - both the questions AND the Answer Options were changed, this makes the tool non-validated, non-reliable and not the same tool. The positioning of the questions in the Nutrition Screen places HFI as a Food access issue - not an Income issue.

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Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)					
Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
Beck et al, 2014	Primary Care Clinics	1) Pediatric providers 2) Families with infants	To design, implement, refine, and evaluate Keeping Infants Nourished and Developing (KIND), a collaborative intervention focused on food-insecure families with infants.	<p>“2 evidence-based screening questions.”</p> <p>Response choices: Yes, No</p> <p>Implementation: The 2 questions and the yes/no response choices were embedded into the Electronic Medical Record</p>	References given are Hager et al, 2010 and Burkhardt et al 2012. Not sure which tool questions were used. Burkhardt modified the questions and response categories. Response categories of yes - or no can be assumed.
Soba, 2014 (Doctoral Thesis)	Diabetes Clinic	Patients with Type 2 Diabetes Mellitus	<p>1) To increase the proportion of patients screened for FI.</p> <p>2) To increase the proportion of screened at-risk patients who received nutrition counseling</p>	<p>“USDA 2-item FI Screening questionnaire”*</p> <p>I am going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months – that is, since last (name of current month).</p> <p>1) The first statement is ‘We worried whether (my/our) food would run out before (I/we) got money to buy more.’</p> <p>2) ‘The food that (I/we) bought just didn’t last and (I/we) didn’t have money to get more.’</p> <p>Response choices: “often true,” “sometimes true,” or “never true” to each statement</p>	<p>The article reference for the screen questions is the Hager et al, 2010, 2-item screen.</p> <p>(Note – the tool was incorrectly identified in the article as the Economic Research Services, USDA 2-Item FSM).</p> <p>The questions and the response categories are not modified from the Hager validation study.</p>

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Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)

Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
Fox et al, 2016	Pediatric Weight Management Clinic, (Multi-disciplinary, tertiary-care, University-based)	Children and adolescents attending the clinic. (Mean age – 13years)	1) Identify the prevalence of food insecurity among households of patients seen in a multidisciplinary pediatric weight management clinic 2) Develop and describe outcomes of a pilot clinical intervention to address food insecurity in families attending this clinic.	“A validated 2-item instrument” 1) Within the past 12 months we worried whether our food would run out before we got money to buy more Or 2) Within the past 12 months the food we bought just didn’t last and we didn’t have money to get more. Response choices: Yes, No	The article reference for the screen questions is the Hager et al, 2010, 2-item screen. BUT the response choices were changed, this makes the tool non-validated, non-reliable and not the same tool.
Adams et al, 2017	Academic general pediatric practice	Families attending the clinics	1) To assess the attitudes of providers during the implementation of the 2- question screening tool 2) To assess the feasibility of providing referrals and interventions.	“AAP..2-question, validated screening tool” For each statement, please tell me whether the statement was “Often true, Sometimes true, or Never true” for your household 1) Within the past 12 months we worried whether our food would run out before we got money to buy more 2) Within the past 12 months the food we bought just didn’t last and we didn’t have money to get more.	The article reference for the screen questions is the Hager et al, 2010, 2-item screen. Coding: When families answered affirmatively to the food security screening questions (Often true or Sometimes true) they were classified as Food Insecure
Barnidge et al, 2017	Pediatric clinics	Caregivers of children aged	1) To identify physician readiness to screen caregivers and the physician’s perceived barriers to	“First 2 questions from the 18-item US Household Food Security Survey” 1. Over the past 12 months, did you worry there would not be	The article reference for the screen questions is the Hager et al, 2010, 2-item screen. BUT the question wording was changed, this makes the tool non-validated, non-reliable and not the same tool.

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Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)					
Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
			conducting a food insecurity screening 2) To assess the prevalence of food insecurity among patients' households, the perceived food environment and the barriers to getting enough food to eat	enough food and there was no money to buy more? 2. Over the past 12 months, did food run out and you did not have money to buy more? Response choices: Often true, sometimes true, never true, don't know/refused	
Lundeen et al, 2017	US health care entity-based programs	Any US population group using health care programs.	To conduct a landscape assessment of US health care entity-based programs that screen patients for food insecurity and connect them with food resources.	"Hunger Vital Sign™ screener questions" 1) "Within the past 12 months we worried whether our food would run out before we got money to buy more" and 2) "Within the past 12 months the food we bought just didn't last and we didn't have money to get more" No mention of the appropriate response categories.	The article reference for the screen questions is the Hager et al, 2010, 2-item screen. Nearly 2/3 of the programs (n = 14) answered they conduct food insecurity screening using the Hunger Vital Signs screener questions. The remaining programs use screening questions developed specifically for the program or other metrics.
Palakshappa et al, 2017	Pediatric primary care practices	Families with children presenting for well-child visits (2, 15- or 36-month visit.	To evaluate the feasibility, acceptability, and impact of screening in suburban practices	"AAP-recommended 2-item FI screen" 1) Within the past 12 months we worried whether our food would run out before we got money to buy more. 2) Within the past 12 months the food we bought just didn't last and we didn't have money to get more. Response choices: Yes or No	The article reference for the screen questions is the AAP Position Statement. The AAP Position Statement reference the Hager et al, 2010, 2-item screen. BUT the response choices were changed, this makes the tool non-validated, non-reliable and not the same tool.

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Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)					
Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
Knowles et al, 2018	Pediatric primary care clinics	Caregivers of all children under 5 years presenting for a well- child visit	Evaluated efficacy of screening and referral	<p>“2-item HFI screener developed by Hager et al”</p> <p>Caregivers are asked how often the following statements were true for their household in the past year:</p> <p>1) “We worried whether our food would run out before we got money to buy more” and</p> <p>2) “The food we bought just didn’t last and we didn’t have money to buy more.”</p> <p>Not clear about the response categories</p>	The article reference for the screen questions is the Hager et al, 2010, 2-item screen.
Robinson et al, 2018	Emergency Departments	Adult caregivers who accompanied the child to the Emergency Department	The primary outcome of interest was food insecurity in the Emergency Department population.	<p>“2-question screen by Hager et al.”</p> <p>FI “screen” defined as worry by an adult caregiver about food availability to feed household members based on the 2-question screen by Hager et al.</p>	<p>The article reference for the screen questions is the Hager et al, 2010, 2-item screen. BUT the article describes it a “based on the 2-question screen”. Wording or question changes make the tool non-validated, non-reliable and not the same tool.</p> <p>From the description in the article it appears the question or responses were altered</p>
Rongstad et al, 2018	Well-child clinics	Parent/caregivers of children attending the clinics.	<p>1. To describe demographic characteristics and health conditions of patients screening positive for food insecurity compared to those who did not screen positive within their health care organization.</p> <p>2. To improve understanding of</p>	<p>“2-question paper screen developed by the USDA”</p> <p>A family was identified as food insecure if they answered “often true” or “sometimes true” to either of the</p> <p>following questions: “We worried whether our food would run out before we got money to buy more,” and “The food we bought just didn’t last and we didn’t</p>	The tool was referred to as a “previously validated 2-question paper screen developed by the US Department of Agriculture”. However this is incorrect, and the reference given was Hager et al, 2010

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Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)					
Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
			social and health issues surrounding food insecurity. 3. To inform the screening process and better tailor interventions.	have money to get more.”	
Steiner et al, 2018	Colorado Permanente Medical Group	Older adults, aged 65 and older.	1) To estimate food insecurity prevalence 2) To develop a statistical prediction model for food insecurity	“Single question... drawn from the Nutrition Health Screener of the Nutrition Screening Initiative.” Food insecurity was assessed using a single question: “Do you always have enough money to buy the food you need?” Response choices: yes or no.	Authors stated the question was drawn from the Nutrition Health Screener of the Nutrition Screening Initiative, a validated instrument to assess nutrition in older adults.
Stenmark et al, 2018	Pediatric Clinic Sites	Parents of children accessing the clinic	To describe barriers encountered and lessons learned from implementation and expansion of the Kaiser Permanente Colorado’s clinical food insecurity screening and referral program.	“Hunger Vital Sign screening tool.” 1. Within the past 12 months, we worried whether our food would run out before we got money to buy more. 2. Within the past 12 months, the food we bought just didn’t last, and we didn’t have money to get more. Response choices: “often true,” “sometimes true,” or “never true” to each statement	The article reference for the screen questions is the Hager et al, 2010, 2-item screen. Neither the questions nor the response categories were modified.
Thomas et al, 2018	Diabetes Clinic	1) Patients with diabetes 2) Care providers of the patients	To explore the acceptability and feasibility of a food insecurity screening initiative within a diabetes care setting in Toronto.	“3 screening questions were identified that originated from the USDA HFSSM” 1. Within the past 3 months, did you ever worry whether your food would run out before you got money to buy more?	Authors state these originated from the USDA FSSM. Note that single and 2-item versions of these questions have been validated in several studies (reference -Baer 2015, Hager 2010, Nolan 2006, Swindle 2012, Urke 2014, Young 2009) but did NOT do

Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)					
Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
				<p>2. Within the past 3 months, was there ever a time when the food you bought just didn't last and you didn't have money to get more?</p> <p>3. Within the past 3 months, did you or others in your household cut the size of your meals or skip meals because there wasn't enough money for food?</p>	any validation of them in their study).
Barnidge et al, 2019	Pediatric Clinical Settings	Parents of children accessing the clinic	TO explore caregivers barriers and facilitators to FI disclosure	<p>"Hunger Vital Sign™ a 2-item household FI screener"</p> <p>The screen asks how often in the last 12 months (1) the household worried about food running out and (2) the food bought did not last and there was not enough money to buy more.</p>	<p>The article reference for the screen questions is the Hager et al, 2010, 2-item screen.</p> <p>It does not appear that the questions nor the response categories were modified.</p>
Carpenter et al, 2019	Children's Hospital, GI Clinic	Parents/cargivers of children accessing the clinic	To assess a direct referral system between 5 clinics and a community partner (who connects caregivers with Supplemental Nutrition Assistance Program (SNAP) benefits).	<p>"Hunger Vital Sign™ a 2-item screening tool"</p> <p>1. Within the past 12 months, we worried whether our food would run out before we got money to buy more.</p> <p>2. Within the past 12 months, the food we bought just didn't last, and we didn't have money to get more.</p> <p>Response choices: Yes or No</p>	<p>The article reference for the screen questions is the Hager et al, 2010, 2-item screen.</p> <p>Author discusses the tool was designed for the "often true", "sometimes true", "never true" choices and that AAP recommends an adapted version.</p>
Chui et al, 2019	Healthcare Organizations	4 Sites: 2 Health Centres servicing "the poor, underserved"	1) To assess the prevalence of food insecurity at health care clinics in Connecticut (2) To identify the barriers to	<p>"2-item screening tool derived from the Hunger Vital Sign™"</p> <p>Reader: Now I'm going to read you several statements that people have made about their</p>	The article reference for the screen questions is the AAP Position Statement. The AAP Position Statement reference the Hager et al, 2010, 2-item screen.

Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)					
Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
		<p>populations and the public”</p> <p>1 private paediatric office</p> <p>1 private family medical office</p>	<p>implementation of screening</p> <p>(3) To learn and apply strategies to successfully execute screening</p>	<p>food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months – that is, since last (name of current month).</p> <p>1) The first statement is ‘(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more.’ Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?</p> <p>2) The food that (I/we) bought just didn’t last and (I/we) didn’t have money to get more.’ Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?</p>	<p>The Preamble, Questions and Response options correspond to the validation of the 2-item screen by Hager et al, 2010.</p>
Orr et al, 2019	Pediatric Clinical Settings	Parents of children accessing the clinic	<p>1) understand the experiences of English and Spanish speaking caregivers of young children with FI</p> <p>2) Describe the frequency and severity of FI, the acceptability of clinic based screening, and the extent to which caregivers reported successful connection with resources as a result of screening.</p>	<p>“A written English/ Spanish version of the Hunger Vital Sign tool.”</p> <p>1) Within the past 12 months, were you worried whether your food would run out before you got money to buy more?</p> <p>2) Within the past 12 months, did the food you bought not last and you didn’t have money to get more? Not clear of the response choices - assume Yes/No</p>	<p>The article reference for the screen questions is the Hager et al, 2010, 2-item screen. BUT the question wording was slightly changed, and the response category appears to be (not stated) yes and no responses.</p>

Table F1: Food Insecurity Screening Tool Used in Research – Details on Tool Used or Promoted and Modification(s)

Article	Population	Target Populations	Study Purpose	Screen Tool Used or Promoted	Comments
Palakshappa et al, 2019	Pediatric Clinical Settings	Parents/guardians of children accessing the clinic	To determine the difference in FI disclosure rates by parents/guardians screened by a written questionnaire compared to verbally	“AAP-recommended 2-item Hunger Vital Sign (HVS)” Questions not provided. Response choices: Yes or No	Hager, 2010
Vital et al, 2019	Diabetes Clinic	1) Patients with diabetes 2) Care providers of the patients	1) to assess the acceptability and feasibility of the screening initiative from the perspective of both families and diabetes dietitian educators and 2) to identify perceived facilitators and barriers to the implementation of the screening initiative	“Screening questions were based on the US Department of Agriculture’s Household Food Security Survey Module” Questions: 1. Within the past 6 months, did you ever worry whether your food would run out before you got money to buy more? 2. Within the past 6 months, was there ever a time when the food you bought just didn’t last and you didn’t have money to get more? 3. Within the past 6 months, did you or others in your household cut the size of your meals or skip meals because there wasn’t enough money for food?	Authors state these originated from the USDA FSSM. Note that single and 2-item versions of these questions have been validated in several studies (reference -Baer 2015, Hager 2010, Nolan 2006, Swindle 2012, Urke 2014, Young 2009) but did NOT do any validation of them in their study). And changed the reference period from their Thomas, 2018 study.

Food insecurity in healthcare settings research commonly uses a brief (1-, 2- or 3-item) screen to determine HFI amongst study participants. The most common reference given for a 2-item screen is the validation study conducted by Hager et al in 2010.⁵² However, of 18 articles that referenced Hager et al as the tool source, only three appeared to use the exact same wording for the questions and response options as the original validation and reliability testing study (Table F2 below). This is an issue because changing the wording of the questions and/or the response options alters the validity of the tool.

Table F2: Food Insecurity Screening Tool Used in Research - Modification(s) Summary

Study	Screening Tool Stated Used	Question Modification	Response Modification	Reference for Tool Used
Burkhardt, 2012	"A published 2-question screen"	Yes. 1 question substantially changed.	Yes. Yes/No response	Hager, 2010
Beck, 2014	"2 evidence-based screening questions"	Unclear	Yes. Yes/No response	Hager, 2010 Burkhardt, 2014
Soba, 2014	"USDA 2-item FI Screening questionnaire"*	No	No	Hager, 2010
Fox, 2016	"A validated 2-item instrument"	No	Yes Yes/No response	Hager, 2010
Adams, 2017	"AAP, 2-question, validated screening tool"	No	No	Hager, 2010
Barnidge, 2017	"First 2 questions from the 18-item US HFSS"	Yes	No	Hager, 2010
Lundeen, 2017	"Hunger Vital Sign™ screener questions"	No	Not Stated	Hager, 2010
Palakshappa, 2017	"AAP-recommended 2-item FI screen"	No	Yes Yes/No Response	Hager, 2010
Knowles, 2018	"2-item screener developed by Hager et al"	Partially, time frame wording	Not Stated	Hager, 2010
Robinson, 2018	"2-question screen by Hager et al."	Questions not included	Responses not included	Hager, 2010
Rongstad, 2018	"2-question paper screen developed by the USDA"	Partially, unclear of time frame wording	No	Hager, 2010
Steiner, 2018	"Single question... drawn from the Nutrition Health Screener of the Nutrition Screening Initiative."	Unknown	Yes/No Response	Nutrition Screening Initiative for Older Adults
Stenmark, 2018	"Hunger Vital Sign screening tool."	No	No	Hager, 2010
Thomas, 2018	"3 screening questions were identified that originated from the USDA HFSSM"	Yes (time frame of 3 months vs 12 months)	Not stated	6 References: Baer 2015, Hager 2010, Nolan 2006, Swindle 2012, Urke 2014, Young 2009
Barnidge, 2018	"Hunger Vital Sign™, a 2-item household FI screener"	No	Unknown	Hager, 2010
Cullen, 2018	"Hunger Vital Sign™, a 2-item household FI screener"	No	Yes Yes/No response	Hager, 2010
Carpenter, 2019	"Hunger Vital Sign™, a 2-item screening tool"	No	Yes Yes/No response	Hager, 2010
Chiu, 2019	"2-item screening tool derived from the Hunger Vital Sign™"	Partially	Partially	Hager, 2010

Table F2: Food Insecurity Screening Tool Used in Research - Modification(s) Summary				
Study	Screening Tool Stated Used	Question Modification	Response Modification	Reference for Tool Used
Orr, 2019	“A written English/ Spanish version of the Hunger Vital Sign tool.”	Partially	Not clearly stated. Appears to be Yes/No response	Hager, 2010
Palakshappa et al, 2019	“AAP-recommended 2-item Hunger Vital Sign (HVS).”	Unknown	Yes Yes/No response	Hager, 2010
Vitale, 2019	“Screening questions were based on the US Department of Agriculture’s Household Food Security Survey Module”	Yes (time frame of 6 months vs 12 months)	Not stated	6 References: Baer 2015, Hager 2010, Nolan 2006, Swindle 2012, Urke 2014, Young 2009

Appendix G: Treatments and Interventions Taken by Care Providers Post Screening

Table G: Validity articles describing actions

Article	Population	Respondents	Actions					
			Alter Clinical Management	Link families to services (general)	Referral to Federal Nutrition Assistance Programs	Referral to an RD for Nutrition Counselling	Emergency Food (Food Banks; Food Pantries)	Social Services
Kleinman et al, 2007 1-Item	Neighbor-hood health centre, inner city.	Parents; inner city, primarily Hispanic background.			✓			
Young et al, 2009 2-Item	Clinic Setting; HIV1 infected patients.	HIV infected individuals; variety of SES backgrounds				✓		
Hager et al, 2010 2-Item	Urban; uninsured from acute care clinics and ERs	Caregivers of children 36 mo. & younger; Urban emerg. & primary care settings.			✓		✓	✓
Swindle et al, 2013 2-Item	Rural and Urban; Head Start	Caregivers of children age 3 to 5 years		✓				
Lane et al, 2014 1-Item	Clinic serving urban low income families	Parents of children; under age 6.			✓			
Baer et al, 2015 2-Items	Urban Adolescent Clinic	Adolescents and young adults (youth); aged 15–25.			✓		✓	
Makelarski et al, 2017	Adult and Pediatric Emergency Departments	Adults >18 years.		✓	✓		✓	
Randant et al, 2018 2-Items	Urban Adolescent Clinic	Parents/ Caregivers of children.		✓	✓		✓	
Gattu et al, 2019 2-Items	Emergency Departments and Primary Care	Caregivers of children younger than 48 months.			✓		✓	
Kerz et al, 2020 2-Items	Hospital Pediatric Outpatient Clinics	Caregivers of children (range 2–12 years).					✓	✓
Gunderse n et al, 2017 2-items	Population data		✓					