Title

A Meta-analysis of the Prevalence of Food Insecurity Among People Experiencing Housing Insecurity and Homelessness in the United States.

Authors

Jackson, Carolyn
Hart, Cody
Uribe-Lacy, C
et al.

Publication Date

2025-01-06

DOI

10.1177/00333549241305349

Peer reviewed

PUBLIC HEALTH REPORTS

Public Health Reports
1–15


Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/00333549241305349
journals.sagepub.com/home/phr

A Meta-analysis of the Prevalence of Food Insecurity Among People Experiencing Housing Insecurity and Homelessness in the United States

Carolyn L. Jackson, MSN, MPH[1]; Cody A. Hart, BA[2]; C. Jeff Uribe-Lacy, MLIS, MA[3]; Phillip Yang, MD, MA[4]; and Jack Tsai, PhD, MSCP[2,5,6]

Abstract

Objectives: Studies suggest that people experiencing housing insecurity and homelessness (HIH) have varying experiences with food insecurity. We estimated the prevalence of food insecurity and identified the factors associated with it among people experiencing HIH in the United States.

Methods: We conducted a meta-analysis of the prevalence of food insecurity among people experiencing HIH and a systematic review of associated factors through a comprehensive search of 8 academic databases. We identified 3398 unique articles and included 40 studies in the review that met the following criteria: included observational or experimental data on the prevalence of food insecurity among people experiencing HIH, conducted in the United States, and written in English.

Results: The overall prevalence of food insecurity was 57% (95% CI, 48%-65%). Most people experiencing HIH had food insecurity, and our estimated prevalence among people experiencing HIH was >4 times higher than the prevalence in the US population. Experiencing symptoms of a mental health condition (eg, depression, posttraumatic stress disorder, anxiety) in addition to HIH was most frequently (7 datasets) associated with increased odds of food insecurity. Social and institutional support was most frequently (5 datasets) associated with decreased odds of food insecurity.

Conclusion: Our findings suggest that multisector coordination is needed to address individual- and system-level factors associated with food insecurity and HIH.

Keywords

food insecurity, housing insecurity, homelessness, prevalence study

Individuals experiencing housing insecurity or homelessness (HIH) in the United States face numerous barriers to accessing basic needs. Conventional wisdom often conflates homelessness and food insecurity; however, people experiencing HIH have varying experiences with food access and adequacy.[1-4] Housing insecurity exists on a continuum, with secure housing at one end and homelessness at the other end as the most severe form of housing insecurity.[5] Housing insecurity, as defined by the US Department of Health and Human Services, encompasses numerous challenges, such as difficulty paying rent because of cost (≥30% of income spent on housing), frequent moves (≥3 times in 1 year), and overcrowding (≥2 people in 1 room or multiple families in 1 house).[6] Homelessness is defined as "lacking a regular nighttime residence or having a primary nighttime residence that is a temporary shelter or other place not designed for sleeping."[6]

[1] Graduate School of Biomedical Sciences, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA
[2] Joe R. and Teresa Long School of Medicine, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA
[3] Dolph Briscoe Jr Library, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA
[4] Department of Psychiatry and Behavioral Sciences, University of California, San Francisco, San Francisco, CA, USA
[5] School of Public Health, University of Texas Health Science Center at Houston, Houston, TX, USA
[6] National Center on Homelessness Among Veterans, US Department of Veterans Affairs, Washington, DC, USA

Corresponding Author:
Carolyn L. Jackson, MSN, MPH, University of Texas Health Science Center at San Antonio, Graduate School of Biomedical Sciences, 7703 Floyd Curl, San Antonio, TX 78229, USA.
Email: carolynlambertjackson@gmail.com

Food insecurity is defined as "uncertain or limited access to adequate food" and is considered a condition distinct from hunger.[7,8] High rates of food insecurity may be expected among people who are experiencing HIH because not having a regular place to live may also result in not having regular access to food and having difficulty connecting with public assistance programs. How often these 2 issues overlap and how they might affect each other are unclear. Some homeless service programs offer food pantries and meal services, but many do not.[9]

A scoping review that synthesized the relationship between food insecurity and mental health outcomes among people experiencing homelessness found an association between food insecurity and depression.[10] However, the review was limited to adults and was not a meta-analytic review; thus, a need exists for a broader review of the HIH population to estimate the prevalence of food insecurity and identify potential associated factors. The findings would provide consolidated information on this issue, establish prevalence numbers, and help provide potential interventions to help address food insecurity among people experiencing HIH in the United States.

Methods

This systematic review follows the *Cochrane Handbook for Systematic Reviews of Interventions*. We adhered to the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-analyses) and MOOSE reporting checklist (Meta-analyses of Observational Studies in Epidemiology) while considering best practices in systematic reviews of prevalence.[11-14] We developed the protocol a priori and registered it with Prospero (CRD42023402438). Institutional review board approval was not necessary per institutional policy at the University of Texas Health Science Center because the review did not involve human data or participants.

For inclusion in the review, studies must have had information on (1) people experiencing HIH as defined by the US Department of Health and Human Services and (2) the prevalence of food insecurity as defined by the US Department of Agriculture, with food insecurity as the numerator and HIH as the denominator.[6,8] Multiple tools and questions meeting the definition of food insecurity were included.[15,16] We established no date or age limits, although studies must have been conducted in the United States and written in English to decrease heterogeneity in the findings. In addition to published literature, the team included gray literature to reduce the influence of publication bias. We also hand-searched the reference lists of the 40 included studies and relevant systematic reviews identified by our search terms. The full criteria are detailed elsewhere (eTable 1 in the Supplement).

Data Sources

Because of the multidisciplinary nature of food insecurity and HIH research, we searched the Cumulative Index of Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, MEDLINE via PubMed, Scopus, ProQuest Dissertations and Theses, and *BMC Proceedings* in January 2023 with the help of a research librarian. The entire search strategy is detailed elsewhere (eTable 2 in the Supplement). Two team members (C.L.J. and either P.Y. or C.A.H.) independently screened the studies, conducted a full-text review, and made decisions about inclusion in Covidence (Covidence Systematic Review Software), a web-based screening and data extraction tool.

Two team members (C.L.J. and either P.Y. or C.A.H.) independently extracted data on the publication year, the first author's last name, and the prevalence of food insecurity (numerator) among people experiencing HIH (denominator). Factors extracted for the secondary objective included the significant and nonsignificant factors associated with food insecurity among people experiencing HIH. We resolved disagreements via discussion or a tie-breaking decision with a third team member (J.T.). One author (C.L.J.) extracted data on the study design, location, food insecurity tool, definition of HIH, and demographic data on people with food insecurity who were experiencing HIH. We synthesized demographic data by calculating mean percentage and mean (SD). We did not include missing or unclear information in the extraction. When multiple publications used the same dataset, the team collated the data and reported the new set as 1 point for the meta-analysis.

Criteria for Assessing Data

We assessed the quality of the studies using the Johanna Briggs Institute Checklist for Prevalence Studies.[17] Two team members (C.L.J. and either P.Y. or C.A.H.) independently rendered a yes or no decision about whether the study adequately met each of the 9 domains. Our team resolved disagreements via discussion and by a tie-breaking vote with a third team member (J.T.). We rated the overall quality as high if all domains met the criteria, medium if 1 to 4 domains failed to meet the criteria, or low if ≥5 domains failed to meet the criteria (eTable 3 in the Supplement). One author (C.L.J.) performed the certainty assessment with 2 authors (P.Y. and C.A.H.) using GRADE (Grading of Recommendations Assessment, Development, and Evaluation) for the prevalence outcomes and GRADE-CERQual (GRADE Confidence in the Evidence From Reviews of Qualitative Research) for the secondary objective of associated factors (eTables 4 and 5 in the Supplement).[18,19]

The prevalence of food insecurity consists of the number of people experiencing food insecurity as the numerator and HIH as the denominator. We performed the meta-analysis using Stata version 18 (StataCorp) and the Freeman–Tukey double arcsine–transformed proportion method with random effects. We chose the Freeman–Tukey method, which computes the weighted pooled estimate and performs a back-transformation on the weighted estimate, to include

proportions close to 0 and 1.[20] We selected the random-effects method to address heterogeneity among studies. We summarized the data using a forest plot. We conducted a subgroup analysis by housing status to further address heterogeneity. We presented the average prevalence for each subgroup and the distribution of the estimates with the I^2 statistic, 95% CIs, and prediction intervals.

We had no systematic way to compare the strengths of various factors because of the varying statistical methods used in each dataset; therefore, we examined the 11 datasets for the most common factors and extracted the data whether significant or not. For the significant factors, we examined the number of studies that reported each factor (eTable 5 in the Supplement). We then inspected the factors for themes and grouped them when appropriate.

Results

After removing duplicates, we screened 3398 abstracts from multiple databases in Covidence and relevant reviews and from reference lists of the included studies. After excluding 3283 studies because of nonrelevant abstracts, we reviewed the full text of 115 studies (eFigure 1 in the Supplement). We included 40 journal articles in the review (Table).[1-4,21-56] We extracted information on the study location, sample size, population, prevalence of food insecurity, food insecurity screening tool, definition of HIH, and factors associated with food insecurity. Four studies were longitudinal cohort studies,[1,48,54,55] and 36 were cross-sectional[2-4,21-23,24-47,49-53,56] (eTable 5 in the Supplement). Nine studies were nationally representative,[4,21,29,42,44,45,49,50,53] and 31 focused on a specific city or region of the United States.[1-3,22,23,24-28,30-41,43,46-48,51,52,54-56] Twenty-three studies exclusively analyzed people experiencing homelessness,[1,2,21-23,24,25,27-40] although 2 studies shared the same dataset and were collated.[3,26] Eight studies examined people experiencing housing insecurity.[4,41-47] Nine studies of people experiencing HIH were collated into 6 datasets, resulting in 36 unique datasets for the review.[48-56] Sample sizes ranged from 18 to 10 165 participants. Twenty-three datasets were of adults aged ≥18 years,[1-4,21,22,25-27,29-32,34,37,38,41,46-48,51-56] although 5 comprised only college-aged or young adults.[1,22,25,28,39] Of 36 datasets, 10 were based on either households or families caring for children aged <18 years.[23,24,33,36,40,43-45,49,50] The remaining 3 datasets focused on young people, ranging from age 9 to 24 years because of variable definitions for each study.[28,35,39] Only 6 datasets had demographic data on people experiencing food insecurity and HIH.[3,21,22,26,38,41,56] A synthesis of the demographic characteristics in the 6 datasets revealed that 61% of participants identified as male, 38% as female, 40% as non-Hispanic White, 52% as non-Hispanic Black, and 28% as Hispanic. The mean (SD) age was 43 (12) years.

Eleven datasets[2,3,21, 26,31,32,38,39,41,48-50,54,55] reported factors associated with food insecurity (Table, eTable 5 in the Supplement). Results from the quality assessment are detailed (eTable 3 in the Supplement). Seventeen studies were of high quality,[4,21,24,29,34,38-40,42-46,49,50,54,55] and 23 were of moderate quality.[1-3,22,23,25-28,30-33,35-37,41,47,48,51-53,56] Most studies were of moderate quality because of sample size or convenience sampling. We had moderate confidence in the prevalence of food insecurity based on the GRADE certainty assessment because of imprecision in the findings, and we had moderate confidence in the majority of factors associated with food insecurity based on the GRADE-CERQual certainty assessment because of some concerns about the adequacy of findings (eTables 4 and 5 in the Supplement).

Prevalence of Food Insecurity

The overall prevalence of food insecurity among people experiencing HIH in the 36 datasets was 57% (95% CI, 48%-65%; for heterogeneity, $P < .001$; $I^2 = 99.5\%$) (Figure). The prevalence of food insecurity among people experiencing HIH ranged from 7% in a cross-sectional study of 55 HIH adults in New York City to 94% in a cross-sectional study of 252 adults in Rhode Island.[30,51,52] The study populations were subdivided by housing status into homeless, housing insecure, and HIH, although differences among the groups were not significant ($P = .09$). The prevalence of food insecurity among people experiencing homelessness was 63% (95% CI, 52%-74%; for heterogeneity, $P < .001$; $I^2 = 99.0\%$); among people experiencing housing insecurity, 51% (95% CI, 33%-69%; for heterogeneity, $P < .001$; $I^2 = 99.81$); and among people experiencing HIH, 40% (95% CI, 23%-58%; for heterogeneity, $P < .001$; $I^2 = 98.0\%$). Differences between high- and moderate-quality studies were not significant: the prevalence was 52% (95% CI, 40%-64%) in high-quality studies versus 61% (95% CI, 48%-73%) in moderate-quality studies ($P = .32$).

Factors Associated With Food Insecurity

Of the 40 studies in the review, 14 studies[2,3,21,26,31,32,38,39,41,48-50,54,55] that collated into 11 unique datasets contained information on factors associated with increased or decreased odds of food insecurity among adults and young people experiencing HIH (Table, eTable 5 in the Supplement).

The most common factor described in 7 datasets was the presence of a mental health condition (symptoms of anxiety, depression, and posttraumatic stress), which increased the odds of food insecurity.[2,3,26,38,41,48-50,54,55] Social and institutional support (medical access, jail, shelter, family, or friend support) was the second-most common factor described in 4 datasets and was associated with decreased odds of food insecurity.[2,38,39,49,50] Other frequently cited factors associated with increased odds of food insecurity among people experiencing HIH were physical health impairments, substance use/alcohol dependence, and a history of personal or sexual abuse.[2,26,39,49] Factors also included high rates of psychiatric/general hospitalization and emergency department use, as well as female gender, oral pain, and history of

Table. Characteristics of studies containing the prevalence of food insecurity among people experiencing homelessness and/or housing insecurity in the United States

Author (year)	Study location and design	Sample size and population	Prevalence of food insecurity	Food insecurity tool; definition of homelessness or housing instability	Variables associated with food insecurity among people experiencing homelessness or housing insecurity
Homeless					
Baggett et al (2011)[21]	United States; cross-sectional	966 adults aged ≥18 years experiencing homelessness	24.3%	USDA[15]; homeless for at least 1 year or having had 4 episodes of homelessness in one's lifetime	Increased odds: Hospitalization: AOR = 1.59 (95% CI, 1.07-2.36); *P* = .02 Psychiatric hospitalization: AOR = 3.12 (95% CI, 1.73-5.62); *P* = .003 ≥4 ED visits: AOR = 2.38 (95% CI, 1.32-6.08) Nonsignificant associations: Any ED use: AOR = 1.20 (95% CI, 0.61-2.37)
Bowen and Irish (2018)[22]	Buffalo, NY; mixed method	30 emerging adults aged 18-24 years experiencing homelessness	93%	HFIAS[16]; participants couch surfing, staying on the streets, and/or using shelters	—
Chatterjee et al (2018)[23]	Boston, MA; cross-sectional	33 families experiencing homelessness (adults aged ≥18 y caring for a child aged <18 y)	88%	USDA[15]; families residing in motel-shelters	—
Dzubur et al (2022)[1]	Los Angeles, CA; longitudinal cohort	100 adults aged 18-24 years experiencing homelessness	73%	HFIAS[16]; street based or living in a dwelling not meant for human habitation or couch surfing in temporary locations	—
Fitzpatrick and Willis (2021)[2]	Washington and Benton counties, AR; cross-sectional survey	158 adults experiencing homelessness	70%	USDA[15]; homeless people living in sheltered and unsheltered environments	Increased odds: History of arrest: AOR = 2.44 (95% CI, 1.16-5.14); *P* < .05 Anxiety symptoms: AOR = 1.30 (95% CI, 1.06-1.59); *P* < .05 Physical health impairments: AOR = 1.13 (95% CI, 1.01-1.25); *P* < .05 Decreased odds: Community connectedness: AOR = 0.75 (95% CI, 0.57-0.98); *P* < .05 Medical access: AOR = 0.28 (95% CI, 0.28-0.75); *P* < .01 Nonsignificant associations: Unsheltered: OR = 2.62 (95% CI, 0.56-12.25) Overweight/obese: AOR = 0.67 (95% CI, 0.30-1.51)
Gundersen et al (2003)[24]	Worchester, MA; cross-sectional	220 female-headed families experiencing homelessness	72.9%	USDA[15]; spent >7 consecutive nights in a car, abandoned building, public park (except voluntary camping), shelter, nonresidential building, or other nondwelling	—
Haskett et al (2020)[25]	Southeast United States; cross-sectional	143 college students experiencing homelessness	25.2%	USDA[15]; individuals lacking a fixed, regular, and adequate nighttime residence	—

(continued)

Table. (continued)

Author (year)	Study location and design	Sample size and population	Prevalence of food insecurity	Food insecurity tool; definition of homelessness or housing instability	Variables associated with food insecurity among people experiencing homelessness or housing insecurity
Hernandez et al (2019)[3]; Hernandez et al (2019)[26]	Oklahoma City, OK; cross-sectional	566 adults experiencing homelessness	77.3%	USDA[15]; individual not having a personal residence or other permanent location to sleep	Increased odds: History of personal or sexual victimization: OR = 1.57 (95% CI, 1.11-2.21); $P<.05$ Poor mental or physical health and risk health behaviors (depression symptoms, posttraumatic stress symptoms, alcohol abuse/dependence, smoking, poor health): OR = 1.80 (95% CI, 1.47-2.21) Nonsignificant associations: Age: OR = 0.99 (95% CI, 0.98-1.01) Female gender: OR = 0.93 (95% CI, 0.58-1.48) Have health insurance: OR = 1.20 (95% CI, 0.74-1.97) Length of homelessness: OR = 1.01 (95% CI, 0.95-1.07)
Kendzor et al (2017)[27]	Dallas, TX; cross-sectional	32 adults experiencing homelessness	93.8%	USDA[15]; residents of a homeless shelter for <3 mo (able to show a badge)	—
Kloubec and Harris (2021)[28]	Seattle, WA; cross-sectional	122 young people aged 14-24 years experiencing homelessness	26.4%	USDA-adapted question[15]: "not enough food to eat"; young people aged <18 years and young adults aged 18-24 years not accompanied by a parent or guardian and not parents presenting with or sleeping in the same place as the children	—
Lee and Greif (2008)[29]	United States; cross-sectional	2898 adults experiencing homelessness	81.2%	USDA[15]; lacking a permanent and adequate nighttime residence of their own, or their residence was temporary in nature or not originally intended as sleeping accommodations	—
Martins et al (2015)[30]	Rhode Island; cross-sectional	252 adults experiencing homelessness	94%	USDA[15]; lacking a fixed, regular, and adequate nighttime residence or having a primary nighttime residence that is (1) a supervised publicly or privately operated shelter; (2) an institution that provides a temporary residence for individuals intended to be institutionalized; or (3) a public or private place not designed for regular sleeping accommodation for human beings	—

(continued)

Table. (continued)

Author (year)	Study location and design	Sample size and population	Prevalence of food insecurity	Food insecurity tool; definition of homelessness or housing instability	Variables associated with food insecurity among people experiencing homelessness or housing insecurity
Ora et al (2008)[31]	Anaheim, CA; cross-sectional	85 adults experiencing homelessness	30.6%	USDA[15]-adapted question: "unable to find food"; people living on the street or in shelters	Increased odds: Female gender: AOR = 3.59 (95% CI, 1.71-19.74); $P < .05$
Reitzel et al (2020)[32]	Oklahoma City, OK; cross-sectional	528 adults	78.4%	USDA[15]; lacking a fixed, regular, and nighttime residence	Increased odds: Heavy drinking: AOR = 2.12 (95% CI, 1.21-1.73); $P < .05$ Probable alcohol abuse: AOR = 2.72 (95% CI, 1.55-4.77); $P = .001$
Richards and Smith (2010)[33]	Minneapolis, MN; cross-sectional	259 women with ≥1 child aged 3-18 years experiencing homelessness	67%	USDA[15]; residing in 1 of 2 homeless shelters	—
Rusness (1990)[34]	Minnesota, North Dakota; cross-sectional	418 adults experiencing homelessness	55%	USDA[15]-adapted question: "worry about enough food"; an individual who lacks a fixed, regular, and adequate nighttime residence and an individual who has a primary nighttime residence that is (1) a supervised publicly or privately operated shelter designed to provide temporary living accommodations (including welfare hotels, congregate shelters, and transitional housing for the mentally ill), (2) an institution that provides a temporary residence for individuals intended to be institutionalized, or (3) a public or private place not designated for or ordinarily used as a regular sleeping accommodation for people	—
Smith and Richards (2008)[35]	Minneapolis, MN; cross-sectional	202 young people aged 9-18 years experiencing homelessness	55%	USDA[15]: "not enough food"; anyone who (1) lacks a fixed, regular, and adequate nighttime residence; or (2) has a primary nighttime residence that is a supervised publicly or privately operated temporary living accommodation, including emergency shelters, transitional housing, and battered women's shelters; or (3) has a nighttime residence in any place not meant for human habitation, such as under bridges or in cars	—

(continued)

Table. (continued)

Author (year)	Study location and design	Sample size and population	Prevalence of food insecurity	Food insecurity tool; definition of homelessness or housing instability	Variables associated with food insecurity among people experiencing homelessness or housing insecurity
Taylor and Koblinsky (1994)[36]	Baltimore, MD; cross-sectional	73 mothers with children aged 3-5 years experiencing homelessness	55%	USDA[15]-adapted question: "major difficulty obtaining food"; residents of an emergency shelter or transitional housing	—
Tello (2017)[37]	Los Angeles, CA; mixed methods	18 adults experiencing homelessness	30%	USDA-adapted question: "difficulty accessing food"; sleeping in a friend's home, shelter, motel, street, or vehicle	—
Tong et al (2019)[38]	Oakland, CA; cross-sectional	350 adults aged >50 years experiencing homelessness	55.4%	USDA[15]; those lacking a fixed residence or residing in places not typically used for sleeping and those in imminent risk of losing housing within 14 d	Increased odds: Oral pain that prevents eating or sleeping: OR = 2.38 (95% CI, 1.43-3.97); $P<.05$ Depressive symptoms: OR = 3.21 (95% CI, 1.85-5.56); $P<.05$ Smoking some days: AOR = 2.11 (95% CI, 1.11-4.01); $P<.05$ Decreased odds: Spending most days in shelter, jail, transitional housing, or other institutions (reference: unsheltered): OR = 0.48 (95% CI, 0.26-0.91); $P<.05$ Nonsignificant associations: Age: OR = 0.93 (95% CI, 0.88-0.98) Self-reported fair/poor health: OR = 1.93 (95% CI, 1.12-3.14) Any chronic health condition: OR = 0.85 (95% CI, 0.51-1.42) Alcohol use problem: OR = 1.85 (95% CI, 1.09-3.17)
Whitbeck et al (2006)[39]	8 Midwest cities; cross-sectional	428 young people aged 16-19 years experiencing homelessness	33%	Modified USDA[15]; adolescents residing in a shelter, on the street, or living independently (eg, friends, transitional living) because they had run away, been pushed out, or drifted out of their family of origin	Increased odds of food insecurity: Older adolescents: adjusted $\beta=0.29$; $P<.01$ Male gender: adjusted $\beta=0.10$; $P<.05$ Unsheltered on the street: adjusted $\beta=0.22$; $P<.01$ History of caretaker abuse/neglect: adjusted $\beta=0.29$; $P<.01$ Substance use disorder: adjusted $\beta=0.10$; $P<.05$ Decreased odds of food insecurity: Heterosexual: adjusted $\beta=-0.10$; $P<.05$ A large number in social support network: adjusted $\beta=0.14$; $P<.01$
Yousefi-Rizi et al (2021)[40]	San Diego, CA; cross-sectional	1271 households experiencing homelessness	82.6%	USDA[15]; lacking a regular nighttime residence or having a primary nighttime residence that is a temporary shelter or other place not designed for sleeping	—

(continued)

Table. (continued)

Author (year)	Study location and design	Sample size and population	Prevalence of food insecurity	Food insecurity tool; definition of homelessness or housing instability	Variables associated with food insecurity among people experiencing homelessness or housing insecurity
Housing insecure					
Bowen et al (2016)[41]	Chicago, IL; cross-sectional	153 adults aged ≥18 years experiencing housing instability	75.2%	HFIAS[16]; marginally housed individuals living in single-room occupancy dwellings	Increased odds of housing insecurity: Women: OR = 2.37 (95% CI, 1.05-5.34); *P* = .04 Mental health condition: OR = 2.38 (95% CI, 1.26-4.48); *P* < .01 Eating most meals at a soup kitchen/church: OR = 9.75 (95% CI, 2.80-34.01); *P* < .01 At least 1 chronic health condition: OR = 2.29 (95% CI, 1.08-4.07); *P* = .03 Diabetes: OR = 2.27 (95% CI, 1.03-7.44); *P* = .04
Chang and Chatterjee (2022)[42]	United States; cross-sectional	345 people aged <65 years in households experiencing housing instability	62%	USDA[15]; (1) people who had been evicted for not paying rent or mortgage within the last 6 mo; or (2) people who could not pay rent/mortgage, utility, or important medical bills within last 6 mo and their monthly shelter expenses exceeded 50% of monthly household income	—
Cutts et al (2011)[43]	Baltimore, MD; Boston, MA; Little Rock, AR; Los Angeles, CA; Minneapolis, MN; Philadelphia, PA; and Washington, DC; cross-sectional	10165 families with children aged <3 years experiencing housing instability	12.4%	USDA[15]; crowding and multiple moves in the previous year, per the US Department of Housing and Urban Development's definition as a guideline	—
Kushel et al (2006)[4]	United States; cross-sectional	4293 adults aged 18-64 years experiencing housing instability	76.7%	USDA[15]; self-reported difficulty in paying rent, mortgage, or utility bills in the past year	—
Lee et al (2021)[44]	United States; cross-sectional	1040 families experiencing housing instability (adults caring for a child aged <18 y)	23%	USDA[15]; 6 questions that determined whether families experienced material hardship related to housing in the past 12 mo	—
Ma et al (2008)[45]	United States; cross-sectional	3760 families experiencing housing instability (households with children aged <18 y)	50.7%	USDA[15]; frequent moves, difficulty paying rent, spending >50% of household income on housing, being evicted, and living in overcrowded conditions	—
Moya et al (2023)[46]	El Paso, TX; cross-sectional	533 college students experiencing housing instability	71%	USDA[15]; lacking access to safe, affordable, and quality housing, including homelessness, housing instability, poor housing conditions, and low household or neighborhood safety	—

(continued)

Table. (continued)

Author (year)	Study location and design	Sample size and population	Prevalence of food insecurity	Food insecurity tool; definition of homelessness or housing instability	Variables associated with food insecurity among people experiencing homelessness or housing insecurity
Willis (2019)[47]	Kansas City, MO; cross-sectional	179 undergraduate students experiencing housing instability	42.8%	USDA[15]; feeling fairly or somewhat stable and secure in housing or feeling very or fairly unstable and insecure in housing	—
Homeless or housing insecure					
Kim et al (2017)[48]	San Francisco, CA; longitudinal cohort	247 women experiencing homelessness or housing instability	59.5%	USDA[15]; sleeping in a homeless shelter, in public (eg, cars, parks, abandoned buildings, stairwells), or at someone else's place for 1 or 2 nights because there was nowhere else to go	Increased odds: Smoker: AOR = 1.90 (95% CI, 1.25-2.90) Heroin use: AOR = 2.80 (95% CI, 1.47-5.33) Worse mental health (SF-12 score): AOR = 0.94 (95% CI, 0.93-0.96)
Lee and Lippert (2021)[49]; Lippert and Lee (2021)[50]	United States; cross-sectional	714 families experiencing homelessness or housing instability (households with children aged <18 y in their care)	49%, adults; 13%, children/ adolescents aged <18 years	USDA[15]; housing insecure defined as poor but domiciled service-using persons, and homeless defined as lacking a permanent and adequate nighttime residence of one's own	Increased odds of food insecurity among children: Children aged >5 years: adjusted β = 1.45 (95% CI, 0.31-1.10); *P* = .02 Larger number of children: adjusted β = 0.71 (95% CI, 0.20-2.69); *P* = .23 Parental temporary employment: adjusted β = 1.53 (95% CI, 0.48-2.58); *P* = .004 Parental mental health problems: adjusted β = 2.23 (95% CI, 0.40-4.06); *P* = .017 Parental history of abuse or neglect: adjusted β = 1.21 (95% CI, 0.36-2.06); *P* = .005 Decreased odds of food insecurity among children: SNAP enrollment: adjusted β = −0.11 (95% CI, −0.19 to −0.03); *P* = .009 Child receiving childcare: adjusted β = −1.26 (95% CI, −2.53 to −0.01); *P* = .005 Child receiving health care: adjusted β = −1.04 (95% CI, −1.92 to −0.16); *P* = .02 Nonsignificant associations: Parental incarceration: adjusted β = −0.65 (95% CI, −1.84 to 0.54); *P* = .29
Luder et al (1989)[51]; Luder et al (1990)[52]	New York, NY; cross-sectional	55 adults experiencing homelessness or housing instability	7%	USDA[15]-adapted question: "not enough to eat"; housing insecure defined as residing in single-room occupancy hotels, and homeless defined as people without a residence	—

(continued)

Table. (continued)

Author (year)	Study location and design	Sample size and population	Prevalence of food insecurity	Food insecurity tool; definition of homelessness or housing instability	Variables associated with food insecurity among people experiencing homelessness or housing insecurity
O'Toole et al (2017)[53]	United States; cross-sectional	270 Veterans Administration patients experiencing homelessness or housing instability or recently homeless	48.5%	USDA[15]-adapted question: "not enough to eat"; veterans who were homeless, at risk for homelessness, or recently homeless living in transitional or supportive housing and enrolled in a Veterans Administration Homeless Patient Aligned Care Team	—
Palar et al (2015)[54]; Weiser et al (2013)[56]	San Francisco, CA; longitudinal cohort (2007-2010)	346 adults living with HIV experiencing homelessness or housing instability	55.5%	HFIAS[16]; housing insecure defined as residing in single-room occupancy hotels, and homeless defined as spent the night in the street or a homeless shelter at least once in the past 90 d	Increased odds: Depression: moderate food insecurity (AOR = 1.34; 95% CI, 1.04-1.78; $P<.05$); severe food insecurity (AOR = 1.64; 95% CI, 1.26-2.13; $P<.001$) Hospitalization: mild/moderate food insecurity (OR = 1.69; 95% CI, 1.16-2.48; $P<.01$); severe food insecurity (OR = 2.62; 95% CI, 1.78-3.55; $P<.001$) Any ED visit: mild/moderate food insecurity (OR = 1.73; 95% CI, 1.34-2.22; $P<.01$); severe food insecurity (OR = 2.20; 95% CI, 1.69-2.86)
Weiser et al (2009)[55]	San Francisco, CA; cross-sectional (2006)	104 adults living with HIV experiencing homelessness or housing instability	25%	HFIAS[16]; homeless or housing insecure defined as residing in homeless shelters and single-room hotels charging <$600/mo	

Abbreviations: —, indicates that no information on factors associated with increased or decreased odds of food insecurity was provided; AOR, adjusted odds ratio; ED, emergency department; HFIAS, Household Food Insecurity Access Scale; OR, odds ratio; SF-12, 12-Item Short Form Health Survey; SNAP, Supplemental Nutrition Assistance Program; USDA, US Department of Agriculture.

arrest.[2,21,31,38,41,54,55] Because temporality could not be established in most studies, the only causal inference explored was the association of food insecurity and depression, with depression likely resulting from severe food insecurity.[48,54,56] Factors uniquely associated with increased odds of food insecurity among HIH children (defined as a child aged <18 y) included families with large numbers of children, children aged >5 years, and parents with temporary employment. Among HIH adolescents aged 16-19 years, factors associated with increased odds of food insecurity included living unsheltered on the street, male gender, and older adolescent age. Social and institutional support was associated with lower odds of food insecurity across all ages.[2,38]

Discussion

Across 40 studies, the overall prevalence of food insecurity among people experiencing HIH was 57%. This estimate is >4 times the 12.8% estimated prevalence of food insecurity in the general US population.[57] These studies demonstrate that most people experiencing HIH also have food insecurity, and these social determinants of health should be addressed together. For many of these individuals, housing insecurity and food insecurity may have been caused by similar socioeconomic or clinical factors, as found in systematic reviews of risk factors for each condition separately.[58-60] The overall prevalence rate that we found can be interpreted another way: many people who experience HIH do not uniformly experience food insecurity, which is an interesting finding that deserves further examination. Many questions remain that warrant further study, such as how those experiencing HIH without food insecurity secure regular food sources and what protective factors keep them from being food insecure.

The demographic characteristics that we synthesized in our review largely mirrored the demographic characteristics of the homeless population overall.[61] Across all age groups,

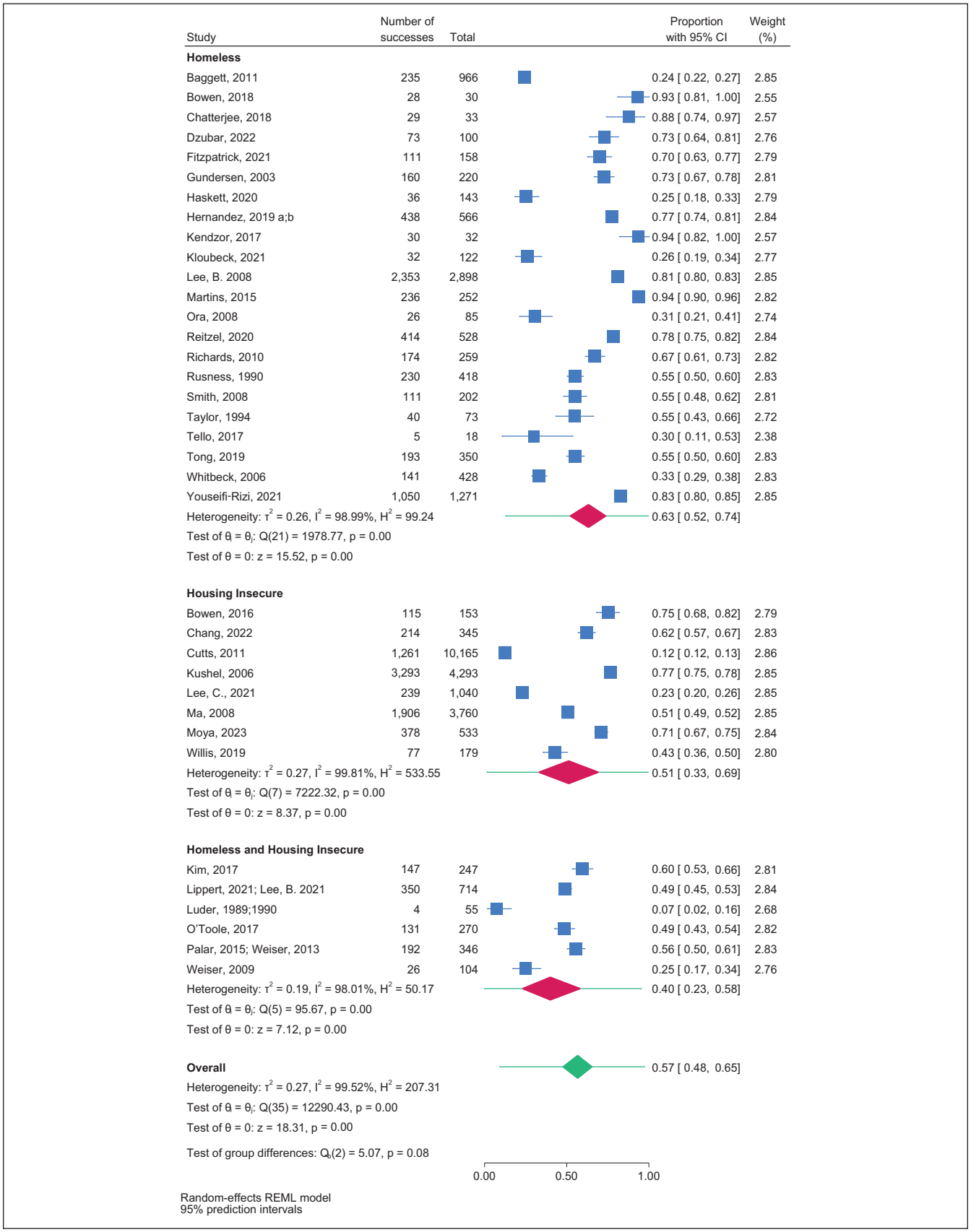

Figure. Forest plot of the prevalance of food insecurity among people experiencing homelessness or housing insecurity, in a meta-analysis of 40 studies in a systematic review conducted before January 2023 in the United States.

the most frequently cited factor associated with an increased risk of food insecurity among people experiencing HIH was a mental health condition.[2,3,26,32,38,39] This finding is in line with a scoping review that found a bidirectional relationship between food insecurity and mental health conditions among people experiencing homelessness.[10] Many protective factors can be synthesized into 1 common theme—social and institutional support decreases food insecurity among people experiencing HIH. Social support encompasses friends, family, and community members, and institutional support encompasses spending time in a shelter or transitional housing, receiving medical care or childcare, or enrolling in SNAP benefits (Supplemental Nutrition Assistance Program). Social and institutional support intuitively makes sense and is supported by the broader literature that people engaging with others and institutions are more likely than isolated individuals to be provided food or connected with resources.[62,63] However, reaching and engaging the most isolated HIH populations is challenging because of the multitude of reasons why people avoid institutional involvement, such as fear of arrest, ineligibility for programs due to immigration status, lack of accessibility, the exclusion of pets, and administrative issues.[2,64-67] Addressing food insecurity and HIH together may help improve physical health and decrease acute care and emergency department use.[68-70]

Public Health Implications

Given the high rate of overlap between housing insecurity and food insecurity, programs can work together to address these challenges.[50,71] Currently, programs for food insecurity and HIH are often siloed in part because of a patchwork of funding streams and various administrative management systems, such as the US Department of Housing and Urban Development and SNAP.[72,73] Community-based providers have reported a need to improve coordinated governmental efforts to address social needs such as food insecurity and HIH.[72,74] This work may be supported by shared evidence-building priorities now required of federal agencies.[75,76] In addition, efforts to screen for food insecurity in HIH service settings and for HIH in food insecurity service settings may help identify clients or systems when opportunities exist for interagency collaboration to address both conditions.

Because of the strong association between mental health conditions and food insecurity among people experiencing HIH, mental health clinics located on-site in temporary housing and shelters may increase access to mental health care and potentially decrease health care costs by avoiding the expense of inpatient psychiatric hospitalizations.[10,21] Various studies have highlighted the benefits of integrated health care and social services for people experiencing HIH.[77,78] Because food insecurity and other issues may remain even after people obtain permanent supported housing, food insecurity should be considered in conjunction with other social needs.[79,80] In addition, the protective nature of institutional and social support in decreasing the incidence of food insecurity among people experiencing HIH highlights the importance of person-centered engagement, programming, and outreach efforts.[74,81]

Strengths and Limitations

This meta-analytic review had several strengths, such as the number of studies analyzed and adherence to the *Cochrane Handbook for Systematic Reviews of Interventions*. The review also had several limitations. First, we found a large amount of heterogeneity in the prevalence of food insecurity, so we provided prediction intervals.[82] In addition, the measures for food insecurity and HIH varied across studies, which led to difficulties determining whether the most cited factors were simply the most frequently investigated. However, we increased transparency by investigating all of the significant and nonsignificant factors in the studies and reporting the most frequently cited.

Conclusion

Most people experiencing HIH also have food insecurity. Factors most frequently cited as increasing the risk of food insecurity among HIH include a mental health condition, physical health impairment, or a history of physical or sexual abuse. Because social and institutional support was the most frequently cited factor associated with a decreased risk of food insecurity among people experiencing HIH, coordinated efforts are needed to provide shelter, health care, food, childcare, and community among people experiencing HIH.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

ORCID iDs

Carolyn L. Jackson, MSN, MPH https://orcid.org/0000-0003-1826-5288
Cody Hart, BA https://orcid.org/0009-0003-3204-2782
Phillip Yang, MD, MA https://orcid.org/0000-0001-8883-0276
Jack Tsai, PhD, MSCP https://orcid.org/0000-0002-0329-648X

Supplemental Material

Supplemental material for this article is available online. The authors have provided these supplemental materials to give readers additional information about their work. These materials have not

been edited or formatted by *Public Health Reports*'s scientific editors and, thus, may not conform to the guidelines of the *AMA Manual of Style*, 11th Edition.

References

1. Dzubur E, Semborski S, Redline B, Hedeker D, Dunton GF, Henwood BF. Food insecurity, hunger, stress, and homelessness among young adults. *Health Psychol*. 2022;41(8):559-565. doi:10.1037/hea0001214
2. Fitzpatrick KM, Willis DE. Homeless and hungry: food insecurity in the land of plenty. *Food Secur*. 2021;13(1):3-12. doi:10.1007/s12571-020-01115-x
3. Hernandez DC, Daundasekara SS, Arlinghaus KR, et al. Cumulative risk factors associated with food insecurity among adults who experience homelessness. *Health Behav Res*. 2019;2(1):7. doi:10.4148/2572-1836.1033
4. Kushel MB, Gupta R, Gee L, Haas JS. Housing instability and food insecurity as barriers to health care among low-income Americans. *J Gen Intern Med*. 2006;21(1):71-77. doi:10.1111/j.1525-1497.2005.00278.x
5. Frederick TJ, Chwalek M, Hughes J, Karabanow J, Kidd S. How stable is stable? Defining and measuring housing stability. *J Commun Psychol*. 2014;42(8):964-979. doi:10.1002/jcop.21665
6. US Department of Health and Human Services. Housing instability. 2023. Accessed June 21, 2023. https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/housing-instability
7. National Research Council. *Food Insecurity and Hunger in the United States: An Assessment of the Measure*. National Academies Press; 2006.
8. US Department of Agriculture. Definitions of food security. September 4, 2024. Accessed October 18, 2024. https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/definitions-of-food-security
9. Richards R, Smith C. The impact of homeless shelters on food access and choice among homeless families in Minnesota. *J Nutr Educ Behav*. 2006;38(2):96-105. doi:10.1016/j.jneb.2005.11.031
10. Loftus EI, Lachaud J, Hwang SW, Mejia-Lancheros C. Food insecurity and mental health outcomes among homeless adults: a scoping review. *Public Health Nutr*. 2021;24(7):1766-1777. doi:10.1017/s1368980020001998
11. Borges Migliavaca C, Stein C, Colpani V, Barker TH, Munn Z, Falavigna M. How are systematic reviews of prevalence conducted? A methodological study. *BMC Med Res Methodol*. 2020;20(1):96. doi:10.1186/s12874-020-00975-3
12. Brooke BS, Schwartz TA, Pawlik TM. MOOSE reporting guidelines for meta-analyses of observational studies. *JAMA Surg*. 2021;156(8):787-788. doi:10.1001/jamasurg.2021.0522
13. Higgins J, Thomas J. *Cochrane Handbook for Systematic Reviews of Interventions Version 6.3*. 2022. Accessed October 18, 2024. https://training.cochrane.org/handbook/archive/v6.3
14. Page MJ, Bossuyt PM, Boutron I, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71. doi:10.1136/bmj.n71
15. Radimer KL, Radimer KL. Measurement of household food security in the USA and other industrialised countries. *Public Health Nutr*. 2002;5(6a):859-864. doi:10.1079/PHN2002385
16. Coates J, Swindale A, Bilinsky P. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide*. Food and Nutrition Technical Assistance; 2007. Accessed October 31, 2024. https://www.fantaproject.org/sites/default/files/resources/HFIAS_ENG_v3_Aug07.pdf
17. Munn Z, Moola S, Lisy K, Riitano D, Tufanaru C. Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and incidence data. *Int J Evid Based Healthc*. 2015;13(3):147-153. doi:10.1097/XEB.0000000000000054
18. Lewin S, Booth A, Glenton C, et al. Applying GRADE-CERQual to qualitative evidence synthesis findings: introduction to the series. *Implement Sci*. 2018;13(suppl 1):2. doi:10.1186/s13012-017-0688-3
19. Schünemann H, Brozèk J, Guyatt G, Oxman A. *GRADE Handbook for Grading the Quality of Evidence and the Strength of Recommendations Using the GRADE Approach*. The GRADE Working Group; 2013. Accessed October 18, 2024. https://gdt.gradepro.org/app/handbook/handbook.html
20. Nyaga VN, Arbyn M, Aerts M. Metaprop: a Stata command to perform meta-analysis of binomial data. *Arch Public Health*. 2014;72(1):39. doi:10.1186/2049-3258-72-39
21. Baggett TP, Singer DE, Rao SR, O'Connell JJ, Bharel M, Rigotti NA. Food insufficiency and health services utilization in a national sample of homeless adults. *J Gen Intern Med*. 2011;26(6):627-634. doi:10.1007/s11606-011-1638-4
22. Bowen EA, Irish A. "Hello, you're not supposed to be here": homeless emerging adults' experiences negotiating food access. *Public Health Nutr*. 2018;21(10):1943-1951. doi:10.1017/s1368980018000356
23. Chatterjee A, Brown R, Block JP. "Feastworthy is something that gives us our dignity back": feasibility of a delivered prepared meal program for families in motel-shelters. *J Health Care Poor Underserved*. 2018;29(4):1333-1355. doi:10.1353/hpu.2018.0099
24. Gundersen C, Weinreb L, Wehler C, Hosmer D. Homelessness and food insecurity. *J Housing Econ*. 2003;12(3):250-272. doi:10.1016/S1051-1377(03)00032-9
25. Haskett ME, Kotter-Grühn D, Majumder S. Prevalence and correlates of food insecurity and homelessness among university students. *J Coll Student Dev*. 2020;61(1):109-114. doi:10.1353/csd.2020.0007
26. Hernandez DC, Daundasekara SS, Arlinghaus KR, et al. Fruit and vegetable consumption and emotional distress tolerance as potential links between food insecurity and poor physical and mental health among homeless adults. *Prev Med Rep*. 2019;14:100824. doi:10.1016/j.pmedr.2019.100824
27. Kendzor DE, Allicock M, Businelle MS, Sandon LF, Gabriel KP, Frank SG. Evaluation of a shelter-based diet and physical activity intervention for homeless adults. *J Phys Act Health*. 2017;14(2):88-97. doi:10.1123/jpah.2016-0343
28. Kloubec J, Harris C. Food acquisition strategies of homeless youth in the Greater Seattle area: a cross-sectional study. *J Acad Nutr Diet*. 2021;121(1):47-58.e1. doi:10.1016/j.jand.2020.05.013
29. Lee BA, Greif MJ. Homelessness and hunger. *J Health Soc Behav*. 2008;49(1):3-19. doi:10.1177/002214650804900102

30. Martins DC, Gorman KS, Miller RJ, et al. Assessment of food intake, obesity, and health risk among the homeless in Rhode Island. *Public Health Nurs*. 2015;32(5):453-461. doi:10.1111/phn.12180
31. Ora AG, Mouttapa M, Weiss J, Weissmuller P. Food security and homelessness in the city of Anaheim. *Calif J Health Promot*. 2008;6(1):17. doi:10.32398/cjhp.v6i1.1300
32. Reitzel LR, Chinamuthevi S, Daundasekara SS, et al. Association of problematic alcohol use and food insecurity among homeless men and women. *Int J Environ Res Public Health*. 2020;17(10):3631. doi:10.3390/ijerph17103631
33. Richards R, Smith C. Investigation of the hunger-obesity paradigm among shelter-based homeless women living in Minnesota. *J Hunger Environ Nutr*. 2010;5(3):339-359. doi:10.1080/19320248.2010.504100
34. Rusness BAR. *Potential Dietary Risks and the Food Insecurity of the Homeless*. Dissertation. The Fielding Institute; 1990. Accessed October 29, 2024. https://www.proquest.com/docview/303887715?sourcetype=Dissertations%20&%20Theses
35. Smith C, Richards R. Dietary intake, overweight status, and perceptions of food insecurity among homeless Minnesotan youth. *Am J Hum Biol*. 2008;20(5):550-563. doi:10.1002/ajhb.20780
36. Taylor ML, Koblinsky SA. Food consumption and eating behavior of homeless preschool children. *J Nutr Educ*. 1994;26(1):20-25. doi:10.1016/S0022-3182(12)80830-2
37. Tello J. *Self-identified Needs of Individuals Experiencing Homelessness in City of Whittier: A Descriptive Study*. Thesis. California State University, Long Beach; 2017. Accessed October 29, 2024. https://www.proquest.com/docview/1933761979?sourcetype=Dissertations%20&%20Theses
38. Tong M, Tieu L, Lee CT, Ponath C, Guzman D, Kushel M. Factors associated with food insecurity among older homeless adults: results from the HOPE HOME study. *J Public Health*. 2019;41(2):240-249. doi:10.1093/pubmed/fdy063
39. Whitbeck LB, Chen X, Johnson KD, Whitbeck LB, Chen X, Johnson KD. Food insecurity among homeless and runaway adolescents. *Public Health Nutr*. 2006;9(1):47-52. doi:10.1079/phn2005764
40. Yousefi-Rizi L, Baek J-D, Blumenfeld N, Stoskopf C. Impact of housing instability and social risk factors on food insecurity among vulnerable residents in San Diego County. *J Community Health*. 2021;46(6):1107-1114. doi:10.1007/s10900-021-00999-w
41. Bowen EA, Bowen SK, Barman-Adhikari A. Prevalence and covariates of food insecurity among residents of single-room occupancy housing in Chicago, IL, USA. *Public Health Nutr*. 2016;19(6):1122-1130. doi:10.1017/S1368980015002384
42. Chang Y, Chatterjee S. Housing instability, food insecurity, and barriers to healthy eating. *Fam Consum Sci*. 2022;51(1):51-64. doi:10.1111/fcsr.12454
43. Cutts DB, Meyers AF, Black MM, et al. US housing insecurity and the health of very young children. *Am J Public Health*. 2011;101(8):1508-1514. doi:10.2105/AJPH.2011.300139
44. Lee CY, Zhao X, Reesor-Oyer L, Cepni AB, Hernandez DC. Bidirectional relationship between food insecurity and housing instability. *J Acad Nutr Diet*. 2021;121(1):84-91. doi:10.1016/j.jand.2020.08.081
45. Ma CT, Gee L, Kushel MB. Associations between housing instability and food insecurity with health care access in low-income children. *Ambul Pediatr*. 2008;8(1):50-57. doi:10.1016/j.ambp.2007.08.004
46. Moya EM, Wagler A, Ayala J, Crouse M, Garcia A, Schober GS. Analysis of food and housing insecurity among university students at a public Hispanic-serving institution. *J Hunger Environ Nutr*. 2023;18(1):21-35. doi:10.1080/19320248.2022.2077159
47. Willis DE. Feeding the student body: unequal food insecurity among college students. *Am J Health Educ*. 2019;50(3):167-175. doi:10.1080/19325037.2019.1590261
48. Kim JE, Flentje A, Tsoh JY, Riiley ED. Cigarette smoking among women who are homeless or unstably housed: examining the role of food insecurity. *J Urban Health*. 2017;94(4):514-524. doi:10.1007/s11524-017-0166-x
49. Lee BA, Lippert AM. Food insecurity among homeless and precariously housed children in the United States: lessons from the past. *Demographic Res*. 2021;45:1115-1148. doi:10.4054/DemRes.2021.45.37
50. Lippert AM, Lee BA. Adult and child food insecurity among homeless and precariously-housed families at the close of the twentieth century. *Popul Res Policy Rev*. 2021;40(2):231-253. doi:10.1007/s11113-020-09577-9
51. Luder E, Boey E, Buchalter B, Martinez-Weber C. Assessment of the nutritional status of urban homeless adults. *Public Health Rep*. 1989;104(5):451-457.
52. Luder E, Ceysens-Okada E, Koren-Roth A, Martinez-Weber C. Health and nutrition survey in a group of urban homeless adults. *J Am Diet Assoc*. 1990;90(10):1387-1392.
53. O'Toole TP, Roberts CB, Johnson EE. Screening for food insecurity in six Veterans Administration clinics for the homeless, June–December 2015. *Prev Chronic Dis*. 2017;14:E04. doi:10.5888/pcd14.160375
54. Palar K, Kushel M, Frongillo EA, et al. Food insecurity is longitudinally associated with depressive symptoms among homeless and marginally-housed individuals living with HIV. *AIDS Behav*. 2015;19(8):1527-1534. doi:10.1007/s10461-014-0922-9
55. Weiser SD, Frongillo EA, Ragland K, Hogg RS, Riley ED, Bangsberg DR. Food insecurity is associated with incomplete HIV RNA suppression among homeless and marginally housed HIV-infected individuals in San Francisco. *J Gen Intern Med*. 2009;24(1):14-20. doi:10.1007/s11606-008-0824-5
56. Weiser SD, Hatcher A, Frongillo EA, et al. Food insecurity is associated with greater acute care utilization among HIV-infected homeless and marginally housed individuals in San Francisco. *J Gen Intern Med*. 2013;28(1):91-98. doi:10.1007/s11606-012-2176-4
57. US Department of Agriculture. Food security and nutrition assistance. 2024. Accessed July 11, 2024. https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/food-security-and-nutrition-assistance
58. Alaimo K. Food insecurity in the United States: an overview. *Topics Clin Nutr*. 2005;20(4):281-298.
59. Nilsson SF, Nordentoft M, Hjorthøj C. Individual-level predictors for becoming homeless and exiting homelessness: a systematic review and meta-analysis. *J Urban Health*. 2019;96(5):741-750. doi:10.1007/s11524-019-00377-x
60. Tsai J, Rosenheck RA. Risk factors for homelessness among US veterans. *Epidemiol Rev*. 2015;37:177-195. doi:10.1093/epirev/mxu004

61. US Department of Housing and Urban Development. The 2022 annual homelessness assessment report (AHAR) to congress. 2022. Accessed October 18, 2024. https://www.huduser.gov/portal/sites/default/files/pdf/2022-ahar-part-1.pdf
62. King C. Informal assistance to urban families and the risk of household food insecurity. *Soc Sci Med*. 2017;189:105-113. doi:10.1016/j.socscimed.2017.07.030
63. Martin KS, Rogers BL, Cook JT, Joseph HM. Social capital is associated with decreased risk of hunger. *Soc Sci Med*. 2004;58(12):2645-2654. doi:10.1016/j.socscimed.2003.09.026
64. Hoang T, Felner JK, Flanigan ST, Carroll MW. Psychological costs and administrative burdens produce systemic service avoidance among people experiencing homelessness. *J Health Human Serv Admin*. 2023;45(3):220-242. doi:10.37808/jhhsa.45.3.4
65. Brayne S. Surveillance and system avoidance: criminal justice contact and institutional attachment. *Am Sociol Rev*. 2014;79(3):367-391. doi:10.1177/0003122414530398
66. Haro-Ramos AY, Bacong AM. Prevalence and risk factors of food insecurity among Californians during the COVID-19 pandemic: disparities by immigration status and ethnicity. *Prev Med*. 2022;164:107268. doi:10.1016/j.ypmed.2022.107268
67. Wusinich C, Bond L, Nathanson A, Padgett DK. "If you're gonna help me, help me": barriers to housing among unsheltered homeless adults. *Eval Program Plann*. 2019;76:101673. doi:10.1016/j.evalprogplan.2019.101673
68. Sun Y, Liu B, Rong S, et al. Food insecurity is associated with cardiovascular and all-cause mortality among adults in the United States. *J Am Heart Assoc*. 2020;9(19):e014629. doi:10.1161/JAHA.119.014629
69. Kirkpatrick SI, McIntyre L, Potestio ML. Child hunger and long-term adverse consequences for health. *Arch Pediatr Adolesc Med*. 2010;164(8):754-762. doi:10.1001/archpediatrics.2010.117
70. Berkowitz SA, Seligman HK, Meigs JB, Basu S. Food insecurity, healthcare utilization, and high cost: a longitudinal cohort study. *Am J Manag Care*. 2018;24(9):399-404.
71. Wiecha JL, Dwyer JT, Dunn-Strohecker M. Nutrition and health services needs among the homeless. *Public Health Rep*. 1991;106(4):364-374.
72. US Government Accountability Office. Hunger and homelessness: funding distribution for key programs. June 2023. Accessed October 18, 2024. https://gao.gov/assets/gao-23-105458.pdf
73. Bipartisan Policy Center. Public health forward: Modernizing the US public health system. 2021. Accessed October 29, 2024. https://bipartisanpolicy.org/download/?file=/wp-content/uploads/2021/12/BPC_Public-Health-Forward_R01_WEB.pdf
74. Jackson CL, Hood E, Jenkins JA, Szanton SL. Barriers and facilitators to nurses addressing social needs and associated outcomes in the ambulatory setting in adult patients: systematic review. *J Adv Nurs*. 2023;79(7):2444-2455. doi:10.1111/jan.15670
75. Steffen BL, Savidge-Wilkins G. Equity in HUD's learning agenda. *Cityscape*. 2022;24(2):93-108.
76. Tsai J. Beyond the usual players: evidence-building priorities for behavioral health among all US federal agencies. *Adm Policy Ment Health*. 2024;51(1):14-16. doi:10.1007/s10488-023-01313-7
77. Christian NJ, Havlik J, Tsai J. The use of mobile medical units for populations experiencing homelessness in the United States: a scoping review. *J Gen Intern Med*. 2024;39(8):1474-1487. doi:10.1007/s11606-024-08731-9
78. Tsai J, Havlik J, Howell BA, Johnson E, Rosenthal D. Primary care for veterans experiencing homelessness: a narrative review of the Homeless Patient Aligned Care Team (HPACT) model. *J Gen Intern Med*. 2023;38(3):765-783. doi:10.1007/s11606-022-07970-y
79. Kertesz SG, Crouch K, Milby JB, Cusimano RE, Schumacher JE. Housing First for homeless persons with active addiction: are we overreaching? *Milbank Q*. 2009;87(2):495-534. doi:10.1111/j.1468-0009.2009.00565.x
80. Tsai J. Is the Housing First model effective? Different evidence for different outcomes. *Am J Public Health*. 2020;110(9):1376-1377. doi:10.2105/ajph.2020.305835
81. US Interagency Council on Homelessness. 10 Strategies to end chronic homelessness. 2016. Accessed October 18, 2024. https://www.usich.gov/guidance-reports-data/federal-guidance-resources/10-strategies-end-chronic-homelessness
82. Migliavaca CB, Stein C, Colpani V, et al. Meta-analysis of prevalence: I^2 statistic and how to deal with heterogeneity. *Res Synth Methods*. 2022;13(3):363-367. doi:10.1002/jrsm.1547