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Sometimes it takes a Village:
Collective Efficacy and Children's Use of Preventive Health Care

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ABSTRACT

This paper addresses the question of whether collective efficacy affects children's use of preventive health care. In a low-income setting collective efficacy at the community-level is shown to increase parental investments in young children. The context for the research is Indonesia before and during the major economic downturn of the late 1990s—a period during which unexpected and substantial changes in neighborhood characteristics took place. Before the crisis collective efficacy has a stronger impact on the use of preventive care by children from socioeconomically disadvantaged households than on children who are better off. During the crisis parental investments in preventive health care for young children were protected in communities where collective efficacy was relatively high. The results are robust to inclusion of a number of other time-varying community factors, as well as to community-level fixed effects. Similar results emerge in a model of individual-level changes in use of care over time.

Although the importance of community attributes for individual well-being is well-established in sociological theory, measurement and incorporation of community characteristics into empirical work was relatively rare until the early 1990s. Over the past fifteen years, however, the question of how environment shapes individual behaviors and outcomes has become increasingly prominent (Jencks and Mayer 1990; Brooks-Gunn et al. 1993; Sucoff and Upchurch 1998; Sampson, Morenoff, and Gannon-Rowley 2002).

Much of the work on the United States focuses on inner cities, examining how behaviors and outcomes of children and young adults are associated with compositional features of the neighborhood, such as its racial make up or level of poverty. Efforts to document neighborhood influences on well-being spring in part from Wilson's (1987) arguments that in the United States, living in a poor neighborhood imposes additional costs beyond those of living in a poor household (Massey 2001). Most of the empirical research, however, has not addressed the mechanisms through which neighborhood-level poverty affects children.

To clarify how and why features of communities matter for various dimensions of well-being, Sampson and colleagues develop a theory of collective efficacy. Defined most generally, collective efficacy is a shared willingness among neighbors to intervene on the behalf of the common good—for example by taking action if a group of neighborhood children are skipping school, or by organizing to prevent closure of a fire station. The first application of this concept was to crime (see Sampson, Raudenbush, and Earls, 1997), but much of the subsequent work has focused on the relationships among collective efficacy, investments in children, and children's outcomes. The pay-offs to understanding the factors that promote investments in children are large because health status and cognitive skills in adolescence and adulthood depend in part on

investments early in life, the absence of which is difficult to compensate for later (Carneiro and Heckman 2003; Shonkoff and Phillips 2000: 6).

In this paper I test for a causal relationship between collective efficacy and use of preventive health care by children under five. At these ages health interventions such as growth monitoring, micronutrient supplementation, and immunizations are critical for short- and long-term health and developmental outcomes. I extend the existing literature in three ways.

First, I operationalize the concept of collective efficacy by developing a measure that reflects the particular behavioral manifestation through which the energy of collective efficacy is harnessed to achieve a specific goal. Most previous work, on the other hand, measures collective efficacy from perceptions and attitudes of neighborhood residents regarding social processes. That work documents a correlation between perceived neighborhood capacity for action and various outcomes, but leaves unspecified the process through which collective efficacy is activated to achieve the intended effect. Identifying how collective efficacy is activated is an important and complementary next step in understanding the phenomena of collective efficacy and the precise routes through which it operates to change outcomes for individuals.

Second, the study site for my analysis is Indonesia, a developing country, rather than an urban context in the United States. An important component of testing a theory is examining its relevance across multiple settings. This paper represents the first test of collective efficacy theory in a resource-constrained setting outside the urban United States. The study also speaks to a growing interest regarding the question of how norms of social cooperation and cohesion thought to characterize some developing settings can best be harnessed to promote development objectives (Woolcock 1998; Woolcock and Narayan 2000; Krishna 2001), and to how such norms affect health behaviors and health outcomes (Kawachi 1999).

Third, the longitudinal nature of the data I use, combined with its timing, helps to go beyond correlations and establish a causal relationship between collective efficacy and investments in children. Rather than focusing on a relationship at a point in time, I use panel data from individuals and communities, collected as part of the 1997 and 1998 rounds of the Indonesia Family Life Survey (IFLS). The 1997 survey was conducted during a period of prosperity, just before the onset of the major economic crisis that enveloped Southeast Asia in the late 1990s. The economic crisis unexpectedly changed the availability of money and time for community activities. This element of surprise, similar to a controlled experiment, provides a window into how neighborhood attributes affect individual behaviors and outcomes, free (under certain assumptions) from biases stemming from the selection of individuals into particular types of neighborhoods in the first place.

THEORY AND PREVIOUS RESEARCH

My primary goal is to test the theory of collective efficacy. Developing a test, however, requires confronting the well-known issue of selectivity into neighborhoods. Accordingly, in this section I review not only the theory of collective efficacy and previous efforts to test it empirically, but also the most intractable methodological difficulties associated with such tests.

Theory

Collective efficacy theory posits that within a community, mutual trust and shared expectations for intervening on behalf of the common good lead to a collective capability to undertake actions that achieve intended effects (Sampson, Raudenbush, and Earls 1997; Sampson and Raudenbush 1999). Collective efficacy involves purposive social action on the part of community members and exists relative to specific tasks (Sampson and Raudenbush 1999; Sampson 2003). Variation in outcomes across neighborhoods, then, is driven in part by

differential neighborhood ability to activate processes that realize the common values of residents.

The concept of collective efficacy builds on the idea of social capital. In early formulations social capital is described as an extraindividual resource arising from various aspects of social organization, such as "a durable network of more or less institutionalized relationships" (Bourdieu 1986) or, with respect to child well-being, a "normative structure that insures that unattended children will be 'looked after' by adults in the vicinity" (Coleman 1988). The emergence of social capital theory has been accompanied by excitement about its potential for clarifying the impact of resources embedded in social relationships on outcomes for individuals and collectivities, but also by criticism and confusion with respect to its conceptualization, measurement, and to the development of strategies for testing its causal effects (Portes 2000; Lin 2001: 1; Bankston and Zhou 2002).

The key distinction between collective efficacy and most conceptualizations of social capital is that social capital is concerned with the "stocks" of social resources residing in personal and organizational networks, whereas collective efficacy emphasizes group members' expectations for and engagement in purposive social action undertaken to achieve desired outcomes (Sampson et al. 1999).[1] The social networks and cohesion that form the basis of social capital play a role in creating the conditions necessary for the emergence of collective efficacy, but efficacy is a process activated with an eye towards achieving particular tasks.

Collective efficacy theory has developed partially in response to the now relatively extensive empirical literature documenting correlations between structural aspects of neighborhoods, such as socioeconomic composition, and various outcomes related to health and

[1] Portes and Sensenbrenner (1993), however, redefine social capital as "expectations for action within a collectivity that affect the economic goals and goal-seeking behavior of its members"—a definition that is largely consistent with the idea of collective efficacy (Sampson et al. 1999; Sampson 2001).

well-being (for recent reviews see Robert 1999; Macinko and Starfield 2001; Diez Roux 2001; Earls and Carlson 2001; Pickett and Pearl 2001). This research demonstrates a strong association between community attributes and individual outcomes, but reveals little about the social mechanisms through which the link arises. As argued by Jencks and Mayer (1990), however, neighborhood effects most likely stem from social processes involving collective aspects of community life. Collective efficacy theory speaks to the question of what social processes are involved.

Empirical Work on Collective Efficacy

Collective efficacy is a higher order concept. Empirical testing of the theory of collective efficacy requires first the conceptualization and construction of a measure that captures collective capacity, second the demonstration of an association between that measure and some other outcome that collective efficacy is hypothesized to affect.

In this section I limit my discussion to the empirical work that focuses most explicitly on the concept of collective efficacy.[2] This research draws on unusually rich data from the Project on Human Development in Chicago Neighborhoods (PHDCN). As part of the PHDCN almost 8,800 residents from 343 neighborhoods were interviewed and asked a series of questions on topics such as the extent to which neighbors trusted one another and how they interact, participation in voluntary organizations, and, given various scenarios, whether residents in the neighborhood would intervene to change a developing situation.

In a seminal paper, Sampson and colleagues use these questions to generate neighborhood-level measures of social cohesion and informal social control (Sampson, Raudenbush, and Earls 1997; see also Sampson and Raudenbush 1999). They document a

[2] Some work considers links between various measures of social capital and different health outcomes (Kawachi et al., 1997; Kawachi et al., 1999), but because this work is not explicitly concerned with the more specific concept of collective efficacy, I do not review it here.

negative neighborhood-level association between these measures and several measures of violence, including homicide.

Other work using the same data has focused on outcomes for children. Morenoff (2003) and Buka et al. (2003) examine the relationship between collective efficacy and birth weight. Morenoff creates a neighborhood-level index measuring exchange and voluntarism based on questions about such things as sharing advice and participation in local voluntary organizations such as religious groups and neighborhood watch. The correlation between this index and birth weight is positive and statistically significant, even in the presence of numerous individual- and family-level characteristics and other neighborhood-level characteristics that capture structural aspects and the rate of violent crime.

Buka and colleagues (2003) create a scale measuring the level of neighborhood support, based on questions about trust and the extent to which neighbors assist one another. This aspect of the neighborhood is also positively associated with birthweight for white mothers, but not for African American mothers.

In these analyses the capacity for collective action is inferred largely from informant perceptions regarding the degree of shared trust, concern, and energy among neighborhood residents. The measures reflect perceived neighborhood capacity, higher levels of which are associated with better outcomes, and the work represents an essential step in testing the theory of collective efficacy. An important aspect of the theory, however, is that underlying neighborhood capacity is *activated* with the goal of producing better outcomes for residents. Existing work does not identify the specific actions and behaviors of residents that arise from neighborhood capacity and exert a direct influence on the outcomes of interest. For example, how does a higher frequency of exchange among neighborhood residents lead to higher birthweight? Are

pregnant women more likely to receive good advice about prenatal care and nutrition? In the literature to date the behaviors that comprise the mechanisms through which latent capacity affects better outcomes have operated in a black box.

A key next step in testing the theory of collective efficacy is to open the black box and pinpoint the behavioral routes through which active engagement on the part of community members produces better outcomes. I develop a measure of collective efficacy based on the actual behaviors of residents rather than on their perceptions of their neighborhood. This measure operates more proximately to the outcome of interest than has been typical in past analyses and illuminates, for a particular context, the precise mechanism through which collective efficacy impacts children's outcomes.

Methodological Considerations in Estimating Neighborhood Effects

Research that attempts to document a causal effect of either collective efficacy or other community features on children's outcomes has been seriously hampered both by methodological difficulties and by lack of detailed contextual data (Raudenbush and Sampson 1999; Frankenberg 2000; National Research Council 2002: 52). There are two key problems: establishing a causal effect of neighborhood attributes on individual outcomes and pinning down the mechanisms through which such an effect operates.

With respect to establishing causality, selection poses a pernicious problem. Individuals with unmeasured characteristics that predispose them to certain outcomes are unlikely to be randomly distributed across neighborhoods (Duncan and Raudenbush 2001; Sampson, Morenoff, and Gannon-Rowley 2002). Instead, they may remain in or move to neighborhoods with attributes thought to cause the outcome of interest. In this case standard regression estimates of the relationship between the neighborhood characteristic and the outcome will be biased.

One approach to this problem is to assign neighborhood characteristics randomly, through a controlled experiment. The "Moving to Opportunity" experiment used this approach, randomly assigning housing project residents to control and treatment groups with different options for relocation, in order to insure that those who move to a new neighborhood are no different, on average, from those who do not. Early results provide convincing evidence of a causal relationship between neighborhood socioeconomic attributes and child health outcomes such as asthma (Katz, Kling, and Liebman 2001).

Harding (2003) combines observational data with propensity score matching (a statistical method for the ex post matching of designated treatment cases to otherwise similar controls) to assess the relationship of neighborhood poverty to pregnancy and schooling outcomes for teenagers. Propensity scoring does not eliminate the possibility of selection bias, but Harding conducts a sensitivity analysis to evaluate the extent to which the relationships he estimates may be biased by unobserved factors that affect both the type of neighborhood in which one lives and the outcomes of interest. His results suggest that children who spend their adolescence in high-poverty neighborhoods have significantly higher chances of dropping out of high school and getting pregnant as a teenager than do children who were observationally similar at age ten but who subsequently grew up in a low poverty neighborhood. He concludes that the estimated effects of neighborhood poverty are quite robust to unobserved characteristics that drive the process whereby children are differentially selected into particular neighborhoods.

Aaronson (1998) uses observational data to examine differences in schooling outcomes between siblings who have grown up in different neighborhoods. Because siblings from the same family are compared, unobserved "family-specific" factors that influence neighborhood choice are held constant—a fixed effects approach to selectivity. He finds that differences

between siblings in the proportion of high-school dropouts in their neighborhoods are associated with differences between siblings in the likelihood of graduating from high school.

Data availability poses another serious stumbling block to assessment of how community features affect outcomes (but see Sampson and Raudenbush, 1999, and Axinn and Yabiku, 2001, for innovative exceptions). Longitudinal data at both the community and household level substantially enhance the ability to make causal inferences regarding neighborhood effects—a point that is emphasized in a recent review of the "state of the art" of neighborhood effects (Sampson, Morenoff, and Gannon-Rowley 2002). However, panel data on both communities and individual-level outcomes are rare.

The typical content of community-level data is also an issue. Most of the research on the United States draws on census data, aggregating up household or individual-level responses to reflect the composition of a census tract with respect to a characteristic such as household poverty or high school graduation. Relatively few studies consider the roles of features integral to the neighborhood itself-- contextual, as opposed to compositional features. This is unfortunate because, as Harding (2003) points out, estimates of the total effect of growing up in poor neighborhoods, for example, reveal nothing about the causal mechanisms through which the effects operate. Similarly, although controlled experiments largely eliminate the problem of selection, they typically do not reveal the mechanisms through which neighborhoods affect outcomes (Smith, 1990; Sampson, Morenoff, and Gannon-Rowley 2002). In the case of the Moving to Opportunity experiment, for example, many neighborhood characteristics changed simultaneously and so it is not clear which aspects of neighborhood improve children's health outcomes.

I use data collected at two points in time from the same individuals, communities, and health facilities. The panel nature of the data supports the estimation of fixed effects models that address unobserved heterogeneity across communities and selection into neighborhoods. Moreover, because the community and facility data are extremely detailed, I am able to pinpoint particular pathways through which the community-level attribute of collective efficacy affects children's use of preventive care. Before describing the data and methodology in detail, however, I turn to a description of the Indonesian context.

COLLECTIVE EFFICACY IN INDONESIAN COMMUNITIES

Although a poor country by international standards, as of the mid-1990s Indonesia was widely heralded as a development success story. From 1967 to 1997 Indonesia's *per capita* gross domestic product (GDP) increased at an average annual rate of almost 5 percent per year. At the same time, Indonesia achieved nearly universal enrollment in primary school, reduced its infant mortality rate by about two-thirds, and experienced a decline in the total fertility rate, from an average of 5.9 children per woman in the late 1960s to 2.8 in 1997.

In part these changes reflect efforts by the national government to design development policies that improve Indonesia's human resource base. Grassroots participation in development activities is an integral component of these policies, many of which build on indigenous ideas of moral obligation and generalized reciprocity within communities (referred to in the Indonesian language as *gotong royong*, or mutual assistance). As a concept, *gotong royong* is similar to the ideas of social capital and collective efficacy described above. The term *gotong royong* encompasses both community "spirit" and the actual work carried out by individuals for the benefit of the collectivity (Bowen 1986).[3]

[3] Indonesia's population consists of different ethnic groups, but the concept of mutual self-help is widespread. As part of the IFLS community survey interviews were conducted with experts in the traditional laws of the area. The

The work, for which individuals are responsible by virtue of community membership, encompasses "neighborly" activities such as helping to raise a roof or to prepare a marriage feast, as well as longer-term projects. Many of these projects are accomplished by local voluntary associations, the formation of which is encouraged by local government, sometimes at the behest of higher administrative levels. These groups exist to accomplish a variety of different tasks, such as guarding the village at night or regularly cleaning public spaces (Grootaert 1999).

One activity of special relevance for young children is the *posyandu*, or "Integrated Service Post," to which I will hereafter refer as the community health post. As a program the health post grew out of a grassroots initiative in Central Java to improve children's health through simple health promotion activities and preventive care (Haliman and Williams 1983; Priyosusilo 1988). The program was established at the national level in the late 1970s (Ministry of Health 1990).

The health post is an activity that takes place once a month. It is organized and staffed by neighborhood volunteers and attended by reproductive-age women and children under five. Typically posts provide four services for children: immunizations, oral rehydration solution (ORS) for children with diarrhea, nutritional monitoring through monthly weighing and nutrition education, and supplementary feeding in the form of a snack prepared by the health post organizers (Frankenberg 1987; Ministry of Health 1990).[4] The posts, which are active one morning per month, are held at the home of a village volunteer or in the village hall and focus on serving children in the immediate neighborhood.[5]

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270 respondents represented more than 15 ethnic groups. Fully 99% reported that an ethic of mutual cooperation was an important tradition, and 97% reported that this ethic still characterized their community.

[4] In addition to the role that the neighborhood volunteers play, health posts are ideally attended by trained health workers from nearby government health clinics as well. The health workers are responsible for keeping the health post stocked with essential supplies and for bringing and administering immunizations.

[5] These observations are drawn in part from fieldwork I have periodically conducted in Indonesia, beginning in 1987.

At the health post, the provision of supplementary food by neighborhood volunteers constitutes a behavior that incorporates multiple dimensions of the concept of collective efficacy. Provision of this food requires not only donations of time and money, but also cooperation and organization on the part of the women in order to decide what is to be made, obtain the ingredients, cook the food, divide it into individual packets, transport it the post, and distribute it to the children.[6] The provision of supplementary food reflects the active engagement of individuals in a process undertaken to accomplish a specific goal—the attraction of children to the health post.

Indonesian villages have been remarkably successful at establishing health posts. As of 1997, for example, over 240,000 posts were in existence, or an average of about four per village (Ministry of Health 1999). In 1998, however, the economic crisis that enveloped much of Southeast Asia created a set of conditions with the potential to undermine the operation of the health post. In January of that year the Indonesian *rupiah* collapsed in value from about 4,800 per US$ to Rp15,000 per US$. Exchange rates continued to fluctuate wildly for the first three quarters of the year and were accompanied by sharp increases in prices (Frankenberg, Thomas, and Beegle 1999; Arndt and Hill 1999: 6). Indonesia's Central Bureau of Statistics put overall annual inflation at about 80 percent in 1998, inflation of food prices at about 120%, and estimated that per capita GDP contracted by 12 percent (Stalker 2000). Wages did not keep pace (Figure 1).

Over the space of a year, an economic crisis, even one as sudden and severe as Indonesia's, is not likely to undermine the social cohesion that creates the capacity for collective action. But such a crisis may well affect the ways in which that capacity manifests itself. When women have less time and money, for example, the effort to supply health posts with

[6] Typically the supplementary food consists of a protein-rich mung green bean porridge.

supplementary food may become unsustainable. To the extent that the provision of supplementary food attracts users, changes in its availability may be accompanied by declines in use of the health post.

The central question I ask in this paper is whether the provision of supplementary food at the health post, a key behavioral manifestation of community collective efficacy, causes greater use of preventive health care by children under five. I turn now to a description of the data, several features of which are quite unusual, and essential to my methodological approach.

DATA

I use data from the Indonesia Family Life Survey. The IFLS represents 83 percent of the Indonesian population and contains information on over 30,000 individuals living in 321 enumeration areas.[7] IFLS1, conducted in 1993, interviewed a total of 7,224 households (Frankenberg and Karoly 1995). IFLS2 was fielded in 1997 with the goal of reinterviewing all households that participated in IFLS1. IFLS2 succeeded at interviewing 94 percent of IFLS1 households and 91 percent of target respondents (Frankenberg and Thomas 2000).

By January, 1998 it was clear that the economic downturn gripping much of Asia would not spare Indonesia. To provide information on the immediate impact of the crisis, another round of the survey was conducted one year after IFLS2. This survey, IFLS2+, interviewed a 25 percent sub-sample of IFLS households in 90 of the 321 original IFLS enumeration areas. IFLS2+ successfully interviewed over 98 percent of target households and 95 percent of target respondents.

[7] An enumeration area is a unit similar to a census block, the boundaries of which are delineated by Indonesia's Central Bureau of Statistics.

The sample of enumeration areas for IFLS2+ was drawn in two stages. First, to reduce costs, 7 of the original 13 IFLS provinces were selected.[8] Second, within these provinces, enumeration areas were purposively selected to match the IFLS sample as closely as possible. The households selected for IFLS2+ cover the full spectrum of socioeconomic status and economic activity represented in the larger sample.

The 1997 and 1998 household survey questionnaires contain information on characteristics of the household, such as its demographic composition and levels and patterns of spending (which allows measurement of economic resources). Each individual in the household provides detailed data on a range of topics as well.[9] For this paper I draw particularly on the information on children's use of health care.

All waves of the IFLS contain extensive information on the villages and municipalities in which individuals reside. Within each community we conduct interviews with the elected community leader and the head of the community women's group. These individuals are selected because their duties require them to be knowledgeable about their communities.[10]

In addition, up to twelve providers of health and family planning services and up to eight schools associated with each community are interviewed as well. In 1997 the health facilities were selected for interview from lists compiled from household survey respondents' answers to questions about knowledge of government and private providers and of community health posts. In each community the most frequently mentioned government and private providers and health

[8] These provinces were West Nusa Tengarra, Central Java, Jakarta, West Java, South Kalimantan, South Sumatra, and North Sumatra.

[9] Individuals age 11 and older answer the questions themselves, unless they are unavailable for three consecutive attempts at contact (at which point a proxy is interviewed). Data on individuals age 10 and below are collected from the child's parent or primary caretaker.

[10] In Indonesia villages and municipalities are the lowest administrative level at which civil servants are recognized. A village/municipality contains multiple enumeration areas, but enumeration areas do not span village/municipality boundaries. In this paper I use the term *community* interchangeably with the term *village* to designate both villages and municipalities.

post were interviewed, and additional providers and posts listed by the household respondents were selected at random.[11]

In 1998 interviewers were instructed to reinterview the facilities interviewed in 1997. If a facility could not be recontacted, interviewers added a new facility based on a recommendation from the community leader. Based on information from community leaders, all of the 90 IFLS communities analyzed in this paper have at least one health post. Community interviewers collected data from an average of two health posts per community.

COMMUNITY HEALTH POSTS AND THEIR USE

Between 1997 and 1998 aspects of the health post operation that require an ongoing commitment of energy and funding may well have deteriorated given the pressures of the economic crisis. The provision of supplementary food is one of those aspects that originates from community volunteers. Other aspects involve the role played by local health center staff in attending the health post and providing supplies such as growth monitoring cards and oral rehydration solution.

Measures of these factors, in 1997 and in 1998, are presented in Table 1. In 1997, in most communities health posts provide supplementary food and have supplies in stock.[12] Between 1997 and 1998, however, significant declines occur in the frequency with which these are offered. For example, in 1997, supplementary food was provided at health posts in 92% of the communities. One year later supplementary food was provided in only 83% of

[11] By sampling from a list of providers compiled from household respondents, we avoid imposing an arbitrary boundary--- in each community the geographic area from which the facilities are drawn is the area that is relevant for a random sample of individuals (those who respond to our household survey) who live there. The facility need not be located within the administrative boundary that defines the village, although in many cases it is. Our methodology is similar to that used by the United States Bureau of Labor in selecting stores at which to collect price data for the consumer price index, where the goal is to sample stores that represent the places where consumers buy particular products.

[12] A community is characterized as providing supplementary food or having a particular supply if it is available from at least one of the health posts interviewed as part of the facility survey.

communities—a statistically significant decline of more than 10 percent. This decline suggests that during the crisis not all communities were able to maintain the behaviors associated with collective efficacy that were possible before the crisis.

The fraction of communities in which at least one health post had growth monitoring cards also declined significantly, as did the fraction with ORS. The changes in these attributes suggest that health centers were less able to keep the posts supplied during the crisis, although the frequency of supervision visits from health center staff did not change.

My primary interest is in assessing the role that collective efficacy, as measured by the behavior of providing supplementary food, plays in children's use of the health post. The provision of supplementary food, however, may reflect aspects of the community other than the extent of collective efficacy for children. If these other features are also determinants of children's use of health posts, they must be taken into account. For example, volunteers in poor communities, or in communities particularly hard hit by the economic crisis, may not be able to marshal the resources to provide supplementary food at health posts. At the same time, parents in these communities may not have time to take young children to the health posts. The broader health service environment may matter as well. The presence of a health center that is nearby and that offers high quality maternal and child health services, may foster both community commitment to maintaining health posts and mothers' enthusiasm for bringing their children to the health post.

I use the IFLS community data to examine the correlates of the provision of supplementary food in 1997, in 1998, and of change in the provision of supplementary food between 1997 and 1998. For the cross-sectional regressions, the provision of supplementary food is measured with a dichotomous indicator and a logistic regression is estimated. For the

change regression, the cessation of supplementary food is modeled with multinomial logistic regression, in which the reference category is whether food was provided both years. The other possibilities (begin providing food and provision of food in neither year) are included in the regression but the results are not shown because the number of communities in these two categories is very small.[13]

I include as regressors measures of the economic and health services environment. I measure economic resources in the community with the IFLS information on household expenditures. I calculated the amount of spending per month (in 1997 *rupiah*) for each household and divided this number by household size to create a *per capita* measure of economic resources. I then averaged this number across all the households in the community. Finally, to diminish the influence of outliers, I took the natural log of mean expenditures in the community. In the regressions, the (natural log of) expenditure level is captured by a piecewise linear spline, with a knot at the median. This specification allows the relationship between expenditures and the provision of supplementary food at health posts to vary above and below the median.

In the regression for change in the provision of supplementary food, I also control for the magnitude of the economic crisis. Specifically, I include the change between 1997 and 1998 in (the natural log of) per capita expenditures, averaged across all households in the community. The larger this number, the larger the decline in expenditures within the community between 1997 and 1998. Mean spending levels dropped from just above Rp. 200,000 per month in 1997 (about $85) to just above Rp. 150,000 per month (about $63)—testimony to the effects of the economic crisis.

I also control for two features of the health service environment. Proximity to a government health center is captured with a measure of distance (in kilometers) from the

[13] Four communities added supplementary food, while only three did not provide supplementary food in either year.

community center to the nearest public health center in 1997 (the average is 1.1 km). Quality of government health centers is captured by a scale of service quality, averaged across the health centers interviewed for each community. The scale ranges from 0 to 13 and is constructed by summing dichotomous indicators of the provision of various services, pieces of equipment, and lab tests relevant to the provision of maternal and child health services. The average value of this scale fell from 10 to 9.7 between 1997 and 1998—a change that is not statistically significant.

The regression results are presented in Table 2. They reveal several strong links between community characteristics and the behavioral manifestation of collective efficacy reflected in the provision of supplementary food. For example, in communities in which average expenditure levels are below the median, increasing expenditures are associated with a greater likelihood that supplementary food is provided in both 1997 and 1998. The coefficient is considerably larger in 1998. Additionally, below the median, increases in the levels of average per capita expenditure are also associated with a lower probability of stopping the provision of supplementary food between 1997 and 1998. Moreover, the magnitude of the economic crisis appears to be related to change in the provision of supplementary food between 1997 and 1998. The greater the decline in average spending levels, the greater is the likelihood that a community ceased providing supplementary food between 1997 and 1998.

With respect to the measures of the health service environment, distance to the nearest government health center is unrelated to supplementary food provision. In 1997, however, supplementary food is more likely to be provided at health posts in communities in which the government health centers provide relatively high quality maternal and child health services.

Health center quality is unrelated to the provision of supplementary food in 1998, or to the change in the provision of supplementary food.

In sum, the provision of supplementary food at health posts is correlated with other aspects of communities that may also affect children's use of health posts. It is, therefore, important to take these other factors into account in arriving at an estimate of the impact of the provision of supplementary food on children's use of health posts. Before describing the methods that I used in detail, however, it is useful to present statistics on the extent to which health posts are used by the children who are targets for their services.

The Indonesia Family Life Survey collected data on use of health care in the four weeks preceding the 1997 interviews and the 1998 interviews. Based on these data, for children under five, use of health posts in the month before the survey dropped by almost half, falling from 48% to 28% in the space of just one year (Table 3). This change does not reflect a substitution of other types of services, as use of neither public nor private services increased significantly (and in fact use of public services appears to have fallen). One can also examine the experience of individual children over time. Fully one-third of children who used a health post in 1997 stopped using a health post in 1998.

These dramatic declines in use of health posts by 1998 are surprising and disconcerting, given that health posts provide free preventive services at convenient locations and were widely used in 1997. I turn now to the question of whether collective efficacy is related to these patterns.

METHODS

In addition to the problems of selectivity discussed above, a statistical approach to estimating a causal relationship between a community attribute and an individual-level outcome

needs to address the multilevel nature of the data. If the data are collected through interviews with multiple individuals from each community, observations on individuals from the same community will not be independent. One approach to this problem is to adjust the estimated variances and covariances for clustering at the community level, using extensions of methods developed by Huber (1967) and White (1980).

Hierarchical linear models (also known as random effects or random coefficients models) represent another approach to clustering. A two-level hierarchical model includes a level-1 model for individual outcomes as a function of individual-level covariates, and a level-2 model in which the level-1 intercepts (and in some applications the level-1 slopes) are allowed to vary as a function of community characteristics and a random error component (Mason 2001, Raudenbush and Bryk 2002). These models assume that the level-1 and level-2 errors are orthogonal to one another, and to all individual and community covariates.

Fixed effects specifications relax the assumptions of orthogonality by the inclusion of a term that is conceptually equivalent to a community-level dummy variable. Because this term accounts for all variation, both observed and unobserved, at the community-level, one cannot use a fixed-effects approach to estimate a main effect of community characteristics with cross-sectional data. If data are available for the same communities for more than one period of time, however, one can examine how change in community characteristics is related to change in outcomes, net of the fixed community-specific effect. The fixed effect accounts for the fact that certain individuals may select to live in communities with a variety of features, not all of which can be measured, that contribute to the outcome of interest and which should therefore be controlled.[14] Fixed effects methods have been used extensively in the program evaluation

[14] By definition fixed effects models do not account for unobserved features of communities that change over time, only for those that are constant.

literature, and are becoming increasingly prominent in the sociological literature (Heckman and Robb 1985; Frankenberg and Thomas 2001; Conley and Springer 2001, Western 2002).

If data are available from the same individuals at more than one point in time, change over time for a particular individual can be related to change in community characteristics, net of fixed characteristics of the individual as well as of the community. This type of model addresses a slightly different aspect of selection: individuals with unobserved characteristics that predispose them to a particular outcome may disproportionately select to live in communities with certain attributes. Individual-level fixed effects models control for all characteristics of individuals that are fixed over time, so the relationship between the community attributes and the individual outcomes will no longer be biased by the unobserved individual-level factors.

In the results presented below, I use several strategies to address the multilevel nature of the data. First I estimate cross-sectional logistic regressions of children's use of health posts in 1997 and 1998.[15] In these regressions the dependent variable is a dichotomous indicator of whether a child visited a health post in the month before the interview. The key right-hand side variable is the measure of collective efficacy for children: whether supplementary food is provided at health posts within the community.

The models also include community-level attributes that are shown in Table 2 to be correlated with the provision of supplementary food and may be correlated with use of the health post. These are (the log of) the mean expenditure level in the community, which captures economic resources, and the measure of the quality of maternal and child health services at the government health centers that are accessible to the community.

[15] Of the children under five who were interviewed in 1997, 19 moved to a new community by 1998. These children are not included in the analysis because we have no data on the communities to which children moved.

Two other community-level attributes are included. As discussed previously, communities in Indonesia are encouraged to establish a number of private voluntary groups oriented toward health and education. I therefore include a count of the number of these groups.[16] Inclusion of this variable helps distinguish the role of task-specific collective efficacy activated to provide supplementary food and thereby encourage use of preventive care from a more general concern for health and educational well-being.

To capture other aspects of the quality of the health post that reflect involvement on the part of the health center staff, I include an indicator that takes on a value of zero if all the health posts in the community are out of both growth monitoring cards and oral rehydration solution, one if at least one post has one of these items, and two if both items are available at health posts within the community (recall that shortages of these items were more common in 1998 than in 1997). Finally, the regressions include indicators of whether the community is in a rural or urban area and the province in which the community is located.

Because children's use of the health post may differ by demographic and socioeconomic features, I control for these features by constructing measures of the characteristics of the individual child and his or her family. Dichotomous variables are used to distinguish male from female children and mothers who a primary school education or less from those who have more schooling (about one-third of the children have mothers with more than a primary school education). I also control for the child's age with variables indicating whether the child is two or three, or four years old, relative to zero or one year old (on average children in the analysis are about two). Finally, I include an indicator of whether the child is from a relatively poor household (defined as one that falls in the bottom third of the expenditure distribution).

[16] The variable is constructed from questions asked to the community leader and to the head of the village women's group about the existence of groups focusing on children's cognitive development, family planning, health insurance, youth activities, library services, neighborhood improvement, and adult literacy.

The analysis just described treats each year of data as a separate cross-section. I also pool the two years of data. In the regressions on the pooled data set, I estimate year-specific coefficients for the provision of supplementary food and include a main effect for whether the year is 1998. I estimate three specifications with the pooled data. The first specification is a logistic regression in which the standard errors are adjusted for community-level clustering using a Huber correction. The second specification includes a community-level random effect. The third specification includes a community-level fixed effect.

Although the pooled estimates take advantage of having data from two years, they do not exploit the fact that most individuals were interviewed in both years. For these individuals I go on to examine change in health post use over time. Among the 499 panel respondents, 33% stopped using a health post in 1998, 6% started using a health post, 18% did not use a health post in either year, and 43% used a health post in both years (Table 3). I estimate a multinomial logistic regression of change in health post use in which the dependent variable indicates to which of these four groups the child belongs. This specification implicitly includes an individual-level fixed effect, because I am examining change over time for an individual. Standard errors are adjusted for community-level clustering.

RESULTS

Regression results from the cross-sectional and pooled data are presented in Table 4. The first two rows of the table contain the results for the measure of collective efficacy, provision of supplementary food in 1997 and 1998. The first column presents the results from the cross-section models for 1997, the second column for 1998. In these models clustering of the

individual observations within communities is accounted for by adjusting the standard errors with a Huber-type correction.[17]

In 1997 the coefficient for the provision of supplementary food is positive (0.18), but it is not statistically significant. In 1998 the coefficient for the provision of supplementary food is more than three times larger (0.65), which translates into a 92% increase in the odds of health post use when supplementary food is provided. This effect is marginally significant (p=.10). These results suggest that collective efficacy, as indicated by the provision of supplementary food, serves to promote use of the health post in 1998 but not in 1997.

This suggestion is confirmed by the pooled estimates presented in columns 3-5. In 1998, but not in 1997, the odds that a child uses the health post are significantly greater in communities in which supplementary food is provided at the health post than in communities at which it is not. The coefficient for 1998 varies in size and significance across the specifications from 0.53 (p=.19) to 0.68 (p=.03). These coefficients imply that when supplementary food is provided the odds that a child uses a health post in 1998 rise between 66% and 97%. In other words, collective efficacy exerts a strong effect on use of community health posts by the average child in 1998, but does not influence use in 1997.

Across the three specifications the coefficients for collective efficacy and for health post supplies are similar, but they differ in size and statistical significance. To decide on a preferred specification I calculate Hausman statistics (presented in the last row of the table). Based on the Hausman test, the null hypothesis of no systematic differences between the logistic regression and the random effects specification (columns 3 and 4) cannot be rejected. I also estimate a Hausman statistic to compare the fixed effects specification to the random effects specification

[17] Because a Hausman test yielded no evidence of a systematic difference between the random effects specification and the logistic specification with robust standard errors, I present only the results from the latter more efficient specification.

(columns 4 and 5). In this case the null hypothesis of no systematic differences between the fixed effects specification and the random effects specification is rejected and the fixed effects specification is preferred on consistency grounds.

Among the community-level features, the only ones that affect children's use of health posts are the measures of collective efficacy and health post supply availability (in the random- and fixed-effects specifications, a one unit increase in the supply scale increases the odds of use by 65-70%). These effects are robust to controls for other community-level unobservables. The coefficient on the variable measuring the number of human capital-oriented private voluntary associations is close to zero and is not statistically significant. The same is true for the measures of community-level average per capita expenditures and quality of maternal and child health services at government health centers.

Communities in which collective efficacy manifested itself in the provision of supplementary food in 1998 were better able to maintain children's use of health posts during the economic crisis, but it does not appear that, for the average child, this manifestation of collective efficacy affects use of health posts in 1997. However, the benefits of collective efficacy may vary across children by age or socioeconomic background. I test this conjecture by estimating the cross-sectional models with a community-level fixed effect and with terms for the interactions between the provision of supplementary food and indicators of age, maternal education, and level of economic resources in the household. Conceptually such a specification asks whether, within communities, the effect of collective efficacy on use of preventive care differs for children with different characteristics.

It turns out that although the effect of supplementary food on use of the health post in 1997 is insignificant when averaged across all children, it is positive for two subgroups of

children (Table 5). Specifically, the provision of supplementary food significantly encourages attendance for children whose mothers have less than a primary school education and for children who are from relatively poor households (p=0.07).

In 1998 the effect of collective efficacy on use of the health post does not vary by socioeconomic status, but it does vary by the child's age. The provision of supplementary food has a more positive impact on use by children above the age of one than on use by children between the ages of zero and one. The difference is statistically significant for children who are two and three years old (p=0.08), but not for children who are four years old (the coefficient on the interaction term is large but imprecisely estimated).

I turn now to the question of whether individual transitions in use of health posts are related to collective efficacy. Table 6 displays the results from the multinomial logit specification, which presents the results for the choice to stop visiting a health post in 1998 and for the choice not to visit a health post in either year, relative to visiting a health post in both years.

The odds that children will stop using a health post in 1998 are 62% lower for children in communities in which supplementary food was provided in 1998 than for children in communities in which it was not (p=0.09). The odds that children will use a health post in neither year are about 75% lower in communities in which supplementary food was provided in 1998.

DISCUSSION

The results presented in Tables 4-6 provide strong evidence that collective efficacy for children, manifested in organizational capacity, time, and money director toward the provision of supplementary food at community health posts, can encourage use of preventive health care. In

1997, before the crisis, collective efficacy encourages use of preventive care among children of mothers with low levels of education, and among children from poor households. During the crisis, in 1998, use of preventive care is higher for all children in communities in which members organized themselves to provide health posts with supplementary food. In other words, the specific manifestation of collective efficacy that I consider, provision of supplementary food, is particularly attractive to relatively disadvantaged mothers in 1997, but is an attractive feature for all mothers in 1998—when household resources were stretched thin because of the economic downturn.

The finding is exceedingly robust. The importance of collective efficacy emerges in the presence of a number of other controls for community-level features, including measures of the magnitude of the economic crisis, provision of supplies at the health post, and the quality of maternal and child health services at government health centers. The importance of collective efficacy also persists in the presence of a community-level fixed effect. The fixed effect controls for all time-invariant unobserved features of neighborhoods, and therefore helps address one of the primary criticisms of research on neighborhood effects: that the attribute of interest is simply correlated with other community features that have not been included in the regression (Duncan and Raudenbush 2001).

Another criticism of research based on cross-sectional data is that neighborhood "effects" simply reflect the fact that individuals with certain predisposing characteristics select themselves into neighborhoods with particular attributes (Duncan and Raudenbush 2001; Sampson et al. 2002). I examine whether collective efficacy protects individual children from dropping out of preventive care use over time, which effectively holds constant whatever characteristics brought

the children or their families to the community in the first place. The provision of supplementary food in 1998 is associated with lower odds of dropping out of preventive care use.

With respect to documenting causal effects of social behaviors on children's outcomes, three features of the data I use stand out as particularly important. First, because the data are longitudinal, I am able to exploit changes over time in the community attributes and behaviors of interest. Although the value of longitudinal data for establishing contextual effects has long been recognized (see Sampson et al. 2002, for a discussion), such data remain relatively rare.

Second, the timing of the two data collection efforts spanned an unexpected economic downturn. This downturn served to introduce changes in community characteristics that were both exogenous and larger in magnitude than one would typically observe in one year.

Third, the community data I use are extremely detailed. This allows me to explore the correlates of collective efficacy, and to include as covariates time-varying community features such as levels of economic resources. Inclusion of these community attributes decreases the likelihood that the relationship between collective efficacy and children's use of preventive care arises spuriously as a result of omitted community features that are changing over time (recall that the community fixed effect accounts only for omitted community attributes that are static over time).

I argue that in this context collective efficacy manifests itself through the behavior of providing supplementary food, which in turn causes children to use the health post. Could the causal ordering work in the opposite direction? That is, could children's cessation of health post use cause community volunteers to cease providing supplementary food? Three factors argue against this interpretation.

First, if this were the case, then health posts that children have stopped attending should be better stocked with growth cards and oral rehydration solution, because children are not using them up. In other words, the coefficient associated with the measure of supply availability should be negative. Instead I find that the relationship is positive: use of health posts is more likely when supplies are available.

Second, the interaction terms reveal that collective efficacy is not of equal significance for all children. Before the crisis, collective efficacy is an important factor in promoting use of preventive care among children whose mothers have relatively little education and among children from poor households. During the crisis collective efficacy makes a particular difference for older children. In light of the significance of the interaction terms, reverse causality can explain the results only if it is lack of use by specific subsets of children that causes the community volunteers to stop providing supplementary food. This seems farfetched.

Finally, in 1998 we asked health post volunteers to describe the biggest problems they faced at the health post over the last year. The majority of the responses concerned the inadequacy of resources within the community for continued operation of the post, rather than lack of interest in the post on the part of mothers and children.

The finding that neighborhood features are important for the health care behaviors of young children is consistent with the work of Morenoff (2003) and Carter and Maluccio (2003). Both of these papers document an association between a measure of neighborhood-level participation in private voluntary organizations and the health outcomes of young children.

CONCLUSIONS

In this work I show that in Indonesia a particular behavioral manifestation of collective efficacy affects children's use of preventive health care. I thereby advance the literature on

collective efficacy theory in three ways. First, rather than measuring collective efficacy based on residents' perceptions of factors such as trust and cohesion, I have considered a behavioral aspect of communities: whether residents cooperate and work together to provide supplementary food. The measure reflects the active engagement of individuals in a process, the provision of supplementary food, undertaken to accomplish a concrete goal, the attraction of children to preventive health care use. The measure is both consistent with the definition of collective efficacy as "a task-specific construct that relates to the shared expectations and mutual engagement by adults in the active support and social control of children" (Sampson et al. 1997; Sampson et al. 1999) and sufficiently proximate to the outcome of interest so as to clarify the mechanism through which underlying capacity is actually harnessed to improve children's outcomes.

Second, by situating my work in the developing country of Indonesia, rather than urban America, I am able to examine the theory's relevance in a different type of a resource-constrained setting than has previously been considered. The evidence does suggest that collective efficacy operates in Indonesian communities. Finally, the availability of detailed longitudinal data from both individuals and communities, allows me to use statistical methods well-suited for addressing issues of causality that have hampered previous efforts to document "neighborhood" effects. Not only does collective efficacy exist, it manifests itself in ways that affect investments in children.

References

Aaronson, Daniel. 1998. "Using Sibling Data to Estimate the Impact of Neighborhoods on Children's Economic Outcomes." *Journal of Human Resources.* 33:915-46.

Arndt, H.W. and Hal Hill. 1999. Southeast Asia's Economic Crisis : Origins, Lessons, and the Way forward. Singapore: Institute Southeast ASEAN Studies.

Axinn, William G. and Scott T. Yabiku. 2001. "Social Change, the Social Organization of Families, and Fertility Limitation." *American Journal of Sociology*. 5(March 2001): 1219-61.

Bankston, Carl L. and Min Zhou. 2002. "Social Capital as Process: The Meanings and Problems of a Theoretical Metaphor." *Sociological Inquiry*. 72(2): 285-317.

Bowen, John. 1986. "On the Political Construction of Tradition: *Gotong Royong* in Indonesia." Journal of Asian Studies XLV(3): 545-561.

Bourdieu, Pierre. 1986. "The Forms of Capital." Pp. 241-58 in *Handbook of Theory and Research for the Sociology of Education*, edited by J. Richardson. New York: Greenwood Press.

Buka, Stephen L, Robert Brennan, Janet Rich-Edwards, Stephen Raudenbush, Felton Earls. 2003. "Neighborhood Support and the Birth Weight of Urban Infants." *American Journal of Epidemiology.* 157(1): 1-8.

Carneiro, P. and J. Heckman. 2003. "Human Capital Policy." Chapter 2 in *Inequality in America: What Role for Human Capital Policies*? Heckman, James and Alan B. Krueger (ed). Massachusetts Institute of Technology.

Carter, Michael R. and John A. Maluccio. 2003. "Social Capital and Coping with Economic Shocks: Evidence from Kwa-Zulu Natal, South Africa." *World Development* 31(7): 1147-1163.

Coleman, James. 1988. "Social Capital in the Creation of Human Capital." *The American Journal of Sociology.* 94: S95-S120.

Conley, Dalton and K Springer. 2001. "The Welfare State and Infant Mortality." *American Journal of Sociology*. Volume 106. November.

Diez Roux, Ana. 2001. "Investigating Neighborhood and Area Effects on Health." *American Journal of Public Health.* 91(11): 1783-1789.

Duncan, Greg J. and Stephen W. Raudenbush. 2001. "Neighborhoods and Adolescent Development: How Can We Determine the Links?" Chapter 8 in *Does it take a village? Community effects on Children, Adolescents, and Families.* Booth, A. and A. Crouter (eds). Mahwah, NJ: Lawrence Erlbaum Associates.

Earls, Felton and Mary Carlson. 2001. "The Social Ecology of Child Health and Well-being." *Annual Reviews of Public Health.* 22:143-66.

Frankenberg, Elizabeth. 1987. "Direct Costs of the Posyandu: A Model for Analysis." Mimeo. Prepared for USAID/Jakarta. 1987.

Frankenberg, Elizabeth and Lynn Karoly. 1995. "The 1993 Indonesian Family Life Survey: Overview and Field Report." Santa Monica: RAND.

Frankenberg, Elizabeth, Duncan Thomas, and Kathleen Beegle. 1999. The Real Costs of Indonesia's Economic Crisis: Preliminary Findings from The Indonesian Family Life Survey. Santa Monica: RAND.

Frankenberg, Elizabeth and Duncan Thomas. 2000. "The Indonesia Family Life Survey (IFLS): Study Design and Results From Waves 1 and 2." Santa Monica: RAND.

Frankenberg, Elizabeth. "Community and price data in the Living Standards Measurement Surveys." 2000. In *Designing Household Survey Questionnaires for Developing Countries: Lessons from Fifteen Years of LSMS Experience*. Grosh, Margaret and Paul Glewwe (editors). The World Bank.

Frankenberg, Elizabeth and Duncan Thomas. 2001. "Women's Health and Pregnancy Outcomes: do Services Make a Difference" *Demograpy*, Volume 38-Number 2 : 253-265.

Grootaert, Christian. 1999. "Local Institutions and Service Delivery in Indonesia." Local Level Institutions Working Paper No. 5. The World Bank.

Haliman, Arif and Glen Williams. 1983. "Can People Move Bureacratic Mountains? Developing Primary Health Care in Rural Indonesia." *Social Science and Medicine*. 17(19): 1449-1455.

Harding, D. 2003. "Counterfactual Models of Neighborhood Effects: the Effect of Neighborhood Poverty on Dropping Out and Teenage Pregnancy." *American Journal of Sociology*. 109(3): 676-719.

Heckman, J.J. and R. Robb. 1985. "Alternative Methods for Evaluating the Impact of Interventions." Pp. 156–245 in *Longitudinal Analysis of Labor Market Data,* edited by J.J. Heckman and B. Singer. New York: Cambridge University Press.

Huber, P. 1967. "The behavior of maximum likelihood estimators under non-standard conditions." In LeCam, LM, Neyman J (eds). Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability. University of California Press, Berkeley CA, Vol 1, pp. 221-33.

Jencks, C. and S. Mayer. 1990. "The social consequences of growing up in a poor neighborhood." In L. Lynn and M. McGeary (Eds). *Inner City Poverty in the United States* (pp. 111-186). Washington DC: National Academy Press.

Katz, Larry, Jeffrey Kling, and Jeffrey Liebman. 2001. "Moving to Opportunity in Boston: Early Results of a Randomized Mobility Experiment." *Quarterly Journal of Economics*. 116(2): 607-645.

Kawachi, I., B. Kennedy, K. Lochner, and D. Prothrow-Smith. 1997. "Social capital, income inequality, and mortality." *American Journal of Public Health*. 87: 1491-1498.

Kawachi, I., B. Kennedy, and R. Glass. 1999. "Social capital and self-rated health: a contextual analysis." *American Journal of Public Health*. 89:1197-1193.

Krishna, A. 2001. "Moving from the stock of social capital to the flow of benefits: the role of agency." *World Development*. 29(6): 925-943.

Lin, Nan. 2001. "Building a Network Theory of Social Capital." Chapter 1 in Lin, Cook, and Burt (eds) *Social Capital: Theory and Research*. New York: Aldine de Gruyter.

Macinko, James, and Barbara Starfield. 2001. "The Utility of Social Capital in Research on Health Determinants." *The Milbank Quarterly*. 79(3): 387-427.

Massey, Douglas. 2001. The Prodigal Paradigm Returns: Ecology Comes Back to Sociology." Chapter 2 in *Does it take a village? Community effects on Children, Adolescents, and Families*. Booth, A. and A. Crouter (eds). Mahwah, NJ: Lawrence Erlbaum Associates.

Mason, William M. 2001. "Statistical Analysis: Multilevel Methods." *International Encyclopedia of the Social Sciences*. Pp 14988-14994.

Ministry of Health (MOH). 1990. *Primary Health Care in Indonesia*. Jakarta: MOH.

Ministry of Health (MOH). 1999. *Community Participation on Health (Indonesian Experience)*. Jakarta: MOH.

Morenoff, Jeffrey. 2003. "Neighborhood Mechanisms and the Spatial Dynamics of Birthweight." *American Journal of Sociology*. 2003: 976-1017.

National Research Council. 2002. *Equality of Opportunity and the Importance of Place. Summary of a Workshop*. Ianotta, Joah G. and Jane L. Ross. Steering Committee on Metropolitan Area Research and Data Priorities. Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

Pickett, K. and M. Pearl. 2001. "Multilevel analyses of neighborhood socioeconomic context and health outcomes: a critical review." *Journal of Epidemiology and Community Health.* 55:111-122.

Portes, Alejandro, and Julia Sensenbrenner. 1993. "Embeddedness and Immigration: Notes on the Social Determinants of Economic Action." *The American Journal of Sociology*. 96(6): 1320-1350.

Portes, Alejandro. 2000. "The Two Meanings of Social Capital." *Sociological Forum*. 15(1): 1-12.

Priyosusilo, A. 1988. Health in the Balance: the under-fives weighing program." *Indian Journal of Pediatrics* (Supplement). 55: S88-S99.

Raudenbush, Stephen W. and Robert J. Sampson. 1999. "Ecometrics: Toward a Science of Assessing Ecological Settings, With Application to the Systematic Social Observation of Neighborhoods." *Sociological Methodology*. 29: 1-41.

Raudenbush, Steven W. and Anthony S. Bryk. 2002. *Hierarchical Linear Models: Applications and Data Analysis Methods.* Thousand Oaks, Calif: Sage Publications.

Robert, Stephanie. 1999. "Socioeconomic Position and Health: the Independent Contribution of Community Socioeconomic Context." *Annual Review of Sociology*. 25:480-516.

Sampson, Robert, Stephen Raudenbush, and Felton Earls. 1997. "Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy." *Science*. 277(5328): 918-924.

Samspon, Robert and Stephen Raudenbush. 1999. "Systematic Social Observation of Public Spaces: A New Look at Disorder in Urban Neighborhoods." *American Journal of Sociology*. 105(3): 603-51.

Sampson, Robert, Jeffrey Morenoff, and Felton Earls. 1999. "Beyond Social Capital: Spatial Dynamics of Collective Efficacy for Children." *American Sociological Review*. 64(October): 633-660.

Sampson, Robert. 2001. "How do communities undergird or undermine human development? Relevant Contexts and Social Mechanisms. Chapter 1 in "Does it take a village? *Community effects on Children, Adolescents, and Families*. Booth, A. and A. Crouter (eds). Mahwah, NJ: Lawrence Erlbaum Associates.

Sampson, Robert, Jeffrey D. Morenoff, and Thomas Gannon-Rowley. 2002. "Assessing "Neighborhood Effects": Social Processes and New Directions in Research." *Annual Review of Sociology*. 28:443-78.

Sampson, Robert. 2003. "The Neighborhood Context of Well-Being." *Perspectives in Biology and Medicine* 46(3): S54-S64.

Sampson, Robert, Jeffrey Morenoff, and Thomas Gannon-Rowley. 2002. "Assessing `Neighborhood Effects': Social Processes and New Directions in Research." *Annual Review of Sociology*. 28: 443-78.

Shonkoff, J. and D. Phillips. 2000. *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Washington, D.C.: National Academy Press.

Smith, Herbert L. 1990. "Specification Problems in Experimental and Nonexperimental Social Research." *Sociological Methodology*. 20(1990): 59-91.

Stalker, Peter. 2000. "Beyond Krismon: The Social Legacy of Indonesia's Financial Crisis." Report for UNICEF.
Western, Bruce. 2002. "The Impact of Incarceration on Wage Mobility and Inequality." *American Sociological Review*. 67:477-89.
White, H. 1980. "Maximum Likelihood estimation of misspecified models." *Econometrica*. 48: 817-38.
Wilson, William Julius. 1987. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago: University of Chicago Press.
Woolcock, Michael. 1998. "Social capital and economic development: toward a theoretical synthesis and policy framework." *Theory and Society.* 27: 151-208.
Woolcock, Michael and Deepa Narayan. 2000. "Social capital: Implications for Developmental Theory, Research, and Policy." *The World Bank Researcher*. 15(2): 225-249.

Table 1
Community-level characteristics of the health post environment

	1997	1998	t-statistic (difference between 1997 and 1998)
% of communities in which supplementary food is provided at a health post	93	82	1.83 (0.07)
% of communities in which growth monitoring cards are available at a health post	99	94	1.66 (0.10)
% of communities in which packets of oral rehydration solution are available at a health post	94	87	1.79 (0.07)
Average number of visits made by health center staff to health posts in the community	9.9	9.9	0.16 (0.88)
N	90		

Note: a community is characterized as providing supplementary food or having a particular supply if it is available from at least one of the health posts interviewed as part of the facility survey.

Table 2
Correlates of levels of and changes in provision of supplementary feeding at community health posts

	Supplementary food provided at a health post:		Supplementary food provided at a health post in 1997 but not in 1998 [b]
	1997[a]	1998[a]	
Mean per capita expenditure (ln)			
< median	3.91*	5.19*	-5.68*
	(1.71)	(1.68)	(1.84)
>= median	-0.48	1.52	-1.71
	(1.92)	(2.57)	(2.13)
Mean change in (ln) per capita expenditure			3.21
			(1.84)
Distance to nearest health center (km)	0.34	0.4	-0.28
	(0.45)	(0.29)	(0.31)
Quality of MCH services at health centers (scale)	0.68*	0.03	-0.35
	(0.32)	(0.20)	(0.26)
Constant	-22.14	-22.83	28.45
	(9.21)	(7.80)	(9.38)
Pseudo R^2	0.29	0.28	0.34
$?^2$ test, all covariates	14.2	22.4	43.1
(p value)	0.00	0.00	

N=90 communities. Standard errors in parentheses.
[a] Logistic regression, outcome variable is coded 1 if the supplementary food is offered in at least one of the health posts within the village or township, 0 otherwise.
[b] Multinomial logistic regression. Reference category is that supplementary food was provided in both years. Results for no supplementary food in either year and for gaining supplementary food are not shown.
Expenditure levels and quality of health services are measured in 1997 for columns 1 and 3, in 1998 for column 2. Distance to the nearest health center and the transportation and communication infrastructure scale are measured in 1997.

Table 3
Use of Health Care among Children under Five, 1997 and 1998

	1997	1998	t-statistic (difference between 1997 and 1998)
Use of care in the month before the interview			
% use community health post	48	28	7.52 (0.00)
% use public provider	12	9	1.54 (0.12)
% use private provider	14	14	0.30 (0.77)
N	666	719	
Transitions in use of health posts between 1997 and 1998 (for children interviewed in both years)			
Stop using	33		
Start using	6		
Used in neither year	18		
Used in both years	43		
N	499		

Constructed from questions to caretakers about whether children under five used various types of services in the month preceding the interview.

Table 4
Collective Efficacy and Children's Use of Preventive Care

	Cross-Sectional Estimates		Pooled Estimates		
	Logistic[a] 1997	Logistic[a] 1998	Logistic[a]	Random Effects	Fixed Effects
Supplementary food provided at health posts, 1997	0.18		0.21	0.09	0.04
	(0.3)		(0.34)	(0.37)	(0.41)
Supplementary food provided at health posts, 1998		0.65	0.53	0.62*	0.68*
		(0.39)	(0.32)	(0.31)	(0.32)
Supplies at the health post (scale)	0.70	0.07	0.31	0.50*	0.54*
	(0.45)	(0.24)	(0.2)	(0.22)	(0.24)
Number of human capital programs in the community	0.00	0.04	0.01	-0.01	-0.06
	(0.06)	(0.10)	(0.06)	(0.06)	(0.08)
Quality of MCH services at health centers (scale)	-0.08	-0.15*	-0.1	-0.09	-0.01
	(0.08)	(0.07)	(0.06)	(0.07)	(0.11)
Average per capita income	-0.17	-0.40	-0.2	-0.14	0.2
	(0.23)	(0.36)	(0.22)	(0.23)	(0.35)
Child is 2 or 3 years old[b]	-0.29	-0.79*	-0.54*	-0.60*	-0.59*
	(0.19)	(0.19)	(0.14)	(0.15)	(0.15)
Child is 4 years old[b]	-0.68*	-1.56*	-1.03*	-1.22*	-1.27*
	(0.20)	(0.26)	(0.16)	(0.18)	(0.18)
Child is male	0.16	0.13	0.15	0.15	0.15
	(0.16)	(0.16)	(0.11)	(0.13)	(0.13)
Mother has six or fewer years of education[c]	-0.29	-0.07	-0.19	-0.06	-0.01
	(0.22)	(0.21)	(0.16)	(0.15)	(0.16)
Per capita household expenditures < 33rd%tile	-0.33	-0.43	-0.34*	-0.39*	-0.40*
	(0.23)	(0.25)	(0.17)	(0.16)	(0.16)
Year is 1998			-1.21*	-1.43*	-1.38*
			(0.41)	(0.4)	(0.4)
Constant	0.92	2.97	2.24	1.93	
	(1.56)	(1.89)	(1.39)	(1.37)	
Chi square statistic	50.1	141.7	208.0	137.8	135.8
Hausman test	2.9[e]	3.2[e]	3.1[e]	22.8[f]	

Notes: N is 666 in 1997, 719 in 1998, and 1385 in the pooled regressions. Controls for province and urban residence are included. * p<=.05 [a]Standard errors (in parentheses) are adjusted for clustering at the community level. [b]Reference category is 0 or 1 years of age. [c]Reference category is that the parent has 7 or more years of education. [d]Reference category is that the household's expenditures are in the top two-thirds of the distribution. [e]Tests for a significant difference between the random effects model and the logistic regression. [f]Test for a significant difference between the fixed effects model and the random effects model.

Table 5
Interactions of Collective Efficacy with Demographic and Socioeconomic Attributes

	1997	1997	1997	1997	1997	1998	1998	1998	1998	1998
Age 2-3 * Supplementary Food	-0.05					0.92				
	(0.49)					0.53				
Age 4 * Supplementary Food		0.77					1.07			
		(0.56)					1.10			
Male * Supplementary Food			-0.45					0.64		
			(0.48)					(0.48)		
Mother's ed <7 yrs * Supp. Food				1.35*					0.20	
				(0.58)					(0.57)	
HH pce <33rd %ile * Supp. Food					1.05					-0.40
					(0.57)					(0.54)
Age 2-3 years[a]	-0.33	-0.36	-0.37	-0.37	-0.38	-1.50*	-0.79*	-0.79*	-0.79*	-0.79*
	(0.45)	(0.21)*	(0.21)	(0.21)	(0.21)	0.47*	(0.23)	(0.23)	(0.22)	(0.23)
Age 4 years[a]	-0.85*	-1.48	-0.85*	-0.87*	-0.85*	-1.94	-2.88*	-1.97	-1.96*	-1.97*
	(0.24)	(0.52)	(0.24)	(0.24)	(0.24)	0.33	(1.05)	(0.34)	(0.34)	(0.34)
Male	0.00	0.00	0.37	0.00	0.01	0.42*	0.41*	-0.07	0.41*	0.41*
	(0.18)	(0.19)	(0.43)	(0.19)	(0.19)	0.21	(0.21)	(0.41)	(0.21)	(0.21)
Mother's Education < 7 years[b]	-0.07	-0.08	-0.07	-1.17*	-0.08	0.04	0.05	0.05	-0.11	0.030
	(0.22)	(0.22)	(0.22)	(0.52)	(0.22)	0.25	(0.25)	(0.25)	(0.51)	(0.25)
HH pce < 33rd %ile[c]	-0.39	-0.38	-0.40	-0.39	-1.23*	-0.51	-0.48	-0.49	-0.48	-0.22
	(0.22)	(0.22)	(0.22)	(0.22)	(0.52)	(0.27)	(0.27)	(0.27)	(0.27)	(0.45)

Notes: N is 666 in 1997, 719 in 1998. Standard errors are in parentheses. * p<=.05 [a]Reference category is 0 or 1 years of age. [b]Reference category is that the parent has 7 or more years of education. [c]Reference category is that the household's expenditures are in the top two-thirds of the distribution.

Table 6
Collective Efficacy and Cessation of Children's Preventive Care Use between 1997 and 1998

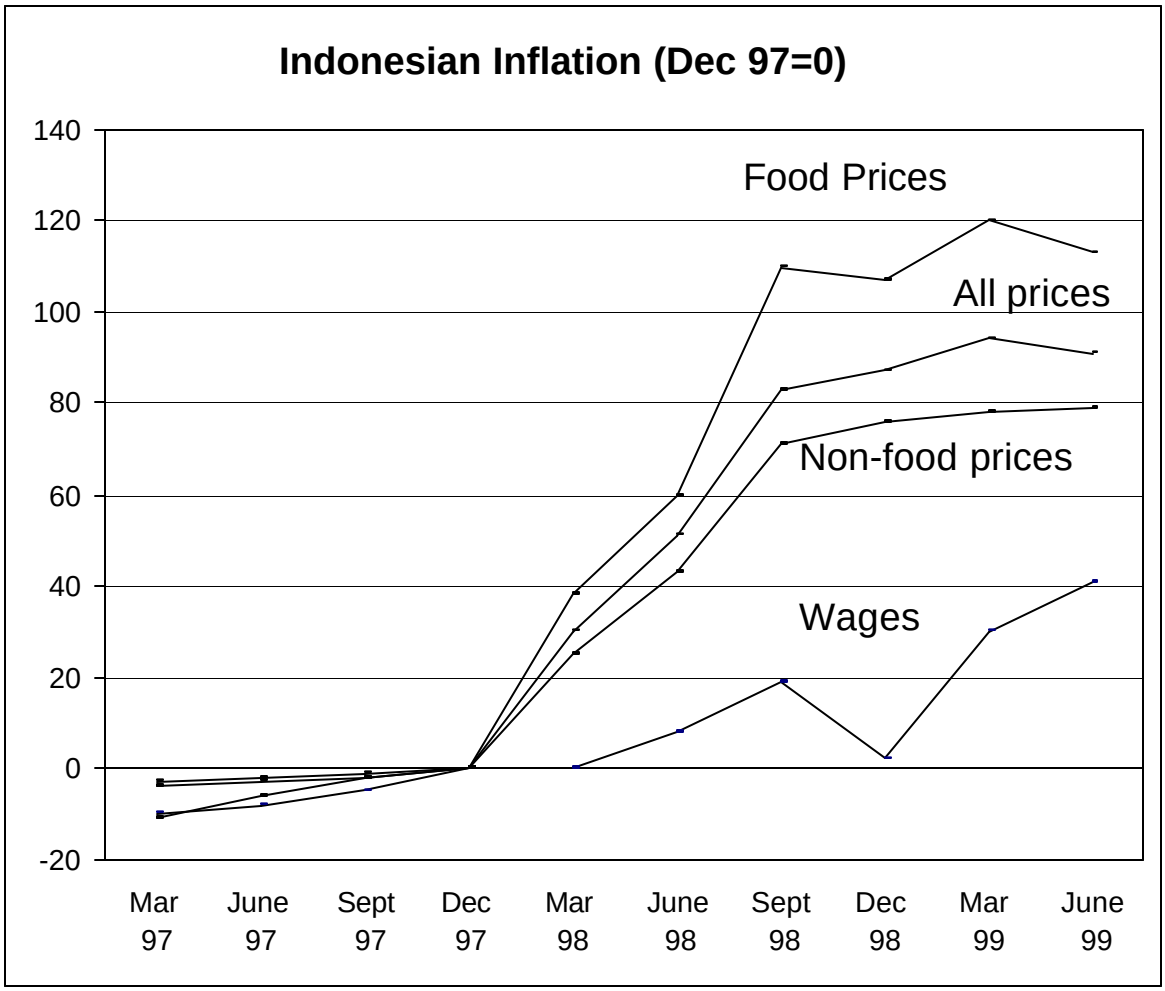
	Visited health post in 1997 but not in 1998	Did not visit a health post in either year
Supplementary food provided in 1997	0.78	0.07
	(0.64)	(0.6)
Supplementary food provided in 1998	-0.97	-1.39*
	(0.58)	(0.53)
Supplies at the health post (scale), 1997	-1.76	-1.1
	(1.63)	(1.44)
Supplies at the health post (scale), 1998	0.19	0.06
	(0.31)	(0.29)
Number of community human capital programs, 1997	0.08	0.1
	(0.12)	(0.11)
Number of community human capital programs, 1998	-0.1	0.03
	(0.14)	(0.12)
Quality of MCH services at health centers (scale), 1997	-0.11	-0.06
	(0.18)	(0.17)
Quality of MCH services at health centers (scale), 1998	0.35	0.2
	(0.22)	(0.21)
Average per capita expenditure level, 1997	-0.13	-0.41
	(0.5)	(0.47)
Average per capita expenditure level, 1998	1.02	1.02*
	(0.56)	(0.51)
Child is older than one	0.73*	0.41
	(0.29)	(0.31)
Child is male	-0.36	-0.32
	(0.24)	(0.29)
Mother has six or fewer years of education[b]	-0.85*	-0.88*
	(0.32)	(0.36)
Per capita household expenditures < 33rd %ile in 1997[c]	0.14	-0.25
	(0.45)	(0.41)
Per capita household expenditures < 33rd %ile in 1998[c]	0.64	0.88*
	(0.37)	(0.38)
Constant	-3.38	-1.39
	(3.95)	(3.34)
Wald Chi-square statistic	712.3	

Notes: * p<=.05 Multinomial logistic regression. Analytical sample consists of children interviewed in both 1997 and 1998 (panel respondents). N=499. Standard errors (in parentheses) are adjusted for clustering at the community level. Controls included for province and urban residence. Reference category is use of health post in both years. Specification includes the outcomes of starting use of health posts in 1998, but results are not shown because of small sample sizes.

[b] Reference category is that the parent has 6 or fewer years of education

[c] Piecewise linear spline with a knot at the median

Figure 1



Source: Indonesian Central Bureau of Statistics