The University of Manchester
Brooks World Poverty Institute

MANCHESTER 1824

Child health and mothers' social capital in Indonesia through crisis

Sujarwoto[1*]

Gindo Tampubolon[2]

[1] **University of Manchester, UK**

* Corresponding author

sujarwoto.sujarwoto@postgrad.manchester.ac.uk

[2] **University of Manchester, UK**

tampubolon@manchester.ac.uk

May 2011

BWPI Working Paper 149

Creating and sharing knowledge to help end poverty

www.manchester.ac.uk/bwpi

Abstract

Social capital has been shown to be positively associated with a range of health outcomes, yet few studies have explored the association between mothers' social capital and child health. We examine the relationship between mothers' access to social capital via participations in community activities and their children's health. Instrumental variable estimator is used to deal with reverse causality. Data come from the Indonesian Family Life Surveys (IFLS) of 1997, 2000, and 2007. We find strong evidence for the association between mother's social capital and child health before and after the Asian financial crisis. In contrast, there is no relation between mother's social capital and child health during the crisis. The results suggest that the link between mother's social capital and child health is severely ruptured during the period of the crisis, possibly by reducing the number of available community activities and the ability of mothers to participate in such activities.

Sujarwoto is a PhD student at the Institute for Social Change, The University of Manchester, UK.

Gindo Tampubolon is a research fellow at the Institute for Social Change, The University of Manchester, UK.

1. Introduction

Human capital is fundamental for economic development and welfare. Human capital in the form of health is particularly important for developing countries (Bhargava et al. 2001; Behrman 1996; Deaton 2003). Bhargava et al. (2001: 15) suggest that the effect of health on economic growth is larger in developing countries than in developed countries. Health is also recognised to be associated with productivity (Strauss 1986; Deolalikar 1988), education achievement (Behrman 1996; McKenzie et al. 1999), wages (Thomas and Strauss 1997), and income (Preston 1975). There is a vast literature which examines health formation, including through education (Ross and Wu 1995; Berger and Leigh 1989; Arendt 2005), consumption (Behrman 1990), and institutions (Gupta and Jones 2010). The most recent contention in the literature is the importance of social capital in improving health. Works on public health and epidemiology find that social capital largely improves individual health and wellbeing (Subramanian et al. 2002; Viswanath et al. 1996; Farquhar et al. 2005).

Two gaps exist within the literature on social capital and health. First, the majority of the literature focuses on adult health in developed countries (for reviews, see Kawachi et al. 1997, Kawachi and Berkman 2000; Macinko and Starfield 2001; Almedom 2005). But, given that the effect of social capital is hypothesised to vary by sub-groups and contexts (Cutrona and Russell 2000; Grootaert and Van Bastelaer 2002; Lochner et al. 2005; De Silva and Harpham 2007), it is important to study the effect of social capital on child health in developing countries. By focusing on child health in a developing country, we provide a contrast with the far more extensive work on social capital and adult health that draws on data from developed countries, mainly the United States and Western Europe. Indonesia is particularly suitable for this study, not only because of the crisis that hit the country in 1998, but also because many regions of the country boast a long-standing indigenous tradition of community involvement or social capital (Grootaert 1999; Beard 2005, 2007; Miller et al. 2006). Relatively little research, however, has examined the implications of this tradition on social capital and child health.

Second, several empirical studies examining the relationship between mothers' social capital and children's health do not take into account the reverse causality issue which compromises the relationship (see for example Macinko and Starfield 2001; Tuan et al. 2006; De Silva and Harpham 2007; Surkan et al., 2007). The characteristics that promote mothers' social capital are likely to be influenced by their children's health. For example, it is possible that sick children prevent mothers to participate in community activities, hence to reduced social capital (Tuan et al. 2006). Failure to take them into account will lead to a biased estimate of the relationship between mothers' social capital and children's health. In this paper, we use instrumental variable estimator to rule out the reverse causality between mothers' social capital and children's health. Previous studies demonstrate that, with suitable instruments, this estimator performed better compared with ordinary least squares and propensity score matching techniques (Heckman 1997; Stukel et al. 2007; Lindenauer et al. 2010).

Our results show that mother's social capital significantly affects child health. This effect is shown before the crisis and after the crisis. However, mother's social capital does not affect child health during the crisis. We find the estimated coefficient of mothers' social capital during the crisis is small and insignificant. Findings from instrumental variable estimator provide strong evidence for the causal flow running from mothers' social capital to child health. All instruments are highly correlated with mother's social capital but uncorrelated with child health. Tests of instruments' strength and relevance reveal the usefulness of the instruments in identifying the effects of mothers' social capital.

The rest of the paper is organised as follows. The next section briefly explains the measures of social capital used in this study and reviews previous works relating social capital and child health. Then, we provide a brief illustration about the Indonesian contexts. This is followed by a description of the data and the results of instrumental variable estimation. Discussion and conclusion close the paper.

2. Social capital and health outcomes

Social capital is a crystallisation of the ideas that have been around since researchers began to examine systematically the relationships between society and individual health. Literature on social capital often presents this concept as the properties of individuals and communities. Portes (1998), for instance, believes that social capital is a property of individuals. He defines social capital as 'the capacity of individuals to command scarce resources by virtue of their membership in networks or broader social structures' (p.12). In contrast, Putnam (1995) conceived of social capital as a community-level resource and a distinctly social feature that is reflected in the structure of social relationships. He defines social capital as:'features of social organisation such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit' (p. 67). For the purpose of our study, we conceive social capital as a community-level resource accessed by individuals, specifically mothers. Child health is affected by mothers' access to networks via their participation in community activities. In these networks, information about health, among others, circulate. Mothers' access to networks may differentially depend on the extent to which they participate in community activities and the availability of such networks.

The theoretical link between social capital and health is supported by studies in the field of social epidemiology, which conclude that social connections are of key importance to health (Seeman 1996; Lindau et al. 2003; Kunitz 2004; Helliwell 2003; Subramanian et al. 2002; Kawachi et al. 1997; Kennedy et al. 1998; Yip et al. 2007). This body of research documents the association between the presence of individual networks and mortality (Seeman 1996), the ability to rebound after illness (Lindau et al. 2003), and mental health status (Kunitz 2004). With the growing recognition of the importance of the social environment for health, researchers began to examine the effect of community social capital on health outcomes. They find that higher community social capital is associated with higher levels of general health and wellbeing (Helliwell 2003; Subramanian et al. 2002), lower cardiovascular and cancer mortality (Kawachi et al. 1997), lower suicide rates (Helliwell 2003), and lower violent crime rates (Kennedy et al. 1998). With a few notable exceptions (Yip et al. 2007), the vast majority of this work is set in developed countries.

4

Kawachi and Berkman (2000) describe mechanisms by which community social capital affects health. First, social capital provides channels for the distribution of knowledge and information related to health. Health promotion can be distributed more rapidly through social networks. Such channels are especially important in developing countries. Second, social capital can serve as a mechanism for maintaining healthy behaviour norms (e.g. regular physical exercise) and exerting social control over detrimental health behaviour (e.g. smoking and drinking). Third, social capital allows for the promotion of access to services and amenities. More cohesive neighbourhoods are better equipped to mobilise collective action to champion the development of and access to health-related services. Fourth, social capital serves as a conduit for psycho-social processes, including the development of social support and mutual respect. These norms of mutual respect can translate into easier child rearing, improved self-government, and the maintenance of a healthy social environment. In addition, the Marmot review (2010) notes that social capital also enables communities to be responsive to the national and local initiatives, including those from health organisations.

More specifically, the mechanisms linking mothers' social capital and their children's health are particularly channelled via improvement in mothers' knowledge that in turn affects mothers' parenting behaviour (De Silva and Harpham 2007; Anderson et al. 2004; Martin and Rogers 2004). De Silva and Harpham (2007: 324) suggest that social networks, through mothers' participation in them, enable mothers: 'to know more due to knowledge transfer (e.g. where to obtain additional cheap sources of food), to think differently due to attitude influences (e.g. attitudes towards hygiene practices), and to do things differently (e.g. breastfeed for longer)'. These mechanisms are illustrated by research from the United States, which shows that women with more social capital have increased odds of breastfeeding their child (Anderson and Damio 2004). Other research shows that both household and community-level social capital are associated with reduced odds of household hunger (Martin and Rogers. 2004). In a setting such as Indonesia, where most adult females have only primary education, social networks may provide mothers with information they have not obtained through schooling. This information ranges from the benefits of oral rehydration therapy to the location of preventive care providers.

Several empirical studies find evidence of the links between social capital and child health. Using data from the Project on Human Development in Chicago Neighborhoods, Morenoff (2003) finds that reciprocated exchange among community members and voluntary participation in local groups are positively associated with birth weight of children in the neighbourhoods. Carter and Maluccio (2003) use height-for-age data to measure family coping in South Africa. They find that the presence of community ties significantly boosts a household's ability to manage economic shocks to the extent that adequate nutrition can still be provided to children. Surkan and colleagues (2007) examine the correlates of children's growth in Brazil. They find that children of mothers who have more friends and family, who engage in leisure activities with others, and who have more affectionate support have higher weight-for-height scores than do children of mothers who have fewer social ties and less support. Using the Young Lives study data from Peru, Ethiopia, Vietnam and Andhra Pradesh, De Silva and Harpham (2007) show that individuals and cognitive social capital (e.g. trust, social harmony) are positively associated with child nutritional status in these countries. In Indonesia, Nobles and Frankenberg (2009) find that children from families with

relatively low levels of human and financial capital fare better with respect to health status when their mothers are more active participants in community programmes. They use Indonesian Family Life Survey (IFLS) wave 2 and 3 and measure mothers' social capital by the number of community programmes in which they participate.

Much of the previous research has produced interesting and informative results, but in only a few cases can one conclude that mothers' social capital causes better children's health. This is because the studies do not take into account the reverse causality, which may explain the relationship between mothers' social capital and children's health. Tuan et al. (2006) explore the association between mothers' social capital and children's physical and mental health in Vietnam. Though they find mothers' social capital to be positively associated with children's physical and mental health, they also realise that sick children may cause mothers to report lower levels of social capital. Using cross-countries data, De Silva and Harpham (2007) find mixed results on the relation between maternal social capital and child nutritional status in Peru, Ethiopia, Vietnam and Andhra Pradesh. They admit that the results can suffer from an endogeneity problem, since the analyses are unable to address reverse causality between maternal social capital and child nutritional status. Surkan et al. (2007) study the link between maternal social support and depression to child physical growth outcomes in Teresina, Northeast Brazil. While they account for random effect, they do not address reverse causality, which plausibly exists between maternal social support and child physical growth. Using IFLS waves 2 and 3, Nobles and Frankenberg (2009) examine causal relationship between mother's social capital and child health by exploiting the temporal ordering of longitudinal data. The causal factor precedes the effect by three years. However, this method may risk contamination, since it fails to capture factors affecting child health in the elapsed/intervening period. For instance, other detrimental or beneficial factors, such as natural hazards during the elapsed period, may have cancelled the positive or negative effect of mothers' social capital. Perhaps because of this, the end result is a conditional.

We use instrumental variable estimator to establish the direction of causal effect between mothers' social capital and child health. Instrumental variable estimator is increasingly gaining ground, even among biomedical researchers who study, among others, chronic obstructive pulmonary disease (Lindenauer et al. 2010), prostate cancer (Lu-Yao et al. 2008) and acute myocardial infarction (McClellan et al. 1994; Stukel et al. 2007). Pitted against the gold standard of randomised clinical trials, instrumental variable estimator performs creditably. For instance, Stukel et al. (2007: 278) report that instrumental variable estimator showed an effect of 16 percent reduction in mortality, whereas randomised clinical trials showed reduction of between eight percent and 21 percent. Ordinary least squares and propensity score matching techniques performed less well in comparison. Previous studies show that this method performs well in ruling out reverse causality from social capital to various variables such as welfare (Narayan and Pritchett 1999), poverty and welfare (Grootaert 1999), employment (Bayer et al. 2005), violent crime (Lederman et al. 2002), and health (d'Hombres 2010; Folland 2007; Tampubolon 2009). Because this approach in part reflects the aspects of the Indonesian setting, we turn to a discussion of contexts and then describe our data and methods.

6

3. The Indonesian contexts

The data used in this study reflect three different contexts of Indonesia's socio-economic development. First, a period before the crisis (1997), during which Indonesia has experienced formidable economic growth and socio-demographic changes. From 1965 to 1997, the annual gross domestic product increased at an average of over five percent a year, while the proportion of women aged 15 to 19 with no formal education fell from one-third to nearly zero. The poverty headcount rate declined from over 40 percent in 1976 to just under 18 percent by 1996. Demographic changes in the form of falling levels of both fertility and infant mortality have been equally substantial in this period. The total fertility rate declined from 5.6 in 1971 to 2.8 in 1997. Infant mortality decreased from 118 per thousand live births in 1970 to 46 in 1997 (Strauss et al. 2004).. The second context is a period during the crisis (2000). Indonesia was hit by the financial crisis in the mid-1997. Among Southeast Asian economies, Indonesia is the worst affected by the crisis. Its economy contracted by 13.6 percent in 1998, about double that of Malaysia and Thailand (Hill 1999). Indonesia's recovery is also among the slowest compared with other Southeast Asian countries (Stiglitz and Yusuf 2001; Wie 2003; Gill and Kharas 2007; Azis 2008). While Singapore, Thailand and Malaysia had recovered in 2000, this country was still in crisis in 2000. As the impact of the economic crisis intensified, many workers were laid off, particularly in the urban-based construction, manufacturing and modern services sectors. This was followed by a drop in capital investments and exports in 2000. From 1999 to 2002 the annual gross domestic product was slowly growing by two to four percent, while the number of people in poverty remained very large. The third context is a period after the crisis (2007). From 2004 to 2007, per capita income and poverty incidence had recovered to levels prevailing in the mid-1990s (Wie 2003; Hill and Shiraishi 2007). Macroeconomic stability had been achieved, with lower inflation and a stronger currency (rupiah). The annual gross domestic product has increased over five percent a year since 2006.

Many regions of Indonesia have been known for their indigenous tradition of community involvement or social capital (Geertz 1962: 244; Bowen 1986: 545-561; Putnam 1993: 168; Grootaert 1999; Beard 2005, 2007). This tradition is often recognised with a set of key Indonesian terms: *gotong royong* (Koentjaraningrat 1961; Bowen 1986), *arisan* or *binda* (Geertz 1962), *koperasi* (Bowen 1986), *rukun* and *musyawarah* (Bowen 1986), and *kerja bakti* (Beard 2005).[1] This tradition of community involvement plays an important role in the history of socio-economic development in the country. In many instances, it leads to grassroots organisation. The government subsequently adopts this tradition as part of its regional and national programmes. The programmes have always been cited by donor organisations as an example of community development success stories (Shiffman 2002). The goals of these programmes differ, but include improving health care, education, sanitation, security and village upkeep (Wibisana et al. 1999). Such programmes, involving active involvement of community members, are found right across the country.

Several empirical studies show the positive effect of the tradition of community involvement and activities on development outcomes in the country. Grootaert (1999: 22) investigates the various

---

[1] Bowen (1986: 545-561) for example describes *gotong royong* or mutual assistance and *rukun* or communal harmony as genuinely indigenous concepts of moral obligation, generalised reciprocity, and community solidarity which are usually established in rural Indonesian communities.

Indonesian community activities in detail in three Indonesian provinces (there were 27 provinces). He demonstrates that social capital as measured by six aspects of local associations has a significant effect on household welfare. Households with higher social capital have higher household expenditure per capita, more assets and better access to credit, and are more likely to have increased their savings in the past year. Using IFLS wave 1 and 2, Miller and colleagues (2006: 1088) explore the association of various types of community activities and adults' health in Indonesia. They find that an increase in community activities is associated with a decrease in poor physical health, as measured by difficulties in performing instrumental tasks, fatigue, and bodily pains. More recently, Nobles and Frankenberg (2009) show the extent of mothers' participation in volunteer community programmes is positively associated with children's health, as indicated by height-for-age, but only for children whose mothers have less education, and for children from poorer households.

Our study differs from previous empirical works, particularly from Nobles and Frankenberg's study, along several lines. Using two waves of IFLS, Nobles and Frankenberg measure child height-for-age in 2000 (IFLS wave 3) as a function of mothers' social capital and other covariates in 1997 (IFLS wave 2). They use this temporal ordering to address the effect of mother's social capital on child nutritional status as measured by child height-for-age. Instead of using this method, we examine the relationship between mothers' social capital and child health in each year of IFLS observation. This choice is based on our understanding about the contexts of the health sector in Indonesia as a developing country. The health sector in Indonesia is not as stable as in developed countries, which have better services as well as more educated populations and higher incomes. In Indonesia, child health status can change more drastically during an extended period, e.g. three years, due to lack of basic health services, poverty, and high incidence of infectious and parasitic diseases. Another reason is that various local natural hazards occurred from 1997 to 2000. These hazards may have a substantial health effect, including on children's health (Van Rooyen and Leaning 2005; Watson et al. 2007; Frankenberg et al. 2008). Hence using temporal ordering over an extended period risks capturing a lot of unobserved factors which affect child health during the elapsed period.

Another aspect which makes our work differ from Nobles and Frankenberg's study is that we measure social capital at both individual and community levels. Nobles and Frankenberg only account for mothers' social capital at the individual level, though they conceive of social capital as the property of communities rather than individuals. Literature on social capital often takes this concept both as an individual property and a collective property which is embedded in networks (Portes 1998; Lin 2002; Coleman 1988; Putnam 1993). In order to make our analysis commensurate with this theory, we measure social capital not only at the individual level, i.e. mothers' participation, but also at the community level, i.e. the number of available community activities.

4. Data and method

4.1. Indonesian Family Life Survey (IFLS)

The IFLS is an ongoing longitudinal survey that began in Indonesia in 1993. The survey sampling scheme stratifies on province and urban/rural areas, selecting a total of 321 enumerator areas from 13 provinces, which represent about 83 percent of Indonesia's population (Frankenberg and Karoly 1995; Frankenberg and Thomas 2000). Households, defined as a group of people who reside together and 'eat from the same cooking pot', were randomly selected from within the communities. Four waves have been fielded so far (1993, 1997, 2000 and 2007). Overall, the survey has successfully re-interviewed over 86.5-91.5 percent of households in the original sample (Frankenberg and Thomas 2000: 2; Strauss et al. 2004: 2; Thomas et al. 2010: 5). This low attrition is exceptional compared with surveys in other countries, including a longitudinal household economic survey in the United States (Thomas et al. 2001: 568-570).

We use data from the 1997, 2000 and 2007 waves, which provide information about respondents' participation in community activities. Unfortunately, the 1993 wave did not ask about participation in community activities.

In this analysis we apply a series of cross-sectional regressions instead of a panel regression because the time interval between the second and the fourth wave is almost ten years. During this long interval, most of the children who were measured in 1997 have entered puberty in 2007 (age above ten years). Literature on child growth and organ development shows a marked difference in growth curves of child height and weight before and during puberty (Cole and Green 1992 :1310-1311; Rogol et al. 2000: 523S; Buckler 1997: 150-151; Cole et al. 1998: 413-414; Bogin 1999: 58-67). Buckler (1997), for instance, explains that the median patterns of growth in weight and height of boys and girls are different before and during puberty. As he puts it in Buckler (1997: 150-151):

> The median patterns of growth in height and height velocity, weight and weight velocity, comparing boys and girls are similar before the onset of puberty. But during puberty girls are earlier by about two years in all aspects of puberty. As a result of the earlier growth spurt, girls are slightly taller than boys for a period of two years or so at an average age of 11.5-13.5 years, with maximum difference of 2.5 cm at 12.5 years. They are also heavier between average age of 11 and 14 years, with a maximum difference of 3.5 kg at age 13 years.

During puberty, factors which affect child height and weight are more complex. These factors are not only nutritional status, but also other factors, especially sex characteristics (Rogol et al. 2000: 523S; Cole 1998:6-7)[2]. Since this study is aimed at examining child nutritional status, using panel

---

[2] For instance, Rogol and colleagues explain puberty as 'a dynamic period of development marked by rapid changes in body size, shape, and composition, all of which are sexually dimorphic or the difference in morphology between boys and girls' (see page 523S).

regression ignoring this long period is inappropriate. Parameter constancy during childhood and during puberty is likely to be violated; such an assumption is necessary for estimation (Hendry and Richard 1982: 16; Hendry 1995)[3].

Following Nobles and Frankenberg's study, our sample is restricted to children who have complete information on height and weight, and mothers who have complete information on their social capital. This yields a sample of 4,467 children and 2,973 mothers in 1997, while in 2000 and 2007 we find 4,580 and 4,541 children with 3,226 and 3,407 mothers living in 307 communities. We assess the relationship between mothers' social capital and child health in all three years separately. As discussed in the previous section, the time span between 1997 and 2007 reflects the socio-economic condition before, during and after the crisis in Indonesia. Using three cross-sectional regressions we can examine whether the effect of a mother's social capital on her child's health is different in three contexts of socio-economic development in the country.

4.2 Instrumental variable estimator

We use instrumental variable estimator to rule out reverse causality between mothers' social capital and child health. In this study, reverse causality is a potential threat to inference: children's poor health status may cause mothers' social capital to be relatively low, rather than the reverse. Instrumental variable estimation rules out this reverse causation. This estimation uses the correlation between mothers' social capital and the instruments to estimate the effect of exogenous shift in mothers' social capital on child health. The instruments must be highly correlated with mothers' social capital but not correlated with child health. This eliminates the difficulty created by the potentially simultaneous determination of child health and mothers' social capital. With suitable instruments, the effect of social interaction facilitating mothers' social capital on child health can be estimated. We discuss our instruments further in the next section.

Instrumental variable estimator also mitigates bias which arises if unobserved mother's characteristics affect both her social capital and her child's health. For instance, some evidence suggests that people who participate in voluntary community programmes are advantaged with respect to otherwise unobserved socioeconomic status (Schady 2001: 12; Thoits and Hewitt 2001: 126). If we fail to control for these factors and they are also positively related to child health, as is almost certainly the case, regression results will bias the contribution of social capital. To address this issue, we identify factors related to mothers' social capital and control for these in the first stage regression. A number of individual, household and community predictors, including the instruments associated with mother's social capital, are included in the first stage regression.

---

[3] Hendry (1995: 31ff).....a parameter must remain constant across realizations of the stochastic process, but we will require that the parameters of an analysis are constant over time as well. This is a fundamental requirement for empirical modelling, and its implications need to be understood. Models which have no set of constancies will be useless for forecasting the future, analysing economic policy, or testing economic theories, since they lack entities on which to base those activities.

The last methodological issue which we address in this study is the potential bias if unobserved factors in the community are correlated with both mothers' social capital and child health. For example, some communities may have more effective local leaders who are likely to succeed in simultaneously promoting social capital and community health. If this were the case, a positive association between mothers' social capital and child health could simply reflect the effects of the unobserved factors, as opposed to the social capital generated through participation. We mitigate this bias by including community fixed effects in our estimation.

4.3 Instruments for mothers' social capital

We now discuss our instruments, including the presence of social and financial associations, the extent of dissemination of information, ethnic similarity and presence of kinship groups. These instruments are deemed to be strongly associated with mothers' social capital, but uncorrelated with child health. First, the presence of social and financial associations, such as saving and borrowing institutions, elicited not from the mothers but from independent informants. Social and financial associations that facilitate social interaction feature prominently in the day-to-day activities of Indonesians. These associations include neighbourhood associations, self-help groups, and saving and borrowing institutions. In Indonesia, self-help groups and saving and borrowing institutions are more than simple economic institutions. These institutions also function to strengthen the solidarity of the community (Grootaert 1999; Beard 2005)..Likewise, neighbourhood associations and self-help groups facilitate people within the neighbourhood to conduct such cooperation and joint activities. The function of neighbourhood associations and self-help groups in the daily life of Indonesians is important as media for meeting together and for strengthening solidarity among neighbourhoods' members, including mothers. Thus, we expect that mothers' participation/social capital is likely to increase in communities which have more of these kinds of social and financial institutions. The presence of social and financial associations, however, is not affected directly by child health, nor do they affect child health directly except through mothers' participation.

Second, we turn to dissemination of information about community activities. This is important, particularly in rural Indonesia, since women in those areas often lack access to information about community activities. Hence the presence of information dissemination activities will motivate women to engage, since the activities provide many socio-economic benefits which they need. For example, mothers who are informed about community women's association activities will be motivated to participate, since the activities often also provide grants for running micro businesses, as well as improving mothers' entrepreneurship skills. Likewise, mothers who are informed about cooperatives' activities will be motivated to become members, since these activities provide cheap financial credit for them. There is also no reason to assume that dissemination about the activities will directly affect children's health, except through mothers participating.

Third, we look at ethnic similarity and presence of kinship groups. We assume both variables are directly correlated with mothers' social capital. Indonesia consists of various ethnic groups with different languages and customs. People of the same ethnic groups may be more likely to interact in social settings, due to similarity of language or custom. These relationships can create bonding social capital which reinforces reciprocity and strengthens solidarity among them (Putnam 1995: 22-23).[4] The possibility for mothers to join and be active in community programmes may increase due to higher ethnic similarity and the presence of kinship groups. Hence, mothers living in communities that have higher ethnic similarity and more kinship groups are likely to participate more or have more social capital. We have no reason to assume that ethnic similarity and the presence of kinship groups have a direct effect on child health except through mothers' participation.

4.4 Measures

Table 1 (below) presents summary statistics for the key measures used in our analysis. We describe each of these measures in more detail in the following.

4.4.1 Child height-for-age and weight-for-age

The IFLS collected data on height and weight measures for all household members by trained nurses. Since height and weight vary systematically with age and gender, we standardise children's height and weight relative to sex- and age-specific height and weight medians of children in the United States. We follow previous studies which used this standardised method to measure child nutrition status in Indonesia (see, for example, Strauss et al. 2004 and Nobles and Frankenberg 2009). For each child, a z score is computed that expresses the child's height-for-age and weight-for-age as the number of standard deviations that the child is above or below the median for a child of that sex and age in the United States.[5] We compute both z scores for boys and girls in all three years. As most Indonesian children are shorter and less heavy than the American children, the median z score for Indonesian children is negative. The median z score for height is -1.25 to -0.87 for females and -1.37 to -0.94 for males, while the median z score for weight is -1.47 to -1.07 for females and -1.54 to -1.08 for males. The highest median both height and weight are recorded after the crisis, while the lowest scores are recorded during the crisis.

4.4.2 Mother's social capital

We measure mothers' social capital through their links in five key community activities: community meetings, cooperatives, voluntary labour, village improvement activities, and the village womens' association. These community activities are commonly found at urban and rural communities in Indonesia. The goals of these activities vary and include improving healthcare, education, sanitation, financial support and community upkeep. Thus higher mothers' social capital is related to more access to the resources that reside in network ties in those activities.

---

[4] In the context of the United States, Putnam (1995: 22-23) argues that bonding social capital can be created in ethnic fraternal organisations, whereas bridging social capital can be produced in youth services groups. According to Putnam, both bonding and bridging social capital could bring out positive social effects in many situations. Bonding social capital is useful for reinforcement of specific reciprocity and encouragement of solidarity. It is also useful for connection to outside resources and information distribution.
[5] For more detail on the LMS method of z-score calculation, see Kuczmarski and colleagues (2002).

Table 1: Summary statistics for key variables

	before crisis		during crisis		after crisis	
	Mean or %	sd	mean or %	sd	mean or %	sd
Mothers' social capital	0.58	0.89	0.45	0.80	0.50	0.84
Children's characteristics:						
Height-for-age *z* score						
Boys	-1.31	1.3	-1.20	1.3	-0.88	1.3
Girls	-1.21	1.3	-1.10	1.3	-0.81	1.4
Weight-for-age *z* score:						
Boys	-1.47	1.3	-1.38	1.3	-1.05	1.4
Girls	-1.41	1.27	-1.32	1.23	-1.04	1.3
Age	6.2	2.5	6.2	2.6	5.9	2.5
Boy	52%		51%		52%	
Birth weight (kg)	3.19	0.22	3.17	0.18	3.18	0.32
Mothers' characteristics:						
Height (in cm)	150	5	150	5	151	5
Age	33.5	6.7	33.6	6.9	33.1	6.8
Primary education or less	6.5	4.1	6.4	4.0	6.6	4.2
Poor health	18%		22%		10%	
Interact with grandmothers often	39%		39%		45%	
Household characteristics:						
Household size	6	2	6	2	5	2
Household below median expenditure	49%		54%		54%	
Community characteristics:						
Urban areas	42%		44%		47%	
Average expenditure (Rp)	111,553	463,227	118,455	386,589	127,203	359,811
Log population	8.40	1.35	8.58	0.92	8.68	0.90
Receive underdeveloped village fund	27%		25%		18%	
The number of available community activities	6	2	3	2	5	2
Instrumental variables:						
Dissemination information about community activities	2	1	2	1	3	1
The number of neighbourhood associations	9	8	9	8	9	13
The presence of rolling funds	26%					
The number of self-help groups			4	14		
The number of saving and borrowing institutions					1	1.4
The presence of kinship groups					8%	
Ethnic similarity					87%	
N children	4467		4580		4541	
N mothers	2973		3226		3407	
N communities	307		307		307	

The IFLS asks respondents whether they participated in these activities in the 12 months prior to the interview. Interviewers asked respondents the question: 'During the last 12 months did you participate in or use these activities?' A list of activities is presented to respondents. We create a continuous variable that takes on a value between zero and five, which measures the number of activities in which mothers participate. Mothers' social capital is quite low, with the lowest mean in the year during the crisis.

4.4.3 Socio-economic and demographic characteristics

Mothers' individual characteristics include education, age, kin ties, height and general health. To measure mothers' education we construct a dummy variable indicating mother completing primary education or less in the Indonesian school system. Mothers after the crisis have better education than those before the crisis. Before the crisis 70 percent of mothers have education up to primary education, while after the crisis this was reduced to 44 percent. We also create an indicator of whether mothers report having frequent person-to-person contact with their own mothers. Around a half of mothers report that they often interact with their mothers.

We include mother's height and child birth weight as indicators for health endowment. Maternal height captures many aspects of the mother's background, including health behaviours and genetic predisposition that may be related to child health (Kuh and Wadsworth 1989: 663). Child birth weight captures the health condition of the child during pregnancy, which has been shown to have a strong relationship with child's physical development (Conley et al. 2003:1-2). The mean of mothers' height and children's birth weight is 150 cm and 3.2 kg, respectively. In addition, we also include a control for whether mothers are in the lower end of the distribution of self-rated health, which in this sample means average or below average health. All respondents in the sample report on self-rated health, which predicts chronic disease in many settings, including Indonesia (Frankenberg and Jones 2004: 444). The survey provides information on self-rated health elicited by a question: 'In general, would you say that your health is very healthy, sufficiently healthy, less than healthy, and unhealthy?' We combined the last two categories because less than one percent of respondents chose the unhealthy category. We find that 10-22 percent of mothers report having poor health, with the higher percentage in the year during the crisis.

Household controls include household size and monthly expenditure. Household size is included to address the issue that women with more household members may have less time to participate or acquire social capital. Household size is relatively large, with an average of five to six members per household. We prefer to use monthly per capita household expenditure rather than income to capture household financial resources. In developing countries such as Indonesia, it is not income but expenditures measured from consumption that more accurately capture levels of long-term economic resources. As Deaton and Zaidi (2002: 12) write: 'consumption will tell us a great deal more about annual-or even longer period-living standards than will a similar observation on income'. The household expenditures variable is logged to correct for a skewed distribution. After conversion to $US, the mean level of monthly expenditure before the crisis was the highest, with $40 (Rp.111.915), while the lowest was in the time during the crisis with $12 (Rp.119.910).

Community covariates include the number of community activities, community per capita expenditure, community receipt of underdeveloped village funds, community population and urban status. Information about the number of community activities is taken from community books which are separated with questions for mothers' participation (Frankenberg and Karoly 1995; Frankenberg and Thomas 2000). This section provides information about various community activities, i.e. village cooperatives, youth groups, religious activities, family groups and

14

neighbourhood security groups, which were conducted on a routine basis. The crisis reduced the number of community activities. The average number of available community activities during the crisis was the lowest, with three activities in each community. The crisis also decreased community-level expenditure. The mean community-level expenditure during this year was the lowest, at \$12. In addition, controls for wealth, population and urban/rural status are included in the model. The proportions of respondents living in rural and urban areas were relatively balanced.

5. Results

5.1 Mothers' social capital and child health

We relate children's health outcomes to mothers' social capital by doing instrumental variable estimation of child health on a number of individual, household and community predictors, including mothers' social capital and community activities. Tables 2 and 3 present the results on a sample of children ages ten and younger in three different contexts: before, during and after the Indonesian crisis. All models include community fixed effects and can thus be interpreted as comparisons among children living within the same communities averaged over 307 communities in our sample.

Table 2: Mothers' social capital and height-for-age *z* score, second stage regression

	before crisis		during crisis		after crisis	
	Coef.	p	Coef.	p	Coef.	p
Mothers' social capital	0.086	0.051	-0.024	0.658	0.175	0.010
The number of available community activities	-0.010	0.436	0.005	0.727	0.012	0.369
Children's characteristics:						
Age	-0.133	0.000	-0.136	0.000	-0.141	0.000
Boy	-0.125	0.000	-0.067	0.022	-0.068	0.058
Birth weight (kg)	0.154	0.080	0.204	0.043	0.261	0.000
Mothers' characteristics:						
Age	0.009	0.004	0.014	0.000	-0.000	0.936
Height (cm)	0.057	0.000	0.064	0.000	0.057	0.000
Education: primary or less	-0.258	0.000	-0.190	0.000	-0.171	0.000
Poor health	-0.143	0.027	-0.061	0.291	-0.091	0.834
Household size	-0.034	0.002	-0.034	0.001	-0.025	0.048
Household below median expenditure	-0.117	0.010	-0.158	0.000	-0.209	0.000
Interact with grandmothers often	-0.030	0.479	-0.028	0.422	-0.091	0.031
Community characteristics:						
Urban areas	0.228	0.000	0.171	0.006	0.143	0.008
Log expenditure	0.200	0.013	0.383	0.000	0.371	0.000
Log population	0.014	0.463	-0.003	0.913	0.039	0.159
Receive underdeveloped village fund	-0.157	0.013	-0.204	0.000	-0.126	0.059
Constant	-11.673	0.000	-15.106	0.000	-14.328	0.000

Table 3: Mothers' social capital and weight-for-age *z* score, second stage regression

	before crisis		during crisis		after crisis	
	Coef.	p	Coef.	p	Coef.	p
Mothers' social capital	0.112	0.021	-0.048	0.438	0.133	0.058
The number of available community activities	0.005	0.704	-0.018	0.250	0.044	0.008
Children's characteristics:						
Age	-0.064	0.000	-0.064	0.000	-0.068	0.000
Boy	-0.081	0.023	-0.064	0.060	-0.011	0.754
Birth weight (kg)	0.237	0.019	0.256	0.006	0.327	0.000
Mothers' characteristics:						
Age	0.011	0.001	0.013	0.000	0.008	0.010
Education: primary or less	-0.171	0.005	-0.187	0.000	-0.136	0.008
Height (cm)	0.043	0.000	0.041	0.000	0.044	0.000
Poor health	-0.215	0.001	-0.060	0.304	-0.523	0.003
Household size	-0.023	0.050	-0.021	0.054	-0.019	0.106
Household below median expenditure	-0.103	0.041	-0.136	0.004	-0.287	0.000
Interact with grandmothers often	-0.037	0.422	-0.030	0.410	-0.073	0.100
Community characteristics:						
Urban areas	0.218	0.001	0.131	0.043	0.118	0.075
Log expenditure	0.147	0.081	0.367	0.000	0.335	0.000
Log population	-0.009	0.695	-0.026	0.479	0.011	0.720
Receive underdeveloped village fund	-0.225	0.001	-0.171	0.005	-0.166	0.061
Constant	-9.910	0.000	-12.096	0.000	-12.970	0.000

We find mothers' social capital is positively associated with child health both before and after the crisis. Mothers' social capital, however, is not associated with child health during the crisis. The estimated coefficient of mothers' social capital during the crisis is small (two to five percent) and insignificant. The effect of mothers' social capital after the crisis is stronger than before the crisis. One standard deviation increase in mothers' social capital is associated with an increase in the initial height-for-age by nearly 18 percent and weight-for-age by 13 percent after the crisis, while before the crisis the magnitude of mothers' social capital effect on both child health indicators is only nine to 11 percent.

Human capital in the form of mothers' education is positively associated with child health. Children whose mothers are educated only up to primary school are less healthy than those with more educated mothers. The effect of mothers' education on child health is quite large (17-26 percent for child height and 13-19 percent for child weight). Likewise, children who live in poor households, as measured by household below median expenditure, are less healthy than children from better-off households. The strongest effect of household expenditure on child health is shown after the crisis; one unit decrease in household expenditure leads to a decrease in child health of 21-29 percent in this year.

Controlling for household resources, community expenditure is strongly related to child health in all three years. The estimated coefficient for the time during the crisis is the strongest among all other

coefficients, with magnitudes of 37-38 percent. A negative association is shown between indicator of community underdevelopment (received underdeveloped funds) and child health in all periods, with the strongest coefficient during the crisis. This evidence reflects the fact that during the crisis children living in poor communities are more disadvantaged with respect to their health compared to those who live in better-off communities. Furthermore, living in urban areas increases children's health. This is due to better public health services which are located in urban areas. In addition, the number of active community activities increases child weight, but the significant association is only shown in the year after the crisis.

5.2 Mothers' social capital and child health: two-way causality?

In analysing the relationship between mothers' social capital and child health, we account for the reverse causality from child health to mothers' social capital: unhealthier children prevent mothers from participating in community activities, since mothers have to take care of the ill children. We use an instrumental variable estimator to rule out such reverse causation from child health to mothers' social capital. A suitable instrument set is specified for mothers' social capital. We then test the validity of each set in the regression model. The results of the first stage regression in Table 4 suggest all instruments are highly correlated with mothers' social capital. Tests of instruments' strength and relevance (Hansen, Lagrange multipliers, Wald, Kleibergen-Paap statistics) reveal the usefulness of the instruments in identifying the effects of mothers' social capital.

Different years provide different instrument sets, because some information, for instance local custom information (*adat*), was collected only in certain years. In all three years, dissemination information about community activities is strongly correlated with mothers' social capital. The estimated coefficient of mothers' knowledge about community activities in the community as a proxy indicator for dissemination information is 18-30 percent.

Mothers living in communities with higher numbers of neighbourhood associations have more social capital than those living in less well endowed neighbourhoods. This evidence is shown in all three years with rather small magnitude. Likewise, mothers' social capital is positively associated with the number of social and informal financial institutions in their community. These institutions include rolling funds, saving and borrowing groups, and self-help groups or *kelompok masyarakat*. The correlation of the presence of these institutions with mothers' social capital appears in some years. For instance, saving and borrowing institutions are correlated with mothers' social capital after the crisis. The number of self-help groups is correlated with mothers' social capital only before the crisis. There is no evidence that both types of institutions affect mothers' social capital during the crisis. For this reason we do not use both instruments for the year during the crisis.

We expect the higher percentage of ethnic similarity and kinship groups to be related to mothers' social capital, and our expectation is confirmed by data from after the crisis. In this year, the magnitude effect of kinship groups on mothers' social capital is the largest among all instruments, at 29 percent. We do not find a significant association between these variables and mothers' social capital before the crisis. For this reason, we dropped these variables from the instrument set for this year.

Table 4: Mother's social capital and child health, first-stage regression

	before crisis		during crisis		after crisis	
	Coef.	p	Coef.	p	Coef.	p
Children's characteristics:						
Age	0.010	0.010	0.014	0.000	0.017	0.000
Boy	0.021	0.341	-0.001	0.971	-0.052	0.025
Birth weight	0.025	0.615	-0.017	0.789	0.031	0.387
Mothers' characteristics:						
Age	0.000	0.852	0.004	0.097	0.008	0.002
Education: primary or less	-0.150	0.000	-0.132	0.000	-0.068	0.049
Height (cm)	0.001	0.849	0.001	0.718	-0.002	0.487
Poor health	0.013	0.795	0.011	0.813	0.291	0.456
Household size	-0.007	0.361	-0.015	0.034	0.010	0.290
Household below median expenditure	-0.124	0.000	-0.075	0.013	-0.138	0.000
Interact with grandmothers often	0.042	0.159	0.009	0.773	-0.028	0.363
Community characteristics:						
Urban areas	-0.051	0.350	-0.065	0.233	0.001	0.987
Log expenditure	-0.125	0.044	0.065	0.346	0.062	0.435
Log population	-0.033	0.037	-0.140	0.000	-0.040	0.182
Receive underdeveloped village fund	-0.023	0.724	-0.034	0.563	-0.027	0.658
The number of available community activities	0.021	0.047	0.019	0.305	0.029	0.039
Instrumental variables:						
Dissemination information about community activities	0.317	0.000	0.192	0.000	0.191	0.000
The number of neigbourhood associations	0.011	0.001	0.023	0.000	0.004	0.002
The presence of rolling funds	0.144	0.058				
The number of saving and borrowing institutions					0.041	0.081
The number of self-help groups			0.003	0.001		
Ethnic similarity					0.003	0.022
The presence of kinship groups					0.265	0.040
Constant	1.353	0.081	0.124	0.890	-0.988	0.392
Kleibergen-Paap LM stats (under id)	121.335		93.233		115.576	
LM p value	0.000		0.000		0.000	
Hansen's J	0.173		2.967		2.485	
p value	0.917		0.227		0.647	
Cragg-Donald Wald F stats (weak id)	532.991		321.773		143.001	

Communities with higher numbers of activities, including village cooperatives, youth groups, religious activities, family groups and neighbourhood security groups, are likely to provide more mothers' social capital. We find this evidence particularly in the year before the crisis and after the crisis. The magnitude of this effect on mothers' social capital in these years indicates that one standard deviation increase (measured at the community level) in the number of community activities is associated with an increase in mothers' social capital by two to three percent. The number of active community activities, however, is not associated with mothers' social capital during the crisis.

Mothers' education and age as well as children's age are significantly associated with social capital. Mothers with primary education or less have less social capital than those with higher education. The estimated coefficient of mothers' education before and during the crisis is relatively strong, at 13-15 percent. Mothers' age has an inverse U-shaped relationship with their social capital: social capital rises with mothers' age and then decreases. The association between age and mothers' social capital appears in all years. Mothers who have older children are likely to have more social capital than those with younger children. The association between children's age and mothers' social capital is significant in all years, though with small magnitude. There is no evidence that other characteristics, such as mothers' height, mothers' general health, and maternal kin ties are associated with social capital.

Living in a household with below median per capita expenditure decreases the average of mothers' social capital. This association is shown both before and after the crisis, with the strongest effect after the crisis, with an estimated coefficient of 14 percent. Household size seems not to matter. The significant association between household size and mother's social capital is only shown in the year during the crisis. In this year, mothers in larger households have less social capital compared to those in smaller ones.

While the effect of household expenditure is shown in all three years, the correlation between average community expenditure and mothers' social capital only appears before the crisis. The effect of average community expenditure on child health after the crisis is relatively high, with a coefficient of 14 percent. Living in a denser population decreases mothers' social capital. We find this association before and during the crisis. The estimated coefficient of community population on mothers' social capital during the crisis is higher than that before the crisis.

5.3 Additional analysis

We show that the link between mothers' social capital and child health is severely ruptured during the crisis. Two possible channels explain this evidence. First, the economic shock reduced the capacity of mothers to participate in community activities. During the crisis mothers may use most of their time and resources fulfilling the needs of their families, especially if the families are large, so that they lack the opportunities to be involved in community activities. Figure 1 shows that average household expenditure decreased dramatically compared to that before the crisis. This economic shock was followed by reduced mothers' social capital. We find the mean of mothers' social capital during the crisis is the lowest, at 0.45, whereas the average number before and after the crisis is 0.58 and 0.50, respectively. Table 5 shows that the mean differences of household expenditure and mothers' social capital between the year during crisis and non-crisis are statistically significant.

Table 5: Mean differences of household expenditure, mothers' social capital, community expenditure and community social capital before, during and after the crisis

Variables	comparison	mean difference	se	t	p
Household expenditure	before-during the crisis	32.622	0.043	749.499	0.000
	after-during the crisis	2.307	0.009	235.593	0.000
Mothers's social	before-during the crisis	0.079	0.016	5.836	0.000
capital	after-during the crisis	0.073	0.016	4.914	0.000
Community expenditure	before-during the crisis	32.806	0.023	1400.204	0.000
	after-during the crisis	2.395	0.004	559.257	0.000
The number of available	before-during the crisis	2.754	0.034	80.204	0.000
community activities	after-during the crisis	1.812	0.034	52.948	0.000

Figure 1: Mean distribution of household expenditure, mothers' social capital, community expenditure and community social capital before, during and after the crisis
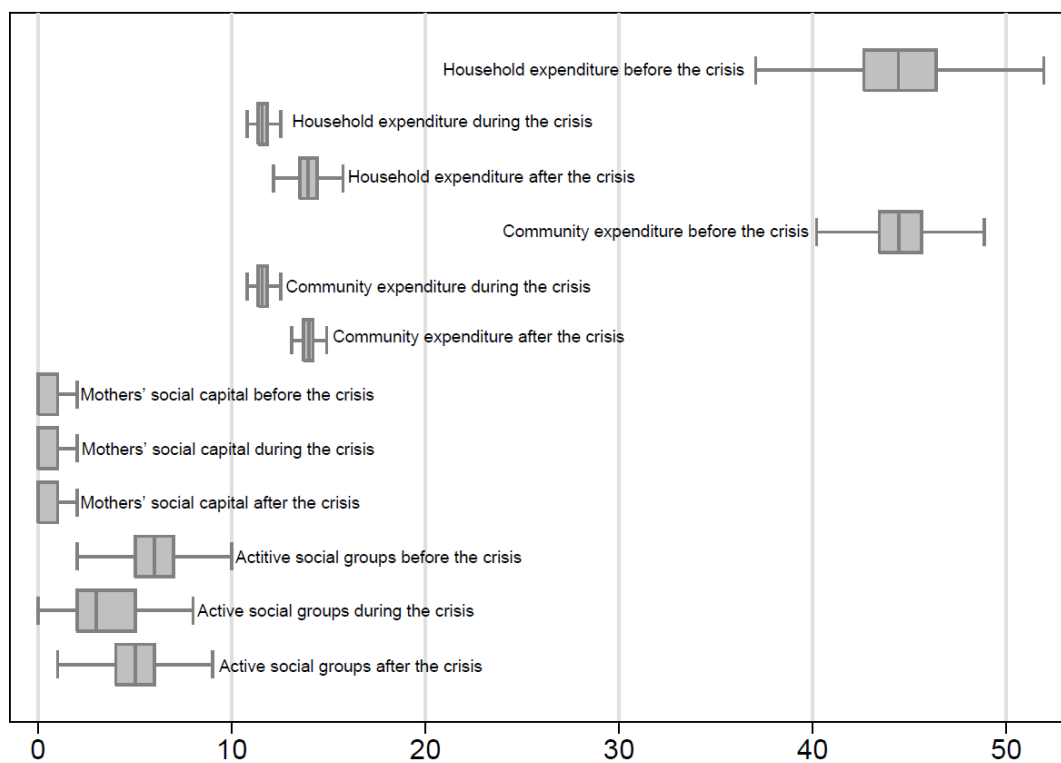
Second, the crisis reduced the number of available community activities. In many places, community activities are sustained by community members. The economic shock damaged the communities' economic capital. The average community expenditure shrank to about $11 a month in the year during the crisis, while before the crisis the average number reached $45. This economic damage may have led to reduced support by community members to sustain various community activities. With a lack of support from communities, many activities simply ceased

during the crisis. Hence, mothers are unable to access the benefit of social capital due to the limited stock of community activities during the crisis. We find the average number of community activities is significantly reduced, from six activities before the crisis to three activities during the crisis.

Further corroborating evidence rests on the larger sizes of the coefficients of mothers' social capital after crisis compared to the sizes before the crisis (see Section 6.1). This increased efficacy of social capital is consistent with the development in these communities after crisis. These communities received a lot of help from national and especially international organisations; and quite a number of these organisations make use of this community tradition and focus on health (Sumarto et al. 2008; World Bank 2010). Such developments are consistent with the increased magnitude of social capital effect.

6. Discussion and conclusion

The purpose of this study is to examine the association between mothers' social capital and child health. We follow recent studies which argue that social capital is an endowment which exists within communities, but individuals have to access it through social participation (Putnam 1995; Berkman and Kawachi 2000; Helliwel 2003; Subramanian et al. 2002). In this study, we measure mother's social capital as the extent to which a mother participates in several community activities and asked whether her participation affect her child's health, as measured by height and weight-for-age. Since social capital is conceptualised both at the individual and community levels, we also include the number of available community activities to capture community social capital. We study the case of mothers' involvement in community activities in Indonesia. The case of the country is interesting, not only because the recent economic crisis causes detrimental effects to its citizens' health, but also because the country has a longstanding tradition of indigenous community involvement (Grootaert 1999; Beard 2005, 2007; Miller et al. 2006).

Our main results show that mothers' social capital is positively associated with child health before and after the crisis. However, mothers' social capital is not associated with child health during the crisis. We find the relation between mothers' social capital and child health follows a causal relationship. An instrumental variable estimator provides strong evidence for the causal flow running from mothers' social capital to child health. All instruments are highly correlated with mothers' social capital. Tests of instruments' strength and relevance also reveal the usefulness of the instruments in identifying the effects of mothers' social capital.

Three cross-sectional regressions show the different influence of mothers' social capital on child health in three different socio-economic contexts: before, during and after the crisis. The contrast between mothers' social capital and child health in the year during the crisis and non-crisis provides important information about how the economic shock affects many aspects of citizens' life in a developing country. We show that the crisis not only has a detrimental effect on household and community economic capital, but also on the social capital of mothers and communities.

Separate cross-sectional regressions may be more appropriate compared with temporal ordering method in certain conditions. This method is suitable in the context of developing countries in which

child health status can drastically change, due to high incidence of infectious and parasitic diseases as well as natural hazards.

Moreover, the use of community fixed effects in the model captures various unobserved factors in the community level which may be associated with mothers' social capital and child health. These communities have different backgrounds in terms of ethnicity, cultures and geography. Such differences may condition mothers' social capital and child nutritional status in these communities. Community fixed effects account for these differences.

Our findings have several important implications, both for the literature and practices of development in developing countries. First, recent works on public health and epidemiology in developed countries find that social capital predominantly improves adult health and wellbeing (Kawachi and Berkman 2000; Helliwel 2003; Subramanian et al. 2002; Viswanath et al. 1996; Farquhar et al. 2005). Our empirical results confirm the validity of the positive effect of social capital on child health formation in the context of a developing country. This study demonstrates that the potential benefits of social capital are not limited to the developed countries. Second, the types of community activities in this study existed not only in Indonesia. Similar community activities spread wide in other developing countries. Narayan and Pritcett (1999) illustrate how such activities help to improve household welfare in rural Tanzania. Similarly, Grootaert and Bastelaer (2002) codify the important roles these types of activities hold in enhancing development across developing countries from Cambodia, India, Bangladesh, Madagaskar, Kenya and South Africa. However, very few studies have examined the effect of those types of community activities on child health. We suggest that the activities are not only beneficial for household economy, but also for other aspects of citizens' wellbeing.

The fact that mothers' social capital largely benefits children's health in developing countries suggests that enhancing this type of capital may provide another channel for reducing health disparities in those countries. Lastly, because child health status has been shown to be related with wellbeing later in life (Strauss and Thomas 1998), mother's social capital (accrued from various community activities) may provide another way to reduce intergenerational socio-economic inequality.

References

Almedom, A. (2005). `Social capital and mental health: an interdisciplinary review of primary evidence'. *Social Science and Medicine* 5(61), 943-964.

Anderson, A. and Damio, G. (2004). `Social capital, acculturation, and breastfeeding initiation among Puerto Rica women in the United States'. *Journal of Human Lactation* 20(1), 1-21.

Arendt, J. (2005). `Does education cause better health? A panel data analysis using school reforms for identification'. *Economics of Education Review* 24(2), 149-160.

Azis, I. (2008). `Indonesia's slow recovery after meltdown'. *Asian Economic Papers* 7(1), 79-103.

Bayer, P., Ross, S. and Topa, G. (2005). `Place of work and place of residence: informal hiring networks and labor market outcomes'. *National Bureau of Economic Research Working Paper Number 11019*.

Beard, V. (2005). `Individual determinants of participation in community development in Indonesia'. *Environment and Planning C: Government and Policy* 23(1), 21-39.

Beard, V. (2007). `Household contributions to community development in Indonesia'. *World Development* 35(4), 607-625.

Beaudoin, C. (2007). `Bonding and bridging neighbourliness: an individual-level study in the context of health'. *Social Science and Medicine* 68(12), 2129-2136.

Behrman, J. (1990). Intra-household allocation of nutrients and gender effects: a survey of structural and reduced form estimates, in S. Osmani (ed.), *Nutrition and Poverty*. Oxford: Oxford University Press.

Behrman, J. (1996). `The impact of health and nutrition on education'. *World Bank Research Observer* 11(1), 23-37.

Berger, M. and Leigh, J. (1989). `Schooling, self selection and health'. *Journal of Human Resources* 24(3), 433-455.

Berkman, L. and Kawachi, I. (2000). *Social Epidemiology*. New York: Oxford University Press.

Bhargava, A., Jamison, D., Lawrence, J. and Murray, C. (2001). `Modelling the effects of health on economic growth'. *Journal of Health Economics* 20(3), 423-440.

Bogin, B. (1999). *Pattern of Human Growth*. Cambridge, UK: Cambridge University Press.

Bowen, J. (1986). `On the political construction of tradition: *gotong royong* in Indonesia'. *The Journal of Asian Studies* 45(3), 545-561.

Buckler, J. (1997). 'A reference manual of growth and development', in C. Kelnar (ed.), *Growth Disorder.* Oxford: Blackwell Scientific Publications.

Carter, M. and Maluccio, J. (2003). `Social capital and coping with economic shocks: an analysis of stunting of South African Children'. *World Development* 31(7), 1147-1163.

Cole, T., Freeman, J. and Preece, M. (1998). `British 1990 growth reference centiles for weight, height, body mass index and head circumference fitted by maximum penalized likelihood'. *Statistics in Medicine* 17(4), 407-429.

Cole, T. and Green, P. (1992). `Smoothing reference centile curves: the LMS method and penalized likelihood'. *Statistics in Medicine* 11(10), 1305-1319.

Coleman, J. (1988). `Social capital in the creation of human capital'. *American Journal of Sociology* 94(3), 95-120.

Conley, D., Bennet, N. and Strully, K. (2003). *The Starting Gate: Birth Weight and Life Chances.* Berkeley, CA: University of California Press.

Cutrona, C. and Russell, D. (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.

Deaton, A. (2003). `Health, inequality, and economic development'. *Journal of Economic Literature* 41(1), 113-158.

Deaton, A. and Zaidi, S. (2002). *Guidelines for Constructing Consumption Aggregates for Welfare Analysis.* Washington, DC: World Bank.

Deolalikar, A. (1988). `Nutrition and labour productivity in agriculture: estimates for rural South India'. *The Review of Economics and Statistics* 70(3), 406-413.

DeSilva, M. and Harpham, T. (2007). `Maternal social capital and child nutritional status in four developing countries'. *Health and Place* 13(2), 341-355.

d'Hombres, B., Rocco, L., Suhrcke, M. and McKee, M. (2010). `Does social capital determine health? Evidence from eight transition countries'. *Health Economics* 19(1), 56-74.

Farquhar, S., Yvonne, L. and Wiggins, S. (2005). `Building on leadership and social capital to create change in urban communities'. *American Journal of Public Health* 95(4), 596-601.

Folland, S. (2007). `Does "community social capital" contribute to population health?' *Social Science and Medicine* 64(11), 2342-2354.

Frankenberg, E., Friedman, J. and Gillespie, J. (2008). `Mental health in Sumatra after the tsunami'. *American Journal of Public Health* 98(9), 1-5.

Frankenberg, E. and Jones, N. (2004). `Self-rated health and mortality: does the relationship extend to a low income setting?' *Journal of Health and Social Behavior* 45(4), 441-452.

Frankenberg, E. and Karoly, L. (1995). *The 1993 Indonesian Family Life Survey: Overview and Field Report DRU-1195*, Santa Monica, CA: RAND.

Frankenberg, E. and Thomas, D. (2000). *The Indonesia Family Life Survey (IFLS): Study Design and Results from Waves 1 and 2 DRU-1195 DRU2238/1NIA/NICHD*. Santa Monica, CA: RAND.

Geertz, C. (1962). `The rotating credit association: a "middle rung" in development'. *Economic Development and Cultural Change* 10(3), 241-263.

Gill, I. and Kharas, H. (2007). *An East Asian Rrenaissance: Ideas for Economic Growth*. Washington, DC: World Bank.

Grootaert, C. (1999). `Social capital, household welfare, and poverty in Indonesia'. *Policy Research Working Paper Number 2148*.

Grootaert, C. and Bastelaar, V. (2002). *Understanding and Measuring Social Capital.* Washington, DC: World Bank..

Gupta, A. and Jones, E. (2010). `The representation of children and their parents in public law proceedings since the Children Act 1989: high hopes and lost opportunities? *Journal of Children's Services* 5(2), 64-72.

Heckman, J. (1997). `Instrumental variables: a study of implicit behavioral assumptions used in making program evaluations'. *The Journal of Human Resources* 32(3), 441-462.

Helliwell, J. (2003). `Well-being and social capital: does suicide pose a puzzle?' Paper presented at the Conference on Well-Being and Social Capital, Harvard University 7-9 November 2003.

Hendry, D. (1995). *Dynamic Econometrics*. New York: Oxford University Press.

Hendry, D. and Richard, J. F. (1982). 'On the formulation of empirical models in dynamic econometrics'. *Journal of Econometrics* 20(1), 3-33.

Hill, H. (1999). *The Indonesian Economy in Crisis*. Pasir Panjang. Singapore: Institute of Southeast Asian Studies.

Hill, H. and Shiraishi, T. (2007). 'Indonesia after the Asia crisis'. *Asian Economic Policy Review* 2(1), 123-141.

Kawachi, I and Berkman, L. (2000). `Social cohesion, social capital, and health. In L. F. Berkman and I. Kawachi (eds.). *Social Epidemiology.* New York: Oxford University Press.

Kawachi, I., Kennedy, B., Lochner, K. and Prothrow-Stith, D. (1997). `Social capital, social inequality, and mortality'. *American Journal of Public Health* 87(9), 1491-1498.

Kennedy, B., Kawachi, I. and Brainerd, E. (1998). `The role of social capital in the Russian mortality crisis'. *World Development* 26(11), 2029-2043.

Koentjaraningrat (1961). *Some Social Anthropological Observations on gotong royong Practices in Two Villages of Central Java.* Ithaca, NY: Cornell University Press.

Kuczmarski, R., Ogden, C. and Guo, S. (2002). `2000 CDC growth charts for the United States: methods and development'. *Vital Health Statistics* 2(46), 246-249.

Kuh, D. and Wadsworth, M. (1989). `Parental height: childhood environment and subsequent adult height in a national birth cohort'. *International Journal of Epidemiology* 18(3), 663-668.

Kunitz, S. (2004). `Social capital and health'. *British Medical Bulletin* 69(1), 61-73.

Lederman, D., Loayza, N. and Menndez, A. (2002). `Violent crime: does social capital matter?' *Economic Development and Cultural Change* 50(3), 509-539.

Lin, N. (2002). *Social Capital: a Theory of Social Structure and Action.* Cambridge, UK: Cambridge University Press.

Lindau, S., Laumann, E. and Levinson, W. (2003). `Synthesis of scientific disciplines in pursuit of health: the interactive biopsychosocial model'. *Perspectives in Biology and Medicine* 46(3), S74-S86.

Lindenauer, P., Pekow, P., Lahti, M., Lee, Y., Benjamin, E. and Rothberg, M. (2010). `Association of corticosteroid dose and route of administration with risk of treatment failure in acute exacerbation of chronic obstructive pulmonary disease'. *Journal of the American Medical Association* 303(23), 2359-2367.

Locher, J., Ritchie, C. and Roth, D. (2005). `Social isolation, support, and capital and nutritional risk in an older sample: ethnic and gender differences'. *Social Science and Medicine* 60(4), 747-761.

Lu-Yao, G., Albertsen, P., Moore, D., Shih, W., Lin, Y., DiPaola, R. and Yao, S. (2008). `Survival following primary androgen deprivation therapy among men with localized prostate cancer'. *Journal of the American Medical Association* 300(2), 173-181.

Macinko, J. & Starfield, B. (2001). `The utility of social capital in research on health determinants'. *Milbank Quarterly* 79(3), 387-427.

Marmot, M. (2010). *Fair Society, Healthy Lives: A Strategic Review of Health Inequalities in England Post-2010* (The Marmot Review). London: University College London,.

Martin, K. and Rogers, B. (2004). `Social capital is associated with decreased risk of hunger'. *Social Science and Medicine* 58(12), 2645-2654.

McClellan, M., McNeil, B. and Newhouse, J. (1994). `Does more intensive treatment of acute myocardial infarction in the elderly reduce mortality? Analysis using instrumental variables'. *Journal of the American Medical Association* 272(11), 859-866.

McKenzie, T., Lewis, B. and Sallis, J. (1999). `Effects of health-related physical education on academic achievement'. *Research Quarterly for Exercise and Sport* 70(2), 127-134.

Miller, D., Schiffer, R., Lam, S. and Rosenberg, R. (2006). `Social capital and health in Indonesia'. *World Development* 34(6), 1084-1098.

Morenoff, J. (2003). `Neighbourhood mechanisms and the spatial dynamics of birth weight'. *American Journal of Sociology* 108(5), 976-1017.

Narayan, D. and Pritchett, L. (1999). `Cents and sociability: household income and social capital in rural Tanzania'. *Economic Development and Cultural Change* 47(4), 871-897.

Nobles, J. and Frankenberg, E. (2009). `Mothers community participation and child health'. *Journal of Health and Social Behavior* 50(1), 16-30.

Portes, A. (1998). `Social capital: its origins and applications in modern sociology'. *Annual Review of Sociology* 24(1), 1-24.

Preston, S. (1975). `Health programs and population growth'. *Population and Development Review* 1(2), 189-199.

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

Putnam, R. (1995). *Bowling Alone: the Collapse and Revival of American Community*. New York: Simon and Schuster.

Rooyen, V. and Leaning, J. (2005). `After the tsunami: facing the public health challenges'. *New England Journal of Medicine* 3(1), 1-8.

Ross, C. and Wu, C. (1995). `The links between education and health'. *American Sociological Review* 60(5), 719-745.

Schady, N. (2001). `Who participates? The supply of volunteer labour and the distribution of government programs in rural Peru'. *World Bank Policy Research 2671*.

Seeman, T. (1996). `Social ties and health: the benefits of social integration'. *Annals of Epidemiology* 6(5), 442-451.

Shiffman, J. (2002). `The construction of community participation: village family planning groups and the Indonesian state'. *Social Science and Medicine* 54(8), 1199-1214.

Stiglitz, J. and Yusuf, S. (2001). *Rethinking the East Asian Miracle*. Washington, DC: World Bank.

Strauss, J. (1986). `Does better nutrition raise farm productivity?' *The Journal of Political Economy* 94(2), 297-320.

Strauss, J., Beegle, K., Sikoki, B., Dwiyanto, A., Herawati, Y. and Witoelar, F. (2004). *The Third Wave of the Indonesia Family Life Survey (IFLS): Overview and Field Report. WR144/1NIA/NICHD*, Santa Monica, CA: RAND.

Stukel, T., Fisher, E., Wennberg, D., Alter, D., Gottlieb, D. and Vermeulen, M. (2007). `Analysis of observational studies in the presence of treatment selection bias: effects of invasive cardiac management on AMI survival using propensity score and instrumental variable methods'. *Journal of the American Medical Association* 297(3), 278-285.

Strauss, J. and Thomas, D. (1998). 'Health, nutrition, and economic development'. *Journal of Economic Literature* 36, 766-817.

Subramanian, S., Kim, D. and Kawachi, I. (2002). `Social trust and self-rated health in US communities: a multilevel analysis'. *Journal of Urban Health* 79(4), S21-S34.

Sumarto, S., Suryahadi, A. and& Bazzi, S. (2008). 'Indonesia's social protection during and after the crisis', in A. Barientos and D. Hulme (eds.), *Social Protection for the Poor and Poorest: Concepts, Policies and Politics.* Basingstoke, UK: Palgrave Macmillan.

Surkan, P., Ryan, L., Vieira, C., Berkman, L. and Peterson, K. (2007). `Maternal social and psychological conditions and physical growth in low-income children in Piaui, Northeast Brazil'. *Social Science and Medicine* 64(2), 375-388.

Tampubolon, G. (2009). `Neighbourhood social capital improves individual health quality of life in a national sample from Wales'. *MPRA Paper No. 16758*, posted 12. August 2009.

Thoits, P. and Hewitt, L. (2001). `Volunteer work and well-being'. *Journal of Health and Social Behaviour* 42(2), 115-131.

Thomas, D., Frankenberg, E. and Smith, J. (2001). `Attrition and follow-up in the Indonesia Family Life Survey'. *The Journal of Human Resources* 36(3), 556-592.

Thomas, D. and Strauss, J. (1997). `Health and wages: evidence on men and women in urban Brazil'. *Journal of Econometrics* 77(1), 159-185.

Thomas, D., Witoelar, F., Frankenberg, E., Sikoki, B., Strauss, J., Sumantri, C. and Suriastini, W. (2010). `Cutting the costs of attrition: results from the Indonesia Family Life Survey'. *Bureau for Research and Economic Analysis of Development (BREAD) Working Paper No. 259.*

Tuan, T., Harpham, T. and DeSilva, M. (2006). `Maternal social capital and child health in Vietnam'. *Journal of Epidemiology and Community Health* 60(1), 865-871.

Viswanath, K., Steele, W. and Finnegan, J. (1996). `Social capital and health: civic engagement, community size, and recall of health messages'. *American Journal of Public Health* 96(8), 1456-1461.

Watson, J., Gayer, M. and Connolly, M. (2007). `Epidemics after natural disasters'. *Emerging Infectious Diseases* 13(1), 1-5.

Wibisana, W., Trihono, T. and Nurwati, S. (1999). *Community Participation in Health Development: Indonesian Experience*. Jakarta: Indonesia Ministry of Health.

Wie, T. (2003). `The Indonesian economy crisis and the long road to recovery'. *Australian Economic History Review* 43(2), 183-196.

Wilkinson, R. (1997). `Comment: income inequality and social cohesion'. *American Journal of Public Health* 87(9), 1504-1506.

World Bank (2004). *Making Services Work for Poor People*. Washington, DC: World Bank.

World Bank (2010). *Empowering Indonesian Communities through Direct Participation in Developing Infrastructure and Services*, *IBRD Results*. Available online at: http://siteresources.worldbank.org/NEWS/Resources/Indonesia_Direct_Participation_4-11-10.pdf (accessed 19 May 2011).

Yip, W., Subramanian, S., Mitchell, A., Dominic, T., Lee, J. and Kawachi, I. (2007). `Does social capital enhance health and well-being? Evidence from rural China'. *Social Science and Medicine* 64(1), 35-49.

The University of Manchester
Brooks World Poverty Institute

MANCHESTER
1824

Executive Director
Professor David Hulme

Research Directors
Professor Armando Barrientos
Professor Rorden Wilkinson

Contact:

Brooks World Poverty Institute
The University of Manchester
Humanities Bridgeford Street Building
Oxford Road
Manchester
M13 9PL
United Kingdom

Email: **bwpi@manchester.ac.uk**

www.manchester.ac.uk/bwpi

The Brooks World Poverty Institute (BWPI) creates and shares knowledge to help end global poverty.

BWPI is multidisciplinary, researching poverty in both the rich and poor worlds.

Our aim is to better understand why people are poor, what keeps them trapped in poverty and how they can be helped - drawing upon the very best international practice in research and policy making.

The Brooks World Poverty Institute is chaired by Nobel Laureate, Professor Joseph E. Stiglitz.

www.manchester.ac.uk/bwpi