

Predictors of Maternal Sensitive Engagement in a peri-urban LMIC context – The Drakenstein Child Health Study

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Research Article

Keywords:

Posted Date: October 20th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11153329/v1>

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Additional Declarations: No competing interests reported.

Abstract

Research from high income industrialized western contexts shows that maternal and child factors influence maternal sensitivity. Less data exists exploring potential predictors in LMICs. This sub-study in the Drakenstein Child Health Study examined maternal HIV, socioeconomic factors, depression (Becks Depression Index-II), substance use (Alcohol, Smoking and Substance Involvement Screening Test), cognitive empathy (Questionnaire of Cognitive and Affective Empathy) and child sex and temperament (Infant Behavior Questionnaire) as predictors for maternal sensitive engagement in this peri-urban cohort (n = 130 mother and child dyads). Both longitudinal (BDI-II and ASSIST) and cross-sectional (Maternal Sensitive Engagement, socioeconomic factors, HIV, empathy and child temperament – child age 42 months) data were collected. Associations between predictors and Sensitive Engagement were analysed using hierarchical linear regression modelling. Demographic and maternal variables were entered into Block 1 to ascertain their influence followed by child variables in Block 2 to measure any unique effects associated with the outcome variable. Our study found that the overall model intercept was 18.74 (SE = 8.79, p = 0.03). After adjusting for all other predictors higher maternal depression across time was inversely associated with sensitive engagement (B = -2.11, SE = 1.00, p = 0.03, 95% CI [-4.09, -0.13]). Additionally, higher child negative emotionality was associated with higher sensitive engagement, though only at trend level significance (B = 1.45, SE = 0.79, p = 0.07, 95% CI [-0.12, 3.01]). These results are novel- some variables that have been shown to predict maternal sensitivity in HICs have not done so in this high-risk context.

Introduction

Maternal sensitivity is widely understood to comprise of a mother's ability to accurately perceive and attend to her child's physical and emotional needs significantly shapes child development (Ainsworth et al., 1978). Prolific research in Western, Educated, Industrialised, Rich and Democratic (WEIRD) (Henrich et al., 2010) contexts shows it promotes secure attachment, socioemotional functioning and cognitive and physical development (Bakermans-Kranenburg et al., 2003; Deans, 2018; Leerkes et al., 2009; Pederson et al., 1990; Tamis-Lamonda et al., 2001; Thomas et al., 2017; Wright et al., 2018). Some LMIC studies link spousal support to greater maternal sensitivity and indicate that better maternal physical and mental health, and improved socioeconomic stability (including education) are important factors supporting parenting skills (Noblega et al., 2024; Seyed Mousavi et al., 2021; Valenzuela, 1997; Zevalkink & Riksen-Walraven, 2001). Sparse Sub-Saharan research on maternal sensitivity, its predictors and associated child outcomes link maternal sensitivity and maternal risks such as depression and iron deficiency to child outcomes including physical growth, cognitive development, emotional regulation, and prosocial behaviour (Cooper et al., 2002; Cooper et al., 1999; Cooper et al., 2013; Perez et al., 2005; Tomlinson et al., 2005; Tomlinson et al., 2020). This study examined the associations between maternal sensitivity and its potential predictors – maternal depression, cognitive empathy, socio-demographics, HIV, substance use (alcohol and tobacco), child temperament and sex.

A mother's capacity to parent her child can be influenced by several factors. Maternal sensitivity studies in WEIRD and LMI countries have found that higher educated and older mothers tend to show higher sensitivity – the premise being that these factors are linked to more resources through formal professional work, knowledge, emotional maturity and lower stress (Dawson et al., 2021; Gedaly & Leerkes, 2016; Prag et al., 2023). Mothers from low socioeconomic contexts may have less access and opportunity to continue formal education into high school or tertiary levels, thus increasing their risk to remain in a cycle of poverty.

Furthermore, HIV prevalence can be high in low socioeconomic under resourced contexts (Stein et al., 2015). Mothers living with HIV are at increased risk of experiencing mental health problems including substance use and neurocognitive impairment (Chersich et al., 2016; Han et al., 2019; Kagee & Martin, 2010) and can influence child physical development (Perumal et al., 2022; Wedderburn et al., 2019; Wedderburn et al., 2024). A risk exists that a mother's caregiving quality could be negatively affected even if her HIV status is well managed.

Maternal mental health in particular depression has been found to be high in low-income settings (Cooper et al., 1999; Stein et al., 2015). In a 2018 review the global study of postnatal depression (PND) (Arifin et al., 2018) reported an alarming discrepancy in the number of studies hailing from the African continent in comparison to other continents - Asia (28,718), North America (309,296), South America (5,934), Europe (426,219), Australia and New Zealand (13,737), and Africa (1,511). In a review of studies on maternal sensitivity in sub-Saharan Africa (Prag et al., 2023) only four investigated depression in relation to maternal sensitivity (Cooper et al., 2002; Cooper et al., 2009; Cooper et al., 1999; Tomlinson et al., 2005) finding that a) improving maternal depression was not correlated with an improvement in maternal sensitivity and b) that higher maternal depression was associated with lower maternal sensitivity. In addition, three recent studies with outcome foci such as maternal infant relationship, the influence of war trauma on attachment and

IPV and attachment disorders reported a positive correlation between elevated symptoms of depression and lower maternal sensitivity (Dozio et al., 2024; Koopowitz et al., 2025; Nshimyumukiza et al., 2024). These studies yielded important findings in under researched contexts using established maternal sensitivity measures (Coding Interactive Behaviour, Global Rating Scale and Maternal Infant Responsiveness Instrument).

Additionally, alcohol and tobacco's neurocognitive, physical and emotional effects may impair a mother's capacity to care for her child in sensitive ways – attention, emotional regulation, perception and responsiveness and consistency could be at risk (Hendricks et al., 2020; May et al., 2013; Molteno et al., 2014; Scholten et al., 2024; Tomlinson et al., 2014). Maternal lack of sensitivity can be a direct consequence of substance related impairment. At the same time, prenatal exposure can alter infant behaviour and temperament (e.g. increased irritability, reduced self-regulation, impaired physical brain development) which makes caregiving more challenging and may further impact maternal sensitivity (Hendricks et al., 2020; May et al., 2013; Molteno et al., 2014; Scholten et al., 2024; Tomlinson et al., 2014). Therefore, observed low sensitivity may reflect both a) direct effects of maternal alcohol use on caregiving capacity and (b) difficult child behaviours stemming from prenatal exposure that strain parental skills; teasing these apart requires longitudinal measurement of prenatal exposure, maternal functioning, child temperament, and postnatal substance use.

Research from WEIRD countries suggest that maternal empathy, one such factor, is a significant variable in positively influencing maternal sensitivity (Coyne et al., 2006; Koren-Karie et al., 2002; Leerkes, 2010). That is that a mother who empathically understands the motives underlying her child's feelings and behaviour will increase the likelihood of her sensitivity (Koren-Karie et al., 2002; Leerkes et al., 2004).

Furthermore, child factors, such as the link between child sex and temperament and maternal sensitivity in WEIRD countries yield varying results. Some have found that mothers are more sensitive to girls and others have not (Woldarsky et al., 2019). Some studies report no association between child temperament and maternal sensitivity while others have found that children with difficult temperaments are more susceptible to negative parenting (Leerkes, 2010; Leerkes et al., 2009; Vaccaro et al., 2021).

Much less is known in low to middle income countries (LMICs), including South Africa and the impact of multiple sociodemographic factors on maternal sensitivity in SA is unknown. Little has been done to describe in detail the characteristics of maternal sensitivity in non-WEIRD contexts (Prag et al., 2026) - it could present differently. Developmental psychology has relied far too heavily on knowledge derived from data originating from the west – potentially negatively misrepresenting maternal skills of a proportionately larger part of the global population (Henrich et al., 2010; Mesman et al., 2021). Fortunately, while not enough, there have been recent attempts at remedying this – in spite of harsh conditions, mothers have shown nuanced sensitivity to their offspring (Dawson et al., 2021; Mesman et al., 2021; Prag et al., 2026)

A further gap in the limited maternal sensitivity research is the lack of study on mother and child risk factors that may threaten maternal sensitivity – especially when research does not focus on both as interactive partners eliciting each other's behaviour. While the interplay between maternal depression and attachment status with minor attention to sensitivity has been studied (Cooper et al., 2002; Cooper et al., 1999; Tomlinson et al., 2005; Tomlinson et al., 2020), other potential risk factors such as maternal HIV, substance use, empathy and child temperament has been neglected.

Caregiving practices, risk/protective factors and contexts differ vastly across cultural and socioeconomic settings – both what predicts maternal sensitivity, its characteristics as well as how it is measured will vary (Grantham-McGregor et al., 2007; Prag et al., 2023; Prag et al., 2026; Walker et al., 2007; Walker et al., 2011). Therefore, research must be conducted in diverse contexts to supplement the extant data, theorising and interventions devised from HIC's.

This study examines maternal (sociodemographic factors, HIV status, depression, substance use, empathy) and child (sex and temperament) predictors of maternal sensitivity in a peri-urban, low-income area of the Western Cape, South Africa, where the legacy of race-based policies remains evident. We used the Emotional Availability Scale (Biringen, 2000) – a dyadic measure, requiring intense training and clinical skills to score. Our study is the first to use a LMIC contextually validated maternal sensitivity measure, providing a novel test if associations reported in WEIRD samples hold here. Cumulative risk for depression and substance use were tested in relation to cross-sectional maternal sensitivity assessment therefore predictive associations could be established. We tested the potential predictive relationship between maternal HIV and maternal sensitivity. Because no data exist from sub-Saharan Africa; cognitive empathy – being relatively stable and unlikely to have been targeted by interventions in this cohort and child temperament as predictors of maternal sensitivity, were examined their association at 42 months.

Methods

Design

The parent study is the Drakenstein Child Health Study (DCHS) investigating respiratory health in 1137 children from two state clinics serving two communities: Mixed race Afrikaans speakers and Black isiXhosa speakers in the Paarl region (Stein et al., 2015; Zar et al., 2015). The larger study encompassed recruiting mothers during antenatal visits with scheduled post-natal assessments and follow up to 14 years. The DCHS was approved by the Faculty of Health Sciences, Human Research Ethics Committee, University of Cape Town (401/2009). The sub-study reported here obtained specific approval from the Faculty of Health Sciences, Human Research Ethics Committee, University of Cape Town (708/2019). The main focus of this study was to investigate the associations between maternal and child predictor variables and their association with maternal sensitivity (maternal sensitive engagement) at child age 42 months.

Participants

Participation in this sub-study was voluntary, and refusal did not affect inclusion in the larger or any sub-study. Specific consent was obtained for video recording.

A subset of the Drakenstein cohort were available for analysis - Afrikaans speaking mixed race mother/child pairs and isiXhosa speaking black African mother/child pairs, yielding a total sample of 130 dyads.

Mean age of mothers at the time of assessment was 29 years (SD 5.83). Children could be assessed 1 month before or 3 months after attaining 42 months of age (boys $n = 73$ and girls $n = 57$). The sample mean age was 42.3 (SD 0.54). Children with any significant health difficulties defined by the larger study were excluded from this study.

The Drakenstein Cohort is recruited primarily from a peri-urban area and is particularly vulnerable to the effects of poverty and lack of resources. The participants are from low SES communities where poor maternal mental health and other maternal risk factors such as alcohol misuse, HIV exposure and exposure to violence are potentially detrimental to parenting and child development (Batura et al., 2019; May et al., 2021; Nstephe et al., 2014; Stein et al., 2015; Walker et al., 2011; Zar et al., 2015).

Procedure

Mothers were invited to participate in this sub-study and full information regarding the nature of assessments, and the focus of the study was provided. Participation was voluntary and refusal to participate did not disqualify dyads from the larger study, or any of their regular clinic appointments or services. Assessments took place at the clinic or an accessible community venue and were conducted by researchers, who were registered psychologists and fluent in Afrikaans. A trained Xhosa 1st language research assistant accompanied registered psychologists for translation during assessments where necessary.

Socioemotional and neuropsychological assessments were conducted at the 42-month timepoint for the larger study. Maternal variables such as demographics, HIV status, depression, substance use were collected longitudinally from antenatal study visit. Maternal sensitivity, maternal empathy and child temperament data were collected at 42 months. The Infant Behaviour Questionnaire – Revised (IBQ-R) was administered to mother retrospectively at 42 months. Self-report questionnaire responses were captured using a secure web based data capture and storage platform - Research Electronic Data Capture (REDCap) (Harris et al., 2019; Harris et al., 2009). Measures were translated into Afrikaans and isiXhosa from English using standard forward-back translation (Stein et al., 2015).

Measures

Maternal Sensitive Engagement

The dyadic interaction was scored using the Emotional Availability Scale (EAS) (Biringen, 2000; Biringen, 2005; Biringen & Robinson, 1991). Mother and toddler were videoed playing for 10 minutes: 5 minutes with blocks followed by child led free play with a mix of toys, for another 5 minutes. Videos were translated and subtitled by 1st language Afrikaans and Xhosa research assistants. Scoring as per EAS developer training was completed and is reported on in depth in a previous study and we used the contextually appropriate Sensitive Engagement scale obtained from exploratory factor analysis conducted in that study (Prag et al., 2026).

Socio-demographics

The larger study had obtained all mothers' relevant demographic information at the antenatal visit. We used maternal age at the time of dyadic interaction assessment, maternal education level i.e. whether she had primary, secondary or some tertiary education or in some case none. Her job status was also considered – whether she was employed or not at the time of assessment.

HIV Status

Our cohort is similar to others in South Africa that have high rates of HIV (Nstepe et al., 2014; Zar et al., 2015). Mothers were tested at enrolment for confirmation of positive or negative diagnosis. In accordance with Western Cape prevention of mother to child HIV transmission guidelines mothers were tested every 12 weeks (Wedderburn et al., 2019; Wedderburn et al., 2024).

Depression

The Beck Depression Index (BDI-II) is widely used, reliable, demonstrates good validity and internal consistency in both psychiatric and non-psychiatric samples (Beck et al., 1988). The BDI-II contains 21 items, each rated 0 (no symptom) to 3 (severe, often impairing), summed to yield a total score—higher scores indicate greater depression severity. A cut-off of ≥ 20 is commonly used to distinguish probable moderate/severe cases from probable sub-threshold cases (Lasa L, 2000). We used the BDI-II to screen for risk of depression symptoms over 5 timepoints – antenatal, 12, 18, 24 and 36 months. Several studies have reported that depression can be stable over time when diagnosed ante/post natally especially in low socioeconomic contexts. In addition, even late onset depression can have negative effects on child outcomes from as little time as 6 months after onset. We opted to focus on the cumulative symptomatic data in relation to the assessment of maternal sensitive engagement (Alvarez et al., 2015; Campbell et al., 2007; Lovejoy et al., 2000). The BDI has been used in several South African studies (Kagee & Martin, 2010; Kagee et al., 2014; Nel & Kagee, 2013).

Substances

The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) is a screening test developed by the World Health Organisation (WHO) to detect and manage substance use in primary care facilities. Using the ASSIST we were able to ascertain what amount of exposure children had to alcohol and tobacco. Data was collected by the larger study starting from enrolment antenatally continuing postpartum – at 10 weeks and 6, 12, 18, 24 and 36 months. Scores 0–10 were considered low risk, 11–26 moderate, and scores > 26 high risk for both substances. Maternal substance use effects on child outcomes are complex - we decided to focus on the cumulative association together to capture overall effects. It has demonstrated good reliability and validity in multi-site studies (Humenuik et al., 2008; WHO, 2002).

Maternal Empathy

The Questionnaire of Cognitive and Affective Empathy (QCAE) (Reniers et al., 2011), is a self-report measure of dispositional and cognitive and affective empathy that has been used widely. Translations have shown good psychometric properties in HIC's (Gomez et al., 2022; Myszkowski et al., 2017; Queiros et al., 2018; Reniers et al., 2011). Its demonstrated applicability across diverse settings, including South Africa (Malcolm-Smith et al., 2024).

Child Temperament

The Infant Behaviour Questionnaire (IBQ-V-RSF) measures individual differences in infant temperament which can be observed by parents. At 42 months, we asked mothers to retrospectively report on their infant's temperament. Detailed measures of child socioemotional development were added to the DCHS protocol only at the 42-month assessment. Because the larger study cohort showed slow cognitive and language development (Donald et al., 2019; Wedderburn et al., 2019), likely reflecting adverse socioeconomic conditions we obtained mothers' retrospective reports of infant temperament at 42 months. Continuity in temperamental traits have been found, with relative variation only in months (Gartstein & Rothbart, 2003; Rothbart et al., 2001)– we therefore administered a translated version of the IBQ. Mothers were asked to recall their child's behaviour between about 6 months and 1 year. In a related study, 86% of active-case mothers reported high confidence in these retrospective ratings and only 3.9% reported low confidence (Malcolm-Smith et al., 2023).

Data Analysis

Using hierarchical linear regression models, we examined associations between maternal (age at birth, education, SES, HIV status, substance exposure, depressive symptoms and cognitive empathy) and child (sex and temperament) predictors and the outcome (Maternal Sensitive Engagement), reporting point estimate unstandardised regression coefficients, standard errors, 95% confidence intervals, and p-values for each model.

Demographic and maternal variables were entered in Block 1 because they represent socioeconomic contextual caregiver characteristics that precede and theoretically shape parenting behaviour over time (e.g., maternal age at time of interaction, education, employment/work status, HIV status, depression, substance use, and cognitive empathy). Entering these factors first accounts for their influence so that the remaining child variable effects can be teased apart from maternal effects. Child variables (Block 2: child sex and child temperament) were added subsequently to test whether child characteristics uniquely predict maternal sensitivity beyond maternal and demographic influences and to enable examination of potential child-driven effects.

Multicollinearity was found to be low (VIF's within acceptable range < 5) (O'brien, 2007) and diagnostic checks indicated that the linear regression assumptions – linearity, homoscedasticity and normality of residuals – were satisfactorily met.

Results

Table 1 shows variable descriptive statistics - the median maternal age at assessment was 29 years and 44% of the child cohort were female and 56% male. 64% mothers had lower than secondary education, 15% HIV Sero Positive and 73% were employed in some manner. The BDI and ASSIST are screening thresholds and not clinical diagnoses – the tally doesn't show when the episodes happened, how long they lasted, or how severe they were—only how many times the screen was positive. Overall, 35% of mothers had never screened positive for depression symptoms over the data collection time. 57% screened as above threshold risk for depression at least once or twice and 7% at three or four screenings. Only one mother had 5 positive screenings. 17% of mothers had zero counts of risk for substance use (alcohol and tobacco) over the data collection time period and a notable 25% of mothers were screened as above threshold risk for substance use at all 7 time points. Our sample demographics and variable characteristics are comparable to the larger DCHS study (see ST1).

Table 1 *Descriptive Statistics*

Variable	Measure	Time Point	Median (Q1;Q3; %)
Maternal Age at Assessment	Intake	42 months	29 (25,34)
Child Sex	Demographics	At Birth	
Female			57 (44%)
Male			73 (56%)
Maternal HIV	Intake Demographics	Antenatal – 42 months	
Sero Negative			110 (85%)
Sero Positive			20 (15%)
Education	Intake Demographics	Antenatal – 42 months	
Lower than secondary education			83 (64%)
At least secondary or higher			47 (36%)
Parent Employment Status	Demographics	Antenatal -42 months	
Not employed			33 (25%)
Employed			97 (75%)
Depression	BDI	Cumulative	
0 counts			45 (35%)
1 count			55 (42%)
2 counts			20 (15%)
3 counts			7 (5.4%)
4 counts			2 (1.5%)
5 counts			1 (0.8%)
Substance Total	ASSIST	Cumulative	
0 counts			22 (17%)
1 count			18 (14%)
2 counts			12 (9.2%)
3 counts			11 (8.5%)
4 counts			10 (7.7%)
5 counts			8 (6.2%)
6 counts			17 (13%)
7 counts			32 (25%)
Maternal Cognitive Empathy	QCAE	42 months	61 (54,68)
Infant Negative Emotionality	IBQ	42 months	3.26 (2.17, 4.17)
Infant Positive Affectivity	IBQ	42 months	4.24 (3.23, 5.00)
Maternal Sensitive Engagement		42 months	33 (24,42)

Table 2 Correlation Table

	Maternal Sensitive Engagement	1	2	3	4	5	6
1. Maternal Age at Assessment	0.07						
2. Maternal HIV	-0.11	0.23*					
3. Maternal Cognitive Empathy	0.12	-0.15 ⁺	-0.20*				
4. BDI Cumulative	-0.06	0.05	-0.15 ⁺	-0.04			
5. Substance Use Cumulative	0.11	-0.33*	-0.18*	0.15 ⁺	0.25*		
6. IBQ Negative Emotionality	0.18*	-0.20*	-0.16 ⁺	0.22*	0.11	0.27*	
7. IBQ Positive Affectivity	0.13	-0.08	-0.20*	0.38*	0.16 ⁺	0.29*	0.35*

* p < 0.05; ⁺ p < 0.10 (trend level)

Spearman correlations (Table 2) between predictors and maternal sensitive engagement are small -the only significant correlation is with child negative emotionality. There are several significant and trend level significant associations between the other variables. Child negative emotionality was also positively associated with maternal cognitive empathy; substance use and positive affectivity and negatively correlated with maternal age. Depressed mothers tended to use more substances and reported more positive affectivity in their children. Maternal HIV shows a significant positive association with maternal age, and is negatively associated with substance use, maternal cognitive empathy and child positive affectivity. Younger and depressed mothers tended to use more substances, mothers with HIV used less. Mothers with higher cognitive empathy reported higher positive and negative emotions in their children.

Table 3 Hierarchical Linear Regression Block 1 Maternal Variables

Variable	B	std.error	statistic	p.value	conf.low	conf.high
(Intercept)	20.87	8.58	2.43	0.01	3.88	37.86
Maternal HIV	-3.08	2.70	-1.14	0.25	-8.43	2.26
Age at Assessment 42months	0.23	0.17	1.31	0.19	-0.12	0.57
Maternal Education	1.28	1.95	0.66	0.51	-2.58	5.15
Maternal Employment 42months	-2.74	2.16	-1.27	0.20	-7.01	1.53
Cumulative Substance Use	0.75	0.40	1.89	0.06	-0.04	1.53
Cumulative Depression	-1.96	0.99	-1.98	0.05	-3.92	0.00
Maternal Cognitive Empathy	0.09	0.11	0.85	0.39	-0.12	0.30

Table 4 Hierarchical Linear Regression Block 2 Maternal plus Child Variables

Variable	B	std.error	statistic	p.value	conf.low	conf.high
(Intercept)	18.74	8.79	2.13	0.03	1.34	36.15
Maternal HIV	-2.72	2.69	-1.01	0.31	-8.05	2.62
Maternal Age at Assessment 42months	0.27	0.17	1.57	0.11	-0.07	0.62
Maternal Education	2.11	2.07	1.02	0.30	-1.99	6.22
Maternal Employment 42months	-1.90	2.18	-0.87	0.38	-6.22	2.42
Cumulative Substance Use	0.65	0.41	1.59	0.11	-0.16	1.45
Cumulative Depression	-2.11	1.00	-2.12	0.03	-4.09	-0.13
Maternal Cognitive Empathy	0.04	0.11	0.34	0.73	-0.18	0.26
Child Sex	-2.09	1.86	-1.13	0.26	-5.77	1.59
Child Negative Emotionality	1.45	0.79	1.83	0.07	-0.12	3.01
Child Positive Affectivity	0.10	1.01	0.10	0.91	-1.89	2.10

Table 5 *Model Fit Statistics*

	r.squared	adj.r.squared	f_statistic	p.value
Null Model	0.00	0.00	NA	NA
Maternal	0.08	0.03	1.6	0.15
Maternal and Child	0.12	0.04	1.6	0.11

The models explain only a small proportion of variance in the outcome. R-squared increases from 0.00 for the null model to between 0.08 and 0.12 for the fitted models, indicating that at best ~12% of outcome variability is captured by the predictors.

Multivariable linear regression results are presented in Table 4. The overall model intercept was 18.74 (SE = 8.79, $p = 0.03$). After adjusting for all other predictors, greater cumulative maternal depression was associated with lower maternal sensitivity ($B = -2.11$, SE = 1.00, $p = 0.03$, 95% CI [-4.09, -0.13]), and greater child negative emotionality was associated with higher maternal sensitivity ($B = 1.45$, SE = 0.79, $p = 0.07$, 95% CI [-0.12, 3.01]) at trend level significance. The remaining predictors—maternal HIV, maternal age at birth, education, cumulative substance use, maternal employment, maternal cognitive empathy, child sex and child positive affectivity—were not statistically significant.

Discussion

Maternal Predictors

HIV and Socioeconomic Demographics. We found no predictive association between these variables, especially maternal age and education and maternal sensitive engagement – a contrasting finding to both South African/LMIC and WEIRD data (Campbell et al., 2007; Dawson et al., 2021; Gedaly & Leerkes, 2016; Lee et al., 2020) – and can possibly be accounted for by the new scale obtained from factor analysis. Where usually studies have found that conditions (maternal education, employment status and age) were associated with lower sensitivity, our sample showed that in spite of low education levels, maternal sensitive engagement scores were variably distributed (Prag et al., 2026). The high instance of employment was likely more informal or low paying (for example domestic work/shift working in surrounding farms or supermarkets). Younger, less educated and unemployed mothers have been theorised to display more insensitive behaviours – our sample showed no significant association (Dawson et al., 2021; Leerkes, 2010). Using a western measure that has been psychometrically validated for samples contrasting WEIRD contexts could yield uniquely unexpected results confirming the importance of contextually relevant analysis of important maternal skills in relation to child development.

Depression. Our study shows that maternal cumulative depressive symptoms are inversely associated with maternal sensitive engagement at 42 months. The finding is in keeping with literature from WEIRD and LMICs - the potential effects of parenting under

distress where maternal mood symptoms impede attunement and responsiveness need more extensive attention (Bernard et al., 2018; Campbell et al., 2007; Christodoulou et al., 2019; Lovejoy et al., 2000; Tomlinson et al., 2005). 42% of mothers had suffered with depressive symptomology (cut-off of ≥ 20 used to distinguish moderate/severe from sub-threshold cases) at least once over the course of her pregnancy up to six months before sensitive engagement was assessed, and 15% did so twice. Once child predictors were added to the model, depression remained significantly associated with sensitive engagement reinforcing its importance in caring for maternal wellbeing. Depression is an important factor to address in LMIC communities - our study has shown that fairly high levels of low mood over time consistent with levels in other studies (Cooper et al., 2002; Kagee & Martin, 2010; Tomlinson et al., 2006).

Substances. In contrast to what might have been expected, maternal substance use did not significantly predict maternal sensitivity (Koopowitz et al., 2025; Siqueland et al., 2014). Contexts such as ours have been shown to have weekend binge drinking patterns of usage (May et al., 2013) - this could have an interesting effect on maternal capacity to parent in a more routine manner during the week than over the weekend. We assessed dyadic interactions in the mornings during the week, and majority of the mothers were employed, potentially influencing responsible behaviours.

Maternal Cognitive Empathy. We found positive significant correlations with positive and negative reactivity suggesting maternal awareness of her child's emotional states. Our study however did not reflect the data obtained from WEIRD contexts suggesting that maternal capacity to take her child's perspective would result in higher levels of sensitivity (Leerkes et al., 2004; Meins et al., 2002). Even though the QCAE has shown validity in the South African context (Malcolm-Smith et al., 2024), our sample size may have been too small or this specific sample may, by chance show no association even if one exists in the larger study. Furthermore, expressions of sensitivity in this sample encompassed more practical caregiving norms than verbalised perspective taking.

Child Predictors - Sex and Temperament

There was no difference in the outcome variable based on child sex. Some studies have shown that mothers have more sensitivity towards girls (Woldarsky et al., 2019) - our study did not mirror that. Of the three subscales of the IBQ, negative emotionality was the only variable to reach trend level significant association with higher sensitivity. While some have found this temperamental trait to undermine sensitivity (Leerkes et al., 2009) they have also found the opposite to be true (Leerkes, 2010). A toddler with negative emotionality behaviours as reported on the IBQ – a retrospective report by mother – would in practical terms require her to attend to her child's distressing behaviour more frequently. After child predictors were included into the model the negative association between depression and sensitivity was slightly increased in strength indicating a potential relationship between child temperament and depression. The lack of association between HIV and substances and maternal sensitive engagement in this albeit small sample is a meaningful finding. Addressing maternal mental health – a predominantly modifiable factor - by providing parenting resources and social support could strengthen foundational child development and the mother-child dyad.

Maternal sensitivity as the focus outcome has been understudied in the South African and LMIC context. Studies that have included sensitivity, have remained within the constraints of the measure developed in their WEIRD context (Cooper et al., 2002; Cooper et al., 1999; Dawson et al., 2021; Tomlinson et al., 2005). In some cases, measures were adapted, however, our study is unique in that the maternal sensitivity scale was derived from exploratory factor analysis of scores from the Emotional Availability Scale (EAS) collected in a prior study. We tested the EAS's psychometric applicability with confirmatory factor analysis, but the model did not fit, so we performed EFA to determine the empirically supported factor structure (Prag et al., 2026). Our prediction findings, are thus novel because the outcome – maternal sensitive engagement- is derived according to data defined scale rather than a predetermined measure developed in WEIRD contexts (Prag et al., 2026).

Limitations

Due to the dearth of focused maternal sensitivity data as an outcome variable in the LMIC and sub-Saharan context, this study did not address any potential complex moderating or mediating factors. Furthermore, the size of our sample was potentially too small to yield any statistically significant results.

There are low levels of literacy in this context therefore and to aid in understanding, the QCAE and IBQ were administered in interview format by clinicians accompanied by a translator where required. It is possible that mother's responses were influenced by social desirability bias.

Conclusion

No other quantitative study in a low resource context has used an empirically determined (EFA) maternal sensitive engagement factor as an outcome variable. In contrast to prevailing theory and WEIRD data the only modest predictors of the outcome maternal sensitive engagement were depression and child temperament. This simplicity may be useful in part – focusing on depression as a clear, measurable target could guide the development of interventions in resource limited low socioeconomic settings keeping in mind that broader psychosocial and child level contributors require ongoing assessment.

Declarations

Author Contribution

A.P - investigation, writing original draft SMS - supervision, review and editing. M.L - formal analysis N.H - project administration H.Z - conceptualisation, methodology, funding acquisition D.J.S - conceptualisation, methodology, funding acquisition

Acknowledgement

We wish to acknowledge the significant guidance and expertise of the late Prof D. J. Stein.

Data Availability

The Drakenstein Child Health Study is committed to the principle of data sharing. De-identified data will be made available to requesting researchers as appropriate. Requests for collaborations are welcome. More information can be found on our website [<http://www.paediatrics.uct.ac.za/scah/dclhs>].

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Figures

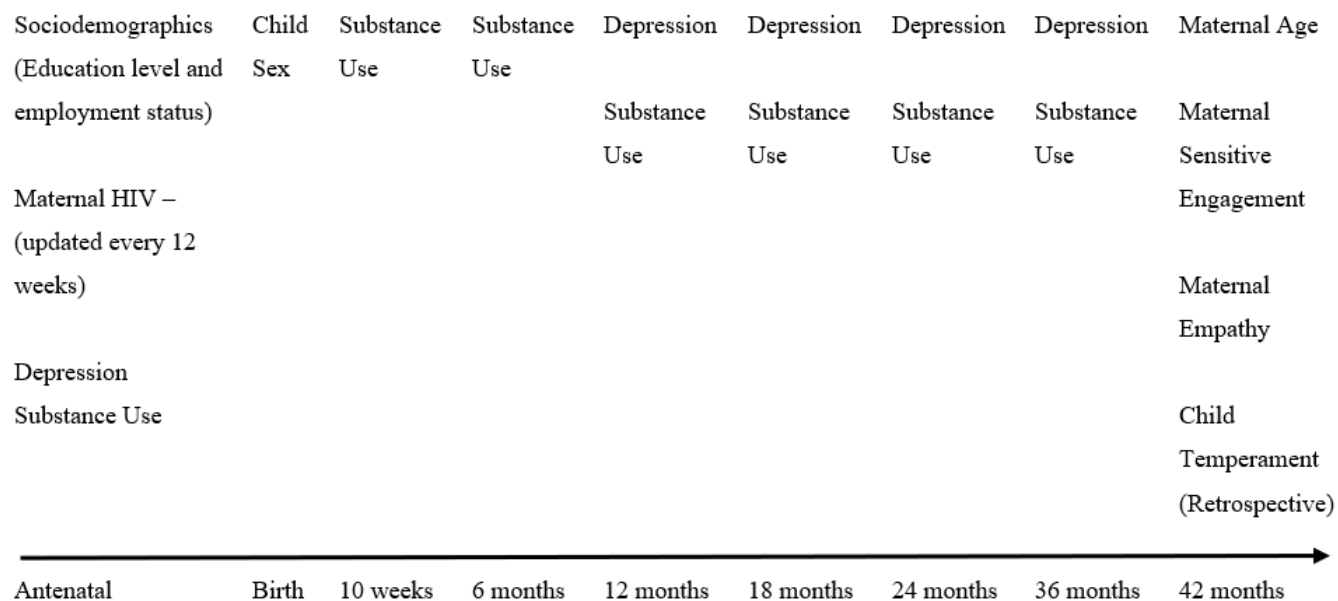


Figure 1

Timeline of Variables

Supplementary Files

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