

# UNDERSTANDING CHILD STIMULATION AND BRAIN DEVELOPMENT IN URBAN INFORMAL SETTLEMENTS OF KENYA

**FACT SHEET**  
March 2026

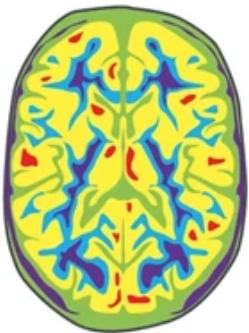
## Background:



The first 1000 days are foundational for children's cognitive, language and socio-emotional development. However, children growing up in informal settlements face multiple challenges including socio-economic disadvantage that could constrain early stimulation during the most critical period of brain growth and development.

The Neuroimaging Project examines how early stimulation through caregiver-child interaction influences early brain and cognitive development among children aged 6-24 months living in informal settlements in Kisumu and Nairobi. Using behavioral assessments alongside portable low-field or low-strength MRI scans conducted at Ngomongo Level II Hospital and Jaramogi Oginga Odinga Teaching and Referral Hospital, the study links early caregiving experiences to structural brain growth and development. The project aims to generate evidence to inform targeted early childhood interventions and policy investments in low-resource urban settings.

## Study Overview



- **Sample:** 980 children aged 6-24 months (low-field MRI on 350 children)
- **Location:** Urban informal settlements in Nairobi and Kisumu Counties
- **Design:** Observational cohort study
- **Tools used:**
  - Global Scales for Early Development (GSED)
  - Communicative Development Inventory (CDI)
  - Caregiver Interaction Scale (CIS)
  - Low-field MRI (brain imaging)
  - Quality assessment in the childcare facilities
  - Knowledge, Attitudes, and Practices (KAP) survey

## Baseline Findings

### 1. Socio-economic context

#### Primary caregivers (mostly mothers)

- Median age: **28 years**
- **46%** completed secondary education
- **59%** earn less than KES 10,000 (USD 78) per month

#### Childcare providers

- Median age: **38 years**
- **52%** have **no formal childcare training**
- Median of **5-7 children per provider**
- Majority earn less than KES 5,000 (USD 39) per month

#### Childcare access & costs

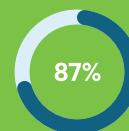
- **37%** of families use childcare facilities
- Nearly half (**49%**) of attending children go 5+ days per week
- Daily childcare costs range from **KES 50-100 (USD 0.39-0.78)**
- High costs limit access for children from low-income or poor families



Completed secondary



Earn less than 10,000/=



Mothers are primary caregivers

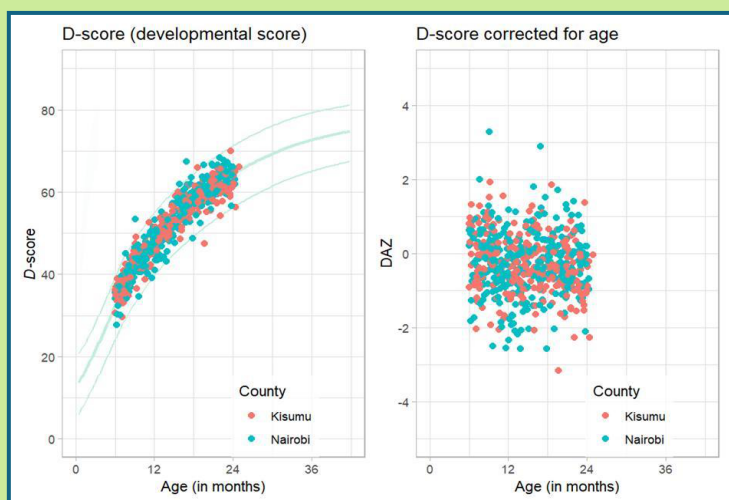
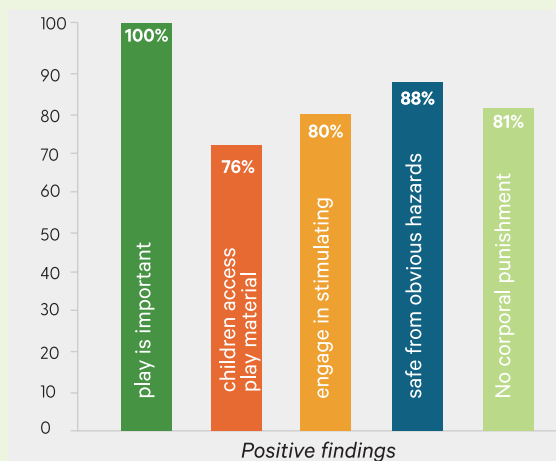
## 2. Stimulation & caregiving practices

### Positive findings

- All childcare providers agree that play is important
- 76% of children have access to play materials
- 80% of children engage in stimulating activities (singing, counting, drawing, play)
- 88% of centers are safe and free from obvious hazards
- No corporal punishment observed among 81% of the primary caregivers

### Gaps in stimulation and caregiving practice

- 80% do not display children's work
- Nearly half of providers lack childcare (ECD) training
- Overcrowding in some centers limits quality interactions
- 14% of children are left alone for 1-2 hours for consecutive 1 to 2 days: a social protection issue
- 22% of children are left in the care of another child under 10 years old for more than one hour at least once in the past week



## 3. Child development outcomes

### Global Scales for Early Development (GSED)

- Development increases steadily with age
- Development of nearly all children is on track
- Variety of child exposures/stimulation is key in early years
- 2.4% of children had delayed development - 1.5% in Kisumu, and 3.1% in Nairobi, but it is still within the expected population expected estimates of <5%
- 0.3% of children had advanced development 0% in Kisumu and 0.6% in Nairobi

### Language Development (CDI)



46% of children (8–15 months) can produce words



Children (16–30 months) produce on average 35–46% of expected vocabulary



Word production increases significantly after 12 months



Need for targeted childcare interventions during foundational years



## 4. Neuroimaging: How we measure brain development

This study uses **portable low strength MRI technology** to understand how early stimulation influences brain development.

### Step 1: MRI scanning

- Children (6–24 months) are scanned using **portable low-field or low strength MRI**
- Scans conducted at:
  - Ngomongo Level II Hospital (Nairobi)
  - Jaramogi Oginga Odinga Teaching and Referral Hospital (Kisumu)
- Performed by trained hospital radiographers
- Safe and non-invasive procedure

### Step 2: Image upload & quality control

- Brain images uploaded to a secure server hosted by our partners
- Experts review for:
  - Image clarity
  - Motion interference
  - Completeness of scan sequences
- Any incidental abnormalities flagged for referral

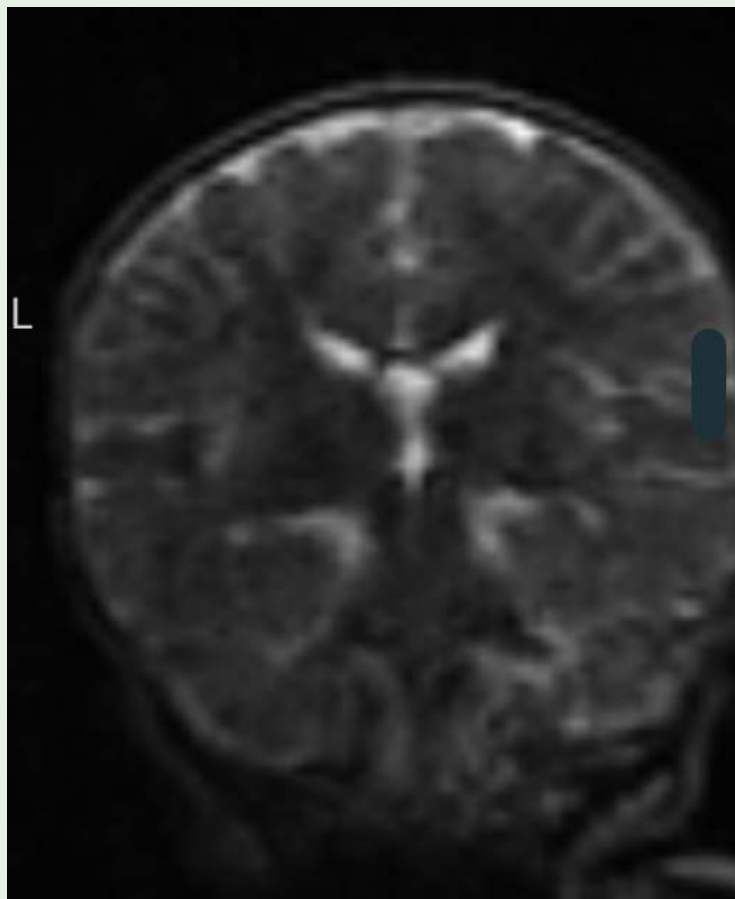
**Participant ID:** APHRC\_NRB\_01\_037\_12M

**MRI scan type:** T2 Coronal

This scan shows the brain in vertical slices, viewed from the front or back. In these images, fluids appear brighter, while bone and fat appear darker.

**Scan quality: High – Excellent**

The images are very clear, with strong contrast and no visible blurring. The scan is of excellent quality and can be confidently used for detailed measurements and further analysis.



### Step 3: Brain volume analysis

- Automated software generates:
  - Brain volumetric measurements
  - Structural development indicators



### Step 4: Linking brain & behavior:

#### Why this matters:

- Early stimulation strongly influences cognitive, language, and socio-emotional development.
- In low-resource settings, limited income, overcrowding, and lack of training reduce stimulation quality.
- The first 1,000 days are critical for brain development.
- Behavioral measures may be subject to reporting bias.
- Neuroimaging results validate behavioral measures.

#### Key recommendations:

1. Invest in ECD training for childcare providers.
2. Subsidize childcare services for low-income families.
3. Strengthen safe, stimulating environments in informal settlements.
4. Introduce childcare interventions in homes and childcare centers to improve brain development and learning.

