

# Identifying Food Insecurity in Health Care Settings: A Review of the Evidence

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## Executive Summary

Food insecurity (FI), or the limited access to adequate food due to a lack of money or other resources, is associated with poor health across the life-course. Spurred by this knowledge, and incentivized by recent health care payment reforms that reward keeping patients healthy, health systems around the country have been exploring ways to screen patients for FI and help food insecure patients access food resources. To inform these efforts, this report summarizes the research evidence published between January 2000 and June 2017 about health care-based screening for FI. A future report will examine research evidence on interventions to address FI in health care settings.

Multiple brief (one- and two-item) FI screening tools have been used and tested in health care settings and were reported to add minimal time burden for health care providers. There was incomplete overlap between patients reporting FI and the desire for assistance with food needs, however, raising questions about whether screening for FI should be complemented or replaced by screening for patient desire for assistance with food needs.

Studies exploring the patient and provider acceptability of FI screening were mixed. Most studies reported that patients were comfortable being asked about FI and that even being asked about social needs could make patients feel cared for by their providers. In other instances, patients and their caregivers indicated that FI is a sensitive issue, in particular for caregivers who might fear being reported to social services if they endorsed not being able to feed their children. This fear appeared to be alleviated by reassurance that providers were asking about FI in order to be able to help address FI and related social needs.

Providers expressed willingness to screen for FI, although in the absence of training both on how to conduct FI screening and on strategies for addressing identified FI, screening rates were low. Several studies described interventions to increase screening, including social screening curricula and observations and feedback around social history taking, which improved provider comfort with FI screening, perceived competence in addressing FI, and overall screening rates. The majority of the work on the validity of FI screening tools and on patient and provider acceptability in this field was conducted in pediatric populations.

More rigorously conducted research is needed to examine FI screening feasibility, acceptability, and interventions to improve screening rates across multiple settings and patient populations. No research identified in this review examined differences across the workforce engaged to conduct screening activities or ideal screening frequency, which may be important, given that household economic conditions and access to food-related benefits are likely to change over time.

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### INTRODUCTION

Robust evidence suggests that food insecurity (FI), the limited access to food due to a lack of money or other resources,<sup>1</sup> adversely impacts health and development across the life course.<sup>2-5</sup> As of 2015, 12.7% of US households reported being food insecure, though rates vary by household demographics. Prevalence of FI was 21% in households headed by non-Hispanic Black individuals, 19% in households headed by Hispanic individuals, and 17% in households with children.<sup>1</sup>

The American Academy of Pediatrics (AAP) and the American Association of Retired Persons (AARP) encourage FI screening in pediatric and older adult populations, and the Center for Medicare and Medicaid Innovation recently included FI screening in a major national demonstration project.<sup>6-8</sup> These activities reflect the health care system's growing interest in capturing and acting on information on patients' social determinants of health (SDH),<sup>9</sup> the conditions in which people are born, grow, live, work, and age that strongly shape health outcomes. Despite the growing interest in FI, health care systems lack clear guidelines on how to select FI screening tools and implement FI screening programs in practice. We undertook this review to identify and synthesize existing evidence on best practices for FI screening with the hope that this evidence can both assist systems in implementing FI screening programs and inform health services researchers about important evidence gaps in this rapidly evolving field.

### METHODS

We extracted articles published between January 2000 and June 2017 on screening for FI in health care settings. Articles pertaining

to this topic were identified and reviewed through standard systematic review methods that will be published separately. Appendix A provides an overview of methods used to extract articles for review.

### RESULTS

A total of 1376 articles were identified in the initial extraction method described in the appendix. One hundred and ninety articles underwent full-text review. Twenty-six unique articles were included in the review (see Appendix Table A for a complete list of included articles with extracted study information; see Appendix Table B for a complete list of included articles by area of contribution). We summarized findings from these articles in three key areas:

- **Measurement:** This section focuses on the validity of screening tools, their ability to capture need for food-related assistance, and the impact the administration mode on disclosure rates (10 articles);
- **Acceptability:** This section reports findings on patient and provider acceptability of FI screening in health care settings (10 articles);
- **Implementation:** This section describes studies that examined time needed to screen and initiatives to improve screening uptake among providers (16 articles).

#### Measurement

*Validity of common health care-based food security screening tools*

Four studies examined the validity of one and two-item FI screeners in health care delivery settings (Table 1).<sup>10-13</sup> These studies included three different FI screening instruments, each derived from the 18-item United States

**Table 1. Articles on Food Insecurity Screening Tools Validated in Health Care Settings**

<b>One-Item Hunger Screening Question in Kleinman et al. 2007<sup>13</sup></b>	<b>One-Item Screening Question Included in SEEK Screener in Lane et al. 2014<sup>12</sup></b>	<b>Two-Item Hunger* VitalSign™ in Hager et al. 2010<sup>11</sup> &amp; Baer et al. 2015<sup>10</sup></b>
“In the past month, was there any day when you or anyone went hungry because you did not have enough money for food?” <i>Yes, No</i>	“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, No</i>	“Within the past 12 months, we worried whether our food would run out before we got money to buy more.” <i>Often True, Sometimes True, Never True</i>  “Within the past 12 months, the food we bought just didn’t last and we didn’t have enough money to get more.” <i>Often True, Sometimes True, Never True</i>
83% sensitivity 80% specificity	59% sensitivity 87% specificity	89-97% sensitivity 83-84% specificity

\*Individuals are considered at risk for food insecurity if they answer that either or both of these statements are “often true” or “sometimes true”.

Department of Agriculture-Food Security Survey (USDA-FSS), which is considered the gold standard for measuring household FI.<sup>14</sup> The USDA-FSS was developed by the USDA in order to understand the extent of FI and hunger in the US. It has been included in ongoing US population-based surveys, such as the US Current Population Survey and the National Health and Nutrition Examination Survey (NHANES) since the mid-to-late-1990s.<sup>15</sup> The 18-item survey was shortened by the USDA to a 6-item survey (USDA-FSS Short Form) that was validated outside of health care settings.<sup>16</sup>

All reviewed studies validated the brief FI screeners by comparing them with responses to the USDA 18-item FSS. The one-item question used by Kleinman et al.<sup>13</sup> and the two-item Hunger VitalSign™ screener<sup>10,11</sup> identify FI in health care settings reasonably well in comparison to the 18-item FSS (sensitivity and specificity at or above 80%). Although the one-item screener included in the SEEK screener had the best specificity (or ability to

correctly identify those who are not FI; 87%,<sup>12</sup> compared to 80%<sup>13</sup> and 83-84%<sup>10,11</sup>), it had much lower sensitivity (or ability to correctly identify those who are food insecure; 59%<sup>12</sup> compared to 83%<sup>13</sup> and 89-97%) than the other two screeners.<sup>10,11</sup>

#### *Capturing desire for food-related assistance in the health care setting*

Although most tools focus on screening for FI, there is evidence that a positive FI screen may not be the best indicator of patient desire for access to food-related assistance. Three studies in our review examined the overlap between positive screens on FI screeners and patient-reported desire for food-related assistance.<sup>17-19</sup> Bottino et al.<sup>18</sup> compared positive FI screen responses (using the 6-item USDA-FSS Short Form) to desire for referrals to food-related services (e.g., food pantries) among 340 caregivers of 3- to 10-year-olds presenting for well-care visits. They found that only half of those screened as food insecure asked for referrals to food

resources, and conversely, only half of those asking for food-related referrals were screened as food insecure.

Similarly, in a study screening for multiple SDH in an urban youth clinic using a self-administered internet-based screening and referral tool, Hassan et al. found that 29% of 400 young adults screened positive for FI, only 17% separately noted a desire for a referral to address it, and only four percent selected a FI referral as a top priority.<sup>19</sup> In a related qualitative study of youth experiences with the same internet-based tool, however, FI had the highest level of concordance between positive screen and referral desire (34% with identified need and 32% with desire for referral, n=50), as compared to other social determinant domains included.<sup>17</sup>

Collectively, these findings suggest that not all patients who screen positive for FI will want help from a health care team to connect to food resources and that some who want help may not screen positive for FI. To our knowledge, reasons for this discordance have not yet been explored in the academic peer-reviewed literature.

### *Screening modality*

Across the FI studies extracted in the review, screening mode of administration was discussed in three articles. In these articles, FI screening was administered either in waiting rooms or in clinic rooms. In waiting rooms, screening was administered face-to-face (by medical assistants [MAs], administrative staff, health care providers, or research assistants [RAs]) or self-administered. Self-administration formats included paper or electronic screening. A recent non-peer reviewed national study of sites using the Hunger VitalSign™ found that 40% of practices routinely screening for FI

used patient self-administered screening.<sup>20</sup> Only one study directly compared screening formats,<sup>21</sup> though two others described some comparative findings.<sup>22,23</sup> In the direct comparison study, 538 pediatric caregivers in a pediatric emergency room setting were randomized to complete a 23-item psychosocial needs questionnaire either on a table via self-administration or face-to-face with an RA.<sup>21</sup> The comprehensive social needs questionnaire included the single-item FI question validated by Kleinman et al.<sup>13</sup> The study found that patients randomized to the computer-based screening had higher rates of social needs disclosure generally, compared to those who responded face-to-face (mean social needs 10.17 vs. 9.87), though there were no significant differences in disclosure of FI, specifically.

In another study, the authors reported the results of a 90-day trial that examined the feasibility of introducing social needs screening and referral programs into three family medicine clinics (two university-based clinics and one Federally Qualified Health Center, all noted to serve low-income populations).<sup>22</sup> Some participating clinic sites chose MA-administered screening, in part out of concerns about response rates in low-literacy patients. In examining social needs endorsement across clinics, the authors reported social needs were more common for respondents completing face-to-face screening compared to those completing self-administered screeners, although results for FI disclosure specifically were not available. Flegler et al.<sup>23</sup> surveyed caregivers on their experience with a self-administered computer-based SDH screening tool that incorporated the 6-item USDA FI questionnaire, finding that 92% of caregivers welcomed or did not mind using a computer-based screening and referral tool during a well-child visit.

## Box 1. Key Findings on Food Insecurity Screening Measures

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- A one-item screener developed by Kleinman et al.<sup>13</sup> and a two-item VitalSign™ FI screener<sup>10,11</sup> have been validated in clinical settings, with moderately high specificity and sensitivity relative to the USDA's "gold standard" FI questionnaire.
- The two-item Hunger VitalSign™ with three-category response options (Often True, Sometimes True, Never True) is currently the most widely used screening instrument and is recommended for clinical use in pediatric populations by the American Academy of Pediatrics and included in the more comprehensive Center for Medicare & Medicaid Innovation social needs screening instrument.
- The one- and two-item screeners may not fully capture patients' desire for food-related assistance. It may be helpful to complement food insecurity screening questions with additional queries about patient desire for assistance.
- We are aware of only one study that rigorously examined the impact of administration mode on screening results.<sup>21</sup> No differences were reported by administration mode in food insecurity endorsement.

### Acceptability

#### *Patient and/or patient caregiver acceptability of FI screening*

One challenge to FI screening is that patients may be uncomfortable or ashamed to disclose that they are not able to feed themselves and/or their family. Patient acceptability of FI screening, like screening for other needs that can carry social stigma, is a key concern for those implementing FI screening programs. Six peer-reviewed studies examined the acceptability of FI screening to patients or patient caregivers in health care settings.<sup>17,23-27</sup> Four of these studies collected data about the acceptability of screening among caregivers of pediatric patients;<sup>17,23,24,26</sup> two additional studies were conducted with young adult patients.<sup>17,27</sup> Several additional studies provided indirect evidence around patient acceptability based on provider and staff perceptions of patient acceptability.<sup>13,21,28-31</sup> These studies almost uniformly suggest that providers and clinical staff feel that screening

is acceptable to patients. However, evidence on patient acceptability from these latter studies may partially reflect providers' own feelings around FI screening efforts. We therefore focus on studies that collected information from patients and caregivers about the acceptability of FI screening.

The six reviewed studies in this area found that caregivers and patients reported high acceptability of being asked about FI in the context of health care visits (see Table 2). Barnidge et al. highlighted a potentially important nuance to the overall findings of high acceptability: caregivers who screened positive for FI in one Mid-western clinic setting had significantly greater odds of reporting potential discomfort with talking to their provider or nurse about food needs (2.7 and 4.0 times greater, respectively).<sup>26</sup> This may mean that those in most need of assistance may be the least comfortable with being asked about FI and, consequently, the most reluctant to disclose needs.

**Table 2. Articles on Patient & Caregiver Acceptability of Food Insecurity Screening**

Article	Population	Tool	Overall Acceptability
Barnidge et al. 2017 <sup>26</sup>	Children's caregivers in pediatric clinic (n=212)	Self-administered paper survey limited to FI	66% would feel comfortable talking to their health care provider about food needs.  19% expressed discomfort discussing FI; those who screened positive for food insecurity were more likely to report discomfort with screening than those who did not screen positive for food insecurity [OR 2.72 (95% CI 1.20-6.15) if talking with clinician; OR 3.99 (95% CI 1.65-9.61) if talking with nurse]
Fleegler et al. 2007 <sup>23</sup>	Children's caregivers in pediatric primary care clinics (academic and community health centers) (n=205)	Self-administered computer-based social needs screening for multiple needs; FI screener = 6-item USDA	88% welcomed or did not mind at all inquiries about FI.
Garg et al. 2009 <sup>24</sup>	Caregivers at urban academic pediatric clinic (n=100)	WE CARE self-administered screening tool	67% thought they could talk to their health care providers about social concerns (not specific to FI).
Hassan et al. 2013 <sup>27</sup>	Young adults at an urban hospital-based Adolescent/Young Adult Program (n=401)	Online self-administered multiple needs screening tool (Online Advocate)	84% open to having SDH screening be a part of an annual exam, 90% open to the responses being shared with their provider, 93% would recommend the Online Advocate tool to a family or friend.
Palakshappa et al. 2017(A) <sup>25</sup>	Caregivers at 6 suburban pediatric clinics (n=23)	Two-item Hunger Vital Sign™ administered by health care provider	Initial surprise by FI screening, then some alleviation of concerns about FI screening after discussion with health care provider. Some caregiver concern about being reported to Child Protective Services if disclosing FI.
Wylie et al. 2012 <sup>17</sup>	Young adults at an urban hospital-based Adolescent/Young Adult Program (n=50)	Online self-administered multiple needs screening tool (Online Advocate)	96% would recommend the tool to a friend; 80% welcomed or would not object to the screening tool being incorporated into clinic visits.  10% felt FI was a sensitive topic, though none wanted the domain excluded or reported concerns about confidentiality; 33% concerned about length of study (average 25 minutes to complete).

Studies that collected answers anonymously with self-administered questionnaires still reported high levels of acceptability, suggesting social desirability bias on the part of patients/care givers may not be driving the reports of high acceptability.<sup>23</sup> Though acceptability rates were high, other specific recommendations about improving FI screening acceptability emerged. Palakshappa et al. reported that caregivers thought it was important for clinicians to ask about FI, but wanted providers to understand potential feelings of stigma, shame, and helplessness for parents that can be associated with FI.<sup>25</sup> Respondents felt clinicians should clarify the purpose of screening (e.g., to offer support) before asking about food insecurity and preferred self-completion of paper forms to being asked in a face-to-face situation. Wylie et al. found that young adult patients surveyed overwhelming supported screening and noted being unconcerned about confidentiality or privacy breaches, yet 10% of the participants felt that FI was a sensitive topic (none reported that the sensitivity influenced their responses to the questions or wanted the domain excluded).<sup>17</sup>

### *Provider acceptability of FI screening*

One of the obstacles to implementing

successful FI interventions in health care settings is provider discomfort with discussing FI and other social needs with patients. We identified five studies reporting on the acceptability of FI screening among residents<sup>28</sup> or practicing physicians.<sup>26,31-33</sup> All five studies reported high provider acceptability (see Table 3).

Positive impacts of screening included providers' perception that patients felt better cared for and that relationships with patients improved.<sup>33</sup> Provider concerns about screening were similar to those surfaced by caregivers/patients, including worries that patients would feel stigmatized or uncomfortable<sup>26,33</sup> and that providers would not know how<sup>26</sup> or have time to address identified needs.<sup>33</sup> Providers also emphasized that screening in some clinical settings might be more appropriate than in others (e.g., acute specialty care settings).<sup>26</sup>

Only one study<sup>31</sup> looked at a more multidisciplinary team perspective on screening, including social workers and nurses, and future research should further explore the different components of team based care that are crucial to the implementation and sustainability of addressing FI within the health care setting.

### **Box 2. Key Findings on Patient & Provider Acceptability of FI Screening**

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- Despite provider concerns about patient acceptability of food insecurity screening, patients appear to be receptive to screening for food insecurity, either alone or along with other social needs.
- Some caregivers of pediatric patients report feeling concerned about how the results of food insecurity screening will be used (e.g., reported to Child Protective Services). Prefacing food insecurity screening with a statement about concern for families and a goal of helping to provide solutions was proposed by caregivers as a way to alleviate these concerns.
- Providers report high acceptability of screening overall, as long as they have access to resources to address identified needs. Providers may feel more comfortable having food insecurity screening completed prior to the visit (e.g., on paper or a tablet in the waiting room).



**Table 3. Articles on Provider Acceptability of Food Insecurity Screening**

Article	Population	Tool	Overall Acceptability
Adams et al. 2017 <sup>28</sup>	Resident providers in an urban, academic pediatric primary care practice (focus group; n not provided)	Hunger VitalSign™	Screening integrated well into clinic and allowed for more time to talk with families, instead of having to search for resources.  Authors pointed out that as an academic clinic, their providers were experienced at trying new clinical tools, and may have more ease at integrating in new screenings than providers in other settings.
Barnidge et al. 2017 <sup>26</sup>	Primary care and specialty service providers (n=76)	Survey on FI screening acceptability	80% of providers said they were willing to screen.  More than 20% had concerns that caregivers would be uncomfortable being screened. Only 15% reported currently screening for FI.
Hoisington et al. 2012 <sup>32</sup>	Family and pediatric physicians and nurse practitioners (n=186)	Mail survey on FI screening	89% of providers were willing to screen for FI if they had an available standardized question.  Three barriers to screening most strongly endorsed by providers: lack of knowledge, discomfort discussing, and inadequate time to address.
O'Toole et al. 2017 <sup>31</sup>	Primary care providers, nurses, and social workers at 6 Veterans Affairs Homeless-PACT clinics (focus groups; n not provided)	1-item screening tool validated by Kleinman et al. 2007 <sup>13</sup>	All staff supported the pilot screening program. Staff did not find screening “burdensome.” Some staff noted positive feedback from patients and that screening helped build rapport.  Some staff noted a need to train additional clinic staff on screening and resources for positive screens.
Palakshappa et al. 2017(B) <sup>33</sup>	Health care providers in 6 suburban pediatric clinics (focus groups; n not provided)	2-item Hunger Vital Sign™ administered by health care provider; integrated within the EHR, as part of the 2, 15, and 36-month well-child visit	Time and workflow were not barriers to screening; all providers viewed screening as quick. Preference for screening to occur before visit (e.g., in waiting room). Some clinicians thought patients viewed screening as caring.  Main barriers to FI screening included provider discomfort and worry that caregivers would react negatively. Some reported concerns about inability to refer or provide resources for FI.

## Implementation

### *Timel to conduct screening*

While overlapping with provider acceptability, information on time for screening contributes distinct information valuable for on-the-ground implementation of screening. Concern about the time required to carry out screening is common for sites implementing screening programs. Eleven articles addressed the perceived and actual time burden related to their FI screening tools,<sup>13,17,18,26,28,31,33-36</sup> while two additional studies limited remarks to duration of screening itself<sup>10,30</sup> (see Table 4).

Providers in some studies reported that time was a significant barrier to FI screening.<sup>17,18,26,35</sup> Other studies reported minimal burden involved with FI screening.<sup>33,34,36-37</sup> One driver of this variability is the wide range in length of

different social needs screening tools. Time for provider-administered screening ranged from 30 seconds<sup>36</sup> to 10-15 minutes.<sup>30</sup> Three studies of the Online Advocate, a web-based tool to screen for health-related social needs and connect users to community resources (now known as HelpSteps),<sup>38</sup> reported time for self-administered screening, but this involved a comprehensive SDH screening tool that took 25 minutes to complete.<sup>10,17,18</sup> In another study that examined a system in which providers screened for SDH needs and provided handouts on relevant community-based resources, the majority of providers reported that screening and referral took <5 minutes.<sup>34</sup>

Perceived time burden appears dependent on individual provider, clinic, and patient level factors. For example, providers in better resourced clinics with support staff who can

**Table 4. Articles on Time to Conduct Food Insecurity Screening**

Article	Population	Tool	Screening Time
Adams et al. 2017 <sup>28</sup>	Providers in an urban, academic pediatric primary care practice (focus group; n not provided)	Hunger VitalSign™	Some providers reported that screening allowed them to spend more time talking to patients about their FI concerns
Baer et al. 2015 <sup>10</sup>	Young adult patients at urban hospital-based Adolescent/Young Adult Medicine Program (n=400)	Online self-administered multiple needs screening tool (Online Advocate); included the 2-item Hunger Vital Sign™	Screening took approximately 25 minutes to complete 130 questions
Barnidge et al. 2017 <sup>26</sup>	Children’s caregivers in pediatric clinic (n=212) & primary care and specialty service providers (n=76)	Self-administered paper survey limited to FI	Time to screen not objectively evaluated but cited by providers as a principal barrier to screening for FI
Bottino et al. 2017 <sup>18</sup>	Caregivers of 3- to 10-year-old patients at an urban pediatric hospital-based clinic (n=340)	Online self-administered multiple needs screening tool (Online Advocate); included 6-item USDA short form	Most common reason caregivers declined to participate was time. Screening took approximately 25 minutes to complete 130 questions

Article	Population	Tool	Screening Time
Garg et al. 2007 <sup>34</sup>	Pediatric residents at an urban hospital-based pediatric (n=45)	Report on the feasibility of social needs screening and resource referral implementation WE CARE (10-item social needs questionnaire, which included a one-item question regarding inadequate food supply).	Pediatric residents reviewed parents' answers to the questionnaire during the clinic visit and provided parents with resource lists related to any identified social hardships. 77% reported that well-child visits were not slowed down by the WE-CARE screening and referral activities. The majority reported that reviewing the questionnaire and providing referrals added < 5 minutes to the clinic visit, and >50% thought that the screening/referrals added <2 minutes per visit.
Harrison et al. 2008 <sup>30</sup>	Prenatal patients at 4 urban FQHCs (n=1386)	Prenatal Risk Overview (PRO) screen tool; 4 items for FI adapted from USDA 6-item tool	Screening by RN or MA took 10-15 minutes to complete 51 questions.
Klein et al. 2014 <sup>35</sup>	Residents at an urban hospital-based pediatric primary care clinic (n=47)	Pre-/post-study of resident views and knowledge of SDH screening with video curriculum	Noted that residents spent more time screening after video curriculum but no exact details; Residents identified time as the biggest barrier to screening.
Kleinman et al. 2007 <sup>13</sup>	Caregivers of pediatric patients presenting to a neighborhood clinic for routine pediatric care (n=1750 families screened with the one-item tool; 122 completed both the 1-item and 18-item USDA-FSS for the validity study).	One-item vs. 18-item USDA-FSS	One-item screen could be done in the waiting room, while the longer 18-item USDA FSS "gold standard" screening tool could take up to 45 minutes.
O'Toole et al. 2012 <sup>36</sup>	Residents at 3 hospital affiliated pediatric primary care clinics (n=40) with varying levels of resources (e.g., onsite social workers, Medical-Legal Partnership staff).	Not reported.	Residents from clinics with more clinic resources spent more time discussing the social history with patients (P 0.02), averaging 115 to 160 seconds, as opposed to residents at a less resourced clinic (average 30 seconds).
O'Toole et al. 2013 <sup>37</sup>	Pediatric residents in three urban outpatient clinics (n=15 intervention, n=21 control). A subset of residents were directly observed taking social histories (n=8 intervention, n=11 control).	Intervention arm residents were trained with video vignettes showing both appropriate and inappropriate methods of SDH (including FI) screening. The video curriculum was provided during a conference with faculty-led discussion of the video content.	After the intervention, intervention residents spent a median of 165 more seconds screening, whereas control residents spent a median of 30 seconds more. Intervention residents were less likely than controls to report lack of time as a barrier (73% compared to 93%).

Article	Population	Tool	Screening Time
O'Toole et al. 2017 <sup>31</sup>	Primary care providers, nurses and social workers at 6 Veterans Affairs Homeless-PACT clinics (focus groups; n not provided).	One-item screening tool validated by Kleinman et al., 2007 <sup>13</sup> ; if positive, patients asked 6 follow-up questions regarding receipt of food benefits, where patients received their food, whether or not they prepared their own meals, number of meals consumed per day, diabetic status, and experience of hypoglycemic episodes. Screening questions embedded in EHR; any member of the health care team could screen and enter in responses.	Screening and recording answers took between 3-5 minutes. In the group interview with health care providers and staff from the 6 pilot sites (specific number of participants not reported), no team members reported that the screening process was burdensome to the care team.
Palakshappa et al. 2017(B) <sup>33</sup>	Health care providers in 6 suburban pediatric clinics (focus groups; n not provided).	Two-item Hunger Vital Sign <sup>TM</sup> administered by health care provider; integrated within the EHR, as part of the 2, 15 and 36-month well-child visit.	Time and workflow were not barriers to screening; all providers viewed screening as quick.
Wylie et al 2012 <sup>17</sup>	Young adults at an urban hospital-based Adolescent/Young Adult Program (n=50)	Online self-administered multiple needs screening tool (Online Advocate), which included the 2-item Hunger Vital Sign <sup>TM</sup> .	22% of respondents thought the screening tool was too long, but a subset thought it was a good use of their time. Screening was reported to take 20-25 minutes.

help once social needs are identified have been shown to spend significantly more time screening for social needs (160 seconds for high resource clinics versus 30 seconds average screening time for low resource clinics,  $p < 0.05$ ).<sup>36</sup>

### *Driving uptake*

This section summarizes existing evidence on initiatives to improve the uptake of FI screening in clinical settings. Seven reviewed studies reported findings from interventions aiming to improve FI screening rates in clinic settings (see Table 5).<sup>29,34-37,39,40</sup> All of the studies focused on pediatric

resident providers; two studies were randomized controlled trials (RCTs) and the remaining studies reported on non-randomized interventions or observational studies. These studies suggest that rates of provider screening may be low in the absence of ongoing provider training and/or resources that help providers feel competent in their ability to address positive screens. These may include onsite staff (e.g., social workers) or directories of community-based services. Efforts to improve FI identification by providers may also empower patients to raise concerns about FI.<sup>39</sup> Initiatives to automate social screening in waiting rooms or EHR templates can help improve rates of

screening for FI as well as other SDH.<sup>39</sup>

In six of the seven studies, residents in pediatric settings received either training around the social determinants of health generally or FI specifically.<sup>29,34,35,37,39,40</sup> These trainings were administered by video or in-person, and in one case training was accompanied by visits to food banks and other social service settings.<sup>40</sup> In some cases, residents were directly observed

taking social histories and given feedback. In all cases, residents who participated in these interventions had higher rates of screening and higher self-reported comfort and competence around FI screening in the clinic than residents who did not.<sup>29,34,35,37,39,40</sup> While these studies generally included very small sample sizes and did not all randomize treatment and control groups, taken together they suggest there is potential for short-form training efforts to improve providers' practice

**Table 5. Articles on Interventions to Improve Food Insecurity Screening Rates, Practices and Provider Comfort/Confidence**

Article	Population	Intervention	Screening Time
Burkhardt et al. 2012 <sup>39</sup>	Pediatric residents at a medical center-based outpatient primary care clinic (n= 24).	QI effort included replacing a single-item FI screening question embedded in the EHR with the validated two-item Hunger Vital Sign™, pediatric residents were observed taking patients' social histories and given direct feedback and reminders to screen for FI. Posters were placed in exam rooms to encourage patients to talk with providers about FI.	Identification of FI increased to 11.9% of families seen by residents after interventions, from a baseline of 1.9%. These were still lower than the estimated prevalence of FI in the clinic setting (15%). The proportion of residents who identified FI among patients increased from 37.5% (9 of 24 residents) to 91.9%.
Feigelman et al. 2011 <sup>29</sup>	Pediatric residents at an urban primary care clinic, assigned to SEEK intervention versus control days (n=50 intervention; n=45 control group).	The SEEK (A Safe Environment for Every Kid) intervention included an 8-hour training session on social needs that included FI and reviewing how social issues impact child health and safety. Review sessions were repeated every six months.	Knowledge tested using clinical vignettes; at 18-month follow-up, intervention residents had significantly better scores for the 2 of 5 cases. Those in the intervention arm also improved screening rates, from 14% of families pre- to 88% of families screened post-training. Those in the control group improved from 4% to 12%, and had significantly lower post-screening rates than the intervention group (p<0.001).
Garg et al 2007 <sup>34</sup>	Pediatric residents randomly assigned to intervention (n=24) and control (n=21).	Twenty-minute teaching session covered WE CARE screening and referral materials and procedures. A 10-minute booster training was administered one month later.	Higher numbers of health-related social needs overall discussed per visits in intervention arm (2.9 vs 1.8, p<0.01). Those in the intervention group were three and half times as likely to discuss FI than the control group. (adjusted OR 3.5, p<0.05). The intervention arm reported higher rates of SDH referrals.

Article	Population	Intervention	Screening Time
Klein et al. 2011 <sup>40</sup>	Pediatric residents who participated in an SDH curriculum (n=20) compared to residents who entered residency the year before the intervention group (n=18).	An SDH component was incorporated into a mandatory 2-week advocacy rotation. Residents shadowed clinical social workers, had ½ day immersive experiences at food banks and other social service agencies, and attended relevant conferences and ongoing training related to Medical-Legal Partnership resources.	Residents in the SDH curriculum had higher rates of documentation for SDH (74% vs. 56% for FI, p<0.001), in addition to higher rates of referral to the clinic's medical legal partnerships (Child HeLP), though not statistically significant (4% vs. 2.9%, p=0.13).
Klein et al. 2014 <sup>35</sup>	Pediatric residents in an urban outpatient pediatric clinic (n=24 in intervention and n=23 in control group). Parents (n=141) of both groups were surveyed regarding screening experiences after the clinic visit.	Residents in the intervention arm were trained with video vignettes showing both appropriate and inappropriate methods of SDH (including FI) screening. The video curriculum also included a "day in the life" segment with clinic families describing social needs. The video curriculum was provided in the context of two 90-minute conferences with faculty-led discussions of the video content.	Residents in the intervention group had improved distribution of cans of formula relative to the control group (formula distribution increased from 4.8% to 7.6% in the intervention group pre- and post-intervention; distribution declined from 4.3% to 2.9% in the control group, p<0.02 for change between two groups). There were no differences in referral rates to MedicalLegal Partnerships. Families of intervention residents were more likely to report FI screening by intervention vs. control residents (OR: 1.95, 95% CI: 0.66, 5.75) but the difference was not statistically significant.
O'Toole et al. 2012 <sup>36</sup>	Residents at 3 hospital affiliated pediatric primary care clinics (n=40) with varying levels of resources (e.g., onsite social workers, Medical-Legal Partnership staff).	No intervention, but clinic sites had variable levels of support for social services such as medical legal partnership and social workers.	Residents from clinics with more resources to address SDH had marginally higher confidence in their knowledge of resources and the importance of food security. These residents also had higher rates of screening for FI (80% in high resource settings were directly observed screening for FI versus 25% in the lowest resource clinic, p<0.10).
O'Toole et al. 2013 <sup>37</sup>	Pediatric residents in three urban outpatient clinics (n=15 intervention, n=21 control). A subset of residents were directly observed taking social histories (n=8 intervention, n=11 control).	Intervention arm residents were trained with video vignettes showing both appropriate and inappropriate methods of SDH (including FI) screening. The video curriculum was provided during a conference with faculty-led discussion of the video content.	No statistically significant differences in self-reported knowledge or screening practices between intervention and control residents across all SDH, including FI. Intervention group had higher rates of observed FI screening both before and after the intervention compared to controls (62.5% in intervention group screened for FI before the intervention compared to 45.5% of the control; 75% screened after the intervention compared to 63.6% of controls), but not statistically significant. After the intervention, intervention residents were less likely than controls to report discomfort screening (13% compared to 33%) and lack of time as a barrier (73% compared to 93%).

of and experience with FI screening in the health care setting.

Some studies examined clinic or system-level efforts to improve screening in addition to provider training. For example, Burkhardt et al. reported on a multi-pronged effort to improve the rate of FI screening at child well-care visits.<sup>39</sup> The intervention included providing individual residents with feedback on their social history-taking practices, patient empowerment efforts (e.g., placing posters in the clinic encouraging patients to talk to their doctor about FI), and upgrading the FI screening tool from a one-item to the two-item Hunger VitalSign™ tool. Identification of FI increased from 1.0% to 11.9% of families after these efforts were implemented. This case study illustrates the potential importance of multi-faceted interventions to increase screening rates. Similarly, an observational study of screening practices among residents at three clinics with variable resources to address SDH (e.g., social workers, Medical-Legal Partnership (MLP) staff) showed that residents in higher resource clinics were more likely to discuss FI during social history taking compared to low resource clinics (80% vs. 25%).<sup>36</sup>

## DISCUSSION & CONCLUSIONS

The results of our systematic scoping review of peer-reviewed research on FI screening in the health care setting point to a number of important findings relevant for providers, system administrators, and policymakers. We found brief (1- and 2-item) FI screening tools that have been validated for use in the clinical setting. Existing research suggests that they add minimal time burden to the clinical encounter. Moreover, most patients and providers report high levels of acceptability around FI screening. Despite this, screening rates are likely to remain low in the absence of quality improvement efforts around screening, including provider training.

There are many opportunities to fill existing evidence gaps in this area around FI metrics and screening implementation:

- **Screening validity:** The validity of FI screening tools has been examined primarily in studies of adult caregivers of young children.<sup>11-13</sup> Future research will need to examine the validity of FI screening tools and different screening administration modalities in other populations, such as in older adults, low-

### Box 3. Research on Implementation of Food Insecurity Screening

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- The reported time burden for FI screening is highly variable, with 30 seconds to 10-15 minutes reported among reviewed studies.
- Time to screen depends on the modality (e.g., self-administered in waiting room vs. administered by staff/provider), measurement tool (1- or 2-item vs. longer USDA versions), and whether FI screening is conducted in conjunction with other social needs screening.
- Initiatives focusing on provider education and patient empowerment can improve FI screening rates. These initiatives can include provider education about associations between FI and health and well-being, observations and feedback of FI screening practices, and efforts to empower patients to bring up FI with providers.

literacy populations, and other patient sub-groups. Furthermore, given the reported discordance in studies between screening positive for a need and desiring intervention assistance,<sup>17-19</sup> further research might also evaluate the effects of screening for FI versus for desire for FI assistance on outcomes like referral uptake.

- **Screening workforce:** We found studies that evaluated programs involving different clinic staff (e.g., medical assistants, nurses, nurse practitioners, medical residents),<sup>11,13,21,22,25,30,36-37,39</sup> but we did not identify any studies that empirically evaluated the optimal workforce for administering FI screening tools in different clinical settings and with different patient populations. Choices about who screens for FI appear to be made by the type of clinical setting (e.g., ED, outpatient) and the human and material resources in those settings. More information is needed to understand how these choices impact the rates of FI disclosure and/or identification.
- **Screening frequency:** To our knowledge, the existing research has not addressed the appropriate frequency of FI screening. Screening frequency recommendations are likely to vary across settings and populations. While less frequent screening may be appropriate in high-income patient populations where food security rates may change infrequently, more frequent screening may be necessary in settings serving low-income patients. For instance, FI is likely to vary both by season (e.g., during the summer when there is less access to free and reduced school meals for children<sup>41</sup> or with seasonal employment trends) and as a result of changes in public benefits at the local, state, and federal levels.<sup>42</sup>
- **Screening acceptability:** Some research has examined patient<sup>17,23-27</sup> and caregiver<sup>26,28,31-33</sup> perspectives on FI screening acceptability, though this work has primarily been limited to pediatric primary care clinics. In addition to further examining acceptability in adult settings, more research is needed on effective strategies to maximize team efficiencies in health care-based screening initiatives. For instance, future work could explore the comparative acceptability of screening across different formats/staff administration modes. The finding that people who are most likely to be uncomfortable with screening may be more likely to have FI<sup>26</sup> also suggests that more research is needed on how to improve the acceptability of screening for specific high-needs populations, including how framing and introducing FI screening may affect comfort and disclosure rates.
- **Targeted versus universal screening:** The screening efforts described in the studies identified in this review were primarily universal (where all patients were screened), with one article focusing on prenatal patients.<sup>30</sup> Research is needed that examines the basis for targeted screening practices (e.g., how to identify at-risk patients) and the incremental benefits of broader screening targets.
- **Screening costs:** Though several reviewed articles noted resources needed to implement FI screening,<sup>11,21,35,37,43</sup> none of the studies we identified provided specific estimates of screening costs or compared costs to the health benefits and/or cost savings that FI screening efforts might yield. Several studies relied on RAs,<sup>11,21</sup> but costs associated with these individuals are difficult to extrapolate for real world health care settings. Future



studies should explore the screening costs, including relative costs of targeted versus universal screening in health systems serving diverse populations.

Future research will continue to contribute meaningfully to important practice decisions around FI. Readers should augment findings from this report with new research as it becomes available.

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## Appendix: Abbreviated Methods

This review was conducted by searching the online databases PubMed and Ovid MEDLINE through July 2017 using a specified set of search terms related to food insecurity (FI). The comprehensive set of study search terms and description of study methods are available upon request.

### Inclusion Criteria

- Published between January 1, 2000 and June 30, 2017.
- English language and based in the United States.
- Peer-reviewed, original research.
- Addressed measurement issues, acceptability, and/or feasibility around screening for FI in the health care setting. FI screening could take place on its own, or as part of screening for a broader range of social determinants of health, although FI outcomes had to be addressed specifically.

### Exclusion Criteria

- Research on FI screening in the health care setting without evidence about the outcomes of interest [measurement, acceptability, and feasibility (e.g., surveys of patient populations to assess FI prevalence without attention to other relevant outcomes)].
- Research on social determinants of health screening that did not present results specific to FI.
- Research on food security, hunger, or food assistance-related interventions in the health care setting, unless these articles included evidence on aspects of screening.
- Studies on the validity, feasibility, etc., of FI screening not in the health care setting (e.g., using population-based survey data).
- Commentaries, conceptual/theoretical articles, or reviews.

Two reviewers (EM and JMT) completed independent initial reviews of abstracts and of full manuscripts. Discrepancies were discussed among the larger group of co-authors. A total of 190 articles required full-text review to determine eligibility; 51 of these were reviewed by two reviewers. Discrepancies in opinions on eligibility were discussed among the entire study team.

**Appendix Table A. Included Study Citations & Selected Details for Scoping Review On Screening for Food Insecurity (FI) in the Health Care Setting, Separated by Setting (Pediatric vs. Adult/Primary Care)**

Citations	Screening Tool	Study/Screening Description	Study Design	Screening Modality
<b>Pediatric Settings</b>				
<p><b>Lane et al. (2014).</b> The effectiveness of food insecurity screening in pediatric primary care. <i>Int J Child Health Nutr.</i></p> <p><b>Feigelman et al. (2011).</b> Training pediatric residents in a primary care clinic to help address psychosocial problems and prevent child maltreatment. <i>Acad Pediatr.</i></p>	<p>Single-item food insecurity screening question in the SEEK parental questionnaire.</p>	<p>Randomized controlled trials of screening outcomes for patients of pediatric residents assigned to SEEK training and screening clinics (n=308 SEEK and n=250 control families). Residents assigned to SEEK days (n=50; n=45 in control group) received training regarding FI screening and interventions (e.g., providing referrals to SNAP). Rates of screening among SEEK and control groups were compared at baseline and 6-month follow-up. A validity study was done to evaluate the single-item FI screener in a subset of SEEK parents with children under 6 (n=205).</p>	<p>Cluster-randomized controlled trial (Lane et al, 2014); Randomized controlled trial (Feigelman et al, 2011)</p>	<p>On paper in the clinic for overall SEEK study; self-administered, computerized for the validation study that included a subset of SEEK participants.</p>
<p><b>Bottino et al. (2017).</b> Food insecurity screening in pediatric primary care: Can offering referrals help identify families in need? <i>Acad Pediatr.</i></p> <p><b>Fleegler et al. (2007).</b> Families' health-related social problems and missed referral opportunities. <i>Pediatrics.</i></p>	<p>The Online Advocate, which included the 6-item short-form version of the USDA FSS as well as a "referral menu" that allows caregivers to indicate interest in referral to food and other SDH-related assistance programs.</p>	<p>Studies of caregivers of young children self-administered the Online Advocate screening tool in the waiting room at well-care visits. The overlap between positive screens and request for referrals to food-related assistance programs for 340 families was examined in Bottino et al, 2017. Families' (n=205) experiences with screening were captured in Fleegler et al, 2007.</p>	<p>Cross-sectional</p>	<p>Computer-based, self-administered</p>
<p><b>Hager et al. (2010).</b> Development and validity of a 2-item screen to identify families at risk for food insecurity. <i>Pediatrics.</i></p>	<p>Hunger Vital Sign™</p>	<p>Validity study of two-item FI screening questions in the Children's HealthWatch survey, later called the Hunger Vital Sign™. Over 34000 caregivers of children &lt;36 months visiting acute and primary care clinics or hospital emergency departments during peak flow times were administered both the 2-item Hunger Vital Sign™ and the 18-item USDA FSS "gold standard".</p>	<p>Cross-sectional</p>	<p>In-person interview</p>

Citations	Screening Tool	Study/Screening Description	Study Design	Screening Modality
<p><b>Baer et al. (2015).</b> Food insecurity and the burden of health-related social problems in an urban youth population. <i>J Adolescent Health.</i></p> <p><b>Hassan et al. (2013).</b> Youths' health-related social problems: concerns often overlooked during the medical visit. <i>J Adolescent Health.</i></p> <p>Hassan et al. (2015). Improving social determinants of health: Effectiveness of a web-based intervention. <i>Am J Prev Med.</i></p> <p><b>Wylie et al. (2012).</b> Assessing and referring adolescents' health-related social problems: qualitative evaluation of a novel web-based approach. <i>J Telemed Telecare.</i></p>	<p>The Online Advocate, which included the 2-item Hunger Vital Sign™ food insecurity screener (validated in Baer et al, 2015 against the 18-item USDA FSS).</p>	<p>Studies of acceptability and screening outcomes for patients in an urban youth clinic who self-administered the Online Advocate (n=400). The embedded 2-item Hunger Vital Sign™ was validated against the 18-item USDA FSS “gold standard”. Screening and referral outcomes and patient acceptability were assessed. Wylie et al (2012), youth patients (n=50) reported on experiences completing the Online Advocate.</p>	<p>Qualitative (Wylie et al., 2012); Cross-sectional (Baer et al, 2015; Hassan et al, 2013)</p>	<p>Computer-based, self-administered</p>
<p><b>Kleinman et al. (2007).</b> Use of a single-question screening tool to detect hunger in families attending a neighborhood health center. <i>Ambul Pediatr.</i></p>	<p>Single-Item Hunger Screening Tool</p>	<p>Validity study of a single-question screening tool to detect hunger in families attending a neighborhood health center. 1750 families were screened and 122 completed extended interviews to validate the single-item screen against the 18-item USDA FSS “gold standard”.</p>	<p>Cross-sectional</p>	<p>In-person interview</p>
<p><b>Gottlieb et al. (2014).</b> A randomized trial on screening for social determinants of health: The iScreen Study. <i>Pediatrics.</i></p>	<p>Single-Item Hunger Screening Tool from Kleinman et al. (2007).</p>	<p>A randomized controlled trial to compare SDH disclosure rates in electronic versus face-to-face screening modalities in an urban pediatric emergency department. 538 caregivers of patients &lt; 18 years were included in the study (n = 285 in electronic and n = 253 in face-to-face arm).</p>	<p>Randomized controlled trial</p>	<p>Face-to-face by a trained bilingual/bicultural research assistant OR electronic/self-administered</p>

Citations	Screening Tool	Study/Screening Description	Study Design	Screening Modality
<p><b>Garg et al. (2009).</b> Screening for basic social needs at a medical home for low-income children. <i>Clinical Pediatrics.</i></p> <p><b>Garg et al. (2007).</b> Improving the management of family psychosocial problems at low-income children's well-child care visits: The WE CARE Project. <i>Pediatrics.</i></p>	<p>A single item question about food insecurity ("Do you need help in getting food by the end of the month?") is included in the Well Child Care, Evaluation, Community Resources, Advocacy, Referral, Education [WE CARE] tool.</p>	<p>In Garg et al, (2007), a randomized controlled trial tested outcomes for patients (n=200) who received a 10-item screening questionnaire for multiple social needs administered in the waiting room before well child visits. Clinicians reviewed results with caregivers and provided a resource list for each identified social need. Garg et al (2009) describe baseline findings from parents included in a WECARE intervention arm (n=100) as well as survey data on residents screening practices.</p>	<p>Cross-sectional survey of parents and residents (Garg et al, 2009); Randomized controlled trial of screening among caregivers and cross-sectional survey of residents (Garg et al., 2007).</p>	<p>Self-reported written questionnaire administered to caregivers</p>
<p><b>Burkhardt et al. (2012).</b> Enhancing accurate identification of food insecurity using quality-improvement techniques. <i>Pediatrics.</i></p>	<p>Switched from single-item food security screening question to two-item Hunger Vital Sign™.</p>	<p>A case study and evaluation of a quality improvement effort to improve the identification of FI among pediatric residents seeing children for well care visits in a pediatric primary care setting. Residents also received training, were observed taking social histories and given feedback. Posters in exam rooms encouraged patients to talk about FI.</p>	<p>Pre-post design, no control group</p>	<p>In-person screening by residents</p>
<p><b>Adams et al. (2017).</b> Screening for food insecurity in pediatric primary care: A clinic's positive implementation experiences. <i>J Health Care Poor Underserved.</i></p>	<p>Two-item Hunger VitalSign™</p>	<p>A case study of a FI screening implementation effort in an academic pediatric primary clinic. FI questions were included alongside other health screening questions, completed prior to the clinic visit. Providers reviewed answers before meeting with families and could provide patients with a resource list or refer to a social worker. They were encouraged to document FI as part of the EHR problem list.</p>	<p>Qualitative, case-study</p>	
<p><b>Barnidge et al. (2017).</b> Screening for food insecurity in pediatric clinical settings: Opportunities and barriers. <i>J Community Health.</i></p>	<p>Two-item Hunger Vital Sign™</p>	<p>Cross-sectional surveys of both providers (n=67) and caregivers (n=212) in a Midwestern pediatric clinic aimed to capture attitudes towards screening for FI and current screening behaviors.</p>	<p>Cross-sectional email survey to providers and paper survey for caregivers.</p>	<p>Pen-and-paper surveys in the waiting room.</p>
<p><b>Hoisington et al. (2012).</b> Health care providers' attention to food insecurity in households with children. <i>Preventive Medicine.</i></p>	<p>N/A</p>	<p>A mail survey of family practice and pediatric primary care providers (n=186) in Oregon regarding FI screening practices.</p>	<p>Cross-sectional mail survey</p>	<p>N/A</p>

Citations	Screening Tool	Study/Screening Description	Study Design	Screening Modality
<p><b>Palakshappa et al. (2017B).</b> Clinicians' perceptions of screening for food insecurity in suburban pediatric practice. <i>Pediatrics</i>.</p> <p><b>Palakshappa et al. (2017A).</b> Suburban families' experience with food insecurity screening in primary care practices. <i>Pediatrics</i>.</p>	Two-item Hunger Vital Sign™	An evaluation of FI screening at suburban pediatric practices. Six practices were selected to implement a FI screening at 2-, 15-, and 36-month well-child visits (n = 5645 patients). Families that screened positive were offered a referral to a community partner for assistance with the application for SNAP. If the referral was accepted, the community partner contacted the family by phone within 1-2 weeks of screening. Parents (n=23) were interviewed to learn about screening experiences.	One qualitative analysis of semi-structured interviews and one mixed methods study of screening/referral outcomes (quantitative) and provider perspectives (qualitative).	In-person screening by nurse practitioner or provider during diet history. Questions included in the EHR template.
<p><b>O'Toole et al. (2012).</b> Resident confidence addressing social history: Is it influenced by availability of social and legal resources? <i>Clin Pediatr</i>.</p>	N/A	A survey of pediatric and medical-pediatric residents at three pediatric clinics regarding their screening practices and level of comfort with screening (n=40). The three clinics had varying levels of social work and medical-legal partnership staff resources.	Cross-sectional email survey	In-person by providers. EHR templates at all three clinics prompted for SDH screening, including for FI.
<p><b>O'Toole et al. (2013).</b> Watch and learn: An innovative video trigger curriculum to increase resident screening for social determinants of health. <i>Clin Pediatr</i>.</p>	N/A	A nonrandomized controlled study of pediatric residents in three urban outpatient clinics (n=15 intervention, n=21 control). A subset of residents were directly observed taking social histories (n=8 intervention, n=11 control). Intervention arm residents were trained with video vignettes showing both appropriate and inappropriate methods of SDH (including FI) screening. The video curriculum was provided during a conference with faculty-led discussion of the video content.	Non-randomized control study	In-person screening by resident. EHR templates at all three clinics prompted for SDH screening, including for FI.
<p><b>Klein et al. (2011).</b> Training in social determinants of health in primary care: Does it change resident behavior? <i>Acad Pediatr</i>.</p>	Two items embedded in the EHR: "Do you worry that your food will run out before you get money or food stamps to get more?" and "Are you having problems receiving WIC, food stamps, daycare vouchers, medical card or SSI?"	An evaluation of the effectiveness of a social needs curriculum on resident screening behavior. Pediatric interns (n=20) shadowed a social worker, observed families at a local food bank and public assistance office, and attended lectures and ongoing seminars. Knowledge, comfort level, and screening practices were compared to 15 interns in the previous class.	Non-randomized, mixed-methods intervention study	In-person screening by resident

Citations	Screening Tool	Study/Screening Description	Study Design	Screening Modality
<p><b>Klein et al. (2014).</b> Can a video curriculum on the social determinants of health affect residents' practice and families' perceptions of care? <i>Academic Pediatr.</i></p>	<p>Not specified, N/A</p>	<p>A evaluation of the impact of a video curriculum on residents' perceptions of SDH screening competence, referral behaviors, and parents' perceptions of residents' engagement and screening practices. Residents in the intervention arm were trained with video vignettes highlighting several SDH, including FI. Families (n=141) were evaluated after been seen by residents to discuss screening experiences with intervention (n=24) versus control (n=23) residents.</p>	<p>Pre-post study of residents (non-randomly) to video curriculum intervention and control groups; parents completed surveys after being seen by residents.</p>	<p>In-person screening by residents</p>
<b>Adult &amp; Primary Care Settings</b>				
<p><b>O'Toole et al. (2017).</b> Screening for food insecurity in six Veterans Administration Clinics for the Homeless June-December 2015. <i>Prev Chronic Dis.</i></p>	<p>A single question regarding FI in the prior 3 months and 6 follow-up questions regarding receipt of public benefits as well as health conditions (e.g., diabetes and symptoms of hypoglycemia).</p>	<p>A qualitative evaluation of a FI screening effort for homeless patients in six Veterans Administration clinics.</p>	<p>Qualitative</p>	<p>In-person, embedded in the EHR, could be administered by anyone on the health care team.</p>
<p><b>Page-Reeves et al. (2016).</b> Addressing social determinants of health in a clinic setting: The WellRx pilot in Albuquerque New Mexico. <i>J Am Board Fam Med.</i></p>	<p>An 11-item instrument to identify social needs, including the following question: "In the past 2 months, did you or others you live with eat smaller meals or skip meals because you didn't have money for food?"</p>	<p>A study of a social needs screening effort among adult patients (n=3048) in primary care clinics. Patients were screened and Community Health Workers (CHWs) and Medical Assistants (MAs) offered assistance in connecting those who screened positive for social needs with appropriate services and resources.</p>	<p>Cross-sectional and qualitative</p>	<p>Varied by site, either in-person by MAs or self-administered pen-and-paper</p>
<p><b>Harrison &amp; Sidebottom (2008).</b> Systematic prenatal screening for psychosocial risks. <i>J Health Care Poor Underserved.</i></p>	<p>Four items drawn from the USDA FSS Short-Item scale included in a larger, novel screening tool – the Prenatal Risk Overview.</p>	<p>A study of the feasibility and patient acceptability of screening for SDH among prenatal patients (n=1386) in four community health centers using a novel screening tool, the Prenatal Risk Overview.</p>	<p>Cross-sectional survey</p>	<p>In-person by RN or LPN after the medical history at the prenatal intake visit; or by social worker, MA, or other health care worker after RN/LPN has obtained the medical history (varied by site). Answers recorded in the EHR.</p>



**Appendix Table B. Reviewed Articles by Inclusion Criteria (26 total overall)**

Measurement	Acceptability	Implementation
<p><b>Validity (4)</b></p> <ul style="list-style-type: none"> <li>• Baer et al. 2015</li> <li>• Hager et al. 2010</li> <li>• Kleinman et al. 2007</li> <li>• Lane et al. 2014</li> </ul>	<p><b>Patient / Caregiver (6)</b></p> <ul style="list-style-type: none"> <li>• Barnidge et al. 2017</li> <li>• Fleegler et al. 2007</li> <li>• Garg et al. 2009</li> <li>• Hassan et al. 2013</li> <li>• Palakshappa et al. 2017A</li> <li>• Wylie et al. 2012</li> </ul>	<p><b>Screening Time (13)</b></p> <ul style="list-style-type: none"> <li>• Adams et al. 2017</li> <li>• Baer et al. 2015</li> <li>• Barnidge et al. 2017</li> <li>• Bottino et al. 2017</li> <li>• Garg et al. 2007</li> <li>• Harrison et al. 2008</li> <li>• Klein et al. 2014</li> <li>• Kleinman et al. 2007</li> <li>• O’Toole et al. 2012</li> <li>• O’Toole et al. 2013</li> <li>• O’Toole et al. 2017</li> <li>• Palakshappa et al. 2017B</li> <li>• Wylie et al 2012</li> </ul>
<p><b>Need for Assistance (3)</b></p> <ul style="list-style-type: none"> <li>• Bottino et al. 2017</li> <li>• Hassan et al. 2015</li> <li>• Wylie et al 2012</li> </ul>	<p><b>Provider (5)</b></p> <ul style="list-style-type: none"> <li>• Adams et al. 2017</li> <li>• Barnidge et al. 2017</li> <li>• Hoisington et al. 2012</li> <li>• O’Toole et al. 2017</li> <li>• Palakshappa et al. 2017B</li> </ul>	<p><b>Interventions driving uptake (7)</b></p> <ul style="list-style-type: none"> <li>• Burkhardt et al. 2012</li> <li>• Feigelman et al, 2011</li> <li>• Garg et al. 2007</li> <li>• Klein et al. 2011</li> <li>• Klein et al. 2014</li> <li>• O’Toole et al. 2012</li> <li>• O’Toole et al. 2013</li> </ul>
<p><b>Modality (3)</b></p> <ul style="list-style-type: none"> <li>• Fleegler et al. 2007</li> <li>• Gottlieb et al. 2014</li> <li>• Page-Reeves et al. 2016</li> </ul>		

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