PhD in Clinical and Experimental Medicine
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Maternal mental health as a predictor of adverse behavioural and emotional outcomes in pre-school age children: a population-based birth cohort study in rural Ethiopia.

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1. INTRODUCTION

1.1 THE PUBLIC HEALTH CASE FOR STUDYING CHILDHOOD MENTAL DISORDERS

Worldwide 10-20% of children and adolescents experience mental problems (Kieling 2011, Belfer 2007). Half of all mental illnesses begin by the age of 14 and three-quarters by mid-20s. Behavioral disorders, such as oppositional defiant disorder (ODD), conduct disorder, and attention-deficit/hyperactivity disorder (ADHD), and emotional disorders, such as anxiety and depressive disorders are the types of mental disorders that are diagnosed most frequently in children (Egger and Angold 2006). Neuropsychiatric conditions are the leading cause of disability in young people in all regions (Gore et al 2011).

Developmental disabilities (such as intellectual disability and autism), emotional disorders (notably anxiety and depression) and disruptive behaviour disorders (notably conduct disorder and ADHD) are the leading mental health-related contributors of the global burden of disease in children aged below 10 years (Murray et al 2012).

Children exposed to violence, trauma and losses, chronic medical conditions, parents' mental disorders, and poverty are particularly vulnerable to the development of mental and neurodevelopmental disorders. If untreated, these conditions severely influence children's development, their chances of attending school and their potential to live fulfilling and productive lives.

A substantial discrepancy has been found between the prevalence of child emotional and behavioural disorders and the proportion that are currently being treated in childhood (Costello et al. 2005). Among the major causes of this divergence is the limited access to mental health care and the stigma associated with mental health

problems (Corrigan 2004; Kataoka et al. 2002). Another explanation is that psychosocial problems in the community are often not recognized or diagnosed (Costello et al. 2005). This is worrisome given the fact that problems in young children show relative stability over time (Caspi et al. 1996) and can potentially progress into psychiatric disorders, adversely affecting children's developmental potential, learning, and future occupational opportunities.

Despite the widespread recognition that psychosocial well-being and optimal child development are prerequisites for healthy, cohesive and productive societies, childhood mental and neurodevelopmental disorders have been widely neglected by policy makers and public health experts. The failure to address mental health problems in children and adolescents in low-resource settings is a public health issue with wide-reaching consequences on the health and social capital of nations.

Over 90% of the global population of children and adolescents in the world live in low and middle-income countries (LMIC).

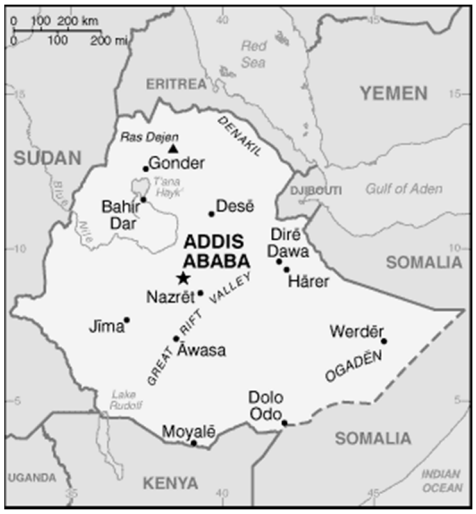
Low and middle-income countries are not only settings where the resources are scarce, but also where the probability of extreme hardships, which can enhance vulnerability to develop mental disorders, is greater. In particular, millions of children in LMIC live in circumstances of extreme poverty, are likely to have had low birth weight and ongoing undernutrition, and are exposed to a high burden of communicable diseases, lack of early childhood stimulation, humanitarian crises and lack of access to education.

The large resource gap for child mental disorders is mirrored in the evidence gap (Patel et al 2007). The vast majority of research on child and adolescent mental health comes from high-income countries. For example, among items on child and adolescent mental health indexed in the Web of Science database over the past

decade, about 90% had an authorship from a high-income county. Authorship from upper middle-income, lower middle-income and low-income countries occurred in 7.79%, 1.19% and 0.33% of the items, respectively (Kieling et al 2012). Thus, little is known about child mental disorders—their epidemiology, phenotypes, aetiology or treatment—from LMIC (Kieling et al 2011). This is a major barrier to improving access to care (Patel et al 2013).

1.2 THE STUDY SETTING

Ethiopia was chosen as the setting for the C-MaMiE study ("Chilhood-Maternal Mental Disorder in Ethiopa") for several reasons: (1) the paucity of information on child mental health in sub-Saharan Africa, (2) the track record of Addis Ababa University in successfully conducting large-scale epidemiological mental health studies, (3) the existing infra-structure of the demographic surveillance site in Butajira, (4) the opportunity to continue a cohort study on perinatal common mental disorders to assess mental health outcomes in the offspring of participating mothers, and (5) pre-existing collaborative contacts between the Department of Psychiatry, School of Medicine, College of Health Sciences, Addis Ababa University and the Section of Epidemiology, Institute of Psychiatry, King's College London.



1.2.1 General statistics for Ethiopia

Ethiopia is located in the horn of Africa. It has a population of more than 80 million people, with an average annual growth rate of 2.1% (UNdata 2013). There are over 80 ethnic groups including: Oromo (34.5%), Amhara (26.9%), Tigre (6.2%), Somali

(5.9%) and Gurage (4.3%). The majority religion is Ethiopian Orthodox Christianity (43.8%), followed by Islam (33.9%) and Protestant Christianity (18.6%). The vast majority of Ethiopians (82.7%) live in rural areas (UNdata 2013). Children younger than 15 years of age represent 40% of the population (UNdata, 2013).

Ethiopia is ranked 173rd out of 187 countries in the Human Development index (UNDP 2013- UNDP Human Development Report 2013). It is estimated that 40% of the population live on less that $1.25 per day (World Bank, 2011). More than half of the adult population is not able to read and write, and the figure is higher in women (UNESCO, 2011). Life expectancy at birth is 61 years in women and 58 years in men (UNdata 2013). Infant mortality rate is 63/1,000 live births and under 5 mortality rate is 77/1,000 live births (UNICEF,2011). Nearly one third of children is moderately or severely underweight and nearly one third of them are employed.

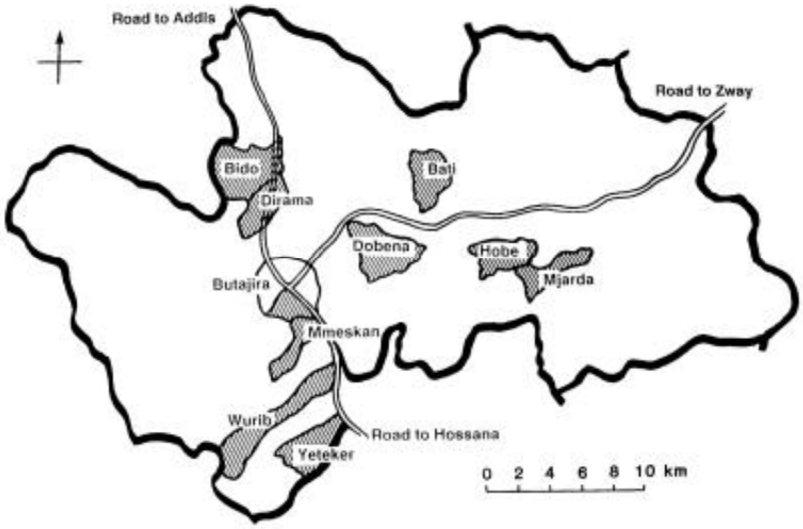
1.2.2 THE C-MAMIE STUDY SETTING

The study took place in and around the Butajira Demographic Surveillance Site (DSS), located 130km south of Addis Ababa, in the Meskan, Mareko and Silti districts, Gurage Zone, of the Southern Nations, Nationalities and People's (SNNP) region of Ethiopia. The SNNP region is the most densely populated region in Ethiopia, with an estimated 134 people per km^2 (Population Census Commission 2008).

Figure 1: Butajira demographic surveillance site

The Butajira DSS was established in 1985 in conjunction with the Butajira Rural Health Programme (BRHP) of the School of Public Health in Addis Ababa University to support public health research (Berhane et al. 1999). The DSS includes ten sub-districts ('*kebeles*'; smallest administrative units) that were selected on a probability-proportional-to-size basis. The population of the Butajira DSS was 54,426 by the end of December 2004 (Fantahun et al. 2008).

Figure 2: The selected sub-districts of the Butajira DSS



The Butajira area covers both urban and rural areas, as well as tropical lowland areas (altitude around 1500m) and temperate mountainous areas (altitude up to 3,500m). Around Butajira, the livelihood of the residents is based on mixed farming, with Khat (an amphetamine-like psychostimulant) and chilli pepper as the main cash

crops and maize as the main subsistence grain. With population expansion, this historically fertile area has become prone to food insecurity, affected by famine in 1974, 1985, 1999 and 2003.

In the Butajira DSS, mortality is higher in the rural areas compared to the town, and in the lowland compared to the highland areas (Byass et al. 2008). The latter mortality differential is probably explained by malaria. The estimated population HIV seroprevalence is 0.1% for women living in the SNNP region (CSA 2006), although national estimates from antenatal clinic sentinel sites indicate a higher prevalence in both rural (2.2%) and urban (11.9%) women (Federal Ministry of Health/National HIV/AIDS Prevention and Control Office 2006).

1.3 ETHICAL CONSIDERATIONS

Ethical approval for the C-MaMiE study was obtained from the Ethiopian Science and Technology Commission, National Ethical Review committee and other collaborating institues.

For the reliability and validation study, after being given an explanation of the purpose of the study, participants were required to provide written, informed consent. Non-literate participants gave a finger-print to signify willingness to participate. All participants were remunerated for transport costs. Any participants found to be suffering from mental illness were referred to the psychiatric out-patient clinic in the nearby hospital.

In the population-based study, the project was explained in detail and an information sheet was provided. If the person was willing to participate, he/she was asked to give written consent. As many of the respondents were non-literate, the consent form was read out and they were required to give a finger-print to signify willingness to participate. All participants were reimbursed for health care costs throughout the duration of the project for themselves and for the project child. Both caregivers and children who were suffering from severe mental disturbance were referred for assessment at the local psychiatric unit in Butajira town, staffed by two psychiatric nurses.

1.4 OUTLINE OF THESIS

This thesis will be divided into two sections to reflect the two phases of the Childhood-Maternal Mental Illness in Ethiopia (C-MaMiE) study: part I. the measurement study, and part II. the longitudinal population-based study.

Each section will include a detailed background and description of the study methodology followed by presentation of the results and discussion. An overall summary of the results of all two phases of the study will then be presented, together with the implications of the findings.

2. AIMS AND OBJECTIVES

2.1 AIMS

(1) To investigate the validity of measures of child emotional and behavioural problems in the Ethiopian context.

(2) To explore causal pathways and mediating factors for childhood emotional and behavioural problems.

2.2 OBJECTIVES

(1) To assess the cultural validity of the Strengths and Difficulties Questionnaire as measure of child emotional and behavioural problems.

(2) To examine prospectively the relationships between early life exposure to maternal common mental disorders, other psychosocial risk factors and protective factors and the presence of behaviourala and emotional disorders in pre-school children at five years of age.

3. PART I: MEASUREMENT STUDY

3.1 INTRODUCTION

A variety of instruments are available for the assessment of child psychopathology and symptoms of chilhood mental disorders. Most measures have been developed for use high-resource settings and often in Western countries; hence, their utilization in in low-income countries poses a number of challenges and ethical concerns, including the need for validation and cultural adaptation and the lack of availability of the required skilled human resources.

For the purpose of this study we decided to adapt and use the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997; http://www.sdqinfo.org/), as it has shown to be a valid instrument for assessment of emotional and behavioural problems in more than fifty countries (Stone et al 2010), it has been used in previous studies investigating the association between maternal mental health and child mental health outcomes (Goodman, 2010), and meets feasibility criteria.

3.1.1The Strengths and Difficulties Questionnaire.

The Strengths and Difficulties Questionnaire (SDQ) is a relatively short, user-friendly screening instrument of emotional and behavioural problems for children. The SDQ also enables assessment of strengths and competences in addition to problems, in line with current approaches for child mental health assessment. In addition, acceptability is improved because the SDQ items are worded more positively compared to other common questionnaires. The SDQ applies to children and adolescents of 4-16 years of age. An approved Amharic version of the SDQ is available online and is free of charge to access and use (www.sdqinfo.com). The SDQ was originally derived from the Rutter Questionnaires (Rutter, 1967) which was

expanded on the basis of criteria from the Diagnostic and Statistical Manual of mental disorders, fourth edition (American Psychiatric Association, 1994) and the International Classification of Diseases, tenth edition (World Health Organization, 1992). Both parents and teachers can be interviewed using the SDQ .

The questionnaire consists of 25 items across five subscales measuring emotional problems, conduct problems, hyperactivity-inattention, peer problems and prosocial behaviour. Each item has to be scored on a 3-point scale (0 = not true, 1 = somewhat true, and 2 = certainly true). The combined scale score of all subscales except the prosocial one provides information on total difficulties and severity of the problem. The SDQ has an impact supplement which enables the informants to report on possible burden of distress (Goodman 1999). The impact supplement comprises eight questions. From these questions three dimensions can be inferred: perceived difficulties (is there a problem?), impact score (distress and social incapacity on the child), and a burden rating (do symptoms impose a burden?) (Goodmann, 1999).

The psychometric qualities of the SDQ have been extensively studied, and the questionnaire shows robust properties. The instrument has been studied in both community and clinical samples. A review of 48 studies using the parent and teacher versions for 4- to 12-year-olds revealed satisfactory internal consistency, sufficient reliability over time, relatively high parent–teacher agreement, acceptable criterion validity, acceptable screening ability for differentiating children with emotional and behavioural problems from those without, and evidence of predictive validity with regard to seeking help (Stone et al 2010). However, few of the validity studies were longitudinal. Overall, the peer problems scale showed the weakest reliability and validity results, particularly for parent ratings. The prosocial scale also showed some

weaknesses, especially concerning internal consistency and capacity to discriminate children with and without problems.

The five-factor structure has been confirmed in some studies, but not in others, which showed different structures (Goodman et al 2010). Most studies targeted at young children explored the factor structure of either the parent or the teacher version of the SDQ. Five and three factor solutions have been reported (Edmunds 2005; Hill et al 2007).

There is theoretical and preliminary empirical support for combining the SDQ's hypothesised emotional and peer subscales into an 'internalizing' subscale and the hypothesised behavioral and hyperactivity subscales into an 'externalizing' subscale (alongside the fifth prosocial subscale).These alternative broad factors might be useful for identifying psychological problems in low-risk populations, whereas the five-factor structure recommended for high-risk children (Goodman et al 2010).

Although the SDQ was developed for children aged four years and older, few evaluations have been made in children under seven years of age (Theunissen 2013; Mieloo 2012) and the validity and reliability of the SDQ has not been investigated fully in younger age groups.

Because different phases of a child's development coincide with age-specific problem behaviour, some items in the SDQ might be less applicable or more difficult to interpret in younger children.

Some studies reported moderate to strong internal consistency but not for all SDQ subscales (Edmunds 2005; Perren et al 2007; Van Leeuwen et al 2006). External validity of the parent version has shown good results (Goodman, 1999). The

interrater correlation between the parent and teacher versions of the SDQ has been investigated only once (Van Leeuwen et al 2006). Thus, although the few studies that investigated 5–6 year old children elucidated different aspects of the validity and reliability of the SDQ (Perren et al 2007; Van Leeuwen et al 2006), the overall picture remains fragmented.

The SDQ has been has been translated into over 60 languages and has been used widely in both research and clinical practice, including in LMICs (Achenbach et al. 2008; Woerner et al. 2004). Studies performed in non-Western countries showed different reliability and validity outcomes when compared to studies that had been conducted in Western countries. Studies of African, Chinese, and Arab children indicated only partial support to the five-factor structure and certain items did not load onto the theoretical factors (Perren et al 2007; Van Leeuwen et al 2006). Furthermore, studies in China and Japan showed lower reliability of the subscales than studies in Great Britain, where the SDQ was developed (Van Leeuwen et al 2006). A possible explanation is that culture influences parents' perceptions of deviant behaviour (Achenbach et al 2001). Language and cultural differences in how emotions are expressed could also play a role (Mieloo et al 2014).

3.1.2 Cultural validation of measures of mental health outcomes

Validity of a measure refers to the extent to which a measure really measure what it sets out to measure. Reliability refers to the consistency of a measure when applied repeatedly under similar circumstances.

Evidence of measurement validity and reliability cannot be assumed to generalise across populations. This lack of generalisability may be especially problematic when the original measure is translated into another language or applied to a different cultural group.

Creating a culturally acceptable, comprehensible, relevant and semantically equivalent translation is difficult (Van Ommeren et al, 1999), making it essential to study the psychometric properties of translated measures that might have changed during imperfect translations. To avoid some of the pitfalls arising from application of a standardised measure of mental health outcomes to a new cultural setting, it has been recommended that researchers should assess five distinct components of validity: content, semantic, technical, construct (conceptual) and criterion validity (Flaherty et al. 1988, Prince 2003).

Content validity refers to the perceived relevance of items in the new culture. Literal translation can reduce a measure's content validity, which is the extent to which a measure's content represents the concept to be assessed. From a theoretical stance, Items should be a sample of the possible items related to the concept being measured in that culture (Flaherty et al. 1988). Items considered irrelevant by a panel of local experts may be discarded or new items of relevance may be added, necessitating reassessment of the psychometric properties of the scale.

Semantic equivalence refers to the meaning of an item after translation into the new language. Use of local idioms may be required to convey the intended meaning of the original scale. This process requires careful back-translations and consensus from an expert panel (Sumathipala and Murray J. 2000).

Technical equivalence refers to alteration in the performance of the scale in a new culture due to the method of data collection. One example might be the reading out of self-report scales in non-literate populations.

Construct validity is the degree to which a measure assesses the theoretical construct it has been designed for.

For diagnostic measure, it is worth considering that there is evidence that sociocultural factors in varying degrees influence the clustering of symptoms and the extent to which symptoms are experienced as distressing (Mezzich et al, 1996).

The scope and content of the construct can be identified in open-ended interviews and focus group discussions with key informants. A proxy indicator of construct validity may be variation in the predicted level of the construct in differing populations. Construct validity can also be evaluated through the statistical techniques of factor analysis. As has been described (Jacob et al. 1998), this approach statistically assesses the pattern of correlations between related groups of scale items, and tries to reduce these to meaningful underlying factors. If scales truly measure the same underlying constructs in different cultures, they would be hypothesised to have the same factor structure.

Concurrent validity, which is tested by the extent to which the new measure relates, as hypothesized, to other measures taken at the same time.

Criterion validity is one type of concurrent validity. It is tested by comparing measured obtained with the new instruments to those obtained with an existing criterion measure (the 'gold standard measure').

Convergent validity**,** which si also a type of concurrent validity, refers to the correlation as predicted with variables associated with what is being measured.

3.2 OBJECTIVES

This study aims to determine if the Amharic version of the SDQ is a reliable and valid instrument for measuring emotional and behavioural problems in children aged five years in Ethiopia, by assessing the following:

- Internal consistency, which is the extent to which individual items address a common underlying construct (Cronbach 1951)
- Construct validity, which is the extent to which a construct that the measure seeks to address is a real and coherent entity, and then also the salience of the measure to that construct. Construct validity can be assessed by examining the fit between the scale structure and the observed data.
- Concurrent validity, which is tested by the extent to which the new measure relates, as hypothesized, to other measures taken at the same time. It will be tested by comparing measured obtained with the new instruments to those obtained with an existing criterion measure (the ‘gold standard measure’) and by assessing the extent to which the new measure is associated to other likely dependent variables, as predicted.

3.3 METHODS

3.3.1 Setting and sampling

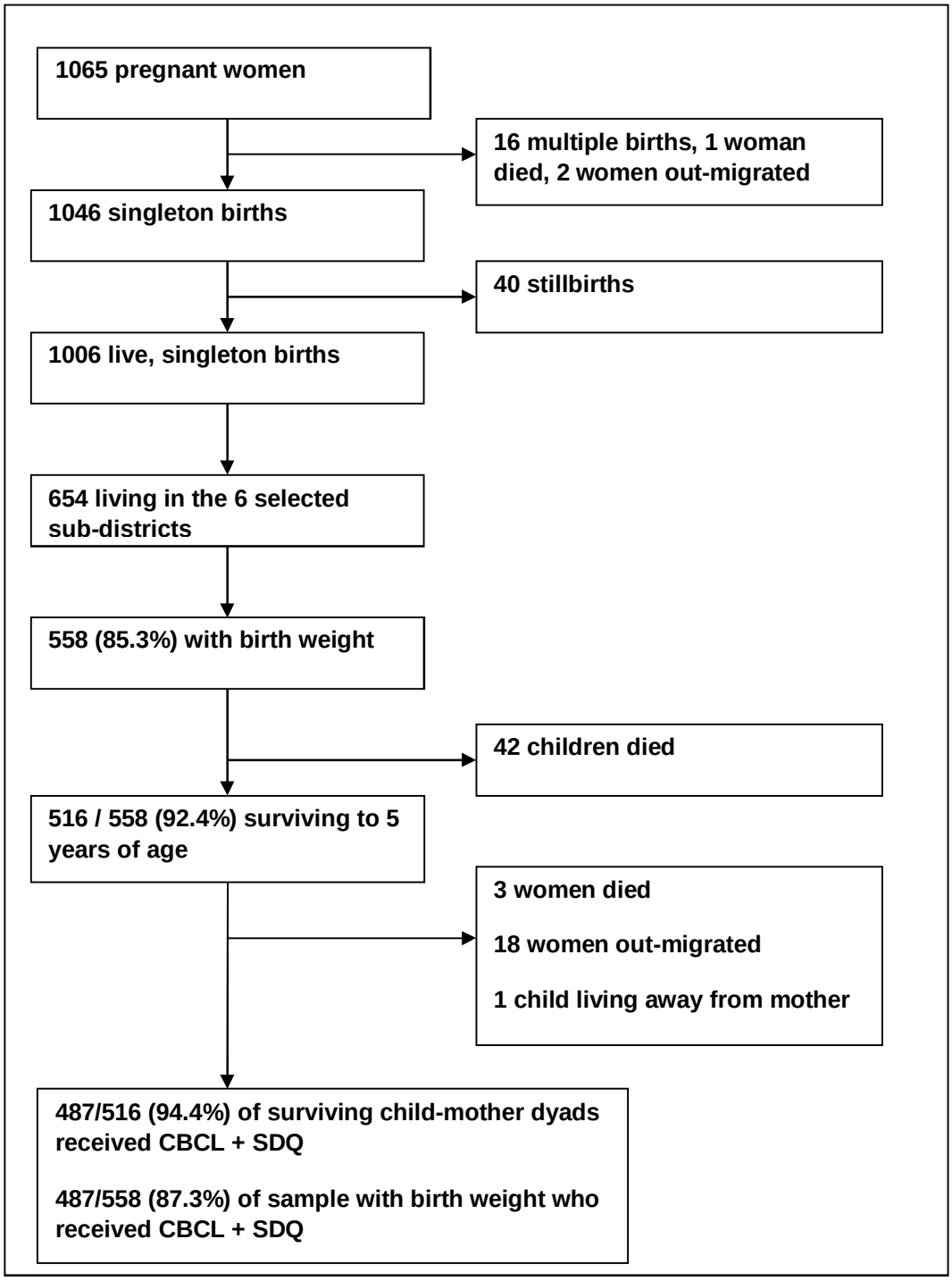
The study was conducted among a subsample of mother-child diads who were recruited to be part of the C-MaMiE cohort study when the women were in third trimester of pregnancy. The subsample was selected on the basis of residence and availability of anthropometric data at birth. This cross-sectional validity study was conducted at the time when children were five years old.

The SDQ was administered to all women meeting the following inclusion criteria: being mothers of singleton children and living in rural districts. Women were excluded from participation if acutely unwell, that is requiring immediate medical attention or too mentally unwell to engage in an interview, or non-fluent in Amharic, the official language of Ethiopia.

The eligible population was n= 558. See Figure 3 fore more details.

For each household another relative with a caregiving role for the child was also invited to be interviewed. In total487 mothers were available and accepted to be interviewed with SDQ and the Child Behaviour Checklist (CBCL).

Figure 3: Subsample of mother-child dyads for cross-sectional validity study.



3.3.2 Measurement instruments

Strenghts and Difficulties Questionnaire (SDQ)

The Amharic version of the SDQ (for parents) was used. The total scores of the four problem subscales of the SDQ (emotional symptoms, conduct problems, hyperactivity-inattention, and peer problems), the positive scale assessing prosocial behaviour, the combined total difficulties score, and scores for internalizing and externalizing problems were computed.

Child Behaviour Checklist (CBCL)

The Child Behaviour Checklist (CBCL) has long been viewed as the "gold standard" in assessing childhood mental problems. The CBCL assesses parental reports about children's behavioral and emotional problems in the preceding two months. The reliability and validity of the CBCL have been found to be sound, including in sub-Saharan Africa (Bangirana et al 2009). The psychometric properties of the CBCL are well-known and have been conveniently summarized (Achenbach 1991).

The CBCL comprises 99 problem items that are used to compute total, internalizing, and externalizing problem scores. The CBCL contains eight syndrome scales: Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Psychiatric Problems, Rule-Breaking Behaviour and Aggressive Behaviour, Attention Problems, and Social Problems. The scales are comparable to the SDQ scales for emotional problems (CBCL scales of Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints), conduct problems (CBCL scales of Rule-Breaking Behaviour and Aggressive Behaviour), hyperactivity/inattention problems (CBCL scales of Attention Problems), and peer problems (CBCL scales of Social Problems). Although, the CBCL is well validated, it has several disadvantages for use in both research and

community-based setting. For example, the questionnaire is long (118 questions), it contains only negative formulated questions, and it was developed for use in a clinical setting.

The Amharic version of the CBCL preschool version (age 1 ½-5 years) was used. This version is a local adaption from the original standardized instrument and has not been validated for use in the country. Locally validated measures for child mental health problems that could be considered as 'criteria' for assessment of concurrent validity of the SDQ in Ethiopia were not available. The Diagnostic Interview for Children and Adolescents (DICA) has also been utilised in Ethiopia but local experts advised against its use in the context of the C-MaMIE study because other epidemiological cross-sectional studies reported unespectedly low prevalence rates of emotional disorders.

Covariates

Socioeconomic status:

Maternal educational status[a]	Whether or not received any formal education
Assets[b]	Possession of assets (ownership of land, home, business, crops, animals, bed, television, radio, cooker,jewellery or other items of value).
Relative wealth[c]	Perceived level of household wealth relative to others (lower vs. the same or greater)
Food insecurity[d]	Hunger in the preceding month due to lack of money
Indebtedness[e]	Debt that unable to pay

[a-e]Indicators of poverty previously utilised by the Butajira Demographic Surveillance Site.

Conflict in the home, exposure to violence and stressful life events:

Marital discord	Assessed with the following variables: Husband not providing enough help, relationship 'average, bad or very bad' (compared to good or very good)[f], sometimes or often quarrel[f] and perceiving that the husband drank too much alcohol. A 'marital discord scale' of these four items was confirmed using Mokken analysis (Loevinger H coefficient 0.35).
Exposure to violence	Reported experience of violence by women
Stressful life events	The original list of threatening experiences (LTE) (Brugha et al. 1985) provides a measure of 12 life event categories associated with long-term threat. The LTE was translated into Amharic, adapted for local conditions and the time-frame restricted to the current pregnancy.

3.3.3 Procedures

Both SDQ and CBCL were administered by data collectors who have extensive experience in research and in administering standardised instruments and mental health questionnaires. The data collectors are all women who have completed high school (10th grade) and that have been working with the C-MaMiE project for several years. They received training on SDQ and CBCL prior to the study, which included communication skills, supervised administration of the questionnaire and group discussions to ensure that the data collectors had a consistent and shared understanding of the items. A team of local supervisors monitored the data collectors and performed quality checks on a regular basis.

The official Amharic translation of the SDQ was used, which was the result of rigorous translation procedures to ensure semantic validity. Focus group discussions with a panel of local experts were carried out to explore content validity, followed by pilot testing. SDQ items appeared to be well understood and to reflect underlying constructs of behaviour and emotional problems and competences, therefore no changes were made to the Amharic translation of the original SDQ questionnaire.

3.3.4 Statistical methods

The employed evaluation methods included scale reliability analyses yielding measures of internal consistency (Cronbach's alpha; α). Internal consistency values below α=0.70 are generally considered low, values between 0.70 and 0.80 acceptable, and values of 0.80 and above good (Cohen 1977).

Next, we examined the fit between the scale structure and the observed data with confirmatory factor analysis (CFA) using AMOS structural equation modeling (SEM). Model fit was assessed with several fit indices, including chi-square, root-mean-square error of approximation (RMSEA; Steiger, 1990), parsimony comparative fit index (PCFI), comparative fit index (CFI; Bentler, 1990), and Akaike information criterion (AIC; Akaike, 1987).

The models were considered to be a good fit when the parsimony comparative fit index (PCFI) was .0.90. RMSEA values of 0.08 or lower indicate adequate fit; values of .05 or lower indicate excellent fit (Browne & Cudeck, 1993). Hu and Bentler (1999) suggested that CFI values of 0.95 or higher indicate good fit, though other researchers have suggested cutoffs of 0.90 for CFI (e.g., Jöreskog, Sörbom, du Toit, & du Toit, 2000). For the AIC smaller values indicate better fit. Items with regression weights below 0.30 were considered not to be a fit (Byrne BM. 2001).

The concurrent validity of the SDQ was tested by computing the Pearson product–moment correlation between the SDQ total and internalzing and externalizing subscale scores and the corresponding CBCL scores. In addition the association of SDQ total difficulties score with variables expected to be related to it, including socioeconomic status and marital conflict, was assessed as an indicator of convergent validity (a sub-set of construct validity).

Data were analysed using Stata version 11.0 (Stata Corporation 2008).

3.4 RESULTS

Demographic characteristics of the study population

Sociodemographic characteristics included area of residence, ethnicity, maternal and paternal education and composite and proxy measures for socioeconomic status, as shown in **Table 1**.

Table 1: Sociodemographic characteristics

Sociodemographic characteristics	Percentage
Gender (boys)	51.6
Area of residence (rural)	85.8
Ethnicity	
Meskan	45.9
Mareko	13.5
Silti	23.9
Other	16.7
Maternal educational status (formal education)	20.5
Paternal educational status (formal education)	63.2
Assets (two or less than two "assets")	8.7
Composite SES score*(2 or more poverty indicators)	8.9

*2 or more indicators of poverty at 60 months (hungry in last month, indebted and/or subjective report of poorer relative wealth)

Mean SDQ scores

Table 2 and **Table 3** presents the frequencies of SDQ items and descriptive statistics for SDQ subscales and SDQ total score. Boys scored higher than girls on the conduct scale according to parent ratings ($p<0.00$). Most items that were positively worded had high levels of endorsement of "not true" responses, which may seem likely to be due to misunderstanding or measurement error.

Table 2: SDQ items frequency

	Frequency N (%)		
SDQ items	**Not true**	**Somewhat true**	**Certainly true**
SDQ 1: Considerate of other people's feelings	**552 (64.4)**	115 (13.5)	187 (21.9)
SDQ 2: Restless, overactive	525 (61.5)	222(26.0)	**107 (12.5)**
SDQ 3: Often complains of headaches, stomachache	502 (58.8)	285 (33.4)	67 (7.8)
SDQ 4: Shares readily with other children	140 (16.4)	287 (33.6)	427 (50.0)
SDQ 5: Often has temper tantrums	499 (58.4)	234 (27.4)	**121 (14.2)**
SDQ 6: Rather solitary	805 (94.3)	37 (4.3)	12 (1.4)
SDQ 7: Generally obedient	**362 (42.4)**	330 (38.6)	167 (19.0)
SDQ 8: Many worries, often seems worried	820 (96.0)	24 (2.8)	10 (1.2)
SDQ 9: Helpful if someone is hurt, upset or feeling ill	474 (55.5)	214 (25.1)	166 (19.4)
SDQ 10: Constantly fidgeting or squirming	704 (82.4)	104 (12.2)	46 (5.4)
SDQ 11: Has at least one good friend	**542 (63.5)**	98 (11.5)	214 (25.1)
SDQ 12: Often fights with other children	618 (72.4)	182 (21.3)	54 (6.3)
SDQ 13: unhappy	727 (85.1)	96 (11.2)	31 (3.6)
SDQ 14: Generally liked by other children	**536 (62.8)**	221 (25.9)	97 (11.4)
SDQ 15: Easily distracted, concentration wanders	619 (72.5)	197 (23.1)	38 (4.4)
SDQ 16: Nervous	578 (67.7)	176 (20.6)	**100 (11.7)**
SDQ 17: Kind to younger children	84 (9.8)	322 (37.7)	448 (52.5)
SDQ 18: Often lies or cheats	771 (90.3)	43(5.0)	40 (4.7)
SDQ 19: Picked on or bullied by other children	633 (74.1)	191 (22.4)	30 (3.5)
SDQ 20: Often volunteers to help others	259 (30.3)	289 (33.8)	306 (35.8)
SDQ 21: Thinks things out before acting	99 (11.6)	149 (17.4)	606 (71.0)
SDQ 22: Steals from home, school or elsewhere	817 (95.7)	25 (2.9)	12 (1.4)
SDQ 23: Gets on better with adults than with other kids	548 (64.2)	241 (28.2)	65 (7.6)
SDQ 24: Many fears, easily scared	578 (67.7)	216 (25.3)	60 (7.03)
SDQ 25: Good attention span	92 (10.8)	285 (33.4)	477 (55.8)

Table 3: Descriptive statistics for SDQ subscales and total difficulties score

SDQ subscales	**Total population**		**Females**	**Males**
	Median (range IQ)	**Mean (SD)**	**Median (range IQ) Mean (SD)**	**Median (range IQ) Mean (SD)**
SDQ Emotional Subscale	1 (8;2)	1.56 (1.65)	1(0;2)1.62 (1.66)	1(0;2)1.50(1.64)
SDQ Conduct Subscale	2 (8;2)	1.86 (1.61)	1(0;2)1.59(1.46)	2(1;3)2.12 (1.71)
SDQ Hyperactivity Subscale	4 (10;2)	4.10 (1.75)	4(3;5)4.00(1.73)	4(3;5)4.21(1.77)
SDQ Peer problems Subscale	2 (8;2)	1.90 (1.48)	2(1;3)1.92(1.47)	2(1;3)1.88(1.49)
SDQ Prosocial Subscale	5 (10;4)	5.03 (2.37)		
SDQ total score	9 (30;6)	9.43 (4.60)	9(6;12) 9.13 (4.51)	9(6;12) 9.72(4.68)

Internal consistency

As shown in **Table 4**, Cronbach's alpha coefficients for the parent SDQ scales demonstrate overall satisfactory internal consistency when the total difficulties score is considered (α: 0.69).

The internal consistency was lower for the subscales, with the emotional symptoms and prosocial subscales having moderate internal consistency (α: 0.53 and 0.59 respectively) and the peer problems subscale having the lowest Cronbach's alpha coefficient value (α: 0.26).

Table 4: SDQ internal consistency

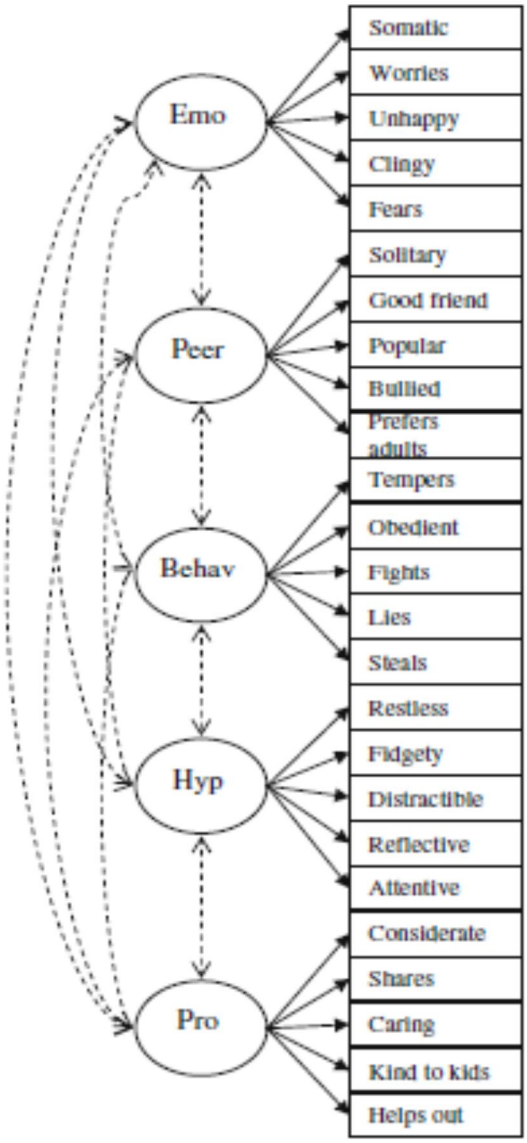
SDQ Scale	Subscale reliability correlations (α)	Item-test correlation
Total difficulties (SDQtot)	0.70	
Emotional symptoms (SDQ_emot)	0.53	SDQ 3: 0.56 **SDQ 8:0.32** SDQ 13: 0.61 SDQ 16: 0.70 SDQ 24:0.70
Conduct problems (SDQ_cond)	0.42	SDQ 5: 0.70 SDQ 7: 0.61 SDQ 12: 0.63 SDQ 18: 0.43 **SDQ 22: 0.25**
Hyperactivity-inattention (SDQ_hyper)	0.42	SDQ 2: 0.64 SDQ10: 0.56 **SDQ15: 0.39** SDQ 21: 0.63 SDQ 25: 0.50
Peer problems	**0.26**	**SDQ 6: 0.25** SDQ 11: 0.62 SDQ 14: 0.61 SDQ 19:0.43 SDQ 23: 0.51
Prosocial	0.59	SDQ 1: 0.68 SDQ 4: 0.61 SDQ 9: 0.59 SDQ 17: 0.54 SDQ 20: 0.64

Construct validity

We tested a 5-factor model, which is supported by both extant literature and previous empirical research. In the hypothesized model (**Figure 4**), the relationships among the

five problem-oriented factors are explained by their intercorrelations rather than by an overarching second order factor (the difficulties factor) as suggested originally by Goodman (1999). This model emphasizes the potential importance of the distinct symptom dimensions rather than of a general difficulties factor (e.g., Goodman, 2001;Hawes & Dadds, 2004;Koskelainen et al., 2001;Muris et al., 2003;Smedje et al., 1999).

Figure 4: SDQ Five-factor first order model.



Fit statistics for the model are presented in **Table 5**. The model provided moderate model-data fit according to the RMSEA and CFI.

Standardized factor loadings are presented in **Table 6**. A number of items across subscales have standardized factor loading below 0.40 (in bold).

Table 5: Fit statistics parameters

	Df	X^2	RMSEA (90%CI)	CFI	AIC	PCFI
5-factor lower-order model	261	1755,745	0.07 (0.07; 0.08)	0.56	1933.74	0.45

Table 6: Standardized factor loadings for SDQ items

Items		Standardized Factor Loadings
SDQ 13: unhappy	emotional	.615
SDQ 16: Nervous		.473
SDQ 24: Many fears, easily scared		.499
SDQ 3: Often complains of headaches, stomachache		**.294**
SDQ 8: Many worries, often seems worried		**.227**
SDQ 12: Often fights with other children	conduct	.506
SDQ 18: Often lies or cheats		**.256**
SDQ 22: Steals from home, school or elsewhere		**.087**
SDQ 5: Often has temper tantrums		.648
SDQ 7: Generally obedient		**-.333**
SDQ 2: Restless, overactive	hyperactive	.734
SDQ 10: Constantly fidgeting or squirming		.575
SDQ 15: Easily distracted, concentration wanders		**.283**
SDQ 21: Thinks things out before acting		**-.195**
SDQ 25: Good attention span		**-.062**
SDQ 6: Rather solitary	peer problems	**.057**
SDQ 11: Has at least one good friend		**-.362**
SDQ 14: Generally liked by other children		-.573
SDQ 19: Picked on or bullied by other children		**-.040**
SDQ 23: Gets on better with adults than with other kids		**-.090**
SDQ 1: Considerate of other people's feelings	prosocial	.430
SDQ 4: Shares readily with other children		.497
SDQ 9: Helpful if someone is hurt, upset or feeling ill		**.231**
SDQ 17: Kind to younger children		**.373**
SDQ 20: Often volunteers to help others		.698

Concurrent validity

Table 7 shows Spearman correlation coefficients between SDQ total, internalizing and externalizing problems, and corresponding CBCL scales.

Correlations between SDQ and CBCL were found to be low for mothers' ratings at the total scales and at the subscales level.

Table 7: Spearman correlation coefficients between SDQ and CBCL scales

SDQ Scales	CBCL Total Problems	CBCL Internalizing Problems	CBCL Externalizing Problems
Total Scale	0.20		
Internalizing Scale		0.13	
Externalizing Scale			0.19

Regression coefficients for the association between SDQ scores and other variables that are expected to be related, to the construct of child emotional and behavioural disorders,on the basis of available literature, are shown in **Table 8**.

Measures for socioeconomic status, indicators of marital conflict, and maternal exposure to violence were all associated significantly with SDQ total difficulties scores. Maternal education was not to be associated with SDQ total scores.

Table 8: Regression coefficients for variables expected to be associated with SDQ total scores.

Convergent validity	**Regression coefficients [95% CI]; p value**
	SDQ TOT
Maternal education	0.17 [-0.62;0.96]; 0.67
Perceived relative wealth	-0.35[-0.68;-0.03]; **0.03**
Debt	1.43[0.10;2.75]; **0.03**
Violence	0.01 [0.00;0.01] **0.01**
Quarrelling with husband	0.01[0.00;0.01]; <**0.001**
Relationship with husband	0.01[0.00;0,01]; <**0.001**

3.5 DISCUSSION

The assessment of the psychometric properties of the Amharic version of the Strengths and Difficulties Questionnaire in a large community-based sample of five years old children in Butajira showed satisfactory reliability and convergent validity for the total difficulties score, as reported in literature (Stone et al 2010; Janssens and Deboutte, 2009), but low internal consistency for all subscales and poor model fit when a 5-factor model was considered.

These results support the recommendation frequently reported in literature that SDQ total difficulties score should be used for screening purposes and in epidemiological studies, whereby the SDQ subscales should only be used as a clinical aid to inform care providers about strengths and weaknesses in children's functioning (Theunissen et al 2013; Mieloo et al 2014; Stone et al 2010).

All SDQ subscales presented inadequate internal consistency, as also reported in a recent review of studies investigating the psychometric properties of the SDQ (Stone et al., 2010). Cronbach's alpha coefficients obtained in our study are lower than the weighted mean reported by Stone, but consistent with findings in studies where different ethnic groups are included (Thabet et al., 2000).

It is important to consider that all subscales include only five items and that scales with smaller number of items are less reliable than scales with larger number of items (Streiner et al., 1989). It is also possible that these subscales measure more heterogeneous content than intended (Smedje et al., 1999; van Widenfelt et al., 2003). In addition, it has been argued that these low reliability coefficients may be due to several positively worded reverse-scored items located on the Conduct Problems and Peer Problems subscales (Muris et al., 2004).

Of note, the items that showed lowest items-test correlations in the emotional, conduct, and hyperactivity/inattention subscales are the ones that appear to be less relevant for the specific age group being considered in our study (“many worries”; “steals from home”) or less easily observed in children that are not yet in school (“easily distracted”). Recent studies investigating the validity of SDQ in pre-school child populations also reported non-satisfactory internal consistency for SDQ subscales (Mieloo et al 2014; Theunissen 2013).

Also in line with previous literature, the peer problems subscale has the lowest internal consistency coefficients. It has been hypothesized that peer problems scale may not reflect the same construct, as one item seems directly related to problem behaviour (“picked on or bullied by other children’’) while other items seem to reflect loneliness on the one hand (“rather solitary, tends to play alone”; “has at least one good friend”) and sociability on the other (“generally liked by other children”; “gets on better with adults than with other children”). It is also suggested that two reverse-scored items might be contributing to measurement error (Stone et al 2010; Palmieri and Smith 2007).

The total difficulties score of the SDQ was found to be significantly associated with indicators for socioeconomic status, as expected and as reported in other studies investigating convergent validity of the SDQ (Stone et al 2010). SDQ total score was also significantly associated with women’s exposure to violence and marital conflict, as expected. The association with maternal education was also assessed, as suggested by previous validity studies. However, the high illiteracy rate and low variance in educational level within the population limit the possibility of detecting an association.

The results of the confirmatory factor analysis from this study do not support a five-factor model. This finding contributes to the ongoing debate about the internal structure of the scale. Previous studies examining the SDQ's proposed factor structure have yielded mixed results. Although some investigators using exploratory techniques (Exploratory Factor Analysis) have essentially confirmed a five-factor structure with minimal cross-loadings observed among subscales (Becker et al. 2006; Goodman 2001; Smedje et al.1999; Woerner et al. 2004a), less satisfactory results have emerged from studies in which the confirmatory factor analysis was performed. In CFA studies conducted in Australia, models based on the hypothesised five factors did not show acceptable model fit for some or all indices considered (Ronning et al. 2004). Other CFA studies from Belgium did report adequate global fit, but also noted that loadings on several items were unacceptably low (<0.4) (Van Leeuwen et al. 2006). This problematic evidence from CFA studies across disparate settings suggests the possible value of considering alternative factor structures.

Differently from findings related to internal consistency, convergent validity and CFA, the assessment of criterion validity in the C-MaMIE study yielded results that diverge from previous literature. There are many possible explanations for the finding that the correlation between SDQ and CBCL was low, at both total scale and subscale level.

As reported above, the CBCL was adapted for use in Ethiopia, with modification of a number of items, and translated in Amharic, but has not been validated in the country. Hence, it is unsure whether it can be considered as "gold standard" for the purpose of this validity study. It is also important to consider that few studies have assessed the criterion validity of the SDQ in pre-school children. Common presentations of emotional and behavioural problems vary with age and certain items

in the SDQ are more appropriate for older children (e.g. the ones related to conduct problems). We used the version of the CBCL that was specifically adapted for pre-school children (for 1 ½-5 year old children) while the SDQ target children from 4-16 years of age. This may have contributed to the low correlation between SDQ and CBCL in our study. To our knowledge, this is the first study to assess the degree of correlation between CBCL 1 ½-5 years and SDQ 4-16 years.

Study limitations

The study presents a number of limitations. The difficulty in interpreting the results of the correlation between SDQ and CBCL has been discussed above. The scarcity of mental health specialists and human and financial resources for research in mental health hinder the possibility of validating the CBCL or other similar instrument in Ethiopia; it is likely that future studies will use SDQ for evaluation of child mental health outcomes. However, whenever possible, it would be important to re-assess criterion validity of the Amharic version of the SDQ with another locally validated instrument.

The longitudinal study design provides the opportunity to investigate predictive validity by assessing the extent to which SDQ total difficulties score predict future occurrences. This is an important parameter that has been explored in only few studies.

Concerning construct validity, we only assessed the fit of observed data to the proposed 5-factor model. It will be important in the future to conduct confirmatory factor analysis to test alternative models that have emerging empirical and theoretical support.

4. PART II: THE C-MAMIE STUDY

4.1 INTRODUCTION: MATERNAL DEPRESSION AND OTHER EARLY LIFE RISK FACTORS FOR ADVERSE CHILD MENTAL HEALTH OUTCOMES.

The association between maternal depression and a range of adverse child behavioural and emotional outcomes has been documented in numerous studies and reviews (Goodman et al 2011; Goodman et al 2007; National Research Council and institute of Medicine 2009). It has been shown that, by middle childhood, children with depressed mothers have significantly higher rates of internalizing and externalizing problems relative to children whose mothers are not depressed.

Emerging evidence shows that maternal depression is also related to heightened negative emotionality and low positive emotionality in children, both of which may predispose them to depression (Klein et al 2009).

There are likely to be multiple complex pathways through which maternal depression is associated to negative mental health outcomes in the offspring, including genetic, neurobiological (e.g. dysregulated stress regulation systems), psychological (e.g. insecure attachment), and social (e.g. modelling) pathways. There are potentially different models of risk for different child outcomes. Furthermore, a number of factors are likely to moderate the intergenerational effects of maternal depression.

The mental health of children is influenced by genetic and biological factors, that is determinants that persons are born or endowed with, including chromosomal abnormalities (e.g. Down syndrome), and by a range of factors related to the family context, including their opportunity to experience secure attachment and responsive care and engage positively with family members (Kieling et al 2011). The wider socioeconomic and geopolitical environment in which families live has also an impact

on children's wellbeing. Living in poverty has been found to be a significant predictor of mental health problems in children (Pound et al 1985).

Children of depressed mothers are more likely to be exposed to other risk factors for adverse mental health outcomes, including poverty, violence, parental alcohol and substance abuse, and marital discord. Available evidence suggests that these family characteristics moderate, but do not fully account for, the association between depression in mothers and children's mental health outcomes (Goodman et al 2011; Barker et al 2012). Furthermore, the additive effect of exposure to multiple risk factors and chronic adversities in childhood, including maternal depression and marital conflict, has been documented (Essex et al 2003).

However, the understanding of developmental pathways and the mediating role of a range of covariates related to behavioural and emotional outcomes in children of depressed mothers is still limited (Goodman, 2014).

Available evidence suggests that timing of exposure, chronicity and severity are important features of maternal depression in relation to child mental health outcomes. Consistent with the theory of 'sensitive' time periods in child development, effects sizes for the associations between depression in mothers and children's internalizing and externalizing problems, and general psychopathology, are stronger for younger children (Goodman et al 2011). Research suggests the notion that the first year is critical (Campbell et al 2009; Hay et al 2003; Murray et al 1999). Developmental frameworks that emphasize emotional security (Daviesand Cummings, 1994), and more generally attachment (Cicchetti et al., 1998), as importantat precursors of child mental health provide theoretical support. It is also important to consider that women who report symptoms when children are young are

likely to continue to report such symptoms during early childhood (Horwitz et al 2000).

A small number of longitudinal studies have shown that children of mothers with more chronic depression have worse emotional and behavioural outcomes at age five (Campbell et al 1995; Teti et al 1995; Brennan et al 2000). Recurrent depression episodes are more likely in women with severe depression, who have greater impairment in functioning and may be less available to children.

Concurrent maternal depressive symptoms appear also to be predictive of behavioural problems in children (Brennan et al 2000).

Our study aims to contribute to unfolding the role of maternal depression as risk factor for child mental health outcomes at five years of age, taking into account the mediating and counfounding role of other maternal and family factors in the Ethiopian context. The longitudinal study design will be instrumental to explore issues related to timing and chronicity of depressive symptoms.

4.2 OBJECTIVES

Parts I of this thesis was concerned with establishing the cultural validity of a measure of behavioural and emotional problems in pre-school children. Building on this, in Part II details will be presented of the population-based cohort study conducted to investigate early life risk factors for childhood emotional and behavioural problems. Specifically, the study set out to examine the relationships between early life exposure to maternal common mental disorders and other risk factors, and the presence of behavioural and emotional disorders in children aged five years in Butajira, Ethiopia.

4.3 METHODS

4.3.1 Study design

Population-based cohort study (Childhood-Maternal Mental Illness in Ethiopia; *C-MaMiE* study).

4.3.2 Site

The ongoing C-MaMie study is located in the demographic surveillance site (DSS) of the Butajira Rural Health Programme (Berhane et al 1999), Ethiopia.

4.3.3 Sample

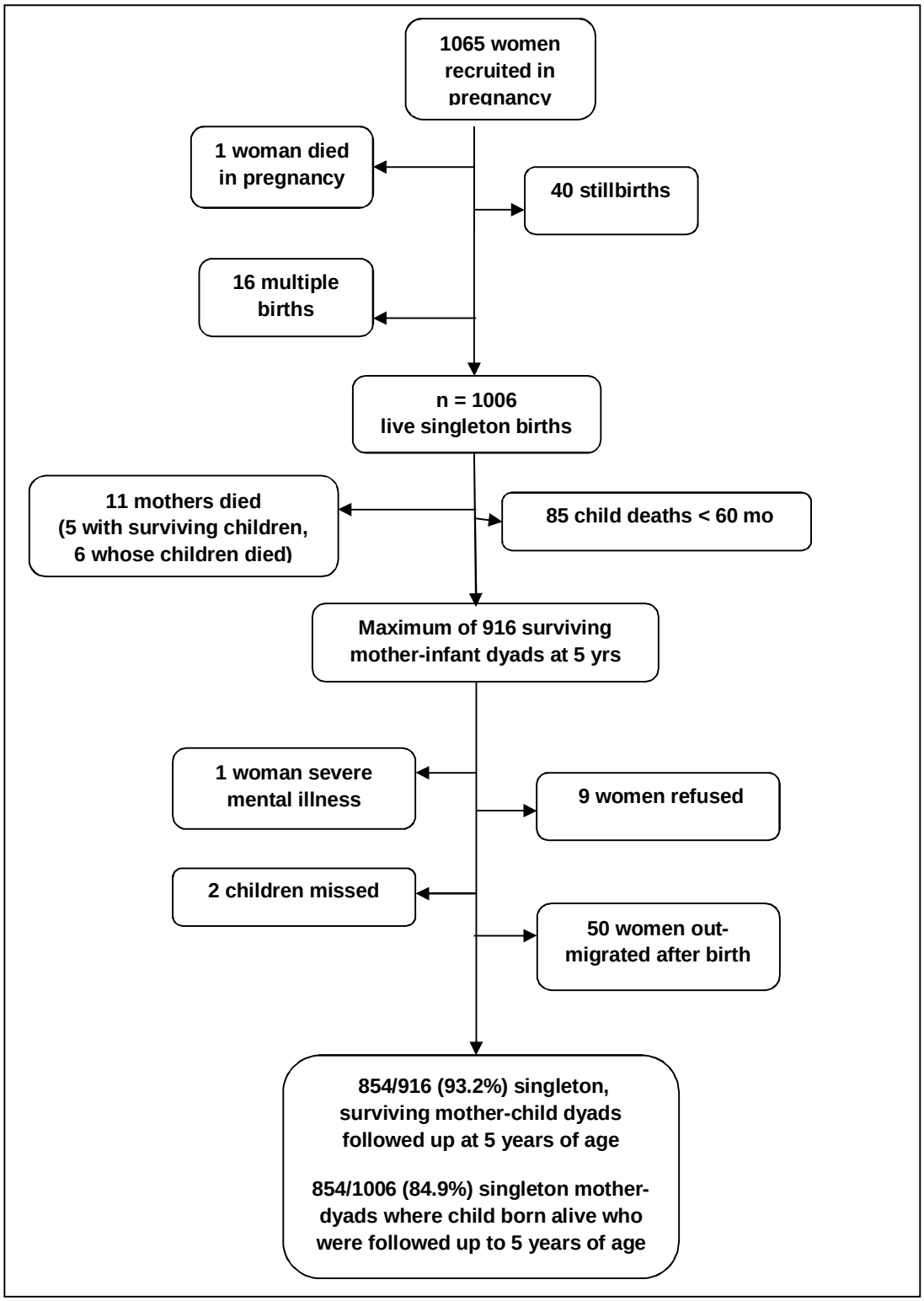
Eligible women were between the ages of 15 and 49 years, able to speak Amharic (the official language of Ethiopia), living in the DSS and in the third trimester of pregnancy during the study recruitment period (July 2005 to February 2006). Women were identified by the Butajira Rural Health Programme (BRHP) enumerators in the course of their 3-monthly surveillance interviews and, after giving informed consent, were interviewed by the project data collectors.

Of eligible pregnant women, 1065 (86.3%) were successfully recruited. Non-recruited women did not differ significantly from participating women in terms of age, religion, ethnicity, level of literacy, or location of residence (Hanlon et al., 2009a).

Women were excluded if they had a stillbirth, multiple birth or if the infant or child died before the age of five years.

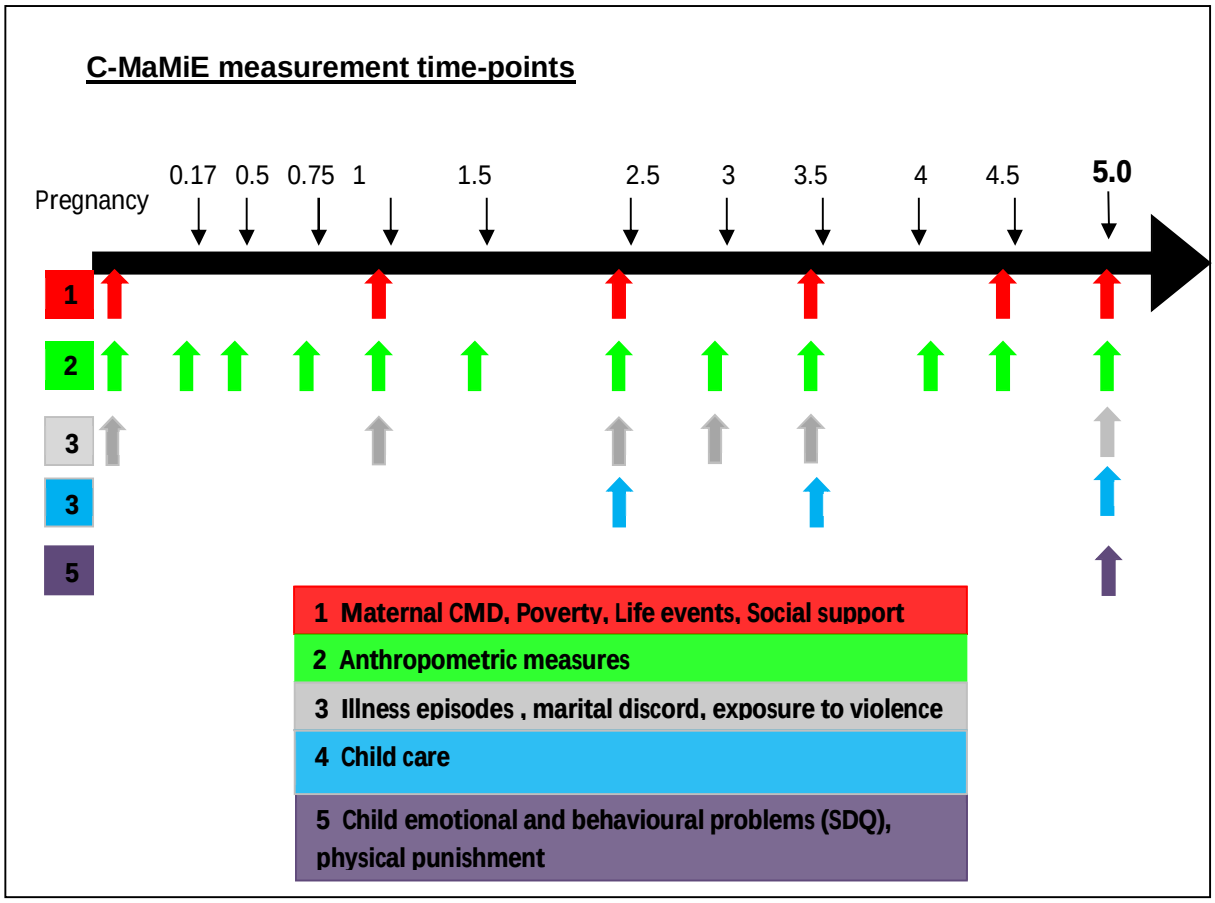
A flow diagram of follow-up of the C-MaMiE cohort is shown in Figure. Of the 1065 women recruited in pregnancy, 40 women had stillbirths and a further 85 children died during the first five years. There were 15 pairs of twins and one set of triplets who were excluded from further analysis. Almost all surviving, singleton mother-child dyads were followed up at five years of age: 854/916 (93.2%).

Figure 5: Flowchart of women-child dyads followed up to 5.



4.3.4 Measurement time-points

Participating women and their children were assessed at several time points, from pregnancy to five years of age in the children.



Key outcome:

a) Child emotional and behavioural problems:
The Strengths and Difficulties Questionnaire (SDQ

Primary exposures:

a) Maternal common mental disorders:
High SRQ-20 score 2 months postnatal ('postnatal') and at two or more other time-points ('recurrent').

Other risk factors and potential confounders:

a) *Maternal CMD:* 'concurrent maternal CMD' – SRQ-20 score at 5 years.
b) Anthropometric measures: Child weight and height.
c) Poverty: Self-report of hunger in preceding month, low relative wealth, indebtedness, lack of emergency financial resources.
d) *Exposure to stressful life events:* The list of threatening experiences has been adapted for use in Ethiopia
e) *Marital discord:* Self-report of quarrelling, violence, insufficient support and husband's substance misuse.

4.3.5 Data collection

The project data collectors were local women with completed high school education. The data collectors were trained for a minimum of one week in questionnaire administration. The project data collectors carried out assessments at the pregnancy and early childhood time-points.

BRHP enumerators, community health agents and traditional birth attendants carried out the assessment shortly after birth.

Assessments were conducted in the homes or immediate vicinity of participating women, with every attempt made to ensure privacy.

4.3.6 Data Quality

Data were checked in the field by supervisors and usually double-entered on the day of collection using Epidata (Lauritsen and Bruus 2003). Women were re-interviewed within one week if data were missing. Quality checks, involving re-interviewing women and sitting in to observe interviews, were performed by the supervisors and project co-investigators throughout the period of data collection.

A committee of in-country collaborators met regularly (approximately two-monthly) in Addis Ababa to oversee conduct of the project.

4.3.7 Measures

All questionnaires were translated into Amharic and piloted to ensure acceptability, validity and feasibility.

Exposure variables: Maternal postnatal and recurrent common mental disorders (CMD)

CMD symptoms were measure using the Self Reporting Questionnaire-20 (SRQ-“=; Beusenberg and Orley, 1994). This 20-item scale asks about depressive, anxiety

and somatic symptoms present in the preceding month. This measure has been used in previous Ethiopian community-based studies (Alem et al 1999), but wwas extensively pre-validated for use in perinatal women in the Butajira population (Hanlon et al 2008). A cut-off of >=6 wsa shown to have convergent validity as indicator of CMD casesness, associated with expected predictors of CMD.

Postnatal CMD symptoms (SRQ-20) were measured between 4 and 23 weeks after birth; 89.5% between 4 and 12 weeks, 1.7% over 16 weeks.

"Cumulative maternal postnal CMD" was defined as the number of postnatal time-points at which the woman scored 6 or more on the SRQ-20, excluding the 5 year time-point.

Women that scored 6 or more on the SRQ-20 at 2 or more time-points have "recurrent CMD".

Outcome variable: Child emotional and behavioural problems

Child emotional and behavioural problems as defined by the total score of the Strengths and Difficulties Questionnaire (0-40).

Exploratory exposures and potential confounding variables

Sociodemographic factors

Maternal age:	Age in pregnancy (in years)
Ethnicity[a]*:*	Self-ascribed ethnic group. Meskan, Silti, Mareko, Sodo, Oromo, Dobi, Welene, Amhara or other, recategorised as Meskan, Silti, Mareko or other.
Religious affiliation[b]*:*	Muslim, Ethiopian Orthodox Christian, Protestant Christian, Catholic.
Urban residence	Living in Butajira town vs. a rural sub-district
Marital status	Marital status of woman at 5 year time-point

[a, b] Categories used by Butajira Demographic Surveillance Site

Socioeconomic status

Maternal educational status[a]	Whether or not received any formal education
Assets[b]	Possession of assets (ownership of land, home, business, crops, animals, bed, television, radio, cooker,jewellery or other items of value). Number of assets and difference in asset score from 3.5 yers to 6 years time points
Relative wealth[c]	Perceived level of household wealth relative to others (lower vs. the same or greater)
Food insecurity[d]	Hunger in the preceding month due to lack of money
Indebtedness[d]	Debt that unable to pay
Composite SES score	Number of time-points (postnatally, excluding 60 month time-point) having 2 or more poverty indicators (hungry in last month, indebted and/or subjective report of poorer relative wealth-0 to 6)

[a-d]Indicators of poverty previously utilised by the Butajira Demographic Surveillance Site.

Conflict in the home, exposure to violence and stressful life events

Marital discord	Assessed with the following variables: Husband not providing enough help, relationship 'average, bad or very bad' (compared to good or very good)[f], sometimes or often quarrel[f] and perceiving that the husband drank too much alcohol. A 'marital discord scale' of these four items was confirmed using Mokken analysis (Loevinger H coefficient 0.35).
Exposure to violence	Reported experience of violence by women Dichotomised variable for sum of exposure to

	violence across all time-points .
Stressful life events	The original list of threatening experiences (LTE) (Brugha et al. 1985) provides a measure of 12 life event categories associated with long-term threat. The LTE was translated into Amharic, adapted for local conditions and the time-frame restricted to the current pregnancy. Number of time-points (excluding 5 yrs) at which woman experiences 2 or more life events.

Child care and child rearing practices

Main carer	Mother not the main carer at 5 years
Physical punishment	Child physically punished at least twice in preceding week at either or both the 2.5 and 3.5 year time-points.
Family support with childcare	Less than weekly support from any family member at 2 time-points; weekly support or more from family at the 5 year time-point.

Child factors

Gender	Female gender
Stunting	Height for age standardised z score at 5 years of age
Illness episodes	Number of postnatal time-points (excluding 5 years) at which the mother thought the baby was going to die because of illness
Weight at birth	Birthweight

4.3.8 Data management

All questionnaires were anonymised and kept in a locked cupboard. A file linking participant details with the identification number was kept in a separate locked location. Data were exported from the double-entered Epidata files (Lauritsen and Bruus 2003) into Stata/SE version 12 for Windows (StataCorp 2008). Details of recoding of variables were saved in Stata 'do' files.

4.3.9 Ethical considerations

Ethical approval was obtained from the Research Ethics Committees of the Ethiopian Science and Technology Agency (Ethiopia) and other collaborating institutes. All women provided informed consent for the study. Participants were reimbursed for any health care costs for themselves and their children from recruitment until five years postnatal, and were referred for mental health care where indicated.

4.3.10 Study power

With a sample size of 850, with alpha of 0.05, the smallest detectable relative risks (RR) for different levels of outcome prevalence and power were as follows:

Exposure prevalence	Outcome prevalence (SDQ cases) among unexposed	Smallest detectable RR	
		80% power	90% power
Postnatal maternal CMD =6%	8%	2.75	3.12
	12%	2.33	2.58
	15%	2.14	2.34
Antenatal maternal CMD =12%	8%	2.23	2.48
	12%	1.94	2.11
	15%	1.81	1.95

The prevalence of child mental disorder measured using SDQ varies (Elhamid et al 2008; Almaqrami et al 2004), tending to be higher in very low socio-economic

settings (Mullick et al 2001), indicating that our power estimates are conservative. Given that we hypothesise a linear effect of maternal SRQ on risk for child mental disorder, and will be parameterising maternal SRQ as an ordinal scale, the power to detect a meaningful effect will be even greater than that suggested by these calculations based upon a dichotomised exposure.

4.3.11 Data analysis

Initially descriptive analyses were carried out. For categorical variables, percentages were calculated. For continuous variables, histograms were plotted and indicators of central tendency calculated: mean (and standard deviation) for normally distributed variables and median (25^{th} and 75^{th} centiles) for skewed data. Appropriate cross-tabulations and scatter plots were used to identify any outlying data points. These were then checked against the original data set to identify any data entry errors, and the data was corrected accordingly.

The associations between exposures (SRQ-20 score during the postnatal period and cumulative SRQ-20 score) and outcome (SDQ total score at 5 year time point) variables were assessed. For both exposures, the coefficients for the association between SRQ-20 score and SDQ total score are presented after (1) separate adjustments for groups of covariates, (2) full adjustment for all covariates.

STATA version 12 software was used for data analysis (StataCorp, 2008).

4.4. RESULTS

Characteristics of the recruited woman-child dyads and their living circumstances are presented in **Table 9**. The Butajira area is ethnically diverse, although predominantly Muslim in religion. Most participating women were non-literate and residing in rural areas.Very few women were unmarried (3.6%).

The majority of the mothers of children at age five years reported being the main carer for their children (56.9%) and almost one-third of women (28.0%) reported that they were not receiving regular help (at least weekly) from family members with tasks related to child care .

Nearl one quarter (22.3%) of women reported that the child was physically punished at least twice in the preceding week at either or both the 30 months and 42 months time-points.

The majority of women (66.3%) reported marital difficulties.

The prevalence of CMD (SRQ-20 score>=6) was slightly higher in the post-natal period (5.4%) than at the five year time-point (4.1%). Overall levels of CMD symptoms (total SRQ-20 score) at five years were associated significantly with postnatal CMD symptom score: the beta coefficient of CMD symptoms at five years for each unit increase in postnatal CMD symptoms was 0.19 (95%CI 0.14, 0.24).

Of note, only 7% of mothers presented with recurrent CMD symptoms (SRQ score higher than six on at least two time-points), which means that 53% of women who reported CMD at least once scored positive at the SRQ-20 at least in another occasion during the first five years of the life of their child.

Table 9 Characteristics of cohort of mother-children dyads	**N(%) or mean (SD)**
Sociodemographic factors	
Maternal age (years)	Mean 26.9 (SD 6.39)
Ethnicity	Meskan: 480 (45.9) Mareko: 141 (13.5) Silti:250 (23.9) Other: 175 (16.7)
Religious affiliation	Muslim:813 (77.7) Orthodox Christian: 159 (15.2) Protestant/Catholic: 74 (7.1)
Rural residency	897 (85.8)
Marital status	Married monogamous: 822(78.6) Married polygamous: 186 (17.8) Single/divorced/widowed: 38(3.6)
Socioeconomic status	
Maternal education (received formal education)	214(20.5)
Two or more indicators of poverty at 60 months	85 (8.9)
Number of time-points (excluding 60 month time-point) having two or more poverty indicators	Never: 583 (64.6) 1 time-point: 171 (18.9) >=2 time-points: 148 (16.4)
Conflict in the home, exposure to violence and stressful life events	
Marital difficulties	Never: 290 (33.7) 1 time-point: 269 (31.2) >=2 time-points: 302 (35.1)
Women's exposure to violence	77 (8.2)
Stressful life events	Never: 581 (64.2) 1 time-point: 218 (24.1) >=2 time-points: 106 (11.7)
Child care and child rearing practices	
Mother main carer	486 (56.9)
Reported physical punishment twice or more in preceding week	Never: 671 (77.8) 1 time-point:155 (18.0) 2 time-points: 37 (4.3)
Family support at least weekly at five years	237 (27.8)
Less than weekly support at two time-points	265 (830.7)
Child characteristics	
Child's gender (boys)	539 (51.6)
Birth weight (grammes)	Mean 3006 (SD 405.27)
Number of time-points at which mothers reported being worried that child was so sick that was going to die	Never: 124 (15.0) 1 time-point: 225 (27.3) 2 time-points: 197 (23.9) >=3 time-points: 278 (33.7)
Height for age at 5 years	-1.92 (0.98)
Mothers' characteristics	
SRQ-20 >=6 at 60 months	39 (4.1)
SRQ-20 >=6 at 2 months	56 (5.4)
Number of time-points at which SRQ-20 >=6	Never: 757 (80.1) 1 time-point: 123 (13.0) >=2 time-points: 65(6.9)

Table 10 shows unadjusted association between a number of exploratory variables and SDQ total score at five years of age.

The presence of child emotional and behavioural problems at five years is significantly associated with women's report of adverse life events, exposure to violence, and low socioeconomic status during early childhood, but it is not associated with women's report of marital difficulties. Mothers of children with high SDQ score at five year were more likely to have symptoms of common mental disorders at the time of assessment and to work outside of the house for five or more days per week.

Mothers who reported severe childhood illnesses and parental use of physical discipline at several time-points during early childhood were more likely to have children with emotional and behavioural problems at five years of age.

Child' gender and stunting were not associated with the SDQ total score at five years.

Table 10 Unadjusted associations between exploratory variables and SDQ total score at five years of age.

Exploratory variables	**Beta coefficient (95% CI)**
Child gender	-0.59(-1.20;0.03)
Two or more poverty indicators at five years	0.44 (-0.67; 1.56)
Time-points at which two or more poverty indicators are reported	0.45 (0.15;0.75)**
Exposure to violence	1.39 (0.27;2.52)*
Marital difficulties at five years	-0.65(-2.06; 1.18)
Marital difficulties at two or more time points	0.57 (-0.52;1.20)
Number of time points at which 2 or more adverse life events reported	0.91 (0.70; 1.76)*
Reported physical punishment twice or more in preceding week	1.98 (0.61;3.36)**
Mother full time employee at 5 years of age	1.60 (0.97;2.29)**
Severe child illness	1.27 (0.64;1.89)**
Child's height for age	-0.99(-0.45;0.25)
SRQ total score >=6 at 5 years	4.26 (2.66;5.87)**

*p< 0.05; ** p<0.01

Table 11 shows the unadjusted associations between recurrent and postnatal common mental disorders, as measure by SRQ-20, and SDQ total difficulties score when children are five years old. Beta coefficients for the associations adjusted separately for concurrent maternal depression and other potential confounders are also provided, along with the fully adjusted model.

Postnatal maternal common mental disorders and recurrent maternal common mental disorders are significantly associated with behavioural and emotional problems in the offspring at five years of age. Both associations remain significant after adjusting for concurrent maternal common mental disorders and other potential confounders.

Table 1. Bivariate and multivariable analysis of associations between postnatal CMD and recurrent CMD in mothers (as per the SRQ-20 scores) and the SDQ score at five years of age.

	Beta coefficient for association between Recurrent SRQ-20 and SDQ Total Score (95% CI)	Beta coefficient for the association between Postnatal SRQ-20 and SDQ Total Score (95% CI)
Crude	0.89 (0.46; 1.32)**	0.32 (0.19; 0.44)**
Association adjusting for:		
SRQ-20 at 5 years	1.61 (0.47;2.76)**	0.26 (0.14;0.39)**
Maternal education	2.09(0.95;3.24)**	0.32 (0.19;0.44)**
Child height for age	2.89 (1.60;4.18)**	0.31(0.18;0.45)**
Time-points at which two or more poverty indicators are reported	1.74(0.57;2.91)**	0.29 (0.16;0.42)**
Two or more poverty indicators at five years	1.91 (0.74;3.09)**	0.31(0.18;0.44)**
Child illness	1.80 (0.66;2.95)**	0.29(0.16; 0.41)**
Exposure to violence	2.02 (0.79;3.26)**	0.31(0.18;0.43)**
Stressful life events [g]	1.86 (0.66;3.07)**	0.30 (0.17;0.43)**
Marital difficulties at two or more time points	1.94(0.78;3.11)**	0.31(0.18;0.43)**
Physical punishment[h]	1.87 (0.72;3.03)**	0.31 (0.18; 0.44)**
Fully adjusted model	1.50 (0.08;2.92)*	0.22 (0.07;0.36)*

*p< 0.05; ** p<0.01 [g] number of time points at which 2 or more adverse life events reported
[h] Reported physical punishment twice or more in preceding week

4.5 DISCUSSION

Findings from the C-MaMiE study provide support for a multiple risks model of child mental health. Factors significantly associated with emotional and behavioural outcomes in our study included (a) adverse contextual factors, such as poverty, recurrent use of physical disciplinary methods, (b) maternal factors, such as maternal depression and mother's exposure to violence and stressful life events, and (c) child factors, such as severe child illness. These findings are consistent with available literature (Goodman et al 2011; Barker et al 2012). The longitudinal study design allowed us to contribute to the limited evidence on the effect of chronic exposure to these risk factors. Of note, children living in poverty throughout their first five years were more likely to experience emotional and behavioural problems at five years while reporting of poverty at five years was not significantly associated with adverse child mental health outcomes.

We explored the role of timing and chronicity of exposure to maternal common mental disorders.

Common mental disorders in the postnatal period, recurrent maternal CMD and concurrent maternal CMD symptoms were all are significantly associated with emotional and behavioural problems in children at five years of age, after adjusting for a comprehensive range of potential confounders.

Previous studies found similar significant associations between maternal depressive symptoms and concurrent child behaviour problems (Josefsson et al 2007; Brennan et al 2000). It has been proposed that this could be a result of lack of parental support or the mother being a poor role model (Agnafors et al 2013). Transactional

interactions whereby challenging behaviours in children increase the likelihood of mood disorders in mothers have also been suggested.

Our findings support the notion that postnatal maternal depression and concurrent maternal depression have independent effects on child mental health outcomes that cannot be fully explained by ongoing maternal depression or by adverse family and contextual factors that are likely to co-occur in families of depressed mothers. These findings are in agreement with previous theoretical frameworks and empirical research (Goodman et al 2011) and are an important contribution to the limited evidence available from longitudinal studies.

Contrary to our expectations, marital difficulties during early childhood were not found to be significantly associated to emotional and behavioural problems in children at five years of age. Previous studies showed that children exposed to interparental conflict are more vulnerable to both externalizing and internalizing problems and that the effects of marital conflict vary by developmental stage and child gender (Kelly, 2000). Infants and toddlers exposed to marital conflict evidenced more insecure attachments, while older children showed internalizing problems and externalizing problems and academic and social difficulties, with a preponderance of emotional problems in girls (Cummings and Davies, 1994; Essex et al 2003).

In the C-MaMiE cohort, 66% of women reported marital discord and dissatisfaction with the support received by husbands. Hence we suggest that the measure adopted to capture this potential risk factor was unable to discriminate families with severe marital discord.

At the level of the child, stunting, childhood illness and gender were considered.

Our study failed to demonstrate an association between anthropometric measures (child height for age) at five years and child behavioural and emotional problems in children.

Theoretical models linking nutritional deficiencies and child mental health have been proposed (Wachs 2009; Black 2009). It has been proposed that nutritional deficiencies in infancy and childhood can influence the central nervous system structural development and the development of neurotransmitter systems (Levitsky et al 1995).

Available evidence suggests that early nutritional deficiencies can influence the quality of parent-child and lead to insecure attachments and inhibited or “difficult” temperament patterns in infancy and childhood (Meeks Gardner et al 1999; Wachs et al 1992). Both insecure attachments and inhibited or difficult temperament patterns, in turn, significantly increase the risk of later adjustment disorders. However very little evidence is available and mainly focusing on iron and zinc deficiencies (Wachs 2009).

Results from a few studies conducted in low- and middle-income countries have reported that infants with moderate-to-severe growth retardation are significantly more likely to be insecurely attached than are infants with more adequate growth (Valenzuela 1990; Solomon et al 1999). Further studies will be required to better understand the complex link between nutrition-child mental health, which has very important implications for preventive interventions for at risk populations in low-resource settings.

Gender did not result to be significantly associated with behavioural and emotional problems in our sample of pre-school children. This finding is consistent with

previous studies suggesting gender differences only in older age groups (Sheeber et al 2002).

Limitations

The study has several limitations.

The SDQ total difficulties score was the only measure of child mental health outcomes used. Since the preliminary validity study showed inadequate internal consistency for the SDQ subscales they were not used. It will be important in the future to explore the effect of maternal depression and other risk factors on specific behavioural and emotional outcomes and their precursors.

The fact that mothers acted as informants about the presence of behavioural and emotional problems in children may have introduced a bias. There has been debate over the potential negative bias of depressed mothers' reports of their children's psychological functioning. Available evidence provides only small to moderate support for an association between maternal depression and mothers' tendency to over-report child behavioural problems (Fergusson et al 1993; Boyle and Pickles 1997). In order to address this concern, we considered 'concurrent' depression as a potential confounding.

We were unable to take into account psychiatric co-morbidity in mothers and paternal psychopathology that may have a moderating role (Foley et al 2001).

The C-MaMIE study was not design to provide insight into the role of genetics in transgenerational transmission of psychopathology. Studies with genetically informed designs and that include measures of neuroendocrine stress levels are needed to clarify potential mechanisms.

5. CONCLUSION

The first part of the study assessed the psychometric properties of the Amharic Strengths and Difficulties Questionnaire in a large community-based sample of 5 years old children in Butajira. It established the usefulness of SDQ total difficulties score as measure of child mental health outcomes in epidemiological studies.

The finding has also important clinical implications as the SDQ can potentially be used as clinical aid and screening instrument in health care and school settings in Ethiopia.

The second part of the study explored the role of maternal common mental disorders and other contextual adversities during childhood as predictors of emotional and behavioural outcomes in five years old children.

Maternal common mental disorders and exposure to a range of contextual factors early in life resulted to be associated with adverse child mental health outcomes in pre-school children. Both timing of exposure and recurrence/chronicity of exposure appear to be important determinants.

These findings, along with evidence about frequent co-occurrence of poverty and other adversities in depressed mothers, support the importance of implementing targeted preventing intervention for vulnerable families. As maternal postnatal depression has an independent effect on child mental health and predicts maternal depression in subsequent years, the postnatal period is an optimum period to identify mothers and children at risk and provide interventions, including parenting skills training, that have the potential to improve women's wellbeing and children developmental trajectories.

Bibliography

Achenbach, Thomas M., *Manual for the Child Behavior Check List 14-18 and 1991 Profile* (Department of Psychiatry, University of Vermont, 1991)

Achenbach, Thomas M., Andreas Becker, Manfred Döpfner, Einar Heiervang, Veit Roessner, Hans-Christoph Steinhausen, and others, 'Multicultural Assessment of Child and Adolescent Psychopathology with ASEBA and SDQ Instruments: Research Findings, Applications, and Future Directions', *Journal of Child Psychology and Psychiatry*, 49 (2008), 251–275 <doi:10.1111/j.1469-7610.2007.01867.x>

Achenbach, Thomas M., and Leslie A. Rescorla, *Manual for the ASEBA School-Age Forms & Profiles: An Integrated System of Multi-Informant Assessment* (Research Center for Children, Youth, & Families/Achenbach System of Empirically Based Assessment (ASEBA), 2001)

Agnafors S., Sydsjo G, Keyser L, Svedin C. Symptoms of Depression Postpartum and 12 years Later-Associations to Child Mental Health at 12 years of Age Matern Child Health J (2013) 17:405–414

Akaike, Hirotugu, 'Factor Analysis and AIC', *Psychometrika*, 52 (1987), 317–332 <doi:10.1007/BF02294359>

Almaqrami, Mohammed H, and Abdullah Y Shuwail, 'Validity of the Self-Report Version of the Strengths and Difficulties Questionnaire in Yemen', *Saudi medical journal*, 25 (2004), 592–601

Association, American Psychiatric, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition: DSM-IV* (American Psychiatric Pub, 1994)

Bangirana, Paul, Noeline Nakasujja, Bruno Giordani, Robert O Opoka, Chandy C John, and Michael J Boivin, 'Reliability of the Luganda Version of the Child Behaviour Checklist in Measuring Behavioural Problems after Cerebral Malaria', *Child and adolescent psychiatry and mental health*, 3 (2009), 38 <doi:10.1186/1753-2000-3-38>

Barker, Edward D., William Copeland, Barbara Maughan, Sara R. Jaffee, and Rudolf Uher, 'Relative Impact of Maternal Depression and Associated Risk Factors on Offspring Psychopathology', *The British Journal of Psychiatry*, 200 (2012), 124–129 <doi:10.1192/bjp.bp.111.092346>

Becker, Daniel F., Thomas H. McGlashan, and Carlos M. Grilo, 'Exploratory Factor Analysis of Borderline Personality Disorder Criteria in Hospitalized Adolescents', *Comprehensive Psychiatry*, 47 (2006), 99–105 <doi:10.1016/j.comppsych.2005.07.003>

Berhane, Yemane, Stig Wall, Derege Kebede, Tobias Andersson, Negussie Deyessa, Ulf Högberg, and others, 'Establishing an Epidemiological Field Laboratory in Rural Areas - Potentials for Public Health Research and Interventions The Butajira Rural Health Programme 1987-1999', *The Ethiopian Journal of Health Development*, Ethiop. J. Health Dev. 1999; Supplement (1999)

Black, Maureen M., and Usha Ramakrishnan, 'Introduction', *The American Journal of Clinical Nutrition*, 89 (2009), 933S–934S <doi:10.3945/ajcn.2008.26692A>

Bollen, Kenneth A., and J. Scott Long, *Testing Structural Equation Models* (SAGE, 1993)

Boyle, M. H., & Pickles, A. R. (1997). Influence of maternal depressive symptoms on ratings of childhood behavior. Journal of Abnormal Child Psychology, 25, 399–412.

Brugha, Traolach S., Paul E. Bebbington, Christopher Tennant, and Jane Hurry, 'The List of Threatening Experiences: A Subset of 12 Life Event Categories with Considerable Long-Term Contextual Threat', 1985 <https://lra.le.ac.uk/handle/2381/261> [accessed 11 February 2014]

Byass, Peter, Mesganaw Fantahun, Anders Emmelin, Mitike Molla, and Yemane Berhane, 'Spatio-Temporal Clustering of Mortality in Butajira HDSS, Ethiopia, from 1987 to 2008', *Global Health Action*, 3 (2010) <doi:10.3402/gha.v3i0.5244>

Byrne, Barbara M., *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming* (Psychology Press, 2001)

Campbell SB, Cohn JF, Meyers T (1995), Depression in first-time mothers: mother–infant interaction and depression chronicity. Dev Psychol 31:349–357

Campbell, S. B., Morgan-Lopez, A. A., Cox, M. J., & McLoyd, V. C. (2009). A latent class analysis of maternal depressive symptoms over 12 years and offspring adjustment in adolescence. Journal of Abnormal Psychology, 118(3), 479–493.

Central Statistical Agency, and ORC Macro, *Ethiopia Demographic and Health Survey 2005* (Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Authority and ORC Macro, 2006)

Cicchetti, D., Rogosch, F., & Toth, S. (1998). Maternal depressive disorder and contextual risk: Contributions to the development of attachment insecurity and behavior problems in toddlerhood. Development and Psychopathology, 10, 283–300.

Cohen, Jacob, *Statistical Power Analysis for the Behavioral Sciences (rev. Ed.)* (Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc, 1977)

Cronbach, Lee J., 'Coefficient Alpha and the Internal Structure of Tests', *Psychometrika*, 16 (1951), 297–334 <doi:10.1007/BF02310555>

Cummings EM, Davies PT (1994), Maternal depression and child development. J Child Psychol Psychiatry 35:73–112

Department of Economic and Social Affairs. Statistics Division, *World Statistics Pocketbook, 2013 Edition*, World Statistics Pocketbook, V (New York: United Nations, 2013), XXXVII

DiGirolamo, Ann M., and Manuel Ramirez-Zea, 'Role of Zinc in Maternal and Child Mental Health', *The American Journal of Clinical Nutrition*, 89 (2009), 940S–945S <doi:10.3945/ajcn.2008.26692C>

Edmunds, S, A Garratt, L Haines, and M Blair, 'Child Health Assessment at School Entry (CHASE) Project: Evaluation in 10 London Primary Schools', *Child: care, health and development*, 31 (2005), 143–154 <doi:10.1111/j.1365-2214.2004.00461.x>

Elhamid, Asmaa Abd, Amanda Howe, and Richard Reading, 'Prevalence of Emotional and Behavioural Problems among 6-12 Year Old Children in Egypt', *Social psychiatry and psychiatric epidemiology*, 44 (2009), 8–14 <doi:10.1007/s00127-008-0394-1>

Essex M, Klein M, Cho E, Kraemer E. Exposure to Maternal Depression and Marital Conflict: Gender Differences in Children's Later Mental Health Symptoms.J. Am. Acad. Child adolesc. Psychiatry, 42:6, June 2003

Everett Waters, and Marta Valenzuela, 'Explaining Disorganized Attachment: Clues From Research On Mild-to-Moderately Undernourished Children in Chile', in *Attachment disorganization*, ed. by Solomon, Judith and George, Carol (New York: Guilford Press, 1999), pp. 265–87 <http://www.psychology.sunysb.edu/attachment/online/chile.pdf> [accessed 12 February 2014]

Fantahun, Mesganaw, Yemane Berhane, Ulf Hogberg, Stig Wall, and Peter Byass, 'Young Adult and Middle Age Mortality in Butajira Demographic Surveillance Site, Ethiopia: Lifestyle, Gender and Household Economy', *BMC Public Health*, 8 (2008), 268 <doi:10.1186/1471-2458-8-268>

Fergusson, D., Lynskey, M., & Horwood, J. (1993). The effects of maternal depression on maternal ratings of child behavior. Journal of Abnormal Child Psychology, 21, 245–269.

Flaherty, J A, F M Gaviria, D Pathak, T Mitchell, R Wintrob, J A Richman, and others, 'Developing Instruments for Cross-Cultural Psychiatric Research', *The Journal of nervous and mental disease*, 176 (1988), 257–263

Foley, D. L., Pickles, A., Simonoff, E., Maes, H., Silberg, J. L., Hewitt, J. K., et al. (2001). Parental concordance and comorbidity for psychiatric disorder and associate risks for current psychiatric symptoms and disorders in a community sample of juvenile twins. Journal of Child Psychology and Psychiatry, 42, 381–394.

Gardner, J M, S M Grantham-McGregor, J Himes, and S Chang, 'Behaviour and Development of Stunted and Nonstunted Jamaican Children', *Journal of child psychology and psychiatry, and allied disciplines*, 40 (1999), 819–827

Goodman, Anna, Donna L Lamping, and George B Ploubidis, 'When to Use Broader Internalising and Externalising Subscales instead of the Hypothesised Five Subscales on the Strengths and Difficulties Questionnaire (SDQ): Data from British Parents, Teachers and Children', *Journal of abnormal child psychology*, 38 (2010), 1179–1191 <doi:10.1007/s10802-010-9434-x>

Goodman, R, 'The Strengths and Difficulties Questionnaire: A Research Note', *Journal of child psychology and psychiatry, and allied disciplines*, 38 (1997), 581–586

Goodman, Robert, Tamsin Ford, Helen Simmons, Rebecca Gatward, and Howard Meltzer, 'Using the Strengths and Difficulties Questionnaire (SDQ) to Screen for Child Psychiatric Disorders in a Community Sample', *The British Journal of Psychiatry*, 177 (2000), 534–539 <doi:10.1192/bjp.177.6.534>

Goodman, Sherryl H, 'Depression in Mothers', *Annual review of clinical psychology*, 3 (2007), 107–135 <doi:10.1146/annurev.clinpsy.3.022806.091401>

Goodman, Sherryl H, Matthew H Rouse, Arin M Connell, Michelle Robbins Broth, Christine M Hall, and Devin Heyward, 'Maternal Depression and Child Psychopathology: A Meta-Analytic Review', *Clinical child and family psychology review*, 14 (2011), 1–27 <doi:10.1007/s10567-010-0080-1>

Graves, P L, 'Nutrition and Infant Behavior: A Replication Study in the Katmandu Valley, Nepal', *The American journal of clinical nutrition*, 31 (1978), 541–551

---, 'Nutrition, Infant Behavior, and Maternal Characteristics: A Pilot Study in West Bengal, India', *The American journal of clinical nutrition*, 29 (1976), 305–319

Hay, D. F., Pawlby, S., Angold, A., Harold, G. T., & Sharp, D. (2003). Pathways to violence in the children of mothers who were depressed postpartum. Developmental Psychology, 39(6), 1083–1094.

Hawes, David J, and Mark R Dadds, 'Australian Data and Psychometric Properties of the Strengths and Difficulties Questionnaire', *The Australian and New Zealand journal of psychiatry*, 38 (2004), 644–651 <doi:10.1111/j.1440-1614.2004.01427.x>

Hill, Crystal R, and Jan N Hughes, 'An Examination of the Convergent and Discriminant Validity of the Strengths and Difficulties Questionnaire', *School psychology quarterly: the official journal of the Division of School Psychology, American Psychological Association*, 22 (2007), 380–406 <doi:10.1037/1045-3830.22.3.380>

Horwitz,. Briggs-Gowan, Storfer-Isser and Carter. Persistence of Maternal Depressive Symptoms throughout the Early Years of Childhood. Journal of women's health Volume 18, Number 5, 2009

Hu, Li-tze, and Peter M. Bentler, 'Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives', *Structural Equation Modeling: A Multidisciplinary Journal*, 6 (1999), 1–55 <doi:10.1080/10705519909540118>

Jacob, K S, B S Everitt, V Patel, S Weich, R Araya, and G H Lewis, 'The Comparison of Latent Variable Models of Non-Psychotic Psychiatric Morbidity in Four Culturally Diverse Populations', *Psychological medicine*, 28 (1998), 145–152

Janssens, Astrid, and Dirk Deboutte, 'Screening for Psychopathology in Child Welfare: The Strengths and Difficulties Questionnaire (SDQ) Compared with the Achenbach System of Empirically Based Assessment (ASEBA)', *European Child & Adolescent Psychiatry*, 18 (2009), 691–700 <doi:10.1007/s00787-009-0030-y>

Jo□reskog, K. G, Dag So□rbom, S. H. C Du Toit, Scientific Software International, and Uppsala universitet, *LISREL 8: New Statistical Features* (Lincolnwood, Ill.: SSI, 2000)

Josefsson, A., & Sydsjo¨, G. (2007). A follow-up study of postpartum depressed women: Recurrent maternal depressive symptoms and child behavior after four years. Archives of Women's Mental Health, 10(4), 141–145.

Kelly J (2000), Children's adjustment in conflict marriage and divorce: a decade review of research. J Am Acad Child Adolesc Psychiatry 39:963–973

Kessler, Ronald C., G. Paul Amminger, Sergio Aguilar-Gaxiola, Jordi Alonso, Sing Lee, and T. Bedirhan Ustun, 'Age of Onset of Mental Disorders: A Review of Recent Literature', *Current opinion in psychiatry*, 20 (2007), 359–364 <doi:10.1097/YCO.0b013e32816ebc8c>

Khalid Malik, and United Nations Development Programme, *Human Development Report 2013: The Rise of the South□: Human Progress in a Diverse World.* (New York: United Nations Development Programme UNDP, 2013)

Klein, D. N., Durbin, C. E., & Shankman, S. A. (2009). Personality and mood disorders. In I. H. Gotlib & C. L. Hammen (Eds.), Handbook of depression (2nd ed., pp. 93–112). New York: Guilford.

Koskelainen, M., A. Sourander, and M. Vauras, 'Self-Reported Strengths and Difficulties in a Community Sample of Finnish Adolescents', *European Child & Adolescent Psychiatry*, 10 (2001), 180–185 <doi:10.1007/s007870170024>

Van Leeuwen, Karla, Thierry Meerschaert, Guy Bosmans, Leen De Medts, and Caroline Braet, 'The Strengths and Difficulties Questionnaire in a Community Sample of Young Children in Flanders', *European Journal of Psychological Assessment*, 22 (2006), 189–197 <doi:10.1027/1015-5759.22.3.189>

Levitsky, D A, and B J Strupp, 'Malnutrition and the Brain: Changing Concepts, Changing Concerns', *The Journal of nutrition*, 125 (1995), 2212S–2220S

Meeks Gardner JM, Grantham-McGregor S, Himes J, Chang S. Behaviour and development of stunted and nonstunted Jamaican children. J Child Psychol Psychiatry 1999;5:819–27.

M, P., 'Comparative Fit Indexes in Structural Models', *Psychological Bulletin*, 107 (1990), 238–246 <doi:10.1037/0033-2909.107.2.238>

Mezzich, Juan E., Arthur Kleinman, and Horacio Fabrega, *Culture and Psychiatric Diagnosis: A DSM-IV® Perspective* (American Psychiatric Pub, 1996)

Michael W. Browne, and Robert Cudeck, 'Alternative Ways of Assessing Model Fit', in *Testing Structural Equation Models*, ed. by Bollen and Long (Beverly Hills, CA: Sage Publications, 1993), pp. 136–162

Mieloo, Cathelijne L., Floor Bevaart, Marianne C. H. Donker, Floor V. A. van Oort, Hein Raat, and Wilma Jansen, 'Validation of the SDQ in a Multi-Ethnic Population of Young Children', *The European Journal of Public Health*, 24 (2014), 26–32 <doi:10.1093/eurpub/ckt100>

Mieloo, Cathelijne, Hein Raat, Floor van Oort, Floor Bevaart, Ineke Vogel, Marianne Donker, and others, 'Validity and Reliability of the Strengths and Difficulties Questionnaire in 5–6 Year Olds: Differences by Gender or by Parental Education?', *PLoS ONE*, 7 (2012), e36805 <doi:10.1371/journal.pone.0036805>

Mullick, M. S., and R. Goodman, 'Questionnaire Screening for Mental Health Problems in Bangladeshi Children: A Preliminary Study', *Social Psychiatry and Psychiatric Epidemiology*, 36 (2001), 94–99 <doi:10.1007/s001270050295>

Muris, Peter, Cor Meesters, and Frank van den Berg, 'The Strengths and Difficulties Questionnaire (SDQ)--Further Evidence for Its Reliability and Validity in a Community Sample of Dutch Children and Adolescents', *European child & adolescent psychiatry*, 12 (2003), 1–8 <doi:10.1007/s00787-003-0298-2>

Muris, Peter, Cor Meesters, Anneke Eijkelenboom, and Manon Vincken, 'The Self-Report Version of the Strengths and Difficulties Questionnaire: Its Psychometric Properties in 8- to 13-Year-Old Non-Clinical Children', *The British journal of clinical psychology / the British Psychological Society*, 43 (2004), 437–448 <doi:10.1348/0144665042388982>

Murray, L., Sinclair, D., Cooper, P., Ducournau, P., Turner, P., & Stein, A. (1999). The socioemotional development of 5-year-old children of postnatally depressed mothers. Journal of Child Psychology and Psychiatry, 40(8), 1259–1271.

National Research Council and Institute of Medicine. (2009). Depression in parents, parenting, and children: Opportunities to improve identification, treatment, and prevention. In M. J. England & L. J. Sim (Eds.), Committee on depression, parenting practices, and the healthy development of children.

Norman, Geoffrey R., and David L. Streiner, *Health Measurement Scales a Practical Guide to Their Development and Use* (Oxford [England], New York: Oxford University Press, 1989)

Ommeren, Mark van, Bhogendra Sharma, Suraj Thapa, Ramesh Makaju, Dinesh Prasain, Rabindra Bhattarai, and others, 'Preparing Instruments for Transcultural Research: Use of the Translation Monitoring Form with Nepali-Speaking Bhutanese Refugees', *Transcultural Psychiatry*, 36 (1999), 285–301 <doi:10.1177/136346159903600304>

Palmieri, Patrick A, and Gregory C Smith, 'Examining the Structural Validity of the Strengths and Difficulties Questionnaire (SDQ) in a U.S. Sample of Custodial Grandmothers', *Psychological assessment*, 19 (2007), 189–198 <doi:10.1037/1040-3590.19.2.189>

Perren, Sonja, Stephanie Stadelmann, Agnes von Wyl, and Kai von Klitzing, 'Pathways of Behavioural and Emotional Symptoms in Kindergarten Children: What Is the Role of pro-Social Behaviour?', *European child & adolescent psychiatry*, 16 (2007), 209–214 <doi:10.1007/s00787-006-0588-6>

Pound, A., Cox, A., Puckering, C., & Mills, M. (1985). The impact of metranl depression on young children. In J. E. Stevenson (Ed.), Recent research in developmental psychopathology (pp. 3–10). Oxford, England: Pergamon Press

Pound, Andrea, Christine Puckering, Tony Cox And, and Maggie Mills, 'The Impact of Maternal Depression on Young Children', *British Journal of Psychotherapy*, 4 (1988), 240–252 <doi:10.1111/j.1752-0118.1988.tb01026.x>

Preventing Mental, Emotional, and Behavioral Disorders Among Young People: Progress and Possibilities <http://www.nap.edu/catalog.php?record_id=12480> [accessed 13 February 2014]

Prince, M. et al. Practical psychiatric epidemiology. Practical Psychiatric Epidemiology Oxford University Press (2003).

Rønning, John A., Bjørn Helge Handegaard, Andre Sourander, and Willy-Tore Mørch, 'The Strengths and Difficulties Self-Report Questionnaire as a Screening Instrument in Norwegian Community Samples', *European Child & Adolescent Psychiatry*, 13 (2004), 73–82 <doi:10.1007/s00787-004-0356-4>

Rutter, M, 'A Children's Behaviour Questionnaire for Completion by Teachers: Preliminary Findings', *Journal of child psychology and psychiatry, and allied disciplines*, 8 (1967), 1–11

Sheeber, L., Davis, B., & Hops, H. (2002). Gender-specific vulnerability to depression in children of depressed mothers. In S. H. Goodman & I. H. Gotlib (Eds.), Children of depressed parents: Mechanisms of risk and implications for treatment (pp.253–274). Washington, DC: APA Books.

Smedje, H, J E Broman, J Hetta, and A L von Knorring, 'Psychometric Properties of a Swedish Version of the "Strengths and Difficulties Questionnaire"', *European child & adolescent psychiatry*, 8 (1999), 63–70

Solomon J, George C, Waters E, Valenzuela M. Explaining disorganized attachment: Clues from research on mild-to-moderately undernourished children in Chile. In: Solomon J, George C. eds. Attachment disorganization. New York, NY: Guilford Press, 1999:265–87.

Steiger, James H., 'Structural Model Evaluation and Modification: An Interval Estimation Approach', *Multivariate behavioral research*, 25 (1990), 173–180

Stone, Lisanne L., Roy Otten, Rutger C. M. E. Engels, Ad A. Vermulst, and Jan M. A. M. Janssens, 'Psychometric Properties of the Parent and Teacher Versions of the Strengths and Difficulties Questionnaire for 4- to 12-Year-Olds: A Review', *Clinical Child and Family Psychology Review*, 13 (2010), 254–274 <doi:10.1007/s10567-010-0071-2>

Sumathipala, Athula, and Joanna Murray, 'New Approach to Translating Instruments for Cross-Cultural Research: A Combined Qualitative and Quantitative Approach for Translation and Consensus Generation', *International Journal of Methods in Psychiatric Research*, 9 (2000), 87–95 <doi:10.1002/mpr.83>

Teti DM, Gelfand DM, Messinger DS, Isabella R (1995), Maternal depression and the quality of early attachment: an examination of infants, preschoolers, and their mothers. Dev Psychol 31:364–376

Thabet, A A, D Stretch, and P Vostanis, 'Child Mental Health Problems in Arab Children: Application of the Strengths and Difficulties Questionnaire', *The International journal of social psychiatry*, 46 (2000), 266–280

Theunissen, Meinou H C, Anton G C Vogels, Marianne S de Wolff, and Sijmen A Reijneveld, 'Characteristics of the Strengths and Difficulties Questionnaire in Preschool Children', *Pediatrics*, 131 (2013), e446–454 <doi:10.1542/peds.2012-0089>

UNDP, 'Human Development Report 2007/8' <http://hdr.undp.org/en/content/human-development-report-20078> [accessed 10 February 2014]

Valenzuela, M, 'Attachment in Chronically Underweight Young Children', *Child development*, 61 (1990), 1984–1996

Wachs, Theodore D, 'Models Linking Nutritional Deficiencies to Maternal and Child Mental Health', *The American journal of clinical nutrition*, 89 (2009), 935S–939S <doi:10.3945/ajcn.2008.26692B>

Wachs, Theodore D., Marian Sigman, Zeinab Bishry, Wafaa Moussa, Norge Jerome, Charlotte Neumann, and others, 'Caregiver Child Interaction Patterns in Two Cultures in Relation to Nutritional Intake', *International Journal of Behavioral Development*, 15 (1992), 1–18 <doi:10.1177/016502549201500101>

Van Widenfelt, Brigit M, Arnold W Goedhart, Philip D A Treffers, and Robert Goodman, 'Dutch Version of the Strengths and Difficulties Questionnaire (SDQ)', *European child & adolescent psychiatry*, 12 (2003), 281–289 <doi:10.1007/s00787-003-0341-3>

Woerner, Wolfgang, Bacy Fleitlich-Bilyk, Rhonda Martinussen, Janet Fletcher, Giulietta Cucchiaro, Paulo Dalgalarrondo, and others, 'The Strengths and Difficulties Questionnaire

Overseas: Evaluations and Applications of the SDQ beyond Europe', *European child & adolescent psychiatry*, 13 Suppl 2 (2004), II47–54 <doi:10.1007/s00787-004-2008-0>

World Health Organization, *International Statistical Classification of Diseases and Related Health Problems (10th Revision) (ICD-10)* (WHO, 1992) <http://www.who.int/classifications/icd/en/> [accessed 13 February 2014]

---, 'WHO | Mental Health Atlas 2011', *WHO* <http://www.who.int/mediacentre/multimedia/podcasts/2011/mental_health_17102011/en/> [accessed 10 February 2014]

---, 'WHO | The World Health Report 2001 - Mental Health: New Understanding, New Hope', *WHO* <http://www.who.int/whr/2001/en/index.html> [accessed 10 February 2014]

---, 'WHO | WHO Statistical Information System (WHOSIS)', *WHO* <http://www.who.int/whosis/en/> [accessed 10 February 2014]

World Health Organization Dept of Mental Health and Substance, and Switzerland) Meeting on Caring for Children and Adolescents with Mental Disorders□: Setting WHO Directions (2002□: Geneva, 'Caring for Children and Adolescents with Mental Disorders□: Setting WHO Directions', 2003 <http://apps.who.int/iris/handle/10665/42679?mode=full&submit_simple=Show+full+item+record> [accessed 11 February 2014]

World Health Organization, World Psychiatric Association, and International Association for Child and Adolescent Mental Health and Allied Professions, 'Atlas□: Child and Adolescent Mental Health Resources□: Global Concerns: Implications for the Future', 2005 <http://apps.who.int/iris/handle/10665/43307> [accessed 10 February 2014]