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Maternal social capital and child nutritional status in four developing countries

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Abstract

Social capital has been shown to be positively associated with a range of health outcomes, yet no studies have explored the association between maternal social capital and child nutritional status. Using data from the Young Lives study comprising 7242 1-year-old children from Peru, Ethiopia, Vietnam and the state of Andhra Pradesh in India, we find significant differences in the levels of, in particular, structural social capital (group membership and citizenship) between countries. While few associations were found between structural measures of social capital, support from individuals and cognitive social capital (e.g. trust, social harmony) displayed fairly consistent positive associations with child nutritional status across countries.

Keywords: Social capital; Maternal; Child nutrition; Stunting; Wasting; Developing countries

Introduction

This paper has two aims: firstly to provide a comparative description of the characteristics and levels of maternal social capital across four developing countries (Ethiopia, Peru, Vietnam and the state of Andhra Pradesh in India), and secondly to explore the association between maternal social capital and child nutritional status in each of the four countries.

Social capital, often defined as the norms, networks and associations that facilitate co-operative action (Putnam, 1993), has been found to be beneficial in an extensive body of literature looking at both developing and developed countries. However, a deepening understanding of social capital is also accompanied by criticism, both conceptually and in terms of added value for policy. For example, social capital has been variously criticised as a repackaging of old concepts (Lochner et al., 1999), of ignoring structural causes of inequalities and shifting attention away from the state's responsibility for service provision (Harris, 2002), and of being gender blind (Molyneux, 2002). Nevertheless, while the enthusiasm which greeted social capital's rise to the development policy agenda in the 1990s has become somewhat bounded, the general consensus seems to be that the 'social' cannot be ignored by the development community, and that debates around social capital have served to bring the importance of civil society composition and dynamics and state/civil society modes of engagement into the mainstream.

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Social capital and child nutrition

While previous research has demonstrated positive associations between adult social capital and adult physical and mental health (Pollack and von dem Kneseback, 2004; Young et al., 2004; De Silva et al., 2005c), and between social capital and child mental health (Caughy et al., 2003; Drukker et al., 2003; Van der Linden et al., 2003), the association between social capital and nutrition has rarely been examined. An electronic search of Embase revealed only four studies examining the association between social capital and nutritional status, only two of which explore child nutritional status.

Reflecting the debate in the literature as to whether social capital is the property of individuals or groups (McKenzie et al., 2002), three of the four studies measure social capital at the community level (Carter and Maluccio, 2003; Drukker et al., 2003; Godoy et al., 2005), the other defining it as the property of individuals (Locher et al., 2005). This variation in measurement levels is mirrored by large differences in the measures of social capital used by the studies, ranging from the levels of generosity and group membership in the community to an individual's perception of trust in their community.

Perhaps because of this, the results of the studies are mixed. Drukker et al. (2003) found no association between levels of social capital (defined as informal social control, social cohesion and trust) in different communities in Maastricht and the growth curves of 11-year-old children. Godoy et al. (2005) also found no association between levels of generosity in the village and anthropometric indicators among adults of the Tsimane tribe living in the Bolivian Amazon jungle. In contrast, Locher et al. (2005) found an association between some aspects of individual-level social capital and nutritional risk among older people in the USA (Locher et al., 2005), while Carter and Maluccio (2003) found that the negative impact of household economic shocks on the height-for-age z-scores of South African children were buffered by living in a community with high social capital.

The results of these and other studies indicate that the effect of social capital on health may vary by sub-groups (Brown et al., 1992; Cutrona et al., 2000). For example, the study by Locher et al. (2005) shows the effect of social capital to vary by gender and also ethnic group, with more aspects of social capital associated with nutritional risk among black men than among other gender and ethnic groups. Such heterogeneity of effects merits further investigation. The emphasis in the development literature on the importance of social capital for poverty alleviation (Carroll, 2001; Grootaert and van Bastelaer, 2001; Robison et al., 2001) points to the need to explore the effect of social capital in different socio-economic groups.

To the best of our knowledge, no study has explored the association between individual-level social capital and child nutritional status. The results of the above studies suggesting that there may be an association between social capital and nutrition among children in the developing world (Carter and Maluccio, 2003), and at the individual level (Locher et al., 2005), indicate that such an analysis may be fruitful.

Hypothesised pathways through which maternal social capital may affect child nutritional status

We hypothesise that social capital may be related to child nutritional status in a number of different ways. Social connectedness may enable mothers to KNOW more due to knowledge transfer (e.g. where to obtain additional cheap sources of food), THINK differently due to attitude influences (e.g. attitudes towards hygiene practices) and to DO things differently (e.g. breastfeed for longer). These hypotheses are illustrated by research from the US which showed that women with more social capital had increased odds of breastfeeding their child (Anderson et al., 2004), and that both household and community-level social capital are associated with reduced odds of household hunger (Martin et al., 2004). Social capital can also enable mothers to FEEL different. For example, high levels of emotional support from connections are positively linked to good maternal mental health, which has been linked to improved child growth (Patel et al., 2004; Harpham et al., 2005).

Kawachi and Berkman (2001) subsumed most of these mechanisms in their two models that explain the pathway between social capital and well being. One is a 'buffering model' whereby social capital protects from or reduces the effects of harmful phenomena (e.g. negative life events) and the other is the 'main affect (sic)' model whereby high social capital results in exposure to positive norms and positively affects state of well being.

Fig. 1 outlines some hypothesised causal pathways through which maternal social capital may affect child nutritional status. These can be illustrated

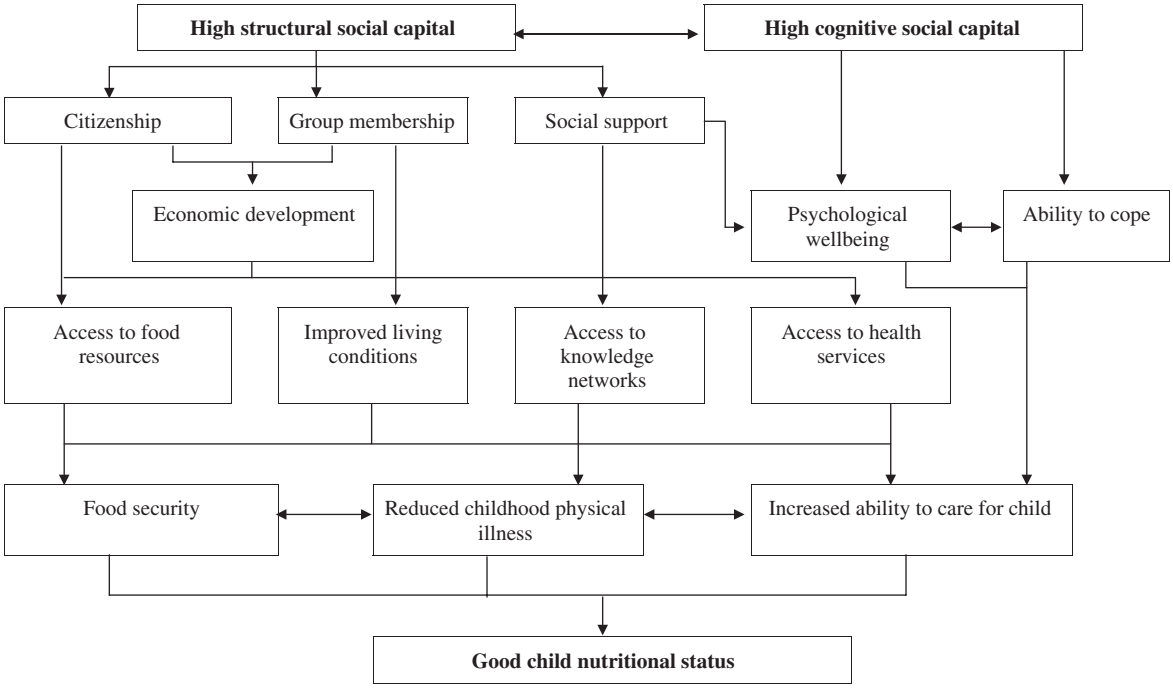


Fig. 1. Hypothesised pathways through which maternal social capital may affect child nutritional status.

using examples from an in-depth exploration of social capital in Peru (De Silva et al., 2005a). For example, some Peruvian mothers participate in citizenship campaigning in shanty towns to get the title deeds to their land and also to get water and electricity and other basic services. This will improve living conditions and may reduce the level of infectious disease among young children, thereby improving their nutritional status. In terms of group membership, some groups in Peru are specifically designed around feeding programs. As a result, mothers who are members of these groups have access to more food resources. For example the Government-run Glass of Milk Program gives free milk and cereals to babies of mother's who participate, while the state-sponsored communal kitchens provide cheap food for the whole family. Qualitative interviews with family members in three communities in Peru (De Silva et al., 2005a) highlight the extensive support that many mothers with young children receive from friends and family, including financial support and supplying food and clothes for the baby. These factors may increase food security and buffer the mother against shocks. Lastly, analyses of the Young Lives (YL) data have shown that cognitive social capital is associated with maternal common mental disorders (De Silva, 2005), which in turn is associated with poorer child nutrition outcomes (Harpham et al., 2005). Therefore, higher levels of cognitive social capital may buffer mother's psychologically, enabling them to better care for their child.

Objectives and hypothesis

1. Describe levels of maternal social capital across four developing countries.
2. Explore the association between maternal social capital and child nutritional status in four developing countries.
3. Explore interactions between social capital and poverty in the prediction of child nutritional status.

We hypothesise that higher levels of maternal social capital will be associated with children being taller and heavier for their age.

Methods

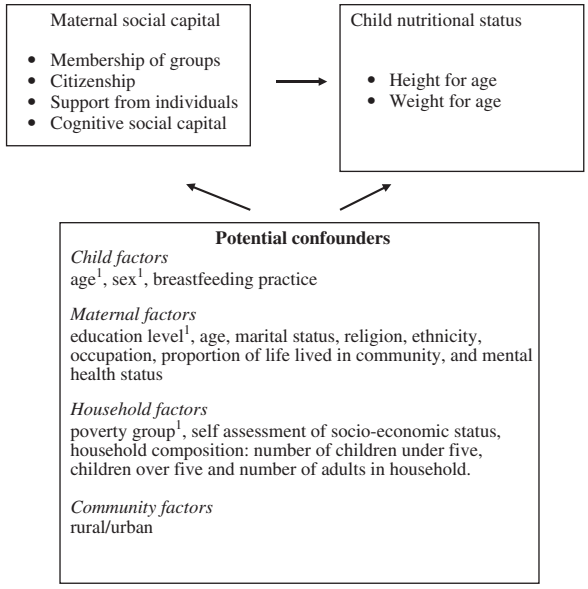
Data from the YL study were used. In each of four countries (Peru, Ethiopia, Vietnam and the state of Andhra Pradesh in India) 20 sites were purposefully selected by a team of local experts to represent a range of regions and living conditions. In each of the 20 sites, a random sample of 100

households containing children aged 6–18 months (hereafter referred to as '1-year-olds') was taken (Wilson and Huttly, 2004). The primary caregiver of the index child was interviewed in their local language by local interviewers and anthropometric measurements (weight and height) of the children were taken. Data on child characteristics and health were cross-checked against documentation where possible. Though the questionnaire aimed to measure items in the same way across the four countries, the variables used to collect this information were adapted for use in each country to provide locally meaningful measures. The full sample details and questionnaire can be found on www.younglives.org.uk. Data were collected in 2002. The response rates in all four countries were high and always above 90%.

For ease of comparison, the sample was restricted to the biological mother of the 1-year-olds, who constituted 98% of the total YL sample. The sample was further restricted to those with complete data on social capital (110 excluded), and complete anthropometric data (213 excluded), leaving a final sample size of 7242.

Conceptual framework

Fig. 2 outlines the conceptual framework for the analysis.



[1]A priori confounders based on previous research.

Fig. 2. Conceptual framework.

Measurement of social capital

While recognising that both individual and ecological approaches to measuring social capital have merit and are complimentary (De Silva, 2006), in order to test the hypothesis that when the child is young the social capital of the mother will have greatest impact upon a child's well-being, this study is restricted to measures of individual-level maternal social capital.

The approach to social capital avoids focussing on *either* norms and trust *or* participation but instead considers both, as recommended by recent texts on social capital (e.g. Dasgupta and Serageldin, 2000). This study recognises the importance of separating structural social capital (objective measures of what people 'do', such as membership of groups) from cognitive social capital (subjective measures of what people 'feel', such as notions of trust and reciprocity) (Harpham et al., 2002). It is important to separate these dimensions of social capital as previous research has shown structural and cognitive social capital to be negatively correlated (De Silva et al., 2005b).

The Short Social Capital Assessment Tool (SASCAT–Appendix A) was used to quantitatively measure social capital. This is a shortened version of the Adapted Social Capital Tool (A-SCAT) developed by Harpham et al. (2002) and previously used in Sub-Saharan Africa (Thomas, 2003) and Colombia (Harpham et al., 2004). SASCAT measures three aspects of structural social capital (membership of groups, involvement in citizenship activities and social support from the community), as well as cognitive social capital (trust, social harmony, perceived fairness and sense of belonging). All social capital measures refer to the 'community' as defined by local administrative boundaries, and the same cut-offs were used in each country when generating the composite variables. A range of methods, including factor analysis and qualitative cognitive interviews, were used to evaluate the construct validity of SASCAT in Peru and Vietnam, and these results are presented elsewhere (De Silva et al., 2005b; Tuan et al., 2005).

Measurement of child nutritional status

Both chronic (height-for-age z-score) and acute (weight-for-age z-score) nutritional indicators were assessed. z-scores were calculated using EpiInfo

EPINUT, and based on the 1977 NCHS reference growth charts (Hamill et al., 1977) that were adopted for use by the World Health Organisation for international comparisons between populations (Waterlow et al., 1977).

Measurement of confounding variables

A range of potential confounders in the relationship between maternal social capital and child malnutrition were considered. Fig. 2 lists the confounding variables considered in this analysis, and Table 1 the categories used for the principle variables.

Child characteristics comprised sex, age in months, and whether the child is currently, has been or was never breastfed. Maternal factors comprised her education level, age in 5-year bands, marital status (whether she is single, widowed or divorced versus married or has a permanent partner), religion, ethnicity, number of occupational activities, the proportion of her life she has lived in the community (number of years lived in the community/age in years). Maternal mental health was assessed using the SRQ20, the WHO screening tool for common mental disorders (WHO, 1994).

Household factors comprised a wealth index, a simple average of three factors: housing quality, consumer durables and services. The calculated index for each household is a score between 0 and 1, which is then divided into four categories to provide a household poverty group. To measure perceptions of inequality which may influence people's social relations with other members of the community, a measure of whether respondents considered themselves better off, the same or worse than other households in the community was used. Three variables relating to household composition were also included: the number of children under five, over five, and the number of adults in household.

Statistical methods

Differences in levels of maternal social capital between countries (Objective 1), and in levels of confounding variables were assessed using chi-square tests for categorical variables and *t*-tests for continuous variables. Multi-variable linear regression models with robust standard errors to adjust for the clustered sampling were fitted to explore associations between maternal social capital and child nutritional status (Objective 2). Linear regression was used as previous research has shown that social capital may have relatively small effects on health (Harpham et al., in press) and so we wanted to be able to detect relatively small differences in nutritional status between different levels of social capital. Both height-for-age and weight-for-age variables were normally distributed.

Separate models were fitted for each country and for each outcome. To ensure that the results from each country are comparable, manual backwards selection of confounders on data from all four countries was used to select a generic list of confounders for each outcome. While previous research indicates that many risk factors are common across different settings, including a generic set may increase the chance of residual confounding if different associations are seen in different settings. However, we considered comparability of results to be of primary importance.

All potential and a priori confounders (child age and sex, maternal education and household poverty group) were entered into a robust standard errors model simultaneously and the variable making the least significant contribution (defined as an overall Wald test *p*-value of less than 0.05, or a 10% or greater change in any of the effect estimates for the social capital variables), dropped from the model. This process was repeated until only those potential confounders which made a significant contribution to the model remained, plus the a priori confounders, and all the social capital variables.

For the multi-variable analyses, respondents with missing data on any of the variables included in the final model were excluded. This resulted in a further 4% and 5% of respondents being excluded in the height-for-age and weight-for-age models, respectively.

Separate models were fitted for each country and each outcome (8 models in total). Firstly, the crude association between each type of social capital and each outcome was estimated, followed by the association adjusted for confounding variables. Interactions between each social capital variable and household poverty group in the prediction of child nutritional status (Objective 3) were tested in the final model for each outcome in each country using Wald tests. Despite using prior research to decide which interactions to test, the large number of social capital variables means that 32 potential interactions were tested. Such multiple testing increases the chance of a Type I error, whereby

Table 1
Description of the sample in each country

	% or mean (range)			
	Peru 1678	Vietnam 1962	Ethiopia 1756	AP 1846
Child nutritional status				
*Height for age z-scores**	−1.3 (−5.8, 4.2)	−1.0 (−5.1, 3)	−1.5 (−6.0, 5.2)	−1.3 (−5.9, 4.5)
*Weight for age z-scores**	−0.5 (−4.4, 5.9)	−1.3 (−5.6, 3.4)	−1.7 (−5.7, 3.1)	−1.8 (−5.9, 2.6)
Child characteristics				
Male	50.4	51.5	52.4	54.0
Age in months	12.0 (6–18)	12.1 (6–18)	12.1 (6–18)	12.3 (6–18)
*Breastfeeding**				
Never breastfed	0.7	1.0	1.7	2.6
Stopped breastfeeding	11.7	12.8	6.4	10.0
Currently breastfed	87.6	86.2	91.9	87.4
Maternal characteristics				
*Age in years**				
<24	43.1	38.3	31.6	60.1
25–29	24.9	30.5	33.5	28.6
30–34	16.7	19.0	18.4	7.6
35+	15.3	12.2	16.5	3.7
*Education level**				
No education	7.9	26.9	58.9	60.8
Primary	3.4	38.7	23.0	10.7
Secondary/middle school	39.1	28.5	17.3	11.6
High school/further education	15.7	5.9	4.8	16.9
*Marital status**				
Permanent partner	85.5	97.6	86.1	99.4
Divorced/widowed/single	14.5	2.4	13.9	0.6
Household characteristics				
*Poverty group**				
Poorest	26.6	22.2	70.2	39.2
Very poor	31.6	37.7	5.1	36.4
Less poor	28.0	30.4	4.7	20.7
Non-poor	13.8	9.6	0.0	3.7
*# adults**				
1 or 2	57.2	61.1	68.4	43.1
3 or 4	27.6	23.1	25.8	32.0
5+	15.2	15.8	5.8	24.9
*# school aged children**				
0	37.5	53.8	26.2	57.4
1	28.6	30.1	24.5	25.0
2+	35.9	16.1	49.3	17.6
*# children under 5**				
1	62.3	76.1	54.6	80.5
2+	37.7	23.9	45.4	19.5
Contextual characteristics				
*Location**				
Urban	66.0	19.9	36.2	25.2
Rural	34.0	80.1	63.8	74.8

*Significant difference ($p<0.05$) between the four countries in the distribution of sample characteristics.

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 $p<0.0016$ reduces the chance of any given significant finding being due to chance to an acceptable level of 5%. All analyses were performed using Stata 9.0. Linear robust standard error models were fitted using the xtreg commands.

Results

The nutritional status of the 1-year-olds is poor with all countries having an average *z*-score for both height-for-age and weight-for-age below the mean (Table 1). Nutritional indicators are particularly poor in Ethiopia and Andhra Pradesh. Practically all of the babies have been breastfed, with nine in ten still being breastfed. Andhra Pradesh has a much higher proportion of mothers under 24 years, and along with Ethiopia has the highest proportion of mothers with no education (60%). Ethiopia also has the highest proportion of households living in extreme poverty, over two thirds compared to around one third in the other countries, and also is the only country where no households in the sample are classified as non-poor. Peru is the most urbanised of the four countries, has the highest levels of maternal education, and the lowest levels of households living in extreme poverty.

Objective 1: description of social capital

Table 2 describes the pattern of maternal social capital within each country. Levels of nearly every social capital variable differ significantly between the four countries, highlighting the culturally specific nature of social capital.

Ethiopia has much higher levels of group membership than any other country, nearly three times higher than in Andhra Pradesh and Vietnam, and four times higher than in Peru. 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 over a third and one half of mothers members of each type respectively, compared to less than 1% in Andhra Pradesh and Vietnam. Membership of women's groups is the most common type of membership across all four countries, though again levels of participation vary between countries. 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.

With the exception of Vietnam, around a third of mothers receive no economic, instrumental or emotional support from other individuals. The sources of support are strikingly similar with family, followed by neighbours and then friends being the most common source of support in all countries. 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.

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 twice the level of participation in Peru, possibly because of the formal system of community leaders in many parts of Peru who take much of the responsibility for citizenship activities away from individual residents (De Silva et al., 2005a). 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 community to access community leaders directly.

Levels of cognitive social capital are much lower in Peru than in the other 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 generalised trust in Peru are particularly low compared to other countries; despite this, 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

Table 2
Description of individual social capital by country

	%			
	Peru 1678	Vietnam 1962	Ethiopia 1756	AP 1846
Membership of community groups				
Work related/trade union*	0.2	7.1	3.4	2.4
Community group*	2.8	5.0	12.8	2.6
Women's group*	8.1	16.5	19.2	24.3
Political group	1.6	0.9	1.9	2.0
Religious group*	5.8	0.7	39.5	0.6
Funeral/credit group*	0.3	5.9	7.5	0.0
Sports/social group*	1.4	0.3	57.5	0.0
None*	83.3	74.1	23.3	70.9
Member of 1 group	14.0	18.0	35.3	26.5
Member of 2 or more groups	2.7	7.9	41.4	2.6
Support from individuals				
Family*	62.3	94.5	46.7	70.4
Neighbours*	17.8	77.3	34.3	48.0
Friends*	17.3	70.4	26.0	15.5
Community leaders*	2.0	15.3	12.5	3.4
Religious leaders*	8.1	1.2	27.3	0.4
Political leaders*	0.8	0.1	2.0	1.3
Government officials*	5.2	4.4	10.0	3.9
NGOs charities	6.0	6.2	3.3	2.7
No support from individuals*	32.3	3.7	37.4	23.0
Support from 1 individual	35.0	11.6	21.9	28.2
Support from 2 or more individuals	32.7	84.7	40.7	48.8
Citizenship activities				
Joined together to address a common problem*	14.1	29.1	41.5	30.0
Talked to authorities about community problem*	10.3	3.7	25.6	17.1
No involvement in citizenship*	81.7	70.1	55.3	69.7
Talked or joined	12.2	27.0	22.4	13.7
Talked and joined	6.1	2.9	22.3	16.6
Cognitive social capital				
The majority of people can be trusted*	36.5	83.7	86.4	95.7
The majority of people get along*	69.8	91.8	91.2	95.5
Really feel part of the community*	84.3	98.3	92.2	97.0
Most people would take advantage given the chance*	40.1	9.2	24.2	41.9
High cognitive social capital*	54.8	90.8	88.9	95.1

*Significant difference ($p<0.05$), assessed using a chi-square test, in the distribution of social capital between countries.

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.

We hypothesised that social capital is higher in rural areas where traditional social networks remain and where social reciprocity might still prevail. Urbanisation and concomitant anomie might sever social ties or require high levels of time and money to create social relations. This is largely borne out by our study which shows generally higher levels of social capital in rural compared to urban areas. There are also significant differences in levels of social capital between different wealth groups, with Ethiopia and Andhra Pradesh consistently showing the poorest to have higher levels of social capital, though this is not the case in Peru or Vietnam (results available from the authors on request).

In summary, while some common themes in the distribution of social capital are seen between-countries

(for example social capital is often higher in rural as opposed to urban areas, and among poorer respondents), these patterns do not hold for all dimensions of social capital in all settings. In particular, between-country differences are seen in the absolute levels of social capital, with comparatively high levels of structural social capital in Ethiopia, and low levels of cognitive social capital in Peru.

Objective 2: association between social capital and child nutrition

The results of the association between maternal social capital and child nutritional status are mixed. While cognitive social capital and support from individuals are consistently associated with higher *z*-scores, group membership shows no association, and involvement in citizenship activities is associated with lower *z*-scores in some settings (Tables 3 and 4). Both acute (weight-for-age) and chronic (height-for-age) indicators of nutritional status show similar patterns of association with maternal social capital.

Maternal group membership is not associated with either height or weight for age after adjusting for other aspects of social capital and confounding variables in any of the four countries (Tables 3 and 4). Contrary to our hypothesis, children whose mothers are involved in some citizenship activities have lower height-for-age *z*-scores in Andhra Pradesh (B −.25, 95% CI −.43, −.07), and lower weight-for-age *z*-scores in Ethiopia (B −.17, 95% CI −.33, −.01), than children of mothers who are not involved in any citizenship activities. Both of these associations only emerge after adjustment, and are not replicated in the other countries.

More consistent patterns are seen between support from individuals and cognitive social capital. In line with our hypothesis, in all countries apart from Andhra Pradesh, receiving support from one or more individuals is associated with increased height-for-age *z*-scores (Table 3), and in Vietnam it is also associated with increased weight-for-age *z*-scores (Table 4). Similarly, high compared to medium or low levels of maternal cognitive social capital are associated with increased height-for-age and weight-for-age *z*-scores in Vietnam and India, and increased weight-for-age *z*-scores in Andhra Pradesh. No association between maternal cognitive social capital and child nutritional status is evident in Peru.

Objective 3: interactions between social capital and poverty

Of the 32 interactions tested between each aspect of social capital and household poverty group, two were significant at the $p<0.0016$ level. In Andhra Pradesh cognitive social capital interacts with poverty group in the prediction of height-for-age (Fig. 3). While high compared to low maternal cognitive social capital is associated with increased height-for-age *z*-scores in the poorest, poor and less poor households, the impact that high cognitive social capital has upon the height-for-age of children living in non-poor households is much less pronounced, illustrated by the converging of lines in Fig. 1. In effect, the impact of household poverty on child height-for-age is much less pronounced among those children whose mother has high levels of cognitive social capital.

In Vietnam, support from individuals and household poverty group interact in the prediction of weight-for-age (Fig. 4). While support from one individual is associated with increased weight-for-age *z*-scores among all children, the association is more pronounced among children living in non-poor households. Interestingly, support from two or more individuals is associated with a slight reduction in weight-for-age *z*-scores among all children apart from those living in non-poor households.

Discussion

The concept of social capital remains contested by researchers and practitioners. Although there are an increasing number of studies that indicate that high levels of social capital are independently associated with a variety of positive outcomes, to our knowledge there are no previous studies that explore differences in levels of social capital or examine whether maternal social capital is associated with child nutrition across different developing country contexts.

Methodological limitations

There are a number of limitations to the approach used in this paper, not least the problems with reverse causality presented by the analysis of cross-sectional data.

Due to the large number of social capital variables and repeating the analyses across four countries and for two outcomes, a large number of associations were tested. It is possible that some of

Table 3
Association between maternal social capital and height for age

	Peru $n = 1659$		Vietnam $n = 1958$		Ethiopia $n = 1547$		Andhra Pradesh $n = 1793$	
	Crude	Adjusted [a]	Crude	Adjusted [a]	Crude	Adjusted [a]	Crude	Adjusted [a]
Structural social capital								
Member of community group								
No	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 group	*−**.17**	−.05	.06	−.01	−.15	−.09	.07	.06
	(−.32, −.01)	(−.20, .09)	(−.05, .18)	(−.12, .10)	(−.35, .06)	(−.30, .11)	(−.08, .21)	(−.09, .21)
2+ groups	−.10	−.12	.15	.04	−.04	−.08	.22	.19
	(−.37, .17)	(−.39, .15)	(−.01, .31)	(−.12, .19)	(−.26, .18)	(−.29, .13)	(−.14, .59)	(−.23, .61)
Involved in citizenship activities								
No	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Talked or joined	−.11	−.11	−.01	−.01	.02	.04	−.05	**−**.25**
	(−.27, .05)	(−.26, .04)	(−.11, .08)	(−.10, .08)	(−.18, .23)	(−.16, .24)	(−.25, .14)	(−.43, −.07)
Talked and joined	−.02	−.09	*.32	.25	.13	.21	.11	.07
	(−.24, .24)	(−.30, .12)	(.03, .60)	(−.03, .53)	(−.19, .35)	(.02, .41)	(−.07, .28)	(−.11, .24)
Support from individuals								
None	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 individual	.12	.10	*.25	*.25	.04	.11	−.10	.08
	(−.01, .25)	(−.03, .22)	(.00, .51)	(.00, .50)	(−.19, .27)	(−.10, .31)	(−.30, .08)	(−.09, .24)
2+ individuals	*.14	**.17	*.27	.17	.17	**.26	−.12	−.05
	(.01, .28)	(.05, .30)	(.04, .50)	(−.05, .40)	(−.06, .40)	(.07, .44)	(−.29, .05)	(−.20, .10)
Cognitive social capital								
Low/medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High	0.01	−.03	*.15	*.14	.20	*.27	.15	.21
	(−.1, .11)	(−.13, 0.7)	(.01, .28)	(.00, .27)	(−.06, .45)	(.02, .52)	(−.14, .45)	(−.08, .49)

[a]Model adjusted for: *Child's characteristics*: age in months, sex, breastfeeding practice. *Maternal characteristics*: education level, # occupational activities, self-assessment of socio-economic status. *Household characteristics*: poverty group, # school-aged children in hh, # infants in hh.

*$p < 0.05$.

**$p < 0.01$.

the findings are due to chance. In particular the results of the interaction analysis should be viewed as exploratory. Nevertheless, Bonferroni corrections were applied to the significance levels of these tests, and in the discussion of results more weight is given to those results replicated across different settings.

The measure of social capital was necessarily short. However, the principles of: separating structural from cognitive social capital; avoiding measuring non-social capital items; validating the measure; and having a reference point of what community is being discussed, were adhered to.

It is possible that some of the differences in levels of social capital between countries are due to differences in the interpretation of the social capital questions by respondents. For instance, the high levels of membership of sports and social groups in Ethiopia (compared to very low levels in India and Vietnam), may be partly due to respondents in each country interpreting this type of group to include different groups. The validation of these questions in Peru and Vietnam did highlight some differences in interpretation between countries for some questions, in particular, the types of group each category comprised (De Silva et al., 2005b). While this is a problem for comparing and contrasting levels of social capital between countries, the analysis of social capital and child nutrition was country-specific, and avoided fine distinctions between types of social capital that may be more affected by local differences in interpretation. For example, the analysis explored absolute levels of group membership rather than membership of specific group types.

Discussion of results

The measure of social capital was sufficiently sensitive to highlight significant differences in social

Table 4
Association between maternal social capital and weight for age

	Peru $n = 1644$		Vietnam $n = 1957$		Ethiopia $n = 1542$		Andhra Pradesh $n = 1759$	
	Crude	Adjusted [a]	Crude	Adjusted [a]	Crude	Adjusted [a]	Crude	Adjusted [a]
Structural social capital								
Member of community group								
No	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 group	−.09	.01	.01	−.06	−.05	−.02	.06	.05
	(−.25, .08)	(−.15, .17)	(−.11, .12)	(−.16, 0.5)	(−.22, .13)	(−.19, .15)	(−.05, .17)	(−.06, .15)
2+ groups	−.25	−.34	***.19**	.08	.04	.12	.04	−.15
	(−.55, .06)	(−.71, .02)	(.01, .37)	(−.09, .25)	(−.15, .22)	(−.06, .30)	(−.21, .29)	(−.28, .25)
Involved in citizenship activities								
No	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Talked or joined	−.01	−.01	−.02	.03	−.09	***−.17**	−.02	−.05
	(−.17, .17)	(−.17, .16)	(−.12, .08)	(−.06, .13)	(−.25, 0.7)	(−3.3, −.01)	(−.17, .12)	(−.18, .08)
Talked and joined	−.01	−.05	.26	.21	.06	.07	0.02	−.07
	(−.25, .23)	(−.29, .18)	(−.4, .55)	(−.06, .48)	(−.12, .23)	(−.08, .23)	(−.11, .14)	(−.19, .06)
Support from individuals								
None	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 individual	0.05	.04	****.33**	***.25**	.07	−.12	−.04	.02
	(−.09, 0.18)	(−.09, .17)	(.10, .57)	(.02, .48)	(−.26, .12)	(−.29, .05)	(−.18, .10)	(−.10, .15)
2+ individuals	.03	.06	****.32**	.16	.03	−.05	−.04	−.01
	(−.12, .17)	(−.07, .19)	(.11, .52)	(−.05, .37)	(−.15, .21)	(−.21, .10)	(−.17, .10)	(−.12, .11)
Cognitive social capital								
Low/medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High	−.01	−.06	***.15**	***.13**	***.24**	***.24**	.13	***0.19**
	(−.12, .11)	(−1.7, 0.5)	(.01, .29)	(0.00, .27)	(.03, .45)	(.04, .43)	(−.08, .34)	(.00, .39)

[a]Model adjusted for: *Child's characteristics*: age in months, sex, breastfeeding practice. *Maternal characteristics*: age, member of majority ethnic group, religion, education level, marital status, self-assessment of socio-economic status. *Household characteristics*: poverty group, # adults in the hh, # school-aged children in hh, # infants in hh. *Contextual characteristics*: rural/urban.

*$p < 0.05$.

**$p < 0.01$.

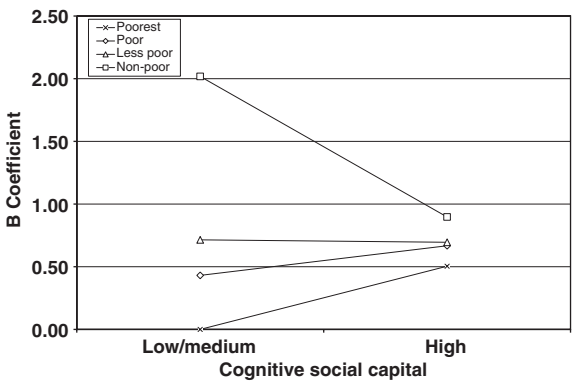


Fig. 3. Interaction between cognitive social capital and household poverty group in the prediction of height for age in Andhra Pradesh.

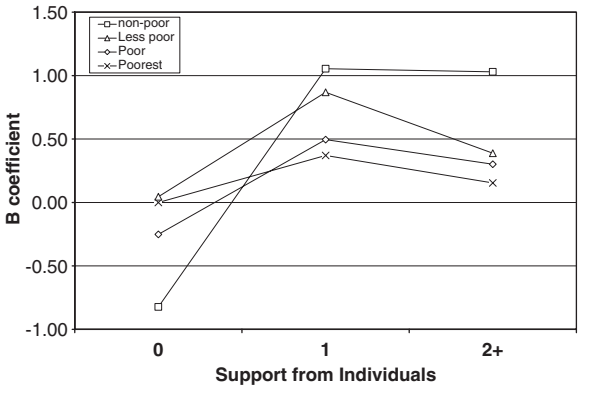


Fig. 4. Interaction between support from individuals and household poverty group in the prediction of weight for age in Vietnam.

dynamics between the four countries. For example, the importance of formal traditional community institutions in Ethiopia and the high levels of support that may flow from them stand in contrast to Vietnam, where, although formal commune institutions were expected to feature highly, there was surprisingly low membership. In addition to these differences, some similarities emerge. For example, the importance of support from friends, family and neighbours, and the lower levels of social capital in urban compared to rural areas.

As with differences in the distribution of social capital between and within countries, different patterns of association are seen between the same indicators of social capital and child nutritional status. While few associations were found between structural measures of social capital (group membership and citizenship), support from individuals and cognitive social capital displayed fairly consistent associations with child nutritional status across countries.

The lack of association with group membership is somewhat surprising given the emphasis on this indicator of social capital in the literature. Maternal membership of groups has been posited as a mechanism for knowledge transfer enabling mothers to learn best practice for the care of their child, and indeed studies have been conducted to explore whether membership of groups can improve maternal well-being (Manandhar et al., 2004). In this study it is possible that effects of group membership on child nutrition are subsumed within the other indicators of social capital included in the analysis, in particular, cognitive social capital. For example, if group membership leads to increased trust as some have argued (Coleman, 1990; Putnam, 2001), then including trust in the analysis will mitigate the effects of group membership. However, the lack of crude associations between group membership and child nutritional status in this analysis suggests that other aspects of maternal social capital are more important for child nutrition. This finding is backed up by other research from the YL project which found that cognitive social capital and support from individuals was much more consistently associated with aspects of child physical and mental health in Vietnam (Harpham et al., in press).

Of particular interest are the findings, contrary to our hypothesis, that maternal involvement in citizenship is associated with poorer child nutritional status in Ethiopia and Vietnam. Caution has to be exerted when interpreting these results from cross-sectional data, and in order to fully understand the underlying mechanisms of this finding, further research will need to be undertaken. Is the mother participating because her child is not growing properly, or is the child suffering because of the burden of activities of the mother? Analysis of future longitudinal data combined with qualitative studies may be able to address this question.

Some reasons for our findings can be hypothesised however. Hypotheses about additional stressors caused by community participation, added to a burden of productive and reproductive roles, could be explored in longitudinal analyses. In light of these findings, further exploration is needed of the particular contexts in which structural social capital may be damaging. Other analyses of the YL data have shown maternal membership of groups in India and involvement in citizenship in Ethiopia to be associated with increased odds of maternal common mental disorders in Peru (De Silva, 2005). Mitchell and La Gory (2002) also found a negative impact of group participation on adult mental health in an impoverished community in the USA, and concluded that the additional burden of participating in a group on an individual who was already struggling to cope was detrimental to their mental health. Such a scenario is plausible among the poor-biased YL sample.

More consistent associations were seen for cognitive as opposed to structural social capital. This accords with the patterns of social capital between countries, with greater differences seen between settings in indicators of structural social capital (i.e. which groups are important) than in levels of cognitive social capital, which, with the exception of Peru, were remarkably similar. 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 are associated with different child outcomes, it is also likely that the type and nature of different groups in different countries have differing effects. 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 child nutritional status in all YL countries apart from Peru.

It is possible that the lack of association seen between cognitive social capital and child nutrition in Peru are due to the low levels of cognitive social capital seen in this setting compared to the other YL countries, as mothers with low cognitive social capital may not be at such a relative disadvantage in a setting where correspondingly low levels are common.

The exploratory analyses of interactions between social capital and poverty point to potentially important differences in the effect of social capital between sub-groups: a finding which deserve further exploration in future studies. These concord with a growing number of studies which also suggest that social capital may have different effects in different sub-groups. In particular, the effect of individual social capital on adult nutritional risk in the USA varies by gender and ethnic group (Locher et al., 2005), while the negative impact of household economic shocks on the height-for-age *z*-scores of South African children was buffered by living in a community with high social capital (Carter and Maluccio, 2003).

In line with these results, this analysis indicates that high levels of cognitive social capital may partly mitigate the effects of poverty on child height-for-age in Andhra Pradesh, and that support from individuals is more beneficial for child weight-for-age among non-poor people in Vietnam. We hypothesise that this may be because non-poor people are more likely to receive support from similar people (i.e. non-poor), and that this support may be more effective at improving child nutrition than the support received from poor people. 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.

The positive findings for cognitive social capital suggest that country-specific ways of protecting and strengthening maternal cognitive social capital need to be explored. The broad areas identified for public policy to strengthen social capital tend to focus on structural social capital (i.e. increasing participation in community groups). It is more difficult to identify direct ways of 'intervening' on cognitive social capital, as it is harder to change norms and values. Indeed, it is often argued that one follows the other: people's feelings about the community depend on activities within the community. In terms of policy for strengthening cognitive social capital, it may be more fruitful to consider intervening more 'upstream' i.e. at the level of determinants of cognitive social capital, for example by focussing on reasons for social exclusion.

Future research needs to

1. Repeat analyses of the association between social capital and child nutritional status using longitudinal data to tease out causal associations and pathways.
2. Explore issues surrounding citizenship involvement in more detail using qualitative methods. For example what types of activities contribute to better child well-being, and which may be damaging and why.
3. Explore in more detail the effect of social capital in different poverty groups.
4. Explore different types of social capital currently not measured by YL, for example the social capital of caregivers' partners, children's social capital and community (ecological) social capital all of which may display different associations with child nutrition.
5. Lastly if we do over time find more positive statistical associations between social capital and child nutrition, we may also want to link the ebbs and flows in social capital levels over time with larger social processes such as regional or national conflict, economic crises, migration and urbanisation processes.

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Appendix A. SASCAT tool

Fieldworker: Now I am going to ask you some questions about your community (refer to administrative boundaries).

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

Group type	Member? 1 = yes 2 = no	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?
Work related/ trade union		
Community association/co-op		
Women's group		
Political group		
Religious group		
Credit/funeral group		
Sports/social group		
Others: specify		

2. 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?

	Support code 1 = yes 2 = no
Family	
Neighbours	
Friends who are not neighbours	
Community leaders	
Religious leader	
Politicians	
Government officials/civil service	
Charitable organisations/NGO	
Other: specify	

3. In the last 12 months, have you joined together with other community members to address a problem or common issue?

4. In the last 12 months, have you talked with a local authority or governmental organisation about problems in this community?

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

6. Do the majority of people in this community generally get along with each other?

7. Do you feel as though you are really a part of this community?

8. Do you think that the majority of people in this community would try to take advantage of you if they got the chance?

References

Anderson, A., Damio, G., et al., 2004. Social capital, acculturation, and breastfeeding initiation among Puerto Rica women in the United States. Journal of Human Lactation 20 (1), 39–45.

Brown, D.R., Gary, L.E., et al., 1992. Patterns of social affiliation as predictors of depressive symptoms among urban blacks. Journal of Health and Social Behaviour 33, 242–253.

Carroll, T.F., 2001. Social capital, local capacity building and poverty reduction. Social Development Papers No. 3, Office of Environmental and Social Development, Asian Development Bank.

Carter, M.R., Maluccio, J.A., 2003. Social capital and coping with economic shocks: an analysis of stunting of South African children. World Development 31 (7), 1147–1163.

Cattell, V., 2001. Poor people, poor places, and poor health: the mediating role of social networks and social capital. Social Science & Medicine 52 (10), 1501–1516.

Caughy, M.O., O'Campo, P.J., et al., 2003. When being alone might be better: neighborhood poverty, social capital, and child mental health. Social Science & Medicine 57 (2), 227–237.

Coleman, J.S., 1990. Foundations of Social Theory. Harvard University Press, Cambridge.

Cutrona, C.E., Russell, D.W., et al., 2000. Direct and moderating effects of community context on the psychological well-being of African American women. Journal of Personality and Social Psychology 79 (6), 1088–1101.

Dasgupta, P., Serageldin, I., 2000. Social Capital: A Multifaceted Perspective. World Bank, Washington, DC.

De Silva, M.J., 2005. Context and composition? Social capital and maternal mental health in low income countries. In: Epidemiology and Population Health. London School of Hygiene and Tropical Medicine, London.

De Silva, M.J., Harpham, T., et al., 2005a. Understanding sources and types of social capital in Peru. Community Development Journal, Advanced Electronic Access.

De Silva, M.J., Harpham, T., et al., 2005b. Psychometric and cognitive validation of a social capital measurement tool in Peru and Vietnam. Social Science & Medicine 62, 941–953.

De Silva, M.J., McKenzie, K., et al., 2005c. Social capital and mental illness: a systematic review. Journal of Epidemiology and Community Health 59 (8), 619–627.

De Silva, M.J., 2006. The methods minefield: a systematic review of the methods used in studies of social capital and mental health. In: McKenzie, K., Harpham, T. (Eds.), Social Capital and Mental Health. Jessica Kingsley Publishers, London.

Drukker, M., Gunther, N., et al., 2003. Social capital and mental health v. objective measures of health in The Netherlands. British Journal of Psychiatry 183, 174.

Godoy, R., Reyes-Garcia, V., et al., 2005. Human capital, wealth and nutrition in the Bolivia Amazon. Economics and Human Biology 3, 139–162.

Grootaert, C., van Bastelaer, T., 2001. Understanding and Measuring Social Capital: A Synthesis of Findings and Recommendations from the Social Capital Initiative. World Bank, Washington, DC.

Hamill, P., Drizid, T., et al., 1977. NCHS growth curves for children birth-18 years. Vital and Health Statistics Series 11, Hyattsville, MD

Harpham, T., De Silva, M., Tuan, T., in press. Maternal Social Capital and Child Health in Vietnam, Journal of Epidemology and Community Health.

Harpham, T., Grant, E., et al., 2004. Mental health and social capital in Cali, Colombia. Social Science & Medicine 58 (11), 2267–2277.

Harpham, T., Grant, E., et al., 2002. Measuring social capital within health surveys: key issues. Health Policy and Planning 17 (1), 106–111.

Harpham, T., Huttly, S.R., et al., 2005. Maternal mental health and infant nutrition in four developing countries. Journal of Epidemiology and Community Health 59, 1060–1064.

Harris, J., 2002. Depoliticizing Development: The World Bank and Social Capital. Anthem Press, London.

Katz, M.H., 1999. Multivariable Analysis: A Practical Guide for Clinicians. Cambridge University Press, Cambridge.

Kawachi, I., Berkman, L.F., 2001. Social ties and mental health. Journal of Urban Health 78 (3), 458–467.

Locher, J., Ritchie, C., et al., 2005. Social isolation, support, capital and nutritional risk in and older sample: ethnic and gender differences. Social Science & Medicine 60 (4), 747–761.

Lochner, K., Kawachi, I., et al., 1999. Social capital: a guide to its measurement. Health and Place 5 (4), 259–270.

Manandhar, D., Osrin, D., et al., 2004. Effect of a participatory intervention with women's groups on birth outcomes in Nepal: cluster-randomised controlled trial. Lancet 364, 970–979.

Martin, K.S., Rogers, B.L., et al., 2004. Social capital is associated with decreased risk of hunger. Social Science & Medicine 58 (12), 2645–2654.

McKenzie, K., Whitley, R., et al., 2002. Social capital and mental health. British Journal of Psychiatry 181 (4), 280–283.

Mitchell, C., La Gory, M., 2002. Social capital and mental distress in an impoverished community. City and Community 1 (2), 199–222.

Molyneux, M., 2002. Gender and the silences of social capital: lessons from Latin America. Development and Change 33 (2), 167–188.

Patel, V., Rahman, A., et al., 2004. Effect of maternal mental health on infant growth in low income countries: new evidence from South Asia. British Medical Journal 328, 820–823.

Pollack, C.E., von dem Kneseback, O., 2004. Social capital and health among the aged: comparisons between the United States and Germany. Health and Place 10, 383–391.

Putnam, R., 1993. Making Democracy Work: Civic Traditions in Modern Italy. Princeton University Press, Princeton, NJ.

Putnam, R., 2001. Social capital measurement and consequences. Canadian Journal of Policy Research (Isuma) 2 (1), 41–51.

Robison, L.J., Siles, M.E., et al., 2001. Social capital and poverty reduction: towards a mature paradigm. In: Social Capital and Poverty Reduction in Latin America and the Caribbean: Towards a new Paradigm. Santiago, Chile.

Thomas, E., 2003. Social Capital and Women's Health in Sub Saharan Africa. South Bank University, University of London, London.

Tuan, T., Harpham, T., et al., 2005. Measuring Social Capital and Mental Health in Vietnam: A Validity Study. Young Lives, London.

Van der Linden, J., Drukker, M., et al., 2003. Children's mental health service use, neighbourhood socio-economic deprivation, and social capital. Social Psychiatry and Psychiatric Epidemiology 38 (9), 507–514.

Waterlow, J., Buzina, R., et al., 1977. The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of 10 years. Bulletin WHO 55, 489–498.

WHO, 1994. A User's Guide to the Self-Reporting Questionnaire (SRQ). World Health Organisation, Geneva.

Wilson, I., Huttly, S.R., 2004. Young Lives: a case study of sample design for longitudinal research. Young Lives working paper 10.

Young, A.F., Russell, A., et al., 2004. The sense of belonging to a neighbourhood: can it be measured and is it related to health and well being on older women? Social Science & Medicine 59, 2627–2637.