# INPLASY

## FOOD INSECURITY AND ITS EFFECTS ON EARLY CHILDHOOD COGNITIVE DEVELOPMENT: A SYSTEMATIC REVIEW PROTOCOL IN AFRICA

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## ADMINISTRATIVE INFORMATION

**Support -** No external source of funding.

**Review Stage at time of this submission -** The review has not yet started.

**Conflicts of interest -** None declared.

**INPLASY registration number:** INPLASY2024120016

**Amendments -** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 4 December 2024 and was last updated on 1 March 2025.

## INTRODUCTION

*R*eview question / Objective 1. What is the relationship between food insecurity and cognitive development in children aged 0-5 years?
2. How does food insecurity affect various cognitive outcomes in early childhood, such as language development, executive function, and overall cognitive abilities?
3. How does different dimensions of food insecurity (e.g., severity, duration) influence cognitive outcomes?

**Rationale** To explore the extent to which food insecurity affects various cognitive outcomes in early childhood and how different dimensions of food insecurity affect early childhood cognitive outcome in Africa. Following extensive search for available literature that examines food insecurity and its effects on early childhood cognitive development, the resources identified for Sub Saharan Africa were limited and this has resulted in extending the geographic scope to cover Africa.

**Condition being studied** This systematic review will study two domains: food insecurity, and early childhood cognitive development.
Lack of reliable access to enough food for an active, healthy life is known as food insecurity. It includes a variety of situations, ranging from a lack of knowledge about the availability of food to the complete inability to obtain enough food. Food insecurity is divided into two severity levels by the U.S. Department of Agriculture (USDA): low food security and very low food security (USDA, 2021). Recent data indicates that millions of households experience food insecurity, with rates being higher for low-income households, families with children, and members of specific racial and ethnic groups (Gundersen & Ziliak, 2021).
Early childhood (ages 0-5) is a crucial time for brain development, characterized by rapid cognitive, emotional, and social growth. During this period,

children establish foundational skills in language, reasoning, and self-regulation, which are vital for later academic success and overall well-being (McCoy et al., 2020). Cognitive development during these years is influenced by various factors, including nutrition, environmental stability, and parental engagement. Adverse conditions such as food insecurity can severely disrupt this developmental trajectory (Berkowitz et al., 2020) Research have shown that food insecurity is linked to negative cognitive outcomes in children. Insufficient access to nutritious food can lead to nutritional deficiencies detrimental to brain health, affecting cognitive functions such as memory, attention, and problem-solving abilities (Alaimo et al., 2020)

The conditions being studied will include Language development (impacts of food insecurity on language skills and literacy in early childhood). Executive Function (impact of food insecurity on early childhood skills such as working memory, attention, and self-regulation). Overall Cognitive abilities (IQ and learning outcomes).

## METHODS

**Search strategy** For the observational studies (Question 1), we will use the Population-Exposure-Outcome (PEO) framework to develop a search strategy for finding studies that explored three concepts: children aged 0-5 years as the population; food insecurity as the exposure variable; and cognitive development as the outcome variable of interest. We will use search terms to search subject headings, free-text words and abstracts that examine the association between food insecurity and cognitive development outcomes in the PubMed MeSH database. We will adopt the search strategy for the PEO framework to the syntax appropriate for Cochrane Library, ProQuest, Scopus and the Web of Science.

For the intervention study (Question 2), we will use the Population, Intervention, Comparison, Outcome (PICO) framework to develop a PubMed search strategy for finding studies that explored four concepts: population: children aged 0-5 years; intervention(s) – experiences of food insecurity compared with- Food-secure children 0-5years; outcomes- cognitive abilities. We will adopt the search strategy for the PICO framework to the syntax appropriate for PubMed, Psych IFO Pro Quest, Scopus and Web of Science.

**Participant or population** The study population in this systematic review will be children aged 0-5 years in Africa.

**Intervention** This systematic review will include studies that have assessed the effect of food insecurity on the early childhood cognitive development. Our systematic review of observational studies will include studies that were conducted in children (aged 0-5 years) in Africa.

**Comparator** Studies that compared food insecurity and food secured or interventions improving micronutrient status or treating nutritional deficits like Zinc supplements, Iron supplements, Folic acid supplements, combined IFA supplements and Deworming programmes in relation to early childhood cognitive development.

**Study designs to be included** We will include Cross-sectional studies, Case control studies, Longitudinal (prospective cohort) studies, Randomized controlled trial (RCT), studies that reported quantitative data, studies that are published dissertations or papers from English-language, peer-reviewed journals.

**Eligibility criteria** This systematic review will include studies that recruited parents/ caregivers with children 0-5 years of age and compared food insecurity and food secured or interventions improving micronutrient status or treating nutritional deficits like Zinc supplements, Iron supplements, Folic acid supplements, combined IFA supplements and Deworming programmes in relation to early childhood cognitive development.

**Information sources** This systematic review will include studies that recruited parents/ caregivers with children 0-5 years of age and compared food insecurity and food secured or interventions improving micronutrient status or treating nutritional deficits like Zinc supplements, Iron supplements, Folic acid supplements, combined IFA supplements and Deworming programmes in relation to early childhood cognitive development.

**Main outcome(s)** The primary outcome measures will be the Overall Cognitive abilities (IQ and learning outcomes). These will include vocabulary acquisition, language comprehension, expressive language skills, attention, working memory, cognitive flexibility, problem-solving abilities, IQ scores and results from standardized cognitive assessments.

**Additional outcome(s)** Other secondary conditions being studied will include Language development (impacts of food insecurity on language skills and literacy in early childhood) and Executive Function (impacts of food insecurity on early childhood skills such as working memory,

attention, and self-regulation). Studies will be included if they report at least one of the following outcome measures.

**Data management** Data will be managed using Microsoft excel and Google products such as Google Drive.

**Quality assessment / Risk of bias analysis**
1. Risk Of Bias In Non-randomized Studies - of Exposure (ROBIN-E) tool (Higgins et al., 2022; Bero, 2018) will be used for assessing risk of bias in longitudinal studies.
2. Appraisal tool for Cross-Sectional Studies (AXIS) tool (Downes et al., 2016) will also be used for checking risk of bias in cross sectional studies.
3. Cochrane Risk of Bias tool (ROB-2) (Sterne et al., 2019) will be used to check risk of bias in randomized control trials.

**Strategy of data synthesis** The proposed systematic review will be conducted using the PRISMA guidelines for systematic reviews. The search strategy will aim to identify relevant studies published in peer reviewed .journals for the past ten years. A preliminary search in PubMed, Cochrane Library, ProQuest, Scopus and the Web of Science Databases. The text words in the titles and abstracts of relevant articles and index terms will be deployed to describe the article databases. The keywords combined using Boolen operators (AND, OR) to refine the search. For example: Food Insecurity AND Early Childhood AND Cognitive development AND Sub Saharan Africa Early childhood OR Early developmental stage OR children 0-5years AND Cognitive development OR intellectual abilities AND Food Insecurity AND Africa.
Information such as title, author, publication year, study design objectives, population characteristics ( age, condition) Settings ( country) , type of intervention , delivery format, duration frequency, Outcome, Reference, time of data collection (baseline, follow-up, post-intervention), food insecurity measure, early childhood cognitive development outcomes, main findings (means, standard errors, correlation coefficients, odds ratios (OR)/risk ratios (RR), 95% confidence intervals, p values), and theory to explain success or failure. One reviewer will fully extract reported point estimates, and a second reviewer will check the data extraction form to ensure they are correct.

**Subgroup analysis** This systematic review will include different dimensions (duration, severity) of food insecurity, gender (male and female) and geographical disparities associated with the effects of food insecurity on early childhood cognitive outcomes (language development, executive function, and overall cognitive abilities).

**Sensitivity analysis** The sensitivity analysis in this systematic review will examine how varying dimensions of food insecurity, such as its severity and duration, influence cognitive outcomes in early childhood. Additionally, subgroup analyses will explore factors like gender and geographical disparities to identify specific vulnerabilities in different populations. This approach ensures a robust understanding of how nuanced variables affect outcomes like language development, executive function, and overall cognitive abilities in children aged 0–5 years in Sub-Saharan Africa, enabling targeted interventions and more precise policy recommendations.

**Language restriction** Only studies conducted in English Language.

**Country(ies) involved** Nigeria - Obafemi Awolowo University.

**Keywords** Food insecurity, Early Childhood Cognitive Development, Africa, Systematic review.

**Dissemination plans** Findings will be submitted to a peer-reviewed journal and presented at relevant conferences. Additionally, summaries will be shared with stakeholders in public health and education.

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