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Poverty and postnatal depression: a systematic mapping of the evidence from low and lower middle income countries

Abstract

This study systematically maps, assesses and aggregates research relating to postnatal depression (PND) and poverty in low and lower middle income countries (LLMICs). Our search of 12 databases yielded 2,202 articles, of which 47 items from 17 countries were included in our mapping. We highlight mechanisms for the relationships between poverty and PND in LLMICs. The research base on the relationships between poverty and PND in LLMIC is limited, but has recently expanded. It is dominated by studies that consider whether poverty is a risk factor for PND. Income, socio-economic status and education are all inconsistent risk factors for PND. Clues to better ways of framing and capturing economic stress in PND research is found in the qualitative studies included in our mapping. Evidence focuses overwhelmingly on individual-level analyses. To understand the scale and implications of PND in LLMICs, research has to take account of neighbourhoods, communities, and localities.

Keywords

postnatal depression; poverty; low income countries; systematic mapping; maternal health; mental health

Introduction

Postnatal depression (PND) is a global public health issue. It is a clinical depression, with symptoms that can include fatigue, social withdrawal, sadness, changes in sleeping and eating patterns, anxiety and guilt (including related to ability to care for the infant), and crying (Craig & Howard, 2008). The postpartum period is characterised by increased physical and emotional demands on women, and PND affects the mother, infant and close others. PND can impact negatively on a wide range of outcomes including: maternal deaths due to suicide (Almond, 2009); the mother-infant relationship (Milgrom et al., 2006); child psychological development (Murray et al., 2000); and infant nutrition (Rahman et al., 2008) and growth (Stewart, 2007b).

The majority of evidence relating to PND is from high income countries (HICs). Perinatal mental health problems have been studied in more than 90% of HICs compared with just 10% of low and middle income countries (WHO, 2008a). Early studies (Stern & Kruckman, 1983) hypothesised that PND was largely absent in “non-Western” contexts, due to greater social support during the postpartum. Recent evidence suggests that levels of PND in low and middle income countries may be even higher than the 10-15% estimated for HICs (Affonso et al., 2000; Husain et al., 2006a; O'Hara & Swain, 1996; Ross & McLean, 2006; Savarimuthu et al., 2010). PND in low and lower middle income countries (LLMICs) is a public health problem with substantial impacts on maternal, pregnancy-related and infant mortality and morbidity that is under-acknowledged and researched.

Poverty, however it is measured, is concentrated in LLMICs. In absolute terms, 27% of people in developing regions live on less than \$1 (Purchasing Power Parity) per day, rising to 53% of people in the Least Developed Countries (UN, 2011). The relationships between poverty and mental ill-health in LLMICs are receiving increasing research attention (Das et al., 2007; Lund et al., 2010; Patel et al., 1999; Patel & Kleinman, 2003b; WHO, 2011). The Mental Health and Poverty Project (MHaPP) represents an important development, but it only deals with four sub-Saharan African countries (Lund, 2010). Increased research attention accompanies an increased focus from policy agendas in LLMICs (Funk et al., 2010; WHO, 2008b). However, people with mental health problems in general tend to be overlooked by poverty reduction agendas in LLMICs (Funk et al., 2010).

The relationships between poverty or socio-economic status and PND are reasonably well-established in HICs (Beck, 2001; Segre et al., 2006). There is emergent evidence of a strong association between mental ill-health and poverty in LLMIC (Fisher et al., 2007; Lund et al., 2007; Patel & Kleinman, 2003a), represented as a vicious, reinforcing cycle (MHaPP, 2008). The relationship between PND and poverty is particularly important because women’s mental health is essential for the achievement of broad development agendas, including the Millennium Development Goals (Fisher et al., 2011). However, despite high levels of poverty in LLMICs, and the relatively high burden of PND, there is no systematic assessment of how the two – PND and poverty – might be related. For example, are poorer women more likely to experience PND? Does the experience of PND lead to increased poverty for the woman (and her household)?

A consequence of the small but growing number of empirical studies on PND in LLMICs is the need to adopt a systematic approach to describing, assessing and aggregating the evidence base. A systematic mapping is essential in order to accurately reflect all of the available evidence, no matter its type, on a topic. The objective of this paper is to systematically and transparently describe the extent of research in LLMICs that deals with the relationships between poverty and PND, including how poverty affects PND and how PND affects poverty. We set out to shed light on the relationship between a wide range of poverty indicators and PND in LLMICs, to systematically map the research strengths and gaps. This study addresses three questions i) What evidence exists that considers the relationship between PND and poverty? ii) What is the evidence for relationships between PND and poverty? and, iii) Where are the gaps in the research base? A mapping describes as widely as possible all of the evidence relating to the topic – in this case the potential relationships between poverty and PND – without excluding research that does not assess the strength or direction of the

relationship. The type of evidence included in a systematic mapping is much more wide-ranging than that normally included in a systematic review. The scope of a systematic mapping is broader than that of a systematic review, reflected in the breadth of the research questions. We did not set out to do a systematic review or meta-analysis; in our opinion, the evidence base is still too nascent to merit these methods. A systematic mapping can be much more inclusive in its selection of studies than a systematic review can be. Being inclusive of studies benefits the evidence base by assembling evidence in a systematic way. As a systematic mapping, rather than a systematic review, we have not assessed the quality of the included studies. This means that the evidence base that we have identified is not necessarily all of high quality.

Defining, measuring and assessing PND

PND is variously defined as commencing within 6 weeks (WHO ICD 2007) or 4 weeks of delivery (DSM-IV), and evidence from HICs suggests that the depressive episode might begin during pregnancy (Evans et al., 2001; Larsson et al., 2004). PND can be assessed either clinically or through the use of screening instruments such as the Edinburgh Postnatal Depression Scale (EPDS) (Cox & Holden, 1996; Cox et al., 1987), Beck Depression Inventory (BDI) (Beck et al., 1996), Zung Self-Rating Depression Scale (Zung, 1971), the Kessler Psychological Distress Scale (K10) (Kessler et al., 2002) and the Self-Regulation Questionnaire (SRQ-20) (Harding et al., 1980) among others? Concerns (Kleinman, 1987) that methods developed in HICs might falsely identify PND in “non-Western” settings have been refuted (Cox & Holden, 1996; Halbreich & Karkun, 2006; Patel et al., 1998; Rodrigues et al., 2003). Examination of the issue across 11 countries (10 HICs and 1 low income country (LIC) - Uganda), supported the “universality” of postpartum morbid unhappiness but raised concerns about the cross-cultural equivalence of PND as an illness requiring clinical intervention (Oates et al., 2004). There has been expansion in the testing of PND screening instruments in LLMICs, significantly improving the validity and reliability of evidence relating to PND from these settings (Baggaley et al., 2007; Banerjee et al., 2000; Gausia et al., 2007; Hanlon et al., 2008; Kaaya et al., 2008; Kazi et al., 2009; Pollock et al., 2006; Randhawa et al., 2009; Regmi et al., 2002; Spies et al., 2009; Stewart et al., 2009; Tesfaye et al., 2010; Weobong et al., 2009; Wulsin et al., 2002). In our mapping we take an inclusive approach and include studies that assessed depression in the postpartum period, for which we do not know the timing of the onset of depression, including maternal depression in the postpartum period.

Measuring and assessing poverty

The definition of poverty is central to mapping the literature for this research. The conceptualisation, definition and measurement of poverty are the subject of well-established and current debates (Stewart et al., 2007). Approaches to defining poverty depend to a large extent on individual (whether one is poor or not) and disciplinary perspective. Reflecting the different approaches to conceptualising poverty are the indicators used to measure it, including proxies (e.g. education, employment/ occupation, housing and living conditions (including access to potable water, electricity etc.), food insecurity, social class and socio-economic status (SES)) and composite indicators (e.g.: Multidimensional Poverty Index (OPHI, 2011), Human Development Index (UNDP, 2011), and assets (Filmer & Pritchett, 2001)).

Methodology

We searched 12 databasesⁱ in August 2010, using combinations of keywords describing postnatal depression and povertyⁱⁱ, and individual countries defined (Bank, 2011) as low or lower middle income countries and associated terms (“developing countries”, “developing world”, “third world”). As a mapping, we did not define how poverty should be conceptualised or measured. We used broad search terms in order to include the widest literature possible in our mapping. This means that we not only identified items where the authors had measured or defined poverty, but we also included items which considered variables often used as proxies for poverty (e.g.: education, unemployment). The search was limited to studies published after 1989 and we identified 2202 relevant articles (Figure 1). The titles and abstracts of these articles were screened and we excluded studies:

- from HICs including those on refugee populations from LLMICs
- on psychosis and paternal postpartum depression.
- editorials, letters, book reviews and articles without English abstracts.

- in which mental health was assessed during pregnancy only
- among women outside 12 months postpartum.

Because we are concerned with describing the breadth and depth of relevant research, we did not exclude multiple studies based on the same sample (as would be the case in a systematic review in order to avoid bias). However, we do note where multiple studies from the same research (project) might influence our description of the evidence base. As our methodology is a systematic mapping rather than a systematic review, we did not assess for, or exclude on the basis of, quality.

Figure 1 about here

Results

47 items representing studies from 17 countries were included in our review (Table 1).

Table 1 about here

Given the recent emergence of research on this topic in LLMICs, most articles in our mapping were published post-2001 (Figure 2).

Figure 2 about here

Study context

44.7% of the studies included are from South Asia and 38.3% of the studies are from sub-Saharan Africa. However, only 9 of the 40 countries in sub-Saharan Africa included in this review are represented, and half of all the research is from one country, Nigeria, possibly reflecting the location of funding and research centres. There are few studies from East Asia and Pacific and Latin America and the Caribbean (LA&C) in the mapping, which may be a reflection of the language of publication of studies from parts of these regions. However, whilst no studies were identified from the 10 LLMICs in LA&C included in this review, numerous studies on poverty and PND from higher income countries in LA&C were noted.

Just over a half (59.6%) of included studies were conducted in an urban setting (either wholly or partially). The majority (61.7%) of studies were facility-based, 34.0% were community-based and n=2 studies were conducted in both settings. The range of study designs is wide, from small-n (n=18) qualitative research (Niemi et al., 2010) to case control design (n=320) (Rahman et al., 2007; Rahman et al., 2004a) to large-scale (n=19,030) experimental intervention research (Tripathy et al., 2010).

Assessment of depression

There is great heterogeneity in the timing of depression assessments in the studies included in the mapping; most studies assessed depression in the first 3 months. Only ten studies repeated assessment of depression in the postnatal period (although many assessed depression prenatally as well as postnatally). Two studies repeated assessment 4 times, two studies repeated assessment 3 times, and six studies repeated assessment twice in the postnatal period. If PND changes within this period (Gjerdengen & Chaloner, 1994), the implications for research findings of taking so few repeated measurements of PND is that it potentially misses some cases of PND.

Approximately one in four (23.4%) studies used clinical assessment for PND diagnosis. The majority of studies used a wide range of screening instruments to assess PND, including: BDI (Ukpong & Owolabi, 2006), Zung (Fatoye et al., 2004; Fatoye et al., 2006), K-10 (Bell et al., 2008; Filippi et al., 2007; Filippi et al., 2010; Fottrell

et al., 2010; Tripathy et al., 2010), SRQ-20 (Collin et al., 2006; Pollock et al., 2009; Rahman et al., 2004b; Ross et al., 2010; Stewart et al., 2008), the most commonly used being the EPDS. Despite calls for context-specific validation of instruments used to assess PND (and other CMDs) (Hanlon et al., 2008), only 40% of studies reported that the instrument used was validated for country and language. Of the remaining studies, they: did not specify whether a tool was devised [2 studies]; did use an instrument and acknowledged that it was not validated in the relevant country and/or language [5 studies]; or, did not specify whether the tool was validated in the relevant country and/or language, although it is possible that the instrument was validated, but that the validation was not reported in the article [12 studies].

Poverty measures

The definition, use and operationalization of poverty-related variables in studies included in our mapping are heterogeneous (Table 2). What is striking about much of the evidence is the absence of discussion about the validity or reliability of poverty-related measures. Studies that carefully and cautiously validate the research instrument used to identify PND, tend not to apply the same rigour to poverty and its indicators. Studies included in our mapping use poverty indicators at a variety of levels - individual, family and household. Indicators that attempt to capture community- or neighbourhood-level poverty are absent. The research tends to ignore broader context – a critical oversight given that women and households living in poverty in LLMICs are significantly affected by their context – both local (e.g.: slum neighbourhood) and national (e.g.: health systems).

Table 2 about here

Research findings: patterns and pathways of the links between poverty and PND

Research that considers the relationships between poverty and PND is dominated by studies that consider whether poverty is a risk factor for PND. Research that considers whether poverty is a consequence of the experience of PND is much less well-represented (Table 3). We review the research for evidence about the ways in which underlying processes might work. We highlight mechanisms and consistency in the possible relationships between poverty and PND, but do not systematically assess the direction and strength of relationships.

Table 3 about here

An inconsistent pattern that emerges from our mapping is that lower levels of education appear to be associated with a higher risk of PND (8 studies report an association and 17 found no association). Where an association is found, it is unlikely to suffer from reverse causality. For those studies that did identify a relationship, the direction is unambiguous, with lower levels of maternal education associated with greater risk of PND in a wide range of settings (Black et al., 2007; Fisher et al., 2004; Gao et al., 2009; Gausia et al., 2009; Patel et al., 2002; Savarimuthu et al., 2009). Findings from multivariate analyses are inconsistent, and including both associations (Savarimuthu et al., 2009) and no association (Gausia et al., 2009). Low or no educational opportunity is associated with poverty in early life, creating a pathway of intergenerational transmission of poverty (Harper et al., 2003; Moore, 2001). We know, for example, that female education is strongly associated with fertility, and higher levels of unwanted fertility are associated with poorer mental health outcomes for women, including suicide (Brockington, 2001).

Income and SES emerge as inconsistent risk factors for PND, reflecting the literature on common mental disorders in LICs in general (Patel & Kleinman, 2003a). A longitudinal community-based study in rural Bangladesh (Black et al., 2007) found evidence of a bivariate relationship between income and PND, and another community-based study in rural India (Chandran et al., 2002) identified “low income” as a significant risk factor for the onset of PND in multivariate analyses. However six studies from a wide range of settings found no bivariate association between income and PND. A study in urban Mongolia (Pollock et al., 2009) is unusual in its measurement of (family) income at two points in time – before and after the birth. Given the

difficulties in collecting accurate income data, inconsistencies in its relationship with PND might be a function of the quality of income data collected in these studies.

Housing is frequently used as a material asset proxy for poverty, but the majority of studies find no association between housing and experience of PND. One study in urban Mongolia (Pollock et al., 2009) found one aspect of housing (room occupation density) to be predictive of PND, although in the same study, housing type (based on wall and roofing materials) was not identified as significant, and in multivariate analysis no housing variables remained in the final model.

Given the relatively low levels of formal employment outside of the home for many women in LLMICs, in some studies there were too few women employed to assess the impact of employment status on PND e.g.: (Rahman et al., 2003). The findings vary between context, probably reflecting context-specific differences in the meaning of female employment. For example, in South Asia employment amongst some poor women is a necessity rather than an expression of self-fulfilment (Mumtaz & Salway, 2009). Three studies (2 from India and 1 from Vietnam) associate employment with greater likelihood of PND (Fisher et al., 2004; Patel et al., 2002; Savarimuthu et al., 2009). In Nigeria, female unemployment is identified as a risk factor for PND (Owoeye et al., 2006), whilst a lack of permanent employment is associated with lower levels of PND in Vietnam (Fisher et al., 2004).

Studies that included an assessment of economic stress or financial difficulties consistently suggest a relationship with depression, both multivariate (Abiodun, 2006; Pollock et al., 2009) and bivariate (Alami et al., 2006; Ho-Yen et al., 2007; Patel et al., 2002). Just one study, from Pakistan, did not find an association (Husain et al., 2006b). A clue to better ways of framing and capturing economic stress in research – moving beyond simplistic income measures – is to be found in the two qualitative studies included in our mapping, one from Vietnam (Niemi et al., 2010; Rodrigues et al., 2003) and one from India (Rodrigues et al., 2003). Both studies show how women highlight financial or economic “difficulties” as being key to causal models for PND.

Hunger was included in one study (Patel et al., 2002) as a predictor of PND, and showed a significant bivariate relationship with PND. Hunger is stressful (Black et al., 2008). Women who are mothers are likely to make sure that their children are fed before they themselves are fed, if there is insufficient food, and a breastfeeding woman has the added stress that her own hunger is likely to affect her breastmilk supply. Our mapping shows that the evidence strongly suggests that experience of PND has a range of negative health consequences for infants, including infant growth. Maternal hunger, PND and poor infant health outcomes form a vicious cycle (Stewart, 2007a; Surkan et al., 2011{Stewart, 2007 #4126}), and one that may reflect a pathway for the intergenerational transmission of poverty.

Intervention research relating to PND in LLMICs is in its infancy; just one study that assessed the effectiveness of an intervention for maternal depression was included in our mapping. The impact of the intervention on maternal depression was secondary to its impact on neonatal mortality in India (Tripathy et al., 2010). The intervention used participatory methods, involving women’s groups focusing on maternal and newborn health outcomes. The intervention did not focus on reducing poverty. The intervention, involving a local woman facilitating women’s group meetings was low cost with potentially high sustainability in low resource settings with poor health systems.

Study Limitations

There are three limitations of our search strategy that have implications for the scope of included evidence. Firstly, we only included items with English abstracts, meaning that we are likely to have excluded substantial research evidence from non-Anglophone settings which may be of relevance for this topic (Guo, 1993; He et al., 2000; Ouedraogo et al., 1998; Thiam et al., 2007). Secondly, we excluded studies that consider PND in LLMICs that did not explicitly include reference to poverty. Therefore, there are themes that are potentially linked with the pathways between poverty and PND that we have not explored in this mapping, which may

further our understanding of the relationship. For example, we know that there are strong socio-cultural influences in some settings (not only in LLMICs) on the gender balance of offspring, and that this can have profound effects on women's propensity to develop PND (Ahmad & Khan, 2005; Xie et al., 2007). Finally, we know that there are many studies from upper middle income countries that might have relevance for understanding the relationships between PND and poverty, but that were excluded on the basis of our geographic limitations, for example, (Avan et al., 2010; Beard et al., 2005; Cooper et al., 2009; Cooper et al., 1999; Danaci et al., 2002; Ramchandani et al., 2009; Tomlinson et al., 2004).

Discussion

The research evidence dealing with PND and poverty in LLMICs has expanded significantly in the last decade, reflecting increasing interest from researchers and mental health practitioners. Poverty – whether in a high or low income country – is stressful (Belle, 1990). People living in poverty in LLMICs are likely to lack access to adequate housing, clean water, health services and nutrition. Childbirth and caring for an infant in addition to pre-existing responsibilities can add yet further layers of stress (physical, mental and economic). These multiple layers of stress can reduce the ability of women and their networks to cope with the insecurity and shocks of day-to-day living, and their ability to fulfil social roles.

Our mapping has shown that research focuses overwhelmingly on individual-level analyses (with household-level data collected from the individual woman). If we are to understand the scale and implications of the public health problem that is PND in LLMICs, then research has to take into account that neighbourhoods, communities, and localities also exert a strong influence on mental health. For example, poor quality housing is likely to be geographically clustered and located in areas of multiple deprivations (e.g.: poor access to health services, clean water, etc.). High housing density and overcrowding, particularly where housing conditions are poor, is a source of stress, and is associated with common mental disorders, including PND (Cooper et al., 1999). In urban areas, poor housing stock is likely to be geographically concentrated in areas of higher population density, typified by stressful neighbourhood effects such as higher levels of crime and violence (UN-HABITAT, 2007). If research does not consider these influences, then it is likely that we are missing much of the picture.

Whilst a third of studies use a longitudinal study design, this tended to reflect repeat assessment of PND and one-off assessment of poverty (not necessarily assessed at the same time as PND). This observation is important for assessing the findings of these sorts of studies – specifically the issue of causality (or direction of relationship) between poverty and PND. Does long-term, persistent poverty create an increased risk for mental ill-health in the postpartum period? Or, is poverty exacerbated during the postpartum period, which leads to increased risk of experiencing PND? We hypothesise that it is likely that some combination of the processes is in operation.

The expansion of longitudinal research sites in LLMICs (for example, (Network, 2011)) is an important development. Longitudinal research (beyond repeat measurements in shorter-term studies) that incorporates qualitative research is needed if we are to better understand not only causal mechanisms between PND and poverty, but also the underlying processes that underpin them. For example, a longitudinal community-based study in urban South Africa (Ramchandani et al., 2009) shows how economic stress (rather than simply income) can be incorporated into quantitative analyses seeking to explain maternal depression.

What are the implications of heterogeneity in poverty indicators for assessing the relationships between poverty and PND? Heterogeneity in the definition, use and operationalization of poverty indicators raises questions for the use and interpretation of research that considers the interplay between health and context more generally. The multiple uses of “poverty”-related indicators reflect not just different emic understandings of poverty in different countries. It also reflects diverse disciplinary perspectives which conceptualise poverty in very different ways. How poverty is defined and used in research relating to PND is critical for the relevance of research findings for policy and planning. International agendas of poverty

reduction and eradication (e.g.: MDGs) mean that the broad term “poverty” has very real resonance for policy agendas. Our mapping shows how the evidence base around PND in LLMICs incorporates many different approaches to understanding poverty, possibly undermining the likelihood that this evidence base is used to inform policy-making.

These sorts of implications are particularly important for considering the design and implementation of interventions in resource-poor settings to either reduce the risk of, or treat, PND. There are no intervention studies that focus on poverty reduction with PND as an outcome. There is a need for broad “development” agendas and interventions to incorporate common mental disorders in general, and for women, PND in particular. Broad-scale social policy interventions tend not to include mental health outcomes in their evaluation. Interventions that target maternal health, for example the JSY conditional cash transfers for delivery care in India, do not include PND as outcome indicators. We suggest that evaluations of large-scale interventions might incorporate PND outcomes in order to better capture the dimensions of impact beyond physical health.

Lessons might be learnt from interventions in higher income countries that also have high levels of poverty. Interventions in South Africa have used community-based workers to support women, although impacts showing no significant reduction of maternal depression (Cooper, 2002; Cooper, 2009). These low cost interventions focused on mother-infant interaction, which is adversely affected by both PND and socioeconomic adversity. Using this sort of approach, there is good potential for intervention sustainability in settings with poor health systems

Qualitative research, although very limited, consistently suggests that poverty – as it is lived and understood by the people who are poor – is likely to be important for PND. It is surprising, given how difficult it is to collect valid and reliable income data in any setting, and how the extant literature suggests a weak relationship with common mental disorders – just how many quantitative studies of PND in LICs continue to include income measures. If research is to better reflect and capture women’s’ experiences, then greater account needs to be taken of the multidimensional nature of poverty, not simply reducing it to “household income” or “assets”. Research in Zambia (Aidoo & Harpham, 2001) shows, for example, that women’s explanatory models of CMD includes “problems making ends meet”. Research instruments can adapt to incorporate this knowledge, and move away from tried and tested variables such as household income. For example, research on PND from South Africa successfully uses the concept of “economic stress”, self-defined by the respondent to incorporate aspects such as being in “serious” debt, having too little money or being in financial need, rather than relying on a quantitatively measured indicator (Ramchandani et al., 2009).

Finally, research about PND in LLMICs tends to be produced in urban areas, including relatively affluent areas for example, (Collin et al., 2006), meaning that evidence relating to rural women and women who live in poor urban areas is relatively under-developed. The future population of LLMICs will be increasingly urban, and urban growth is “reshaping” population health, particularly among the urban poor (CSDH, 2008, p.4). By 2050 there will be an estimated 6.4 billion urban dwellers, compared to 3.4 billion in 2009 (UNHABITAT-WHO, 2010), with almost all of this growth taking place in LLMICs. It is estimated that one in three urban dwellers lives in a slum, producing so-called “hidden cities” (UNHABITAT, 2010). If research is to reflect how people live, then an increasing proportion of PND-related research and the management and treatment of PND in LLMICs will need to focus on the urban poor.

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Figure 1: Search strategy and results

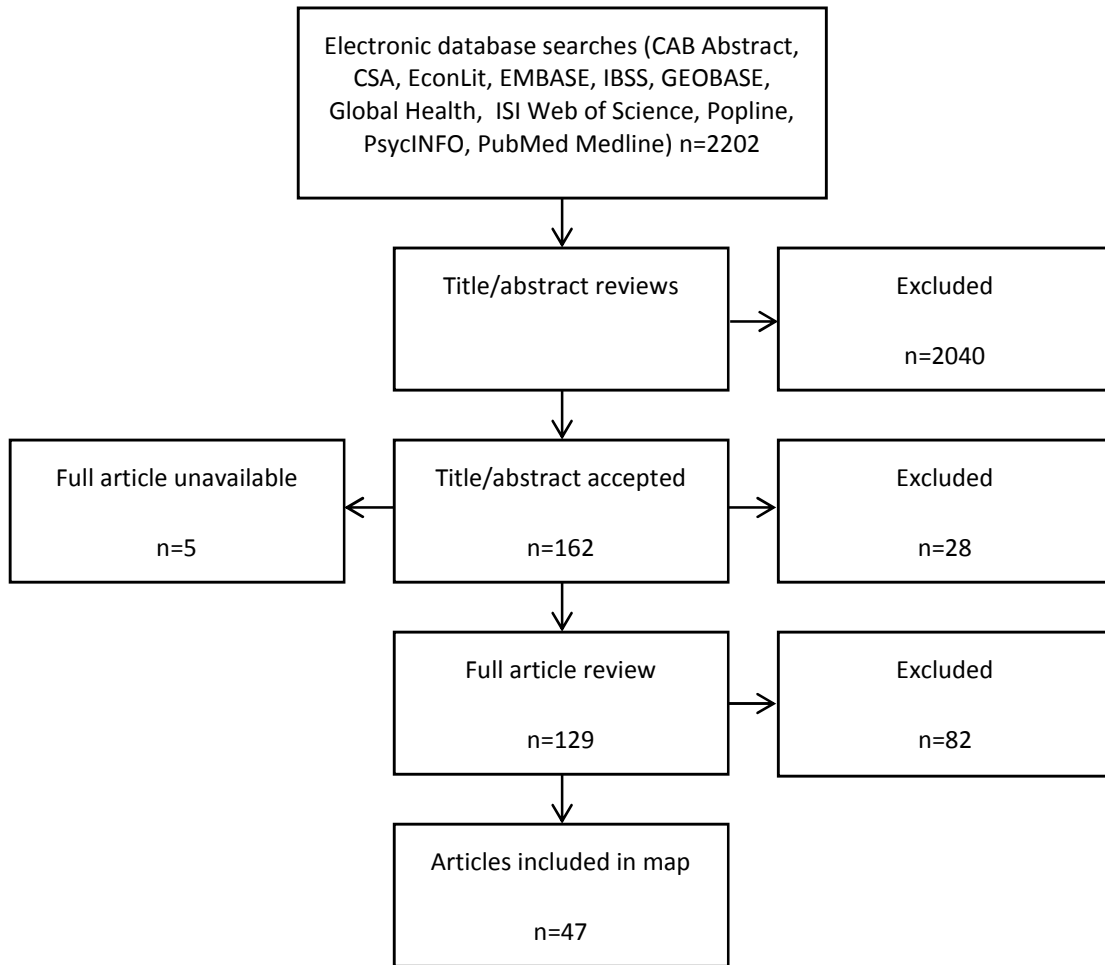


Table 1: Study characteristics

Variable	Number of studies	%
Setting		
- Community-based	16	34.0
- Facility-based	29	61.7
- Community+facility based	2	4.3
Location		
- Urban	21	44.7
- Rural	15	31.9
- Urban + rural	7	14.9
- Not specified	4	8.5
Study design		
- Case control	8	17.0
- Cross-sectional	18	38.3
- Experimental	1	2.1
- Longitudinal	16	34.0
- Mixed methods	2	4.3
- Qualitative	2	4.3
Sample size		
- Minimum		18
- Median		300
- Maximum		19,030
Region		
- Sub-Saharan Africa	18	38.3
- South Asia	21	44.7
- East Asia + Pacific	6	12.8
- Middle East + North Africa	2	4.3
Country income group (World Bank classification)		
- Low	14	29.8
- Lower-middle	33	70.2

Figure 2: Number of studies included in mapping, by year of publication

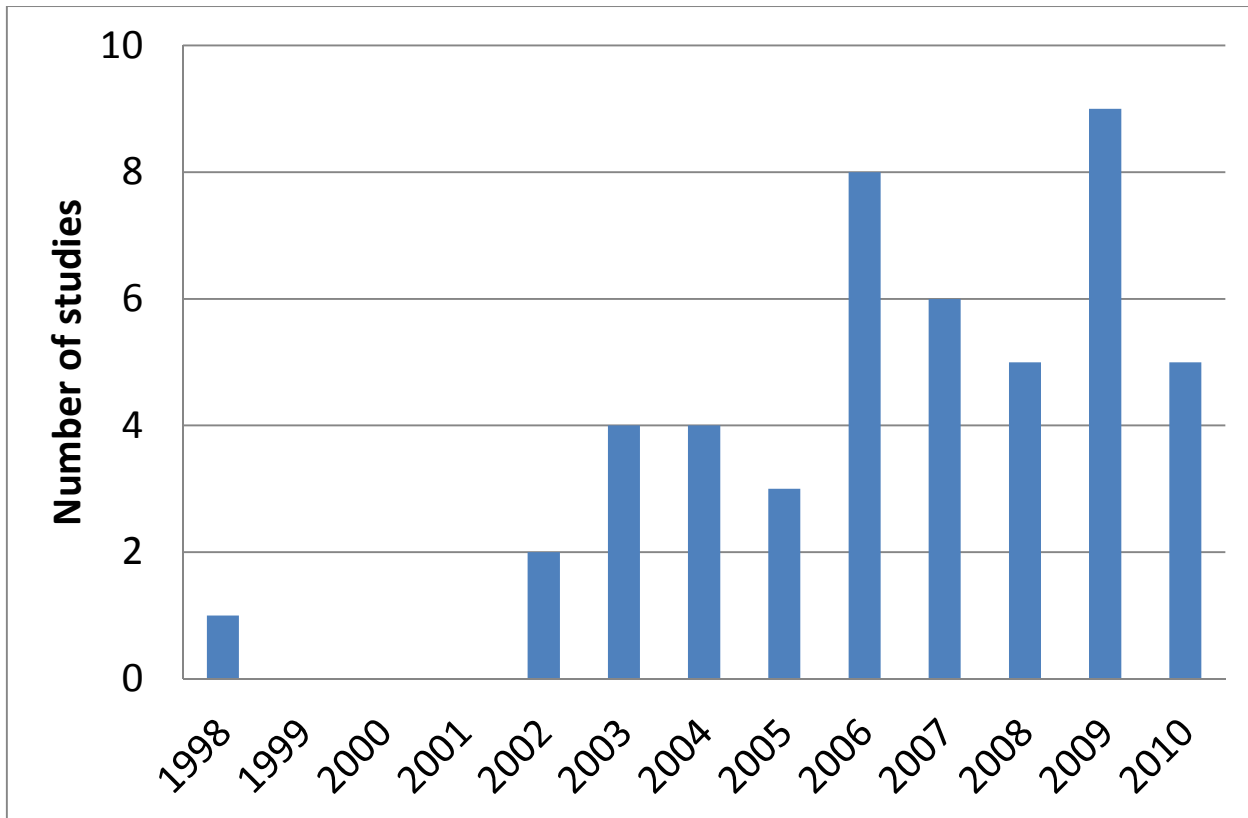


Table 2: Examples of poverty indicator definitions from studies included in the mapping

Indicator	Definition	Study
Socio-economic status (SES)	“Socioeconomic status was assessed...by inquiring if the household was in debt and by asking Lady Health Workers, who lived in the same locality and had intimate knowledge of the families being studied, to rate the household on a 5-point Likert scale ranging from 1 (richest) to 5 (poorest)” (p.3)	(Rahman & Creed, 2007)
	“socioeconomic status (SES) was defined by maternal and paternal education” p.766	(Black et al., 2007)
	“Socio-economic status was measured....by examining educational status, occupation and income. Based on the total score obtained on the scale, subjects are classified as belonging to upper, upper middle, lower middle, upper lower and lower socio-economic class” p.72	(Mariam & Srinivasan, 2009)
	“The size of house lived in by the women and their families was used as a proxy measure of their social economic status, rated as low if the house was one to two rooms and high if it was three rooms or more.” p.209	(Nakku et al., 2006)
	“profession, education and income were also recorded to enable classification of socioeconomic status ...i.e. high socioeconomic class (HSEC), middle socioeconomic class (MSEC) and low socioeconomic class (LSEC)	(Nagpal et al., 2008)
Income / Finances/ Assets and housing	Household income	(Ali et al., 2009; Black et al., 2007; Chersich et al., 2009; Gao et al., 2009; Nhiwatiwa et al., 1998; Xie et al., 2009)
	Family income	(Chandran et al., 2002){Husain, 2006 #4023}{Pollock, 2009 #119}{Savarimuthu, 2009 #38}
	“Poverty was defined by household income divided by household size”	(Black et al., 2009)
	Husband’s mean monthly income	(Rodrigues et al., 2003)
	Monthly income [not specified whether individual or household or family]	(Wan et al., 2009)
	“able to meet needs financially” (Mongolia)	(Pollock et al., 2009)
	“had difficulty meeting daily needs” (India)	(Patel et al., 2002)
	Car ownership (China)	(Wan et al., 2009)
room occupation density, wall and roofing materials (Mongolia)	(Pollock et al., 2009)	
Maternal education	Educational level: primary / secondary / postsecondary (Nigeria)	(Abiodun, 2006)
	Illiterates / Elementary / Secondary / High (Morocco)	(Agoub et al., 2005)
	Illiterate / <5 years / 5–12 years / >12 years (Morocco)	(Alami et al., 2006)
	Illiterate / Can read & write / Schooling 1-9 years / 10 years of schooling / 11 years & above (Pakistan)	(Ali et al., 2009)
	No formal education / ≤ Std 3 64 / ≤ Std 4–5 / ≤ Std 6–8 / ≤ Std 9–10 /	(Bell et al., 2008)
	Some formal education / no formal education (Burkina Faso)	(Chandran et al., 2002)
	Years of education: 0 / 1-5 / 5-10 / >10 (India)	(Chersich et al., 2009)
	Never attended school / Primary school / Secondary school / Tertiary education	(Collin et al., 2006)
	Primary / Secondary / Tertiary (Zambia)	(Fisher et al., 2004)
	Number of years of education (Vietnam)	(Fottrell et al., 2010)
Any formal education / no formal education (Benin)	(Adewuya et al., 2005)	
Highest educational attainment	(Gao et al., 2009)	
High school or below / University or above (China)		
Occupation and employment	trading/civil servant/unemployed/student (Nigeria)	(Adeyemi et al., 2008)
Hunger	“Had been hungry during past month because of lack of money” (India)	(Patel et al., 2002)

Table 3: Relationships between PND and poverty identified in the mapping

I n d i c a t o r		Association found		Unclear association / Association changes over time	No association found	
		M u l t i v a r i a t e	B i v a r i a t e		M u l t i v a r i a t e	B i v a r i a t e
Wealth	Income	(Chandran et al., 2002)	(Chandran et al., 2002) (Black et al., 2007)	(Pollock et al., 2009)	-	(Ali et al., 2009; Husain et al., 2006b; Rahman et al., 2003; Savarimuthu et al., 2009; Wan et al., 2009; Xie et al., 2007)
	Socio-economic status (SES)	(Rahman & Creed, 2007)	(Rahman & Creed, 2007) (Black et al., 2009; Mariam & Srinivasan, 2009)	-	-	(Adewuya et al., 2005; Fatoye et al., 2004; Fatoye et al., 2006; Nakku et al., 2006; Rahman et al., 2003; Ukpong & Owolabi, 2006)
	Assets & housing	(Wan et al., 2009)	-	-	-	(Ali et al., 2009; Husain et al., 2006b; Rahman & Creed, 2007)
	Financial difficulties	(Pollock et al., 2009)	(Abiodun, 2006; Alami et al., 2006; Ho-Yen et al., 2007; Patel et al., 2002; Pollock et al., 2009)	-	(Abiodun, 2006)	(Husain et al., 2006b)
Human capital	Maternal education	-	(Black et al., 2009; Black et al., 2007; Fisher et al., 2004; Gao et al., 2009; Gausia et al., 2009; Ho-Yen et al., 2007; Patel et al., 2002; Pollock et al., 2009; Savarimuthu et al., 2009)	(Adeyemi et al., 2008; Collin et al., 2006)	(Gausia et al., 2009)	(Abiodun, 2006; Adewuya, 2005; Adewuya et al., 2005; Agoub et al., 2005; Alami et al., 2006; Ali et al., 2009; Fatoye et al., 2004; Fatoye et al., 2006; Husain et al., 2006b; Mariam & Srinivasan, 2009; Pollock et al., 2009; Rahman et al., 2007; Rahman & Creed, 2007; Rahman et al., 2003; Ukpong & Owolabi, 2006; Wan et al., 2009)
	Maternal Occupation / employment	-	(Fisher et al., 2004; Owoeye et al., 2006; Patel et al., 2002; Savarimuthu et al., 2009)	(Adeyemi et al., 2008) (Collin et al., 2006)	-	(Abiodun, 2006) (Agoub et al., 2005; Alami et al., 2006; Ali et al., 2009; Mariam & Srinivasan, 2009; Rahman et al., 2007)
	Paternal employment	Rahman, Iqbal et al. 2003)	(Fisher et al., 2004; Patel et al., 2002)	-	-	(Rahman & Creed, 2007)

Table 3 continued

Health	Maternal health/nutrition/hunger	(Bell et al., 2008; Nakku et al., 2006; Pollock et al., 2009)	(Ho-Yen et al., 2007; Nakku et al., 2006; Patel et al., 2002; Pollock et al., 2009)	-	(Ho-Yen et al., 2007; Nakku et al., 2006)	(Wan et al., 2009)
	Pregnancy outcome (including infant mortality)	(Filippi et al., 2010; Fottrell et al., 2010; Gausia et al., 2009)	(Adeyemi et al., 2008; Agoub et al., 2005; Bell et al., 2008; Gausia et al., 2009; Owoeye et al., 2006; Patel et al., 2002)	(Filippi et al., 2007)	-	-
	Health service use	-	-	-	-	(Adewuya et al., 2005; Gausia et al., 2009; Patel et al., 2003; Rahman et al., 2004a)
	Infant birth weight	(Savarimuthu et al., 2009)	(Adewuya, 2005) (Adewuya et al., 2005; Alami et al., 2006)	-	(Adewuya, 2005; Adewuya et al., 2005)	(Patel et al., 2003; Rahman et al., 2007; Wan et al., 2009)
	Infant growth	(Fisher et al., 2004) (Avan et al., 2010; Patel et al., 2003; Rahman et al., 2004a) Length for age - (Black et al., 2009; Stewart et al., 2008)	(Adewuya et al., 2008; Fisher et al., 2004; Patel et al., 2003)	-	Weight for age - (Black et al., 2009; Stewart et al., 2008)	(Black et al., 2007)
	Infant health	(Patel et al., 2002; Rahman et al., 2004b) (Rahman et al., 2007; Rahman et al., 2004a; Ross et al., 2010)	(Adewuya et al., 2008; Patel et al., 2002; Rahman et al., 2004b)	-	-	-

ⁱ PubMed, Medline, Popline, Embase, ASSIA, PAIS, EconLit, ISI Web of Knowledge, CAB Direct, PsycInfo, IBSS, GeoBase

ⁱⁱ Postpartum, postnatal, pregnan*, perinatal, childbirth, puerperal, parturition, parity, mother, maternal, post-partum, “post natal”, puerperium, or post-natal) in combination of (depress*, “mental health”, “mental illness”, “mental disorder”, “mood disorder”, “affective disorder”, “baby blues”, “psychiatric morbidity”, “psychiatric disorder”, “psychiatric illness”, “mental distress” or “psychological distress”) and (poverty, deprivation, socio-economic, socioeconomic, income, distress, “financial stress”, debt, consumption, expenditure, wealth, poor*, hardship, penury, destitution, “economic burden”, social or pay*