HHS Public Access

Author manuscript

J Epidemiol Community Health. Author manuscript; available in PMC 2017 April 15.

Published in final edited form as:

J Epidemiol Community Health. 2016 February ; 70(2): 168–173. doi:10.1136/jech-2014-205311.

Maternal mental health and child growth and development in four low and middle income countries

Ian Bennett, MD, PhD[*], **Whitney Schott, PhD**[**], **Sofya Krutikova, PhD**[***], and **Jere R. Behrman, PhD**[**]

[*]Perelman School of Medicine, University of Pennsylvania [**]The Population Studies Center, University of Pennsylvania, USA [***]Institute for Fiscal Studies, London, England

Abstract

Objective—Extend analyses of maternal mental health and infant growth in low- and middle-income countries (LMICs) to children through age eight and broaden analyses to cognitive and psychosocial outcomes.

Design—Community-based longitudinal cohort study in four LMICs (Ethiopia, India, Peru, and Vietnam). Surveys and anthropometric assessments were carried out when the children were approximately ages one, five and eight years. Risk of maternal common mental disorders (rCMD) was assessed with the SRQ-20 (score ≥8).

Setting—Rural and urban as well as middle and poor income communities.

Participants—7,722 mothers and their children.

Main outcome measures—Child stunting and underweight (Z score <-2 of height and weight for age), and < 20th percentile for: cognitive development (Peabody Picture Vocabulary Test), and the psychosocial outcomes self-esteem and life satisfaction.

Results—A high rate of rCMD, stunting, and underweight was seen in the cohorts. After adjusting for confounders significant associations were found between maternal rCMD and growth variables in the first year of life with persistence to age eight in India and Vietnam but not in the other countries. India and Vietnam also showed significant associations between rCMD and lower cognitive development. After adjustment, rCMD was associated with low life satisfaction in Ethiopia but not in the other cohorts.

Conclusions—Associations of maternal rCMD in the first year of life with child outcomes varied across the study cohorts. and in some cases persisted across the first eight years of life of the child and included growth, cognitive development and psychosocial domains.

Corresponding Author: Ian M. Bennett MD PhD, Department of Family Medicine and Community Health, HUP, 2nd Floor gates Pavilion, 3400 Spruce Street, Philadelphia PA 19104, USA, Ian.bennett@uphs.upenn.edu.

Competing interests: There are no competing interests relevant to the current work for any of the authors.

Keywords

mothers; postnatal; postpartum; mood disorder; depression; mental health; infant; child; weight; malnutrition; growth; nutritional status; cognitive; developing countries

INTRODUCTION

Conditions in early childhood matter for child growth and development. There is a substantial body of suggestive evidence that maternal mental health affects children in many domains, including nutritional status, health, cognitive and socio-emotional development.[1,2] Early impacts on physical growth persist through life.[2,3] While most research has been carried out in high income countries (HICs) the child outcomes associated with maternal mental health vary across the income status of the nation in which they are assessed; in HICs these effects are primarily in the domains of psychosocial, behavioural, and emotional development while in some low-income countries (LMICs) associations with physical growth and illness are also seen; this difference in risk of poor growth outcomes presumably results from the relative caloric/nutritional and public health resources (i.e., public water treatment) available in these different settings.[1,4–8] Interventions to improve maternal depression have been associated in experimental studies with improved pediatric outcomes in both HICs and LMICs supporting a causal relationship between these maternal mental health and child outcomes.[9–11]

Although general patterns across both HICs and LMICs are apparent there is a great need for additional research assessing the relationship of poor maternal mental health to child outcomes in LMICs.[1] The range of economic and public health resources vary widely across these nations making any generalizations tenuous given the current small level of research among them. In addition the assessment of these associations has primarily been over a relatively short time period – generally within the first twelve to eighteen months of the life of the infant.[1,12] These limitations make it difficult to inform interventions that aim to address child outcomes in these vulnerable populations through maternal interventions. In this study we examine the associations between risk of maternal common mental disorders (rCMD) and child growth, cognitive development, and psychosocial wellbeing between infancy and age eight years in four LMICs which vary significantly across a range of cultural and economic contextual factors.[12]

Our study contributes to the existing literature in a number of important ways. First, the great majority of studies examining the effect of maternal depression on child outcomes are based on samples from high-income countries.[1] Although sparse, the available evidence suggests that maternal depression prevalence rates in developing countries are unlikely to be lower than in developed countries. In fact, some of the risk factors for depression (for instance, lack of support, and negative life events) are more prevalent in poorer settings and actual prevalence has been estimated to be higher in low-income countries.[13] Additionally, many of the studies available for developing countries are based on highly selected samples such as patients in health clinics or samples from restricted small geographical areas. Our study is based on samples that are approximately representative of national populations in

three LMICs and of the states of Andhra Pradesh and Telangana in India. Further, the focus of this literature is on the relatively brief first year postpartum period that includes postpartum depression (PPD). While this focus is in part motivated by the importance of infancy for long-term development, there is a dearth of evidence on the association of maternal mental health during infancy with health and other outcomes later in childhood. Our data offer the opportunity to examine associations of maternal rCMD in infancy with outcomes not only in infancy but also at ages five and eight years. Finally, the great majority of studies examine correlations between maternal mental health and child well-being (usually using cross-sectional data) without controlling for likely confounders of this relationship. The longitudinal design of the unique panel data-set utilised in this study offers opportunities to address some challenges of identifying relationships between maternal rCMD and different child outcomes at different ages in these four LMICs.

METHODS

The data used for the current analyses are from Young Lives, a multi-country longitudinal study of child poverty that tracks approximately 2,000 children in each of four LMICs: Ethiopia, India (Andhra Pradesh, Telangana), Peru and Vietnam.[12,14–16] The research was approved by appropriate ethics committees and conform to the principles embodied in the Declaration of Helsinki. In all four countries approximately one hundred children who were aged 6–18 months in 2002 were randomly selected from each of 20 sites (purposively selected to represent diversity within each country on key socio-economic, demographic and geographic dimensions with a pro-poor focus) to make a cohort of approximately 2,000 very young children per country (an older cohort also was selected but is not used in this paper). Detailed descriptions of data collection and interview methodologies have been previously published.[14–16] Briefly, adaptation of a common interview for each of the four countries was carried out through a pilot study focused on incorporating local idioms and expressions. Three rounds of data are currently available (in 2002, 2006–7 and 2009), with a fourth round (2013–4) scheduled to be released in late 2015.

Study measures

The primary measures for the analysis in this paper include maternal risk of common mental disorders (rCMD),[1,12] child nutritional status, child cognitive development, and child psychosocial outcomes. rCMD was measured using the Self-Reporting Questionnaire (SRQ-20), a screening tool developed by the World Health Organization (WHO) specifically for developing countries and widely used in that context.[17–19] It consists of 20 yes/no statements relating to the mental well-being of the mother. As with other instruments used for epidemiologic studies of both mental and physical health this measure is designed to identify risk of mental disorders, with appropriate psychometric properties, and is not a diagnostic tool. The SRQ-20 also identifies risk of both depression and anxiety/stress, the most common maternal mental health disorders, but does not distinguish between them. Based on these considerations we modify the previously adopted language “common mental disorder” (CMD) by adding “risk” (rCMD) to describe a positive SRQ20 screen in order to better reflect the characteristics of the tool.[11] This instrument has acceptable levels of reliability and validity in a range of developing countries. Cut-off scores to determine how

many yes-answers constitute a possible case, balanced against acceptable levels of false positive cases, have been validated against clinical assessments in each of the study countries.[18,19] These validations indicated a score cut-point of 7/8 to separate risk of non-cases/cases of CMD. We used multiple imputation procedures to fill in missing data on independent variables with the ice command in Stata 12.1 software (StataCorp LP) and the option of 15 imputations.

The main outcomes of interest are child nutritional status, cognitive skills, and psychosocial outcomes. Nutritional status is captured using anthropometric indicators of long-term growth (stunting; height-for-age z-scores <-2) and body-mass-index (underweight; bmi z-scores <-2) for each of the three rounds of the survey. Cognitive skill is assessed at ages 5 and 8 using the Peabody Picture Vocabulary Test (PPVT), a widely-used test of receptive vocabulary (Spanish version PPVT-R).[20] This instrument measures vocabulary acquisition in persons from 2.5 years old to adulthood. The test is individually administered, untimed, and orally delivered. While the PPVT-R is also norm-referenced for high-income countries these references do not exist for populations from LMICs and so were not used – rather, country-specific distributions were used to determine risks. The task of the test taker is to select the picture that best represents the meaning of a stimulus word presented orally by the examiner. We define low cognitive skill as scores at or below the 20th percentile in each round of (country-specific) scores for that cohort.

Psychosocial outcomes were measured using assessments of self-esteem and life satisfaction at age 8 years.[21,22] Self-esteem, a psychological construct, was operationalized and contextualized as the lay concept of *pride* to increase understanding among children and assessed through their agreement with three statements: 1) “I am proud of my shoes or having shoes,” 2) “I feel my clothing is right for all occasions,” and 3) “I am proud of my clothes.” Responses were on a five point Likert-type scale from “totally disagree” (1 point) to “totally agree” (5 points). These scores were summed and having a score in the lowest quintile for the country was used as the risk category for analyses.[22]

Life satisfaction is important to consider in poverty research because the poorest are not necessarily the least satisfied and there is growing recognition that people’s own perceptions of their situations should be taken into account when seeking to develop or improve their living conditions.[23] The “Ladder of Life” satisfaction tool, based on widely-used validated measures, has been used in global studies of satisfaction and happiness including studies of development in India and Ethiopia.[24–26] Children were asked to indicate their position between their best- and worst- possible lives on a nine-point scale represented visually as a ladder. We again used scoring in the lowest quintile to indicate the risk category.

Potential confounders were controlled for based on conceptual considerations and previous work with which we want to compare the current analyses. Child characteristics included age in months at each of the study assessment periods and gender (female). We included schooling attainment as a maternal control variable because of the extensive linkage between maternal schooling and both maternal mental health and child health status.[27] A household wealth index based on the first principal component of household assets, housing quality and service access was used as a control for household resources.

Analyses

The analytic approach taken in the current study is framed by a conceptual model linking maternal mental health with child outcomes adapted from previous work with the current study sample (Figure 1).[12] Descriptive analyses were carried out for all of the primary independent and dependent variables. Because of the high prevalence of the outcome condition we chose to use Modified Poisson regression analyses with robust error variance with SRQ-20 score of <8 versus ≥8 as the primary independent variable; child outcomes at each of the appropriate ages were regressed on elevated SRQ-20 score to create risk ratios (RR) for assessment of magnitude of association between the independent and dependent variables.[28] We then regressed child outcomes on elevated SRQ-20 and the control variables to create adjusted RRs (aRR).

RESULTS

Table 1 presents the prevalence of women with maternal rCMD, child stunting, and underweight, cognitive development, psychosocial outcomes, and the distributions of the other variables included in the conceptual framework (Figure 1), for the four study populations. Rates of rCMD ranged from 20% in women from Vietnam to 33% in those from Ethiopia. Though there was variation we find high prevalences of stunting and underweight in all populations assessed. Large variations in child growth and development were seen as well across these samples.

The unadjusted (RR) and adjusted risk ratios (aRR) for the association of maternal rCMD with independent variables are shown in Table 2. The crude association of maternal rCMD with growth measures is significant at age one for the cohorts in India and Peru, and persisting to age eight for both of these countries, and is significant for stunting in Vietnam at ages five and eight years. For underweight, the relationship was significant for India and Vietnam at ages one, five, and eight years. After adjustment for confounding, significant associations are retained for India in both stunting (ages one and eight years) and underweight in India (ages five and eight years) and Vietnam (ages one and eight years). Cognitive and psychosocial outcomes varied as well. Significant unadjusted and adjusted RR of low PPVT score (lowest quintile) was seen in India at age eight while a significant aRR was seen at age five in Vietnam. For the psychosocial variables, an association between maternal rCMD and low self-esteem was seen only in the crude model in Vietnam; a significant association with low life satisfaction was seen in crude and adjusted models in in Ethiopia and only the crude model for India.

CONCLUSIONS

In this analysis of the mothers of 7772 children we found associations between maternal mental health in the first year of life with growth and development as well as the life satisfaction of that child through eight years of age with varying patterns across four LMICs. The prevalence of elevated risk of maternal mental disorders is consistent with epidemiologic studies of mental disorders globally.[29] We found significant associations in adjusted models between exposure to maternal rCMD in early childhood and increased risk of poor growth and cognitive development in India and Vietnam, not just at the time of the

assessment of mental health symptoms but persisting to later ages. The association seen for stunting in Peru, in contrast, does not persist in adjusted models, and no significant associations were found for growth outcomes in Ethiopia. We also found that risk of poor cognitive development in India and life satisfaction in Ethiopia is detected at age eight after exposure to maternal rCMD in infancy consistent with our model linking maternal mental health and longer-term outcomes for children.

The identification of these persistent effects of poor maternal mental health on diverse outcomes in child growth and cognitive as well as psychosocial development is consistent with conceptual models of life course effects of negative exposures in vulnerable periods as well as other studies that have explored these issues.[1] The majority of these previous studies have been carried out in HICs however and those that have looked at the LMIC setting have focused on outcomes within the first or second years of life. The presence of growth stunting and underweight at the same time points for India and Vietnam suggests common mechanistic pathways and/or diverse effects of maternal mental health on child growth and development. Poor nutritional status resulting from reduced functioning of the mother in critical periods could account for both outcomes though distinct channels of nutritional and psychosocial impacts are plausible.

Our finding that maternal rCMD in infancy was associated with low life satisfaction in children at age eight in Ethiopia is novel and of interest. The potential sensitivity of this outcome to exposure to early maternal rCMD provides new insights into possible processes and mechanisms by which maternal mental health can negatively influence child trajectories of wellbeing and lifetime success. Previous studies assessing negative impacts of maternal depression on children have focused on behavioural outcomes in younger children. In these studies an increased risk of psychopathology/behavioural abnormalities are seen in the children of women with major depression in the year postpartum – risk that is ameliorated with effective treatment of the mothers.[9–11] The assessment of other aspects of psychological wellbeing such as life satisfaction provide an opportunity to more fully understand the consequences of this exposure and potentially provide novel avenues for helping children with this exposure. Additional work is needed to confirm and extend these novel findings. Interventions to improve maternal mental health might consider adding measures such as this to assess benefits to children of such programs. The heterogeneity in growth, cognitive, and psychosocial outcomes is of significance as it is clear that a “one-size-fits-all” approach to addressing these issues will not reflect the variability seen in national contexts. It is unclear what factors might result in the wide variation seen. Exploration of potential protective effects of national conditions is warranted.

There are a number of limitations to the current study. First, the Young Lives study is observational – and while it is longitudinal, any associations identified are weak evidence for causality. However, studies of this type provide a necessary opportunity to explore a complex set of conditions and factors that can lead to significant insight into the economic, social, and psychological forces influencing children in poverty in LMICs. Second, there was a significant period of elapsed time between the measure of maternal rCMD and the developmental and psychosocial outcomes. Only the anthropometric measures were available before age 5 years. However, we were able to detect persistent associations of

maternal rCMD with these critical domains of child wellbeing. Finally, the SRQ20 is a screening instrument and is not able to provide a clinical diagnosis of mental disorders. It is possible that more precise mental health measures would identify greater magnitudes of associations with child outcomes. Nevertheless, we were able to see significant associations of elevated SRQ20 scores with outcomes. Despite these limitations, the study contributes to the literature by investigating the associations between rCMD when children were infants and child growth, cognitive development, and psychosocial wellbeing between infancy and age eight in four LMICs with very different contexts. This information is key to formulating policy for appropriate interventions in these vulnerable settings.[1]

Acknowledgments

Thanks to Nan M. Astone, assigned discussant, and other participants in Session 222 on Parental Characteristics on Child Health and Behavioral Outcomes at the Population Association of America Annual Meetings (Boston, MA, 3 May 2014) for useful comments on an earlier version.

Funding: This research has been supported by the Bill and Melinda Gates Foundation (Global Health Grant OPP10327313), Eunice Shriver Kennedy National Institute of Child Health and Development (Grant R01 HD070993) and Grand Challenges Canada (Grant 0072-03 to the Grantee, The Trustees of the University of Pennsylvania). The data used in this study come from Young Lives, a 15-year survey investigating the changing nature of childhood poverty in Ethiopia, India (Andhra Pradesh), Peru and Vietnam (www.younglives.org.uk). Young Lives is core-funded by UK aid from the Department for International Development (DFID) and co-funded from 2010–2014 by the Netherlands Ministry of Foreign Affairs. The findings and conclusions contained within are those of the authors and do not necessarily reflect positions or policies of the Bill and Melinda Gates Foundation, the Eunice Shriver Kennedy National Institute of Child Health and Development, Grand Challenges Canada, Young Lives, DFID or other funders.

References

1. Stein A, Pearson R, Goodman SH, et al. Effects of perinatal mental disorders on the fetus and child. Lancet. 2014; 384:1800–19. [PubMed: 25455250]
2. Stein AD, Wang M, Martorell R, et al. Growth Patterns in Early Childhood and Final Attained Stature: Data from Five Birth Cohorts from Low- And Middle-Income Countries. American Journal of Human Biology. 2010; 22(3):353–359. [PubMed: 19856426]
3. Lundeen EA, Stein AD, Adair LA, et al. Increases in HAZ co-exist with increasing deficits in height among children in middle-income countries. American Journal of Clinical Nutrition. 2014 (forthcoming).
4. Medhin G, Hanlon C, Dewey M, et al. The effect of maternal common mental disorders on infant undernutrition in Butajira, Ethiopia: The P-MaMiE study. Bmc Psychiatry. 2010:10. [PubMed: 20109169]
5. Patel V, DeSouza N, Rodrigues M. Postnatal depression and infant growth and development in low income countries: a cohort study from Goa, India. Archives of Disease in Childhood. 2003; 88(1): 34–37. [PubMed: 12495957]
6. Patel V, Prince M. Maternal psychological morbidity and low birth weight in India. British Journal of Psychiatry. 2006; 188:284–285. [PubMed: 16507972]
7. Rahman A, Bunn J, Lovel H, Creed F. Maternal depression increases infant risk of diarrhoeal illness: a cohort study. Archives of Disease in Childhood. 2007; 92(1):24–28. [PubMed: 16966339]
8. Rahman A, Lovel H, Bunn J, et al. Mothers' mental health and infant growth: a case-control study from Rawalpindi, Pakistan. Child Care Health and Development. 2004; 30(1):21–27.
9. Patel V, Weiss HA, Chowdhary N, et al. Lay health worker led intervention for depressive and anxiety disorders in India: impact on clinical and disability outcomes over 12 months. British Journal of Psychiatry. 2011; 199(6):459–466. [PubMed: 22130747]

10. Rahman A, Iqbal Z, Roberts C, Husain N. Cluster randomized trial of a parent-based intervention to support early development of children in a low-income country. Child Care Health and Development. 2009; 35(1):56–62.
11. Weissman MM, Pilowsky DJ, et al. Remissions in maternal depression and child psychopathology: a STAR*D-child report. JAMA. 2006; 295(12):1389–1398. [PubMed: 16551710]
12. Harpham T, Huttly S, De Silva MJ, Abramsky T. Maternal mental health and child nutritional status in four developing countries. J Epidemiol Community Health. 2005; 59:1060–1064. [PubMed: 16286495]
13. Patel V, Araya R, Bolton P. Treating depression in the developing world. Tropical Medicine & International Health. 2004; 9:539–541. [PubMed: 15117296]
14. Petrou S, Kupek E. Poverty and childhood undernutrition in developing countries: A multi-national cohort study. Social Science & Medicine. 2010; 71(7):1366–1373. [PubMed: 20691525]
15. Crookston BT, Schott W, Cueto S, et al. Post-Infancy Growth, Schooling, and Cognitive Achievement: Young Lives. American Journal of Clinical Nutrition. 2013; 98:1555–63. [PubMed: 24067665]
16. Schott W, Crookston BT, Lundeen EA, et al. Child Growth from Ages 1 to 8 Years in Ethiopia, India, Peru and Vietnam: Key Distal Household and Community Factors. Social Science & Medicine. 2013; 97:278–87. [PubMed: 23769211]
17. Harpham T, Reichenheim M, Oser R, et al. How to do (or not to do)SMeasuring mental health in a cost-effective manner. Health and Policy Planning. 2003; 18:344–9.
18. Tuan T, Harpham T, Huong N. Validity and reliability of the self- reporting questionnaire 20 items (SRQ20) in Vietnam. Hong Kong Journal of Psychiatry. 2004; 14:15–18.
19. Beusenberg, M., Orley, J. A Users Guide to the Self Reporting Questionnaire. Geneva: Division of Mental Health, World Health Organization; 1994.
20. Dunn, LM., DMD. Peabody Picture Vocabulary Test. 4. Pearson; 2007.
21. Cueto, S., León, J. Psychometric Characteristics Of Cognitive Development And Achievement Instruments In Round 3 Of Young Lives. Dec. 2012
22. Camfield, L., McGregor, A. Handbook for Working with children and youth: Pathways to Resilience across Cultures and Contexts. 2005. Resilience and Well-Being in Developing Countries.
23. Cantril, H. The pattern of human concerns. New Brunswick, NJ: Rutgers University Press; 1965.
24. World Database of Happiness, Item bank. Erasmus University;
25. Bourai, VA., Bahadur, SR., Panwa, KM., Mishra, KM. Props for research. London: IIED; 1997.
26. Almlund, M., Duckworth, A., Heckman, J., Kautz, T. IZA discussion paper no. 5500. 2011. Personality Psychology and Economics.
27. Bennett IM, Culhane JF, Webb DA, et al. Perceived Discrimination and Depressive Symptomatology, Smoking, and Recent Alcohol Use in Pregnancy. Birth: Issues in Perinatal Care. Jun; 2010 37(2):90–97.
28. Zhou G. A modified poisin regression approach to prospective studies with binary data. Am J Epi. 2004; 159(7):702–6.
29. Whiteford HA, Degenhardt L, Rehm J, Baxter AJ, Ferrari AJ, Erskine HE, Charlson FJ, Norman RE, Flaxman AD, Johns N, Burstein R, Murray CJL, Vos T. Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. Lancet. 2013; 382:1575–86. [PubMed: 23993280]

What is already known on this subject?

It is known that poor mental health in mothers is associated with poor infant nutritional status and measures of cognitive development in some low and middle income countries. It is not well known however whether these associations persist outside of the infant period and whether the effect of maternal mental health extends to other psychosocial outcomes.

What this paper adds

This paper extends the time period of assessment from infancy through eight years of life of the child and across four distinct low and middle income countries. We show that markers of poor nutritional status associated with poor maternal mental health persist, in countries where the association is seen in infancy, into mid childhood. In addition we show that cognitive and psychosocial factors are also affected by poor maternal mental health into childhood. These findings provide important evidence of the significant consequences of maternal mental health on child growth, development, and well-being in diverse LMIC settings.

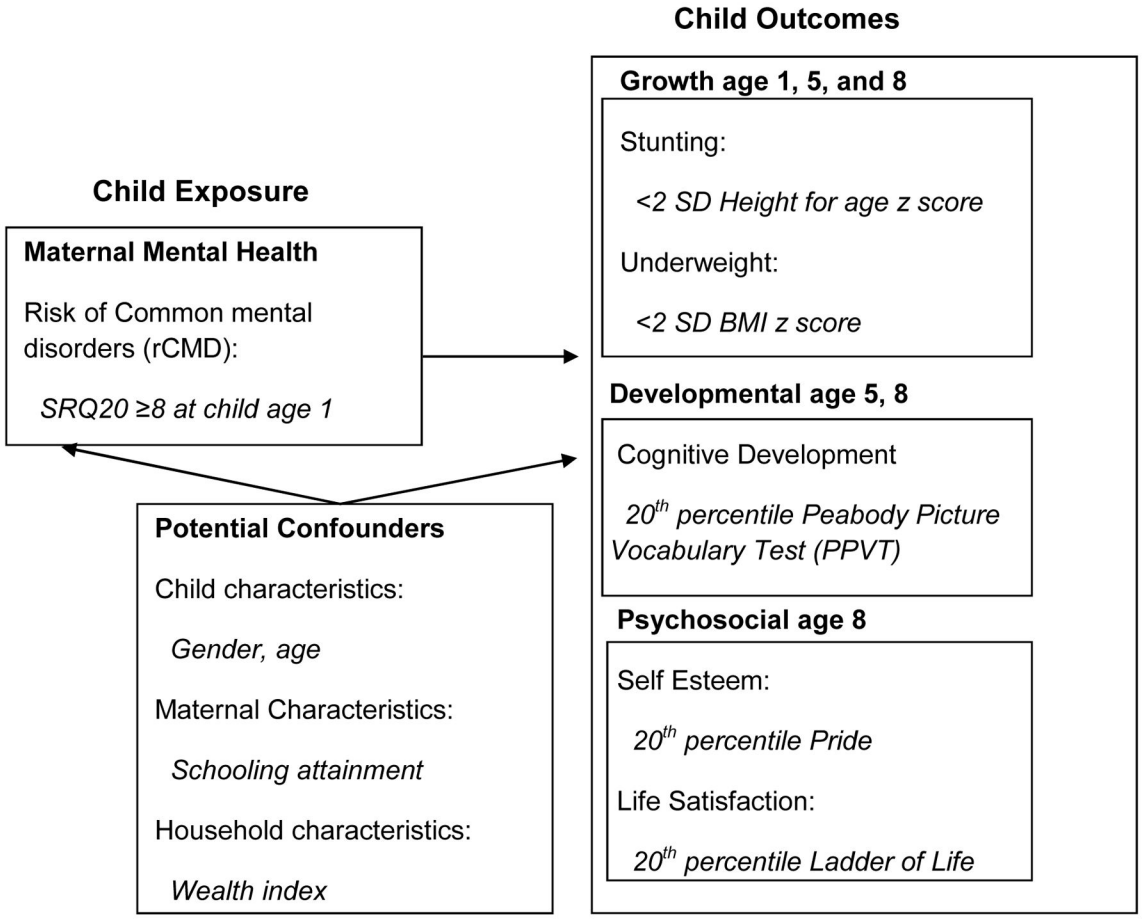

Figure 1.
Conceptual framework and measures.

J Epidemiol Community Health. Author manuscript; available in PMC 2017 April 15.

Table 1

Description of study population.

	Ethiopia (n=1,885)		India (n=1,930)		Peru (n=1,946)		Vietnam (n=1,961)	
	Mean (SD) or Percent	**N**	**Mean (SD) or Percent**	**N**	**Mean (SD) or Percent**	**N**	**Mean (SD) or Percent**	**N**
Maternal Mental Health								
Percentage rCMD*	32.6	1,885	28.3	1,930	29.5	1,946	19.9	1,961
Child Growth & Development								
Percentage stunted								
Age 1	40.6	1,885	30.8	1,930	28.2	1,946	21.1	1,962
Age 5	31.1	1,885	36.1	1,930	32.8	1,946	25.6	1,962
Age 8	21.5	1,885	29.5	1,930	20.9	1,946	20.1	1,962
Percentage underweight at								
Age 1	31.0	1,885	32.7	1,930	7.0	1,946	15.0	1,962
Age 5	24.0	1,885	44.7	1,930	5.4	1,946	17.9	1,962
Age 8	34.6	1,885	46.2	1,930	5.8	1,946	24.7	1,962
PPVT Mean (SD) at age 5	21.3 (12.1)	1,837	27.4 (21.1)	1,834	29.1 (17.9)	1,858	37 (18.2)	1,732
PPVT Mean (SD) at age 8	79.2 (44.2)	1,857	58.5 (30.5)	1,901	58.9 (17.6)	1,845	94 (28.6)	1,848
Child Psychosocial								
Self Esteem (Sum of 3 item likart scale, 3–15)	10.5 (3)	1,817	11.6 (2.3)	1,887	11.9 (1.8)	1,920	11.9 (1.9)	1,938
Life Satisfaction Scale (1–9)	5.3 (2)	1,868	5.1 (2.3)	1,901	7 (2.1)	1,920	6 (2.2)	1,928
Child Characteristics								
Percent Female	46.9	1,885	46.4	1,930	49.6	1,946	48.6	1,961
Age in months (age 1 y)	11.7 (3.6)	1,885	11.8 (3.5)	1,930	11.5 (3.5)	1,946	11.8 (3.4)	1,961
Age in months (age 5 y)	61.9 (3.8)	1,883	64.3 (3.8)	1,929	63.5 (4.7)	1,918	63.1 (3.8)	1,952
Age in months (age 8 y)	97 (4)	1,883	95.5 (3.9)	1,929	95 (3.6)	1,946	96.6 (3.8)	1,951
Household characteristics								
Maternal grades completed	3 (3.9)	1,866	3.7	1,925	7.7	1,903	6.9	1,936
Wealth index** (age 5 y)	0.28 (0.18)	1,883	0.46	1,928	0.47	1,918	0.50	1,950
Wealth index** (age 8 y)	0.33 (0.18)	1,885	0.51	1,930	0.54	1,946	0.59	1,943

*SRQ20≥8,

** The wealth index is a Young Lives measure constructed as the simple average of a housing quality index (reflecting number of rooms per person and the materials of the wall, roof and floor), a consumer durables index (reflecting ownership of 10 consumer durables), and a services quality index (reflecting electricity, water source, toilet facility, and cooking fuel). N is total number of observations with non-missing values.

Table 2

Risk of poor growth, cognitive development, and psychosocial outcomes among children of women with probable rCMD (SRQ20≥ 8) at child age 1

	Ethiopia (n=1,885)		India (n=1,930)		Peru (n=1,946)		Vietnam (n=1,961)	
	RR [95% CI]	**aRR [95% CI]**	**RR [95% CI]**	**aRR [95% CI]**	**RR [95% CI]**	**aRR [95% CI]**	**RR [95% CI]**	**aRR [95% CI]**
Stunting								
Age1	0.93 [0.83 –1.05]	0.91 [0.81 – 1.02]	**1.37 * [1.19 – 1.57]**	**1.18 * [1.03 – 1.35]**	**1.24 * [1.07 – 1.44]**	1.06 [0.93 – 1.22]	0.93 [0.83 – 1.05]	0.91 [0.81 – 1.02]
Age 5	0.97 [0.84 – 1.12]	0.94 [0.82 – 1.09]	**1.22 * [1.08 – 1.38]**	1.07 [0.95 – 1.22]	1.08 [0.94 – 1.23]	0.96 [0.85 – 1.09]	**1.20 * [1.01 – 1.43]**	1.12 [0.95 – 1.33]
Age 8	1.02 [0.85 – 1.23]	1.02 [0.85 – 1.22]	**1.32 * [1.15 – 1.52]**	**1.16 * [1.01 – 1.33]**	**1.24 * [1.04 – 1.48]**	1.09 [0.92 – 1.29]	**1.28 * [1.05 – 1.57]**	1.20 [0.99 – 1.45]
Underweight								
Age1	1.03 [0.90 – 1.19]	1.01 [0.89 – 1.15]	**1.25 * [1.10 – 1.43]**	1.11 [0.97 – 1.26]	1.05 [0.74 – 1.49]	0.85 [0.60 – 1.19]	**1.44 * [1.14 – 1.82]**	**1.29 * [1.03 – 1.62]**
Age 5	0.97 [0.82 – 1.15]	0.95 [0.80 – 1.12]	**1.28 * [1.15 – 1.41]**	**1.16 * [1.05 – 1.29]**	1.21 [0.82 – 1.78]	0.99 [0.67 – 1.46]	**1.27 * [1.02 – 1.58]**	1.19 [0.96 – 1.48]
Age 8	0.96 [0.84 – 1.10]	0.96 [0.84 – 1.09]	**1.31 * [1.19 – 1.44]**	**1.18 * [1.07 – 1.30]**	1.24 [0.85 – 1.80]	1.07 [0.74 – 1.57]	**1.30 * [1.09 – 1.55]**	**1.22 * [1.03 – 1.45]**
†PPVT								
Age 5	0.94 [0.79 – 1.13]	0.91 [0.77 – 1.08]	1.1 [0.91 – 1.33]	0.93 [0.77 – 1.11]	1.14 [0.95 – 1.37]	1.01 [0.86 – 1.19]	1.23 [1.00 – 1.52]	**1.23 * [1.01 – 1.49]**
Age 8	1.04 [0.86 – 1.26]	1.07 [0.90 – 1.28]	**1.40 * [1.17 – 1.68]**	**1.25 * [1.05 – 1.49]**	1.05 [0.86 – 1.27]	0.93 [0.78 – 1.10]	1.11 [0.90 – 1.37]	1.05 [0.86 – 1.27]
†Self-Esteem (Age 8)	1.09 [0.91 – 1.31]	1.08 [0.90 – 1.30]	1.14 [0.98 – 1.32]	1.02 [0.88 – 1.19]	1.11 [0.96 – 1.29]	1.04 [0.90 – 1.21]	**1.24 * [1.01 – 1.53]**	1.21 [0.98 – 1.49]
†Life Satisfaction (Age 8)	**1.19 * [1.05 – 1.36]**	**1.18 * [1.04 – 1.34]**	**1.26 * [1.07 – 1.48]**	1.13 [0.96 – 1.33]	1.13 [0.96 – 1.32]	1.05 [0.90 – 1.23]	1.16 [0.98 – 1.39]	1.12 [0.94 – 1.32]

*p<0.05.

†Bottom 20th percentile, RR= unadjusted risk ratios; aRR =risk ratios adjusted for maternal schooling, sex of child, and age in months of child, wealth index when outcome was measured, and language of exam (in the case of PPVT only).