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Short Communication

Participation in the special supplemental nutrition program for women, infants, and children is not associated with early childhood socioemotional development: Results from a longitudinal cohort study

Abigail Arons MPAff[d], Corneliu Bolbocean Ph.D.[c], Nicole R. Bush Ph.D.[a], Frances A. Tylavsky DPH[b], Kaja Z. LeWinn Sc.D.[e,*]

[a] Departments of Psychiatry and Pediatrics, University of California, San Francisco, United States
[b] Department of Preventive Medicine, University of Tennessee Health Science Center
[c] Department of Economics, Baylor University
[d] University of California, San Francisco
[e] Department of Psychiatry, University of California, San Francisco, USA

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ABSTRACT

Socioemotional development in early childhood has long-term impacts on health status and social outcomes, and racial and socioeconomic disparities in socioemotional skills emerge early in life. The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is an early childhood nutrition intervention with the potential to ameliorate these disparities. Our objective was to assess the impact of WIC on early socioemotional development in a longitudinal study. We examined the association between WIC participation and scores on the Brief Infant Toddler Social Emotional Assessment (BITSEA) in 327 predominantly African American mother–child dyads who were participants in the longitudinal Conditions Affecting Neurocognitive Development in Early Life (CANDLE) Study (Memphis, TN). To account for selection bias, we used within-child fixed effects to model the variability in each child's BITSEA scores over two measurement occasions (ages 12 and 24 months). Final models were adjusted for time-varying characteristics including child age, maternal stress, mental health, child abuse potential, marital status, and food stamp participation. In fully adjusted models, we found no statistically significant effect of WIC on change in socioemotional development ($\beta = 0.22$ [SD = 0.39] and $\beta = -0.58$ [SD = 0.79] for BITSEA Competence and Problem subdomains, respectively). Using rigorous methods and a longitudinal study design, we found no significant association between WIC and socioemotional development in a high needs population. This finding suggests that early childhood interventions that more specifically target socioemotional development are necessary if we are to reduce racial disparities in socioemotional skills and prevent poor social and health outcomes across the life course.

1. Introduction

Socioemotional development in early childhood has been shown to have long-term impacts on health status and social outcomes, including disability, premature mortality, and adult socioeconomic status (Power et al., 2013). This far-reaching influence is especially important because racial and socioeconomic disparities in socioemotional development emerge early in life, with low-income and minority children typically experiencing poorer outcomes. For instance, an analysis of the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) data found significant socioemotional disparities by income and race by 9 months of age, and that these disparities continue to widen with age (Halle et al., 2009). Analysis of data from the Conditions Affecting Neurocognitive Development and Learning in Early Childhood (CANDLE) study (a subsample of which was used for the current study) found similar racial disparities in socioemotional development at 12 months, with African American children more likely to have behavioral problems than Caucasian children (Palmer et al., 2013). Because these disparities appear early in life and have long-term consequences for many health outcomes, improving childhood socioemotional development is a key target for interventions to reduce health and social disparities across the life course.

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is one program that may improve socioemotional development and has been evaluated extensively over four decades. Early studies were fraught with issues related to self-selection, as a large proportion of people eligible for WIC do not participate in the

* Corresponding author. Tel.: +415 890 6475.
E-mail address: Kaja.lewinn@ucsf.edu (K.Z. LeWinn).

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program (Colman et al., 2012). Still, recent evidence that accounts for selection bias using statistical techniques such as propensity score matching and fixed effects suggests that WIC participation improves a variety of health outcomes, including low birth weight (Foster et al., 2010) and childhood anemia, (Currie, 2009) and reduces racial disparities in several health outcomes such as infant mortality (Khanani et al., 2010).

However, the impact of WIC on socioemotional and cognitive outcomes is relatively understudied, as most prior WIC studies focus on indices of physical health. Notably, a recent rigorous study found positive WIC effects on cognitive development (Jackson, 2015). However, in comprehensive literature reviews conducted for WIC studies from 1972 to 2012 (Hamilton and Lin, 2004; Colman et al., 2012) only 3 of 153 studies examined WIC's impact on socioemotional outcomes (Rush et al., 1988; Kowaleski-Jones and Duncan, 2000; Rivera, 2008a). None of these studies found significant effects of WIC on socioemotional development. Two of the three studies used rigorous methods to account for selection bias; however, neither of these more rigorous studies used a measure of socioemotional development that assesses both adaptive and maladaptive domains of behavior and is predictive of future outcomes.

In a large, predominantly African American population with known racial disparities in socioemotional outcomes (Karabekiroglu et al., 2010), we examined the association between WIC participation and socioemotional development. We improve on prior studies by 1) using a predictive measure of socioemotional development that covers a broad array of socioemotional domains, 2) drawing on a longitudinal dataset in which the social environments of children are well characterized, allowing for greater adjustment for potential confounders and 3) rigorously accounting for selection bias by using a within-child fixed effects modeling approach. By applying these more rigorous methods to a high-needs, predominantly African American sample, we aimed to clarify whether WIC is a potentially effective intervention for improving early childhood socioemotional development and reducing racial disparities in that domain.

2. Methods

The Urban Child Institute's Conditions Affecting Neurocognitive Development and Learning in Early Childhood (CANDLE) study is a longitudinal cohort study of 1503 mother–child dyads in Shelby County, Tennessee recruited between 2006 and 2011. The study has been described previously (Palmer et al., 2013). We used Medicaid participation as a proxy for WIC eligibility, as Medicaid confers WIC eligibility and Medicaid take-up is higher than WIC take-up (Bitler and Currie, 2005). For instance, in 2006–2009 during the time of the CANDLE study, Tennessee's WIC take-up rate was 52–53% of eligible people enrolling, (Betson et al., 2011) versus a child Medicaid take-up rate in Tennessee of 86–91% in 2008–2010 (Kenney et al., 2012). Using this method, our analytic subset included 327 mother–child dyads who reported participating in Medicaid at ages 12 months and 24 months, meaning the entire subsample of families was eligible for WIC at both time points.

The WIC participation variable was collected in the Food Supplement Information questionnaire, a CANDLE-specific questionnaire administered at the 12 month clinic visit and the 24 month home visit, in which participants were asked “Is your CANDLE child now receiving benefits from the WIC program?”

We measured socioemotional development with the Brief Infant Toddler Social Emotional Assessment (BITSEA), which was assessed during clinic visits by a licensed psychologist or an advanced graduate student when children were 12 and 24 months of age. The BITSEA is a 42-item questionnaire used to screen infants and toddlers for socioemotional competence and behavioral problems. The BITSEA has been found to be reliable and valid for children of diverse demographic backgrounds ages 12 months to 36 months (Karabekiroglu et al., 2010) and is predictive of future socioemotional development (Briggs-Gowan and Carter, 2008). Responses are aggregated into two index scores, the Problem Total for socioemotional and behavior problems (i.e. aggression, anxiety, maladaptive behaviors) and the Competence score for socioemotional competency (i.e. empathy, prosocial peer relations). Falling in the lowest 25th percentile for the Problem score indicates possible socioemotional problems, and falling below the 15th percentile for the Competence score indicates delays in this subdomain.

The CANDLE study richly characterized additional aspects of the maternal and child environment, and we were able to include a number of time-varying child and family covariates in our analyses that may have confounded our results. These characteristics include child age, maternal education, income, maternal stress as measured by the Parenting Stress Index, maternal mental health as measured by the Brief Symptom Inventory, child abuse as measured by the Child Abuse Potential Inventory, maternal marital status, and food stamp participation.

2.1. Statistical analyses

The primary statistical analysis employed in this study was within-child fixed effects, with separate models assessing the effect of WIC participation on a child's BITSEA Competence score and BITSEA Problem score. Because ordinary least squares regression and similar methods fail to account for selection bias, fixed effects have been used in several recent WIC studies. These models can compare within-child data over time to control for time invariant characteristics that impact WIC participation (Colman et al., 2012). We used within-child fixed effects to capitalize on the longitudinal nature of our study data. These analyses explicitly model the variability in BITSEA scores within each child over our two measurement occasions, at age 12 months and age 24 months.

The model employed was: $Y_{it} = \beta_1 * F_{it} + X_{it} * \gamma + \alpha_i + \varepsilon_{it}$, where i is the mother–child dyad identifier, t is 12 or 24 months, Y is BITSEA score, F is a binary variable for WIC participation, X is a vector of time-varying, dyad-specific covariates, and α represents time-invariant dyad-specific covariates. The design controls for unobserved child characteristics, and for time-invariant family and environmental background attributes. In the adjusted model, we also include the time-varying covariates mentioned above. To further investigate the effect of WIC, we created two subsamples that included only African Americans and only those who received WIC prenatally. Each of these subsamples included the vast majority of our participants (88% and 91% of the analytic sample, respectively). Using the same modeling strategy, we also examined whether WIC was associated with BITSEA as a dichotomous variable (cutoff met or not) using logistic fixed effects models. We also ran random effects models adjusting for the same covariates as above. All statistical analyses were conducted using STATA 13 (Stata Corp., College Station, TX).

3. Results

The study sample was majority African American, with a majority of mothers reporting unmarried/non-cohabitating marital status, a high school education, and prenatal WIC participation (Table 1). We further subdivided the sample into groups depending on their WIC participation: 41% had WIC at both time points, 28% had WIC only at age 12 months, 7% had WIC only at 24 months, and 24% had no WIC at either time point. One way ANOVA tests showed significant differences ($p < 0.05$) among these subgroups across some time invariant and time varying characteristics (Appendix A).

We found a significant association between WIC participation and continuous BITSEA Competence in the unadjusted model; however, the addition of covariates eliminated this association (Table 2). We failed to show a significant association between WIC participation and continuous BITSEA Problem scores (Table 2), and BITSEA Problem and Competence cut-off scores (not shown). The covariate with the largest