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Camden-Smith, Taryn

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Research Report

Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg

Student Ms. Taryn Camden-Smith (student number, 457741)

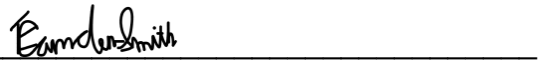
Supervisor Dr Wiedaad Slemming

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment for the degree of Master of Public Health

May 2022

Candidate's Declaration

I, Taryn Camden-Smith (student number 457741), declare that this Research Report is my original and own work. It is submitted for partial fulfilment for the Degree of Master of Public Health, in the field of Maternal and Child Health, at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature of Student: 

Date: 28/5/2022

Dedication

I dedicate this research to the mothers, fathers, grandmothers, grandfathers, aunts, uncles and friends who bring joy, happiness and love into the lives of children across South Africa. And I also dedicate this to the people striving to find ways to transform our health system to be the best for our children that they not only ‘survive’ but ‘thrive’ in life. Therefore, this is dedicated to the nurses, community health workers, allied health workers, doctors, researchers and all the people working tirelessly behind the scenes.

Abstract

Introduction**:** 250 million children are failing to reach their developmental potential in low- and middle- income countries. The first 1000 days of life (pregnancy and the first two years) are critical for brain and child development. Outputs of strategies that target child development include stimulating home practices (early learning opportunities such as singing/storytelling) and caregiver knowledge about child development. The status of these in caregivers of children younger than two years old and the associations of these to child development in the South African context have only been minimally explored. Therefore, the aim was to determine home practices, caregiver knowledge and child development in children aged one to 24 months in Soweto, Johannesburg and to determine if home practices and caregiver knowledge were associated with child development.

Methodology**:** A cross-sectional study was conducted on 160 caregiver-child pairs attending well-child services at a community health centre in Johannesburg. Data was collected using a questionnaire including home practice questions, the Caregiver Knowledge of Child Development Inventory, and the Ages and Stages Questionnaire (3rd edition). Bivariate and multiple linear regressions were conducted.

Results: Only one in three children are on track in all areas of development. Home practices were found to be associated with child development, such as talking to children during pregnancy (adjusted B=-67.6, $p<0.05$, 95%CI:-120.0,-15.2), singing (B=-17.5, $p<0.05$, 95%CI:-33.4,-1.7), naming/counting/drawing with children (B=-12.3, $p<0.1$, 95%CI:-26.4,1.8) and storytelling (B=-18.9, $p<0.01$, 95%CI:-31.9,-5.9). There was a high prevalence of some home practices (singing: 83%, taking children outside: 79%) but a low prevalence of others (reading/looking at pictures with children: 38%, storytelling: 30% and naming/counting/drawing with child: 24%). Caregivers had a relatively low level of knowledge about child development (mean CKCDI total score out of 40 was 21.6±5.4) and predicted milestones and stimulation activities to occur at older ages. Caregiver knowledge about child development was not associated with child development.

Conclusion**:** In the first 1000 days of life, early learning opportunities (and not caregivers' knowledge about child development) promote child development. Such early learning opportunities include singing, story-telling, naming/counting/drawing

with children and allowing children to play with household items/homemade toys/children's books.

Key words: Child development, caregiver knowledge, home practices, early learning opportunities

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List of Abbreviations

ASQ-3	Ages and stages questionnaire, 3rd edition
BSID-III	Bayley-III Scales of Infant and Toddler Development
CHC	Community health centre
CINAHL	Cumulative Index of Nursing and Allied Health
CKCDI	Caregiver Knowledge of Child Development Inventory
ECD	Early childhood development
EPI-SA	Expanded Programme on Immunisation for South Africa
HIC	High income country
HSQ	Home screening questionnaire
LMIC	Low- and middle- income country
MICS	Multiple Index Cluster Survey
NDoH	National Department of Health
NHRD	National Health Research Database
RtHB	Road to Health Booklet
WHO	World Health Organisation

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Chapter 1: Introduction

This chapter provides an overview of the global and national child development agenda and specifically South Africa's health system's strategies for child development in the first 1000 days of life. The outputs of early learning opportunities (such as singing/storytelling) and caregiver knowledge about child development for the health system's programmes are then realised. The evidence surrounding these outputs and gaps in the knowledge base are presented, leading to what this study is about and why the study is justified.

1.1 Background

Two hundred and fifty million (43%) children in low- and middle- income countries (LMICs) fail to reach their developmental potential(1,2). This finding has prompted the shift in health system's thinking from a 'survive' to a 'survive and thrive' focus in many countries, including South Africa(3). This is in line with the World Health Organisation's "Survive, Thrive, Transform" global strategy and thus a global and national imperative.

South Africa has shown commitment through the recent revision of the Road to Health Booklet (RtHB) (which includes an updated developmental screening tool and child development information for caregivers and health professionals) and the Side-by-Side campaign (which promotes nurturing care to promote child development through mass media)(3). The RtHB and accompanying Side-by-Side campaign is led by the Department of Health and is the start of an ongoing process to move 'beyond survival'(3,4). The health system interacts the most with caregivers and children during the critical first 1000 days of life (starting from conception) during routine and other health visits and therefore is in the best seat to launch such initiatives(4).

The first 1000 days of life is a critical period for rapid brain development (and thus child development) where a child unlocks their developmental potential through the sequential attainment of developmental milestones. During this time, the brain forms the simple circuitry onto which complex brain circuitry will build on later in life, therefore setting the foundation for life-long learning(5,6). During the first 1000 days of life, conditions such as optimal nutrition, responsive caregiving and a safe environment

with play and early learning opportunities cultivate this brain development and the absence of such conditions can hinder brain development(5).

To promote child development during the first 1000 days of life, the National Department of Health (NDoH) (allocated this responsibility by the National Integrated Early Childhood Development Policy) outlined five responsibilities(4). These responsibilities can be divided into child development-sensitive (indirectly affect child development) and child development-specific (directly affect child development) interventions. Child development-sensitive interventions include healthcare programmes (such as sick-child consultations and well-child routine visits for immunisation/growth monitoring/administering of deworming and Vitamin A), nutrition programmes (such as growth monitoring and supplementation) and social welfare services (such as referral for birth registration and access to social grants). Child development-specific programmes include early detection and referral of developmental delays (with routine screenings in the RtHB and referral to services), parenting support (providing caregivers with education and information to improve parental knowledge and practices that promote child development) and supporting caregivers to provide opportunities for early learning and play (during routine health system encounters and community health worker home visits to children at specific risk of poor development)(4). Outputs of the NDoH's responsibilities for parenting support and providing early learning opportunities include improving caregiver knowledge on child development and increasing adult-child home practices that promote child development.

1.2 Literature review

In conducting this literature review, CINAHL (Cumulative Index of Nursing and Allied Health), Global Health and PubMed databases were searched. Search terms included child development AND South Africa, child development AND caregiver knowledge, child development AND home practices OR singing OR reading OR adult-child activities OR storytelling OR stimulation OR home stimulation, knowledge AND adult-child activities OR interactions OR practices AND child development. The timeframe was January 2000 - March 2021. Relevant articles that were specific to the first two years of life or specific to the outcomes were chosen.

1.2.1 Child development

Child development is the attainment of age-appropriate milestones in cognitive, social, emotional, sensory and motor domains with each milestone forming the foundation of future milestones(7). For example, within motor development, a child typically starts hand-knee crawling when they are between six and twelve months old and mastering this milestone will assist the walking milestone when the child is between nine and sixteen months old(8). Achievement of a milestone in one area/domain of development will also contribute to development in another domain(7). For example, the attainment of motor milestones can contribute to language development because after a child learns to sit, they are able to interact with their environment more easily and start to use their hands for communicative gestures(9).

Child development is affected by numerous factors outside of the child's control. At a household level, socioeconomic status is protective against developmental delays and exposure to violence (including intimate partner violence) or poor sanitation is a risk factor for child development(10,11). At a caregiver level, a protective factors is maternal education and risk factors include maternal depression, maternal HIV and maternal anaemia during pregnancy(10-12). At a child level, exposure to learning opportunities is protective and risk factors include in-utero growth retardation, stunting and poor nutritional status(10,13-15).

A child's development during the early years of life affects their life trajectory. Children's development in infancy (especially motor and social development) is associated with their development (especially cognitive) in preschool(16). This has a ripple effect throughout school and into tertiary education, ultimately resulting in reduced earning potential up to 20 years later in life(17). However, this trajectory can be changed by factors such as psychosocial/sensory stimulation(17,18), maternal education(16), supportive partners(14) and social support(14) among other factors. Looking at stimulation in particular, stimulation in combination with supplementation at a young age (9-24 months old) in stunted children in Jamaica has been shown to improve child development (such as perceptual-motor function) up to six years after the intervention occurred(19). The same children had higher scores in IQ and verbal/vocabulary/reading tests at 17-18 years old compared to children who had received the intervention(20).

Globally and nationally, child development is not routinely monitored. There are inconsistencies with how child development is measured because numerous screening or diagnostic tools are used. Therefore, the prevalence of children not reaching their full developmental potential is calculated using two indicators of poor development: stunting and poverty prevalence(1). Using this method, it is estimated that in excess of 200 million children under 5 years old are not realising their full developmental potential and most of these children reside in LMICs(1). However, within LMICs there are inequalities in child development present. The suspected developmental delay in children aged 36-59 months (calculated with national health surveys) range from 3% to 67% across 63 LMICs(21). Within the Eastern and Southern African region, developmental delays are present in literacy-numeracy (85%), socio-emotional (31%), learning (16%) and physical (7%) areas of development(21). Sub-Saharan Africa appears to have the most children not developmentally on track (51-64%) compared to regions such as Europe and Central Asia (4%)(22).

Within South Africa, it is estimated that a third of children are not reaching their developmental potential. Using the same proxy indicators that estimated global child development (stunting and poverty), it was estimated that 52% of children were at risk of not reaching their developmental potential in South Africa in 2005 and this improved to 38% in 2015(23). Isolated studies from South Africa on child development depict a similar picture. Children within the control group in a Northern Cape study had average development when they were younger than 12 months old and low-average development when they were 17-29 months old(24). In a cohort study in the Western Cape, 23%-56% of two year old children were delayed within cognitive, motor and language domains(10). In a cross-sectional study of children under five years old from Kwa-Zulu Natal and Lusaka, children performed better in the ASQ-3, especially communication, gross motor and fine motor domains compared to children from Norway, Korea, US and Spain(25). However, by age five years old, children were performing worse in fine motor and problem solving domains of development compared to children from other countries(25).

With regards to child development, there is limited literature pertaining to the developmental status of children younger than two years old who attend routine health

services. These children are within the first 1000 days of life (pregnancy until two years old), which is a time of rapid brain and child development. Children younger than two years old are the focus of NDoH's child development-specific and child development-sensitive strategies. Therefore, further evidence surrounding the developmental status of children younger than two years old attending health services has a unique offering to the knowledge bank on child development in South Africa.

1.2.2 Home practices

Home practices are interactive caregiver-child encounters or early learning opportunities that promote a child's development. Types of home practices include a caregiver (mother/father/grandparent) telling a story to a child, reading a book to a child or looking at pictures with a child, singing to/with a child, taking children outside of the home and naming/counting/drawing with children. They can be separated into cognitive caregiving practices and socioemotional caregiving practices. Cognitive caregiving is where caregivers help children to understand their world by caregivers showing and describing aspects of the world to their children(26). Cognitive caregiving includes early learning opportunities such as reading, storytelling and naming/counting/drawing with children(26). Socioemotional caregiving is where caregivers engage in personal interactions with children(26). Socioemotional caregiving includes singing and taking children outside to experience different sights, sounds and experiences(26). Interactive encounters within the first 1000 days of life start during pregnancy(27). Such interactive encounters in pregnancy include singing/talking to the unborn child, talking about family to the unborn child, abdomen touching and dancing(28). By engaging in home practices, children develop motor, cognitive, communicative and socio-emotional skills(29,30).

Globally, the prevalence of socioemotional caregiving practices are higher than cognitive caregiving practices. In data pooled from 28 developing countries for children younger than five years old, 64% of mothers took children outside and 50% of mothers sang with children(26). Cognitive caregiving practices were less prevalent with 47% of mothers naming/counting/drawing with children, 35% of mothers engaging in storytelling with children and 25% of mothers reading books with young children(26). However, the prevalence of home practices do appear to be increasing with recent studies showing an above 80% prevalence of all home practices in Thai children 3-4

years old(29) and an above 80% prevalence of singing and taking children outside in a recent study from Burkina Faso(30).

In South Africa, StatsSA's 2018 Early Childhood Development report, indicates the status of some home practices in children younger than six years old(31). Caregivers commonly engaged daily in singing (74%) and conversations (50%) with their children(31). Less common daily activities included reading/storytelling (36%), encouraging children to imitate play (34%) and providing an explanation when a child points to request an explanation (25%)(31).

Home practices have largely been investigated in children older than two years old. The status of home practices specifically in the first 1000 days of life (pregnancy to two years old) require further investigation.

1.2.3 Caregiver knowledge on child development

Caregiver knowledge about child development is divided into development and stimulation knowledge. A caregiver's knowledge on development is the knowledge of when developmental skills emerge in infants and toddlers(32). Stimulation knowledge is the knowledge about when to initiate activities that promote child development, such as giving children clean and safe household items to play with or looking at children's books with children(32).

Knowledge about child development allows caregivers to promote and provide appropriate stimulation and to timeously detect deviations in development. Reduced knowledge of child development can result in delayed development because caregivers may be delaying stimulation activities for certain milestones that they are only expecting at an older age(32). Caregivers who are expecting milestones at an older age may also miss the opportunity of early detection and early childhood intervention services should a developmental delay be present(33).

Caregiver knowledge about child development is an emerging research field and there are inconsistencies with what factors may be associated with the knowledge of child development. Maternal education was associated with caregiver knowledge of child development in Turkey and Pakistan(32,34), but not in Nepal(35). Having other

children in the household was not associated with child development knowledge in Turkey and Pakistan(32,34), but having more than one child was associated with child development in Nepal(35). Employment and age have also been found to be associated with caregiver knowledge of child development(34).

Reduced parent/caregiver knowledge about child development milestones and beneficial home stimulation practices has consistently been found across settings(32,33,35,36). Studies on mothers in Turkey, Nepal and Pakistan reported that 50-62% of caregivers have reduced knowledge about child development or when to start activities that promote child development(32,34,35). Within the scope of child development knowledge, knowledge on linguistic and motor development appears to be more prevalent than knowledge on brain development and academic milestones (such as matching colours)(35,37,38). Within the scope of stimulation knowledge, knowledge on cognitive stimulation activities appears lowest with few caregivers knowing when to look at children's books together, when to give children a spoon to feed themselves and when to give children household items to play with(34,35). Knowledge on socio-emotional development also appears to be low. Knowledge on socio-emotional development was low in a study in Columbia where 60% of caregivers thought that too much attention/affection can spoil a child and 60% of caregivers agreed that carrying a baby who is crying teaches the baby to want to be carried all of the time(39).

In South Africa, caregiver knowledge about child development also appears to be low. Caregiver knowledge on child development was investigated in a study in Soshanguve, where 71 caregivers of young children were asked questions regarding the appropriate ages for several developmental milestones(33). Knowledge of gross motor development was relatively high with an average knowledge of 60%(33). Knowledge of all other domains were lower; with caregiver knowledge of cognitive and language development being the lowest, with only about a third of caregivers knowing, for example, when a baby should search for a hidden object and half of caregivers knowing when a baby should know their name(33).

In South Africa, caregiver knowledge of child development has only been investigated in one study. Expanding the knowledge in this area using a standardised tool will assist

in developing this evidence base. Additionally, NDoH programmes include a focus on caregiver knowledge about child development and stimulation. Determining the child development knowledge of caregivers of children younger than two years old will guide programme development.

1.2.4 Associations between home practices and caregiver knowledge to child development

Globally, home practices appear to be consistently associated with child development in both LMICs and HICs(29,40-42), however this has mostly been investigated in children older than two years old. Stimulating interactions (such as shared book reading and storytelling) create an optimal caregiving home environment, increase maternal knowledge on child development and promote interactions between children and caregivers promoting child development(43). However, focusing solely on parental stimulation and toys/books, without addressing caregiver responsiveness and sensitivity, appears to diminish the effects of stimulation on child development. In a Mexican study with children younger than five years old, parental stimulation and learning materials was not associated with child development(44). Instead, parents being warm and responsive to children (4-18 months) was associated with child development (at 3-5 years)(44).

A caregiver who is knowledgeable about their child's development may know ways to promote development through stimulating interactions or be able to detect a potential delay in development and respond sooner. Recently, this was found to be true in a study from Columbia where maternal knowledge about child development was associated with maternal stimulating practices which promoted cognitive, communicative and motor development in children younger than five years old(39). However, the association between caregiver knowledge and home practices was not found to be true in an Italian study where knowledge about child development and parenting was not associated with fewer dysfunctional parenting practices in mothers(36). In LMICs, many parents thought that child development only began later in children and that it was inappropriate to do stimulation/play activities with young children because they would not understand the activities, or benefit from such activities that spontaneously occur in all children(38,45,46). Potentially as a result of this knowledge in caregivers, some stimulating practices (such as reading books to

children) do not occur frequently in the first year of life in LMICs(30,38) which would affect child development. However, numerous risk factors for child development in LMICs could confound the knowledge/practices/child development relationship, including poverty and stunting(1) and lack of caregiver support(36).

In South Africa, home practices have been found to promote child development. Engaging in shared book reading with young children (14-16 months old) is associated with both language and socioemotional development(47,48). High levels of cognitive stimulation (at 6 months to 2 years) is associated with cognitive development (at 5 years old) in Sowetan children from low socio-economic backgrounds in particular(49). High levels of cognitive stimulation included taking children outside to the shops/for visits, having store-bought or homemade toys, teaching children skills and reading books/newspaper(49). The association between caregiver knowledge about child development and children's development has not yet been investigated in South Africa.

Early learning opportunities and caregiver knowledge about child development are promoted by strategies in the first two years through the health system. Evidence on the associations between home practices and caregiver knowledge to child development would add to the evidence behind programmes that target child development in this population.

1.3 Problem Statement

Whilst there is limited evidence on the status of child development, specifically in children younger than 2 years old, there is a large proportion of children under 5 years old not realising their developmental potential, globally and in South Africa. In response to this, there is an emergence of public health interventions in South Africa targeted at improving child development in the first 1000 days of life and beyond. Some of these interventions aim to increase child development knowledge in caregivers and promote stimulating home practices that promote child development in children younger than two years old. However, there is limited knowledge on the status of child development knowledge among caregivers and the prevalence of home practices in a South African context, especially in children younger than two years old.

There is also limited knowledge regarding the associations between home practices and caregiver knowledge to child development in children younger than two years old.

1.4 Justification

It is not yet known whether home practices and caregiver knowledge about child development are associated to child development in children younger than two years old. Therefore, a study investigating such associations in South Africa would add evidence behind public health initiatives emerging that hinge on the assumption that practices and caregiver knowledge promote child development in children younger than two years old. By addressing this gap in literature, public health interventions that promote child development in the first 1000 days of life through the health system can be further informed and evidence-based.

1.5 Research question, aim and objectives

1.5.1 Research Question

Is child development associated with caregiver knowledge and home practices among young children in Soweto, Johannesburg?

1.5.2 Study Aim

The study aims to investigate caregiver-reported home practices, child development-related caregiver knowledge, child development and the associations between these home practices and knowledge to child development in children aged one to 24 months old in Soweto, Johannesburg between March and November 2020. As data collection procedures coincided with the COVID-19 pandemic and resultant lockdown in South Africa, the impact of the lockdown on sociodemographic variables and caregiving practices were investigated within the objectives.

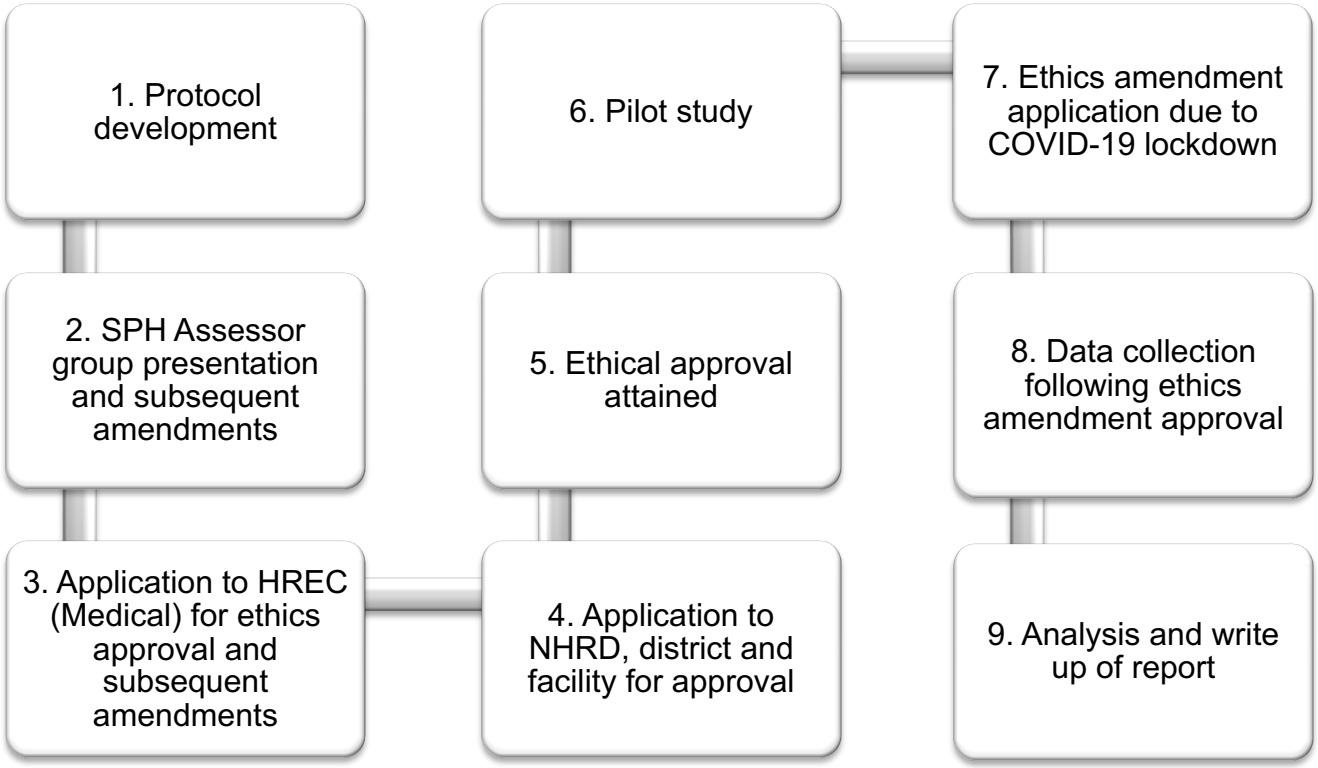
1.5.3 Study Objectives

1. To identify the presence of caregiver-reported home practices that promote child development among primary caregivers of children aged one to 24 months old in Soweto.
2. To determine knowledge about child development among primary caregivers of children aged one to 24 months old in Soweto.
3. To assess the developmental status of children aged one to 24 months old in Soweto, Johannesburg.

4. To determine the associations between caregiver-reported home practices (regarding child development) and caregivers' knowledge about child development to child development status among children aged one to 24 months old in Soweto.

Chapter 2: Methods

In this chapter, the procedures for conducting this research will be elaborated on. As such the study design, site, population and sample will be discussed as well as data collection, management and analysis. Lastly, the ethical considerations will be presented.



SPH – School of Public Health; HREC-Human Research Ethics Committee; NHRD- National Health Research Database

Figure 2.1 Outline of the research process

2.1 Study design

The study used a cross-sectional study design with descriptive and analytical components. Using this design, participants were selected based on the study's inclusion and exclusion criteria and the outcome (child development) and exposures (reported home practices, caregiver knowledge and demographic variables) were measured at the same point in time(50).

2.2 Study site and time period

The study was conducted at Chiawelo Community Health Centre (CHC) in Chiawelo, Soweto, within the City of Johannesburg municipality. Chiawelo CHC services areas including Chiawelo, Protea Glen, Protea North, Protea South, Dlamini, Klipspruit West

and Phiri(51). Within Soweto, 98.5% of the population fall into the black African race group(52). The common primary languages include IsiZulu, Sesotho, Setswana and Xitsonga(52), however, English is commonly spoken in Soweto and has been used for child development related questionnaires in Soweto(53). The majority of citizens in Soweto have either completed secondary schooling (38%) or have some secondary schooling (38%)(52). The average household size is 3.4 and 84% of its people live in formal dwellings with electricity (93%), piped water in dwelling (55%) and a flush toilet connected to sewage (92%)(52).

Chiawelo CHC provides, among other services, well-child services that include the Expanded Programme on Immunisation for South Africa (EPI-SA), growth monitoring, deworming and Vitamin A supplementation in a stand-alone building. The well-child services at Chiawelo CHC were purposefully chosen because the service accommodates a large number of children on a weekly basis.

The study was conducted between March and November 2020 at Chiawelo CHC's well-child services. The pilot study was completed during March 2020. South Africa then entered varying levels of a national lockdown due to the COVID-19 pandemic since 27 March 2020. The main study's data collection in October and November 2020 coincided with Level One regulations of the lockdown, during a time when South Africa was in-between the first and second waves of the COVID-19 pandemic.

2.3 Study population

The study population is children aged one to 24 months and their primary caregivers who attended well-child services at Chiawelo CHC in Soweto during October and November 2020. A primary caregiver is someone who cares for the child most of the time and includes parents, foster parents or someone who cares for the child with the parent's consent, for example, a grandmother. For ethical reasons surrounding consent in this study, the primary caregiver was the parents, foster parents or a relative that cares for the child with the parent's consent and therefore not a non-relative nanny.

2.4 Study sample

2.4.1 Inclusion and exclusion criteria

Primary caregivers (as defined above) of children aged one to 24 months old attending well-child visits at Chiawelo CHC and who were 18 years old or older at the time of data collection were included in the study. These primary caregivers and their children were not residing in Places of Safety. Children from multiple births (for example twins) were to be included, with each child receiving a separate questionnaire.

Children who were accompanied by a non-relative (such as a neighbour or a nanny) were excluded as well as children who had received a diagnosis of a condition affecting their development such as Cerebral Palsy, Spina Bifida, genetic syndromes (such as Down Syndrome), sensory impairment or children attending rehabilitation services (Occupational Therapy, Physiotherapy and Speech Therapy). The reason for excluding such participants was that exposure to specific rehabilitation programmes may have influenced caregiver's knowledge on child development and aspects of the questionnaire may not have been appropriate to these groups of children.

2.4.2 Sample size

The sample size was calculated using StataSE 15.1 (Stata Corporation, College Station, Texas, USA). The calculation was based on a sampling method using a score test to compare one proportion to a reference value. The significance level (alpha) was set to 0.05. The power was set to 0.80 and the null (p0) set to 0.55. The expected proportion of caregivers in the sample with incorrect knowledge of child development was estimated at 55%. This proportion was informed by a study in Soshanguve in Tshwane, where collectively, the average proportion of mothers with incorrect knowledge was 54.96%(33). When the difference was set at 10% either side of the null, the sample size was 154 and 149 participants. However, to accommodate for missing data and to increase study rigor, as many extra participants as possible were recruited within the time constraints between the first and second wave of the COVID-19 pandemic in South Africa.

2.4.3 Sampling

At conceptualisation of the study, systematic sampling was to be used. During piloting in March 2020, systematic sampling was feasible because the building, which houses well-child services, was open to caregivers and children from early in the morning so

data collection could begin before services began and caregivers split into sub-queues within the facility.

However, due to the COVID-19 pandemic and the resultant lockdown in South Africa, data collection only commenced in October 2020, during a time in which Chiawelo CHC changed queueing practices in order to limit gathering and encourage social distancing within the waiting rooms. Caregivers and children only entered the waiting room just before services began and several queues for different services emerged quickly after that (such as a queue for growth monitoring and separate queues for immunisation at different ages). This change meant that systematic sampling was no longer feasible because caregivers were shifted between queues before the questionnaire could be completed. Hence, the intended sampling strategy needed to be changed. The researcher and research assistant started sampling independently from the front of one side of the waiting room and the back of the other side of the waiting room where caregivers with their children were sitting at random, as their Road to Health Booklet (RtHB) held their place in line. If caregivers were called for services, the researcher or research assistant would follow them to the next queue to complete the questionnaire and then return to the waiting room for further recruitment. When there were no more caregivers in the waiting area, the researcher and research assistant would recruit from the different queues within the well-child services.

Caregivers with children aged one to 24 months old were enrolled into the study if they complied with the study's inclusion and exclusion criteria (Appendix B) and if they consented and signed the consent form (Appendix D) after the study was explained to them as per the information sheet (Appendix C). Caregivers did not lose their place in the waiting line because their position in the queue was held by the position of their RtHB given to the data capturers on entering the facility. This sampling was feasible within the constraints of time (brought on by the need to collect data from the facility before the second wave of COVID-19 in South Africa), manpower (the recruiters and interviewers included the researcher and one research assistant) and practicality (due to the numerous sub-queues and new queueing system brought about for social distancing purposes).

2.5 Data collection procedures

2.5.1 Data collection for pilot study

The process of data collection and the study questionnaire was piloted in March 2020 at Chiawelo CHC's well-child services with seven caregivers (who were not included in the study). The process of systematic sampling was adjusted from every third caregiver to every second caregiver in order to feasibly obtain the sample size of 154 caregivers with two interviewers. This was later changed to convenience sampling in October 2020 as a result of changes in the queueing system at Chiawelo CHC due to the COVID-19 pandemic. An interviewer-administered questionnaire was found to be more feasible compared to self-administered because it reduced the incidence of missing data on the paper-based questionnaires and uncertainties regarding the ASQ-3 questionnaire or the CKCDI questionnaire could be addressed timeously. Amendments to the questionnaire following piloting were made such as the rewording of questions (for example, the one question within the CKCDI uses the word "raisin" which was changed to "raisins/beans" as two of the seven caregivers recruited in the piloting were unsure as to what a raisin was), addition of questions (such as the inclusion of education level questions of the child's father and primary caregiver in addition to mother) and restructuring of the questionnaire for better flow to reduce questionnaire fatigue (such as moving the primary outcome measure, the ASQ-3, earlier in the questionnaire) and social desirability bias with caregiver responses to knowledge questions (the CKCDI was asked first). The COVID-related questions added to the questionnaire were not piloted prior to commencing with the main study.

2.5.2 Data collection for the main study

Data collection took place at Chiawelo CHC's well-child services during October and November 2020. All data were collected using an interviewer-administered questionnaire (Appendix E). The researcher or a trained Masters-level research assistant interviewed caregivers with the hardcopy questionnaire in English or in a language they could understand (most commonly Xitsonga or IsiZulu) respectively in the waiting area of Chiawelo CHC's well-child services. To determine which ASQ-3 questionnaire to use based on the child's corrected age, the child's birthday and the mother's gestational age were obtained from the caregiver and this data was entered into an online ASQ calculator (https://agesandstages.com/free-resources/asq-

calculator/) on the researcher or research assistant's cell phones. Two ASQ kits were created with items for the ASQ-3 questionnaires from the two-month questionnaire to the 24-month questionnaire. These items were able to be sanitised between each use and included items such as wooden blocks, a plastic bath book (as opposed to the cardboard books, which are not sanitisable), a mirror, a ball etc. If a caregiver was unsure if their child could do a certain task (such as smile in a mirror or throw a ball forwards), the kit was used. Questionnaires were quickly checked through by the researcher or research assistant prior to ending the interview with a caregiver to reduce missing data.

2.6 Measures

A questionnaire was used to obtain information on participant's backgrounds (including household, caregiver and child information), reported home practices, caregiver knowledge about child development and the child's development status. The only physical component of data collection was the use of the ASQ-3 kit to check items on the ASQ-3 if caregivers were uncertain as to whether their child could perform a particular task. Table 2.1 details the type of data collected for the variables per objectives of the study.

Table 2.1 Variable data descriptions and data analysis plan

Variable	Type of data collected
Household members dynamics	Household size; crowding (ratio of number of people: rooms used for sleeping); children in household (number of children and their ages)
Social support access	Yes/no and type
Water and sanitation access	Household water access and toilet access options
Home material	Home material options used for building
Household assets	Yes/no responses for electricity, television, fridge, care, computer/tablet, internet access.
	Household assets score out of 6 calculated for access to the above assets
Who spends the most time with child	Categorical options reduced to mother, father, grandmother and other (which included aunt, nanny and day-care centre)

Maternal age and primary caregiver age	Age in years
Absent father	Yes/no
Maternal, paternal and primary caregiver education	Categories reduced to post-school education, secondary school or some secondary school, and primary school or less
Maternal and paternal employment	Categories reduced to employed full time, employed part time or unemployed where maternity leave was absorbed into full or part time employment
Support received by participant	Access (yes/no); need for more support (yes/no); and type of support required (recategorised as partner, family, financial and emotional support)
Child gender	Male/female
Child age	Age in months
Gestational age	Gestational age in weeks
Child health	Hospitalisation at and after birth (yes/no) with grouped categories for reasons given, immunisation history (yes/no) with grouped categories for reasons, caregiver opinion on child's growth during lockdown (categories) and lastly concerns which were grouped into categories afterwards (e.g. concerns about structural abnormalities included having an extra digit and abnormal earlobe)
Food security as a result of lockdown	Categorised as less choice, less amount, no effect
Caregiving during lockdown	Categorised as easier, the same or more difficult. If a caregiver commented on why this was the case, this information was captured on the questionnaire and grouped into themes.
Time spent with child as a result of lockdown	Categorised as less, the same or more. If reasons were captured, these were grouped into themes.
Change of maternal and paternal employment status during lockdown	Categorised as no change, newly unemployed, reduced hours or now employed. An additional category of more hours was added in analysis as this was a response.
COVID grant application and access	Yes/No

Child age when caregiver first started talking to their child	Categories include pregnancy, 0-3 months, 4-7 months, 8-11 months, more than 12 months or when their child could understand them (with a subsequent question about at what age they thought this would be). For analysis these categories were reduced to pregnancy, 0-3 months, 4-7 months and older than 8 months
Prevalence of children participating in home practices in the previous three days with an adult	Home practices enquired about included storytelling, singing, taking children outside, reading/looking at books/pictures together, naming/counting/drawing with the child. Yes/no responses captured and if "yes" then which adult was captured (categories reduced later to mother, father, grandparents and other which included aunts/uncles/adult cousins/friends)
Toys at home (children's books, homemade toys, store-bought toys and playing with household items)	Categories included none, 1-3 books, 4-5 books, 6-9 books or more than 10 books. Another variable was created with two categories for no children's books at home and children's books at home during analysis Homemade/household/store bought toys were captured as yes/no/unsure
Information seeking behaviours	Sources of information categories included Google, social media, clinics, parenting books, from mother/grandmother and other with multiple options could be selected
Individual questions of CKCDI (1-20)	Responses from caregivers captured in days/weeks/months and then converted to months for analysis.
Caregiver knowledge measured with CKCDI	CKCDI subscale scores and total scores
Child development measured with ASQ-3 scores	Responses from caregivers to each question was yes/sometimes/not yet. These were scored as 10/5/0 and total ASQ-3 score and domain specific ASQ-3 scores (communication, gross motor, fine motor, problem solving and personal social) were generated.
ASQ-3 classifications	Categories include "referral" (baby's total score is below cut-off and further assessment with a professional may be needed), "at risk" (baby's score is close to cut-off) or developing well (baby's score is above the cut-off and baby's development appears to be on schedule). This was calculated using domain scores on the age-specific ASQ-3. From this, another variable

	was created for number of domains where a child was at risk or needed referral (ranging from 0-5)

2.6.1 Household, caregiver and child characteristics

Household characteristics included household size, the number and ages of children in the household, crowding ratio (people-to-sleeping room ratio), social support access (SASSA grant status), water and sanitation access, house material and household assets (including electricity, television, refrigerator, car, computer/laptop/tablet, internet connection). A household asset score out of 6 was calculated for the accumulation of the above household assets.

Caregiver characteristics included who the primary caregiver was (the person spending the most time with the child), maternal age, primary caregiver age, whether the father was absent in the child's life (participant has no information regarding the father as he is not involved in the child's life), education of mother/father/primary caregiver, employment status of mother/father (employed full time, employed part time or unemployed) and if there was support in caring for their child as well as if the participant felt like they needed more support from their partner, family, financial or other.

Child characteristics included gender, age, gestational age and child health was measured as child hospitalisation history (birth and non-birth hospitalisation), whether immunisation status was up to date (with reasons given if not up to date), caregiver's opinion on child's growth during the lockdown and if they had any concerns about their child or their child's behaviour. In South Africa, immunisation status is measured using the Expanded Programme on Immunisation for South Africa (EPI-SA) schedule and if a child has received all immunisations due to them for their specific age then their immunisation status is considered up to date.

As data collection commenced during the tail end of the first wave of the COVID-19 pandemic in South Africa, questions about caregiver's experiences of the lockdown (that could influence caregiving practices) were added to the questionnaire. Due to the novelty of COVID-19, no questionnaires or tools were found that related to this specific area. Therefore, the researcher with guidance from her supervisor drafted questions

surrounding change in caregiving, change in time spent with child, food security, COVID grant access and change in parental employment during lockdown.

2.6.2 Home practices: Caregiver–reported home practices

Home practices are activities that an adult older than 15 years old participated in with a child within the previous three days. The questions that were asked were derived from the Home Screening Questionnaire (HSQ)(54) and the Early Childhood Development module from the UNICEF Multiple Index Cluster Surveys(MICS)(55). Both tools are interview-administered.

The HSQ has been used in South Africa before(41) and the MICS has been used in numerous other LMICs but not routinely in South Africa. The MICS questions about home practices have been used in the 0-2 year population in another research study in a LMIC before(30). The activities selected which were performed with a child in the previous three days by an adult included (1) telling stories to the child, (2) singing to or with the child, (3) taking the child outside the home, (4) reading books or looking at pictures/books with the child and (5) naming/counting/drawing things with the child. These variables had two values (“Yes” or “No”) and if the activity was conducted, a follow up question was asked for each variable as to who performed this activity where multiple responses were allowed (mother, father, grandparents or other which included adult siblings, aunts/uncles, cousins and adult friends). Other variables included at what age did the participant start talking to their child, having children’s books in the home, playing with toys that were household objects and/or shop-bought toys and/or homemade toys and lastly their source of information on child development.

2.6.3 Caregiver knowledge on child development: Caregiver Knowledge of Child Development Inventory (CKCDI)

The CKCDI is a 20-question tool that assesses a caregiver’s knowledge of when basic developmental milestones emerge (the developmental skills component) and knowledge as to what the appropriate age is to engage in activities that encourage child development (the developmental stimulation component)(32). Each of these components have a score out of 20 with a total CKCDI score of 40, with higher scores indicating more knowledge(32). Answers that fall within the correct age range are

given two points, answers that fall one month below or above the correct age ranges are given one point and all other answers are considered incorrect and receive zero points(32).

A panel of Turkish and other international experts collectively designed the CKCDI drawing questions from established tools(32). The CKCDI was chosen instead of other available tools as it was developed and tested in a middle-income setting similar to South Africa(32,35). However, the researcher was unable to source published local studies that used the CKCDI in South Africa.

2.6.4 Child development: Ages and Stages Questionnaire, 3rd edition (ASQ-3)

The ASQ-3 is a 30-question screening tool (and not a diagnostic tool), which takes 10-15 minutes to complete. Caregivers are required to answer "Yes", "Sometimes" or "Not yet" to age-appropriate questions pertaining to their child's development, with point values of 10, 5 or 0 given respectively(56).

Within each of the five developmental domains (communication, gross motor, fine motor, problem solving, personal-social), there is a defined score (unique to each age-based ASQ-3) that will determine if the child's development appears on schedule (where the score is above cut-off), if the child requires monitoring and learning activities (where score is close to cut-off) or if the child needs further assessment with a professional (where the score is below cut-off)(56). An adapted version of the ASQ-3 has been tested in South Africa and Zambia and the psychometric properties of the adapted version were consistent with findings in other countries(57). In LMICs similar to South Africa, the original ASQ-3 has been validated and found to have a high sensitivity (between 83.3% to 88%) and high specificity (between 75.4% and 94%)(57,58).

The ASQ-3 uses caregiver report and is sometimes used as a combination of caregiver report and direct observations(57). In this study, the ASQ-3 was used as caregiver report and, if the caregiver was uncertain, a kit (with toys and items) was available for the caregiver to try the activity with their child and the researcher/research assistant observed to ascertain the response to the question.

2.7 Data management and analysis

The screening forms, consent forms and questionnaires were safely stored by the researcher. The researcher scored the ASQ-3 and CKCDI on the hard copy questionnaires following data collection. Data from the questionnaires were then entered by the researcher into a *Microsoft Excel* spreadsheet and then exported into StataSE 15.1 (Stata Corporation, College Station, Texas, USA) for data cleaning and analysis. Data cleaning was done by summarising each continuous variable and tabulating each categorical variable. If an outlier or additional category was detected, the original questionnaires were checked and either the data input was rectified or classified as missing. A complete case analysis was done with data that was missing which entailed removing that participant's data from the analysis at hand. New variables were created during cleaning and analysis to standardise variables in their units of measurement and to create new variables for analysis (for example, new variables with fewer categories were created as per Table 2.1).

Descriptive data were described using frequencies and proportions for categorical variables and continuous variables were summarised using means and standard deviations (if they were normally distributed) and medians and interquartile ranges (if they were not normally distributed). The distribution of continuous variables (such as CKCDI scores or ASQ-3 raw scores) was checked using the Skewness/Kurtosis test where $p>0.05$ was interpreted as normally distributed. Normally distributed continuous variables included maternal age, CKCDI total score and CKCDI development score. Continuous variables found to not be normally distributed included gestational age, child's age, primary caregiver age, the raw scores for all of separate ASQ-3 domains as well as the total raw score for the ASQ-3, the responses for the CKCDI questions and the CKCDI stimulation score.

Bivariate analyses were conducted to determine the unadjusted associations between the exposure variables (caregiver knowledge on child development, home practices and the household, caregiver and child variables) and the outcome (child development). The strength of association between child development (outcome) and each exposure variable was assessed using simple linear regression with a 5% significance value and results were presented with 95% confidence intervals (CI).

Multiple linear regression analysis was used to determine associations between ASQ-3 total score (a continuous variable) and exposure variables significant at $p<0.15$ in bivariate analyses. Possible covariates also included variables with theoretical relevance and were adjusted for in the analyses. A series of multiple linear regression models were estimated.

Model 1 included key exposure variables for this study (caregiver knowledge and home practices). In subsequent models, child factors (Model 2) and caregiver variables (Model 3) were added. Model significance and fit were assessed using the overall significance of the model, the R^2 and adjusted R^2 values and regression specification-error tests. Collinearity in the models was determined by assessing the Variance Inflation Factors (VIF); elevated VIF>10 indicated collinearity(59). Statistical significance was set at $p<0.05$ and results are presented with 95% Confidence Intervals (CI).

2.8 Ethical considerations

Ethical approval (M190854) was obtained from the University of the Witwatersrand Human Research Ethics Committee (HREC) (Medical) in August 2019 (Appendix F). Permission to conduct the study at Chiawelo CHC's well-child services was obtained from National Health Research Database (NHRD) (GP_201911_030), from Johannesburg Health District (2019-11-003) (Appendix G) as well as from Chiawelo CHC. Permission to re-enter facilities during lockdown for data collection was obtained from the facility and from the HREC (Medical) in October 2020 (Appendix H).

Study information sheets (Appendix C) were handed to caregivers and the study was explained to them. If caregivers complied with the study's inclusion and exclusion criteria and agreed to partake in the study, signed consent forms (Appendix D) were obtained from each participant. The explanation of the study and consent form was done in English by the researcher or was verbally translated into a language that participants understood by a trained research assistant (mainly Xitsonga or IsiZulu). These forms with the accompanying explanation outlined that there were no risks, direct benefits or costs to caregivers or their children for participating in the study, that the caregivers could answer any or all of the questions, that they could withdraw their consent at any time, how their privacy and confidentiality would be maintained and

who would have access to the information that they provided. Participant information is kept confidential and data is reported on as aggregated data and not individual data. Questionnaires and consent forms are stored in a locked cupboard.

Nurses at the well-child services and therapists (physiotherapists, occupational therapists and speech therapists) at Chiawelo CHC were consulted prior to data collection and participants expressing concerns regarding their child's development during the interview were referred to the facility's nurses to facilitate referral to occupational therapy, speech therapy or physiotherapy services at Chiawelo CHC for further assessment.

Chapter 3: Results

In this chapter, the sample's household, caregiver and child characteristics will be described. Following this, the results of primary exposure variables of home practices and caregivers' knowledge of child development will be presented. Results of the primary outcome of the study, developmental status of children, will follow and lastly the associations between child development and exposure variables.

3.1 Description of the study sample

3.1.1 Household characteristics

All participants had access to electricity and running water with a tap either inside/outside the house. The majority of participant's homes were made from brick/cement (86%). Household sizes ranged from 2 to 12 people with a crowding ratio of 2 (2-4) people per a room used for sleeping. Nearly all households owned a television and refrigerator. Nearly half of the households possessed a computer/laptop/tablet and a third had internet access or a car.

Table 3.1 Household characteristics of study sample (N=160)

Household characteristics	**Number (%)**	**Mean ± SD/ Median (IQR)**
Household size		4 (4-6)
Crowding ratio (People-to-sleeping room ratio)		2 (2-4)
Only-child households	55 (34)	
Other children in household		
<5 years	34 (21)	
5-10 years	60 (38)	
10-18 years	50(32)	
Household grant access		
None	53 (33)	
Child support	97 (60)	
Older person's	8 (5)	
Other (Disability, care dependency)	2 (1)	
Water and sanitation access		
Tap inside house	78 (49)	

Tap in yard	82 (51)	
Flushing toilet inside	64 (40)	
Flushing toilet outside	90 (56)	
Outside pit latrine	6 (4)	
House main material		
Bricks/cement	138 (86)	
Metal	22 (14)	
Household assets		
Electricity	160 (100)	
Television	159 (99)	
Refrigerator	158 (99)	
Car	56 (35)	
Computer/laptop/tablet	75 (47)	
Internet connection	58 (36)	
Household assets score (out of 6)		4 (3-5)

3.1.2 Caregiver characteristics

A total of 160 primary caregivers were interviewed, of which 151 were mothers. Children spent the most time with their mothers (86%), followed by their grandmothers (9%). The mean age of mothers in this sample was 29±6 years. One in five mothers did not finish high school and 70% were unemployed. One in ten fathers did not complete high school and 18% of fathers who were present in their children's lives, were unemployed. In addition, 11% of children had absent fathers, i.e. who were not involved in their lives. Sixty-six caregivers (41%) felt like they needed more support and the majority of these caregivers needed more financial support (71%) followed by family/partner support (30%).

Table 3.2 Caregiver characteristics of the sample (N=160)

Caregiver characteristics	**Number (%)**	**Mean±SD/ Median (IQR)**
Caregivers interviewed		
Mothers	151 (94)	
Fathers	4 (3)	
Grandmothers	4 (3)	

Aunt	1 (1)	
Person who child spends the most time with		
Mother	138 (86)	
Father	3 (2)	
Grandmother	15 (9)	
Other*	4 (3)	
Maternal age (years) (n=159)		29 ± 6
Age of person who child spends the most time with (years)		30 (24-35)
Absent fathers**	17 (11)	
Maternal education level (n=159)		
Post-school education	57 (36)	
Completed secondary school	68 (42)	
Some secondary school	31 (20)	
Primary school or less	4 (3)	
Paternal education level (n=144)		
Post-school education	62 (43)	
Completed secondary school	67 (47)	
Some secondary school	12 (8)	
Primary school or less	3 (2)	
Education level of person that the child spends the most time with		
Post-school education	54 (34)	
Completed secondary school	65 (41)	
Some secondary school	36 (23)	
Primary school or less	5 (3)	
Maternal employment (n=159)***		
Employed full-time	56 (23)	
Employed part-time	12 (8)	
Unemployed	111 (70)	
Paternal employment (n=143)		
Employed full-time	105 (73)	
Employed part-time	13 (9)	
Unemployed	25 (18)	
Caregiver support		
Caregivers requiring more support	66 (41)	

Types of support caregivers require:		
Partner	8 (12)	
Family	21(18)	
Financial	47 (71)	
Emotional	2 (3)	
Childcare****	2 (3)	

*Other primary caregiver includes nanny, aunt or day care centre; **Absent fathers are fathers who do not live in the same household nor are involved in their child's life; ***Maternity leave was included into categories of full time or part time employment, ****Caregivers expressing they need help from a nanny/babysitter

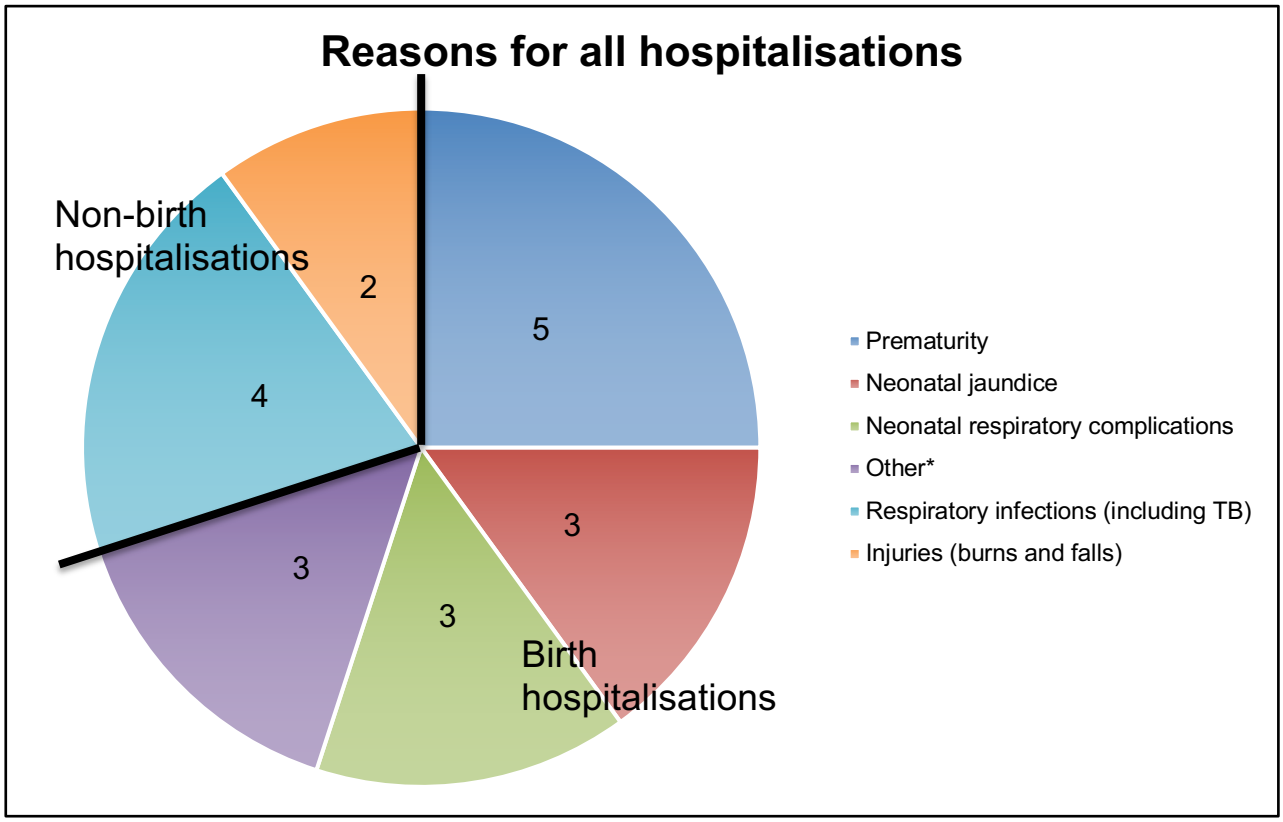
3.1.3 Child characteristics

Fifty-two percent of the children were male (83 of 160). The age of the children ranged from 1.3 - 24 months; with a median age of 6 (3-12) months. The median gestational age in this sample was 39 (38-39) weeks (Table 3.3). Nine percent of children required hospitalisation at birth and nearly 1 in 20 children (4%) required a hospital admission subsequent to their birth. Underlying reasons for hospital admissions (Figure 3.1) at birth, included prematurity, neonatal jaundice, neonatal respiratory complications, low birth weight and neonatal seizures. Reasons for non-birth hospitalisations included injuries (including burns and falls) and respiratory complications (including respiratory tract infections and tuberculosis). Nearly all caregivers (98%) reported that their child received all age-appropriate immunisations as per the EPI-SA schedule. Of the four children who were not fully immunised, the reasons given were due to illness, COVID-19 lockdown restrictions, that the clinic was closed and that the vaccine was out of stock.

Table 3.3 Child characteristics of the sample (N=160)

Child characteristics	**Number (%)**	**Mean±SD/ Median (IQR)**
Child sex		
Male	83 (52)	
Child age (months)		6 (2-12)
Gestational age (weeks)		39 (38-39)
Hospitalisations		
Birth	14 (9)	
Non-birth	6 (4)	

Reasons for birth hospitalisations		
Prematurity	5 (33)	
Neonatal jaundice	3 (20)	
Neonatal respiratory infections	3 (20)	
Neonatal seizures	1 (7)	
Low birth weight	1 (7)	
Monitor brain cysts and “hole in heart”	1 (7)	
Reasons for non-birth hospitalisations		
Respiratory tract infections	3 (50)	
Tuberculosis	1 (17)	
Burns	1 (17)	
Falls	1 (17)	



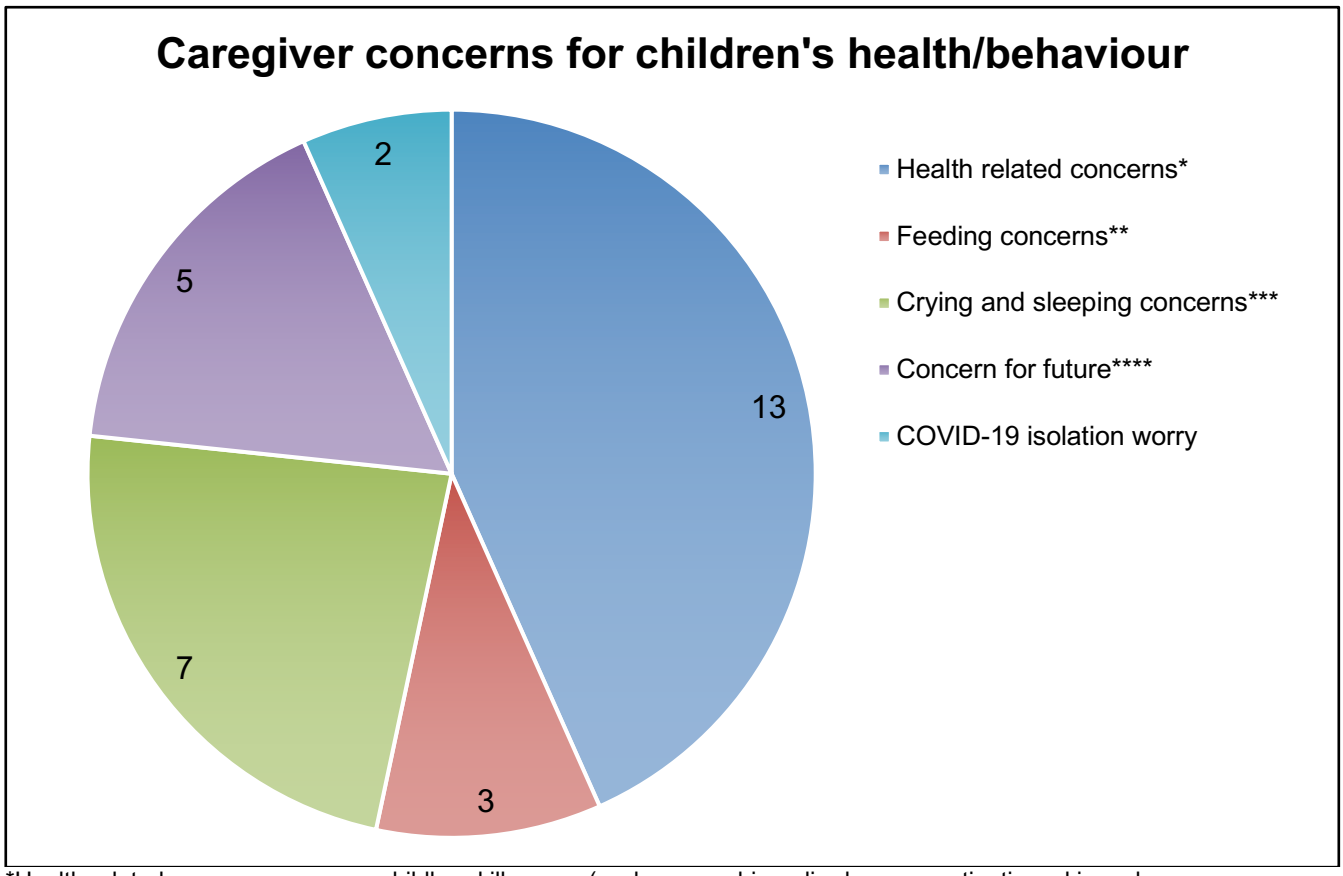
*Other includes neonatal seizures, low birth weight and monitoring for brain/heart complications as reasons for birth hospitalisations

Figure 3.1 Reasons for children’s hospital admissions in the study (n=20)

Thirty caregivers (19%) reported having a concern regarding their child or their child’s health/behaviour (Table 3.4). The majority of caregiver’s concerns were health related (43%) followed by concerns about crying and sleeping (23%) (Figure 3.2).

Table 3.4 Caregiver concerns about their child's health or behaviour

Caregiver concerns	**Number (%)**
Caregivers reporting concern (n=160)	30 (19)
Reasons for concern (n=30)	
Common childhood illnesses	
Coughing	2 (7)
Diarrhoea	1 (3)
Constipation	1 (3)
Skin rashes	2 (7)
Nosebleeds	1 (3)
Concerns about child's body	
Irregular earlobe	1 (3)
Extra toe	1 (3)
One eye used to face inwards	1 (3)
Feeding and weight concerns:	
Breastfeeding difficulties	2 (7)
Difficulty introducing solid foods at 6 months	1 (3)
Worried baby is not picking up enough weight	2 (7)
Sleep concerns:	
Unable to get baby to sleep	2 (7)
Baby sleeping too much	1 (3)
Baby snoring when sleeping	1 (3)
Crying:	
Inconsolable crying	3 (10)
Worry about well-being:	
Worried about their development as foetal scans said child was high risk for Down Syndrome	1 (3)
Financial worry for child's future	2 (7)
Worried about child's development due to their prematurity	1 (3)
Worried about their performance in school one day	1 (3)
Other:	
Having to isolate away from child due to COVID-19	2 (7)
Child HIV status still unknown	1 (3)



*Health related concerns: common childhood illnesses (such as coughing, diarrhoea, constipation, skin rashes and nosebleeds), structural abnormalities (such as extra digits and irregular earlobes), concern for child's weight, child's HIV status; **Feeding concerns: breastfeeding and complementary feeding concerns; ***Crying and sleeping concerns: inconsolable crying and sleep (too much and not enough sleep); ****Concern for future: worry about their development, school performance and financial concern for their future

Figure 3.2 Caregiver concerns for children's health/behaviour (n=30)

3.1.4 The effect of COVID-19 pandemic

The COVID-19 pandemic and the resultant lockdown had affected household food availability, caregivers' ability to provide care to children, time spent with children and parental employment. Fourteen percent of caregivers reported having less food available as a result of the lockdown; with 9% reporting reduced choice of foods in the household (Table 3.5). Despite this, almost all caregivers reported that their children were growing well during the lockdown.

One in four caregivers reported that caring for their children during the lockdown period was more difficult. Reasons for this included financial difficulty or job loss, difficulty buying baby clothes and that they could not visit family. Of the 18% of caregivers who reported that caring for their children was easier during lockdown, this was mainly

attributed to having more time to spend with their children because of being home more.

As a result of the COVID-19 lockdown, most caregivers indicated that they were spending either more or the same amount of time with their children. Of those spending less time with their children, reasons included new employment or seeking employment as a result of spousal job loss. One in five mothers and 14% of fathers lost employment or had to reduce their working hours as a result of the COVID-19 pandemic and resultant lockdown and more than a fifth of households were accessing the COVID relief grant.

Table 3.5 COVID-19 impact on caregiving (N=160)

Characteristic	**n (%)**
Caregiving during the lockdown (n=138)*	
Same	79 (57)
Easier to care for children	25 (18)
More difficult to care for children	34 (25)
Time spent with child as a result of lockdown	
More time	81 (51)
Same amount of time	75 (47)
Less time	4 (3)
Household food access due to lockdown	
No effect on food supply	128 (80)
Reduced choice of food	15 (9)
Reduced amount of food	23 (14)
Caregiver opinion on child growth during lockdown (n=131)*	
Child growing well	129 (98)
Child not growing well	2 (2)
Maternal change in employment during lockdown (n=159)	
No change	124 (80)
Now unemployed	22 (14)
Reduced hours	7 (4)
Now employed	6 (4)

Paternal change in employment during lockdown (n=143)	
No change	110 (77)
Now unemployed	9 (6)
Reduced hours	11 (8)
Now employed	11 (8)
Increased hours	2 (1)
COVID grant access	
No application made	119 (74)
Applied and received	35 (22)
Applied but did not receive	6 (4)

*Reduced sample sizes were the result of caregivers whose children were born in the lockdown preferring not to answer as they could not compare their experiences to pre-lockdown

3.2 Home practices related to child development

3.2.1 Caregiver-child home practices

The majority of caregivers (61%) reported that they started talking to their children during pregnancy. Nearly a third of caregivers (31%) starting talking to their child at birth or within three months after birth. Nine percent of caregivers started talking to their children after three months; with one caregiver stating that they will start talking to their child when they are three years old.

Caregivers were questioned on activities that were performed with the child in the previous three days by an adult such as storytelling, singing, taking children outside of the home, looking at/reading book/pictures together and naming/counting/drawing with their child. Singing with children was the most common activity conducted (83%), followed by taking children outside of the home (79%) (Table 3.6). Reading books/looking at pictures, storytelling and naming/counting/drawing with children were less common. Mothers were most commonly conducting these activities, followed by fathers and grandparents.

Table 3.6 Caregiver-child home practices conducted in the previous three days (N=160)

Activity conducted	**n (%)**	**Adults who conduct activity: n (%)**			
		Mother	**Father**	**Grand-parents**	**Other***

Story telling	48 (30)	45 (28)	17 (11)	6 (4)	3 (2)
Singing	132 (83)	129 (81)	36 (23)	34 (21)	14(9)
Taking children outside	126 (79)	120 (75)	37 (23)	18 (11)	16 (10)
Looking at or reading books or pictures together	61 (38)	61 (38)	20 (13)	6 (4)	5 (3)
Naming, counting or drawing with child	39 (24)	37 (23)	11(7)	3 (2)	5 (3)

*Other refers to adults who are aunts, uncles, cousins and friends

A fifth of children experienced none or only one of these activities. Only 25% of children experienced ≥4 of these activities in the previous three days (Figure 3.3).

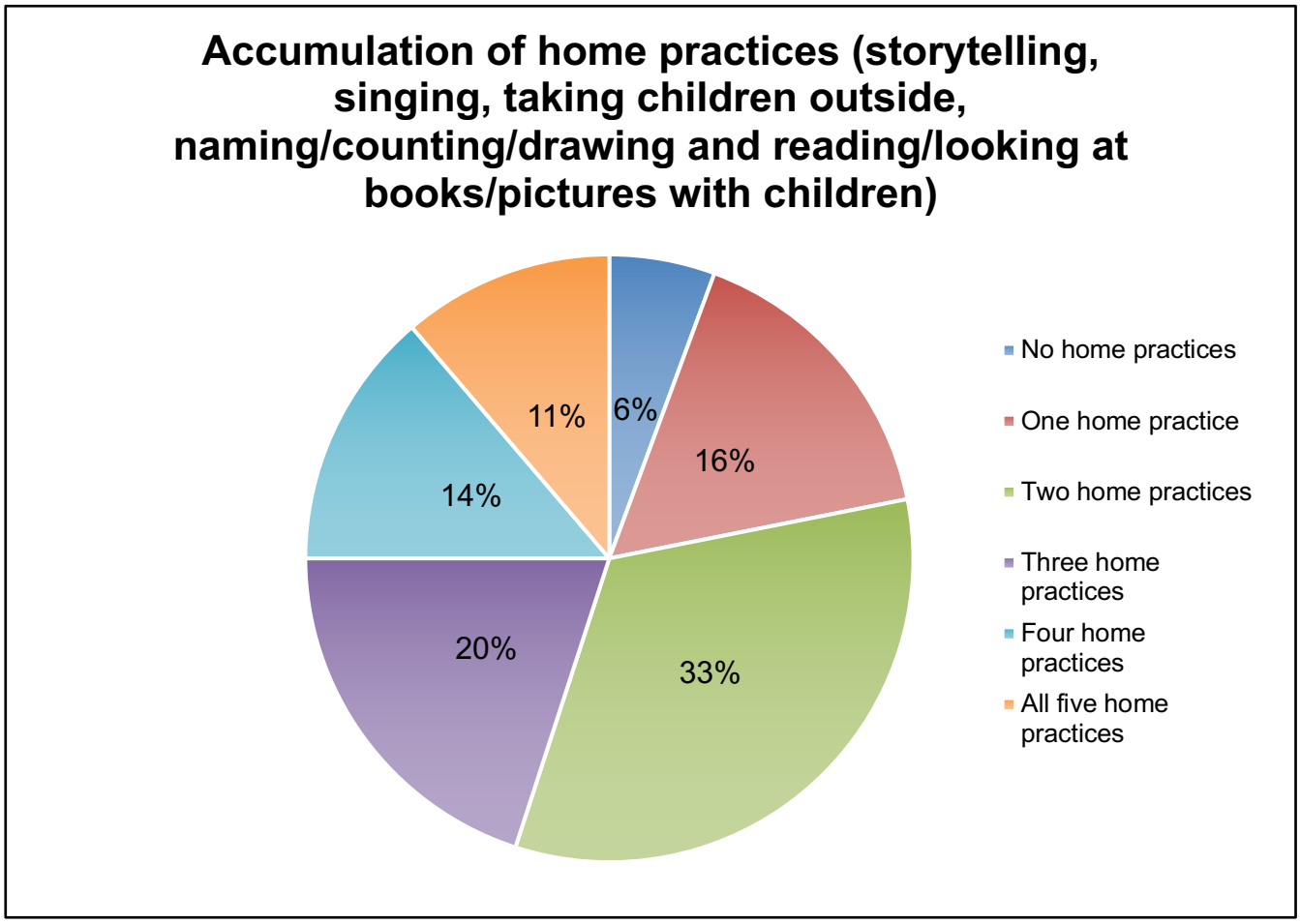


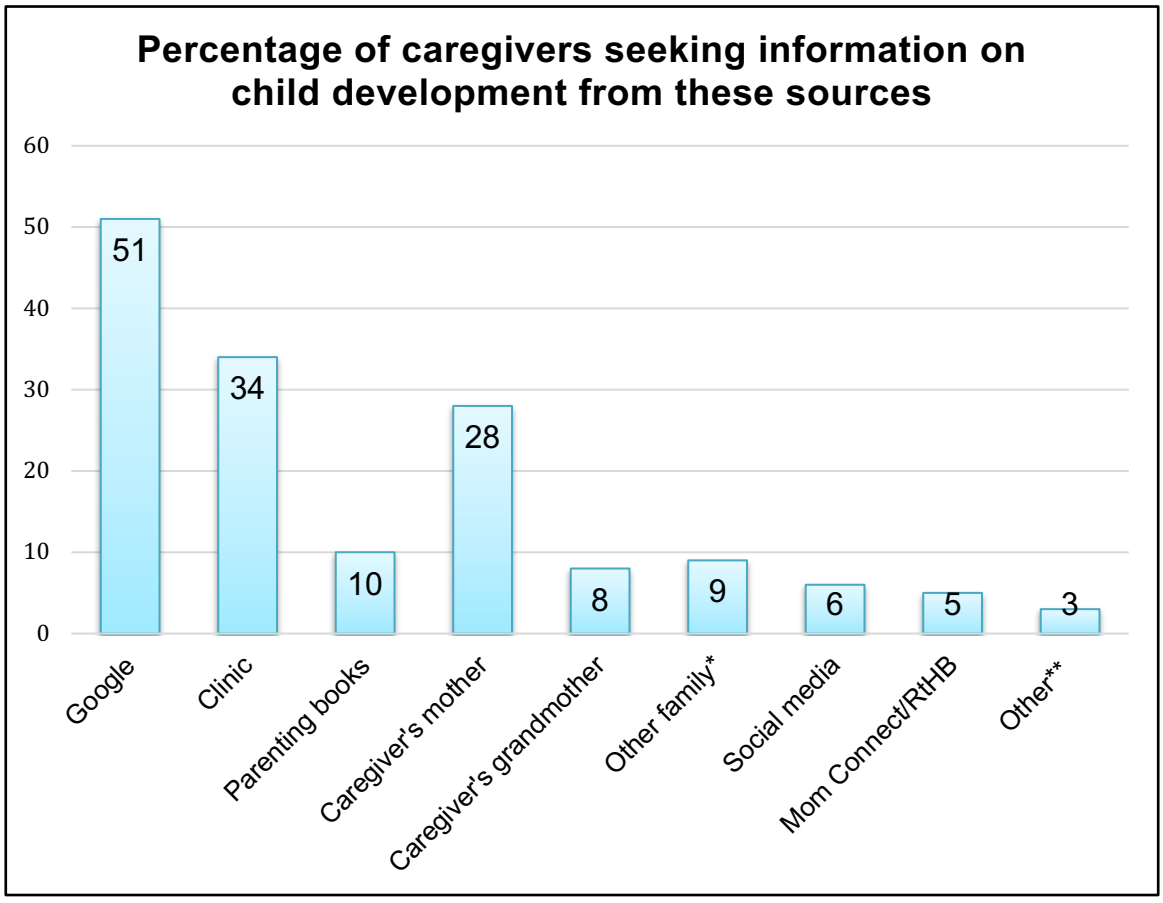
Figure 3.3 Pie chart of the accumulation of home practices related to child development conducted by an adult in the previous three days

3.2.2 Toys at home

Playing with store bought toys was most common (84%). Caregivers also reported that their children play with household items (45%). Playing with homemade toys was the least common (33%). More than half (53%) of the caregivers did not have a children's book at home, a third of caregivers (35%) had 1-3 children's books and only one in ten (12%) had >3 children's books at home.

3.2.3 Information-seeking on child development

Majority of caregivers (64%) only consulted one source of information if they had a question about their child's development. *"Searching Google"* was the most common response as to where caregivers would go for information on child development (51%), followed by asking at the clinic (34%) or asking their mothers (28%) (Figure 3.4).



* Other family includes father, sister, spouse, cousin, friend; ** Other including email subscriptions, radio, television, studies

Figure 3.4 Bar graph of sources of child development information used by caregivers

3.3 Caregiver knowledge on child development

Caregiver knowledge was assessed using the Caregiver Knowledge of Child Development Inventory (CKCDI). The CKCDI total mean score was 21.6±5.4 and ranged from 7-35. Caregivers had better knowledge of when to stimulate child development compared to the age at when developmental milestones emerged. The stimulation sub score (out of 20) had a median value of 12 (IRQ=8.5-14, range 0-18) compared to the development sub score (out of 20) with a mean score of 10±3.2 (range 2-17).

Overall, caregivers thought milestones occurred later than they do, with the exception of when children start saying meaningful words where caregivers reported this milestone earlier than the range provided in the CKCDI (median answer of 8 months where the range is 9-14 months). Milestones which caregivers thought occurred later included when a child's brain begins to develop and learn (median reported age=2 months, correct range is pregnancy/birth); when children start to see (median reported age=1 month, correct range is pregnancy/birth); when do children start to vocalise (median reported age=3 months, correct range=0-2 months); and when children begin to reach in front of them (median reported age=6 months, correct range=4-5 months).

In terms of the stimulation subscale of the CKCDI, caregivers reported that they would start activities later than the correct range for several questions. These included when should mothers start looking at children's books with their children (median reported age=12 months, correct range is 4-6 months); when should mothers start to give their children clean and safe household items to play with (median reported age=9 months, correct age is 4-6 months); and when to start showing colourful objects for children to practice reaching (median reported age=6 months, correct range is 0-4 months). The majority of caregivers gave correct answers for questions about when to give children paper and crayons to draw and colour (74%), teach children colours (71%), teach children to count (71%) and when children start following a moving person with their eyes (69%). Only twenty two caregivers (14%) knew when to start looking at children's books with their children and thirteen caregivers (8%) knew that children start seeing from in-utero/birth (Table 3.7).

Table 3.7 Caregiver Knowledge of Child Development Inventory (CKCDI) results (N=160)

Questions		**Correct CKCDI answer (month)**	**Range of answers reported by caregivers**	**Caregivers with correct answer n (%)**	**Median (IQR) age reported (months)**
1	When does a child's brain begin to develop and learn?	*In-utero or birth*	Pregnancy-48 months	41 (26)	2 (0-6)
2	When do children begin to see?	*In-utero or birth*	Birth-15 months	13 (8)	1 (0-2)
3	When do children begin to follow a moving person or toy with their eyes?	*Birth to 2 months*	Birth-12 months	110 (69)	1.4 (1-3)
4	When do children begin to vocalise in response to someone talking to them?	*Birth to 2 months*	1 week-24 months	66 (41)	3 (2-6)
5	When do children begin to smile socially, that is smile into the face of another person?	*Birth to 2 months*	Birth -11 months	106 (66)	2 (1-3)
6	When do children begin to say single meaningful words?	*9-14*	2 weeks-24 months	72 (45)	8 (6-11)
7	When do children begin to play imaginary play like feeding a doll or driving a toy care?	*12-24*	4-48 months	79 (49)	12 (8-12)
8	When do children begin to reach for a toy in front of them?	*4-5*	2 weeks-12 months	28 (18)	6 (3-7)
9	When do children begin to grasp tiny things like raisins with their fingertips? (n=159)	*7-9*	2-24 months	52 (33)	9 (6-11)

10	When do children begin to walk alone and with good co-ordination?	*10-15*	6 months-24 months	99 (62)	11 (9-12)
11	When should mothers begin to talk to their children?	*In utero to birth*	Pregnancy-96 months	102 (64)	0 (0-2)
12	When should mothers begin to show colourful objects to children to help them practice reaching?	*0-4*	1 week-36 months	63 (39)	6 (3-12)
13	When should mothers begin to teach children to count?	*12-24*	1 month-60 months	113 (71)	12 (12-18)
14	When should mothers begin to teach children colours?	*12-24*	2 months-60 months	113 (71)	12 (12-24)
15	When should mothers start to give children a spoon or fork to let them eat by themselves?	*9-12*	2 months-60 months	82 (51)	12 (9-18)
16	When should mothers begin to give children paper and crayons to draw and colour?	*12-24*	2 months-72 months	118 (74)	12 (12-24)
17	When should mothers begin to let children sit with support?	*3-4*	Birth-36 months	80 (50)	4 (4-6)
18	When should mothers begin to give children clean and safe objects or toys, which they can mouth?	*4-6*	Birth-36 months	87 (54)	6 (4-7)
19	When should mothers begin to look at children's' books with their children?	*4-6*	Birth-108 months	22 (14)	12 (9-24)
20	When should mothers begin to give children clean and safe household items to play with?	*4-6*	Birth-96 months	51 (32)	9 (6-12)

3.4 Child development: Ages and Stages Questionnaire, 3rd edition (ASQ-3)

For the child development assessments, 80% of children were aged 12 months or younger; with most of these children being six months or younger (52%) (Table 3.8).

Children scored a median total score (out of 300) of 235 (210-255) in the ASQ-3 (Table 3.9).

Table 3.8 Age specific Ages and Stages Questionnaire, 3rd edition (ASQ-3) (N=160)

ASQ-3 questionnaire type	**n (%)**
2 months	48 (30)
4 months	17 (11)
6 months	18 (11)
8 months	4 (3)
9 months	14 (9)
10 months	10 (6)
12 months	16 (10)
14 months	1 (1)
16 months	6 (4)
18 months	16 (10)
20 months	2 (1)
24 months	8 (5)

Table 3.9 Ages and Stages Questionnaire, 3rd edition (ASQ-3): Total and domain scores (N=160)

Total ASQ-3 score out of 300 (n=159)		**Domains of child development screened with ASQ-3 (each domain score out of 60)**				
		Communication	Gross motor	Fine motor	Problem solving (n=159)	Personal social
Mean ±SD	232±39	45 ± 13	51 ± 11	43 ±12	45 ± 13	48 ± 12
Median (IQR)*	235 (210-255)	50 (35-55)	53(45-60)	45 (40-50)	50 (40-55)	50 (40-55)
Range	60-295	10-60	0-60	10-60	0-60	10-60

*Total score and all domain scores are not normally distributed

Children performed best in the gross motor domain (median score of 53, IQR=45-60, with 81% of children passing the ASQ-3 screening) and performed poorest in the fine motor domain (median score of 45, IQR=40-50, with 38% of children's development not being on schedule). The performance in the remaining three domains were similar where all median scores were 50 and 78-81% of children's development appeared on schedule with the ASQ-3 within these domains (communication domain: IQR=35-55, 19% of children 's development not on schedule; personal-social domain: IQR=40-55 and 78% of children's development on schedule; and problem solving domain: IQR=40-55 with 80% of children's development on schedule) (Table 3.10).

Table 3.10 Ages and Stages Questionnaire, 3rd edition (ASQ-3): Classification outcomes (N=160)

Domains of the ASQ-3	**n (%)**		
	Children requiring referral for further assessment with a professional*	**Children who require learning activities and for their development to be monitored****	**Children whose development appeared to be on schedule*****
Communication	11 (7)	19 (12)	130 (81)
Gross motor	15 (9)	16(10)	129 (81)
Fine motor	21 (13)	40 (25)	99 (62)
Problem solving (n=159)	11 (7)	24 (15)	124 (80)
Personal social	11 (7)	25 (16)	124 (78)

*The total ASQ-3 score is below cut-off
**The total ASQ-3score is close to cut-off
***The total ASQ-3 score is above cut-off

Only fifty-five children's (35%) development appeared to be on schedule in all five domains of child development (Table 3.11). Majority of children's (52%) development was not on schedule in one or two domains of development. One in twenty children's (5%) development was not on schedule in four or all five domains of development and none of these children were attending therapy services (as this was an exclusion for participation in the study).

Table 3.11 Proportion of children whose development did not appear to be on schedule (n=159)

Number of domains where the child's development was not on schedule according to the Ages and Stages Questionnaire, 3rd edition	**n (%)**
Children classified as needing their development to be monitored or classified as in need of referral for further assessment in:	
No domains (i.e. child's development appeared on schedule in all five domains)	55 (35)
1 domain	51 (32)
2 domains	31 (20)
3 domains	14 (9)
4 domains	5 (3)
5 domains	3 (2)

3.5 Associations between caregiver home practices, knowledge and child development

3.5.1 Bivariate analysis

Child development was significantly associated with several adult-child home practices at the bivariate level (Table 3.12). Activities already in pregnancy were associated with child development with children whose caregivers started speaking to them after eight months of age scoring 78 points less on the ASQ-3 compared to children whose caregivers started talking to them during pregnancy (B=-78.0, p<0.01, 95%CI: -131.9, -24.1). Compared to children whose caregivers conducted home practices within the previous three days, children whose caregivers did not consistently performed worse in the ASQ-3. Such activities included story telling (B=-18.9, p<0.01, 95%CI:-31.9,-5.9), singing (B=-17.5, p<0.05, 95%CI:-33.4,-1.7) and naming/counting/drawing with child (B= -12.3, p<0.1, 95%CI:-26.4, 1.8). In addition to these individual home practices, the total number of home practices performed was also important for a child's development. For every one activity (singing, storytelling, reading/looking at books together, taking children outside and naming/drawing/counting with their child) more that a caregiver took part in with their

child, their child scored seven points higher in the ASQ-3 (B=6.6, p<0.01, 95%CI:2.3,11.0).

Child development was also associated with what was available in the household for children under two years old to play with. Playing with store-bought toys was not associated with child development in this study, but being allowed to play with household items, children's books and homemade toys was associated with child development. Compared to children allowed to play with household items, children who were not playing with household items scored 15 points less on the ASQ-3 (B=-15.3, p<0.05, 95%CI: -27.4,-3.2). Similarly, children not playing with homemade toys scored 12 points less on the ASQ-3 compared to children who played with homemade toys (B=-12.8, p<0.10, 95%CI:-25.6,0.1). Children not having a children's book in the household scored 11 points lower on the ASQ-3 compared to children with children's books at home (B=-11.4, p<0.10, 95%CI:-23.6,0.7).

Caregiver knowledge about child development, developmental milestones and stimulation activities were not found to be significantly associated to child development at a bivariate level.

Other exposure variables included household, caregiver and child characteristics of which only some caregiver and child characteristics were associated with child development. Having access to social protection (a SASSA grant), household assets, or other household characteristics (such as crowding or having other children in the household) were not indicative of a child's performance in the ASQ-3. Caregiver characteristics associated with child development included caregivers having support to care for children, caregiver age and paternal education. Children whose caregivers did not feel supported in looking after children scored 16 points in the ASQ-3 compared to caregivers who felt supported in caring for their children (B=-16.1, p<0.10, 95%CI:-32.5,0.2). For every year older a primary caregiver of a child was, their child scored 1 point lower in the ASQ-3 (B=0.7, p<0.05, 95%CI:-1.3, -0.1). Compared to fathers with primary school education or less, children whose fathers had completed or had some secondary school scored 55 points higher in the ASQ-3 (B=55.1, p<0.05, 95%CI:10.2, 100.1). The presence of a father figure, parental employment or who was the primary caregiver of a child was not associated with child development in this study. The only

child characteristic associated with child development was non-birth hospitalisations where children who were not hospitalised scored 43 points higher in the ASQ-3 (B=42.7, p<0.01, 95% CI: 11.3, 74.1) compared to children who were hospitalised. The age or gender of children, their gestational age or immunisation status was not associated with their development.

3.5.2 Multiple linear regression analysis

In the adjusted analysis, talking to children in pregnancy remained associated with child development in children younger than two years old. Children whose caregivers started talking to them after they were eight months old scored 68 points less in the ASQ-3 compared to children whose caregivers started talking to them during pregnancy (B=-67.6, p<0.05, 95%CI:-120.0, -15.2). The other home practices previously significant at a bivariate level, lost their significance in the multiple linear regression analysis and caregiver knowledge remained insignificant (at p>0.05) in the adjusted models (Table 3.12).

Of the caregiver and child characteristics included in the adjusted analysis, non-birth hospitalisations, caregiver age and paternal education remained significant and paternal employment became significant (at the 10% level). The association between non-birth hospitalisations and child development was only slightly reduced with children who were not hospitalised subsequent to their birth scoring 41 points more compared to children hospitalised subsequent to their birth (B=40.9, p<0.01, 95%CI: 11.4, 70.4). The association of child development to the age of a primary caregiver slightly strengthened in the adjusted linear regression models (B=-0.8, p<0.01, 95%CI:-1.4, -0.2). The association of paternal education to child development was weakened in the adjusted models as children whose fathers had completed or had some secondary school compared to children whose fathers had primary school education or less scored 49 points higher on the ASQ-3 (B=48.8, p<0.05, 95%CI:7.2, 90.5). Paternal employment was tending towards significance in the adjusted models because its significance increased from p<0.15 to p<0.1. In the adjusted model, compared to children whose fathers were employed full time, children whose fathers were employed part time scored 19 points more in the ASQ-3 (B=18.9, p<0.1,95%CI:-1.9, 39.7) (Table 4.12).

Table 3.12 Unadjusted and adjusted associations with child development (Ages and Stages Questionnaire, 3rd edition total score) in children 1-24 months old

Variable	**Unadjusted B (95% CI)** n=159	**Adjusted B (95% CI)** n=142
Total CKCDI score	-0.4 (-1.6,0.7)	-1.0 (-2.1, 0.1)*
Development CKCDI sub-score	-0.6(-2.5,1.3)	
Stimulation CKCDI sub-score	-0.4 (-2.1,1.3)	
When caregiver first started talking to child		
Pregnancy	ref	ref
0-3 months	-2.8 (-16.1, 10.4)	-7.1 (-20.3, 6.1)
4-7 months	10.3 (-12.8, 33.4)	-2.1 (-24.9, 20.6)
>8 months	-78.0 (-131.9, -24.1)***	-67.6 (-120.0, -15.2)**
Story-telling		
Yes	ref	ref
No	-18.9 (-31.9,-5.9)***	-6.8 (-20.9, 7.3)
Singing		
Yes	ref	ref
No	-17.5 (-33.4,-1.7)**	-13.3 (-29.9, 3.3)
Taking children outside		
Yes	ref	
No	-10.0 (-24.8,4.9)	
Reading books or looking at picture books or pictures together		
Yes	ref	
No	-8.0 (-20.5,4.5)	
Naming, counting or drawing things with child		-
Yes	ref	
No	-12.3 (-26.4,1.8)*	
Number of practices conducted (out of 5)	6.6 (2.3,11.0)***	-
Having children's books in the household		

Yes *No*	ref -11.4 (-23.6,0.7)*	ref -4.7 (-18.3, 9.0)
Having store-bought toys in household *Yes* *No*	 ref -4.9 (-21.7,11.9)	
Children playing with household items *Yes* *No*	 ref -15.3 (-27.4,-3.2)**	 ref -9.1 (-22.5, 4.4)
Children playing with homemade toys *Yes* *No*	 ref -12.8 (-25.6,0.1)*	 ref -8.3 (-22.4, 5.7)
Child gender *Male* *Female*	 ref 5.4 (-6.9, 17.6)	
Child age	-0.5 (-1.5, 0.4)	
Gestational age	-0.1 (-3.2, 3.0)	
Birth hospitalisation *Yes* *No*	 ref -1.8 (-23.4,19.8)	
Non-birth hospitalisation *Yes* *No*	 ref 42.7 (11.3,74.1)***	 ref 40.9 (11.4, 70.4)***
Immunisations *Up to date* *Not up to date*	 ref -12.3 (-51.3,26.8)	
Caregiver opinion on child's growth during lockdown (n=130) *Growing well* *Not growing well*	 ref -41.0 (-96.9,14.9)	
Caregiver concerns for child *Yes* *No*	 ref -6.7 (-22.3,8.9)	

Person who spends the most time with the child		
Mother	ref	
Father	9.3 (-36.0, 54.5)	
Grandmother	-5.7 (-26.8, 15.4)	
Other (Creche, aunt, day care)	-3.7 (-43.0, 35.7)	
Maternal age (n=158)	-0.8 (-1.9, -0.3)	
Age of person spending the most time with the child	-0.7 (-1.3, -0.1)**	-0.8 (-1.4, -0.2)***
Prescence of a father figure		
Yes	ref	
No	1.1 (-18.7, 21.0)	
Maternal education (n=158)		
Primary school or less	ref	
Secondary school or some secondary school	8.0 (-30.5, 46.5)	
Post school education	-9.4 (-48.5, 29.7)	
Paternal education (n=143)		
Primary school or less	ref	ref
Secondary school or some secondary school	55.1 (10.2, 100.1)**	48.8 (7.2, 90.5)**
Post school education	41.7 (-3.5, 87.0)	34.4 (-7.6, 76.4)
Education of person spending the most time with the child		
Primary school or less	ref	
Secondary school or some secondary school	16.4 (-18.3, 51.0)	
Post school education	-1.3 (-36.7, 34.0)	
Maternal employment (n=158)		
Employed full time	ref	
Employed part-time	-2.6 (-28.4,23.2)	
Unemployed	-2.3 (-17.1,12.5)	
Paternal employment (n=142)		
Employed full time	ref	ref
Employed part time	16.8 (-6.1,39.7)	18.9 (-1.9, 39.7)*
Unemployed	-10.4 (-28.0,7.2)	-4.3 (-20.2, 11.6)

Caregiver support *Feeling supported* *Not feeling supported*	 ref -16.1 (-32.5,0.2)*	 ref -10.7 (-27.1, 5.7)
Number of children in the household	-2.5 (-8.2,3.3)	
Household size	0.8 (-2.5,4.2)	
Crowding ratio	-0.9 (-5.3,3.4)	
Household asset score (out of 6)	0.4 (-4.8,5.7)	
SASSA grant access *Yes* *No*	 ref -0.2 (-12.8,12.5)	
R^2		0.3506

*p<0.10, **p<0.05, ***p<0.01, (ref) is the reference category, CI is confidence intervals; Final model adjusted for CKCDI, household toys, homemade toys, children's books in household, storytelling, singing, when caregivers first start talking to children, non-birth hospitalisations, caregiver support, paternal education, paternal employment and primary caregiver age; Final model: F (16, 125)=4.22, R^2 =0.3506, P=0.0000

Chapter 4: Discussion

In this chapter, the study findings are discussed in relation to other studies conducted in South Africa and regionally/internationally. Furthermore, it is suggested how these findings may advance what is known about home practices, caregiver knowledge about child development and child development; and the associations between these practices and knowledge to child development in South Africa.

This study set out to investigate the prevalence of home practices related to child development, caregivers' knowledge on child development, young children's developmental status and the associations between home practices/caregiver knowledge to young children's development in Soweto.

Of the five home practices enquired about, only one in five children experienced four or five of these home practices in the previous three days. In particular, the prevalence of storytelling, reading/looking at books/pictures together and naming/counting/drawing with a child were low, with fewer than one third of children participating in these home practices with an adult in the previous three days. At most, only one in four fathers participated in a home practice with their child. Caregivers had a relatively low level of knowledge of child development with the majority of caregivers

thinking developmental milestones and stimulation activities occurred much later than they do. Only one third of the children under two years old who were assessed, were developing well in all domains of development according to the ASQ-3. Associated with child development in this study, was starting to talk to your child during pregnancy, singing, storytelling, naming/counting/drawing with children and allowing children to play with a variety of items (most importantly household/homemade items and children's books).

4.1 Home practices

In our study, the prevalence of socio-emotional caregiving home practices, such as singing and taking children outside, were high while the prevalence of cognitive caregiving home practices, such as reading to children/looking at pictures together, were low. This is consistent with other studies(26,30). In a large study that included pooled MICS data from 28 LMICs, there was a higher prevalence of singing/playing/taking children outside but only a third of caregivers engaged in book reading and storytelling with children younger than five years(26). Additionally, a recent study in Burkina Faso that focused specifically on children aged 0-3 years old, found that singing and being taken outside were highly prevalent (80-84%) but reading, storytelling and naming objects were less prevalent (5-16%)(30). Reasons for the reduced prevalence of cognitive caregiving home practices (reading/looking at books/pictures with children, storytelling and naming/counting/drawing) in children younger than two years old, may be related to the child's age, time/literacy limitations of the caregiver and beliefs about child development. In studies from Burkina Faso, Morocco and Paraguay, a common barrier to cognitive caregiving home practices in young children, is the assumption that the child is too young and/or that learning only starts in preschool/school(30,38,45). Studies from Limpopo, Malawi and Burkina Faso further highlight caregiver time constraints due to competing household and work demands, as well as illiteracy, as barriers to participating in cognitive home practices with young children(30,46,60). Beliefs about modifying child development through play activities is another barrier to participating in these practices. Through qualitative studies in Soweto, Malawi and Paraguay, play is thought to spontaneously occur in children and be the result of good health rather than a parent-initiated interaction that promotes development(45,46,61).

Some research from Thailand, Morocco and the United States (US) suggest a higher prevalence of cognitive caregiving practices than was found in our study. In a recent study in Thailand with children 3-4 years old, the prevalence of all home practices, including storytelling and reading books/looking at pictures together, were above 83%(29). This was consistent in a Moroccan study with children younger than 6 years old where, on average, caregivers read a story or taught children counting at least once a week(38). Additionally, in a US study with children 1-5 years old, more than half of caregivers read or told stories to their children on a daily basis(42). These findings from both high- and lower- income settings may differ from our study findings because these studies included older children where cognitive caregiving practices (reading/storytelling/naming objects) appear more prevalent. A barrier to cognitive caregiving practices in younger children is the belief that young children are too young to learn from cognitive activities, such as reading/storytelling/naming objects(30,38,45).

The total number of home practices performed by caregivers was low in our study. Only one in four children (25%) participated in four or five of the specified activities (story-telling, singing, been taken outside the home, looking at/reading books/pictures, naming/counting/drawing) in the previous three days. This finding is consistent with another study conducted in Soweto among children 6 months to 2 years old, where only 28% of children received a high level of cognitive stimulation in the home (activities such as going to the shops, reading a book/newspaper, buying/making toys for children and teaching young children)(49). This finding also remains true in a study with data from 62 LMICs, where high levels of stimulation (defined as caregivers doing 4 of 6 activities with a child, such as the five activities investigated in our study as well as playing with the child) are low with 40% of mothers and 12% of fathers providing high levels of stimulation(62). In a study with children 3-5 years old, caregivers from Sub-Saharan Africa were performing better as 47% of caregivers provided adequate stimulation to their children(22). This further highlights the influence of age on adult-child interactive activities as that study included children older than the other studies. Children older than two years old appear more likely to be engaging in more activities (including reading/storytelling/naming objects) with their caregivers.

Consistent with international literature, mothers were the adults conducting the child development related activities most frequently(30,46). Fathers in our study only conducted 7-23% of the home activities and 11% of fathers were completely absent from their children's lives. In South Africa, fathers face numerous barriers to the active involvement in the lives of their children, such as families not living together, poverty/unemployment and migrant labour, conflict with mothers of their children and health facilities being unwelcoming to fathers in antenatal and child health visits(63). Our study adds that even fathers who are present in their children's lives, are not always actively engaging in activities helpful for their child's developmental potential (such as storytelling, singing, taking children outside). However, the role of fathers and grandmothers/grandfathers in promoting child development shows great potential as there is a growing eagerness to engage in early childhood development activities and the need for support from partners/family was highlighted by caregivers in our study.

Early learning opportunities start in pregnancy. Early stimulation behaviours include talking/singing, dancing and telling the unborn child about family(27). Talking to children during pregnancy was investigated in this study. The prevalence of talking/singing to children during pregnancy was fairly similar in our study (61%) compared to a study on early stimulation behaviours in Ghana (53%)(28).

Caregiver well-being, an important aspect in providing stimulating care to children, was affected by South Africa's lockdown. Caregivers in our study had a variety of experiences of the lockdown due to the COVID-19 pandemic. One in four caregivers found caring for children to be more difficult because they were unable to visit family and from additional stress (including stress from job loss). One in five caregivers found caring for children to be easier because they had more time alone with their children. This mixture of findings is consistent with a study from Canada where some new mothers found it difficult to not share new-born/baby moments with their families while other new mothers enjoyed the lockdown time for bonding, without having to fulfil other expectations (such as cleaning for family coming to visit their new-born)(64). Majority of caregivers in our study were spending either more or the same amount of time with their children due to the lockdown. Having more time with children may increase the opportunities to provide stimulating home practices to children, however, there were numerous sources of stress on caregivers during the lockdown. In our study, sources

of stress included the high incidence of job loss/reduction in working hours (18% in mothers, 14% in fathers) and households having less amount/choice of food. In a South African study using National Income Dynamics Study (NIDS)- Coronavirus Rapid Mobile Survey (CRAM) data, women were found to be more affected by job losses and taking on more childcare responsibilities (as was found in our study)(65). Other than the economical stresses of job loss on the household, job loss during the South African lockdown was also associated with depression(66), which is a known risk factor for child development(10-12).

Our study's findings add local evidence to the low prevalence of certain stimulation activities such as reading/looking at books/pictures with children and storytelling in children younger than two years old. The findings further highlight the current lack of involvement of fathers in promoting child development in the early years.

4.2 Caregiver knowledge

On average, caregivers in our study knew slightly more about child development (using the CKCDI) compared to caregivers in other LMICs. Participants in our study had a mean CKCDI score of 21.6 (out of 40), which was slightly higher compared to Nepalese mothers (20.4)(35) and Turkish mothers (19.2)(32). Similar to these studies, the caregivers in our study were lacking knowledge about developmental milestones and stimulation activities. Of particular concern, was the low level of knowledge with regards to book reading. Caregivers predicted that looking at books together with children should start much later than the four to six month age range (86% in this sample). This particular knowledge gap is also evident among Nepalese mothers (where 0.6% of mothers correctly answered that question)(35), Turkish mothers (4.8% answering the question correctly)(32) and mothers in Pakistan (12% correctly answered that question)(34). The effects of this knowledge gap was reflected in our study, where only 38% of children had been read a book by a caregiver/looked at pictures with a caregiver; and 53% of households did not have a children's book at home. Another area where caregivers in our study performed poorly, was with regards to when to give children clean and safe household items to play with (two thirds of caregivers answered this question incorrectly). This knowledge gap perhaps explains why only 33% of caregivers allowed their children to play with clean and safe

household items, which would be readily available for their children to explore and was associated with child development in our study.

In a researcher-developed questionnaire in a Soshanguve study, adequate caregiver knowledge for certain developmental milestones ranged from 10-79%(33). While the item choices were different to the CKCDI, our findings were similar in knowledge of certain aspects of motor development (e.g. walking, where 62% of caregivers in our study answered this correctly versus 61% in the Soshanguve study) and personal-social development (with more than two thirds of caregivers in both studies correctly reported smiling to occur in the first two months of life). Some of the other items were more advanced milestones than the CKCDI covers (for example toilet training) and comparisons cannot be made for such questions. Our study adds to this existing evidence in South Africa, reinforcing previous findings that caregivers think developmental milestones and stimulation activities occur at an older age in children.

Caregivers in our study most commonly underestimated children's abilities and predicted developmental milestones and stimulation activities to occur at older ages. This is consistent with studies from Jordan(67), Nepal(35), Pakistan(34) and Soshanguve(33). Children whose caregivers underestimate child development are at risk of developmental delay because home activities are introduced at older ages and deviations in development are undetected by the caregiver(32,67). Additionally, it could be hypothesized that caregivers who are knowledgeable about development milestones may have a better understanding of their children and be motivated to provide responsive and age-appropriate parenting. However, knowledge of child development has not been shown to impact parenting styles or parent's enthusiasm for providing stimulating interactions(68,69).

Caregivers may have limited knowledge about child development due to biases by healthcare providers and traditional beliefs surrounding child development. The health system interacts with caregivers and children the most during the first 1000 days of life(4). Additionally, the health system was a popular source of knowledge for child development related caregiver concerns (34% in our study). Historically, the health system was 'survival' focused, where the emphasis was placed on maintaining and restoring health. The shift to 'survive and thrive', where this emphasis is expanded to

also include child development, was recently made with the release of the new RtHB and Side-by-Side campaign(3). Prior to this, caregivers would be receiving information from clinics/health providers about care, growth and health of children, but not necessarily child development(3,70,71). Secondly, caregivers' knowledge of child development may be affected by beliefs about child development and parenting, influenced by mothers/grandmothers/family. Almost half of caregivers in our study consulted their mothers/grandmothers/family as a source of information about child development. Caregivers' mothers and caregivers' grandmothers may hold traditional views about adults engaging in play activities with children. Traditional beliefs include that child development innately occurs in healthy children and caregivers do not need to promote it(45,46,61). However, caregiver beliefs that promoting child development in young children is important for their future well-being and educational success are growing(71).

4.3 Child development

In our study, only about one third of the children's development appeared to be on schedule in all five domains of development. More than half of the children's development was not on schedule in one or two domains of development. Five percent of children's development was not on schedule in four or all five domains of development and none of these children were attending therapy services (as this was an exclusion for participation in the study). These findings are consistent with studies that looked at slightly older children in South Africa (2 years old), Thailand (3-4 years old) and Peru (3 months to 5 years)(10,29,72). In the South African study by Donald et al(10), with a larger sample size, 55% of children were delayed in more than one area of development; but 10% of children had a delay in all areas of development. A possible reason for the lower prevalence of children with a delay in all areas of development in our study, could be that our children were younger (80% were younger than one year of age)(10). Older children tend to have more developmental delays than younger children(24,25,72) because more developmental milestones are expected at older ages.

Within all areas of child development (except fine motor skills), the children in our study performed slightly better in the ASQ-3 compared to children assessed with the Bayley-III Scales of Infant and Toddler Development (BSID-III) in a South African cohort study

from the Western Cape(10). Children presented with a higher prevalence (38-50%) of delays in most domains of development(10), compared to our findings where about 20% of children were not on schedule in their development of communication, gross motor or problem solving skills. However, children in our study did worse in fine motor skills (38% of children not on schedule with their fine motor development) compared to the Western Cape study (23%)(10). The ASQ-3 used to screen child development in our study, is a screening tool where children are classified as (i) appearing on schedule with their development, (ii) requiring monitoring and learning activities and lastly (iii) requiring referral for further assessment with a professional. Additionally, the ASQ-3 in this study relied on caregiver-report (and if the caregiver was unsure, a kit was available to check). In the case of the BSID-III, a trained investigator assesses if the child can perform certain tasks providing a more accurate depiction of a child's development.

Other studies using ASQ-3 to measure child development also report a high prevalence of children not on track with their development. In a study in Peru with children of a similar age group, using the ASQ-2 and ASQ-3, 54% of children younger than 20 months old were not on schedule with their development(72). In the Peru study, more children were not on track with their development in the domains of communication (16%) and problem solving (14%)(72), whereas more children in our study were not on track in the fine motor domain. This is consistent with another study on South African children. In a study from Zambia and South Africa using the ASQ-3 in children under five years, children had the lowest mean score in fine motor development as well(25). Children most commonly not being on track in the fine motor domain in our study could be due to home practices and associated factors (such as stunting). Fine motor development in young children is influenced by stimulating practices of the person caring for the child, which include drawing/self-feeding/picking up small items with caregiver supervision(21). Another reason for children's fine motor development not appearing on schedule could also be the result of stunting, as stunting was associated with specifically fine motor delay in children less than 5 years old from a study in Indonesia(73).

Overall, two thirds of children younger than 2 years old attending routine health services in Soweto are not on track with their development according to the ASQ-3,

and all areas of development are affected. This finding adds evidence to the need for the health system to implement its plans to target child development during this critical time with the use of developmental screening and supporting caregivers to provide young children with responsive care and early learning opportunities(4).

4.4 Associations of child development to caregiver knowledge and home practices

Our study found that talking to children during pregnancy is associated with child development among children younger than two years old. This association adds to the evidence of the Nurturing Care Framework, which advocates for singing and talking in pregnancy as the start of nurturing care for children(27). The exact pathway to how talking to children during pregnancy promotes their child development needs to be further investigated. A hypothesis is that talking to your unborn child is one mechanism of increasing maternal-foetal attachment and that this attachment in turn improves responsive caregiving post-birth which improves child health and development(28,74).

The results of our study highlight the importance of home practices (namely singing, storytelling and naming/counting/drawing with children) for unlocking young children's developmental potential. This is consistent with other studies that found frequent and varied forms of stimulation (including playing/reading/storytelling/singing and taking children to visit family/friends/shops) to be associated with child development in children less than 18 months old(75), and children 6-24 months(15). This association remains true for children slightly older at 1-5 years old(42) and 3-4 years old(29). In a large study conducted in Thailand using MICS data, on children aged 3-4 years old, singing was associated with cognitive development (among all participants) and non-cognitive development (among children living with both parents)(29). Additionally, the finding that singing/storytelling is associated with child development remained true in a US study, where storytelling/singing was protective to a child's risk of developmental, social or behavioural delays(42). In contrast to our study, outings were also associated with child development in children 3-4 years old in Thailand(29). The difference in results could be the result of different age groups, study designs, settings and different tools used to assess child development.

In our study, interactive activities like singing was more common and associated with child development compared to reading/looking at books together. Reading/looking at books/pictures with children not being associated with child development is not consistent with other studies. In South Africa, a randomised controlled trial in Khayelitsha with children 14-16 months old, found training on interactive reading shared between children and caregivers to be associated with language development (comprehension and production of language) and attention(47), as well as socioemotional development (such as imitation and prosocial skills)(48). This was also found in US studies, where book reading with children 1-5 years old and 21 months old was found to be protective against developmental delay(42,76). In children even younger, this association between book reading and communication development remains true. In an Australian study, book reading with babies 3-12 months (in particular parents reading and interacting with children during book reading following six parent workshops) was shown to improve their communication development soon after and up to two years later(77). Book reading with children in the first years of life appears to promote child development as it increases the amount that parents talk, the amount that children talk and allows for more opportunity for rich interactions between parents and young children(48,78). An association between book reading and child development is expected even in our young sample, as age of the child was unrelated to gains in language development in a meta-analysis of shared book reading interventions(79). However, a potential reason why our study did not yield this association may be that we assessed child development as a total ASQ-3 score and did not sub-analyse the communication domain where associations may be more easily found.

Our study further highlights the importance of children's books and play items (especially household/homemade items) for children's development. In other studies, books and toys have been associated with communication and cognitive development. In a longitudinal cohort study that followed Latino children in New York (6-21 months old), having books in the household was associated with cognitive and receptive language development, while toys was associated with only receptive language development(76). Books and toys in the household create opportunities for more frequent parent-child verbal interactions and contribute to stimulating and learning environments, thus impacting child development(43,76,80). Interestingly, in our study

store bought toys were not found to promote child development, rather books and playing with household items and homemade toys promoted child development. Children experience high quality play (that incorporates curiosity, sustained interest, thinking, problem solving and creativity) with simple toys that can be used in a variety of ways(81). Books/household/homemade items lend themselves more to this simplicity.

In our study, there was no significant association between child development and caregiver knowledge of child development. This is in contrast to a study in Columbia where maternal knowledge about child development was associated with stimulation and this was then associated with child development outcomes in cognition, receptive language and gross motor skills(39). However, there were significant differences between the studies including sample size (they had a much larger sample size of 1277 participants), age of children (children under five years old versus children less than two years of age in our study) as well as a difference in outcome measures (they used a researcher-developed tool assessing caregiver knowledge of eight items in comparison to our tool, the CKCDI, and they used BSID-III where we used a screening tool (ASQ-3) to assess child development).

Hospitalisations were fairly common and non-birth hospitalisations were found to negatively impact early childhood development in our study. This finding is consistent with studies from both high and lower resourced settings. In a five country study (including South Africa), following children from 6 to 60 months old, illnesses (diarrhoea, respiratory tract infections, fever and vomiting) were associated with reduced cognitive development(80). In an Australian study, hospitalisations for infections before the age of 4 years old were associated with developmental vulnerabilities in all areas of child development when the child was 5 years old(82). The mechanism behind which hospitalisation affects child development is largely still hypothetical. Theories range from a biological nature (the brain is affected by the inflammatory response to the infection in the body)(82) to a behavioural nature (children's engagement in play, sleep and learning activities are affected by their poor health and hospital stay)(83). This finding highlights the importance of child development-sensitive interventions (such as child health/nutrition/social

programmes) in promoting child development in addition to child development-specific interventions (such as early learning opportunities).

A surprising finding was that maternal educational attainment (a well-known protective factor against developmental delay) was not associated with child development. This is not consistent with other studies, which had larger sample sizes and stronger designs(10,15,29,42,57). In particular, in a study from South Africa and Zambia(57), children (9-34 months old) of caregivers who completed secondary education (compared to primary education) scored higher in the personal-social domain of child development and older children (35 to 60 months old) whose caregivers had tertiary education (compared to primary education) had higher problem solving development.

Unlike maternal education, paternal education was associated with child development in our study. The influence of a father's education on child development is not as frequently studied as maternal education but has also been found to be associated with child development(84,85). The pathway through which paternal education influences child development is likely through increased support for learning (such as stimulating activities with the child) with higher levels of education(85). The association between paternal education and child development could be influenced by numerous factors such as employment, household wealth, child's growth status, books in the home, among others, which are beyond the scope of this study.

Paternal employment was associated with child development in this study where children whose fathers were employed part-time scored higher in the ASQ-3 compared to children whose fathers were employed full-time. Children whose fathers work part-time may be home more with children and participating more in home practices with their child. Part-time versus full-time employment has not yet been explored in other studies. In studies which include older children, children with employed caregivers (compared to unemployed caregivers) scored higher in fine motor development (for ages 9 to 34 months) and problem solving development (for children 35 to 60 months old)(57).

In terms of associations, the positive relationship between home practices and child development in children as young as 1-24 months old is promising. Our findings add

that simple home practices and simple toys (books and household items) are early learning opportunities that already promote child development at a very young age and can be encouraged through routine health encounters as is already envisioned in the RtHB(3).

Chapter 5: Conclusion

This chapter summarises the key findings and reflects on the strengths and limitations of the study. Recommendations for research, policy and practice are also presented.

Main findings

Only one in three children aged 1-24 months old attending routine health services is on track with their development. Activities found to be associated with child development in this age group include home practices such as starting to talk to children during pregnancy, singing with children, telling children stories, naming/counting and drawing with children and children playing with household items/homemade toys/children's books. However, the prevalence of some of these activities in young children in Soweto is as low as one in three children being told a story or engaging in naming/counting/drawing with a caregiver. Caregiver knowledge on child development is relatively low with the majority of caregivers thinking that milestones and stimulation activities occur later than they do. However, caregiver knowledge of child development was not associated with child development in our study. This study highlights the importance of early learning opportunities (home practices) in unlocking children's developmental potential in the first 1000 days in our context.

Strengths

This study expands on what is known about caregiver knowledge of child development and home practices (early learning opportunities) related to child development at a descriptive level and within a South African population of caregivers and children utilising routine healthcare services, which is the target population for public health interventions led by the National Department of Health (NDoH). A strength of this study is also the use of standardised tools to assess caregiver knowledge of child development and children's development. Whilst being limited in study design and sample size, this study also shows that these home practices/early learning opportunities, which are being promoted in public health interventions are indeed associated with improved child development adding local evidence behind such programmes. Strategies from NDoH also target caregiver support and children staying healthy and out of hospital, both of which were found to be associated with child

development. Therefore, evidence from this study reaffirms the importance of both child development-specific and child development-sensitive approaches by NDoH.

Limitations

The study had several limitations including the cross-sectional study design, and potential selection, recall and social desirability biases, which warrant further examination for future research. The sample was drawn from caregivers attending well-child visits with their children at one clinic in Soweto and so limits generalisability of the findings. Within this study sample, potential selection bias was introduced by convenience sampling (which had to be instituted due to a change in queueing practices brought on by COVID-19). This bias cannot be measured or controlled for and the results from this study therefore cannot be generalised beyond the study sample(86). Eighty percent of the children were younger than one year old due to the nature of EPI-SA schedule, where visits are more frequent in the first year. Purposive sampling, which would have limited this selection bias was not possible due to time and COVID constraints.

The questionnaire used caregiver report for activities conducted in the previous three days and a few questions were based on caregiver's opinion (for example, on their child's growth), which introduces recall and social desirability bias (where caregivers try to give model answers). Initially, the RtHB was going to be checked for certain variables (such as immunisation or growth status) but this was no longer possible with COVID-19 restrictions and that the RtHB kept the caregiver's place in the queue.

There were two measures in place to reduce bias. Firstly, the CKCDI tool to measure caregiver's knowledge about child development requires caregivers to provide an answer and not to select an answer from a category, thereby ensuring more accurate reporting of knowledge. The CKCDI has been used in various LMICs before but not within South Africa. However, during piloting, the CKCDI was pretested in the study population and caregivers appeared to understand the tool well. Secondly, an ASQ-3 tool kit was available for the researcher and caregiver to check if the child could do certain activities should the caregiver be uncertain. Upon reflection post-data collection, certain aspects of the questionnaire could have been improved to include more continuous variables and less categorical variables within the questionnaire as

well as the wording of COVID-related questions, which were not piloted due to time constraints.

Child development can be influenced by many protective and risk factors of which only a few could be included in the study due to the scope of this study. Some factors not included in the study, and that could have influenced the results include stunting (highly prevalent in South Africa at 26.5% as per the South African National Health and Nutrition Survey (SANHANES) and which is known to affect cognitive development(10)); maternal depression (that is associated with reduced cognitive development in children(12)); maternal anaemia (associated with lower cognitive development scores(10)); children's HIV status and better child health and growth measures. Child health was only measured by caregiver report of immunisation status and hospitalisation history and nutritional status was only measured by a question on caregiver's opinion on their child's growth during the lockdown.

Recommendations for research, policy and practice

Future research

Research in this field could be strengthened by using a more robust study design, using a standardised child development assessment tool and increasing the study sample. Stronger study designs with larger sample sizes as well as using a standardised child development assessment tool ,such as the Bayley-III Scales of Infant and Toddler Development (BSID-III), would make it possible to estimate associations between child development and other factors more reliably. Additionally, the value of qualitative studies in identifying the barriers and facilitators of caregivers providing early learning opportunities as well as caregiver perceptions of child development in the first 1000 days of life would add deeper understanding to findings and guide programme development. This study could be strengthened by including factors such as screen time (especially within this first 1000 days of life population), stunting and maternal depression to account for more variance in child development findings. And lastly, future research on home practices and child development could be strengthened by collecting information on the frequency and time spent on home practices to determine dose-dependent relationships between home practices and child development.

Policy

The National Integrated Childhood Development Policy and the Nurturing Care Framework outline the importance of good health, nutrition, safety and security, responsive caregiving and early learning opportunities for children's health and wellbeing. This study reinforces the significance of early learning opportunities for children (from as early as pregnancy) and good health. Additionally, this study provides practical examples as to what key early learning opportunities may be (such as talking to children starting in pregnancy, singing, naming/counting/drawing with children, looking at pictures with children, reading to children, letting children play with household/homemade toys). Providing information and support to caregivers on how to provide such early learning opportunities needs to be integrated in routine packages of care available through South Africa's health system (namely, routine antenatal visits, routine well-child visits and community health worker visits) as provision of early learning opportunities and parenting support for young children is led by the Department of Health(4). This study also shows that children who have been hospitalised require additional support for their development. This support (in terms of monitoring their development/providing early learning opportunities/therapeutic services) needs to be offered during and following their hospital stay within the appropriate tiers of health services.

Practice

As per the 2015 National Integrated Childhood Development Policy(4), the health system assumes responsibility for the prevention, early detection and rehabilitation of development challenges in young children. In our study, only one in three children were developing well in all areas of development and five percent of children were at risk of a delay or delayed in four/five domains of development. None of these children were receiving therapy services (as that was an exclusion criteria to the entry of the of the study). Therefore, it is recommended that nurses conduct the routine RtHB developmental screenings at well-child visits and refer for further assessment and management where applicable. Children who are at higher risk of falling behind in their development (such as children who were hospitalised) should routinely receive developmental support.

Additionally, this study finds that in supporting development for all children under the age of two years, more emphasis needs to be placed on responsive caregiving and increasing opportunities for play and learning through simple adult-child interactions rather than focusing on increasing a caregiver's knowledge on age specific stimulation and developmental milestones. Such simple adult-child interactions include starting to talk to children during pregnancy, singing and storytelling that can be incorporated into routine activities such as nappy changes, bath times or feeding times.

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Appendices

Appendix A: Plagiarism declaration and Turn-it-in report



PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I T.E.C. Camden-Smith (Student number: 457741) am a student registered for the degree of MPH (Maternal and Child Health) in the academic year 2021.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: 28/4/2021

457741:T.CamdenSmith.MPH.ResearchReport.pdf

28 April 2021

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Appendix B: Screening form for participants

Screening form

Study title: "Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg"
Researcher: Taryn Camden-Smith
Approval: Ethics: M190854, District: 2019-11-003, NHRD: GP_201911_030

Date: dd/mm/2020

Filled in by: _____

	Yes	No
Is the caregiver over the age of 18 years old?		
Is the caregiver the mother, father, grandmother or another relative of the child?		
Is the child between 1 and 24 months old?		
Has the child **NOT** been diagnosed with a condition such as Cerebral Palsy, Down Syndrome, Spina Bifida, sensory disability (including blindness or deafness) or attending Physiotherapy, Occupational Therapy or Speech Therapy?		
Has the caregiver signed consent form?		

If all of the above are "Yes", please proceed to administer the questionnaire.

*Keep all forms

Appendix C: Information sheet for participants

Study Information Sheet

Study Title

Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg

Introduction

Hello, my name is Taryn Camden-Smith and I am currently doing my Masters in Public Health at the University of the Witwatersrand.

What is being studied and why

I am doing research on child development among young children (aged one to 24 months old), parent/caregiver home practices (such as book reading), knowledge about child development and caregiver experiences of lockdown in Soweto, Johannesburg.

Invitation to Participate

I invite you and your child to participate in this research project. In so doing, I will ask you questions. Participation is voluntary and if you choose not to participate, you will not be affected in any way. If you agree to participate, you can withdraw at any time and there will be no penalties for this, nor will it affect your or the baby's treatment or the services offered to you.

What is involved?

1. If you agree to participate, I or my research assistant are going to ask you questions about your child and their development, questions about child development in general and some questions about activities at home (like reading books or playing with toys). There are also some questions about your experiences during lockdown. There are no wrong answers.
2. Your responses to these questions will be written on a questionnaire. Your answers and information will be kept confidential.
3. It should take 20-30 minutes to complete the questionnaire.

Risks involved in participating in the research project

There are no risks to you or your child.

Benefits of participating in the research project

There are no benefits directly to you or your child, however, assisting us to better understand this topic area will aid the further development of programmes that might help children in the future. You

will not receive money for participating in the study. If you are concerned about your child's development, you will be referred to a staff member to refer you to Chiawelo CHC's Speech Therapy, Occupational Therapy or Physiotherapy Department for further assessment.

Costs of participating in the research project

There are no costs to you or your child if you participate in this study.

Confidentiality

You and your child will remain anonymous because I or my research assistant will not ask for your or your child's name or address when asking you the questions on the questionnaire. I or my research assistant will ask you the questions on the questionnaire in a quiet corner or in a separate room where others will not be able to hear your answers. All personal information and recorded answers to questions will be kept confidential on a password protected database. Your records may be reviewed by other people to check that the research is ethically conducted but your information will be kept confidential by these parties.

Who to contact if you have any concerns?

Should you have any questions or complaints, please feel free to contact Taryn Camden-Smith (457741@students.wits.ac.za) or her supervisor Dr Wiedaad Slemming (Wiedaad.Slemming@wits.ac.za; 0117172282).

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Appendix D: Consent form for participants

Study Consent Form



Study Title: Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg

Name of principal researcher: Taryn Camden-Smith (457741@students.wits.ac.za; 0825683416)

Department: School of Public Health, University of the Witwatersrand, York Road, Parktown, 2191

I _____ agree to participate in the study.

I understand that:

1. I can withdraw my consent at any time and this will not affect me or my child in any way.
2. I can answer any or all questions asked during the interview
3. The results will be treated with confidentiality
4. My individual results will not be published, but rather group results so as to further not identify me or my child
5. The University of the Witwatersrand Human Research Ethics committee has approved this study protocol.
6. I have been given an opportunity to ask any questions.
7. I will receive a referral note if my child is presenting with a significant developmental delay.

_____ _____

Signature of participant Date

_____ _____

Signature of researcher Date

Appendix E: Questionnaire

Questionnaire

Study title: "Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg"
Researcher: Taryn Camden-Smith
Approval: Ethics: M190854 District: 2019-11-003 NHRD: GP_201911_030

Participant no.	Filled in by	Today's date dd/mm/2020

A: Child details				
1	Is (child name) a boy or a girl?	1.Boy ☐	2.Girl ☐	
2	What is their date of birth?	DD-MM-YYYY		
3	How many weeks pregnant were you when (child name) was born? (Gestational age)	_____ weeks		____ weeks
4	Using https://agesandstages.com/free-resources/asq-calculator/)	Chronological age: ___m ____d		
		Corrected age: ___m ____d		
		Which ASQ? ___ months		

B: ASQ I am now going to ask you questions about (child name)				
	COMMUNICATION			
	1	Yes ☐	Sometimes ☐	Not yet ☐
	2	Yes ☐	Sometimes ☐	Not yet ☐
	3	Yes ☐	Sometimes ☐	Not yet ☐
	4	Yes ☐	Sometimes ☐	Not yet ☐
	5	Yes ☐	Sometimes ☐	Not yet ☐
	6	Yes ☐	Sometimes ☐	Not yet ☐
	GROSS MOTOR			
	1	Yes ☐	Sometimes ☐	Not yet ☐
	2	Yes ☐	Sometimes ☐	Not yet ☐
	3	Yes ☐	Sometimes ☐	Not yet ☐
	4	Yes ☐	Sometimes ☐	Not yet ☐
	5	Yes ☐	Sometimes ☐	Not yet ☐
	6	Yes ☐	Sometimes ☐	Not yet ☐
	FINE MOTOR			
	1	Yes ☐	Sometimes ☐	Not yet ☐
	2	Yes ☐	Sometimes ☐	Not yet ☐
	3	Yes ☐	Sometimes ☐	Not yet ☐
	4	Yes ☐	Sometimes ☐	Not yet ☐
	5	Yes ☐	Sometimes ☐	Not yet ☐
	6	Yes ☐	Sometimes ☐	Not yet ☐

	PROBLEM SOLVING				
	1	Yes ☐	Sometimes ☐	Not yet ☐	
	2	Yes ☐	Sometimes ☐	Not yet ☐	
	3	Yes ☐	Sometimes ☐	Not yet ☐	
	4	Yes ☐	Sometimes ☐	Not yet ☐	
	5	Yes ☐	Sometimes ☐	Not yet ☐	
	6	Yes ☐	Sometimes ☐	Not yet ☐	
	PERSONAL-SOCIAL				
	1	Yes ☐	Sometimes ☐	Not yet ☐	
	2	Yes ☐	Sometimes ☐	Not yet ☐	
	3	Yes ☐	Sometimes ☐	Not yet ☐	
	4	Yes ☐	Sometimes ☐	Not yet ☐	
	5	Yes ☐	Sometimes ☐	Not yet ☐	
	6	Yes ☐	Sometimes ☐	Not yet ☐	
C: Family characteristics					
1	Who spends the most time with your child (name)?	1=Mother ☐ 2=Father ☐ 3=Grandmother ☐ 4=Nanny ☐ 5=Preschool/creche ☐ 6=Other (specify) ☐			
2	Before lockdown, who spent the most time with your child (name)?	1=Mother ☐ 2=Father ☐ 3=Grandmother ☐ 4=Nanny ☐ 5=Preschool/creche ☐ 6=Other (specify) ☐ 7= n/a (my child was born in lockdown)			
3	How many years old is the **mother**?				___ years
4	How many years old is the **person who spends the most time** with the child?				___ years
5	What is the highest level of education that the **mother** has completed?	1= More than secondary school ☐ 2= Secondary school complete ☐ 3=Secondary school incomplete ☐ 4=Primary school complete ☐ 5= Primary school incomplete ☐ 6=No education ☐			

6	What is the highest level of education that the **father** has completed?	1= More than secondary school ☐ 2= Secondary school complete ☐ 3=Secondary school incomplete ☐ 4=Primary school complete ☐ 5= Primary school incomplete ☐ 6=No education ☐	
7	What is the highest level of education that the **person who spends the most time** with the child?	1= More than secondary school ☐ 2= Secondary school complete ☐ 3=Secondary school incomplete ☐ 4=Primary school complete ☐ 5= Primary school incomplete ☐ 6=No education ☐	
8	What is **mother's** employment status?	1=On maternity leave ☐ 2=Employed full-time ☐ 3=Employed part-time ☐ 4=Unemployed ☐	
9	How has employment status of **mother** changed since lockdown?	1= No change ☐ 2= Now unemployed ☐ 3= Reduced hours ☐ 4= Now employed ☐ 5= Other (please specify) ☐	
10	What is **father's** employment status?	1=Employed full-time ☐ 2=Employed part-time ☐ 3=Unemployed ☐	
11	How has employment status of **father** changed since lockdown?	1= No change ☐ 2= Now unemployed ☐ 3= Reduced hours ☐ 4= Now employed ☐ 5= Other (please specify) ☐	
12	Is anyone in the household receiving a grant from SASSA	1=Yes ☐ 2=No ☐	
		If yes, what kinds of grant and how many? 1=child grant ☐, number:	

		2=older person's grant (pensioner's grant) ☐, number: 3=disability grant (adult disability) ☐, number: 4= care dependency grant (child disability) ☐, number: 4=foster care grant ☐, number: 4=other (please specify) ☐		
13	Have you or anyone in your household applied for the R350 unemployment grant during COVID?	1= Yes ☐	2= No ☐	
14	If yes, have they started to receive it?	1= Yes ☐	2= No ☐	
15	How many children (younger than 18 years old) are in the household and what are their ages?			No. of children: Age: Age: Age: Age:
16	How many adults (older than 18 years old) live in the household?			
17	How many rooms in your home are used for sleeping?	Write number of rooms		
D: Child health characteristics				
1	Do you have any concerns about your baby's behaviour? If yes, explain			
2	Does anything about your baby worry you? If yes, explain			
3	Has this child been hospitalized since birth?	1=Yes ☐	2=No ☐	
		How many times has your child been hospitalized? ___		
		Reasons if hospitalized at birth (select all that apply) 1=Prematurity ☐ 2=Jaundice ☐ 3=Respiratory infection/pneumonia ☐ 4=Other (please state) ☐		
		Reasons for hospitalizations (select all that apply)		

		1=Diarrhoea ☐ 2=Respiratory tract infections/pneumonia ☐ 3=Burns ☐ 4=Surgery, what type: ☐ 6= Other (please state) ☐	
4	Has your child received all immunisations due to them for their age?	1= Yes ☐ 2= No ☐ 3= Not sure ☐	
		If no, why 1= The clinic was closed ☐ 2= I did not want to leave the house ☐ 3= The vaccine was not in stock ☐ 4= I was turned away from the clinic ☐ 5 =Other (please specify)☐ _____	
5	In your opinion, how has your child's growth been affected during lockdown?	1= (Child name) growing well. They are picking up weight like they are supposed to☐ 2= (Child name) is not growing well. They are not picking up enough weight☐ 3= Other (please specify)☐ 4=n/a My child was born in lockdown ☐	
6	How has lockdown affected your ability to feed your child?	1= No effect ☐ 2= Less choice of food ☐ 3= Reduced amount of food ☐ 4= Other (please specify) ☐	
7	How has caring for child (name) changed since lockdown?	1= It is the same ☐ 2= It is easier ☐ 3= It is more difficult ☐ 4= Child (name) was born during lockdown ☐	

8	Do you have support to look after/care for (child name)?	1= Yes ☐	2= No ☐	
9	Has this changed since lockdown?	1= Yes ☐	2= No ☐	
10	Do you feel like you need more support?	1= Yes ☐	2= No ☐	
		If yes, what kind of support? 1= More help from partner ☐ 2= More help from my family ☐ 2= More financial support ☐ 3= Other (please specify) ☐		
E: Household questions				
1	Where do you get the **water** you drink from?	1=Tap inside the house ☐ 2=Tap in the yard of my house ☐ 3=Public tap ☐ 4=Water from a water tank ☐ 5=Water from a water-truck ☐ 5=Rainwater ☐ 6=Surface water (e.g. river, dam) ☐ 7=Packaged water (e.g. bottle water) ☐		
2	What kind of **toilet** facility does your household usually use?	1= Inside toilet that flushes and is connected to sewer system ☐ 2= Outside toilet that flushes and is connected to sewer system ☐ 3= Toilet flushed to septic tank ☐ 3=Pit latrine ☐ 4=Port-a-loo ☐ 5= No facility ☐		
3	What is the main **material** that your home is made out of?	1= Bricks, cement ☐ 2= Metal ☐ 3=Wood ☐ 44=Other ☐		
4	Do you have **electricity** at home?	1=Yes ☐ 2=No ☐ 3=Not sure ☐		
5	Is there a **television** at home?	1=Yes ☐ 2=No ☐		

		3=Not sure ☐	
6	Do you have a **fridge** at home?	1=Yes ☐ 2=No ☐ 3=Not sure ☐	
7	Do you or anyone living with you own a **car**?	1=Yes ☐ 2=No ☐ 3=Not sure ☐	
8	Do you or some in your household own a **computer or tablet**?	1=Yes ☐ 2=No ☐ 3=Not sure ☐	
9	Does your household have access to **internet** at home?	1=Yes ☐ 2=No ☐ 3=Not sure ☐	
F: Knowledge *Please indicate when children (in general) start to do the following*			
			Clarify when (days/weeks/months)
1	When does a child's brain begin to develop and learn?		
2	When do children begin to see?		
3	When do children begin to follow a moving person or toy with their eyes?		
4	When do children begin to vocalize in response to someone talking to them?		
5	When do children begin to smile socially, that is smile into the face of another person?		
6	When do children begin to say single meaningful words?		
7	When do children begin to play imaginary play like feeding a doll or driving a toy care?		
8	When do children begin to reach for a toy in front of them?		
9	When do children begin to grasp tiny things like raisins with their fingertips?		
10	When do children begin to walk alone and with good co-ordination?		
11	When should mothers begin to talk to their children?		
12	When should mothers begin to show colourful objects to children to help them practice reaching?		
13	When should mothers begin to teach children to count?		
14	When should mothers begin to teach children colours?		
15	When should mothers start to give children a spoon or fork to let them eat by themselves?		
16	When should mothers begin to give children paper and crayons to draw and colour?		
17	When should mothers begin to let children sit with support?		

18	When should mothers begin to give children clean and safe objects or toys, which they can mouth?		
19	When should mothers begin to look at children's' books with their children?		
20	When should mothers begin to give children clean and safe household items to play with?		
G: Home practices *The next questions are about your you and your child and activities and toys. There are no wrong answers.*			
1	When did you start talking to your child?	1=During pregnancy ☐ 2=0-3 months old ☐ 3=4-7 months old ☐ 4=8-11 months old ☐ 5=Older than 12 months ☐ 6=When he/she is old enough to understand ☐	
		If (6), at what age will he/she be old enough?	__ months old
	In the past three days, which household member aged 15 years or older engage in any of the following activities with (name):		
2	Told stories to this child?	1= Yes ☐ 2= No ☐	
		If yes, who? (Select all that apply) 1=Mother ☐ 2= Father ☐ 3=Grandparents ☐ 4= Siblings ☐ 5= Aunts or uncles ☐ 6= Other (please specify) ☐	
3	Sang songs to or with this child including lullabies?	1= Yes ☐ 2= No ☐	
		If yes, who? (Select all that apply) 1=Mother ☐ 2= Father ☐ 3=Grandparents ☐ 4= Siblings ☐ 5= Aunts or uncles ☐ 6= Other (please specify) ☐	
4	Took this child outside the home (to parks, shops, to neighbours, out for a walk)?	1= Yes ☐ 2= No ☐	
		If yes, who? (Select all that apply) 1=Mother ☐ 2= Father ☐ 3=Grandparents ☐ 4= Siblings ☐ 5= Aunts or uncles ☐ 6= Other (please specify) ☐	

5	Before lockdown, did you or any household member older than 15 year usually take your child (name) outside the home to parks/neighbours/for a walk/shops?	1= Yes ☐ 2= No ☐ 3= This child was born during lockdown	
		If yes, who? (Select all that apply) 1=Mother ☐ 2= Father ☐ 3=Grandparents ☐ 4= Siblings ☐ 5= Aunts or uncles ☐ 6= Other (please specify) ☐	
6	Read books or looked at picture books with this child?	1= Yes ☐ 2= No ☐	
		If yes, who? (Select all that apply) 1=Mother ☐ 2= Father ☐ 3=Grandparents ☐ 4= Siblings ☐ 5= Aunts or uncles ☐ 6= Other (please specify) ☐	
7	Named, counted or drew things for or with this child	1= Yes ☐ 2= No ☐	
		If yes, who? (Select all that apply) 1=Mother ☐ 2= Father ☐ 3=Grandparents ☐ 4= Siblings ☐ 5= Aunts or uncles ☐ 6= Other (please specify) ☐	
	In terms of toys		
8	How many children's **books**, including picture books do you have for this child?	a) None ☐ b) 1-3 ☐ c) 4-5 ☐ d) 6-9 books ☐ e) Ten or more books ☐	
9	Does the child play with toys from a **shop or manufactured** toys?	a) Yes ☐ b) No ☐ c) I don't Know ☐	
10	Does the child play with **household objects** such as bowls or pots, or objects found outside, such as sticks, rocks or leaves?	a) Yes ☐ b) No ☐ c) I don't Know ☐	
11	Does the child play with **homemade** toys, such as dolls, cars or other toys made at home?	a) Yes ☐ b) No ☐ c) I don't Know ☐	

12	Has the amount of time that you spend with your child changed as a result of lockdown?	1= I spend the same amount of time with my child ☐ 2= Yes, I am home with my child more now compared to before lockdown. ☐ 3= No, I am away from my child more now compared to before lockdown. ☐ 4= Other (please specify) ☐	
13	Where do you go to get information about child development *(how children learn to talk, move, play)?*	**Select all that apply** 1=I know from my other children ☐ 2=My mother ☐ 3=My grandmother ☐ 4=My friends ☐ 5= Internet (e.g. google) ☐ 7=Social media (e.g. Facebook, twitter) ☐ 8=Parenting books ☐ 9=Other- please specify ☐	
Thank you for your time today			

Appendix F: HREC (medical) ethical approval

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R14/49 Miss Taryn Camden-Smith

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M190854

NAME: (Principal Investigator)	Miss Taryn Camden-Smith
DEPARTMENT:	School of Public Health Chiawelo Community Health Centre
PROJECT TITLE:	Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg
DATE CONSIDERED:	30/08/2019
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Wiedaad Slemming
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	24/02/2020

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in **August** and will therefore be due in the month of **August** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

Date 12/03/2020

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix G: Johannesburg district approval

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

JOHANNESBURG HEALTH DISTRICT

Wits
Research Ethics Committee,
University of The Witwatersrand
Johannesburg, South AfricaWits
taryncamdensmith@gmail.com

Enquiries: Dr EM Ohaju
Tel: 011 694 3888 Cell: 076 8831659
Email: Elizabeth.Ohaju@gauteng.gov.za
Hillbrow CHC: Administration Building
Cr Smith Str. & Klein Street
Private Bag X21, Johannesburg
South Africa, 2017

DRC Ref: 2019-11-003

NHRD Ref no: GP_201911_030

Dear: Ms Taryn Camden-Smith

TITLE*: Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg*

Your application for research approval refers.

The District Research Committee has reviewed your application. This letter serves as an in-principle approval to access the Districts Health facilities (mentioned below) for the above project subject to following conditions:

- The facility to be visited: **CHIAWELO CHC**
- This facility will be visited from **08/01/2020 to 08/01/2021**
- The research can only commence after you submit an ethics clearance certificate from a recognized institution.
- You will report to the Facility Manager before initiating the study.

Sub District	Sub District Manager/ Area Manager	Contact No.	Cell phone
D	Ms. Maria Mazibuko	011 674 1200	082 781 9919

The following conditions must be observed:

- Participants' rights and confidentiality will be maintained all the time.
- No resources (Financial, material and human resources) from the above facilities will be used for the study. Neither the District nor the facility will incur any additional cost for this study.
- The study will comply with **Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations**.

- You will submit a copy (electronic and hard copy) of your final report. In addition, you will submit a six-monthly progress report to the District Research Committee.
- Your supervisor and University of the Witwatersrand will ensure that these reports are being submitted timeously to the District Research Committee.
- The District must be acknowledged in all the reports/publications generated from the research and a copy of these reports/publications must be submitted to the District Research Committee.

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above.

Please feel free to contact us, if you have any further queries. On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study.

Regards,

p.p.

Dr E.M Ohaju
Chairperson: District Research Committee
Johannesburg Health District
Date 09/01/2020.

Mrs M.L Morewane
Chief Director
Johannesburg Health District
Date: 09/01/2020

Appendix H: HREC (medical) permission to commence data collection in COVID-19 pandemic

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

2020/10/27

Ms T Camden-Smith
School of Public Health
Medical School
University

Sent by e-mail to: taryncamdensmith@gmail.com

Dear Ms Camden-Smith

Re: **Protocol Ref No: M190854**
Protocol Title: *Associations between young children's development and their caregiver's practices and knowledge about child development in Soweto, Johannesburg*
Principal Investigator: Ms T Camden-Smith

I refer to your letter of 2020/08/17 and our subsequent e-mail exchanges.

I confirm that we approve your request to resume face-to-face interviews with patients at Chiawelo Community Health Centre, subject to the usual COVID-19 protective protocols.

Thank you for keeping us informed.

Yours Sincerely

I. Burns

.....
Mr I Burns
For the Human Research Ethics Committee (Medical)

C B Penny

.....
Dr CB Penny, Chairperson, Human Research Ethics Committee (Medical)

cc Dr W Slemming