Caregiver, Child and Family Characteristics associated with Parenting Stress in Rural Kwazulu-Natal

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Declaration

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Signature: Signed by candidate

Date: _____

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Abstract

Parenting Stress (PS) has been shown to negatively impact on various areas of child development. Additionally, clinically significant levels of PS have been shown to be fairly stable over time and thus unlikely to decrease without intervention. Understanding factors that contribute to PS is therefore important for developing preventative interventions. Despite this, PS has largely been understudied, particularly in low- and middle-income countries (LMICs). The present study aimed to explore PS among 1535 caregivers of primary school-aged children in rural KwaZulu-Natal. The data were collected by experienced fieldworkers, in interviewer style, over three visits, and underwent checks for completeness and quality assurance, prior to data entry. The analysis for the present study included using logistic regression techniques to examine contributing caregiver, child and family factors, as well as content analysis to examine caregivers' most prominent concerns about their children. Around 16% of this sample were experiencing clinically significant PS. The following factors were found to increase risk of PS: the mother becoming HIV infected post-pregnancy, the family experiencing recent food insecurity, the child exhibiting internalizing or externalizing behaviours and the child having academic or other problems at school. Two factors were linked to a reduced likelihood of PS, namely the child being helped to learn shapes and sizes at home and maternal participation in a breastfeeding study. The content analysis revealed that caregivers most frequently reported having psychosocial concerns about their children, including specific personality traits such as low levels of conscientiousness and poor self-regulation. These findings illustrate the need for early intervention and support for mothers and children in LMICs. Furthermore, this research showed the impact of parental HIV and the need for comprehensive life-course approaches to curb future adversities for HIV infected women and families.

Keywords: *Parenting Stress; Contributing Factors; Maternal HIV; KwaZulu-Natal*

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Abbreviations

AHRI	African Health Research Institute
ART	Antiretroviral Therapy
CBCL	Child Behaviour Checklist
DC	Difficult Child Subscale
DSA	Demographic Surveillance Area
EPV	Events per Variable
HIC	High Income Countries
HIV	Human Immunodeficiency Virus
HOME	The Home Observation for Measurement of the Environment
LMICs	Low- and Middle-Income Countries
P-CDI	Parent-Child Dysfunctional Interaction (P-CDI) Subscale
PCG	Primary Caregiver
PD	Parental Distress
PS	Parenting Stress
PSI-SF	Parenting Stress Index Short Form
VTS	Vertical Transmission Study

Chapter 1

Introduction

1.1 Background

It is well established that parental mental health impacts significantly on child development in high income countries (HIC), as well as in low- and middle-income countries (LMICs) (Herba, Glover, Ramchandani, & Rondon, 2016; Stein et al., 2014). In contrast, the effects of Parenting Stress (PS) on child development have been understudied. All parents experience stress, but there is a point where it begins to adversely impact on both parent and child wellbeing (Deater-Deckard, 2004). This level of PS was defined as clinically significant by Abidin (1995) and is likely to take place when a parent perceives the demands of their parenting role to outweigh their access to resources (Crnic & Low, 2002).

The quality of the parent-child relationship is arguably one of the most significant factors in a child's early life and subsequent development. Parenting theories demonstrate that increased PS can contribute to the deterioration of the parent-child relationship (Abidin, 1992; Belsky, 1984), as well as impact negatively on child functioning (Crnic & Low, 2002). The mechanisms through which these effects take place have been proposed to be through parenting practices, specifically harsh and punitive parenting (Barnhart & Maguire-Jack, 2016; Mortensen & Barnett, 2015). Elevated PS has also been linked to increased risk of abuse and neglect (Dubowitz & Bennett, 2007). Distressingly, this pattern may manifest in future generations, negatively affecting millions of children (Walker et al., 2011). This is particularly salient in the context of LMICs where adversity is high, with children and parents alike being vulnerable to a multitude of risk factors.

High levels of PS have been demonstrated to be fairly stable over time (Östberg, Hagekull, & Hagelin, 2007; Putnick et al., 2010), illustrating that for PS to decrease, intervention may be essential. For interventions to be successful, PS needs to be adequately

understood. The factors increasing risk, as well as protecting against risk of PS, warrant attention. Research to date has largely been in HIC and has found the following caregiver and contextual factors to impact on levels of PS: relationship status, economic resources, level of education, physical and mental health (Anderson, 2008; Cain & Combs-Orme, 2005; Leigh & Milgrom, 2008). Similarly, mostly in the context of HIC, the following child factors were shown to influence PS: a disability or health condition, internalizing or externalizing behavioural problems and deficits in social skills (Anderson, 2008; Golfenshtein, Srulovici, & Medoff-Cooper, 2015; Neece & Baker, 2008).

1.2 Motivation for Present Study

Given the threat to quality parenting and subsequent child development, understanding PS is a pressing public health issue and integral to designing effective interventions. To date, the majority of research on PS has taken place in HIC. Research on PS in LMICs, where a multitude of adversities are experienced and millions of children are at risk, is pressing (Walker et al., 2011). If factors influencing PS in adverse settings are adequately understood, appropriate resources can be allocated.

Based on literature searches using online databases - including psycINFO and Academic Search Premier - and reviewing reference lists of relevant publications, only two African studies reporting on PS as the main outcome were found (Guo et al., 2014; Potterton, Stewart, & Cooper, 2007). While these studies shed an important light on the plight of mothers in LMIC settings, they also have limitations. For example, they were conducted with clinical samples (Potterton et al., 2007) or with infants to toddler-aged children (Guo et al., 2014), they only used quantitative techniques and examined a limited number of variables in terms of their impact on PS.

1.3 Structure of Dissertation

The dissertation is presented in 5 chapters. Chapter 2 gives an overview of relevant literature, including: the definition of PS; the links between PS, parenting behaviour and children's developmental outcomes; an overview of the caregiver, contextual and child factors contributing to PS; as well as the rationale for the present study. The methodology followed in the study is described in Chapter 3 and includes research aims, context, design, recruitment, sample, measures, procedures and data analysis. Chapter 4 outlines the results. Chapter 5 discusses the results and includes conclusions, implications, limitations and strengths.

Chapter 2

Literature Review

2.1 Defining Parenting Stress

Parenthood is a time of transition, with an exponential increase in responsibilities, resulting in stress. This stress not only originates from big stressful events, but also from the accumulation of daily stresses over time (Crnic & Low, 2002). Experiencing some level of Parenting Stress (PS) is normal, but there is a level at which it begins to impact adversely on the parent-child relationship and the child's functioning (Deater-Deckard, 2004). High levels of PS are generally experienced when the parent feels that parenting demands outweigh their perceived resources to cope (Crnic & Low, 2002). Abidin (1995) conceptualised PS to consist of negative feelings (attributable to the demands of parenting) towards the self and also towards the child. Research has demonstrated high levels of PS to persist and remain fairly constant over the course of childhood (Östberg et al., 2007; Putnick et al., 2010). Thus, high levels of PS may be unlikely to decrease without intervention.

2.2 Parenting Stress, Parenting Behaviour and Child Outcomes

The adverse effects of PS on child development have been widely demonstrated (Deater-Deckard, 2004) and have been noted to be transactional and bidirectional. These effects have been shown in various areas of child development, including: child behavioural and emotional problems (internalizing and externalizing behaviours) (Mackler et al., 2015; Stone, Mares, Otten, Engels, & Janssens, 2016); cognitive and academic abilities (Baker & Iruka, 2013; Harmeyer, Ispa, Palermo, & Carlo, 2016); socio-emotional development (Huang, Costeines, Ayala, & Kaufman, 2014; Whittaker, Harden, See, Meisch, & Westbrook, 2011) and social competence (Anthony et al., 2005; Östberg & Hagekull, 2013). The association between elevated PS and adverse child outcomes has been proposed to be mediated through the use of authoritarian parenting practices (Abidin, 1992). These practises include: decreased

levels of parental warmth, sensitivity and responsiveness, as well as an increased use of harsh punitive punishment (Barnhart & Maguire-Jack, 2016; Mortensen & Barnett, 2015).

Parental warmth and appropriate responding has been cited as important in developing a positive parent-child relationship (Smith, 2010). However, elevated PS is likely to limit a parent's capacity to adequately respond to their child, as demonstrated by research showing links between heightened PS and decreased levels of parental warmth and sensitivity (Baker & Iruka, 2013; Melis Yavuz, Selcuk, Corapci, & Aksan, 2017; Whittaker et al., 2011). Potential evidence of pathways between parenting practises and child outcomes are supported through research indicating lower levels of parental warmth and sensitivity to be linked with subsequent adverse behavioural, academic and socio-emotional outcomes for children (Baker & Iruka, 2013; Melis Yavuz et al., 2017; Whittaker et al., 2011).

Recent literature has reiterated the effect of caregivers' subjective experiences on their parenting behaviour (Finegood, Raver, DeJoseph, & Blair, 2017). Furthermore, PS has been shown to affect how parents perceive their children and their behaviour. Specifically, PS has been posited to contribute to children being perceived as difficult (Mantymaa, Puura, Luoma, Salmelin, & Tamminen, 2006), as well as to an increased focus on negative child behaviours (Fischer, 1990). This is supported by literature showing PS to be linked to decreased positive reinforcement of child behaviour (Abidin, 1992; Crnic & Low, 2002). For example, it was illustrated that mothers with high levels of PS more frequently corrected antisocial behaviours, as opposed to reinforcing prosocial behaviours (Bhavnagri, 1999). Fischer (1990) adds that together with PS increasing a focus on negative child behaviours, there is a tendency to make negative inferences about children, based on perceived negative behaviours. These negative inferences are then proposed to contribute to a specific perception of the child and lower the parent's threshold for tolerating certain behaviours, which in turn increases negative responses to the child, impacting detrimentally on the parent-child

relationship. This cycle of interaction may account for research concluding that negative parental perceptions of children are associated with subsequent child behavioural problems (Renk, 2011; Semke, Garbacz, Kwon, Sheridan, & Woods, 2010).

In contrast to authoritarian parenting practises, research from different cultural settings has provided evidence for authoritative parenting (defined by warm, involved parenting with appropriate amounts of control) to be associated with improved developmental outcomes (Garcia & Gracia, 2009; Querido, Warner, & Eyberg, 2002; Steinberg, 2001). Potentially, parents experiencing lower levels of PS are more likely to utilise authoritative practices.

2.3 Factors Contributing to Parenting Stress

Given the stability of high levels of PS over time and the subsequent negative impact on both parents and children, it is essential to examine factors which contribute to PS. Abidin (1995) theorised that PS is a function of parent, child and contextual characteristics. This section outlines factors from each of these domains, which have been shown to influence PS.

2.3.1 Caregiver and contextual factors

Salient caregiver and contextual factors shown to affect PS include: relationship status, economic resources, level of education, physical and mental health. Several studies have reported single parents (as compared to married or cohabiting parents) to experience elevated levels of PS (Anderson, 2008; Son & Peterson, 2017; Williford, Calkins, & Keane, 2007). Heightened PS may result from not having a partner to assist with child rearing tasks (Price, Price, & McKenry, 2010) and generally having lower levels of social support (Brown & Moran, 1997). However, disentangling the association between caregiver relationship status and PS is complicated as single parents often experience concurrent factors which could influence levels of PS, such as financial hardship, lower levels of education and increased levels of depression (Brown & Moran, 1997; Son & Peterson, 2017). For example,

among a sample of African American mothers (N=103), family configuration (including having a partner or living with their own parent) was found to have no effect on PS, whereas financial resources had a significant effect (Cain & Combs-Orme, 2005).

Limited financial resources have widely been shown to be associated with PS (Cain & Combs-Orme, 2005; Mortensen & Barnett, 2015; Potterton et al., 2007; Reitman, Currier, & Stickle, 2002; Seo & Moon, 2012). Parents experiencing financial strain have limited access to resources which could assist in preventing and mitigating the effects of stress. This impacts negatively on both parental and child well-being (Taylor, Rodriguez, Seaton, & Dominguez, 2004). Qualitative research has corroborated financial strain as a salient factor, with caregivers in low-income settings perceiving poverty to be the primary barrier in providing quality care for their children (Russell, Harris, & Gockel, 2008).

In South Africa, among caregivers of Human Immunodeficiency Virus (HIV) infected children (N=122), the quality of housing facilities was reported as an important predictor of PS (Potterton et al., 2007). Caregivers living in better housing facilities could be experiencing a level of financial security, protecting them from some of the chronic stressors of extreme poverty. Additionally, among the caregivers in this sample (Potterton et al., 2007), higher education levels were protective against PS. This finding has also been reported in other samples (Parkes, Sweeting, & Wight, 2015). Potentially, caregivers with higher levels of education have increased access to available resources and services in their communities, thus reducing levels of stress.

Moreover, parents experiencing chronic health conditions and poor physical health have been shown to be susceptible to PS (Anderson, 2008). For example, elevated levels of stress have been reported among HIV infected caregivers (Catz, Gore-Felton, & McClure, 2002; E. R. Johnson et al., 2015; Murphy, Marelich, Armistead, Herbeck, & Payne, 2010). Specifically, HIV infected mothers have been reported to experience anxiety related to their

health, which contributes to PS (Murphy et al., 2010). Among samples of HIV infected caregivers, elevated levels of stress have been shown to result in the use of poorer parenting skills and fewer active coping strategies (Catz et al., 2002; Murphy et al., 2010).

Additionally, there is strong consensus in international literature that parental psychopathology, most often depression, is associated with PS (Chang & Fine, 2007; Chester & Blandon, 2016; Huang et al., 2014; Leigh & Milgrom, 2008; Mortensen & Barnett, 2015; Williford et al., 2007). There are various pathways which could account for the link between depression and PS. For example, mothers with depression have been shown to have low levels of self-efficacy and belief in their parental competence (Chang & Fine, 2007). Furthermore, research has shown mothers with depression to be less responsive to their children (Arteche et al., 2011), as well as more likely to construe their children's difficult behaviour as intentional (Callender, Olson, Choe, & Sameroff, 2012). These pathways would likely contribute to frustration in the parental role and add to parent-child dysfunction, thereby increasing overall PS.

Although the research on PS in Sub-Saharan Africa has been limited, depression has been shown as a salient risk factor for PS among a longitudinal cohort of mothers from Ghana and Ivory Coast (N=577) (Guo et al., 2014). Antenatal and postnatal depression were significantly associated with PS at three months, one year and two years postpartum.

2.3.2 Child factors

Given that the quality of the parent-child relationship influences PS, an understanding of child factors contributing to high levels of PS is important (Deater-Deckard, 1998). Child factors often cited in the literature include: disability or health conditions, problem behaviours and deficits in social skills.

PS has consistently been shown to be elevated among caregivers of children with various paediatric health conditions, including intellectual disability, Down syndrome and

autism (Golfenshtein et al., 2015; Hassall, Rose, & McDonald, 2005; Phillips, Conners, & Curtner-Smith, 2017).

Additionally, child problem behaviours (including internalizing and externalizing) have been widely reported to contribute to high levels of PS (Anderson, 2008; Hassall et al., 2005; Reitman et al., 2002). Parents of children with externalizing behaviours (specifically oppositionality and hyperactivity) have reported experiencing low levels of parental competence and reduced quality of parent-child interactions (Beernink, Swinkels, Van der Gaag, & Buitelaar, 2012), likely contributing to PS. The relationship between child behavioural problems and PS has also been observed in the other direction, with early PS being linked to later emotional and behavioural problems in children (Haapsamo et al., 2013). An increasing number of longitudinal studies have confirmed a bidirectional and transactional relationship between child behaviour and PS, finding that they co-vary over time and that this pattern is fairly stable over the course of childhood and adolescence (Mackler et al., 2015; Neece, Green, & Baker, 2012; Stone et al., 2016; Williford et al., 2007).

Social skills have also been shown to be an important factor in PS, specifically among children in middle and later childhood (Anderson, 2008; Neece & Baker, 2008). Social skills are defined as socially acceptable learned behaviours, which enable effective interaction with others and include elements of cooperation, assertion, responsibility, empathy and self-control (Gresham & Elliot, 1990). Examples of social skills include: following directions, finishing tasks, initiating interactions with others, requesting help and compromising. When children enter middle childhood and begin formal schooling, good social skills become increasingly important as children are required to negotiate interactions and relationships with teachers and peers (Neece & Baker, 2008). The quality of these social skills can impact on school adjustment, social relationships and academic achievement (Malecki & Elliott,

2002), which in turn could impact on PS. Longitudinal research has also reported a bidirectional relationship between social skills and PS (Neece & Baker, 2008). Therefore, the quality of social skills may be vital for ensuring positive outcomes for children in middle and late childhood, as well as for their parents.

2.4 Conclusion and Rationale for Present Study

PS has been linked to negative child outcomes in various areas of development, including behavioural, emotional, cognitive and social. This relationship has been proposed to be moderated through parenting behaviour. PS has been linked to specific parenting practises, including the use of authoritarian parenting, decreased parental warmth and sensitivity, and decreased positive reinforcement of child behaviour.

Caregiver and contextual factors shown to influence PS include relationship status, economic resources, education levels and both physical and mental health. Salient child factors include health status of the child, problem behaviours and social skills. However, much of the research examining these factors was conducted in HIC. Research in LMICs, and specifically in Sub-Saharan Africa, is more limited. Two studies in Africa (West Africa and South Africa) have reported on PS as the main outcome and have examined contributing factors (Guo et al., 2014; Potterton et al., 2007). This research has limitations, namely the use of clinical samples (Potterton et al., 2007) which may show bias and samples being largely urban based and limited to infants and toddlers (Guo et al., 2014).

The present study used data from the Siyakhula Study, a large population-based sample (N=1536) of rural mothers with primary school-aged children in KwaZulu-Natal, South Africa. The present research is important as it contributes to a small existing research base and is set in South Africa, a setting heavily affected by adversity, where maternal and child mental health is precarious. Furthermore, the sample being population-based allows for a more holistic view of parenting stress, one not as skewed by children's morbidity, as could

be the case in clinical samples. The children in the current sample being of primary-school age adds more age diversity into the existing data, allowing for increased understanding of PS across a child's life stages. Previous research from the Siyakhula Study has reported a high prevalence of PS, and has examined the effect of specific maternal and contextual factors on PS (Rochat et al., 2017b). The present study adds to this previous research, by including child factors and a wider range of caregiver and contextual factors. Furthermore, the present study includes qualitative data on what caregivers perceive as their most prominent concerns regarding their child. This data allows some insight into the subjective experience of these caregivers and how this may influence PS.

Chapter 3

Methods

The present study is a secondary data analysis using data from the Siyakhula Study. The Siyakhula Study was conducted between 2012 and 2014 at the African Health Research Institute (AHRI) - formerly known as the Africa Centre for Population Health. This chapter outlines the methodology used in both the Siyakhula Study and the present study, specifically outlining the following: research aim and questions, research context, design, sample recruitment, measures, study procedures, ethical statement and data analysis conducted.

3.1 Research Aim and Questions in the Present Study

The aim of the present study was to further explore PS among caregivers of primary school-aged children in rural KwaZulu-Natal; including contributing factors and associations with caregiver concerns about their children.

This study addressed the following specific research questions:

1. What maternal/caregiver, child and family risk and protective factors are associated with PS outcomes at or above the 90th percentile?
2. What do caregivers describe as their most prominent concerns regarding their child?
3. Are there specific concerns more prevalent among caregivers with PS, at or above the 90th percentile, as compared to those who are not experiencing PS above that cut off?

3.2 Research Context

AHRI is funded by the Wellcome Trust and is located in the Hlabisa sub-district of Umkhanyakude, in rural Northern KwaZulu-Natal, South Africa. This area has a high prevalence of HIV and has experienced a successful large-scale roll out of Antiretroviral Therapy and Prevention of Mother-to-Child Transmission programs (Chetty, Thorne, Tanser, Bärnighausen, & Coutsoudis, 2016; Zaidi, Grapsa, Tanser, Newell, & Barnighausen, 2013). The demographic surveillance system of AHRI routinely collects data from members of all

households in a defined geographical area in the surrounding community, called the demographic surveillance area (DSA).

The DSA spans 438 kilometres, includes an estimated population of 85 000 people and contains six primary healthcare clinics (Tanser et al., 2008). Data collected is at the household and individual level. Data at the household level is collected from a senior member and covers the composition and makeup of the household, including births, deaths and migrations. At the individual level, the data covers HIV status, sexual behaviour and biomeasures, and is obtained from all members over the age of 15 years (Tanser et al., 2008).

3.3 Research Design

The Siyakhula Study was a cross-sectional assessment of longitudinal data, which aimed to examine the long-term effects of an exclusive breastfeeding intervention on the physical, cognitive and socio-emotional development of children aged 7-11 years (Rochat et al., 2016). The sample of the Siyakhula Study comprised of an intervention and comparison group - both drawn from longitudinal cohorts consisting of mother-child dyads (Rochat et al., 2017a). The intervention group was recruited through re-enrolling mother-child dyads from an early life breastfeeding intervention, the Vertical Transmission Study (VTS) (Bland, Coovadia, Coutsoudis, Rollins, & Newell, 2010). The comparison group of mother-child dyads were enrolled from the DSA of AHRI.

VTS was a non-randomized cohort intervention (2001-2007) which took place at AHRI and aimed to investigate the risk of HIV transmission associated with different infant feeding practices among HIV infected women (Bland et al., 2008). During VTS lay counsellors visited participants four times in the antenatal period, four times in the first two weeks post-partum and thereafter fortnightly up to 6 months post-partum (Bland et al., 2008). Results of the VTS study showed that exclusive breastfeeding for the first six months of life significantly reduced the likelihood of mother-to-child HIV transmission, as compared to mixed feeding (Bland et al., 2010).

The present study employed a mixed methods approach, with quantitative and qualitative analyses. Mixed method approaches have become increasingly popular as it has been argued that quantitative and qualitative analyses complement each other, with qualitative data allowing insight and adding context-specific meaning to the quantitative component (R. B. Johnson & Onwuegbuzie, 2004). Within mixed methods research there are various designs; with the present study following an embedded design. In an embedded design unequal priority is given to the two types of analyses. In this study the quantitative analysis was the main focus, with the qualitative analysis playing a secondary role (Creswell, Plano Clark, Gutmann, & Hanson, 2003).

3.4 Recruitment of the Siyakhula Study Sample

All the children included were HIV uninfected. The HIV status of the mother was not an exclusion criterion. Although mother-child dyads were enrolled and data were collected from every biological mother, she did not have to be the primary caregiver (PCG) of the child. Where applicable, the alternative PCG also participated in aspects of data collection. Recruitment strategies and criteria differed for the intervention and comparison groups, as discussed below.

3.4.1 Intervention group (from VTS)

Women who had participated in VTS were contacted by phone or through a home tracing visit and invited to participate. To be eligible for enrolment in the intervention group, the mother-child dyad needed to be alive and contactable, the child needed to be HIV uninfected, aged between 7 and 11 years and residing in the study area (which was not limited to the DSA). The motivation for the exclusion of HIV infected children was that children with HIV follow a different developmental trajectory (Sherr, Croome, Parra Castaneda, Bradshaw, & Herrero Romero, 2014), which could have confounded the effects of VTS. HIV status results for these mothers were available as they had been tested at 2 years

post-partum as part of VTS. If the mother was HIV uninfected at that point, she needed to know her current HIV status within the previous 12 months to be eligible to enrol in the Siyakhula Study. Furthermore, the mother and/or relevant PCG had to agree to home visits and be willing for the child to participate in an assessment session.

3.4.2 Comparison group (from DSA)

To enrol a comparison group, a list of randomly selected mothers with a child aged between 7 and 11 years and living within the DSA was drawn from the demographic surveillance at AHRI. These mothers were contacted through a home tracing visit and invited to participate. Criteria included not having participated in VTS, having an HIV uninfected child in the correct age range, living in the study area, known HIV status during pregnancy and current HIV status within the last 12 months, willingness to be visited at home and for the child to participate in an assessment session.

Additional criteria were that the mother had to have received antenatal and postnatal care within the DSA and have a Road to Health Card for the child. This is a government issued record of early growth data and details of clinic visits, including HIV status of both mother and child. Compared to the VTS group, there was limited data available for the group from the DSA. These additional criteria were taken as an indication that the mothers received the standard of care typical in the district.

3.4.3 Sample

The sample consists of 1,536 mother-child dyads who took part in the Siyakhula Study. The children were aged 7-11 years and HIV uninfected when the data was collected, whereas the mothers were either HIV infected or uninfected. The consort diagram is shown in Figure 1. A full description of the sample characteristics is found in the Results chapter (section 4.1, page 51).

3.5 Measures

The measures included in the present analyses are described below. PS, the main outcome measure, is described, as well as the predictor variables used in the quantitative analyses and the variable used in the qualitative analysis. The screening steps followed in selecting the relevant predictor variables are outlined in section 3.8.1.1.

3.5.1 Parenting Stress Index Short Form (PSI-SF)

PS was the main outcome in this secondary analysis and was measured using the Parenting Stress Index Short Form (PSI-SF). The PSI-SF, consisting of 36 items, is a shortened version of the original Parenting Stress Index (Abidin, 1995). The reliability and validity of the PSI-SF has been studied in the United States (Haskett, Ahern, Ward, & Allaire, 2006), including among high risk samples (Barroso, Hungerford, Garcia, Graziano, & Bagner, 2016; S. J. Lee, Gopalan, & Harrington, 2016). Additional studies examining the psychometric properties have been conducted with samples in Chile (Aracena et al., 2016) and Spain (Perez-Padilla, Menendez, & Lozano, 2015). The PSI-SF was shown to have good internal consistency among low-income mothers in the United States (Cronbach's $\alpha = .91$) (Barroso et al., 2016), as well as among the Chilean (Cronbach's $\alpha = .92$) (Aracena et al., 2016) and Spanish (Cronbach's $\alpha = .89$) (Perez-Padilla et al., 2015) samples. In terms of validity, studies showed support for the factor structure of the PSI-SF (Aracena et al., 2016; S. J. Lee et al., 2016) and demonstrated convergent validity with theoretically related measures of maternal mental health, parenting practices and child behaviour (Barroso et al., 2016; Haskett et al., 2006).

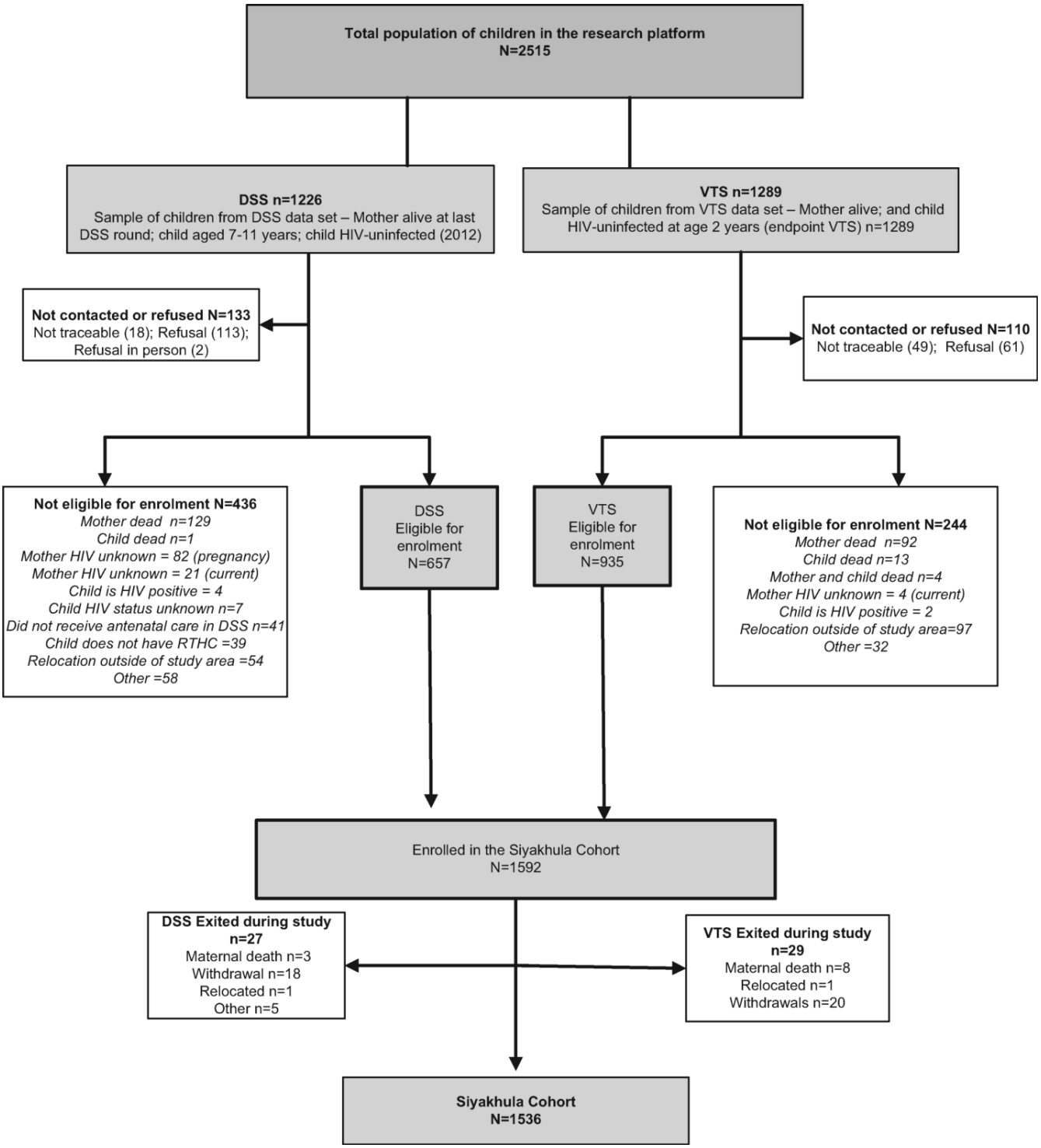

Figure 1. Consort diagram for the Siyakhula Study. DSS= Demographic Surveillance System (coordinates the routine data collection from the DSA). Reprinted from "Cohort Profile: The Siyakhula Cohort, rural South Africa," by T.J. Rochat et al., 2017, *International Journal of Epidemiology, 46,* p. 3. Copyright 2017 by T.J. Rochat. Reprinted with permission.

The PSI-SF has been used with HIV infected mothers in KwaZulu-Natal, South Africa (Rochat, Arteche, Stein, Mitchell, & Bland, 2015). It was forward and back translated into isiZulu and was shown to have excellent internal consistency (Cronbach's $\alpha = .92$) (Rochat et al., 2015).

The PSI-SF items use a Likert scale; with responses ranging from strongly disagree to strongly agree. It yields a Total PS Score ranging from 36 to 180, with higher scores indicating higher levels of PS. The PSI-SF consists of three subscales, with scores ranging from 12-60 each, making up the Total PS Score.

The subscales of the PSI-SF are:

- Parental Distress (PD) Subscale: This refers to a parent's perception of the competence of their parenting, conflict within their intimate relationship, levels of social support and feeling restricted by their parental role.
- Parent-Child Dysfunctional Interaction (P-CDI) Subscale: This includes how the parent views the quality of the relationship and interactions with their child.
- Difficult Child (DC) Subscale: This reflects the degree to which a parent perceives their child as difficult, including temperament, demandingness and compliance.

The test authors recommended specific cut offs for the PSI-SF outcomes, which indicate clinically significant/elevated levels of stress (Abidin, 1995). These are based on raw scores and are the following: a Total PS score of ≥ 90, a PD and DC score of ≥ 33 and a P-CDI score of ≥ 27. These thresholds were determined using the 90^{th} percentile on the outcomes among the normative sample in the United States. The normative sample (N=800) was recruited in the 1980s through annual clinic visits; a third of the sample had some form of tertiary education, 87% were Caucasian and 88% married (Abidin, 1995). The aforementioned thresholds were used to form binary variables (yes/no) in the present

analysis, in order to report the prevalence of clinically significant/elevated PS outcomes (as defined by the test authors).

It is, however, inappropriate to assume that thresholds based on the normative sample are applicable in contexts which differ greatly in culture, language and socioeconomic status (van Widenfelt, Treffers, de Beurs, Siebelink, & Koudijs, 2005). For example, as compared to the normative sample, higher scores on the PD subscale were found in the sample from the present study. Subsequently, for the PS variables used as outcomes in later analysis (outlined in section 3.7.1), I created binary variables (yes/no) using scores falling at or above the 90th percentile in this sample. Using these cut offs allows for the exploration of factors contributing to PS among a particularly highly stressed group of PCGs. In LMICs contexts where mental health provision is a challenge (Rathod et al., 2017), it is important to examine the most affected in order to appropriately allocate resources. Cut off values at the 90th percentile for the PS raw scores in this sample were as follows: Total PS scores of ≥ 98, PD Subscale of ≥ 44, P-CDI Subscale of ≥ 28 and DC Subscale of ≥ 34.

3.5.2 Socio-demographics

The following socio-demographics were drawn from study forms included in Appendices A to E:

- Maternal/PCG: variables specific to the mother: relationship status, HIV status, number of deceased children, age and chronic medication. Variables specific to the PCG (i.e. mother/other): age, education level and paid employment.
- Child: sex, birth order, whether hospitalized since birth and if ever had TB.
- Family/Household: current PCG of child (mother/other), head of household, man most involved in child's life, food security (whether there have been days in the previous four weeks where there has not been enough food available to

feed the child), if any resident household member has been a victim of any crime in the previous 12 months and whether the household owns a fridge. The ownership of a fridge was used as proxy for socio-economic status, as has been done in other LMICs (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006).

3.5.3 General Patient Health Questionnaire Scales

Maternal mental health was measured using the General Patient Health Questionnaire Depression Scale and the General Patient Health Questionnaire Anxiety Scale (GAD-7) (Kroenke, Spitzer, & Williams, 2001; Spitzer, Kroenke, Williams, & Löwe, 2006). Both screening tools have been shown to be effective and useful for identifying potential mental health problems in LMICs (D. Goldberg, 2014). They have been used in South Africa (Richter et al., 2014) and specifically in KwaZulu-Natal with HIV infected adults (Rochat et al., 2015; Yeji et al., 2014). Reliability was excellent among the HIV infected women in KwaZulu-Natal (Cronbach's $\alpha = .92$) (Rochat et al., 2015). Binary indicators (yes/no) based on diagnostic clinical algorithms for depression and anxiety (American Psychiatric Association, 2013) were created.

3.5.4 Child Behaviour Checklist (CBCL)

Children's mental health problems were measured using the parent reported Child Behaviour Checklist (CBCL) (Achenbach & Rescorla, 2001). The CBCL is a widely used measure which assesses children's emotional and behavioural problems and has been validated across a wide range of cultural settings (Rescorla et al., 2007). It has been used in South Africa (Sabet et al., 2009), including with children affected by HIV (Cluver, Gardner, & Operario, 2007). It has been shown to have excellent reliability in a population of HIV infected women in KwaZulu-Natal (Cronbach's $\alpha = 0.94$) (Rochat et al., 2015). The CBCL

was translated and back translated into isiZulu for use in the Siyakhula Study (translation license #512-10-29-10).

The CBCL has two parts, namely the Competence Scale and the Behaviour Rating Scale. The Competence Scale records descriptive information about the child, including items which reflect social and school competence, whereas the Behaviour Rating Scale consists of 113 items used to assess for the presence of mental health problems. The scores on the Behaviour Rating Scale were transformed using the multi-cultural rating-to-score norming software (Achenbach et al., 2008). With this norming software the following scores are produced: a total score, scores for six disorders defined by the *Diagnostic and Statistical Manual* (namely: affective, anxiety, somatic, ADHD, oppositional and conduct), as well as scores for the internalizing and externalizing subscales. The internalizing subscale reflects emotional problems (affective, anxiety and somatic) and the externalizing subscale reflects behavioural problems (ADHD, oppositional and conduct).

In the present study, I used binary outcomes (yes/no) from the Behaviour Rating Scale for the internalizing and externalizing subscales. These outcomes were calculated using the cut off of ≥ 65, which includes the borderline and clinical thresholds (Achenbach & Rescorla, 2001). Three items from the Competence Scale were used: the number of times a week the child sees friends outside of regular hours (<1/ 1 or 2/ 3+), how well the child gets on with siblings compared to other children of his/her age (worse/average/better) and the ability to play or work alone (worse/average/better). Furthermore, the following item from the Competence Scale was used for the qualitative analysis; “What concerns you most about your child?”

3.5.5 The Home Observation for Measurement of the Environment (HOME)

The Home Observation for Measurement of the Environment (HOME) in middle childhood (Bradley, Caldwell, Rock, Hamrick, & Harris, 1988) was used to measure aspects

of the home environment. The HOME has been widely used, including with high-risk populations (Totsika & Sylva, 2004). A recent multi-site analysis provided evidence of the HOME maintaining validity and partial measurement equivalence across a variety of LMICs, including South Africa (Jones et al., 2017). During the Siyakhula pilot study, it was found that completing the items requiring observation of mother and child together was not feasible, as we were working with school going children, and often saw them separately. Therefore, we used an abbreviated version of the HOME which was completed with only the mother or the PCG (Appendix F).

After the screening of the data (described in section 3.8.1.1), fifteen HOME items, all with binary outcomes (yes/no), were retained. These included the following items inquiring about expectations of the child to: make own bed, clean up after spills, bath him/herself, keep shared living area clean and straight, do routine chores and organize own time. Also included were the following items reflecting family involvement, discipline and home stimulation: the child eats a meal with mother/PCG once a day or more, mother reports no more than one smack during past week, child has at least 3 children's books (which are not school books), whether the child is read to 3 times or more a week, whether the child reads several times a week for enjoyment, whether the child receives lessons/belongs to sports/music/art/dance/drama organizations, whether there is a musical instrument in the home the child can use, whether the family visits with family or friends 2-3 times a month and whether the child is helped to learn shapes and sizes at home.

3.5.5.1 Other measures

Data from three other measures were included following the data selection and screening (3.8.1.1). The cognitive functioning of the mothers was assessed using the Raven's Progressive Matrices which has been shown to be psychometrically sound (Raven, Raven, & Court, 1998) and has been widely used in South Africa (Cockcroft & Israel, 2011). For this

analysis the total Raven's score was coded using the median score to create binary categories (low/high). The children's cognition was assessed using the Kaufman Assessment Battery, Second Edition, which has shown favourable psychometric properties in this community (Mitchell et al., 2017). For this analysis the global score calculated from the Kaufman Assessment Battery, the Mental Processing Index was coded into binary categories (low/high) using the median score. Any alcohol use among caregivers was assessed using the World Health Organisation Alcohol Use Disorder Identification Test, widely considered a gold standard measure of alcohol use (Reinert & Allen, 2002).

3.6 Procedures

This section is presented in two parts. The first describes the Siyakhula Study visits and the second the data collection and entry process.

3.6.1 Siyakhula Study visits

The Siyakhula Study consisted of three visits. The first visit was completed with the mother (and if applicable the alternative PCG) to assess eligibility and to complete enrolment, if willing. The second was an individual session with the mother (and if applicable the alternative PCG) where quantitative and qualitative data were collected by means of open-ended questions with short responses. This included study forms recording sociodemographic, socioeconomic and medical data, as well as the following measures: PSI-SF, General Patient Health Questionnaire Depression and Anxiety Scales, CBCL, HOME, Raven's and the Alcohol Use Disorder Identification Test. The third visit was an individual session with the child where the KABC-II was administered.

3.6.2 Data collection and entry

The Siyakhula Study employed a team of 18 isiZulu-speaking fieldworkers who had all finished high school and had at least two years of fieldwork experience in KwaZulu-Natal. Each fieldworker was trained and responsible for completing different study visits. The team

underwent an extensive training session and competency assessment prior to the start of data collection. Refresher training was provided throughout the study. Data were collected using hard copy forms in interviewer style, with all questions asked and information provided in isiZulu, while the responses were recorded in English.

Throughout the study, the fieldworkers reported to the AHRI office in the mornings and were assigned a participant and issued with the appropriate hardcopy forms for completion during the specific visit. These forms were signed out in the fieldworker's name. Each fieldworker was required to return to the office before the end of the work day, submit their completed hard copy forms and sign to confirm the submission. Uncompleted forms would remain signed out in the fieldworker's name, but needed to be stored at the office. All hardcopy forms were securely stored in locked cabinets at AHRI.

Following submission, the hardcopy forms were reviewed for data quality and completeness by the Siyakhula Study data entry team. Once any queries had been resolved with the fieldworker, the data were entered into Microsoft Access (a database management system) and securely stored on the AHRI server.

3.7 Ethical Clearance

The Siyakhula Study was funded by Grand Challenges Canada (grant number 0063-03). Ethical clearance was received from the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (reference number: BF184/12). Ethical clearance for 2012 to 2013 was obtained (Appendix G), followed by recertification for 2013 to 2014 (Appendix H). The activities outlined in this proposal are covered by that clearance.

Consent from mothers/primary caregivers and assent from children were obtained prior to enrolment. Each mother-child dyad was given a randomly generated study ID number which was used to refer to their data. The hard copies of the study forms were treated with

confidentiality and kept in a locked filing cabinet. Following the approval of my research proposal and data management plan, I received a de-identified dataset.

3.8 Data Analysis

The analysis undertaken consisted of two main parts. The first used logistic regression techniques and the second content analysis. Data analysis was mainly conducted using STATA version 14 (StataCorp, 2007).

3.8.1 Logistic Regression

I used logistic regression techniques to determine the Mother/PCG, Child and Family/Household variables which contributed to PS outcomes at the 90th percentile in this sample. To ensure that logistic regression was an appropriate choice of analysis for the data, I followed guidelines outlined by Hosmer, Lemeshow, and Sturdivant (2013). This method was appropriate, because my main outcome variables are dichotomous and have mutually exclusive categories with each observation belonging to only one group.

3.8.1.1 Data selection and screening

In order to choose the variables which would make up the Maternal/PCG, Child and Family/Household Models, I used a purposeful selection approach, relying on theoretical and statistical association with the outcome variable (Hosmer et al., 2013). This was completed through three steps.

Step 1: Selection from the Siyakhula Study database

I selected variables from the larger Siyakhula Study database which are theoretically linked to PS and then categorised them as Maternal/PCG, Child or Family/Household variables. As the mother did not have to be the PCG for the child to be eligible for enrolment, there are variables which are specific to the biological mother and others to the relevant PCG (i.e. mother/other). The selected variables are listed in Table 1 and consist of: 15 Maternal/PCG variables, 20 Child variables and 39 Family/Household variables.

Step 2: Testing statistical relevance of potential predictors

Here I tested the statistical association of the variables from *Step 1* with the Total PS 90th percentile outcome. As all the predictor variables selected are categorical variables, I followed the guideline of using standard contingency tables to examine the level of association between the predictors and the outcome (Hosmer et al., 2013). Predictors which had a chi-square statistic with a *p*-value of ≤ .25 were included in *Step 3*. This cut off was chosen, seeing as a more traditional significance value of $p \leq .05$ may fail to identify variables which could become important in multivariate analyses (Mickey & Greenland, 1989). The results of the chi-square analyses are shown in Table 1. Three Maternal/PCG variables, four Child variables and 15 Family/Household variables had a *p*-value of > .25 and were subsequently dropped.

Table 1

Chi Square Statistics of Mother/PCG, Child and Family/Household Characteristics and Parenting Stress (N=1536)

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Maternal / PCG				
Age (*n*=1511)			3.39	**.18**
≤ 30 years	38 (24)	323 (24)		
31-40 years	71 (45)	518 (38)		
41+ years	49 (31)	512 (38)		
Relationship status (*n*=1516) [a]			5.18	**.08**
Single	33 (21)	214 (16)		
With biological father	59 (38)	634 (47)		
With new partner	63 (41)	513 (38)		
Education level (*n*=1512)			19.10	**<.001**
None	11 (7)	81 (6)		
Primary	74 (47)	459 (34)		
Grade 10	55 (35)	464 (34)		
Matric or post-matric	18 (11)	350 (26)		
Raven's Progressive Matrices (*n*=1505) [a]			4.99	**.03**
Low	96 (62)	703 (52)		
High	60 (39)	646 (48)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Paid employment (*n*=1533)			6.11	**.01**
Yes	29 (18)	376 (27)		
No	130 (82)	998 (73)		
Maternal HIV status (*n*=1534) [a]			21.31	**<.001**
Uninfected	57 (36)	722 (53)		
Infected in pregnancy	55 (35)	421 (31)		
Infected post-pregnancy	47 (30)	231 (17)		
On ART (*n*=752) [a]			0.00	.97
Yes	60 (59)	381 (59)		
No	42 (41)	269 (41)		
In VTS (*n*=1536) [a]			2.75	**.10**
Yes	84 (53)	821 (60)		
No	75 (47)	555 (40)		
Anxiety (*n*=1535)			55.73	**<.001**
Yes	21 (13)	29 (2)		
No	138 (87)	1347 (98)		
Depression (*n*=1535)			80.39	**<.001**
Yes	34 (21)	54 (4)		
No	125 (79)	1322 (96)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Any drinking (*n*=1535)			7.03	**.01**
Yes	35 (22)	194 (14)		
No	124 (78)	1192 (86)		
Number of deceased children (*n*=1535) [a]			6.40	**.01**
0-3	105 (66)	1036 (75)		
4+	54 (34)	340 (25)		
Hospitalizations since child's birth (*n*=1536) [a]			0.004	.99
0	133 (84)	1150 (84)		
1	19 (12)	164 (12)		
2+	7 (4)	62 (5)		
Chronic medication (*n*=1531) [a]			2.22	**.14**
Yes	23 (15)	145 (11)		
No	136 (86)	1227 (89)		
TB (*n*=1529) [a]			0.82	.37
Yes	26 (16)	188 (14)		
No	133 (84)	1182 (86)		
Child				
Age (*n*=1535)			1.29	.26
7-8 years	30 (19)	212 (15)		
9+ years	129 (81)	1164 (85)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Sex (*n*=1535)			9.50	**.002**
Male	87 (55)	577 (42)		
Female	72 (45)	799 (58)		
Birth order (*n*=1535)			2.83	**.24**
1-2	82 (52)	755 (55)		
3-4	47 (30)	325 (24)		
5+	30 (19)	296 (22)		
Repeated Grade (*n*=1535)			18.55	**<.001**
Yes	90 (57)	535 (39)		
No	69 (43)	841 (61)		
Any academic or other problems in school (*n*=1472)			46.28	**<.001**
Yes	39 (26)	110 (8)		
No	111 (74)	1212 (92)		
Child has any illness or disability (physical/mental) (*n*=1505)			15.66	**<.001**
Yes	23 (15)	86 (6)		
No	129 (85)	1267 (94)		
Child hospitalized since birth (*n*=1535)			4.79	**.03**
Yes	30 (19)	174 (13)		
No	129 (81)	1202 (87)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Child ever had TB (*n*=1521)			3.32	**.07**
Yes	14 (9)	73 (5)		
No	143 (91)	1291 (95)		
Child on any chronic medication (*n*=1522)			0.08	.77
Yes	2 (1)	14 (1)		
No	155 (99)	1351 (99)		
Child receiving special education or remedial services (*n*=1528)			0.26	.61
Yes	1 (1)	5 (0.4)		
No	157 (99)	1365 (100)		
Mental Processing Index (*n*=1535)			3.81	**.05**
Low	86 (54)	632 (46)		
High	73 (46)	744 (54)		
CBCL Total (*n*=1532)			279.43	**<.001**
Yes	60 (38)	41 (3)		
No	99 (62)	1332 (97)		
CBCL Internalizing (*n*=1532)			226.70	**<.001**
Yes	59 (37)	55 (4)		
No	100 (63)	1318 (96)		
CBCL Externalizing (*n*=1532)			223.99	**<.001**
Yes	63 (40)	66 (5)		
No	96 (60)	1307 (95)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Number of close friends (*n*=1532)			2.14	.54
None	10 (6)	69 (5)		
One	25 (16)	234 (17)		
Two or three	106 (67)	962 (70)		
Four or more	17 (11)	109 (8)		
Times/week spent with friends out of regular school hours (*n*=1521)			4.70	**.10**
Less than one	25 (16)	297 (22)		
One or two	23 (15)	235 (17)		
Three+	110 (70)	831 (61)		
How well gets along with other children (*n*=1525)			48.72	**<.001**
Worse	26 (17)	58 (4)		
Average	86 (54)	673 (49)		
Better	46 (29)	636 (47)		
How well gets along with siblings (*n*=1403)			82.53	**<.001**
Worse	51 (35)	119 (10)		
Average	53 (37)	548 (44)		
Better	41 (28)	591 (47)		
How well behaves with parents (*n*=1526)			87.56	**<.001**
Worse	22 (14)	24 (2)		
Average	84 (53)	578 (42)		
Better	52 (33)	766 (56)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
How well plays/works alone (*n*=1524)			13.54	**.001**
Worse	23 (15)	100 (7)		
Average	88 (56)	715 (52)		
Better	47 (30)	551 (40)		
Family/Household				
Primary caregiver (*n*=1535)			5.35	**.02**
Mother	144 (91)	1149 (84)		
Other	15 (9)	227 (17)		
Head of the household (*n*=1509)			5.60	**.23**
Mother	31 (20)	190 (14)		
Husband/partner	38 (24)	397 (29)		
Maternal grandparents	50 (32)	451 (33)		
Paternal grandparents	6 (4)	72 (5)		
Other	32 (20)	242 (18)		
Residence (*n*=1534)			1.27	.26
Urban	16 (10)	183 (13)		
Rural	142 (90)	1192 (87)		
Father of index child alive (*n*=1533)			0.59	.44
Yes	125 (79)	1115 (81)		
No	34 (21)	259 (19)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Man most involved in child's life (*n*=1503)			5.00	**.17**
Biological father	68 (44)	682 (51)		
Mother's current partner	26 (17)	172 (13)		
Other	17 (11)	104 (8)		
None	42 (28)	392 (29)		
Number of resident adults in household (≥18years) (*n*=1532)			0.00	.99
0-3	96 (60)	829 (60)		
4+	63 (40)	544 (40)		
Number of resident children in household (<18years) (*n*=1533)			1.02	.31
0-3	66 (42)	514 (37)		
4+	93 (59)	860 (63)		
If other households on property, other residents involved in child care (*n*=266)			0.08	.77
Yes	27 (77)	173 (75)		
No	8 (23)	58 (25)		
Fridge ownership (*n*=1535)			2.67	**.10**
Yes	109 (69)	1026 (75)		
No	50 (32)	350 (25)		
Receiving a child grant (*n*=1531)			1.15	.28
Yes	147 (93)	1297 (95)		
No	12 (8)	75 (6)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Food insecurity in the last 4 weeks (*n*=1522)			45.64	**<.001**
Yes	117 (74)	623 (46)		
No	41 (26)	741 (54)		
Anyone in household a victim of crime in last 12 months (*n*=1535)			3.94	**.05**
Yes	27 (17)	159 (12)		
No	132 (83)	1217 (88)		
Child expected to make own bed (*n*=1532)			3.92	**.05**
Yes	128 (81)	1185 (86)		
No	31 (20)	188 (14)		
Child expected to clean up after spills (*n*=1532)			2.38	**.12**
Yes	150 (94)	1328 (97)		
No	9 (6)	45 (3)		
Child expected to bath him/herself (*n*=1531)			10.28	**.001**
Yes	146 (92)	1329 (97)		
No	13 (8)	43 (3)		
Child expected to keep shared living area clean and straight (*n*=1531)			2.39	**.12**
Yes	122 (77)	1122 (82)		
No	37 (23)	250 (18)		
Child expected to do routine chores e.g. fetching water/washing (*n*=1530)			5.50	**.02**
Yes	124 (78)	1167 (85)		
No	35 (22)	204 (15)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Child expected to help organize own time e.g. homework/playtime (*n*=1531)			3.20	**.07**
Yes	135 (85)	1229 (90)		
No	24 (15)	143 (10)		
Child eats meal with mother/caregiver once a day/more (*n*=1531)			10.04	**.002**
Yes	145 (92)	1122 (82)		
No	13 (8)	521 (18)		
Child eats meal with mother/PCG and other family once day/more (*n*=1529)			8.02	**.01**
Yes	140 (88)	1075 (79)		
No	19 (12)	295 (22)		
Child spends time with father (-figure) 4 times a week (*n*=1531)			0.27	.60
Yes	56 (35)	455 (33)		
No	103 (65)	917 (67)		
Child spends time with father (-figure) in outdoor activities once a week (*n*=1532)			0.00	.95
Yes	44 (28)	383 (28)		
No	115 (72)	990 (72)		
Non-physical discipline if child hits, bites, swears, speaks in anger (*n*=1529)			0.00	.98
Yes	107 (67)	923 (67)		
No	52 (33)	447 (33)		
Does Mom report no more than 1 smack during past week (*n*=1532)			4.72	**.03**
Yes	79 (50)	559 (41)		
No	80 (50)	814 (59)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
TV is on at home less than 5 hours per day (*n*=1529)			0.95	.33
Yes	75 (47)	702 (51)		
No	84 (53)	668 (49)		
Family gets a newspaper once a week (*n*=1532)			0.60	.44
Yes	66 (42)	614 (45)		
No	93 (59)	759 (55)		
Child has at least 3 children's books (not school books) (*n*=1528)			2.96	**.09**
Yes	21 (13)	257 (19)		
No	138 (87)	1112 (81)		
Child read to 3 times or more a week (*n*=1527)			1.81	**.18**
Yes	80 (51)	770 (56)		
No	78 (49)	599 (43)		
Child reads several times a week for enjoyment (*n*=1529)			8.32	**.004**
Yes	110 (70)	791 (58)		
No	48 (30)	580 (42)		
Child taken on educational trip in past year (*n*=1531)			1.00	.32
Yes	20 (13)	214 (16)		
No	139 (87)	1158 (84)		
Family encourages child to start and do hobbies (*n*=1532)			0.53	.47
Yes	114 (72)	1021 (74)		
No	45 (28)	352 (26)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Child receives lessons/belongs to sports/music/art/dance/drama organizations (*n*=1532)			1.39	**.24**
Yes	57 (36)	429 (31)		
No	102 (64)	944 (69)		
Child taken to musical, drama or dance performance in past year (*n*=1531)			0.08	.78
Yes	17 (11)	137 (10)		
No	142 (89)	1235 (90)		
Musical instrument in home child can use (*n*=1530)			1.32	**.25**
Yes	7 (4)	93 (7)		
No	152 (96)	1278 (93)		
Family visits with family or friends 2-3 times a month (*n*=1532)			4.45	**.04**
Yes	29 (18)	169 (12)		
No	130 (82)	1204 (88)		
Child helped to learn numbers at home (*n*=1532)			0.46	.50
Yes	133 (84)	1176 (86)		
No	26 (16)	197 (14)		
Child helped to learn the alphabet at home (*n*=1531)			1.60	**.21**
Yes	127 (80)	1150 (84)		
No	32 (20)	222 (16)		

Variables selected from database based on theory *(Step 1)*	PS (*n* = 159) [b] *n* (%)	No PS (*n* = 1376) [b] *n* (%)	Chi-Square *(Step 2)*	*p*-value *(Step 2)*
Child helped to learn colours at home (*n*=1532)			2.81	**.09**
Yes	118 (74)	1097 (80)		
No	41 (26)	276 (20)		
Child helped to learn shapes and sizes at home (*n*=1530)			29.65	**<.001**
Yes	89 (56)	1042 (76)		
No	70 (44)	329 (24)		

Note. *p*-values ≤ .25 and therefore retained, are shown in boldface. PCG= Primary Caregiver (i.e. mother/other), VTS= Vertical Transmission Study, CBCL= Child Behaviour Checklist, ART= Antiretroviral Therapy.

[a] Data specific to the biological mother. [b] The Parenting Stress outcomes calculated at the 90th percentile.

Step 3: Testing for multicollinearity between predictors

Lastly, I tested for multicollinearity between predictor variables. This is an important step as multicollinearity among explanatory variables can skew the relationships with the outcome variable in multivariate analysis (Yoo et al., 2014). The level of collinearity between predictors was assessed using Cramer's V, which is based on Pearson's chi-squared statistic, which has a range of 0 to 1, with a result of $\geq .50$ showing a strong relationship between variables (Cohen, 1988). Cramer's V was used because it measures the association between all types of categorical variables, including nominal variables (Cramér, 1946).

Cramer's V was calculated between each pair of variables included from *Step 2*. Where values were $\geq .50$, collinearity among these variables was assumed and one of the variables was dropped. Multicollinearity was tested for separately within the predictors for the Maternal/PCG, Child and Family/Household models and these results are presented in Tables 2, 3, and 4 respectively. No multicollinearity was detected between Maternal/PCG variables. However, there was multicollinearity among the Child variables. The CBCL Total Score was highly associated with the CBCL Internalizing and Externalizing outcomes. How well the child gets along with other children was highly associated with sibling relationships and behaviour in front of parents. Therefore, the CBCL Total Score, how well the child gets along with other children and behaves with parents were dropped from the Child Model.

There was also multicollinearity among the Family/Household variables. Whether the child eats a meal with PCG and other family once a day/more was highly collinear with whether the child eats a meal just with PCG once a day/more. Whether the child is helped to learn the alphabet, colours or shapes and sizes at home, were strongly associated with each other. Therefore, whether the child eats a meal with PCG and other family and whether the child is helped to learn the alphabet or colours at home were dropped from the Family/Household Model.

Table 2

Cramer's V Statistics among the Maternal/PCG variables (Step 3)

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	1.00	.19	.23	.15	.06	.15	.05	.06	.03	.15	.22	.24
2. Relationship		1.00	.12	.08	.12	.22	.11	.03	.07	.11	.07	.15
3. Education			1.00	.38	.18	.07	.02	.03	.05	.06	.22	.16
4. Raven's				1.00	.09	.03	-.02	-.05	-.03	-.02	-.05	-.09
5. Employment					1.00	.09	.03	.01	-.03	-.00	-.03	-.04
6. HIV status						1.00	.16	.05	.07	.09	.11	.03
7. VTS							1.00	.01	.02	.06	-.03	-.08
8. Anxiety								1.00	.30	.30	.05	.04
9. Depression									1.00	.05	.05	.04
10. Drinking										1.00	-.03	-.05
11. Deceased children											1.00	.08
12. Chronic meds												1.00

Table 3

Cramer's V Statistics among the Child Variables (Step 3)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Sex	1.00	.04	.18	-.05	.01	.02	-.04	-.04	.04	.11	.04	.06	.06	.06	.06	.03
2. Birth order		1.00	.00	.04	.05	.02	.04	.05	.01	.05	.04	.05	.06	.06	.05	.06
3. Repeated grade			1.00	-.12	.05	.06	-.02	0.30	.08	.08	.08	.05	.07	.06	.05	.04
4. Academic/ problems				1.00	-.14	.10	.00	.10	-.16	-.15	-.17	.04	.11	.12	.11	.07
5. Illness/disability					1.00	.07	-.03	.00	.10	.13	.07	.07	.06	.03	.04	.09
6. Hospitalized						1.00	-.10	.01	.04	.06	.03	.01	.02	.08	.03	.04
7. TB							1.00	.00	-.04	-.10	-.02	.04	.07	.05	.07	.05
8. MPI								1.00	-.06	-.02	-.05	.02	.04	.06	.02	.02
9. CBCL Total*									1.00	**.64**	**.72**	.04	.34	.32	.30	.16
10. CBCL Internalizing										1.00	.43	.05	.25	.26	.25	.11
11. CBCL externalizing											1.00	.07	.35	.36	.29	.17
12. Time spent w/friends												1.00	.11	.13	.12	.07
13. With other children*													1.00	**.60**	**.52**	.45
14. With siblings														1.00	**.51**	.42
15. Behaves with parents*															1.00	.45
16. Plays/works alone																1.00

Note. Variables in boldface showed collinearity with other variables (Cramer's V ≥ .50). MPI = Mental Processing Index

* Variables dropped from the model due to multicollinearity

Table 4

Cramer's V Statistics among the Family/Household Variables (Step 3)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1.	PCG	1.00	.30	.13	.24	-.01	.00	-.06	-.02	-.06	.03	-.04	-.01	-.02	-.05	-.07	.00	.02	-.04	-.04	-.05	.01	.05	.05	.05
2.	Head household		1.00	.33	.04	.06	.09	.05	.02	.05	.06	.03	.04	.10	.09	.10	.05	.02	.11	.09	.04	.05	.07	.07	.06
3.	Man involved			1.00	.08	.03	.07	.03	.03	.01	.05	.09	.03	.12	.10	.13	.06	.06	.13	.11	.06	.08	.04	.03	.06
4.	Fridge				1.00	-.19	.03	-.08	.00	.03	-.04	-.06	-.04	-.01	-.01	-.01	.07	.05	.00	.00	.00	.04	.09	.04	.02
5.	Food insecurity					1.00	.07	.02	-.01	-.01	.01	.08	-.02	.02	.01	.10	-.08	.05	.03	-.02	-.04	-.02	-.01	-.03	-.04
6.	Experienced crime						1.00	-.05	-.05	-.02	.01	-.03	-.01	.06	.07	.03	.03	.00	.06	.00	-.04	.01	-.07	-.05	-.05
7.	Make bed							1.00	.31	.32	.30	.31	.14	-.04	-.05	.02	.03	.01	.00	.04	.00	-.02	.02	.04	.06
8.	Clean spills								1.00	.30	.20	.20	.15	.00	.02	.04	-.02	-.02	-.01	.01	.04	.03	.02	-.03	-.02
9.	Bath self									1.00	.26	.19	.11	-.02	-.09	-.04	-.02	-.03	-.05	.00	-.02	.01	.01	-.03	.00
10.	Clean living										1.00	.34	.19	.05	.07	.01	.02	-.05	.08	.06	-.02	.05	.04	.04	.06
11.	Chores											1.00	.20	-.04	-.04	-.04	-.04	-.04	-.04	.03	.00	-.01	.05	.02	.07
12.	Organize time												1.00	.04	.04	.07	.00	.04	.08	.06	.03	.04	.02	.00	.06
13.	**Eat w/PCG**													1.00	**.70**	.15	.13	-.21	.38	.20	.07	.13	-.12	-.14	-.15
14.	**Eat w/ PCG+** [1]														1.00	.17	.15	-.33	.47	.27	.04	.14	-.15	-.18	-.21
15.	< 1 smack/week															1.00	.04	.05	.21	.14	.02	.01	-.10	-.14	-.15

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
16. Child has 3 books																1.00	.20	.27	.15	.14	.20	-.01	.02	.03
17. Read to 3X week																	1.00	.03	.04	.10	.05	.08	.09	.08
18. Read enjoyment																		1.00	.35	.09	.20	-.09	-.11	-.12
19. Organizations																			1.00	.14	.16	.06	.01	.03
20. Musical																				1.00	.14	.03	.00	.00
21. Visits family																					1.00	.03	.03	.01
22. Alphabet at home[1]																						1.00	**.74**	**.63**
23. Colours at home[1]																							1.00	**.75**
24. Shapes at home																								1.00

Note. Variables in boldface showed collinearity with other variables (Cramer's V ≥ .50)

[1] Variables dropped from the model due to multicollinearity

3.8.1.2 Logistic regression models

This two-part section describes the logistic regression analyses conducted following the selection and screening of data. The first describes the regression models using the Total PS as the outcome and the second the PSI-SF Subscales as outcomes.

3.8.1.2.1 Parenting Stress at the 90th percentile

Using the Total PS Score at the 90th percentile as the outcome, I ran separate Maternal/PCG, Child and Family/Household Models and secondly, I created a Combined Model.

Separate Maternal/PCG, Child and Family/Household Models

The variables included in these three separate regression models are listed in Table 5. These variables (initially selected in *Step 1* based on theory) showed moderate associations with Total PS in *Step 2* and showed no multicollinearity in *Step 3*.

Before running these models, I considered the sample size requirements of logistic regression. I consulted literature which used events per variable (EPV) as a guideline for sample size; with EPV defined by dividing the *N* of the smaller category of the outcome variable by the number of predictors in the model. Peduzzi, Concato, Kemper, Holford, and Feinstein (1996) recommended a minimum EPV of 10 for logistic regression, asserting that a lower EPV may skew results. However, a more recent publication (Vittinghoff & McCulloch, 2007) challenged this rule of a minimum EPV of 10, by testing a wider range of cut off EPVs with varied sample sizes and under several conditions. Their results showed frequent problems with the accuracy of results of models with EPV values ranging from 2-4, but not with values of 5-9.

In the outcome variable in this analysis, the proportion of participants experiencing PS at the 90th percentile is the smaller group (N=159). The number of variables in each model can be seen in Table 5. The EPV values for each model are as follows: Maternal/PCG Model

(EPV= 13.25 [159/12]), Child Model (EPV=12.23 [159/13]) and the Family/Household Model (EPV=7.57 [159/21]). Therefore according to the guidelines of Peduzzi et al. (1996), the sample size is sufficient for the Maternal and Child Models. For the Family/Household Model the sample size is sufficient following the less conservative guidelines of Vittinghoff and McCulloch (2007).

Table 5

Variables included in the Maternal/PCG, Child and Family/Household Models

Maternal/Relevant PCG Characteristics	Child Characteristics	Family/Household Characteristics
1. Age of PCG (≤ 30/31-40/41+ years)	1. Sex (male/female)	1. PCG (mother/other)
2. Maternal relationship status (single/with biological father/with new partner)	2. Birth order (1-2/3-5/5+)	2. Head of household (mother/husband or partner/maternal grandparents/paternal grandparents/other)
3. Education level of PCG (none/primary/grade 10/ matric or post-matric)	3. Repeated Grade (yes/no)	3. Man most involved in child's life (biological father/mother's current partner/other/none)
4. Raven's (low/high)	4. Any academic/other problems in school (yes/no)	4. Does the family have a fridge? (yes/no)
5. PCG paid employment (yes/no)	5. Child has any illness or disability, physical/mental (yes/no)	5. Food insecurity in the last 4 weeks (yes/no)
6. Maternal HIV status (uninfected/infected in pregnancy/ infected post-pregnancy)	6. Hospitalized since birth (yes/no)	6. Anyone in household a victim of crime in last 12 months (yes/no)
7. In VTS (yes/no)	7. Ever had TB (yes/no)	7. Child expected to make own bed? (yes/no)
8. Anxiety (yes/no)	8. Mental Processing Index (low/high)	8. Child expected to clean up after spills? (yes/no)
9. Depression (yes/no)	9. CBCL internalizing (yes/no)	9. Child expected to bath him/herself? (yes/no)
10. Any drinking by PCG (yes/no)	10. CBCL externalizing (yes/no)	10. Child expected to keep shared living area clean and straight? (yes/no)

Maternal/Relevant PCG Characteristics	Child Characteristics	Family/Household Characteristics
11. Number of deceased children (0-3/4+)	11. Times/week spent with friends out of regular school hours (<1/ 1 or 2/ 3+)	11. Child expected to do routine chores e.g. fetching water/ meals/washing? (yes/no)
12. Chronic medication (yes/no)	12. How well gets along with siblings (worse/average/better)	12. Child expected to help organize own time e.g. homework/play? (yes/no)
	13. How well plays/works alone (worse/average/better)	13. Child eats meal with mother/caregiver once a day/ more? (yes/no)
		14. Does Mom report no more than 1 smack during past week? (yes/no)
		15. Child has at least 3 children's books (not school books) (yes/no)
		16. Child read to 3 times or more a week (yes/no)
		17. Child reads several times a week for enjoyment (yes/no)
		18. Child receives lessons/belongs to sports/music/art/dance/drama organizations (yes/no)
		19. Musical instrument in home child can use (yes/no)
		20. Family visits with family or friends 2-3 times a month (yes/no)
		21. Child helped to learn shapes and sizes at home (yes/no)

Combined Model

The Combined Model aimed to draw out the predictors most strongly predicting PS and to form a parsimonious model. In order to achieve this, predictors showing significance at the $p \leq .05$ level in the separate multivariate Maternal/PCG, Child and Family/Household Models were drawn into one model (15 predictors). To refine the model, I followed guidelines by Hosmer et al. (2013). They recommend running multiple iterations of a model and after each iteration examining the Wald Statistic (the individual contribution of each predictor) and dropping the predictor with the lowest contribution. This process is repeated until only significant variables remain. The first iteration of the Combined Model included 15 predictors, with the final version containing 11, which meets sufficient sample size requirements (Peduzzi et al., 1996; Vittinghoff & McCulloch, 2007). During the iterations of the model, I tracked the pseudo-R^2 value to check that there was not a considerable drop in variance explained by the predictors in the model.

As I used multiple iterations to arrive at the final model of 11 variables, the likelihood of a type 1 error occurring increased. To reduce this likelihood I used the Bonferroni correction to adjust the *p*-value accordingly (Kim, 2015). I divided the original cut off value ($p = .05$) by four (the number of iterations I ran) to arrive at the adjusted *p*-value of $\leq .0125$. I used this cut off of $p \leq .0125$ to interpret the significance of the individual variables in the Combined Model.

3.8.1.2.2 PSI-SF subscales at the 90th percentile

The predictors included in each of these models were from the Combined Model described above, and the outcomes were the PSI-SF Subscales (PD, P-CDI and DC Subscales) coded at the 90th percentile. The rationale for including these models in the analysis is that they may shed light on the pathways through which predictors influence PS.

3.8.2 Content analysis

I used content analysis to code the PCG's responses to the question of "What concerns you most about your child?" on the CBCL. Content analysis aims to categorize and quantify qualitative data (Downe-Wamboldt, 1992). This method was appropriate as the question was delivered uniformly to all participants and the data are in the form of short statements. The content analysis took an inductive approach, as existing knowledge of PCG concerns about children in this context is limited (Hsieh & Shannon, 2005). I followed guidelines suggesting a three-step approach to content analysis. The first step involved *preparation* and getting a sense of the data as a whole by reading the responses through several times. Then I *organized* the data, which involved creating open codes through writing notes when reading through the data. Thereafter these codes were used to form groupings which became larger categories. All this was done in conjunction with my supervisors who advised and guided me in developing the coding framework for this analysis. Following the content analysis, I grouped the coded concerns by PS at the 90^{th} percentile (yes/no) and used the *z*-test of proportions to test for significant differences.

Chapter 4

Results

This chapter presents the sample characteristics, followed by the results of the data analysis plan presented in section 3.8 (page 25).

4.1 Sample Characteristics

The sample characteristics of the mother/PCG-child dyads (N=1535) in the Siyakhula Study are shown in Table 6. In this sample data were collected from all biological mothers, and in cases where the biological mother was not the PCG, the alternative PCG was also included. In this sample, 84% of the PCGs were the biological mothers. The data which are specifically from the biological mother versus from the PCG (i.e. mother/other) are noted in Table 6.

The majority of PCGs in the sample were above the age of 30 years and over half had an education level of grade 10 or above. Most of the mothers were in relationships and had taken part in VTS. Approximately half the mothers were HIV infected. The majority of the children were female and aged 9-11 years at the time of data collection. According to the PCG report, 10% of children had experienced academic or other problems at school and the majority had been helped to learn shapes and sizes at home. Most children were reported to get along with their siblings. Around 8% of children met clinical significance on the Internalizing and Externalizing Subscales on the CBCL. A large proportion of households had experienced food insecurity in the 4 weeks prior to data collection.

Table 6

Sample Characteristics of the Mother/PCG-Child Dyads (N=1535)

Characteristics	**Frequency (%)**
Mother / PCG	
Age (*n*=1511)	
≤ 30 years	361 (24)
31-40 years	589 (39)
41+ years	561 (37)
Relationship status (*n*=1516) [a]	
Single	247 (16)
With biological father	693 (46)
With new partner	576 (38)
Education level (*n*=1512)	
None	92 (6)
Primary	533 (35)
Grade 10	519 (34)
Matric or post-matric	368 (24)
Paid employment (*n*=1533)	
Yes	405 (26)
No	1128 (74)
Maternal HIV status (*n*=1534) [a]	
Uninfected	779 (51)
Infected in pregnancy	477 (31)
Infected post-pregnancy	278 (18)
In VTS (*n*=1536) [a]	
Yes	906 (59)
No	630 (41)
Child	
Age (*n*=1535)	
7-8 years	242 (16)
9+ years	1293 (84)
Sex (*n*=1535)	
Male	664 (43)
Female	872 (57)

Characteristics	Frequency (%)
Any academic/other problems in school (*n*=1472)	
Yes	149 (10)
No	1323 (90)
Repeated Grade (*n*=1535)	
Yes	625 (41)
No	910 (59)
CBCL internalizing (*n*=1532)	
Yes	114 (7)
No	1418 (93)
CBCL externalizing (*n*=1532)	
Yes	129 (8)
No	1403 (92)
How well gets along with siblings (*n*=1403)	
Worse	170 (12)
Average	601 (43)
Better	632 (45)
Family/Household	
Primary caregiver (*n*=1535)	
Mother	1293 (84)
Other	242 (16)
Food insecurity in the previous 4 weeks (*n*=1522)	
Yes	740 (49)
No	782 (51)
Child expected to bath him/herself (*n*=1531)	
Yes	1475 (96)
No	56 (4)
Child expected to do routine chores (*n*=1530)	
Yes	1291 (84)
No	239 (16)
Child helped to learn shapes and sizes at home (*n*=1530)	
Yes	1131 (74)
No	399 (26)

Note. PCG= Primary Caregiver (i.e. mother/other), VTS= Vertical Transmission Study, CBCL= Child Behaviour Checklist.

[a] Data specific to the biological mother.

4.2 Prevalence of Parenting Stress and Mental Health Problems among PCGs

The frequency of clinically significant PS and mental health outcomes among PCGs are shown in Table 7. The number of PCGs meeting criteria for clinically significant PS was much larger than for anxiety and/or depression. Among the PSI-SF subscales, the largest group of PCGs had elevated PD subscale scores, as opposed to the P-CDI and DC subscales which had similar proportions. As outlined in section 3.5.1 (page 16), prevalence of PS outcomes was calculated using clinical cut offs recommended by test authors and derived from the normative sample.

Table 7

PCG Mental Health and Parenting Stress Outcomes (N=1535)

Characteristics	**M (SD)**	**Range**	**Frequency (%)**
Anxiety [a]			
Yes			50 (3)
No			1485 (97)
Depression [b]			
Yes			88 (6)
No			1477 (94)
Parenting Stress Total [c]	69.80 (22)	36-174	
Yes			247 (16)
No			1289 (84)
Parental Distress Sub-Scale [d]	27.60 (11)	12-60	
Yes			435 (28)
No			1101 (72)
Parent-Child Dysfunctional Interaction [e]	19.00 (8)	12-60	
Yes			220 (14)
No			1316 (86)
Difficult Child [f]	23.24 (8)	12-55	
Yes			199 (13)
No			1337 (87)

Note. [a] Measured by the General Patient Health Questionnaire Anxiety Scale (GAD-7), [b] Measured by the General Patient Health Questionnaire Depression Scale (PHQ-9), [c] Based on recommended cut off (≥ 90), [d] Based on recommended cut off (≥ 33), [e] Based on recommended cut off (≥ 27), [f] Based on recommended cut off (≥ 33)

4.3 Logistic Regression: Parenting Stress at the 90th Percentile

This section presents the results of the logistic regression models using the PS Total Score (at or above the 90th percentile) as the outcome. The Maternal/PCG, Child and Family/Household Models are discussed separately, followed by the Combined Model.

4.3.1 Maternal/PCG, Child and Family/Household Models

The multivariate results of the predictors included in these models are shown in Table 8. As outlined in section 3.8.1.1 (page 25), the variables included in these models were initially selected based on theory (*Step 1*), then subsequently showed moderate associations with Total PS (*Step 2*) and lastly showed no multicollinearity (*Step 3*).

In the multivariate Maternal/PCG Model, the following PCG variables were associated with a significant reduction in the odds of experiencing PS: being 41 years or older, having a matric or post-matric education and being employed. For mothers, participation in VTS was associated with a significant reduction in the likelihood of PS. In contrast, mothers becoming HIV infected post-pregnancy and the PCG experiencing anxiety or depression were significantly associated with increased PS. In the multivariate Child Model, getting along with siblings significantly reduced the odds of PS, while having academic or other problems in school and exhibiting internalizing or externalizing behaviours significantly increased the odds of PS. In the multivariate Family/Household Model, the child being expected to bath him/herself and being helped to learn shapes and sizes at home were significantly associated with reduced PS. Where the mother was the caregiver and also when the household experienced food insecurity in the previous four weeks, an increased likelihood of PS was observed.

Table 8

Multivariate Logistic Regression Results of the Mother/PCG, Child and Family/Household Models on Parenting Stress (90th Percentile)

Variables	**aOR**	**95% CI**	***p*-value**
Maternal/PCG Model (N=1437)			
Age			
≤ 30 years	1.00	1.0-1.0	Ref
31-40 years	1.09	0.7-1.8	.72
41+ years	**0.53**	**0.3-0.9**	**.03**
Relationship status [a]			
Single	1.00	1.0-1.0	Ref
With biological father	0.63	0.4-1.1	.08
With new partner	0.89	0.5-1.5	.64
Education level			
None	1.00	1.0-1.0	Ref
Primary	1.14	0.5-2.4	.72
Grade 10	0.76	0.4-1.7	.49
Matric or post-matric	**0.37**	**0.2-0.9**	**.03**
Raven's Progressive Matrices			
Low	1.00	1.0-1.0	Ref
High	0.87	0.6-1.3	.48
Paid employment			
Yes	**0.58**	**0.4-0.9**	**.03**
No	1.00	1.0-1.0	Ref

Variables	**aOR**	**95% CI**	***p*-value**
Maternal HIV status [a]			
Uninfected	1.00	1.0-1.0	Ref
Infected in pregnancy	1.28	0.8-2.0	.28
Infected post-pregnancy	**2.18**	**1.4-3.5**	**.001**
In VTS [a]			
Yes	**0.67**	**0.5-1.0**	**.03**
No	1.00	1.0-1.0	Ref
Anxiety			
Yes	**4.30**	**2.1-8.8**	**<.001**
No	1.00	1.0-1.0	Ref
Depression			
Yes	**4.27**	**2.5-7.4**	**<.001**
No	1.00	1.0-1.0	Ref
Any drinking			
Yes	1.27	0.8-2.0	.32
No	1.00	1.0-1.0	Ref
Number of dead children [a]			
0-3	1.00	1.0-1.0	Ref
4+	1.39	0.9-2.1	.11
Chronic medication [a]			
Yes	1.50	0.9-2.5	.17
No	1.00	1.0-1.0	Ref

Variables	aOR	95% CI	*p*-value
Child Model (N=1302)			
Sex			
Male	1.20	0.8-1.9	.40
Female	1.00	1.0-1.0	Ref
Birth order			
1-2	1.00	1.0-1.0	Ref
3-4	1.51	0.9-2.5	.10
5+	0.94	0.5-1.7	.83
Repeated Grade			
Yes	1.52	1.0-2.4	.06
No	1.00	1.0-1.0	Ref
Any academic or other problems in school			
Yes	**2.27**	**1.3-3.9**	**.003**
No	1.00	1.0-1.0	Ref
Child has any illness or disability (physical/mental)			
Yes	1.44	0.7-2.8	.29
No	1.00	1.0-1.0	Ref
Child been hospitalized since birth			
Yes	1.25	0.7-2.2	.44
No	1.00	1.0-1.0	Ref
Child ever had TB			
Yes	0.56	0.3-1.2	.13
No	1.00	1.0-1.0	Ref

Variables	**aOR**	**95% CI**	***p*-value**
Mental Processing Index			
Low	1.00	1.0-1.0	Ref
High	0.94	0.6-1.5	.78
CBCL Internalizing			
Yes	**4.58**	**2.6-8.2**	**<.001**
No	1.00	1.0-1.0	Ref
CBCL Externalizing			
Yes	**4.49**	**2.6-7.9**	**<.001**
No	1.00	1.0-1.0	Ref
Times/week spent with friends out of regular school hours			
Less than one	1.00	1.0-1.0	Ref
One or two	1.13	0.5-2.4	.74
Three+	1.35	0.8-2.4	.31
How well gets along with siblings			
Worse	1.00	1.0-1.0	Ref
Average	**0.48**	**0.3-0.9**	**.01**
Better	**0.42**	**0.2-0.8**	**.01**
How well plays/works alone			
Worse	1.00	1.0-1.0	Ref
Average	0.93	0.5-1.8	.83
Better	0.90	0.4-1.9	.79

Variables	aOR	95% CI	*p*-value
Family/Household Model (N=1446)			
Primary caregiver			
Mother	**1.96**	**1.1-3.6**	**.03**
Other	1.00	1.0-1.0	Ref
Head of the household			
Mother	1.00	1.0-1.0	Ref
Husband/partner	0.70	0.4-1.3	.27
Maternal grandparents	0.78	0.5-1.3	.36
Paternal grandparents	0.64	0.2-1.7	.38
Other	0.88	0.5-1.6	.68
Man most involved in child's life			
Biological father	1.00	1.0-1.0	Ref
Mother's current partner	1.25	0.7-2.2	.43
Other	1.53	0.8-3.0	.21
None	0.94	0.6-1.6	.82
Fridge ownership			
Yes	0.97	0.7-1.4	.86
No	1.00	1.0-1.0	Ref
Food insecurity in the previous 4 weeks			
Yes	**3.17**	**2.1-4.7**	**<.001**
No	1.00	1.0-1.0	Ref

Variables	**aOR**	**95% CI**	***p*-value**
Anyone in household a victim of crime in last 12 months			
Yes	1.23	0.8-2.0	.41
No	1.00	1.0-1.0	Ref
Child expected to make own bed?			
Yes	1.00	0.6-1.7	.99
No	1.00	1.0-1.0	Ref
Child expected to clean up after spills			
Yes	0.87	0.3-2.2	.78
No	1.00	1.0-1.0	Ref
Child expected to bath him/herself			
Yes	**0.44**	**0.2-1.0**	**.05**
No	1.00	1.0-1.0	Ref
Child expected to keep shared living area clean and straight			
Yes	1.00	0.6-1.8	.99
No	1.00	1.0-1.0	Ref
Child expected to do routine chores such as fetching water, meals, washing			
Yes	0.63	0.4-1.0	.08
No	1.00	1.0-1.0	Ref
Child expected to help organize his/her own time e.g. homework/playtime			
Yes	0.83	0.5-1.5	.51
No	1.00	1.0-1.0	Ref

Variables	aOR	95% CI	*p*-value
Does child eat meal with mother/primary caregiver once a day or more			
Yes	1.41	0.7-2.7	.30
No	1.00	1.0-1.0	Ref
Does Mom report no more than 1 smack during past week			
Yes	1.0.	0.7-1.5	.89
No	1.00	1.0-1.0	Ref
Child has at least 3 children's books (not school books)			
Yes	0.62	0.4-1.1	.09
No	1.00	1.0-1.0	Ref
Child read to 3 times or more a week			
Yes	0.85	0.6-1.2	.39
No	1.00	1.0-1.0	Ref
Child reads several times a week for enjoyment			
Yes	1.36	0.9-2.1	.17
No	1.00	1.0-1.0	Ref
Child receives lessons or belongs to sports/music/art/dance/drama organizations			
Yes	1.14	0.8-1.7	.54
No	1.00	1.0-1.0	Ref
Musical instrument in home child can use			
Yes	0.76	0.3-1.8	.52
No	1.00	1.0-1.0	Ref

Variables	**aOR**	**95% CI**	***p*-value**
Family visits with family or friends 2-3 times a month			
Yes	1.51	1.0-2.5	.11
No	1.00	1.0-1.0	Ref
Child helped to learn shapes and sizes at home			
Yes	**0.44**	**0.3-0.6**	**<.001**
No	1.00	1.0-1.0	Ref

Note. *p*-values ≤.05 shown in boldface. aOR = adjusted odds ratio, PCG = Primary Caregiver (i.e. mother/other), VTS= Vertical Transmission Study, CBCL= Child Behaviour Checklist.

[a] Data specific to the biological mother

4.3.2 Combined Model

As outlined in section 3.8.1.2.1 (page 45), the Combined Model was formed through several iterations using variables which showed significant associations in the separate Maternal/PCG, Child and Family/Household Models. Following each iteration, the predictor contributing the least was dropped, until only significant variables remained and the most parsimonious model was retained. This section is presented in two parts. The variables retained in the final iteration are presented first. Thereafter the multivariate results of the final Combined Model are discussed.

4.3.2.1 Variables retained in Combined Model

Figure 2 illustrates the variables included in the first iteration of the Combined Model and those retained in the final iteration. Fifteen variables, showing significant associations with PS in the separate multivariate models, were included in the first iteration. Four of the collective 15 variables did not significantly contribute to the Combined Model and were subsequently dropped. These were: age of PCG, whether the PCG had paid employment, whether the mother was the PCG and whether the child is expected to bath him/herself.

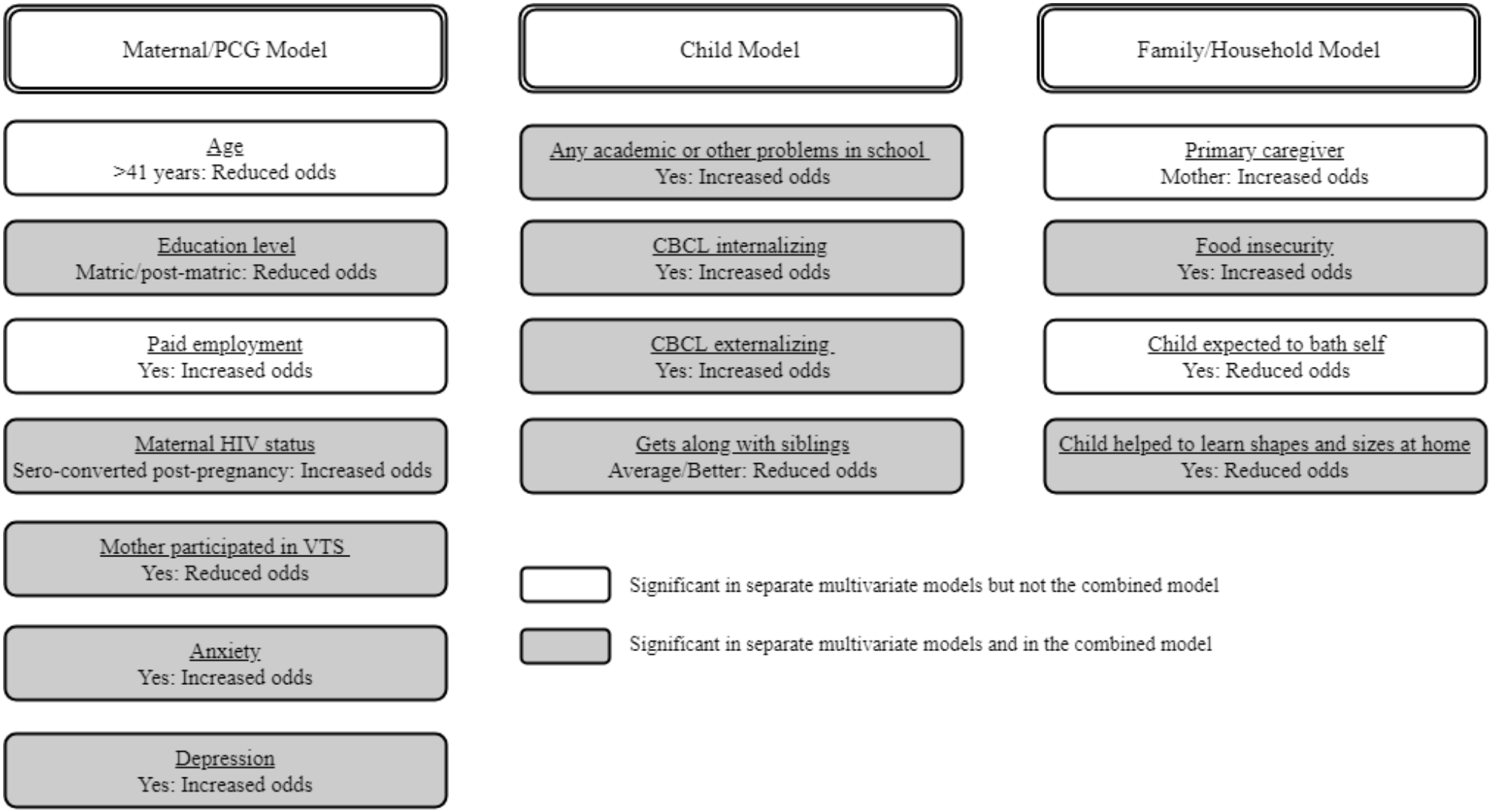

Figure 2. Variables significantly associated with Total PS in the multivariate Maternal/PCG, Child and Family/Household Models, and which variables remained significant in the Combined Model

4.3.2.2 Results of the Combined Model and Total PS

The Combined Model accounted for an estimated 31% of the variance in the PS Total Score outcome. The adjusted odds ratios and significance of each variable are presented in Table 9. As detailed in Section 3.8.1.2.1 (page 45), I used the Bonferroni correction to reduce the likelihood of a type 1 error and the p-value for this model was adjusted to ≤ .0125. Seven variables were shown to be significantly associated with PS at this adjusted level.

Concerning the Maternal/PCG variables, if the mother had become HIV infected post-pregnancy, she had more than three times the odds of experiencing PS, whereas participation in VTS significantly decreased the odds. Regarding the Child variables, academic or other problems in school, as well as internalizing and externalizing behaviours, were associated with increased PS. Externalizing behaviours showed the strongest effects, by increasing the odds four-fold. Lastly, in terms of the Family/Household variables, the household experiencing food insecurity in the last four weeks was associated with increased PS and the child being helped to learn shapes and sizes at home was associated with reduced PS.

Table 9

Logistic Regression Results of the Combined Model and Total Parenting Stress (90th Percentile) (N=1318)

Variables	aOR	95% CI	*p*-value
Mother /PCG			
Education level			
None	1.00	1.0-1.0	Ref
Primary	0.94	0.4-2.2	.89
Grade 10	0.74	0.3-1.8	.50
Matric or post-matric	0.35	0.1-1.0	.04
Maternal HIV status [a]			
Uninfected	1.00	1.0-1.0	Ref
Infected in pregnancy	1.79	1.1-3.0	.03
Infected post-pregnancy	**3.40**	**2.0-5.9**	**<.001**
In VTS [a]			
Yes	**0.49**	**0.3-0.8**	**.002**
No	1.00	1.0-1.0	Ref.
Anxiety			
Yes	2.25	1.0-5.1	.05
No	1.00	1.0-1.0	Ref
Depression			
Yes	2.22	1.1-4.4	.02
No	1.00	1.0-1.0	Ref
Child			
Any academic/other problems in school			
Yes	**2.80**	**1.6-4.9**	**<.001**
No	1.00	1.0-1.0	Ref
CBCL internalizing			
Yes	**3.57**	**2.0-6.3**	**<.001**
No	1.00	1.0-1.0	Ref
CBCL externalizing			
Yes	**4.12**	**2.3-7.3**	**<.001**
No	1.00	1.0-1.0	Ref

Variables	aOR	95% CI	*p*-value
How well gets along with siblings			
Worse	1.00	1.0-1.0	Ref
Average	0.50	0.3-0.9	.02
Better	0.49	0.3-0.9	.03
Family/Household			
Food insecurity in the last 4 weeks			
Yes	**2.49**	**1.5-4.0**	**<.001**
No	1.00	1.0-1.0	Ref
Child helped to learn shapes and sizes at home			
Yes	**0.47**	**0.3-0.8**	**.001**
No	1.00	1.0-1.0	Ref
Pseudo R^2 = 0.3122			

Note. *p*-values ≤.0125 shown in boldface. aOR = adjusted odds ratio, PCG = Primary Caregiver (i.e. mother/other), VTS= Vertical Transmission Study, CBCL= Child Behaviour Checklist.

[a] Data specific to the biological mother

4.4 Logistic Regression: PSI-SF Subscales at the 90th percentile

The Combined Model, which was refined using PS (at the 90th percentile) as the outcome, was then run using the three PSI Subscales at the 90th percentile as outcomes. The Combined Model accounted for the least amount of variance in the PD Subscale (17%), followed by the P-CDI Subscale (25%) and the most variance explained in the DC Subscale (28%). The results of these separate models are shown in Table 10. Figure 3 illustrates which predictors are associated with each subscale and where there are unique or overlapping associations.

Participation in VTS reduced the likelihood of meeting the cut off for all three subscales. PCG education level at the matric or post matric was significantly associated with decreased odds on the PD and P-CDI Subscales. The mother being HIV infected in pregnancy and seroconverting post-pregnancy were both significantly associated with increased odds of PD, whereas only seroconverting post-pregnancy was associated with the DC Subscale. Anxiety and depression, the remaining maternal factors, were only significantly associated with the PD subscale.

Three child factors significantly increased the odds for both the P-CDI and DC subscales, namely: having academic or other problems in school, internalizing and thirdly externalizing behaviours. How well the child gets along with siblings was only significantly associated with reduced odds for the DC Subscale. Food insecurity was significantly associated with increased odds of PD and DC and it approached significance for the P-CDI Subscale. The child receiving help in learning shapes and sizes at home was linked to decreased odds for the P-CDI and DC subscales.

Table 10

Logistic Regression Results of the Combined Model and Parental Distress, Parent-Child Dysfunctional Interaction and Difficult Child Sub-Scales (90th Percentile) (N=1318)

Variables	**Parental Distress**			**Parent-Child Dysfunctional Interaction**			**Difficult Child**		
	aOR	**95% CI**	***p*-value**	**aOR**	**95% CI**	***p*-value**	**aOR**	**95% CI**	***p*-value**
Mother/PCG									
Education level									
None	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
Primary	0.99	0.5-2.0	.97	0.52	0.3-1.0	.06	0.88	0.4-2.0	.76
Grade 10	0.72	0.3-1.5	.39	**0.40**	**0.2-0.8**	**.01**	0.74	0.3-1.7	.49
Matric or post-matric	**0.29**	**0.1-0.8**	**.01**	**0.27**	**0.1-0.6**	**.001**	0.63	0.3-1.6	.33
Maternal HIV status [a]									
Uninfected	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
Infected in pregnancy	**2.98**	**1.9-4.7**	**<.001**	1.10	0.7-1.7	.69	0.79	0.5-1.3	.37
Infected post-pregnancy	**2.91**	**1.7-5.0**	**<.001**	1.04	0.6-1.8	.88	**1.94**	**1.1-3.3**	**.02**
In VTS [a]									
Yes	**0.56**	**0.4-0.8**	**.01**	**0.55**	**0.4-0.8**	**.003**	**0.55**	**0.4-0.9**	**.01**
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
Anxiety									
Yes	**3.70**	**1.8-7.6**	**<.001**	0.98	0.4-2.3	.96	1.06	0.4-2.6	.91
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
Depression									
Yes	**2.77**	**1.5-5.1**	**.001**	1.07	0.5-2.2	.85	1.04	0.5-2.2	.92
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref

Variables	Parental Distress			Parent-Child Dysfunctional Interaction			Difficult Child		
	aOR	**95% CI**	***p*-value**	**aOR**	**95% CI**	***p*-value**	**aOR**	**95% CI**	***p*-value**
Child									
Any academic/other problems in school									
Yes	1.13	0.6-2.1	.70	**5.86**	**3.7-9.4**	**<.001**	**3.06**	**1.8-5.2**	**<.001**
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
CBCL internalizing									
Yes	0.95	0.5-1.8	.88	**4.51**	**2.6-7.9**	**<.001**	**3.74**	**2.1-6.7**	**<.001**
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
CBCL externalizing									
Yes	1.69	0.9-3.2	.11	**3.79**	**2.2-6.6**	**<.001**	**4.93**	**2.9-8.5**	**<.001**
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
How well gets along with siblings									
Worse	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
Average	0.99	0.5-1.8	.99	0.69	0.4-1.2	.18	**0.38**	**0.2-0.7**	**.001**
Better	0.86	0.5-1.6	.66	0.64	0.4-1.2	.13	**0.38**	**0.2-0.7**	**.002**
Family/Household									
Food insecurity in the last 4 weeks									
Yes	**3.00**	**1.9-4.7**	**<.001**	1.49	1.0-2.3	.06	**1.71**	**1.1-2.7**	**.02**
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
Child helped to learn shapes and sizes at home									
Yes	0.84	[0.5-1.3	.42	**0.47**	**0.3-0.7**	**<.001**	**0.36**	**0.2-0.6**	**<.001**
No	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref	1.00	1.0-1.0	Ref
Pseudo R^2	**0.1709**	**0.1709**		**0.2493**	**0.2493**		**0.2825**	**0.2825**	

Note. *p*-values ≤.05 shown in boldface. aOR = adjusted odds ratio, PCG = Primary Caregiver (i.e. mother/other), VTS= Vertical Transmission Study, CBCL= Child Behaviour Checklist. [a] Data specific to the biological mother

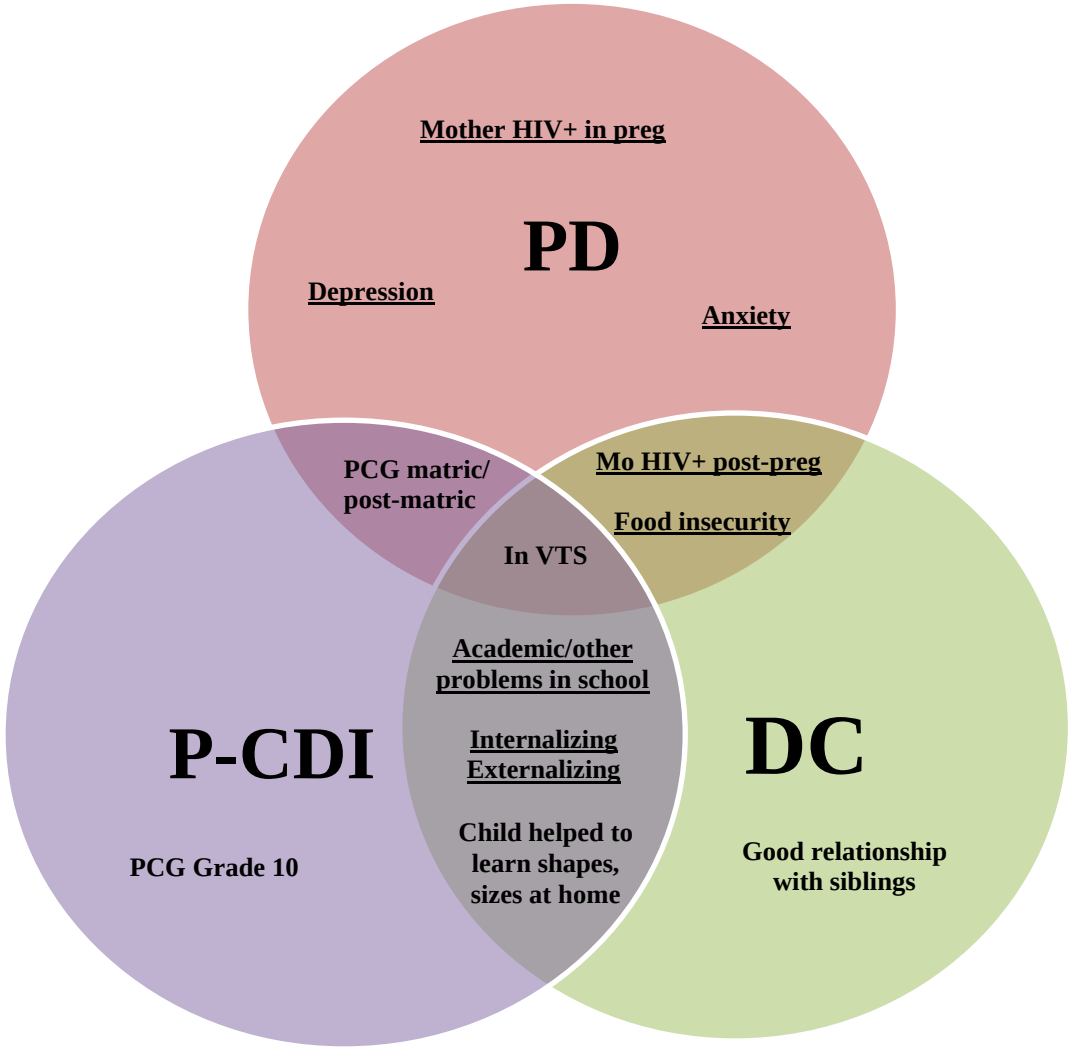

Figure 3. A visual representation of the significant predictors from the Combined Model on the PSI Subscales as outcomes

Note. PD: Parental Distress; P-CDI: Parent-Child Dysfunctional Interaction; DC: Difficult Child; Mo: Mother
The underlined variables are significantly associated with an increase in the respective subscale, the variables not underlined are significantly associated with a decrease in the respective subscale

4.5 Content Analysis: PCG Reported Concerns about Child

This section presents the results of the content analysis of the PCG responses to the CBCL question “What concerns you most about your child?” I firstly describe the results of the content analysis and secondly display the categories and sub-categories of the results grouped by PS.

4.5.1 Results of the content analysis

Where a PCG named more than one concern, each concern was coded separately. The results of the coding are shown in Table 11 with explanations of what each code includes. A large proportion of the sample reported having no concerns about their child (59%). From the remaining 635/1535 (41%) PCG, 815 concerns were reported and coded. These concerns were coded into the following five categories: physical concerns (25%), cognitive concerns (16%), psychosocial concerns (50%), parenting context (5%) and non-normative/in society (4%). Only the psychosocial concerns category consists of sub-categories. These are: personality traits, non-compliance, interpersonal difficulties in relationships and emotional immaturity.

Table 11

Primary Caregiver Responses to the Question, "What concerns you most about your child?" on the CBCL (grouped through content analysis)

Categories/Codes	***N* (815) [1]** **n (%)**	**Description of Responses included in Codes**
Category 1- Physical Concerns	**200/815 (25)**	
Physical symptoms and health problems	159/200 (80)	Including: the child gets sick easily; suffers from asthma; experiences ear, eye or skin infections; has headaches, nosebleeds, stomach aches or toothaches. Concerns about the child gaining or losing weight, experiencing incontinence and oversleeping are also included
Disturbed eating	28/200 (14)	Refer specifically to the child's eating habits, e.g. the child does not want to eat/eats too much
Diagnosed disorders	7/200 (4)	Pertain to a diagnosed disorder, such as speech impairment or epilepsy
Poor hygiene	3/200 (2)	Refer to the child's hygiene, for example that the child does not like bathing
Thumb-sucking	3/200 (2)	Include that the child likes sucking thumbs or fingers
Category 2- Cognitive Concerns	**130/815 (16)**	
Poor academic potential/achievement	114/130 (88)	Include: the child is 'slow/a slow learner'; does not do well in school/with schoolwork; is failing or repeating grades
Forgetful	12/130 (9)	These concerns refer to the child being forgetful
Lack of focus	2/130 (2)	These concerns refer to the child not being able to focus
Developmental problem	1/130 (1)	This concern specifically refers to the child having a developmental problem
Indecisive	1/130 (1)	This concern specifies that the child is indecisive
Category 3- Psychosocial Concerns	**407/815 (50)**	
3.1 Personality Traits	***184/407 (45)***	
Low conscientiousness	78/184 (42)	Child's sense of motivation and level of conscientiousness
Categories/Codes	***N* (815) ***	**Description of Responses included in Codes**

	n (%)	
Too playful	45/78 (58)	Refer to the child being too carefree, most commonly described as too playful
Low motivation	33/78 (42)	Described the child as 'lazy' and not wanting to do/being slow at chores
Various personality traits	60/184 (33)	Child's personality, including introverted/extraverted, stubborn and mature behaviours
Stubborn	38/60 (63)	Where the caregiver specifically used the word "stubborn"
Extraverted behaviours	15/60 (25)	Includes extraverted behaviours such as the child being too talkative/too active
Too mature	4/60 (7)	Behaviours considered too mature, e.g. enjoying things done by adults/doing too much work
Introverted behaviours	3/60 (5)	Including liking to play alone/be alone, being reserved, too shy/sensitive
Poor self-regulation/psychological factors	46/184 (25)	Psychological issues and the child's ability to regulate own emotions
Short temper/anger	29/46 (63)	Has anger issues/outbursts, or is short tempered
Emotional	14/46 (30)	The child cries a lot, is moody/gets upset easily
Mental illness	2/46 (4)	Specifically contain the term "mental illness"
Not coping	1/46 (2)	Specifically stated that the child "is not coping"
3.2 Non-compliance	***108/407 (27)***	
Disobedient	69/108 (64)	Child is disobedient/does not follow instructions, does things without consent and does not listen.
Naughty	36/108 (33)	Specifically contain the term "naughty"
Untidy	3/108 (3)	The child is untidy, either in general/in how they dress
3.3 Interpersonal difficulties in relationships	***67/407 (17)***	
Aggressive behaviour	35/67 (52)	The child is aggressive, fights or is violent to others
Harsh/intolerant	17/67 (25)	The child is harsh, rude or intolerant

Categories/Codes	***N* (815) ***	**Description of Responses included in Codes**
	n (%)	

Bullying behaviour	9/67 (13)	The child engages in bullying behaviour
Disrespectful	6/67 (9)	The child is disrespectful in general, or specifically to mother and teachers
3.4 Emotional immaturity	***48/407 (12)***	
Irresponsible	38/48 (79)	Include that the child is irresponsible; or other responses alluding to a sense of irresponsibility, such as: the child is fearless, likes to swim, is careless and loses items (such as school supplies/clothes); comes home late/not on time
Dependent on others	4/48 (8)	The child displays dependent behaviour
Ignorant	2/48 (4)	Specifically contain the word "ignorant"
Inconsiderate/selfish	2/48 (4)	The child being described as inconsiderate or only doing things when it suits them
Inflexible	2/48 (4)	The child always does the same thing every day/takes long to adapt
Category 4- Parenting Context	**40/815 (5)**	
Demanding material things	18/40 (45)	The child is demanding: asks for things or money all the time
Concerns about provision	16/40 (40)	Refers to the caregiver worrying about their ability to provide for the child/to whether the child is getting what they need. Including: being uncertain about the child's further education due to financial constraints; that the child should be in a special needs school; the child does not have enough clothes/food; or there is a lack of money to provide for the child
Fear of injury/sickness	3/40 (8)	Including the fear that the child will get TB; be bitten by a snake; or the child is afraid of corporal punishment at school
No birth certificate	2/40 (5)	Specifically, that the child does not have a birth certificate
Lack of support	1/40 (3)	Specifically states that the child is not 'supported enough'

Categories/Codes	***N* (815) *** **n (%)**	**Description of Responses included in Codes**

Category 5- Non-normative/In Society	**30/815 (4)**	
Lack of school participation/enjoyment	19/30 (63)	The child misses school; does not want/like going to school; does not do/have time for homework; d does not like studying/doing schoolwork
Rule-breaking behaviour	5/30 (17)	The child violates rules, such as taking things without permission
Trauma	3/30 (10)	The child experienced trauma, including rape
Child possessed	1/30 (3)	Specifically states that the child is possessed by a demon
Gender-inappropriate behaviour	1/30 (3)	Specifically states that the child does not behave like a girl
Paranoid when sick	1/30 (3)	Specifically states that the child worries a lot when sick- she feels like she is dying if she has flu
Missing	***7/815 (0.4)***	
No Concerns	*901*	*Includes caregivers who expressed not having any concerns*

[1]*This total (N=815) is the total number of concerns listed by 635 PCG, 901 PCG expressed having no concerns (Full sample=1535)*

4.5.2 Results grouped by PS

Table 12 shows the categories and sub-categories grouped by PS at the 90th percentile, along with the results of the *z*-tests of proportions. Out of the PCGs who reported having no concerns about their children (as seen at the bottom of Table 11), the majority were experiencing low PS (854/901, 95%).

Of the PCGs experiencing high PS, a significantly larger proportion expressed concerns regarding the following categories: psychosocial, parenting context and non-normative/in society. All four psychosocial sub-categories showed significant differences, with caregivers with high PS expressing more concerns. The personality traits sub-category consists of three groupings; two of which showed significant differences, namely various personality traits and poor self-regulation/psychological factors.

Table 12

Coded Responses of PCG Reported Concerns about Children shown by Total Parenting Stress at the 90th Percentile

Categories/Codes	**High PS (N=223)**	**Low PS (N=1492)**	**Z**	***p*-value**
	n (%)	**n (%)**		
Category 1- Physical Concerns	**32 (14)**	**168 (11)**	1.34	.18
Physical symptoms and health problems	24 (11)	135 (9)		
Disturbed eating	3 (1)	25 (2)		
Diagnosed disorders	4 (2)	3 (0.2)		
Poor hygiene	1 (1)	2 (0.1)		
Thumb-sucking	0 (0)	3 (0.2)		
Category 2- Cognitive Concerns	**19 (9)**	**111 (7)**	0.57	.57
Poor academic potential/achievement	16 (7)	98 (7)		
Forgetful	3 (1)	9 (1)		
Lack of focus	0 (0)	2 (0.1)		
Developmental problem	0 (0)	1 (0.1)		
Indecisive	0 (0)	1 (0.1)		
Category 3- Psychosocial Concerns	**101 (45)**	**306 (21)**	**8.11**	**<.001**
3.1 Personality Traits	***34 (15)***	***150 (10)***	**2.34**	**.02**
Low conscientiousness	9 (4)	69 (5)	-0.39	.70
Too playful	3 (1)	42 (3)		
Low motivation	6 (3)	27 (2)		
Various personality traits	13 (6)	47 (3)	**2.03**	**.04**
Stubborn	10 (5)	28 (2)		
Extroverted behaviours	1 (1)	14 (1)		
Too mature	1 (1)	3 (0.2)		
Introverted behaviours	1 (1)	2 (0.1)		
Poor self-regulation/psychological factors	12 (5)	34 (2)	**2.68**	**.01**
Short temper/anger	7 (3)	22 (2)		
Emotional	4 (2)	10 (1)		
Mental illness	1 (1)	1 (0.1)		
Not coping	0 (0)	1 (0.1)		
3.2 Non-compliance	***32 (14)***	***76 (5)***	***5.31***	***<.001***
Disobedient	24 (11)	45 (3)		
Naughty	6 (3)	30 (2)		
Untidy	2 (1)	1 (0.1)		

Categories/Codes	High PS (N=223)	Low PS (N=1492)	Z	*p*-value
	n (%)	n (%)		
3.3 Interpersonal difficulties in relationships	***24 (11)***	***43 (3)***	***5.67***	***<.001***
Aggressive behaviour	12 (5)	23 (2)		
Harsh/intolerant	7 (3)	10 (1)		
Bullying behaviour	4 (2)	5 (0.3)		
Disrespectful	1 (1)	5 (0.3)		
3.4 Emotional immaturity	***11 (5)***	***37 (3)***	***2.07***	***.04***
Irresponsible	5 (2)	33 (2)		
Dependent on others	3 (1)	1 (0.1)		
Ignorant	1 (1)	1 (0.1)		
Inconsiderate/selfish	1 (1)	1 (0.1)		
Inflexible	1 (1)	1 (0.1)		
Category 4- Parenting Context Concerns	**11 (5)**	**29 (2)**	**2.76**	**.01**
Demanding material things	4 (2)	14 (1)		
Concerns about provision	5 (2)	11 (1)		
Fear of injury/sickness	1 (1)	2 (0.1)		
No birth certificate	1 (1)	1 (0.1)		
Lack of support	0 (0)	1 (0.1)		
Category 5- Non-normative/In Society Concerns	**12 (5)**	**18 (1)**	**4.43**	**<.001**
Lack of school participation/enjoyment	8 (4)	11 (1)		
Rule-breaking behaviour	4 (2)	1 (0.1)		
Trauma	0 (0)	3 (0.2)		
Child possessed	0 (0)	1 (0.1)		
Gender-inappropriate behaviour	0 (0)	1 (0.1)		
Paranoid when sick	0 (0)	1 (0.1)		
No Concerns	**47 (21)**	**854 (57)**	**-10.09**	**<.001**

Note. As some PCGs reported more than one concern and these were coded separately, the total used in this table was N=1715. All category/code proportions were calculated using either 223 (the PS group) or 1492 (the no PS group) as the denominator.

Chapter 5

Discussion

The aim of the present study was to increase understanding of PS among caregivers of primary school-aged children in rural KwaZulu-Natal. This study examined maternal/PCG, child and family/household factors predicting PS. Qualitative data on caregivers' most prominent concerns regarding their child were analysed. Thereafter those concerns were stratified by PS outcome.

5.1 Summary of main findings

Using the original cut offs defined by Abidin (1995), around 16% of this sample of PCGs in rural KwaZulu-Natal would be classified as experiencing clinically significant PS. When considering the subscales individually, the highest proportion of PCGs exhibited clinically elevated scores on the PD Subscale (28%).

In the Combined Model, using the $p \leq .0125$ threshold, seven factors were found to be significantly associated with PS at or above the 90th percentile. The factors significantly increasing the odds of PS were: the mother becoming HIV infected post-pregnancy, the family experiencing recent food insecurity, the child exhibiting internalizing or externalizing behaviours and the child having academic or other problems at school. Two factors were linked to a reduced likelihood of PS, namely the child being helped to learn shapes and sizes at home and maternal participation in VTS. In the separate multivariate regressions four additional variables showed significant effects on PS at or above the 90th percentile, but did not reach significance in the Combined Model. These are depression and anxiety being associated with more PS, while higher PCG education levels and good sibling relationships were linked with less PS.

The content analysis revealed that PCGs most frequently reported having psychosocial concerns about their children. These concerns included: negatively perceived

personality traits, non-compliant behaviour, difficulties in relationships and emotional immaturity. Of the PCGs experiencing PS (versus those not experiencing PS), a significantly larger proportion were noted to have psychosocial, parenting-related and/or normative concerns about their children.

5.2 Prevalence of Total Parenting Stress

The prevalence of PS in this sample is discussed in terms of the means of the continuous variables and the proportions meeting clinical thresholds, as defined by Abidin (1995). It is important to note that comparisons made below are purely descriptive and that no firm conclusions can be drawn in the absence of any statistical tests.

The level of general PS (M = 69.8) found in this sample is mostly higher than that reported in studies with PCGs of typically developing children of a similar age in HIC (average M = 62.34) (Keenan, Newman, Gray, & Rinehart, 2016; G. K. Lee et al., 2009). It is not surprising that higher levels of PS were observed in the current sample, given the additional risk factors faced in this low-income context. Linked to this, a more comparable mean of total PS (M = 72.3) was reported among low-income African American mothers of preschool children (2-5 years) (Reitman et al., 2002). Slightly higher scores being observed in low-income settings illustrates the potential need for different norms for PS in different contexts.

To my knowledge, only two studies in Sub-Saharan Africa have used PS as their main outcomes. In relation to the level of PS found in a sample of PCGs of HIV infected toddlers in South Africa (M = 96.66) (Potterton et al., 2007), the mean level of PS in the present sample was considerably lower. This is in line with literature showing significantly elevated levels of PS among PCGs of children with disabilities and chronic illnesses (Golfenshtein et al., 2015). The children in the present study were HIV uninfected and

largely did not have major health issues; evidenced by low levels of TB, chronic medication use and hospitalizations.

A study using data from two countries in West Africa reported the prevalence of clinically significant PS among mothers at two years postpartum (Guo et al., 2014). The proportion experiencing significant PS in the present sample (16%) was similar to the Ghanaian sample (15%), but lower than the Ivory Coast sample (23%). The higher PS among the Ivory Coast sample was possibly influenced by political unrest and armed conflict in the area (Guo et al., 2014).

The higher proportion of PCGs experiencing clinically elevated levels of PD (28%) in the current sample, as compared to the P-CDI (14%) and DC (13%) Subscales, is striking. A similar trend of elevated PD scores has been reported in Sub-Saharan Africa (Guo et al., 2014; Potterton et al., 2007) and also in an at-risk sample of Portuguese mothers (Ayala-Nunes, Nunes, & Lemos, 2017). Potentially this suggests that mothers in at-risk settings are more stressed by their parental role, than by the relationship with their children.

5.3 Risk Factors associated with Parenting Stress

These factors are discussed in two parts, firstly the relevant maternal/caregiver and household factors and secondly the child behaviour factors.

5.3.1 Maternal/caregiver and household factors

Food insecurity and maternal HIV were the maternal/caregiver and household factors with the strongest association with increased PS. The presence of mental health problems in caregivers was associated with higher scores on PS outcomes in the separate multivariate model but not the Combined Model. These three factors had the strongest association with the PD Subscale. The impact of food insecurity and HIV in increasing the risk of PS in this sample is expected, given the extent of poverty (Gradín, 2013) and prominence of HIV infection among women in South Africa (Dellar, Dlamini, & Karim,

2015). Furthermore, common mental disorders, HIV infection and poverty often intersect and are experienced co-morbidly (Lund et al., 2010; Myer et al., 2008; Steinert, Cluver, Melendez-Torres, & Herrero Romero, 2017).

5.3.1.1 Caregiver provision and food insecurity

It is well established that poverty and inequality negatively impact on the well-being of mothers and children (Walker et al., 2011). Consistent with the findings in this study, research has also shown a lack of financial resources to be particularly linked to elevated PS (Mortensen & Barnett, 2015; Potterton et al., 2007; Steele et al., 2016).

In the present study, food insecurity was strongly associated with the PD Subscale, and to a weaker extent the DC Subscale. Naturally, a PCG who cannot feed her child consistently is likely to experience distress. A strong association between financial strain and parental distress has been demonstrated in other low-income samples (Reitman et al., 2002; Whiteside-Mansell et al., 2007). In the context of food insecurity, the PCG may also experience the child as being more difficult to take care of. There is evidence linking food insecurity to higher levels of behavioural issues in children, with a particular emphasis on hyperactivity and inattention (Melchior et al., 2012). A child exhibiting such behaviours is likely to contribute to and exacerbate negative perceptions held by their caregiver.

Concerns around parenting and provision also emerged in the content analysis. A larger proportion of PCGs experiencing PS at the 90th percentile (5%), as opposed to those below that cut off (2%), reported having such concerns regarding their child. These concerns centred on not being able to meet the child's material needs and demands, including a lack of clothes and food. While this concern was raised, it was not the most salient concern reported among stressed PCGs.

5.3.1.2 Maternal HIV infection

HIV infection has been shown to affect psychological well-being during pregnancy and the postpartum period (Kapetanovic, Dass-Brailsford, Nora, & Talisman, 2014). In the current sample, HIV infected mothers (who made up around 50% of the sample) had an elevated risk of PS. This is in line with the PS literature among the population of women living with HIV (E. R. Johnson et al., 2015; Murphy et al., 2010). This research illustrated that the risk of PS was significantly greater among mothers who seroconverted post-pregnancy. These findings corroborate previous research examining maternal psychological morbidity in the Siyakhula Study (Rochat et al., 2017b). The results of the current study show that the significance of seroconversion post-pregnancy is maintained, even when various child variables are accounted for.

Being HIV infected in pregnancy and seroconversion post-pregnancy were both associated with elevated PD. This is supported by research reporting HIV infected pregnant women and mothers to experience extreme emotional distress and ambivalent feelings towards motherhood post diagnosis (Sandelowski & Barroso, 2003; Sanders, 2008). These mothers have the additional burden of managing the psychological and physical strain of their chronic illness along with their parental role (DeMarco, Lynch, & Board, 2002; Murphy et al., 2010). A tendency for HIV infected mothers to silence their own physical and psychological needs and put their children's needs ahead of their own, has been reported (DeMarco et al., 2002). Moreover, HIV infected women are at an increased risk of experiencing concurrent adverse situations, such as mental health problems and intimate partner violence (Mitchell, Wight, Van Heerden, & Rochat, 2016). These additional challenges faced by HIV infected mothers are likely to increase levels of personal distress.

Seroconversion post-pregnancy was also associated with higher scores on the DC Subscale. Since this was not the case for mothers HIV infected in pregnancy, a more recent

diagnosis could influence a mother's perceptions of her child. Mothers who seroconverted post-pregnancy may have experienced less support around the time of their diagnosis, as compared to women who received Prevention of Mother-to-Child Transmission services (Rochat et al., 2017b). A more recent diagnosis could have afforded the mother less time to adjust to the idea of being an HIV infected parent. Additionally, she may face the challenge of having to disclose her status to others, including her child. PS among HIV infected mothers prior to disclosure has been shown to be elevated (Rochat et al., 2015).

Mothers living with HIV face particular stressors, impacting on their parenting behaviour. Elevated levels of stress and anxiety have been reported among this population and subsequently linked to poorer parenting skills (Murphy et al., 2010). HIV infected mothers have specifically reported a lack of confidence in implementing household routines and enforcing discipline with their children (Murphy, Armistead, Marelich, & Herbeck, 2015; Murphy et al., 2010). These parenting difficulties may contribute to children of HIV infected mothers showing lower levels of adaptive functioning in communication and daily living skills (Allen et al., 2014). Children's impairment in these domains of functioning may in turn exacerbate negative maternal perceptions. These perceptions are likely to persist, as evidence suggests that negative perceptions of child behaviour are fairly stable (Johnston, 1996). Additionally, parents with elevated stress are more likely to emphasize the negative behaviour and attribute it to the child, rather than to the situation (Murphy et al., 2010).

5.3.1.3 Caregiver mental health

In the present study, variables reflecting caregiver levels of anxiety and depression were not significant in the Combined Model, but were however associated with a higher likelihood of PS in the Maternal/PCG Model. The impact of maternal mental health problems on PS was expected and is consistent with other research (Guo et al., 2014; Leigh

& Milgrom, 2008). In the present study the mental health measures were uniquely associated with the PD Subscale.

5.3.2 Child behaviour factors

In this sample, the likelihood of experiencing PS was significantly increased by child behavioural problems (internalizing and externalizing) and by the child having academic or other problems at school.

5.3.2.1 Internalizing and externalizing behaviours

A relationship between child problem behaviours and PS has been well demonstrated (Morgan, Robinson, & Aldridge, 2002). This relationship has been established in both directions: with PS as an antecedent to child problem behaviours (Anthony et al., 2005) and also as a consequence (Jackson, 2000). The finding that children's internalizing and externalizing behaviours were significantly associated with an increased likelihood of PS in this sample, is consistent with other research in low-income samples (Anderson, 2008; Jackson, 2000; Reitman et al., 2002). The Siyakhula data measuring child behavioural problems and PS are cross-sectional, therefore limiting analysis of the relationship between them. However, it is likely that they have a bidirectional and transactional effect on each other, as increasingly shown by longitudinal research (Mackler et al., 2015; Rochat et al., 2017a; Stone et al., 2016).

Internalizing and externalizing behaviours were shown to significantly increase scores on the P-CDI and DC Subscales. The impact on the P-CDI domain is expected, as negative parent-child interactions have been shown to be more prevalent in families with a child with behavioural problems (Feinfield & Baker, 2004). PS and child behavioural problems have been proposed to influence each other via negative or compromised parenting practices (Belsky, 1984). Parents of children with externalizing problems have also been reported to perceive themselves as having less parenting knowledge and

competence (Mash & Johnston, 1990). This is likely to affect parenting behaviour and attitudes, impacting on the parent-child relationship.

The effect of child behavioural problems on the DC Subscale highlights the negative impact internalizing and externalizing behaviours could have on caregiver perceptions of the child. These negative perceptions could be affecting parenting behaviour (for example the use of inconsistent discipline), which in turn is linked to increased child behavioural problems (Renk, 2011). As described previously, parental perceptions are likely to be fairly stable (Johnston, 1996) and could result in the PCG locating the problem behaviour within the child. If such a cycle of effects is occurring, negative parental perceptions may be exacerbating existing child behavioural problems and sustaining PS.

5.3.2.2 Academic or other problems at school

The child having academic or other problems at school significantly increased the likelihood of PS. The present study found no relationship between PS and grade repetition or child cognition. It is therefore plausible that responses endorsing this item are not reflecting academic problems per se, but rather other issues at school, such as behaviour and peer relationships.

This is supported by the findings of the content analysis in the present study. There was no significant difference among PCGs with PS at or above the 90th percentile (versus those below) in terms of the cognitive concerns category. Research has shown PS to be better explained by child behaviour rather than child cognition (Beck, Hastings, Daley, & Stevenson, 2004). In this sample, where child problem behaviour is strongly associated with PS, it is feasible that children, who exhibit problem behaviours at home, may be exhibiting similar behaviours at school. Supporting this, literature on PS in early and middle childhood highlights the importance of other school-related factors, including children's classroom adjustment and prosocial behaviour (Anthony et al., 2005).

Findings of the content analysis reflected concerns about non-normative behaviour in children to be more prominent among stressed PCGs (5% versus 1%). Concerns largely pertained to a lack of school participation and enjoyment. This may support the importance of school-related factors in this phase of childhood (Anthony et al., 2005; Howie, Lukacs, Pastor, Reuben, & Mendola, 2010). Further content analysis findings highlighted the importance of child behaviour and social factors among PCGs experiencing PS. Of the PCGs experiencing PS, 45% reported psychosocial concerns regarding their child, as opposed to 21% of the PCGs not experiencing PS. Salient psychosocial concerns included defiant or negative personality traits (including internalizing and externalizing behaviours), poor self-regulation, non-compliance, interpersonal difficulties and emotional immaturity.

These findings are in line with child development literature showing that social skills and prosocial behaviour become especially important in middle childhood. Children starting school have to negotiate interactions and relationships with peers and teachers (Neece & Baker, 2008). There is evidence supporting a bidirectional relationship between PS and social skills: a deficit in social skills has been linked to increased PS (Anderson, 2008; Neece & Baker, 2008), and PS has been shown to inhibit the development of and cause children's social skills to deteriorate (Bhavnagri, 1999; Neece & Baker, 2008).

5.4 Protective Factors associated with Parenting Stress

Factors shown to reduce the likelihood of PS in this sample are discussed below, including: good sibling relationships, a higher PCG education level, children being helped to learn shapes and sizes at home and maternal participation in the VTS intervention.

5.4.1 Good sibling relationships

If the child was reported to have good sibling relationships, the risk of PS was significantly reduced in the Child Model, but not in the Combined Model. Positive sibling relationships could indicate a level of family cohesion, which has been shown to decrease

PS (Anderson, 2008). Siblings have been described as playing an important role in African contexts, in contributing to the home and caring for younger children (Niehaus, 1994). Research in this rural KwaZulu-Natal setting has shown good sibling relationships to be associated with improved schooling outcomes for younger children (Mitchell, Rochat, et al., 2016).

Better sibling relationships were uniquely associated with decreased scores on the DC Subscale. This is likely attributed to the idea that the nature of children's psychosocial traits is linked to the quality of sibling relationships (Brody, 1998; McHale, Updegraff, & Whiteman, 2012). Current findings support this notion by showing good sibling relationships to be correlated with getting on well with other children generally. Therefore, children exhibiting more positive psychosocial traits may therefore be more likely to form good relationships and less likely to be perceived as difficult by the PCG.

5.4.2 Caregiver education level

Higher education levels in PCGs were associated with a decreased likelihood of PS in the Maternal/PCG Model, but not in the Combined Model. PCG education level significantly impacted on the PD and P-CDI Subscales. Maternal education reducing PS is in line with other research from the Siyakhula Study (Rochat et al., 2017b). Similar findings were also reported among another sample of caregivers in South Africa (Potterton et al., 2007), where comparable rates of high school completion (25%) were observed. Nomaguchi and Brown (2011) also found that higher education levels were associated with lower levels of parental anxiety. Lower levels of PS and anxiety could be linked to increased access to resources, for example improved living conditions and fewer concerns about providing for the child (Cooper, McLanahan, Meadows, & Brooks-Gunn, 2009; Nomaguchi & Brown, 2011; Potterton et al., 2007).

Connections between higher levels of parental education and greater parental investment have also been reported. Greater parental investments could in part be resource-driven, with higher levels of PCG education being linked to children having more books, access to a computer and extra lessons (Carneiro, Meghir, & Parey, 2013). In addition, studies have shown that higher levels of parental education are associated with the use of particular age-appropriate parenting practices. For example, Kalil, Ryan, and Corey (2012) reported that mothers with higher levels of education more appropriately invest their time in different developmental phases, for example: basic care and play for infants and toddlers, teaching activities for preschool children and supervision and management in middle childhood. These age-appropriate parenting practices in turn promote children's health and development (Kalil et al., 2012; Prickett & Augustine, 2016).

5.4.3 Home stimulation and intervention participation

In the present study, the greatest reductions in the likelihood of PS in the Combined Model were associated with the child being supported to learn shapes and sizes at home and with VTS participation. The child being helped to learn shapes and sizes was correlated with being taught the alphabet and colours at home, and this could be indicative of exposure to home stimulation. Children's exposure to home stimulation may in turn be related to the variable of maternal education. For example, Kalil et al. (2012) reported that mothers with higher levels of education and increased access to resources are more likely to engage in learning activities with their children. Siblings could also be involved in helping to teach the child (Brody, 1998). As previously mentioned, better sibling relationships in this context have been linked to improved learning outcomes (Mitchell, Rochat, et al., 2016). Much research has demonstrated the benefits of home stimulation to the child (Bakermans-Kranenburg, Van Ijzendoorn, & Juffer, 2003; Kagitcibasi, Sunar, Bekman, Baydar, & Cemalcilar, 2009; Walker, Chang, Younger, & Grantham-Mcgregor, 2010), with

comparatively less research examining maternal benefits. Available literature has shown home-based interventions focusing on child stimulation to result in decreases in maternal distress and depression (Baker-Henningham, Powell, Walker, & Grantham-McGregor, 2005; Klebanov, Brooks-Gunn, & McCormick, 2001). These interventions in part attribute maternal mental health benefits to receiving visits from a supportive fieldworker. However, in the present study, home stimulation was not delivered as an intervention. As home stimulation is significantly related to the P-CDI and DC Subscales, this may suggest that more positive mother-child interactions could be driving the reduction in PS.

The relationship between home stimulation and PS may be bidirectional. Effects in the opposite direction have been demonstrated, with PS significantly reducing maternal warmth and home stimulation among a sample of African American mothers (Baker & Iruka, 2013). Likewise, de Cock et al. (2017) showed PS to be a mediator between early maternal bonding and later child executive functioning. Interpretations of this mediating effect of PS include that mothers with elevated PS may spend less time interacting and engaging with their children in cognitively stimulating activities (de Cock et al., 2017). Other research with from the Siyakhula Study has found home stimulation and executive functioning of the children to be correlated (Rochat et al., 2016).

Maternal participation in VTS significantly reduced PS. In VTS, mothers received antenatal home visits and were visited up to 6 months post-partum. Mothers were counselled to exclusively breastfeed. They were taught how to position and attach the baby and also helped to deal with any breastfeeding difficulties (Bland et al., 2008). Mothers were requested to keep food intake diaries for their infants. Other research on the Siyakhula Study demonstrated that exclusive breastfeeding (as part of VTS) was linked to fewer conduct disorders among the current sample of primary school-aged children (Rochat et al., 2016). It is however important to note that VTS was not a randomized control trial and the Siyakhula

Study was only a population comparison of age matched children; therefore, cautious interpretation is needed. Nonetheless, the impact of VTS on conduct disorders and PS adds to the growing evidence demonstrating the importance of prenatal and postnatal support and subsequent benefits for mother and child (Barlow et al., 2006; de Cock et al., 2017; Landsem, Handegard, Tunby, Ulvund, & Ronning, 2014).

VTS significantly decreased the odds across all three of the PSI Subscales, illustrating that participation in the intervention seemed to impact on each aspect of PS. The pathways through which these early experiences between mother and infant influence PS are most likely transactional. The home visits that mothers received during VTS may have provided support during a potentially stressful time. This support could have lowered levels of distress, in turn resulting in increased maternal responsiveness and sensitivity and healthier mother-child interactions (Landsem et al., 2014). This cycle of healthy interactions could facilitate mother-child bonding. Strong maternal antenatal and postnatal bonds have been shown to be protective against later PS (de Cock et al., 2017; Reck, Zietlow, Müller, & Dubber, 2016). This stronger bond could also contribute to an increased engagement in home stimulation activities with the child.

A longer-term reduction in PS has also been demonstrated in an intervention with parents of premature infants in Norway (Landsem et al., 2014). The intervention consisted of sessions prior to hospital discharge and subsequently at home until the child was 3 months old. Results showed levels of maternal PS among the intervention group to decrease across several assessments, spanning from 6 months to 9 years postpartum. Intervention content included parents being supported and guided to help recognize and be sensitive to the infant's behavioural cues. This understanding of their infant was used to adjust their daily care routines to best suit their child's temperament and therefore reduce stress levels (Landsem et al., 2014). As PS is influenced by children's temperamental difficulties, this

intervention lends support to the notion that the basis of mothers' perceptions of their children should be explored (Ostberg & Hagekull, 2000).

The VTS intervention and other studies demonstrating longer term positive outcomes for mothers and children (de Cock et al., 2017; Landsem et al., 2014) illustrate the importance of longitudinal research and intervening in the antenatal and postnatal period. These protective trends point to the potential of early maternal intervention to promote maternal bonding, decrease PS, promote home stimulation and potentially improve child executive functioning. Further longitudinal research is needed to disentangle the pathways of these effects.

5.5 Implications

This study provides even more evidence for the essential support for HIV infected women and HIV affected children in South Africa.

The finding that children's behavioural problems and problems at school were strongly linked to levels of PS demonstrates that interventions aimed at PS could significantly alleviate children's behavioural problems. Such interventions are even more important in HIV prevalent settings as literature has shown maternal HIV to be linked to increased internalizing and externalizing behaviours in children (R. E. Goldberg & Short, 2016), with PS shown to mediate this relationship (Allen et al., 2014).

While women who were HIV infected in pregnancy had elevated odds of PS, mothers who seroconverted post-pregnancy were even more at risk. This adds to the literature illustrating the need to provide support to HIV infected mothers, not only from pregnancy, but also throughout the course of the child's early and middle childhood (Rochat, Bland, Coovadia, Stein, & Newell, 2011). This support should include nutritional considerations, as food insecurity was shown to increase the risk of PS. The results of the current study suggest that later PS among caregivers could be reduced through participation

in a home-based perinatal support intervention, as well as engagement in activities with children, focused on cognitive stimulation.

5.6 Limitations

The present study has several limitations. The Combined Model only explained an estimated 31% of the variance in the PS outcome. Consequently, there are a number of other variables affecting PS, but measurement of additional variables was beyond the scope of this study.

This sample demonstrated high levels of PD, with the Combined Model accounting for only 17% of the variance. It would be useful if future research were to examine additional factors impacting on PD in this rural South African context. For example, adverse life events have been cited as potentially important in the ability to cope with the parental role (Abidin, 1995). In this setting, where many women live in the context of poverty and HIV, it is plausible that adverse life events (such as intimate partner violence or bereavement) may be contributing to PD. The presence of mental health problems in this study could have been partially accounted for by adverse life events; thus, specific data offering insight into any potentially salient events would have been beneficial.

Another limitation of the present study is that certain aspects of PCG's personalities, which could have impacted on the parenting experience, were not measured. For instance, positive maternal personality traits (including optimism, trustworthiness and compassion) have been linked with reduced PS (Mulsow, Caldera, Pursley, Reifman, & Huston, 2002). Other important factors in the experience of PS could include parental beliefs, such as parental self-efficacy (Berryhill, 2016; Chang & Fine, 2007). Future research should consider including measures which would capture aspects of the caregiver's personality and parenting beliefs.

This study did not find significant effects of variables reflecting family structure, such as relationship status and family size. A limitation of this study is that the quality of family relationships was largely not assessed. Measures of family cohesion and participation could be better predictors of PS, as compared to family structure alone (Anderson, 2008). For example, marital intimacy and relationship quality has been shown to be protective against PS (Chester & Blandon, 2016; Mortensen & Barnett, 2015). Additionally, the social support networks of PCGs were not assessed. Other studies have shown higher levels of support to reduce PS (Ayala-Nunes et al., 2017). Future research could aid in determining the effects of family relationship quality and functioning, as well as the importance of social support for caregivers.

Regarding the child factors, a limitation of the present study includes a lack of data illustrating the nature of other problems (besides academic) that children may be experiencing at school. Issues of child personality and social skills emerged in the content analysis, but further research would benefit from measuring these constructs quantitatively. Furthermore, the CBCL being parent-reported is an important consideration – as PS or other parental pathology may affect the perception and rating of child behaviour. Additionally, it must be noted that while the multicultural norming software for the CBCL was used, it has not been specifically normed in South Africa.

Many of the risk and protective factors described in this research are likely interlinked. Future research would benefit from employing structural equation modelling techniques, which could aid in determining the direction of relationships and in disentangling the effects of various predictors. This would allow for more clarity into the importance of specific factors, which could assist in the development of targeted interventions.

5.7 Strengths

The present study has several strengths. First, the study used a large population-based cohort. To date, much PS research has been with clinical samples of children, which are not reflective of normal populations. Second, much of the data used was drawn from validated measures which have been used locally. The main outcome of PS was measured using the PSI-SF which has been widely validated and has shown excellent internal reliability in this rural KwaZulu-Natal sample. Third, the use of maternal, child and family factors controlled for many variables in the analysis and allowed for a more comprehensive understanding of factors influencing PS. The inclusion of the timing of HIV seroconversion allowed for a more nuanced interpretation of potential pathways in which HIV exposure detrimentally affects mother and child well-being. Last, the use of a mixed methods design aided in the interpretation of results and highlighted potential avenues for future research.

5.8 Conclusion

The present study aimed to increase understanding of PS among PCGs of primary school-aged children in rural KwaZulu-Natal. Results showed the prevalence of clinically significant levels of PS (16%) to be higher than those of anxiety (3%) or depression (6%). In terms of the individual domains of PS, more than a quarter of PCGs (28%) met the threshold for elevated PD as originally defined by Abidin (1995). Such high levels of stress in this large population-based cohort illustrate the need for targeted interventions.

Caregivers in this high-risk context experience severe hardships, impacting negatively on parental distress. Two highly prevalent adversities faced in this community, namely HIV infection and food insecurity, emerged as prominent risk factors for overall PS and PD. Elements of child behaviour, including internalizing and externalizing behavioural problems, as well as academic or other difficulties at school, were strongly related to PS. The findings of the content analysis showed that children's psychosocial development was a

prominent concern for PCGs. Salient protective factors against PS included the child receiving learning stimulation at home and mothers having participated in the VTS intervention.

These findings illustrate that a range of caregiver, child and contextual factors influence levels of PS. These findings further add to evidence illustrating the extensive impact of parental HIV on families in South Africa. Although these children are HIV uninfected, approximately half of them may be living with HIV infected mothers/caregivers. Existing research has linked HIV exposure to later child behavioural problems. It is therefore plausible that interventions with HIV infected mothers may significantly curb future PS and child behavioural problems. Mothers who seroconverted post-pregnancy had an especially elevated risk of PS. This finding demonstrates the need for comprehensive approaches to support HIV infected women and families across the life course.

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Appendix A

Enrolment Form

Africa Centre **Siyakhula Project (Saving Brains)**

Form 2: Enrolment Form – ENF

Form completion date Y Y Y Y M M D D

Field worker

Child VTS ID

Child ACDIS DSID -

1. Mother's details

Surname

Maiden name

Date of birth Y Y Y Y M M D D

First name

Second name

VTS ID (if applicable)

ACDIS DSID (if applicable) -

2. Child's details

Surname

Date of birth Y Y Y Y M M D D

Gender: O Male O Female

Is this child a twin? O Yes O No

First name

Second name

If yes, O Twin 1 O Twin 2

3. Tracking information

BSID No.

Physical address

Phone number

Alternative number

Contact – Surname (known person at home)

Contact – First name

Isigodi

Local area name

Head of the homestead– Surname

Head of the homestead – First name

Nearest shop

Directions to reach home (e.g. roads, rivers, school, etc).

Description of household (including colour)

Appendix B

Socio-Demographic Form

Africa Centre **Siyakhula Project (Saving Brains)**

Form 3: Socio-Demographic Form – SDF

Form completion date Y Y Y Y M M D D

Field worker

Study ID

1. Child's details

a. How many living biological children does the mother have (including index child)?

b. How many dead biological children does the mother have? (do not include miscarriages)

Birth order of index child (e.g. 2 of 4) of

Instruction: List all biological siblings (living or dead), starting with the oldest sibling (do not include index child) O **NA**

Name	Year of birth	Current school grade*	Name	Year of birth	Current school grade*
1.	Y Y Y Y		11.	Y Y Y Y	
2.	Y Y Y Y		12.	Y Y Y Y	
3.	Y Y Y Y		13.	Y Y Y Y	
4.	Y Y Y Y		14.	Y Y Y Y	
5.	Y Y Y Y		15.	Y Y Y Y	
6.	Y Y Y Y		16.	Y Y Y Y	
7.	Y Y Y Y		17.	Y Y Y Y	
8.	Y Y Y Y		18.	Y Y Y Y	
9.	Y Y Y Y		19.	Y Y Y Y	
10.	Y Y Y Y		20.	Y Y Y Y	

* If not at school write N

* If don't know write U

* If died write D

2. Father and mother's details

a. Is the child's father still alive? O Yes O No O Don't know If no or don't know, go to q2d

b. Is the mother still in a relationship with him? O Yes O No

c. Does he provide for the child financially? O Yes O No

d. If the mother is not in a relationship with child's father, is she O Single O With new partner

e. Which man is most involved with this child?

O Biological father O Mother's current partner O Other O None If other, specify:_____

3. Caregiver's details

a. Does the child live with his/ her mother? O Yes O No

If No, what age was the child when the mother started living apart from the child? ☐☐ child age (then skip to q3c)

b. Is the mother at home with the child every night? O Yes O No O Don't know

If No, how many days per month is the mother at home with the child at night? ☐☐

c. Does the child live with his/ her biological father? O Yes O No

d. Who is considered the current **primary** caregiver of the child? O Mother O Other

If other, what is the relationship of the current primary caregiver to the child?

O Father O Paternal grandmother O Maternal grandmother O Step mother O Step father

O Cousin O Uncle O Aunt O Paid nanny O Other

If other, specify:_____ Estimated age of the caregiver ☐☐ years

e. Does somebody receive a child grant for this child? O Yes O No

If yes, who is it? O Mother O Primary caregiver (other than mother) O Other If other, specify:_____

f. Who is responsible for feeding the child most of the time? O Mother O Primary caregiver (other than mother)

O Other If other, specify:_____

4. Educational details: mother and caregiver

What is the highest educational level completed by the mother?

O None O Some primary O Primary completed

O Grade 10 (Std 8) O Matriculation O Post matriculation

If the primary caregiver is not the mother, what is the highest educational level completed by the primary caregiver?

O None O Some primary O Primary completed

O Grade 10 (Std 8) O Matriculation O Post matriculation

5. Living arrangements

Answer the following questions regarding the head of the homestead

a. Gender of the head O Male O Female Age in years ☐☐☐

b. What is the relationship of the head of the homestead to the child's mother?

O Mother herself O Husband/partner O Mother's father O Mother's mother O Husband/ partner's father

O Husband/ partner's mother O Other If other, specify:_____

Answer the following questions regarding members of the household

c. How many resident adults (i.e. >18 years) are there in this household? ☐☐

d. How many non-resident adults (i.e. > 18 years) are there in this household? ☐☐

e. How many resident children (i.e. ≤ 18 years) are there in this household? ☐☐

f. How many non-resident children (i.e. ≤ 18 years) are there in this household? ☐☐

g. Are there other households in this homestead? O Yes O No If yes, how many? ☐☐

h. If, yes are there any adults (i.e. >18 years) from other households in the homestead involved in the care of this child?

(i.e. watching, feeding, playing with and helping with homework) O Yes O No

Appendix C

Socio-Economic Form

Africa Centre **Siyakhula Project (Saving Brains)**

Form 4: Socio-Economic Status Form - SESF

Form completion date Y Y Y Y M M D D | Field worker | Study ID

Instruction: Please indicate who has answered this questionnaire
O Mother O Primary caregiver

1. Household and maternal income

1a. Does the mother/ primary caregiver have any paid employment? O Yes O No **If No**, go to q1d

If Yes,

1b. Is the employment part-time or full time? O Part-time O Full time

1c. How many days does she/he work each week? O <1 day O 1-2 day O 3 days O 4-5 days O 6 – 7 days

1d. Who is the main provider of income for the household?

O Mother /primary caregiver O Other household member

O Non-household member O Refused to answer

Type of income of main provider (mark one or more type)

☐ Regular employment ☐ Irregular employment ☐ Home employment ☐ Contribution

☐ State pension/ grant ☐ Other ☐ Don't know ☐ Refused to answer

2. Food security

Have there been days in the past 4 weeks where there has not been enough food available to feed the child?
e.g. when you have had to skip meals yourself for the child, or given smaller amounts? O Yes O No O Don't know
If yes, does this happen every week? O Yes O No O Don't know

3. Household information

3a. What is the most often used source of drinking water in the household? (Tick only one)

Piped – internal ☐ Piped – Public tap/kiosk (free) ☐ Flowing river/stream ☐ Dam/stagnant water ☐ Protected spring ☐ Water carrier or tanker ☐

Borehole ☐ Piped – Public tap/kiosk (paid) ☐ Rainwater ☐ Other ☐ Don't know ☐ Refused ☐

3b. What kind of toilet does the household use? (Tick only one)

Flush toilet ☐ VIP ☐ Other pit latrine ☐ Bucket toilet ☐ Chemical toilet ☐ Other ☐ None ☐ Don't know ☐ Refused ☐

3c. Is the household connected to an electricity supply?

O Yes O No O Don't know O Refused

3d.What is the main fuel used for cooking?

Wood ☐ Gas (PG) ☐ Coal ☐ Electricity from solar energy ☐ Electricity from generator ☐ Electricity from grid ☐ Other ☐ Don't know ☐ Refused ☐

3e. Is the owner of this Bounded Structure a member of this household? (Tick only one)

O Yes O No O Don't know O Refused

3f. Does the household have any of the following items in good working order?

	Yes	No		Yes	No		Yes	No		Yes	No
Home telephone	☐	☐	Cellphone	☐	☐	Primus Cooker, Sikeni	☐	☐	Electric hot plate	☐	☐
Electric stove with oven	☐	☐	Gas cooker	☐	☐	Fridge or freezer	☐	☐	Electric kettle	☐	☐
Television	☐	☐	Video recorder /DVD player	☐	☐	Radio/ Stereo	☐	☐	Sewing machine	☐	☐
Block maker	☐	☐	Car or bakkie	☐	☐	Motorcycle or scooter	☐	☐	Bicycle	☐	☐
Kombi, lorry or tractor	☐	☐	Bed	☐	☐	Table and chairs	☐	☐	Sofa or sofa set	☐	☐
Car battery for electricity	☐	☐	Wheelbarrow	☐	☐	Hoe, spade, or garden fork	☐	☐	Washing machine	☐	☐
Cattle	☐	☐	Other livestock (chicken, etc)	☐	☐	DS TV	☐	☐	Microwave	☐	☐

Appendix D

Mother's Medical Information

Africa Centre **Siyakhula Project (Saving Brains)**

Form 6: Mother's Medical Information Form - MMIF

Form completion date Y Y Y Y M M D D

Field worker

Study ID

1. Mother's physical assessment details

a. Is the mother HIV infected? O Yes O No If yes, ask q1a - e If No, skip to q2

b. Are you currently on ART? O Yes O No If No go to q 1c If yes, when was this commenced? Y Y Y Y M M

If can't recall O ≤ 12 months ago O > 12 months ago O Don't know

c. Which clinic do you normally attend for your HIV treatment/ care? Name of clinic: _____

d. What was your most recent CD4 count result? O Don't know O Not done If not done, go to q2

e. When was it done? Y Y Y Y M M

If can't recall O ≤ 12 months ago O > 12 months ago O Don't know

2. Mother's hospitalization details (Ask to all mothers)

a. Have you been hospitalized overnight since the study child was born? (probe about injuries) O Yes O No O Don't know

If yes, how many times? If no or don't know, go to q 2b

1st admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

2nd admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

3rd admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

4th admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

5th admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

b. Have you ever been diagnosed with TB? O Yes O No O Don't know If no or don't know, skip to q 2c

If yes, when did treatment start? Y Y Y Y

c. Are you on any chronic medication? O Yes O No If yes, for what condition? (do not include TB)

☐ Epilepsy ☐ Asthma ☐ Hypertension ☐ Other If other, specify:_____

Appendix E

Child's Medical Information

Africa Centre **Siyakhula Project (Saving Brains)**

Form 7: Child's Medical Information Form - CMIF (A)

Form completion date Y Y Y Y M M D D

Field worker

Study ID

1. Study Child's hospitalization details

a. Has the child ever been hospitalized overnight since birth? (probe about injuries) O Yes O No O Don't know

If yes, how many times? If no or don't know, go to q1b

1st admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

2nd admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

3rd admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

4th admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

5th admission (year) Y Y Y Y Diagnosis:_____

Length of stay O< 7 days O ≥ 7 days O Don't know

b. Has the child ever been diagnosed with TB? O Yes O No O Don't know If no or don't know, skip to 1c

If yes, when did treatment start? Y Y Y Y

c. Is the child on any chronic medication? O Yes O No If yes, for what condition? (do not include TB)

O Epilepsy O Asthma O Other If other, specify:_____

2. Immunization

Age of child	Please tick vaccinations received. Use RTHC and Maternal recall							
At birth	(a) BCG	O Yes	O No	O Don't know	(b) OPV	O Yes	O No	O Don't know
6 weeks	(a) DTaP-IPV.HiB (1)	O Yes	O No	O Don't know	(b) Hep B (1) Hepatitis B vaccine	O Yes	O No	O Don't know
10 weeks	(a) DTaP-IPV.HiB (2)	O Yes	O No	O Don't know	(b) Hep B (2) Hepatitis B vaccine	O Yes	O No	O Don't know
14 weeks	(a) DTaP-IPV.HiB (3)	O Yes	O No	O Don't know	(b) Hep B (3) Hepatitis B vaccine	O Yes	O No	O Don't know
9 months	(a) Measles vaccine (1)	O Yes	O No	O Don't know				
18 months	(a) DTaP-IPV.HiB (4)	O Yes	O No	O Don't know	(b) Measles vaccine (2)	O Yes	O No	O Don't know
6 years	(a) Td vaccine	O Yes	O No	O Don't know				

Appendix F

Abbreviated Version of HOME

Africa Centre **Siyakhula Project (Saving Brains)**

Form 19: Home Inventory Form

Form completion date Y Y Y Y M M D D | Field worker | Study ID

Instruction: Please indicate who has answered this questionnaire: O Mother O Primary caregiver		
Mother Self-Report (S)	**Yes**	**No**
1. Child expected to make his/her bed		
2. Child expected to clean up after spills		
3. Child expected to bath him/herself		
4. Child expected to keep shared living areas clean and straight		
5. Child expected to do routine chores such as fetching water, help with meal preparation, washing, etc.		
6. Child expected to help organize his/her own time e.g. homework/ playtime		
7. Family gets a newspaper once a week		
8. Child has at least 3 children's books (not school books)		
9. Child read to 3 times or more a week:		
If yes, O By mother / primary caregiver O By other		
10. Child reads several times a week for enjoyment		
11. Child eats meal with mother/ primary caregiver once a day or more		
12. Child eats meal with mother/ primary caregiver and other family members once a day or more		
13. Non-physical discipline if child hits (bites/swears/speaks in anger)		
14. Child taken on educational trip in past year		
15. Family encourages child to start and do hobbies e.g. making models, cars, etc, collecting things, music, choirs, sports		
16. Child receives lessons or belongs to sports/music/art/dance/drama organistions		
17. Child taken to musical, drama or dance performance in past year		
18. Musical instrument in home child can use		
19. Family visits with family or friends 2-3 times a month		
20. Child spends time with father(-figure) 4 times a week (includes eating a meal with them, having a conversation for at least 5 minutes, helping with homework, playing a game, reading)		
21. Child spends time with father(-figure) in outdoor activities once a week (includes football, sport, going on a trip/outing/to school, clinic or shops)		
22. Mom reports no more than 1 smack during past week		
23. Child helped to learn numbers at home		
24. Child helped to learn alphabets at home		
25. Child helped to learn colours at home		
26. Child helped to learn shapes and sizes at home		
27. TV is on at home less than 5 hours per day		

Appendix G

Ethical Clearance

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

10 October 2012

Dr. R Bland
Africa Centre for Health and Population Studies
Mtubatuba
3935

Dear Dr Bland

PROTOCOL: The effect of an exclusive breastfeeding support intervention on subsequent development of children in the context of HIV. REF: BF184/12

The Biomedical Research Ethics Committee (BREC) has considered the abovementioned application.

The study was provisionally approved by a quorate meeting of BREC on 12 June 2012 pending appropriate responses to queries raised. Your responses dated 24 July 2012 to queries raised on 19 July 2012 have been noted by the Biomedical Research Ethics Committee at a quorate meeting on 09 October 2012. **All questionnaires etc must be submitted to BREC for approval before they are used.** The conditions have now been met and the study is given full ethics approval and may begin as from 10 October 2012.

This approval is valid for one year from **10 October 2012.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx. BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

Professor D Wassenaar (Chair)
Biomedical Research Ethics Committee
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 2384 **Facsimile:** +27 (0)31 260 4609 **Email:** brec@ukzn.ac.za
Website: http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

Appendix H

Recertification

UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

RESEARCH OFFICE
BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 260-4609
Email: BREC@ukzn.ac.za
Website: http://research.ukzn.ac.za/ResearchEthics/BiomedicalResearchEthics.aspx

20 December 2013

Dr. R Bland
Africa Centre for Health and Population Studies
Mtubatuba
3935

Dear Dr Bland

PROTOCOL: The effect of an exclusive breastfeeding support intervention on subsequent development of children in the context of HIV. REF: BF184/12

RECERTIFICATION APPLICATION APPROVAL NOTICE

Approved: 10 October 2013
Expiration of Ethical Approval: 09 October 2014

I wish to advise you that your application for Recertification received on 09 October 2013 for the above protocol has been noted and approved by the Biomedical Research Ethics Committee (BREC) at a meeting that took place on **12 November 2013 (meeting not quorate) and ratified at a full meeting on 10 December 2013** for another approval period. The start and end dates of this period are indicated above.

BREC has noted Ms Joanie Mitchell's (Student no.: 15655369) Masters study as part of the above study.

If any modifications or adverse events occur in the project before your next scheduled review, you must submit them to BREC for review. Except in emergency situations, no change to the protocol may be implemented until you have received written BREC approval for the change.

Yours sincerely

Signature removed to avoid exposure online

Mrs A Marimuthu
Senior Administrator: Biomedical Research Ethics