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Table F.1: Model 1: Association between social capital and maternal CMD in Peru. Individuals=1642, communities=82, clusters=20

Social capital variables	Stage 1		Stage 2		Stage 3		Stage 4		
	Crude	Social capital	+ Confounders	+ Interactions	OR	95% CI	OR	95% CI	
<i>Group membership</i>									
ISC	No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Yes	1.12	0.84, 1.50	1.03	0.76, 1.39	0.91	0.66, 1.27	0.90	0.68, 1.19
ESC	Average group membership	0.69	0.29, 1.63	*0.37	0.16, 0.87	*0.39	0.16, 0.95	*0.37	0.17, 0.79
<i>Support from bonding individuals</i>									
ISC	No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Yes	1.14	0.89, 1.45	1.12	0.88, 1.44	1.22	0.93, 1.61	1.22	0.93, 1.61
ISC	Support from bonding individuals * poverty ¹								
	No support, extremely poor	--	--	--	--	--	--	1.00	
	No support, poor							0.48	0.30, 0.75
	No support, non-poor							0.21	0.13, 0.36
	Support, extremely poor							1.52	1.12, 2.07
	Support, poor							0.52	0.35, 0.77
	Support, non-poor							0.14	0.09, 0.21
ESC	Mean support from bonding individuals	*1.72	1.01, 2.93	1.56	0.86, 2.85	**2.30	1.28, 4.13	***2.55	1.54, 4.21
<i>Support from bridging individuals</i>									
ISC	No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Yes	1.24	0.93, 1.67	1.20	0.88, 1.63	1.04	0.74, 1.46	1.04	0.74, 1.46

Continued...

Context and composition? Social capital and maternal mental health in low income countries

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For Ni

Abstract

Background and rationale

Women and the poor are disproportionately affected by common mental disorders (CMD), yet few studies have explored their aetiology in low income countries. Social capital may explain some of the geographical variation in CMD. A systematic review shows that only one study has examined the association between individual social capital and CMD in low income countries. No study has explored the effect of ecological social capital on CMD in this setting. The objective of this thesis is to explore the relationship between individual and ecological measures of social capital and maternal CMD in four low income countries.

Methods

Cross-sectional data from the Young Lives (YL) project with information across 234 communities in Peru, Ethiopia, Vietnam and Andhra Pradesh (India) were used. The mental health of caregivers of one-year-old children, and the individual social capital of all caregivers was assessed. Ecological social capital was calculated by aggregating individual responses to the community level. Mothers of one year old children were selected for analysis (n=6909). Multi-level modelling was used to explore the association between individual and ecological social capital in each of the four countries, adjusting for a wide range of individual and community level confounders. Psychometric techniques and qualitative interviews were used in Peru to validate the tool used by YL to measure social capital. Results of these interviews were supplemented with a literature review to explore the nature of social capital in Peru, and analyses were conducted to explore the determinants of social capital. The results of these analyses were used to help interpret the results of a further analysis of the Peruvian data.

Results

The comparative analysis of social capital and CMD across the four countries shows that combined measures of individual cognitive social capital are associated with reduced odds of CMD. The results for structural social capital are more mixed and culturally specific, with some aspects associated with increased odds of CMD. The

validation of the tool to measure social capital in Peru emphasises the difficulties of measuring complex concepts in different cultural settings, and illustrates the culturally specific nature of social capital. The description and analysis of social capital in Peru show it to be multi-dimensional and complex and suggest that social capital may have different effects on CMD in different sub-groups.

Conclusions and implications

Contextual and compositional factors are inter-related and are both associated with CMD. Structural social capital has context-specific effects and cognitive social capital more universal effects on CMD. Social capital may have different effects in different sub-groups, with potentially damaging effects in some disadvantaged groups. While social capital is important for mental health, its complex and context-specific nature means that it is impractical to use it as an intervention to prevent or treat CMD. Instead, its value is as a tool for understanding the social context in which the complex relationship between an individual's own characteristics and those of their environment is played out.

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Glossary of terms and abbreviations

A-SACT	Adapted Social Capital Assessment Tool
CES-D	Centre for Epidemiological Studies Depression Scale
CI	Confidence interval (95% level unless specified otherwise)
CMD	Common mental disorders
DWCRA	Development of Women and Children in Rural Areas (Andhra Pradesh development project)
DFID	Department for International Development
ESC	Ecological social capital
GEE	Generalised estimating equations
GHQ-12	General Health Questionnaire
GIS	Geographical Information Systems
GLLAMM	Generalised Linear Latent and Mixed Models
HH	Household
INEI	Peruvian Office for National Statistics
ISC	Individual social capital
NGO	Non-governmental organisation
OR	Odds ratio
<i>Peonada</i>	A rural system of reciprocal work in agriculture and construction
<i>Peones</i>	Unskilled agricultural labourers
SASCAT	Short Adapted Social Capital Assessment Tool
SCUK	Save the Children UK
SES	Socio-economic status
SRQ-20	Self Reporting Questionnaire 20
UNICEF	United Nations Children's Fund
YL	Young Lives
WHO	World Health Organisation

Organisation of thesis

The nine chapters in this thesis are organised into four parts.

Part I: Social capital and mental health: existing evidence

In Chapter 1, I briefly outline maternal common mental disorders (CMD) in low income countries by indicating the scale of the problem and what is known about their causes. I then outline the theoretical development of social capital and the main criticisms of the concept which continue to impede progress in the field. In light of this, I present my combined theory of social capital and the causal pathways through which social capital may affect mental health, both of which form the theoretical basis of the thesis.

Chapter 2 comprises two systematic reviews of the literature. The first review is a critique of the methods used to measure social capital in studies exploring the association between social capital and all types of mental illness. The second is restricted to those studies exploring the association between social capital and CMD in order to provide a summary of what is already known about the association. Based on the results of the literature reviews presented in Chapters 1 and 2, I end Part I with the justification, objectives and research hypotheses for the thesis.

Part II: Cross-cultural analysis of social capital and CMD

In Chapter 3 I summarise the methods used to collect the Young Lives (YL) data including the measurement of social capital and CMD, followed by the analytical framework that I use for all my analyses, and an overview of the statistical methods used.

I present the findings of the comparative analysis of the association between social capital and CMD across the four YL countries in Chapter 4. The chapter concludes by highlighting the issues which require further exploration.

Part III: Social capital and CMD in Peru

Part III examines the issues highlighted in Chapter 4 through a detailed exploration of the association between social capital and CMD in Peru. I use psychometric and qualitative methods to validate the tool used by YL to measure social capital in Peru in Chapter 5.

The results of these qualitative interviews are supplemented by a review of the available literature on social capital in Peru to explore which types of social capital are important in Peru (Chapter 6). I use this to generate hypotheses about the determinants of individual social capital (ISC) in Peru, which are tested in Chapter 7 through an analysis of the determinants of each type of social capital using data from the YL study.

In Chapter 8 I present a further analysis of the association between social capital and maternal CMD in Peru using the results presented in Chapters 4, 5, 6 and 7 to frame new research questions and hypotheses, to re-formulate the analysis strategy, and to interpret the results.

Part IV: Social capital and CMD: Where are we now?

In the concluding chapter I present an overview of the results for each of the objectives explored in this thesis. I then address methodological considerations, including the strengths and limitations of the approaches used and issues surrounding the measurement of social capital. This is followed by a discussion of the common themes in the association between social capital and maternal common mental disorders (CMD), and the implications of these for mental health interventions and future research.

Publications arising from this thesis

1. De Silva MJ (In Press). The methods minefield: a systematic review of the methods used in studies of social capital and mental health. *Social Capital and Mental Health*. K McKenzie and T Harpham. London, Jessica Kingsley Publishers.
2. De Silva MJ, McKenzie, K, Huttly, SR, Harpham, T (2005). "Social capital and mental illness: a systematic review". *Journal of Epidemiology and Community Health* 58(8):619-27
3. De Silva MJ, Harpham T, Huttly SR, Bartolini R and Penny ME (2005). "Understanding sources and types of social capital in Peru". *Community Development Journal* Advance Electronic Access.
4. De Silva MJ, Harpham, T, Tuan T, Bartolini R, Penny ME and Huttly SR (2005). "Psychometric and cognitive validation of a social capital measurement tool in Peru and Vietnam" *Social Science and Medicine*. Advance Electronic Access.

**Part I: Social capital and mental health:
existing evidence**

1. Social capital and mental health: key issues

In this chapter I provide a brief overview of maternal common mental disorders (CMD) in low income countries. I outline the scale of the problem and what is known about their individual and contextual causes. I argue that social capital may explain some of the geographical patterning seen in the prevalence of CMD. This is followed by a brief overview of the theoretical development of social capital and the main criticisms of the concept which continue to impede progress in the field. In light of this, I outline my combined theory of social capital which views social capital as both context and composition – the property of groups and individuals. I conclude with an overview of how the theory of social capital translates into measurement, and some hypothesized causal pathways through which social capital may affect mental health.

1.1 Mental health

1.1.1 CMD in low income countries

Mental illness is a broad concept which encompasses many different conditions with differing aetiologies, ranging from schizophrenia to depression and substance misuse. The World Health Organisation (WHO) estimates that over 450 million people worldwide (10% of the adult population) suffer from mental disorders at any one time. In 2001, mental disorders accounted for 12% of the global burden of disease (WHO 2001b). Among the non-communicable diseases, psychiatric illnesses are the most important cause of disability in low income countries (Abas and Broadhead 1994). Common mental disorders (CMD) are the most prevalent psychiatric illnesses: the WHO estimates that one in three people will be affected by CMD in their lifetime (WHO 2001b). CMD is a term used to describe a range of different conditions characterised by anxiety and depression which are “*commonly encountered in community settings and whose occurrence signals a breakdown in normal functioning*” (Goldberg and Huxley 1992). Anxiety disorders include generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, and phobias. Mood disorders include bipolar disorders and major and minor depressive disorders. Of these, depression is rated the single most disabling disorder in the world, accounting for more than one in ten years of life lived with disability (Murray and Lopez 1996).

Women in low income countries are disproportionately affected. Results from a range of studies show that across the world three times more women than men (around 30%) suffer from CMD (Patel 2001), while rates of post-natal depression are three times that of the developed world (Cooper et al. 1999b). Women are believed to be more vulnerable to CMD due to their multiple roles as caregivers and economic producers, exposure to domestic violence, and unequal power relations with men (Patel 2001, WHO 2001b). CMD not only impact the health of the mother, but also that of the children she cares for. Poor maternal mental health has been linked to reduced quality of interaction with infants (Cooper et al. 1999b, Miranda et al. 2000), infant malnutrition (Miranda *et al.* 1996), reduced infant growth (Patel 2003, Harpham et al. In Press), and later child cognitive and developmental problems (Murray and Cooper 1997, Runyan et al. 1998).

CMD are common, often chronic, and profoundly disabling, yet cheap and effective pharmacological and psycho-social interventions are available to treat them in low income countries (Patel et al. 2004). Unfortunately, as more than 30% of countries have no mental health programme (WHO 2001b), these interventions are not reaching those most in need. A recent evaluation of mental disorders in six low income countries found that 76-85% of serious psychiatric cases went untreated in the 12 months before the survey (WHO 2004). Targeting depression in women has been rated the fifth most important priority for world health intervention (Abas and Broadhead 1994).

1.1.2 Individual risk factors for maternal CMD

While a number of studies have examined the prevalence of CMD in the developing world, few have explored their aetiology, and even fewer have evaluated interventions to combat them (Blue and Harpham 1998, Patel et al. 1999). In a recent review of six leading international psychiatric journals, only 6% of the research published was not from Western countries (Patel and Sumathipala 2001).

Drawing largely on literature from the developed world, CMD are viewed as the result of a complex interaction between biological, psychological, and social risk factors (WHO 2001b). The risk factors for CMD emerging from low income countries are remarkably similar to those established in the developed world, suggesting common

mechanisms across cultures (Patel *et al.* 2001). These include a significant genetic component to nearly all CMD, indicating a complex interaction between genetic susceptibility and environmental triggers (WHO 2001b). These triggers primarily involve social factors such as poverty and its associated conditions including migration, low education and a higher burden of poor physical health (Fryers *et al.* 2003). As Patel argues, there is a “*vicious cycle of poverty, depression, illness, disability, increased health costs, inadequate health care, and further impoverishment*” (Patel 2001). Relative deprivation and increasing inequalities are also important risk factors, with residents’ assessment of their own standard of living compared to their neighbours associated with CMD (Ellaway *et al.* 2001). Worryingly, these social risk factors are on the increase across low income countries, for example in the last 50 years of the 20th Century urbanisation tripled from 16% to 50% of the population (Harpham and Blue 1995). This may increase the future burden of mental illness in these settings.

Severe life events such as the death of a loved one, domestic abuse or family breakdown are all associated with an increased risk of CMD (WHO 2001b), contributing to the vicious cycle between poverty and mental illness as the poor are disproportionately affected by such events. This cycle is continued as previous mental illness is one of the strongest predictors of CMD (Cooper *et al.* 1999b, Inandi *et al.* 2002, Patel *et al.* 2002), therefore severe life events which trigger an episode may instigate a downward spiral of mental illness.

In addition to these risk factors, mothers face additional stresses as a result of their reproductive role. For example miscarriages, unplanned or difficult pregnancies, lack of social support after the birth, and child illness are all risk factors for post-natal depression (depression occurring within six weeks of giving birth) (Cooper *et al.* 1999b, Inandi *et al.* 2002, Patel *et al.* 2002). Cultural factors may also disproportionately affect mothers, for example in Goa, India, Patel *et al.* (2002) found in a prospective cohort study that sadness about having a daughter rather than a son was associated with increased rates of post-natal depression.

1.1.3 Community risk factors for maternal CMD

There has been a recent increase in interest in the effect of area level risk factors on health, for example the effect of community socio-economic status on mortality (Kearns 1993, Macintyre and Ellaway 2000a, Kawachi and Berkman 2003). This has been facilitated by the development of multilevel modelling techniques which allow the effect of context on individual outcomes to be estimated. Multi-level modelling avoids the ecological fallacy whereby inferences about individuals are based on data collected at the ecological level; a problem which has hampered previous efforts (see for example Lynch et al. 2001, Skrabski et al. 2003). There is now a growing body of research exploring the impact of neighbourhood social characteristics ranging from socio-economic deprivation to neighbourhood disorder on a wide range of health outcomes including mental health (Subramanian 2004).

The advantages of using multi-level models to explore community level influences on health are numerous. Firstly, the effect of compositional (characteristics of individuals) and contextual (characteristics of places) factors can be estimated. This places individual risk factors in context, for example whether an individual smokes or not is partly a consequence of cultural attitudes towards smoking (Macintyre and Ellaway 2000a). Secondly, it reconciles the two divergent epidemiological traditions of individual risk factors and ecological analyses, and enriches the almost exclusive focus on the former throughout the last century (Pickett and Pearl 2001). Perhaps most importantly, the recognition that the health of individuals is determined not only by their own characteristics but by those of the places they live, results in more holistic (and it can be argued, realistic) models of disease causation.

A number of methodological issues need to be resolved for the promise of research into community level influences on mental health to be fulfilled. Macintyre et. al. (2002) argue that the inter-relationship between compositional and contextual factors needs to be explored and that it is an over-simplification to view them as unrelated constructs. Context is not just what is left over when all possible individual level factors have been accounted for, as individual factors are partly determined by the context in which people live. For example, an individual's income may be partly determined by the type and availability of local employment opportunities, hence "*people make places and places make people*" (Macintyre and Ellaway 2003).

Macintyre and Ellaway argue that this over-simplification has led to over-adjustment for individual attributes which may actually be on the causal pathway between community level factors and health. For example, community deprivation may affect mortality through restricting the socio-economic status of individuals in poor communities. They argue that conclusions such as that of Sloggett and Joshi (1994) that it is composition and not context which matters prematurely dismiss this field of research as they ignore the fact that context can determine composition (Macintyre and Ellaway 2003).

A further problem with existing research is the predominance of cross-sectional studies which ignore the time lag through which community effects on health probably operate (Kawachi and Berkman 2003). Cross-sectional studies are also unable to separate out social selection versus social causation hypotheses. Do poor people 'choose' to live in poorer areas, or does living in a poorer area make people worse off (Kawachi and Berkman 2003)?

Diez Roux (2003) argues that the key challenge facing neighbourhoods and health research is to pin down a definition of community. While in much research communities have come to mean geographically bounded units (Kawachi and Berkman 2003), they can also be seen as overlapping contexts, for example communities of friends or the work place community, all of which may affect health (Subramanian *et al.* 2003a). Despite these different definitions, it seems sensible to at least start with more easily defined geographically bounded communities, before moving onto more fluid and therefore more difficult to measure contexts (Kawachi and Berkman 2003).

Macintyre and Ellaway (2003) consider the most important problem facing this research to be the lack of theorising about the pathways through which community can affect health. Formulating specific hypotheses about causal pathways not only allows the explicit testing of these hypotheses, but also makes it possible to disentangle the effect of context and composition by classifying variables as either confounders or intermediate variables.

In spite of these methodological problems, there are compelling reasons for studying the effect of community characteristics on CMD. Firstly, rates of mental illness vary both within and between populations (Duncan et al. 1995, Wight et al. 2005), pointing to the role of contextual factors in disease causation. For example, in a recent WHO survey of 16 countries the prevalence of mental disorders across countries varied between 4.3% and 26.4% (WHO 2004). Secondly, Blue and Harpham (1998) have argued that the majority of people with CMD do not seek medical care, and therefore that intervening at the community level is vital to ensure that the majority of affected people can be targeted. Thirdly, Patel argues that the protective factors in a community that enable people living in deprived circumstances to remain in good mental health need to be identified and used as a basis for interventions. He argues that where mental health services are poorly developed, preventative strategies aimed at strengthening protective factors in local communities may be more sensible than replicating the expensive (and not necessarily effective) health care systems of the developed world (Patel 2001).

As yet no study has explored community level risk factors for mental illness in low income countries. This contrasts with a significant increase in this research in the West. In 2001 Picket and Pearl (2001) identified only one study exploring the association between community level socio-economic status and mental health. A repeat of this review in 2004 found 12 studies (none of which were set in low income countries), showing strong evidence of an association between community deprivation and CMD, and some evidence of an association between community level inequality and CMD (Muntaner *et al.* 2004). Other studies from the USA and UK suggest a role for the ethnic composition of communities (Tweed et al. 1990, Dumont 2002, Wight et al. 2005), neighbourhood problems (Ellaway *et al.* 2001), and social disorder (Aneshensel and Sucoff 1996, Ross et al. 2000) in the prediction of CMD.

1.2 Social capital

1.2.1 The adoption of social capital in mental health research

Social capital is a relatively new concept which may provide an explanation of how the social environment affects mental health. It is a way of describing social relationships within societies or groups of people and adds a social dimension to

traditional structural explanations of disease by viewing communities not just as contextual environments but as connected groups of individuals (Cullen and Whiteford 2001).

There are many definitions of social capital (Bourdieu 1986, Coleman 1990, Putnam 1993) but most overlap. The most accessible definition used in the health sciences originates with Putnam (1993). He stated that social capital consists of five principal characteristics, namely: (a) community, voluntary, state and personal networks; (b) civic engagement; (c) local civic identity, sense of belonging, solidarity and equality with other members; (d) reciprocity and norms of co-operation; (e) trust in the community.

The rise of social capital research in the last ten years has been meteoric. Medline cites well over 150 studies examining the association between social capital and health (Kawachi *et al.* 2004), and many hundreds more exploring the relationship between social capital and non-health related outcomes (Halpern 2004). Research has shown social capital to be associated with outcomes as diverse as crime rates (Sampson *et al.* 1997), political development (Putnam 1993, 1995), and economic development (Narayan and Pritchett 1997, Grootaert and van Bastelaer 2001). While a substantial amount of work has been conducted primarily by the World Bank into the role of social capital in sustainable development in low income countries (Krishna and Shrader 2000, Grootaert and van Bastelaer 2001, 2002), hardly any studies have examined the association between social capital and health in this context. Interest in social capital has also been growing among health researchers, with associations shown in developed countries between social capital and, for example mortality (Kawachi *et al.* 1997, Skrabski *et al.* 2003) and self-rated health (Kawachi *et al.* 1999b, Boreham *et al.* 2003, Pevalin and Rose 2003). Interest is now focusing on the association between social capital and mental health, as the psychosocial pathways through which social capital are thought to affect health may be more relevant for the pathology of mental disorders (Cullen and Whiteford 2001, McKenzie *et al.* 2002).

In the field of mental health, social capital is starting to influence mental health policy development (Cullen and Whiteford 2001, Henderson and Whiteford 2003), despite the lack of a clear evidence base to support these policy changes coupled with wide

ranging criticisms of the concept. Building or sustaining healthy communities is now considered an important weapon in a state's strategy to prevent mental illness. For instance, the UK Government has written the building of social capital into its mental health policy. The Department of Health has explicitly cited developing social capital as an important feature of mental health promotion (Department of Health 2001), and more recently the Government's Social Exclusion Unit's action plan to improve mental health in England and Wales has advocated that authorities should target access to volunteering, roles in the community, improving social networks and general participation to improve mental health (Deputy Prime Minister 2004). In addition, the WHO and in particular the World Bank have adopted social capital as an important tool in poverty reduction and community development (Henderson and Whiteford 2003).

It is unclear whether there is an adequate evidence base to support these policy changes. Despite three recent reviews of the association between social capital and all mental illness, the exact association remains elusive. Two of the reviews are non-systematic and do not synthesise results from different studies to provide an overall picture of the association (Whitley and McKenzie 2005, Almedon In press). The third is an earlier version of my review presented in section 2.4, which though systematic, covers all mental illnesses making the studies difficult to summarise (De Silva et al. 2005). The burgeoning social capital and mental health literature since this review was completed in 2003 makes an updated and restricted review of the association between social capital and CMD possible and timely. Such a systematic review is required to inform the debate concerning the veracity of claims that building social capital is an important facet of national mental health policy.

1.2.2 The development of social capital theory

The development of social capital theory has been extensively critiqued (see for example (Macinko and Starfield 2001, Van Deth 2003, Szreter and Woolcock 2004, Whitley and McKenzie 2005), so only a broad overview will be presented here. Initial attempts to define social capital were made by sociologists who added onto traditional social network analysis the notion that networks have benefits which can be used productively, for example to secure access to economic markets (Bourdieu 1986, Coleman 1988). Social networks are therefore a form of capital, hence the term

‘social capital’. These theories focus on the value of an individual’s social networks, but as Portes points out (1998) “ *the term does not embody any idea really new to sociologists*”. Indeed, social capital thus defined has been studied for some time under the alternative name of social network analysis.

It was not until Putnam’s (1993) analysis of the political development of Italian states that the concept of social capital really took off. In addition to defining social capital as networks, Putnam expanded the definition to include the shared norms, values and mutual trust which “*facilitate coordination and cooperation for mutual benefit*”. Putnam also introduced a conceptual twist by arguing that social networks not only have a value to the people within the social network (compositional effects), but also to people outside the network (contextual effects). Social capital thus defined is the value of social relationships to groups (including communities, states and countries), as well as to individuals. This has led to significant debate as to whether social capital should be considered a property of groups of people (an ecological construct) or of individuals.

1.2.3 Criticisms of social capital

Partly as a result of the three different conceptualisations of social capital represented by the work of Putnam, Bourdieu and Coleman, significant criticism of the theory, measurement, and application of social capital has been levied from many quarters (Portes 1998, Woolcock 1998, Macinko and Starfield 2001, Fine 2002). These criticisms must be addressed before the utility of social capital in mental health research can be determined.

One major criticism is that social capital as a concept is too broad, essentially encompassing all social relationships at any level be that within families, or between state level organisations (Macinko and Starfield 2001, Muntaner et al. 2001, Fine 2002, McKenzie 2003). This is a direct consequence of the different theoretical conceptualisations of social capital. While individual measures such as the number of groups that an individual belongs to have been criticised as ‘old wine in new bottles’ (Lochner *et al.* 1999), ecological measures such as the percentage of non-voters show little commonality with such measures and yet are included under the same term. Further confusion has been added by the broad conceptualisation of social capital in

the development literature, including the Department for International Development (DFID) Livelihoods framework (www.livelihoods.org). The situation has not been helped by critiques erroneously calling measures such as income inequality and racial segregation social capital (Kunitz 2001). This diversity has led to some theorists calling for social capital to be re-named ‘social capitals’, thereby allowing the different, and perhaps irreconcilable, streams of research to continue (Whitley and McKenzie 2005).

A further justified criticism is that some of the proxies used to measure social capital present tautological arguments by measuring both the causes and consequences of social capital (Portes 1998, Kawachi and Berkman 2000, Stone 2001, Harpham et al. 2002). The existence of social capital cannot be inferred from the very outcomes which it is hypothesized to generate (for example low crime rates). In addition, the principal theorisations define social capital as a social good, resulting in the common criticism that social capital only explores the positive side of social relations (Portes 1998, Kawachi and Berkman 2000, Macinko and Starfield 2001, McKenzie et al. 2002). For example, Putnam (1995) defines social capital as “*coordination and co-operation for mutual benefit*” and Coleman (1990) as “*relations among actors ...that are useful for the cognitive or social development of a child or young person*”. Hypothesised negative consequences of social capital include exclusion of outsiders, excess claims on group members, restrictions on individual freedoms, and downward levelling of norms (Portes 1998).

A major criticism levied against social capital is that the measurement does not match up to the theory (Woolcock 1998, Stone 2001, McKenzie et al. 2002). A number of studies retrofit concepts of social capital onto existing survey data, resulting in measures such as newspaper readership or census response rates which bear little relation to the theoretical concepts (Weitzman and Kawachi 2000, Rosenheck et al. 2001, Harper et al. 2003). Such practices are largely responsible for the tautological measures outlined above. A number of theorists stress that social capital is a multi-dimensional concept, the complexity of which cannot be accurately captured by a single question (Stone 2001, Harpham et al. 2002, Lynch 2002, McKenzie et al. 2002). Yet some studies use only one indicator of social capital (Weitzman and Kawachi 2000, McCulloch 2001), or collapse several indicators into one scale of low,

medium or high social capital (Rosenheck et al. 2001, Desai et al. 2005). Nevertheless, in recent years progress has been made towards more theoretically informed and multi-dimensional measures (Harpham *et al.* 2002), although the debate about the level at which social capital should be measured remains.

Compounding this problem is the lack of validation of tools to measure social capital. While hundreds of studies have measured social capital, only a handful have attempted psychometric validation of these tools, and even fewer have undertaken in depth validations. In a systematic search of the literature for all studies validating tools to measure social capital, I found only eleven studies attempting some validation. Of these, eight used psychometric validation such as factor analyses to assess internal validity (Robinson and Wilkinson 1995, Onyx and Bullen 2000, Narayan and Cassidy 2001, Stone and Hughes 2002, Yang et al. 2002, Hean et al. 2003, Li et al. 2003, O'Brien et al. 2004), and three used qualitative validation techniques (Boreham 1999, Earthy et al. 2000, Blaxter and Poland 2002, Tuan et al. In Press). The results of this review are presented in detail in section 5.1.

Despite these criticisms, social capital still holds promise for a greater understanding of the causes of ill health. It expands the focus from the individual to the collective, highlights the social causes of disease as well as the biological and material, and explores the complexity of social relationships through recognising that they can occur at different levels and have indirect effects.

1.2.4 Measurement of social capital

The way social capital is measured must match up to the complexity of the theory which emphasises multiple dimensions within the concept. There is consensus that social capital consists of social networks (quantity of relationships) characterised by norms of trust and reciprocity (quality of relationships) (Lochner *et al.* 1999), but these must be broken down into their component parts and measured separately (Stone 2001). Social capital can be divided into a behavioural/activity component of what people do (for example participation in groups) and a cognitive/perceptual component of what people think (for example whether they trust other people). These are referred to as structural and cognitive social capital respectively (Bain and Hicks 1998). Structural and cognitive social capital can refer to linkages and perceptions in relation

to people who are similar to each other, such as others in one's own community or people of the same socio-economic status (called bonding social capital), or to people who are different, such as people outside one's community or with a different social identity (called bridging social capital). Social capital can also occur through formal institutions such as between a community and local government structures, or through people with different power relations, termed linking social capital (Szreter and Woolcock 2004). Thus while structural and cognitive social capital explain the nature of networks (i.e. their quality or quantity), bonding, bridging and linking social capital explain where these relationships take place. Table 1.1 illustrates the different dimensions of social capital, what they can be used for, and some examples of how they are measured.

It is important that all dimensions of social capital are measured in order to fully assess their impact upon health. For example, a community may have very strong bonding ties but weak bridging ties, reducing the ability of that community to effect change beyond what it has immediate control over. Equally, measuring the quantity of networks (structural social capital) has little meaning unless the quality of those networks is also assessed (cognitive social capital).

As with the theory of social capital, the most significant debate surrounding the measurement of social capital relates to whether it is considered the property of individuals or groups. Individual social capital is most commonly measured by asking individuals about their participation in social relationships and their perceptions of the quality of those relationships. For example it may measure whether a person participates in local social groups not related to work or whether they trust their neighbours. Ecological social capital has most often been measured by aggregating the responses of individuals in population surveys to the community level (for example, average level of trust), which relies on the aggregation of subjective assessments which are dependent upon the personal characteristics of the respondents (McKenzie *et al.* 2002).

Table 1.1: The dimensions of social capital

Definition	Purpose	Example question¹
Cognitive Trust, reciprocity, sharing and support.	Reduces levels of mistrust and anxiety. Leads to communities acting together for their best interest rather than people working against each other.	<i>In general, can the majority of people in this community be trusted?</i>
Structural Extent and structure of relationships such as size of networks, and degree of group membership.	Provides the structures through which people can create more networks, exchange favours, and engage in collective action.	<i>In the last 12 months have you been an active member in any of the following types of groups in your community?</i>
Bonding Linkages to people who are similar.	Strengthens ties between people of similar status allowing people to subsist of a daily basis.	<i>In the last 12 months, have you joined together with other community members to address a problem or common issue?</i>
Bridging Linkages to people who are different.	Gives access to resources, information and opportunities which are not available in ones own group.	<i>In the last year have people in this neighbourhood carried out any organised activities with people from another neighbourhood?</i>
Linking Links between people or institutions with different power levels.	Provides access to resources and power.	<i>In the last 12 months, have you talked with a local authority or governmental organisation about problems in the community?</i>

A number of problems have been identified with this approach. Macintyre and Ellaway (2003) have cautioned against the atomistic fallacy whereby ecological characteristics are incorrectly inferred from individual level data. For example, individuals may have high social capital by being very socially active, but this will not necessarily produce a cohesive society if people are engaged in different religions or social groupings within that community, as seen in the segregated communities in Belfast. They also point out that less variation in neighbourhood scores has been found in subjective assessments of neighbourhoods when compared to objective assessments (Macintyre 1997). This may be due to psychological adjustment whereby a downward levelling of aspirations means that residents downplay the differences

¹ Example questions taken from the Adapted Social Capital Assessment Tool (A-SCAT) (Harpham, T, Grant, E and Thomas, E (2002). "Measuring social capital within health surveys: key issues." *Health Policy and Planning* 17(1): 106-11..

between communities as a protective mechanism against despair (Sen 1992). The further problem of reverse causality occurs when subjective assessments of the social environment are used to predict health outcomes, in particular mental health, as respondents' mental illness may cause them to under-report social capital in their community.

In light of these problems, some researchers have argued for the use of 'true' contextual measures of community characteristics (McKenzie et al. 2002, Henderson and Whiteford 2003, Macintyre and Ellaway 2003). However, to date no study has successfully measured social capital in a truly contextual way. The two most innovative projects developing these measures, the Health Survey for Scotland (Cummins *et al.* 2005) and the Project on Human Development in Chicago Neighbourhoods (PHDCN) (Raudenbush and Sampson 1999), have both been unable to produce adequate contextual measures of social capital. Cummins et al. (2005) attempted to use routinely and non-routinely collected data to measure 10 aspects of social capital ranging from paid newspaper circulation to religious congregation size, blood donations, and volunteering rates. However, due to issues of data reliability and the geographical levels at which data were available, only two of the 10 variables could be used (voter turnout in the general election and political party in power). Even if reliable data were available for all these variables, they remain poor proxies for the complex aspects of the social environment which social capital aims to capture. Raudenbush and Sampson (1999) achieved more success with the intensive video-taped observations of neighbourhood environments in Chicago. However, contextual observations were limited to physical and social disorder (for example presence of graffiti, rubbish, and anti-social behaviour), which are outcomes of social capital and not social capital itself.

Indeed, Raudenbush (2003) acknowledges that some aspects of the social environment such as social cohesion, norms of support and perceptions of fear and violence are actually best measured using aggregations of respondents views as it is the perception of the social environment rather than the reality which may be important for health. In addition, there is evidence that respondents are able to give objective assessments of their environment. Subramanian et al. (2003b) have shown that significant contextual differences between communities remain even after controlling for individual

predictors of perceptions of trust such as age and socio-economic status, indicating that subjective assessments of the environment do reflect contextual realities. Aggregations of individual perceptions therefore remain the best currently available way to measure ecological social capital.

1.2.5 A combined theory of social capital

The dichotomy between individual and ecological social capital epitomises the criticisms of the concept with no reconciliation of diverse theoretical definitions and measurement levels. Without a clear definition of social capital, accurate measurement that reflects the theory is almost impossible, making an analysis of its effect on a specific outcome meaningless. So can individual and ecological social capital be reconciled? Pollack and von dem Knesebeck (2004) argue that the two are not mutually exclusive and that *“the degree to which the individual-level infuses with the neighbourhood level and visa versa requires further theoretical and empirical study”*. On reflection, it seems that research into the two streams are so entrenched that it would be naive to assume that either one can be ignored. I argue that taking a holistic view of social capital as the ‘value’ of social relationships at any level allows the two streams not only to co-exist but to complement each other, and also recognises the complex relationship between compositional and contextual factors. Just as the distinction between compositional and contextual factors is artificial, so is the distinction between individual and ecological social capital. Individuals’ social capital is influenced by what is available to them in the community, and the level of social capital in a community is determined by the social capital of its residents.

My proposed combined theory of social capital attempts to reconcile these two streams of research. Individual social capital (ISC) considers direct relationships within a network (i.e. the impact of an individual participating in a network), while ecological social capital (ESC) considers indirect relationships (i.e. the impact of networks irrespective of participation). For example, effective community networks which prevent the closure of a local hospital benefit everyone who depends on that hospital, not just those involved in campaigning against the closure. As it is not necessary to be part of the campaign group to benefit from its actions this is an example of an indirect relationship. However, there may also be an additional impact on those personally involved in the group (direct effects). These may include positive

effects such as feelings of self-worth, and negative effects such as a drain on time and emotions. In order to measure the indirect effects of ESC on an individual's mental health, the direct effects of that individual's own social capital must also be taken into account. Multi-level modelling can be used to assess the direct effect of ISC and the indirect effect of ESC on an individual's risk of suffering from CMD.

While recognising that both ISC and ESC are important, I propose that measuring ESC at the community level (rather than at the family, state or even country level as other studies have done) is the most useful for exploring the aetiology of CMD. ISC has been studied in some detail via sophisticated social network analyses. However, ESC is a newer concept that seeks to explore the social context in which people live, resulting in more holistic models of disease causation. Exploring social capital as a community characteristic is exciting as it moves beyond individual determinants of health to the way that society can reduce the risk of illness (McKenzie 2003). Furthermore, in contrast to traditional structural ecological measures, it provides a novel way of exploring health determinants which recognises that communities are made up of groups of connected individuals rather than describing them in one-dimensional terms such as mean deprivation levels. Social capital thus defined is no longer 'old wine in new bottles' (Lochner *et al.* 1999). ESC also provides a clear methodological framework within which to explore associations with health outcomes. The research methodology used to explore relationships at an ecological level are very different from those required at an individual level, and include sophisticated techniques such as multilevel modelling. Standardising the research in this way will enable a cohesive body of work to be undertaken, allowing conclusions to be drawn regarding the association between social capital and different outcomes.

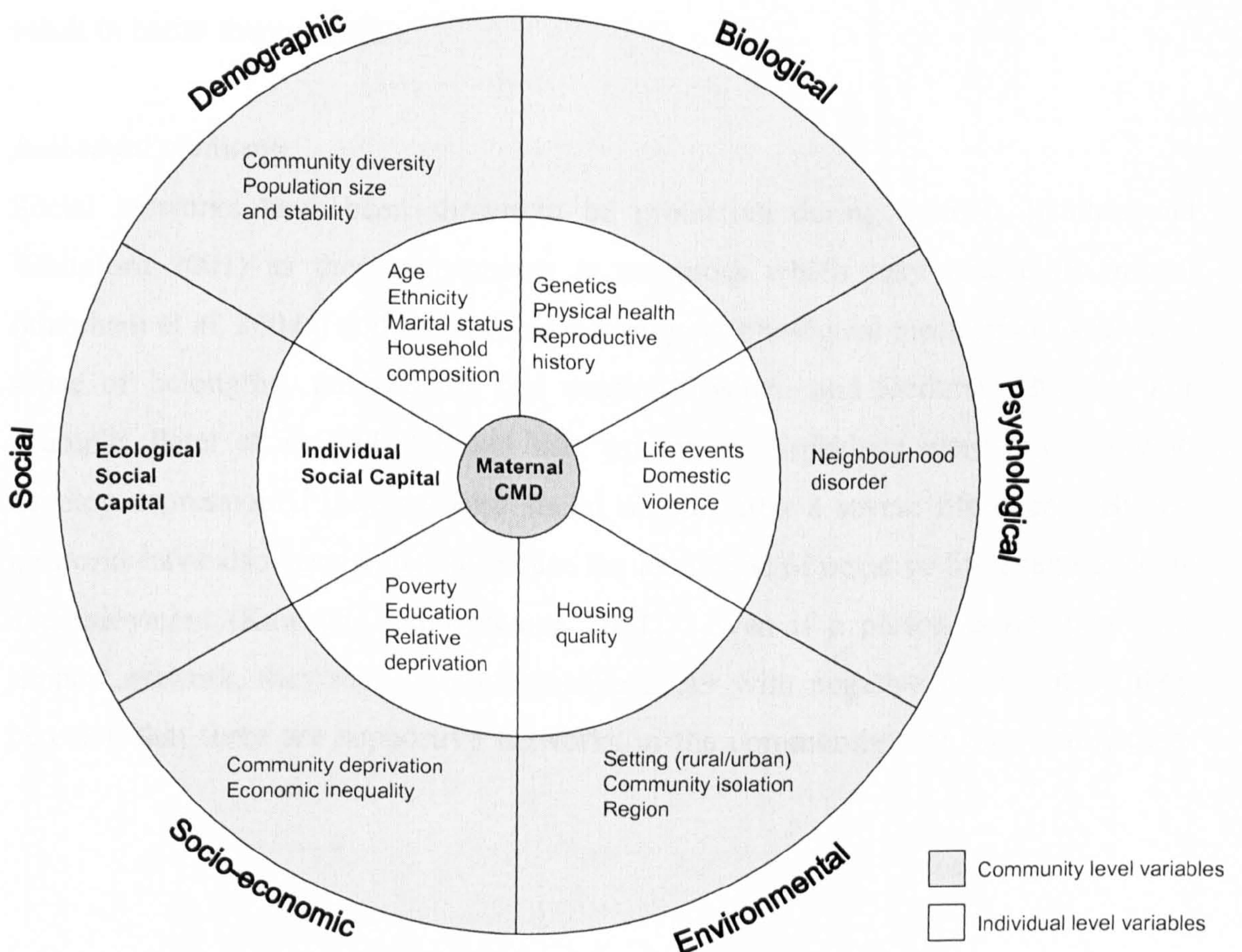
1.3 Association between social capital and mental health

In response to the criticism that there has been a lack of theoretical development about the causal pathways through which neighbourhood contexts affect health (Macintyre and Ellaway 2003), this section presents a conceptual framework outlining which individual and community level variables are risk factors for CMD, followed by a series of proposed pathways through which both individual and ecological social capital may affect mental health.

1.3.1 Conceptual framework

Based on the results of the literature review on individual and community risk factors for CMD presented in sections 1.1.2 and 1.1.3, the following conceptual framework (Figure 1.1) was developed. The variables are divided into the six main risk factor types for CMD, and into individual or community level factors. This framework views CMD as the result of a complex interaction between biological, psychological, environmental, socio-economic, demographic and social factors operating at both the individual and the community level. The framework was developed to provide a holistic model of CMD causation, rather than only exploring those variables that may confound the relationship between social capital and CMD, and is the basis for the analytical framework used for all the analyses in this thesis. It does not present the pathways through which these variables affect CMD, though it is assumed that there is a complex relationship between context and composition whereby individual characteristics affect community characteristics and vice versa.

Figure 1.1: Conceptual framework of risk factors for CMD



1.3.2 Causal pathways through which social capital may affect CMD

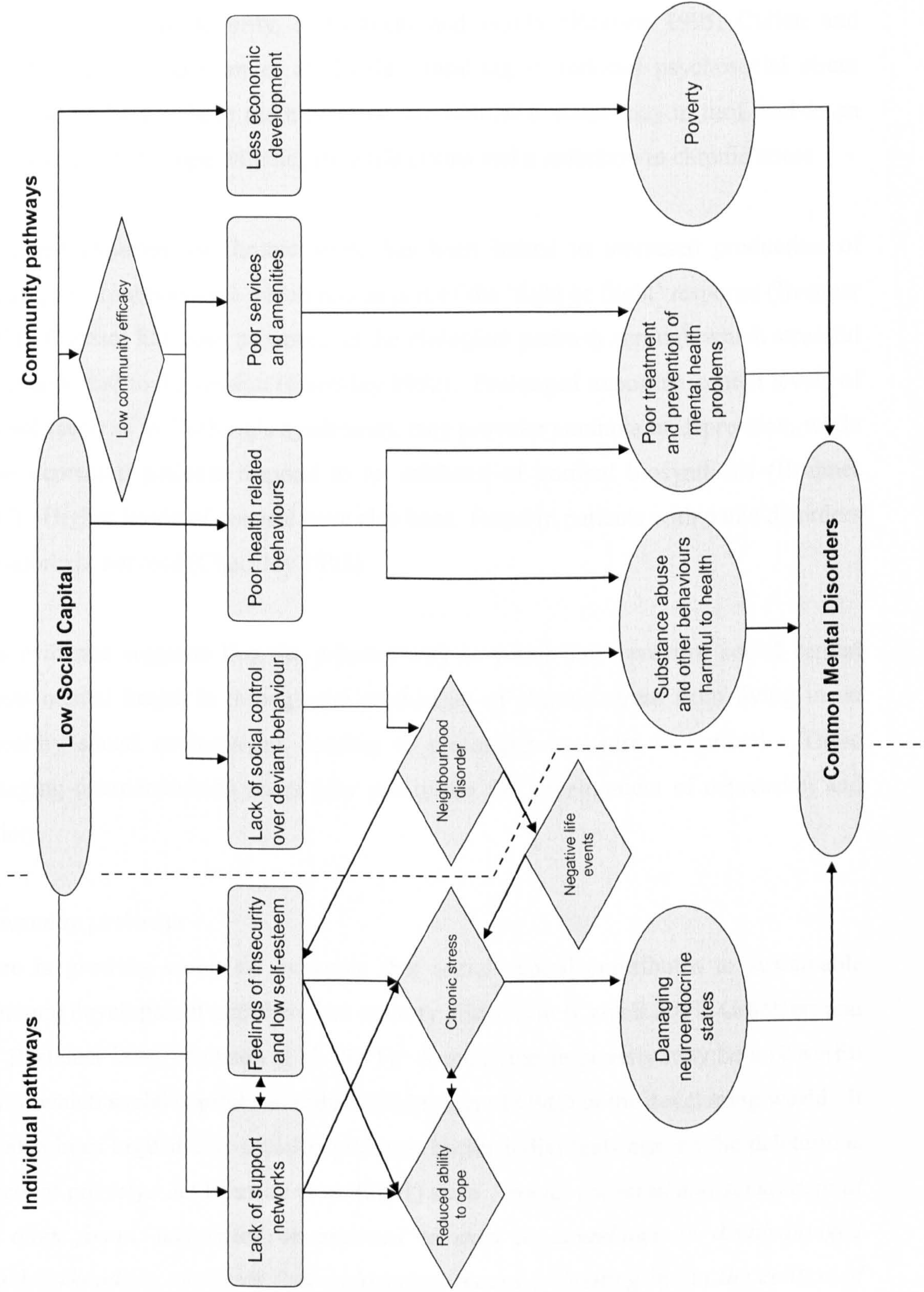
A number of potential mechanisms through which social capital may affect mental health have been proposed, largely drawing on the associations that individual social networks and support have been shown to have with health (Kawachi and Berkman 2001). These include: (a) more rapid diffusion of health information; (b) social control over deviant health-related behaviour (collective efficacy); (c) increased access to local services and amenities; and (d) psychosocial processes such as self-esteem and mutual respect (Kawachi *et al.* 1999a). However, no cohesive theory has been developed to explain how all of these factors may lead to the development of CMD.

I developed a conceptual framework based on the mechanisms proposed as potential pathways through which social capital may affect CMD (Figure 1.2). ESC can affect an individual's risk of developing CMD through both community and individual pathways. ESC should not only be viewed as a resource to collective action, but also as instrumental in creating and maintaining positive psychological states which may result in better mental health.

Individual pathways

Social networks have been shown to be protective during a crisis (Cullen and Whiteford 2001) as they give access to resources which may reduce its impact (Harpham *et al.* 2004a) and may promote coping psychological mechanisms such as a sense of belonging, purpose, or self worth (Kawachi and Berkman 2001). For example, Patel *et al.* (2001) found that women in Zimbabwe were less likely to develop depression if they received social support after a severe life event. Strong networks have also been shown to reduce the likelihood of negative life events such as unemployment (Kawachi and Berkman 2001). Even if a person is not part of a support network, they may be able to cope better with negative life events if they perceive that there are supportive networks in the community that they can access.

Figure 1.2: Hypothesised pathways through which social capital affects CMD



Living in a community where people trust each other has been hypothesized to increase feelings of security, self-esteem and equity (Putnam 1995, Cullen and Whiteford 2001, Harpham et al. 2004a), resulting in reduced psychosocial stress (Wilkinson 1996). These more positive psychological states may in turn lead to an increased ability to cope with negative life events and a reduction in chronic stress.

Prolonged exposure to chronic stress has been linked to increased production of cortisol, a steroid hormone which acts as part of the 'fight or flight' response (Brunner 1997). Cortisol has been proposed as the biological pathway through which stressful life events lead to depression (Checkley 1992). Prolonged exposure to high levels of cortisol (such as in Cushing's syndrome), may provoke paranoia or depression, while some depressed patients respond to an inhibitor of cortisol biosynthesis (Brunner 1997). Higher levels of cortisol have also been found in patients with panic disorders and anorexia nervosa (Checkley 1992).

This evidence suggests that the primary way in which low levels of social capital affects mental health is through the production of chronic stress from living in an unhealthy social environment, leading to prolonged exposure to cortisol. These damaging neuroendocrine states may precipitate the development of depression and anxiety.

Community pathways

There is growing empirical evidence that social capital contributes to sustainable economic development and therefore poverty alleviation (Carroll 2001, Grootaert and van Bastelaer 2001, Robison et al. 2001). A reduction in poverty may be a powerful way in which social capital can reduce the burden of CMD in the developing world. It has also been argued that social capital can buffer individuals against the deleterious effects of poverty. As Ellaway et al. (2001) state "*social cohesion and social capital are often found, advocated or assumed to exist in abundance in disadvantaged neighbourhoods as residents find endogenous means of 'getting by' in the context of poverty and social exclusion*". This has led to some commentators criticising social capital as a dangerous alternative to state-centred economic redistribution policies which excludes the structural determinants of health such as socio-economic status,

gender and ethnicity (Muntaner et al. 2001). Nevertheless, the potentially buffering effect of social capital on poverty is a pathway that deserves attention in low income countries where expensive mental health treatment programmes may not be feasible.

High ESC may also reduce CMD by creating effective communities that are better at exerting social control over deviant behaviour. This type of collective efficacy has been shown to result in less drug taking and anti-social behaviour which may be damaging to mental health (Kawachi *et al.* 1999a). Effective communities may also be better at acquiring and maintaining good health services, leading to improved prevention and treatment of mental disorders. For example, socially cohesive neighbourhoods have been shown to be more effective at preventing budget cuts and lobbying for more services (Sampson *et al.* 1997), though this pathway may be less important in low income countries, few of which have mental health services (WHO 2001b).

Cohesive communities have also been shown to promote good health-related behaviour. This may include the adoption of healthy behavioural norms (Kawachi *et al.* 1999a) such as preventing smoking in public places, a rapid diffusion of health information (Kawachi and Berkman 2000), and the increased adoption of innovative behaviours (Rogers 1983).

It must be stressed that while the purpose of Figure 1.2 is to explore the pathways through which social capital may affect mental health, the direction of causation in these proposed pathways may run either way. For example, as Szreter and Woolcock (2004) argue, social capital is a product of the prior history of political, constitutional and ideological developments in any given setting. It is highly plausible that economic and political development (in particular equitable development and greater state capacity) will lead to higher levels of social capital by creating more fertile ground for collective action and community initiatives. An improvement in social capital leading to greater community efficacy may subsequently increase the effectiveness of community development programmes, setting up a positive feedback loop. In addition, Figure 1.2 is not meant to suggest that social capital is the only way in which the social environment affects mental health. To a large extent the quality of services and amenities, control over deviant behaviour and economic development, all

of which may have an impact on mental health, are a product of the larger political, economic and social context, for example state policies on crime prevention and distribution of resources. ESC is proposed here as a mediating factor through which a community is able to access and make use of the wider social, political and economic context.

1.4 Next steps

In this chapter I have argued the need for research that explores the association between individual and ecological social capital and CMD in low income countries. As well as outlining the concept of social capital and its major criticisms, I present my combined theory of social capital which aims to reconcile some of the disparate schools of thought, and suggest some hypothesized pathways through which social capital could affect mental health.

Existing studies examining the association between social capital and mental health now need to be systematically reviewed in order to:

1. identify the limitations of existing research into social capital and mental health in order to determine the direction that future research needs to take to move the field forward; and
2. establish what is already known about the association between social capital and CMD and identify where new research can make an original contribution.

Both these topics will be covered in Chapter 2.

2. Systematic review of social capital and mental illness

In order for the concept of social capital to fulfil its promise, the criticisms surrounding its conceptualisation and measurement outlined in section 1.2 must be addressed. This chapter is divided into two parts, both based around a systematic review of quantitative studies exploring the association between social capital and mental illness. Despite a small number of excellent qualitative studies on social capital and mental illness (Sayre 2000, Cattell 2001, Whitley and Prince 2005), I focus in this review on quantitative studies as these reflect the methods used in this thesis. In the first part of the chapter I critically review the quantitative methods used to measure social capital in studies exploring the association between social capital and all types of mental illness in order to provide a representative overview of the research field. I explore how these studies have conceptualized and measured social capital and evaluate them in the light of criticisms of social capital research. As the focus of this thesis is common mental disorders (CMD), in the second section I restrict the review to those quantitative studies which examine the association between social capital and CMD in order to provide a summary of what is already known. The methods generic to both systematic reviews are presented at the start of this chapter. On the basis of the status of existing research I highlight the areas in which this thesis can make an original contribution, and outline the justification, objectives and research hypotheses of this thesis.

2.1 Chapter objectives

1. Systematically review the quantitative methods used to measure social capital in existing studies of social capital and mental illness, and evaluate these measures in the light of criticisms of the concept.
2. Systematically review quantitative studies exploring the association between social capital and CMD in order to provide an estimate of the effect of social capital on CMD.

2.2 Methods

A protocol was developed in accordance with guidelines in the Cochrane Reviewers' Handbook (Clarke and Oxman 2003). I aimed to identify all quantitative studies investigating the association between any aspect of social capital and mental illness up to the start of December 2004. The selection of databases and search terms was made following consultation with a Cochrane Information Scientist².

Published articles and grey literature were identified by searching keywords, titles and abstracts in 14 electronic databases and three social capital websites using appropriate text words and thesaurus terms related to mental illness and social capital. In addition, 'in press' articles of the two journals which publish the majority of social capital and health research (Social Science and Medicine and the Journal of Epidemiology and Community Health) were hand searched to identify forthcoming papers. Box 2.1 lists the databases searched and search terms used.

As different terms were, and still are, used to refer to concepts that have now been joined together under the umbrella term 'social capital', a wide range of search terms were used, for example 'social cohesion', 'collective efficacy' and 'trust'. The search term 'social support' was not included as there is a vast literature which has previously been reviewed relating social support to mental illness and I do not wish to repeat this work here (Kawachi and Berkman 2001). I believed that those social support studies which measure social capital would be picked up by the more specific search terms I used. Thesaurus terms (for example 'mental disorders') were used to search for all mental illnesses.

The search identified over 30,000 abstracts and titles which I reviewed electronically to identify original research which explored the association between some aspect of social capital and a mental illness outcome. Commentaries and reviews were excluded. The reference sections of studies identified in this way were hand searched to identify additional papers. Studies were excluded if they contained only measures of social capital which could be considered to be consequences of social capital, for

² Fiona Renton, Cochrane Injuries Group.

example neighbourhood disorder, divorce, or homicide rates. Papers were not excluded on the grounds of methodological quality as part of the purpose of the review was to document and evaluate limitations of existing research. No restrictions were put on date, geographical location, or language of publication. As the exact selection criteria for the two systematic reviews differed, specific details of the selection process for each review will be covered in the methods section for each review (sections 2.3.1 and 2.4.1).

Box 2.1: List of sources searched and search terms used for systematic reviews

<p>Electronic databases PubMed Embase PsychInfo IBSS Science and Social Science Citation Index TRIP Database Popline CAB abstracts HMIC SERFile SIGLE4 Lilacs Eldis ID21</p>	<p>Internet resources Inter-American initiative on social capital, ethics and development³ World Bank Social Capital document library⁴ Social Capital Gateway⁵</p>	<p>In press articles Social Science and Medicine Journal of Epidemiology and Community Health</p>
<p>Search terms mental disorders OR psychology OR psychiatry OR mental health OR mental distress OR psychological morbidity OR mental wellbeing OR emotional wellbeing AND social capital OR social cohesion OR neighbourhood cohesion OR neighborhood cohesion OR informal social control OR collective efficacy OR civil society OR group participation OR participation OR trust</p>		

2.3 Systematic review of the methods used in studies of social capital and mental illness

2.3.1 Methods

Papers were included if they had a mental illness outcome (including suicide as it is highly correlated with mental illness (Harris and Barraclough 1997)), but excluded if

³ <http://www.iadb.org/etica/ingles/index-i.cfm>

⁴ <http://www1.worldbank.org/prem/poverty/scapital/index.htm>

⁵ <http://www.socialcapitalgateway.org/>

they only measured sub-threshold states such as alcohol use but not misuse. As the aim of this study is to review existing research on social capital and mental illness in the light of criticisms of the field, studies were included only if they made explicit reference to the concept of social capital either by calling the measure ‘social capital’, or by explicitly grounding the measure in social capital research. Methodological characteristics of the studies were reviewed (for example study design and setting), and the measure of social capital examined.

2.3.2 Results

Characteristics of studies

Twenty-eight papers were included in the review. Table 2.1 summarises the methodological characteristics of the studies, and Appendix A lists the characteristics of each study. Only a limited range of mental illness outcomes are explored by the studies, with the majority (17/28) using screening instruments to measure CMD. Other mental illness outcomes include child mental disorders, mental health service use, psychosis, suicide and substance misuse. The studies are set in a limited geographical range with only one of the 28 studies from a low income country (Harpham et al. 2004a), and half set in North America. Urban populations are over-represented, in particular the urban poor. Most (22/28) of the studies are cross-sectional, making the direction of causality between social capital and mental illness impossible to determine.

Conceptualisation of social capital

The way in which the studies included in the review define and conceptualize social capital lends credence to the criticism that social capital as a concept is too broad, essentially encompassing all social relationships at any level, whether within families, within communities or between state level organisations (Macinko and Starfield 2001, Muntaner et al. 2001, Fine 2002, McKenzie 2003). The three major schools of thought characterised by the work of Putnam, Bourdieu and Coleman are represented. While the majority of studies adopt Putnam’s definition of social capital as a community level resource which is reflected in the structure of social relationships, a number of studies use Bourdieu’s individualistic definition as the resources that accrue to individuals as a result of their membership of social networks. Three studies

adopt Coleman's definition of social capital as embedded in the social relations between individuals, but available as a resource to individuals. Coleman developed his theory in relation to educational outcomes in children, and it is notable that all three papers using Coleman's definition measure child mental disorders (Parcel and Menaghan 1993, Furstenberg and Hughes 1995, Runyan et al. 1998). It should be noted that none of the original theories were developed in relation to health outcomes, and it is unclear whether the definitions reflect those aspects of social relationships which are most important for mental health.

Table 2.1: Description of studies included in systematic review of methods

Methodology		Number of studies¹
<i>Level of measurement of social capital</i>	Individual	21
	Ecological	8
<i>Mental illness outcome:</i>	Adult common mental disorders	17
	Child mental disorders	5
	Mental health service use/care	5
	Psychosis	1
	Substance misuse	1
	Suicide	1
<i>Study type:</i>	Cross sectional	20
	Longitudinal	8
	Case-control	2
<i>Setting:</i>	North America	14
	Other Europe	8
	UK	4
	Australia	2
	Low income countries	1
		Mixed
	Urban	12
	Rural	1
Total number of studies		28

¹ These studies total more than 28 as some studies fitted more than one category, for example used both cross-sectional and longitudinal methods, or measured more than one mental illness outcome.

The common criticism that social capital research only explores the positive side of social relations (Portes 1998, Kawachi and Berkman 2000, Macinko and Starfield 2001, McKenzie et al. 2002) is not borne out by this review. Many of the studies do acknowledge the potentially harmful effects of social capital and in fact measure social capital in a value-neutral way as evidenced by the positive association found between group participation and mental illness in one study (Veenstra 2005).

Level of measurement

The existing literature on social capital and mental illness does little to resolve the debate between ecological and individual measures of social capital, with seven studies measuring it at the ecological level, 20 at the individual level, and one at both levels (Veenstra 2005). This makes Shortt's (2004) claim that there is a "*consensus that social capital is a characteristic of social groups rather than individuals*" seem rather optimistic. The issue is further complicated by the fact that few papers state whether they measure ecological or individual social capital, or indeed make any reference to the existence of the debate surrounding level of measurement. In addition, a large number of the studies using Putnam's definition actually measure social capital at the individual level. These studies measure either an individual's access to an ecological resource (i.e. the extent they are personally involved in the community through social participation), or an individual's perception of it (i.e. whether they think people in general are trustworthy), rather than the resource itself.

The fact that only eight studies measure ESC, three of which use the same dataset (Drukker et al. 2003, Van der Linden et al. 2003, Drukker et al. 2004), highlights the difficulties with the measurement of this concept. While six studies aggregate individual responses to the community level, two use routinely collected data at the level of USA states. Yet as in the income inequality literature where different effects have been shown at different levels of aggregation (Wilkinson 1997), the differences between the results of the ecological studies may also be explained by different levels of aggregation measuring different types of social capital. Furthermore, with the exception of two studies (Hendryx and Ahern 2001, Veenstra 2005), all ecological studies use measures which are aggregations of individual responses. Though there is an acknowledged need for contextual measures that do not require aggregation of individual responses or rely on individual perceptions which may be confounded by mental health status, in practice such measures are elusive. For example, Veenstra (2005) used per capita number of public spaces as a proxy for structural social capital, but found that this was associated with worse depression scores. He concluded that per capita public spaces may reflect demographic phenomena such as population size declining over time rather than extent of social participation. Other contextual proxy measures such as voting rates (Rosenheck et al. 2001, Greenberg and Rosenheck

2003, Desai et al. 2005) are also open to different interpretations, as it is unclear to what degree voting is confounded by cultural factors such as political history.

One study (Veenstra 2005) includes both individual and ecological measures of social capital, though it identifies itself more with ecological measures by viewing individual social capital merely as *“individual level actions and sentiments that may contribute to a community’s store of social capital”*. This emphasises Macintyre and Ellaway’s (2003) theory that there is no clear distinction between contextual and compositional factors. Just as individual levels of trust partly determine levels of trust in the community, so community cohesion affects an individual’s perception of their social environment.

Diversity of social capital measures

A review of the social capital measures used in the 28 papers confirms Wall’s (1998) assertion that *“there is a point at which diverse interpretations create more confusion than clarity. Social capital is on the threshold of being used so widely and in such divergent ways that its power as a concept is weakened”*. The 28 papers measure 11 different aspects of ‘social capital’, outlined in Table 2.2. Of these, eight reflect common definitions of social capital. Three relate to cognitive measures of social capital such as trust and sense of community, four to structural social capital such as group participation and engagement in public affairs, and one to Coleman’s definition of family social capital which, while rooted in theory, has so little in common with the other measures that the results from these studies have to be viewed separately.

Two of the eleven social capital measures do not fit any of the three major definitions outlined above. Hendryx and Ahern (2001) frame their work within Putnam’s definition of social capital yet measure ‘community level health care social capital’ operationalised as collaborations among health care organisations and the proportion of the community with public health insurance. Liukkonen et al. (2004) measure ‘workplace social capital’ with the security of the employment contract (which they deem an indicator of trust) and social support from co-workers combined into a social capital score. In addition, four studies include measures of neighbourhood disorder or safety, despite these never appearing in the original definitions of the concept. This results in tautological arguments as both the causes and consequences of social capital

are measured (Portes 1998). Further heterogeneity stems from the fact that six of the studies retro-fit concepts of social capital onto existing survey questions rather than developing questions specifically to measure social capital, resulting in crude proxies for social capital such as voting rates (Rosenheck et al. 2001, Greenberg and Rosenheck 2003, Desai et al. 2005).

Table 2.2: Measures of social capital used in studies included in methods review

Structural social capital	No. studies
<i>Group participation</i>	
Individual	10
<ul style="list-style-type: none"> Participation in voluntary or local organizations. Frequency not always measured. 	
Ecological	4
<ul style="list-style-type: none"> Per capita membership of voluntary organisations, per capita number of public spaces. 	
<i>Civic action</i>	
Individual	8
<ul style="list-style-type: none"> Citizenship - involvement in local civic action such as attending meetings, demonstrating, voting in elections. Informal social control - willingness to intervene in hypothetical neighbourhood-threatening situations i.e. children mis-behaving, or opening of brothel. 	
Ecological	3
<ul style="list-style-type: none"> Voting rates. 	
<i>Social support</i>	
Individual	6
<ul style="list-style-type: none"> Actual social support - extent of help received from neighbours for different needs (i.e. helping if someone is sick), support from co-workers. Perceptions of social support - neighbours willing to help in theoretical situations such as taking care of kids. Reciprocity. 	
<i>Community networks</i>	
Individual	6
<ul style="list-style-type: none"> Informal social contacts with neighbours, bridging social ties with dissimilar people, contact with friends and family. 	
Ecological	3
<ul style="list-style-type: none"> Social contacts with neighbours 	

Continued...

Compounding the confusion, some researchers have deliberately not called their measures social capital despite direct overlap with the theoretical constructs of social capital. Shortt (2004) identifies a range of overlapping terms including social cohesion, sense of community, collective efficacy and community competence which reflect aspects of social capital, and concludes that “*under-theorisation has rendered social capital susceptible to confusion with related terms*”. The broad search terms used for the systematic search ensured that papers which measured aspects of social capital but did not specifically call them social capital were also identified. In all, 11 studies were excluded from the review because although they measured aspects of social capital, they did not use the term, bringing the total number of studies to 39. This means that nearly a third of social capital and mental illness research to date has explicitly not identified itself as social capital research.

These 11 studies fall into two main types: those that measure social cohesion (Aneshensel and Sucoff 1996, Cutrona et al. 2000, Ross et al. 2000, Ellaway et al. 2001, Curtis et al. 2004, Silk et al. 2004, Young et al. 2004), and those that measure group participation (Wright 1990, Brown et al. 1992, Rietschlin 1998). In addition, one paper called the exposure ‘sense of community’ (Gatrell et al. 2004). All of these papers were published after 1990, and seven of them after 2000, thus it seems that the researchers simply chose not to identify their research with the social capital literature rather than that they were unaware of the concept. This increasing trend towards measuring single aspects of social capital such as group participation and not relating this to the wider social capital literature is perhaps a direct response to criticisms of the concept.

To further add to the confusion surrounding the measurement of social capital, the same term is often used to describe different things. For example, ‘civic participation’ is used by some studies to measure engagement in public affairs or citizenship activities such as talking to community leaders (Harpham et al. 2004a), and by others to refer to membership of community groups (Ziersch and Baum 2004). Trust in people in general is variously called ‘social trust’ (Desai et al. 2005), ‘generalized trust’ (Lindstrom 2004), and ‘thin trust’ (Harpham et al. 2004a).

One-dimensional measures of social capital

Many of the social capital measures used by the studies in this review do not match the complexity of recent theory which recognises that social capital is a multi-dimensional concept comprising cognitive and structural components occurring within bridging, bonding and linking types of relationships. Only one study included in the review measures bridging social capital (Mitchell and La Gory 2002), and none explicitly measure bonding or linking social capital. Instead, most studies measure aspects of cognitive and structural social capital, perhaps because it is easier to measure the quality and quantity of social relationships as opposed to where they take place. Nevertheless, though many studies measure these concepts, few use the terms, making comparison between studies difficult.

Measurement simplicity is further evidenced by 12 of the studies measuring only one aspect of social capital such as social cohesion or group participation, rather than all the different dimensions. In addition, 10 of the studies that do measure more than one aspect combine the results into one score of high or low social capital. Such studies are unable to explore the inter-relations between different aspects of social capital (such as between trust and social participation), or to explore the relative importance of different aspects of social capital, and thus do not further our understanding of the concept as a whole. The validity of combining disparate measures is unclear, as those studies which have separated out different aspects of social capital have found different effects of different aspects of social capital on mental illness (e.g. Veenstra 2005).

A number of the questions used to measure aspects of social capital in the studies are simplistic and may not capture the important aspects of social capital for mental health. For example, community per capita membership of organizations does not measure type of participation or extent of involvement, both of which may be important for mental health. However, a number of more recent studies have used complex measures such as membership of different group types both inside and outside the community (Harpham et al. 2004a, Ziersch and Baum 2004), or frequency of participation in the group (Pollack and von dem Kneseback 2004). Distinguishing between different group types may be important as qualitative interviews in Australia have shown that respondents make a link between involvement and poor mental and

physical health for some group types (i.e. community action groups), whereas other types of groups such as sports and social groups are viewed as beneficial to health (Ziersch and Baum 2004). Similar patterns can be seen with the measurement of trust. While some recent studies have used a range of questions to capture a variety of different types of trust such as thin and thick trust, and trust in institutions (e.g. Harpham et al. 2004a), the majority measure only generalized trust using variations of the classic question 'do you think people in general can be trusted?' Yet as Blaxter (2004) argues, it is not clear that complex questions measuring many dimensions of trust are any better than simple ones, and qualitative research is needed to compare these types of questions. Lastly, the measurement complexity that does exist is often lost in the analysis, for example with different group types collapsed into one scale of group participation, or many different questions combined into one score using factor analysis. Much more work is needed to tease out the dimensions of social capital which are most important for mental health, but this can only be done with measurement and analytical complexity.

As outlined in section 1.2.3, the problems with the measurement of social capital are compounded by the lack of validation of the tools used by the studies, and this is borne out by the studies in this review. Only four of the 28 papers reported psychometric validation (internal reliability) of the social capital tools they used (Runyan et al. 1998, Caughy et al. 2003, Pevalin and Rose 2003, Pevalin 2004). The rest made no reference to validation. Without appropriate validation it remains unclear exactly what these complex questions are measuring and therefore whether an association between social capital and mental health exists. The issue of validating tools to measure social capital in different contexts will be addressed in Chapter 5.

2.3.3 Discussion

This review highlights the limitations of research conducted to date and lends some credence to the criticism that the current measurement of social capital does not match up to the theory. Too many studies use one-dimensional measures or rely on non-validated tools or questions not originally designed to measure social capital. The problem of how to validate social capital tools remains one of the major challenges facing this research (Macinko and Starfield 2001, Harpham et al. 2002).

The most serious charge against social capital is the lack of theoretical rationalization resulting in little agreement as to what social capital is, and consequently how to measure it. Though the consensus among health researchers leans towards Putnam's conceptualization of the concept, Bourdieu and Coleman's definitions still receive significant support. The debate about the level at which social capital should be measured does little to resolve the issue. This theoretical diversity results in related but distinct concepts being included under the umbrella term 'social capital'. If this situation is left unresolved, it will surely lead to social capital being consigned to the 'unproven' dustbin of academic ideas.

It is unrealistic to expect that a single definition of social capital can be adopted from the three existing schools of thought, or that researchers will come to a consensus as to whether social capital is the property of groups or individuals. But the least that can be expected is for studies to identify themselves with one of the schools of thought, and to clearly state which measure of social capital they are using and at what level. Only then can we begin to systematically evaluate the strength of evidence for each type of 'social capital' and decide which, if any, is the most important for mental health.

2.4 Social capital and common mental disorders: a systematic review

2.4.1 Methods

The aim of this review is to systematically review all studies exploring the association between any aspect of social capital and adult CMD in order to provide an estimate of the effect of social capital on CMD. In order to ensure that the studies are as homogeneous as possible and to allow comparisons with results from the analyses conducted in this thesis, only studies which use measures identified with Putnam's definition of social capital are included. The review is restricted to studies measuring CMD so that the results can be directly compared to those from this thesis, but also because a recent Lancet editorial (Henderson and Whiteford 2003) argued that social capital is unlikely to be universally associated with the whole range of mental disorders, and a start would be to use non-specific screening instruments to explore its association with CMD.

Selection of studies

I reviewed the abstracts of all studies identified through the search strategy outlined in section 2.2 to identify original quantitative studies which appeared to measure the association between one or more aspects of social capital and CMD. Independent screening of methods sections was then used to determine whether a study really did measure social capital and CMD, and to ensure consistency of studies selected. To achieve this, I photocopied the methods sections of papers potentially eligible for inclusion and removed all references to authorship and place of publication. I then distributed these photocopies to two independent reviewers⁶. All three of us independently assessed every study for inclusion against agreed criteria. Any differences of opinion were resolved by discussion.

Studies were included if they had CMD as an outcome and a measure of social capital as defined by Putnam as the exposure. As many studies do not use the term ‘social capital’ despite measuring aspects which fall under the concept (section 2.3), studies were included if they contained aspects of social capital such as membership of organisations or generalized trust in others, but did not call these terms ‘social capital’. Studies (or measures from studies) were excluded if they only measured one type of group participation (for example religious involvement or membership of sports teams), as specific types of participation may be indicative of things other than social capital. For example religious involvement may be more reflective of religious beliefs than civic participation. Studies were first excluded if they did not measure CMD as an outcome, and subsequently excluded if they did not contain an appropriate measure of social capital. Papers were not excluded on the grounds of methodological quality. Methodological limitations were evaluated, documented and are presented as part of the review.

Data extraction

The following data were extracted from each study and tabulated: setting, study design, population studied, sample size used for analysis, measure of social capital, measure of CMD, methodological validity of the study, and result. The

⁶ Trudy Harpham, Professor of Urban Development and Policy at London South Bank University and Kwame McKenzie, Senior Lecturer in Psychiatry, Royal Free and University College Medical School, London.

methodological limitations of each study were evaluated using a 11 point validity checklist covering problems with the measurement of social capital and CMD (for example, use of non-validated measures), methodological limitations which may distort the results (for example, selection bias), and features of the analysis which may distort the results (for example no control for confounding by socio-economic status).

Effect estimates (odds ratios and regression coefficients) and 95% confidence intervals were extracted separately for different aspects of social capital where these were measured. More than one effect estimate was available for studies that measured multiple aspects of social capital. For each effect estimate the most complete model was selected in order to achieve the best control for confounding. Models containing variables hypothesized to be on the causal pathway between social capital and mental illness were disregarded (for example neighbourhood disorder), and the next most complete model selected. Authors were contacted where necessary for information not present in a published paper that was required for a full assessment of the study (most often effect estimates and their 95% confidence intervals).

Data analysis

There is a danger that due to confounding and selection bias a meta-analysis of observational studies will produce precise yet spurious results (Egger et al. 1995). In addition, differences in the measurement of social capital and CMD and the varied nature of the statistical techniques employed by the studies meant that formal meta-analysis was impossible. Instead, effect estimates were divided into those measuring social capital at the individual level and the ecological level. They were further categorized according to type of social capital (for example group participation, trust, civic action and social harmony) and statistical approach used (whether they treated CMD as a continuous variable in linear regression or as case/non-case in logistic regression). To ensure comparability, the effect estimates from studies which had high levels of social capital as the reference category were transformed to have low social capital as the baseline. For linear regression this involved reversing the sign of the beta regression coefficient, and for logistic regression computing the reciprocal of the odds ratio. All reported effect estimates are therefore the effect of increasing levels of social capital on the risk of CMD. Where categories of social capital rather than a continuous score were used (for example low, medium and high trust), the

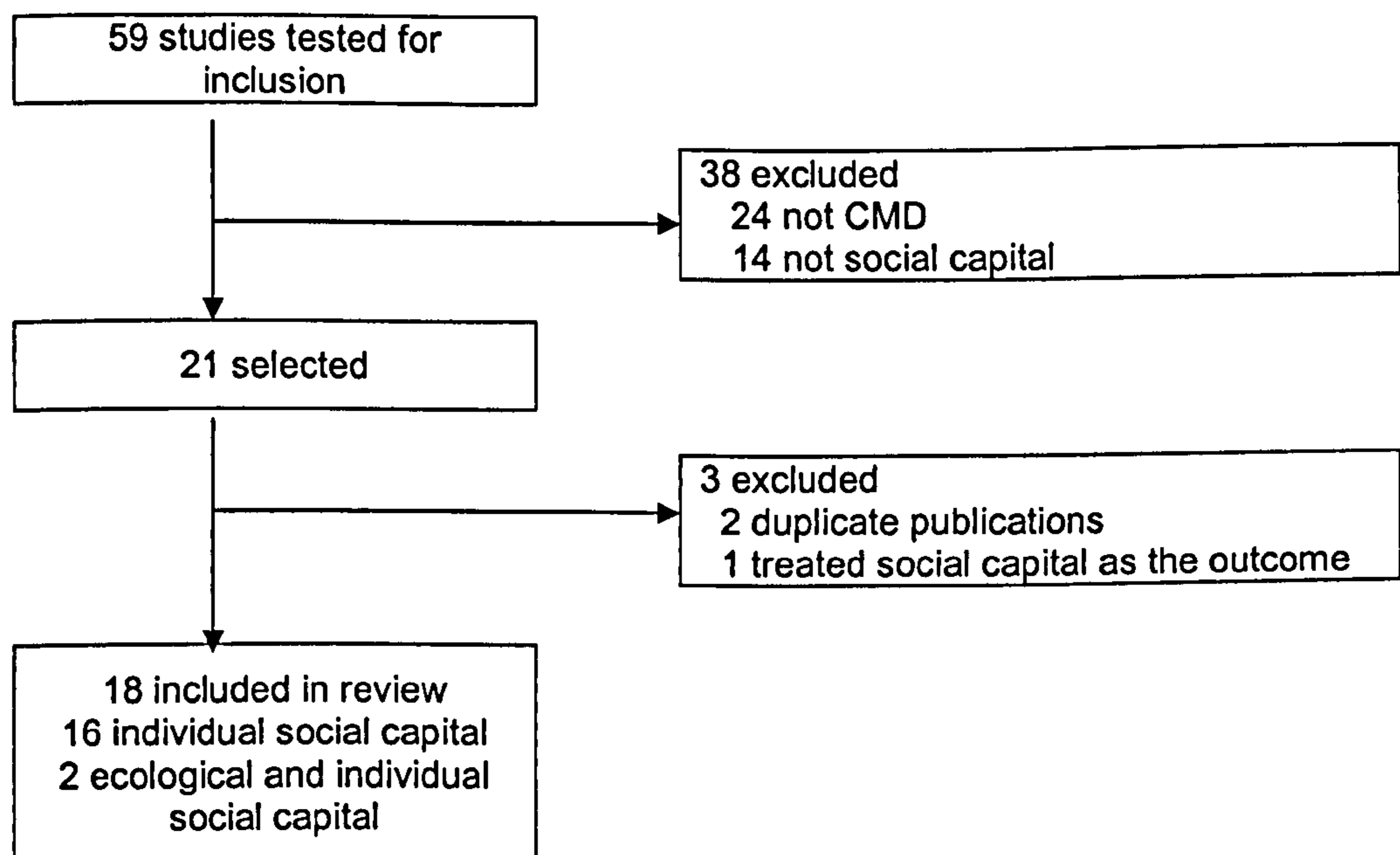
effect estimate for the highest versus the lowest category (i.e. high versus low trust) was selected. Effect estimates for each type of social capital were compared using forest plots, but no meta-analysis was conducted to calculate a pooled effect estimate. Replication of an inverse association (high levels of social capital associated with lower levels of CMD) across different populations using comparable methods was considered good evidence of an association.

2.4.2 Descriptive results

Selection of studies

The selection of studies is shown in Figure 2.1. From the 30,000 titles and abstracts retrieved from the electronic database and reference sections search, 59 studies met the initial screening criteria of measuring both mental illness and some aspect of social capital. After independent assessment by myself and the two other reviewers, eighteen studies were selected for inclusion in the review.

Figure 2.1: Selection of studies for systematic review of social capital and CMD



Twenty four papers were excluded because although they included appropriate measures of social capital, they measured other aspects of mental health and not CMD. Eight of these papers measured child mental disorders (Aneshensel and Sucoff 1996, Runyan et al. 1998, Stevenson 1998, Caughy et al. 2003, Drukker et al. 2003, Greenberg and Rosenheck 2003, Saluja et al. 2003, Silk et al. 2004), five measured

alcohol and drug abuse (Ennett et al. 1997, Weitzman and Kawachi 2000, Duncan et al. 2002, Coley et al. 2004, Weitzman and Ying-Yeh 2005), three measured severe mental illnesses such as schizophrenia (Rosenheck et al. 2001, Boydell et al. 2002, Sundquist et al. 2004), three measured mental health service use (Greenberg and Rosenheck 2003, Van der Linden et al. 2003, Drukker et al. 2004), two measured stress (Cooper et al. 1999a, Kunovich and Hodson 1999), and one measured emotional wellbeing (Rose 2000).

Fourteen papers were excluded because although they measured CMD, they did not contain an appropriate measure of social capital. Three of these measured socialising (Pahkala 1990, LaGory and Fitzpatrick 1992, Drukker and van Os 2003), three measured community satisfaction (Linn et al. 1989, Sooman and Macintyre 1995, Wilson et al. 2004), two measured community problems (Hendryx and Ahern 1997, Ross 2000), two measured attachment to community (O'Brien et al. 1994, O'Brien et al. 1996), and one measured unfair treatment (Schulz et al. 2000). In addition, two studies used Coleman-style definitions of family social capital (Furstenberg and Hughes 1995, Hao and Johnson R 2000), and one measured 'workplace social capital' (Liukkonen et al. 2004). In total, 21 studies met the initial inclusion criteria for the review. Three studies were subsequently excluded: one treated social participation as an outcome for depression rather than a predictor (Wright 1990), and two were duplicates (Macintyre and Ellaway 2000b, McCulloch 2001). In total, 18 studies yielding 56 effect estimates were included in the review.

Description of studies

The characteristics of the included studies measuring social capital at the individual and ecological level are shown in Tables 2.3 and 2.4 respectively. As with the review of all social capital and mental illness studies presented in section 2.3, there is a strong bias towards studies set in high income countries. All but one study (Harpham et al. 2004a) is set in the developed world, with the majority (14/18) based in the UK or North America. While over half (10/18) include residents from both rural and urban areas, the remainder are set in urban environments, with none exclusively set in rural areas. This geographical patterning is reflected in the tools used to measure CMD. Studies set in North America tend to use the Centre for Epidemiological Studies Depression Scale (CES-D), while those in Europe use the General Health

Questionnaire 12 (GHQ-12). Two studies (Greiner et al. 2004, Veenstra 2005) use their own questions to measure CMD rather than pre-existing validated tools.

Sixteen studies treat social capital as the property of individuals and two studies as the property of communities (ecological social capital) and individuals. The 18 studies measure six types of social capital as outlined in Table 2.5. Eleven studies yielding 20 effect estimates measure some aspect of structural social capital encompassing group participation and/or civic action. Fourteen studies measure one or more aspect of cognitive social capital yielding 36 effect estimates. These measures can be divided into three groups: social harmony such as visiting neighbours and reciprocity; trust in specific groups of people (for example politicians) or generalized trust; and measures combining different aspects of cognitive social capital often termed 'social cohesion'. One study combines structural and cognitive questions to provide a single score of social capital (Lindstrom 2004).

Some measures from the studies were excluded from the review as they did not conform to Putnam's definition of social capital. These included rating community as a place to live (Ellaway et al. 2001, Gatrell et al. 2004, Greiner et al. 2004), involvement in religious groups (Brown et al. 1992), and contact with friends and family (Boreham et al. 2003, Pevalin and Rose 2003). As with the review presented in section 2.3, a considerable number of researchers (6/18) choose not to engage in social capital debates by not calling their measure social capital. Four of these studies make no reference to the concept at all, despite many of them being published after 1998 when the concept was well known. Three of these studies use the term 'social cohesion' (Cutrona et al. 2000, Ross et al. 2000, Ellaway et al. 2001), two measure group participation (Brown et al. 1992, Rietschlin 1998), and one measures 'social contacts' (Gatrell et al. 2004). As well as precision in terminology, this may reflect increasing disillusionment with social capital and a desire to avoid engagement in debates about the utility of the concept.

Table 2.3: Summary of studies measuring both individual and ecological social capital

Study	Setting, design, sample size	CMD measure	Social capital measure	Limitations ⁷	Result
Cutrona et al. 2000	USA XS 700 African American women caregivers of 10 – 12 year old children from 39 clusters created from 259 block census areas in Georgia and Iowa	Mini-MASQ	Individual social capital <i>Cognitive</i> Social cohesion score measured using 15 questions including generalized trust, social harmony, reciprocity and citizenship. Ecological social capital <i>Cognitive</i> Social cohesion score aggregated to cluster level (mean score).	2, 4, 9, 11	Individual social capital No association. Ecological social capital No association.
Veenstra 2005*	Canada XS 1,194 adults from 25 communities across British Columbia	Depression (11 question scale)	Individual social capital <i>Group participation</i> Participation in 17 types of voluntary organisations summed into 1 score. <i>Social harmony</i> ⁸ 2 questions on perceptions of helpfulness in community combined into 1 scale. <i>Trust</i> 8 questions on political trust combined into 1 scale.	5, 8	Individual social capital <i>Group participation</i> No association. <i>Social harmony</i> Associated with lower depression scores. <i>Trust</i> Associated with lower depression scores.
			Ecological social capital <i>Group participation</i> Per capita number of public spaces (contextual), per capita membership of voluntary organisations (aggregate). <i>Social harmony</i> Mean (aggregate) levels helpfulness in the community and civic action. <i>Trust</i> Mean (aggregate) levels of political trust.		Ecological social capital <i>Group participation</i> More per capita public spaces associated with higher depression scores. No association with group participation. <i>Social harmony</i> No association. <i>Trust</i> No association.

⁷ Key to methodological limitations is listed at the end of Table 2.4.

Table 2.4: Summary of studies measuring individual social capital

Study	Setting, design, sample size	CMD measure	Social capital measure	Limitations	Result
Rietschlin 1998	Canada XS 850 22-89 year olds from Ontario	CES-D	<i>Group participation</i> Voluntary group participation score (log scale).	2, 3, 8	<i>Group participation</i> Associated with lower depression scores.
Mitchell and La Gory 2002*	USA, urban poor XS 199 adults from Alabama	Modified CES-D	<i>Group participation</i> ⁹ Number of organisations respondent is a member of. <i>Cognitive</i> 4 questions on trust in neighbours, community leaders and people in general, and 3 questions on bridging social ties with dissimilar people combined into 1 score.	3, 7, 8, 11	<i>Group participation</i> ¹⁰ No association. <i>Cognitive</i> No association.
Greiner et al. 2004	USA XS 4254 adults from Kansas	Single question on depression	<i>Civic action</i> 1 question on active in past 5 years in a civic group to address community problems (y/n).	2, 3, 8, 9	<i>Civic action</i> No association.
Brown et al. 1992	USA, urban XS 927 18+ years old African-Americans from Virginia	CES-D	<i>Group participation</i> Membership of 9 types of voluntary associations summed into one score.	2, 3, 7	<i>Group participation</i> No association.
Ross et al. 2000	USA XS 2470 18+ year olds from different census tracts in Illinois	Modified CES-D	<i>Social harmony</i> 3 questions measuring Informal social ties with neighbours including visiting informally, chatting and helping each other averaged to produce a mean score.	2, 6	<i>Social harmony</i> High informal social ties associated with lower levels of CMD.

⁸ The author calls this measure 'community trust', but as it has more in common with measures of social harmony used by other studies, for the purposes of this review it is included under social harmony.

⁹ The authors term group participation 'bonding social capital' and social ties and trust 'bridging social capital'.

¹⁰ The paper reported a significant association, however this was from a 1-tailed t-test. To ensure accurate comparisons between studies, only results of 2-tailed tests are reported in this systematic review.

Study	Setting, design, sample size	CMD measure	Social capital measure	Limitations	Result
Pollack and von dem Knesebeck 2004	USA and Germany XS 682 60+ yrs in Germany and 608 in USA	Modified CES-D	<i>Group participation</i> Monthly participation in 5 types of local organisations (combined membership y/n). <i>Social harmony</i> 1 question on reciprocity 'people are willing to help others' <i>Trust</i> 1 question 'I can trust most people in my neighbourhood'	3, 8	<i>Group participation</i> Lack of participation associated with CMD in Germany but not USA. <i>Social harmony</i> Lack of reciprocity associated with CMD in Germany and the USA. <i>Trust</i> Mistrust associated with CMD in the USA but not Germany.
Boreham et al. 2003	England - national sample XS 7988 16+ yr olds	GHQ12	<i>Group participation</i> Regular participation in any of 11 types of groups. Coded into never, 1 group and 2+ groups. <i>Cognitive</i> 3 questions on generalized trust, sense of fairness and reciprocity combined into 1 score.	3, 11	<i>Group participation</i> Not participating was associated with CMD in women but not men. <i>Cognitive</i> Low levels associated with CMD in men and women.
Gatrell et al. 2004	England, urban XS Urban 777 adults from North West England	GHQ-12	<i>Social harmony</i> 2 questions - 'Do you feel a sense of community?' and 'Do you talk to neighbours?' analysed separately.	2, 8, 11	<i>Social harmony</i> No association.
Steptoe and Feldman 2001*	England, urban XS 658 adults from 38 post code sectors	GHQ-12	<i>Cognitive</i> 5 questions measuring social cohesion and trust e.g. 'people are willing to help their neighbours' and 'this is a close knit neighbourhood' combined into 1 score and divided into quartiles.	2, 6, 8	<i>Cognitive</i> Low social cohesion associated with CMD.
Pevalin 2004*	UK national sample XS L 4656 16+ yr old co-habiting married adults	GHQ12	<i>Cognitive</i> 8 questions on neighbourhood attachment including sense of belonging, reciprocity and citizenship, combined into 1 score.	1, 2	<i>Cognitive</i> Low neighbourhood attachment associated with CMD in both men and women in the cross-sectional analysis, but no association with the onset of CMD (longitudinal).

Study	Setting, design, sample size	CMD measure	Social capital measure	Limitations	Result
Pevalin and Rose 2003	UK national sample XS 16+ yrs Group participation = 16,750 Neighbourhood attachment = 7,974	GHQ12	<i>Group participation</i> Active membership in any of 17 different types of groups combined into none groups vs. 1+ groups. <i>Cognitive</i> Neighbourhood attachment – see above, (Pevalin 2004).	1, 11	<i>Group participation</i> Non participation associated with CMD. <i>Cognitive</i> Low neighbourhood attachment associated with CMD.
	L 16+ yrs Group participation = Onset = 35,907 person yrs Recovery = 8,840 person yrs Neighbourhood attachment = Onset = 5,840 person yrs Recovery = 1,429 person yrs	Onset, recovery from, and time to recovery from CMD measured using GHQ12	<i>Group participation</i> Social participation – as above.		<i>Group participation</i> No group participation associated with onset of CMD but not with recovery from CMD.
Ellaway et al. 2001*	Scotland, urban XS 592 25 – 65 year olds from 4 neighbourhoods in Glasgow	GHQ-12	<i>Social harmony</i> 6 questions combined into 1 score on neighbouring. <i>Cognitive</i> 8 questions combined into 1 score of psychological sense of community.	2, 3, 8, 9, 10	<i>Social harmony</i> High neighbouring associated with lower CMD. <i>Cognitive</i> High psychological sense of community associated with lower CMD.
	Sweden XS 13,604 adults from Scania	GHQ12	<i>Combined</i> Participation in 13 different types of groups during the past year and generalized trust in other people. Grouped into high social capital (high trust/high participation), 'miniaturisation of community' (low trust high participation), traditionalism (high trust, low participation), and low social capital (low trust/low participation).	2, 3, 8, 9	<i>Combined</i> Low social capital associated with CMD in both men and women.

Study	Setting, design, sample size	CMD measure	Social capital measure	Limitations	Result
Ziersch et al. 2005	Australia, urban XS 2400 adults from 1 district in Adelaide	SF-12 mental health subscale	<i>Civic action</i> Undertaken 1 of 6 different types of citizenship activities in last 12 months (y/n). <i>Social harmony</i> 4 questions on the strength of connections with other neighbourhood residents combined into 1 score. 2 questions on reciprocity with friends and neighbours combined into 1 score <i>Trust</i> 1 question 'most people can be trusted'	3, 11	<i>Civic action</i> No association. <i>Social harmony</i> More neighbourhood connections were associated with better mental health. No association with reciprocity <i>Trust</i> No association.
Ziersch and Baum 2004	Australia, urban XS 530 adults from 2 suburbs of Adelaide	SF-12 mental health subscale	<i>Group participation</i> Involvement in 10 types of civil society groups inside and outside the local area in the last 12 months summed into 1 score.	2, 3, 7, 8	<i>Group participation</i> No association.
Harpham et al. 2004a*	Columbia, urban poor XS 1060 15-25 year olds	SRQ20	<i>Group participation</i> 1 question on participation in community groups. <i>Civic action</i> 4 questions on personal civic involvement combined into 1 score including talking to local authorities, participating in electoral campaigns and demonstrations. 4 questions on neighbours civic action as above. 7 questions on hypothetical social control combined into 1 score. <i>Social harmony</i> 5 questions on social cohesion and solidarity including social harmony, visiting people, and neighbours helping combined into 1 score. <i>Trust</i> 3 questions on generalized trust combined into 1 score. 15 questions grouped into 5 factors comprising trust in state and community institutions, generalized trust and trust in neighbours.	3, 7	No associations.

Key to Limitations:

Measurement of social capital

- 1 = Secondary analysis of survey questions not originally designed to measure social capital
- 2 = Not all aspects of social capital measured, or combined different aspects of social capital into one score
- 3 = No information on validity of social capital measure
- 4 = Clusters may not represent respondents' views of their community

Measurement of mental health

- 5 = non-validated measure of mental illness.

Methodological limitations of study which may bias results

- 6 = Testing the direct relationship between aspect of social capital and CMD not a stated objective of the study
- 7 = Sampled from one community type so little variation in social capital scores between individuals
- 8 = Response rate less than 60% or not stated

Features of analysis that may bias results

- 9 = Insufficient control for confounding by socio-economic status (for example education or social class included but not both)
- 10 = Hierarchical data structure (individual and community level variables, or clustered data), but only single level modelling used
- 11 = Neighbourhood disorder, violence or psychological resources adjusted for in analysis. These variables may be on the causal pathway between social capital and mental illness, thus making the relationship non-significant

* Results obtained from author as not given in published paper.

Table 2.5: Social capital measures used by studies included in systematic review of social capital and CMD

Dimension of social capital	Measurement	No. studies	No. effect estimates ¹	
			ISC	ESC
STRUCTURAL SOCIAL CAPITAL				
<i>Group participation</i>	Participation in voluntary or community organisations, usually asked as a series of y/n questions on membership of specific group types summed into one score.	9	13	2
<i>Civic action</i>	Participation in civic action such as talking to authorities, demonstrating, getting together with other local people, and hypothesized participation in different scenarios.	3	5	0
COGNITIVE SOCIAL CAPITAL				
<i>Trust</i>	Trust in specific groups of people such as politicians, community leaders. Also generalized trust (trust in people in general).	4	8	1
<i>Social harmony</i>	Varied questions including sense of community, visiting neighbours and reciprocity between neighbours.	7	10	1
<i>Combined</i>	A mixture of trust, social harmony and sense of belonging questions, often called 'social cohesion'.	7	13	1
COMBINED	A mixture of structural and cognitive questions	1	2	0
Total		18	51	5

¹ This column does not add up to 18 studies because a number of studies contain more than one measure of social capital.

The principal limitations of the studies are listed under 'study validity' in Tables 2.3 and 2.4, and summarised in Table 2.6. Some of the studies included in this review are subject to a number of the common limitations of observational studies, for example inadequate control for confounding, low response rates and cross-sectional design. Though all studies control for some aspect of socio-economic status, the principal confounder in the association between social capital and mental health, four use only one indicator (for example education or social class), and therefore may be subject to residual confounding. Over half of the studies have a response rate of less than 60% or fail to report the response rate. All 18 studies have cross-sectional elements, though two also contain longitudinal analyses (Pevalin and Rose 2003, Pevalin 2004). The issue of reverse causality is particularly problematic when exploring associations between social capital and mental illness. While low levels of social capital might lead to higher rates of CMD, it is also plausible that mental illness could weaken an

individual's social capital, that geographical clustering of mental illness results in lower ecological social capital scores, or that depressed or anxious people may over-report poor social capital.

Table 2.6: Methodological limitations of studies included in systematic review of social capital and CMD

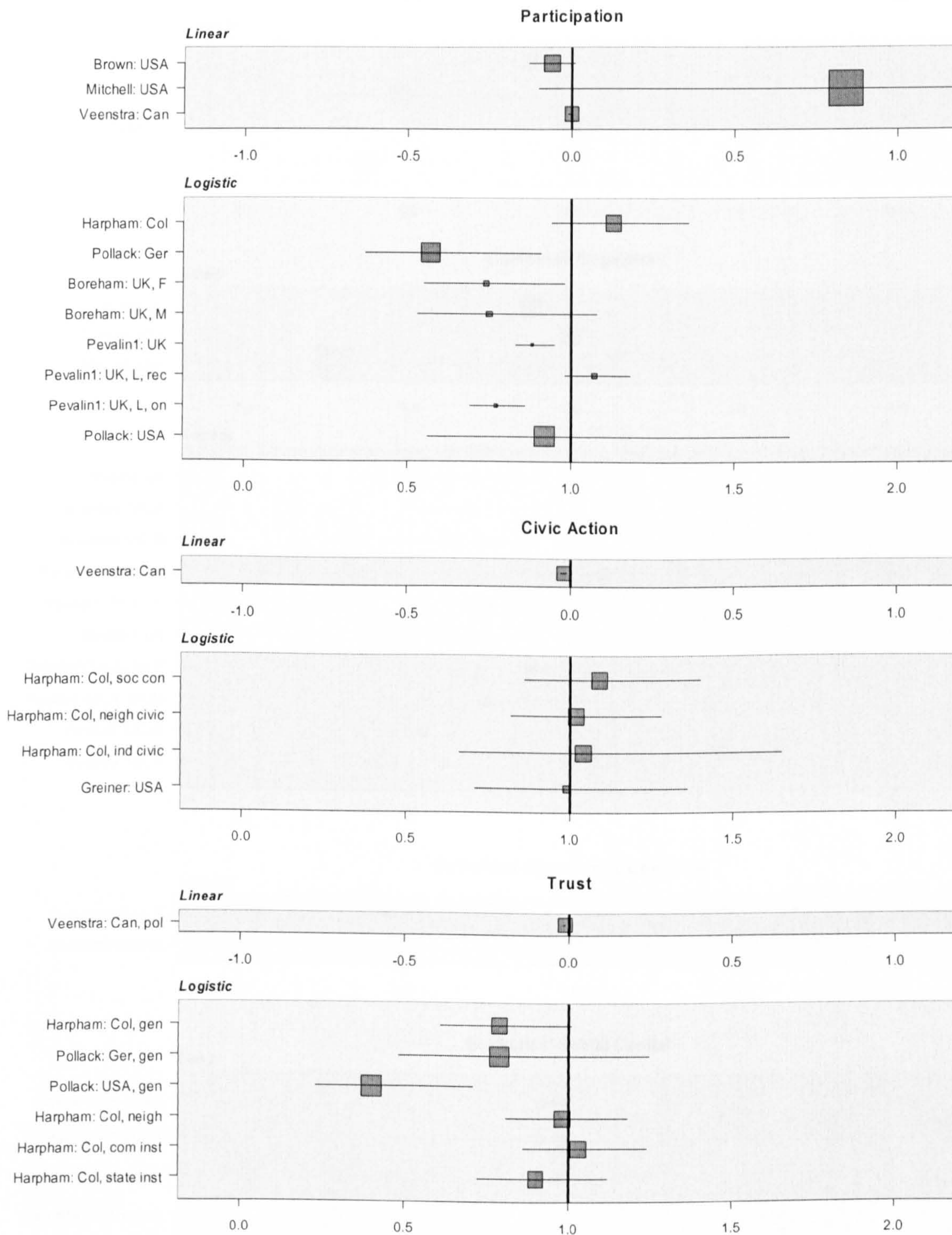
Limitation	No. Studies
<i>Measurement of social capital</i>	
Secondary analysis of survey questions not originally designed to measure social capital	2
Not all aspects of social capital measured, or combined into one score	11
No information on validity of social capital measure	11
Clusters may not represent respondents' views of their community	1
<i>Measurement of mental illness</i>	
Non-validated measure of CMD	1
<i>Methodological limitations of study which may bias results</i>	
Testing the direct relationship between social capital and CMD not a stated objective	2
Sampled from one community type so little variation in social capital scores	4
Response rate less than 60% or not stated	10
<i>Features of analysis that may bias results</i>	
Insufficient control for confounding by socio-economic status	4
Hierarchical data structure but only single level modelling used	1
Analysis adjusted for variables on the causal pathway	6

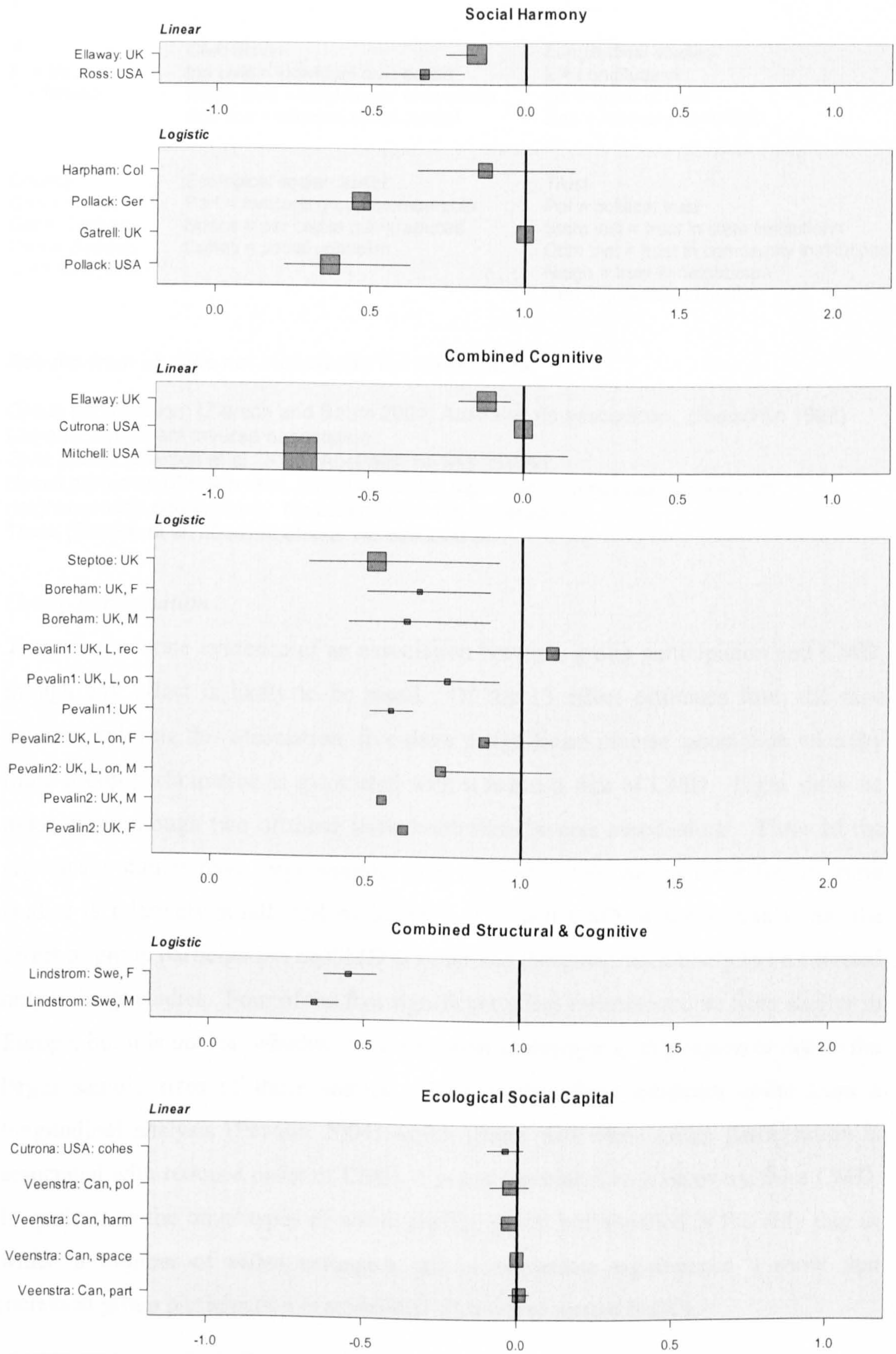
Other limitations are specific to social capital research. Eleven studies provide no information about the validity of the tool used to measure social capital, and six adjust for variables such as neighbourhood disorder which may be on the causal pathway between social capital and mental illness and therefore reduce the effect of the social capital variables. Only four studies use pre-existing measures of social capital (Cutrona et al. 2000, Ellaway et al. 2001, Steptoe and Feldman 2001, Harpham et al. 2004a); the remainder develop their own measures of social capital. Despite the theory emphasising the multi-dimensional nature of social capital, only one study includes a comprehensive set of questions which measure all aspects of social capital (Harpham et al. 2004a), the majority measuring only one or two aspects of social capital such as social participation and/or trust. Despite these problems, the majority of studies use appropriate data collection and analytical methods, adequately adjust for confounding and use validated tools to measure CMD.

2.4.3 Results of the studies measuring social capital at the individual level

The results of these studies are presented in Tables 2.3 and 2.4 and summarised in Figure 2.2. The forest plot presents the effect estimate and 95% confidence interval for the association between each aspect of social capital and CMD. The size of the box depicting the effect estimate is inversely proportional to the sample size of the study, with larger studies having smaller boxes. It was not possible to include the effect estimates from three studies in the forest plots (Figure 2.2) as their effect estimates are not directly comparable with the other studies that use linear or logistic regression. Two conduct path analysis (Ziersch and Baum 2004, Ziersch et al. 2005) and one transforms group participation into a log scale (Rietschlin 1998). The results from these studies are listed in a footnote to Figure 2.2 and are discussed in conjunction with the results from the studies included in the forest plots. Information on effect estimates and confidence intervals was not available from three authors (Cutrona et al. 2000, Pevalin and Rose 2003, Gatrell et al. 2004). These studies are represented as boxes without confidence intervals in Figure 2.2 if the association was significant, and as a box with an upper confidence interval crossing the line of no effect if non-significant.

Figure 2.2: Forest plot of studies exploring the association between different types of social capital and CMD.





Key:

<i>Sex</i>	<i>Civic action</i>	<i>Longitudinal studies</i>
M = Male	Ind civic = individual civic action	L = Longitudinal
F = female	Neigh civic = neighbours' civic action	On = onset of CMD
	Soc con = informal social control	Rec = recovery from CMD
<i>Country</i>	<i>Ecological social capital</i>	<i>Trust</i>
Can = Canada	Part = Average group membership	Pol = political trust
Ger = Germany	Space = per capita public spaces	State inst = trust in state institutions
Swe = Sweden	Cohes = social cohesion	Com inst = trust in community institutions
Col = Columbia		Neigh = trust in neighbours
		Gen = generalized trust

Results from studies not included in the forest plots:

Group participation: (Ziersch and Baum 2004) Australia: no association. (Rietschlin 1998) Canada: significant inverse association.
 Civic action: (Ziersch et al. 2005) Australia: no association
 Social harmony: (Ziersch et al. 2005) Australia: significant inverse association with neighbourhood connections. No association with reciprocity.
 Trust: (Ziersch et al. 2005) Australia: No association

Group participation

There is moderate evidence of an association between group participation and CMD, though any effect is likely to be small. Of the 13 effect estimates from the nine studies exploring this association, five show a significant inverse association whereby more group participation is associated with a reduced risk of CMD. Eight show no association, though two of these show borderline inverse associations. Three of the significant studies have large sample sizes of over 7,900, and as the effect in these studies is relatively small (OR of between 0.57 and 0.88), it seems likely that the effect of group participation on CMD is small and therefore more likely to be detected only in large studies. Four of the five significant effect estimates come from studies in Europe, but it is unclear whether the association is stronger in this region or due to the larger sample sizes of these studies. Two of the effect estimates come from a longitudinal analysis (Pevalin 2004) which shows that while group participation is associated with reduced onset of CMD, it is not associated with recovery from CMD. In contrast to the other types of social capital, group participation is the only one in which a number of effect estimates (all of borderline significance¹¹) show that increased group participation is associated with worse mental health.

¹¹ The study by Mitchell, C and La Gory, M (2002). "Social Capital and Mental Distress in an impoverished community." *City and Community* 1(2): 199 - 222 concluded that group participation was significantly associated with an increased in CES-D score, however this result came from a 1-tailed t-test. Results from a 2-tailed t-test show borderline significance (B 0.84, 95% CI -0.1, 1.77).

Civic action

There is no evidence of an association between participation in civic action and CMD. The three studies measuring civic action yield five effect estimates (three from the same study), but none shows a significant association despite all having sample sizes of over 1000.

Trust

There is little evidence that trust either in people in general or in politicians is associated with CMD. Four studies yield eight effect estimates, two of which are significant (one for political trust and one for generalized trust) and one of which is borderline (generalized trust).

Social harmony

There is good evidence that social harmony is associated with a reduced risk of CMD. Seven studies yield ten effect estimates, six of which show a significant negative effect and four no effect. There is no clear geographical patterning, with studies from Germany, the USA, Canada, the UK and Australia all displaying the association. The size of the effect is much larger than that seen for group participation, with over a halving of the odds of CMD in one study (Pollack and von dem Kneseback 2004), and a reduction in CMD score of between 0.2 and 0.3 in two others (Ross et al. 2000, Ellaway et al. 2001).

Combined score of cognitive social capital

There is good evidence of an inverse association between combined measures of cognitive social capital and CMD whereby higher levels of cognitive social capital are associated with lower levels of CMD. Seven studies yield 13 effect estimates, eight of which show a significant inverse association and none a significant positive association. There is a strong UK bias with all but two of the effect estimates coming from studies set in the UK and seven from the same set of studies (Pevalin and Rose 2003, Pevalin 2004). The size of the effect is large and similar to that for social harmony, with significant odds ratios of between 0.53 and 0.76. Four of the effect estimates come from longitudinal analyses. As with group participation, high cognitive social capital is associated with reduced onset of CMD but not with recovery from CMD (Pevalin and Rose 2003).

Combined score of structural and cognitive social capital

No conclusions can be drawn about the association between combined scores of social capital and CMD as only one study combined measures of group participation and generalized trust into a social capital score (Lindstrom 2004). This study found a large and significant inverse association for both men and women in Sweden.

2.4.4 Results of studies measuring social capital at the ecological level

The results of these studies are presented in Table 2.3 and summarised in Figure 2.2. The small number of studies and diverse range of social capital measures make conclusions about the association between ESC and CMD problematic. Two studies measure four aspects of ESC: group participation, social harmony, political trust and combined cognitive social capital. Only one effect estimate is significant, though not in the expected direction. In Canada, more per capita number of public spaces, a contextual proxy for social participation, is associated with an increased depression score (regression co-efficient 0.001, 95% CI 0.00, 0.002, Veenstra 2005).

2.4.5 Discussion*Methodological limitations of this review*

This review is subject to a number of limitations. Treating each effect estimate as if it comes from a different study gives disproportionate weight to studies that report more than one exposure or outcome. I did not apply a Bonferroni correction (Katz 1999) to the significance levels of studies with more than one outcome and thus may have overestimated the significance of coefficients from these studies. This is because while a Bonferroni correction decreases the chance of a type I error this is at the cost of an increased chance of a type II error. As I was not conducting a meta-analysis, I considered the bias inherent in only selecting one effect estimate from each study to be greater than that of over-estimating the significance of a few coefficients.

It is possible that some studies investigating social support and mental illness measured variables that would satisfy criteria for individual social capital but were not included. Short of repeating existing reviews of the vast social support literature it is

difficult to know how this could be avoided. I assessed all papers in which social capital or its synonyms were in a heading, abstract or keyword and I also searched the reference lists of papers which met the inclusion criteria. The purpose of this review is to investigate the evidence for a link between social capital and CMD in order to inform the development of this thesis. I believe that my strategy served this purpose.

Discussion of results

Differences in the way that social capital has been conceptualised and measured makes it difficult to evaluate the evidence. I tried to address this problem and compare results from similar studies by limiting the review to one mental illness outcome of great public health importance and by taking a narrow definition of social capital. This approach builds on the results from the first systematic review I conducted two years previously, which, though showing moderate evidence of an association between individual cognitive social capital and CMD, was unable to draw any conclusions about the association with other forms of social capital due to a paucity of studies (De Silva et al. 2005). The results of the second updated review show that different aspects of social capital are associated with CMD across different settings. While there is relatively strong evidence of an inverse association between individual measures of cognitive social capital and CMD, group participation and trust only show associations in some settings and there is no evidence of an association with individual civic engagement. However, as regards ecological social capital, the small number and diverse nature of the studies reviewed means that no meaningful conclusions can be drawn.

The evidence suggests that social capital is inversely associated with CMD. Of the 56 effect estimates included in this review, only 10 showed social capital to be associated with worse mental health, and only one of these associations was significant at the five per cent level. Veenstra (2005) concluded that the positive association between a high number of public spaces per capita and higher depression scores was most likely a reflection of demographic phenomena such as declining population size than of social capital. This finding is therefore perhaps a reflection of the problems of contextual measures of ecological social capital.

Despite these broad conclusions, there is much heterogeneity between results from different studies. This may be due to a number of factors. Firstly, despite limiting the studies to those that reflect similar measures to those used by Putnam, no two studies used the same questions to measure social capital. Secondly, six different tools were used to measure CMD, and these were variously treated as either a continuous score of CMD (linear regression) or on a case/non-case basis (logistic regression). Thirdly, the level of control for confounding differed between studies. While all included at least some control for confounding by socio-economic status, some studies included a much more comprehensive set of confounders including length of residence in the community and demographic characteristics. Fourthly, six studies included variables such as neighbourhood disorder which may be on the causal pathway between social capital and CMD (low levels of social capital result in increased neighbourhood disorder and this leads to stressful living conditions for residents). Such studies may underestimate the effect of social capital by including more proximate determinants of CMD in the model. This is borne out by the review as three of these six studies show no association at all between different aspects of social capital and CMD.

Lastly, and perhaps most importantly, studies included different measures of social capital in the analysis. While some included only one aspect of social capital such as group participation, a few included many aspects including participation, civic action, and different measures of cognitive social capital. The relationship between these different aspects of social capital is largely unknown, though it is probable that they are to some degree correlated. Studies that include multiple dimensions of social capital are therefore analysing which aspect is the most important predictor of CMD, which is different from analysing the independent effect of individual aspects of social capital on CMD.

Despite these methodological differences, at least some of the variation in the results between studies is due to the contextual nature of social capital. Pollack and von dem Kneseback (2004) use the same methods to measure individual social capital and CMD in the USA and Germany. They find that while reciprocity is inversely associated with CMD in both contexts, generalized trust and group participation shows a different relationship in each setting. Lack of participation is associated with CMD in Germany but not in the USA, while generalized mistrust is associated with

CMD in the USA but not Germany. The authors conclude that this result is due to cultural differences between the two countries, for example higher expectations of trust in the USA.

Further heterogeneity is seen in the presence of interactions between social capital and other variables. Cutrona et al. (2000) find a significant interaction between community level cognitive social capital and individual personal outlook whereby the effect of a positive outlook is stronger in cohesive neighbourhoods. The authors conclude that *“high neighbourhood cohesion appears to play a facilitation role, intensifying the benefits of a positive outlook on psychological wellbeing”*. Brown et al. (1992) also find evidence of an interaction between group participation and economic strain whereby lower levels of depression are associated with high levels of group membership among people under economic strain, thus indicating a potential buffering effect of social capital on poverty. The other study to explore interactions finds no interaction between population density and group membership on CMD risk (Greiner et al. 2004).

This review provides evidence about the relative importance of structural and cognitive social capital. Six studies include both types of social capital in the same analysis, and they overwhelmingly show cognitive social capital to be the more important predictor of CMD. In one study, individual level social harmony along with individual income is actually the strongest predictor of CMD (Veenstra 2005). Lindstrom et al’s (2004) study which combines group participation and generalized trust into one social capital score also finds that being in the lowest trust category is associated with worse CMD irrespective of the level of social participation, the authors concluding that *“the lack of self-reported trust completely thwarts the impact of high social capital”*. Both Putnam (2001) and Coleman (1990) argue that participation fosters trust. It is therefore possible that the lack of an association seen between participation and CMD in these studies is due to the positive benefits of participation on mental health (i.e. fostering increased trust and social cohesion) having been accounted for by the inclusion of cognitive measures of social capital in the analysis. However, it is likely that the association runs in both directions. As Brehm and Rhan argue (1997), trust and cohesion may also foster participation. The

complex relationship between structural and cognitive social capital highlighted by this review can only be teased out through longitudinal studies.

Methodological limitations of studies

The studies included in this review suffer from many of the same methodological limitations as those included in the first review reported in section 2.3. Principal among these is the predominance of cross-sectional studies which makes the direction of association between social capital and CMD impossible to determine. It is highly plausible that depression and anxiety could result in reduced social participation and distrust rather than the other way round. However, two papers based on the same UK study do conduct longitudinal analyses (Pevalin and Rose 2003, Pevalin 2004). They find that participation in groups and higher cognitive social capital is associated with reduced onset of CMD, but not with recovery from CMD. This is perhaps not surprising as in the UK context of widespread treatment for mental illnesses, recovery may be more directly determined by access to appropriate treatment than by an individual's social capital. However, these results do suggest that even if mental illness may to some extent determine individual levels of social capital, social capital also independently affects an individual's risk of developing CMD.

Additional limitations common to much social capital and mental health research include one-dimensional measures of social capital, an almost complete absence of research from low income countries, and most importantly a lack of appropriate validation and standardisation of tools to measure social capital. Until these limitations are resolved, attempts to combine results from different studies measuring the effect of social capital on different outcomes will be hampered by necessary discussions as to the definition and measurement of social capital.

Despite these problems there remains cause for optimism. There is a promising trend towards increasing measurement sophistication with more recent studies using multi-dimensional measures capable of exploring the impact of different aspects of social capital on mental health. This increasing measurement complexity is mirrored by analytical sophistication through the use of multi-level analyses appropriately adjusted for a wide range of confounding factors. The evidence to date suggests that the relationship between social capital and CMD varies by setting and aspect of social

Cognitive social capital	No. studies
<i>Trust</i>	
Individual	13
<ul style="list-style-type: none"> • Generalised trust - would you say in general that people can be trusted?' • Trust in institutions - e.g. politicians, community leaders, government. • Thick trust – trust in specific people. • Security of employment contract. 	
Ecological	4
<ul style="list-style-type: none"> • Average level of generalized trust. • Average level of trust in politicians. 	
<i>Social cohesion</i>	
Individual	7
<ul style="list-style-type: none"> • Social harmony - getting along with neighbours, this is a close neighbourhood, people know each other, degree neighbours are aware and supportive of actions i.e. watch out for kids. 	
<i>Sense of community</i>	
Individual	6
<ul style="list-style-type: none"> • Feeling at home in neighbourhood, rating community as a place to live, neighbourhood attachment, community integration. 	
Other social capital measures	
<i>Neighbourhood problems</i>	
Individual	4
<ul style="list-style-type: none"> • Perceptions of neighbourhood problems, safety and crime levels. 	
<i>Family social capital</i>	
Individual	3
<ul style="list-style-type: none"> • Family structure - i.e. single parent family, number of kids. • Family characteristics - i.e. work patterns of mother, emotional support from parents to children. 	
<i>Health care social capital</i>	
Ecological	1
<ul style="list-style-type: none"> • Community level of health care insurance. • Collaborations among health care organisations. 	

The net result is that studies purporting to measure social capital in relation to mental illness are actually measuring a very disparate group of exposures. It seems that social capital has been a victim of its own success with researchers labelling related but distinct concepts social capital, thereby weakening the theoretical robustness of the concept. This process started with the theoretical confusion stemming from three very different conceptualizations of the term, and has been compounded by the adoption of these different schools of thought by researchers from different disciplines with little or no rationalisation of the disparate streams.

capital being measured. Only sophisticated tools for measurement and analysis are capable of eliciting the true complexity of the relationship. Without them, the promise of social capital research will remain unfulfilled.

2.5 Next steps

The two systematic reviews presented in this chapter have highlighted a number of limitations of existing research into social capital and mental health. These include a lack of conceptual clarity about the type of social capital being measured and the level at which it is measured, the predominance of cross-sectional studies, and the lack of validation of social capital tools.

I am able to address some, though not all, of these issues in my thesis. The measure of social capital used by Young Lives (YL) is based on the Putnam school of thought and measures multiple aspects of social capital. I clearly separate out structural and cognitive aspects of individual and ecological social capital based on a combined theory of social capital (section 1.2.5), though I am unable to explore fully bonding, bridging and linking aspects of the concept. I use multi-level modelling to test the theory that ESC has indirect effects and ISC direct effects on mental health. I use qualitative and quantitative methods to validate the tool used to measure social capital in Peru (Chapter 5). I construct hypotheses about the causal pathways through which social capital may affect mental health (section 1.3.2), and explore interactions between social capital and socio-economic status in the prediction of CMD (Chapter 8). Though the data are cross-sectional, to the best of my knowledge this is the first study to measure both individual and ecological social capital in relation to mental health in low income countries, and to compare this association across diverse contexts.

2.6 Justification, objectives and hypotheses

The literature review presented in Chapters 1 and 2 provide the basis for the justification, objectives and research hypotheses for the analyses presented in the remainder of this thesis. These are outlined below.

2.6.1 Thesis justification

1. As argued in section 1.1.1 CMD are a large and growing problem in low income countries, yet their causes are largely unknown and their symptoms rarely treated. Maternal CMD has an impact on the wellbeing of the mother and that of her children.
2. As outlined in section 1.2, social capital is a relatively new concept which adds a social dimension to traditional structural models of mental illness. Measuring it at the individual (ISC) and ecological (ESC) level recognizes both compositional and contextual influences of the social environment on mental health.
3. Specifically, ESC measured at the community level may help to:
 - a. explain geographical variations in the prevalence of CMD;
 - b. provide a framework with which to identify at risk communities; and
 - c. design effective community level interventions to reduce CMD.
4. As the results of the systematic review reported in section 2.4 show, the relationship between social capital and CMD in low income countries is unknown, and only a handful of studies have explored the association in developed countries. Specifically, the association between ESC and maternal CMD has never been studied in low income countries.

2.6.2 Objectives of thesis

The following are the principal objectives for the whole thesis. More detailed objectives will be stated at the start of each chapter.

1. To examine the role of ISC and ESC as independent risk factors for maternal CMD in low income countries using data from Peru, Vietnam, Ethiopia and India (Andhra Pradesh). This will be covered in Part II of this thesis.
2. To explore the association between social capital and maternal CMD in Peru in more depth. This will be covered in Part III of this thesis. Specifically:

- a. to validate the social capital tool used by the YL project in Peru;
- b. to explore the nature of social capital in Peru;
- c. to investigate the determinants of each aspect of social capital in Peru;
- d. to explore interactions between ISC and ESC, structural and cognitive social capital, and social capital and poverty in the prediction of CMD; and
- e. to examine the relative importance of social capital in the prediction of CMD in Peru by including it in a holistic model of disease causation with other risk factors for maternal CMD.

2.6.3 Research hypotheses

Based on the literature reviews presented in Chapters 1 and 2, I have three primary research hypotheses relating to the association between social capital and maternal CMD. These will be tested in Chapter 4 in the comparative analyses of the four YL countries, and again in Chapter 8 through a further analysis of the data from Peru. Secondary hypotheses relating to the specific analyses conducted in each chapter will be presented in the corresponding chapters. My primary research hypotheses are given below.

- A. Both context and composition are important in the prediction of CMD, therefore ISC and ESC variables will show independent associations with maternal CMD.
- B. High social capital is associated with a reduced risk of CMD. This association remains after individual and community level confounders are controlled for.
- C. Cognitive social capital is a ‘universal truth’ in that the same associations are seen with CMD in different countries and contexts. The effect of structural social capital on CMD may vary due to cultural differences within and between countries.

In the next section of this thesis (Part II) I outline the generic methods used throughout the thesis (Chapter 3) and report the results of the comparative analysis of social capital and maternal CMD in Peru, Vietnam, Ethiopia and Andhra Pradesh (Chapter 4).

Part II: Cross-cultural analysis of social capital and CMD

3. Methods

In this chapter I provide an overview of the data collection methods used by the Young Lives (YL) Project and the quantitative methods of analysis used in this thesis. The chapter is split into two sections. In the first I outline the methods used to collect the quantitative YL data, giving a brief overview of the four YL countries and an account of sampling and fieldwork methods. In the second section I outline the analytical methods used in the thesis, including the analytical framework, how social capital and common mental disorders (CMD) are measured, and an overview of the statistical methods employed. Details of the statistical methods for specific analyses are reported in the appropriate results chapters. In addition to these quantitative methods, I conducted qualitative research in Peru to achieve objectives 2a and 2b (section 2.6.2). The methods used for this qualitative study are described in Chapter 5.

3.1 The Young Lives Project

This thesis uses data from the YL project, an international cohort study of childhood poverty and wellbeing, following 12,000 children from Peru, Vietnam, Ethiopia and India (the state of Andhra Pradesh) for 15 years (www.younglives.org.uk). The project links research to policy makers through a collaboration between academic researchers and the Non Governmental Organisation (NGO) Save the Children UK (SCUK).

3.1.1 Country profiles

Over 20 countries expressed an interest in participating in the project, and four were chosen in order to illustrate the effects of a range of policy, social and economic issues on child poverty and wellbeing. In India, the state of Andhra Pradesh was chosen as with a population of nearly one billion it would not have been feasible to sample the whole of the country. Table 3.1 presents summary statistics for each of the four countries. Peru is the wealthiest country and also has the smallest population, though Vietnam has the highest female literacy rates and similar female life expectancy to Peru. Ethiopia is the poorest of the four countries with the worst development

indicators, and also has the worst provision of mental health services of the four countries. Compared to the UK where there are 11 psychiatrists per 100,000 people, Ethiopia has only 0.02 per 100,000, while Peru has 2.4. Despite this, all countries apart from Ethiopia do have a national mental health policy, while some provision for the treatment of mental illness is present within primary health care in all the countries (WHO 2001a).

Table 3.1: Characteristics of Young Lives countries.

	Peru	Vietnam	Ethiopia	Andhra Pradesh ¹
Population (millions)	25.2	78.7	61.1	75.7
Income band ²	Lower middle	Low	Low	Low
Female literacy rate (%)	84.3	90.6	30.5	43.5
Female life expectancy at birth (years)	69.1	68.8	43.1	61.2
% GDP spent on health care	5.6	4.8	3.8	5.2
No. psychiatrists per 100,000	2.4	0.25	0.02	0.4
Year national mental health programme implemented (if present)	1991	1999	None	1982
Specified budget allocation for mental health	Yes	Yes	Yes	Yes
Mental health present in primary care	Yes	Yes	Yes	Yes

Source: WHO Atlas Project (WHO 2001a).

¹ Figures for Andhra Pradesh where possible, and otherwise for the whole of India.

² Based on World Bank criteria (2000)

Boxes 3.1 to 3.4 summarise some of the key social issues which may influence the nature of social capital in each country.

Box 3.1: Description of Peru*Social factors*

Peru is divided into three main regions: the highland largely rural region of mainly native Quechua speaking population, the lowland jungle region encompassing the Amazon basin, and the coastal region where most cities are located, home to the majority Spanish speaking population. The complex hierarchical system set up in Peru's colonial past has resulted in discrimination against the native and largely rural Quechua-speaking minority by the majority Spanish-speaking population (www.MapZones.com). The terrorist activities of the Shining Path and other groups throughout the 1980s and early 1990s also disproportionately affected the rural Quechua population, with an estimated 60,000 people killed and 600,000 internally displaced (Truth and Reconciliation Commission of Peru 2003). Partly due to this, Peru has seen high levels of rural-to-urban migration leading to the establishment of large shanty towns on the outskirts of Lima and other major cities. Over the generations successive waves of migrants have settled in Peru, including significant numbers of Europeans, Chinese and Japanese. Generally these different cultures have mixed well and inter-married, producing a vibrant ethnic mix (www.MapZones.com).

Economic factors

The late 1980s saw one of the worst economic crises in recent history with inflation rates of over 7000% and a consequent rise in the number of poor households from 43% to 59% over this period. Despite a period of economic adjustment implemented by President Fujimori in the early 1990s, subsequent political and international crises have wiped out much of the social progress achieved during this period, resulting in increased levels of inequality especially between rural and urban areas.

Political factors

Government social reforms in the 1990s instigated a number of food aid programs run through community groups that remain today. However, state apparatus is large and has many different levels. Overall state intervention is seen to be ineffective with insufficient resources and few incentives for public officials to perform efficiently.

Source: (Escobal et al. 2003) unless otherwise stated.

Box 3.2: Description of Vietnam*Social factors*

Confucian traditions mean the family is very important in Vietnam. Though patrilineal, women play an important role in society both in the workplace and at home. Vietnamese is the national language though Chinese and various tribal languages are also spoken. Kinh is the majority ethnic group.

Economic factors

The 1980s saw the start of macro-economic reforms aimed at integrating Vietnam into the world economy along with reforms in the social sector. Despite a resulting significant drop in poverty over the last 10 years, socio-economic differentials between regions and groups of people are growing.

Political factors

Division of the state in 1956 led to a communist government in the north and a western-style parliamentary system in the south, though neither was a practicing democracy. After re-unification in 1976 the whole of Vietnam came under the communist system, and today the Vietnamese Communist Party is the only legal party in the country.

Source: (Tuan et al. 2003).

Box 3.3: Description of Ethiopia*Social factors*

Ethiopia is a vast country with diverse social, cultural, and religious values. There are over 100 ethnic groups speaking in excess of 70 local languages. The Amhara (ruling class), Oromo, and Tigray are the largest ethnic groups, each occupying distinct regions. In this predominantly agricultural society women play a traditional role as mothers and agricultural labourers, a position reinforced by the traditional belief system (www.MapZones.com).

Economic factors

Ethiopia is one of the poorest countries in the world: in 1999 44% of the population were classified as living in absolute poverty. This situation has remained despite government investment in health, education and infrastructure, because of a volatile economy due to war, recurrent drought, falling agricultural prices, and foreign debt. In addition, large regional disparities exist in terms of access to services, largely due to the lack of an infrastructure in rural areas.

Political factors

The government is in the process of devolving responsibility for the delivery of basic services to the regional and district level, though this process is far from complete. Civil society including NGOs are having an increasing influence on government decision making, and are growing in number.

Source: (Alemu et al. 2003) unless otherwise stated.

Box 3.4: Description of India and Andhra Pradesh*Social factors*

While Hindi and English are the official languages in India, Telugu is the regional language in Andhra Pradesh where Hindu is the major religion. The Varna (Caste) system is very complex with four main Varnas based on occupational lines divided into many Jats (sub-castes). Other sections of society which fall outside the Caste system include Scheduled Caste which include the 'untouchables', Scheduled Tribes who are ethnically distinct and often live in remote regions of India, and Other Backward Castes who have converted away from Hinduism (ref www.adaniel.tripod.com/modernindia.htm).

Economic factors

Andhra Pradesh is largely agricultural and is one of India's main rice producing regions. Poverty has declined across the whole of India from 45% in 1986 to 26% in 1999-2000, though the rate of decline in rural Andhra Pradesh is lower than in urban areas. Health and education indicators are also lower in Andhra Pradesh than in other South Indian states, despite the state government implementing a number of poverty reduction policies in the last decade.

Political factors

India is a multi-party democracy with separate state governments who have control over education, health and welfare. There are a large number of government development programs such as the District Poverty Initiatives Project (DPIP) many of which organise women's self help credit groups and are targeted at local communities. Civil society is also well developed with many NGOs operating in the field and being successful in implementing policy changes.

Source: (Galab et al. 2003) unless otherwise stated.

3.1.2 Survey methods and sampling

While the exact methods used for sampling and fieldwork vary between the countries, several key principles were followed (Wilson and Huttly 2004). Firstly, over-sampling of the poor was used as a nationally representative sample would provide too small a sample of poor respondents to explore the changing nature of childhood poverty. The YL samples are therefore not intended to be nationally representative. Twenty clusters of equal sample size were semi-purposively sampled from each country to allow a more in-depth investigation of local issues and to allow comparisons between sites. Approximately 100 children aged between six and 17 months, and 50 children aged between seven and a half and eight and a half years were sampled from each cluster. For ease of reporting, the children aged between 6 and 17 months will be referred to as ‘one-year-olds’, and those aged between seven and a half and eight and a half years as ‘eight-year-olds’ throughout this thesis. In total, 8061 one-year-olds and 3722 eight-year-olds were sampled. Semi-purposive sampling was used to select the clusters, recognizing that random sampling of only 20 units would not ‘even out’ the diversity between sites and would also ignore the detailed information about potential sites. Sites were therefore selected by an advisory panel made up of experts in each country using a poverty ranking system to ensure over-sampling of poor clusters (Wilson and Huttly 2004). The different sampling strategies used in each country are detailed in Appendix B, Figure B.1.

Within each cluster communities were selected. Communities were locally defined using administrative boundaries as these are geographically well defined and are often the level of policy allocation and secondary data collection. Table 3.2 shows the definition of community in rural and urban areas used by each country. A post-mortem of the sampling procedure revealed difficulties in the local definition of community in all countries except Vietnam where the resilient and highly meaningful geographical construct of Communes was used. In contrast the definition of community in the other countries differed between rural and urban areas. In urban areas communities were largely defined as the smallest administrative unit, and in rural areas as a collection of villages or a small town, though exact definitions varied between countries. In Ethiopia for example, only 20 communities were identified (corresponding to the 20 clusters), compared to 31 in Vietnam, 82 in Peru and 101 in India.

Table 3.2: Definition of geographical community used in each country

	Peru ¹	Vietnam ²	Ethiopia ³	India ⁴
Rural	Small town or group of villages within 1.5 hours walking distance of each other	Commune	Peasant associations (cluster)	Village and its associated hamlets
Urban	Census tract or district	Commune	Kebeles – smallest urban administrative unit (cluster)	Municipal wards
Total	82	31	20	101

Source: ¹(Escobal et al. 2003) ²(Tuan et al. 2003) ³(Asgedom 2002) ⁴(Galab et al. 2003)

A community questionnaire was used to collect contextual information in each community and to link meso-level data to micro and macro events. The questionnaire collected information on a number of topics including the physical environment, infrastructure, access to services, demographic information, and political representation. Information was collected from a variety of sources including interviews with expert informants and official statistics.

Random sampling adapted to the local settlement patterns was used to select eligible households within each community, often through the use of a census. Interviews with the primary caregiver of each child were conducted by a trained fieldworker. Specific fieldwork procedures differed between countries and are compared in Appendix B, Table B.2. Broadly, questionnaires were translated into the major local languages and field tested, though in Peru and India local interpreters were used for less common local languages that the fieldworkers did not speak. The questionnaires covered a wide range of topics related to child welfare and poverty including child health, socio-economic status, livelihoods, caregiver characteristics, and household composition. The mental health status of the primary caregiver of one-year-olds was measured, as was the social capital of all respondents. In addition to the core questionnaire, countries were able to add their own country-specific questions. Peru in particular added a large number of additional questions, and also sometimes asked different sections of the questionnaire, including the questions on social capital, to different members of the household to conduct reliability checks. All interviews were conducted in the home and took between one and two and a half hours to complete

depending on the country. The baseline cross-sectional survey was conducted in each of the four countries between July and December 2002.

Data was entered and cleaned in each of the countries using Microsoft Access 2000. A member of the UK YL team oversaw the process, conducted consistency checks on the data, and returned queries to the country teams for correction. I converted the data to Stata 8.0 format, conducted additional consistency checks, and merged data from all four countries into one data set. All data cleaning, recoding, and analyses were conducted using Stata 8.0 (Stata Corporation 2003).

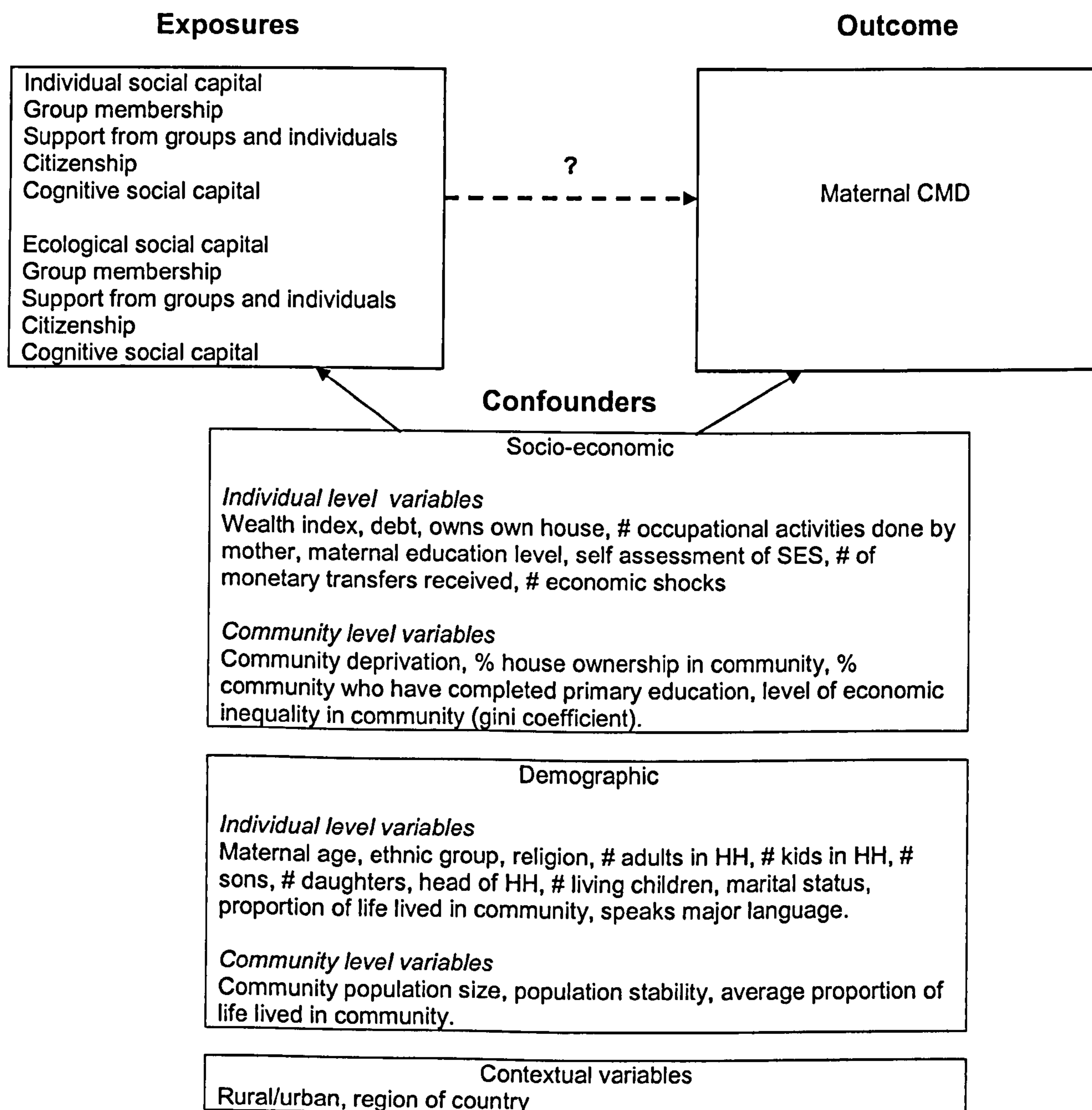
3.1.3 Ethical approval

Ethical approval was obtained from all academic partner institutions in the UK (London School of Hygiene and Tropical Medicine, London South Bank University and the University of Reading), and from appropriate institutions in each of the four countries. Verbal or written informed consent was obtained from each respondent depending on whether the respondent was literate.

3.2 Analytical framework

As recommended by Victora et al. (1997), I constructed an analytical framework based on the conceptual framework for CMD causation outlined in section 1.3.1 to structure the variables collected by YL which I use to explore the association between social capital and maternal CMD (Figure 3.1). The framework lists all of the variables to be used in the analysis and identifies the exposure and outcome variables as well as potential confounders in the association between social capital and maternal CMD.

As YL was not specifically designed to explore the determinants of maternal CMD, a number of the risk factors outlined in the conceptual framework (Figure 1.1) are not measured by YL. In particular maternal physical health is not comprehensively measured, and life events related to trauma and domestic violence are only measured in Peru. As such it is not possible to fit a comprehensive model containing all the known risk factors for maternal CMD to establish the relative importance of social capital in comparison to other risk factors in all four countries. As it is not known whether social capital affects maternal CMD it is perhaps more important to first

Figure 3.1: Analytical framework of association between social capital and CMD

explore whether an association exists before exploring its relative importance compared to other factors. In light of this, the analytical framework outlines a model which will be used to explore the association between social capital and maternal CMD adjusted for those variables that may confound this association. As there has been no research in any of the YL countries linking social capital to mental health, no evidence exists as to which variables may confound the association. Instead, a wide range of variables which I hypothesize may act as confounders are included in the analytical framework and will be tested in the analyses. The measurement of each of

the variables listed in the analytical framework will be explored below in sections 3.6 to 3.8.

3.3 Measurement of social capital

The Short Adapted Social Capital Assessment Tool (SASCAT) was used to measure social capital in the YL study. SASCAT is a shortened version of the Adapted Social Capital Assessment Tool (A-SCAT) developed by Harpham et al. (2002), which itself was formed from a longer instrument developed by a World Bank team (Krishna and Shrader 2000) specifically to measure social capital in low income countries. A-SCAT is intended for use in surveys where social capital is just one element of a broader study. It has been used in Colombia (Harpham et al. 2004a) and Sub-Saharan Africa (Thomas 2003), though before the YL study neither A-SCAT nor SASCAT had been validated.

The nine questions of the SASCAT tool measure the structural and cognitive social capital of respondents within a community. Five questions measure structural social capital and relate to membership and support from community groups, support from individuals in the community and participation in citizenship activities in the community. The four cognitive social capital questions refer to generalized trust in others in the community, community social harmony, sense of belonging to the community, and sense of fairness. Box 3.5 lists the SASCAT questions grouped according to the aspect of social capital they measure.

SASCAT predominantly measures bonding social capital as all questions refer to the respondent's community. However, elements of bridging and linking social capital are also measured through the structural social capital questions. For example, membership of women's groups measures bonding social capital where women of similar socio-economic status are members of the group, but may also measure linking social capital as membership of the group may provide access to external resources and policy makers. As it is not possible to separate out exactly which types of social capital are being utilised through different relationships, the SASCAT questions are analysed according to the types of relationships they measure, for example links to groups, links to individuals and links through citizenship activities.

Box 3.5: Short Social Capital Assessment Tool (SASCAT) questions**Structural social capital***Group membership*

1. In the last 12 months have you been an active member of any of the following types of groups in your community?

Work-related/ trade union

Religious group

Community association/ co-op

Credit/funeral group

Women's group

Sports group

Political group

If respondent is a member of a group ask:

2. In the last 12 months, did you receive from the group any emotional help, economic help, or assistance in helping you know or do things?

Social support from individuals

3. In the last 12 months, have you received any help or support from any of the following, this can be emotional help, economic help, or assistance in helping you know or do things?

Family

Politicians

Neighbours

Government officials/civil service

Friends who are not neighbours

Charitable organisations/NGO

Community leaders

Religious leaders

Other

Citizenship

4. In the last 12 months, have you joined together with other community members to address a problem or common issue?
5. In the last 12 months, have you talked with a local authority or governmental organisation about problems in this community?

Cognitive social capital

6. In general, can the majority of people in this community be trusted?
7. Do the majority of people in this community generally get along with each other?
8. Do you feel as though you are really a part of this community?
9. Do you think that the majority of people in this community would try to take advantage of you if they got the chance?

3.3.1 Measurement of individual social capital

ISC is measured by using the individual responses to the SASCAT questions. As outlined in Table 3.3, the nine questions are divided into five variables: number of groups respondent is a member of; number of groups respondent receives support from; number of individuals respondent receives support from; participation in citizenship activities; and level of cognitive social capital. As the relationship

between the different aspects of social capital and maternal CMD is unlikely to be linear in all countries, each variable was categorized rather than being treated as a continuous variable. Yes/no dichotomizations were avoided if possible to test whether levels of social capital are important rather than absolute presence or absence of a factor. Unfortunately this was not possible with the cognitive social capital variable as a very large proportion of respondents reported high cognitive social capital. This means that a category of low social capital would have contained only a small number of respondents and the resulting lack of power would have made statistical comparisons difficult.

Table 3.3: Coding of individual social capital variables

Variable	How variable generated
<i>Group membership</i>	Score generated by adding the total number of groups an individual is a member of. Score then categorized into the following groups: 0 = Not a member of any group 1 = Member of 1 group 2 = Member of 2 or more groups
<i>Support from groups</i>	0 = Respondent does not receive support from any groups, or is not a member of a group. 1 = Respondent receives support from at least one of the groups they are a member of.
<i>Support from individuals</i>	Score generated by adding the total number of individuals support is received from. Score then categorized into the following groups: 0 = No support 1 = Support from 1 individual 2 = Support from 2 or more individuals
<i>Citizenship activities</i>	Generated by adding responses to both citizenship questions. 0 = No citizenship activities 1 = 1 citizenship activity (either joined together or talked to authorities) 2 = 2 citizenship activities (joined together and talked to authorities)
<i>Cognitive social capital</i>	4 cognitive social capital variables coded 0 for low (i.e. no trust) and 1 for high cognitive social capital. Variables added together to create continuous score 0 = no cognitive social capital, 4 = very high cognitive social capital. Score dichotomised into the following categories: 0 = Low cognitive social capital (score of 0 – 2) 1 = High cognitive social capital (score of 3 - 4)

3.3.2 Measurement of ecological social capital

Sample used to generate ESC variables

As discussed in section 1.2.4, because no truly contextual measures of ESC have so far been developed, ESC is most commonly measured by aggregating up individual responses to questions about social capital to the community level. Ideally, the ESC variables should be generated using a separate sample to that on which the outcome is measured (for example by excluding biological mothers of the one-year-olds with known case/non-case status for CMD). This avoids potential problems with reverse causality as the outcome cannot have caused the exposure if the exposure is measured in a different sample. It also avoids problems of individual level confounding as individual level predictors such as socio-economic status cannot confound the relationship because an individual's characteristics can have no effect on a variable to which their responses did not contribute. Theoretically therefore, only community level predictors are able to confound the relationship between ESC and CMD.

It was not possible to exclude the biological mothers of one-year-olds from the sample used to generate the ESC score for each community for two reasons. Firstly, the large number of communities in India and Peru meant that the sample sizes used to calculate the ESC scores in some communities would be too small to provide reliable estimates of ESC if the biological mothers of the one-year-olds, who make up about 60% of the total sample, were excluded from the analysis. Secondly, excluding mothers of one-year-olds would bias the sample towards older mothers, reducing the representativeness of the sample. Thus all YL respondents were used to calculate the ESC variables.

ESC scores for each community were generated by aggregating the responses to the SASCAT tool from every YL respondent within each community. This sample included a small proportion of fathers, grandparents and other caregivers (4.7% of the total sample), though the sample is still heavily weighted in favour of biological mothers. Thus the ESC scores are essentially an aggregation of the social capital of mothers in each community, and may not be representative of the social capital of all members of the community. As the YL study does not contain scope for a more accurate estimation of ESC, this method of aggregation was considered less

problematic than not attempting to measure ESC at all. The methodological issues surrounding the measurement of ESC in this study will be explored in detail in the discussion chapter of this thesis (Chapter 9).

Coding of ESC variables

Mirroring the ISC variables, five composite ESC variables were generated: group membership, support from groups, support from individuals, citizenship and cognitive social capital. The continuous forms of these variables at the individual level were aggregated to the community level where the mean of each variable was generated. For example the ISC variable ‘absolute number of groups a respondent is a member of’ becomes the ‘mean number of groups that respondents in each community are a member of’.

As with ISC, the ESC variables were categorized to avoid assumptions of linearity and to allow the relationship between different levels of social capital and CMD to differ between countries. Quartiles of the distribution in each country were chosen rather than absolute cut-off points (for example, average group membership in community = none, one group, two or more groups). This was for the following reasons:

1. The distribution of the variables differs between countries, so using absolute cut-off points would mean that some countries had very few respondents in certain categories, reducing power for statistical comparisons.
2. For some variables in some countries there is not much variation in ESC scores between communities. For example, most of the communities in all four countries have an average cognitive social capital score of over three (Table 4.3) so absolute cut-off points would not discriminate between communities. Quartiles allow comparisons between communities with the highest and lowest values within each country.

3.4 Measurement of CMD

Depression and anxiety (CMD) in the caregiver of each one-year-old child (n=8061) was assessed using the Self Reporting Questionnaire 20 (SRQ-20). The SRQ-20 is a screening tool for CMD designed by the WHO for use in low income countries. It is recommended as the most cost effective way of measuring adult mental health in these

settings (WHO 1994). Respondents are asked 20 yes/no questions relating to symptoms of depression and anxiety that they have experienced in the past 30 days (see Box 3.6 for a complete list of questions). Responses are then summed and a country-specific cut off used to determine probable cases and non-cases of CMD. The SRQ-20 has been extensively used in over 20 low income countries, and has acceptable reliability and validity (Harpham et al. 2003).

Box 3.6: Self Reporting Questionnaire 20

The following questions are related to certain pains and problems that may have bothered you in the last 30 days. If you think the question applies to you and you have had the described problem in the last 30 days, answer YES. If you did not have the problem in the last thirty days answer NO. If you are unsure about how to answer a question, please give the best answer you can.

1. Did you often have headaches?
2. Was your appetite poor?
3. Did you sleep badly?
4. Were you easily frightened?
5. Did your hands shake?
6. Did you feel nervous, tense or worried?
7. Was your digestion poor?
8. Did you have trouble thinking clearly?
9. Did you feel unhappy?
10. Did you cry more than usual?
11. Did you find it difficult to enjoy your daily activities?
12. Did you find it difficult to make decisions?
13. Was your daily work suffering?
14. Were you unable to play a useful part in life?
15. Had you lost interest in things?
16. Did you feel you are a worthless person?
17. Had things been so bad that you felt that you just couldn't go on?
18. Did you feel tired all of the time?
19. Did you have uncomfortable feelings in your stomach?
20. Were you easily tired?

The SRQ-20 has previously been used and country-specific cut offs validated in all of the YL countries except Vietnam. In both Peru and India validation studies have concluded that cut-off points of seven and below (probable non-case) and eight and above (probable case) provides the optimum balance between sensitivity and specificity (WHO 1994). In contrast, a review of SRQ-20 validation studies in Ethiopia shows mixed results (Hanlon 2005). Of the eight validation studies which validated the SRQ-20 in community samples in Ethiopia, optimum cut-offs varied from a high of 11/12 (Kortmann and ten Horn 1988), to a low of two/three (Hanlon 2005). However, as the majority of Ethiopian studies concluded that a cut-off of

between six and nine was the most valid and it remains unclear why such different results were found, the most commonly used international cut-off of seven/eight was used for this study. As no cut-off had previously been validated for Vietnam, the Vietnamese team conducted their own validation of the SRQ-20. They concluded that the cut-off of seven/eight maximized the specificity and sensitivity of the instrument (Tuan et al. 2003).

A large number of respondents (n=1100) did not have complete data for all SRQ-20 questions and so could not automatically be classified as a probable case/non-case of CMD. In order to maximize the sample size available for analysis, I developed an algorithm to classify respondents who did not have complete data for all 20 SRQ-20 questions. For example, if a respondent had answered 'yes' to 15 out of the 20 questions, but had missing data for two questions, that respondent would be a probable case of CMD irrespective of the answer to the missing questions, and therefore this respondent was classified as a probable case. Only respondents whose number of missing questions plus the number of 'yes' responses equalled seven or eight could not be assigned a case status and were therefore excluded from further analysis. This resulted in 855 respondents being included in the analysis who would otherwise have been excluded due to missing data.

3.5 Measurement of confounding variables

The analytical framework (Figure 3.1) outlines a wide range of variables which may confound the relationship between social capital and maternal CMD. These variables may be measured at either the individual or the community level. This section outlines broadly why they are considered as potential confounders in the association between social capital and maternal CMD, how these variables were measured in YL, and how they were transformed for use in this analysis. I followed five principles when coding the variables:

1. All variables must be coded in the same way in all four countries to allow the results to be directly compared. On the few occasions where this was not possible (for example, where the ethnic classification differed between countries), the most comparable categories between countries were used.

2. In order to avoid assumptions of linearity, categorical rather than continuous variables must be used unless the association between that variable and the outcome is linear in all four countries¹².
3. Categories should be based on criteria that are biologically or socially meaningful rather than on statistical criteria.
4. No category should have less than five per cent of the sample in any one country, and each category must have an acceptable number (five per cent) of CMD cases to maximise power for statistical comparisons.
5. The baseline category should ideally be the largest category to reduce the size of the standard errors of the effect estimates in the other categories.

All of the variables listed below were assessed as potential confounders in the analyses presented in Chapters 4 and 8.

3.5.1 Socio-economic status

As shown in section 1.1.2, socio-economic status is one of the strongest predictors of CMD and also may determine levels of ISC as well as an individual's access to stocks of ESC. Community deprivation may be an independent risk factor for CMD and may also determine the nature and type of ESC. Both individual and community level deprivation are measured in this study. YL recognizes the multi-dimensional nature of socio-economic status by measuring a range of different variables reflecting both economic and social position. Though counts are often used to measure socio-economic status (for example number of monetary transfers received), the variables used to collect this information are adapted for use in each country to provide locally meaningful measures. For example, number of monetary transfers received is measured by asking about the major sources of economic support available in each country.

Household wealth index

The household wealth index is the main instrument used to measure long-term socio-economic status in YL. The measure is based on work by the World Bank and Macro

¹² This was assessed by using a likelihood ratio test to compare the likelihood of a model containing the continuous variable and a model with the variable transformed into a quadratic term. A significant difference in likelihood indicates that there is a non-linear relationship between the variable and CMD and therefore that it would be inappropriate to enter the variable as continuous.

International for UNICEF (2000). The index is a simple average of three factors: housing quality (number rooms per person; floor, roofing and wall materials); consumer durables (scaled sum of a list of items such as a radio and bicycle); and services (average of drinking water source, electricity, toilet type and cooking fuel). Country-specific items were used to provide locally meaningful measures of socio-economic status, for example by having country-specific lists of common roofing materials, sources of drinking water or consumer durables. The calculated index for each household is a score between 0 and 1, which is then divided into four categories (0-0.25 = extremely poor, 0.25-0.5 = very poor, 0.5-0.75 = less poor, 0.75-1.0 = better off). The average wealth index of all the surveyed households in each community was calculated to provide a measure of community deprivation, and this continuous score was categorized in the way described above to classify communities as extremely poor, very poor, less poor and better off.

Household debt

Respondents were asked whether they had any serious debts (yes/no), and this was used as a binary variable in the analysis.

House ownership

Respondents were asked whether they owned the land the house was built on and this was used as a binary variable in the analysis. The average of this variable was calculated for each community to provide the proportion of households in each community that owned their own house. This continuous variable was categorized into quartiles of the distribution within each country.

Number of occupational activities done by mother

This was recoded as an indicator of livelihoods and also of pressures on the mother's time which may influence her ability to participate in social capital activities (such as group membership) and also affect her risk of CMD. This variable was categorized into zero, one, and two or more activities.

Maternal education level

Education level was measured as the highest level of schooling reached by the mother. As the education system differs between countries and there are big differences in the

proportion of mothers achieving different levels of education, the education variable was coded slightly differently in each country. Table 3.4 lists the codes used in each country. The percentage of respondents in a community who had completed primary education in each community was calculated as a measure of community level education. This continuous variable was categorized into quartiles of the distribution within each country.

Table 3.4: Coding of education variables in each country

Peru	Vietnam	Ethiopia	India
No education	No education	No education	No education
Primary	Primary	Incomplete primary	Primary
		Incomplete junior high	
Secondary	Secondary	Incomplete secondary	Secondary
Technical College	High school	Secondary school or higher	High school or higher
University/higher	Further education		

Number of monetary transfers received by household

The number of sources from which monetary transfers are received by each household was measured as an indication of additional income and financial support. Sources included government benefits, religious organisations, NGOs and individuals outside the household. The variable was categorized into zero, one, and two or more transfers received.

Number of economic shocks suffered by household

Respondents were asked whether the household had suffered any shocks such as natural disasters, death in the family or crop failure which had resulted in a reduction in the economic welfare of the household. This variable was coded into zero, one, and two or more shocks.

Maternal self assessment of socio-economic status

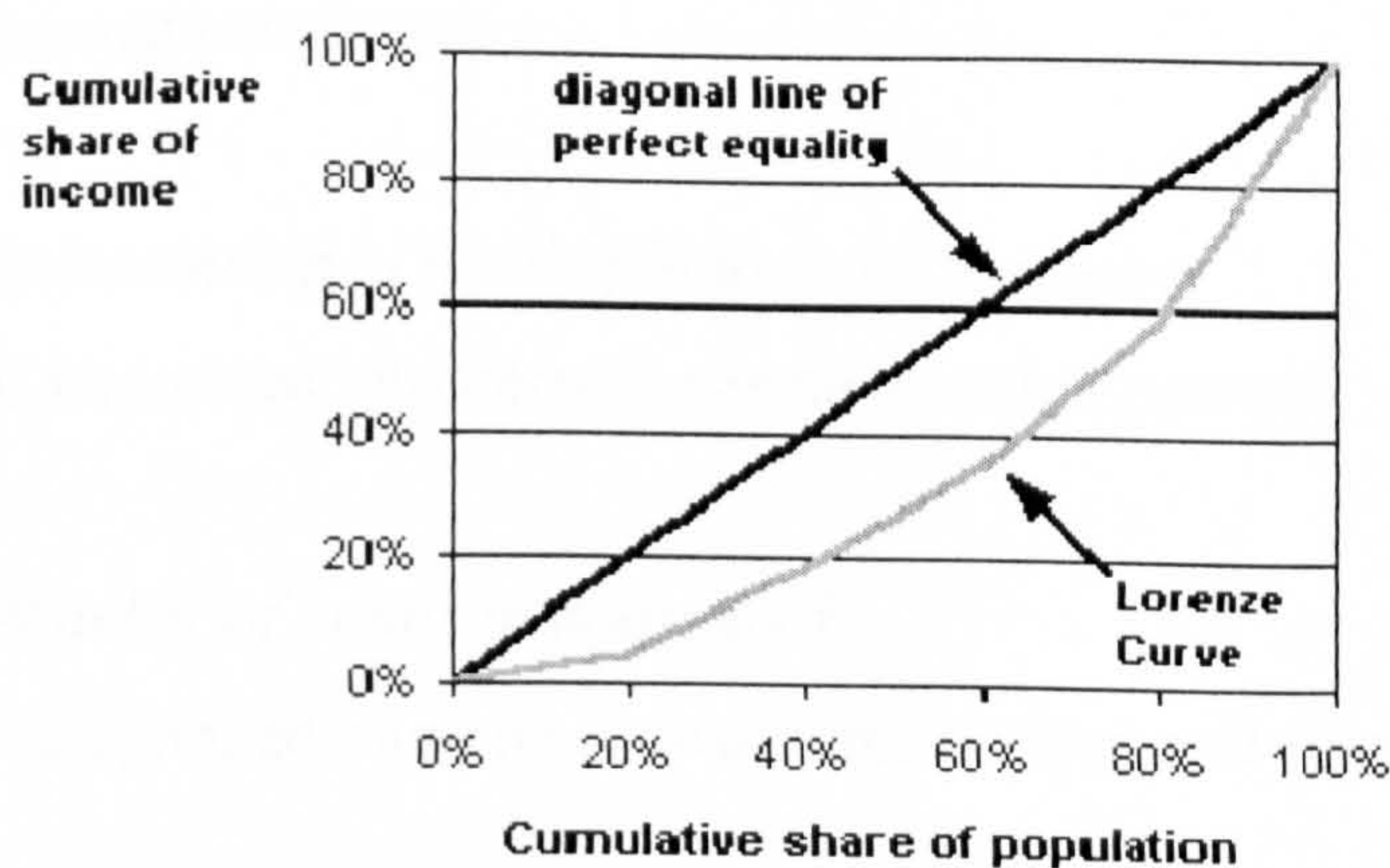
The question ‘Do you consider yourself better off, similar to or worse off than most other households in this community?’ was used to provide a self-assessment of socio-economic status. While partly reflecting actual status, the question also measures

perceptions of inequality which may influence people's social relations with other members of the community, and independently affect their mental health.

Community economic inequality

The level of economic inequality in a community may influence the nature of social capital in that community and also have an impact on CMD. In order to control for this effect, a gini coefficient was calculated for each community based on the wealth index of all the sampled households in that community. The gini coefficient is a standard measure of inequality, with values ranging from zero (perfect equality) to one (perfect inequality). It was calculated by ranking all individuals within each community according to their wealth index score, then dividing the sample into deciles. The percentage of the total wealth index in each of these ten groups was then plotted and the resulting Lorenze Curve compared to the diagonal line of perfect equity. The further the Lorenze curve is from the line of perfect equity, the larger the gini coefficient and the more unequal the community as illustrated in Figure 3.2. The `ginidesc` command in Stata 8.0 (Stata Corporation 2003) was used to calculate the gini coefficient.

Figure 3.2: Lorenze curve of economic inequality.



Source: <http://www.communityaccounts.ca>

3.5.2 Demographics

Demographic variables such as age, ethnicity, household composition and community population dynamics may confound the relationship between social capital and CMD as they may affect a mother's access to social capital as well as her risk of CMD. The degree to which an individual is integrated into the community may also affect not

only their levels of ISC, but also their access to community ESC. Integration factors such as length of residence and speaking the major language may also influence their mental health through increased knowledge of and access to resources.

Maternal age

Categorized into <24, 25-29, 30-34 and 35 + years of age at the time of the survey.

Maternal ethnic group

The categories used for ethnic groups necessarily differ between countries. Where possible, divisions were made along the lines of majority versus minority ethnic groups (for example Kinh versus non-Kinh in Vietnam).

Maternal religion

Religious groupings also vary by country, however the main world religions (Christianity, Islam, Hinduism etc.) are categorized separately, as are local religions such as ancestor worship in Vietnam.

Maternal marital status

Divided into two categories: single, widowed or divorced versus married or has a permanent partner.

Relationship of head of household to mother

Categorized into herself, partner or other person.

Number of adults in household

Categorized into one or two, three or four, and five or more adults in household.

Number of sons and daughters born alive

Because of the importance attached to having a son in Vietnam and India in particular, separate variables were computed for the number of sons and number of daughters born. Having daughters rather than sons may affect maternal CMD and also influence their involvement in community activities. These variables were both categorized into zero, one, and two or more born.

Proportion of mother's life lived in community

The number of years a mother had lived in the community was divided by her age in years and multiplied by 100 in order to obtain the proportion of her life she had lived in the community (women with scores of 100 were born in the community). This continuous variable was categorized into less than one third, between one and two thirds, between two and just under three thirds of life lived in community, and born in the community.

The continuous variable was also averaged at the community level and divided into quartiles to measure the average proportion of their lives that residents had lived in the community. This provides a measure of population stability.

Mother speaks major language

The ability to speak the major local language affects social capital by enabling social integration, and may also affect CMD by increasing knowledge of and access to resources. This binary variable was coded 'yes' if the respondent was fluent in the major specified language and 'no' if she was not.

Community population size

The size of the community may impact on the nature of social capital as it may affect levels of cohesion within the community. Living in larger (and therefore urban) communities may also be associated with an increased risk of CMD. The community questionnaire collected information on the population size of each community, and this variable was coded into less than five thousand, five to ten thousand, ten to fifteen thousand, and twenty thousand or more residents.

Community population stability

The community questionnaire also collected information about population stability which may affect the risk of CMD and the nature of social capital through the effects of migration. This variable was divided into three categories: the population had increased over the previous three years, decreased over that period, or stayed the same.

3.5.3 Contextual variables

The context in which the community is situated may confound the association between social capital and mental health; for example, an urban environment may be damaging to mental health. In addition, the nature of social capital may be partly dependent on the community setting, with different types of organizations and social customs in rural and urban areas, or in different regions of the country.

Rural/urban

This variable is classified at the community level.

Region of country

Country-specific variable.

3.6 Statistical methods

3.6.1 Choice of statistical model

The data are structured in a hierarchy with individuals nested within communities within clusters in each country. In this situation, single-level multiple regression analyses are inappropriate as the assumption of independence of observations is violated. People within the same community are likely to be more similar to each other than to people from other communities on a series of measured and unmeasured characteristics, resulting in intra-community correlation. Modelling such data with single-level regression models can lead to the incorrect estimation of standard errors of model parameters, and thus the possibility of drawing incorrect inferences.

Multi-level modelling is an extension of ordinary regression analysis which can deal with data which are structured in a hierarchy. It accounts for intra-community correlation and therefore provides valid estimates of the standard errors of the model's parameters. By recognising the hierarchical nature of the data, multi-level modelling allows for the effect of community level variables (such as ESC) on individual level outcomes (in this case CMD) to be directly estimated.

Multi-level models allow separation of components of variance at the different levels of the model. In this case, not only can the association between both ecological and

individual social capital and CMD be estimated independently of other individual and community level risk factors, but the amount of variance in CMD at the community and cluster level can also be estimated. This allows the relative importance of compositional (individual level) and contextual (community level) characteristics on CMD to be explored.

As the data are structured in a three level hierarchy, three level (individual, community, cluster) logistic regression models are used for the analyses. This is expressed in the following equation:

$$\log \text{ odds } [P_{ijk}] = B_0 + X_{1i} + X_{2ij} + \underline{X}_{3ij} + v_{0k} + u_{ojk}$$

P_{ijk} = Probability that the i^{th} person in the j^{th} community in the k^{th} cluster is a case of CMD

B_0 = Global mean (intercept)

X_{1i} = Individual social capital

X_{2ij} = Ecological social capital

\underline{X}_{3ij} = Confounding variables

v_{0k} = Level 3 random error term (between cluster variance)

u_{ojk} = Level 2 random error term (between community variance)

There are two random parameters in the models corresponding to error terms for clusters and communities, treating communities and clusters as random effects. It is assumed that these components of variance are normally distributed and have a variance of zero. Unlike linear multi-level regression models, no estimate of the variance in the outcome at the individual level (level 1) is estimated, as all individuals are either cases (1) or non-cases (0). All other variables in the model (such as the social capital variables and the confounding variables) are entered as fixed effects, where the direct effect of this variable on CMD is estimated.

Multi-level modelling also enables interactions to be fitted between variables at different levels (for example between individual socio-economic status and ESC), and for fixed and random effects of variables to be explored. Fixed effects are when the direct effect of a variable is estimated, for example the effect of each different

community on CMD. In this case, a separate dummy variable is entered into the model for each community, and the effect of living in community B on CMD compared to living in the baseline community A is estimated. This is obviously an unwieldy technique when there are a large number of communities. Instead, community can be entered into the model as a random effect. This allows inferences to be drawn about the underlying population despite the hierarchical nature of the data. By entering community as a level two random effect, the effect of social capital on CMD can be estimated across all communities.

Random intercepts and fixed slopes models are fitted initially, allowing the prevalence of CMD to vary across communities (random intercepts), but forcing the relationship between social capital and CMD to be the same across communities (fixed slopes). Social capital can then be modelled as a random effect (random intercepts and slopes model), allowing the effect of social capital on CMD to vary between communities. All multi-level analyses are conducted using the GLLAMM (Generalised Linear Latent and Mixed Models) commands in Stata 8.0 (Stata Corporation 2003).

3.7 Next steps

The generic methods outlined in this chapter will form the basis of the analysis described in the next chapter which explores the association between individual and ecological social capital and maternal CMD in the four YL countries. More detailed methods, including the selection of confounders and model building stages are described in more detail in that chapter.

4. Comparative analysis of social capital and CMD

In this chapter I present the findings of a comparative analysis of the association between social capital and common mental disorders (CMD) in the four Young Lives (YL) countries. I aim to test the principal research hypotheses listed in section 2.6.3 and re-iterated below. Firstly I present the statistical methods used for the analysis, building on the methods outlined in Chapter 3. I then present the results of the analysis followed by a discussion that relates the results to the research hypotheses. I conclude the chapter by highlighting certain issues that require further exploration. These issues are examined in more depth in Part III of this thesis, which deals with the association between social capital and CMD in Peru.

4.1 Chapter objectives and hypotheses

4.1.1 Objectives

1. Examine the role of ISC and ESC as independent risk factors for maternal CMD in low income countries using data from Peru, Vietnam, Ethiopia and India (Andhra Pradesh).

4.1.2 Hypotheses

- A. Both context and composition are important in the prediction of CMD, therefore ISC and ESC variables will show independent associations with maternal CMD.
- B. High social capital is associated with a reduced risk of CMD. This association remains after individual and community level confounders are controlled for.
- C. Cognitive social capital is a ‘universal truth’ in that the same associations are seen with CMD in different countries. The effect of structural social capital on CMD may vary due to cultural differences within and between countries.

4.2 Methods

4.2.1 Sample selection

The sample was initially restricted to biological mothers of one-year-olds with known case status for CMD and complete data for all social capital variables. Once the final

list of confounding variables had been decided in each country the sample was further restricted to respondents who had complete data for all variables included in the final model for each country. All analyses were conducted separately for each country using this sample. As stated in section 3.1.2, the YL samples from each country are not nationally representative. For ease of reporting in the remainder of this thesis country samples are referred to by the country's name, and the phrase 'between countries' refers to comparisons of the YL samples between the four countries.

4.2.2 Descriptive statistics

A range of descriptive analyses were conducted to explore the distribution of social capital and CMD between countries. Standard single-level descriptive tests such as Pearson's Chi Square tests and Student's t-tests are inappropriate as they do not account for the structure of the data. It was not practical to use the GLLAMM command in Stata to fit multi-level models of the crude association between two variables as each model takes up to 15 hours to converge. Instead, the percentage distribution of each social capital variable was tabulated separately for each country, and differences between countries tested using two-level (individual and community) regression models with robust standard errors (Generalised Estimating Equations – GEE - commands in Stata). Binary social capital variables (such as whether a member of a trade union or not) were tested using two-level logistic regression models, and continuous social capital variables (such as average level of group membership in the community) with two-level linear regression.

Raw and composite individual (ISC) and ecological social capital (ESC) variables were tabulated to describe patterns of social capital and to assess whether levels of social capital varied between countries. The prevalence of probable cases of CMD in each community within each country was plotted to determine whether the prevalence of CMD differs significantly between countries, and whether CMD varies between communities within countries. Levels of the most important confounding variables were tabulated and compared between countries. Finally, the crude association between all social capital variables and CMD was explored to describe patterns of association in each country. This showed that support from groups was very highly correlated with membership of groups due to respondents not being asked if they received support from a group unless they were first a member of that group. As both

variables explain the same variance in the outcome, support from groups was dropped as a social capital variable and excluded from further analyses.

4.2.3 Selection of confounders

Based on the conceptual framework in Chapter 3 (Figure 3.1), potential confounders were categorized into socio-economic, demographic, child care support, and contextual variables. As social capital may have a different association with CMD in each country, selection of confounders was carried out separately for each country. As only one study has explored the association between social capital and mental illness in a low income country (Harpham et al. 2004a), there is not enough evidence to select a priori confounders on the basis of previous research. As a result only one measure of socio-economic status (wealth index) was included in all models as an a priori confounder irrespective of its statistical significance in the models. Instead, a largely statistical approach to the selection of confounders was taken.

The common practice of using chi square or t-tests to identify potential confounders associated with both the outcome and the exposure was not used as these single-level tests do not take the structure of the data into account. Instead, all potential and a priori confounding variables were entered simultaneously into a three-level model containing all the social capital variables, with CMD as the outcome variable. In all countries apart from Andhra Pradesh the inclusion of these variables explained all of the community and cluster level variance, making the multi-level model numerically very similar to two-level robust standard error models or single-level logistic regression models. Fitting multi-level models with three levels is computationally intensive (the models took up to 15 hours to converge using the GLAMM command in Stata). As approximately the same results are achieved by using two-level robust standard error logistic regression models (GEE) in all countries apart from Andhra Pradesh, these models were used to select confounders in every country. The final models were then fitted using three-level multi-level logistic regression to obtain accurate estimates of the association between social capital and maternal CMD.

After all variables had been entered into a robust standard errors model, Wald tests were used to assess the contribution of each term to the model. The variable making the least significant contribution was excluded from the model and the model re-fitted.

A significant contribution to the model was defined as an overall Wald test p-value of less than 0.05, or a 10 per cent or greater change in any of the effect estimates for the social capital variables. This process was repeated until only those potential confounders which made a significant contribution to the model remained, plus the a priori confounder (wealth index), and all the social capital variables. Backward selection of confounders was used as the effect of each variable in a model depends upon the other variables included in that model; thus their relative importance cannot be assessed unless all other variables are included in the model. This method also deals with multi co-linearity as the least significant of a group of correlated variables will be dropped from the model leaving the more important remaining variables each explaining their unique portion of the variance. This was important in this analysis as correlation matrices for each country showed multi co-linearity principally between the ESC and community level variables resulting in unacceptably high standard errors of model parameters (results available on request).

4.2.4 Model formulation

Three steps were used to formulate the final model in each country. Firstly, the crude odds ratio (OR) for the association between each social capital variable and CMD was estimated using three-level (individual, community, cluster) models. In Ethiopia only two-level models (individual and cluster) could be fitted as information was only collected at the cluster level and so this had to be used as a proxy for community. For the ESC variables the corresponding ISC variable was also included in the model (for example individual group membership and average community group membership) in order to estimate accurately the effect of the ESC variable – the impact of community level social capital on an individual’s mental health irrespective of their own level of social capital. This is in line with the complementary nature of my combined theory of social capital presented in Chapter 1 (section 1.2.5) whereby the effect of ESC cannot be estimated without accounting for ISC.

Secondly, all four types of social capital (group membership, support from individuals, citizenship and cognitive social capital) at both the individual and community level were entered in the same model to estimate the relative importance of each aspect of social capital in the prediction of CMD. I decided not to fit separate models for each type of social capital as the multi-dimensional nature of the construct

outlined in section 1.2.4 indicates that the different aspects of social capital should be measured together. In addition, a factor analysis of the raw social capital variables (described in Chapter 5) showed that the four constructs are not highly correlated. They are therefore measuring different aspects of the social environment and can be entered into the same model. In order to ensure an accurate estimate of the likelihood of each model, no limit was put on the number of quadrature points used in the estimation.

Once the final list of confounders had been established in each country, three groups of variables (socio-economic, demographic, and contextual variables) were added one at a time to the basic three-level model containing all social capital variables in order to establish the effect of each group of confounders on the social capital estimates. Likelihood ratio tests were performed on each group of variables comparing the likelihood of a model including these variables to the likelihood of a model excluding them.

The robustness of the final model in each country was tested by fitting the same set of variables in a two-level logistic regression with robust standard errors (GEE) and a working exchangeable correlation matrix, and also in a single-level logistic regression. Results from these models should be identical if there is no significant level two or level three variance in the final multi-level model (this was the case for Vietnam and Ethiopia). The assumption of a positive correlation matrix in multi-level modelling (people living in the same community are more similar to each other than to people from other communities) was tested by analyzing the variance structure from the robust standard errors model (GEE) with unconstrained variance (exchangeable correlation matrix) which allows within-group correlations to be negative.

Even though logistic regression was analogous to multi-level modelling in Vietnam and Ethiopia, multi-level modelling was still used to fit the final models as the remaining variance, though not statistically significant, may be numerically important. In addition, as multi-level modelling was required in Andhra Pradesh and Peru, the same technique was used in all countries to produce directly comparable results.

4.3 Results

4.3.1 Sample selection

Figure 4.1 outlines the selection of the final sample for analysis in each country. Of the 7922 caregivers who are the child's biological mother and therefore eligible for inclusion in the analysis, 1014 (12.8%) were excluded from the analysis due to missing data. In Peru, the practice of asking certain sections of the questionnaire to other members of the household resulted in 10 biological mothers being excluded as they did not answer the mental health section, and 110 being excluded as they did not answer the social capital section.

The extent of bias caused by excluding mothers with missing data was assessed by comparing separately for each country key characteristics of mothers who were included and mothers who were excluded due to missing data (results available on request). In Andhra Pradesh, Peru and Ethiopia the final selected sample does not differ from the excluded mothers in terms of either socio-economic status or demographic characteristics. However, in Vietnam the final selected sample is better educated, has suffered fewer economic shocks and has slightly lower levels of poverty than those who were excluded. There are some differences in ISC between selected and excluded mothers, with different patterns between countries. In Peru, Vietnam and Andhra Pradesh selected mothers are less likely to participate in citizenship activities than those excluded because of missing data (there is no difference in Ethiopia), while in Vietnam and Ethiopia selected mothers are more likely than excluded mothers to be a member of a group, but less likely in Peru. Finally, while Vietnam and Andhra Pradesh show no difference in the prevalence of CMD between selected and excluded mothers, in Peru selected mothers have a higher proportion of CMD than excluded mothers while the reverse is true in Ethiopia. In summary, while there is little bias in terms of the major confounding factors, selected and excluded samples do exhibit some differences according to the exposure and outcome variables.

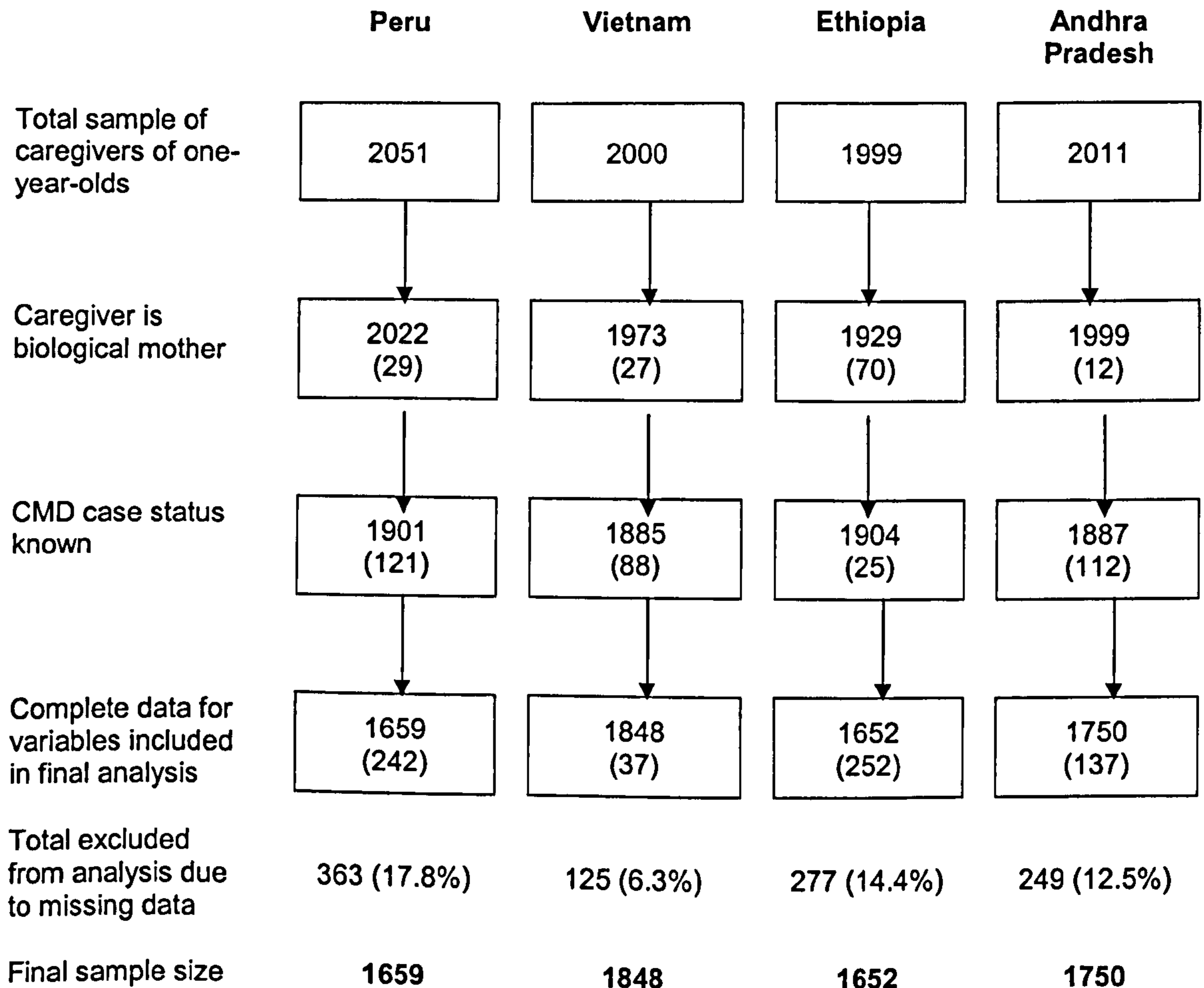
Figure 4.1: Selection of final sample in each country (number excluded at each stage)

Table 4.1 presents the number of clusters and communities included in the final analysis after respondents with missing data for variables included in the final model have been excluded. Table 4.1 also includes information on the average, minimum and maximum number of biological mothers included in the analysis from each community, as well as the average number of individuals (including caregivers of both one-year-olds and eight-year-olds) used to generate the ESC scores and community level variables in each community. As Peru and Andhra Pradesh have the largest number of communities, the average number of respondents in each community is correspondingly smaller.

Table 4.1: Number of clusters, communities and respondents in each community by country.

	Peru	Vietnam	Ethiopia	AP
# clusters	20	20	20	20
# communities	82	31	--	101
Total sample of mothers with known CMD status	1659	1848	1652	1750
Mean # mothers with CMD case status in each community (range)	20.2 (2-87)	59.6 (24-97)	82.6 (51-97)	17.3 (1-54)
Total sample used to generate community level variables and ESC	2565	3000	2999	3019
Mean # respondents in each community used to generate community level variables and ESC (range)	31.3 (3-154)	96.8 (35-150)	149.95 (148-151)	29.9 (1-86)

4.3.2 Description of individual social capital

Table 4.2 describes the pattern of ISC within each country. Levels of every social capital variable apart from membership of political groups and support from NGOs and charities differ significantly between the four countries, highlighting the culturally specific nature of social capital.

Membership of community groups

Ethiopia has much higher levels of group membership than any other country, with three quarters of mothers members of at least one group. This is nearly three times higher than in Andhra Pradesh and Vietnam, and four times higher than in Peru where only one fifth of mothers are members of one or more types of groups.

The type of group that the mothers are members of also differs between the countries. For example, religious and sports/social groups are very important in Ethiopia with a third and one half of mothers members of each type respectively. These types of groups are much less important in the other three countries, in particular in Andhra Pradesh and Vietnam where less than 1% of mothers report being a member of either group type. Membership of women's groups is the most common type of membership across all four countries, though again participation varies from a high of 24% in

Andhra Pradesh where women's groups form an important channel for development aid, to a low of only 8% in Peru.

Table 4.2: Description of individual social capital by country

	Peru n=1659	Vietnam n=1848	Ethiopia n=1652	AP n=1750
%				
<i>Membership of community groups</i>				
Work related/trade union*	0.2	7.5	3.2	2.3
Community group*	5.9	5.3	12.1	2.7
Women's group*	8.0	16.9	18.2	24.1
Political group	1.5	0.9	1.8	2.0
Religious group*	5.8	0.7	38.1	0.6
Funeral/credit group*	0.2	6.1	7.0	0.0
Sports/social group*	1.3	0.3	55.4	0.0
None*	81.5	73.2	26.1	71.1
Member of 1 group	15.0	18.6	34.3	26.3
Member of 2 or more groups	3.6	8.3	39.7	2.6
<i>Support from individuals</i>				
Family*	62.4	94.4	46.5	70.4
Neighbours*	17.8	77.4	33.8	47.9
Friends*	17.2	70.5	24.9	15.3
Community leaders*	2.0	14.8	12.0	3.4
Religious leaders*	8.0	1.2	25.9	0.5
Political leaders*	0.8	0.1	1.9	1.3
Government officials*	5.2	4.7	9.6	4.1
NGOs, charities	5.9	6.3	3.2	2.7
No support from individuals*	32.3	3.7	37.9	22.8
Support from 1 individual	35.1	11.5	22.5	28.6
Support from 2 or more individuals	32.6	84.8	39.6	48.6
<i>Citizenship activities</i>				
Joined together to address a common problem*	14.2	28.4	40.6	29.7
Talked to authorities about community problem*	10.3	3.7	24.8	17.1
Either talked with authorities or joined together*	18.4	29.2	43.6	30.1
<i>Cognitive social capital</i>				
The majority of people can be trusted*	36.5	83.7	86.0	95.7
The majority of people get along*	69.6	91.7	91.3	95.3
Really feel part of the community*	84.2	98.3	92.4	97.0
Most people would take advantage given the chance*	40.1	9.4	24.4	40.2
High cognitive social capital*	54.7	90.7	88.3	94.9

* Significant difference at 5% level in distribution of social capital between countries. Assessed using two level logistic regression models with robust standard errors (GEE).

Interestingly, Vietnam has much lower rates of group membership than expected from the large number of state-sponsored community-based mass organisations which exist there. Such groups include the Women's Union which organises income generation and credit schemes and family planning programmes, and the Collectives which provide services such as electricity and farming products to its members. Yet while national estimates for membership of the Women's Union run at half of the adult female population (Ha et al. 2005), in the YL sample fewer than one in five mothers say they are members.

Support from individuals

With the exception of Vietnam, around a third of mothers receive no economic, instrumental, or emotional support from other individuals. However, if mothers do receive support, they are more likely to receive it from two or more sources and therefore display some diversification in their social safety nets. Vietnam has significantly higher levels of support than the other countries, with less than 4% of mothers receiving no support from any source and 85% receiving support from two or more sources. Despite differing levels of support from individuals between countries, the sources of support are strikingly similar. Family, followed by neighbours and then friends provide the most support in all countries, with political leaders providing the least support in all countries apart from Andhra Pradesh where they are the second lowest source of support behind religious leaders. In line with levels of group membership patterns, popular groups are mirrored by support from the individuals who make up that group. For example in Peru and Ethiopia where membership of religious groups is quite important, support from religious leaders is high (8% and 26% respectively). In contrast, in Vietnam and Andhra Pradesh where religious groups are not so important, support from religious leaders is correspondingly low, though interestingly in Vietnam 60% more mothers report support from religious leaders than are members of religious groups. It is noteworthy that reported support from political leaders and government officials in Vietnam is very low despite the communist system of governance, though support from community leaders is the most important form of support after family, friends and neighbours.

Citizenship activities

Ethiopia has the highest level of participation in citizenship activities, with over 40% of mothers having joined together with others or talked to the authorities to address a local problem in the last 12 months. This is 10% higher than Vietnam or Andhra Pradesh and twice the level of participation in Peru. Combined with high levels of group membership, this means that Ethiopia has significantly higher levels of structural social capital than the other three countries. In all four countries joining together with other community members is more common than talking to local authorities, especially in Vietnam where mothers are more than seven times more likely to join together with others than to talk directly to the authorities, perhaps reflecting the reduced ability of women within the commune to access the community leaders directly.

Cognitive social capital

Levels of cognitive social capital are much lower in Peru than in the other three countries, with around 90% of the mothers in Andhra Pradesh, Vietnam and Ethiopia having high cognitive social capital compared to just over half in Peru. Levels of generalized trust in Peru are particularly low compared to other countries – less than 40% of mothers there think that people in general can be trusted compared to over 80% in the other countries. Yet despite relatively low levels of trust and social harmony, more than 80% of the sampled Peruvian mothers report that they do feel part of their community, a figure which compares favourably with the other countries. The reverse-coded question ‘Do you think that the majority of people in this community would try to take advantage of you if they got the chance?’ mirrors the pattern of cognitive social capital from the other questions, with similar proportions of people answering ‘yes’ as had answered earlier in the questionnaire that they did not trust people in general and that people in general did not get along. This was with the exception of Andhra Pradesh where many more mothers than expected think people would take advantage of them.

Overall, the distribution of social capital shows low levels of structural social capital in all countries apart from Ethiopia, and very high levels of cognitive social capital in all countries apart from Peru.

4.3.3 Description of ecological social capital

Table 4.3 describes the mean, standard deviation, and 10th and 90th percentile range of the ESC variables across the four countries. The percentile range is used instead of the minimum and maximum values in order to exclude those communities with extreme values caused by the small number of individuals who make up the aggregate scores for some communities in Andhra Pradesh and Peru. As with the ISC variables, two-level robust standard error models show significant differences between countries in the level of every ESC variable. Levels of ESC follow the same pattern as ISC, partly because between 55% and 67% of the value of ESC in each country is an aggregate of the ISC of the mothers in the analysis, and also because the social capital of the caregivers of the eight-year-old children who make up the remainder of the ESC scores does not differ significantly from the ISC of the mothers used in this analysis (results available on request).

Table 4.3: Description of ecological social capital by country

	Mean (SD) 10 th and 90 th percentile range			AP
	Peru	Vietnam	Ethiopia	
<i>Number of communities</i>	82	31	20	101
<i>Group membership</i>				
Average membership of community groups*	0.3 (0.2)	0.4 (0.3)	1.4 (0.5)	0.4 (0.2)
	0.1- 0.4	0.2 – 0.7	0.5 – 2.0	0.1 – 0.6
<i>Social support</i>				
Average # of individuals that support is received from*	1.2 (0.4)	2.8 (0.3)	1.6 (1.3)	1.4 (0.6)
	0.6 – 1.7	2.4 – 3.4	0.3 – 3.8	0.7 – 2.0
<i>Citizenship</i>				
Average level of citizenship*	0.3 (0.2)	0.4 (0.2)	0.7 (0.4)	0.5 (0.3)
	0.1 – 0.6	0.3 – 0.6	0.3 – 1.3	0.1 – 0.9
<i>Cognitive social capital</i>				
Average level of cognitive social capital*	2.5 (0.5)	3.7 (0.1)	3.5 (0.2)	3.5 (0.3)
	1.7 – 3.1	3.5 – 3.8	3.2 – 3.8	3.1 – 3.9

* Significant difference at 5% level in distribution of social capital between countries. Assessed using two-level logistic regression models with robust standard errors (GEE).

Membership of groups

As with ISC, average membership of community groups is much higher in Ethiopia than in the other countries. On average residents of a given community in Ethiopia are members of 1.4 groups, compared to one group membership for every two residents in the other countries. Importantly, the average level of group membership differs between different communities within the same country, indicating different levels of ESC across communities. Despite having the largest communities, Ethiopia displays the greatest range in levels of average group membership across communities, while Peru has the most homogenous communities.

Support from individuals

Mirroring the distribution of ISC, Vietnam has the highest amount of community level support from individuals with people in each community receiving support from on average three individuals. Again there is a wide range of levels of community support, especially in Ethiopia where communities range from the very supportive end of the spectrum where on average residents receive support from four individuals, to the very unsupportive end where many residents receive no support at all.

Citizenship activities

Ethiopia has the highest community level citizenship with an average score of 0.7 (the maximum possible score is 2.0). Again, the level of citizenship varies between communities within each country, especially in Peru and Andhra Pradesh where there are communities with extremely low levels of citizenship (0.1) as well as ones with comparatively high levels (0.9).

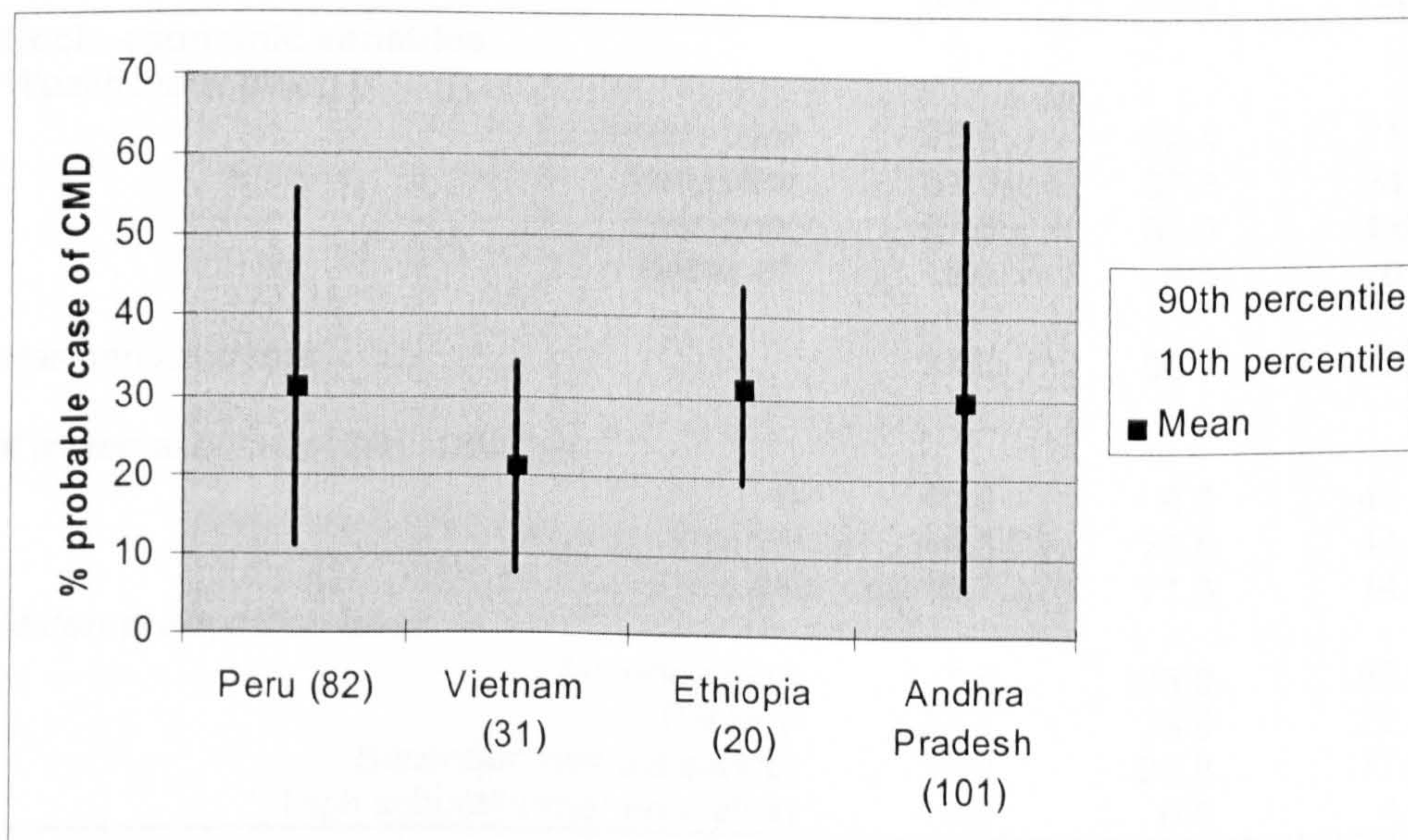
Cognitive social capital

Vietnam, Andhra Pradesh and Ethiopia all have very high average levels of community cognitive social capital with means near the maximum score of four. Particularly in Vietnam, there is very little variation between communities, reflecting the large proportion of individuals who reported high cognitive social capital across these countries. Peru displays much more variation between communities with some having relatively high levels of cognitive social capital (3.1), and some quite low levels (1.7).

4.3.4 Description of maternal CMD

Figure 4.2 presents the point prevalence and range of probable cases of CMD among mothers in each community in each country. As with the ESC scores, the 10th and 90th percentiles are reported instead of the minimum and maximum values as the small number of mothers in some communities in Peru and Andhra Pradesh makes the latter values unreliable. The Vietnamese sample has the lowest prevalence with only 21% of mothers answering ‘yes’ to eight or more of the SRQ20 questions and therefore being classified as a probable case. In contrast, the prevalence of CMD in the samples from Peru, Ethiopia and Andhra Pradesh is 10% higher at around 30%. These results mirror those reported in much larger and nationally representative prevalence studies which show much lower rates of mental illness in Asian countries (WHO 2004). All four countries display internal geographical differences in the prevalence of CMD with significant variation in the proportion of probable cases of CMD between communities, ranging from around 10% to well over half of the mothers sampled. Peru and Andhra Pradesh show the widest variation in levels of CMD, possibly because of the smaller sample sizes in each community. The following analysis will determine whether these differences are solely due to the individual characteristics of the mothers who live in these communities (compositional factors), or whether contextual factors such as ESC also explain some of the observed geographical variation in CMD.

Figure 4.2: Distribution of CMD across communities by country



4.3.5 Description of principal confounders

Table 4.4 shows the distribution of the principal confounding variables in each country. As with the social capital variables, all of the major potential confounders in the association between social capital and CMD show significant differences between countries. These differences are particularly apparent in the socio-economic profiles of the countries, with Peru and Vietnam having a smaller proportion of extremely poor mothers and a large number of mothers who have had some education. For example, in Ethiopia over 70% of mothers are classified as extremely poor compared to just over 20% in Vietnam. Similarly, in Peru fewer than one in ten mothers have received no education yet this figure is well over 50% in Ethiopia and Andhra Pradesh. Levels of debt are highest in Vietnam and Andhra Pradesh, where around half of mothers have serious debts compared to around a third in Peru and Ethiopia. Diversification of maternal occupational activities is more than three times greater in Vietnam than in the other countries, with over 70% of mothers involved in two or more activities to earn money. Ethiopian mothers have suffered the greatest number of shocks which have affected the economy of the household, such as crop failure or death of a family member. Over two thirds have suffered at least one such shock and half have suffered two or more, compared respectively with a third and less than 10% in Peru, the country where mothers are least exposed to shocks.

Table 4.4: Distribution of major confounders by country

		Peru 1659	% Vietnam 1848	Ethiopia 1652	AP 1750
Socio-economic variables					
<i>Wealth index group</i>					
	Extremely poor	26.8	22.4	71.3	38.9
	Very poor	31.5	37.2	24.1	36.1
	Less poor	27.8	30.6	4.60	21.3
	Better off	13.9	9.8	0.0	3.8
	<i>Has serious debts</i>	37.8	50.7	32.6	49.7
	<i># maternal occupational activities</i>				
	0	40.0	6.7	41.5	50.9
	1	44.3	21.8	44.1	29.9
	2+	15.7	71.3	14.4	19.2
	<i>Maternal education level</i>				
	No education	7.8	26.9	55.8	60.4
	Primary	37.4	38.0	22.5	11.0
	Secondary/middle school	38.9	28.8	17.0	11.6
	High school/further education	15.9	6.3	4.8	17.0

Continued...

	Peru n=1659	% Vietnam n=1848	Ethiopia n=1652	AP n=1750
<i>Perceived economic position in community</i>				
Better off than others	11.0	3.3	13.5	19.5
Similar to others	65.3	54.5	52.3	78.4
Worse off than others	23.7	42.2	34.2	2.1
<i>Number of economic shocks</i>				
0	61.1	57.5	29.7	56.2
1	30.0	26.9	15.9	11.5
2+	8.9	15.6	54.5	32.3
Demographic variables				
<i>Maternal age in years</i>				
<24	43.0	38.6	32.7	59.9
25-29	24.8	30.5	32.7	29.0
30-34	17.1	18.7	18.2	7.7
35+	15.1	12.2	16.4	3.5
<i>Number of children born alive</i>				
1	37.3	44.8	24.8	41.0
2	26.8	37.2	20.5	38.6
3+	35.9	18.0	54.7	20.4
<i>Marital status</i>				
Permanent partner	85.8	97.7	86.1	99.4
Divorced/widowed/single	14.2	2.3	13.9	0.6
<i>Head of household</i>				
Partner	74.6	68.1	83.6	62.7
Respondent	6.3	6.1	9.4	2.3
Other person	19.1	25.8	7.0	34.9
<i>Permanent health problem that limits normal daily activity</i>				
Yes	5.7	0.1	5.3	2.8
<i>% of mothers' life lived in community</i>				
0-33%	36.1	35.3	35.3	62.2
33-66%	14.4	8.2	26.7	21.5
66-99%	11.9	9.7	6.9	2.6
100%	37.1	46.8	31.1	13.7
<i>Religion</i>				
Christian	91.0	2.5	81.2	4.0
Hindu	0.0	0.0	0.0	87.3
Muslim	0.0	0.0	17.8	7.7
Buddhist	0.0	10.5	0.0	1.0
Other	5.0	4.7	1.0	0.0
None	4.0	82.4	0.0	0.1
Community level variables				
<i>Location</i>				
Urban	65.7	19.9	34.8	25.5
Rural	34.3	80.1	65.2	74.5
<i>Community wealth index</i>				
Poorest	17.4	4.9	65.2	35.0
Very poor	34.2	57.0	34.8	40.6
Less poor	47.7	33.0	0.0	24.4
Better off	0.7	5.1	0.0	0.0
Mean (SD)				
<i>% of community completed primary school</i>	70 (23)	71 (23)	21 (19)	37 (26)
<i>% of community who own their own house</i>	67 (18)	80 (11)	67 (28)	83 (17)

The demographic profiles of the countries also differ. Mothers in Andhra Pradesh are on average much younger than elsewhere, with 60% under 25 years old, but age distributions in the other three countries are similar. Ethiopian mothers have more children than mothers in the other countries with over half having three or more children. This contrasts with Vietnam where the majority have only one child. Nearly all mothers in Andhra Pradesh and Vietnam are married or living with a permanent partner, while in Peru and Ethiopia similar proportions of mothers (about 15%) are single parents being either unmarried, widowed or divorced. Despite this, similar proportions of mothers in Vietnam and Peru classify themselves as the head of the household, though across all countries their partner or another member of the household such as a parent are over ten times more likely to be the head of the household than the mother. Around one in 20 mothers in Peru, Ethiopia and Andhra Pradesh report a permanent health problem that limits their daily activity, the very small numbers reported in Vietnam perhaps being the result of under-reporting by the mother's in the Vietnamese sample.

Residential stability was high across all countries apart from Andhra Pradesh where just over one in 10 mothers had lived in the community all of their life, compared to nearly half of the mothers in Vietnam. This may be explained by the Indian tradition of women going to live in their husband's village after marriage. About one third of mothers in Peru, Ethiopia and Vietnam have lived in their community for less than a third of their life, perhaps reflecting migration patterns. Patterns of religious affiliation naturally differ between countries and reflect the predominant religion within each setting. In Peru over 90% of mothers classify themselves as Christian, predominantly Catholic, while in Andhra Pradesh nearly 90% are Hindus. Ethiopia has the most religiously polarised population, with nearly 80% Christian (the vast majority of whom are Orthodox), and 20% Muslim. In line with their Communist culture, over 80% of the Vietnamese mothers sampled say they have no religious affiliation, with Buddhism the only major religion reported.

In terms of contextual variables, all countries are predominantly rural apart from Peru where two thirds of mothers live in urban environments. This may be partly due to differences in definition between countries, though Peru is the most urbanised country in the YL study. Peru adopted the rural/urban definition used by the Peruvian

National Institute of Statistics and Computer Science (INEI), which classifies as urban any settlement with more than 500 dwellings. This means that large villages in remote rural areas are defined as urban in Peru. As with the ESC variables, community level variables such as the community wealth index generally reflect patterns at the individual level, and show important variation between communities. Vietnam and Peru have the richest communities and also the widest range of economic levels, with communities at both ends of the distribution of the community wealth index. In contrast, in the Ethiopian sample no communities are categorized as ‘less poor’ or ‘better off’, and two thirds of communities are classified as ‘poorest’. Communities in Vietnam and Peru also have the highest levels of education, with on average 70% of the full YL sample of mothers and carers in each community having completed primary education in contrast to around one third in Ethiopia and Andhra Pradesh. In contrast, average levels of house ownership within communities are relatively high in all countries, ranging from two thirds to over four fifths.

4.3.6 Association between social capital and CMD in Peru, Vietnam, Ethiopia and Andhra Pradesh

Variation in CMD

Table 4.5 presents the estimated variance components for a model containing just CMD at the community and cluster level in each of the four countries. As expected, there is significant variation in CMD between clusters in all countries. Variation in CMD between communities is much smaller and only approaches significance in Vietnam and Andhra Pradesh. This is most likely due to the sampling strategy of YL whereby distinct clusters were semi-purposively selected from each country to provide a spread of areas across each country. As communities were then sampled from within each cluster, communities are more likely to be more similar to each other than clusters are.

Table 4.5: Variation in CMD at the community and cluster level by country

	Peru	Vietnam	Ethiopia	AP
Community level variation (level 2)	0.03	*0.08	--	*0.05
Cluster level variation (level 3)	****0.09	****0.36	***0.12	****1.0

* P<0.01, ** p <0.05***, p <0.01, **** p <0.001

Community and cluster level variation was explored at each stage of the modelling process as successive groups of confounders were entered into the model for each country. Table 4.7 presents the community and cluster level variance estimates from the final model for each country. The full results of the final model in each country including all confounding variables are presented in Appendix C. In Ethiopia and Andhra Pradesh significant community level variance remains after all variables are included in the final model. This contrasts with Vietnam and Peru where all level two and level three variance has been explained largely by the inclusion of individual level variables. Thus the difference in the prevalence of CMD between communities and clusters in Vietnam & Peru is largely due to the compositional factors of the individuals who make up these communities and clusters such as their socio-economic status and demographic characteristics, in addition to significant contextual factors included in these models such as community level deprivation and the ESC variables. In Vietnam and Peru, although the variation between communities and clusters has been explained, all the variation in CMD between individuals has not, but is now evenly distributed across communities and clusters. As there is no longer any significant level two or level three variation in Peru and Vietnam, the results from a single-level logistic regression are analogous to those from multi-level modelling. However, to ensure direct comparability with the results from Ethiopia and Andhra Pradesh, and as non-significant variance components can still be numerically important in the estimation of effect estimates from single-level models, multi-level modelling was still used for all countries.

The co-variance matrices of the final model from each country were explored by fitting the final set of variables for each country in a robust standard errors (GEE) model with unconstrained variance. In Peru, Vietnam and Andhra Pradesh the co-variance matrix is positive. This confirms the assumption inherent in multi-level modelling that there is a positive correlation between people within each level (i.e. people in the same community are more similar to each other than to people in different communities). However, the correlation matrix for the final model in Ethiopia shows a very small negative correlation. As the variance matrix comes from a probability distribution, this indicates that the co-variance is tending towards zero, or in other words that there is no longer any significant difference in CMD prevalence

between different communities or clusters. This is confirmed by the fact that in the initial stages of the model in Ethiopia when the level two and level three variance is significant, the co-variance is positive, and only tends towards zero when the level two variance reduces.

Association between social capital and CMD

Table 4.6 presents the percentage distribution of probable cases of CMD by each social capital variable used in the analysis for each country. The significance levels reported in the table refer to the crude association between each social capital variable and CMD from a three-level (individual, community, cluster) multi-level model which takes account of the structure of the data. As mentioned above (Section 4.2.4), only two-level models were fitted in Ethiopia as information was only collected at the cluster and not the community level. To estimate the crude effect of ESC on CMD, the corresponding ISC variable was also included in the model in order to estimate the indirect effect of ESC on an individual's mental health irrespective of their own social capital. The crude associations will be discussed below in conjunction with the results from the adjusted analysis.

Table 4.7 presents the adjusted odds ratios for the association between each social capital variable and CMD taken from the final model in each country containing all social capital variables plus the a priori and significant confounders chosen during the model building process outlined in section 4.2.3. The role of confounders will be discussed in detail in the Peru analysis presented in Chapter 8 (section 8.4.1).

In general, the results of the association between maternal CMD and social capital are mixed. Associations between CMD and some social capital variables are seen in some countries but not in others. Only individual cognitive social capital is associated with CMD across all four countries, showing a remarkably consistent size of effect with individuals with high cognitive social capital having about half the odds of being a probable case of CMD compared to individuals with low or medium cognitive social capital. Overall, Peru and Ethiopia show the most significant associations between social capital and CMD.

Table 4.6: Crude association between composite social capital variables and CMD in each country

	% probable CMD case			
	Peru n=1659	Vietnam n=1848	Ethiopia n=1652	AP n=1750
CMD cases	31.3	21.2	32.0	29.8
<i>Membership of community groups</i>				
ISC – Individual membership of groups				
No groups	30.7	19.5	30.9	27.8
1 group	34.3	25.7	30.0	35.4
2+ groups	33.9	25.5	34.4	26.7
ESC – average membership of groups in community				
1 st quartile	32.8	18.5	33.7	21.3
2 nd quartile	*27.3	13.2	29.5	24.5
3 rd quartile	33.6	24.3	32.9	40.4
4 th quartile	31.5	28.2	31.8	34.3
<i>Support from individuals</i>				
ISC – Individual support from individuals				
None	27.3	31.9	28.1	32.3
1 individual	31.6	27.8	32.3	26.4
2+ groups	*35.1	19.8	*35.5	33.6
ESC – average number of individuals that support is received from in community				
1 st quartile	27.7	26.1	29.4	34.0
2 nd quartile	27.8	21.7	33.2	21.7
3 rd quartile	34.4	18.3	30.4	23.0
4 th quartile	36.4	18.1	35.3	44.0
<i>Citizenship</i>				
ISC – individual involvement in citizenship				
None	30.5	21.2	30.7	28.4
Either talked to authorities <i>or</i> joined with others	31.7	20.8	*36.2	39.9
Talked with authorities <i>and</i> joined with others	*42.0	24.1	30.9	27.7
ESC – Average level of citizenship in community				
1 st quartile	28.6	22.1	35.8	16.9
2 nd quartile	33.3	24.0	30.7	33.9
3 rd quartile	29.7	20.7	31.4	29.6
4 th quartile	34.0	17.2	29.2	41.4
<i>Cognitive social capital</i>				
ISC – individual level of cognitive social capital				
Low/medium	35.8	37.8	48.2	39.3
High	***27.6	***19.5	***29.8	***29.3
ESC – average level of cognitive social capital in community				
1 st quartile	28.9	28.3	35.7	35.1
2 nd quartile	32.8	18.4	33.4	39.0
3 rd quartile	31.9	20.7	31.4	28.4
4 th quartile	31.7	15.1	26.0	17.2

*p<0.05, **p<0.01, ***p<0.001 p-value of crude OR for each dummy variable compared to the baseline category.

Table 4.7: Multivariable association between social capital and CMD in Peru, Vietnam, Ethiopia and Andhra Pradesh

	Peru ¹ n=1659		Vietnam ² n=1848		Ethiopia ³ n=1652		Andhra Pradesh ⁴ n=1750	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Member of community group</i>								
ISC								
No	1.00		1.00		1.00		1.00	
1 group	0.87	0.62, 1.23	1.34	0.97, 1.85	1.00	0.73, 1.38	*1.36	1.03, 1.80
2+ groups	0.91	0.43, 1.92	1.23	0.76, 1.97	1.21	0.86, 1.71	0.69	0.32, 1.53
ESC								
1 st quartile	1.00		1.00		1.00		1.00	
2 nd quartile	*0.61	0.43, 0.98	*0.58	0.34, 1.00	0.61	0.31, 1.15	1.33	0.81, 2.19
3 rd quartile	0.84	0.48, 1.47	1.45	0.76, 3.57	0.98	0.57, 1.70	1.30	0.76, 2.20
4 th quartile	0.72	0.44, 1.19	1.65	0.76, 3.57	0.66	0.30, 1.45	0.96	0.56, 1.66
<i>Support from individuals</i>								
ISC								
None	1.00		1.00		1.00		1.00	
1 individual	*1.39	1.02, 1.88	0.86	0.43, 1.71	*1.40	1.02, 1.94	0.88	0.61, 1.26
2+ individuals	1.28	0.93, 1.76	0.68	0.36, 1.28	1.28	0.92, 1.79	0.79	0.56, 1.12
ESC								
1 st quartile	1.00		1.00		1.00		1.00	
2 nd quartile	1.07	0.59, 1.95	0.78	0.45, 1.34	*1.75	1.02, 3.01	0.71	0.43, 1.17
3 rd quartile	1.30	0.77, 2.19	0.94	0.41, 2.15	*2.34	1.21, 4.54	0.83	0.43, 1.59
4 th quartile	1.59	0.85, 3.00	0.77	0.25, 2.39	*2.32	1.07, 5.03	1.11	0.55, 2.27

Continued...

*p<0.05, **p<0.01, ***p<0.001

¹ Model adjusted for: wealth index, debt, # economic activities undertaken by mother, education level, self assessment of socio-economic position, # events that have affected the economy of the household, age, # kids in the household, relationship of head of household to mother, marital status, ethnic group, religion and physical disability.

² Model adjusted for: wealth index, debt, self assessment of socio-economic position, # events that have affected the economy of the household, relationship of head of household to mother, marital status, community wealth index and community education level.

	Peru		Vietnam		Ethiopia		Andhra Pradesh	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Involved in citizenship activities</i>								
ISC	1.00		1.00		1.00		1.00	
No	0.82	0.56, 1.19	0.97	0.72, 1.30	**1.54	1.13, 2.09	0.85	0.59, 1.24
Talked or joined	1.41	0.88, 2.27	1.28	0.61, 2.68	1.30	0.94, 1.80	1.00	0.70, 1.43
ESC	1.00		1.00		1.00		1.00	
1 st quartile	1.09	0.58, 2.06	1.02	0.54, 1.93	**0.31	0.14, 0.71	1.13	0.66, 1.94
2 nd quartile	0.96	0.56, 1.65	1.00	0.41, 2.45	*0.35	0.14, 0.88	1.02	0.55, 1.88
3 rd quartile	1.14	0.68, 1.93	0.75	0.22, 2.52	0.74	0.40, 1.36	1.00	0.49, 2.06
4 th quartile								
<i>Cognitive social capital</i>								
ISC Low/medium	1.00		1.00		1.00		1.00	
High	***0.61	0.48, 0.78	***0.45	0.31, 0.66	***0.49	0.35, 0.69	*0.53	0.31, 0.92
ESC	1.00		1.00		1.00		1.00	
1 st quartile	1.04	0.60, 1.80	0.81	0.42, 1.56	*0.34	0.13, 0.86	1.10	0.68, 1.64
2 nd quartile	0.86	0.49, 1.52	0.69	0.36, 1.31	*0.45	0.20, 0.99	1.53	0.86, 2.70
3 rd quartile	0.99	0.54, 1.79	0.68	0.24, 1.94	**0.42	0.24, 0.74	1.17	0.60, 2.27
4 th quartile								
Likelihood		-895.86		-801.59		-913.53		-880.66
Community level variance	0.04		0.02		--		<0.01	
Cluster level variance	0.03		<0.01		0.04*		0.33***	

*p<0.05, **p<0.01, ***p<0.001

³ Model adjusted for: wealth index, debt, self assessment of socio-economic position, # events that have affected the economy of the household, # male children, # female children, and physical disability.

⁴ Model adjusted for: wealth index, house ownership, education level, self assessment of socio-economic position, # events that have affected the economy of the household, region of Andhra Pradesh, level of community house ownership and community education level.

Group membership

These results are mixed with community level group membership associated with decreased odds of CMD in Peru and Vietnam, but contrary to Hypothesis B (section 4.1.2), individual group membership of one group, but not of two or more groups is associated with an increased odds of CMD in Andhra Pradesh (OR 1.36, CI 1.03, 1.80). This finding is not present in the crude analysis, but emerges only after all the other social capital variables have been controlled for and remains the same no matter what additional confounders are included in the model. In order to explore this finding further, group membership was dichotomised into whether the mother was a member of a group or not as opposed to distinguishing different levels of group membership. This variable shows no significant association with CMD. As membership of women's groups is by far the largest type of group membership among mothers in our sample (24% are members), an additional model was fitted looking at whether it was membership of women's groups in particular that was important in the prediction of CMD. This model also shows no significant difference in the odds of being a case of CMD for mothers who were members of women's groups compared to those who were members of other types of groups, or those who were not members of any group. Thus it seems that being a member of one group, but not two or more groups, is associated with an increased odds of CMD. Possible reasons for this finding will be explored in the discussion of the results of this chapter.

In contrast, and in line with Hypothesis B, community group membership is negatively associated with CMD in both Vietnam and Peru, though the association is not linear and is of borderline significance. Mothers who live in communities classed in the second quartile of group membership have just under half the odds of being a probable case of CMD compared to mothers living in communities classed in the bottom quartile of group membership, irrespective of their own individual membership level. However, a linear trend of decreasing odds of mental illness with increasing levels of community group membership is not evident, in particular in Vietnam where a u-shaped relationship might indicate that these results are due to chance. In Peru the association is consistent throughout all stages of the model, while in Vietnam the association is unstable with earlier stages of the model showing a positive association between community group membership and CMD, only turning negative when community level variables are added. It is interesting that no

significant associations between group membership and CMD are seen in Ethiopia, despite Ethiopia having nearly triple the level of group membership to that seen in the other countries.

Support from individuals

Contrary to Hypothesis B (section 4.1.2), individual level support from individuals is positively associated with CMD in Peru and Ethiopia, whereby receiving support from one individual (but not two or more) is associated with increased odds of being a probable case of CMD. The magnitude of effect is strikingly similar in both countries (OR of 1.39 in Peru and 1.4 in Andhra Pradesh), while support from two or more individuals shows the same, though insignificant, pattern of association. No association is seen in Vietnam or Andhra Pradesh, though the direction of effect is in the hypothesized direction with support from individuals associated with reduced odds of suffering from CMD.

In Ethiopia, again contrary to Hypothesis B, higher levels of support from individuals within the community are associated with increased odds of CMD across every quartile of community support. This result emerges only after all the social capital variables have been included in the model, but is unchanged by the inclusion of confounding variables. It also shows a trend of increasing odds of CMD as community levels of support increase, with mothers living in a community in the highest quartile of support having odds 2.32 (CI 1.07, 5.03) times greater than those living in a community in the lowest quartile of support. No associations with community levels of support from individuals are found in the other countries.

Citizenship activities

Ethiopia is the only country to show a significant association between either individual or ecological levels of citizenship and CMD. Though in the unadjusted analysis high levels of individual citizenship are associated with increased odds of CMD in Peru, this association disappears once the other social capital variables are included in the model. Contrary to Hypothesis B, medium though not high levels of citizenship are associated with increased odds of CMD in Ethiopia (1.54, CI 1.13, 2.09). This association remains from the crude analysis right through to the final model. When the analysis is repeated using the dichotomised yes/no variable, being

involved versus not involved in citizenship activities is significantly associated with 1.47 (CI 1.13, 1.92) greater odds of being a probable case of CMD, suggesting that it is lack of power in the high citizenship category which explains the finding, rather than anything particular about medium levels of citizenship.

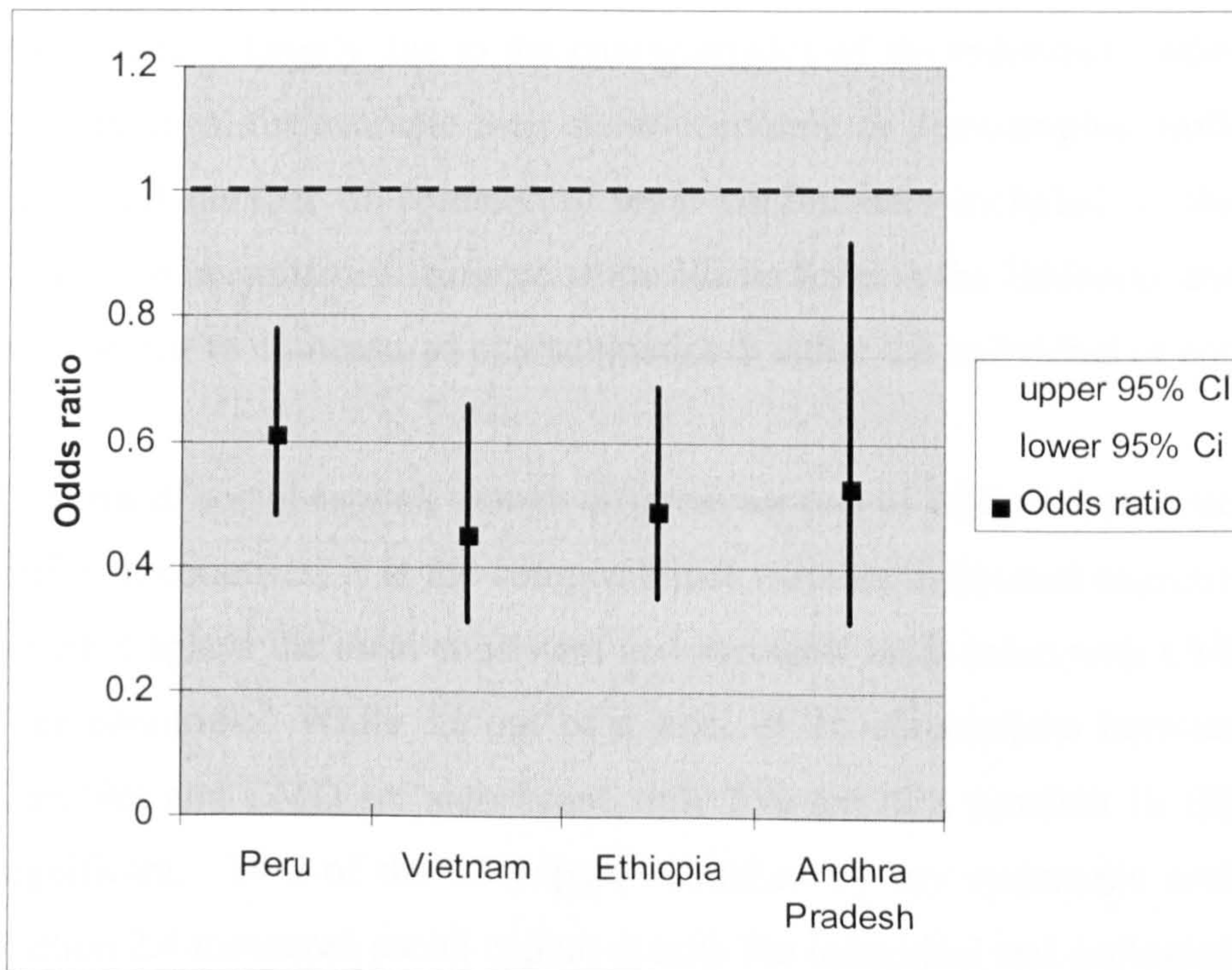
Interestingly, and in line with Hypothesis B, community levels of citizenship activity show the reverse association, where high levels of community citizenship are associated with greatly reduced odds of CMD. This protective effect is only seen after the other social capital variables are included in the analysis, though it remains irrespective of which confounders are included.

Cognitive social capital

The principal finding from these analyses is that individual level cognitive social capital is consistently associated across all four countries with a halving of the odds of being a probable case of CMD, in line with Hypotheses B and C (section 4.1.2). This finding is remarkable in that it is present across all four countries in the crude analysis, and remains throughout all stages of the model irrespective which other variables are included in the models. The size of the effect is also extremely consistent across countries ranging from an odds ratio of 0.6 in Peru, through to 0.52 in Andhra Pradesh, 0.45 in Ethiopia, to the greatest protective effect of 0.45 in Vietnam. Figure 4.3 highlights the consistency of this association.

In contrast to the results at the individual level, only Ethiopia showed a significant association between community level cognitive social capital and CMD, with the results being in the hypothesized direction with every category of higher cognitive social capital compared to low cognitive social capital associated with significantly reduced odds of CMD. The magnitude of the effect was similar to that seen at the individual level, with odds ratios ranging from 0.34 to 0.45.

Figure 4.3: Association between individual cognitive social capital and maternal CMD by country



4.4 Discussion

Overall, the analysis shows mixed results with some types of social capital associated with maternal CMD in some countries but not in others. Only individual cognitive social capital displays the same association across all four countries, with high versus low cognitive social capital associated with about a halving of the odds of being a probable case of CMD. Contrary to my hypothesis that social capital is associated with better mental health (Hypothesis B), a number of aspects of individual level structural social capital were associated with increased odds of CMD. This discussion will address in turn the results pertaining to hypotheses A to C (outlined in section 4.1.2).

4.4.1 Hypothesis A: Context or composition?

Hypothesis A states that both context and composition are important in the prediction of CMD. However, while different aspects of both ISC and ESC are variously associated with CMD across the four countries, the majority of the variation in CMD is explained by individual level compositional variables. No significant variation at

either the community or the cluster level remains in the Peruvian or Vietnamese final models, indicating that the differences observed between communities in CMD prevalence is largely due to the characteristics of the individuals who make up these communities, for example their socio-economic or demographic profiles, and also to the small number of community level confounders included in the models. The remaining unexplained variance at the cluster level in the Ethiopian and Indian models may be due to unmeasured characteristics at either the individual or community level.

In terms of social capital, though different aspects of ESC are associated with CMD in different countries, it is the compositional variable individual cognitive social capital which displays the most consistent and strongest association with CMD across all the four countries. While 12 out of a total of 16 associations between different ISC variables and CMD are significant, only five out of a possible 16 ESC variables are significant. Two of the 18 papers identified by my systematic review reported in section 2.4 measured social capital at both the individual and ecological level, both set in North America. The study by Cutrona et. al. (2000) showed no significant effect of community or individual level cognitive social capital once individual characteristics were included in the model. In contrast, Veenstra's (2005) study showed that while indicators of community level cognitive social capital were not associated with CMD, individual cognitive social capital was associated with reduced depression scores. It seems therefore that while context is important in the prediction of CMD in some settings, the characteristics of individuals are always important.

4.4.2 Hypothesis B: Is social capital associated with better mental health?

Hypothesis B proposes that high social capital is always associated with better mental health, after controlling for individual and community level confounders. This hypothesis is not supported as a number of aspects of structural social capital are associated with increased odds of being a probable case of CMD at both the individual and community level.

Group membership in Andhra Pradesh

Andhra Pradesh is the only setting to show a significant positive association between social capital and individual membership of community groups, whereby being a member of one group is associated with increased odds of CMD. There are many

possible explanations for this finding, including error in the measurement of social capital and CMD, both of which are discussed below (section 4.5). Another plausible explanation is reverse causality in this cross-sectional dataset, whereby women who are depressed and anxious are more likely to join a group in order to receive help. Though plausible, this conclusion does not tally with research which shows that depression results in less rather than more social participation (Wright 1990). Furthermore, the one study in the systematic review to explore this association longitudinally found the opposite: in the UK group participation lead to a reduction in the onset of CMD (Pevalin and Rose 2003).

The Indian mothers in our sample are overwhelmingly members of women's groups over any other type of group (Table 4.2), and bi-variate analyses show that members of women's groups have a much higher prevalence of CMD than non-members (35% versus 28%, $p=0.004$). While membership of women's groups specifically did not come out in the multi-level multivariate analysis presented in section 4.3.6 (results available on request), it remains likely that this type of group either offers support for depressed mothers (reverse causality), or that membership of this type of group conveys some cost to the mental health of participants.

While an analysis of the nature of women's groups in Andhra Pradesh is useful for exploring these two hypotheses, only the analysis of longitudinal data can distinguish between them. The Andhra Pradesh government has led an initiative in recent years to set up micro-credit schemes specifically for women aimed at reducing poverty and increasing female empowerment. These form the predominant type of women's groups in Andhra Pradesh (Galab and Rao 2003). There are three main schemes in the state all based around women's thrift co-operatives. Women form local groups and each member is required to save a small amount of money each month in the credit scheme, for which they receive a small amount of interest. They can then borrow money from this communal pot (in proportion to what they have saved) at low interest rates. Some schemes, for example the Development of Women and Children in Rural Areas (DWCRA) scheme, encourage groups to take up economic activities suitable to them, for example tailoring, or setting up small grocery stores or tea, coffee and 'paan' shops. A group leader monitors loan repayments and administers the scheme (Galab and Rao 2003).

Some women have reported that the solidarity and unity among women members is one of the most important benefits of membership as it gives them a forum to share their problems and seek help. This lends credence to the hypothesis that depressed and anxious women are joining the groups for support (Galab and Rao 2003). However, there is also evidence that membership of the scheme may be stressful, in particular for those living in extreme poverty (Galab and Rao 2003). The scheme has increased access to loans for the poorest section of society, and has also encouraged them to set up business enterprises which may not have been possible without the scheme. While middle class women have access to both the education and financial resources to make these schemes a success, those living in extreme poverty may not, resulting in the failure of a disproportionate number of enterprises set up by the poorest women. The resulting inability to repay the loans and the breakdown of social relations within the group may have negative mental health consequences. Indeed, Galab and Rao (2003) report increased levels of distress and a decline in the living conditions of some of the poorest women as a result of their involvement in the scheme. Further evidence is provided by research in Bangladesh which shows increased rates of domestic violence against women participating in micro-credit schemes, attributed to the additional stress placed upon the women by their husbands who are not happy with the change in power relations within the family (Mallick 2002). As the YL sample is biased towards poor families, it is likely that the sample picks up a disproportionate number of women who are adversely affected by these types of credit schemes, possibly explaining the associations seen in this analysis.

An additional source of stress may come from the burden of leadership of these groups. Though the leadership role is supposed to rotate, Galab and Rao (2003) report that many members do not want to take on this responsibility, leaving the existing leader over-burdened. As responsibility for running the scheme and administering loans and repayments rests with the leader, it is likely that this position entails a degree of stress. However, it is extremely unlikely that all 24% of mothers in the YL sample who report being a member of this type of group are also group leaders.

Though none of the studies included in the systematic review (section 2.4) report individual level group membership to be associated with an increased risk of CMD, a number of studies do show a non-significant trend in that direction (Mitchell and La

Gory 2002, Pevalin and Rose 2003, Harpham et al. 2004a, Ziersch and Baum 2004). In particular, the study by Michell and La Gory (2002) reports a borderline association between group membership and CMD in an impoverished inner city community in the Southern USA. The authors hypothesize that participation in community groups may come at a cost to the individual in impoverished areas where the individual's resources are already stretched. Similarly, Brown et al. (1992) show that at the most intense level of religious involvement among African Americans living in urban areas in the USA, significantly higher level of depression are seen among those who have chronic economic strain compared to those with less religious involvement and the same level of economic strain. These results suggest that in the context of extreme deprivation, membership of groups may impose a cost to an already over-stretched individual.

Involvement in citizenship activities in Ethiopia

The results from Ethiopia add weight to the idea that the cost of building social capital may be borne by some individuals. In contrast to the other three countries where no association is seen, and contrary to Hypothesis B, in Ethiopia, individual level involvement in citizenship activities is associated with increased odds of CMD. This is offset by the finding that living in a community in which many residents are involved in citizenship activities is associated with reduced odds of CMD, irrespective of whether the individual is involved or not. The association at the individual level is less likely to be due to reverse causality due to the evidence for social withdrawal of depressed people (Wright 1990), though it is possible that a mother may become involved in resolving a community problem that is causing her depression and anxiety. At the community level the association is also unlikely to be due to reverse causality (this is true of associations seen with all ESC variables), as on average any mother on whom the outcome is measured makes up only one fiftieth of the sample used to calculate the ESC scores for each community (on average across the four countries, 50 respondents are used to generate the ESC scores for each community). It is plausible however that living in a community where residents are actively engaged in solving local problems such as education, housing and social disorder produces an environment more conducive to wellbeing. Perhaps the growth in number and influence of NGOs in Ethiopia as outlined in Box 3.3 goes some way to explaining the

effectiveness of civil society in improving people's living conditions and hence CMD in this setting.

No association was seen between citizenship and CMD in any of the other countries. This reflects the results of the systematic review (section 2.4), where the two studies to explore the association at the individual level also found no association (Greiner et al. 2004, Harpham et al. 2004a). It seems likely therefore that citizenship activities do not play an important role in the prediction of CMD.

Support from individuals in Peru and Ethiopia

Contrary to Hypothesis B which suggests that social capital is a universal good, the amount of support an individual receives is associated with *increased* odds of CMD in both Peru and Ethiopia, while higher levels of support from individuals at the community level is associated with increased odds of CMD in Ethiopia. This is contrary to a vast body of research, including many longitudinal studies, which show that increased levels of social support are associated with reduced risk of mental illness (Berkman 2000, Kawachi and Berkman 2001). This finding is therefore much more likely to be the result of reverse causality whereby mothers who are depressed and anxious are more likely to receive support from other individuals within their community, in particular family and friends. However, the alternative explanation that receiving social support is associated with worse mental health must also be considered. As Kawachi and Berkman argue (2001), the protective effects of social support on mental health may not be uniform across society. They argue that social connections may actually increase levels of distress among women with low resources, if such connections entail the role strain associated with reciprocal obligations to provide support to others.

At the community level, as discussed above, observed associations are less likely to be due to reverse causality due to the way in which ESC is calculated. One possible explanation for this finding is that in order for there to be high levels of community support, someone within the community has to be providing that support. These givers of support are much more likely to be mothers and other caregivers (Kawachi and Berkman 2001), and thus the observed association may well be due to the costs to the individual of giving support to others as outlined above. This is supported by a

qualitative study into social capital in Australia in which some respondents reported sometimes feeling emotionally drained when supporting others (Ziersch et al. 2005).

Individual cognitive social capital

In line with Hypothesis B, cognitive social capital does seem to be a universal good. All significant associations (and all non-significant associations apart from in Andhra Pradesh) show that high compared to low levels of cognitive social capital are associated with reduced odds of CMD. This is extended to the community level in Ethiopia where living in a community with high levels of cognitive social capital, irrespective of whether a given individual also has high cognitive social capital, is associated with reduced odds of CMD. This finding accords with that of my systematic review (section 2.4), where all of the 13 effect estimates exploring this association show high cognitive social capital to be associated with a reduced risk of CMD, eight of which are statistically significant. The size of effect estimates are strikingly similar, with adjusted odds ratios of between 0.4 and 0.7 from the systematic review in comparison to odds ratios between 0.4 and 0.6 from the YL data.

It is possible that this association is due to reverse causality, whereby the characteristics of low individual cognitive social capital (distrust, lack of social harmony etc.) are merely a description of mental illness. However, research has shown that aggregations of individual responses do measure contextual phenomena (Subramanian et al. 2003b). In addition, the size and consistency of the association across both the YL countries and the studies included in my systematic review, suggests that there is more to the association than just reverse causality. Unfortunately only one study in the systematic review looks at this association longitudinally (Pevalin 2004). While this study found a cross-sectional association between individual cognitive social capital and CMD, no association was found with onset of CMD, though the effect estimates were in the expected direction. Clearly many more longitudinal studies are needed before the direction of causality can be established.

The strength of the association between CMD and cognitive social capital may explain the finding that aspects of structural social capital are associated with increased odds of CMD. If the positive consequences of participation in structural social capital are,

as Putnam (1993) and Coleman (1990) argue, increased trust, then controlling for these benefits by including cognitive social capital in the analysis leaves only the effect of negative aspects of participation on mental health. Of the five positive associations found in this analysis, three only emerged after cognitive social capital was added to the model. The same is seen in studies included in the systematic review which show reduced associations between group membership and CMD when trust is included in the analysis (Lindstrom 2004, Pollack and von dem Kneseback 2004, Veenstra 2005). In particular, Lindstrom's study (2004) combines group membership and trust together to generate four categories: high social capital (high participation and high trust), low social capital (low participation and trust), traditionalism (low participation, high trust), and miniaturization of community (high participation, low trust). Lindstrom found that low trust is associated with worse mental health irrespective of the level of social participation and concludes that "*the lack of self-reported trust completely thwarts the impact of high social capital*". Thus it seems that cognitive social capital is the most important aspect of social capital for CMD, irrespective of whether participation increases trust, or trust leads to increased participation.

4.4.3 Hypothesis C: Is cognitive social capital a 'universal truth' but structural social capital culturally specific?

Hypothesis C is supported by the analysis in that while individual cognitive social capital shows the same association in each country, different aspects of structural social capital vary according to the context in which it is measured. This accords with the results of my systematic review (section 2.4) which shows that while individual cognitive social capital is associated with better mental health across a wide range of countries including the USA, Canada, Germany and the UK, structural social capital shows more varied associations across the same countries. This cultural specificity may be due to the nature of structural social capital which is dependent upon the specific groups, norms of participation and civic structures within each country. These determine to what extent, and how, individuals are able to participate. Just as it is highly probable that different types of participation in different types of groups result in different outcomes for mental health, it is also likely that the type and nature of different groups in different countries have differing effects on mental health. Cognitive social capital on the other hand deals with fundamental human emotions

which, it can be argued, do not vary culturally to the same extent. Basic notions of trust, sense of fairness, social harmony and sense of belonging seem to be important for mental health across all four of the YL countries, and also in the Western countries surveyed in the studies included in my systematic review.

4.5 Methodological limitations

Specific methodological limitations of this analysis are discussed below, along with a brief outline of the limitations of the study as a whole. Methods used to explore these limitations through the further exploration of the Peruvian data reported in Part III of this thesis are highlighted. As discussed above, this study is hampered by a limitation generic to all cross-sectional studies - the inability to determine temporal relationships, and this limitation is not discussed in detail here. Analysing the association between ESC and CMD may be particularly problematic as levels of some aspects of social capital, in particular cognitive social capital, may change slowly in relation to external stimuli (for example political climate), and therefore there may be a time lag in terms of their effect on mental health. The extent of these methodological limitations are explored in detail in the discussion chapter to this thesis (Chapter 9).

4.5.1 Bias in the measurement of social capital

Interpretations of social capital questions

Like other studies that explore the relationship between social capital and mental health, one of the main limitations of this study is the use of a non-validated measure of social capital. Though the same questions are asked across all four countries, it is unclear whether respondents interpret the questions in the same way as each other, or indeed in the way that the researchers intend them to. This makes it hard to draw conclusions from the data as it is unclear what the questions are actually measuring. For example, in India, it is unclear exactly which types of groups respondents include in the category women's groups. Why for example do no mothers report being a member of credit groups, when local research shows that micro-credit schemes are the most common type of group that women participate in? Furthermore, the difference in levels of social capital seen between countries could be the result of different

interpretations of the questions; for example the very high levels of participation in sports and social groups in Ethiopia could be due to informal social gatherings being included in this category in Ethiopia but not in the other countries. In addition, the comparatively low levels of formal group membership in Vietnam in spite of the presence of state-led institutions may be due to differences in the interpretation of the question by YL respondents in Vietnam. Differences in interpretation are also likely within as well as between countries. Though establishing the exact meaning of the questions across all four countries is beyond the scope of this thesis, a qualitative validation of the social capital tool in Peru (Chapter 5) combined with an in depth exploration of the nature of social capital in Peru (Chapters 6 and 7) aims to explore this limitation further.

Differential misclassification of social capital

Due to the cross-sectional nature of the data, it is possible that depressed respondents over-report poor social capital. This may lead to differential misclassification whereby cases are more likely to over-report poor social capital than non-cases.

12 month recall

The 12 month recall used for the social capital variables may be problematic as this covers the period that the mother gave birth for those whose children are under 12 months old at the time of the survey. The levels of in particular structural social capital that these mothers report may potentially be unrepresentative of their normal levels of social capital, as they may have withdrawn from some forms of social participation as a result of giving birth.

Calculation of ESC score

As mentioned in section 3.3.2, ESC scores are generated by aggregating the individual social capital scores of the YL respondents to the community level. In all countries apart from Peru, all YL respondents are the primary caregiver of either a one-year-old or an eight-year-old child, and it is unclear how representative this sample is of the whole community. The biases inherent in generating the score in this way will be explored by using data from Peru where the social capital section of the interview was sometimes asked of other members of the household, as this permits me to test

whether levels of social capital vary between biological mothers and other demographic groups (Section 7.5).

4.5.2 Bias in the measurement of CMD

The non-specificity of the SRQ-20 means that the results of this study cannot be generalized to specific mental disorders, including post-natal depression, which may have aetiologies distinct from the broad classification of CMD. Furthermore, some of the items in the SRQ20 (for example 'did you sleep badly' or 'were you easily tired') may be normal for mothers of very young children and therefore not be indicative of CMD. This may lead to a higher number of false positives, especially among the mother's of children under 12 months as the instrument only asks for a 30 day recall and this group may carry a higher burden of caring for their younger child. However, the SRQ20 has been validated against psychiatric diagnosis for the YL sample of mother's of one-year-olds in Vietnam, and found to have acceptable sensitivity and specificity (Tuan et al. 2004), though the appropriateness of the measure for mothers of young children in the other countries remains unclear.

The 30 day recall of symptoms may also result in recall bias and a concertina effect, whereby people who have suffered from the symptoms more than 30 days ago respond positively. It is also likely that the impact of social capital on CMD works over a long time period. It will not be possible to explore temporal associations until data from future rounds of the YL study are available.

Lastly, though validated cut-offs for case status were used in each country, the use of a cut-off means that there will be some misclassification of CMD case status. If this is assumed to be non-differential the difference between the two groups will be reduced, attenuating the effect and meaning that observed associations are more likely to be real.

4.5.3 Same source bias

It is possible that some of the observed associations between social capital and CMD are due to same source bias as both social capital and CMD are measured by self-report. Respondents who have a pessimistic outlook may over-report poor mental health and also over-report poor social capital, while respondents who are generally

optimistic may tend to under-report poor mental health and over-report good social capital. This may artificially inflate the observed association between social capital and CMD, and may explain some of the associations seen in the analysis. However, associations between ESC and CMD are unlikely to be due to same source bias as an individual only makes up on average one fiftieth of the sample used to calculate the ESC score for each community. Nevertheless, independent assessment of CMD status (such as by psychiatric interview) and using a different sample to that on which the outcome is measured to calculate ESC, remains the only way to prevent this bias.

4.5.4 Definition of community

As noted in section 3.1.2, different definitions of ‘community’ are used in each country. While the official Commune in Vietnam is a politically and geographically robust definition, in the other three countries definitions of community may not be so meaningful. This is particularly the case in Ethiopia where for practical reasons a large unit of aggregation (sampling cluster) was used to represent communities. It is unclear whether the greater number of associations seen in Ethiopia between ESC and CMD is due to using this large unit of aggregation, but it raises the question of which definition of community is meaningful for respondents and at what level ESC should be measured. Definitions of community are explored through qualitative interviews in Peru (Chapter 5).

4.5.5 Residual confounding

It is possible that despite including a wide range of potential confounders, residual confounding remains in the models and therefore that some of the observed associations are spurious. Residual confounding may arise from measurement error in the confounding variables, in particular through the use of a wealth index rather than a more detailed assessment of income and occupation, and through additional confounding by unmeasured variables. As mentioned in section 3.2, the lack of detailed measures of maternal physical health may be an unmeasured confounder, as poor physical health is associated with CMD and may also limit involvement in social capital. In addition, a previous episode of CMD is a very strong predictor of future episodes and was not measured by YL. As the Peruvian YL team collected a wide range of additional information on respondents including measures of income, domestic violence and other life events associated with CMD, a further analysis

including these variables will be able to control more completely for confounding (Chapter 8).

On the other hand, it is also possible that I have included too many inter-related variables in the models and therefore underestimated the effect of social capital. As Macintyre et al. argue (2002), individual factors such as physical health and socio-economic status may actually be on the causal pathway between ESC and CMD rather than acting as confounders. For example, social capital could affect mental health by fostering community economic development which reduces an individual's exposure to economic shocks which in turn protects their mental health. This limitation will be discussed further in the discussion chapter of this thesis (Chapter 9).

4.5.6 Chance findings

Eight social capital variables, some with as many as four categories, were tested in four countries, so it is probable that some of the significant findings are due to chance. This may explain some of the findings of borderline significance where there was no clear evidence of a pattern between categories of a factor and CMD. However, the principal finding that individual level cognitive social capital is associated with CMD is highly unlikely to be a chance finding (1 in 1000) as it showed such a high level of statistical significance in all four countries.

4.6 Next steps

The analyses presented in this chapter are an attempt at testing the principal research hypotheses of this thesis (section 2.6.3). As is to be expected with exploratory cross-sectional analyses, it has thrown up many more questions than it has been able to answer. Additional research is necessary to test these hypotheses more completely. Outlined below are the principal questions which I hope to explore in Part III of this thesis through a detailed exploration of social capital and CMD in Peru.

Measurement of social capital – Chapter 5

1. Are the social capital questions valid and what are they actually measuring?

Understanding social capital in Peru – Chapter 6

2. What is the nature of social capital in Peru? For example, what types of groups are important and what does being a member of them entail?

Determinants of social capital in Peru – Chapter 7

3. What are the determinants of social capital? How are structural and cognitive social capital inter-related? Is CMD a determinant of cognitive social capital?

Association between social capital and CMD in Peru – Chapter 8

4. Does an association between aspects of social capital and CMD remain after more complete control for confounding?
5. Does social capital interact with other variables in the prediction of CMD? For example, is group membership only associated with worse mental health among the poorest sections of society, or does social capital buffer mothers living in extreme poverty against CMD?
6. What is the relationship between structural and cognitive social capital in the prediction of CMD? Are some types of participation only damaging when they are accompanied by low levels of cognitive social capital?
7. Do ISC and ESC interact in the prediction of CMD? Are individuals whose levels of ISC are at odds with the level of ESC in their community at particular risk of CMD? For example, are high levels of community cognitive social capital only protective when an individual's own level of cognitive social capital corresponds to the community level?
8. What is the relative importance of social capital compared to other risk factors for CMD?

There are a number of policy, methodological and statistical reasons for restricting the further analyses to Peru. From a policy point of view, the high rates of CMD in Peru (10% higher than Vietnam) means that it is important to investigate the aetiology of CMD in this setting. Secondly, Peru has the most established mental health treatment programme of any of the YL countries (2.4 psychiatrists per 100,00 compared to fewer than 0.4 in the other countries), and it is also the most developed country (Table 3.1). This means that the infra-structure and resources needed to address mental

illness in this population are more readily available, and that research into the causes of CMD is more likely to have an impact on policy.

There are also a number of methodological factors which make Peru the most appropriate country for further analysis. Firstly, with the exception of Vietnam, the definition of community used in Peru is the most robust, as Geographical Information Systems (GIS) mapping was used to cluster individuals within geographically meaningful communities. This results in more meaningful geographical communities particularly in rural areas where houses which were quite close 'as the crow flies' may actually not be part of the same community as they are separated by geographical barriers such as a mountain or lake. Secondly, Peru displays the greatest range of cognitive social capital scores, which means that the analyses are more able to detect the effect that varying levels of cognitive social capital may have on CMD. Thirdly, the calculation of the ESC is slightly more representative than in other countries as the social capital section was sometimes asked of other members of the household. Lastly, the Peru team collected a wide range of additional variables including domestic violence and household income which allow estimates to be computed of the relative importance of social capital compared to other potential risk factors for CMD.

These factors mean that Peru is the most suitable country for the further analyses presented in Part III. These comprise: the psychometric and qualitative validation of the SASCAT tool in Peru (Chapter 5); an in depth exploration of the nature and determinants of social capital in Peru (Chapters 6 and 7); and further analyses of the Peruvian YL data to explore the association between social capital and maternal CMD (Chapter 8).

Part III: Social capital and CMD in Peru

5. Validation of the social capital tool for use in Peru

The use of a non-validated tool to measure social capital is one of the most serious limitations of the analysis presented in Chapter 4, as without an understanding of what the questions are measuring it is not possible to determine what aspects of social capital are associated with common mental disorders (CMD) and why. This chapter seeks to resolve this limitation by using a range of different psychometric methods to evaluate the construct validity of the Short Adapted Social Capital Assessment Tool (SASCAT) in Peru. These standard validation techniques are supplemented with qualitative interviews with 20 respondents from Peru in order to explore what each question is actually measuring.

In this chapter I focus on the validation of individual social capital (ISC) as measured by the SASCAT. The evidence presented also provides a partial validation of the ecological social capital (ESC) measures used in this thesis, as these measures are an aggregation of individual responses to the SASCAT questions. Ideally, validation of the ESC scores would involve comparison with a gold standard such as contextual measures of social capital. However, as discussed in section 1.2.4, such measures have proved elusive. Other aspects of the validity of the ESC measures including whether the sample used for aggregation provides a representative picture of social capital and whether the aggregation of individual responses measures something contextual are explored in the discussion chapter to this thesis (Chapter 9).

5.1 Introduction

One of the most serious problems facing social capital research is the lack of validated tools to measure social capital (section 1.2.3). Despite the sometimes sophisticated theoretical development of the concept, significant questions surrounding its measurement remain, in particular how to translate the different theoretical components of social capital into valid and measurable constructs (Kawachi et al. 2004). This has resulted in the development of a wide range of tools available to measure social capital (for example Buckner 1988, Narayan and Cassidy 2001, Grootaert and van Bastelaer 2002, Harpham et al. 2002, Yang et al. 2002, Hean et al.

2003). Yet Van Deth's (2003) plea that "*assessing the validity of each measure of social capital in different settings (both cross-cultural and longitudinal) should be standard practice among empirical researchers in this area*" has not been heeded. In a search of the literature I found only thirteen studies attempting some validation of social capital tools, despite there being well over 150 studies cited in Medline examining the association between social capital and health (Kawachi et al. 2004), and many hundreds more exploring the relationship between social capital and non-health related outcomes (Halpern 2004). The problem, partly due to differences in the conceptualisation of social capital, is that researchers have not settled on one tool and then validated it over a number of years, but instead have developed new tools. Without an accompanying assessment of the validity of these tools it is difficult to distinguish between them, resulting in yet more tools being developed.

Of the thirteen studies that did conduct some validation of their social capital tool, nine used psychometric validation such as factor analysis to assess validity (Robinson and Wilkinson 1995, Onyx and Bullen 2000, Narayan and Cassidy 2001, Stone and Hughes 2002, Yang et al. 2002, Hean et al. 2003, Li et al. 2003, O'Brien et al. 2004, Young et al. 2004). All of these studies found that the tools they validated were able to distinguish between the different theoretical constructs that they were trying to measure, and therefore that they had acceptable discriminant validity. However, in a field where no gold standard measure is available to assess concurrent validity, a broader approach to validation is necessary (see Box 5.1 for a definition of the different types of validity).

As Bowden et al. argue (2002), psychometric validation does not involve any analysis from the respondent's viewpoint, a perspective which is vital in order to understand how respondents interpret the questions and therefore what the tool is actually measuring. Four of the thirteen studies did use qualitative validation techniques. Three of these were set in the UK (Boreham 1999, Earthy et al. 2000, Blaxter and Poland 2002), and the other used a slimmed down version of the methods presented in this chapter to validate the SASCAT for use by the YL team in Vietnam (Tuan et al. In Press). The results from these studies highlight the importance of using qualitative methods of validation in addition to more standard quantitative approaches, with

important differences reported between what the researchers believed they were asking, and the way in which the respondents interpreted the questions.

Box 5.1: Types of validation (Trochim 2000)

Construct validity: does the tool measure the theoretical construct it intends to measure?

1. *Translation validity:*

- Face validity: are the questions a good translation of the construct being measured?
- Content validity: does the tool reflect all theoretical concepts within the construct?

2. *Criterion-related validity*

- Predictive validity: does the tool show associations with things it should be associated with?
- Concurrent validity: does the tool distinguish between groups that should be different (i.e. between men and women?)
- Convergent validity: agreement with gold standard tool.
- Discriminant validity: does the tool distinguish between the different theoretical constructs it aims to measure?

While generic tools are often used to measure social capital in different cultural settings, Szreter and Woolcock (2004) argue that social capital is a product of the prior history of political, constitutional and ideological developments in any given setting. As such, it is important to validate a generic tool in each cultural setting in which it is to be applied. The organisations and social networks which are important for structural social capital may differ between different settings, while culture may affect perceptions of social relationships (cognitive social capital), for example notions of trust. This means that the same question may be interpreted differently in different settings, and that culturally specific questions may need to be asked in order to capture the range of social capital available.

In this chapter I validate the SASCAT for use in Peru, in order that the association between social capital and CMD can be better interpreted in the remainder of this thesis. As there is no 'gold standard' tool for measuring social capital with which the SASCAT can be compared, I used a range of different methods to evaluate its construct validity (defined as the degree to which a tool measures the theoretical construct it intends to measure). Firstly, different aspects of construct validity are assessed using psychometric techniques including factor analysis and an assessment of face and content validity. This is followed by an in-depth cognitive assessment of the

respondent's viewpoint through qualitative interviews in Peru. Methods and results are presented separately for the two different analyses.

5.2 Chapter objectives

1. To use psychometric and qualitative methods to validate the social capital tool used by YL to measure social capital in Peru.

5.3 Psychometric assessment of validity

In order to provide a comprehensive assessment of the validity of SASCAT, each type of construct validity outlined in the schema developed by Trochim (2000) was assessed (Box 5.1). Methods and results are presented separately for each aspect of construct validity.

5.3.1 Translation validity

Translation validity focuses on whether the tool is a good reflection of the construct which is being measured. It encompasses two types of validity: face validity ('on the face of it' whether the questions are a good translation of the construct being measured); and content validity (whether the tool reflects all concepts within the construct).

Face validity

SASCAT has credible face validity as it measures both structural and cognitive social capital and does not measure any outcomes of social capital such as crime rates. However, as it was designed for use in a much larger survey instrument, SASCAT is considerably shorter than the original Adapted Social Capital Assessment Tool (A-SCAT), and while covering many aspects of social capital it may not measure them comprehensively. For example, SASCAT contains 45 fewer questions than A-SCAT (nine as opposed to 54 questions), and the Likert scale responses have been restricted to yes/no answers thereby potentially reducing the sensitivity of the questions. In addition, SASCAT groups together emotional, economic and instrumental sources of support instead of measuring them separately. Group membership is recorded not as the absolute number of groups a respondent is a member of, but whether a respondent

is a member of a particular type of group or not (for example sports group or community association). As such, the question may under-report group membership.

The face validity of the question on social support ('In the last 12 months, have you received any help or support from any of the following') is also questionable as it appears to be measuring emotional or economic neediness which may be positively correlated with CMD. This lends weight to the interpretation that the positive finding between individual social support and CMD seen in Chapter 4 is due to reverse causality, as the question is measuring whether individuals in need (i.e. because of a mental illness) have received support. The question does not address perceptions of social support or reciprocity which may be better indicators of social capital, but only actual support received from specific individuals.

Content validity

The content validity of SASCAT is good. It measures both cognitive and structural social capital, with similar weight given to each (four and five questions respectively). Within the structural social capital questions, one relates to group membership, two to social support, and two to citizenship activities, encompassing the 'public good' aspects of social capital. The four cognitive social capital questions cover trust, social harmony, sense of belonging and sense of fairness, all key concepts in social capital theory (Harpham et al. 2002).

SASCAT also covers bonding, bridging and linking social capital with questions asking about bonding relationships with people who have a similar social identity (for example neighbours, friends and relatives), bridging relationships with people who have a different social identity (for example community leaders and local politicians), and linking relationships through formal power structures and official organisations (for example local government authorities and trade unions).

5.3.2 Criterion-related validity

Criterion-related validity assesses whether the tool behaves as it should given the theory of the construct, and is judged against four criteria.

Convergent and concurrent validity

This study is unable to assess the first criterion, convergent validity (the degree of association among different measurement instruments that purport to measure the same concept), as no 'gold standard' way of measuring social capital exists. Other tools that measure social capital were not included in the YL survey so the results of two or more different tools cannot be compared. I am also unable to assess the second criterion, concurrent validity (the ability to distinguish between groups that should be different) as existing research has so far not highlighted consistent differences in levels of social capital between different groups (for example between men and women).

Predictive validity

The third criterion is predictive validity (the ability to predict something that the tool should theoretically be able to predict), for example whether social capital measured by the tool displays known associations with other variables. However I am not aware of any other research that has explored the association between social capital and other variables in Peru, and the extent to which associations found in the developed world should be replicated in low income countries is unclear. As a result, I am not able to assess the predictive validity of SASCAT.

Discriminant validity

The last criterion, discriminant validity, examines the lack of association among constructs that are supposed to be different (for example whether the questions that are intended to measure structural and cognitive social capital really do measure different constructs). SASCAT aims to measure four distinct aspects of social capital, three relating to structural social capital (group membership, support from groups and individuals, and citizenship), and one relating to cognitive social capital. Factor analyses using Principal Components Analysis with Varimax rotation and Kaiser Normalization was used to test whether the tool discriminates between these four theoretical factors. The analysis used data from the 2771 caregivers with complete data on the social capital variables collected by the Young Lives (YL) survey in Peru. The SASCAT questions comprise both continuous and categorical variables. Principal Components Analysis appropriate for continuous items was used instead of tetrachoric correlations (for binary data) to prevent loss of data from collapsing the

three continuous variables into dichotomous variables. This, combined with the fact that the factor analysis only involves nine items and so there may not be enough items to create robust factors, means that the results cannot provide a comprehensive assessment of the discriminant validity of SASCAT.

Table 5.1 presents the results of these factor analyses. Three factors are identified as independent factors with Eigenvalues over one. These three factors account for 56.4% to the total variance among the inter-correlations of the nine social capital items. The strongest factor is group membership and support from groups, accounting for 20.5% of the total variance. I expected group membership and support from groups to be highly correlated as support from groups was only asked if the respondent had stated that they were a member of a group. Support from individuals loads more weakly onto this factor (0.49), but does not emerge as a separate factor as I had hypothesized. The second factor, accounting for 19.3% of the total variance, is cognitive social capital, with all four questions relating to cognitive social capital loading onto this factor. The third factor is citizenship, with both questions relating to citizenship activities loading onto this factor and accounting for 16.6% of the total variance.

Table 5.1: Factor loadings for SASCAT in Peru using Principal Components Analysis with varimax rotation using Kaiser Normalisation

	Group membership	Citizenship	Cognitive
Number of groups respondent is a member of	0.88	-0.35	-0.17
Support from groups	0.90	-0.40	-0.18
Support from individuals	0.49	-0.25	-0.11
Talked to authorities about a community problem	0.07	0.68	-0.03
Joined with others in community to resolve a problem	0.113	0.65	-0.05
Can the majority of people be trusted?	0.02	0.02	0.64
Do the majority of people get along with each other?	0.00	-0.09	0.74
Do you feel part of this community?	0.04	0.02	0.60
Would people try and take advantage of you if they got the chance? ¹	-0.04	-0.12	0.57
Total variance explained (%)	20.5	16.6	19.3

¹ This variable has been coded 0=yes, people would take advantage and 1=no, people would not take advantage, so high scores on the factor indicate high social capital.

The factor analysis shows that SASCAT has good discriminant validity as it clearly distinguishes the different concepts which form the construct social capital. While only three components come out as independent factors instead of the four which SASCAT aims to measure, the fourth (support from individuals) does not load strongly onto any of the three factors, indicating its potential as a separate factor. Importantly, the factor analysis also confirms that SASCAT distinguishes between structural and cognitive social capital as the latter was an independent factor which is negatively correlated with the questions which make up the two structural social capital factors.

5.3.3 Summary

Overall the SASCAT displays credible face and content validity, though the shortness of the tool may mean that not all aspects of social capital are measured comprehensively. It also displays good discriminant validity by clearly measuring the separate constructs which make up social capital. However, while the results from this psychometric validation provide some evidence about the validity of the SASCAT, these techniques rely on data already collected by the tool and are therefore not capable of eliciting how the respondents interpret the questions and thus what the questions are actually measuring. These tests assume that respondents interpret the questions in the same way that the researcher intends them to. With complex questions containing culturally specific constructs this assumption may not always hold. Cognitive validation has been suggested for addressing this problem (Bowden et al. 2002).

5.4 Cognitive assessment of validity

5.4.1 Methods

The cognitive validation was undertaken between October and December 2003, one year after the quantitative YL survey in which SASCAT was used. The fieldwork comprised three stages. Firstly, I conducted an in-depth interview with Professor Trudy Harpham (London South Bank University), the designer of the SASCAT, to establish what each question was intended to measure. With the aid of Dr Mary Penny (Nutrition Research Institute, Lima, Peru) I then conducted interviews with the principal investigators (n = 3), field supervisors (n = 4) and fieldworkers (n = 6) from

the Peru YL team in order to identify any problems with the administration of the tool or with the respondents' understanding of the questions. Thirdly, in-depth cognitive interviews were conducted by myself and a Peruvian anthropologist (Rosario Bartolini) with 20 community members from four communities in Peru to establish how respondents interpret the questions.

Selection of community members

In light of the socio-geographic background of Peru (described in Box 3.1), one rural and two urban clusters from the YL project were purposively selected. These included Villa Maria, one of the oldest and best established shantytowns in Lima, Huaycán, a more recent shantytown on the outskirts of Lima with large areas of newly occupied land, and Chalaco, a remote Andean town and its surrounding villages in the Morropón region in the north of Peru. The questionnaire was piloted in Huascar, another shantytown in Lima, and the results from this interview were included in the analysis. For logistical reasons, no community from the jungle region was selected.

Within each cluster community members matching the inclusion criteria for the YL study (primary caregiver of a child between 6 and 18 months old or 7.5 and 8.5 years old) were purposively selected. Two fathers and four grandparents were also purposively selected to reflect the 6% and 3% of respondents to the SASCAT in the YL survey who were fathers or grandparents respectively. Table 5.2 presents the sampling of community members.

Table 5.2: Purposive sampling of community members for qualitative interviews in Peru

	Huascar	Huaycán	Villa Maria	Chalaco	Total
Mother	1	3	5	5	14
Father	0	2	0	0	2
Grandmother	0	0	0	1	1
Grandfather	0	1	1	1	3
Total	1	6	6	7	20

In Huaycán respondents were located using participants in a vaccine trial as a lead in. In Chalaco a contact in the community was used to identify suitable respondents, and in Villa Maria doorstep canvassing was used until a respondent meeting the inclusion

criteria was found. The purpose of the study was explained and verbal consent obtained. In total six potential respondents (all in Villa Maria) refused to participate.

Description of sample

The average age of the three male and 17 female respondents was 40 years (range 21 – 76). All but three were either married or living with a partner, and most had two children (range 0 – 10 children). The respondents covered a range of different socio-economic levels as measured by the wealth index, and had lived in their community for a mean of 25 years (range 1 – 76 years).

Cognitive interviews

Semi-structured in-depth interviews were conducted in Spanish in the respondent's home. Interviews lasted between 15 and 100 minutes (mean 50 minutes) and used the cognitive interviewing techniques developed by Bowden et al. (Bowden et al. 2002) whereby the respondent is asked a question from the SASCAT and then the thought processes behind their answer are probed.

A potential pitfall of this approach is that respondents will become accustomed to intensive probing after each question and this will affect the spontaneity of their responses. However, as I was interested in probing exactly what respondents were thinking when they answered the question, rather than their answer to the social capital question itself, this method of interviewing was considered desirable. The alternative of leaving the cognitive probing until after all the SASCAT questions had been asked to prevent this bias would have reduced the ability of respondents to recall accurately what they were thinking when they answered each question. Issues arising from the answers to these initial questions were then explored in more depth with each respondent. Box 5.2 gives examples of some of the questions used.

Analysis

Interviews were tape recorded with the permission of the respondent and subsequently transcribed and translated into English by myself and Rosario Bartolini. The translation process also served as the first analysis of the data, with major themes drawn out and placed in historical and political context. Transcripts were formally analysed according to the framework developed by the National Centre for Social

Research (www.natcen.ac.uk). The analysis identified particular questions or concepts that were interpreted by the respondents in a different way to that intended by the researchers who designed the tool.

Box 5.2: Example questions from cognitive interviews

Structural social capital

SASCAT question

In the last 12 months, have you received any help or support from your neighbours?
This can be emotional help, economic help or assistance in helping you know or do things.

Cognitive probing

What type of help did they give you?
Who do you include when you think of your neighbours?

Cognitive social capital

SASCAT question

In general, can the majority of people in this community be trusted?

Cognitive probing

Who were you thinking of when you were thinking about 'the majority of people'?
Can you give me some examples of people trusting each other?
Can you give me some examples of people not trusting each other?

5.4.2 Results

Table 5.3 summarises the intended meaning of each question and whether the majority of respondents interpreted each question as intended. The first column contains the original Spanish wording of the questions which as a result of translation differs slightly from the English version (See Chapter 3 Box 3.5 for the complete version of the SASCAT questions). The second column lists the meaning of each question as intended by Professor Trudy Harpham, the designer of SASCAT, and the third column whether the majority (defined as over half of respondents) interpreted the questions as intended. Results are presented separately for each question from the SASCAT. As a result of this work I made a series of recommendations to the YL Project for how the tool should be adapted for use in Peru (recommendations and the revised tool are presented in Appendix D).

Table 5.3: Differences between intended and actual interpretation of the SASCAT questions

Question	Intended meaning	Interpreted as intended?
Structural social capital		
Definition of community	Spatial definition of community based on administrative boundaries.	No
In the last 12 months have you been an active member of any of the following groups or associations in your community?	Respondents have to connect with other people in the group they are a member of in order to have structural connections. These should be live, current connections as opposed to dormant ones where there is no social interaction.	No
In the last 12 months have you received any emotional support, economic help, advice, recommendations from the group to help you do or learn anything?	Respondents should think widely about types of support received, not just economic, hence the inclusion of different types of support in the question wording.	No
In the last 12 months, have you received any help or support from any of the following individuals?	Respondents should define the groups of individuals (e.g. 'family') however they want. There can be overlap between individuals listed here and the groups listed above (e.g. politicians/political groups)	Yes
In the last 12 months, have you joined together with other community members to resolve a problem or work together?	The actual connections between people that are formed when people join together. It does not refer to hypothetical action. Joined together = Definition deliberately left open for respondents to decide what activities they consider 'joining together'. Intended to cover a broad range from just talking to other people in the community about a problem, to setting up a formal action group. Problem or common issue = Left to respondent to decide which issues constitute a problem or common issue.	Yes
In the last 12 months have you talked with a local authority or government representatives about problems in this community?	Exact meaning left to respondents, but intended to have a broad meaning ranging from a phone call, writing a letter or having meetings. Does not include voting.	Yes

Continued...

Question	Intended meaning	Interpreted as intended?
Cognitive social capital		
In general, can the majority of people in this community be trusted?	Giving access to things that you care about to other people in the community because you know that respect, fellow feeling and reciprocity is such that they would not harm the things that you care about. For example trusting neighbours to look after your house keys.	No
Do the majority of people in this community generally get along with each other?	Left to respondents to interpret what 'generally getting along' means. No order of magnitude specified. Personal contact between people is not required for people to get along with each other.	Yes
Do you feel as if you are really part of this community?	Sense of belonging and emotional attachment to community.	Yes
Do you think the majority of people in this community would try to take advantage of you if they got the chance?	Perceived fairness, lack of altruism, selfishness and exploitation. What 'taking advantage of ' means is left to respondent to interpret, but may include not returning money that was lent or asking for favours that are not reciprocated.	Yes

Concept of community

The SASCAT is prefaced with the statement 'Now I would like to ask you some questions about your community', and prompts the fieldworker to define the respondent's geographical community for them (for example the village they live in). The interviews with fieldworkers revealed that 'community' was often not defined for the respondent in this way; instead the definition of what was their community was left to respondents.

However, the cognitive interviews revealed that many respondents did not have a clear concept of the meaning of the word 'community'. It was a word hardly ever used spontaneously, and many respondents had difficulty defining what their community was when asked. For example, nearly all of the respondents from the rural area equated 'community' with 'communal' – the communal lands owned by the village for grazing cattle. In urban areas, half of respondents interpreted 'community' as people helping each other. As one resident of Villa Maria Del Triumfo commented "*The community is people who help each other, who share things and are*

supportive". Only a minority of respondents defined their community as the geographical area in which they lived, as had been intended.

Asking respondents 'What is the name of the place where you live?' proved more successful in establishing respondents' geographical community. In urban areas this was usually reported to be the zone of the shantytown (an administrative area comprising 15 to 30 blocks of houses), and in rural areas it was usually reported to be the town or village. However, 'layered' concepts of community were common, whereby where respondents lived could be defined by any one of a decreasing circle of areas. For example, a respondent might say they lived in block number 151 within zone B of Huaycán, and then refer to different levels of 'community' depending on the question asked. For example, questions on group membership might be answered on the basis of the whole of Huaycán, while those regarding trust might only relate to the residents of their block whom they knew personally.

Group membership

The questions on active membership of community groups were intended to measure live, current connections as opposed to dormant ones where there is no social interaction, as individuals must actually connect with other people in the group they are a member of in order to have structural social capital.

Active participation was appropriately interpreted by respondents, who only reported membership of groups that they were currently members of. However, the definition of 'active' participation varied according to the type of group that respondents were a member of. While active participation in a community organisation such as a residents association was frequently interpreted as meaning having an official position such as treasurer or president, simply attending meetings was sufficient to be considered active participation for religious and political groups. It is plausible that this is because it is easier to 'participate' in a religious or political belief, whereas residents seek to distance themselves from community politics (residents groups) and therefore only admit to active participation if they actually hold an official position within the group. It is necessary to define clearly what active membership means for each group type, based upon concepts of structural social capital, in order to ensure

that only active membership that contributes to an individual's social capital is recorded.

The different interpretations by respondents of what each group type meant highlights the need for culturally specific questions relevant to the local context. For example, trade unions, credit, and funeral groups were rarely recognised by respondents. Most YL respondents are part of the informal labour market and thus not eligible for trade union membership, while only residents of Villa Maria Del Triunfo, the oldest, most established and richest shantytown in the sample correctly understood credit groups. Residents from other areas interpreted them as loans from banks, and in rural areas as credit from local stores. Similarly, only a few residents from urban areas understood what funeral groups were. This is backed up by my analysis in Chapter 4 which shows that less than 1% of respondents were a member of such groups (Table 4.2), suggesting that these types of group do not constitute an important source of structural social capital for Peru's poor.

There was also confusion as to what constituted a community association in Peru. While many respondents included food distribution programmes such as communal kitchens, few included residents associations in this group. Indeed, two respondents said they were not members of community associations yet it later emerged that they were both committee members in their local residents association. The same confusion existed with women's groups, with some respondents classifying food distribution programs such as communal kitchens as women's groups rather than community associations, based on the fact that the membership of these groups is predominantly female.

Active membership of political groups was widely interpreted as being a supporter of a political party or cause (*simpatizante*). Active participation ranged from merely supporting a political party to being a member and helping out with elections. One rural respondent interpreted the question as voting for the mayor in the local elections.

While many respondents stated a religious affiliation, for example 'I'm Catholic', when asked about membership of religious groups, this, along with going to church, was rarely interpreted by either respondents or fieldworkers as constituting active

participation. Instead respondents considered membership of parish organisations or specific religious groups such as those that hold prayer meetings as active participation in religious groups.

The analysis of the face validity of SASCAT (section 5.3.1) raised concerns that group membership may be under-reported as only whether a respondent is a member of a particular type of group is reported, rather than the actual number of groups within each type that a respondent is a member of. The qualitative interviews suggest that while present, this may not be a significant bias. Only four respondents reported being a member of more than one group within a particular group type. All were members of more than one type of community group such as the Glass of Milk Programme or communal kitchens, groups with over-lapping membership and similar goals. Therefore the additional contribution to that individual's overall stock of structural social capital may be minimal.

These results highlight the need for a culturally relevant list of organisations that are important to the setting in which social capital is to be measured. All groups which make a significant contribution to the social capital of an area must be included, and stated in such a way that respondents recognise the group types as non-overlapping categories. What constitutes active participation sufficient for creating or maintaining social capital for each group type must also be pre-defined by researchers, to ensure that all types of social connections that may be important for social capital are captured. As a result, SASCAT has been modified to include a list of organisations important for Peru (Appendix D).

Social support

Respondents were asked to report any support or help received from groups they were a member of or from a list of individuals. They were asked to think widely about different types of support received including emotional, economic and instrumental (help to know or do things). Despite this, the first type of support that most respondents listed was economic, comprising financial assistance in urban areas and donated goods in rural areas. Instrumental support was hardly ever reported.

Respondents had different layers of understanding as to what constituted emotional support. While advice was the most common and often the first interpretation offered by respondents, to be really helpful respondents reported that the advice must be good advice and come from people whose opinion is valued such as church leaders or parents. A deeper form of emotional support was *aliento* (literally ‘giving breath’), a form of moral support and encouragement to help people through tough times. As one mother reported “*Help to make us feel better, to give us aliento (encouragement) that we are going to get out of the problems that we have*”. This form of emotional support was received exclusively from informal sources of support (friends and family). The deepest level of emotional support reported was simply ‘being there’ and sharing problems without necessarily offering advice or a solution to the problem. As one older mother said of her friends in the communal kitchen, “*In our suffering life we share our pain, our sadness. For a moment I forget the problems that I have and this is good*”.

The threshold for what was considered support by respondents was quite high, leading to an underestimation of the total support received. For example, though nearly all respondents received donated milk for their children from the Glass of Milk Programme, only a few considered this to be a form of support. In addition, a single mother living with and financially supported by her parents did not report receiving any support from them. The question may also underestimate social support as it does not list separately the different types of support received, yet many respondents reported receiving both economic and emotional help from the same source. As the different types of support received may have very different effects on poverty and health outcomes, it is important to distinguish between them.

Respondents had no trouble defining who they considered to be family, with most making a distinction between immediate family such as parents, siblings and children, and more distant relatives such as uncles and cousins. As intended, most respondents interpreted ‘neighbours’ to be the people who live close to their home. In rural areas respondents often cited the whole hamlet or village as neighbours. However, only one respondent interpreted ‘friends who are not neighbours’ correctly as friends who live in the same community but who are not immediate neighbours. All other respondents

said that their friends who were not neighbours were people living in other communities, for example people they had met through work.

The word 'leader' was not well recognised by respondents, with some reporting that there were no leaders in their community when they themselves were community leaders. A few respondents only included as leaders people who inspired respect. As one reported, *"A leader has to be someone you admire, who inspires respect. Not just someone who holds an official position"*.

Joined together to address a common problem

The Spanish translation included joining together to work together as well as to resolve problems, and this wording was well understood by respondents. However, as well as reporting times when they had joined together to resolve community problems such as campaigning for the title to the land in a shantytown or doing communal works such as clearing drains and repairing roads, respondents also reported joining together to address individual problems. These often involved helping a friend or neighbour who was sick by raising money through the sale of fried chicken or pork, or a group of mothers raising money to buy Christmas presents for their children. When asked why she considered helping a sick neighbour to be a community problem, one respondent replied *"Because we are all in the same place, the same community. We define ourselves by this. So we should help each other to get ahead. If I help him today he can help me tomorrow"*. This sense of community responsibility not only for issues that affect the whole community but also for issues that affect individuals may be a powerful indicator of the social capital of a community.

Talked with a local authority about problems in this community

This was universally interpreted as intended to mean personally talking with authorities. All contact was with the local municipality rather than with higher up governmental organisations, and many people reported not talking with authorities as this was the job of the elected community leaders. There is the possibility of double reporting with this question as a few respondents repeated the activities that they had reported under the previous question of joining together to address a common problem because the resolution of the problem involved talking to the authorities.

Generalised trust

Respondents' interpretation of trust was multi-faceted. Importantly, respondents were unwilling to provide an assessment of trust in 'people in general'. The vast majority would only comment about trusting known individuals, and statements such as "*I need to know a person to trust them*" were common. A more worrying finding was the interpretation by half of the respondents, including all the respondents in Huaycán, of the question as referring directly to trust in authorities rather than to the general population. Opinion was widespread that community leaders work for their own personal benefit and cannot be trusted, and thus many respondents answered 'no' when asked if they trusted others. One respondent, himself a long standing community leader, explained that the conduct of leaders is an important indicator of levels of trust in the community as they are held up as examples of how people should behave.

Trust was also commonly interpreted as *cumplido* (keeping your word), both in terms of being able to trust the authorities, but also other people. Being able to trust people with secrets was also considered an important component of trust, and there was a strong feeling that high levels of gossip in the community were a bad thing. Other interpretations included entrusting others with material possessions, and in rural areas, trusting others not to do harm to you in the form of witchcraft (*daño*). Perceptions of trust therefore depend on personal experience, and are variable in that people can be trusted in some things, but not others. These factors make the intended interpretation of questions measuring generalized trust extremely difficult to capture.

Social harmony

This question was well understood and correctly interpreted by respondents. While there were many different interpretations of 'getting along' ranging from not fighting or arguing to helping each other and working together, all tapped into the concept of social harmony. Interesting differences emerged between rural and urban respondents in their interpretation of social harmony, with much more profound levels required in rural areas where people rely upon each other for their livelihoods. As one rural respondent reported, "*If you don't get along with people you can't ask them to come and help you work*". Whereas in rural areas not reciprocating work favours was considered a serious threat to social harmony, in urban areas getting along was much

more superficial and was largely interpreted as *saludos*, or greeting each other. Residents of shantytowns largely do not rely on each other for day to day living, and the costs of becoming more involved in other people's lives in terms of the increased risk of gossiping may outweigh any benefits. Indeed, not being too close to other residents was seen as actually contributing to social harmony in Villa Maria Del Triunfo. As one resident said, *"People get along because everyone has their own interests at heart and so don't get involved in other people's lives"*.

Sense of belonging

Many respondents reported a strong sense of belonging to their community despite previously reporting low levels of trust and social harmony, and even reporting that they did not like where they lived. This sense of belonging was expressed by respondents in terms of residency: *"I live here"*, *"I am used to it here"*, and long-standing association: *"Because this is where I was born and grew up and maybe will die"*.

A common requisite for feeling part of shantytowns was participating in community activities. This may be partly due to the Spanish translation of the question as *'parte de'* (feel part of) as opposed to *'pertenece a'* (belong to). In a social environment where people do not interact on an everyday basis due to common work interests as in rural areas, one of the only ways that a resident of an urban area can get to know the other residents and feel involved in the community is by participating in community activities. This was also expressed in helping each other as those who were given help from other members of the community, or who felt useful because they helped others, were more likely to report feeling part of their community.

Sense of fairness

This question was the most difficult for respondents to understand, a finding supported by the YL fieldworkers who also reported the most problems when asking this question. However, once the question was understood, respondents interpreted it as intended to cover a range of different ways in which people could be taken advantage of. The most common was taking advantage of people financially, for example by charging them too much in a store or by lending money that is not repaid. The preoccupation with corrupt authorities re-surfaced with respondents from urban

areas reporting community leaders taking money for community projects which did not get completed as a common way in which they are taken advantage of.

5.5 Discussion

5.5.1 Discussion of results

In this chapter I argue that cognitive validation is a valuable addition to psychometric techniques when validating complex tools for use in different cultural settings. Psychometric techniques to explore discriminant validity show SASCAT to be a valid tool reflecting theoretical constructs. However, these techniques rely on data already collected by the tool. The addition of an analysis from the respondent's viewpoint using qualitative cognitive interviewing techniques explores how the respondents interpret each question and therefore what each question is actually measuring. Such an analysis paints a more complex picture of the validity of the SASCAT, with some questions being appropriately interpreted by respondents, and others displaying important differences between what the designers of SASCAT intended to measure and what they actually do measure.

Only four other studies have used cognitive interviewing techniques to qualitatively validate social capital questions. Three of these were set in the UK (Boreham 1999, Earthy et al. 2000, Blaxter and Poland 2002) and one used slimmed-down methods from my own study to validate the SASCAT for use in Vietnam as part of the YL study (Tuan et al. In Press). The results of the Vietnamese study were combined with the results from Peru reported here to explore the cross-cultural validity of the SASCAT (De Silva et al. In Press). The results of all four studies show striking similarities with the results of my Peruvian validation study.

In the validation of the SASCAT in Vietnam a factor analysis to assess discriminant validity showed strikingly similar results to the factor analysis of the Peruvian data with the same three factors emerging with similar loadings (De Silva et al. In Press). This may be because each question is designed to measure distinct concepts with little overlap between questions. Therefore even if respondents interpreted the question in a way different from what was intended, for example by reporting all group membership rather than just active group membership, the question is still

fundamentally measuring group membership. This highlights the complementary nature of the two approaches to validation. While psychometric validation can assess among other things whether key concepts are being measured, cognitive validation can delve deeper into the meaning of those key concepts. Despite this, combining the results of these different validation techniques remains a challenge. It is perhaps best achieved by conducting the cognitive validation during initial development of the tool to ensure that the questions elicit the desired interpretation, followed by psychometric validation after the tool has been applied to a much larger sample during piloting.

In line with much of the community psychology literature, my qualitative interviews highlight problems with the definition of community in Peru with respondents referring to different geographical areas depending on the question being asked. This is mirrored by findings from two of the UK studies (Boreham 1999, Earthy et al. 2000). For example, in cognitive interviews with 31 respondents from rural and urban areas in Southern England, Earthy et al. (2000) found that when asked about community services respondents talked about the area within a 15 minute walk from their home. However, when asked about trust in people in general they only referred to their street or immediate vicinity.

The community psychology literature emphasises the different definitions of community ranging from a geographical area defined by administrative boundaries to a dense inter-connected network of people who care about each other (Kaplan 2004). My study showed that the term 'community' was little used or understood by Peruvian respondents. Cognitive interviews with 35 elderly residents in the UK also found that community "*was a word almost never used*" (Blaxter and Poland 2002). However, the validation of the SASCAT in Vietnam where the resilient and highly meaningful geographical construct of commune was used found no problems with interpretation (Tuan et al. In Press). These studies highlight my conclusion that a culturally specific geographical frame of reference must be clearly defined for respondents and repeated in each question to ensure that the area to which the questions refer remains constant.

Questions referring to group membership were particularly problematic in my study. The use of generic group types not salient in the Peruvian context meant that many respondents had difficulty understanding which groups each category referred to.

Earthy et al. (2000) also found questions on group membership the most difficult to ask in the UK, largely due to the small numbers of respondents who participated in groups.

My study showed that only recording membership of group types may underestimate group membership as a number of respondents were members of more than one group within each group type. This is backed up by a quantitative analysis of group membership in the USA which showed that while 26% of people are a member of four or more groups, only 16% are a member of four or more types of groups (deUlzurrun 2002), highlighting the fact that people tend to be members of more than one of the same type of group.

Social support may also be underestimated by the SASCAT in Peru, with respondents thinking primarily about economic help and only considering emotional and instrumental support when prompted. These results replicate those found by the validation of the SASCAT in Vietnam, whereby half of all respondents thought only of material support and emotional support was never mentioned (Tuan et al. In Press). This highlights the importance of separating out different forms of support in the questions.

Perhaps the most problematic question in my study was that related to generalized trust in others. Respondents were unable or unwilling to comment about people they did not know personally, and therefore did not include people who did not live in their immediate vicinity. Importantly, this finding was replicated in all of the cognitive validation studies that tested this variable. In Vietnam and in two UK studies, respondents had difficulty abstracting responses to the community level and preferred to talk only about those people they knew personally (Earthy et al. 2000, Blaxter and Poland 2002, Tuan et al. In Press). These findings have ramifications for the many social capital tools which include questions on generalized trust, as respondents have difficulty making statements about people in general and therefore may not be reliable informants about some types of social relationships in their community.

Both studies validating the SASCAT highlight the importance of appropriate translation of the tool in order to ensure that respondents interpret the questions as

intended. In Peru, the question on whether respondents feel part of their community was literally translated into '*parte de*' (part of), which elicited responses related to participation in the community rather than deeper feelings of attachment. In Vietnam, the question on social harmony was translated as 'having a good relationship' as opposed to 'getting along', resulting in respondents finding it hard to distinguish this question from that on trust (Tuan et al. In Press). These findings highlight the importance of cognitive piloting of the translation of an instrument in a new cultural setting.

5.5.2 Implications for the future validation of social capital tools

This chapter highlights two issues for survey methodology. Firstly, it is very important to conduct cognitive interviewing during the development and piloting of tools, especially those measuring complex constructs such as social capital. Such validation exercises are especially important when implementing existing tools in new cultural settings, and should incorporate an analysis of the appropriateness of the translation of the tool in eliciting the correct interpretation of the question from respondents. Such studies can highlight both culturally specific problems with the tool, and also universal challenges to its validity which require the original tool to be redesigned.

Secondly, this chapter highlights the importance of cognitive interviewing for the analysis and interpretation of quantitative data collected by the tool. Respondents showed varied, layered and complex interpretations of the questions, highlighting the complex and layered nature of many of the concepts that were being measured. An understanding of these different layers of meaning facilitates a deeper interpretation of quantitative data. These results will be used to aid interpretation of the further analysis of social capital and maternal CMD in Peru in Chapter 8.

To the best of my knowledge, this study (combined with the sister study in Vietnam) is the first to use cognitive interviewing techniques to validate a tool to measure social capital in low income countries, and also to compare these results with those obtained from psychometric validation. This has enabled an existing tool to be modified into a valid and low cost instrument designed to measure social capital within larger surveys in Peru (Appendix D) with the potential for use in other low income countries

following local piloting and cultural adaptation of the tool. Establishing the validity of any tool is a cumulative process requiring different approaches across a number of different studies. Hopefully future research will continue the validation of the SASCAT in different cultural settings.

5.6 Next steps

This chapter has explored in detail the meaning of the SASCAT questions in the Peruvian context. However, the validation exercise is not capable of providing the in depth exploration of the nature of social capital in Peru necessary in order to interpret the associations between social capital and CMD explored in Chapters 4 and 8 of this thesis. The following chapter addresses this gap through a detailed qualitative exploration of the types of organisations and networks which form an important part of Peruvian social capital, while Chapter 7 presents a quantitative analysis of the determinants of different types of social capital in Peru.

6. Understanding social capital in Peru

In response to the finding in Chapter 4 that aspects of social capital are culturally specific, in this chapter I attempt to understand the nature of social capital in Peru. This will be used to generate hypotheses about the determinants of social capital which will be tested in Chapter 7, and to aid interpretation of the results of a further analysis of social capital and maternal common mental disorders (CMD) in Peru (Chapter 8). I draw on two sources of evidence to achieve this: a literature review of existing research on social capital in Peru and the qualitative in-depth interviews with 20 respondents in Peru conducted in order to validate the SASCAT tool (Chapter 5). I focus on individual rather than ecological measures of social capital as the aggregation of individual social capital (ISC) to generate ecological social capital (ESC) scores means that the results will be pertinent to both types of social capital.

6.1 Chapter objectives

1. To explore the nature of social capital in Peru in particular the organisations and networks which constitute Peru's structural social capital.

6.2 Methods

Two sources of information are used to explore the nature of social capital in Peru: a literature review of existing research on social capital in Peru and additional analysis of the qualitative interviews conducted to validate the SASCAT tool in Peru (results and full methods presented in Chapter 5).

6.2.1 Literature review of existing research on social capital in Peru

Twelve electronic databases (listed in Box 6.1) were searched in February 2004 using the terms 'social capital' and 'Peru'. In addition, the search terms were entered into the internet search engine Google, and colleagues working in Peru were contacted to request any literature on social capital they were aware of. The reference sections of all relevant papers were searched for additional studies. No restrictions were made on the type of study. The aim was to find all studies published to date on social capital in

Peru, irrespective of the purpose of the study or the methodology used. A total of nine papers were located (Bebbington 1997, Anderson 2000, Bebbington and Carroll 2000, Woolcock 2000, Drumm et al. 2001, Portocarrero et al. 2001, Schady 2001, Diaz et al. 2002, Tuesta 2003). All papers dealt with individual social capital as opposed to ecological, were heavily focused on structural rather than cognitive social capital, and none explored the social capital of populations in the jungle regions.

Box 6.1: Databases searched for research on social capital in Peru

BIDS – International Bibliography of the Social Sciences
 Eldis
 Embase
 Health Development Agency
 ID21
 Inter-American Development Bank – Ethics and Development database
 Lilacs - Latin America & Caribbean Health Sciences
 PAHO – Pan American Health Organisation
 PsychInfo
 Pubmed
 World Bank Social Capital database
 Zetoc (British Library)

6.2.2 Qualitative interviews in Peru

In depth qualitative interviews with 20 respondents in one highland rural and two coastal urban areas of Peru were conducted to validate the Short Adapted Social Capital Assessment Tool (SASCAT) used by YL. Full methods for these interviews are presented in section 5.4.1. As a result of the cognitive probing of answers to the SASCAT questions, respondents often made comments about the nature of social capital in Peru. In addition they were asked specific questions regarding the nature of social capital in their communities, for example differences in the participation of men and women, and their role in different community organisations.

After analysing the transcripts in order to validate the SASCAT tool, transcripts were re-analysed according to the framework laid out by the National Centre for Social Research (www.natcen.ac.uk), whereby responses are grouped into themes. Themes included the nature, purpose and importance of organisations and networks in people's lives (structural social capital), and the cultural norms which may influence the nature of social capital in Peru (cognitive social capital).

Both the existing literature and the results of my interviews focus more on structural than on cognitive social capital. This limitation is mitigated by the finding from Chapter 4 that structural social capital varies more between settings than cognitive social capital, indicating that it is most important to explore the organisations and networks that contribute towards social capital in Peru. As neither the literature review nor the interviews cover the jungle region or ESC, this analysis is restricted to a discussion of individual structural social capital in the highland and coastal regions of Peru. It is divided into two sections. The first describes the formal and informal networks important for social capital in Peru, and the second discusses factors associated with individual participation in structural social capital. The results from the literature review and the qualitative interviews are presented in parallel.

6.3 Results: Organisations and networks important for social capital in Peru

6.3.1 Formal networks

Extra-community organisations

As the SASCAT questionnaire focuses on social capital within communities, bridging forms of social capital generated by large organisations which work across communities is not explicitly measured. Such extra-community organisations may have an important impact on mental health by facilitating economic development and helping to alleviate poverty.

For example, extra-community organisations which act as intermediaries between communities and national organisations form an important source of linking social capital in Peru as they connect those with little power to those who have power. Bebbington and Carroll (2000) compare federations in the Andes of Peru, Bolivia and Ecuador and show religious organisations and Non-Governmental Organisations (NGOs) to be the most important and effective federations in Peru. Such organisations can have an impact on poverty as they act as gatekeepers to external power structures. They cite a successful organisation of over 5000 coffee-growers from the Cuzco region which collects and markets members' coffee to external markets and has been successful in gaining access to the international Fair Trade

market. Such organisations have been linking communities with similar interests to government, civil society, organisations and markets in Peru for over 30 years (Woolcock 2000).

SASCAT does capture membership of intra-community groups set up by external organisations such as NGOs or the government. At the beginning of the 1980s, a period of economic and social crisis in Peru, many community organisations were set up principally by the government with the broad aim of poverty alleviation. These organisations comprise three main types: women's groups related to feeding programmes, neighbourhood organisations aimed at improving local living conditions primarily by procuring basic amenities, and self defence committees set up to defend communities against the terrorist activities of the Shining Path (Cueto et al. In press).

Women's groups

A large number of government-sponsored food distribution programmes such as community kitchens exist in both rural and urban areas of Peru. These organisations are run by small groups of local women and aim to help women feed their families by providing often pre-prepared food for free or at a much reduced cost (Cueva and Millán 2000).

The Glass of Milk Programme is a national governmental welfare programme started in 1984 to distribute milk and cereals primarily to children under six and to pregnant or lactating women. The programme cost more than \$100 million in 2003 (Ministerio de Economía y Finanzas, Peru), and currently represents the largest social transfer in the country. The programme is decentralised, with a monthly earmarked transfer of funds from the government to municipalities who distribute the products to committees set up in each community. This decentralisation has led to widespread implementation of the programme, with more than 50% of the poor receiving milk (Stifel and Alderman 2003).

Mother's Groups are self-organised groups of mothers who undertake a diverse range of activities (Cueto et al. In press). These include skills training and fundraising for their members, thus the actions of the group may not always benefit those external to the group. For example, at the time of my interviews (November), members of a

Mother's Group in Huaycàn were raising money to buy Christmas presents for their own children. In addition Mother's Groups channel resources donated to the community from religious, political or charitable groups, and therefore are an important source of linking social capital for other members of the community. It can be argued however that this linking social capital merely serves to maintain the established hierarchy, as the Mother's Groups control access to these external funding sources.

Tuesta (2003) adopts Woolcock's (2000) argument that these community organisations are important sources of bonding social capital in Peru which help people to 'get by'. This contrasts to bridging social capital whereby links to people or organisations that are different give access to additional resources which help people to 'get ahead'. This distinction was confirmed in my interviews for some organisations, with those respondents who use Community Kitchens reporting that they played an important role in their ability to subsist on a day to day basis. As cooking in the home was considered more desirable by respondents, they are only used by a group of people with similar and relatively great needs, constituting powerful links between people of a similar status.

However, my interviews show that this distinction between 'getting by' and 'getting ahead' is too simplistic. Many organisations foster both; for example links between people of similar status in Mother's Groups (bonding social capital) are used to develop economic resources enabling people to 'get ahead' as well as to help them 'get by'. One member of a Mother's Group from our study reported how the group ran training courses to teach women how to bake cakes and bread to sell to supplement their income. In addition, a number of mothers from the shantytowns in my study who participated in the Glass of Milk Programme cited occasions when the group had got together to raise money for themselves in addition to their normal activities. My results are corroborated by a case study of a shantytown in Lima which showed that a local artisan centre set up by a Mother's Group in the community encompassing a bakery and sewing shop provided employment for 60 women and access to markets for many more (Anderson 2000). Such findings are replicated in other settings. In India for example, one of the side effects of government micro-credit schemes aimed at helping people 'get ahead' has been increased feelings of

solidarity and support among some members, helping them to 'get by' on a daily basis (Galab and Rao 2003). Such simplistic classification of the usefulness of organisations may ignore the unintended consequences of social capital and its potential effects on mental health.

My interviews highlight important differences between rural and urban areas in the organisation of the Glass of Milk Programme, differences which affect the capability of the organisation to build social capital. Importantly, the women involved in the Glass of Milk Programme have a statutory obligation to prepare the milk before delivery which forces a large group of women to co-operate. This was evident in the shantytowns of Huaycàn and Villa Maria del Triunfo, where the programme was well organised with an elected executive council who oversaw the daily preparation and distribution of the milk and cereals. In contrast, Chalaco and its surrounding villages had much smaller groups of women involved, which only met to distribute the milk and elect the next committee. The large distances to travel to collect the milk and the lack of money to buy fuel for preparing it made the daily preparation and distribution of the milk impractical. As a result, recipients collected tins of milk and a bag of oats once a month from the committee president, limiting opportunities for social interaction and building social capital. Whereas in the shantytowns a number of women involved in the programme mentioned additional activities which the group had been involved in as a result of working closely together, no such activities were mentioned by women in Chalaco, where the lack of interaction with other members was lamented. Thus the context in which the group operates affects its capacity to build social capital, possibly explaining my finding in Chapter 4 that different aspects of structural social capital have different effects on CMD in different settings.

Resident's associations

Links between residents and community authorities who act as 'gatekeepers' to resources outside the community are an important form of linking social capital in many settings. In Peru, this role is filled by community leaders, elected local representatives who organise communal works, distribute resources that come into the community and liaise with authorities outside the community.

Some of the shantytowns I visited have a highly organised system of local representation which forms part of the structural social capital of these communities. In Huaycàn residents elect an executive council to run the residents association for their block of houses. The executive council may organise communal works such as making roads or green spaces, or call official meetings which every resident is expected to attend. The executive council for each block elects community leaders for the zone and subsequently the whole shantytown, creating a clear structure of representation.

While community leaders provide the structure through which linking social capital can potentially occur, such links may only be effective with correspondingly high levels of cognitive social capital. This is illustrated by my qualitative interviews in which many respondents expressed doubts about the integrity of the community leaders who represented them, indicating low levels of cognitive social capital in this relationship. There was a widespread view in both urban and rural areas that community leaders do not help people, that they promise things but never do them, and that they are corrupt and keep community resources for themselves. The perception of corruption among community leaders may have a serious impact on the level of trust between a community and its leaders, limiting the extent of and access to linking social capital due to a lack of shared norms and values. This highlights the inter-relatedness of structural and cognitive aspects of social capital. Whether trust is an outcome of participation as Putnam argues (1993), or whether it is a pre-requisite of participation as Brehm and Rahn argue (1997), both are necessary for the effective functioning of social capital as a whole.

Self-defence committees

Concerns about security in the 1980s led to the development of organisations which encourage bonding social capital among men. Self-defence committees were set up to protect communities from the threat of terrorism in the 1980s and early 1990s, and have been retained although the conflict has abated. These self-defence committees are thus an excellent example of how an organisation set up for one purpose builds additional social capital by being put to different uses once its original purpose is fulfilled. In rural areas, self-defence committees now consist of men who patrol the area around the village at night primarily to deter animal rustlers. They also intervene

in local disputes, and may administer punishments for petty thefts or other misdemeanours. In urban Villa Maria del Triunfo, my interviews show that these groups are now used to combat youth gangs, drug abuse and anti-social behaviour, thereby exerting social control over dangerous behaviour that could lead to mental health problems in the future.

6.3.2 Informal networks

In addition to formal organisations, there are a number of informal individual networks which make an important contribution to Peruvian social capital. These may play a big role in generating and maintaining cognitive social capital and therefore be extremely important for mental health.

Friends, family and neighbours

Community organisations make a small contribution to the total stock of social capital in Peru compared to the contribution made by connections to individuals. My analysis of the YL data from Peru show that while 68% of respondents had received social support from individuals in the past year, only 19% were members of a group (Table 4.2). While nearly all those who received support from individuals (96%) got support from informal sources comprising family, friends or neighbours (bonding social capital), only a quarter also received support from individuals who could provide linking or bridging social capital such as community leaders or politicians. Thus the most common source of structural social capital for Peruvians is bonding social capital through informal connections with individuals of similar status. This is confirmed by Tuesta's study (2003) of social capital and poverty in rural areas, which found that bonding social capital was much more common than bridging social capital. He also found that bonding social capital was more common among those living in extreme poverty, while bridging social capital was more common among the non-poor.

My interviews highlight a system of reciprocal work called *peonada* as a clear example of how bonding links between similar people can enable people to survive. Residents help each other in work which cannot be performed alone, usually agricultural and construction tasks. These *peones* (unskilled agricultural labourers) are 'paid' with food, and the obligation that the recipient will reciprocate the favour when another needs help. Thus the structural connections are reinforced by strong

cognitive social capital. Respondents in Chalaco and its surrounding villages all emphasised the importance of this system of reciprocal help. In a society where few people have access to cash reserves to pay workers, the *peonada* system represents for many the only way that they can build their own house or work their land. The interdependence of members of the community appeared to result in a deeper level of trust and social harmony than was found in established urban areas where people did not have to depend upon each other for their livelihood. Similar patterns of rural dependence are seen in very different contexts highlighting the commonalities of social capital, for example the traditional system of reciprocal exchange in Indonesia (gotong-royong) and patterns of work in Scottish crofting communities.

Respondents from our interviews often emphasised the importance of bonding social capital to their communities. For example, there was widespread recognition that more can be achieved when people work together, and that this is one of the key factors in community development. One rural respondent commented that the relatively worse development status of their village compared to surrounding ones was largely due to the fact that the people did not work together: *“If the people were united El Palmo would be a different place. We would have electricity because everyone has to work together to do this”*.

There was also a sense that ‘community’ should be something which works for the good of everyone. As one of the founding members of Huaycàn said, *“I understand community to be when people help each other; if a neighbour doesn’t have something I give it to them”*. Thus while not all respondents have had the experience of living in a supportive and united community with strong bonding social capital, many understand that such a social environment would be beneficial to them and the community as a whole. This may partly explain the association between low cognitive social capital and CMD seen in Chapter 4.

6.4 Results: Determinants of participation in structural social capital in Peru

6.4.1 Barriers to participation

While rates of participation in Peru are high compared to western levels, Peru still has the lowest level of group membership of all four YL countries. Reasons for participation are based around opportunity costs, attachment to community and social position. Those who participate appear to have a higher opportunity cost than non-participants, as they are more likely to be employed and better educated (Schady 2001), and proportionately more people from higher socio-economic groups participate (Portocarrero et al. 2001). Participants are more likely to be married, male, be the head of the household, and to be born in the place they live (Schady 2001). These characteristics may be correlated with attachment to community, making them more willing to invest in their social environment.

These findings are backed up by my interviews. When asked why people did not participate in community organisations, respondents cited machismo, infighting, opportunity costs and family priorities as barriers to participation. Opportunity costs and family priorities were frequently cited as barriers to participation, with those with jobs and children having more demands on their time. The Glass of Milk Programme was considered particularly time-consuming by respondents in the shantytowns where the time required to help prepare the milk was not worth the single portion of milk for each of her children that the woman received in return for her labour. While women with several children received more portions of milk for the same amount of work, the opportunity costs for mothers with only one or two children were considered unacceptably high and these mothers often said they did not participate in the scheme. My results are backed up by Portocarrero's (2001) survey in urban Peru which showed lack of time, working, and other priorities to be the most frequently cited barriers to participation. Thus while participating in community organisations is widespread in both rural and urban areas, and makes a significant contribution to Peruvian social capital, barriers to participation mean that not every one in the community is able to participate.

6.4.2 Gendered participation

In my interviews women from both rural and urban areas felt that some husbands discouraged their wives from participating in community projects as they felt a woman's place was in the home. While many respondents recognised that attitudes were changing, access to and participation in structural social capital remains highly gendered.

For example, while both men and women volunteered, the activities they volunteered for were different. Schady (2001) found that in rural areas men were two times more likely to volunteer for farming activities than women, while activities related to feeding programmes were much more common among women. My qualitative interviews also highlight differences in spheres of participation between men and women. Men from both rural and urban areas participated more than women in sports groups, communal works and self-defence committees, and were also more likely to serve as community leaders. Women were more involved in food programmes such as Communal Kitchens and the Glass of Milk Programme, as well as in activities related to children. However in contrast to the study by Schady (2001) where men were more likely to participate, respondents felt that overall women participated more than men in community activities as the largest groups in the community were feeding programmes which are almost exclusively the domain of women.

Anderson (2000) argues that the changing attitudes towards the role of women in Peru over the last two decades has encouraged female empowerment and involvement in their communities, thereby increasing their contribution and access to structural social capital. However, prevailing traditional power structures means that linking social capital is still largely accessed by men. This means that aggregating largely female social capital to the community level may underestimate the total amount of linking social capital in a community. In a qualitative study of the changing roles of women in Leoncio Prado (a shantytown in Lima) between 1978 and 1992, Anderson (2000) reports that the increasing participation of women in community food distribution programmes led to increased female autonomy and empowerment. According to Anderson, by 1990 nearly all men had accepted that women could be community leaders, however inequalities remained in the prestige conferred to men and women. The leadership roles that the women took up such as president of the Glass of Milk

Programme or of the Community Kitchen were often difficult and resulted in little recognition. The additional stresses that women in leadership roles face may help to explain some of the negative findings where participation in groups is associated with worse mental health. These findings are corroborated by my qualitative interviews. Many respondents recognised that women now participate in the previously male arenas of sports groups and community leadership, and also that macho ideas of female roles are changing. However they also recognised that access to social capital remains gendered, as do the benefits derived from participation.

6.4.3 Changing participation over time

The founding of shantytowns in Lima provides an interesting case study illustrating how attitudes to participation and cognitive social capital can change over time as a result of changing community contexts. Anderson (2000) outlines the phases in the establishment of Leoncio Prado, starting with initial squatting on unimproved land far from services fed by migration from rural areas. The intermediate stage involved political struggle and self-help in order to obtain basic services, resulting in a normal, if poor, urban neighbourhood. Anderson describes the process as *“the shanty community consolidating itself, socially, and physically, through internal organizing efforts and through accessing resources from a wide variety of individual institutions”*. Shantytown establishment can therefore be seen as a process of building social capital.

My interviews allow an examination of characteristics of social capital at different stages of shantytown development. In the recently established areas in Huaycàn, participation in community projects was almost universal with residents having to pay a fine if they did not participate in communal works such as road building or laying drains. Respondents reported feelings of ownership, a sense of solidarity and generally good social relations between neighbours. As one resident said, *“The suffering that we went through makes it feel like our place”*.

Anderson (2000) reports that in Leoncio Prado, as the basic services such as water, electricity and roads were acquired and the reasonable aspirations of residents met, residents turned inwards towards their growing families. She reports that *“people’s feelings of welfare depended less on the community and more on the household’s*

fortunes". Conflict and factionalism increased making new projects harder to implement, accusations of corruption and poor leadership grew, and the supply of volunteer labour fell dramatically.

These findings are reflected clearly by the respondents from more established areas who had little faith in the ability of community leaders to change things, and confessed to being more concerned with their own family than with their community. Preoccupations with gossiping and infighting meant relations with neighbours were sometimes strained. Yet people harked back to the 'good old days' when they founded the community, people worked together and goals were achieved. As one father commented, "*There was trust when we made the roads. But from then on we had problems. People now say if you want something done do it yourself*". This declining cognitive social capital may inhibit access to structural social capital by weakening links with community leaders and other individuals who are gatekeepers to resources that can help people to 'get ahead'. It can also limit access to bonding social capital by weakening links between neighbours who could provide an additional source of social support to help people 'get by'.

These findings highlight the contextual nature of social capital. Residents are spurred to action by external circumstances in their community (such as the need to establish basic services), while personal factors such as other commitments and gender determine the extent and sphere of participation. A change in either external or internal circumstances (for example the community becoming established or having children) ensures that participation and access to structural social capital remains a dynamic process.

6.5 Discussion

6.5.1 Discussion of results

The diverse types of social capital explored here clearly illustrate that it is a multi-dimensional concept. Structural, cognitive, bridging, bonding and linking social capital all make an important contribution to stocks of Peruvian social capital. An analysis of the ways that these different forms of social capital inter-relate in Peru contributes to theoretical debates. For example, Woolcock's (2000) distinction

between 'getting by' and 'getting ahead' seems simplistic when compared to the complex roles that the same organisation can play in people's lives. In addition, the complex relationship between cognitive and structural social capital whereby shared norms and values influence the nature and extent of networks makes it unlikely that one is a simple consequence of the other as Putnam has argued (1993), but that the two are mutually reinforcing.

The contribution that different organisations and networks make to different aspects of social capital varies by setting (rural/urban), person involved (male/female), and over time. Clear differences in the composition of social capital in Peru occur between the rural highlands and the coastal largely urban areas. Different organisations are important in different areas, and the same organisations make different contributions to social capital in the different settings. Differences are also evident between the social capital of men and women. While the last 20 years have seen increasing female empowerment and involvement in community development projects, the principal spheres of involvement for men and women are still very different. While men are more likely to hold positions of power and prestige within the community, women carry the burden of implementing large scale food distribution programmes which are time-consuming and confer less prestige. Social capital can change with time. For example, community organisations contribute more to the stock of social capital during the establishment of a shantytown, but become increasingly less important after basic services are acquired as people turn for support to their growing families rather than to their communities.

Despite these cultural specificities, common patterns are evident. While the actual organisations important in rural and urban areas may differ, the role that these different organisations play can be very similar. For example, women's groups in shantytowns serve to strengthen bonding social capital, while *peonadas* serve the same purpose in rural areas. However, it is cognitive notions of trust, shared norms and values that form the unifying thread across areas, expressed in a strong sense of the importance of bonding social capital between family, friends and neighbours characterised by high levels of trust and reciprocity.

6.5.2 Methodological limitations

This chapter is not a comprehensive review of the nature of social capital in Peru but a first attempt at synthesising what is already known, supplemented by additional qualitative interviews. Areas that require more investigation include the contribution of religious organisations and NGOs to social capital, and more analysis of the quality of the relationships formed by Peruvian networks and organisations (cognitive social capital).

6.6 Next steps

The deeper understanding of the nature of social capital in Peru gained from this chapter will be used in the next chapter to generate and test hypotheses about the determinants of social capital in Peru using the YL data. These results, combined with those of this chapter and Chapter 5, will be used to aid interpretation of a further analysis of the association between social capital and maternal CMD presented in Chapter 8.

7. Determinants of social capital in Peru

In this chapter I use the results presented in Chapters 4 and 5, combined with the exploration of the nature of social capital in Peru (Chapter 6) to generate hypotheses about the determinants of ISC in Peru. I test these hypotheses in a multi-variable, multi-level analysis of the determinants of each type of social capital in Peru using data from the Young Lives (YL) study. Exploring the determinants of social capital enables us to understand how it forms and therefore how it might be created and maintained in specific interventions designed to improve mental health. These issues will be explored further in the discussion chapter to this thesis (Chapter 9). The results from the present chapter, combined with a deeper understanding of social capital in Peru (Chapter 6) and the results of the validation of the social capital tool (Chapter 5), will be used to aid interpretation of the more detailed analysis presented in Chapter 8 of the association between social capital and CMD in Peru.

7.1 Chapter objectives

1. Investigate the determinants of each aspect of individual social capital in Peru.

7.2 Hypotheses

Based on the results presented in Chapters 4, 5 and 6, I generated the following hypotheses regarding the determinants of ISC. They are not intended to be a comprehensive list of all hypotheses regarding the determinants of social capital, but represent the hypotheses generated from the results of this thesis so far.

Determinants of individual structural social capital

- A. Whether an individual participates in a group or in civic action is determined by need (the presence of problems that need to be solved) and by enabling factors (for example age, sex, residential stability), and is limited by other commitments (for example work and family).
- B. Bonding social capital is more common among poor people, while bridging and linking social capital is accessed more frequently by wealthier people.

Determinants of individual cognitive social capital

- C. Demographics such as age, sex and ethnicity do not determine levels of cognitive social capital.
- D. The greater inter-dependence of people in rural areas means that cognitive social capital is higher in rural than in urban areas.
- E. Community problems such as political corruption and neighbourhood disorder limit cognitive social capital.

Association between cognitive and structural social capital

- F. Structural and cognitive social capital are mutually reinforcing.
- G. Levels and types of both cognitive and structural social capital change over time according to changes in external context and personal circumstances.

All but one of these hypotheses will be tested with a multi-variable multi-level analysis of the determinants of ISC using the YL data from Peru. Unfortunately changing levels of social capital over time (Hypothesis G) cannot be tested as only cross-sectional data are available at present.

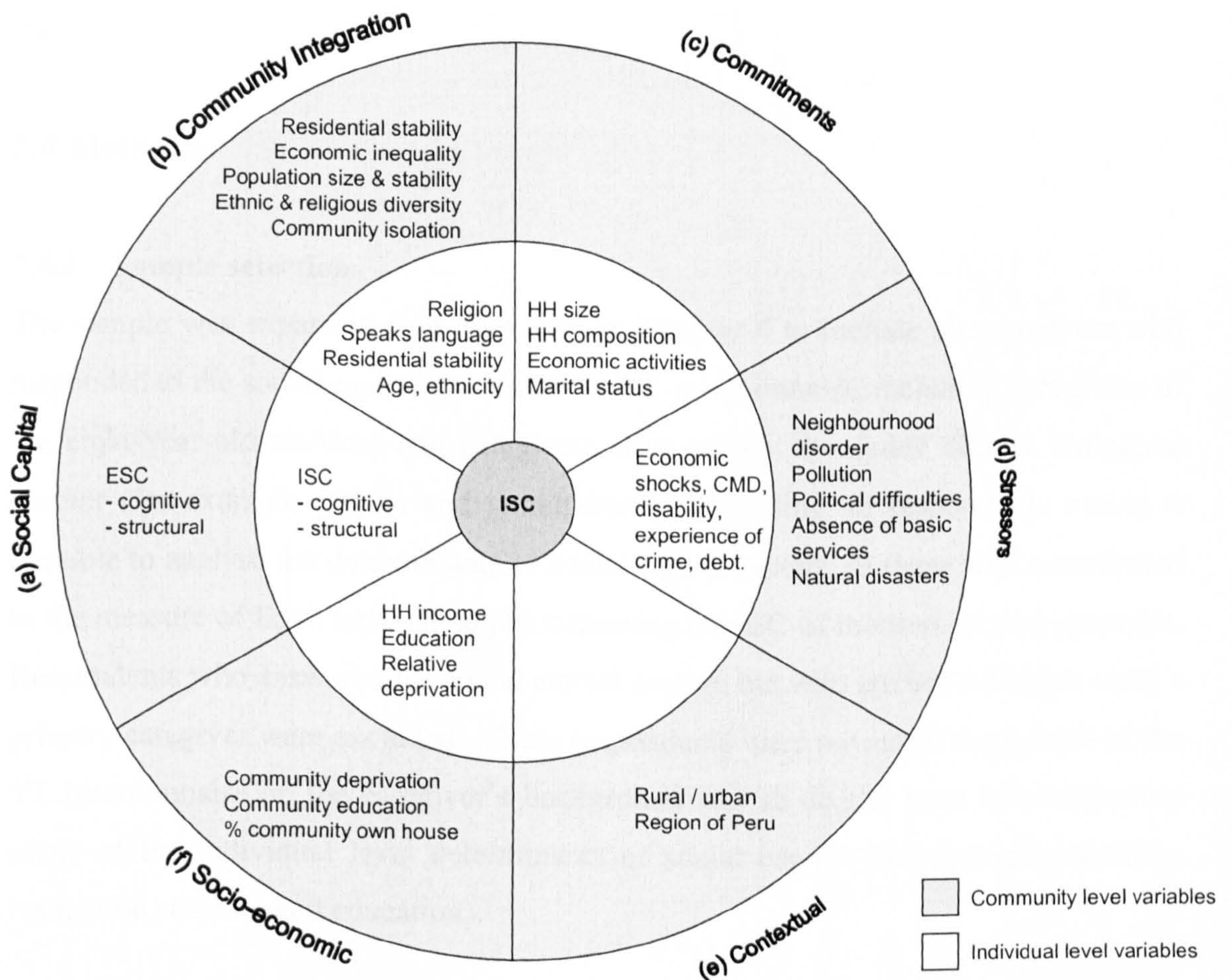
7.3 Conceptual framework of determinants of ISC

In order to test Hypotheses A to F, I developed a conceptual framework based on the results presented in Chapters 4, 5 and 6 (Figure 7.1). The potential determinants of ISC are divided into six groups operating at both the individual and the community level: (a) other types of social capital; (b) community integration; (c) commitments; (d) stressors; (e) contextual factors; and (f) socio-economic factors. By including both individual and community predictors, the framework recognises that an individual's stock of social capital is influenced by contextual factors in the community as well as by their own personal characteristics.

The six groups of potential determinants fall into three categories. The first category comprises factors which are hypothesized to foster social capital by enabling individuals to participate, or which are hypothesized to increase levels of cognitive social capital by improving social relationships ((a) other types of social capital and (b) community integration). Factors which may increase community integration such

as residential stability and ethnic and religious homogeneity (Putnam 2003) are hypothesized to lead to improved social relationships (cognitive social capital) and to facilitate participation in structural social capital. Different aspects of social capital may also foster other types of social capital as shown by the reciprocal relationship between trust and participation (Putnam 1993, Brehm and Rahn 1997).

Figure 7.1: Conceptual framework for determinants of ISC



The second group includes factors which are hypothesized to limit social capital ((c) commitments and (d) stressors). For example, having commitments such as a number of dependent children or a job may reduce the time available for participation. Similarly, the presence of stressors such as neighbourhood disorder and corruption in local authorities may alienate community members and reduce cognitive social capital (though these stressors may also force people to join together to solve problems). CMD is included as a potential determinant of social capital as it is plausible that being depressed or anxious may limit an individual's access to social capital.

The third group comprises factors which are hypothesized to have either negative or positive effects on social capital depending on the circumstances ((e) contextual and (f) socio-economic factors). For example, living in a rural community may result in higher levels of cognitive social capital, but may limit opportunities for social participation as there may be fewer community groups. In addition, being poor may limit access to bridging social capital, but increase access to bonding social capital (Woolcock 2000). These classifications, though necessarily simplistic, provide a framework within which to begin exploring the determinants of different aspects of ISC.

7.4 Methods

7.4.1 Sample selection

The sample was expanded from that used in Chapter 4 to include all caregivers who responded to the social capital section of the YL questionnaire, including caregivers of the eight-year-old children and caregivers who are not the index child's biological mother (for example fathers and grandparents). Including all respondents makes it possible to analyse the determinants of social capital among all those who contributed to the measure of ESC, rather than just exploring the ISC of mothers of one-year-olds. Respondents who answered the social capital section but who are not the index child's primary caregiver were excluded. These respondents were not asked the section of the YL questionnaire on the caregiver's background and so do not have information on many of the individual level determinants of social capital (for example ethnicity, residential stability and education).

7.4.2 Measurement of variables

Variables were coded in the same way as for the analysis presented in Chapter 4. In addition to those variables described in sections 3.3 to 3.5, a number of new variables from both the community and the household questionnaire were used.

There are several variables identified in the conceptual framework (Figure 7.1) which, although measured by the community questionnaire, were not suitable for analysis due to high levels of missing or inconsistent data. Variables unavailable for analysis comprise: community isolation, the existence of community development

programmes, the ethnic composition of the community, natural disasters which have affected the community and the presence of basic services. Table 7.1 lists all the variables used in the analysis and Table 7.2 shows the coding of the additional variables not used in the analysis presented in Chapter 4 (these are identified in Table 7.1 by an asterisk).

Table 7.1: Variables included in analysis of determinants of social capital

Socio-economic status	Stressors
<i>Individual level</i>	<i>Individual level</i>
* Household poverty group	Household debt
* Respondent's education level	# economic shocks suffered by household
Respondent owns their house	Respondent has been a victim of crime
Self assessment of socio-economic status	CMD
<i>Community level</i>	<i>Community level</i>
Community deprivation level	* Neighbourhood disorder
Proportion of community that owns their house	* Problems with pollution in community
Proportion of community that has completed primary education	* Community legally recognised
	* Political problems in community
Community integration	Contextual
<i>Individual level</i>	<i>Community level</i>
Sex	Rural/urban
Age	Region of Peru
Speaks major language in community	
Religion	
Ethnicity	
Proportion of life lived in community	
<i>Community level</i>	Social capital
* Community economic inequality	<i>Individual level</i>
Residential stability	Member of community group
Community population stability	Support from individuals
Community population size	Talked to authorities
	Joined with others to address a common problem
	Trust
	Social harmony
	Sense of fairness
Commitments	<i>Community level</i>
<i>Individual level</i>	% community member of group
Household size	% receive support from individuals
# of kids in household	% talked with authorities
# of adults in household	% generalized trust in community
Marital status	% social harmony in community
Respondent is head of household	% sense of belonging in community
# economic activities done by respondent	% sense of fairness in community
Respondent has long term limiting illness	
* Member of household has long term limiting illness	
* Household helps with childcare	
* Child goes to child care facility	

* New variable not included in analysis presented in Chapter 4. Coding of this variable described in Table 7.2.

Table 7.2: Coding of variables included in analysis of determinants of social capital

Coding	
<i>Socio-economic variables</i>	
Household poverty group	Sum of per capita household income from five sources: paid employment, social security, rental income, private sources such as NGOs and friends and family, and other sources. Total income divided by number of people in the household and each household categorized as extremely poor, poor or non-poor based on local poverty lines designated by the Peruvian Office for National Statistics (INEI).
Member of household has a long term health problem that limits their daily activities	Yes/No
Community deprivation	Per capita household income from all respondents aggregated to the community level and communities classified as extremely poor, poor and non-poor based on the criteria used for household socio-economic status outlined above.
Community economic inequality	Gini coefficient calculated for each community based upon the per capita household income of all the sampled households in each community, using the methods outlined in section 3.5.1.
<i>Biological risk factors</i>	
Most recent pregnancy was medically difficult	1 = Good/average 2 = Poor/bad
Child goes to childcare facility	Yes/No
<i>Stressors</i>	
Victim of crime	Yes = Victim of a theft or robbery, or suffered threats to inheritance or land rights in the last 3 years No = Not been a victim of crime in last 3 years.
Neighbourhood disorder*	Community classified as few problems, (none to two problems), some problems (three or four problems), and many problems (five or more problems) if it suffers from a range of social disorders including theft, violent crime, youth gangs, prostitution and if community divisions are a problem in the community.
Problems with pollution in the community*	Community classified as having no problems, some problems, and severe problems if it suffers from air, water, noise, and industrial waste pollution.
Community legally recognised by the state*	Yes/No
Political problems in the community *	Yes = Community has suffered from one or more of the following in the last 5 years: a Mayor or local authority been the victim of assassination, been charged for corruption, or lost office because of corruption. No = Community has not suffered from political problems in the last 5 years.

* Variable collected in community questionnaire

7.4.3 Model formulation

Separate models were fitted with each type of ISC (group membership, support from individuals, citizenship and cognitive social capital) as the outcome variable. For cognitive social capital, the components of the variable (namely trust, social harmony, sense of belonging and sense of fairness) were modelled rather than the composite cognitive social capital score in order to explore whether determinants differed between different aspects of cognitive social capital. For group membership and support from individuals, determinants of both the binary and continuous versions of the variable were explored; for example the determinants of whether or not a respondent was a member of a group were modelled as well as the determinants of the number of groups the respondent belonged to.

The following procedure was used to select the final list of determinants for each type of social capital:

1. Bivariate associations between each aspect of social capital and all potential determinants (listed in Table 7.1) were explored using Generalised Estimating Equations (GEE) with robust standard errors to account for the multi-level structure of the data. Logistic regression models were fitted for binary social capital variables (for example trust yes/no), and linear regression models were fitted for continuous outcomes (for example the number of groups the respondent was a member of).
2. All potential determinants which were significantly associated with a social capital outcome ($p < 0.1$) were entered simultaneously into a GEE model.
3. Backwards selection of variables (manual) was used to determine the final list of determinants (described in full in section 4.2.4). Briefly, a Wald test was used to assess the contribution of each variable to the model. The variable which made the least significant contribution at each stage was dropped and the model re-fitted until only variables which made a significant contribution ($p < 0.1$) remained. Due to the highly correlated nature of some of the variables, the most distal of a set of correlated variables was excluded first (for example region or rural/urban), retaining the most proximal determinants (for example community level deprivation).
4. This final set of determinants was then fitted in a three-level (individual, community, cluster) GLLAMM model.

Due to the exploratory nature of this analysis and the large number of variables tested as potential determinants (some of which are highly correlated), a less stringent statistical test was used for variable selection ($p < 0.1$ rather than $p < 0.05$). As only 1% of sample members are male, analyses estimating the effect of sex as a potential determinant lack power. Sex was therefore included as a determinant of social capital if significant in bi-variate rather than multi-variable analyses. As CMD was only measured for the caregivers of the one-year-old children ($n=2051$), a separate model including just this sample was fitted to explore whether CMD is a determinant of social capital.

7.5 Results

7.5.1 Description of sample

In total 2765 respondents answered the social capital section of the YL questionnaire. 175 of these were not the index child's primary caregiver and were excluded. The majority of these (130) were the child's father, and the remainder were grandparents (24), siblings (8), uncle or aunt (6), or the child's mother (7). The final sample for the multivariable analysis is therefore 2590. The full sample of 2765 was used in the bivariate analyses to assess whether sex is a determinant of social capital, and the sample of 2051 caregivers of one-year-old children used in multi-variable analyses exploring whether CMD is a determinant of social capital.

The major features of the sample are described in Table 7.3. Nearly all sample members are female and the biological mother of a child aged one or eight years old. One in ten is a teenage mother, and three quarters of the households are poor, with two thirds of these classified as living in extreme poverty. Over 90% have received some level of education, and two thirds live in urban areas.

Table 7.3: Description of sample for determinants of social capital analysis

		% n=2590
<i>Sex</i>	Male	1
	Female	99
<i>Age</i>	<20	9.4
	20-29	48.1
	30-39	32.2
	40+	10.3
<i>Relationship to index child</i>	Mother	97.7
	Father	0.5
	Grandparent	1.2
	Other	0.6
<i>Household poverty group</i>	Extreme poverty	50.5
	Poor	26.3
	Non-poor	23.2
<i>Education level</i>	No education	8.2
	Primary	36.6
	Secondary/middle school	40.1
	High school/further education	15.1
<i>Community context</i>	Rural	30.8
	Urban	69.2

7.5.2 Determinants of ISC

The exploratory nature of these analyses means that emphasis should not be placed on the statistical significance or size of the effect estimates. Instead, I use diagrams to illustrate the hypothesized relationship between the different correlates of each type of social capital based on the results of the exploration of the nature of social capital in Peru (Chapter 6). These diagrams are not meant to imply causality (which cannot be determined from cross-sectional data), but to act as illustrations of hypotheses supported by exploratory quantitative analyses. The full statistical results are presented in Appendix E.

Group membership

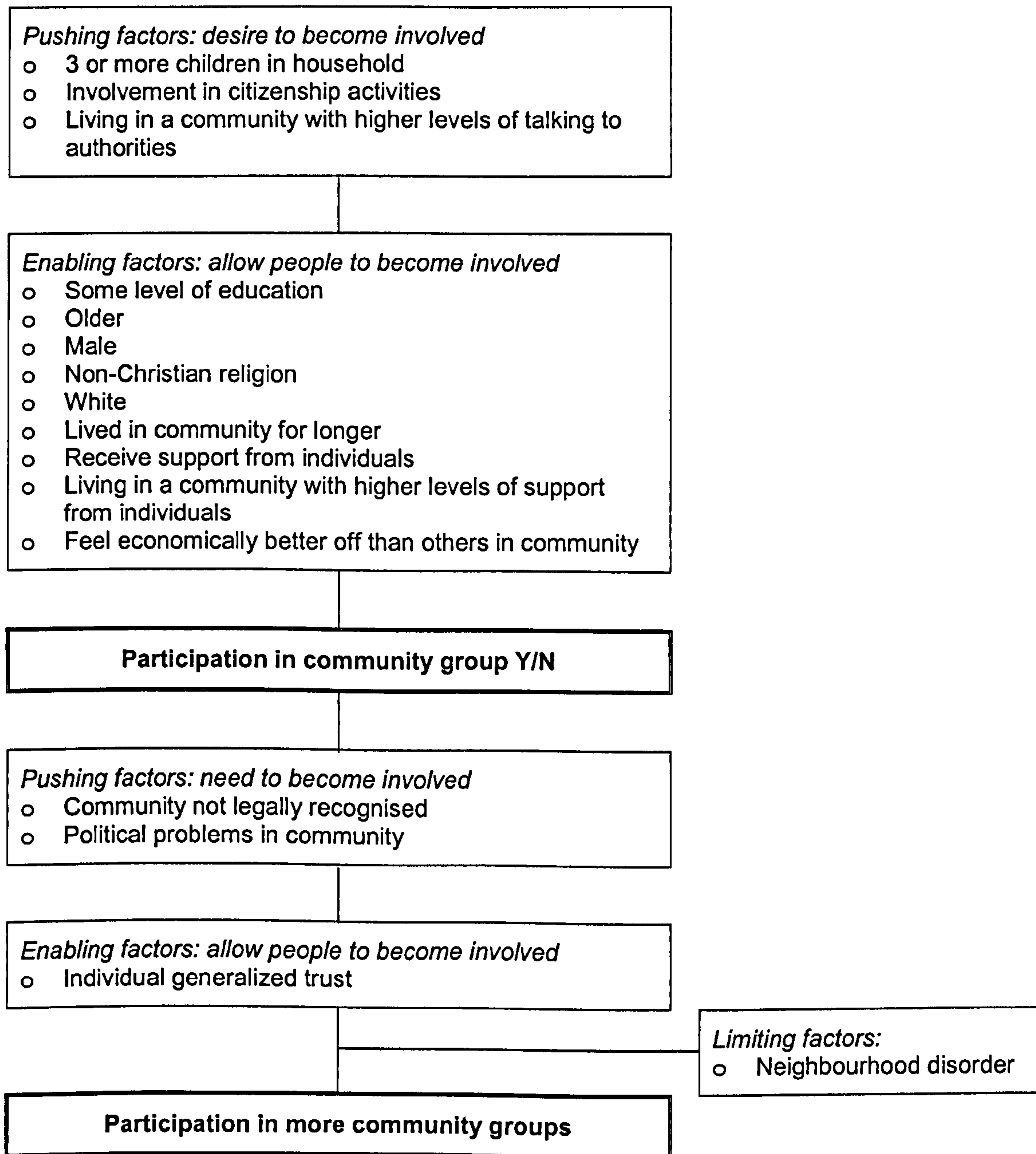
Figure 7.2 is a visual display of the results of the analyses exploring the potential determinants of individual group membership (full statistical results are presented in Table E.1 in Appendix E). Potential determinants which are significantly associated with group membership are grouped in Figure 7.2 according to the type of determinant I hypothesize them to be, based on the results of Chapter 6. In the case of group

membership these comprise factors which push people to participate such as corruption in the community, enabling factors which allow people to participate such as higher education level, and limiting factors which restrict participation such as neighbourhood disorder. Those factors associated with whether a respondent is a member of a group or not are explored first, followed by the additional factors associated with the extent to which a respondent is involved.

The results (Figure 7.2) largely confirm the analysis presented in section 6.4. Respondents who are members of a group are more likely to be educated, older and male, to perceive themselves to be economically better off than their neighbours, and to have lived in their community for longer. These factors may be associated with higher community attachment. However, the barriers to participation such as family commitments and infighting mentioned by respondents in my interviews (section 6.4.1) do not come out as strong correlates. Instead, enabling factors such as receiving social support and living in a community with high levels of support are more important. This suggests either that these barriers to participation can be overcome given adequate support, or that participation results in increased levels of social support. In terms of limiting factors, only higher levels of neighbourhood disorder are associated with being a member of fewer groups, perhaps by deterring participation through detachment from the community or by promoting a fatalistic view that nothing can be done to solve the problems.

In addition to the factors associated with being a member of any group, a number of additional factors are associated with increased membership of more than one group. Interestingly, no indicator of cognitive social capital is associated with whether or not a person is a member of a group, though higher levels of trust are associated with increased levels of group membership. Political problems such as corruption and living in a community that is not legally recognised are correlates of increased involvement, and can be viewed as factors pushing residents to become involved in order to resolve the problem.

Figure 7.2: Determinants of membership of community groups

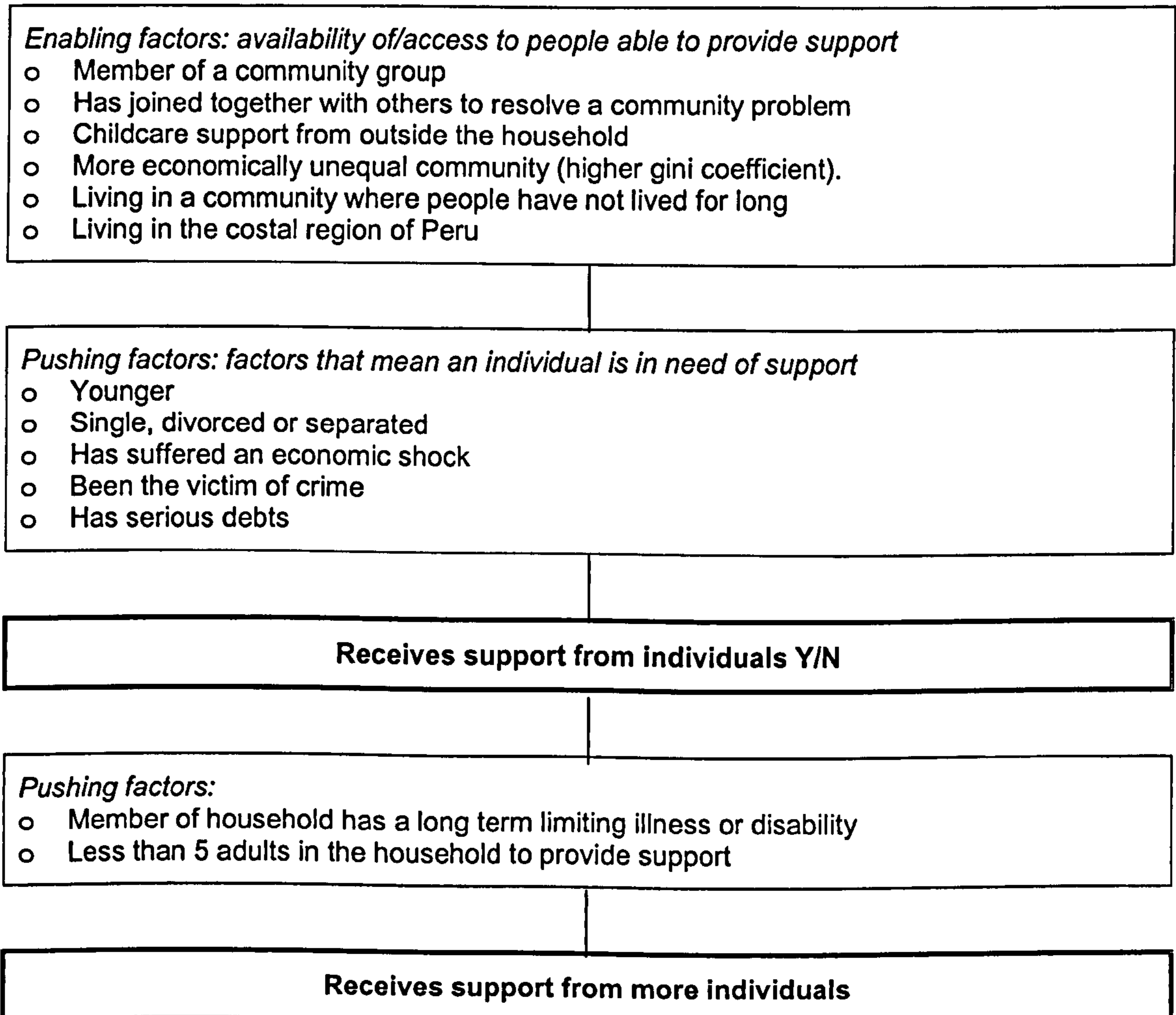


Support from individuals

Receiving support from individuals is associated with the availability of and access to people in the community to provide support, and also with the extent of the need for support (Figure 7.3, Table E.2). Factors capturing the availability of support include childcare facilities outside the household and living in a community with higher levels of economic inequality, perhaps indicating the presence of people able to provide assistance. Access to individuals to provide support is also important, and interestingly other forms of structural social capital (participation and citizenship)

seem to provide important forums through which residents can meet other people and access support.

Figure 7.3: Determinants of support from individuals



Whether an individual receives support or not is also associated with the extent of the need for support. Factors such as being a younger and perhaps less experienced caregiver, being unmarried, suffering economic shocks, having been the victim of a crime and having serious debts all characterise individuals in need of support. Few additional factors are associated with how much support an individual receives, though additional stressors such as having a member of the household with a long term limiting illness and having fewer adults in the household to share the burden of child care are both associated with increased levels of support.

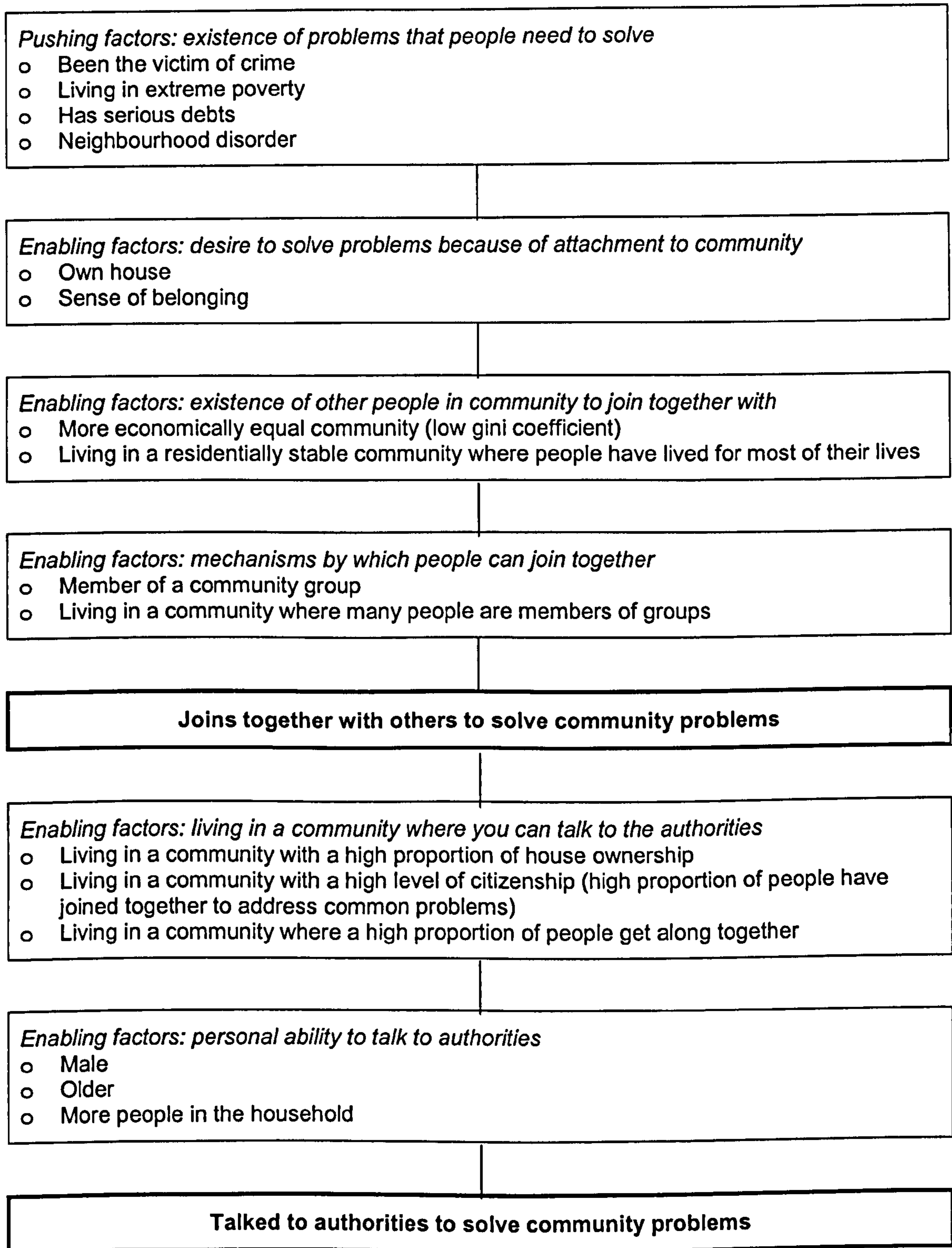
Citizenship

Of all the forms of social capital, citizenship has the largest number of determinants (Figure 7.4, Table E.3). As talking with the authorities rarely took place unless the individual had already joined together with others in the community, joining together was treated as the initial stage of civic action, with talking to the authorities a much less common secondary stage. Pushing factors associated with involvement which may spur residents to become involved in civic action include living in extreme poverty, having serious debts, having been the victim of crime, and neighbourhood disorder.

As well as having a reason to get involved, a number of enabling factors are associated with whether or not people join together with others or talk to the authorities about the problem. These comprise level of attachment to the community (home ownership and sense of belonging), the existence of other people in the community to join together with (residential stability and living in a more economically equal community), and the existence of mechanisms through which people can join together or talk to authorities (member of a community group and living in a community where many residents are members of groups).

Additional factors associated with talking to the authorities include living in a community where this is acceptable (high level of citizenship in community and living in a socially harmonious community). In addition, demographic characteristics such as being older, male and having more people in the household, may provide the social status which enables an individual to talk to the authorities.

Figure 7.4: Determinants of involvement in citizenship

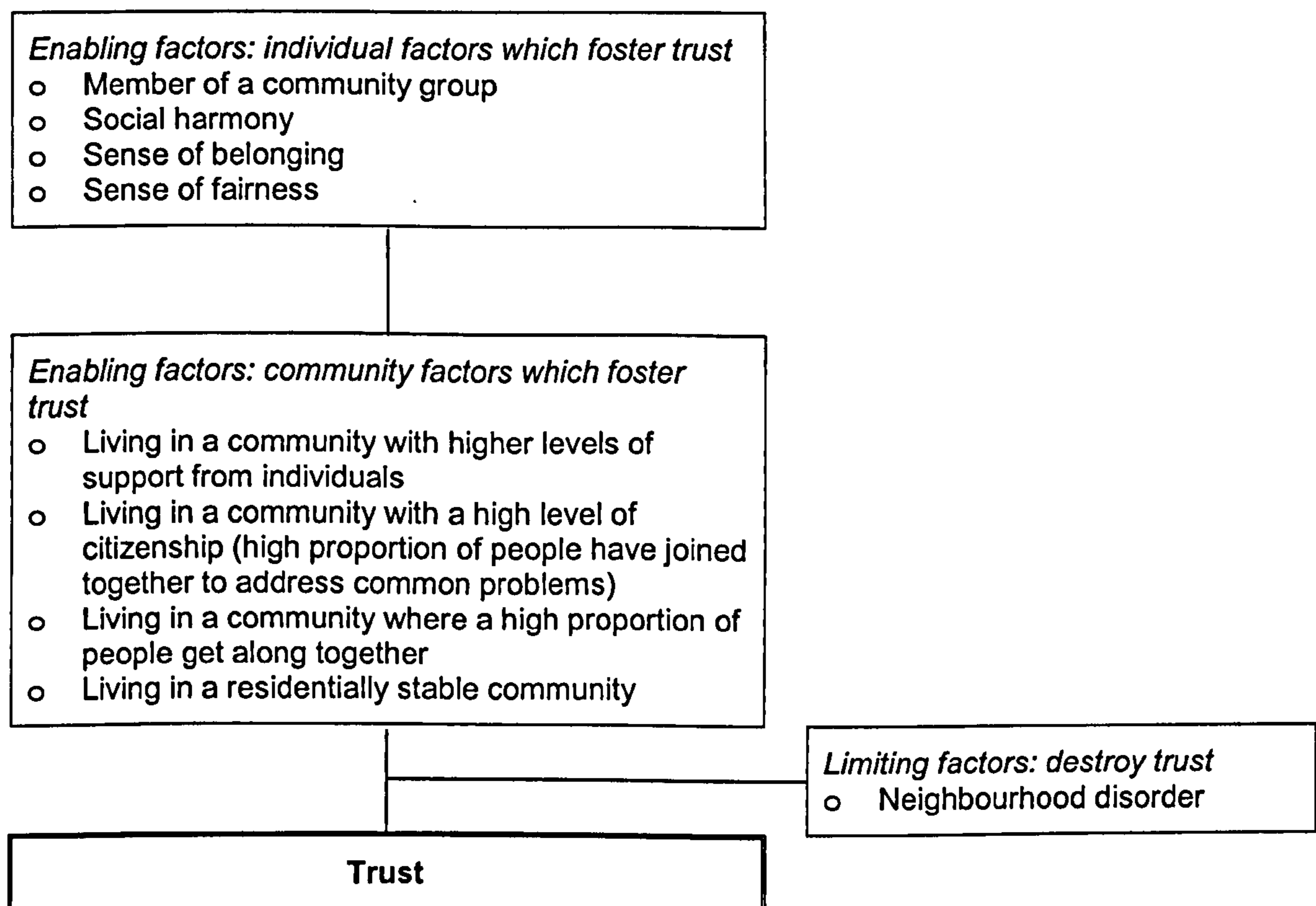


Cognitive social capital

Fewer factors are associated with levels of cognitive social capital than are associated with structural social capital. In particular, no demographic characteristics are associated with any aspect of cognitive social capital. The correlates of individual cognitive social capital fall into two groups: individual and community factors which

foster it and limiting factors which restrict it (Figures 7.5 – 7.8, Table E.4). The most important factors associated with increased levels of cognitive social capital are high levels of the other individual cognitive social capital variables, with all four variables significantly associated with each other. High levels of some aspects of community level cognitive social capital are also associated with individual cognitive social capital. For example, living in a community where a high proportion of residents get along together is associated with higher levels of individual trust (Figure 7.5), while living in a community with higher levels of trust is associated with an increased sense of belonging (Figure 7.7).

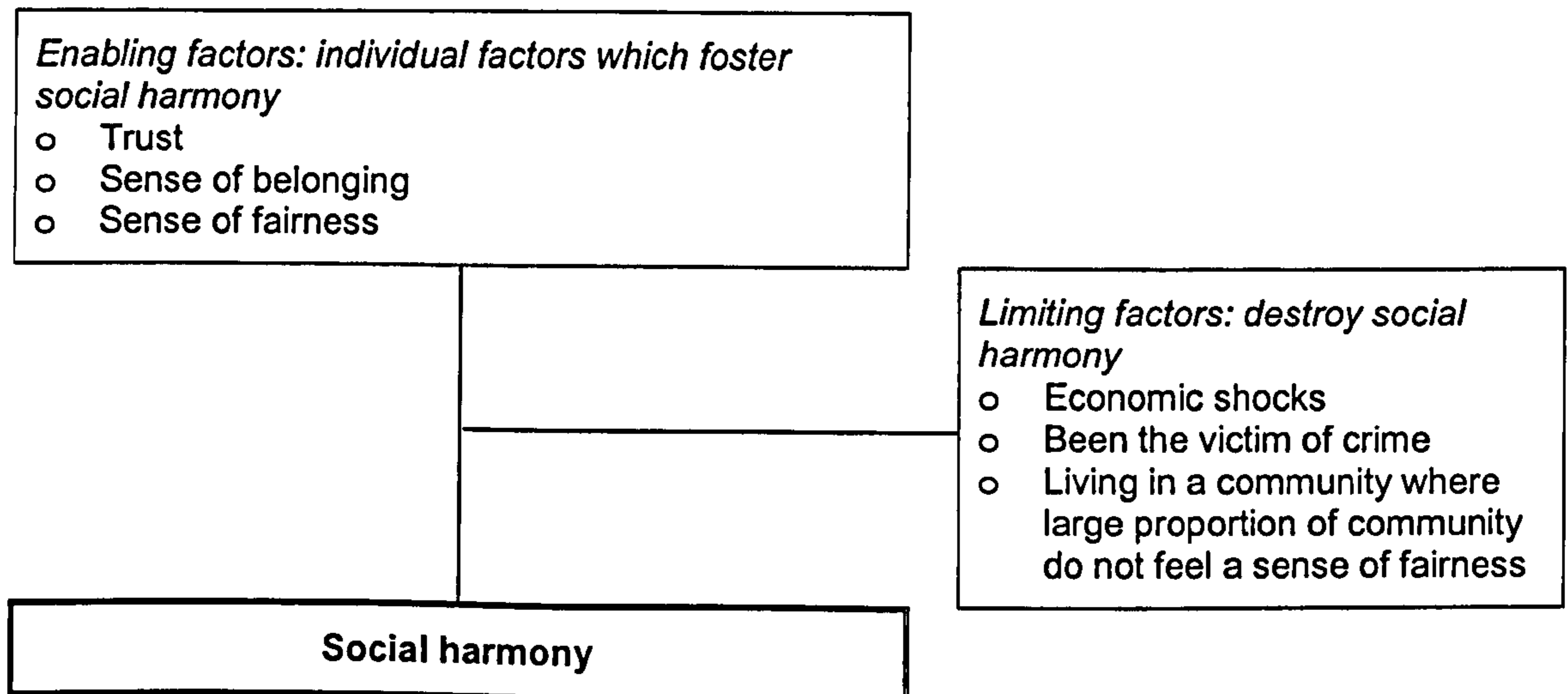
Figure 7.5: Determinants of trust



High levels of some aspects of individual and ecological structural social capital are also associated with higher cognitive social capital. For example, individual involvement in citizenship activities is associated with an increased sense of fairness and sense of belonging, while support from individuals is associated with an increased sense of fairness. Mirroring the results of Figure 7.2, group membership is associated with higher levels of individual trust. Community levels of structural social capital are also associated with individual cognitive social capital. In particular, living in a

supportive and civically active community is associated with increased levels of generalized trust (Figure 7.5). The only other factors associated with high levels of cognitive social capital are residential stability at both the individual level (sense of belonging) and at the community level (trust and sense of fairness).

Figure 7.6: Determinants of social harmony



A number of limiting factors are associated with lower levels of cognitive social capital. Sense of fairness and social harmony have similar correlates centring around personal problems such as having been the victim of crime and suffering economic shocks. Both these factors may make people feel that they have been taken advantage of and therefore limit their ability to get on with others. Indeed, living in a community where a large proportion of people feel that other people would take advantage of them if given the chance is associated with not feeling part of the community. A sense of fairness is also inversely associated with other personal commitments which may mean that an individual is over-stretched, for example being a bread-winner as well as a caregiver, and being a member of a community group. In contrast, limiting factors for trust and sense of belonging are related to contextual rather than individual factors such as neighbourhood disorder and pollution. Both are associated with living in a less desirable environment which may reduce people's attachment to their community and also reduce levels of trust as they see other people not treating their community with respect. Importantly, CMD is a limiting factor for sense of belonging and fairness, but not for trust or social harmony, or for any aspect of structural social capital (sample limited to caregivers of one-year-old children only), indicating that

reverse causality whereby CMD leads to lower levels of social capital may be less of a problem in this dataset than previously feared (section 4.5).

Figure 7.7: Determinants of sense of belonging

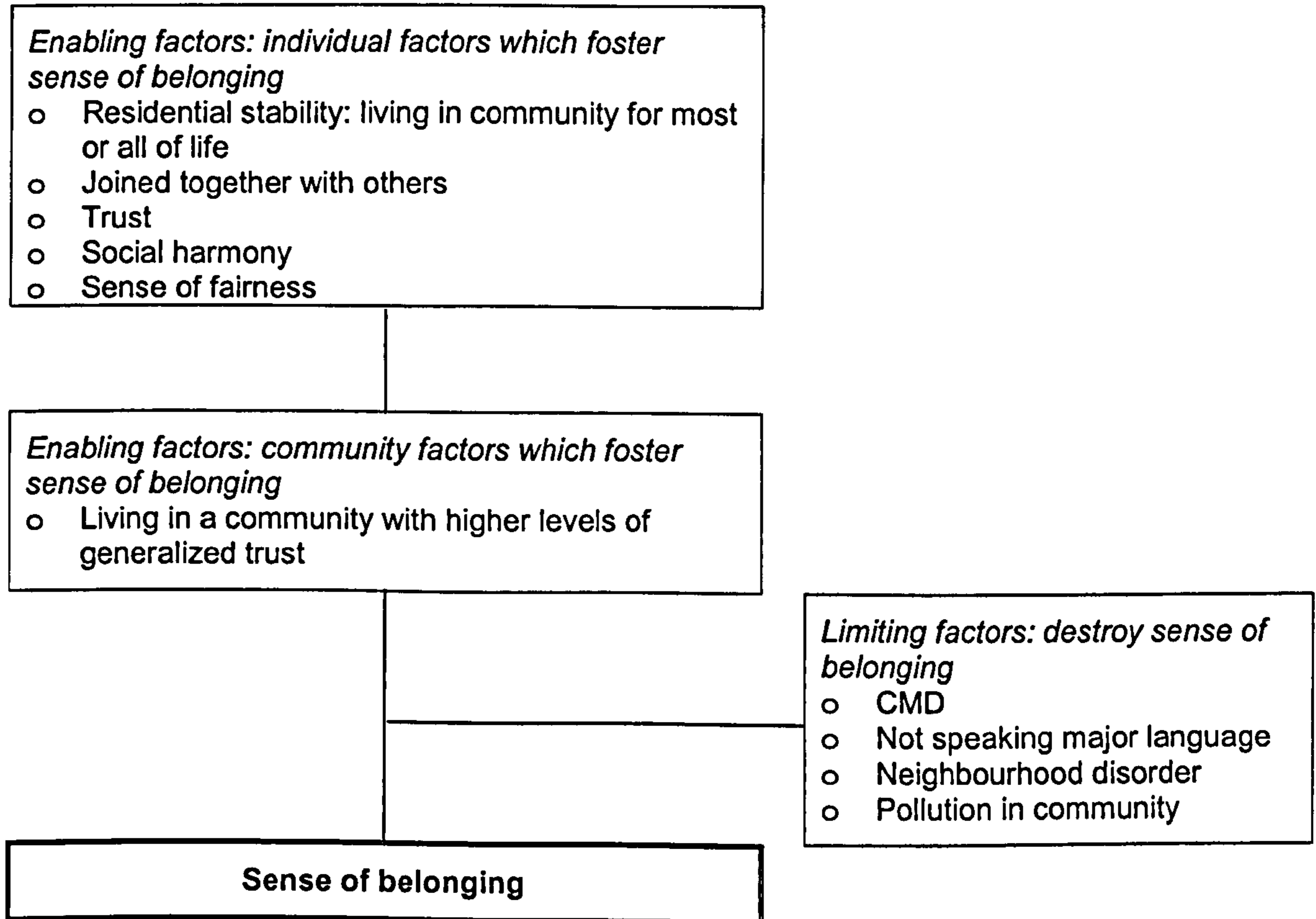
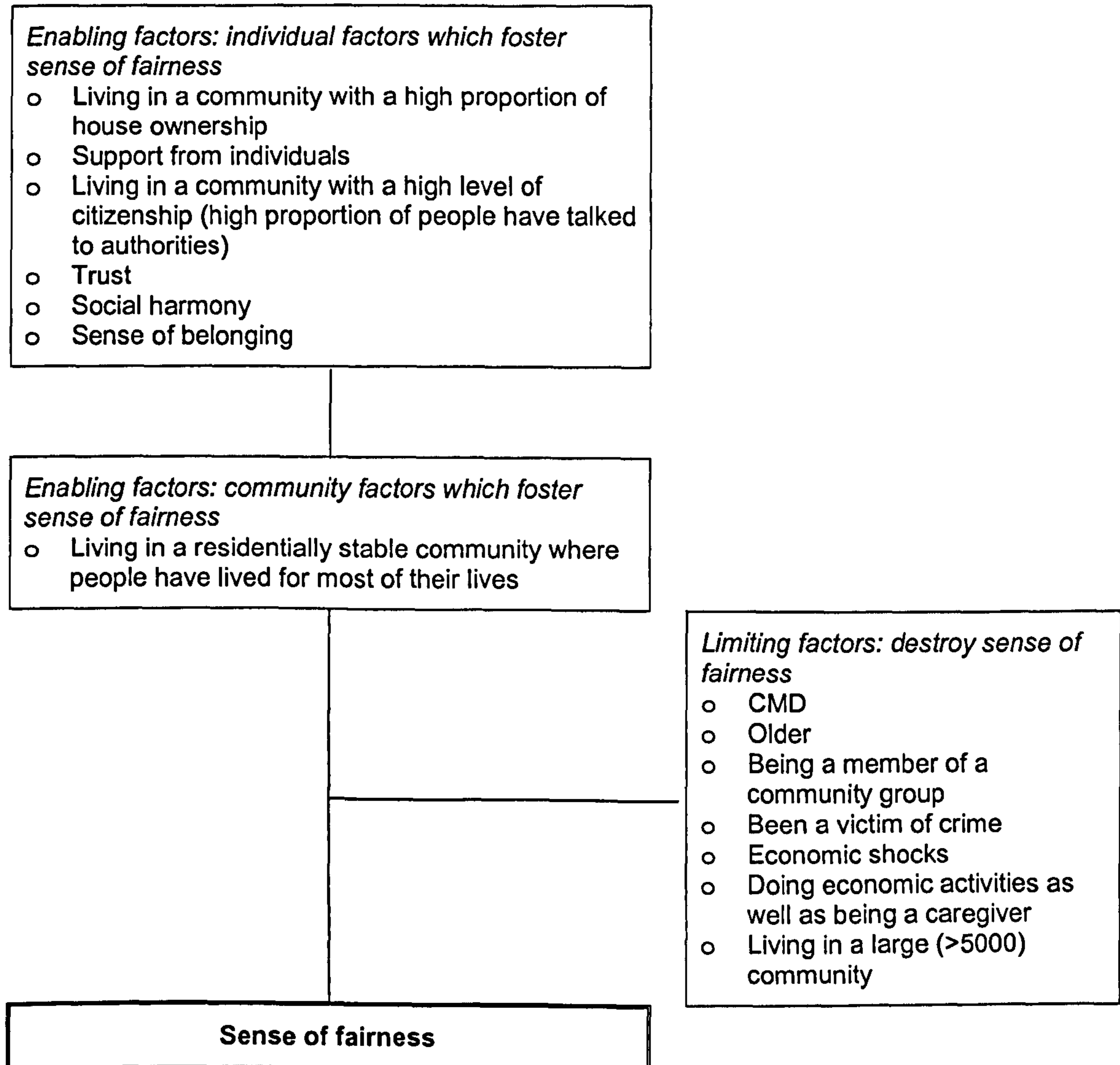


Figure 7.8: Determinants of sense of fairness

7.6 Discussion

7.6.1 Discussion of results

The results are discussed in relation to each of the hypotheses proposed in section 7.2.

Hypothesis A: Whether an individual participates in a group or in civic action is determined by need, enabling factors, and limited by other commitments.

This hypothesis is supported by the results which show that all three types of determinants are associated with structural social capital. The need to participate in order to resolve problems is apparent for participation both in community groups and in civic action, with problems such as having been the victim of crime, living in

extreme poverty, having debts and neighbourhood disorder associated with citizenship activities. Political problems such as corruption and living in a community that is not legally recognised are the most important correlates of increased involvement in community groups. Both factors may force residents to participate, as a community that is not legally recognised may be less likely to have basic services, while political problems in a democracy demand public intervention. This was evidenced in my qualitative interviews where one male resident of Huaycàn had become extensively involved in the local residents association after the secretary of the group was accused of stealing local funds. In addition, a number of respondents from the newly established shantytown of Huaycàn were preoccupied with getting legal recognition for their community, and cited the struggle to obtain title deeds to their land as one of the major areas of civic action in which they were involved.

Factors which may enable participation are also associated with structural social capital. For example, being an older male is associated both with being a member of a group and with civic action, confirming the finding in Chapter 6 that older men with increased social status are more likely to participate in these activities. Community characteristics can also produce an environment conducive to participation. For example, living in a community where people get along together is associated with talking to the authorities, while residential stability is associated with both group membership and civic action.

The hypothesis also holds for support from individuals, where support received is associated with the availability of support in the community in terms of help with child care outside the household and living in a community with higher levels of economic inequality. This somewhat surprising finding may be explained by qualitative research into the nature of social capital in two deprived areas of East London. Cattell (2001) found that residents with homogenous networks made up of people of a similar socio-economic status often derived little practical support from these networks as everyone faced similar problems and so the network did not contain surplus resources for times of need. In contrast, communities with more unequal wealth distributions contain residents with the ability to help those worse off than themselves, assuming that this is combined with a feeling of social responsibility to do so. This interpretation is strengthened by my finding that respondents who think that

they are economically better off than others in their community are more likely to join community groups, indicating that people who are better off are not only able but also willing to help others.

Contrary to Hypothesis A, few factors which limit participation emerged from the analysis. In particular, family and other commitments which I hypothesized would restrict the time available for participation (Figure 7.1) did not emerge as significant in the analysis. These results suggest therefore that while the need to solve problems pushes people to participate, enabled by a series of factors which makes participation possible, few limiting factors prevent those who want to participate from doing so.

Hypothesis B: Bonding social capital is more common among poor people, while bridging and linking social capital is accessed more frequently by wealthier people.

The analyses cannot adequately test this hypothesis as they do not distinguish between bridging and bonding sources of support but instead explore the correlates of the amount of support received from individuals. In addition, over-sampling of poor people by the YL survey means that there may not be adequate variation in the data to explore the social capital of wealthy people. There is some evidence against the hypothesis however, as household income was only associated with one aspect of social capital (involvement in citizenship activities). Contrary to Hypothesis B, respondents living in extreme poverty participate more in citizenship activities which can be seen as form of bridging social capital helping people to 'get ahead'. This result combined with those from Chapter 6 indicate that Woolcock's (2000) distinction between bonding social capital for poor people and bridging for rich is too simplistic.

Hypothesis C: Demographic factors do not determine levels of cognitive social capital.

This hypothesis is supported by the analysis which shows that no demographic factors are associated with cognitive social capital. This suggests that people's perceptions of the quality of their social environment are not mediated by their social position. This contrasts to participation in structural social capital where social position (age and sex) are important determinants of whether, and how, an individual participates. This may be because structural social capital deals with what people do rather than what

they think and is therefore partly determined by what is culturally acceptable. Older men in particular are much more involved in formal community groups and civic action as a consequence of their elevated position in the community. Rather than demographics, the main correlates of each type of cognitive social capital are the other aspects of cognitive social capital. However, the different set of determinants for each type of cognitive social capital suggests that their separate effect on CMD should also be explored.

Hypothesis D: The greater inter-dependence of people in rural areas means that cognitive social capital is higher in rural than in urban areas.

The analyses provide no evidence to support this hypothesis as no rural/urban differences were evident for any indicator of social capital. This is possibly because more proximal determinants of social capital such as residential stability and levels of support in the community were also included in the models, accounting for the effect of community location.

Hypothesis E: Community problems such as political corruption and neighbourhood disorder limit cognitive social capital.

There is some evidence in support of this hypothesis with neighbourhood disorder associated with lower levels of both trust and sense of belonging, and problems with pollution in the community associated with a lower sense of belonging. The reverse is also seen with a number of community factors (for example higher levels of citizenship and support from individuals) associated with increased levels of cognitive social capital, indicating that people are influenced by the quality of relationships in the community. This reinforces the reciprocal relationship between compositional and contextual factors as people's perception of their social environment is influenced by the context in which they live as well as by their own personal attributes.

Hypothesis F: Structural and cognitive social capital are mutually reinforcing.

There is some evidence to support this hypothesis, with aspects of cognitive and structural social capital associated with each other. Higher levels of trust are associated with the extent of group membership and vice versa, indicating a reciprocal relationship between trust and participation rather than that one is the simple consequence of the other as some have argued (Putnam 1993, Brehm and Rahn 1997).

Though it is not possible to conclude from cross-sectional data, it is likely that trust is formed after a person has started to participate, and that this increased trust in turn leads to increasing levels of participation.

However, in the analyses more aspects of structural social capital are associated with cognitive social capital than the other way round. For example, while no aspect of individual cognitive social capital is associated with citizenship or support from individuals, and only one is associated with group membership (trust), a number of structural social capital variables are associated with aspects of cognitive social capital. These include among others, the association between civic action and an increased sense of belonging, fairness and trust. It is possible that structural social capital is more able to foster cognitive social capital than cognitive social capital is able to foster increasing participation, because participation creates the context in which cognitive social capital can be developed.

7.6.2 Methodological limitations

As the analyses presented in this chapter are cross-sectional they are limited to an exploration of the correlates rather than the determinants of social capital. I have placed these cross-sectional analyses within a hypothetical causal framework based upon the results of Chapter 6, but longitudinal data are needed to adequately test this framework. The analyses also only address the correlates of ISC possessed by mainly poor, female caregivers in Peru. The sample of men and caregivers who are not the index child's biological mother is too small to draw conclusions about the nature of the social capital possessed by these groups. However, the fact that sex and age were significant in some analyses despite low power to detect an effect, combined with the results of my qualitative interviews, suggests that at least structural social capital may vary between demographic groups in Peru.

Though a wide range of both community and individual level determinants were included in the analysis, inconsistencies and missing data from the community questionnaire meant that a number of potential determinants identified in the conceptual framework (Figure 7.1) such as community isolation, natural disasters and ethnic diversity were not tested in the analysis. It is likely however that the effects of these variables were at least in part captured by the inclusion of more proximal

variables in the models. For example, the impact of natural disasters on an individual's social capital may be mediated through the household suffering economic shocks as a result of the disaster. Furthermore, the wide variety of individual and community level potential determinants tested ensures that this is a comprehensive exploration of the ISC of caregivers in Peru.

The analysis did not differentiate between membership of different types of groups, (principally because the number of members of each group type was too small), or between bridging, bonding and linking social capital. The next chapter will address these issues.

7.7 Next steps

The results of this chapter reinforce the findings from the rest of the thesis that social capital is multi-faceted and context specific. Different aspects of social capital are associated with different determinants, indicating that their effect on CMD may also differ. These differences indicate that rather than using composite variables, the effect of each type of social capital on CMD should be estimated separately.

The deeper understanding of the nature of social capital in Peru and the appreciation of what the SASCAT questions are actually measuring gained from the analyses presented in Chapters 5, 6 and 7 pave the way for the more detailed exploration of the association between social capital and CMD in Peru that is presented in the next chapter.

8. Further analysis of social capital and CMD in Peru

In this chapter I present a further analysis of the association between social capital and maternal common mental disorders (CMD) in Peru. I use the results presented in Chapters 4 to 7 to frame new research questions and hypotheses, and to re-formulate the analysis strategy used in Chapter 4 to one more appropriate for the Peruvian setting. The methods unique to this chapter are presented, followed by the results and a discussion of their implications in the light of the in depth exploration of social capital in Peru presented in Chapters 5, 6 and 7.

8.1 Rationale

A number of issues have been raised so far in this thesis, issues which can be best explored through a further analysis of the association between social capital and maternal CMD in Peru. These issues are discussed in turn below, followed by an explanation of how this chapter will address them.

1. Control for confounding by socio-economic status

Despite the role of socio-economic status being emphasised in much of the research on social capital and mental health to date (section 2.3), Chapter 4 found no association between the wealth index (the measure of socio-economic status used by the Young Lives (YL) survey) and CMD. This indicates problems with the measurement of the wealth index in the YL survey, and suggests that residual confounding may be a problem. In order to address this issue, the more detailed assessment of household income used by the Peruvian YL team and described in section 7.4.2 will be used as a better control for confounding by socio-economic status.

2. Different aspects of social capital have different effects on CMD

The results of Chapter 4 indicate that different types of social capital have different associations with CMD. The results of my qualitative interviews and literature review (Chapter 6) also indicate that different types of groups and support from different types of individuals may have different effects on CMD. The difference between

bridging and bonding sources of support in Peru has been emphasised (Tuesta 2003). This distinction was reinforced by the negative attitudes to community leaders expressed by a number of respondents to my qualitative interviews, suggesting that people may view support from bonding sources (such as friends and family) in a different light from support from bridging sources (such as community leaders and politicians). While the factor analysis (section 5.3.2) showed that the composite social capital variables measured distinct concepts, these composite variables cannot separate out the specific effects of different aspects of social capital. In addition, using the same coding for the social capital variables to permit cross-country comparisons does not necessarily result in the most meaningful comparisons within countries.

In response to these issues, the independent effect of each aspect of social capital on CMD will be explored (for example trust, social harmony, sense of belonging and sense of fairness will be examined separately rather than in a combined cognitive social capital score). The effect of each type of group membership on CMD as well as the impact of level of participation will be examined, as will the separate effect of bonding and bridging sources of support. Lastly, each ecological social capital (ESC) variable will be recoded to reflect absolute levels of social capital, for example the proportion of the community that has joined together rather than quartiles of the distribution.

3. Social capital has different effects on CMD in different sub-groups

There is some evidence from the literature to suggest that the effect of place on health may be different for different subgroups (Campbell et al. 1999, Macintyre et al. 2002, Wen et al. 2005). The existence of a number of interactions in studies included in the systematic review presented in section 2.4 supports this. There are three main ways in which interactions between social capital and other variables could operate.

Firstly, the complex relationship between context and composition highlighted in section 1.1.3 suggests that individual social capital (ISC) and ESC could interact in the prediction of CMD. This is because an individual's ISC is partly determined by the available ESC in the community, and conversely, the level of ESC in a community is determined by the ISC of the individuals who make up that community. Only two

studies were found which explored the interaction between ISC and ESC. Subramanian (2002) found in a USA population that the health-promoting effects of community level trust were significantly greater for individuals who also had high levels of individual trust. In contrast, individuals with low levels of trust but who lived in communities with high levels of trust were more likely to report poor physical health. Similarly, Poortinga (2005) found that trusting and socially active individuals more often report good physical health in countries with high levels of social capital than people with low levels of trust and participation, but are less likely to report good health in countries with low levels of social capital. In the light of these findings, interactions between ISC and ESC for each aspect of social capital will be explored.

Secondly, it is plausible that an interaction between structural and cognitive social capital could explain the finding from Chapter 4 that some types of participation are associated with increased odds of CMD. For example, group membership may only be detrimental to mental health when accompanied by low levels of cognitive social capital. In order to test this, interactions between structural and cognitive social capital in the prediction of CMD will be explored.

Lastly, as outlined in section 1.3.2, there has been some debate in the literature about the potential buffering effect of social capital against the detrimental impact of poverty, a hypothesis which has led some commentators to argue that an emphasis on social capital detracts attention from more important structural causes of ill health (Muntaner et al. 2001). This issue is particularly pertinent to the YL sample of predominantly poor people. In addition, the emphasis in the literature on the role of bonding social capital for poor people and bridging social capital for non-poor people (Woolcock 2000) needs to be tested. Both issues will be explored by testing interactions between individual poverty or community deprivation and different types of social capital.

4. Social capital has different effects on CMD in different communities

Just as the results from Chapter 4 emphasise the cultural specificity of social capital, my qualitative research presented in Chapter 7 suggests that it may have different effects on CMD in different communities. In particular, the same organisation had a different impact in rural and urban areas, and there were differences in the nature of

social capital between shantytowns at different stages of development. This will be tested in the analysis by fitting random slopes as well as random intercepts at the community level in a multi-level model to explore whether the effect of social capital on CMD varies between communities.

5. The relative importance of social capital for mental health

As outlined in section 4.6, while some aspects of social capital may be associated with CMD, their relative importance compared to other known risk factors for CMD is unknown. As YL collects information on a wide range of risk factors for maternal CMD, including specific variables related to domestic violence collected only in Peru, the public health importance of social capital as a risk factor for maternal CMD can be determined.

8.2 Chapter objectives and hypotheses

8.2.1 Objectives

1. Analyse the association between each aspect of social capital and CMD in one model, including more complete controls for confounding by socio-economic status.
2. Explore the possibility that ISC and ESC, structural and cognitive social capital, and social capital and poverty interact in the prediction of CMD.
3. Estimate the relative importance of social capital compared to other known risk factors for CMD.

8.2.2 Hypotheses

The results of Chapters 4 to 7 suggest eight additional hypotheses based on the primary research hypotheses of this thesis (section 2.6.3) which will be tested in this chapter (Hypotheses A to H).

- A. Aspects of individual cognitive social capital are most strongly associated with CMD.
- B. Membership of different types of groups have different effects on CMD.
- C. Support from bonding and bridging sources have different effects on CMD.
- D. Social capital has different effects on CMD in different sub-groups. Specifically:

- E. Social capital and poverty interact in the prediction of CMD. Social capital acts as a buffer against the negative impact of poverty on CMD with mothers living in extreme poverty benefiting more from social capital.
- F. Structural and cognitive social capital interact in the prediction of CMD. Some types of participation are damaging when they are accompanied by low levels of cognitive social capital.
- G. ISC and ESC interact in the prediction of CMD. Individuals whose levels of ISC are at odds with levels of ESC in the community are particularly at risk of CMD.
- H. Some aspects of cognitive social capital in particular remain independent risk factors for CMD once other known risk factors are considered.

8.3 Methods

8.3.1 Model 1: Association between social capital and maternal CMD

Model 1 will be used to test hypotheses A to G.

Sample selection

The same criteria were used as in Chapter 4 to enable direct comparison of results between chapters (biological mother of one-year-olds with known case/non-case status for CMD and complete data for all variables included in the model). As the final sets of variables in the two models differ slightly, the final sample size for analysis in this model is 1642 compared to 1659 in Chapter 4.

Coding of variables

As outlined in the rationale to this analysis (section 8.1), each social capital variable was coded and entered separately into the model instead of using composite variables. Membership of different group types was entered as separate variables (for example member of community group yes/no). Membership of funeral and credit groups and of trade unions was not included as too few respondents are involved in these groups to allow meaningful comparisons. Absolute values for all social capital variables were used rather than quartiles of the distribution as in Chapter 4. The assumption of a linear relationship with CMD was tested for all continuous ESC variables by using a likelihood ratio test to compare the likelihood of a model containing the continuous variable to the likelihood of a model with the variable coded as categorical. Variables

were entered as continuous terms when there was no significant difference in the likelihood of the two models. Three continuous ESC variables displayed a non-linear relationship with CMD (proportion of community that have joined together, trust others, and feel part of the community). These variables were categorized into three groups reflecting absolute levels of social capital.

Model formulation

Confounding variables were selected using the procedure described in detail in section 4.2.3. Briefly, a two-level (individual, community) logistic regression model with robust standard errors (GEE) was fitted containing all social capital variables and potential confounders. Wald tests were used to eliminate the least significant potential confounders one at a time until only the social capital variables, significant confounding variables ($p < 0.05$) and a priori confounders (household income) remained in the model.

The model was formulated in the same way as described in section 4.2.4, using multi-level logistic regression with three levels (individual, community, cluster). The model was fitted in four stages. First, the crude association between each aspect of social capital (measured at both the individual and community level) and CMD was estimated. Secondly, all social capital variables were entered into the model to estimate the relative importance of each aspect of social capital on CMD. Thirdly, the a priori and significant confounders from the variable selection process were added into the model to estimate the adjusted odds of being a probable case of CMD for each aspect of social capital (Objective 1). Lastly, interaction terms were fitted between ISC and ESC, structural and cognitive social capital, and social capital and poverty. Significant interactions were included in the final model (Objective 2).

Despite using prior research to decide which interactions to test, the large number of social capital variables means that 39 potential interactions were tested. Such multiple testing increases the chance of a Type I error whereby observed significant results are actually due to chance. To reduce the chance of a Type I error a Bonferroni correction (Katz 1999) was applied to the significance levels of the Wald test used to assess the significance of each interaction. Restricting the cut-off for statistical significance

from $p < 0.05$ to $p < 0.0014$ reduces the chance of any given significant finding being due to chance to an acceptable level of five per cent.

Unfortunately, the GLLAMM command for multi-level modelling in Stata cannot support multiple interactions with the same variable in one model. As the level two and three variance components were negligible in the final model, all subsequent models containing interaction terms were estimated using two-level (individual and community) logistic regression models with robust standard errors.

Fitted probabilities were calculated for each effect estimate to illustrate the impact of different types of social capital on the probability of being a case of CMD. The probability of CMD for a mother with average characteristics for all variables in the model (for example poor, of average age, and married with two children) and low levels of one aspect of social capital (for example not member of a group) was calculated. This was compared to the probability of a mother with the same set of characteristics but high levels of the social capital variable (for example member of a group). The difference in fitted probabilities is therefore the probability of being a case of CMD as a result of having high versus low levels of a particular aspects of social capital (in this example, being a member of a group). Fitted probabilities are used throughout the results section to illustrate the relative importance of different risk factors on CMD.

8.3.2 Model 2: Holistic model of risk factors for maternal CMD

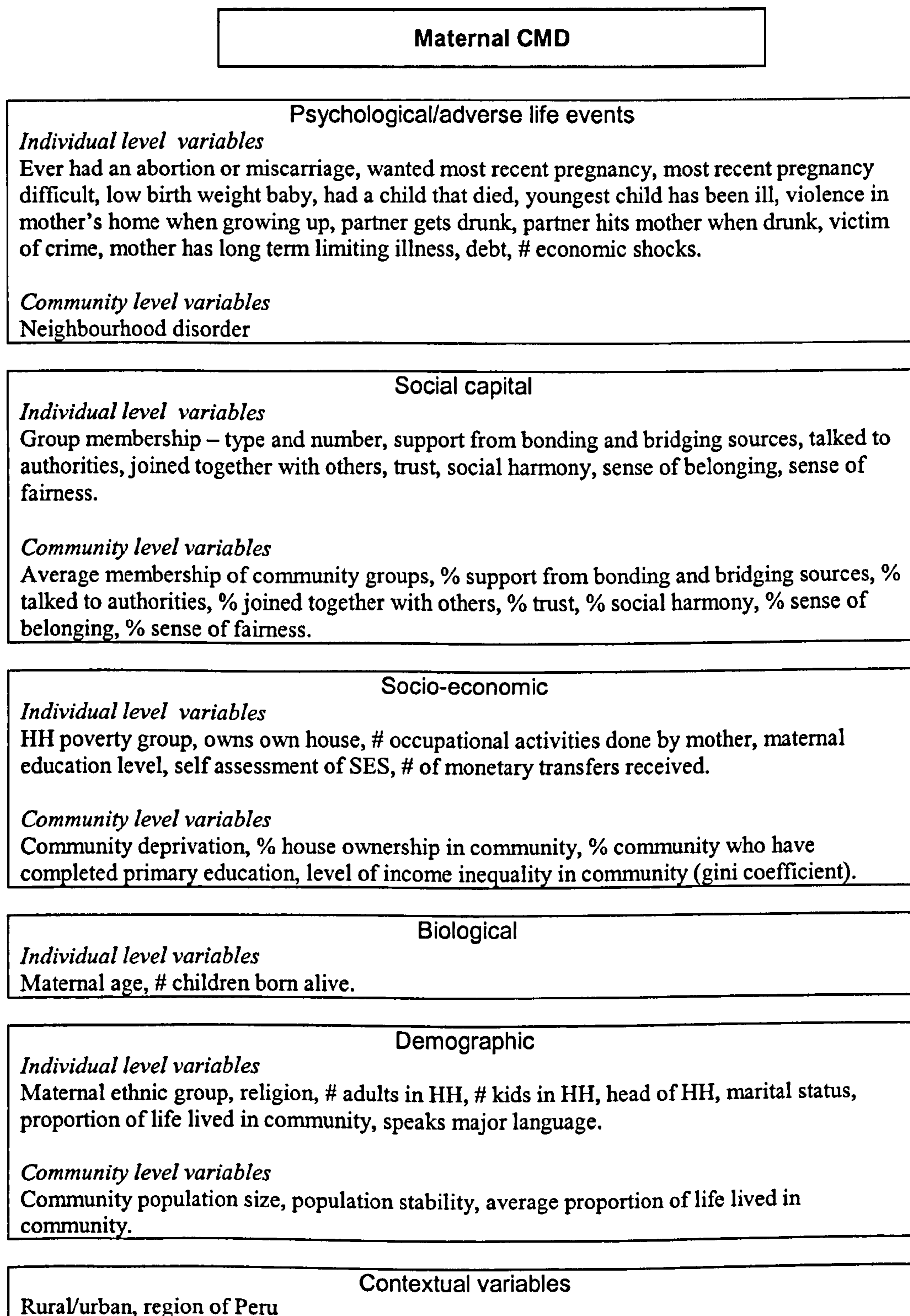
Model 2 will be used to test Hypothesis H.

Analytical framework

Based on the conceptual framework outlining all risk factors for CMD (Figure 1.1), the following analytical framework was developed containing all the variables measured by YL (Figure 8.1). The conceptual framework views CMD as the consequence of a combination of six different sets of risk factors operating at both the individual and the community level. Risk factors operate at different points along the causal pathway. For example, contextual factors such as living in a rural or urban area are distal risk factors which may partly determine more proximal risk factors such as socio-economic status. Psychological risk factors comprising adverse life events are

hypothesized to be the most proximal determinants of CMD, though these may be largely determined by more distal factors such as poverty, demographic characteristics and social capital.

Figure 8.1: Analytical framework of association between social capital and CMD



Sample selection

As for Model 1, biological mothers of one-year-olds with known case/non-case status for CMD and complete data for all variables included in the model were selected. The final sample size for Model 2 is 1774¹³.

Measurement of additional risk factor variables

In addition to the variables used in the analyses in Chapters 4 and 7 and previously described in this thesis (sections 3.8 and 7.4.2), a number of new variables are used in this analysis. These are briefly described in Table 8.1. Due to large amounts of missing data, one of the psychological variables (whether the mother's partner beats her when drunk) had to be excluded from the analysis. The implications of this will be discussed in the methodological limitations section of this chapter (section 8.5.2).

Table 8.1: Additional variables included in the holistic model of CMD

Variable	Coding
<i>Psychological risk factors</i>	
Had a child that died	Yes/No
Youngest child has been ill	0 = No 1 = Child has been so ill mother thought they might die and/or had a severe injury and/or had a long term health problem
Maternal assessment of child's size at birth	1 = Very large/average 2 = Small/very small
Ever had an abortion or miscarriage?	Yes/No
Was most recent pregnancy wanted?	Yes/No
Mother suffered physical and/or verbal abuse at home when she was growing up	Yes/No
<i>Biological risk factors</i>	
Most recent pregnancy was medically difficult	1 = Good/average 2 = Poor/bad

Model formulation

The principles for selecting variables and model formulation outlined in sections 4.2.3 and 4.2.4 were followed. Firstly, a model containing all potential risk factors for

¹³ This total is more than for Model 1 because a number of social capital variables with relatively high levels of missing data are not significant and are therefore not included in the final model.

CMD identified in the analytical framework (Figure 7.2) was fitted, along with any significant interactions with social capital variables identified in Model 1. Wald tests were used to eliminate the least significant risk factors, including the social capital variables, one at a time. If one aspect of either individual or ecological social capital was significantly associated with CMD (for example individual but not community level trust), both were included in the final model to ensure that the direct effects of ISC and the indirect effects of ESC were estimated. The final model therefore contained only significant risk factors for maternal CMD ($p < 0.05$) in order to estimate the relative importance of social capital (Objective 3, section 8.2.1).

8.4 Results

8.4.1 Model 1: Association between social capital and maternal CMD

Table 8.2 presents the final model including interactions for the association between each aspect of social capital and maternal CMD. Appendix F lists the full results from each stage of the modelling process, including crude and adjusted odds ratios. Though it largely reinforces the results of the Peruvian analysis presented in Chapter 4, this analysis paint a more complex picture. For example, not all components of the composite variables are significantly associated with CMD, while the presence of interactions shows that some aspects of social capital previously thought not to be associated with CMD do have important effects in sub-groups. As no significant community level variance remained in the final model (Model 1), random slopes at the community level were not tested. The results for each type of social capital are discussed in turn.

Table 8.2: Model 1: Association between social capital and maternal CMD in Peru.
Individuals=1642, communities=82, clusters=20

Social capital variables		OR	95% CI	
<i>Group membership</i>				
ISC	No	1.00		
	Yes	0.90	0.68, 1.19	
ESC	Average group membership	*0.37	0.17, 0.79	
<i>Support from bonding individuals</i>				
ISC	Support from bonding individuals * poverty ¹			
	No support, extremely poor		1.00	
	No support, poor		0.48	0.30, 0.75
	No support, non-poor		0.21	0.13, 0.36
	Support, extremely poor		1.52	1.12, 2.07
	Support, poor		0.52	0.35, 0.77
Support, non-poor		0.14	0.09, 0.21	
ESC	Mean support from bonding individuals	***2.55	1.54, 4.21	
<i>Support from bridging individuals</i>				
ISC	Support from bridging individuals * ESC sense of belonging ¹			
	No support, low belonging		1.00	
	No support, medium belonging		0.42	0.29, 0.61
	No support, high belonging		0.21	0.10, 0.42
	Support, low belonging		2.90	1.90, 4.43
	Support, medium belonging		0.27	0.15, 0.48
Support, high belonging		0.29	0.14, 0.62	
ESC	Mean support from bridging individuals	1.75	0.81, 3.77	
<i>Talked with authorities</i>				
ISC	No	1.00		
	Yes	1.19	0.76, 1.88	
ESC	% talked to authorities	1.00	0.98, 1.01	
<i>Joined together with others</i>				
ISC	ISC join * ESC % in community who have joined ¹			
	No join, low joining in community		1.00	
	No join, medium joining in community		0.91	0.59, 1.41
	No join, high joining in community		1.21	0.76, 1.94
	Join, low joining in community		4.30	1.69, 10.92
	Join, medium joining in community		0.64	0.33, 1.25
Join, high joining in community		1.05	0.56, 1.98	
<i>Trust</i>				
ISC	No	1.00		
	Yes	1.12	0.86, 1.46	
ESC	% community that trust others <30%		1.00	
	30-60%		1.43	0.94, 2.16
	60%+		1.39	0.74, 2.61

			<i>Continued...</i>	
			OR	95% CI
<i>Social harmony</i>				
ISC		No	1.00	
		Yes	0.79	0.59, 1.06
ESC	% people think others get along		1.01	0.99, 1.03
<i>Sense of belonging</i>				
ISC		No	1.00	
		Yes	**0.64	0.49, 0.85
ESC	Community sense of belonging * poverty ¹			
	Low belonging, extremely poor		1.00	
	Low belonging, poor		0.48	0.30, 0.75
	Low belonging, non-poor		0.21	0.13, 0.36
	Medium belonging, extremely poor		0.42	0.29, 0.61
	Medium belonging, poor		0.46	0.27, 0.78
	Medium belonging, non-poor		0.59	0.36, 0.98
	High belonging, extremely poor		0.21	0.10, 0.42
	High belonging, poor		0.38	0.17, 0.86
	High belonging, non-poor		0.22	0.08, 0.64
<i>Sense of fairness</i>				
ISC		No	1.00	
		Yes	***0.62	0.48, 0.80
ESC	% think people would take advantage		1.00	0.99, 1.01
Confounding variables				
<i>Has serious debts</i>				
		No	1.00	
		Yes	***1.66	1.35, 2.03
<i>Owns house</i>				
		No	1.00	
		Yes	***0.69	0.56, 0.85
<i># maternal occupational activities</i>				
		0	1.00	
		1	*1.30	1.05, 1.60
		2+	1.22	0.85, 1.75
<i>Maternal education level</i>				
		None	1.00	
		Primary	*0.62	0.41, 0.93
		Secondary	**0.51	0.32, 0.82
		Technical college or university	***0.34	0.19, 0.59
<i>Perceived economic position in community</i>				
		Better off than others	1.00	
		Similar to others	**0.62	0.44, 0.89
		Worse off than others	1.34	0.93, 1.94
<i>Number of household economic shocks</i>				
		0	1.00	
		1	*1.42	1.08, 1.87
		2+	1.18	0.75, 1.85

		<i>Continued...</i>	
		OR	95% CI
<i>Marital status</i>			
	Permanent partner	1.00	
	Single/divorced/widowed	***1.74	1.28, 2.35
<i>Maternal age group</i>			
	<24	1.00	
	25-29	1.33	0.97, 1.81
	30-34	***2.22	1.57, 3.15
	35+	1.49	0.93, 2.38
<i>Number of children in the household</i>			
		*1.12	1.03, 1.22
<i>Maternal ethnic group</i>			
	Andean Indian	1.00	
	White	**0.44	0.25, 0.78
	Asian, African, Amazon	0.92	0.45, 1.87
<i>Maternal long term limiting illness</i>			
	No	1.00	
	Yes	***2.80	1.63, 4.82
<i>Community income inequality</i>			
	Equal		
	Less equal	*0.64	0.44, 0.91
	Unequal	0.83	0.51, 1.37

*p<0.05, **p<0.01, ***p<0.001

¹ No p-values available for calculated interaction effect estimates.

Group membership

Preliminary analyses of participation by group type showed little difference in the odds of CMD between members of different types of groups (full results available on request). Only an increase in the proportion of the community who are members of a community group was significantly associated with reduced odds of CMD (OR 0.97, 95% CI 0.95, 0.99). However, non-significant differences in the impact of membership of different group types on CMD were evident. For example, individual membership of religious groups displayed a non-significant inverse association with CMD, while individual membership of women's groups showed a non-significant positive association. The small number of mothers participating in some of these group types means this analysis has low power to detect an effect, and that Hypothesis A (section 8.2.2) cannot be adequately tested. As a result, for the remainder of the analysis group membership was treated as amount rather than type of participation.

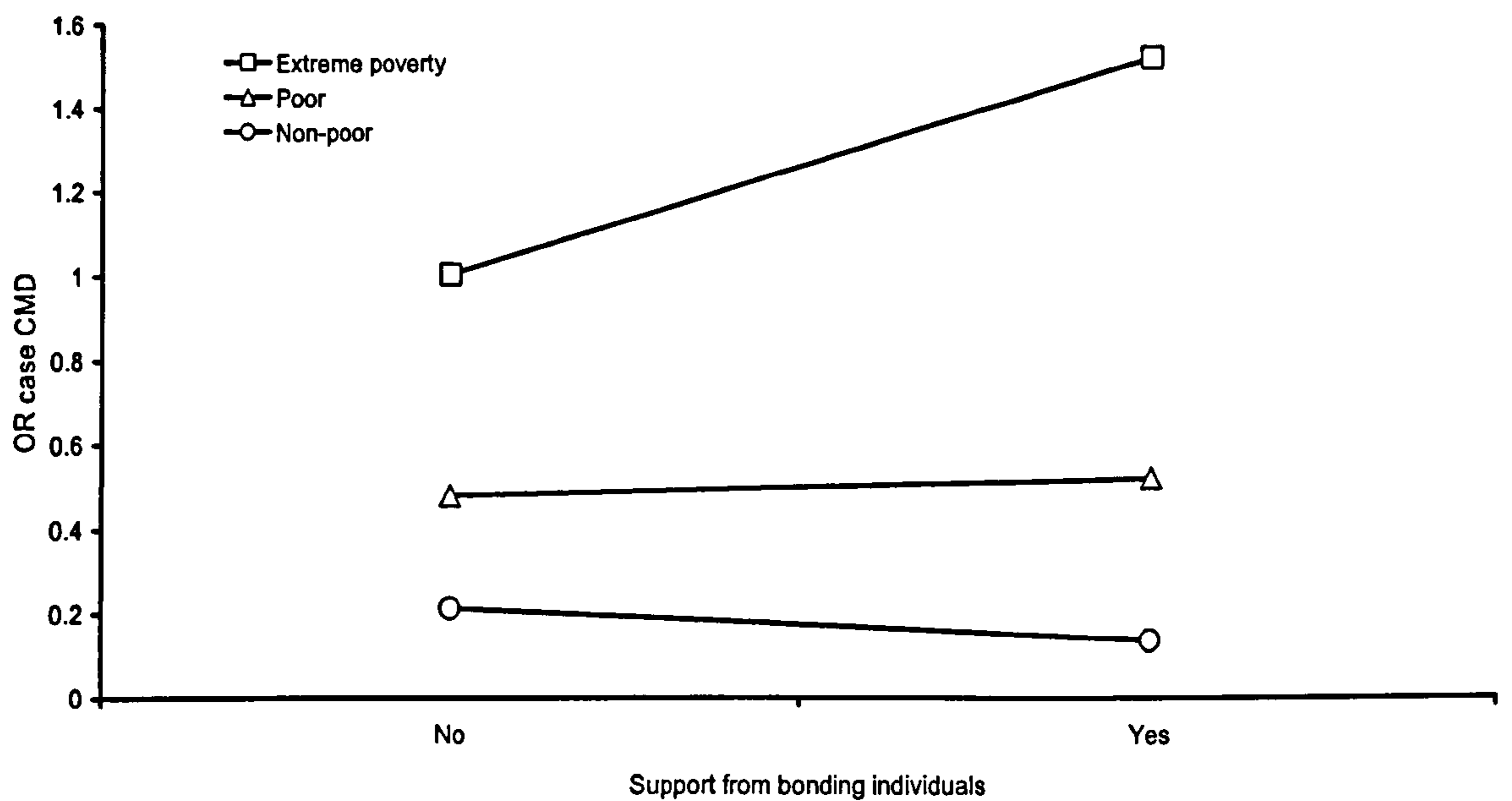
While there is no evidence of an association between individual group membership and CMD, an increase of one group in the average group membership of a community is significantly associated with reduced odds of CMD (OR 0.37, 95% CI 0.17, 0.79).

This corresponds to a 12% decrease in the probability of having CMD for a mother who lives in a community with an average group membership one group higher, all other variables being equal.

These results mirror those in Chapter 4 where no association is seen between individual group membership, but community level group membership (measured in quartiles) is associated with reduced odds of CMD. This association only emerges in Stage 2 of the model when all the social capital variables are included in the model, but remains stable throughout the other stages (full results for all stages of the model are listed in Appendix F). This suggests that there is negative confounding by the other social capital variables. No significant interactions with group membership were detected.

Support from bonding individuals

Contrary to expectations, the analysis presented in Chapter 4 showed that support from individuals was associated with increased odds of CMD (Table 4.7). This analysis explores this finding further by breaking it down into support from bonding and bridging sources. While support from bonding sources such as friends, family and neighbours is associated with increased odds of CMD throughout all stages of the model, it only becomes significant in Stage 4 when an interaction with household poverty group is included. This interaction (Figure 8.2) shows that support from bonding individuals is only associated with increased odds of CMD among mothers living in extreme poverty. There is no association between bonding support and CMD among poor people, while support from bonding individuals among mothers who are not poor is associated with slightly reduced odds of CMD. The magnitude of this effect is large. Assuming average characteristics of all other variables in the model, mothers who live in extreme poverty and who receive support from bonding sources are 18% more likely to have CMD compared to mothers who receive bonding support but are not poor.

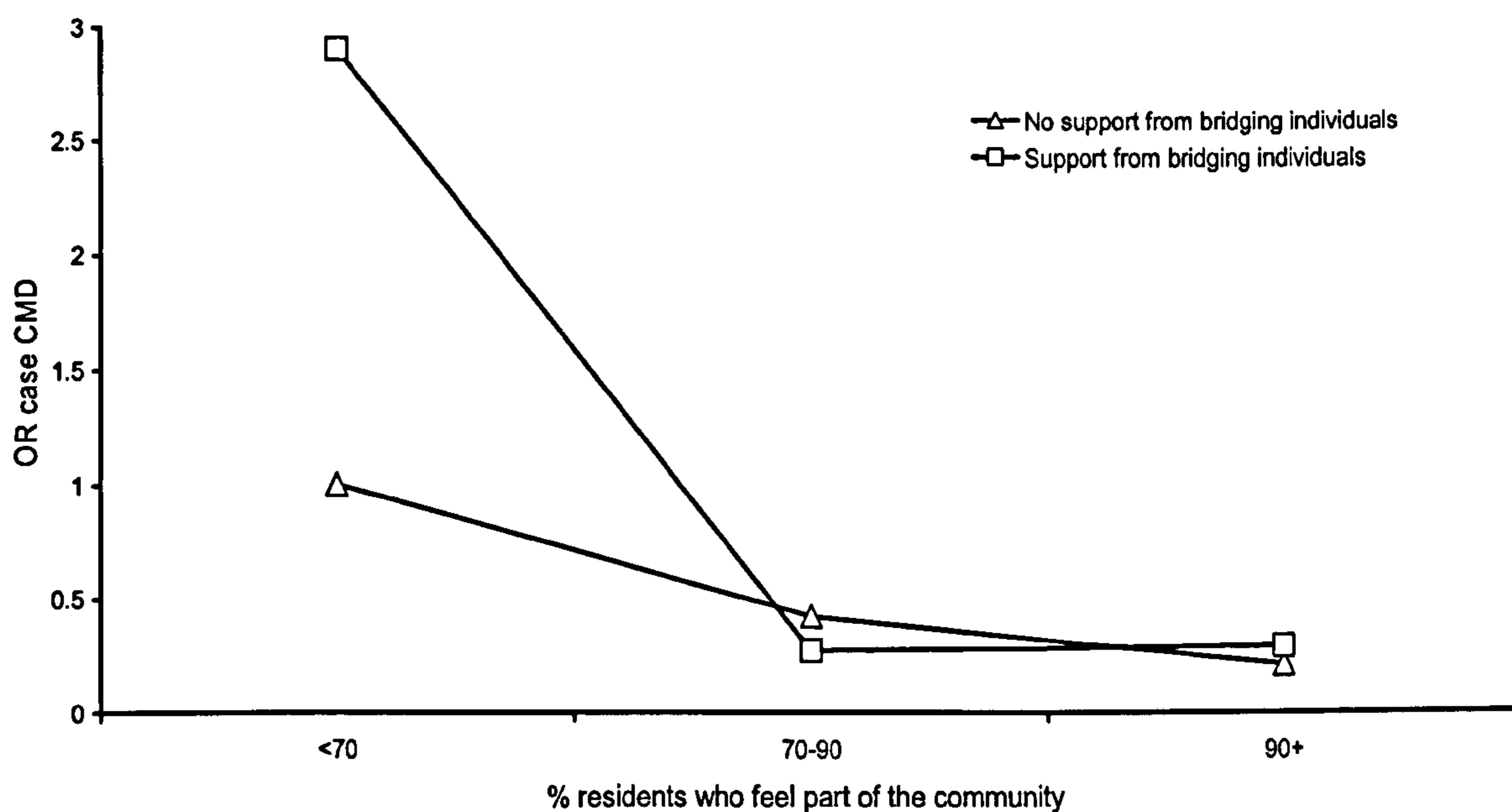
Figure 8.2: Interaction between support from bonding individuals and poverty group

In contrast to the results in Chapter 4 where no association was found between ecological measures of support and CMD in Peru, in this analysis there is a positive association between CMD and the average number of bonding individuals that residents in a community receive support from (OR 2.55, 95% CI 1.54, 4.21). Living in a community with on average support from one more bonding source is associated with a 31% increase in the probability of being case of CMD.

Support from bridging individuals

As with support from bonding individuals, whether a mother receives support from bridging individuals such as community leaders, politicians and NGOs is only associated with CMD for mothers living in communities with a low sense of belonging. As with bonding support, support from bridging individuals is only associated with increased odds of CMD in more disadvantaged sub-groups. A mother with average levels of all other variables who receives support from bridging sources and who lives in a community where less than 70% of people feel part of the community is 38% more likely to suffer from CMD than a mother with the same characteristics but who does not receive support and lives in a community where more than 90% of residents feel part of the community (Figure 8.3).

Figure 8.3: Interaction between community sense of belonging and support from bridging individuals



Though community levels of bridging support are associated with increased odds of CMD in the crude analysis (Appendix F, Stage 1), this association is confounded by the other social capital variables and is not present in subsequent stages of the model.

Talked with authorities

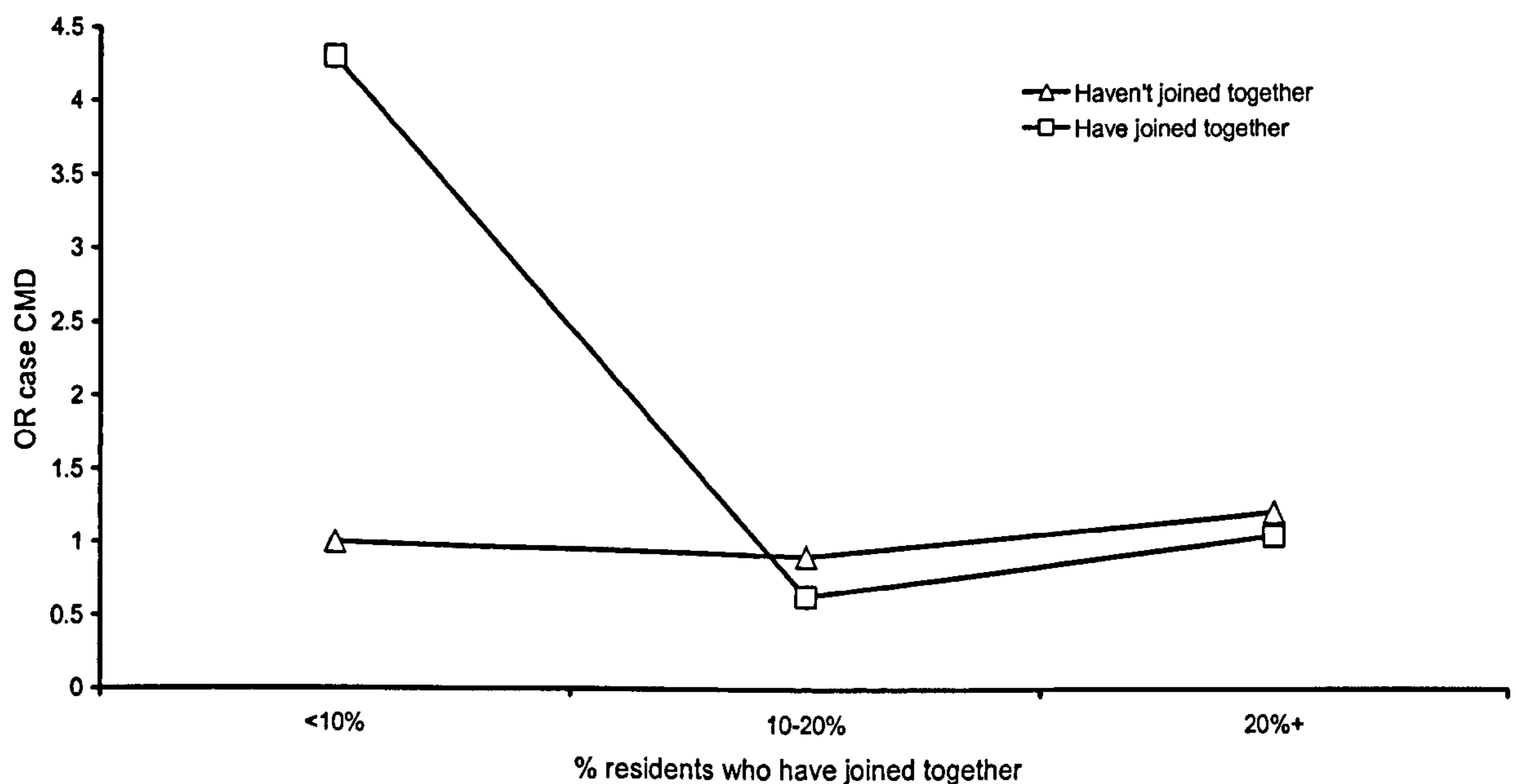
In line with the results from Chapter 4, neither talking to authorities at the individual level nor talking to authorities at the community level is associated with CMD after controlling for the other social capital variables.

Joined together with others to address a common problem

A similar pattern is evident for joining together with other community members to address a common problem, with no significant associations seen between either individual or community civic action and CMD in Stages 1 to 3 of the model. However, as with support from bridging individuals, the true effect of this variable is masked by the presence of an interaction between individual and community levels of joining together (Figure 8.4). For residents who have not joined together to address a common problem in the last 12 months, the level of civic action in the community has no effect on their mental health. However, community levels of civic action have a large impact on the mental health of mothers who have joined together with others. Compared to other mothers who live in a community where less than 10% of residents

join together, mothers who join together have odds 4.3 (95% CI 1.69, 10.92) times greater of being a probable case of CMD. However, as levels of civic action in the community increase, the odds of CMD among those who are part of this civic action dramatically decrease so that joining together in a community where a significant proportion of other residents also join together is associated with reduced odds of CMD. Compared to mothers who join with others in communities where more than 20% of the community are also involved in civic action, mothers involved in civic action in communities where less than 10% are similarly involved have a 45% increased probability of having CMD.

Figure 8.4: Interaction between joining together with others and levels of joining together in the community



Trust

By analysing the separate effect of each aspect of cognitive social capital, this analysis is able to shed light on the results of Chapter 4 which showed that individual cognitive social capital was the strongest predictor of CMD across all four countries. Contrary to expectations, neither individual nor community levels of trust are associated with CMD at any stage of the model, and no significant interactions with trust were detected.

Social harmony

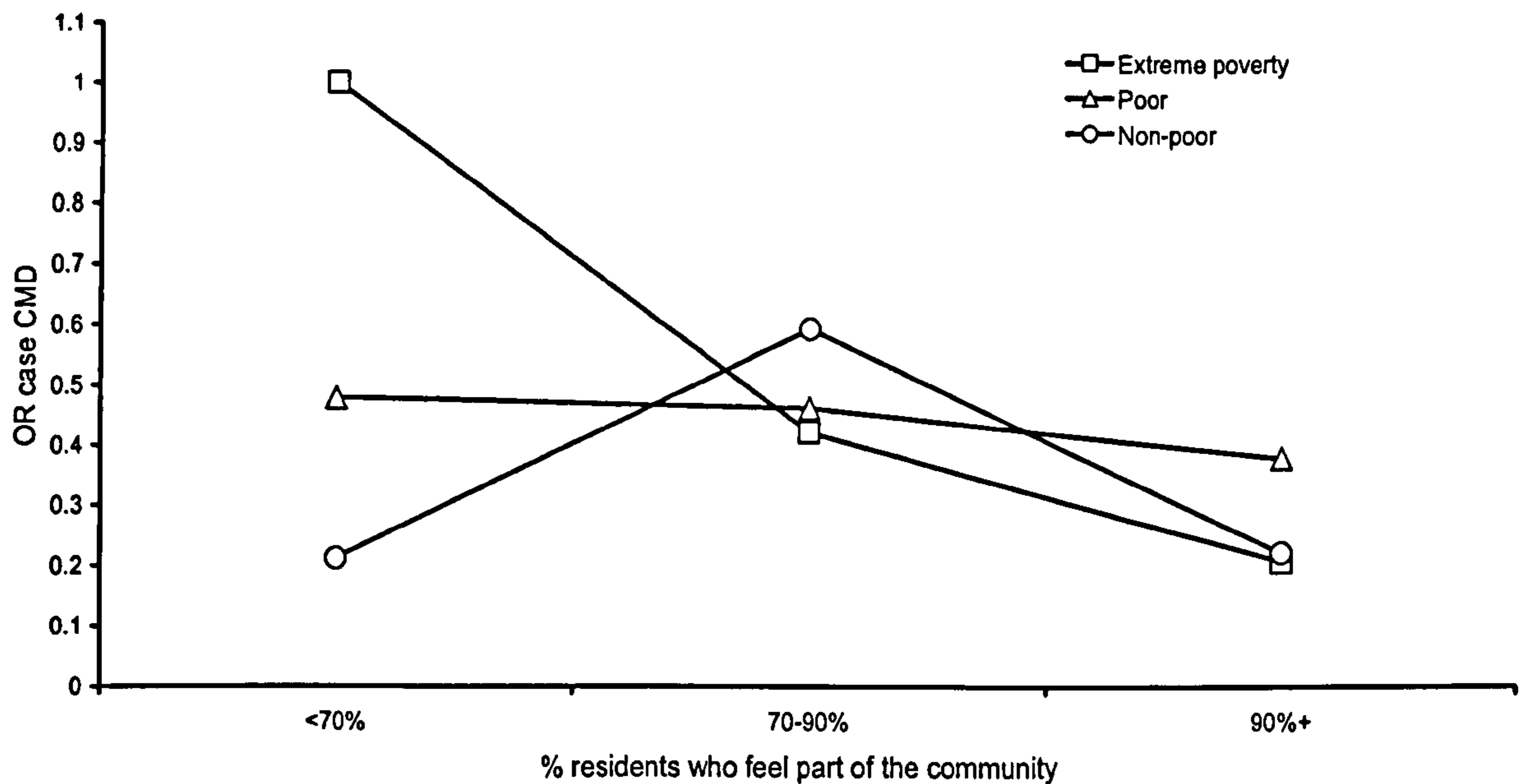
Similarly, neither individual nor community levels of social harmony are associated with CMD. Though individual levels of social harmony are associated with CMD in the crude analysis, this effect disappears after the other social capital variables are included in the model (Stage 2).

Sense of belonging

In contrast, both individual and community levels of sense of belonging are associated with reduced odds of CMD. Irrespective of which other social capital variables or confounders are entered into the model, feeling part of the community is associated with a reduction in the odds of CMD of about 0.64 (95% CI 0.49, 0.85). Similarly, high levels of sense of belonging in the community are associated with a reduction in the odds of CMD in all stages of the model, though this only becomes significant after all confounders are included in Stage 3. However, the effect becomes much more pronounced when an interaction with household poverty group is included (Figure 8.5). While increasing levels of sense of belonging in the community has little effect on the mental health of poor people and varied effects on non-poor people, it has a much greater impact on the mental health of mothers living in extreme poverty. Compared to a mother living in extreme poverty in a community with a high sense of belonging, a mother living in extreme poverty in a community with little sense of belonging has a 66% greater chance of being a probable case of CMD.

Sense of fairness

The other aspect of cognitive social capital which may explain the majority of the association seen in Chapter 4 is sense of fairness. Throughout all stages of the model it is consistently associated with a reduction in the odds of CMD of about two thirds (OR 0.62, 95% CI 0.48, 0.80). This translates into a 26% reduction in the probability of being a case of CMD. No significant interactions were detected with this variable.

Figure 8.5: Interaction between community sense of belonging and poverty group

Confounding variables

The set of confounders included in this analysis are almost identical to those included in the analysis presented in Chapter 4 (Table 4.7). The majority of confounders measure socio-economic status and include household poverty group, maternal occupational activities, education, debts and shocks that have affected the economy of the household. Other significant confounders include demographic factors comprising marital status, age, number of children in the household and ethnic group.

8.4.2 Model 2: Holistic model of risk factors for maternal CMD

Table 8.3 presents the results of the holistic model of risk factors for maternal CMD in Peru. The risk factors fall into two main groups: social capital and adverse life events including socio-economic status. With the exception of the social capital variables, these risk factors correspond to the ones that existing research suggests are important (section 1.1.2 and 1.1.3). In contrast to the results of Model 1, a number of significant social capital variables drop out after all risk factors for CMD are included, indicating that some of the risk factors are on the causal pathway between social capital and CMD. Support from bonding individuals, joining together with others and sense of fairness are no longer associated with CMD after other risk factors have been taken

into account. However, community level group membership, community level support from bridging individuals and individual sense of belonging remain significant risk factors for CMD in the same direction and of a similar magnitude to that found in Model 1. Of the four interactions included in the first model, only two remain: between support from bridging individuals and community sense of belonging and between community sense of belonging and household poverty. These again show the same associations with CMD as were found in Model 1.

Apart from the social capital variables, all of the significant risk factors for CMD included in Model 2 can be viewed as adverse life events. A number of variables reflecting socio-economic stress are important risk factors for CMD and reflect the results from Model 1. Having serious debts and suffering economic shocks are associated respectively with a 5% and 3% increased probability of having CMD, all other variables being equal. Negative events surrounding child-rearing such as the death or serious illness of a child and having a difficult most recent pregnancy are significant risk factors for maternal CMD, as are experience of domestic violence as a child and high levels of neighbourhood disorder in the community. Having a long term limiting illness or disability is associated with the greatest increased probability of CMD of all the risk factors (14%), illustrating the powerful relationship between physical and mental health.

Interestingly, the effects of the social capital and adverse life events variables are similar in size. The average effect of any given adverse life event on the probability of suffering from CMD is 7%, and for the social capital variables (excluding interactions) it is 3%. The effect of the interactions on CMD are much greater for people in the extreme groups. All other variables being equal, a mother living in extreme poverty in a community where few people feel a sense of belonging is 66% more likely to have CMD than a mother who is not poor and who lives in a community with a strong sense of belonging. Importantly, these large differences in risk are real for some women: 35 mothers in this sample live in extreme poverty in communities with a low sense of belonging.

Table 8.3: Model 2: Holistic model of risk factors for maternal CMD in Peru. Individuals=1774, communities=81, clusters=20.

Social capital variables		OR	95% CI	
<i>Group membership</i>				
ISC	No	1.00		
	Yes	0.96	0.75, 1.23	
ESC	Average group membership	***0.25	0.12, 0.52	
<i>Support from bridging individuals</i>				
ISC	Support from bridging individuals * ESC sense of belonging ¹			
	No support, low belonging		1.00	
	No support, medium belonging		0.39	0.28, 0.55
	No support, high belonging		0.24	0.17, 0.35
	Support, low belonging		4.25	3.54, 5.12
	Support, medium belonging		0.29	0.17, 0.49
Support, high belonging		0.34	0.29, 0.52	
ESC	Mean support from bridging individuals	**2.77	1.31, 5.88	
<i>Sense of belonging</i>				
ISC	No			
	Yes	*0.72	0.53, 0.97	
ESC	Community sense of belonging * poverty ¹			
	Low belonging, extremely poor		1.00	
	Low belonging, poor		0.35	0.25, 0.50
	Low belonging, non-poor		0.13	0.06, 0.27
	Medium belonging, extremely poor		0.39	0.28, 0.55
	Medium belonging, poor		0.30	0.20, 1.44
	Medium belonging, non-poor		0.24	0.17, 0.34
	High belonging, extremely poor		0.24	0.17, 0.35
	High belonging, poor		0.24	0.14, 0.39
High belonging, non-poor		0.13	0.06, 0.31	
Other risk factors				
<i>Has serious debts</i>				
	No	1.00		
	Yes	***1.48	1.18, 1.86	
<i>Number of household economic shocks</i>				
	0	1.00		
	1	***1.54	1.24, 1.92	
	2+	1.24	0.84, 1.84	
<i>Maternal long term limiting illness</i>				
	No	1.00		
	Yes	***2.35	1.54, 3.60	
<i>Difficult most recent pregnancy</i>				
	Good/average	1.00		
	Fair/poor	***1.86	1.41, 2.46	

Continued...

Other variables		OR	95% CI
<i>Number of children born alive</i>	1	1.00	
	2	***1.20	0.88, 1.64
	3+	***1.69	1.30, 2.18
<i>Had a child that died</i>	No	1.00	
	Yes	**1.80	1.16, 2.79
<i>Youngest child has had serious injury or thought might die</i>	No	1.00	
	Yes	***1.67	1.31, 2.13
<i>Mother suffered physical or verbal abuse when growing up</i>	No	1.00	
	Yes	***1.47	1.16, 1.86
<i>Neighbourhood disorder (number of problems)</i>	0-2		
	3-4	***0.67	0.52, 0.86
	5-7	1.18	0.67, 2.05

*p<0.05, **p<0.01, ***p<0.001

¹ No p-values available for calculated interaction effect estimates.

8.5 Discussion

8.5.1 Discussion of results

Results are discussed in relation to each of the hypotheses outlined in section 8.2.2.

Hypothesis A: Aspects of individual cognitive social capital are most strongly associated with CMD.

Contrary to this hypothesis, only two aspects of cognitive social capital are significantly associated with CMD: individual sense of fairness, and both individual and community level sense of belonging. The discriminant validity analysis reported in section 5.3.2 showed that all four cognitive social capital questions load onto the same factor. As such, including them all in the same analysis results in only those aspects of cognitive social capital most important for CMD being retained in the model. This is the case with social harmony which, though significant in the crude analysis (Stage 1), becomes non-significant when the other social capital variables are included. The analysis in Chapter 7 showed complex inter-relatedness between the cognitive social capital variables, with each being a determinant of the other. It is

therefore possible that social harmony largely affects CMD by contributing to more proximate determinants of CMD: sense of belonging and fairness.

In contrast to much of the literature which emphasises trust as an important indicator of social capital (Putnam 2001, Subramanian et al. 2002), no association is found between individual generalized trust and CMD at any stage of the model. This may be for a number of reasons. Firstly, the results from my qualitative validation (section 5.4.2) show the question on generalized trust to be the most problematic, with respondents unwilling to provide an assessment of trust in ‘people in general’ and instead answering only about specific people, often community leaders. This question is therefore unlikely to be measuring generalized trust. In addition, other research has shown trust to be context dependent (Goudge and Gilson 2005), so measures of generalized trust may not reflect social relationships which are important for mental health. Nevertheless, the results of my analyses call into question whether generalized trust is an important aspect of social capital for mental health in low income countries.

Mirroring results from Chapter 7 where CMD is a determinant of sense of both fairness and belonging, these were the only cognitive variables significantly associated with CMD. The cross-sectional nature of these data makes it impossible to estimate causal relationships. However, it is likely that just as ‘feeling part of the community’ and not ‘feeling taken advantage of’ may lead to better mental health, people with CMD may report that they are being unfairly treated or feel detached from their communities. Both of these variables show effects on CMD (about a 40% reduction in the odds of being a probable case) that are similar to the effect reported for the composite cognitive social capital variable used in the analysis in Chapter 4. It is likely that this composite effect is due to the effects of sense of belonging and sense of fairness and not to trust or social harmony.

Sense of belonging at the individual and sense of belonging at the community level are the most important cognitive predictors of CMD and the only ones to remain as independent risk factors in Model 2. My qualitative validation (section 5.4.2) showed that respondents in urban areas often equated feeling part of the community with actual participation as this was one of the mechanisms through which people became attached to where they lived. Some of the positive effects of group membership may

therefore be picked up by this variable. They also reported feeling part of the community despite earlier reporting dissatisfaction with aspects of the community such as political corruption, lack of services or low levels of the other cognitive variables. Sense of belonging may therefore be the most important aspect of cognitive social capital for CMD as it reflects deep-set feelings of social identity – feelings which can survive more superficial and perhaps shorter lived insults to levels of trust or social harmony.

Hypothesis B: Membership of different types of groups has different effects on CMD.

Despite the results presented in section 6.3 indicating that different types of group may have different effects on maternal CMD, no associations were found in this analysis. A number of factors mean that these data are not capable of adequately testing this hypothesis. Firstly, the validation exercise showed that the questions on membership of different types of groups were problematic, with confusion as to exactly which groups each category included. The same group being included in more than one category results in non-differential misclassification of exposure status leading to an attenuation of effect. Secondly, these quantitative measures may not be sensitive enough to pick up the complexities of group functioning highlighted by the description of social capital in Peru (section 6.3), for example the context in which the group functions and the quality of group leadership. Thirdly, the small number of mothers who are a member of any one group type results in a lack of power to detect an effect. Nevertheless, the existence of crude associations between different group types and CMD from preliminary analyses suggests that this is an issue worthy of further investigation.

In light of these problems, the more robust measure of whether or not an individual is a member of any group was used. While no association was seen at the individual level, an increase of one group in average community group membership is associated with a 12% reduction in the probability of having CMD. This accords with the results from Chapter 4 where community level group membership was associated with reduced odds of CMD in both Peru and Ethiopia, and indicates that the actions of a few can indirectly benefit others. The only other study to explore this association (Veenstra 2005) found no association, possibly because the impact that community

development groups in particular can have on the welfare of residents is greater in low income countries.

Hypothesis C: Support from bonding and bridging sources have different effects on CMD.

This hypothesis is not supported by the analysis which shows that individual level support from both bonding and bridging individuals is associated with increased odds of CMD. Support from bonding individuals is associated with increased odds of CMD among mothers living in extreme poverty, and support from bridging individuals is associated with increased odds of CMD among mothers living in communities with a low sense of belonging. In addition, and in line with results from Ethiopia (Table 4.7), higher community levels of support from bonding individuals is associated with increased odds of CMD.

The parallel associations seen between bonding and bridging sources of support may be partly due to limitations in the definition of these categories. As argued in Chapter 6, defining bridging and bonding support by the outcomes each are hypothesized to provide (Woolcock 2000, Tuesta 2003) ignores the fact that the same source of support can produce different outcomes. Community leaders may provide emotional or practical support helping people to 'get by', while relatives may provide additional resources enabling people to 'get ahead'. Dividing sources of support into people of similar status (for example friends, family and neighbours), and those of different status (for example community, political and religious leaders) ignores the dual role the same individual can play. In addition, linking sources of support (from institutions such as NGOs) were not separated out in the analysis due to the small number of people receiving such support, and were instead included as bridging sources. These somewhat simplistic classifications may partly explain why different associations between different types of support and CMD were not found.

The consistent positive association between social support and CMD deserves closer attention as it is at odds with much of the literature which shows support to be associated with a reduced risk of CMD (Berkman and Glass 2000, Kawachi and Berkman 2001). The possibility of reverse causality whereby mothers with CMD receive more support cannot be excluded and remains the most likely explanation. A

further possibility is that support from individuals is acting as a proxy for adverse life events. The analysis of the determinants of social support in Chapter 7 showed that receiving support is associated with extent of need as a result of suffering adverse life events (Figure 7.3). Nevertheless, as argued in section 4.4.2, reverse causality cannot explain the association with bonding support at the community level as on average an individual's social capital score makes up only one fiftieth of the ESC measure.

A number of methodological issues may help to explain the association. The analysis of the face validity of the SASCAT tool (section 5.3.1) highlighted that the question does not separate emotional, economic and instrumental sources of support, and may also measure neediness rather than actual social support and therefore be positively correlated with CMD. The subsequent qualitative validation (section 5.4.2) showed that when asked about support, respondents largely reported economic rather than emotional help, and rarely reported instrumental support (help in knowing or doing things). The latter two types of support have been hypothesized to be the mechanisms through which poor people are able to help themselves (Baum 1999, Woolcock 2000), their probable under-reporting in these data potentially explaining the lack of a protective effect of social support on CMD.

The possibility that the observed associations are real must also be explored. The presence of interactions lends weight to the argument put forward in Chapter 4 in response to the finding that individual social support was associated with increased odds of CMD in both Peru and Ethiopia. Kawachi and Berkman argue (2001) that the protective effects of social support on mental health may not be uniform across society and that social connections may actually increase levels of distress among women with low resources, if such connections entail the role strain associated with reciprocal obligations to provide support to others. This may be the case in the Peruvian sample as receipt of economic help may entail obligations to reciprocate which are particularly stressful for those living in extreme poverty, or those living in communities with little sense of belonging. The finding that support from bonding sources is associated with reduced odds of CMD among non-poor mothers further supports this hypothesis. Not only may reciprocation of such support confer less stress among mothers who are not poor, as they have a reasonable expectation of being able to reciprocate in the future, but the economic support received from family

and friends who are also likely not to be poor may be more effective. As Cattell (2001) found in her qualitative study of social capital in impoverished areas of London, support from individuals who are part of homogenous networks made up of poor people often do not receive effective support as other members of the network are not able to provide the assistance required.

A further explanation is provided by recent studies indicating that social integration may be associated with worse rather than better health outcomes. In a re-analysis of Durkheim's classic thesis that modern life disrupts social cohesion resulting in higher suicide rates, Kushner and Sterk (2005) argue that social integration is actually associated with high levels of suicide. This is reinforced by a prospective analysis of the association between community social capital measured on a different sample and death rates among elderly patients in Chicago (Wen et al. 2005). In this analysis, increased social network density (measured as an index of how often residents meet socially with each other and have friends or relatives in the neighbourhood) resulted in increased hazard of death. Though the authors found no interaction with community level deprivation, neighbourhoods with dense social networks were more likely to be deprived and to have higher crime rates. The authors hypothesized that dense social networks may be detrimental to people living in deprived areas as they help to spread risky behaviours. This is mirrored by empirical work by Wilson (1996) which showed that impoverished and dangerous neighbourhoods also often have a relatively high degree of social integration and high levels of neighbouring accompanied by low levels of informal social control.

Hypothesis D: Social capital has different effects on CMD in different sub-groups.

The presence of four different interactions supports this hypothesis, though it should be noted that these analyses were exploratory and any findings should be subject to confirmation by further research. The variety of the different interactions suggests that social capital may have a complex relationship with CMD with different effects for different sub-groups, and that generalisations about effects across groups may be misleading. For example, while individual support from bonding sources is associated with increased odds of CMD among extremely poor mothers, it is associated with reduced odds among non-poor mothers. In addition, the inverse association between community sense of belonging and CMD is much stronger among those who receive

support from bridging individuals, while the inverse association between community sense of belonging and CMD is stronger for mothers living in extreme poverty. Lastly, the level of civic action in a community may only be important for the mental health of mothers who have personally contributed to that civic action.

Importantly, four out of the five social capital variables involved in these interactions show no significant association with CMD until the interaction term is included. These comprise individual support from bridging and bonding individuals, and joining together at the individual and community level. This indicates that the effect of social capital on CMD may be underestimated in the existing literature which rarely explores the association within sub-groups. The few studies which have explored interactions support this. In both of the studies from my systematic review (section 2.4) which show significant interactions between social capital and other variables, the social capital variable showed no association with CMD before the interaction term was entered (Brown et al. 1992, Cutrona et al. 2000). As only three studies explored interactions, the results of this review are likely to underestimate the effect of social capital in specific sub-groups. The differential effect of social capital in sub-groups is not confined to CMD, as two other studies exploring the association between social capital and child mental health also found no association until interaction terms were included (Caughy et al. 2003, Van der Linden et al. 2003).

Hypothesis E: Social capital and poverty interact in the prediction of CMD. Social capital acts as a buffer against the negative impact of poverty on CMD.

The results of the analysis are conflicting with regards to this hypothesis. While it is clear that social capital and individual poverty status interact in the prediction of CMD (two significant interactions were found), no interactions between community level deprivation and social capital were detected. In addition, the evidence as to whether social capital acts as a buffer against the deleterious effects of poverty is conflicting. While higher levels of community sense of belonging are associated with a greater reduction in the odds of CMD among mothers living in extreme poverty, support from bonding individuals is associated with increased odds of CMD among the same group.

In line with the buffering hypothesis, Brown et al. (1992) showed that among African Americans living in urban USA experiencing economic strain, group membership was

associated with reduced odds of depression. In addition, Van der Linden et. al (2003) showed that the effect of poverty on child mental health service use was stronger in neighbourhoods with low levels of social cohesion and trust, indicating that social capital may buffer poor children against mental health risk by increasing their access to mental health services.

Yet my results show that not all aspects of social capital act as a buffer against poverty, and furthermore that support from bonding individuals may have deleterious effects. Another study has reported a similar interaction, whereby the association between how well a parent knows her neighbours and the presence of child behaviour problems differs depending on the degree of economic impoverishment of the neighbourhood (Caughy et al. 2003). In wealthy neighbourhoods, children whose parent reported knowing few of the neighbours had the highest levels of internalizing problems such as anxiety and depression. In contrast, in poor neighbourhoods, children whose parent reported knowing few of the neighbours had the lowest levels of internalizing problems. The authors conclude that not knowing ones neighbours may be protective against child behaviour problems in impoverished communities.

The higher social network density in impoverished neighbourhoods found by the studies reported above (Wilson 1996, Cattell 2001, Wen et al. 2005) may help to explain these findings, as denser networks may facilitate a downward levelling of norms and the spread of dangerous behaviours, resulting in mental health problems. Qualitative research in London also suggests that social capital may not always be capable of buffering poor people against mental illness. Whitley and Prince (2005) conducted qualitative interviews with 32 residents of Gospel Oak, a deprived district of London, and supplemented this with in depth ethnographic observations. They found that despite satisfaction about levels of cognitive and structural social capital among residents, confirmed by participant observations, rates of CMD in the community were high. Instead, the authors point to the role of individual compositional factors such as poverty and unemployment which respondents argued had a bigger impact on their mental health. They conclude: *“The ability of social capital in Gospel Oak to mitigate against the impact of the individual level risk factors that have been consistently identified as predisposing an individual to CMD appears to be low”* (Whitley and Prince 2005). Thus while some aspects of social capital seem

to have different effects for different sub-groups, it cannot always mitigate the effects of poverty, and some of these effects may actually be damaging. Nevertheless, it seems that those living in extreme poverty are more susceptible to changes in levels of social capital than other wealth groups, and therefore that this sub-group should be explored in more detail.

Hypothesis F: Structural and cognitive social capital interact in the prediction of CMD.

One significant interaction was found that gave some support to this hypothesis. Individual support from bridging individuals is associated with greatly increased odds of CMD in communities with a low sense of belonging, lending support to the hypothesis that structural social capital may be damaging to mental health when accompanied by low levels of cognitive social capital. Potential explanations for the association between social support and increased odds of CMD have been outlined above. In addition, it is possible that support from bridging individuals is associated with more CMD when accompanied by low community sense of belonging, because the recipient feels more indebted to those who provide assistance in the absence of a shared sense of belonging which may be accompanied by reduced expectations of reciprocity. The findings from the description of social capital in Peru (section 6.3) that residents in shantytowns viewed community leaders as generally corrupt and unhelpful provides a further insight, as any support received from such individuals may be under-valued by residents. Exploratory analyses show that not feeling part of the community is strongly associated with level of political corruption in the community (results available on request), so not feeling part of the community may act as an indicator of corruption which makes recipients less likely to appreciate any support received and may also affect the quality of support offered.

Hypothesis G: ISC and ESC interact in the prediction of CMD.

This hypothesis is supported by the interaction between individual and community level joining together to address a common problem and shows that in line with research by Subramanian (2002), and Poortinga (2005), individuals whose levels of ISC are at odds with the level of ESC in the community are particularly at risk of CMD. Subramanian's study of over 21,000 adults across 40 US communities showed that people who trust others and who also live in communities with high levels of trust

have the lowest probability of reporting poor physical health. In contrast, individuals who do not trust others and who live in communities with high levels of trust have the highest probability of reporting poor physical health. Similarly, Poortinga (2005) in a study of 22 European countries found an interaction between individual and country level social capital. While trusting and civically active individuals were more likely to report good physical health if they lived in countries with correspondingly high levels of social capital, they were more likely to report poor physical health if they lived in a country with low social capital. Both studies indicate that a mismatch between an individual's social capital and that of their social environment may be detrimental for mental health. They also suggest that just as the distinction between context and composition may be artificial, so may the distinction between individual and ecological social capital. An individual's own social capital is influenced by what is available to them in the community, just as the level of social capital in a community is influenced by the social capital of its residents.

The presence of the interaction between individual and community level citizenship means that the conclusion from Chapter 4 that citizenship activities are not important risk factors for CMD is premature, as they may be important for specific groups. While there is no association between levels of community civic action and CMD for mothers who are not involved in citizenship activities, mothers who have joined together with others but who live in a community where few other people join together have a 45% increased probability of having CMD. Furthermore, mothers who have joined together and who live in communities where more than 10% have also joined together have lower odds of suffering from CMD than mothers who do not participate. I hypothesize that this is due to increased levels of stress among mothers seeking to solve community problems in communities where few other people are interested or willing to help. Conversely, increased feelings of solidarity and the possibility of more successful outcomes from better supported campaigns may explain the finding that participating in civic action with a critical mass of others is associated with reduced odds of CMD.

The lack of significance of the ESC citizenship variable suggests somewhat surprisingly that involvement in citizenship activities confers no indirect benefit on the mental health of the wider community (for example a group of residents

campaigning to get electricity for the shantytown benefits everyone). This may be for a number of reasons. Firstly, the powerful indirect effect of levels of group membership in the community on individual CMD means that this association could account for the variance in CMD risk attributable to citizenship activities. Many community development projects will be undertaken by community groups such as residents associations, rather than by individuals. Secondly, my description of social capital in Peru (section 6.3) showed that residents join together for many reasons, not all of them altruistic. If the majority of activities directly benefit participants, for example collecting money to buy Christmas presents for members' own children or helping to pay for medical treatment for one of the group, these activities would not be expected to confer indirect benefits on those not involved in the activity.

Hypothesis H: Some aspects of in particular cognitive social capital remain independent risk factors for CMD once other known risk factors are controlled for.

There is some support for this hypothesis as five aspects of both individual and ecological social capital remain as independent risk factors for CMD in Model 2. The size of effect of social capital on CMD is of public health importance. Compared to a mother with no adverse life events, average socio-economic status, and in the lowest risk category for all social capital variables, a mother with the same characteristics but in the highest risk category for all social capital variables (including the interaction terms) has a 93% increased probability of suffering from CMD. In contrast, a mother with average social capital values but in the greatest risk categories for all the other factors (i.e. suffered adverse life events, has debts etc.) has a 76% greater probability of having CMD than a mother with the same characteristics but in the lowest risk categories for the other risk factors. While only a few mothers fall into these extreme groups in the dataset, a combination of even a few of these risk factors would result in a substantial increase in the risk of CMD.

A number of social capital variables significant in Model 1 did not remain as independent risk factors for CMD once adverse life events were included in the model, most notably support from bonding individuals and sense of fairness. It is possible that these variables drop out of the model because they are acting as proxies for adverse life events. For example, Chapter 7 showed that mothers are more likely to report that people would take advantage of them if they have suffered an economic

shock, have debts or have been a victim of crime (Figure 7.8). Extent of need as measured by adverse events was also associated with support from individuals (Figure 7.3). It is possible that adverse life events such as having a difficult pregnancy or suffering the illness or death of a child may result in those affected receiving more social support. It is therefore more likely that the associations between social support and CMD observed both in this chapter and in Chapter 4 are the result of mothers who have suffered adverse life events receiving support, than that social support is itself associated with worse mental health.

The significance of neighbourhood disorder as an independent risk factor for CMD may also account for the reduction in the effect of social capital variables between Model 1 and Model 2, indicating that neighbourhood disorder is on the causal pathway between these aspects of social capital and CMD. A number of studies included in my systematic review (section 2.4) also found no association between social capital and CMD after controlling for neighbourhood disorder or violence (Cutrona et al. 2000, Mitchell and La Gory 2002, Gatrell et al. 2004, Harpham et al. 2004a). Wen et. al. (2005) hypothesized that a similar reduction in the association between social network density and mortality among elderly patients in Chicago indicates that social resources affect levels of neighbourhood disorder which in turn affect mortality risk. These results support one of the causal pathways through which I hypothesized social capital may affect CMD, whereby low levels of social capital result in less effective informal social control and increased neighbourhood disorder. Raised levels of violence and disorder in the community may result in feelings of insecurity and stress in residents, and also increase the chances of individuals becoming the victim of crime and therefore suffering an adverse life event (Figure 1.2).

8.5.2 Methodological limitations

The major limitations of this analysis are the same as those of the analysis presented in Chapter 4. As they have already been discussed in detail (section 4.5), they will not be explored further here. Two additional limitations are specific to this analysis. Firstly, a variable recording partner violence could not be used due to large amounts of missing data. However, the inclusion of a number of other risk factors relating to adverse life events, including domestic abuse as a child and neighbourhood disorder,

may account for some of the variance attributable to this variable. This is supported by exploratory analyses with a reduced sample (n=932) including the partner violence variable (results available on request). While partner violence was significantly associated with CMD (OR 2.42, 95% CI 1.47, 3.96), the size and significance of the social capital variables and other risk factors remained largely unchanged.

Secondly, the GLLAMM command in Stata used for multi-level modelling does not support multiple interactions with the same variable. Instead, two-level logistic regressions with robust standard errors were used for all models containing interactions, providing a very close, but not exact, approximation to multi-level modelling. However, the negligible size of the community and cluster level variance from the three-level models makes it unlikely that this will have led to an over-estimation of the significance of the coefficients in the model.

8.6 Summary

The in depth exploration of social capital in Peru presented in Chapters 5 to 8 has permitted many of the questions posed as a result of the cross-country analysis (section 4.6) to be addressed. Specifically, an analysis of what the SASCAT questions actually measure combined with an understanding of the nature of social capital in Peru has enabled a more nuanced interpretation of the association between social capital and CMD in this setting.

Social capital in Peru is complex and context-specific. Different aspects of social capital have different effects on CMD in different sub-groups, and these effects may not always be beneficial. While many aspects of social capital do not seem capable of mitigating the effects of poverty on CMD, those living in extreme poverty do seem more susceptible to changes in levels of social capital than other wealth groups, indicating that the effect of social capital among the very poor should be explored in more detail. Some aspects of social capital operating at both the individual and the community level exert relatively large effects on CMD independent of other known risk factors, suggesting a role for social capital in CMD prevention.

The final chapter will summarise the main results of this thesis and then draw together common themes explored throughout the thesis. These include the measurement of social capital, the complex relationship between compositional and contextual factors, the nature of the association between social capital and CMD, and whether interventions to improve social capital hold any promise for the treatment or prevention of CMD in low income countries.

**Part VI: Social capital and CMD:
Where are we now?**

9. Discussion and conclusions

In this concluding chapter I outline the strengths of the approach used in this thesis, followed by an overview of the results for each of the objectives which I have explored. Methodological considerations are then addressed, including methodological limitations and how I have attempted to address them, and issues surrounding the measurement of social capital. This is followed by a discussion of the common themes in the association between social capital and maternal common mental disorders (CMD) which have emerged from this thesis, and the implications of these for mental health interventions and future research.

9.1 Strengths of the approach used in this thesis

The approaches I have used in this thesis have a number of strengths which mean that it is not subject to many of the criticisms of social capital research outlined in section 1.2.3.

1. I focus on primarily poor mothers in low income countries, a group at high risk of CMD and for which there have been calls for international intervention (section 1.1.1).
2. I conduct the most comprehensive systematic review of social capital and mental health research methods and findings to date (Chapter 2). These allow the methods for the thesis to be developed in the light of existing research, and for the results to be discussed in the context of similar studies.
3. I use multi-dimensional measures of social capital measured at both the individual and at the community level.
4. This is the first time that the same methods have been used to compare directly the association between both individual and ecological social capital and any health outcome across four low income countries (Chapter 4).
5. I use multi-level modelling techniques to account for the structure of the data, control for a wide range of confounders, and include individual and ecological measures of social capital in the same analysis. These methods provide a stringent

statistical assessment of the association between social capital and maternal CMD (Chapters 4 and 8).

6. I compare psychometric and cognitive methods of validation to validate the social capital tool for use in Peru (Chapter 5).
7. I supplement the results of my further quantitative analyses in Peru with qualitative data to try to understand the context of that setting and to aid interpretation of the results (Chapters 7 and 8).

9.2 Overview of thesis

9.2.1 Rationale and objectives

1. CMD are a large and growing problem in the developing world, yet their causes are largely unknown and their symptoms rarely treated. Maternal CMD has an impact on the wellbeing of the mother and that of those she cares for.
2. Social capital is a relatively new concept which adds a social dimension to traditional structural models of mental illness. Measuring it at the individual and community level recognizes both compositional and contextual influences of the social environment on mental health.
3. While the cross-sectional association between individual level cognitive social capital and CMD in developing countries is relatively well established, there has only been one study of individual social capital in a low income country (Harpham et al. 2004a). The association in this setting, and with ecological measures of social capital, remains largely unknown.

The primary objective of this thesis is to explore the association between individual and ecological (community level) measures of social capital and maternal CMD in four low income countries.

9.2.2 Main findings

Table 9.1 presents the main findings for each of the objectives of my thesis.

Table 9.1: Summary of objectives and main results of thesis

Objectives	Summary of findings
Part I: Social capital and mental health: the existing evidence	
1. Systematically review the methods used to measure social capital in existing studies of social capital and mental illness, and evaluate these measures in the light of criticisms of the concept.	<ul style="list-style-type: none"> - The wide range of definitions and measures used by studies to measure social capital mean that the concept is too broad. - There has been no resolution of the debate between individual and ecological measures. - Many measures of social capital are one-dimensional. - Very few tools have been properly validated. - All but one study uses aggregations of individual responses to measure ESC.
2. Systematically review studies exploring the association between social capital and CMD in order to provide an estimate of the effect of social capital on CMD.	<ul style="list-style-type: none"> - 18 studies, two of which measure ESC met the criteria for the review. - Among the studies measuring ISC there is strong evidence for an inverse association between social harmony and combined measures of cognitive social capital and CMD, and moderate evidence for a small inverse association between group participation and CMD. - There is no evidence of an association between trust and civic participation and CMD. - Only two studies include ecological measures of social capital, making their results hard to summarise.
Part II: Cross-cultural analysis of social capital and CMD	
3. Examine the role of ISC and ESC as independent risk factors for maternal CMD in the developing world using data from Peru, Vietnam, Ethiopia and Andhra Pradesh.	<ul style="list-style-type: none"> - Results from each country are mixed, with associations between CMD and some social capital variables in some countries but not in others. - Only cognitive social capital is inversely associated with CMD in all four countries, with individuals with high cognitive social capital having roughly half the odds of being a probable case of CMD. - Individual group membership is positively associated with CMD in Andhra Pradesh. - Community level group membership is inversely associated with CMD in Peru and Vietnam, though the association may not be linear. - Support from individuals is positively associated with CMD in Peru and Ethiopia. - No association between civic action and CMD apart from in Ethiopia.

Continued...

Objectives	Summary of findings
Part III: Social capital and CMD in Peru	
4. Use both quantitative and qualitative methods to validate the social capital tool used by YL to measure social capital in Peru.	<ul style="list-style-type: none"> - Psychometric validation techniques alone are not sufficient to validate adequately multi-faceted social capital tools for use in different cultural settings. - Psychometric techniques show SASCAT to be a valid tool reflecting known constructs of social capital. - However, results from the cognitive interviews present a more mixed picture, with some questions being appropriately interpreted by respondents and others displaying significant differences between what the researchers intended them to measure and what they actually do measure. - Questions on generalized trust and group membership were particularly problematic.
5. Explore the nature of social capital in Peru.	<ul style="list-style-type: none"> - The diverse types of social capital important in Peru show that it is a multi-dimensional concept. - The contribution that different organisations and networks make to different aspects of social capital varies by setting (rural/urban), person involved (male/female), and over time. - No clear distinction between using bonding social capital to 'get by' and bridging social capital to 'get ahead'. The same organisation or network can be used for multiple purposes. - Cognitive social capital and strong links with friends, family and neighbours are the most important forms of social capital in Peru.
6. Investigate the determinants of each aspect of social capital in Peru.	<ul style="list-style-type: none"> - Both individual and community level factors are associated with social capital. - Social position is associated with participation in structural social capital, but does not affect perceptions of social relationships. - The different determinants for each aspect of social capital suggests that composite variables may not capture this complexity and that the effect of social capital on CMD may be different for different sub-groups
7. Analyse the association between each aspect of social capital and CMD in one model, including more complete control for socio-economic status.	<ul style="list-style-type: none"> - More complete control for confounding by socio-economic status does not attenuate the effect of any of the associations seen in Chapter 4. - Analysing each aspect of social capital separately (rather than using composite variables) shows that different aspects of social capital have different associations with CMD.

Continued...

Objectives	Summary of findings
8. Explore interactions between ISC and ESC, structural and cognitive social capital, and social capital and poverty in the prediction of CMD in Peru	<ul style="list-style-type: none"> - The presence of some interactions suggests that the effect of social capital on CMD may vary between sub-groups, though these analyses are exploratory - Individual support from bonding individuals is positively associated with CMD among extremely poor people. - Individual support from bridging individuals is positively associated with CMD among mothers living in communities with low sense of belonging. - Mothers living in extreme poverty have increased odds of CMD if they live in a community with low sense of belonging. - Mothers who join together with others have increased odds of CMD if they live in communities where few other people participate in civic actions.
9. Estimate the relative importance of social capital compared to other known risk factors for CMD.	<ul style="list-style-type: none"> - A number of social capital variables at both the individual and ecological level remain as independent risk factors after controlling for known risk factors for CMD. - Community level group membership and individual sense of belonging are inversely associated with CMD. Community level support from bridging individuals is positively associated with CMD. - There are interactions between community sense of belonging and household poverty, and between community sense of belonging and individual support from bridging individuals in the prediction of CMD. - In addition to some social capital variables, adverse life events are important risk factors for maternal CMD.

Part I: Social capital and mental health: existing evidence

The systematic review of social capital and all mental illnesses (section 2.3) highlighted a number of limitations of existing research, in particular in the measurement of social capital. Restricting the review to CMD showed that while there is good evidence for an inverse association between individual measures of cognitive social capital and CMD, there are few other consistent associations. Only one study had explored social capital and CMD in low income countries.

Part II: Cross cultural analysis of social capital and maternal CMD

The comparative analysis of social capital and CMD across the four Young Lives (YL) countries (Chapter 4) replicates the finding from developed countries that combined measures of individual cognitive social capital are associated with reduced odds of CMD. The results for individual measures of structural social capital are more mixed and culturally specific, with some aspects associated with increased odds

of CMD. This analysis raises more questions than it answers. There are unresolved issues regarding the measurement and meaning of social capital in different cultural settings, the possibility of different effects in different sub-groups and the relative importance of social capital as an independent risk factor for CMD.

Part III: Social capital and CMD in Peru

These issues are explored in a further analysis of the Peruvian data. Firstly, I validate the SASCAT tool used to measure social capital in YL using psychometric and cognitive methods (Chapter 5). The results emphasise the difficulties of measuring complex concepts in different cultural settings and highlight the need for multi-disciplinary approaches to validation. They also illustrate the culturally specific nature of social capital and thus the need to validate tools in different cultural settings. Importantly, the validation enables more accurate interpretation of the results of the further Peruvian analysis (Chapter 8) based on what the questions are likely to be measuring rather than what they are assumed to measure.

The description of social capital in Peru (Chapter 6) shows it to be multi-dimensional and complex with networks and organisations playing different roles in different contexts. The varied determinants of different aspects of social capital suggest that composite variables may not capture the complexity of social capital and that the effect of social capital on CMD may be different for different sub-groups (Chapter 7). These analyses facilitate the design of more appropriate analysis and more nuanced interpretations of the Peruvian data.

The in depth and more complex analysis of the Peruvian data (Chapter 8) shows that different aspects of social capital have different associations with CMD and that not all components of the composite variables are important. The presence of interactions suggests different effects in different sub-groups and a complex relationship between compositional and contextual factors. Even after controlling for other known risk factors, some aspects of both cognitive and structural social capital and of both individual and ecological social capital remain independent risk factors for CMD.

9.3 Methodological considerations

My research raises a number of methodological issues for consideration. These comprise the methodological limitations of the analyses and how I tried to address them, and issues surrounding the measurement of social capital, in particular ecological social capital (ESC).

9.3.1 Methodological limitations

The majority of the methodological limitations of the analyses presented in this thesis have already been discussed in section 4.5 and they will not be considered in detail here. The impact that these limitations may have upon the conclusions drawn in this thesis is discussed below.

Temporal direction of associations

As the analyses are all cross-sectional it is not possible to attribute causality in any of the associations found. It is possible that CMD affects levels of individual social capital, for example by reducing participation in groups or networks or by increasing feelings of mistrust and social isolation. In addition, the use of self-reports to measure both social capital and CMD may result in same source bias which artificially inflates the observed association between social capital and CMD. These limitations have been highlighted throughout the thesis and are common to the vast majority of social capital and mental health research (De Silva et al. 2005). In addition, observed associations between ESC and CMD are unlikely to be due to reverse causality as an individual's social capital makes up only a small proportion of the ESC score of their community.

Analysing the association between ESC and CMD may be problematic as some aspects of social capital, in particular cognitive social capital, may change slowly in relation to external stimulus (i.e. political climate), and thus there may be a time lag in their effect on mental health. In addition, the cross-sectional nature of the data means that the degree to which observed associations are actually due to residents with high risk individual characteristics moving to high risk communities cannot be determined (the selection hypothesis). However, unlike other studies exploring the effect of context on health which have been criticised by others for not adjusting for social

mobility (Kawachi and Berkman 2003, Macintyre and Ellaway 2003), length of residence was included in the models, though it did not have a confounding effect (Table 4.7). This may be because a large proportion of respondents have lived in their community for all of their lives (Table 4.4), a fact which makes these analyses a better test of the causation hypothesis whereby the outcomes of individuals are caused by the context in which they live. All of these limitations are areas in which the YL study will be able to make a significant contribution, as future rounds of data collection will enable associations to be explored longitudinally.

Residual confounding

Residual confounding due to unmeasured variables, exclusion of variables due to missing data, and measurement error may mean that some of the observed associations are spurious. However, additional analyses exploring the impact of residual confounding indicate that any effects are likely to be minor. For example, the inclusion of maternal long term limiting illness accounts for much of the variation in maternal CMD due to physical health in Ethiopia and Peru (Table 4.7), despite a lack of detailed information on maternal physical health. The lack of a confounding effect of wealth index in the cross-cultural analysis (Chapter 4) suggests that there might be residual confounding by socio-economic status. However, this may be due to the inclusion of a number of other socio-economic measures including educational status and debts. In addition, the use of household income rather than wealth index in the further Peruvian analyses (Chapter 8) more fully controls for socio-economic status in this analysis and reduces the chance that these findings are spurious. Lastly, despite not being able to use the variable on current partner violence as a risk factor for CMD in the Peruvian analysis, exploratory analyses showed that the inclusion of this variable did not affect any conclusions about the association between social capital and CMD (section 8.5.2).

Over-adjustment for variables on the causal pathway

Instead of the observed associations being spurious due to residual confounding, it is more likely that the models are over-adjusted due to the inclusion of a wide range of individual and community level variables which could be on the causal pathway between social capital and CMD. Macintyre and Ellaway (2003) argue that as contextual factors can partly determine the characteristics of individuals, these

compositional factors may be on the causal pathway between community factors and individual outcomes, and therefore that adjusting for them may attenuate the effect of the contextual characteristic. This may be the case for a number of variables included in my analyses. For example, if social capital leads to poverty reduction as some research has argued (Carroll 2001, Grootaert and van Bastelaer 2001, Robison et al. 2001), adjusting for individual socio-economic status will attenuate the true effect of social capital on CMD. As my analysis contains the most comprehensive control for confounding of any of the studies included in my systematic review (section 2.4), it is possible that the true effect of ESC on CMD is greater than that shown in my analyses. In spite of this I made the decision to include a wide range of potential confounders. As the causal pathways through which social capital affects CMD are not known, any decisions about which variables to exclude on the basis that they are on the causal pathway would be based on untested (and untestable in this dataset) hypotheses. Instead I considered it better potentially to underestimate the effect of social capital on CMD by over-adjusting for variables, than to increase the chance of residual confounding and erroneously conclude that an association exists

Chance findings

The large number of social capital exposures tested in the analyses presented in this thesis mean that some of the statistically significant findings could be due to chance (Type I error). I attempted to reduce the likelihood of this by always testing explicit hypotheses. In addition, when testing for interactions with multiple social capital variables was required in order to test my hypotheses I used a Bonferroni correction to adjust the acceptable level of statistical significance (section 8.3.1). Lastly, I interpreted with caution all results of borderline significance, and only placed weight on those findings which were replicated across different contexts or remained robust throughout different stages of the modelling process.

9.3.2 Measurement of social capital

Issues surrounding the measurement of social capital form an important theme in this thesis. The measurement of ISC has already been extensively discussed (Chapter 5) and will only be briefly reviewed here, followed by a more detailed discussion of the measurement of ESC.

Bias in the measurement of ISC

The complex findings from the cognitive validation of the SASCAT tool in Peru in Chapter 5 show that respondents did not always interpret the social capital questions as intended. As discussed in section 8.5.2, this may explain the lack of association seen between some aspects of social capital, most notably with trust. While the validation conducted in Vietnam also showed some problems with the social capital tool (Tuan et al. In Press), the less detailed approach used there means that linking differences in interpretation to the results of the analysis is more difficult. No validation has been conducted in either Ethiopia or Andhra Pradesh, and so interpretation of the results from these countries remains speculative.

Bias in the measurement of ESC

The validation of measures of ESC is much more problematic. Due to the focus on Peru in this thesis, I will explore this issue in relation to the measurement of ESC in Peru only. As no gold standard way of measuring ESC exists, and contextual measures of cognitive ESC in particular are problematic (section 1.2.4), there is no obvious reference with which to test convergent validity (agreement between measures purporting to measure the same construct). Instead, five questions can be addressed concerning the validity of the ESC score used in this thesis. The first, whether the individual level data which are aggregated to produce the community level scores are valid, has been answered by the validation of the SASCAT tool in Peru and will not be discussed further. The other questions have been indirectly explored in the further analysis of social capital in Peru and will be discussed here. They comprise: does the sample used for aggregation provide a representative picture of the social capital of the whole community; does the aggregation of individual responses measure something contextual; is the definition of community used as the level of aggregation meaningful for respondents; and lastly, is the use of mean scores to reflect the social capital of a community appropriate?

1. Does the sample used for aggregation produce a representative picture of the social capital of the whole community?

The results of the descriptive analysis (Chapter 6) and determinants of social capital analysis (Chapter 7) suggest that aggregating the social capital of primarily female caregivers is unlikely to produce a representative picture of the social capital of the

whole community. The score in Peru is an aggregation of the individual social capital of the main caregiver of one-year-old and eight-year-old children. While this covers different demographic groups including fathers and grandparents, the vast majority of respondents are the biological mother of the child. The sample is also limited to those who have children in the household, the presence of whom may have an important impact on not only the extent and type of participation, but also on perceptions of the quality of social relationships within the community.

While the lack of variation in the dataset means that it is difficult to assess the role of demographic factors such as age, sex and having children as determinants of the social capital of individuals, some clues are provided by Chapters 6 and 7. The analyses there suggest that while structural social capital varies by demographic groups, cognitive social capital does not. For example, being older and male are significantly associated with increased participation in both community groups and in civic action (Figures 7.2 and 7.4). Spheres of participation are also gendered. Men are much more likely to participate in community governance and protection such as self-defence committees and residents associations. They are also more likely to hold positions of power such as community leaders, and therefore to control access to linking social capital in the community. Women on the other hand are more likely to be involved in groups related to feeding and children, and although they may hold positions of power, these do not always confer the same prestige that they would on a man. In contrast, demographic factors are not strongly associated with levels of cognitive social capital, and male and female respondents in my qualitative interviews differed little in their perceptions of the quality of social relationships in the community (section 6.4).

The effect of having children on levels of social capital cannot be assessed in this study as there is no comparison group without children. However, it is highly likely that parents are plugged into a different set of networks than people without children. For example, school based groups may predominantly involve those with children, while some social networks such as sports groups may be biased towards single people. The effect that having children has on perceptions of cognitive social capital is unknown.

In summary, the ESC scores used in this study are unlikely to be providing a representative picture of the structural social capital of a geographical community. The indirect effect that the social capital of other groups in the community has on the mental health of mothers remains unknown, in particular the activities of men, older people, and residents without children. However, the fact that a number of ecological measures are significantly associated with maternal CMD even after controlling for a wide range of confounders suggests that these measures are capturing something meaningful for maternal CMD. It is possible that these mothers are more influenced by the activities of other residents who are similar to them and who participate in similar spheres of activity, rather than by the actions of different groups with which they may not have regular contact. Without representative samples of the community, these indirect effects of social capital on mental health cannot be estimated.

2. Does the aggregation of individual responses measure something contextual?

Macintyre and Ellaway (2003) argue that aggregating individual responses to measure contextual effects implies that there is a 'social miasma' whereby the collective characteristics of people's neighbours affect them (for example, living near to a lot of poor or unemployed people). They argue that most researchers are not aware they are using this model, and prefer to think of their measures as proxies for contextual variables. However, as discussed in section 1.2.4, truly contextual measures may not be capable of capturing the complexities of ecological cognitive social capital. Raudenbush argues (2003) that some aspects of the social environment such as social cohesion and norms of support are actually best measured using aggregations of respondents' views as it is the perception of the social environment rather than the reality which may be important for health.

Nevertheless the question of whether aggregations of individual responses measure something contextual must be addressed. There is some evidence to suggest that subjective assessments of the environment do reflect contextual realities. For example, Subramanian et al. (2003b) demonstrated that even after controlling for individual predictors of perceptions of trust such as age and socio-economic status, significant contextual differences between communities remain.

I have effectively replicated this analysis by including individual predictors of ISC in my analyses (for example age and socio-economic status), as well as each mother's own level of ISC. Thus the effect of each ESC variable is only the impact of the contextual effect (i.e. the effect of levels of social capital in the community irrespective of an individual's own level of social capital). The fact that there is still an effect of these variables over and above the effect of ISC and the determinants of reporting perceptions of ESC, suggests that these aggregations of individual responses are measuring something contextual.

3. Is the definition of community used as the level of aggregation meaningful for respondents?

As discussed in section 4.5.3, the definition of community used in each country differed. While the definition of Official Commune used in Vietnam is a politically and geographically robust concept, the definitions of community used in the other three countries may not be so straight forward. This is particularly the case in Ethiopia where for practical reasons a larger unit of aggregation (sampling cluster) was used to represent communities. It is unclear whether the greater number of associations seen between ESC and CMD in Ethiopia is due to using this larger unit of aggregation, but it does raise the question of which definition of community is most meaningful for mental health and at what level ESC should be measured, questions I am unable to answer in this thesis.

These concerns were strengthened by results from my qualitative interviews in Peru (section 5.4). Respondents hardly used the word 'community', and more worryingly referred to different areas depending on the question asked. Therefore it is likely that the level of aggregation used in this study (locally defined communities) does not correspond exactly to the area that the respondents were referring to when answering the questions.

4. Is the use of mean scores to reflect the social capital of a community appropriate?

To calculate the ESC for each community I took the average of all of the ISC scores in each community. However, it is plausible that rather than (or as well as) the average levels of social capital in a community, the range of social capital scores is important for mental health. For example, a polarised community with extremes of trust and

mistrust may have very different effects on CMD from a community where the majority of people have medium levels of trust. The development of statistical techniques to model the variation in scores as well as the point estimates is warranted, but is unfortunately beyond the scope of this thesis.

Summary

The measurement of ESC poses many more methodological challenges than the measurement of ISC. Difficulties surround the use of aggregation of individual responses versus contextual measures, the level of aggregation to use, methods of validating the measures, and the need for complex statistical methods (multi-level modelling) to analyse the results. As such, few studies have attempted to measure ESC, and the development and validation of tools to measure ESC remain major challenges facing this research. This thesis has attempted to address some of these problems, but has been ultimately constrained by the only available measure which is an aggregation of the social capital of predominantly female caregivers. Once this measure had been shown not to provide a representative picture of the social capital of a community, there was little point in developing methods to validate it or to explore its determinants because such information would be not useful to other researchers attempting to measure ESC. Instead, the extent of the bias was evaluated, and the broader implications for the measurement of ESC discussed.

The true ESC of communities in low income countries still remains to be measured. As argued above, it is possible that by measuring only the ESC of women I am measuring those aspects of ESC that they have access to and that are therefore more likely to have an impact on their mental health. As this is the same type of social capital that they have as individuals, the indirect effect of the social capital generated by unlike groups in the community on maternal CMD also remains unknown.

9.4 Conclusions: the association between social capital and maternal CMD

Specific results of this thesis have been explored in the discussion section to each chapter and will not be repeated here. Instead, the results of my analyses of the association between social capital and CMD will be added to those of other studies exploring the association by updating the systematic review presented in section 2.4, and the principal conclusions across all the analyses presented in this thesis will be drawn out.

9.4.1 Updated systematic review

Combining the results from Chapters 4 and 8 with those from the studies included in my systematic review (section 2.4) almost doubles the total number of effect estimates from 56 to 97 and increases the number of countries in which the association has been explored from seven to 11 (see Appendix G for updated forest plots). This additional evidence changes the conclusions drawn in the systematic review in a number of ways.

The small inverse association between individual participation and CMD seen in the review is not replicated in low income countries (Appendix G, Figure G.1). Though only significant in Andhra Pradesh, a non-significant positive association is also seen in Ethiopia, Vietnam, Columbia, the UK, and the USA. With the exception of the UK study, all of these positive associations are seen in deprived populations, indicating that group participation may only convey a cost to the mental health of individuals living in deprived circumstances.

Including my results reinforces the conclusion that there is little evidence of an association between civic action and CMD, or between individual levels of trust and CMD. It also strengthens the conclusion that social harmony and combined measures of cognitive social capital are inversely associated with CMD. Of the 25 effect estimates from 12 studies exploring this association, 17 show higher levels of individual cognitive social capital to be associated with reduced risk of CMD.

Including the results of this thesis increases the number of effect estimates exploring the association between ESC and CMD from five to 29 (Appendix G, Figure G.2). As such, the results are heavily biased towards the conclusions drawn in this thesis. Overall, fewer consistent associations emerge than with ISC, though the interaction between ESC and both individual and community level variables in the prediction of CMD may be particularly important.

9.4.2 Principal conclusions

There are four principal conclusions of this thesis: contextual and compositional factors both predict CMD; structural social capital has context specific effects and cognitive social capital more universal effects on CMD; social capital may have different effects on CMD in different sub-groups; and some aspects of social capital are independent risk factors for CMD.

1. Context and composition are both important predictors of CMD

The results of this thesis show that both contextual and compositional factors are important predictors of maternal CMD. While adverse life events, demographics and socio-economic status are confirmed as important risk factors for individuals, a number of community level variables are also associated with CMD. These are particularly evident in the further analyses of the Peruvian data, possibly because the use of composite variables and lack of tests for interactions in the cross-country analysis masked the true effect of some of the ESC variables in the other countries.

Importantly, my results illustrate the complex relationship between context and composition, reinforcing Macintyre and Ellaway's (2003) argument that the distinction between context and composition is artificial. Context is not just what remains once all individual level factors have been accounted for, as the context in which a person lives may influence their individual characteristics. For example, living in a socially harmonious community may increase the chance that an individual participates in citizenship activities for that community (Figure 7.4). The complex interactions between context and composition and between individual and ecological social capital seen in this thesis reinforce this argument. Out of the four significant interactions in the Peru further analyses (Chapter 8), three were between contextual and compositional factors. This suggests that individuals interact with their

environment to produce specific outcomes and that context and composition do not operate independently of each other.

2. Structural social capital has culturally specific effects on CMD while cognitive social capital has consistent effects across different contexts.

Results from this thesis consistently show that cognitive social capital is associated with reduced odds of CMD across different settings. However, the association between structural social capital is much more context dependent with associations varying by country and also between different groups within a country. The only consistent finding is that where there is an association, structural social capital is often associated with increased odds of CMD among some disadvantaged groups. Examples of this include the increased odds of CMD among mothers in Peru who participate in civic action in communities where few other residents are also engaged in civic action, and among mothers living in extreme poverty or in communities with a low sense of belonging who receive support from individuals.

As argued in section 4.4.2, this cultural specificity may be due to the nature of structural social capital which is dependent upon the specific groups, norms of participation and civic structures within each country. As shown in Chapter 6, these structures, combined with an individual's own personal circumstances, determine to what extent, and how, individuals are able to participate, and therefore what effect that participation has on their mental health. Cognitive social capital on the other hand deals with fundamental human emotions which do not seem to vary culturally to the same extent. The quality of social relationships seems to be important for CMD across all four of the YL countries, and also in the Western countries surveyed in the studies included in my systematic review.

This finding accords with the results of my systematic review (section 2.4), which show that while individual cognitive social capital is associated with better mental health across a wide range of countries including the USA, Canada, Germany and the UK, structural social capital displays more varied associations across the same countries. In addition, two studies using the same methods to explore the association in different countries have shown the same effects of cognitive social capital between countries, but differing effects of structural social capital. Drukker et al. (2005) found

that an ecological measure of cognitive social capital was associated with better child self-reported health in both the Netherlands and the USA. Similarly, Pollack and von dem Kneseback (2004) showed that reciprocity was associated with reduced risk of CMD in both the USA and Germany, while the effects of participation and trust differed between the two countries. The authors conclude that this result is due to cultural differences between the two countries, for example higher expectations of trust in the USA.

In summary, the inverse association between individual cognitive social capital and CMD seen in the developed world is replicated in low income countries. The different associations for structural social capital seen in the developed world and low income countries highlights the cultural specificity of participation, and indicates that some forms of structural social capital may have a negative impact on the mental health of some disadvantaged groups.

3. Social capital may have different effects on CMD in different sub-groups.

The specificity of social capital is emphasised by the presence of interactions in the further Peruvian analyses suggesting that social capital may only affect the mental health of certain groups. This indicates that both the studies included in my systematic review and the results of my cross-country analysis (Chapter 4) may underestimate the effect of social capital on CMD as they rarely explore interactions among disadvantaged sub-groups. The differential impact of social capital in different groups may be partly explained by inequality in access to social capital in the community. Kawachi and Berkman (2000) argue that forms of discrimination such as residential and workforce segregation mean that residents interact with their community in different ways, and have access to different types of social resources. Other research also indicates that social capital may be accessed differently by different groups in the community. Richer people may range over wider geographical areas and participate in more social circles (Macintyre and Ellaway 2003), while older people are particularly influenced by their community as they spend more time at home, rely more on local resources and may be more emotionally attached to their communities (Wen et al. 2005). Recognising that the effect of social capital on CMD may not be universal across all members of a community highlights the need to

explore the context in which social capital is formed and operates, as well as the need to address issues of equality of access to social resources.

4. Some aspects of social capital are independent risk factors for CMD.

Despite controlling for a wide range of known individual and community level risk factors for CMD in the further Peruvian analyses (Chapter 8), some of which may be on the causal pathway between social capital and CMD, a number of ISC and ESC variables remain independently associated with CMD. These comprise ecological group membership, ecological support from bridging individuals, individual sense of belonging, the interaction between ecological sense of belonging and poverty, and the interaction between support from bridging individuals and community sense of belonging.

My systematic review (section 2.4) and cross-cultural analysis (Chapter 4) emphasise the importance of the independent effect of cognitive social capital for mental health. Six studies in the systematic review include both structural and cognitive social capital in the same analysis, and overwhelmingly show cognitive social capital to be the more important predictor of CMD. For example the study by Lindstrom et al. (2004), which combines group participation and generalized trust into one social capital score, found that being in the lowest category of trust is associated with worse CMD irrespective of the level of social participation.

Sense of belonging emerges as the most important aspect of cognitive social capital for CMD in the Peru-specific analysis, mirroring results from the community psychology literature which indicate that attachment to the community is a powerful predictor of mental health (Davidson and Cotter 1991, Brodsky 1996). It may be that sense of belonging captures a deeper level of emotional attachment to the community than other aspects of social capital such as social harmony, with changes in levels of social harmony having possibly a relatively superficial impact on the functioning of the community. Sense of belonging is the only aspect of cognitive social capital that is associated with residential stability (Figure 7.7), indicating that it deals with more fundamental emotions such as social identity which may have a greater influence on mental health. The importance of sense of belonging for CMD may help to explain the controversial recent finding by Putnam (2003) that ethnic diversity is associated

with a reduction in social capital, as ethnically heterogeneous communities may be less residentially stable resulting in a lower sense of shared identity and sense of belonging.

9.5 Policy implications: the utility of social capital in CMD prevention

The findings of this thesis have implications for existing policies aimed at strengthening social capital with the intention of improving mental health. As outlined in section 1.2.1, a number of such policies are already in existence in the developed world (Department of Health 2001, Henderson and Whiteford 2003, Department of the Deputy Prime Minister 2004). The potential of social capital for CMD prevention in low income countries has been highlighted by Patel (2001) who argues that the protective factors in a community that enable people living in deprived circumstances to remain in good mental health need to be identified and used as a basis for interventions. He argues that where mental health services are poorly developed, preventative strategies aimed at strengthening protective factors in local communities may be more sensible than replicating the expensive (and not necessarily effective) health care systems of the developed world.

The combination of my systematic review (section 2.4) and analyses provide strong evidence that aspects of individual level cognitive social capital are inversely associated with CMD. While this result needs to be confirmed in longitudinal and experimental research, it does indicate that strengthening cognitive social capital may be fruitful in the prevention or treatment of CMD. However, the varied associations between structural social capital and CMD, and the potentially damaging effect that some forms of participation may have in some disadvantaged groups, means that policies aimed simply at increasing levels of social capital may have unintended (and unpredictable) consequences. In light of this, I explore three ways in which social capital could be used as a policy tool in the prevention or treatment of CMD in low income countries.

1. Improve levels of social capital

Lochner (2000) has suggested four ways in which levels of social capital could be increased. These comprise: strengthening social networks; creating or strengthening

social organisations; strengthening community ties; and strengthening civil society. In practice however, the few intervention studies that have aimed to improve levels of social capital in low income countries have had limited success. For example, Harpham et. al (2004b) aimed to build structural and cognitive social capital among youths in Columbia by using existing youth groups to strengthen community social connectedness and to link youth to state institutions. This intervention had little impact on levels of social capital, though it may have contributed to a reduction in the rate of decline in social capital, and did not affect levels of violence or CMD. Other interventions have also enjoyed only moderate success, for example the use of discussion groups between elderly residents and school children in Brazil to increase social cohesion (de Souza 2003), and stimulation of group credit initiatives for agricultural production and technical transfer in Guatemala (Durstun 1998).

The results of my thesis indicate this lack of success may be because social capital is so complex and culturally embedded that in practice it is very difficult to change exogenously. In addition, the potentially detrimental aspects of social capital for some sub-groups means that only certain aspects of social capital should be improved, and only for some sub-groups. Even if it were possible to improve levels of social capital, the unintended consequences for some groups, and the potential impact on other outcomes, make community interventions to improve social capital with the aim of preventing CMD too non-specific to be effective.

2. Use social capital to understand community structures to implement interventions

The results of my thesis suggest that a more fruitful approach would be to use an understanding of social capital in a specific context to develop community-based interventions specifically targeting CMD. This would involve exploiting existing community structures and cultures to deliver CMD treatment or prevention programmes, essentially tapping into and strengthening social capital specifically around those suffering from CMD. A number of interventions to treat CMD in low income countries have been conducted which fit this model, though few explicitly recognise the role that social capital plays in the intervention. In the last two years there have been three randomised control trials using psychological interventions administered through groups in low income countries (Araya et al. 2003, Bolton et al. 2003, Patel et al. 2003). While no effect was found in India, group therapy that

emphasised support and sharing between members of the same community was highly effective in the treatment of CMD in both Chile and Uganda (Patel et al. 2004). This approach has been taken a step further by a new study including members of the community who do not have CMD as well as sufferers in community support groups in Brazil (Garcia In Preparation), and may be a model for how non-pharmacological interventions to treat CMD can be made more effective by incorporating the building of social capital into their programme design.

3. Use social capital as a tool for understanding context to improve the efficacy of targeted interventions to improve mental health.

An additional potentially fruitful avenue for future research is to use social capital not as an intervention to improve mental health, but as a tool for exploring how medico-social interventions (such as community self-help groups) work, or fail to work, in different contexts. Understanding the context in which complex interventions are implemented, and measuring that context before the intervention is put in place so that it can be tailored to suit the needs of the community in which it is applied, may well be the most practical implementation of social capital research.

Summary

Interventions to improve CMD aimed solely at improving the social capital of individuals or communities, even if possible, are likely to be too non-specific and to have too many unpredictable consequences for some sub-groups to make them practical or desirable. Instead, the best application of social capital research may be to use it as a tool to measure the social context in which community interventions are applied, and as a means of exploiting existing community structures to deliver interventions targeted at CMD treatment or prevention.

9.6 Recommendations for future research

Social capital still holds the promise of a greater understanding of the causes of ill health. It shifts the focus from the individual to the collective, highlights the social causes of disease as well as the biological and material, and explores the complexity of social relationships by recognising that they can occur at different levels and have indirect effects. However all of the policy implications for interventions described in

the last section are premature without further research. Thus the concept of social capital may be of more use in aetiological investigations into the causes of CMD than in public health interventions, and more research should be done. During this thesis I have indicated a number of areas which future research needs to address in order to take the field forward. These are drawn together and summarised below.

Issues for researchers seeking to measure social capital

1. The many different conceptualisations of social capital outlined in section 1.2 means that researchers should clearly state which school of thought (i.e. Putnam, Bourdieu or Coleman) their measure of social capital relates to and the level at which it is measured.
2. The complexity of social capital theory outlined in section 1.2.2 needs to be matched by the use of multi-dimensional measurement tools.
3. The culturally specific nature of social capital highlighted by my in depth exploration of social capital in Peru (Chapters 5 and 6) means that the specific nature of social capital in different contexts must be explored by conducting appropriate qualitative and anthropological work.
4. This includes the local development, piloting and external validation of tools to measure social capital in each cultural setting in which it is to be applied.

Development of measures of ESC

A significant body of research needs to be conducted in order to develop new tools to measure ESC more effectively. This includes:

1. developing contextual measures of structural social capital;
2. using a representative sample of the community to aggregate up perceptions of cognitive social capital;
3. exploring which level of aggregation is most meaningful for mental health;
4. and developing statistical modelling techniques that include a measure of variability in aggregate scores, for example by modelling the standard error of the measure as well as the mean.

Areas for further research

The systematic reviews presented in this thesis (Chapter 2) have highlighted a number of gaps in existing research which future research should aim to fill.

1. Longitudinal research to establish the direction of causality between social capital and CMD.
2. More research in low income countries and in rural populations.
3. Test explicit hypotheses about the pathways through which social capital affects mental health.
4. Comparisons between different population groups and diverse communities to ensure that there is enough variation in levels and types of social capital to pick up any effects on mental health.
5. Research into the effects of bridging, bonding and linking social capital to see whether it is the nature of the relationship that is important (i.e. cognitive and structural social capital), or where those relationships take place (i.e. bridging, bonding, or linking social capital).
6. Explore the effect of structural social capital on the mental health of different sub-groups, in particular those living in extreme poverty.
7. Additional research into the effect of ESC. So far the promise of social capital as a community resource has not been adequately tested as so few studies have explored community level effects, and those that have are hampered by the methodological difficulties of measuring the effect of social context on mental health.

9.7 Summary

Though some aspects of social capital are important for CMD in low income countries, it is not a panacea capable of curing the world's ills. Social capital is complex, multi-dimensional, culturally and temporally specific, and has different effects in different groups of people. Understanding this diversity presents the greatest challenge not only to social capital research, but to its utility in mental health interventions. Using social capital as a 'treatment' to cure or prevent mental illness is analogous to using a non-specific drug targeting all of the body's systems to treat heart disease. While it may have the intended effects on a few, its lack of specificity means that there will be unintended, and often unpredictable, effects on sub groups of the population. The fact that social capital has been linked to so many diverse outcomes is partly its appeal, but also its downfall, as different aspects of social capital will have different effects on different outcomes (not only medical). It is too

non-specific, and too expensive and difficult to change, to make it a viable option for widespread mental illness treatment or prevention.

Instead, the use of social capital as a tool to understand the context in which illness develops may be fruitful. This and other studies have shown mental illness to be partly determined by the context in which people live. Understanding this context is vital for the development of targeted interventions aimed specifically at improving mental health which are successful in the local context. In this way those aspects of the social environment which we know to be beneficial to mental health could be used to deliver mental health services, to reduce the stigma surrounding mental illness, or ultimately to reduce the population prevalence of CMD.

Social capital is important for mental health, but its value lies not in the prevention or treatment of CMD, but as a tool for understanding the social context in which the complex relationship between an individual's own characteristics and those of their environment are played out.

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**Appendix A: Characteristics of studies included
in systematic review of methods used in studies
of social capital and mental illness**

Table A.1: Characteristics of the 28 studies included in systematic review of methods used in studies of social capital and mental illness

Study	Study setting and design	Mental illness measure	Social capital measure
Putnam: trust and social participation			
Veenstra 2005	Canada XS	Depression	Individual: Group participation, trust. Community: Per capita number of public spaces, per capita membership of voluntary organizations, average level of community and political trust
Desai et al. 2005	USA L	Death from suicide	Group participation, civic action, community networks, trust.
Greenberg and Rosenheck 2003	USA XS	Mental health care	As above.
Rosenheck et al. 2001	USA L	Recovery from psychotic disorders or addiction	As above.
Mitchell and La Gory 2002	USA	CMD	Group participation, community networks, trust.
Pollack and von dem Knesebeck 2004	USA and Germany	CMD	Group participation, trust.
Lindstrom 2004	Sweden XS	CMD	Group participation and trust grouped into one score.
Boreham et al. 2003	England	CMD	Group participation, social support, trust, neighborhood problems, ease of access to services.
Ziersch et al. 2005	Australia XS	CMD	Community networks, trust, neighbourhood safety, civic action.
Harpham et al. 2004a	Columbia XS	CMD	Group participation, trust, social cohesion, informal social control, civic action.
Putnam: group participation			
Sundquist et al. 2004	Sweden L	Admission to hospital due to psychiatric illness	Group participation.
Ziersch and Baum 2004	Australia XS	CMD	Group participation.
Sampson: informal social control, social cohesion and trust			
Stevenson 1998	USA XS	CMD	Community networks.
Van der Linden et al. 2003	Netherlands CC	Child mental health service use	Informal social control, social cohesion, trust.
Drukker et al. 2004	Netherlands CC	Adult mental health service use	As above.
Drukker et al. 2003	Netherlands XS	CHQ	As above.
Steptoe and Feldman 2001	England XS	CMD	As above.

Continued...

Study	Study setting and design	Mental illness measure	Social capital measure
Sense of community/neighbourhood attachment			
Caughy et al. 2003	USA XS	Child Behaviour Checklist	Sense of community, community networks.
Greiner et al. 2004	USA XS	CMD	Community attachment, civic action.
Saluja et al. 2003	USA XS	Child Behaviour Checklist	Social support, trust.
Pevalin 2004	UK XS	CMD	Sense of community.
Pevalin and Rose 2003	L UK XS	CMD	Group participation, community networks, neighbourhood attachment, neighbourhood problems.
	L	Onset, recovery from, and time to recovery from CMD	As above.
O'Brien et al. 1996	Russia XS	CMD	Social support, sense of community.
Coleman: family characteristics			
Runyan et al. 1998	USA XS	Child development and behaviour combined into 'child doing well' yes/no	2 parent figures in home, social support of mother, no more than 2 children in home, neighbourhood support, and regular church attendance grouped into 1 index.
Parcel and Menaghan 1993	USA L	Change in child behaviour problems	Family working characteristics (i.e. number of hours, occupational complexity), and family characteristics (i.e. number of children, divorce, home environment).
Furstenberg and Hughes 1995	USA L	CMD	Parents' social investment in their children (i.e. emotional support from mother, father in home, frequency of seeing siblings or grandparents), and family's links to the community (i.e. religious involvement, help network, neighbourhood as a place for kids to grow up).
Other measures			
Hendryx and Ahern 2001	USA XS	Adult and child mental health service use	Community level health care social capital - collaborations among health care organizations and community level of public health insurance.
Liukkonen et al. 2004	Finland L	CMD	Workplace social capital – security of employment contract and social support from co-workers combined into score of high/low social capital.

XS = cross sectional, L = Longitudinal, CC = case control

Appendix B: Sampling and survey methods used by the Young Lives Project

Figure B.1: Comparison of YL sampling methods between countries

Peru ¹	Vietnam ²	Ethiopia ³	India ⁴
	Selection of regions		
All districts ranked by poverty level and the top 5% eliminated	5 out of 9 regions of Vietnam chosen to provide geographical spread. 1 typical province chosen from each region	5 out of 11 regions of Ethiopia selected as contain 96% of population and logistically not feasible to sample whole country	1 poor and 1 non-poor district selected from each of the 3 distinct agro-climatic regions in Andhra Pradesh
	Selection of clusters		
Systematic sampling to select districts (clusters) with a geographical spread across Peru. 75% selected districts were poor and 25% non-poor	Communes within each province ranked by poverty level. 2 poor, 1 average and 1 above average cluster selected from each province	Districts ranked on poverty level and 3 poor and 1 non-poor district (cluster) selected from each region	Mandals (administrative areas containing 30 – 40 villages) ranked on development indicators for each district. 19 mandals (clusters) selected from 6 districts and 1 from Hyderabad
	Selection of communities		
Community selected at random from selected districts. Additional communities added if quota of children not reached	Additional communes with same poverty level added if quota of children not reached	Communities selected within clusters	Mandals divided into 4 geographical areas and 1 community randomly selected from each area
	Selection of individuals		
Census conducted in each cluster to identify eligible households	Census within each commune to list eligible children. Respondents selected by random sampling	Eligible households selected within communities	Census conducted in each of selected villages. All eligible children included
1 yr olds 2051	1 yr olds 2000	1 yr olds 1999	1 yr olds 2011
8 yr olds 714	8 yr olds 1000	8 yr olds 1000	8 yr olds 1008

Source: ¹(Escobal et al. 2003) ²(Tuan et al. 2003) ³(Asgedom 2002) ⁴(Galab et al. 2003)

Table B.1: Comparison of survey methods used by each country

	Peru ¹	Vietnam ²	Ethiopia ³	India ⁴
Country-specific questions				
Many country specific questions added including income, domestic violence, and child vaccination.	Questions included tobacco use, more detail on childcare and social support.		Few country specific questions added.	Questions included migration and child labour.
Photographs taken of households and family members.				
GPS location of each household taken for tracking				
Questionnaire translation				
Translated into Spanish, though no formal back translation.	Formally back-translated from English into Vietnamese.		Translated into Amharic, Oromiffa and Tigrigna, though no formal back translation.	Formally back-translated into Telugu.
Local interpreters used for Quechua speaking respondents.			Fieldworkers completed translated questionnaire in English.	Local interpreters used for non-Telugu speaking respondents (7% of all interviews).
Training of fieldworkers				
3 months training and piloting combined.	15 days training in Hanoi.		5 – 7 days training.	Fieldworkers recruited and trained in the regions.
Majority of fieldworkers were female.	All but one fieldworker was female.		Fieldworkers recruited and trained in the regions to ensure they spoke the regional language.	Majority of fieldworkers were male.
			Majority of fieldworkers were male.	
Fieldwork procedures				
3 fieldwork teams working in different areas of Peru.	Four fieldwork teams working in different sentinel sites.		20 fieldwork teams (1 per cluster).	4 fieldwork teams.
Data monitoring procedures				
Supervisors checked forms for errors in the field and re-interviewed 5% sample as reliability check.	Supervisors checked forms for errors in the field.		Supervisors checked forms for errors in the field and re-interviewed 5% sample as reliability check.	Supervisors checked forms for errors in the field.

Source: ¹ (Escobal et al. 2003) ² (Tuan et al. 2003) ³ (Asgedom 2002) ⁴ (Galab et al. 2003)

**Appendix C: Full results of comparative
analysis of social capital and maternal
CMD in the four YL countries**

Table C.1: Peru: Association between social capital and maternal CMD: complete final model with all confounders

		OR	95% CI
Social capital variables			
<i>Member of community group</i>			
ISC	No	1.00	
	1 group	0.87	0.62, 1.23
	2+ groups	0.91	0.43, 1.92
ESC	1 st quartile	1.00	
	2 nd quartile	*0.61	0.43, 0.98
	3 rd quartile	0.84	0.48, 1.47
	4 th quartile	0.72	0.44, 1.19
<i>Support from individuals</i>			
ISC	None	1.00	
	1 individual	*1.39	1.02, 1.88
	2+ individuals	1.28	0.93, 1.76
ESC	1 st quartile	1.00	
	2 nd quartile	1.07	0.59, 1.95
	3 rd quartile	1.30	0.77, 2.19
	4 th quartile	1.59	0.85, 3.00
<i>Involved in citizenship activities</i>			
ISC	No	1.00	
	Talked or joined	0.82	0.56, 1.19
	Talked and joined	1.41	0.88, 2.27
ESC	1 st quartile	1.00	
	2 nd quartile	1.09	0.58, 2.06
	3 rd quartile	0.96	0.56, 1.65
	4 th quartile	1.14	0.68, 1.93
<i>Cognitive social capital</i>			
ISC	Low/medium	1.00	
	High	***0.61	0.48, 0.78
ESC	1 st quartile	1.00	
	2 nd quartile	1.04	0.60, 1.80
	3 rd quartile	0.86	0.49, 1.52
	4 th quartile	0.99	0.54, 1.79
Socio-economic confounders			
<i>Household wealth index group</i>			
	Poorest	1.00	
	Very poor	1.27	0.92, 1.77
	Less poor	*1.52	1.00, 2.32
	Better off	1.00	0.58, 1.72
<i>Has serious debt</i>			
	No	1.00	
	Yes	***1.68	1.31, 2.15

Continued...

		OR	95% CI
# maternal occupational activities			
	0	1.00	
	1	*1.34	1.02, 1.76
	2+	1.24	0.85, 1.81
Maternal education level			
	No education	1.00	
	Primary	0.73	0.46, 1.17
	Secondary	*0.59	0.35, 1.00
	Technical college	**0.42	0.22, 0.79
	University	*0.28	0.10, 0.77
Perceived economic position in community			
	Better off than others	1.00	
	Similar to others	**0.58	0.40, 0.84
	Worse off than others	1.30	0.86, 1.98
Number of economic shocks			
	0	1.00	
	1	*1.40	1.08, 1.82
	2+	1.30	0.85, 1.97
Demographic variables			
Maternal age in years			
	<24	1.00	
	25-29	0.23	0.90, 1.69
	30-34	***1.93	1.35, 2.76
	35+	1.03	0.87, 1.95
	Number of children in household (continuous)	***1.16	1.06, 1.26
Marital status			
	Permanent partner	1.00	
	Divorced/widowed/single	***2.54	1.54, 4.19
Who is head of household			
	Partner	1.00	
	Mother	0.86	0.49, 1.53
	Other person	*0.60	0.38, 0.95
Permanent health problem that limits normal daily activity			
	No	1.00	
	Yes	***3.29	2.00, 5.41
Mother's religion			
	Christian	1.00	
	Mormon, other religion	*1.68	1.00, 2.81
	None	*1.82	1.05, 3.17
Mother's ethnic group			
	White	1.00	
	Andean	*2.14	1.06, 4.31
	Black, Asian, Amazon	1.78	0.62, 5.17
Likelihood		-895.86	
Community level variance		0.04	
Cluster level variance		0.03	

*p<0.05, **p<0.01, ***p<0.001 p-value of crude OR for each dummy variable compared to the baseline category.

Table C.2: Vietnam: Association between social capital and maternal CMD: complete final model with all confounders

		OR	95% CI
Social capital variables			
<i>Member of community group</i>			
ISC	No	1.00	
	1 group	1.34	0.97, 1.85
	2+ groups	1.23	0.76, 1.97
ESC	1 st quartile	1.00	
	2 nd quartile	*0.58	0.34, 1.00
	3 rd quartile	1.45	0.76, 3.57
	4 th quartile	1.65	0.76, 3.57
<i>Support from individuals</i>			
ISC	None	1.00	
	1 individual	0.86	0.43, 1.71
	2+ individuals	0.68	0.36, 1.28
ESC	1 st quartile	1.00	
	2 nd quartile	0.78	0.45, 1.34
	3 rd quartile	0.94	0.41, 2.15
	4 th quartile	0.77	0.25, 2.39
<i>Involved in citizenship activities</i>			
ISC	No	1.00	
	Talked or joined	0.97	0.72, 1.30
	Talked and joined	1.28	0.61, 2.68
ESC	1 st quartile	1.00	
	2 nd quartile	1.02	0.54, 1.93
	3 rd quartile	1.00	0.41, 2.45
	4 th quartile	0.75	0.22, 2.52
<i>Cognitive social capital</i>			
ISC	Low/medium	1.00	
	High	***0.45	0.31, 0.66
ESC	1 st quartile	1.00	
	2 nd quartile	0.81	0.42, 1.56
	3 rd quartile	0.69	0.36, 1.31
	4 th quartile	0.68	0.24, 1.94
Socio-economic confounders			
<i>Household wealth index group</i>			
	Poorest	1.00	
	Very poor	**0.61	0.41, 0.89
	Less poor	***0.36	0.22, 0.59
	Better off	**0.31	0.14, 0.68
<i>Has serious debt</i>			
	No	1.00	
	Yes	**0.70	0.54, 0.92
<i>Perceived economic position in community</i>			
	Better off than others	1.00	
	Similar to others	2.34	0.68, 8.03
	Worse off than others	*4.03	1.16, 14.0

Continued...

	OR	95% CI
Number of economic shocks		
0	1.00	
1	***2.05	1.53, 2.76
2+	***3.03	2.13, 4.32
Demographic variables		
<i>Marital status</i>		
Permanent partner	1.00	
Divorced/widowed/single	**3.03	1.47, 6.27
<i>Who is head of household</i>		
Partner	1.00	
Mother	1.42	0.87, 2.34
Other person	0.74	0.53, 1.03
Community level variables		
<i>Community wealth index</i>		
Poorest	1.00	
Very poor	*3.26	1.14, 9.29
Less poor	*3.73	1.09, 12.72
Better off	*6.65	1.18, 37.32
<i>% of community completed primary school</i>		
1 st quartile	1.00	
2 nd quartile	1.51	0.73, 3.15
3 rd quartile	*2.52	1.21, 5.25
4 th quartile	1.55	0.68, 3.50
Likelihood	-801.59	
Community level variance	0.02	
Cluster level variance	<0.01	

*p<0.05, **p<0.01, ***p<0.001 p-value of crude OR for each dummy variable compared to the baseline category.

Table C.3: Ethiopia: Association between social capital and maternal CMD: complete final model with all confounders

		OR	95% CI
Social capital variables			
<i>Member of community group</i>			
ISC	No	1.00	
	1 group	1.00	0.73, 1.38
	2+ groups	1.21	0.86, 1.71
ESC	1 st quartile	1.00	
	2 nd quartile	0.61	0.31, 1.15
	3 rd quartile	0.98	0.57, 1.70
	4 th quartile	0.66	0.30, 1.45
<i>Support from individuals</i>			
ISC	None	1.00	
	1 individual	*1.40	1.02, 1.94
	2+ individuals	1.28	0.92, 1.79
ESC	1 st quartile	1.00	
	2 nd quartile	*1.75	1.02, 3.01
	3 rd quartile	*2.34	1.21, 4.54
	4 th quartile	*2.32	1.07, 5.03
<i>Involved in citizenship activities</i>			
ISC	No	1.00	
	Talked or joined	**1.54	1.13, 2.09
	Talked and joined	1.30	0.94, 1.80
ESC	1 st quartile	1.00	
	2 nd quartile	**0.31	0.14, 0.71
	3 rd quartile	*0.35	0.14, 0.88
	4 th quartile	0.74	0.40, 1.36
<i>Cognitive social capital</i>			
ISC	Low/medium	1.00	
	High	***0.49	0.35, 0.69
ESC	1 st quartile	1.00	
	2 nd quartile	*0.34	0.13, 0.86
	3 rd quartile	*0.45	0.20, 0.99
	4 th quartile	**0.42	0.24, 0.74
Socio-economic confounders			
<i>Household wealth index group</i>			
	Poorest	1.00	
	Very poor	1.32	0.95, 1.85
	Less poor	0.79	0.40, 1.58
<i>Has serious debt</i>			
	No	1.00	
	Yes	**1.43	1.11, 1.86
<i>Perceived economic position in community</i>			
	Better off than others	1.00	
	Similar to others	*1.56	1.06, 2.32
	Worse off than others	***3.21	2.13, 4.83

Continued...

		OR	95% CI
Number of economic shocks			
	0	1.00	
	1	1.24	0.85, 1.81
	2+	***2.05	1.51, 2.79
Demographic variables			
Number of male children			
	0	1.00	
	1	1.37	0.95, 1.97
	2+	*1.55	1.11, 2.17
Number of female children			
	0	1.00	
	1	1.39	0.98, 1.98
	2+	**1.58	1.14, 2.18
Permanent health problem that limits normal daily activity			
	No	1.00	
	Yes	***3.52	2.16, 5.75
<hr/>			
Likelihood		-913.53	
Community level variance		--	
Cluster level variance		0.4*	

*p<0.05, **p<0.01, ***p<0.001 p-value of crude OR for each dummy variable compared to the baseline category.

Table C.4: Andhra Pradesh: Association between social capital and maternal CMD: complete final model with all confounders

		OR	95% CI
Social capital variables			
<i>Member of community group</i>			
ISC	No	1.00	
	1 group	*1.36	1.03, 1.80
	2+ groups	0.69	0.32, 1.53
ESC	1 st quartile	1.00	
	2 nd quartile	1.33	0.81, 2.19
	3 rd quartile	1.30	0.76, 2.20
	4 th quartile	0.96	0.56, 1.66
<i>Support from individuals</i>			
ISC	None	1.00	
	1 individual	0.88	0.61, 1.26
	2+ individuals	0.79	0.56, 1.12
ESC	1 st quartile	1.00	
	2 nd quartile	0.71	0.43, 1.17
	3 rd quartile	0.83	0.43, 1.59
	4 th quartile	1.11	0.55, 2.27
<i>Involved in citizenship activities</i>			
ISC	No	1.00	
	Talked or joined	0.85	0.59, 1.24
	Talked and joined	1.00	0.70, 1.43
ESC	1 st quartile	1.00	
	2 nd quartile	1.13	0.66, 1.94
	3 rd quartile	1.02	0.55, 1.88
	4 th quartile	1.00	0.49, 2.06
<i>Cognitive social capital</i>			
ISC	Low/medium	1.00	
	High	*0.52	2.97, 0.89
ESC	1 st quartile	1.00	
	2 nd quartile	1.10	0.68, 1.64
	3 rd quartile	1.53	0.86, 2.70
	4 th quartile	1.17	0.60, 2.27
Socio-economic confounders			
<i>Household wealth index group</i>			
	Poorest	1.00	
	Very poor	0.82	0.63, 1.08
	Less poor	***0.39	0.24, 0.65
	Better off	*0.33	0.11, 1.00
<i>Owns own house</i>			
	No	1.00	
	Yes	**0.61	0.43, 0.87

Continued...

	OR	95% CI
Maternal education level		
No education	1.00	
Primary	0.84	0.56, 1.28
Secondary/middle school	0.83	0.55, 1.25
High school/further education	***0.44	0.27, 0.70
Perceived economic position in community		
Better off than others	1.00	
Similar to others	**1.73	1.22, 2.45
Worse off than others	**3.52	1.52, 8.12
Number of economic shocks		
0	1.00	
1	**1.66	1.13, 2.43
2+	1.18	0.85, 1.65
Contextual variables		
Region of Andhra Pradesh		
Coastal	1.00	
Rayalaseema	1.36	0.57, 3.22
Telangana	***5.21	2.28, 11.92
Community level variables		
% community own their house		
1 st quartile	1.00	
2 nd quartile	1.70	0.77, 3.73
3 rd quartile	1.60	0.70, 3.68
4 th quartile	1.55	0.64, 3.74
% of community completed primary school		
1 st quartile	1.00	
2 nd quartile	1.15	0.78, 1.68
3 rd quartile	1.07	0.68, 1.69
4 th quartile	*2.04	1.02, 4.08
Likelihood	-880.66	
Community level variance	<0.01	
Cluster level variance	0.33	***

*p<0.05, **p<0.01, ***p<0.001 p-value of crude OR for each dummy variable compared to the baseline category.

Appendix D: Recommendations for re-wording of SASCAT tool for use in Peru

D.1: Recommendations for re-wording of SASCAT tool for use in Peru

Concept of community

1. In order to ensure that all respondents refer to the geographical community in which they live, the SASCAT tool should be prefaced by the words ‘Now I am going to ask you some questions about the place that you live in at the moment, which is called (name of place)’. The name of the place should be re-iterated in each question (for example ‘In general, can the majority of people in (name of place) be trusted?’), so that the frame of reference for each question is always the respondent’s geographical community as defined by the researchers.

Group membership

2. Clearly defining what active membership is for each group type, based upon concepts of structural social capital, is needed to ensure that only active membership that contributes to an individual’s structural social capital is recorded.
3. Clear definitions of what constitutes ‘active participation’ need to be developed for each group type (and recorded in a fieldworker manual) so that respondents’ answers are consistently reported by fieldworkers.
4. Some group types currently represented (Trade Unions, credit and funeral groups) are not important sources of structural social capital among Peru’s poor and should be dropped from the questionnaire.
5. Some names of groups need to be changed to reflect how respondents categorize groups and ensure that group membership is not under-reported and that respondents do not categorize the same group in different categories. Proposed changes include grouping all food distribution programmes together as one category, and adding in a category for self-defence groups to capture membership of *Ronderos*.

Support from individuals

6. Exclude the category ‘members of household’ as this overlaps almost completely with support received from family.
7. Use the word ‘*dirigentes*’ rather than ‘community leaders’ as this term was better understood by respondents.

8. The Spanish translation is different from the original version in that it contains more examples of the types of support received, listing 'emotional, advice, a recommendation, money, or goods'. The original question lists 'emotional help, economic help or assistance in helping you know or do things' which more clearly separates out instrumental support. The re-wording of the question into Spanish may explain the under-reporting of instrumental help, and the original wording should be adopted.
9. Separate out the three different types of support so that the exact type of support received (emotional, economic, instrumental) can be recorded.

Trust

10. Re-wording the question using the name of the place they live as the reference point prevented respondents thinking solely of *dirigentes*, though asking respondents to make statements about trust in general remains problematic.
11. Ask separate questions about trust in neighbours, leaders and strangers in the community to avoid asking questions about generalized trust, and to measure levels of trust in specific groups of people.

Sense of belonging

12. The phrase '*pertenece a*' (belong to) should be used rather than '*parte de*' (part of) as is more effective at eliciting deeper feelings of emotional attachment to the community rather than just those engendered by participation.

Sense of fairness

13. Add an example of someone taking advantage (for example, not returning borrowed money) to help fieldworkers explain to respondents who do not understand the question.

D.2: Revised SASCAT tool for use in Peru

DECIR: *Vamos a conversar sobre algunas cosas de su comunidad, que es el lugar donde Usted vive.*

¿Me podría decir cómo se llama el lugar donde Usted vive?

- 1 En los últimos 12 meses ¿Ha sido Ud. a participado activo de alguno de los siguientes tipos de grupos o asociaciones en (nombre de lugar donde vive)...?

Instrucciones: Pregunte leyendo la lista de la tabla y anote las respuestas de la madre. Luego al terminar, en cada una que dijo que era miembro haga la pregunta de la siguiente columna, sobre si recibió apoyo de alguna de ellas.

ID Grupo	Tipo de Grupo / Asociación	Ha sido miembro 1 = Si 2 = No	En los últimos 12 meses, Ha recibido de ellos algún tipo de apoyo emocional o recibió consejo/aliento, o apoyo material, o apoyo a aprender algo?		
			1= Si 2=No	Emocional	Material
01	Organización de su comunidad (Ej. Junta directiva, grupo de socios)				
02	Grupos que reciben ayuda alimentaria (Ej. Vaso de leche, comedores, club de madres)				
03	Grupo político				
04	Grupo religioso, parroquial				
05	Grupo deportivo /club social				
06	Comités de salud, agua, luz				
07	Comités del colegio (Ej. Apafa)				
08	Comités de vigilancia (Ej. Ronda)				
09	Otro: _____ (Especifique)				

DECIR: *Ahora le voy a hacer algunas preguntas sobre personas que le han dado algún tipo de ayuda en los últimos 12 meses.*

- 2 En los últimos 12 meses, ¿ha recibido Ud. alguna apoyo emocional o recibió consejo/aliento, o apoyo material, o apoyo a aprender algo, de alguno de los siguientes grupos o individuos en (nombre de lugar donde vive)...?

Instrucciones: Lea los grupos/individuos de la siguiente tabla y anote si recibió algún tipo de apoyo de ellos.

ID de grupo	En últimos 12 meses Recibió de: algún tipo de apoyo? 1=Si 2=No
01	Familiares /parientes
02	Vecinos
03	Amigos que no son vecinos
04	Dirigentes de su comunidad
05	Dirigentes religiosos
06	Líderes políticos
07	Representantes del gobierno
08	Representantes de la municipalidad
09	De una organización de caridad /ONG
10	Otro: _____ (Especifique)

- 3 En los últimos 12 meses ¿se ha unido a otros residents de (nombre de lugar donde vive) para resolver un problema o hacer un trabajo juntos
1 = Si 0 = No
- 4 En los últimos 12 meses ¿ha conversado con autoridades locales o representantes del gobierno acerca de alguna cosa o problema para (nombre de lugar donde vive) ?
1 = Si 0 = No
- 5 En general ¿se puede confiar en la mayoría de personas que viven en (nombrar de lugar)...?
1 = Si 0 = No
- 6 ¿La mayoría de personas en (nombre de lugar donde vive)... se llevan bien entre ellos?
1 = Si 0 = No
- 7 ¿Se siente Ud. que pertenece a (nombre de lugar donde vive)?
1 = Si 0 = No
- 8 ¿Siente Ud. que la mayoría de personas en (nombre de lugar donde vive) tratarían de aprovecharse de Ud si ellos tuvieran la oportunidad?
1 = Si 0 = No

Appendix E: Results: determinants of social capital in Peru

Table E.1: Determinants of group membership: linear and logistic multi-level regression

	Member of group y/n Logistic MLM		# groups member of Linear MLM	
	OR	95% CI	B	95% CI
Number individuals		2494		2441
communities		82		81
clusters		20		20
Socio-economic				
<i>Caregiver's education level</i>				
No education	1.00		0.00	
Primary	***2.22	1.30, 3.79	**0.10	0.02, 0.18
Secondary	***2.47	1.39, 4.38	***0.14	0.05, 0.23
Technical college	***2.47	1.31, 4.66	****0.19	0.09, 0.30
University	***3.25	1.41, 7.49	**0.20	0.05, 0.35
<i>Perceived economic position in community</i>				
Better off than others	1.00		0.00	
Similar to others	**0.65	0.46, 0.91	**0.08	-0.14, -0.02
Worse off than others	*0.71	0.48, 1.04	*0.07	-0.14, 0.00
Community integration				
<i>Sex¹</i>				
Male	1.00			
Female	*0.86	0.73, 1.02	--	--
<i>Caregiver's age in years</i>				
<20	1.00		0.00	
20-29	1.18	0.77, 1.81	0.02	-0.05, 0.09
30-39	**1.78	1.13, 2.80	**0.09	0.02, 0.17
40+	*1.68	0.97, 2.91	0.07	-0.02, 0.16
<i>Caregiver's religion</i>				
Christian	1.00		0.00	
Mormon, other religion	****2.88	2.01, 4.13	****0.22	0.14, 0.30
None	1.16	0.65, 2.07	-0.01	-0.11, 0.09
<i>% of caregiver's life lived in community</i>				
Just moved there – 33%				
34% - 66%	**1.45	1.05, 1.99	***0.08	0.03, 0.14
67% - 99%	1.15	0.78, 1.68	0.02	-0.05, 0.08
Whole life	****1.77	1.33, 2.36	****0.10	0.05, 0.15
<i>Mother's ethnic group</i>				
White	1.00			
Andean	***0.50	0.31, 0.82	--	--
Black, Asian, Amazon	0.76	0.32, 1.83		
Commitments				
<i># kids in household</i>				
1	1.00		0.00	
2	1.10	0.79, 1.53	0.03	-0.02, 0.09
3	**1.43	1.01, 2.04	**0.07	0.01, 0.13
4+	**1.52	1.05, 2.18	**0.08	0.02, 0.14

Continued...

	Member of group y/n Logistic MLM		# groups member of Linear MLM	
	OR	95% CI	B	95% CI
Stressors				
<i># neighbourhood disorder problems</i>				
0-2			0.00	
3-4	--	--	*-0.05	-0.11, 0.01
5-7			** -0.09	-0.16, -0.02
<i>Community is legally recognised</i>				
No			0.00	
Yes	--	--	***-0.16	-0.26, -0.06
<i>Political problems in community</i>				
No			0.00	
Yes	--	--	*0.05	0.00, 0.11
Social capital				
<i>Support from individuals - ISC</i>				
None	1.00		0.00	
1 individual	*1.34	0.99, 1.80	0.03	-0.01, 0.08
2+ individuals	****2.07	1.55, 2.78	****0.16	0.11, 0.21
<i>Talked to authorities - ISC</i>				
No	1.00		0.00	
Yes	**1.54	1.10, 2.16	****0.11	0.04, 0.17
<i>Joined together with others - ISC</i>				
No	1.00		0.00	
Yes	****1.66	1.24, 2.24	***0.09	0.03, 0.15
<i>Trust - ISC</i>				
No			0.00	
Yes	--	--	**0.04	0.00, 0.09
<i>Support from individuals - ESC</i>				
Low - 1 st quartile	1.00			
2 nd quartile	1.48	0.90, 2.44		
3 rd quartile	**1.62	1.06, 2.49	--	--
High - 4 th quartile	*1.53	0.97, 2.41		
<i>Talked to authorities - ESC</i>				
Low - 1 st tertile	1.00			
2 nd tertile	*1.50	0.97, 2.33	--	--
High - 3 rd tertile	1.27	0.81, 2.01		
Likelihood		-1065.69		-1668.90
Individual level variance		--		****0.23
Community level variance		<0.01		<0.01
Cluster level variance		****0.18		****0.02

*p<0.1, **P<0.05, ***p<0.01, ****p<0.001 -- variable not included in model

¹ Results from bi-variate robust standard errors (GEE) model.

Table E.2: Determinants of support from individuals: linear and logistic multi-level regression

	Receives support y/n		# individuals support from	
	Logistic MLM OR	95% CI	Linear MLM B	95% CI
Number of individuals		2580		2538
Number of communities		82		82
Number of clusters		20		20
Community integration				
<i>Caregiver's age in years</i>				
<20	1.00		0.00	
20-29	0.94	0.67, 1.31	-0.06	-0.20, 0.09
30-39	**0.66	0.46, 0.93	** -0.17	-0.32, -0.02
40+	****0.44	0.29, 0.67	** -0.22	-0.40, -0.03
<i>Community income inequality</i>				
Equal - 1 st quartile	1.00			
2 nd quartile	1.14	0.72, 1.79		
3 rd quartile	***1.73	1.18, 2.54	--	--
Unequal - 4 th quartile	*1.52	0.99, 2.32		
<i>Community residential stability</i>				
Low - 1 st quartile	1.00			
2 nd quartile	0.66	0.40, 1.09		
3 rd quartile	***0.39	0.22, 0.71	--	--
High - 4 th quartile	**0.48	0.27, 0.85		
Commitments				
<i>Marital status</i>				
Permanent partner	1.00		0.00	
Divorced/widowed/single	***1.55	1.17, 2.05	****0.24	0.13, 0.36
<i>Help with childcare outside HH</i>				
No	1.00		0.00	
Yes	****1.62	1.26, 2.08	****0.20	0.10, 0.31
<i># adults in HH</i>				
1-2			0.00	
3-4			-0.07	-0.16, 0.03
5+	--	--	** -0.14	-0.26, -0.02
<i>Member of HH disabled</i>				
No			0.00	
Yes	--	--	*0.14	-0.03, 0.31
Context				
<i>Region of Peru</i>				
Coast	1.00			
Mountain	0.69	0.36, 1.31	--	--
Jungle	**0.32	0.13, 0.78		

Continued...

		Receives support y/n		# individuals support from	
		Logistic MLM OR	95% CI	Linear MLM B	95% CI
Stressors					
<i>Has serious debt</i>					
	No	1.00		0.00	
	Yes	****1.44	1.18, 1.75	***0.13	0.05, 0.22
<i>Number of economic shocks</i>					
	0	1.00		0.00	
	1	****1.58	1.29, 1.94	****0.19	0.10, 0.28
	2+	****3.24	2.23, 4.72	****0.50	0.36, 0.64
<i>Victim of crime</i>					
	No	1.00		0.00	
	Yes	***1.40	1.13, 1.73	****0.18	0.09, 0.27
Social capital					
<i>Member of a community group</i>					
	No	1.00		0.00	
	Yes	****1.58	1.23, 2.04	****0.28	0.18, 0.39
<i>Joined together with others - ISC</i>					
	No	1.00		0.00	
	Yes	*1.26	0.96, 1.65	****0.21	0.10, 0.33
Likelihood			-1438.12		-3660.84
Individual level variance			--		1.01
Community level variance			***0.08		****0.07
Cluster level variance			****0.21		****0.05

*p<0.1, **P<0.05, ***p<0.01, ****p<0.001 -- variable not included in model

Table E.3: Determinants of citizenship: logistic multilevel regression

	Joined together		Talked to authorities	
	OR	95% CI	OR	95% CI
Number of individuals		2320		2574
Number of communities		81		81
Number of clusters		20		20
Socio-economic				
<i>Household poverty group</i>				
	Extreme poverty	1.00		
	Poor	***0.58	0.41, 0.82	--
	Non-poor	***0.64	0.45, 0.92	
<i>Owns house</i>				
	No	1.00		
	Yes	***1.52	1.12, 2.07	--
<i>% community that owns house</i>				
	Low - 1 st quartile		1.00	
	2 nd quartile		1.04	0.60, 1.81
	3 rd quartile	--	1.30	0.76, 2.22
	High - 4 th quartile		***2.22	1.30, 3.80
Community integration				
<i>Sex¹</i>				
	Male		1.00	
	Female	--	*0.37	0.11, 1.21
<i>Caregiver's age in years</i>				
	<20		1.00	
	20-29	--	*1.71	0.91, 3.23
	30-39		**2.27	1.20, 4.30
	40+		***3.29	1.64, 6.60
<i>Community income inequality</i>				
	Equal - 1 st quartile	1.00		
	2 nd quartile	**0.62	0.40, 0.96	
	3 rd quartile	1.03	0.68, 1.54	--
	Unequal - 4 th quartile	*0.69	0.45, 1.06	
<i>Community residential stability</i>				
	Low - 1 st quartile	1.00		
	2 nd quartile	**1.73	1.11, 2.69	
	3 rd quartile	**1.74	1.07, 2.83	--
	High - 4 th quartile	1.24	0.81, 1.89	
Commitments				
<i>HH size</i>				
	2-4 people		1.00	
	5-6 people	--	**1.47	1.03, 2.10
	7+ people		*1.46	1.00, 2.12

Continued...

		Joined together		Talked to authorities	
		OR	95% CI	OR	95% CI
Stressors					
<i>Has serious debt</i>					
	No	1.00		1.00	
	Yes	*1.27	0.97, 1.67	**1.35	1.01, 1.82
<i>Victim of crime</i>					
	No	1.00		1.00	
	Yes	***1.49	1.13, 1.97	*1.31	0.98, 1.77
<i># neighbourhood disorder problems</i>					
	0-2	1.00		1.00	
	3-4	0.77	0.51, 1.18	*0.67	0.44, 1.04
	5-7	**1.76	1.14, 2.71	1.03	0.65, 1.63
Social capital					
<i>Member of a community group</i>					
	No	1.00		1.00	
	Yes	***1.66	1.21, 2.27	**1.51	1.09, 2.10
<i>Talked to authorities - ISC</i>					
	No	1.00			
	Yes	****12.64	9.25, 17.28	--	--
<i>Joined together with others - ISC</i>					
	No			1.00	
	Yes	--	--	****9.88	7.37, 13.24
<i>Feel part of community - ISC</i>					
	No	1.00			
	Yes	*1.39	0.93, 2.08	--	--
<i>Membership of groups - ESC</i>					
	Low - 1 st quartile	1.00			
	2 nd quartile	1.29	0.80, 2.10		
	3 rd quartile	1.10	0.69, 1.76	--	--
	High - 4 th quartile	**1.86	1.11, 3.10		
<i>% Joined together - ESC</i>					
	Low - 1 st tertile			1.00	
	2 nd tertile	--	--	*1.59	0.98, 2.58
	High - 3 rd tertile			**1.78	1.07, 2.97
<i>% get along - ESC</i>					
	Low - 1 st tertile			1.00	
	2 nd tertile	--	--	**1.65	1.05, 2.59
	High - 3 rd tertile			1.03	0.63, 1.67
Likelihood			-757.54		-686.03
Community level variance			<0.01		<0.01
Cluster level variance			<0.01		**0.05

*p<0.1, **P<0.05, ***p<0.01, ****p<0.001 -- variable not included in model

¹ Results from bi-variate robust standard errors (GEE) model.

Table E.4: Determinants of cognitive social capital: logistic multi-level regression

	Trust		Along		Part		Advantage	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Number individuals		2296		2299		2075		1991
Number of communities		81		82		78		71
Number of clusters		20		20		19		18
Socio-economic								
<i>% community that owns house</i>								
Low - 1 st quartile							1.00	
2 nd quartile							**1.51	1.07, 2.13
3 rd quartile							0.97	0.71, 1.33
High - 4 th quartile							1.00	0.73, 1.39
Community integration								
<i>Caregiver's age in years</i>								
<20							1.00	
20-29							0.84	0.60, 1.19
30-39							0.77	0.54, 1.11
40+							***0.52	0.34, 0.80
<i>Speaks local language</i>								
Yes							1.00	
No							**0.38	0.17, 0.84
<i>% of caregiver's life lived in community</i>								
Just moved there – 33%							1.00	
34% - 66%							*1.40	0.97, 2.04
67% - 99%							*1.43	0.95, 2.17
Whole life							****1.75	1.28, 2.39

Continued...

	Trust		Along		Part		Advantage	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Community residential stability</i>								
Low - 1 st quartile	1.00							
2 nd quartile	0.93	0.67, 1.28						
3 rd quartile	1.07	0.75, 1.53						
High - 4 th quartile	****1.90	1.36, 2.65						
<i>Community population size</i>								
<5000 people					1.00			
>5000 people	--	--	--	--	--	--	***0.69	0.53, 0.90
Commitments								
<i># caregiver occupational activities</i>								
0					1.00			
1	--	--	--	--	--	--	*0.81	0.65, 1.01
2+							0.90	0.67, 1.20
Stressors								
<i>CMD²</i>								
Non-case					1.00			
Case	--	--	--	--	****0.72	0.55, 0.96	****0.60	0.47, 0.76
<i>Number of economic shocks</i>								
0					1.00			
1	--	--	0.89	0.71, 1.11	--	--	**0.76	0.62, 0.94
2+			****0.59	0.42, 0.81			0.84	0.61, 1.15
<i>Victim of crime</i>								
No			1.00				1.00	
Yes	--	--	***0.74	0.60, 0.92	--	--	**0.78	0.63, 0.96

Continued...

	Trust		Along		Part		Advantage	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i># neighbourhood disorder problems</i>								
0-2	1.00				1.00			
3-4	**0.75	0.57, 0.99	--	--	**0.71	0.51, 0.99	--	--
5-7	0.97	0.70, 1.35			0.94	0.62, 1.45		
<i>Pollution problems in community</i>								
No pollution problems					1.00			
Some pollution problems	--	--	--	--	0.83	0.57, 1.21	--	--
Many pollution problems					**0.60	0.41, 0.89		
Social capital								
Member of a community group								
No	1.00						1.00	
Yes	***1.42	1.11, 1.82	--	--	--	--	**0.77	0.60, 0.99
<i>Joined together with others - ISC</i>								
No					1.00			
Yes	--	--	--	--	***1.72	1.15, 2.57	--	--
<i>Trust - ISC</i>								
No					1.00		1.00	
Yes	--	--	***4.77	3.67, 6.21	***2.07	1.45, 2.95	***1.65	1.33, 2.05
<i>People get along - ISC</i>								
No	1.00				1.00		1.00	
Yes	***4.72	3.61, 6.16	--	--	***3.58	2.72, 4.70	***2.26	1.82, 2.82
<i>Feel part of community - ISC</i>								
No	1.00						1.00	
Yes	***2.30	1.62, 3.26	***3.51	2.71, 4.54	--	--	***1.48	1.13, 1.93
<i>Take advantage - ISC</i>								
No	1.00				1.00			
Yes	***1.67	1.36, 2.05	***2.19	1.78, 2.69	***1.50	1.15, 1.96	--	--

Continued...

	Trust		Along		Part		Advantage	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Support from individuals - ESC</i>								
Low - 1 st quartile	1.00						1.00	
2 nd quartile	0.80	0.55, 1.15					1.03	0.78, 1.37
3 rd quartile	***0.37	0.27, 0.51	--	--	--	--	***1.75	1.28, 2.39
High - 4 th quartile	**0.68	0.49, 0.96					***1.46	1.10, 1.93
<i>% talked to authorities - ESC</i>								
Low - 1 st tertile							1.00	
2 nd tertile	--	--	--	--	--	--	1.20	0.87, 1.67
High - 3 rd tertile							***1.63	1.19, 2.23
<i>% joined together - ESC</i>								
Low - 1 st tertile	1.00							
2 nd tertile	***1.58	1.15, 2.17	--	--	--	--	--	--
High - 3 rd tertile	1.26	0.90, 1.75						
<i>% trust - ESC</i>								
Low - 1 st tertile					1.00			
2 nd tertile	--	--	--	--	1.31	0.92, 1.88	--	--
High - 3 rd tertile					**1.67	1.13, 2.48		
<i>% get along - ESC</i>								
Low - 1 st tertile	1.00							
2 nd tertile	1.30	0.93, 1.81	--	--	--	--	--	--
High - 3 rd tertile	***1.62	1.17, 2.24						
<i>% take advantage - ESC</i>								
Low - 1 st tertile			1.00					
2 nd tertile	--	--	***1.83	1.37, 2.44	--	--	--	--
High - 3 rd tertile			**1.46	1.09, 1.96				
Likelihood		-1245.50		-1154.34				-1232.49
Community level variance		<0.01		<0.01				<0.01
Cluster level variance		*0.02		**0.03				<0.01

*p<0.1, **P<0.05, ***p<0.01, ****p<0.001 -- variable not included in model

² Results from multi-level GLLMM model of respondents of one-year-old children only.

**Appendix F: Full results of association between
social capital and maternal CMD in Peru**

Social capital variables	Stage 1		Stage 2		Stage 3		Stage 4	
	Crude	95% CI	Social capital	95% CI	+ Founders	95% CI	+ Interactions	95% CI
ISC								
Support bridging * ESC sense of belonging ¹								
No support, low belonging	--	--	--	--	--	--	1.00	0.42 0.29, 0.61
No support, medium belonging								0.21 0.10, 0.42
No support, high belonging								2.90 1.90, 4.43
Support, low belonging								0.27 0.15, 0.48
Support, medium belonging								0.29 0.14, 0.62
Support, high belonging								
ESC								
Mean support from bridging individuals	*2.13	1.04, 4.33	2.25	0.96, 5.26	1.92	0.78, 4.74	1.75	0.81, 3.77
Talked with authorities								
ISC								
No	1.00		1.00		1.00		1.00	
Yes	*1.50	1.06, 2.12	1.45	0.98, 2.15	1.28	0.83, 1.96	1.19	0.76, 1.88
ESC								
% talked to authorities	1.00	0.99, 1.01	1.00	0.98, 1.02	1.00	0.98, 1.02	1.00	0.98, 1.01
Joined together with others								
ISC								
No	1.00		1.00		1.00		--	--
Yes	1.11	0.82, 1.51	0.93	0.66, 1.32	0.94	0.65, 1.37		
ESC								
% community joined together	1.00		1.00		1.00		--	--
<10%	1.13	0.75, 1.69	1.08	0.71, 1.64	0.82	0.53, 1.25		
10-20%	1.13	0.76, 1.67	1.14	0.69, 1.90	1.04	0.63, 1.73		
20%+								

Continued...

Social capital variables	Stage 1		Stage 2		Stage 3		Stage 4		
	Crude	Social capital	+ Confounders	+ Interactions	OR	95% CI	OR	95% CI	
ISC join * ESC % in community who have joined¹									
	No join, low joining in community	--	--	--			1.00		
	No join, medium joining in community						0.91	0.59, 1.41	
	No join, high joining in community						1.21	0.76, 1.94	
	Join, low joining in community						4.30	1.69, 10.92	
	Join, medium joining in community						0.64	0.33, 1.25	
	Join, high joining in community						1.05	0.56, 1.98	
Trust									
ISC	No	1.00	1.00	1.00	1.00	1.00	1.00		
	Yes	0.97	0.77, 1.23	1.17	0.91, 1.50	1.15	0.88, 1.50	1.12	0.86, 1.46
ESC									
	% community that trust others	1.00		1.00		1.00		1.00	
	<30%								
	30-60%	1.30	0.93, 1.82	1.42	0.96, 2.11	1.49	0.99, 2.25	1.43	0.94, 2.16
	60%+	1.34	0.83, 2.14	1.48	0.75, 2.89	1.34	0.67, 2.67	1.39	0.74, 2.61
Social harmony									
ISC	No	1.00		1.00		1.00		1.00	
	Yes	**0.72	0.57, 0.92	0.86	0.66, 1.13	0.82	0.62, 1.08	0.79	0.59, 1.06
ESC									
	% people think others get along	1.01	1.00, 1.02	1.01	0.99, 1.03	1.01	0.99, 1.03	1.01	0.99, 1.03
Sense of belonging									
ISC	No	1.00		1.00		1.00		1.00	
	Yes	**0.64	0.48, 0.86	*0.68	0.50, 0.93	*0.65	0.47, 0.91	**0.64	0.49, 0.85
ESC									
	% community feel part	1.00		1.00		1.00		--	
	<70%								
	70-90%	0.79	0.38, 1.65	0.54	0.27, 1.05	0.66	0.33, 1.32		
	90%+	0.91	0.43, 1.93	0.47	0.21, 1.02	*0.42	0.19, 0.97		

Social capital variables	Stage 1		Stage 2		Stage 3		Stage 4	
	Crude	Social capital	+ Confounders	+ Interactions	OR	95% CI	OR	95% CI
ESC Sense of belonging * poverty ¹								
Low belonging, extremely poor	--	--	--	1.00			1.00	
Low belonging, poor							0.48	0.30, 0.75
Low belonging, non-poor							0.21	0.13, 0.36
Medium belonging, extremely poor							0.42	0.29, 0.61
Medium belonging, poor							0.46	0.27, 0.78
Medium belonging, non-poor							0.59	0.36, 0.98
High belonging, extremely poor							0.21	0.10, 0.42
High belonging, poor							0.38	0.17, 0.86
High belonging, non-poor							0.22	0.08, 0.64
Sense of fairness								
ISC								
No	1.00	1.00	1.00	1.00			1.00	
Yes	***0.57	0.45, 0.71	***0.59	0.47, 0.75	***0.62	0.48, 0.80	***0.62	0.48, 0.80
ESC % think people would take advantage	1.00	0.99, 1.02	1.00	0.99, 1.01	1.00	0.98, 1.01	1.00	0.99, 1.01
Confounding variables								
Household poverty								
Extremely poor	--	--	--	1.00			--	--
Poor				0.96			0.71, 1.31	
Non poor				0.70			0.49, 1.01	
Has serious debts								
No	--	--	--	1.00			1.00	
Yes				***1.72	1.34, 2.21		***1.66	1.35, 2.03
Owns house								
No	--	--	--	1.00			1.00	
Yes				*0.70	0.54, 0.92		***0.69	0.56, 0.85

Continued...

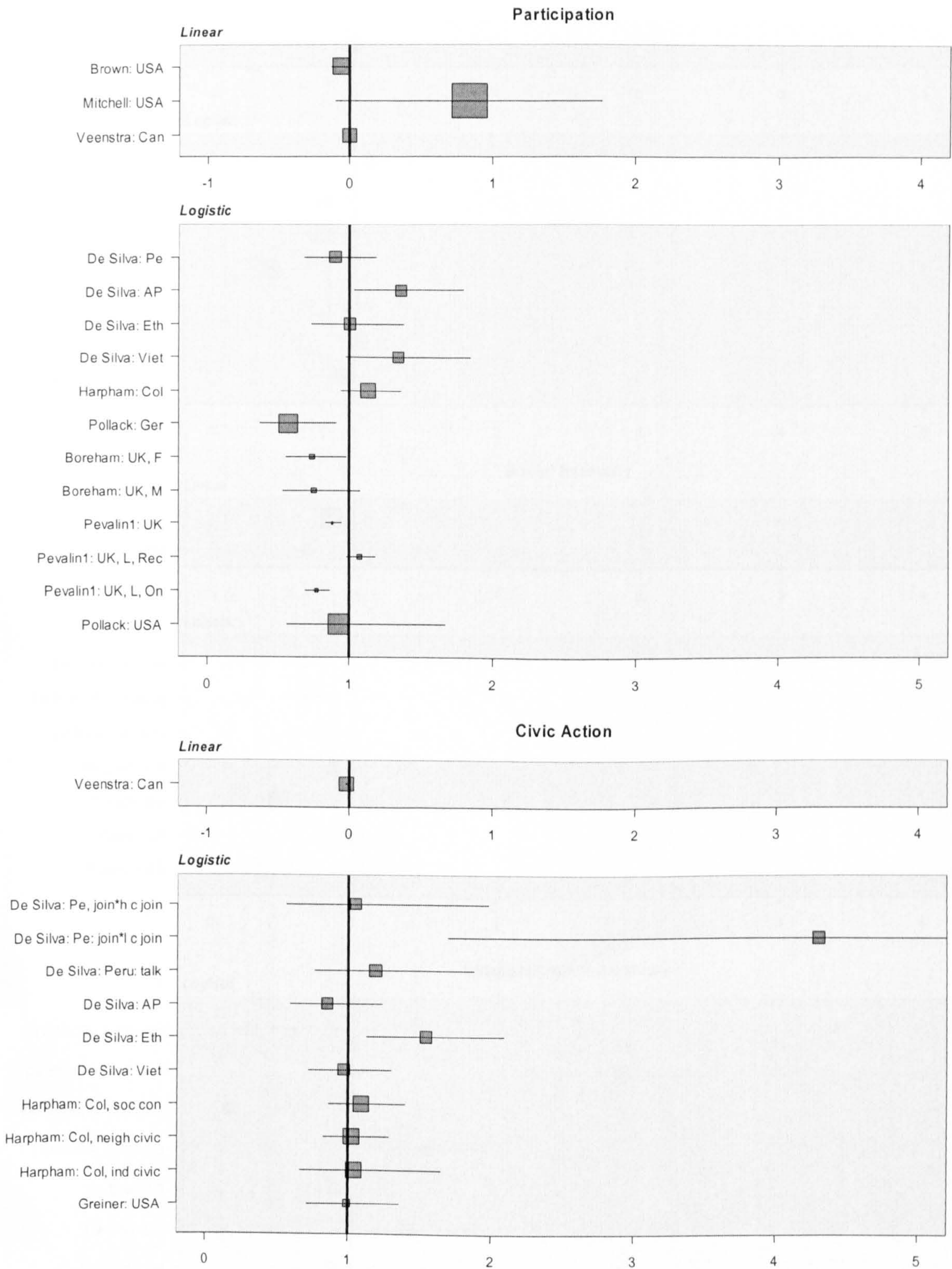
Social capital variables	Stage 1		Stage 2		Stage 3		Stage 4	
	Crude		Social capital		+ Confounders		+ Interactions	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<i>Maternal ethnic group</i>								
Andean Indian	--	--	--	--	1.00		1.00	
White					*0.44	0.22, 0.89	**0.44	0.25, 0.78
Asian, African, Amazon					0.85	0.38, 1.86	0.92	0.45, 1.87
<i>Maternal long term limiting illness</i>								
No	--	--	--	--	1.00		1.00	
Yes					***2.85	1.74, 4.67	***2.80	1.63, 4.82
<i>Community income inequality</i>								
Equal	--	--	--	--				
Less equal					*0.64	0.41, 0.99	*0.64	0.44, 0.91
Unequal					0.80	0.48, 1.35	0.83	0.51, 1.37

*p<0.05, **p<0.01, ***p<0.001 – variable not included in model
¹ No p-values available for calculated interaction effect estimates.

Confounding variables	Stage 1		Stage 2		Stage 3		Stage 4	
	Crude	Social capital	+ Confounders	+ Interactions	OR	95% CI	OR	95% CI
<i># maternal occupational activities</i>								
0	--	--	1.00	1.00	1.00		1.00	
1	--	--	*1.31	1.00, 1.72	*1.30	1.05, 1.60	*1.30	1.05, 1.60
2+	--	--	1.26	0.86, 1.83	1.22	0.85, 1.75	1.22	0.85, 1.75
<i>Maternal education level</i>								
None	--	--	1.00	1.00	1.00		1.00	
Primary	--	--	0.63	0.39, 1.01	*0.62	0.41, 0.93	*0.62	0.41, 0.93
Secondary	--	--	*0.52	0.31, 0.88	**0.51	0.32, 0.82	**0.51	0.32, 0.82
Technical college or university	--	--	***0.34	0.18, 0.62	***0.34	0.19, 0.59	***0.34	0.19, 0.59
<i>Perceived economic position in community</i>								
Better off than others	--	--	1.00	1.00	1.00		1.00	
Similar to others	--	--	*0.64	0.44, 0.93	**0.62	0.44, 0.89	**0.62	0.44, 0.89
Worse off than others	--	--	1.30	0.86, 1.97	1.34	0.93, 1.94	1.34	0.93, 1.94
<i>Number of household economic shocks</i>								
0	--	--	1.00	1.00	1.00		1.00	
1	--	--	**1.42	1.09, 1.84	*1.42	1.08, 1.87	*1.42	1.08, 1.87
2+	--	--	1.25	0.82, 1.89	1.18	0.75, 1.85	1.18	0.75, 1.85
<i>Marital status</i>								
Permanent partner	--	--	1.00	1.00	1.00		1.00	
Single/divorced/widowed	--	--	***1.78	1.26, 2.50	***1.74	1.28, 2.35	***1.74	1.28, 2.35
<i>Maternal age group</i>								
<24	--	--	1.00	1.00	1.00		1.00	
25-29	--	--	1.31	0.96, 1.79	1.33	0.97, 1.81	1.33	0.97, 1.81
30-34	--	--	***2.17	1.53, 3.08	***2.22	1.57, 3.15	***2.22	1.57, 3.15
35+	--	--	1.45	0.98, 2.14	1.49	0.93, 2.38	1.49	0.93, 2.38
<i>Number of children in the household</i>								
0	--	--	1.00	1.00	1.00		1.00	
1	--	--	*1.12	1.02, 1.22	*1.12	1.03, 1.22	*1.12	1.03, 1.22

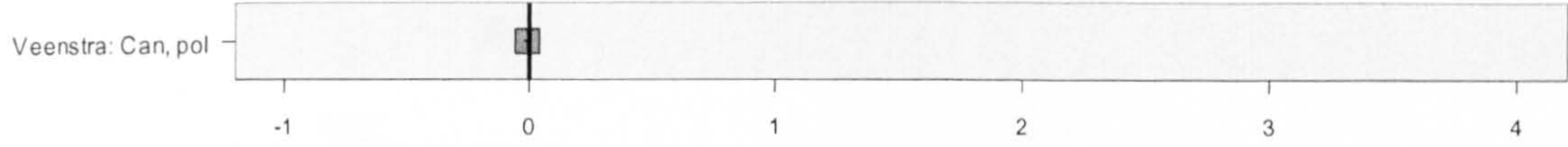
**Appendix G: Forest plots of studies
exploring the association between
social capital and CMD**

Figure G.1: Forest plot of studies exploring the association between ISC and CMD

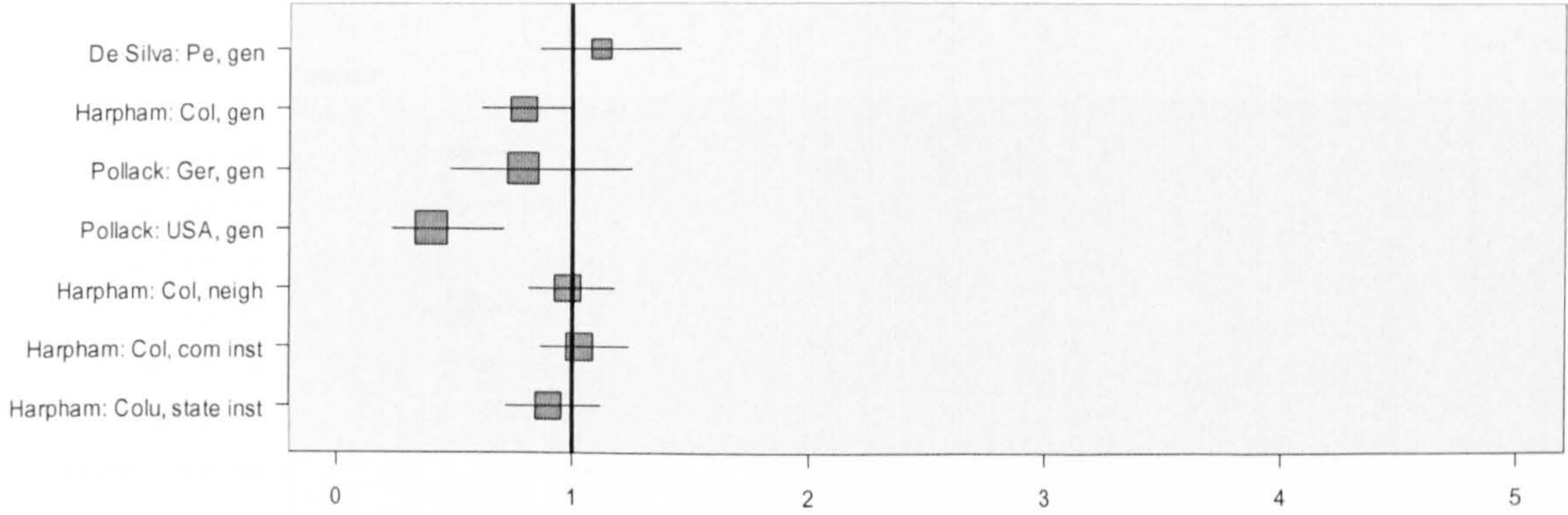


Trust

Linear

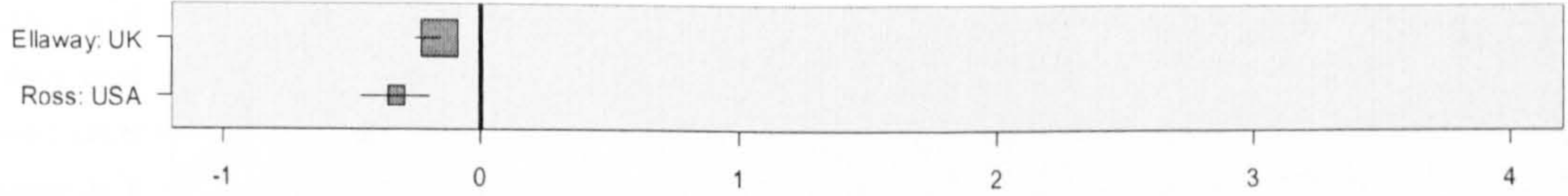


Logistic

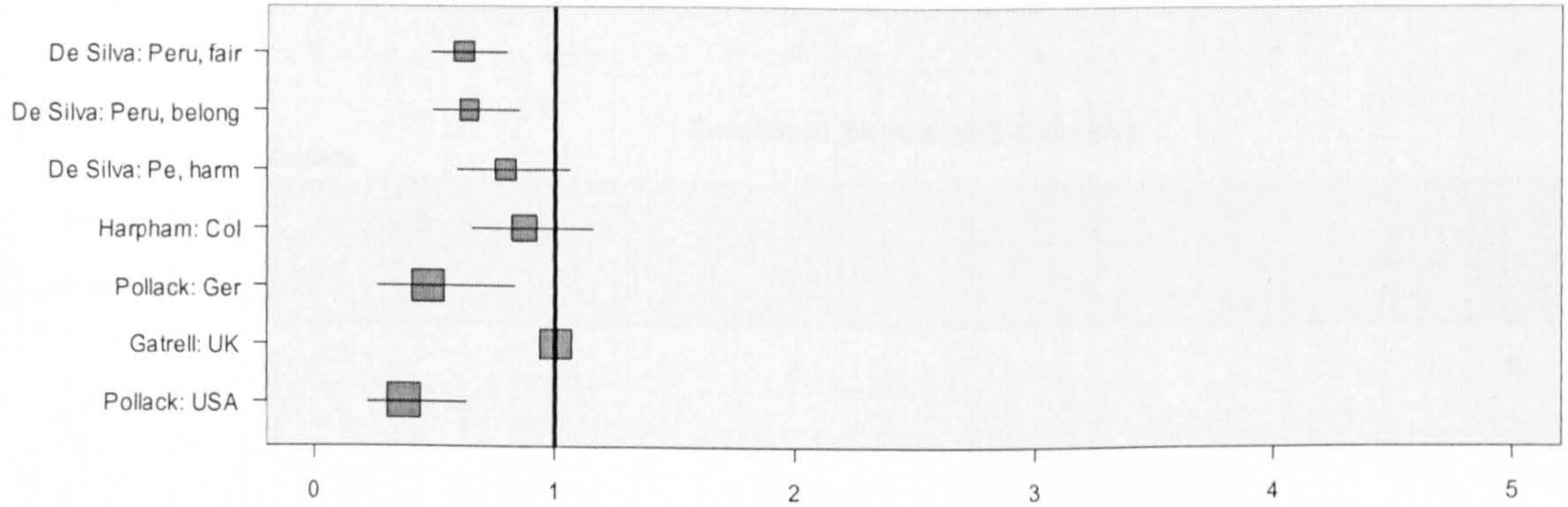


Social Harmony

Linear

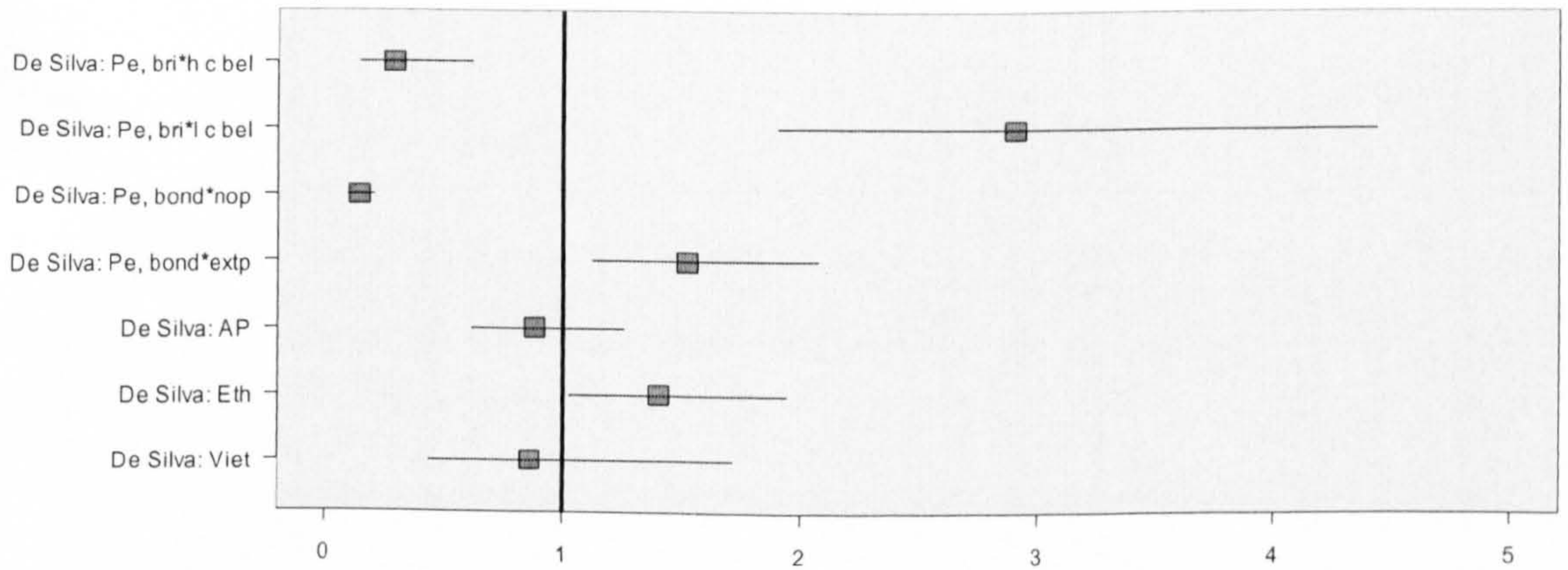


Logistic

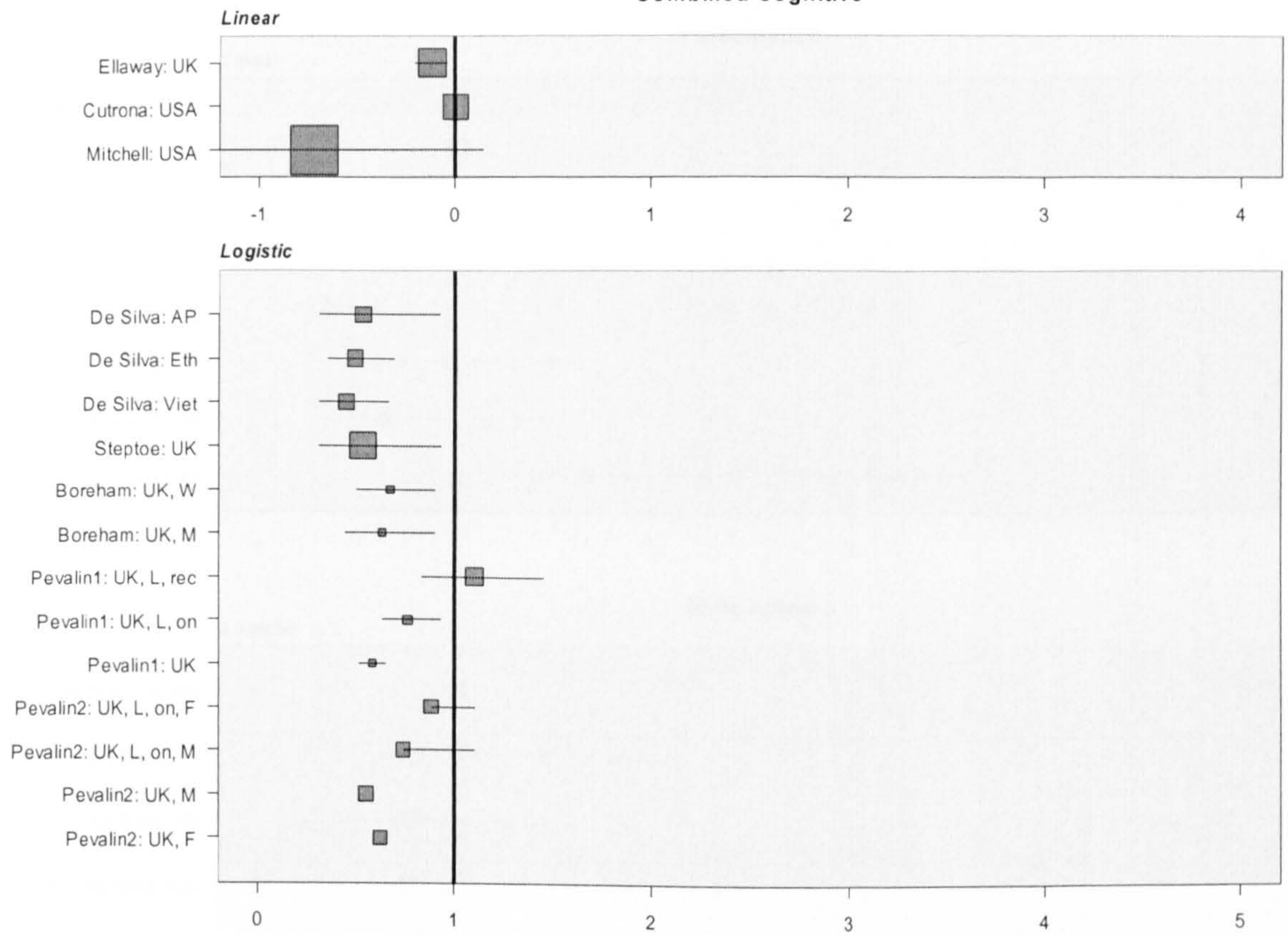


Support From Individuals

Logistic



Combined Cognitive



Combined Structural & Cognitive

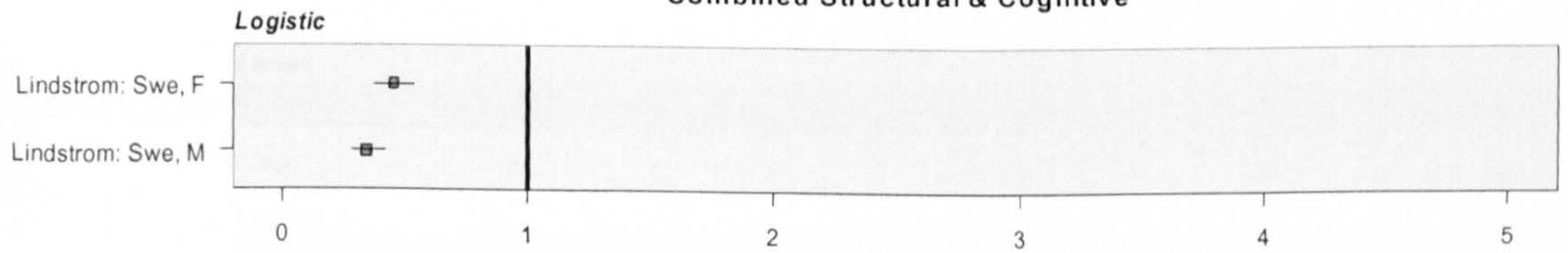
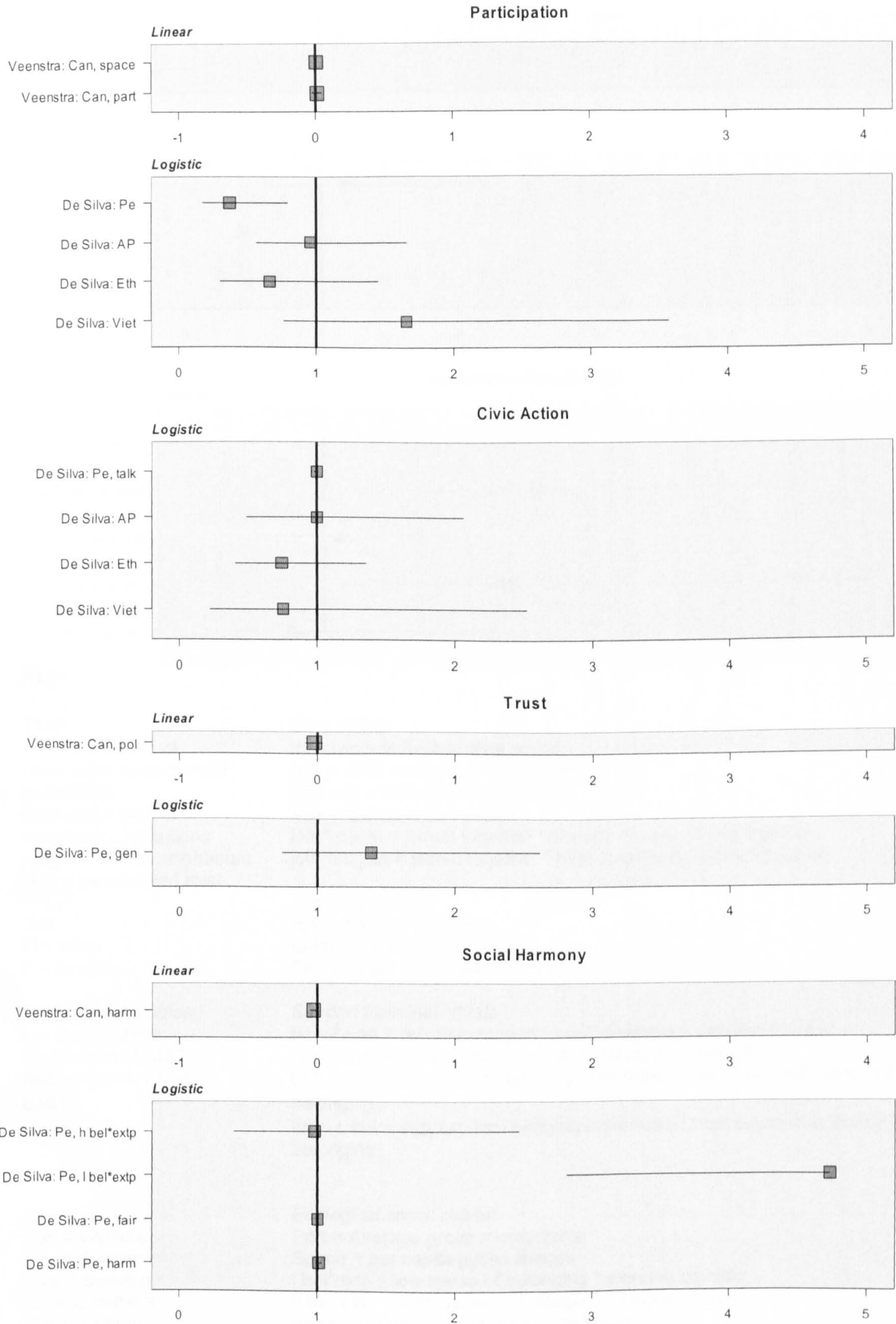
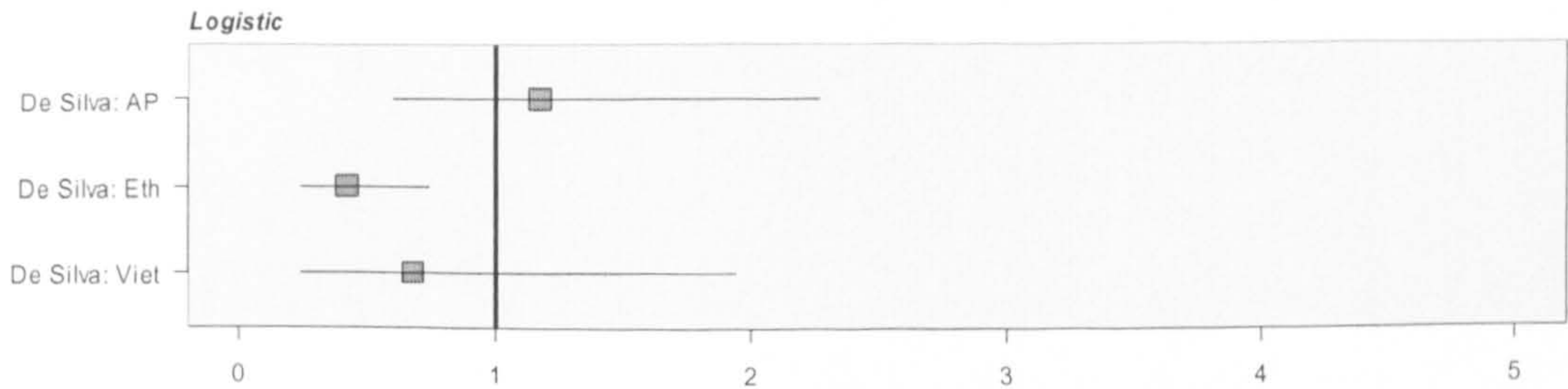
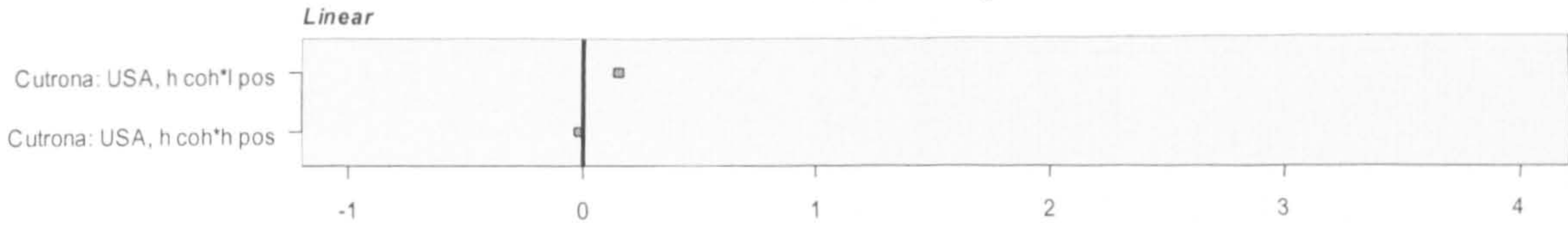


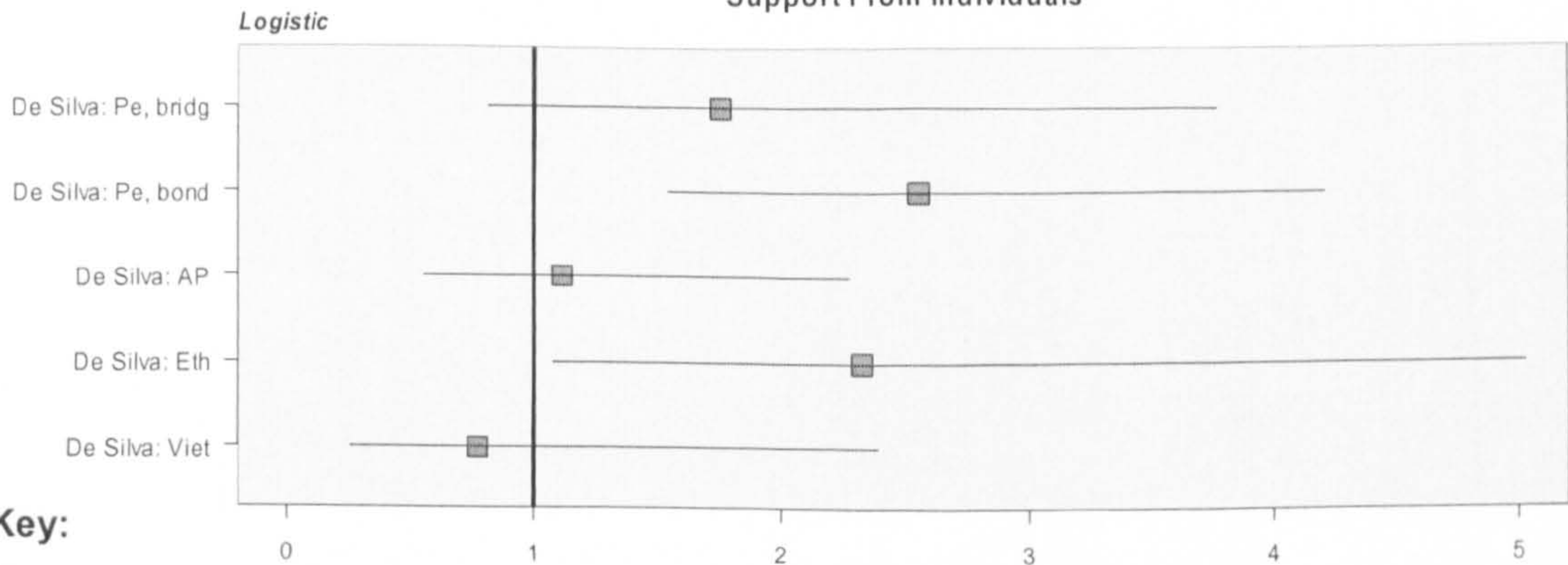
Figure G.2: Forest plot of studies exploring the association between ESC and CMD



Combined Cognitive



Support From Individuals



Key:

Trust

Pol = political trust
 State inst = trust in state institutions
 Com inst = trust in community institutions
 Neigh = trust in neighbours
 Gen = generalized trust

Sex

M = Male
 F = female

Longitudinal studies

L = Longitudinal
 On = onset of CMD
 Rec = recovery from CMD

Country

Can = Canada
 Ger = Germany
 Swe = Sweden
 Col = Columbia
 Viet = Vietnam
 Eth = Ethiopia
 AP = Andhra Pradesh
 Pe = Peru

Civic action

Ind civic = individual civic action
 Neigh civic = neighbours' civic action
 Soc con = informal social control
 Talk = talked to authorities
 join*I c join = joined together * low community joining together
 join*h c join = joined together * high community joining together

Social harmony

Harm = social harmony
 Belong = sense of belonging
 Fair = sense of fairness

Support from individuals

bond*extp = bonding support from individuals * extreme poverty
 bond*nop = bonding support from individuals * non-poor
 bri*I c bel = support from bridging individuals * low community sense of belonging
 bri*h c bel = support from bridging individuals * high community sense of belonging

Ecological social capital

Part = Average group membership
 Space = per capita public spaces
 l bel*extp = low sense of belonging * extreme poverty
 h bel*extp = high sense of belonging * extreme poverty
 bond = support from bonding individuals
 bridg = support from bridging individuals
 h tru*equ = high trust * income equality
 h tru*inequ = high trust * income inequality
 h coh*h pos out = high social cohesion * high positive outlook
 h coh*I pos out = high social cohesion * low positive outlook