Original Article

Associations of child food insecurity in Florida with social determinants of health and child population health outcomes

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Abstract

Background: Child food insecurity (CFI) in Florida is 25% higher than the national average, however, no studies currently exist which investigate the association between CFI and population health or social determinants of health in the State. The goal of this study was to identify those variables in order to inform future policy addressing CFI in the state of Florida.

Methods: Data on CFI, child health, and social determinants of health were collected from the Florida Department of Health website for the years 2014-2018. Variables were selected based on previous studies on CFI conducted primarily in the United States. A correlation analysis was conducted to determine associations between the selected variables and CFI in Florida.

Results: CFI had a moderate positive association with emergency department visits among children aged 0-5 in the years 2017 and 2018. All other child health outcomes examined in this study did not have significant associations with CFI. Teenage mothers represented the strongest positive association with CFI whereas breastfeeding represented the strongest negative association.

Conclusion: In Florida, CFI surprisingly had few correlations with population health outcomes that have known national associations. This indicates that the factors contributing to and resulting from CFI are different in Florida relative to those found nationally. Several social determinants of health were identified that could help identify individuals and communities at increased odds of having CFI.

Keywords: Food Insecurity; Child Health, Social Determinants of Health, Population Health.

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Introduction

Food Insecurity is defined by the United States Department of Agriculture (USDA) as "a household-level economic and social condition of limited or uncertain access to adequate food" (1). In 2019, it was estimated that 13.6% of households with children in the United States were food insecure (2). Contributing factors may vary for each case, but often include poverty, low education status, single-parent households, and lack of access to nutrition assistance programs (3, 4). Pregnant women, already at an increased metabolic demand due to their pregnancies, are at increased risk of nutritional insecurity (5), which can have negative adverse consequences on the developing fetus such

as neural tube defects, intrauterine growth retardation, and low birth weight (5-7). Childhood food insecurity can lead to adverse consequences resulting in delayed developmental milestones (7), increased childhood asthma (6), and increased emergency room visits (8).

In 2019, Florida had an estimated childhood food insecurity rate (CFI) of 17.1% of households with children (9), more than 25% higher than the national average that same year (2). Between 2020 and 2030, the number of children under 5 is projected to increase in Florida by 10.6%, an increase of over 123,000 kids (10). It is currently unknown to what extent CFI in Florida impacts population health outcomes among children aged 0-5, and what factors are associated with CFI in the state. Large differences have been found between socioeconomic and health disparities in Florida and other parts of the country, with one study finding almost no overlap in trends associated with widening maternal and child health disparities during 2005-2011 between Washington State and Florida (11). With an increasing population of children aged 0-5 and the unknown burden of CFI on population health outcomes, an analysis of CFI as well as associated and alleviating factors is needed to inform future public health policy in the state of Florida.

Methods

Data on all variables in this study were collected from the publicly accessible database FLHealth Charts through the Florida Department of Health (FDOH) website for all 67 counties in Florida for each year from2014 to 2018 (9). Data on all variables used in the study were collected at the county level and included the entire population for each variable within each county as reported to the FDOH. The FDOH calculates the county rates of CFI based on survey data which uses the validated US Household Food Security Survey Module (12). Child health outcomes of low birth weight, emergency department (ED) visits among those aged 0-5, asthma hospitalizations among those under age 5, and infant mortality rate were selected based on their reported association with CFI in previously conducted studies (7, 8, 13, 14). These variables are reported directly to the FDOH by hospitals at the county level (9).

Various demographic and socioeconomic population level covariates that affect CFI have been identified in other studies conducted in the United States including enrollment in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), child race, child ethnicity, total population 0-5 year olds, births to teenage mothers, adult education status, household income, living in a rental property, living in single-parent households, mothers initiating breastfeeding at any time during infancy, prenatal care status throughout pregnancy at the time of birth, pre-kindergarten (pre-K) free/reduced lunch, child health insurance coverage, and fluency in English (7, 8, 13-17). Most of these variables were reported directly to and made publicly accessible by the FDOH through the Bureau of Vital Statistics, Florida State Legislature Office of Economic and Demographic Research, Florida Department of WIC and Nutrition Services, and the Florida Agency on Healthcare Administration (9, 18, 19). Data on education status, housing, income, and language fluency were imported by the FDOH from the United States Census Bureau American Community Survey and made publicly accessible through FLHealth Charts (9, 20). Correlation analysis was used to find if there was a relationship between the variables and CFI for every county in Florida in every year from 2014 through 2018. These analyses were completed using STATA14.

Results

The correlation analysis showed some statistically significant associations with the selected population health outcomes

Table 1. Statistically Significant Variables Correlated with CFI

	2014	2015	2016	2017	2018
ED visits 0-5	0.283 (p=0.98)	0.300 (p=0.93)	0.369 (p=0.33)	0.434 (p=0.045)	0.449 (p=0.26)
Families with Children under 5 years below poverty	0.555 (p=0.0002)	0.574 (p=0.0001)	0.620 (p=0.0000)	0.485 (p=0.006)	0.485 (p=0.006)
Population over 25 without a high school diploma or equivalency	0.602 (p=0.0000)	0.561 (p=0.0001)	0.610 (p=0.0000)	0.564 (p=0.001)	0.623 (p=0.0000)
Children under 18 in single-parent households	0.430 (p=0.0514)	0.380 (p=0.2505)	0.516 (p=0.0015)	0.552 (p=0.0002)	0.505 (p=0.0024)
Births to teen mothers aged 15-19	0.660 (p=0.0000)	0.592 (p=0.0000)	0.679 (p=0.0000)	0.651 (p=0.0000)	0.706 (p=0.0000)
Mothers who are breast feeding	-0.64 (p=0.0000)	-0.608 (p=0.0000)	-0.568 (p=0.0001)	-0.522 (p=0.0011)	-0.738 (p=0.0000)
Black & other non-white births	-0.497 (p=0.0413)	-0.312 (p=0.8597)	-0.263 (p=0.9978)	-0.237 (p=1.0000)	-0.429 (p=0.0547)
Black & other non-white population aged 1-5	-0.492* (p=0.0413)	-0.442 (p=0.0344)	-0.366 (p=0.3588)	-0.341 (p=0.5979)	-0.427 (p=0.0588)

and social determinants of health in each year (Table 1). Children under 5 in poverty, population over 25 without a high school diploma, teenage mothers, and breastfeeding were found to have correlations with every year in the analysis. Ranges for each year combining data from all 67 Florida counties are reported for CFI and each variable that had statistically significant associations with CFI (Table 2). The proportion of teenage mothers represented the strongest positive association with CFI in the analysis with a range of correlation coefficient from 0.592 ($p< 0.001$) to 0.706 ($p<0.001$) over the 5 years. The strongest negative association was found with the proportion of mothers who are breastfeeding, with a 5-year range for correlation coefficient from -0.522 ($p=0.0011$) to -0.738 ($p<0.001$). Among our health outcomes of interest, only ED visits had significant correlations with CFI. Unexpectedly, black and other non-white race population aged 1-5 years old for years 2014 and 2015, and black and other non-white race births for year 2014 had moderate negative associations with CFI.. The variables of low birth weight, asthma hospitalizations under age 5, infant mortality rate, children under 5 covered by MediKids, renter-occupied housing units, population 5+ that speaks English less than very well, births with late or no prenatal care, enrollment in WIC, and pre-K for free/reduced lunch eligibility had no statistically significant correlation in any year and were therefore not included in Table 1 or Table 2.

Table 2. Range of values within the 67 Florida counties for CFI and correlated variables

	2014	2015	2016	2017	2018
CFI (percent)	20.1 – 31.3	18.8 – 30.3	16.5 – 27.8	16.6 – 29.0	13.7 – 29.5
ED visits 0-5 (per 100,000 population age 0-5)	35,043.6 - 115,068.0	35,428.5 – 125,827.6	43,270.1 – 125,892.1	42,918.1 – 124,135.1	40,465.4 – 135,988.4
Families with Children under 5 years below poverty line (percent)	9.19 - 60.78	7.46 – 52.22	1.72 – 56.13	5.80 – 86.13	6.95 – 94.27
Population over 25 without a high school diploma or equivalency (percent)	6.2 - 34.7	6.15 - 36.97	5.34 – 37.14	5.57 – 34.85	5.41 – 34.27
Children under 18 in single-parent households (percent)	21.94 - 59.11	17.86 – 62.57	20.69 – 55.80	20.94 – 60.23	21.53 -58.92
Birth to teen mothers aged 15-19 (per 1,000 females age 15-19)	10.44 – 66.74	9.46 – 69.44	8.40 – 55.14	8.59 – 59.43	7.10 – 53.57
Mothers who are breast feeding (percent)	57.61 – 92.10	52.67 – 92.64	56.05 – 93.15	56.25 - 92.70	58.02 – 92.90
Black & non-white other births (per 1,000 live births)	3.32 – 17.18	0.67 -17.03	2.93 – 18.29	3.54 – 19.90	2.56 – 17.23
Black & other non-white population aged 1-5 (count)	61.0 – 39,912.0	51.0 – 41,773.0	52.0 – 42,267.0	49.0 – 41,753.0	47.0 - 41,767.0

Discussion

With markers of low socioeconomic status (SES) such as poverty, low education status, single-parent households, and teenage mothers associated most or every year with CFI, these findings underscore how interconnected low SES is with CFI in Florida. Low SES not only is the primary driver of CFI in many studies (6, 8, 21), but CFI has been found to further contribute to low SES through increased economic expenditures, poor school performance, and increased morbidity (7, 8, 21). In addition to the adverse health consequences, those who are food insecure pay more than 45% in healthcare expenditures compared to similar cohorts who are not food insecure, further exacerbating the cycle of poverty, food insecurity, and poor health outcomes (21).

While recommendations currently exist to encourage healthcare providers to screen pregnant women and pediatric patients for food insecurity (22, 23), this analysis further provides population-level variables such as poverty, low education status, single-parent households, and teenage mothers to potentially assist local and regional efforts to better identify populations interacting with the healthcare system for targeted screening and needs-based programming. While our study found that non-white race was negatively associated with CFI in 2014 and 2015, national-level research over several decades indicates that non-white race confers a higher odds of food insecurity relative to white race (24). The correlation identified in this study does not necessarily suggest non-white race potentially confers a protective effect against CFI in Florida. Rather, additional variables which were not accounted for in this analysis may serve as moderators of this relationship. Additional research is needed to better define the relationship between non-white race and CFI in Florida and to explain the findings in this study.

Research conducted on WIC participants using national data between 1999-2008 found that the program reduces food insecurity among children by 20% (25). Our findings did not reveal an association between CFI and the percentage of WIC-eligible women and children enrolled in the program, indicating that CFI in Florida follows a different pattern than that identified at the national level. These findings likely do not indicate that WIC is ineffective as a program, rather that recipients of the program in Florida may require additional services in addition to WIC to achieve food security that were unaccounted for in this study and require additional research to ascertain.

Research has found that breastfeeding can have a negative impact on CFI (26), and in this analysis, it was found to have the strongest negative association of all variables. One study found that some mothers who are food insecure stop breastfeeding because they believe the misconception that their poor diets will result in poor-quality breast milk for their child (26). This reinforces the need for healthcare professionals to educate expecting and new mothers about breastfeeding, particularly those who are at risk of CFI, in addition to facilitating linkages to other safety-net services. Through educating about the positive effects of breastfeeding, healthcare professionals working with new and expecting mothers can play a role in impacting CFI in the populations that they serve.

This analysis has shown that CFI has impacts on population health in Florida. CFI is associated with increased emergency department visits among children 0-5, particularly in the two most recent years of our analysis. At one pediatric hospital with capabilities to provide need-based social service alignment in Washington state, the implementation of a validated two-question food insecurity screening in the emergency

department led to 17.5% of patients' screenings positive for experiencing CFI (27). With increased hospitalization among children being associated with an increased risk of further injury (28), CFI can represent a significant direct or indirect burden to both families with young children and the healthcare system of the state. A multi-state study conducted between 2009 and 2017 including Arkansas, Maryland, Massachusetts, Minnesota, and Pennsylvania found that across all states, CFI was associated with poor child health, increased childhood obesity, and developmental stunting (7). The correlation between CFI and ER visits in this study may represent the downstream implications of the effects of CFI on variables that were unmeasured due to lack of availability such as childhood obesity, overall child health, and developmental stunting. Further research in Florida should therefore focus on these additional variables to better define and identify downstream child population health implications associated with CFI. It remains unclear as to why correlations were not found during most years for most other health outcomes of interest as is found at a national level and merits further investigation into the nature of CFI in Florida.

The COVID-19 pandemic significantly worsened food insecurity, particularly CFI, with national estimates putting the number of children experiencing food insecurity in 2020 at 18 million, up from 7 million in 2018. This increase was not uniform, with areas of the Southeast, including Florida, experiencing the highest increases compared to other regions in the United States (29). These findings are likely to magnify the associations between CFI, social determinants of health, and health outcomes, making investigating and addressing these relationships an even more urgent public health need.

Limitations

Because of the cross-sectional design of the study and the use ofsecondary, aggregated data there was no way of tracking the CFI status of individual households throughout time as well as knowing their unique set of risk factors. As a result, this study cannot suggest causality and is only able to report associations. Additionally, many variables that are strongly associated with CFI nationally, such as childhood obesity, developmental delays, poor mental health, enrollment in SNAP, and poor school performance, were not available.

While this analysis focuses on population health markers for children aged 0-5 years old, data on CFI specifically for that age range was not available. National data collected by the USDA indicate that the overall CFI rate slightly underestimates the true food insecurity rate of households with children 0-5 years old by around 2 percentage points, so the true associations may be stronger than what is reported in this analysis (2).

Conclusion

CFI is associated with social determinants of health and population health in Florida. Markers of low SES were strongly associated with increased CFI, however, the relationship between CFI and population health outcomes differs from those identified at the national level. Further research is needed to better understand the relationship between CFI and these population-level variables to better define the burden CFI has on the population and to develop targeted interventions addressing the identified issues.

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- Research idea and study design: MED, JF
- Data analysis and interpretation: MED, JF
- Statistical analysis: JF, MED
- Supervision and mentorship: JF

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The authors do not have any conflicts of interest.

Informed Consent:

This study was approved as exempt by the University of Central Florida Institutional Review Board.

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