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Associations Between Prenatal Food Insecurity and Prematurity, Pediatric Health Care Utilization, and Postnatal Social Needs

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Abstract

Objective—Childhood food insecurity endangers child development and health outcomes. Food insecurity will grow increasingly common in the economic wake of the coronavirus pandemic and prenatal care represents an early, clinical opportunity to identify families at risk. However, longitudinal relationships between clinically-identified *prenatal* food insecurity and prematurity, pediatric health care utilization, and *postnatal* social needs have not been described.

Methods—We examined longitudinal data from mother-child dyads who received prenatal and pediatric care and social needs screening at a large academically-affiliated safety net medical center between October 2018 and July 2019. Associations among household food insecurity and premature birth, pediatric inpatient and outpatient utilization, missed immunizations, and postnatal social needs were estimated using adjusted regression.

Results—Among the 268 mothers, those who experienced prenatal household food insecurity had 3 times higher odds of having a child born prematurely (95% confidence interval [CI] 1.0–8.9, p=0.05) and had children with higher inpatient hospitalizations (incidence rate ratio [IRR] 2.4, 95% CI 1.0–5.6, p=0.04) and missed immunizations (IRR 3.4, 95% CI 1.1–10.3, p=0.03) in the first 6 months of the child's life. These mothers also had higher odds of having any social needs in the pediatric setting (odds ratio 3.4; 95% CI 1.5–8.0, p=0.004).

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Conclusions—Prenatal household food insecurity was linked to future adverse perinatal and pediatric outcomes in low-income mother-child dyads. Food insecurity identifies children at social and medical risk, providing an early clinical opportunity to intervene.

Keywords

childhood food insecurity; prenatal food insecurity; maternal child health

INTRODUCTION

Understanding the impact of prenatal food insecurity has become increasingly important due to the COVID-19 pandemic's economic impact. Rates of food insecurity and other social needs are rising quickly and could result in millions more Americans experiencing food insecurity.[1] Expectant mothers are a particularly vulnerable group whose experience of food insecurity has the potential to impact not only their own but also their future children's lives. Thus, this surge in food insecurity presents an urgent need for clinicians to find ways to identify food-insecure families as early in the life course as possible to intervene and mitigate potential poor health outcomes.

Food insecurity during early childhood is profoundly harmful to the child's health and quality of life. It has been linked to developmental, behavioral, and academic problems,[2–3] as well as worse overall health status.[4–6] There is also ample evidence that childhood food insecurity increases acute health care utilization.[4,6–7] These studies rely on food insecurity measures assessed in the childhood period, but there may be clinical opportunities to gather information on social needs for the same family unit far earlier using prenatal food insecurity measures.

Food insecurity during pregnancy may be especially risky for the health of the developing fetus and the well-being of the postnatal child,[8–10] and programs to respond to food insecurity, such as Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC), have been known to benefit maternal and child health. However, many existing studies examining food insecurity during pregnancy focus only on the association between food insecurity and maternal illness.[3,10–12] A recent systematic review exploring the association between household food insecurity and gestational and neonatal outcomes noted the paucity of studies that exist exploring associations with neonatal outcomes specifically.[13] The few US studies that have examined how prenatal household food insecurity may impact postnatal child health have focused specifically on low birthweight, congenital birth defects, and neonatal abstinence syndrome.[14–16] Some studies conducted outside of the US in countries with higher rates of food insecurity have shown associations between prenatal food insecurity and other postnatal outcomes including neonatal mortality, hearing disorders, low birthweight, and prematurity.[17–21] No studies have examined this association in the US nor specifically in the US safety net clinical setting, where these relationships are likely to be especially critical to understand and respond to through improved health care delivery. Additionally, few US studies have examined how *clinically-identified* prenatal household food insecurity specifically may predict multiple child health risks including premature births, health care utilization, and postnatal social needs. This

distinction – identification of prenatal food insecurity in the clinical setting specifically – is particularly relevant as health care systems increasingly adopt clinical social needs screening with its unique challenges, and as this information is used for clinical risk prediction.[22]

Our study examines the association between clinically-identified *prenatal* household food insecurity and child premature gestational age at birth, child health care utilization (including emergency department visits, inpatient hospitalizations, and missed well child visits), immunizations, and clinically-identified *postnatal* social needs.

METHODS

We conducted a retrospective chart review of mother-child dyads receiving prenatal and pediatric care at a large, municipal, academically-affiliated safety net medical center in Los Angeles County (Harbor-UCLA Medical Center, HUMC) where 98% of mothers are Medicaid enrollees. The HUMC primary pediatrics clinic sees an average of 12,000 patients annually and the regional rate of food insecurity is estimated to be 11.4%.[23] All expectant mothers receiving prenatal care at HUMC are screened for social risks on a standard form by the MAMA'S Neighborhood program. The MAMA'S Neighborhood program is a prenatal social needs screening and risk assessment-based program designed to identify and address social determinants that may increase risk of preterm birth and low birthweight.[24] Risk scores, determined by patient responses to the MAMA'S Neighborhood prenatal screening questionnaire, determine the frequency and intensity of appointments with a care team including care coordinators, health educators, nurses, physicians, and social workers. Patients with risk scores that indicate need for social services (Section 8, disability aid, Cal-Fresh, WIC, etc.) receive a referral from their care coordinators who either facilitate contact with agencies or community organizations or model contact for the patient. Social needs screening in the HUMC primary pediatrics clinic is performed during all well child visits on a paper-based standardized screening form that is scanned and uploaded to the mother's electronic health record (Appendix, description of measures below). Prenatal and pediatric clinic social needs data, along with demographic and health outcome data, were abstracted from the electronic health record. All mother-child dyads in which the mother was screened by the MAMA'S Neighborhood program and then later by pediatric clinic social needs screening between October 2018 (when pediatric screening began) and July 2019 were included in the study. The average age of the child at the time of postnatal social needs screening was 11 months, and the mean time between prenatal and postnatal screening was 16.3 months. If multiple screenings were completed, only the earliest screening form was included in the analyses. Demographic characteristics of the sample were confirmed to be similar to the characteristics of the MAMA'S Neighborhood and HUMC prenatal patient population as a whole.

Measures

Prenatal Food Insecurity—Prenatal food insecurity data were collected via the MAMA'S Neighborhood program using the USDA Six-Item Short Form for the U.S. Household Food Security Survey Module.[25] Mothers with a positive response to any of the six validated question items were coded as food insecure (Appendix).

Postnatal Social Needs—Social needs data from the pediatric care setting were collected using validated measures of household food insecurity, transportation barriers, housing insecurity, unemployment or underemployment, and overall financial strain in English or Spanish (Appendix). Postnatal household food insecurity and transportation barriers were determined using questions adapted from the USDA U.S. Household Food Security Survey Module and the Center for Medicare and Medicaid Services' Accountable Health Communities Screening Tool.[26–27] Postnatal housing insecurity was measured using a question from the Homelessness Screening Clinical Reminder Tool.[28] Postnatal unemployment or underemployment and postnatal financial strain were measured using items validated in clinical settings.[29–30] Postnatal legal social needs were measured using the following question: "Would you like legal guidance or help?" Binary social needs variables were then constructed using data from these questions.

Child Health & Health Care Utilization—The child health outcome of prematurity was assessed using estimated gestational age confirmed via ultrasound per American College of Obstetrics and Gynecology practice standards,[31] and was analyzed using the standard gestational age threshold for prematurity (under 37 weeks), as well as lower gestational age cutoffs such as the late preterm and moderately preterm threshold (under 36 weeks and under 34 weeks, respectively). The child health care utilization outcomes analyzed in this study included the number of inpatient visits, emergency department visits, missed immunizations, and missed well child check (WCC) appointments recorded in the child's electronic health record by 6 months of life. The number of inpatient visits included any hospitalization after discharge from the newborn nursery through the child's first 6 months of life. Missed WCCs were analyzed in two ways—missed WCCs according to the American Academy of Pediatrics Periodicity Schedule for preventive visits[32] at 1, 2, 4, or 6 months or missed WCCs during which recommended immunizations are administered at 2, 4, or 6 months only—and results were substantially similar.

Data Analysis

Logistic regression models were used to assess whether prenatal food insecurity was associated with prematurity at birth and postnatal social needs. Count regression models were used to assess whether prenatal food insecurity was associated with the health care utilization outcomes. We used a Poisson regression model to examine the relationship between prenatal food insecurity and the count of inpatient visits and missed well child check appointments, a negative binomial regression model to examine the over-dispersed outcome of emergency department visits, and a zero-inflated negative binomial regression model to analyze the over-dispersed and zero inflated missed immunizations outcome data. Covariates in all models included the mother's race, ethnicity, preferred language, education level, employment status, number of prior gestations, number of prior live births, and the relationship with the child's father and presence of a partner in the home, all collected from electronic health record documentation. The only exception was the model analyzing the association between prenatal food insecurity and postnatal unemployment or underemployment, which did not include an adjustment for employment status. Data on household income were not available to include in the analyses, though all participants were low-income (under 213% Federal Poverty Level) and educational attainment was included as

a measure of differences in socioeconomic status. Regression models stratified by interval between prenatal and postnatal screenings (less than or more than one year between screenings) to assess whether timing between screenings affected the association between prenatal and postnatal social needs were run as sensitivity analyses. All analyses were carried out using STATA 15 (StataCorp, College Station, TX). The Harbor-UCLA Lundquist Institute Institutional Review Board approved the study overall and the Los Angeles Department of Public Health approved use of MAMA'S Neighborhood data for this study.

RESULTS

Of the 268 mothers in this study, most were Hispanic or Latina (69.0%), had a high school education or less (82.4%), were unemployed (50.6%), and lived with their partner (59.4%) (Table 1). Twelve percent of mother-child dyads had prenatal household food insecurity. Most mothers in both the food insecure and non-food insecure groups entered prenatal care at a gestational age of 19 weeks or less (81.3% versus 77.1%). The sample of mothers with prenatal food insecurity resembled the overall sample (Table 1).

Postnatal Social Needs

Mothers who experienced prenatal household food insecurity had higher odds of experiencing social needs in the pediatric setting (odds ratio [OR] for any social need 3.4; 95% confidence interval [CI] 1.5–8.0, p=0.004). They were more likely to experience postnatal housing insecurity, financial strain, household food insecurity, transportation barriers, and legal social needs (Table 2). These associations were largely unchanged regardless of interval since prenatal screening and were slightly larger with longer intervals between screens.

Child Health & Health Care Utilization

Mothers experiencing prenatal household food insecurity had three-fold higher odds of having a child born at the less than 37 weeks gestation (95% CI 1.0–8.9, p=0.05) and 4.8-fold higher odds of having a child born moderately preterm under 36 weeks gestation (95% CI 1.4–16.3, p=0.01). Mothers with prenatal household food insecurity also had children with higher counts of inpatient visits (incidence rate ratio [IRR] 2.4, 95% CI 1.0–5.6, p=0.04) and missed immunizations (IRR 3.4, 95% CI 1.1–10.3, p=0.03) in the first 6 months of the child's life. Prenatal food insecurity was not associated with number of emergency department visits or missed preventive care appointments in the first 6 months of life (Table 2).

DISCUSSION

In this observational study of low-income mother-child dyads receiving both prenatal and pediatric care at a large safety net medical center, clinically-identified prenatal household food insecurity was linked to preterm birth prior to 37 weeks of gestation. Prenatal household food insecurity was also associated with higher counts of inpatient visits and missed immunizations in the first 6 months of the child's life in our study. This is the first study to demonstrate these associations between clinically-identified prenatal food insecurity

and prematurity and pediatric outcomes in a US sample. Prior studies that have examined associations between food insecurity and pediatric outcomes have relied on measures of food insecurity identified during the childhood period, have been conducted outside of the US, or explore associations with less prevalent social needs such as housing insecurity.[4, 20–21, 33–35] Our study is also the first to focus on an especially at-risk US clinical population of mother-child dyads served in the medical safety net, a setting in which understanding and responding to the relationships uncovered in the study are critically important to improve health equity.

While our study was not designed to determine the mechanisms of these associations, prenatal household food insecurity and preterm birth may be linked through nutritional deficiencies[36–39] or higher levels of anxiety, stress, and depression that can lead to a dysregulated physiologic stress response.[3,12,40–41] Associations between prenatal food insecurity and clinical utilization outcomes appear not to be solely explained by poor access to health care overall,[7] since women in this study had free access to prenatal care covered by public insurance and those in the food-insecure group entered prenatal care at similar gestational ages as those in the non-food insecure group. Mothers with prenatal food insecurity may simply choose to prioritize competing demands of acquiring food over preventive health care for themselves and their children. Previous studies have shown associations between household food insecurity in the childhood period and increased emergency department visits and missed WCCs.[4,6–7] However, the associations between household food insecurity and missed WCCs or emergency department visits did not reach statistical significance in our study, likely due to sample size limitations.

Our study findings have clinical implications, with appropriate caveats related to generalizability of our single site study. While previous studies have found associations between childhood food insecurity and pediatric health outcomes, our results suggest that there is an opportunity to identify children at increased health risk far earlier in the life course using prenatal food insecurity screening and clinical data sharing. These results have implications for current health care facilities where prenatal social needs screening has not been implemented or that lack the time or workforce capacity to maintain a social needs screening process. Our findings suggest likely advantages of increasing prenatal food insecurity screening and developing social needs interventions for expectant mothers, especially in the medical safety net. While our study was not designed to evaluate whether intervention from the MAMA'S Neighborhood program influenced the strength of associations between prenatal and postnatal social needs, the study outcomes of increased risk among food-insecure dyads help identify a potential point of entry for intervention in the social safety net. Future interventional studies should explore whether addressing prenatal social needs including food insecurity may help mitigate the risk for prematurity, increased child health care utilization, missed immunizations, and longitudinal social needs.

Our study also demonstrates the potential benefits of information sharing across prenatal obstetrics and pediatric care settings. Expectant mothers' prenatal food insecurity was associated with their postnatal social needs, which are directly linked to their child's health and health care utilization. As such, pediatricians with this prenatal information can more readily address childhood social determinants of health and potentially prevent poor health

outcomes in children of food-insecure mothers, including higher rates of inpatient utilization or missed immunizations. It is also important for providers to be aware of the potential unintended consequences of documenting family level social risk in a child's medical record, including the stigma associated with being identified as food insecure. However, the benefits of identifying these high-risk families, including the opportunity to intervene and address social needs, may outweigh these potential risks.

Our findings are especially relevant now as the COVID-19 pandemic continues to take a toll on the U.S. economy, with increasing unemployment and poverty rates driving food insecurity and other social needs. This will leave many families and expectant mothers hungry, impacting not only those mothers but also their future children's health and health care utilization. Thus, it is critical to ensure that these food-insecure mothers are being identified early in the prenatal period to potentially avoid exacerbating disparities in health and health care utilization in their children. Understanding that prenatal food insecurity is associated with increasing rates of postnatal hospitalizations, missed immunizations, and other social needs will allow clinicians to provide more specialized care to these families and to intervene before these outcomes arise. Adequate nutrition assistance programs and policies for pregnant mothers may be needed to meet the increase in demand due to rising levels of food insecurity in the years ahead. There will likely be similar profound needs for programs to address other social and financial needs for parents and young families.

Limitations

Mothers who completed the postnatal social needs screener did so at their child's follow-up appointments, introducing the possibility of selection bias if some mothers who were in prenatal care chose not to follow up into the pediatric setting in some systematic way. However, patients who did not follow up and were not included in this study may be at higher risk of postnatal social needs, meaning that the direction of likely bias is toward more conservative findings. Additionally, the demographics in our sample were comparable to the demographics of all mothers in the MAMA'S Neighborhood program, regardless of where they sought pediatric care, suggesting that any selection issues were minimal.

Several known determinants of premature birth were not included in this study, such as participation in WIC because information regarding whether the mother utilized the WIC referral provided to her was not available. Furthermore, this study was an observational secondary data analysis and could not control for potential unobserved confounders or establish causality. The overall rates of prenatal and postnatal household food insecurity, although consistent with national and regional averages,[23,42] are lower than expected for this high-risk population, which may suggest high access to services like WIC or hesitancy to report given the stigma associated with the need for social services. Additionally, mothers who may have higher rates of food insecurity may not be accessing prenatal services as frequently.

Our prenatal food insecurity screening items were more inclusive than the single-item postnatal food insecurity item and may identify a larger group that screen positive than alternative screening items. We were also underpowered to show if postnatal child health outcomes were partially mediated by the child's history of prematurity itself. Additionally,

we recognize that our findings are limited by our small sample drawn from a single medical center and that these findings may not be generalizable broadly. Future studies should aim to explore these associations in a larger, more diverse sample of expectant mothers.

CONCLUSION

Prenatal food insecurity was associated with adverse perinatal and pediatric outcomes, including prematurity, inpatient hospitalizations, missed immunizations, and postnatal social needs. Identification of food insecurity in the prenatal period may offer opportunities to reduce associated adverse outcomes and positively impact child health and family well-being. As health systems develop processes for addressing social determinants of health, using a life course approach may offer advantages for improving health outcomes. Ultimately, health systems should advocate for programs that aim to address social needs, including food insecurity, in the prenatal setting to prevent adverse child health outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

OR	odds ratio
CI	confidence interval
IRR	incidence rate ratio
HUMC	Harbor-UCLA Medical Center
WCC	well child check
USDA	United States Department of Agriculture
WIC	Women, Infants, and Children

References

1. Feeding America. The Impact of the Coronavirus on Food Insecurity. Available at: https://hungerandhealth.feedingamerica.org/wp-content/uploads/2020/03/Brief_Covid-and-Food-Insecurity-3.30.pdf. Updated March 20, 2020. Accessed April 25, 2020.
2. Shankar P, Chung R, Frank DA. Association of food insecurity with children's behavioral, emotional, and academic outcomes: a systematic review. J Dev Behav Pediatr. 2017;38(2):135–150. [PubMed: 28134627]

3. Whitaker RC, Phillips SM, Orzol SM. Food insecurity and the risks of depression and anxiety in mothers and behavior problems in their preschool-aged children. Pediatrics. 2006;118(3):e859–868. [PubMed: 16950971]
4. Cook JT, Frank DA, Berowitz C, et al. Food insecurity is associated with adverse health outcomes among human infants and toddlers. J Nutr. 2004;134(6):1432–1438. [PubMed: 15173408]
5. Alaimo K, Olson CM, Frongillo EA Jr, Briefel RR. Food insufficiency, family income, and health in US preschool and school-aged children. Am J Public Health. 2001;91(5):781–786. [PubMed: 11344887]
6. Cook JT, Frank DA, Levenson SM, et al. Child food insecurity increases risks posed by household food insecurity to young children's health. J Nutr. 2006;136(4):1073–1076. [PubMed: 16549481]
7. 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. [PubMed: 18191782]
8. Lindsay KL, Buss C, Wadhwa PD. The interplay between nutrition and stress in pregnancy: implications for fetal programming of brain development. Biol Psychiatry. 2019; 85(2):135–149. [PubMed: 30057177]
9. Moore VM, Davies MJ. Diet during pregnancy, neonatal outcomes and later health. Reprod Fertil Dev. 2005;17(3):341–348. [PubMed: 15745642]
10. Harding JE, Johnston BM. Nutrition and fetal growth. Reprod Fertil Dev. 1995;7(3):539–547. [PubMed: 8606966]
11. Johnson AD, Markowitz AJ. Food insecurity and family well-being outcomes among households with young children. J Pediatr. 2018;196:275–282. [PubMed: 29703363]
12. Laraia BA, Siega-Riz AM, Gundersen C, Dole N. Psychosocial factors and socioeconomic indicators are associated with household food insecurity among pregnant women. J Nutr. 2006;136(1):177–182. [PubMed: 16365079]
13. Augusto ALP, de Abreu Rodrigues AV, Domingos TB, Salles-Costa R. Household food insecurity associated with gestacional and neonatal outcomes: a systematic review. BMC Pregnancy Childbirth. 2020;20:229. [PubMed: 32303221]
14. Borders AE, Grobman WA, Amsden LB, Holl JL. Chronic stress and low birth weight neonates in a low-income population of women. Obstet Gynecol. 2007;109(2 Pt 1):331–338. [PubMed: 17267833]
15. Carmichael SL, Yang W, Herring A, et al. Maternal food insecurity is associated with increased risk of certain birth defects. J Nutr. 2007;137(9):2087–2092. [PubMed: 17709447]
16. Rose-Jacobs R, Trevino-Talbot M, Lloyd-Travaglini C, et al. Could prenatal food insecurity influence neonatal abstinence syndrome severity? Addiction. 2018;114(2):337–343. [PubMed: 30422365]
17. Campbell AA, de Pee S, Sun K, et al. Relationship of household food insecurity to neonatal, infant and under-five child mortality among families in rural Indonesia. Food Nutr Bull. 2009;30(2):112–119. [PubMed: 19689089]
18. Castillo Chávez AM, Torres RM, González VHH. Association between food insecurity and perinatal risk factors with hearing problems in preterm birth. Nutr Hosp. 2019;36(2):267–274. [PubMed: 30868909]
19. Gizaw B, Gebremedhin S. Factors associated with low birthweight in North Shewa zone, Central Ethiopia: case-control study. Italian J Pediatrics. 2018;44(1):76.
20. Dolatian M, Sharifi N, Mahmoodi Z. Relationship of socioeconomic status, psychosocial factors and food insecurity with preterm labor: A longitudinal study. Int J Reprod BioMed. 2018;16(9):563–570. [PubMed: 30643863]
21. Zar HJ, Pellowski JA, Cohen S, et al. Maternal health and birth outcomes in a South African birth cohort study. PLoS One. 2019;14(11):e0222399. [PubMed: 31751344]
22. Fierman AH, Beck AF, Chung EK, et al. Redesigning health care practices to address childhood poverty. Academic Pediatrics. 2016;16(3):S136–146. [PubMed: 27044692]
23. Feeding America. Food Insecurity in Los Angeles County. Available at: https://map.feedingamerica.org/county/2017/overall/california/county/los-angeles. Accessed September 22, 2020.

24. Saleeby E, Scibetta E, Moini M, et al. MAMA'S Neighborhood-maternity assessment management access & service synergy through the neighborhood for health. Obstetrics & Gynecology. 2017;129(5):S125–S126.
25. United States Department of Agriculture Economic Research Service. Six Item Short Form of the Food Security Survey Module. Available at: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/#six. Updated September 4, 2019. Accessed October 3, 2019.
26. United States Department of Agriculture Economic Research Service. How Are Food Security and Insecurity Measured? Available at: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement.aspx. Updated September 4, 2019. Accessed October 3, 2019.
27. Billioux A, Verlander K, Anthony S, Alley D. Standardized screening for health-related social needs in clinical settings: the accountable health communities screening tool. Washington, DC: National Academy of Medicine; 2017.
28. Enhancing Family Stability: A Guide for Assessing Housing Status and Coordinating with Local Homelessness Programs for TANF Agencies. U.S. Department of Health and Human Services, Administration for Children and Families, Office of Family Assistance; 2016. Available at: https://www.acf.hhs.gov/sites/default/files/ofa/enhancing_family_stability.pdf
29. Schickedanz A, Sharp A, Hu YR, et al. Impact of social needs navigation on utilization among high utilizers in a large integrated health system: a quasi-experimental study. J Gen Intern Med. 2019;34(11):2382–2389. [PubMed: 31228054]
30. Brcic V, Eberdt C, Kaczorowski J. Development of a tool to identify poverty in a family practice setting: a pilot study. Int J Family Med. 2011;2011:812182. [PubMed: 22312547]
31. Committee on Obstetric Practice, the American Institute of Ultrasound in Medicine, and the Society for Maternal-Fetal Medicine. Committee Opinion No 700: Methods for estimating the due date. Obstet Gynecol. 2017;129(5):e150–e154. [PubMed: 28426621]
32. American Academy of Pediatrics. Bright Futures/AAP Recommendations for Preventive Pediatric Health Care (Periodicity Schedule). Available at: https://www.aap.org/en-us/Documents/periodicity_schedule.pdf. Updated March 2019. Accessed August 17, 2019.
33. Sandel M, Sheward R, Ettinger de Cuba S, et al. Timing and duration of pre- and postnatal homelessness and the health of young children. Pediatrics. 2018;142(4):e20174254. [PubMed: 30177513]
34. Sullivan MC, Tegegn A, Tessema F, Galea S, Hadley C. Minding the immunization gap: family characteristics associated with completion rates in rural Ethiopia. J Community Health. 2010;35(1):53–59. [PubMed: 19847631]
35. Tebeje NB, Biks GA, Abebe SM, Yesuf ME. Magnitude of child food insecurity, its association with child immunization and household wealth status, and coping strategies in Dabat demographic and Surveillance system north west Ethioopa. Int J Pediatr. 2020.
36. Rose D, Oliveira V. Nutrient intakes of individuals from food-insufficient households in the United States. Am J Public Health. 1997;87(12):1956–1961. [PubMed: 9431283]
37. Fall CH, Yajnik CS, Rao S, et al. Micronutrients and fetal growth. J Nutr. 2003;133(5 Suppl 2):1747S–1756S. [PubMed: 12730494]
38. Wu G, Bazer FW, Cudd TA, et al. Maternal nutrition and fetal development. J Nutr. 2004;134(9):2169–2172. [PubMed: 15333699]
39. Scholl TO. Iron status during pregnancy: setting the stage for mother and infant. Am J Clin Nutr. 2005;81(5):1218S–1222S. [PubMed: 15883455]
40. Copper RL, Goldenber RL, Das A, et al. The preterm prediction study: maternal stress is associated with spontaneous preterm birth at less than thirty-five weeks' gestation. Am J Obstet Gynecol. 1996;175(5):1286–1292 [PubMed: 8942502]
41. Lobel M, Dunkerl-Schetter, Scrimshaw SC. Prenatal maternal stress and prematurity: a prospective study of socioeconomically disadvantaged women. Health Psychol. 1992;11(1):32–40.
42. Coleman-Jensen A, Rabbitt MP, Gregory CA, Singh A; U.S. Department of Agriculture Economic Research Service. Household food security in the United States in 2016. September 2017. https://www.ers.usda.gov/publications/pub-details/?pubid=84972. Updated September 6, 2017. Accessed September 22, 2020.

WHAT'S NEW

Prenatal household food insecurity was associated with several child health outcomes including premature births, higher inpatient utilization, more missed immunizations, and continued social needs of the household in the postnatal and early childhood period.

TABLE 1:

Demographics

Characteristic	Overall Sample (N=268) % (N) or Mean (SD)	Food Insecure* (N=32) % (N) or Mean (SD)	Non-Food Insecure* (N=236) % (N) or Mean (SD)
Mother's Race			
White	72.0% (193)	68.8% (22)	72.5% (171)
Black or African American	13.8% (37)	18.8% (6)	13.1% (31)
Asian	10.1% (27)	6.3% (2)	10.6 (25)
Other	4.1% (11)	6.3% (2)	3.8% (9)
Mother's Ethnicity			
Hispanic or Latino	69.0% (185)	68.8% (22)	69.1% (163)
Not Hispanic or Latino	31.0% (83)	31.3% (10)	30.9% (73)
Mother's Preferred Language			
English	75.4% (202)	71.9% (23)	75.8% (179)
Spanish	22.8% (61)	28.1% (9)	22.0% (52)
Mother's Education			
Did not graduate high school	28.7% (77)	40.6% (13)	27.1% (64)
High school/GED	53.7% (144)	40.6% (13)	55.5% (131)
Some college or above	17.5% (47)	18.8% (6)	17.4% (41)
Mother's Employment Status			
Unemployed	50.6% (135)	50.0% (16)	50.6% (119)
Employed	49.4% (132)	50.0% (16)	49.4% (116)
Mother's Partnered Status			
Living with partner	59.4% (158)	62.5% (20)	59.0% (138)
Not living with partner	40.6% (108)	37.5% (12)	41.0% (96)
Number of Prior Gestations	1.51 (1.72)	1.91 (1.77)	1.46 (1.71)
Number of Previous Live Births	0.87 (1.16)	1.22 (1.34)	0.83 (1.13)

*No statistically significant difference ($p < 0.05$) when compared to overall sample

TABLE 2:

Association Between Prenatal Food Insecurity & Pediatric Health

Outcomes[a]	Prenatal Food Insecurity	
	OR/IRR (95% CI)	***P***
Prematurity		
Less than 37 Weeks Gestation	**3.0 (1.0–8.9)**	**0.05**
Less than 36 Weeks Gestation	**4.8 (1.4–16.3)**	**0.01**
Less than 35 Weeks Gestation	**5.3 (1.1–26.2)**	**0.04**
Less than 34 Weeks Gestation	8.7 (1.0–79.1)	0.06
Health Care Utilization		
Inpatient Visits	**2.4 (1.0–5.6)**	**0.04**
Missed Immunizations	**3.4 (1.1–10.3)**	**0.03**
Emergency Department Visits	1.4 (0.7–2.7)	0.36
Missed WCC[b] at Ages 1, 2, 4, 6 Months	1.2 (0.5–2.6)	0.69
Missed WCC at Ages 2, 4, 6 Months	1.5 (0.6–3.5)	0.36
Social Needs in the Pediatric Period		
Housing	**4.0 (1.2–13.8)**	**0.03**
Employment[c]	2.4 (0.7–8.8)	0.18
Financial Strain	**6.1 (1.9–19.6)**	**0.003**
Food	**7.0 (2.2–22.7)**	**0.001**
Transportation	**4.2 (1.2–15.3)**	**0.03**
Legal	**4.0 (1.1–14.4)**	**0.03**
Any of the Above	**3.4 (1.5–8.0)**	**0.004**

[a]Adjusted for mother's race, ethnicity, preferred language, education level, employment status, number of prior gestations, number of prior live births, relationship with the child's father, and presence of a partner in the home

[b]Well child check

[c]This outcome was not adjusted for employment status