

Association Between an Increase in the WIC Fruit and Vegetable Benefit and WIC Participant Food Purchases:

A Quasi-experimental Study



Positionality



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RWJF Healthy Eating
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Arnold Ventures

Collaborators and Funders

Objective

Estimate the effect of the CVB increase on WIC shopper purchases of CVB-eligible fruits and vegetables using longitudinal food transaction data from June 2020–April 2022



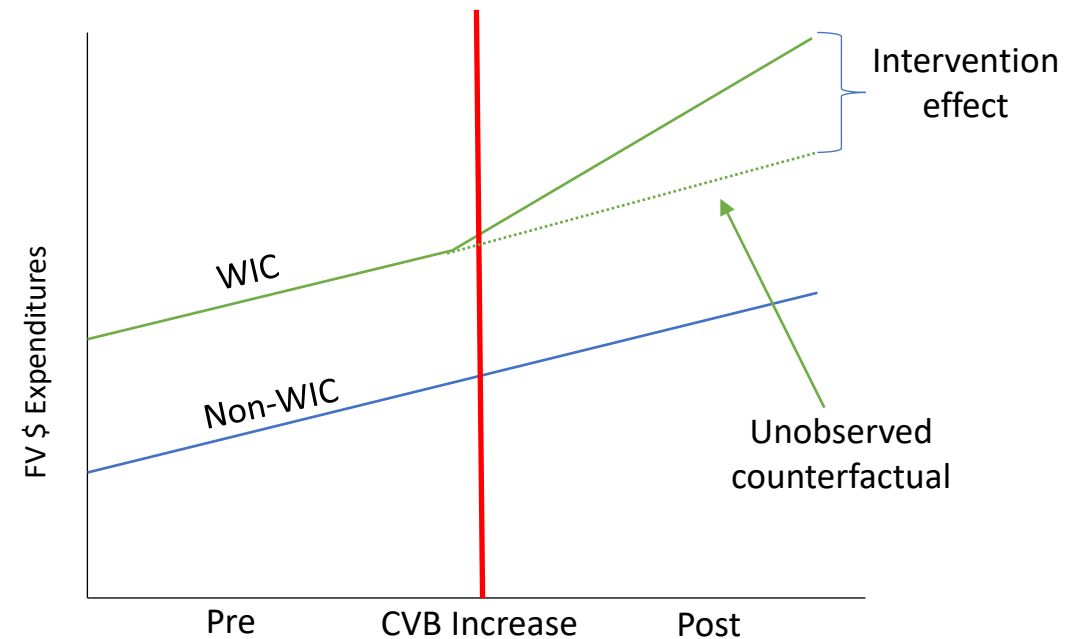
Food Transaction Data



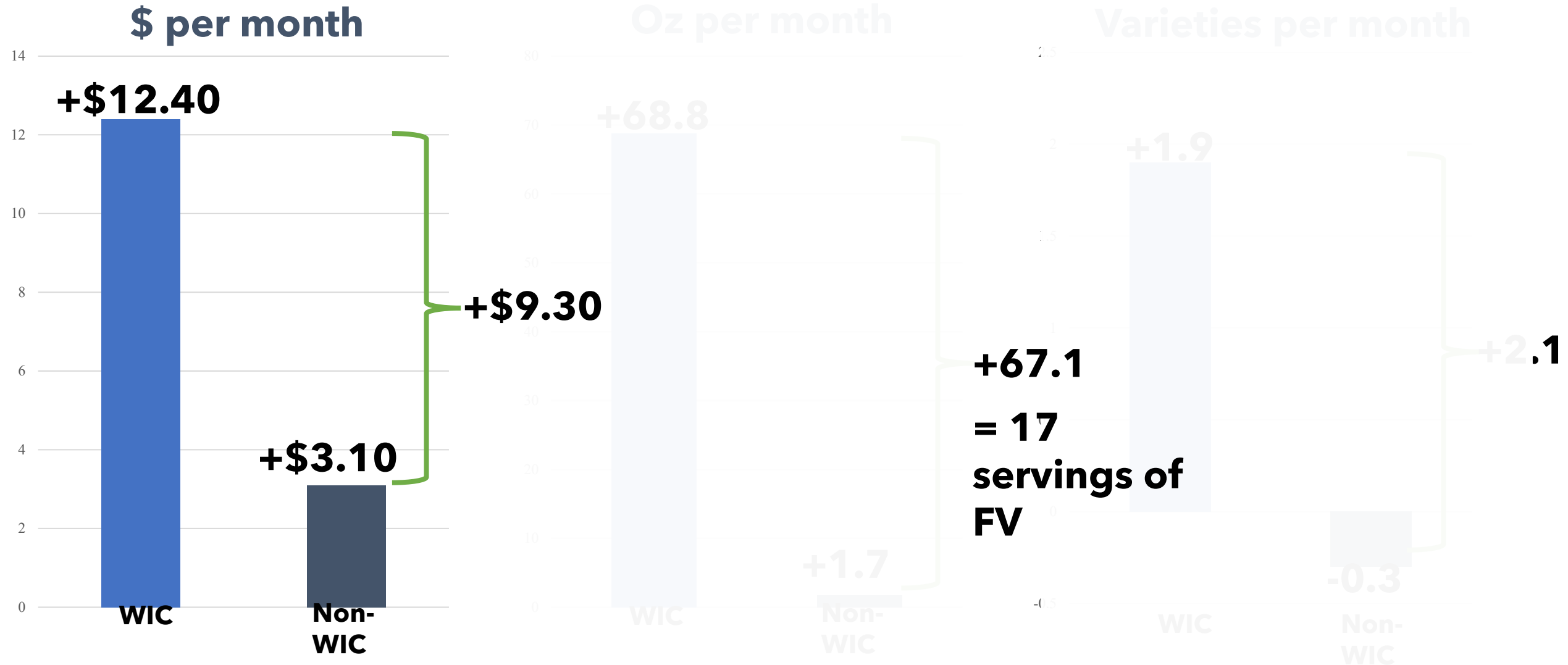
- Loyalty card data from 496 stores across 86/100 counties in NC
- Every item purchased and payment method(s) used
- Linked to nutrition information using UPC/PLU
- Foods categorized into nutritionally-relevant food groups

Approach

- Difference-in-differences
- WIC (n=536,349) and non-WIC (n=1,894,056) shopper-month observations
- June 2020-April 2022
- Use WIC or shop at retailer quarterly
- Propensity score weighted two-part and zero inflated negative binomial models
- Outcomes: expenditures(\$), volume, and unique varieties of CVB-eligible fruits and vegetables

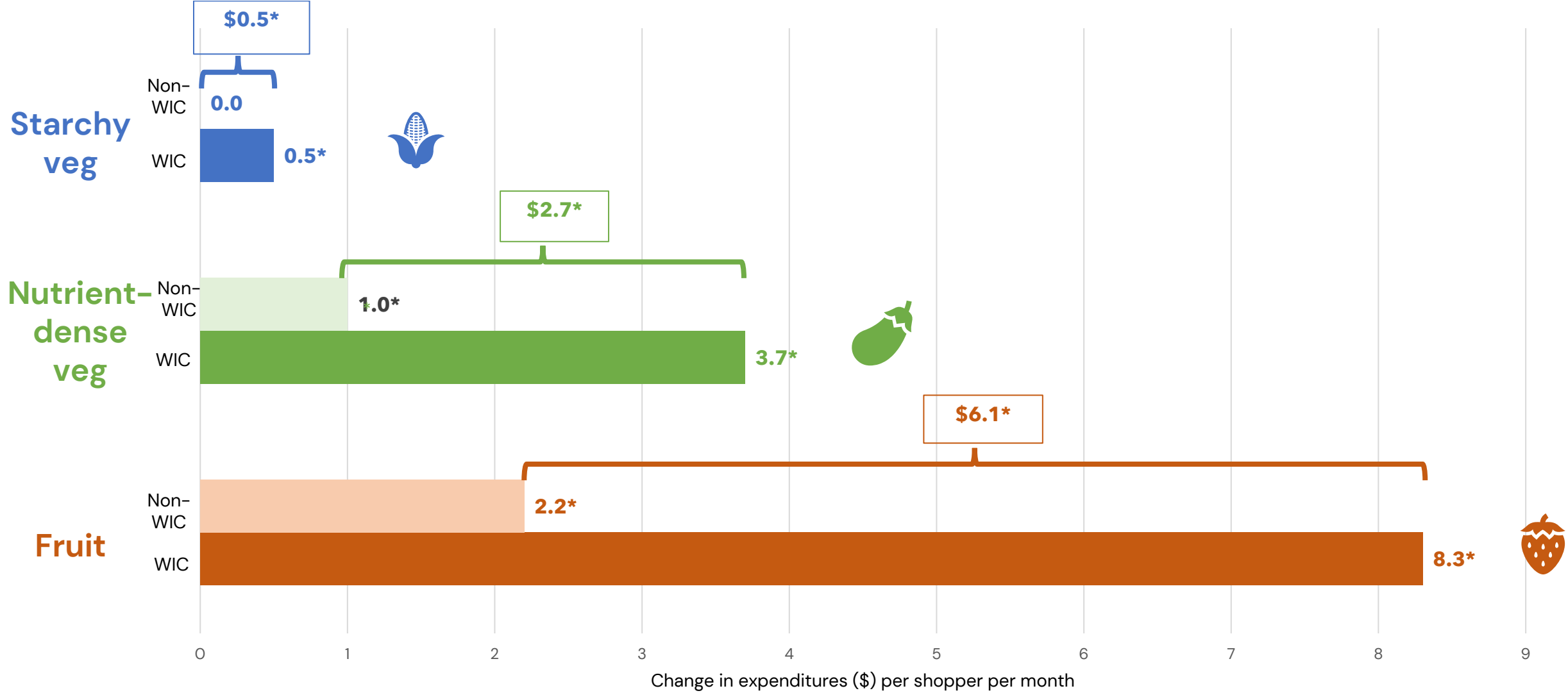


WIC Shoppers Increased FV Expenditures and Bought a Larger Volume and Variety of FV



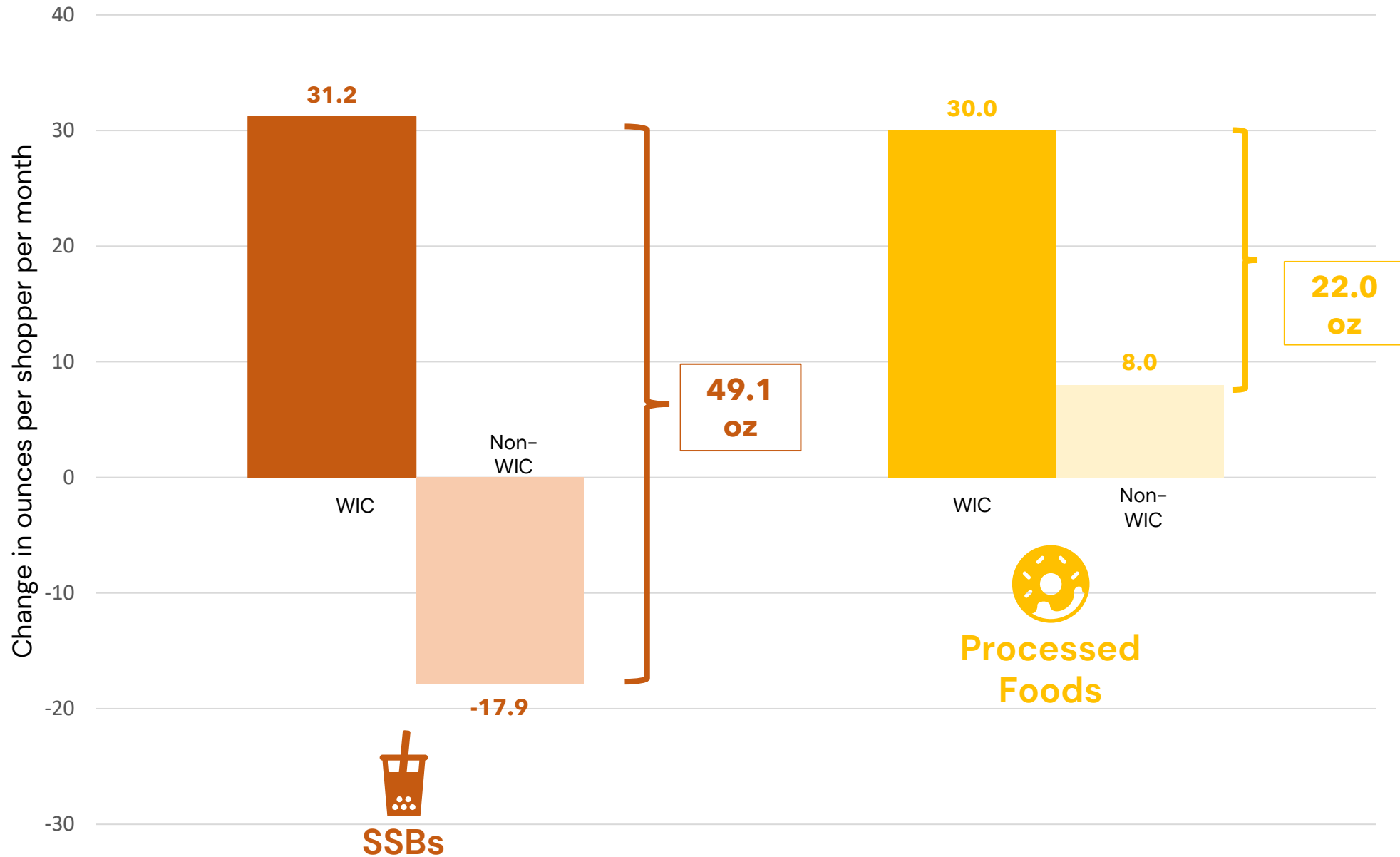
Estimates are marginal effects of the pre/post variable holding the group variable at WIC and non-WIC, and their difference, from weighted and adjusted models. All changes are statistically significant after adjustment for multiple comparisons.

Most of the Increases Came from Fruits



Estimates are marginal effects of the pre/post variable holding the group variable at WIC and non-WIC, and their difference, from weighted and adjusted models. * changes are statistically significant after adjustment for multiple comparisons.

Small Increases in Processed Foods and SSBs



Estimates are marginal effects of the pre/post variable holding the group variable at WIC and non-WIC, and their difference, from weighted and adjusted models. All changes are statistically significant after adjustment for multiple comparisons.

Conclusions and Implications

- 1** CVB increase associated with notable increases in CVB-eligible FV purchases in terms of \$, ounces, and varieties
- 2** Need more studies to better understand redemption, substitutions, and effects on total diet
- 3** Can and has informed efforts to make the higher CVB amounts permanent

Resources

go.unc.edu/cvbbrief

The Cash Value Benefit Increase: A Key Step Toward Healthier WIC Families

Research Brief | June 2022

Emily Duffy, Daniele Vest, Cassandra Davis, Marissa Hall, Molly De Marco, Shu Wen Ng, Lindsey Smith Tallie



The Issue

As a federal nutrition assistance program, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides access to healthy food, nutrition services, and healthcare referrals to more than 6 million women and children at risk of food insecurity. The COVID-19 pandemic brought many challenges and put many more citizens at risk of food insecurity, particularly low-income families with children.

New legislation and emergency funding during the pandemic led to changes to WIC and participants' experiences in the program. Federal waivers for WIC agencies allowed remote appointments and expanded flexibilities in how services are offered. In June 2021, the American Rescue Plan Act was passed leading to a temporary increase in the cash value benefit (CVB) WIC participants can use to buy fruits and vegetables. This increased the benefit amount from \$9-11 per person per month to \$35 per person per month. In September 2021, the CVB increase was extended and the amounts were changed to \$24 for children and \$43 or \$47 for women.

To explore WIC participants' experiences with the CVB changes, we held 10 online focus groups with WIC participants in North Carolina in March 2022. Each group had 4-8 participants from similar racial/ethnic backgrounds. Half of the participants lived in rural counties and half lived in urban or suburban counties. Participants were also asked about their experiences shopping with WIC during the pandemic, their awareness of CVB changes, and their experiences using the higher CVB amount. The information collected in this study has the potential to inform changes to the WIC program and provide evidence for future emergency response policies.

Key Findings

Higher CVB Met Participants' Needs

- **Participants welcomed the CVB increase:** Responses to the higher CVB amount were overwhelmingly positive.
 - "But when they increased the [CVB] amount we loved it, we enjoyed every bit of it."
 - "...that's one of my kid's main things. He loves fruits and vegetables...So we were very grateful for it."
- **The increase met household needs:** Participants viewed the CVB increase as a beneficial change that helped meet their needs during the pandemic.
 - "I can't stress this enough the amount that they gave us in fruits and vegetables during the pandemic...was an extreme help."
- **The pre-pandemic amount was not enough:** Participants were dissatisfied with the \$9-11/person amount and felt the amount only lasted one shopping trip.
 - "...But you know, anybody that shops for themselves knows that \$9 in the produce department is going to last you maybe two days with children."
 - "It's just not really enough money to buy much, you know, it's almost like an insult."
- **The CVB is one of the most valued parts of the WIC food package:** Participants felt the CVB increase was one of the best changes to the food package because they use fruits and vegetables most.
 - "I think that's the most beneficial change that, that WIC has made in a really long time..."
 - "So I would say like, it's definitely giving me a reason to stay enrolled [in WIC] and everything."

Read more at go.unc.edu/cvbstudy



go.unc.edu/foodpackage

Improving the WIC Experience: Recommendations for a More Valuable WIC Food Package

Research Brief | October 2022

Emily Duffy, Daniele Vest, Cassandra Davis, Marissa Hall, Molly De Marco, Shu Wen Ng, Lindsey Smith Tallie

The Current State

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was created to provide access to healthy foods for women and young children at risk of food insecurity in the 1970s and has continued to do so throughout the years. Although there are now other benefits and services offered to participants, the WIC food packages remain the primary benefit of the program. While the packages have been shown to improve participants' eating habits and reduce the risk of nutrient deficiencies, there are several areas for improvement.

In 2009, the packages were updated to more closely align with the Dietary Guidelines for Americans (DGAs) and included fruits and vegetables, low-fat milk, and whole grain products and reduced the amounts of eggs, milk, and juice offered. Though this was a turning point in improving the health of WIC participants, the packages have not been updated since then and do not reflect the current 2020-2025 DGAs. The National Academies of Sciences, Engineering, and Medicine (NASEM) report in 2017 reviewed the packages and proposed changes that would ensure participants receive more of the necessary nutrients within each food category, such as adding seafood to adult and child packages and replacing half of the juice amount with whole fruits. The report also emphasized the need for more flexibility in package sizes, substitutions within and across categories, and more options for those with specific dietary preferences. A proposed revision to the WIC food package rule is expected this year.

To understand participants' thoughts about the food packages, we held 10 online focus groups with WIC participants in North Carolina in March 2022. Each group had 4-8 participants from similar racial/ethnic backgrounds. Half of the participants lived in rural counties and half lived in urban or suburban counties. Participants were asked what they use most and least in the food package, their experience grocery shopping using WIC benefits during the pandemic, and how the package could be more useful. The information collected in this study has the potential to inform the upcoming WIC food package review and identify strategies for improving the WIC experience overall.

Key Findings

Food Package Changes

Increase the Cash Value Benefit (CVB) amount for fruits and vegetables: Many participants felt they need more than the current amount.

- "I could definitely use more. I mean, fruits and vegetables are a large part of my diet, especially throughout the day, between meals."
- "They also need to think about the reality of inflation and...what we can actually get is actually smaller..."

Participants want to be able to receive more CVB in place of baby food for their children ages 6-12 months

- "So I wish that they would continue to give us the fruits and vegetable money once they turned six months...because [my child] loves fresh fruits and vegetables as well."


Offer options to substitute items within and across food categories: Participants expressed the desire for more flexibility in the food package to meet their children's shifting eating habits and reduce waste.

- "You can keep this bread and give it to someone who would actually use this bread and someone who will actually use this cereal, go ahead and just give me \$5 more for fruits and vegetables..."

Address the diversity of WIC participants and their varying dietary/cultural preferences

- "I think that it would be a positive turn for WIC to start thinking about families who have alternative diets."
- "...just because we are lower income does not mean that, you know, we all eat the same..."



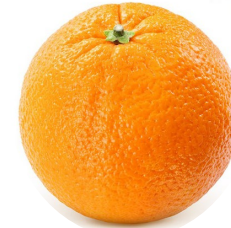
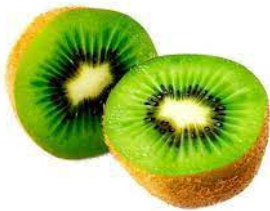
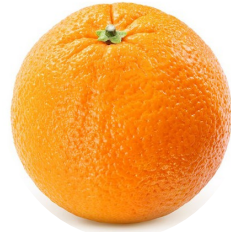


Thank You!
Questions?

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17 Servings of FV





Adequate Fruit and
Vegetable
Consumption
Critical for Disease
Prevention



Households with
Low Incomes
Disproportionately
Negatively
Impacted by
COVID-19



USDA Increased WIC Funding for Fruits and Vegetables During COVID-19

Cash Value Benefit (CVB) = Fruit and Vegetable Component of WIC Food Package

So What? Aim 2 Implications



CVB increase associated with
greater volume and variety of FV
purchased



- Permanent change in the food package
- Policies to decrease consumption of ultraprocessed foods
- Policies targeting structural and commercial determinants of health



Unclear effect on total diet
and health



Food Groups

 **Fruit**

 Nutrient-dense vegetables

 **Starchy vegetables**

 **Processed foods**

 **Sugar sweetened beverages**

**CVB-eligible in
NC:
no salt, sugar,
fat**



Analysis

Exposure: binary indicator for pre/post CVB increase (June 2021)

Primary Outcomes:

- \$ spent/month on fruits and vegetables
- Ounces purchased/month of fruits and vegetables

Secondary Outcomes:

- Unique varieties purchased/month of fruits and vegetables
- Ounces purchased/month of processed foods and SSBs

Two-part and zero-inflated negative binomial models overlap weighted and adjusted for seasonality, top store and used standard errors clustered at the shopper level



Presented by
Tirna Purkait, MS, M.Tech



The Impact of Food and Nutrition Assistance Programs (FNAPs) on Young Children's (2-6 years) Food Environment in Early Care and Education (ECE) Settings: A Systematic Review using the RE-AIM Framework

Tirna Purkait^a, Dipti A. Dev^a, Deepa Srivastava^a, Lisa Franzen-C

^a University of Nebraska-Lincoln



- 2.5 million households with children (<6 years) are food insecure (Coleman-Jensen et al., 2021).
- USDA administers FNAPs to improve food environment in ECE settings (Heflin et al., 2015; Ritchie et al., 2012).
- A healthy food environment includes availability, accessibility, affordability, acceptability, and accommodation (Caspi et al., 2012; Charreire et al., 2010)
- ECE's participation in FNAPs improves food insecurity, diet quality, food environment dimensions, and child development (Gundersen & Ziliak, 2015).
- ECE-based FNAPs benefit one-fourth of young children in ECE settings (Glynn, 2012; American Dietetic Association, 2005).

Background



- Access and affordability alone may not ensure children meet dietary recommendations (Hasnin et al., 2020) .
- No systematic review has analyzed the impact of FNAPs on young children's food environment.
- Further investigation is needed to understand FNAPs' impact in low-income ECEs and inform targeted strategies.

Research Gap





Objectives

Identify the reach, effectiveness, adoption, implementation, and maintenance (RE-AIM) of ECE based FNAPs in children's food environment.

Determine the FNAPs' role in equity-related factors (e.g., availability, accessibility, affordability, acceptability, accommodation) influencing children's food environment in ECE.

Provide implications for future FNAPs' design, implementation, and the development of an equitable ECE food system for young children.

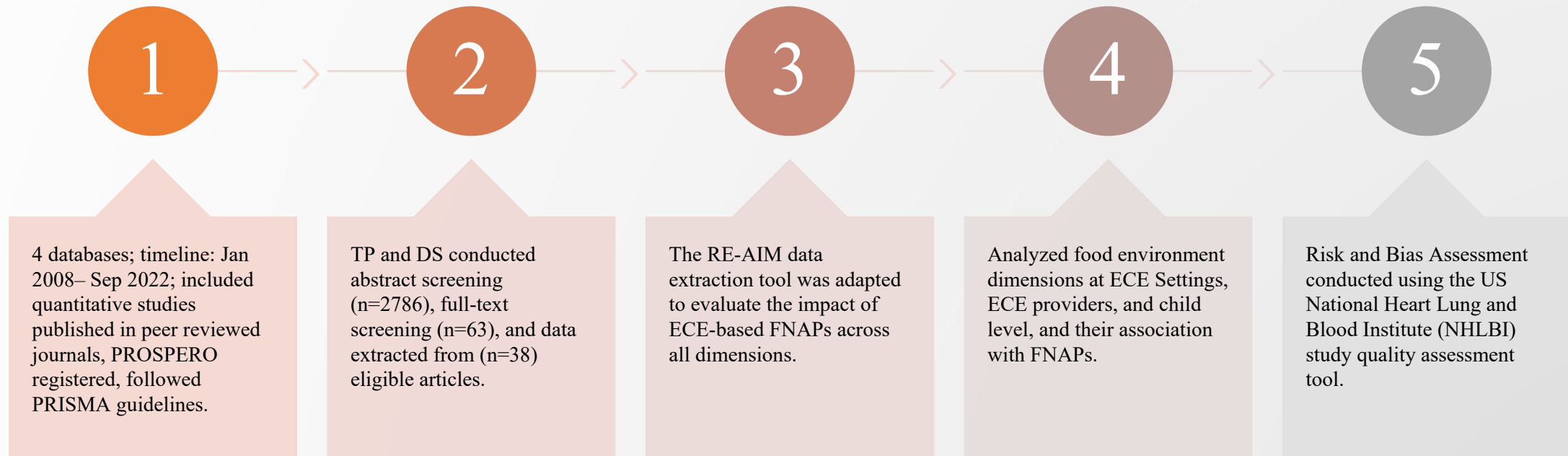
Theoretical Background



Measurable Outcomes

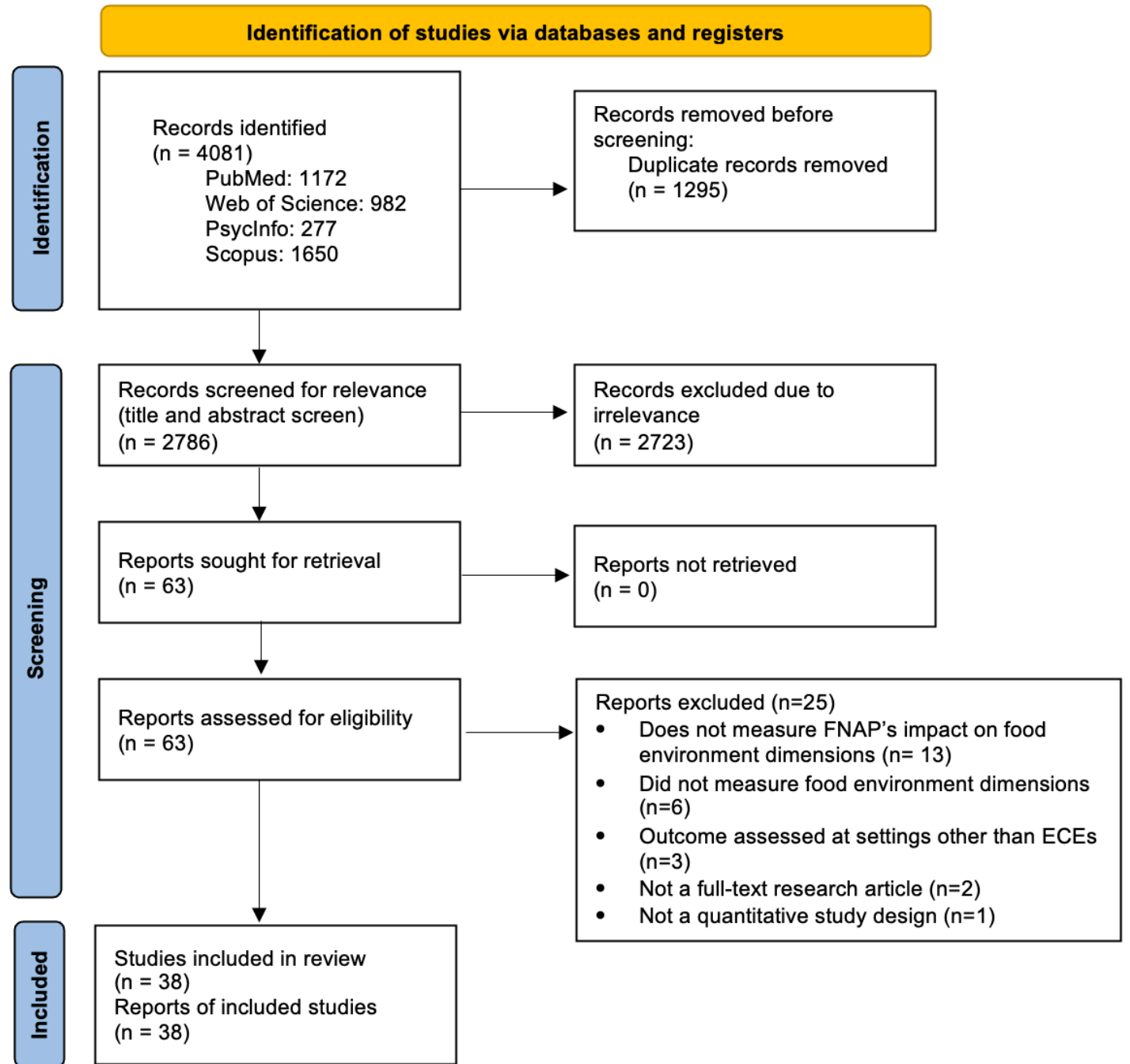
Level	Dimension
ECE setting	Availability
	Accessibility
	Affordability
	Acceptability
	Accommodation
ECE provider	Feeding practices
Child	Dietary intake
	Food insecurity
	BMI percentile

Methodology



PRISMA Flow Diagram

(Page et al., 2021)



Results

Study Designs	Number (n)
Cross-sectional	30
Pre-post	5
Longitudinal	2
Mixed-method	1

Evaluated FNAPs	Number (n)
CACFP	35
Farm to ECE	2
Food bank-ECE partnership	1

NHLBI Risk of Bias	Number (n)
High	15
Moderate	15
Low	8

RE-AIM Dimensions	Percentage of Studies Reporting
Reach	5.7%
Effectiveness	13.2%
Adoption	3.9%
Implementation	38.4%
Maintenance	0.9%

AIM 1: Applying RE-AIM Framework on ECE-based FNAPs in Children's Food Environment

- Implementation indicators were frequently reported.
- Maintenance dimension had the least amount of reporting, limiting understanding of long-term outcomes and program status.
- Longitudinal studies are needed to assess sustained impact and program effectiveness.
- Researchers can adopt the RE-AIM framework a priori for evaluating FNAPs and making well-informed decisions.

AIM 2: FNAP's Role in ECE Food Environment

Areas not addressed:

Accommodation (cultural diversity, special dietary needs, developmental disabilities etc.) and child food insecurity.

FNAP	ECE Setting Level	ECE Provider Level	Child Level
CACFP	Food availability (n=28) Affordability (n=2)	Feeding practices (n=12)	Dietary intake (n=6) BMI (n=1)
Farm to ECE	Food affordability (n=1) Acceptability (n=1)		
Food bank-ECE partnership	Food availability (n=1)		



Aim 3: Implications



Program	Policy	Research
CACFP	Improve participation through strategies like provider education, expanded outreach, and additional funding.	Implement robust research designs, prioritize equity considerations and explore the impact of CACFP across urban vs. rural locations, center-based vs. home-based ECE settings, and race/ethnicity of ECE providers and children.
Farm to ECE	Expand access to gardening, nutrition education, and local foods in ECEs, addressing challenges with suppliers.	Research should focus on reducing ECE-specific barriers.
Food Bank-ECE Partnership	Encourage collaboration and partnerships between food banks and ECE programs to promote equitable access to nutritious food for young children, leveraging existing facilities and culinary programming.	Continued efforts to explore equitable impact on reducing food insecurity and promoting healthier food environments for marginalized and underserved populations.



Strengths



Limitations



Diverse study designs

Rigorous and transparent methods

Identified knowledge gaps and future research needs

Heterogeneity in study designs, measures, and populations

Limited generalizability of findings

High or moderate risk of bias in some studies



Conclusion

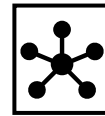


To maximize the effectiveness of FNAPs, stakeholders can use the RE-AIM framework to inform decision-making, address implementation gaps, and promote healthy nutrition among young children.



Training ECE providers to recognize food insecurity and encouraging families to seek assistance, can improve young children's ECE food environment.

Involving ECE providers in program planning and implementation can help ensure the effectiveness of FNAPs.



Collaborative efforts can help achieve equity in ECE food system, promote food and nutrition security for all children and ultimately reduce prevalence of childhood obesity.

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The background is a dark blue color. There are five circles of various sizes and colors: a large yellow circle in the top-left, a medium blue circle in the top-center, a medium red circle in the top-right, a medium yellow circle in the bottom-left, and a medium blue circle in the bottom-center. A large red circle is partially visible in the bottom-right corner.

Thank You!

ANY QUESTIONS?

Good Friends and Good Neighbors: Food Insecurity is Independently Associated with Caregiver Social Support and Neighborhood Social Cohesion among Families with Newborns

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H. Shonna Yin, Lee M. Sanders, William Heerman, Russell Rothman,
Alan M. Delamater, Charles T. Wood, Jonathan S. Schildcrout,
Aihua Bian, Michelle White, Eliana M. Perrin

Disclosures

We have no disclosures.

Food Insecurity

"Households were, at times, unable to acquire adequate food for one or more household members because the households had insufficient money **and other resources** for food."

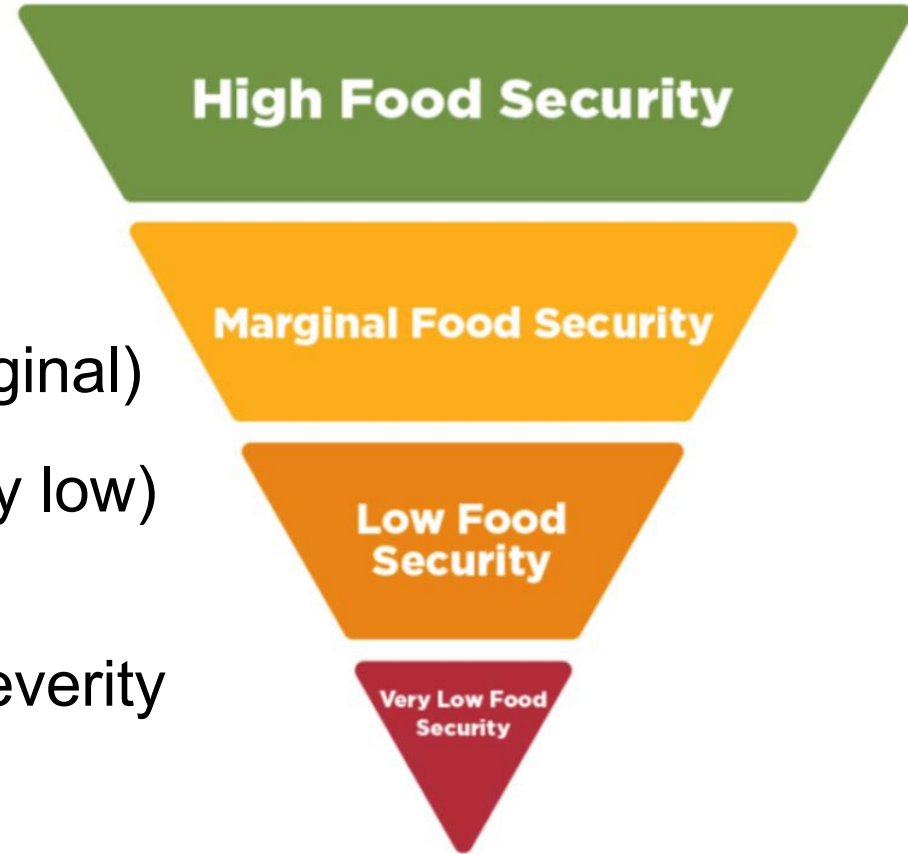
- In 2021, affected 12.5% US households with children
- Associated with adverse physical, mental, and developmental health

Food Security Status

Often dichotomized:

- Food security (high + marginal)
- Food insecurity (low + very low)

Health effects worsen as the severity of food insecurity increases



(Adapted from USDA Economic Research Service by Feeding America)

Social Support

The "support accessible to an individual through social ties to other individuals, groups, and the larger community"



- Buffering hypothesis: social support attenuates the effects of stressors on health outcomes
- Link between social support and food insecurity is unclear in adults and unknown for families with children

(Lin 1979, Ozbay 2007, DeMarco 2009, Ashe 2018)

Neighborhood Social Cohesion

The "trusting network of relationships and shared values and norms of residents in a neighborhood"



- Inversely associated with food insecurity among families with children in multiple studies
- Did not include children <4 years old or did not include child ages

(Brisson 2014, Carter 2012, Brisson 2012, Denny 2017)

Objectives

To examine the association between

- 1) caregiver social support
- 2) neighborhood social cohesion

and household food insecurity for families with newborns

Hypothesis: Both caregiver social support and neighborhood social cohesion will be inversely associated with food insecurity among families with newborns

Methods

Cross-sectional secondary data analysis of Greenlight Plus trial baseline data

- 900 newborn-caregiver dyads at six US academic sites enrolled October 2019 – August 2021
- English- or Spanish-speaking caregivers of newborns ≤ 3 weeks old with no medical history that would affect growth
- Greenlight Plus is a childhood obesity comparative effectiveness trial funded by PCORI (NCT 04042467)

(Heerman, Perrin, Yin, Schildcrout, Delamater, Flower, Sanders, Wood, Kay, Adams, and Rothman, 2022.)

Proportional Odds Models

- Outcome: Food security status, four-level ordinal outcome
- Exposures: Caregiver social support (ENRICHD Social Support Instrument) and Neighborhood social cohesion (Social Cohesion Scale)
- Covariates: household income, caregiver educational attainment, caregiver race/ethnicity, number of adults in the home, number of children in the home, household WIC participation, study site

US Household Food Security Survey

- Differentiates four levels of food security
- Higher score indicates higher food **insecurity**

1. The food that we bought just didn't last, and we didn't have money to get more.
2. We couldn't afford to eat balanced meals.
3. In the last 12 months, since last [name of current month], did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?
4. [If YES to item 3] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
5. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?
6. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?

Food security status	Score
High	0
Marginal	1
Low	2-4
Very low	5-6

(Blumberg 1999)

ENRICHD Social Support Instrument

- Validated scale for self-reported social support

1. Is there someone available to whom you can count on to listen to you when you need to talk?
2. Is there someone available to you to give you good advice about a problem?
3. Is there someone available to you who shows you love and affection?
4. Is there someone available to help with daily chores?
5. Can you count on anyone to provide you with emotional support (talking over problems or helping you make a difficult decision)?
6. Do you have as much contact as you would like with someone you feel close to, someone in whom you can trust and confide in?

Response	Score
All of the time	5
Most of the time	4
Some of the time	3
A little of the time	2
None of the time	1

(Berkman 2000)

ENRICHD Social Support Instrument

- Validated scale for self-reported social support
- Highest social support = 30
- Score ≤ 18 reflects lower social support

(Berkman 2000)

1. Is there someone available to whom you can count on to listen to you when you need to talk?
2. Is there someone available to you to give you good advice about a problem?
3. Is there someone available to you who shows you love and affection?
4. Is there someone available to help with daily chores?
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Response	Score
All of the time	5
Most of the time	4
Some of the time	3
A little of the time	2
None of the time	1

Neighborhood Social Cohesion Scale

- Validated scale for self-reported social cohesion in one's neighborhood

1. This is a close-knit or unified neighborhood.
2. People around here are willing to help their neighbors.
3. People in this neighborhood generally don't get along with each other. [Reverse scored.]
4. People in this neighborhood can be trusted.
5. People in this neighborhood do not share the same values. [Reverse scored.]

Response	Score
Strongly agree	5
Agree	4
Neutral	3
Disagree	2
Strongly disagree	1

(Echeverria 2004)

Neighborhood Social Cohesion Scale

- Validated scale for self-reported social cohesion in one's neighborhood
- A threshold for lower vs higher has not been established

(Echeverria 2004)

1. This is a close-knit or unified neighborhood.
2. People around here are willing to help their neighbors.
3. People in this neighborhood generally don't get along with each other. [Reverse scored.]
4. People in this neighborhood can be trusted.
5. People in this neighborhood do not share the same values. [Reverse scored.]

Response	Score
Strongly agree	5
Agree	4
Neutral	3
Disagree	2
Strongly disagree	1

Demographic characteristics	n (%) Total n=849
Child age (days), mean (SD)	5.1 (3.0)
Caregiver relation to child Mother	832 (98%)
Caregiver race/ethnicity Hispanic White, non-Hispanic Black, non-Hispanic Other, non-Hispanic	412 (49%) 203 (24%) 147 (17%) 87 (10%)
Annual household income <\$20,000 \$20,000-\$49,999 \$50,000-\$99,999 \$100,000 or more Other	203 (24%) 216 (25%) 98 (12%) 121 (14%) 211 (25%)
Caregiver educational attainment Less than high school grad Some college College degree or higher	176 (21%) 366 (43%) 307 (36%)

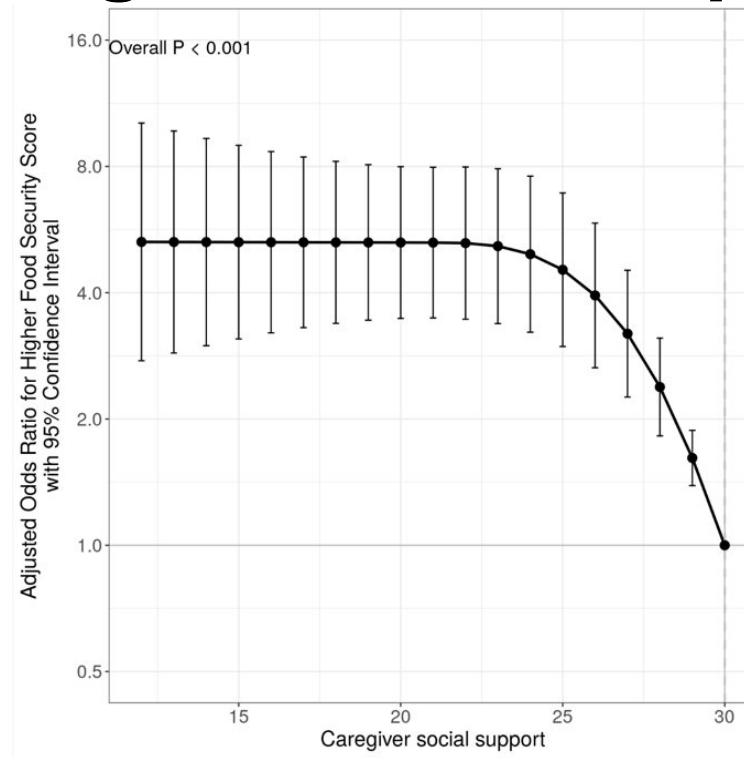
Demographic characteristics	n (%) Total n=849
Child age (days), mean (SD)	5.1 (3.0)
Caregiver relation to child Mother	832 (98%)
Caregiver race/ethnicity	
Hispanic	412 (49%)
White, non-Hispanic	203 (24%)
Black, non-Hispanic	147 (17%)
Other, non-Hispanic	87 (10%)
Annual household income	
<\$20,000	203 (24%)
\$20,000-\$49,999	216 (25%)
\$50,000-\$99,999	98 (12%)
\$100,000 or more	121 (14%)
Other	211 (25%)
Caregiver educational attainment	
Less than high school grad	176 (21%)
Some college	366 (43%)
College degree or higher	307 (36%)

Food Security Status of Sample

Food security status	n (%) Total n=849
High	645 (76%)
Marginal	77 (9%)
Low	93 (11%)
Very low	34 (4%)

Results- Caregiver Social Support

Adjusted Odds Ratio of Greater Food Insecurity
(Higher food security score) with 95% confidence intervals

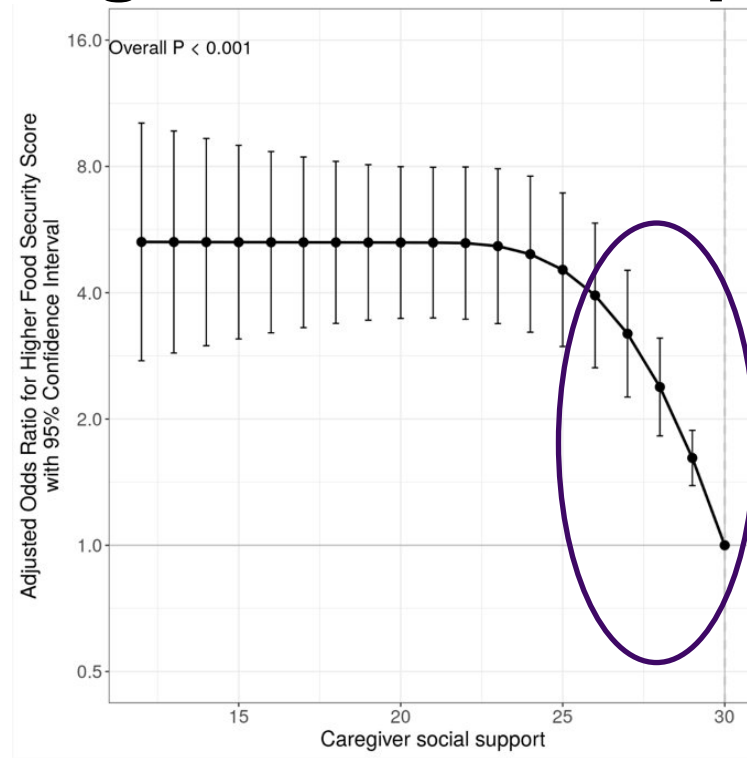


Increased odds of greater food insecurity at lower levels of caregiver social support

Caregiver Social Support
(ENRICHD Social Support Instrument Score)

Results- Caregiver Social Support

Adjusted Odds Ratio of Greater Food Insecurity
(Higher food security score) with 95% confidence intervals

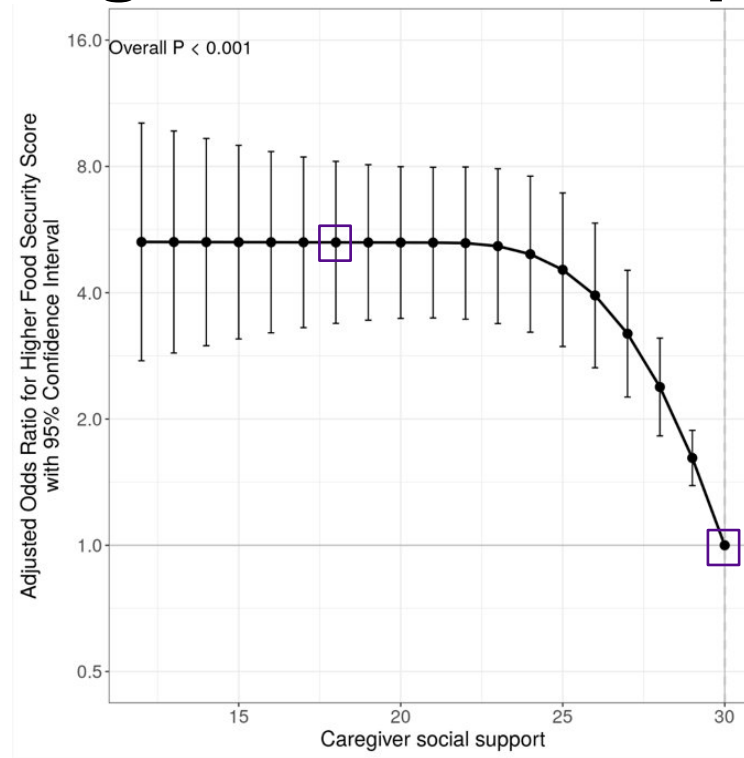


Lower odds of greater food insecurity at the highest levels of caregiver social support

Caregiver Social Support
(ENRICH Social Support Instrument Score)

Results- Caregiver Social Support

Adjusted Odds Ratio of Greater Food Insecurity
(Higher food security score) with 95% confidence intervals



Adjusted odds ratio=
5.03 (95% CI 3.28-7.74)

Caregiver Social Support
(ENRICH Social Support Instrument Score)

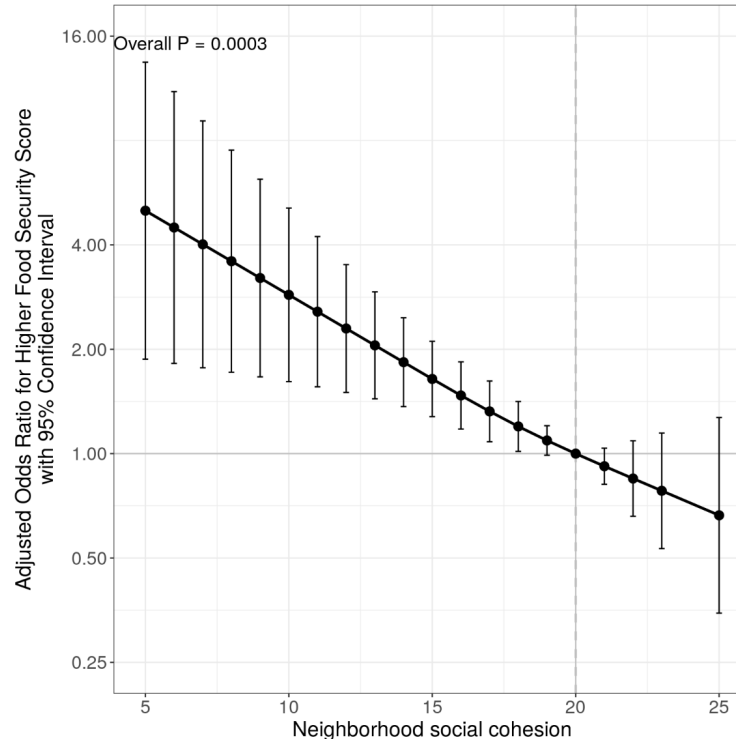
Results- Caregiver Social Support

Caregivers with a low caregiver social support score of 18 had over 5 times the odds of greater food insecurity compared to caregivers with the highest possible caregiver social support score of 30 after adjusting for covariates

- Adjusted odds ratio = 5.03 (95% CI 3.28 - 7.74)
- Covariates: household income, caregiver educational attainment, caregiver race/ethnicity, number of adults in the home, number of children in the home, household WIC participation, study site

Results- Neighborhood Social Cohesion

Adjusted Odds Ratio of Greater Food Insecurity
(Higher food security score) with 95% confidence intervals

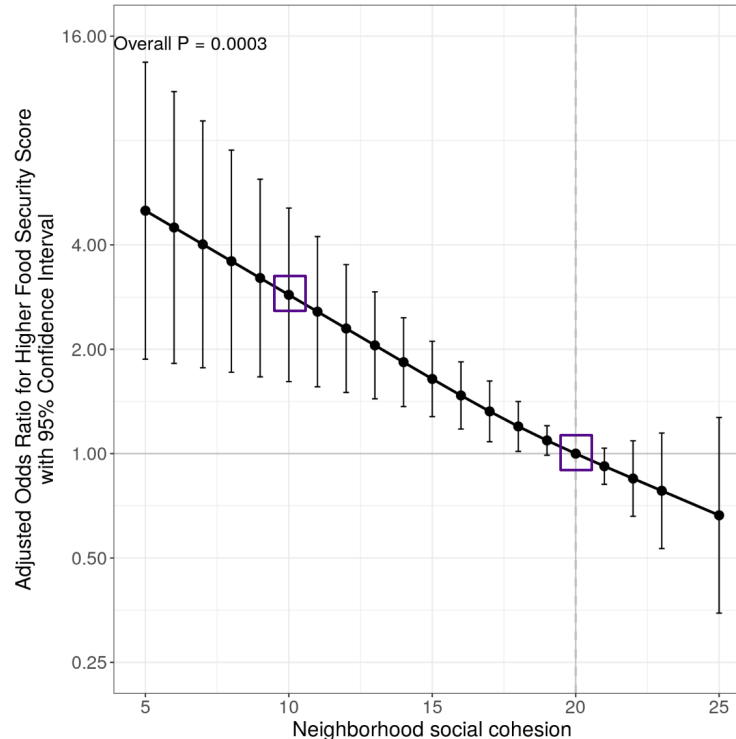


Increased odds of greater food insecurity at lower levels of neighborhood social cohesion

Neighborhood Social Cohesion
(Social Cohesion Score)

Results- Neighborhood Social Cohesion

Adjusted Odds Ratio of Greater Food Insecurity
(Higher food security score) with 95% confidence intervals



Adjusted odds ratio=
2.87 (95%CI 1.61-5.11)

Neighborhood Social Cohesion
(Social Cohesion Score)

Results- Neighborhood Social Cohesion

Caregivers with a low neighborhood social cohesion score of 20 had nearly 3 times the odds of greater food insecurity compared to caregivers with a high neighborhood social cohesion score of 10 after adjusting for covariates

- Adjusted odds ratio = 2.87 (95%CI 1.61 - 5.11)
- Covariates: household income, caregiver educational attainment, caregiver race/ethnicity, number of adults in the home, number of children in the home, household WIC participation, study site

Overall Results

Caregiver social support and neighborhood social cohesion are inversely associated with greater food insecurity among families with newborns even after adjusting for income and other relevant covariates

- Household income and caregiver educational attainment were inversely associated with greater food insecurity
- No significant association between greater food insecurity and other covariates

Strengths

- Novel population: families with newborns
- Analyzed food insecurity as an ordinal outcome instead of oversimplifying as binary
- Large sample with diverse participants



Limitations

- Cross-sectional data
- Residual confounding
- Did not include families with language preferences other than English or Spanish



Conclusions and Future Directions

- Social connections may represent some of the "other resources" that affect food security status
- Longitudinal data are needed to assess directionality
- Additional research is needed to determine whether improving social connections might be a novel means of addressing food insecurity in addition to connecting families with nutritional resources

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Thank you!

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Correlation between independent variables

Significant correlation between Caregiver social support and Neighborhood social cohesion

- Spearman's rho = 0.285
- p value <0.0001

In a third proportional odds regression model including both independent variables, the associations remained significant

- CSS OR 4.50 (95% CI 2.90-6.98), p<0.001
- NSC OR 2.15 (95% CI 1.18-3.93), p=0.031

Caregiver Social Support Table

term	Reference	highc	est95ci	Overall_pvalue
enrichd_sum	30	18	5.03 (3.28-7.74)	<0.0001
cg_race_model	Hispanic	Black, non-Hispanic	1.02 (0.59-1.76)	0.3215
		White, non-Hispanic	1.48 (0.83-2.64)	
		Other, non-Hispanic	1.60 (0.87-2.95)	
diet_wic_any	No	Yes	1.52 (0.97-2.38)	0.0645
cg_income_model	< \$20,000	\$20,000 to \$49,999	0.63 (0.41-0.99)	0.0004
		\$50,000 to \$99,999	0.24 (0.10-0.56)	
		\$100,000 or more	0.06 (0.01-0.29)	
		Other	0.83 (0.55-1.26)	
cg_education_model	Less than high school graduate	High school graduate, but less than a college degree	0.62 (0.42-0.92)	0.0424
		College degree or higher	0.59 (0.35-0.99)	
redcap_data_access_group	Duke	Miami	0.33 (0.09-1.26)	0.6605
		NYU	0.85 (0.49-1.46)	
		Stanford	0.80 (0.39-1.64)	
		UNC	0.67 (0.31-1.45)	
		Vanderbilt	0.80 (0.48-1.33)	
cg_home_child_num_cat	1	2	0.78 (0.51-1.20)	0.5312
		>=3	0.88 (0.58-1.32)	
cg_home_adult_num_cat		2	0.69 (0.40-1.19)	0.2395
		>=3	0.89 (0.49-1.60)	

Neighborhood Social Cohesion Table

term	Reference	highc	est95ci	Overall_pvalue
pbs_soc_sum	20	10	2.87 (1.61-5.11)	0.0003
cg_race_model	Hispanic	Black, non-Hispanic	0.75 (0.44-1.28)	0.1584
		White, non-Hispanic	1.29 (0.73-2.28)	
		Other, non-Hispanic	1.62 (0.89-2.96)	
diet_wic_any	No	Yes	1.53 (0.98-2.38)	0.0589
cg_income_model	< \$20,000	\$20,000 to \$49,999	0.61 (0.39-0.94)	0.0001
		\$50,000 to \$99,999	0.22 (0.09-0.51)	
		\$100,000 or more	0.05 (0.01-0.24)	
		Other	0.83 (0.55-1.25)	
cg_education_model	Less than high school graduate	High school graduate, but less than a college degree	0.59 (0.40-0.87)	0.0257
		College degree or higher	0.64 (0.38-1.06)	
redcap_data_access_group	Duke	Miami	0.33 (0.09-1.26)	0.5915
		NYU	0.87 (0.51-1.48)	
		Stanford	0.68 (0.34-1.38)	
		UNC	0.80 (0.37-1.72)	
		Vanderbilt	0.93 (0.56-1.53)	
cg_home_child_num_cat	1	2	0.80 (0.52-1.21)	0.5213
		>=3	0.95 (0.64-1.42)	
cg_home_adult_num_cat		2	0.64 (0.38-1.10)	0.2361
		>=3	0.76 (0.42-1.37)	

Social Support and Food Insecurity

Link between social support and food insecurity is unclear in adults

- Social support was **not** associated with FI in Oregonian adults (DeMarco 2009)
- Social support was associated with FI in US women age ≥ 40 (Ashe 2018)

Social Support Domains

- **Informational support:** advice, referral, situational appraisal, teaching
- **Tangible support:** loan, direct task, indirect task, active (joint) participation, willingness
- **Esteem support:** compliment, validation, relief of blame
- **Network support:** access, presence, companions
- **Emotional support:** relationship, physical affection, confidentiality, sympathy, listening, understanding/empathy, encouragement, prayer

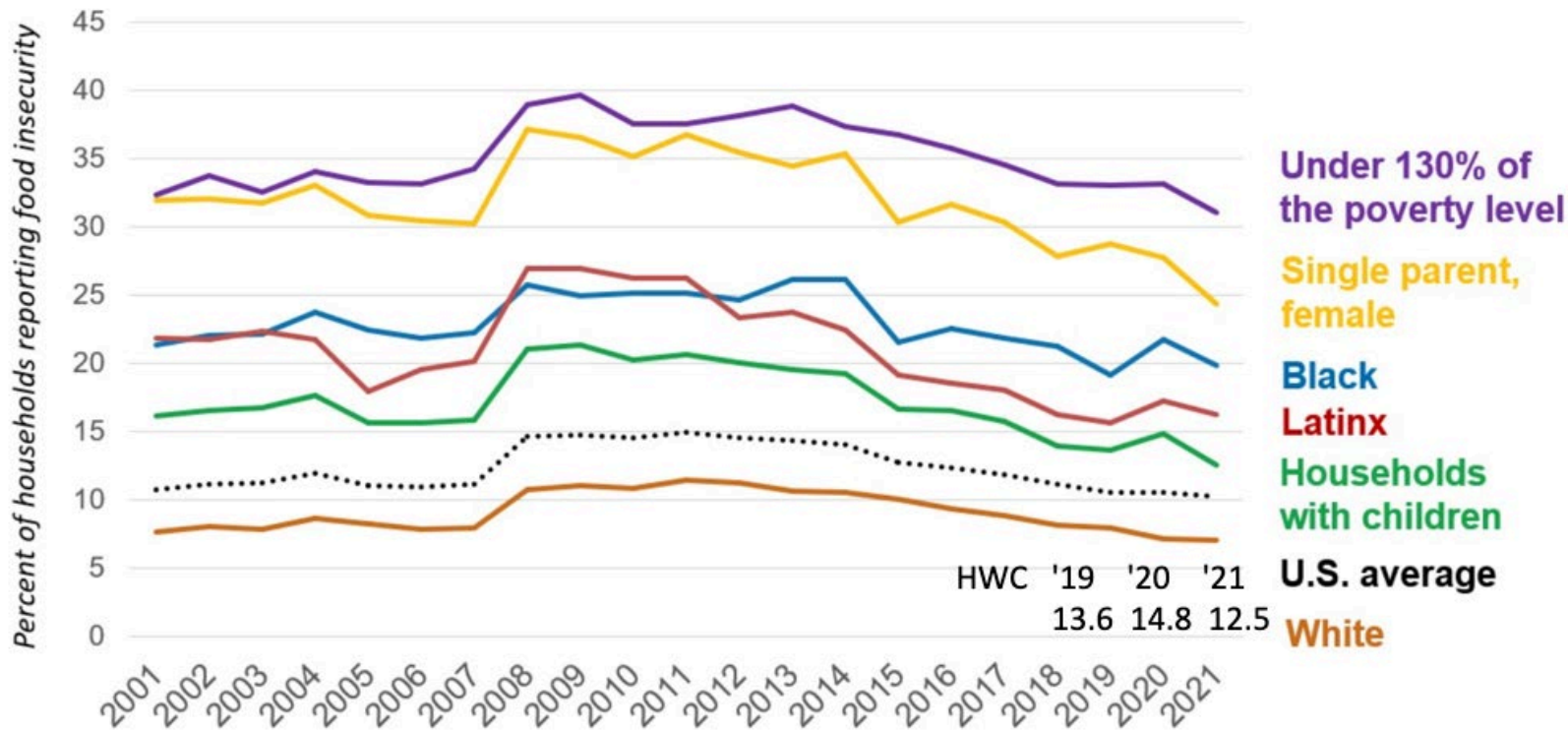
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Neighborhood Social Cohesion and Food Insecurity

Inverse association between neighborhood social cohesion and food insecurity among families with children

- Quebec longitudinal study of child development: ages 4 years+ (Carter 2012)
- Three cities study: child age data not provided (Brisson 2012)
- Geographic Research on Wellbeing study: ages 5 years+ (Denny 2017)

Food Insecurity Trends



Greenlight Plus Eligibility Criteria

- 1) an English- and Spanish-speaking parent/legal guardian
- 2) infant born in the newborn nursery with plans to have care in the local clinic OR presenting in that clinic for the first newborn visit (1–21 days of life),
- 3) attendance at a newborn clinic visit (1–21 days of life),
- 4) no plans to leave the clinic within 2 years,
- 5) completion of baseline data collection (survey data, child weight and length measures prior to randomization), and
- 6) own a smartphone with access to data services.

Greenlight Plus Exclusion Criteria

Infant exclusion criteria:

1. born prior to 34 weeks gestation or birth weight <1500g; weight <3rd%tile at enrollment (WHO growth curves); or
 2. any chronic medical problem that may affect weight gain (e.g., metabolic disease, uncorrected congenital heart disease, renal disease, need for high-calorie formula, cleft palate, Down syndrome).
- If a child was a twin, only one of the twins was randomly selected and eligible for the study.
If the child was a higher order multiple gestation, none of the children from that family was eligible.
If a child developed or was diagnosed with an exclusion criterion (e.g., condition that would impact weight gain such as cystic fibrosis) after randomization, they were withdrawn from the study to prevent biasing the results.

Caregiver exclusion criteria:

1. under 18 years old;
2. serious mental or neurologic illness that impairs ability to consent/participate;
3. poor [visual acuity](#) (corrected vision worse than 20/50 with Rosenbaum Screener). Only assessed if a participant demonstrated or expressed difficulty reviewing study materials;
4. biological mother is HIV-positive.

Comparison	Odds ratio with 95% CI
12 vs.30	5.18 (2.75 - 9.76)
13 vs.30	5.16 (2.86 - 9.32)
14 vs.30	5.13 (2.96 - 8.91)
15 vs.30	5.11 (3.05 - 8.55)
16 vs.30	5.08 (3.14 - 8.23)
17 vs.30	5.06 (3.22 - 7.96)
18 vs.30	5.03 (3.28 - 7.74)
19 vs.30	5.01 (3.32 - 7.57)
20 vs.30	4.99 (3.33 - 7.46)
21 vs.30	4.96 (3.33 - 7.40)
22 vs.30	4.93 (3.29 - 7.38)
23 vs.30	4.83 (3.20 - 7.28)
24 vs.30	4.61 (3.05 - 6.98)
25 vs.30	4.24 (2.82 - 6.37)
26 vs.30	3.69 (2.51 - 5.43)
27 vs.30	3.02 (2.15 - 4.23)
28 vs.30	2.28 (1.76 - 2.96)
29 vs.30	1.58 (1.36 - 1.83)

**OR at 95%CI
for CSS and FI**

Comparison	Odds ratio with 95% CI
5 vs.20	5.02 (1.87 - 13.46)
6 vs.20	4.49 (1.82 - 11.07)
7 vs.20	4.01 (1.77 - 9.11)
8 vs.20	3.59 (1.72 - 7.51)
9 vs.20	3.21 (1.67 - 6.19)
10 vs.20	2.87 (1.61 - 5.11)
11 vs.20	2.57 (1.56 - 4.23)
12 vs.20	2.30 (1.50 - 3.51)
13 vs.20	2.05 (1.44 - 2.93)
14 vs.20	1.84 (1.37 - 2.47)
15 vs.20	1.64 (1.28 - 2.11)
16 vs.20	1.47 (1.18 - 1.84)
17 vs.20	1.32 (1.08 - 1.62)
18 vs.20	1.20 (1.01 - 1.41)
19 vs.20	1.09 (0.99 - 1.20)
21 vs.20	0.92 (0.82 - 1.04)
22 vs.20	0.85 (0.66 - 1.09)
23 vs.20	0.78 (0.53 - 1.15)
25 vs.20	0.66 (0.35 - 1.27)

**OR at 95%CI
for NSC and FI**