
FOOD NEGLECT AND INFANT DEVELOPMENT

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ABSTRACT: The impact of food insecurity on child development in the general U.S. population is well-established, yet little is known about the harm of food neglect relative to other types of maltreatment. Due to the harmful physiological impact of inadequate nutrients and the social impact of food-related stress, it was hypothesized that food neglect would be more likely to impair infant cognitive and language development than physical abuse, sexual abuse, and other forms of neglect. Families of infants ($N = 1,951$) investigated by Child Protective Services were studied using the second cohort of the National Survey of Child and Adolescent Well-Being (NSCAW II; NSCAW Research Group, 2002). Results from multivariable logistic regression models that controlled for likely confounding variables showed that the odds of impairment in cognition and language were significantly greater when food neglect was the most serious form of maltreatment. Considering that both food insecurity and child neglect are associated with poverty and parental mental health problems, it will be important for child welfare and mental health professionals to work collaboratively to better the health of these vulnerable children.

Keywords: food neglect, cognition, language, infants

RESUMEN: El impacto que la falta de seguridad de alimentos tiene en el desarrollo del niño dentro de la población estadounidense en general está bien establecido, sin embargo, poco se sabe acerca del daño de la negligencia alimenticia en relación con otros tipos de maltrato. Debido al dañino impacto psicológico de no tener los nutrientes adecuados y el impacto social del estrés relacionado con la alimentación, la hipótesis fue que la negligencia alimenticia estaría más propensa a causar impedimentos en el desarrollo cognitivo y de lenguaje de los infantes que el abuso físico, el abuso sexual y otras formas de negligencia. Se estudiaron familias de infantes ($N = 1951$) que habían sido investigadas por los servicios de protección al niño usando el segundo grupo de la Encuesta Nacional del Bienestar del Niño y del Adolescente (NSCAW II). Los resultados a partir de modelos de regresión logística de variables múltiples que regularon el control por posibles variables confundidas, mostraron que las posibilidades de impedimentos en cuanto a cognición y lenguaje eran significativamente más grandes cuando la negligencia alimenticia era la más seria de las formas de maltrato. Considerando que tanto la inseguridad alimenticia y la negligencia hacia el niño están asociadas con la pobreza y los problemas de salud mental de los padres, será importante para el bienestar del niño y los profesionales de la salud mental trabajar colaborativamente para mejorar la salud de estos niños vulnerables.

Palabras claves: negligencia alimenticia, cognición, lenguaje

RÉSUMÉ: L'impact de la précarité alimentaire sur le développement de l'enfant dans la population générale américaine est bien documenté, et pourtant on sait peu de choses sur le mal que fait la négligence liée à la nourriture, la négligence alimentaire, par rapport à d'autres formes de maltraitance. Du fait de l'impact physiologique nuisible de nutriments inadéquat et de l'impact social du stress lié à la nourriture, on a fait l'hypothèse que la négligence liée à la nourriture pourrait affecter le développement cognitif et du langage du bébé bien plus que la maltraitance physique, les sévices sexuels et d'autres formes de maltraitance. Les familles de nourrissons ($N = 1951$) faisant l'objet d'enquêtes des services de protection de l'enfant ont été étudiées en utilisant la deuxième cohorte du *National Survey of Child and Adolescent Well-Being* (NSCAW II). Les résultats de modèles de régression logistique à variable multiple qui contrôlaient des variables probablement déconcertantes ont montré que les probabilités des déficiences dans la cognition et le

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langage étaient bien plus élevées lorsque la négligence liée à la nourriture était la forme la plus sérieuse de maltraitance. Vu que la précarité alimentaire et la maltraitance de l'enfant sont liés à la pauvreté et aux problèmes de santé mentale parentale, il sera important que les services sociaux à l'enfance et les professionnels de la santé mentale travaillent ensemble afin d'améliorer la santé de ces enfants vulnérables.

Mots clés: Négligence alimentaire, Cognition, Langage

ZUSAMMENFASSUNG: Die Auswirkungen der Ernährungsunsicherheit auf die Entwicklung von Kindern in der allgemeinen US-Bevölkerung sind bestens bekannt, allerdings ist wenig über den Schaden bekannt, den die Vernachlässigung der Ernährung im Vergleich zu anderen Arten von Misshandlung verursacht. Aufgrund der schädlichen physiologischen Auswirkungen unzureichender Nährstoffe und der sozialen Auswirkungen von nahrungsbedingtem Stress wurde die Hypothese aufgestellt, dass die Vernachlässigung der Ernährung die kognitive und sprachliche Entwicklung von Säuglingen eher beeinträchtigen würde als physischer Missbrauch, sexueller Missbrauch und andere Formen der Vernachlässigung. Familien von Säuglingen ($N = 1951$), die von Kinderschutzbehörden untersucht wurden, wurden mit Hilfe der zweiten Kohorte der „National Survey of Child and Adolescent Well-Being“ (NSCAW II) erforscht. Die Ergebnisse der multivariablen logistischen Regressionsmodelle, die für mögliche Störvariablen kontrolliert wurden, zeigten, dass die Wahrscheinlichkeit einer Beeinträchtigung von Kognition und Sprache signifikant größer war, wenn die Vernachlässigung der Ernährung die schwerste Form der Misshandlung war. In Anbetracht der Tatsache, dass sowohl die Ernährungsunsicherheit als auch die Vernachlässigung von Kindern mit Armut und psychischen Problemen der Eltern verbunden sind, wird es wichtig sein, dass die Fachkräfte der Kinderfürsorge und psychischen Gesundheit gemeinsam daran arbeiten, die Gesundheit dieser gefährdeten Kinder zu verbessern.

Stichwörter: Vernachlässigung der Ernährung, Kognition, Sprache

抄録: アメリカの一般人口において、食料の不安定さが子どもの発達に与える影響は十分に確立されているが、他の種類の虐待と比べて、食べ物のネグレクトの危害についてはほとんど知られていない。不適切な栄養の有害な生理学的影響と、食べ物に関連したストレスの社会的影響のために、食べ物のネグレクトは、身体的虐待、性的虐待、および他の形のネグレクトよりも、乳児の認知及び言語の発達を損なう危険性が高いだろうという仮説が立てられた。児童保護サービスによって調査された乳児の家族 ($N = 1951$) が、児童思春期の福祉全国調査 National Survey of Child and Adolescent Well-Being (NSCAW II) の第2コホートをを用いて研究された。交絡の可能性のある変数をコントロールした多変量ロジスティック回帰モデルの結果、食べ物のネグレクトが虐待の最も深刻な形だったとき、認知と言語の障害のオッズが有意に大きいことが示された。食べ物の不安定さと子どものネグレクトの両者が貧困と親の精神保健の問題と関連することを考慮して、これらの脆弱な子どもたちのよりよい健康のために、子どもの福祉と精神保健の専門家が協働することが重要だろう。

キーワード: 食べ物のネグレクト, 認知, 言語

摘要: 美國一般人口中糧食不安全對兒童發展的影響已經確立, 但對於忽視食物與其他類型虐待的危害知之甚少。由於營養不足以及與食物有關的壓力的社會影響會對人體產生有害的生理影響, 因此假設忽略食物會比身體虐待、性虐待和其他形式的忽視更容易損害嬰兒的認知和語言發展。研究使用第二次全國兒童和青少年福利調查 (NSCAW II) 中被兒童保護服務機構調查的嬰兒家庭 ($N = 1951$)。多變量邏輯回歸模型分析數據, 控制了可能的混雜變量, 結果表明, 當忽視食物是最嚴重的虐待形式時, 認知和語言障礙的勝算顯著更大。糧食不安全和兒童忽視與貧困和父母心理健康問題有關, 兒童福利和心理健康專業人員共同努力, 改善這些易受傷害兒童的健康問題是非常重要的。

關鍵詞: 忽視食物, 認知, 語言

ملخص: لا شك أن اثر انعدام الأمن الغذائي علي نمو الطفل ثابت وموثق بالدراسات السابقة على مستوى الولايات المتحدة. ومع ذلك لا نعرف سوي القليل عن الضرر الذي يلحقه إهمال الطعام مقارنة بأنواع أخرى من سوء المعاملة. ونظرا للأثر الفسيولوجي الضار الناجم عن عدم كفاية المغذيات والأثر الاجتماعي للإجهاد العصبي المرتبط بالغذاء، كانت فرضية الدراسة أن إهمال الطعام هو الأكثر تأثيرا في إضعاف النمو المعرفي واللغوي للرضع أكثر من تأثير الإيذاء البدني والاعتداء الجنسي وأشكال أخرى من الإهمال. وتم دراسة أسر الرضع الذين تم بحثهم ضمن الخدمات الوقائية للطفل ($N = 1951$) باستخدام الفوج الثاني من الدراسة الاستقصائية الوطنية لرعاية الأطفال والمراهقين (NSCAW II). وأظهرت النتائج المستمدة من نماذج الانحدار اللوجستي أن احتمالات الضعف في الإدراك واللغة كانت أكبر بكثير عندما كان إهمال الغذاء هو أخطر أشكال سوء المعاملة. وباعتبار ان انعدام الأمن الغذائي وإهمال الأطفال مرتبطان بالفقر ومشاكل الصحة النفسية للوالدين، فإنه سيكون من المهم لاختصاصيي رعاية الأطفال والصحة النفسية العمل بصورة تعاونية من أجل تحسين صحة هؤلاء الأطفال المعرضين للمخاطر.

الكلمات الرئيسية: إهمال الطعام؛ الإدراك؛ اللغة

* * *

Families investigated for child maltreatment are an important population to infant mental health clinicians, as home-visitation programs such as the Nurse–Family Partnership and Parents-as-Teachers work to decrease child abuse and neglect and serve at-risk families (Olds, 2006). Of all forms of maltreatment experienced

by infants, neglect is a much more prominent (Sedlak et al., 2010) and, in some cases, a more developmentally harmful form of maltreatment than is physical or sexual abuse (see Hildyard & Wolfe, 2002). Neglect also is much harder to define and study because it encompasses numerous acts of omission, including inadequate

supervision, medical negligence, unsafe housing, and other ways that parents fail to provide for a child's basic needs. A parent's inability to provide adequate food can be reported to Child Protective Services (CPS) and investigated as child neglect. Identifying failure to provide food in the context of a CPS investigation suggests that there is a food deficit serious enough to harm children in the home. Studies have shown a strong link between food insecurity and impaired infant development in the general U.S. population (Rose-Jacobs et al., 2008). Although food neglect has been linked to chronic maltreatment (Helton, 2016) and future violence in adulthood (Vaughn, Salas-Wright, Naeger, Huang, & Piquero, 2016), no research to date has examined the impact of food neglect on infant development. This study explores the relationship between food neglect and impaired cognitive and language development in a national probability sample of infants involved in CPS investigations.

For this article, *food insecurity* is defined as lacking physical and economic access to sufficient quantities of affordable and nutritious food (Coleman-Jensen, Nord, Andrews & Carlson, 2011), and we define *food neglect* as a parent's failure to provide adequate food. While food neglect and food insecurity are likely to be related, they are not equivalent. Food neglect could be more severe than food insecurity if, for example, caregivers both lack access to food *and* are not adequately providing food that they can access. Or food neglect could be less severe than food insecurity if food is adequate and accessible, but caregivers' problems interfere with them providing their children food.

Other forms of maltreatment aside from food neglect can similarly impair cognitive and language development either through direct abuse, such as physical abuse or substance exposure in utero, or indirectly through neglectful relationships. Physical abuse, including shaking, can cause bruising, bleeding, and swelling of the brain, resulting in visual, motor, and cognitive impairment (Barlow, Thomson, Johnson, & Minns, 2005; Geddes et al., 2003; Kivlin, Simons, Lazoritz, & Ruttum, 2000). Substance exposure in utero—including alcohol, opiates, and cocaine exposure—can cause abnormal fetal growth and alter neurotransmitters and their receptors, resulting in learning, memory, and language delays in infancy (Behnke et al., 2013). The omission of nurturing care or developmentally appropriate supervision that CPS would identify as neglect also can disrupt the neurological development of infants at sensitive time periods and change neurohormonal secretions and synaptic connections (Glaser, 2000).

Previous research on the effects of physical neglect, which encompasses food neglect, on child development is relevant. In a sample of preschool-aged foster children and nonmaltreated peers, Bruce, Fisher, Pears, & Levine (2009) found that foster children with histories of physical neglect were more likely to have low morning cortisol levels. Low morning cortisol is an indication of chronic hyperactivity of the HPA axis, which can impair memory. In another recent study, Cicchetti, Rogosch, Howe, and Toth (2010) found that school-aged children with a history of both physical neglect with emotional abuse and low cortisol exhibited heightened false recognition memory, as compared to nonmaltreated peers.

Multiple child welfare studies have suggested that physical neglect is correlated with impaired development in young children even when the effect of other forms of maltreatment are controlled (English et al., 2005; O'Hara et al., 2015; Pears, Kim, & Fisher, 2008).

There has been less research on the impact of food neglect on infant language development, however. Scarborough, Lloyd, and Barth (2009), using a nationally representative sample of families investigated for child maltreatment, found that infants living with parents who were unable to provide basic necessities (including food, clothing, shelter, medical, and hygiene) were at 2.5 greater odds of a developmental delay in language and cognition at 18 and 36 months' postinvestigation than were infants living with parents who were unable to provide adequate supervision. Another study, conducted in rural Bangladesh, found that household food security was positively associated with language comprehension and expression in early childhood (Saha et al., 2010). With slightly older children (kindergarten to third grade), Jyoti, Frongillo, and Jones (2005) found that food insecurity was associated with poor academic performance, including reading ability.

Iron deficiency, the most common nutritional deficiency (Saloojee & Pettifor, 2001), has been associated with delayed infant and toddler cognition (Lozoff et al., 2006) and language development (Stoltzfus et al., 2001), with potentially long-lasting consequences. Food insecurity has been associated with iron deficiency in infants and toddlers (Park et al., 2009). Infant lack of food containing adequate vitamins and other micronutrients are likely to cause cognitive and language developmental delay as well as to contribute to behavioral problems (Bourre, 2006; Engle et al., 2007). Another study of housing instability and food insecurity has found that housing instability was associated with developmental risk (including language delay) and that children and households were at greater risk of food insecurity when housing was not stable (Cutts et al., 2011). There is a lack of evidence linking food neglect with infant language development using a child welfare sample.

Food neglect during the first year of life could be a particularly dangerous form of maltreatment since it is likely to affect development both directly, by depriving infants of nutrients, and indirectly, by contributing to disturbed infant–parent relationships. Adequate food, either breast milk or formula, is the most fundamental biological need of an infant's life. Neural maturation and formation of synaptic connections during the first year is critical for cognitive development, and nutritional deficiencies due to child hunger can permanently disrupt normal brain development (Beard, 2003). Neglecting this need over time represents an abusive neurophysiological series of events that directly impedes brain development. Both macronutrients (protein, fats, and carbohydrates) and micronutrients (vitamins, minerals, and trace elements) are important when rapid brain development is under way. Enzymes such as serotonin and norepinephrine, essential for brain growth, require iron for neurotransmitter synthesis (Zaslow et al., 2009). Iron deficiency, the most common form of malnutrition in the United States, has been found to disrupt cognitive and motor development and even impact emotional and behavioral regulation (Lozoff et al., 2003;

Lozoff & Georgieff, 2006). In addition, infants who are iron deficient are more likely to have problems regulating socioemotional behavior and are less likely to be soothed by a caregiver when stressed (Lozoff et al., 2003).

The stress mothers experience due to not being able to obtain enough healthy food is correlated with depression, low levels of involvement in parenting, and poor parenting practices (Bronte-Tinkew, Zaslow, Capps, Horowitz, & McNamara, 2007; Zaslow et al., 2009). The addition of child socioemotional difficulties may lead frustrated parents to withdraw from infants. Moreover, it is possible that food neglect is just one manifestation of other difficulties that parents have relating to infants and responding to their needs. These could include poverty, which is associated with food insecurity, and related stress, which impacts time and quality of parent–infant interactions (Chilton, Chyatte, & Breau, 2007); maternal depression, which is associated with food insecurity, poverty, and mother–child attachment (Casey et al., 2004; Coyl, Roggman, & Newland, 2002); domestic conflict, which also is associated with poverty and attachment (Barnett, Miller-Perrin, & Perrin, 2005; Owen & Cox, 1997); and exposure to violence, which is associated with food insecurity, poverty, and maternal depression (Chilton, Rabinowich, & Woolf, 2014; Clark et al., 2008). These deficits in their relationship to parents can reduce the stimulation that infants need for brain development and also can trigger the hypothalamic–pituitary–adrenal (HPA) axis to release cortisol when an infant feels frightened or insecure (Scarpa, 2004). Chronically high levels of cortisol are correlated with atrophy of hippocampal dendrites, which diminishes infants’ memory (Howe, Cicchetti, & Toth, 2006).

Research on physical neglect, however, has been limited in its ability to explain the effect of food neglect since it clusters inadequate provision of food with inadequate provision of clothes, shelter, hygiene, and medical care—five different deficits with five potentially different developmental consequences. Considering the neurobiological research on the physiological impact of nutritional deficiencies on infant neurological development, along with the additional detrimental impact of family food insecurity on mother–child interactions, food neglect may impair infant development more than inadequate provision of shelter, clothing, or hygiene; shelter, clothing, or hygiene neglect may not have a direct physiological impact on neurological development. Food neglect also may be more injurious than other forms of maltreatment, such as supervision neglect. To conclude, all forms of neglect are stressful to infants, not not all have a direct physiological effect like nutrient deprivation.

The present study constructs a statistical model to examine the relationship between food neglect with infant cognitive and language development while also controlling for other potentially confounding variables. The model is tested on a national probability sample of children ages 3 to 12 months in families involved in a child maltreatment investigation. We are not aware of a study that compares the effect of food neglect on infant development to the effect of other forms of abuse or neglect. Because little is known about food neglect as a separate phenomenon from other forms of

maltreatment, we also examine if parent, child, and investigative case characteristics of families with allegations of food neglect are different than are characteristics of families with other allegations of abuse and neglect.

METHOD

Sample

Data from the second cohort of the federally funded National Survey of Child and Adolescent Well-Being (NSCAW II; NSCAW Research Group, 2002) study were used. The NSCAW II study sampled cases from U.S. CPS investigations that were closed between February 2008 and April 2009 in 83 counties nationwide; each county provided 40 to 200 sampled children (Dolan et al., 2011). Once children were sampled, their siblings were ineligible for the study to prevent overlapping results from same-family environments. The cohort included substantiated and unsubstantiated investigations as well as cases who received child welfare services and those who did not. At the time of the interview, which included direct assessments of children as well as caregiver interviews, children could be living in-home with biological parents or in out-of-home care with a foster caregiver. To ensure adequate statistical power, the sample design oversampled infants and cases receiving ongoing services after investigation. The NSCAW II subsample analyzed here consisted of these infants, 3 through 12 months of age, whose family was investigated for child abuse or neglect ($N = 1,951$).

Measures

Predictor variable. A standardized measure of family or child food insecurity was not available; instead, the predictor variable was the most serious type of alleged maltreatment, as reported by the CPS case investigator at baseline. CPS investigators were asked to select from the following allegations: physical abuse, physical neglect, supervision neglect, substance exposure in utero or substance-abusing parent,¹ domestic violence exposure, or other, which included sexual abuse, emotional abuse, abandonment, and children in need of services. Food neglect was a subsection of physical neglect, but was treated as a separate category for this study by subdividing physical neglect as follows: allegations including food neglect and allegations not involving food neglect (i.e., inadequate clothing, shelter, medical care, or hygiene). Therefore, food neglect was not a separate category from physical neglect but included physical neglect allegations that contained food neglect. Physical neglect allegations that included a food neglect allegation will be described as “food neglect” for the rest of the article. There were five categories of food neglect severity reported by

¹Allegations that newborns were exposed to illegal substances in utero were combined with substance-abusing parent allegations, as 29 states do not even classify substance exposure of infants as child maltreatment (Child Welfare Information Gateway, 2013).

the caseworker: mild (*no regular meals*), moderate (*caregiver does not ensure that food is available*), serious (*frequently missed meals*), severe (*poor nourishment to point that child fails to gain weight or grow as expected*), and grave (*poor nourishment to point that child has severe physical consequences*). Due to the small number of cases reporting severity ($n = 61$), this variable could not be used in the analysis but was used for descriptive purposes only.

Outcome variables. Cognitive functioning was assessed by trained NSCAW interviewers using the cognitive domain of the Battelle Developmental Inventory (BDI-2; Newborg, 2005), and language development was assessed by the Preschool Language Scale-3 (PLS; Zimmerman, Steiner, & Pond, 1992). The BDI-2 is a standardized, interviewer-administered assessment of attention, memory, perception, and conceptual recognition (Newborg, 2005). These four subdomains had a standardized mean score of 100 and an *SD* of 15; they were combined and averaged into a standardized composite measure of cognition for this study. The PLS measured both receptive communication skills and expressive communication skills (Zimmerman et al., 1992). The PLS had a standardized mean score of 100 and an *SD* of 15; the receptive and expressive subdomains also were combined and averaged. Both BDI-2 and PLS score distributions were positively skewed, which, if left continuous, would violate the assumptions of ordinary least squares regression that errors are normally distributed. Therefore, infants scoring more than 1.5 *SDs* below the mean on either the BDI-2 or the PLS were categorized as impaired. Further, many states require infants and toddlers to be 1.5 *SDs* below the population mean of standardized tests to be considered eligible for early intervention services to address delays in development.

Covariates. Potential confounding variables correlated with delayed cognitive and language development were included in regression models as covariates. These include the demographic characteristics of race (Fuller et al., 2009), age (Chugani, Phelps, & Mazziotta, 1987) and gender (Kimura, 2000), which were collected at each wave during the caregiver interview. It also included caseworker-reported social and familial risks that also could have influenced child development, including whether there had been a prior maltreatment investigation (Jonson-Reid, Kohl, & Drake, 2012); whether a parent had a serious mental health problem at the time of the investigation (Conroy et al., 2012); whether the family had trouble paying for basic necessities such as food, shelter, clothing, electricity, or heat (Scarborough et al., 2009); and whether the allegation(s) were substantiated. Because infants placed with foster parents enter a different environment than those children in CPS investigations who are left in home with biological parents (Barth et al., 2008), we also controlled for placement into out-of-home care following the investigation, which was reported by the caseworker.

Analytic Approach

All analyses were performed using STATA Statistical Software Release 13. Due to NSCAW's complex sampling design, special STATA survey commands were applied to obtain unbiased estimates of population parameters (NSCAW Research Group, 2002). All percentages were adjusted, or weighted, for sample probabilities. The association of maltreatment type, including food neglect, with child demographic and maltreatment case characteristics was examined with bivariate contingency table analysis using the Pearson χ^2 test. To account for the complex survey design, χ^2 statistics were converted to *F* statistics with noninteger degrees of freedom, using a second-order Rao and Scott correction (StataCorp, 2015). Separate multivariable logistic regressions were then used to model differences in odds of cognitive and language impairment between infants experiencing different types of maltreatment allegations, food neglect being one, controlling for the likely confounding variables listed earlier. Missing data were limited to less than 1% and therefore did not require adjustments in the analysis. The final weighted sample represented 204,386 infants across the United States served by child welfare.

RESULTS

As shown in Table 1, 3% of all investigations of infants involved an allegation of food neglect; 88% of those allegations were reported by the caseworker as "moderate" to "grave" food neglect. The greatest percentage of cases was investigated due to parental substance abuse or infant substance exposure in utero. Child age was equally distributed, and the majority of children were White or Hispanic. A slightly greater number of the children were male. A little more than 1 in 3 families had trouble paying their monthly bills, a little less than 1 in 3 families had been investigated for maltreatment in the past, 1 in 5 parents had a serious mental health problem, and 40% of the allegations were substantiated. Only 18% of infants were placed in out-of-home care following an investigation. Overall, a smaller percentage of children had a cognitive impairment (4%) versus a language impairment (11%).

Food Neglect and Demographics

Bivariate results (Table 2) show that food neglect was significantly associated with race/ethnicity, with White children making up a higher proportion of cases than for other forms of maltreatment, $\chi^2(10, n = 1,693) = 3.08, p = .01$. Previous CPS involvement was significantly less common for food neglect cases than for cases involving physical abuse, substance abuse, and the other maltreatment category, $\chi^2(6, n = 1,668) = 2.90, p = .03$. A substantially larger percentage (41%) of children in cases with food neglect allegations, $\chi^2(6, n = 1,665) = 2.71, p = .03$, were placed in out-of-home care following the investigation, as compared to cases with other allegations (The next highest was physical abuse at 25%).

TABLE 1. Sample Characteristics ($N = 1,951$)^a

	%	SE
Child Age (months)		
3–6	50	3.67
7–12	50	3.67
Child Race/Ethnicity		
White	37	6.37
African American	33	4.1
Hispanic	37	3.21
Other ^b	7	2.58
Child Gender		
Female	47	3.38
Male	53	3.38
Family Has Trouble Paying Bills		
Yes	36	4.06
No	64	4.06
Caregiver Serious MH Problem		
Yes	21	3.73
No	79	3.73
Prior CPS Investigation		
Yes	31	3.73
No	69	3.73
Allegation Outcome		
Substantiated or Indicated	40	3.85
Neither Substantiated or Indicated	60	3.85
Placement Following Investigation		
Out of Home	18	2.55
In Home	82	2.55
Maltreatment		
Physical Abuse	10	2.92
Physical Neglect Not Reporting Food Neglect	9	3.84
Supervision Neglect	18	4.19
Substance Exposure/Parent	30	2.66
Domestic Violence	9	2.64
Other	21	2.87
Physical Neglect Reporting Food Neglect	3	0.83
Cognitive Impairment	4	0.86
Language Impairment	11	2.67

Note. CPS = Child Protective Services; MH = mental health; CI = 95% confidence intervals.

^aPercentages are weighted to the U.S. population.

^bincluding American Indian, Alaskan Native, Asian, Native Hawaiian, or other Pacific Islander.

Food Neglect and Cognitive Impairment

Table 3 shows the bivariate associations between impaired cognition, covariates, and most serious allegation type in the first set of columns. A greater percentage of children with a substantiated allegation had impaired cognition (8%), as compared to neither substantiated or indicated (2%), $\chi^2(3, n = 1,951) = 23.29, p = .001$. A greater percentage of children placed in out-of-home care had impaired cognition (10%), as compared to those left in-home (3%), $\chi^2(3, n = 1,951) = 12.96, p = .01$. There was no bivariate association between cognitive impairment and most serious allegation type. Table 3 also reports the adjusted odds ratios (OR) from multivariable logistic regression models explaining child cogni-

tive impairment and the statistical significance of those OR in the second set of columns. Hispanic children were at greater odds of cognitive impairment versus White children, OR = 3.07, $p = .01$. Food neglect was used as a reference group to assess the relative risk of other forms of maltreatment. Infants with allegations of physical abuse, OR = .19, $p = .03$, domestic violence, OR = .12, $p = .01$, and other types of maltreatment, OR = .16, $p = .01$, were at a decreased odds of cognitive impairment versus infants with allegations of food neglect.

Food Neglect and Language Impairment

Table 4 shows in the first set of columns that there was no bivariate association between covariates or most serious type of allegation and impaired language. In the multivariate analysis, seen in the second set of columns, Hispanic children were at greater odds of language impairment, as compared to White children, OR = 3.18, $p = .02$, and girls were at decreased odds of language impairment, as compared to boys, OR = .39, $p = .03$. Infants with allegations of physical neglect, OR = .08, $p = .01$, supervision neglect, OR = .20, $p = .01$, and domestic violence, OR = .19, $p = .03$, were at a decreased odds of language impairment, as compared to infants with allegations of food neglect.

DISCUSSION

It has been well-established that maltreatment and food insecurity have long-lasting and harmful developmental consequences for children, especially very young children (Cicchetti & Toth, 2005; Cook et al., 2004). Our task with this study was to assess the effect of food neglect on cognitive and language development compared to non-food-related maltreatment. The analysis controlled for factors that could influence development, including parent mental health and indicators of severe poverty. Only a small percentage of infants aged 3 to 12 months experienced food neglect, and there were no bivariate relationships between food neglect and infant development. However, the multivariate results indicate that food neglect may have a greater detrimental effect on infant development than may other forms of maltreatment when controlling for other child and family covariates, with the exception of children being exposed to substances in utero or living with a substance-abusing parent.

We hypothesized that physiologically injurious events or abuses may be more likely to be traumatic for cognitive development than may emotional relationships that trigger a stress response. Due to the severe nature of the food neglect these infants were experiencing, nutritional deficiencies—a physiologically injurious event—are likely. We lacked the data, however, to determine to what extent the food neglect experienced by infants directly impacted development through nutrient deficiencies versus indirectly through disrupted and disordered mother-child interactions. Although the effect of food neglect specifically on child development has never been appraised in a child welfare sample, the results of this study are comparable to previous works

TABLE 2. Child Demographic, Investigation Case Characteristics, and Child Developmental Outcomes by Type of Maltreatment Allegation ($N = 1,951$)^a

	Physical Abuse		Physical Neglect ^b		Supervision Neglect		Substance Abuse		Domestic Violence		Other		Food Neglect	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Age (months)														
3–6	55	13.04	65	19.32	37	11.94	64	8.34	32	14.83	45	9.36	33	10.51
7–12	45	13.04	35	19.32	63	11.94	36	8.34	68	14.83	55	9.36	67	10.51
Race**														
White	54	12.11	15	9.44	36	12.95	35	7.02	31	10.73	42	10.14	61	12.10
African American	32	12.09	76	13.63	28	8.95	28	7.76	55	12.30	17	4.84	18	7.52
Hispanic	13	3.43	7	4.69	31	9.12	33	8.62	11	3.86	21	5.56	17	7.67
Other	1	0.92	2	1.31	5	3.69	4	2.29	4	2.15	21	12.12	4	2.81
Female	32	11.22	34	19.38	41	7.11	51	7.39	48	13.46	59	8.82	49	13.51
Trouble Paying Bills	27	13.76	13	7.41	40	13.42	40	6.92	31	13.32	45	10.81	31	10.05
Caregiver MH	12	3.46	28	16.55	15	5.24	28	7.41	9	3.18	21	6.00	47	14.11
Prior Investigation*	36	12.60	10	5.86	16	6.12	31	7.91	21	8.72	53	10.49	20	7.26
Substantiated	26	6.00	18	10.56	30	5.49	55	7.72	34	9.03	46	11.95	57	15.27
Out of Home*	25	9.40	10	5.49	10	3.41	24	4.85	7	2.46	17	4.80	41	12.76

Note. MH = mental health; CPS = Child Protective Services.

^aPercentages are weighted to the U.S. population.

^bwithout a food neglect allegation.

* $p < .05$. ** $p < .01$.

that have shown a correlation between physical neglect and cognitive impairment (English et al., 2005; Geoffroy, Pereira, Li, & Power (2016); O'Hara et al., 2015; Pears et al., 2008), lack of basic necessities and cognitive and language impairment (Scarborough et al., 2009), and food security and positive language development (Saha et al., 2010). The increased odds of Hispanic infants with a developmental impairment as compared to White children in this study also is consistent with their risk profile in the general U.S. population (Fuller et al., 2009).

These results have important practice and policy implications for the field of public health, child mental health, and child welfare. The U.S. Department of Health and Human Service's (2012) *Healthy People 2020* has set a goal of reducing the number of infants who are iron-deficient. Intervening with maltreating families reported for food neglect by CPS is one potentially effective way to reduce the number of infants with iron deficiency. When food neglect is identified by CPS, caseworkers should act to increase families' participation in the Supplemental Nutritional Assistance Program (SNAP); Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); and child and daycare programs that participate in the Child and Adult Care Food Program, which provides free nutritious meals and snacks. However, it is unknown how many families involved with CPS are currently using formal or informal food assistance. Future research is needed on this issue.

The significantly greater impact of food neglect on cognitive and language development as compared to other types of maltreatment suggests that assessing and responding to this form of maltreatment should be a priority for CPS. We recommend training CPS workers on how to assess and respond to food neglect in the

home at the time of investigation. Investigators should ask parents how they are able to identify infant hunger cues, the amount and type of food provided, and if restricting feedings are ever used as punishment. It also is important to assess household food insecurity, as the lack of food accessible to the family may impact food neglect, particularly nutritional deficiencies. A simple, two-question screener used by pediatricians in a clinical setting also may be applicable to CPS investigators and caseworkers when trying to assess food adequacy and accessibility. This method involves simply asking parents two questions regarding (a) whether food is running out and (b) when it does, whether families have enough money to get more (Hager et al., 2010). Finally, CPS investigators, caseworkers, and administrative staff need to be aware of the eligibility requirements and availability of federal, state, and local food-assistance programs in their state and community to help support families struggling with food insecurity. Investigators and caseworkers must be frontline contacts for programs such as SNAP, WIC, and local food pantries. The field of child welfare has an opportunity to address the depression and mental health problems of food-insecure mothers while also providing concrete financial and food assistance to families.

CPS investigators and caseworkers are not the only groups that may encounter children experiencing food neglect. Infant mental health clinicians, who work with multiple risk families, are in the position to identify and mitigate food neglect in at-risk homes. If not already, infant mental health clinicians could easily be trained to administer the two-question, food-insecurity screener described earlier and in how to mitigate food insecurity through referrals to SNAP and WIC. Other resources and services could include transportation to grocery stores or food pantries as well as education

TABLE 3. *Percentage With Cognitive Impairment by Child Demographics, Investigation Case Characteristics, and Maltreatment (N = 1,951)^a*

	%	SE	Odds Ratio	SE
Child Age (months)				
3–6	3	0.83	1.44	0.50
7–12	5	1.32		
Child Race/Ethnicity				
African American	5	1.37	1.64	0.77
Hispanic	6	1.75	3.07**	1.27
Other	4	2.10	1.74	1.06
White	3	0.98		
Child Gender				
Female	4	0.92	0.58	0.19
Male	5	1.12		
Trouble Paying Bills				
Yes	5	1.62	0.65	0.23
No	4	0.82		
Caregiver MH				
Yes	9	2.19	1.24	0.47
No	3	0.79		
Prior Investigation				
Yes	5	1.50	1.05	0.28
No	4	0.94		
Allegation Outcome				
Substantiated	8**	1.60	2.39	1.10
Neither Substantiated or Indicated	2	0.60		
Placement				
Out of Home	10*	1.98	2.15	0.91
In Home	3	0.84		
Maltreatment				
Physical Abuse	3	1.30	0.19*	0.15
Physical Neglect	6	3.49	0.58	0.57
Supervision Neglect	2	0.99	0.21	0.19
Substance Exposure/Parent	7	1.79	0.37	0.30
Domestic Violence	2	1.44	0.12*	0.11
Other	4	1.83	0.16*	0.12
Food Neglect	12	6.78		

Note. MH = mental health; CPS = Child Protective Services.

^aAll models are weighted to the U.S. population.

* $p < .05$. ** $p < .01$.

for parents on infant and toddler nutritional needs. In addition, the results of this study point to just how critical the assessment and management of inadequate feeding practices are for at-risk infants. When discussing developmental guidelines with new parents, either in the home or in a clinical setting, it is critical to assure that parents understand how to properly identify hunger cues and adequately feed their baby. This will require asking questions about frequency of feedings (whether breastfeeding or bottle feeding), fullness cues, and what kind of food and drinks are developmentally appropriate for a child's changing nutritional needs. This is not only important for a child's dietary needs; feedings also provide parents an opportunity to interact with their infants and potentially bolster attachment if parents are sensitive to their child's cues (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003).

TABLE 4. *Percentage With Language Impairment by Child Demographics, Investigation Case Characteristics, and Maltreatment (N = 1,951)^a*

	%	SE	Odds Ratio	SE
Child Age (months)				
3–6	14	3.81	1.07	0.52
7–12	10	2.47		
Child Race/Ethnicity				
African American	14	6.09	3.12	2.53
Hispanic	18	7.89	3.18*	1.62
Other	6	3.26	1.38	0.89
White	7	2.45		
Child Gender				
Female	10	3.24	.39*	0.17
Male	13	3.27		
Family Has Trouble Paying Bills				
Yes	15	5.69	1.18	0.48
No	8	1.90		
Caregiver Serious MH Problem				
Yes	17	4.44	2.13	1.18
No	9	2.98		
Prior CPS Investigation				
Yes	10	4.14	.72	0.44
No	10	2.80		
Allegation Outcome				
Substantiated or Indicated	12	2.71	1.38	0.47
Neither Substantiated or Indicated	11	3.54		
Placement Following Investigation				
Out of Home	17	2.34	1.13	0.49
In Home	11	3.03		
Maltreatment				
Physical Abuse	13	7.33	.82	0.79
Physical Neglect	3	2.22	.08*	0.09
Supervision Neglect	6	2.28	.20*	0.14
Substance Exposure/Parent	15	4.58	.45	0.31
Domestic Violence	4	1.64	.19*	0.16
Other	14	5.14	.86	0.63
Food Neglect	17	7.65		

Note. MH = mental health; CPS = Child Protective Services.

^aAll models are weighted to the U.S. population.

* $p < .05$. ** $p < .01$.

The current study has limitations to consider. First, our measure of maltreatment was confined to either a single allegation or, if multiple allegations are reported, the most serious type as determined by the investigator. Recent studies have advocated for profiles of maltreatment to be developed (Jackson, Gabrielli, Fleming, Tunno, & Makanui, 2014). These profiles include all forms of maltreatment experienced by the child, the severity and frequency of each type, and the age of onset. Although creating profiles is important considering that most children are investigated for multiple types of maltreatment (Casanueva, Smith, Dolan, & Ringeisen, 2011), this study was more exploratory and concerned with parsing out the effects of one type of maltreatment. Second, 49% ($n = 30$) of the food neglect cases included another allegation of abuse or neglect; these allegations were not considered as serious by the

CPS investigator as was food deprivation. Therefore, it is unclear if inadequate nutrition had a truly independent effect on infant development. It is possible that food neglect is a consequence of other types of maltreatment and only detrimental to infant health when combined with other forms of abuse or neglect. Third, we were only able to control for a limited number of family factors since some children were placed in foster care following the investigation. Therefore, only family characteristics as explained by the caseworker that were present at the time of the investigation were available. We were thus unable to control for issues such as maternal impulsivity, intelligence, and educational levels. Fourth, since the measure of food neglect used had to exceed a threshold of severity to be identified as child maltreatment, it possibly represented extreme cases of food deprivation and not an indication of less severe forms of household food insecurity. This analysis, in all likelihood, underreported the number of food-insecure child welfare involved families.

The article also had several strengths. To our knowledge, this is the first study to examine the relationship between food neglect and infant developmental outcomes and to compare food neglect to other forms of maltreatment. In addition, we believe it is the first study to separate food neglect conceptually from other forms of physical neglect. Indeed, this is one of only a handful of studies that has attempted to disaggregate the effects of different neglectful acts. Third, these results come from a nationally representative sample, meaning the weighted percentages reported are representative of all infants from high-risk families investigated by CPS across the country.

Conclusion

Although it is difficult to infer specific biological or social mechanisms at play, we assume that the failure to provide nutritious food is likely to disrupt normal infant development both directly, by depriving infants of nutrients, and indirectly, by causing stress that interferes with brain development. Our results demonstrate that providing infants with adequate food is as critical to cognitive and language development as is the prevention of other forms of child abuse and neglect. Considering that both food-related hardships and child neglect are products of poverty, family dysfunction, and parental mental health (Fallon, Ma, Black, & Wekerle, 2011; Westad & McConnell, 2012), it is critical to continue to study how family food problems affect child well-being.

REFERENCES

- Bakermans-Kranenburg, M.J., van IJendoorn, M.H., & Juffer, F. (2003). Less is more: Meta-analyses of sensitivity and attachment interventions in early childhood. *Psychological Bulletin*, 129(2), 195. <https://doi.org/10.1037/0033-2909.129.2.195>
- Barlow, K.M., Thomson, E., Johnson, D., & Minns, R.A. (2005). Late neurologic and cognitive sequelae of inflicted traumatic brain injury in infancy. *Pediatrics*, 116(2), e174–e185. <https://doi.org/10.1542/peds.2004-2739>
- Barnett, O., Miller-Perrin, C.L., & Perrin, R.D. (2005). *Family violence across the lifespan: An introduction*. Newbury Park, CA: Sage.
- Barth, R.P., Green, R., Webb, M.B., Wall, A., Gibbons, C., & Craig, C. (2008). Characteristics of out-of-home caregiving environments provided under child welfare services. *Child Welfare*, 87(3), 5–39.
- Beard, J. (2003). Iron deficiency alters brain development and functioning. *Journal of Nutrition*, 133(5), 1468S–1472S.
- Behnke, M., Smith, V.C., Levy, S., Ammerman, S.D., Gonzalez, P.K., Ryan, S.A. et al. (2013). Prenatal substance abuse: Short- and long-term effects on the exposed fetus. *Pediatrics*, 131(3), e1009–e1024. <https://doi.org/10.1542/peds.2012-3931>
- Bourre, J.-M. (2006). Effects of nutrients (in food) on the structure and function of the nervous system: Update on dietary requirements for brain. Part 1: Micronutrients. *Journal of Nutrition Health and Aging*, 10(5), 377–385.
- Bronte-Tinkew, J., Zaslow, M., Capps, R., Horowitz, A., & McNamara, M. (2007). Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. *Journal of Nutrition*, 137(9), 2160–2165.
- Bruce, J., Fisher, P.A., Pears, K.C., & Levine, S. (2009). Morning cortisol levels in preschool-aged foster children: Differential effects of maltreatment type. *Developmental Psychobiology*, 51(1), 14–23. <https://doi.org/10.1002/dev.20333>
- Casanueva, C., Smith, K., Dolan, M., & Ringeisen, H. (2011). NSCAW II Baseline Report: Maltreatment (OPRE Report No. 2011-27c). Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families, Office of Planning, Research and Evaluation.
- Casey, P., Goolsby, S., Berkowitz, C., Frank, D., Cook, J., Cutts, D. et al. (2004). Maternal depression, changing public assistance, food security, and child health status. *Pediatrics*, 113(2), 298–304. <https://doi.org/10.1542/peds.113.2.298>
- Child Welfare Information Gateway. (2013). *Making and screening reports of child abuse and neglect*. Washington, DC: U.S. Department of Health and Human Services.
- Chilton, M., Chyatte, M., & Breaux, J. (2007). The negative effects of poverty & food insecurity on child development. *Indian Journal of Medical Research*, 126(4), 262–272.
- Chilton, M.M., Rabinowich, J.R., & Woolf, N.H. (2014). Very low food security in the USA is linked with exposure to violence. *Public Health Nutrition*, 17(1), 73–82. <https://doi.org/10.1017/S1368980013000281>
- Chugani, H.T., Phelps, M.E., & Mazziotta, J.C. (1987). Positron emission tomography study of human brain functional development. *Annals of Neurology*, 22(4), 487–497. <https://doi.org/10.1002/ana.410220408>
- Cicchetti, D., Rogosch, F.A., Howe, M.L., & Toth, S.L. (2010). The effects of maltreatment and neuroendocrine regulation on memory performance. *Child Development*, 81(5), 1504–1519. <https://doi.org/10.1111/j.1467-8624.2010.01488.x>
- Cicchetti, D., & Toth, S.L. (2005). Child maltreatment. *Annual Review of Clinical Psychology*, 1, 409–438. <https://doi.org/10.1146/annurev.clinpsy.1.102803.144029>

- Clark, C., Ryan, L., Kawachi, I., Canner, M.J., Berkman, L., & Wright, R.J. (2008). Witnessing community violence in residential neighborhoods: A mental health hazard for urban women. *Journal of Urban Health*, 85(1), 22–38. <https://doi.org/10.1007/s11524-007-9229-8>
- Coleman-Jensen, A., Nord, M., Andrews, M., & Carlson, S. (2011). Household food security in the United States in 2010 (Economic Research Report No. ERR-125). Washington, DC: U.S. Department of Agriculture, Economic Research Service.
- Conroy, S., Pariente, C.M., Marks, M.N., Davies, H.A., Farrelly, S., Schacht, R., & Moran, P. (2012). Maternal psychopathology and infant development at 18 months: The impact of maternal personality disorder and depression. *Journal of the American Academy of Child & Adolescent Psychiatry*, 51(1), 51–61. <https://doi.org/10.1016/j.jaac.2011.10.007>
- Cook, J.T., Frank, D.A., Berkowitz, C., Black, M.M., Casey, P.H., Cutts, D.B. et al. (2004). Food insecurity is associated with adverse health outcomes among human infants and toddlers. *Journal of Nutrition*, 134(6), 1432–1438.
- Coyle, D.D., Roggman, L.A., & Newland, L.A. (2002). Stress, maternal depression, and negative mother–infant interactions in relation to infant attachment. *Infant Mental Health Journal*, 23(1–2), 145–163. <https://doi.org/10.1002/imhj.10009>
- Cutts, D.B., Meyers, A.F., Black, M.M., Casey, P.H., Chilton, M., Cook, J.T. et al. (2011). US housing insecurity and the health of very young children. *American Journal of Public Health*, 101(8), 1508–1514. <https://doi.org/10.2105/AJPH.2011.300139>
- Dolan, M., Smith, K., Casanueva, C., Ringeisen, H., Dolan, M., Smith, K. et al. (2011). NSCAW II Baseline Report: Introduction to NSCAW II final report. Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families, Office of Planning, Research and Evaluation.
- Engle, P.L., Black, M.M., Behrman, J.R., De Mello, M.C., Gertler, P.J., Kapiriri, L. et al. (2007). Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. *The Lancet*, 369(9557), 229–242. [https://doi.org/10.1016/S0140-6736\(07\)60112-3](https://doi.org/10.1016/S0140-6736(07)60112-3)
- English, D.J., Upadhyaya, M.P., Litrownik, A.J., Marshall, J.M., Runyan, D.K., Graham, J.C., & Dubowitz, H. (2005). Maltreatment's wake: The relationship of maltreatment dimensions to child outcomes. *Child Abuse & Neglect*, 29(5), 597–619. <https://doi.org/10.1016/j.chiabu.2004.12.008>
- Fallon, B., Ma, J., Black, T., & Wekerle, C. (2011). Characteristics of young parents investigated and opened for ongoing services in child welfare. *International Journal of Mental Health and Addiction*, 9(4), 365–381. <https://doi.org/10.1007/s11469-011-9342-5>
- Fuller, B., Bridges, M., Bein, E., Jang, H., Jung, S., Rabe-Hesketh, S. et al. (2009). The health and cognitive growth of Latino toddlers: At risk or immigrant paradox? *Maternal and Child Health Journal*, 13(6), 755–768. <https://doi.org/10.1007/s10995-009-0475-0>
- Geddes, J.F., Tasker, R.C., Hackshaw, A.K., Nickols, C.D., Adams, G.G.W., Whitwell, H.L., & Scheimberg, I. (2003). Dural haemorrhage in non-traumatic infant deaths: Does it explain the bleeding in 'shaken baby syndrome'? *Neuropathology and Applied Neurobiology*, 29(1), 14–22. <https://doi.org/10.1046/j.1365-2990.2003.00434.x>
- Geoffroy, M.C., Pereira, S.P., Li, L., & Power, C. (2016). Child neglect and maltreatment and childhood-to-adulthood cognition and mental health in a prospective birth cohort. *Journal of the American Academy of Child & Adolescent Psychiatry*, 55(1), 33–40. <https://doi.org/10.1016/j.jaac.2015.10.012>
- Glaser, D. (2000). Child abuse and neglect and the brain—A review. *Journal of Child Psychology and Psychiatry*, 41(01), 97–116.
- Hager, E.R., Quigg, A.M., Black, M.M., Coleman, S.M., Heeren, T., Rose-Jacobs, R. et al. (2010). Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics*, 126(1), e26–e32. <https://doi.org/10.1542/peds.2009-3146>
- Helton, J.J. (2016). Food neglect and maltreatment re-report. *Children and Youth Services Review*, 71, 77–83. <https://doi.org/10.1016/j.childyouth.2016.10.042>
- Hildyard, K.L., & Wolfe, D.A. (2002). Child neglect: Developmental issues and outcomes. *Child Abuse & Neglect*, 26(6), 679–695. [https://doi.org/10.1016/S0145-2134\(02\)00341-1](https://doi.org/10.1016/S0145-2134(02)00341-1)
- Howe, M.L., Cicchetti, D., & Toth, S.L. (2006). Children's basic memory processes, stress, and maltreatment. *Development and Psychopathology*, 18(03), 759–769. <https://doi.org/10.1017/S0954579406060378>
- Jackson, Y., Gabrielli, J., Fleming, K., Tunno, A.M., & Makanui, P.K. (2014). Untangling the relative contribution of maltreatment severity and frequency to type of behavioral outcome in foster youth. *Child Abuse & Neglect*, 38(7), 1147–1159. <https://doi.org/10.1016/j.chiabu.2014.01.008>
- Jonson-Reid, M., Kohl, P. L., & Drake, B. (2012). Child and adult outcomes of chronic child maltreatment. *Pediatrics*, 129(5), 839–845. <https://doi.org/10.1542/peds.2011-2529>
- Jyoti, D.F., Frongillo, E.A., & Jones, S.J. (2005). Food insecurity affects school children's academic performance, weight gain, and social skills. *Journal of Nutrition*, 135(12), 2831–2839.
- Kimura, D. (2000). Sex and cognition. Cambridge, MA: MIT Press
- Kivlin, J.D., Simons, K.B., Lazowitz, S., & Ruttum, M.S. (2000). Shaken baby syndrome. *Ophthalmology*, 107(7), 1246–1254. [https://doi.org/10.1016/S0161-6420\(00\)00161-5](https://doi.org/10.1016/S0161-6420(00)00161-5)
- Lozoff, B., Beard, J., Connor, J., Felt, B., Georgieff, M., & Schallert, T. (2006). Long-lasting neural and behavioral effects of iron deficiency in infancy. *Nutrition Reviews*, 64(Suppl. 2), S34–S43. <https://doi.org/10.1111/j.1753-4887.2006.tb00243.x>
- Lozoff, B., De Andraca, I., Castillo, M., Smith, J.B., Walter, T., & Pino, P. (2003). Behavioral and developmental effects of preventing iron-deficiency anemia in healthy full-term infants. *Pediatrics*, 112(4), 846–854.
- Lozoff, B., & Georgieff, M.K. (2006). Iron deficiency and brain development. In H. Goebel (Ed.) *Seminars in Pediatric Neurology* (Vol. 13, No. 3, pp. 158–165). Philadelphia: W.B. Saunders. <https://doi.org/10.1016/j.spen.2006.08.004>
- Newborg, J. (2005). *Battelle Developmental Inventory*, 2nd ed. Itasca, IL: Riverside.
- NSCAW Research Group. (2002). Methodological lessons from the National Survey of Child and Adolescent Well-Being:

- The first three years of the USA's first national probability study of children and families investigated for abuse and neglect. *Children and Youth Services Review*, 24(6–7), 513–541. [https://doi.org/10.1016/S0190-7409\(02\)00199-8](https://doi.org/10.1016/S0190-7409(02)00199-8)
- O'Hara, M., Legano, L., Homel, P., Walker-Descartes, I., Rojas, M., & Laraque, D. (2015). Children neglected: Where cumulative risk theory fails. *Child Abuse & Neglect*, 45, 1–8. <https://doi.org/10.1016/j.chiabu.2015.03.007>
- Olds, D.L. (2006). The nurse-family partnership: An evidence-based preventive intervention. *Infant Mental Health Journal*, 27(1), 5–25. <https://doi.org/10.1002/imhj.20077>
- Owen, M.T., & Cox, M.J. (1997). Marital conflict and the development of infant-parent attachment relationships. *Journal of Family Psychology*, 11(2), 152–164. <https://doi.org/10.1037/0893-3200.11.2.152>
- Park, K., Kersey, M., Geppert, J., Story, M., Cutts, D., & Himes, J.H. (2009). Household food insecurity is a risk factor for iron-deficiency anaemia in a multi-ethnic, low-income sample of infants and toddlers. *Public Health Nutrition*, 12(11), 2120–2128. <https://doi.org/10.1017/S1368980009005540>
- Pears, K.C., Kim, H.K., & Fisher, P.A. (2008). Psychosocial and cognitive functioning of children with specific profiles of maltreatment. *Child Abuse & Neglect*, 32(10), 958–971. <https://doi.org/10.1016/j.chiabu.2007.12.009>
- Rose-Jacobs, R., Black, M.M., Casey, P.H., Cook, J.T., Cutts, D.B., Chilton, M. et al. (2008). Household food insecurity: Associations with at-risk infant and toddler development. *Pediatrics*, 121(1), 65–72. <https://doi.org/10.1542/peds.2006-3717>
- Saha, K.K., Tofail, F., Frongillo, E.A., Rasmussen, K.M., Arifeen, S.E., Persson, L.-Å. et al. (2010). Household food security is associated with early childhood language development: Results from a longitudinal study in rural Bangladesh. *Child: Care, Health and Development*, 36(3), 309–316. <https://doi.org/10.1111/j.1365-2214.2009.01049.x>
- Saloojee, H., & Pettifor, J.M. (2001). Iron deficiency and impaired child development: The relation may be causal, but it may not be a priority for intervention. *BMJ: British Medical Journal*, 323(7326), 1377–1378.
- Scarborough, A.A., Lloyd, E.C., & Barth, R.P. (2009). Maltreated infants and toddlers: Predictors of developmental delay. *Journal of Developmental & Behavioral Pediatrics*, 30(6), 489–498. <https://doi.org/10.1097/DBP.0b013e3181c35df6>
- Scarpa, A. (2004). The effects of child maltreatment on the hypothalamic-pituitary-adrenal axis. *Trauma, Violence, & Abuse*, 5(4), 333–352. <https://doi.org/10.1177%2F1524838004269486>
- Sedlak, A.J., Mettenburg, J., Basena, M., Petta, I., McPherson, K., Greene, A., & Li, S. (2010). Fourth National Incidence Study of child abuse and neglect (NIS-4): Report to Congress. Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families.
- StataCorp. (2015). Stata Statistical Software: Release 14. College Station, TX: Author.
- Stoltzfus, R.J., Kvalsvig, J.D., Chwaya, H.M., Montresor, A., Albonico, M., Tielsch, J.M. et al. (2001). Effects of iron supplementation and anthelmintic treatment on motor and language development of preschool children in Zanzibar: Double blind, placebo controlled study. *BMJ: British Medical Journal*, 323(7326), 1389. <https://doi.org/10.1136/bmj.323.7326.1389>
- U.S. Department of Health and Human Services, & Office of Disease Prevention and Health Promotion. (2012). *Healthy People 2020*. Washington, DC: Author.
- Vaughn, M.G., Salas-Wright, C.P., Naeger, S., Huang, J., & Piquero, A.R. (2016). Childhood reports of food neglect and impulse control problems and violence in adulthood. *International Journal of Environmental Research and Public Health*, 13(4), 389. <https://doi.org/10.3390/ijerph13040389>
- Westad, C., & McConnell, D. (2012). Child welfare involvement of mothers with mental health issues. *Community Mental Health Journal*, 48(1), 29–37. <https://doi.org/10.1007/s10597-011-9374-0>
- Zaslow, M., Bronte-Tinkew, J., Capps, R., Horowitz, A., Moore, K.A., & Weinstein, D. (2009). Food security during infancy: Implications for attachment and mental proficiency in toddlerhood. *Maternal and Child Health Journal*, 13(1), 66–80. <https://doi.org/10.1007/s10995-008-0329-1>
- Zimmerman, I.L., Steiner, V.G., & Pond, R.E. (1992). *PLS-3: Preschool Language Scale-3*. San Antonio, TX: Psychological Corporation.