



Current Advancements and Future Directions in Nutrition Security Measurement

About Us



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- ★ Website: www.centerfornutrition.org
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- ★ Founded in 1973, the Gretchen Swanson Center for Nutrition is a national nonprofit research institute
- ★ We provide expertise in measurement and evaluation to help develop, enhance and expand programs focused on healthy eating and active living, improving food security and healthy food access, promoting local food systems and applying a health equity lens across all initiatives.
- ★ The Gretchen Swanson Center works nationally and internationally, partnering with other nonprofits, academia, government and private foundations to conduct research, evaluation and scientific strategic planning.

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Partners:

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Cherokee Health (TN)

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Gaithersburg HELP (MD)

HopeSource (WA)

Hunger and Health Coalition (NC)

Manna Food Market (MD)

Montgomery County DHHS (MD)

Montgomery County Food Policy Council (MD)

North County Food Pantry (WA)

Nourish Now (MD)

Tampa Bay Network to End Tampa Bay Network to End Hunger (FL)

Together (NE)

UC San Diego - Center for Community Health (CA)

University District Food Bank (WA)

University of Arkansas for Medical Sciences (UAMS) (AR)



Nutrition security measurement – Initial Development

Ultimate Goal

- Develop low-burden measures that are complementary to the USDA's Household Food Security Survey Module (HFSSM) and address critical measurement gaps related to food security that are of interest to both practitioner and academic audiences.

Measurement Gaps

Household Resilience

Measures of the factors that make a household resilient to household-level financial shocks (e.g., job loss, medical debt).

Perceived Availability, Utilization, Stability

Measures of the household level perceptions of the other three pillars of food security.

Nutrition Security

Measures of the household's ability to acquire foods that are good for their health and well-being.

Measurement Gaps

Household Resilience

Measure of the factors that make a household resilient to household-level financial shocks (e.g., job loss, medical debt).

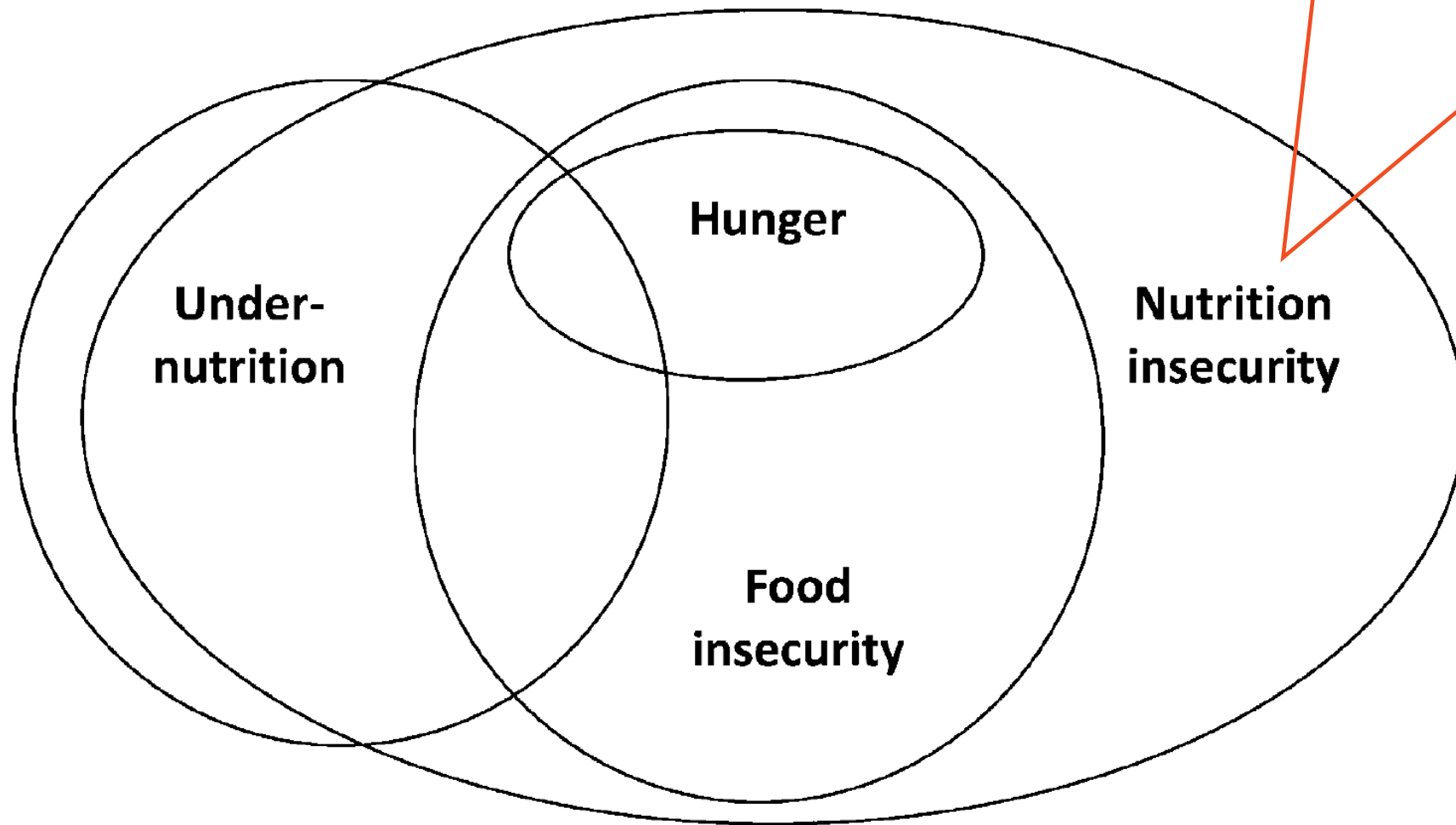
Perceived Availability, utilization, stability

Measure of the household level perceptions of the other three pillars of food security.

Nutrition Security

Measure of the household's ability to acquire foods that are good for their health and well-being.

“Nutrition security means all Americans have consistent and equitable access to healthy, safe, affordable foods essential to optimal health and well-being.” - USDA



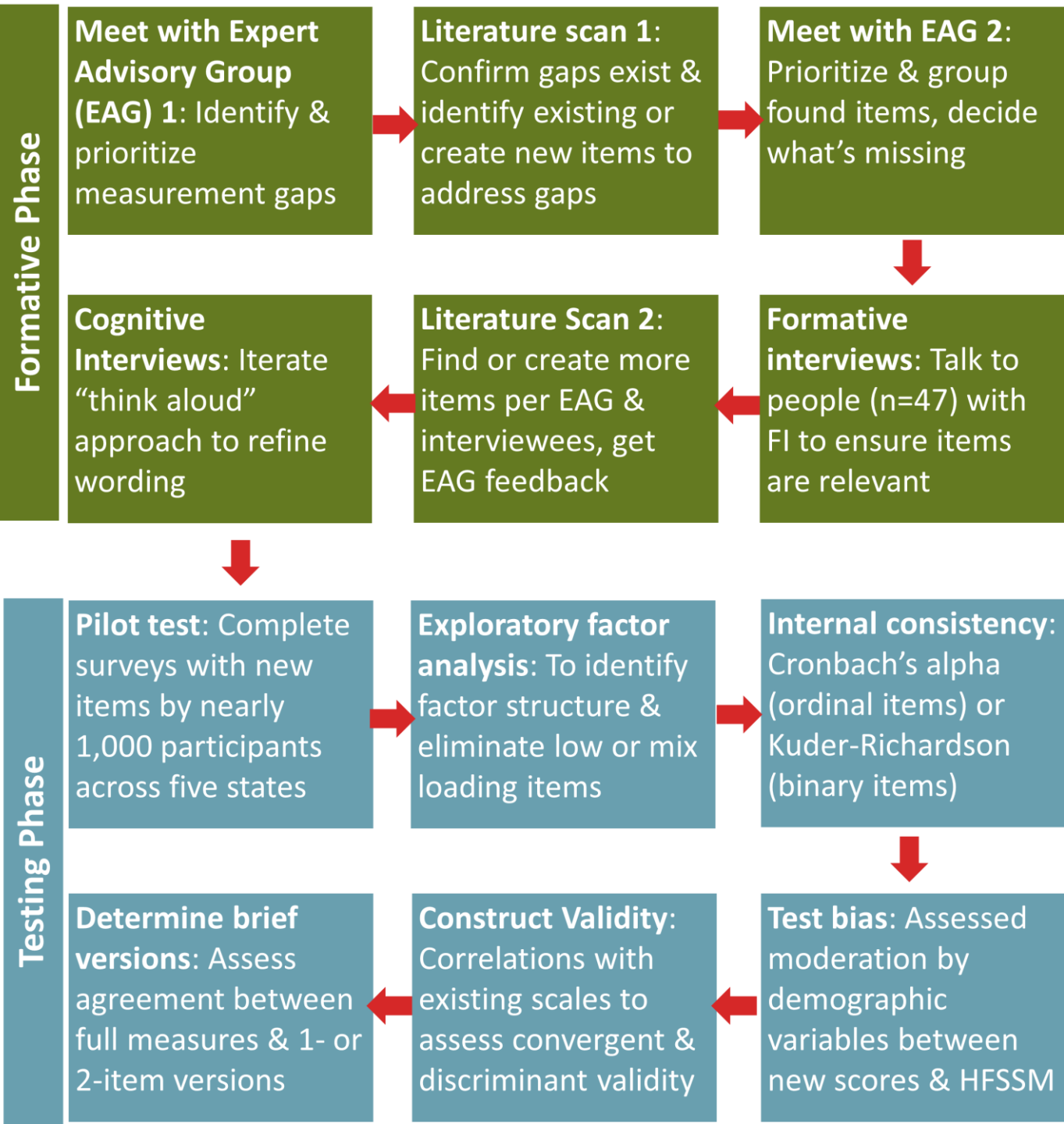
Jones et al., 2013

Measurement Development

Nutrition Security paper in Appetite



Link to the website for measures and guidance



Formative Phase

Meet with Expert Advisory Group (EAG) 1: Identify & prioritize measurement gaps



Literature scan 1: Confirm gaps exist & identify existing or create new items to address gaps



Meet with EAG 2: Prioritize & group found items, decide what's missing



Cognitive Interviews: Iterate "think aloud" approach to refine wording



Literature Scan 2: Find or create more items per EAG & interviewees, get EAG feedback



Formative interviews: Talk to people (n=47) with FI to ensure items are relevant

Testing Phase

Pilot test: Complete surveys with new items by nearly 1,000 participants across five states

Exploratory factor analysis: To identify factor structure & eliminate low or mix loading items

Internal consistency: Cronbach's alpha (ordinal items) or Kuder-Richardson (binary items)

Determine brief versions: Assess agreement between full measures & 1- or 2-item versions

Construct Validity: Correlations with existing scales to assess convergent & discriminant validity

Test bias: Assessed moderation by demographic variables between new scores & HFSSM

Selected sample characteristics for the analytic samples for each of the new measures		
Sample Characteristics		Analytic Sample (n=380)
Age (years)	Mean (SD)	44.9 (14.4)
Food pantry utilization (%)		75%
Women (%)		78%
Food Security (%)	High	17%
	Marginal	13%
	Low	30%
	Very Low	41%
Educational Attainment (%)	Less than high school	9%
	High school diploma or G.E.D.	33%
	Some college	27%
	Associates degree or greater	31%
Race or Ethnicity (%)	White, non-Hispanic	45%
	Latino/Hispanic	23%
	Black, non-Hispanic	18%
	Multi-racial/-ethnic, another	7%
	Asian, non-Hispanic	6%
	Tribal/Indigenous	1%

Testing highlights

Household Nutrition Security

- 4 items
- Cronbach’s Alpha: 0.85
- Test bias: Survey mode
- Max range: 0-4
- Mean (SD): 2.58 (0.97)
- 36% “low” = 2.0 or below

Factor Loadings for nutrition focused items		
Items	Factor 1	Factor 2
Should or should not	0.881	
Did not meet health needs	0.878	
Worried affect health	0.665	
Same in a row	0.647	
Control-health needs		0.871
Control-fruits and veg		0.694
Control-processed food		0.683

Nutrition Security Scale (4 items)

N1. In the last 12 months, (I/we) had to eat some foods that were not good for my health and well-being because (I/we) couldn't get other types of food.

N2. In the last 12 months, (I/we) knew there were things (I/we) should or should not eat for (my/our) health and well-being but could not get healthful food.

N3. In the last 12 months, (I/we) worried that the food (I was/we were) able to eat would hurt (my/our) health and well-being.

N4. In the last 12 months, (I/we) had to eat the same thing for several days in a row because (I/we) didn't have money to buy other food.

Assessing associations (odds ratios (95% confidence intervals)) between scores for the new measures and poor dietary and health outcomes controlling for food security status and sample characteristics (n=380)				
Binary Outcome Variable		Model 1	Model 2	Model 3
Nutrition Security	"Fair" or "Poor" General Health	0.540 (0.420-0.694)	0.552 (0.395-0.770)	0.513 (0.356-0.740)
	High Cholesterol/Hypertension	0.774 (0.610-0.983)	0.759 (0.550-1.046)	0.671 (0.467-0.965)
	Heart Disease or Stroke	0.780 (0.495-1.228)	1.074 (0.552-2.093)	0.922 (0.407-2.090)
	Diabetes	0.732 (0.560-0.958)	0.773 (0.540-1.106)	0.613 (0.405-0.927)
	"Low" Fruit and Vegetable ^A	0.584 (0.458-0.747)	0.720 (0.522-0.995)	0.782 (0.551-1.111)
	"Low" Scratch-Cooked Meals ^B	0.536 (0.415-0.691)	0.623 (0.448-0.868)	0.568 (0.388-0.833)
	"High" Fast Food Meals ^C	0.890 (0.682-1.162)	0.708 (0.493-1.019)	0.752 (0.507-1.116)
	"High" Processed Meals ^D	0.642 (0.492-0.838)	0.847 (0.598-1.199)	0.863 (0.591-1.261)
Healthfulness Choice	"Fair" or "Poor" General Health	0.710 (0.569-0.885)	0.797 (0.627-1.012)	0.857 (0.658-1.116)
	High Cholesterol/Hypertension	0.999 (0.806-1.238)	1.070 (0.843-1.359)	1.110 (0.842-1.464)
	Heart Disease or Stroke	0.916 (0.608-1.380)	1.034 (0.628-1.703)	0.885 (0.493-1.588)
	Diabetes	0.978 (0.770-1.244)	1.111 (0.845-1.463)	1.015 (0.750-1.373)
	"Low" Fruit and Vegetable ^A	0.654 (0.524-0.816)	0.752 (0.592-0.956)	0.853 (0.655-1.111)
	"Low" Scratch-Cooked Meals ^B	0.570 (0.452-0.720)	0.658 (0.513-0.843)	0.679 (0.508-0.909)
	"High" Fast Food Meals ^C	0.802 (0.628-1.024)	0.743 (0.571-0.967)	0.700 (0.517-0.946)
	"High" Processed Meals ^D	0.714 (0.562-0.907)	0.811 (0.621-1.058)	0.847 (0.626-1.146)
Dietary Choice	"Fair" or "Poor" General Health	0.617 (0.486-0.783)	0.657 (0.478-0.904)	0.605 (0.427-0.856)
	High Cholesterol/Hypertension	0.797 (0.634-1.003)	0.809 (0.594-1.100)	0.741 (0.522-1.051)
	Heart Disease or Stroke	0.767 (0.496-1.186)	0.765 (0.409-1.431)	0.617 (0.281-1.354)
	Diabetes	0.927 (0.719-1.195)	1.145 (0.812-1.613)	0.911 (0.616-1.348)
	"Low" Fruit and Vegetable ^A	0.601 (0.475-0.762)	0.763 (0.559-1.041)	0.803 (0.571-1.129)
	"Low" Scratch-Cooked Meals ^B	0.577 (0.453-0.736)	0.710 (0.518-0.973)	0.702 (0.489-1.008)
	"High" Fast Food Meals ^C	1.015 (0.785-1.311)	0.918 (0.650-1.294)	0.864 (0.590-1.265)
	"High" Processed Meals ^D	0.681 (0.529-0.878)	0.922 (0.661-1.286)	0.983 (0.683-1.416)

Assessing associations (odds ratios (95% confidence intervals)) between scores for the new measures and poor dietary and health outcomes controlling for food security status and sample characteristics (n=380)

Binary Outcome Variable		Model 1	Model 2	Model 3
Nutrition Security	"Fair" or "Poor" General Health	0.540 (0.420-0.694)	0.552 (0.395-0.770)	0.513 (0.356-0.740)
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Nutrition security measurement – Further Validation

Confirmatory Factor Analysis

Greater Boston Food Bank

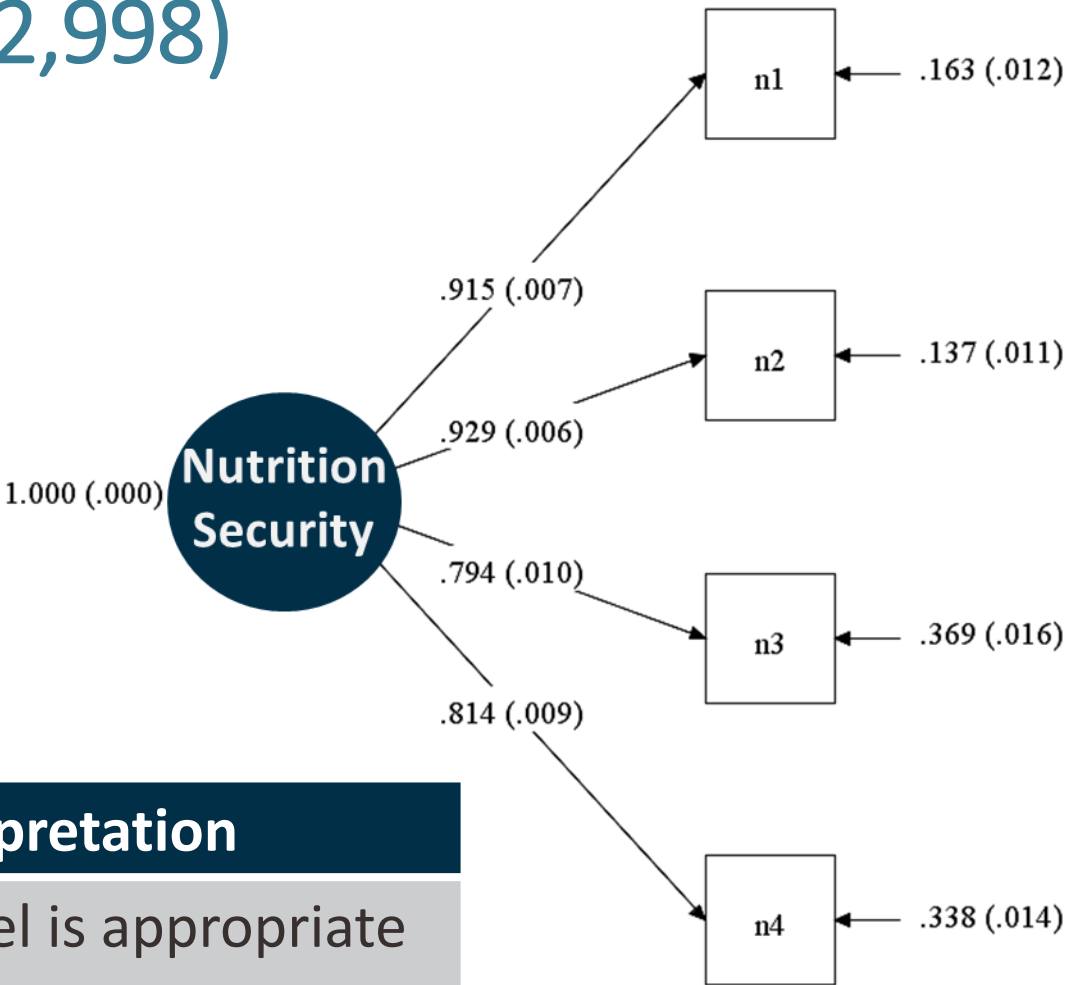


Sample characteristics (n=3,024)

Age (18-54 Years)	61%
Age (55 years and older)	39%
White (Non-Hispanic)	71%
Hispanic/Latino	13%
Black (non-Hispanic)	8%
Asian (non-Hispanic)	6%
Female (%)	58%
Income <\$25,000 (%)	23%
Child in home (%)	31%
Food insecure (%)	42%
Low Nutrition Security (% _M)	25% (2.98)

Confirmatory Factor Analysis (n=2,998)

Purpose: Assess if the items show a similar factor structure and level of interrelatedness as they did in another sample.



Metric	Value	Interpretation
Chi-Square Test of Model Fit	P >0.05	Model is appropriate
RMSEA	0.025 (0.00-0.05)	< .05 (Byrne, 1994)
CFI	0.999	> .96 (Hu, 1999)
SRMR	0.005	< .08 (Byrne, 1994)

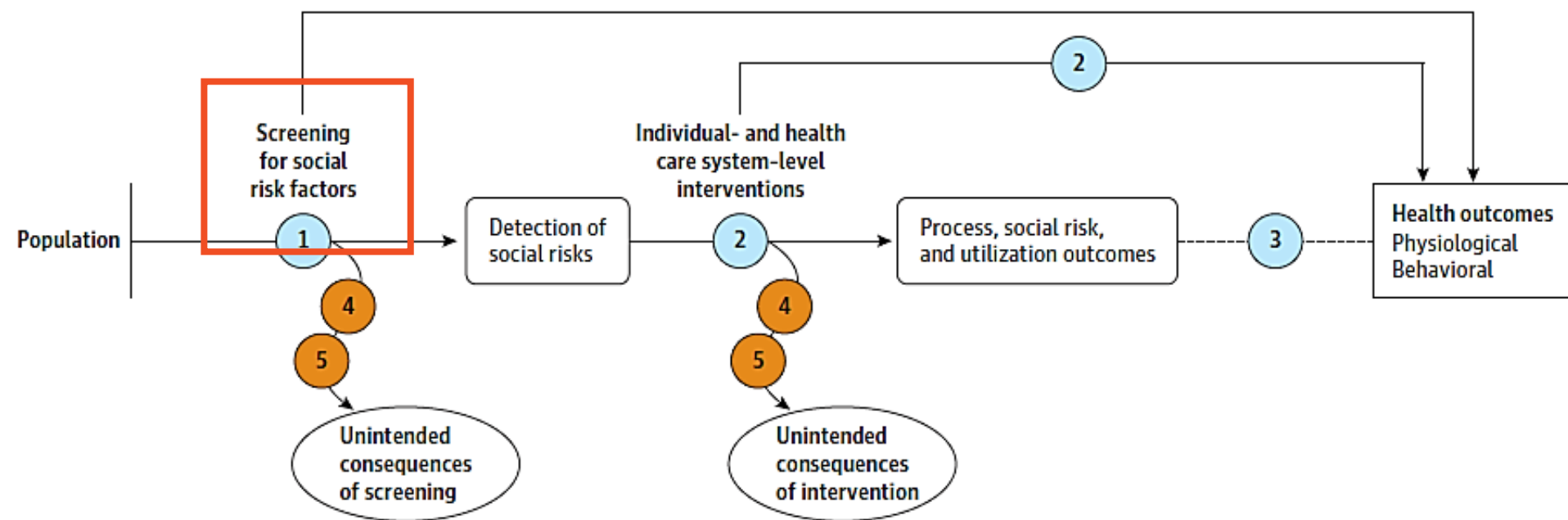
Takeaways

- Nutrition security scale items based on strong formative qualitative work.
- Scale performed well in psychometric assessments in different samples of food bank/food pantry clients and similar people at risk for food insecurity.
- Scale can be used confidently in food bank and similar populations to measure the subjective experience of nutrition insecurity.
 - i.e., perceived access, and concerns about access, to healthful foods.
- **Purpose**: Research and evaluation



Screening for
nutrition security
as part of health-
related social
needs screening

Figure 1. Analytic Framework: Screening and Interventions for Social Risk Factors



Guiding questions

- 1 What are the available multidomain screening tools to identify social risk and what social risk domains do they identify? How valid are these tools? How does measurement of specific social risk domains vary by screening tool?
- 2 What social risk-related interventions have been evaluated? What are the characteristics of the studies that have evaluated these interventions and what outcomes do they report?
- 3 What are the effects of improvements in process outcomes, health care utilization outcomes, or social risk outcomes on physiological and behavioral health outcomes?
- 4 What are the perceived or potential challenges to implementation of widespread screening and interventions for social risk factors within health care? What potential solutions have been proposed to address these challenges?
- 5 What are the challenges or unintended consequences of screening and interventions for social risk factors to patients and clinicians? What is the acceptability of screening for and intervening on social risk factors for patients and clinicians?



Eder, M., Henninger, M., Durbin, S., Iacocca, M. O., Martin, A., Gottlieb, L. M., & Lin, J. S. (2021). Screening and interventions for social risk factors: technical brief to support the US Preventive Services Task Force. *JAMA*, 326(14), 1416-1428.

Health-Related Social Needs Screening Tools

Name: _____ Health Plan #: _____



PRAPARE®: Protocol for Responding to and Assessing Patients' Assets, Risks, and Needs
Paper Version of PRAPARE® for Implementation

Personal Characteristics

1. Are you Hispanic or Latino?

☐ Yes	☐ No	☐ I choose not to answer this question
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2. Which race(s) are you? Check all that apply

☐ Asian	☐ Native Hawaiian
☐ Pacific Islander	☐ Black/African American
☐ White	☐ American Indian/Alaskan Native
☐ Other (please write): _____	
☐ I choose not to answer this question	

3. At any point in the past 2 years, has season or migrant farm work been your or your family's main source of income?

☐ Yes	☐ No	☐ I choose not to answer this question
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4. Have you been discharged from the armed forces of the United States?

☐ Yes	☐ No	☐ I choose not to answer this question
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5. What language are you most comfortable speaking?

Family & Home

6. How many family members, including yourself, do you currently live with? _____



WE CARE SURVEY

Place Patient Sticker Here

We want to make sure that you know all the community resources that are available to you for problems. Many of these resources are free of charge. Please answer each question and hand it to your child's medical assistant at the beginning of the visit. Thank you!

	Do you have a high school degree?	Yes No ↓ If NO, would you like help to get a GED?	Yes No Maybe Later
	Do you have a job?	Yes No ↓ If NO, would you like help with finding employment and/or job training?	Yes No Maybe Later
	Do you need daycare for your child?	Yes No ↓ If YES, would you like help finding it?	Yes No Maybe Later
	Do you think you are at risk of becoming homeless?	Yes No ↓ If YES, would you like help with this?	Yes No Maybe Later ↓ If yes, is this an emergency? Yes* No
	Do you always have enough food for your family?	Yes No ↓ If NO, would you like help with this?	Yes No Maybe Later ↓ If yes, do you need food for tonight? Yes* No
	Do you have trouble paying your heating bill and/or electricity bill?	Yes No ↓ If YES, would you like help with this?	Yes No Maybe Later ↓ If yes, are you at risk of having your utilities shut off in the next week? Yes* No

☐ None/uninsured	☐ Medicaid
☐ CHIP Medicaid	☐ Medicare
☐ Other public	☐ Other Public Insurance

Your Current Life Situation (Shorter Form)

to help us better understand you and your current situation. entered into your Kaiser Permanente medical record and will be used plan to help you maintain or improve your health and well-being.

your current living situation? (Select ONE only)

apartment, condo, trailer, etc.); may have a pet
als and household help are routinely provided by paid staff (or could
me which provides meals and 24-hour nursing care ☐ Temporarily
meless

current living situation, like housing conditions, safety,

☐ Lack of more permanent housing
g or utilities ☐ Feeling safe ☐ Other

nable paying for any of the following? (Select ALL that apply)

nd electricity ☐ Medical needs ☐ Transportation
☐ None of these

you worried that your food would run out before you had
☐ Sometimes ☐ Often ☐ Very often

om medical appointments or from doing things needed for daily

or from getting medications
or daily living

ctivities of daily living such as bathing, preparing meals,
o you get the help that you need?

☐ I could use a little more help ☐ I need a lot more help

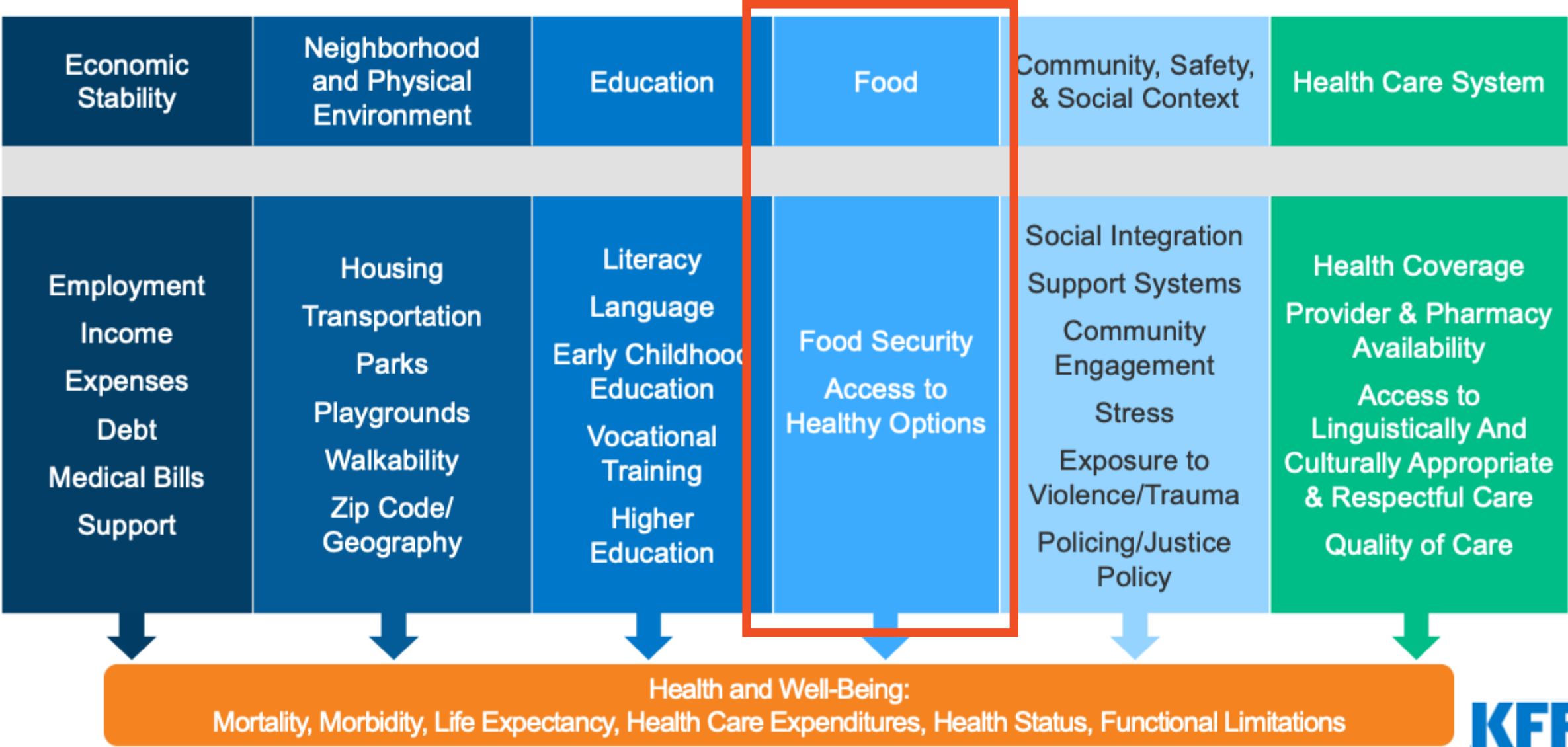
felt difficulties were piling up so high that you could not



SCREEN AND INTERVENE:

A Toolkit for Pediatricians to Address Food Insecurity

Social Determinants of Health





Food

Food Security: “...access by all people at all times to enough food for an active, healthy life.”

Food Security

Access to
Healthy Options

Nutrition Security: “...have consistent and equitable access to healthy, safe, affordable foods essential to optimal health and well-being.”

Screeners

Food Security:

“ Within the past 12 months we worried whether our food would run out before we got money to buy more.”

“ Within the past 12 months the food we bought just didn’t last and we didn’t have money to get more.”

Often true

Sometimes true

Never true

Affirmative response to either =
Positive Screen for Food Insecurity

Hunger Vital Sign

Hager ER, Quigg AM, Black MM, Coleman SM, Heeren T, Rose-Jacobs R, Cook JT, De Cuba SA, Casey PH, Chilton M, Cutts DB. Development and validity of a 2-item screen to identify families at risk for food insecurity. Pediatrics. 2010 Jul 1;126(1):e26-32.

**USDA's Household Food Security
Survey Module (18 items)**



Hunger Vital Sign (2 items)

Affirmative to either: sensitivity of 97%, specificity of 83%

“ Within the past 12 months we worried whether our food would run out before we got money to buy more.”

“ Within the past 12 months the food we bought just didn't last and we didn't have money to get more.”

Screeners

Nutrition Security:



Brief Nutrition Security Screener (BNSS)

Nutrition Security (N3). In the last 12 months, (I/we) worried that the food (I was/we were) able to eat would hurt (my/our) health and well-being.

☐ Never

☐ Rarely

☐ Sometimes

☐ Often

☐ Always

☐ Don't know

If "Sometimes," "Often," or "Always" is selected for this question, then the participant has screened positive for needing support around accessing healthful foods.

**Compared to the full measure:
sensitivity 93%, specificity 78%**

Research Question

Is there a benefit to adding nutrition security screening to food security screening?

Brief Methods

- Cross-sectional survey data were collected from April to June 2021 across five states on participant demographics, food and nutrition security screening, and dietary and health variables.
- Generalized linear mixed models, both unadjusted and adjusted for state-level clustering and demographics were used to assess associations between screening status and dietary and health variables.
- Two screeners used together:
 - **Food Security:** Hunger Vital Sign (2 items)
 - **Nutrition Security:** Brief Nutrition Security Screener (1 item)

Sample characteristics, dietary, and health related variables for the analytic sample (n=435)		
Households with children (%)		60%
Women (%)		77%
Educational Attainment (%)	Less than high school	9%
	High school diploma or G.E.D.	36%
	Some college	26%
	Associate degree or greater	29%
Race or Ethnicity (%)	White, non-Hispanic	43%
	Latino/Hispanic	24%
	Black, non-Hispanic	18%
	Multi-racial/-ethnic, or another not listed	7%
	Asian, non-Hispanic	6%
	Tribal/Indigenous, non-Hispanic	2%
State (%)	California	25%
	Florida	20%
	Maryland	17%
	North Carolina	19%
	Washington	19%

Nutrition and food security screening status

Food Secure & Nutrition Secure 17%	Food Secure & Nutrition Insecure 5%
Food Insecure & Nutrition Secure 37%	Food Insecure & Nutrition Insecure 41%

Table 2. Assessing dietary and health risk (odds ratios (95% confidence intervals)¹ associated with food and nutrition security screening group (n=435)

Binary Outcome Variable	Food and Nutrition Security Group ^{2,3}	
"Fair" or "Poor" General Health	FI & NI (n=180)	2.914* (1.521-5.581)
	FI & NS (n=159)	1.761 (0.912-3.399)
	FS & NI (n=22)	1.355 (0.440-4.172)
Self-Reported Chronic Condition (e.g., Diabetes)	FI & NI (n=180)	2.028* (1.024-4.018)
	FI & NS (n=159)	1.703 (0.852-3.402)
	FS & NI (n=22)	1.768 (0.541-5.770)
"Low" Fruit and Vegetable intake (below median)	FI & NI (n=180)	2.421* (1.258-4.660)
	FI & NS (n=159)	1.684 (0.865-3.278)
	FS & NI (n=22)	1.856 (0.596-5.780)
"Low" Scratch-Cooked Meals (below median)	FI & NI (n=180)	3.471* (1.653-7.287)
	FI & NS (n=159)	2.219* (1.043-4.725)
	FS & NI (n=22)	0.985 (0.272-3.571)
"High" Processed Meals (above median)	FI & NI (n=180)	2.619* (1.320-5.198)
	FI & NS (n=159)	2.130* (1.061-4.278)
	FS & NI (n=22)	1.414 (0.429-4.653)

Table 2. Assessing dietary and health risk (odds ratios (95% confidence intervals)¹ associated with food and nutrition security screening group (n=435)^{2,3}

Binary Outcome Variable	Food and Nutrition Security Group^{2,3}	
"Fair" or "Poor" General Health	FI & NI (n=180)	2.914* (1.521-5.581)
	FI & NS (n=159)	1.761 (0.912-3.399)
	FS & NI (n=22)	1.355 (0.440-4.172)
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Takeaways

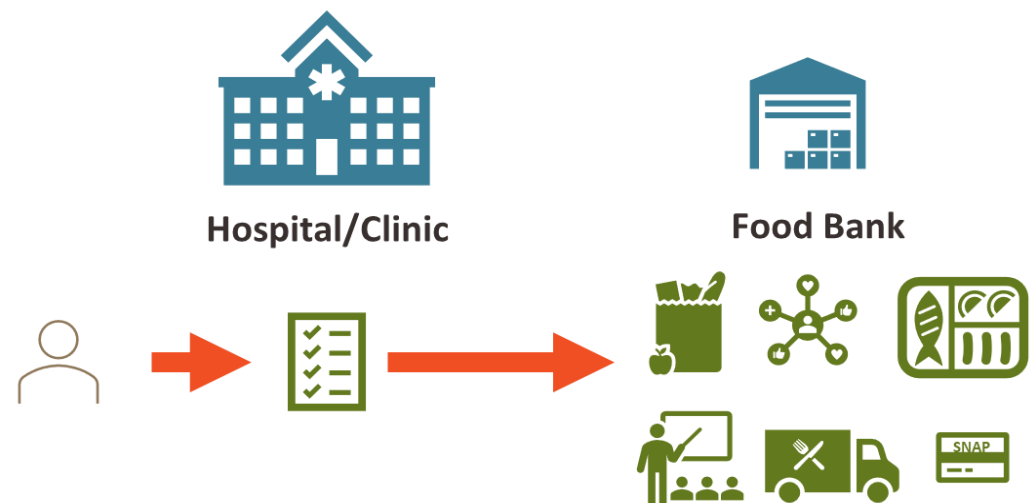
- Knowing both food and nutrition security status is key for identifying those at the highest risk for poor diet and health outcomes, and intervening efficiently.
- Hunger Vital Sign is widely used and recommended if only one can be used, but Brief Nutrition Security Screener alone may be useful for populations with high underlying rates of food insecurity.
- More work is warranted for additional studies on this screening protocol in real world settings using both the Hunger Vital Sign and Brief Nutrition Security Screener, simultaneously.
- **Purpose**: Health-related social needs screening



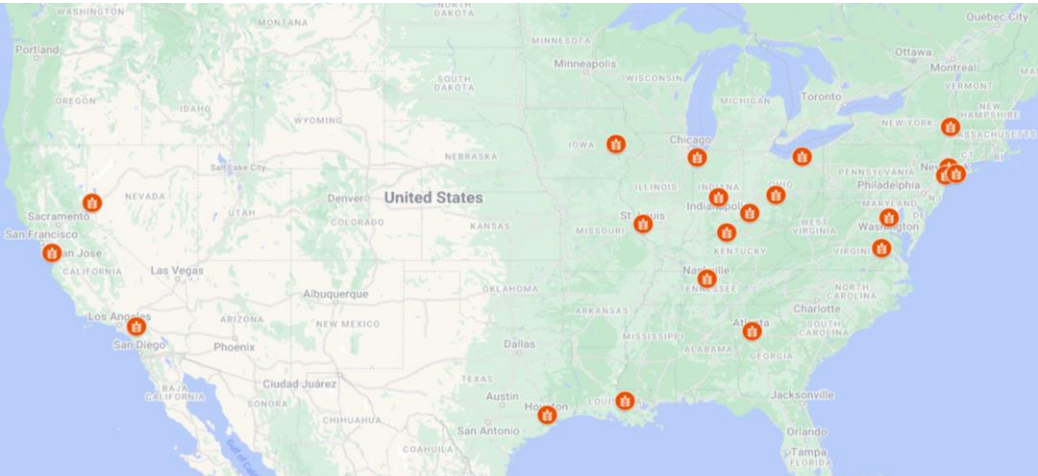
Using the
screening tools
and future
directions

Nutrition Security Scale (4-items) Example: Food as Medicine 3.0

Many varied FAM3 program models. All involve clinical-food bank screen-and-refer partnerships.



21 grantees spread across the U.S.



Key data collection activities:

Survey



- Pre/Post surveys
- Standard for all sites
- Diet, food security, BMI, A1c, and quality of life
- Five languages

EMR Data



- Pre/Post clinical data from sub-set of sites
- BMI, A1c, and blood pressure

Claims Data



- Insurance claims data to assess hospital utilization
- Part of cost assessment and impact assessment

Qualitative



- Qualitative longitudinal sub-study
- Follow patients from screening, access referral, one-month after

Expected outcomes of this work:



Implementation Guidance: Identify strategies to effectively implement and refine FAM programs.



Effectiveness: Measure the effectiveness of various FAM models across many health and diet outcomes.



Improvement: Generate participant-driven recommendations for improving FAM programs.

Brief Nutrition Security Screener (BNSS) (1-item) Examples

Promedica (Toledo, OH)



- Healthcare system with large community presence
- Piloting a two-step social needs intake screening, includes the BNSS
- Those who screen positive get a dietitian consultation and offered cooking classes and help with kitchen equipment

Nicklaus Children's Hospital (Miami, FL)



- Piloted BNSS screening with 8,000 patients/families, rolling out across system soon
- Saw rates of positive screens jump from 2% to 16% after switching to a form versus verbal screening
- Working on building out the referral arm of their program

Future Research Directions

- Further develop nutrition security conceptualization to better understand peoples' experiences and differing severities.
- Investigate the intersection of nutrition and food insecurity status to better understand implications for health risks, and devise best practices for measurement and screening.
- Explore intervention approaches and implementation strategies to identify effective approaches address food and nutrition security.

Questions?



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Website with the measures:

[https://www.centerfornutrition.org/
food-security-measures](https://www.centerfornutrition.org/food-security-measures)

