Costly Posturing: Ceremonies and Early Child Development in China

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Abstract

Participating in and presenting gifts at funerals, weddings, and other ceremonies held by fellow villagers have been regarded as social norms in many parts of the world for thousands of years. However, it is more burdensome for the poor to take part in these social occasions than for the rich. Because the poor often lack the necessary resources, they are forced to cut back on basic consumption, such as food, in order to afford a gift to attend the social festivals. For pregnant women in poor families, such a reduction in nutrition intake as a result of gift-giving can have a lasting detrimental health impact on their children. Using a primary census-type panel household survey in 18 villages in rural China, this paper first documents the fact that child health status has barely improved in the past decades despite more than double digit of annual per capita income growth. Next, we show that social squeeze plays an important role in explaining this phenomenon. The toll of participating in social events is heavy for the poor — doubling the number of prenatal exposures to social ceremonies in a village would lower the height-for-age z-score of children born to poor families by .54 standard deviation and raise their stunting rate by .48 standard deviation. This finding sheds some light on the "food puzzle" raised by Deaton as to why the nutritional status of the poor tends to be stagnant amid rapid income growth in developing countries.

Keywords: Economic Status, Squeeze Effects, Food Consumption, Stunting, Malnutrition

JEL Codes: D13, I14, I32, O15

1. Introduction

It is common wisdom that the best way to cut hunger and malnutrition is through income growth. However, Deaton (2010) uncovers a famous food puzzle: Despite rapid economic growth in the past several decades in India and China, calorie consumption per capita has declined and the rate of improvement in nutritional status, in particular among the poor, has been relatively slow. Surprisingly, when given more resources, the poor tend to eat less basic staple food but consume greater amounts of tastier, albeit less nutritious, food (Jensen and Miller, 2008). Moreover, the poor are more likely to spend their extra income on entertainment and social festivals than on food (Banerjee and Duflo, 2007). A question arises: Why, amid income growth, do the poor prefer to consume less food at the potential high cost of nutritional status?

Of course, there are many potential explanations to the puzzle. For instance, reductions in physical activities and thus the need for calories associated with economic growth is one representative explanation (Deaton, 2010). However, this channel alone cannot explain why the child malnutrition rate in India has barely improved in the past several decades, considering that children's physical activities might not have declined as much as those of adults. In this paper, we offer an alternative explanation: Due to social pressures and concern for status, the poor are forced to cut basic necessities in order to afford gifts for social events in their communities.

In many low income countries, rural people live in closely knit communities. It is a social norm that people are compelled to attend weddings, funerals, and other social festivals in their communities and present a gift. In a recent book (2011), Banerjee and Duflo provide the following insightful observation on the phenomenon of *keeping up with the Joneses*:

"Poor people in the developing world spend large amounts on weddings, dowries, and christenings. Part of the reason is probably that they don't want to

lose face, when the social custom is to spend a lot on those occasions. In South Africa, poor families often spend so lavishly on funerals that they skimp on food for months afterward." (2011, page 35)

Because the poor have limited resources, the fiscal burden of hosting or taking part in these social events is much higher for the poor than for the rich. In order to save money for hosting the events or preparing a gift, the poor may have to cut back basic necessities such as food. Such a reduction in food consumption may have a lasting detrimental impact on the nutritional and health status of the poor. For example, a child is thought to have achieved rapid bone and tissue growth, linear growth and brain development before births. Therefore, the reductions in food consumption and the resulting stagnant improvement in nutritional status, defined as *squeeze effects* in this paper, are likely to be caused by increased social spending.

It is challenging to test the *squeeze effects* of *keeping up with the Joneses* using commonly available household surveys, since they normally sample only a few households in a community, making it impossible to define reference groups and measure relative concerns. In this paper, we use a primarily collected census-type panel household survey in 18 villages in rural China to test the *squeeze effects* of social spending on children's health outcomes. The dataset is unique in several ways. First, all of the households in the villages are measured in three waves. Since the villages are in remote and poor mountainous areas, each village forms a good reference group. Therefore, we are able to measure the relative deprivation status for each household over several years. Relative income status, rather than absolute income level, is utilized due to the strong evidence that people's motives to consume visible goods are context-specific and that attending costly social events are clearly positional consumption in the Chinese custom. Second, all of the children's anthropometric information was collected in the third wave survey in 2009. Third, we collected detailed information on funerals, weddings, and all other ceremonies in the past ten years. Moreover, consumption of detailed subcategories of food items was collected from each household member.

Because the number of social events held by other households in a village is largely beyond the control of a family, we use it as an identification strategy to examine the impact of fetal exposures to costly social events on children's health outcomes. However, if the health outcome and number of social events are both influenced by some unobserved factors, the above identification strategy will be biased. For example, a village with a higher mortality rate may be inherently less healthy and therefore displays a higher rate of stunting among children. To alleviate this concern, we classify social events into negative and positive shocks. Among all social events, funerals are more likely to be associated with bad economic conditions, while non-funeral ceremonies (e.g. weddings, coming-of-age, and house building celebrations) tend to represent good economic times. We separately examine the impact of fetal exposures to negative and positive shocks on child health outcomes and find the results are robust no matter whether the positive or the negative shock variable is used.

We focus on the impact of frequent social events that occur at the very beginning of life — the fetal period. Our results show that it is the children of the poor who are more vulnerable to the shocks of social events. Those born to mothers who were exposed to frequent social events during their pregnancies are more likely to display higher rates of stunting. For the poor, attending social events may yield an unintended negative consequence on their children's health outcomes. However, avoiding social networking with neighbors may result in social exclusion.

The rest of the paper is organized as follows: Section 2 provides evidence that social spending squeezes the food consumption of the poor, section 3 examines the impact of prenatal exposures to social shocks on child health outcomes, and Section 4 concludes.

2. Social Spending and Food Consumption

Literature on Social Spending

It has been recognized in the economics literature that people care about their relative standing in a society and that the concern for status shapes both consumption and savings behavior (Veblen, 1989; Duesenberry, 1949; Esterlin, 1974; Sen, 1983; Frank, 1985; Van de Stardt et al., 1985). The literature on relative standing concern and status consumption is largely focused on rich people and high-income countries. It is widely documented that the rich care about status and tend to indulge in conspicuous consumption. Recently, there is an emerging body of literature showing that the poor are also subject to relative status concerns—the phenomenon of *keeping up with the Joneses* applies to the poor as well. For example, the poor prefer to consume designer-label goods in Bolivia (Kempen, 2003); lavish weddings are ubiquitous in India (Banerjee and Duflo, 2007); funerals in Ghana (The Economist, 2007) and South Africa (Case et al., 2008) cost more than one year's household income; and in Nepal, rural residents' expected adequate level of consumption is largely influenced by the average consumption of the other people living in the same village (Fafchamps and Shilpi, 2008). Powered by relative concerns in a manner similar to that of the rich, the poor also tend to spend much of their extra income on status goods and visible social occasions.

Apart from relative status concerns, social norms may also dictate the behavior of social spending. In developing countries, social networks, particularly within villages, can provide informal insurance (Udry, 1994). Gift exchanges play an important role in lubricating social networks. For instance, in the event of a family member's death, the pooled gifts from social networks can help the survivors to defray part of what are quite often costly funeral expenses. Attending and presenting a gift at friends' and neighbors' weddings, funerals, and other social occasions is a social norm in many parts of the world.

Though gift giving is largely reciprocal, it takes time and effort to build and maintain social networks. In China, a family is supposed to pay back previously received gifts later on according to the prevalent market price of a gift of similar size per occasion (Yan, 1996). Unfortunately, gift price has been escalating in recent years due to worsening inequality and particular demographic patterns. Specifically, some people get rich and spend heavily on social events, so others have to follow suit (Chen et al., 2011). The unbalanced sex ratio under China's one child policy also strengthens the fast increasing gift trend because families with an unmarried son tend to throw more lavish wedding banquets and send larger gifts as a marriage market signal (Brown et al., 2011). However, households get gift back only when they have major ceremonies to hold or suffer from major idiosyncratic shocks, none of which occur regularly. Ceremonies, on average, cost more than twice the income from gifts received and are becoming even more costly (Chen et al., 2011). Therefore, reciprocal gift exchange is not necessarily very effective in smoothing consumption.

It is an open question as to which of the above two channels, i.e., concern for relative standing or social norms, better explains the observed social spending behavior among the poor. Putting that aside, however, both mechanisms predict that the poor tend to spend a larger share of their extra money on more socially visible goods and activities than do the rich.

Patterns of Social Spending in Rural China

The objective of this paper is not to test the mechanisms behind social spending but rather to present empirical evidence, using a unique dataset from China, that social spending poses a heavy burden on the poor. China is largely a *guanxi* (network) society. Participating in and presenting gifts at funerals, weddings, and other ceremonies held by fellow villagers have been regarded as social norms in Chinese villages for thousands of years. Despite the ubiquitousness of gift giving in daily life, there is surprisingly little empirical evidence in the economics literature on the patterns of social spending across income groups and over time in Chinese societies, in large due to lack of data.

The dataset for this study comes from three waves of a census-type household survey conducted in 18 villages in Puding County, a nationally designated poor county in Guizhou Province in China (see Figure A.1).[1] The survey collected detailed information on household demographics, income, consumption and transfers (see Table A.1 for summary statistics of key variables used in this study). The first wave of the survey included 801 households and was conducted at the beginning of 2005. The second wave of the survey was administered in the early 2007 and 833 households was interviewed. In the end of 2009, the third wave follow-up survey was conducted, with 872 households interviewed.

The survey area offers an ideal setting to study the relationship between social spending and food intake among the poor for several reasons. First, the poverty rate is quite high in the county. As shown in Table 2.1, in 2004, more than one-third of people lived below the national poverty line. Using the higher international poverty line of one US dollar per day, the poverty incidence is even higher up to 71%. Second, despite the initial high incidence of poverty, real per capita income has grown rapidly at an annual rate of more than 10% from 2004 to 2009. Even for the poor households below the $1.25 international poverty line, we still observe annualized income growth rate at 3.7%. However, we do not observe

[1] This survey was jointly conducted by the International Food Policy Research Institute (IFPRI), the International Center for Agricultural and Rural Development (ICARD) at the Chinese Academy of Agricultural Sciences (CAAS), and Guizhou University.

any improvement in most categories of basic food consumption. This provides us with a good opportunity to study Deaton's (2010) food puzzle as to why the improvement in nutritional status has been stagnant among the poor amid rapid income growth. Third, our survey villages are in rather isolated and mountainous areas. In such an isolated environment, villagers naturally interact much more frequently with each other within the same village than with those residing outside their home village. As a result, the villages form clearly defined reference groups.[2] By surveying all the households in the villages, we are able to accurately measure relative income status for each household within a village.

In the second and third waves of the survey, we asked all households in the 18 villages to report all major events hosted, including weddings, funerals, and coming-of-age ceremonies, during the past ten years, as well as the related expenses and gifts received. In this area, all the households spontaneously keep a gift book, which lists the amount of all gifts received and the names of gift givers in ceremonies held by the household. In the third wave of the survey, we used digital cameras to record gift books from all the households in three out of eighteen villages. Though we do not have such information for the other 15 villages due to the large costs, the three villages we collected gift books are randomly chosen and can represent the whole sample. The data enable us to examine the patterns of social spending in different social occasions over time and across income groups.

Table 2.2 presents the average gift size per occasion, number of weddings and funerals, gift size per occasion by income group, and participation rate in funerals within a village from 2004 to 2008, based on the gift record data collected in 3 out of 18 villages. Three salient features are apparent from the table.

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[2] Because of the high degree of isolation from the outside, people within a village know each other well. In our sample, three small neighboring villages of ethnic Miao group form a strong bond among themselves. Therefore, we combine them when defining a reference group.

First, average gift size per occasion has increased from 2004 to 2008. Second, the difference in gift size between rich and poor is minimal. The poor at the bottom 25% of income distribution on average spend even more on a gift per occasion than their counterparts in the top 25 percent group in the same village across all the years. The finding is consistent with our field observation that in the surveyed areas, there is an implicit "market price" for gift size per occasion that people follow when extending a gift. Third, participation in funerals is almost universal within a village. As shown clearly from the last column, more than 95% of households attend fellow villagers' funerals. Moreover, participation rates between the rich and the poor in social events are very similar, especially for funerals. Figure 2.1 shows that households in the poorest income group participate more widely in funerals than do the third- and fourth-highest income groups. This is consistent with the findings by Brown et al. (2011) that participating in funerals is largely driven by social norms. The rather standard gift size and nearly universal participation rate in funerals as well as other major ceremonies indicate that the average gift expenditure per capita in a village should be positively related to the number of ceremonies held in a year. This is apparently the case, as shown by the strong positive correlation between the two variables in Figure 2.2.

The Squeeze Effects of Social Spending on Food Consumption

Because the poor have limited financial resources, social spending poses a much heavier fiscal burden on the poor than on the rich. In order to afford a gift to attend a social festival, they have to make a sacrifice elsewhere. Living on the margin, they have little to cut back. Tightening their financial belt and skimping on purchases of meat, sugar and other food items for a few weeks after the ceremony is often the default option for the poor. Figure 2.3 plots the share of cash expenditure on gifts and food by relative status, measured by Deaton's (2001) relative deprivation (RD) index.[3] For those with lower relative status (larger value along the horizontal axis), we can clearly see that a drop in the share of food expenditure is accompanied by an increase in the share of gift expenditure. In principle, these people could eat more food and suffer less from malnutrition by simply spending less on gifts. But apparently they did not make such a choice. By comparison, for those households with higher status (smaller values along the horizontal axis), both lines barely move.

To further test the *squeeze effects* of social spending on the food consumption of people with low status, in Table 2.3 we run a series of seemingly unrelated regressions (SURs) on cash expenditure spent on food and gifts. Ceremonies held by other families within the same village are largely exogenous shocks to a family. Since the 18 villages are in the same township, they are likely to be subject to the same covariate natural shocks, if any, mitigating some concerns about unobserved idiosyncratic natural shocks. However, one may still argue that the number of ceremonies might capture some unobserved factors that also determine consumption patterns. For example, it is possible that residents in a richer village can afford more wedding, house building and coming-of-age ceremonies (positive shocks) than those in a poorer village and they are also likely to consume more food. In contrast, the population in villages with a greater number of funerals (negative shocks) may be generally poorer. Consequently, they may have less money to buy food. Therefore, the positive and negative shocks may bias the estimation of food consumption in different directions. Although it is difficult to find good instruments to ameliorate the concern about the potential endogneity problem of the ceremony variable, we run separate regressions using positive and negative shocks to see if the estimates fall in a

[3] We will discuss the measure in detail in the next section.

narrow band. If both positive and negative shocks yield similar results, we can confidently rule out potential bias as a result of endogeneity.

In the first set of regressions (R1, R2), we include the number of funerals held by fellow villagers,[4] the Deaton RD index, the interaction term between the above two variables, a set of control variables at the household level, and year and village fixed effects. The coefficient for the interaction term in the cash food expenditure equation (R1) is statistically significant and negative. This suggests that those with lower status spend less on food consumption than their richer counterparts, provided that they attend the same number of funerals in a given year. To the contrary, the correspondent interaction term in the cash gift expenditure equation (R2) has a statistically significant and positive coefficient, suggesting that gift spending squeezes basic food consumption. The second set of regressions (R3, R4) find similar results, once again suggesting *squeeze effects* of social spending on food consumption among those in the lower social spectrum. Comparing estimations for ceremonies during good years (non-funeral events) with those in bad years (funerals), the consequences for the latter are graver, as shown by the larger (in absolute term) and more significant coefficient.

The test result in Table 2.3 relates to the literature on how income shocks during the prenatal period affect subsequent outcomes (see section 5.1 in Almond and Currie (2011) for example). The findings inform researchers that income shocks due to large spending on fellow villagers' ceremonies may affect food consumption and basic nutrients intake. The next section will further investigate its health consequences.

3. Quantifying the Effect of Social Spending on Child Health Outcomes

Fetal Origins Hypothesis

[4] Throughout the estimations in this paper, we take the log form for the number of funerals and other non-funeral ceremonies.

To resolve Deaton's (2010) food puzzle, next we need to test whether a cut in food intake as a result of social spending compromises nutritional status, in particular that of children. A burgeoning body of literature on the fetal origins hypothesis suggests that the time *in utero* is a critical period for human development. Regardless of whether catch-up growth is ultimately achieved, *in utero* exposures to malnutrition are associated with adversely affect health outcomes in later life (Barker and Osmond, 1986; Barker et al., 1989; Victoria et al. 2008).

However, it is impossible to directly test this hypothesis using human subjects in a controlled experiment. The empirical literature largely relies on natural shocks, such as famine and drought, to identify the casual effect of prenatal exposures to malnutrition on long-term health outcomes. For example, studies based on the Dutch Famine (1944-1945) reveal that the famine had negative impacts on various health related outcomes, such as mental disorder in early adulthood, schizophrenia, and lower glucose tolerance in adults (Neugebauer et al., 1999; Brown et al., 2000; Hulshoff Pol et al., 2000; Ravelli et al., 1998). Similar fetal origins effects are found in studies on the 1918 flu (Almond, 2006) and the Chernobyl radioactive fallout (Almond et al., 2009). Children born during a drought in rural Zimbabwe show a higher rate of stunting in the subsequent two years (Hoddinott and Kinsey, 2001). Maccini and Yang (2009) show that high rainfall at the very beginning of life is associated with better health and education outcomes in later life for Indonesian women.

Yet, not all empirical studies based on natural shocks confirm the fetal origins hypothesis. For instance, studies on the survivors of the Leningrad Siege (1941-1944) in general conclude that those exposed to starvation in the fetal stage do not show much difference in health outcomes in the later stages of life from cohorts born outside Leningrad and in other years. One key reason is that in the event of severe shocks like the Leningrad Siege, only the healthier survive and can be observed in later life. Therefore, the presence of mortality selection renders it less likely for researchers to observe the negative health impact on the survivors later on. Mu and Zhang (2011) show that prenatal exposures to the Chinese Great Famine (1959-1961) result in higher disability rates for female survivors but not for males, largely because of much larger excess male mortality rates during the famine. Exposure to milder shocks, however, might facilitate the testing of fetal origin hypothesis, since scarring effects for survivors are much less likely to be offset by selective mortality in extreme fetal exposures.

The studies based on natural shocks have provided tremendous insight on the fetal origins hypothesis in extreme events. However, estimates of the effects of mild exposures may be more relevant to policy than estimates of the effects of disasters. Almond and Currie (2011) argue that the immediate mortality and economic disruption from the 1918 flu or the China famine are sufficient to imply that any reasonable measure to prevent such catastrophes is likely to pass a cost-benefit calculation. Therefore, they argue, showing that there was additional damage to fetal health from these disasters does not make much difference in decision-making.

Moreover, most people, even the poor, do not suffer from natural shocks as severe as famine. Instead, they face more frequent, yet minor, social shocks — funerals and wedding that they are obligated to attend. Do children born to mothers exposed to more frequent social shocks have worse health outcomes as predicted by the fetal origins hypothesis? To our knowledge, no studies have examined the impact of prenatal exposures to social shocks on child health outcomes.

Our baseline survey and the two surveys followed by track more than 800 households with a 10-year history of all local ceremonies. The number of children before five years old amounts to 234 effective observations in the third wave of our survey during which we collected anthropometric information for all the children in our sample. The data enables us to address the above question. We use three variables—height-for-age z-score, stunting and underweight—as major child health outcome measures. A comparison of our focused anthropometric indicator in this paper – height-for-age z-score – between our Guizhou sample and a matched Guizhou sample from the 2004 and 2006 China Health and Nutrition Survey (CHNS) is drawn in Figure A.2 and helps confirm the data representativeness. Stunting and underweight are defined based on two standards: the World Health Organization (WHO) standard and the standard of the China Center for Disease Control and Prevention (CDC).

Height-for-age[5] measures the cumulative long-term nutritional status an individual has obtained over the life course, while weight-for-height or BMI-for-age measures more acute changes. Weight-for-age[6] and underweight may confound the height-for-age measure. A stunted child would have a low weight-for-age z-score due to his short stature even if his weight-for-height z-score is normal. If *squeeze effects* due to prenatal exposure to social shocks are found, they should be reflected in stunting status but not in wasting status.

As shown in Table 3.1, nearly half of children born in 2008 are stunted. Despite impressive annual rates of income growth at more than 10% from 2004 and 2008, the stunting rate had not declined, but rather rose slightly in the sample villages. The problem is more acute among girls, whose stunting rate increased

[5] Since the survey was conducted before the end of 2009, most children born in 2009 do not experience a full year ceremonies after births, considering that most ceremonies were held at the beginning of 2010 when migrant works came back to celebrate the lunar new year. Thus, the parameter for after-birth ceremony shocks cannot be separately identified with a biased estimation of our most interested parameter – *in utero* ceremony shocks. Though excluded from our results, estimations with these samples do not affect our results and will be available upon request.

[6] Weight-for-age z-score and BMI index are subject to the concern for measurement errors. The third wave survey took place in winter, the coldest time of the year when people often wear heavy winter clothes. It is hard to weigh children's clothes, in particular those of newborns. Therefore, the measurement for the weight of young babies is likely less accurate. Fortunately, the age fixed effects and birth season fixed effects in the regressions should take care of any systematic measurement error of weight.

from 41.4% in 2004 to 55.6% in 2008. The rate of underweight shows a similar pattern. Overall, the prevalent high stunting and underweight trend is consistent with the results of He and Chen (2004), who found that in impoverished counties in Guizhou and Guangxi the most recent stunting and underweight rates are around 60% and 30%, respectively. As illustrated, the Deaton (2010) food puzzle can be observed in rural China as well.

The observed Deaton (2010) puzzle may have something to do with *in utero* exposures to social shocks. Table 3.2 reports the average height-for-age z-score for children born between 2004 and 2008 according to low and high income groups in villages with more frequent and less frequent social shocks (number of all ceremonies). The last column measures the difference-in-differences (DID) of the z-score. Almost all the values are negative, suggesting that it is children of the poor income groups who exhibit lower z-scores when exposed to more frequent social shocks at the fetal stage. Because of the small sample size for each cohort, we cannot compute the *t*-value of the DIDs. In the last row, we pool together all the children born between 2004 and 2008. The DID value is significant and negative. While this simple analysis based on two-by-two discrete groups shows some suggestive evidence on the *squeeze effects* of social spending on child health outcomes, it is interesting to further investigate whether there is a linear negative relationship between the continuous variables of z-scores and number of ceremonies. Figure 3.1 depicts the height-for-age z-score against the number of ceremonies exposed to in the fetal period for the high- and low-income groups. For the low-income group, the greater the number of exposures to ceremonies, the lower the z-score. In contrast, the figure does not reveal an obvious pattern between z-scores and social shocks for the high-income group.

The simple DID analysis and bivariate plot provide tentative evidence in support of the *squeeze effects* of fetal exposures to social events. In order to more rigorously verify the *squeeze effects*, we need to control for more variables in more quantitative analyses.

Measuring Reference Groups and Relative Status

Before going on to the quantitative analyses, we need to first define reference groups and measure relative status. The theoretical models on relative status concerns often take reference groups as given. However, in empirical analyses, defining reference groups is more of an art than a science. People interact with others in different cycles in their work and family life. Identifying and measuring reference groups are always a great challenge for empirical research on social interactions.

The challenge might be greater in cities than in rural areas. In rural areas in developing countries, people often live in a rather close community. Two recent studies on China show that rural people often use their home village as a reference group (Knight, Song and Gunatilaka, 2007; Mangyo and Park, 2011). In our surveyed area, the villages are located in an area renowned for its karst landform[7], which presents a barrier to frequent interactions across villages. Therefore, in this paper, we primarily use villages as reference groups in our empirical analyses.[8]

Having defined reference groups, next we need to measure relative status concerns, which are often mentioned in the literature as a key motive behind social spending (e.g. Brown et al., 2011; Chen et al., 2011). In this paper, we adopt the widely used Deaton (2001) RD index, which supports the findings in the biochemical and psychological literature. The index captures the idea that a person is deprived if others in the group possess something that he or she does not

7 The karst topography in our surveyed region is in a typical form of closely spaced conical hills (cone karst).

[8] We also check the robustness of our results using alternative reference groups - surname networks within a village.

have. It closely follows the spirit of Hopkins and Kornienko (2004) and Frank, Levine, and Dijk (2010).[9]

The Deaton RD index originated from Yitzhaki (1979) and Wildman (2003). The level of deprivation experienced by an individual *i* with income *y*[10] relative to another individual with income *z* is formulated as

$$D(i; y) = z - y \quad \text{if } y < z \qquad (1)$$

or

$$D(i; y) = 0 \qquad \text{if } y \geq z \qquad (2)$$

Based on this formula, an individual would feel more deprived as the number of individuals in society with more income than this individual increases. Thus, an overall measure of deprivation for individual *i* is computed by summing the differences in income and weighting the sum with the proportion of people with higher income than individual *i*. The above measures tend to overstate relative deprivation of individuals in high-income reference groups. This could be a very important issue when incomes differ substantially across groups. To make scale invariant, Deaton (2001) proposes a measure of relative deprivation for an individual *i* with income *x*:

$$(1/\mu)\int_{x}^{x^T}(y-x)dF(y) \quad \text{or} \quad (1/\mu)[1-F(x)][\mu^{+}(x)-x] \qquad (3)$$

where μ denotes mean income for those in the reference group, x^T is the highest income in the group. *F(y)* is the cumulative distribution of incomes among individuals in the group, and $\mu^{+}(x)$ is the average income of those with income

[9] Frank, Levine and Dijk (2010) define an "expenditure cascade" in an economy where every agent judges his own behavior based on that of others closest above him. Hopkins and Kornienko (2004) develop a rank-based theoretical model that captures the status concern motive for lower ranked agents. In the model, rising average income of fellow residents triggers a competition for status that extends all the way down to the bottom of the distribution.

[10] The variable *y* can be defined in the dimension of income, consumption, assets and so on. Here income is utilized, which includes both in-kind and cash income.

higher than the individual with income *x*. The Deaton RD index normalizes the difference between average income of those with higher income and income *x* weighted by the proportion of those with income higher than that of individual *i*. The Deaton RD index takes into account differences in the scale of income distribution across groups. Unlike other deprivation measures, such as deprivation of absolute income (Li and Zhu, 2006), the Deaton RD index is scale invariant. In others words, it will not automatically double as everyone's income doubles. The index ranges from 0 (the richest) to 1 (the poorest) in each reference group.

<u>Quantifying the Effect of Social Shocks on Child Health Outcomes</u>

The standard child nutritional and health demand function, derived from a welfare maximization framework, often includes income, food prices, access to healthcare, genetic makeup, and other individual characteristics (Behrman and Deolalikar, 1988; Strauss and Thomas, 1995, 2008). In this paper, we include the Deaton RD measure as well as its interactions with variables of interest as additional variables. The specification can be written as

$$Outcome_{ijt} = \alpha RD_{j,t=1} * CAB_{j,t=1} + \beta RD_{j,t=0} * CBB_{j,t=0} + \gamma_0 RD_{j,t=1} + \gamma_1 RD_{j,t=0} + \gamma_2 CAB_{j,t=1} + \gamma_3 CBB_{j,t=0} + \alpha_c \cdot C_{ijt} + \alpha_p \cdot PCG_{j,t=1} + \alpha_p \cdot PB_{j,t=0} + \alpha_h \cdot H_{j,t=0} + \upsilon_v + \delta_t + \varphi_{vt} + \varepsilon_{ijt} \quad (4)$$

where $Outcome_{ijt}$ denotes child *i*'s health status in household *j* at survey time (*t*); relative status for household *j* is denoted $RD_{j,t=0}$ at child birth and $RD_{j,t=1}$ after child birth; C_{ijt} is a vector of child i's characteristics, including age, sex, birth season and birth order in family j; $PCG_{j,t=1}$ is a vector of characteristics of the principal care giver, including household head sex, mother's education, ethnicity, mothers' height[11], presence of grandparents, and presence of mother and father in a household after child birth; $PB_{j,t=0}$ denotes parental health behavior at the time of the child's birth, including smoking and drinking alcohol; and $H_{j,t=0}$ is a vector of local health facility characteristics at the time of the child's birth, such as distance to the closest clinic. Other household characteristics, including household size, major shocks (illnesses[12] and natural disasters) and per capita income at the child's birth are controlled for.[13]

υ is a set of administrative village fixed effects that account for any time-invariant differences between villages (such as geography) that may also be correlated with social events and child health outcomes. [14] δ is a set of birth year fixed effects, which account for any year-to-year changes in birth conditions that occur for the surveyed region that potentially correlate with social events (such as business cycles). The baseline model in Panel A of Table 3.4 includes no covariates, while Panel B incorporates covariates, year fixed effects and administrative village fixed effects. In our preferred specifications in Panel C, as well as all the other regression tables, administrative village x year fixed effects φ_{vt} are further added. To account for the possibility that the stochastic error terms (ε_{ijt}) are correlated within villages over time, the estimations are clustered at the village level. In Panel C of Table 3.4, we check the robustness of the main results to our relatively small number of clusters via correcting the standard errors

11 Fathers' health status is not included, since some of them were migrating out to work during our survey. In most cases, mothers and children were left behind in the villages. Throughout this paper, our results controlling mother's height are robust to the use of mother's BMI.
12 Our results without controlling potentially endogenous illness shocks remain.
13 Here we use income as a proxy for wealth and to measure relative deprivation status in our paper. We also compute asset index based on livestock and family assets and used it as a proxy and the main results remain largely the same.
14 An "administrative village" is the lowest level bureaucratic entity comprised of several villages. The surveyed 18 villages belong to 3 administrative villages, one with 10 villages, each of the other two with 4 villages respectively.

following the cluster bootstrap procedure used in Cameron, Gelbach and Miller (2008).

Two time periods are critical in the identification of *squeeze effects*: the fetal period (t=0) and the period after birth (t=1). $CBB_{j,t=0}$ is the number of ceremonies held by other families within the same home village in the year prior to child i's birth. Similarly, $CAB_{j,t=1}$ is the number of ceremonies held by others during child i's birth year. The main coefficients of interest are γ_2, γ_3, α and β. The magnitude and significance level of these coefficients as well as $\gamma_2 + \alpha RD_{jt}$ and $\gamma_3 + \beta RD_{jt}$, shows us to what extent exposures to social events shocks in the fetal period or after birth matter to child health outcomes.

As discussed earlier, although the number of all ceremonies held by other families within a village is largely beyond an individual household's control, the number of ceremonies may reflect a village's wealth level as well as other underlying unobserved factors, which may potentially influence child health outcomes. To address this concern, we distinguish negative shocks (number of funerals) from positive shocks (e.g. weddings, coming-of-age celebrations, and other ceremonies). If positive and negative shocks also represent the underlying unobserved health conditions in a village that are correlated with child health outcomes, then the estimations based on positive and negative shocks will yield biases in opposite directions. Therefore, separate regressions using positive and negative shocks provide us with a lower and upper bound of the effect. If both sets of regressions produce significant results with similar magnitude and the same sign, it suggests that there are indeed squeeze effects.

The simultaneous identification of prenatal social events shocks $CBB_{j,t=0}$ and social events shocks after birth $CAB_{j,t=1}$ does not confound each other. In our survey, dates of birth were recorded based on the household registration book, which follows the Western calendar. However, dates of social events were recorded in respondents' gift books, and local rural residents adopt the lunar calendar in their everyday life, which spans from February to January. Though we do not have information about the exact timing of all social events for all 18 villages, complete gift record books we collected from 3 out of 18 villages provide us with rich information about the timing. Since the three villages are very similar in terms of socioeconomic conditions to the other 15 villages, we infer that the pattern of timing in Figure 3.2 generally applies to all other villages as well.

As shown in Figure 3.2, most ceremonies (except funerals and childbirths) are held at the end of a lunar year or the beginning of another lunar year, i.e., January or early February, when nearly all families come back to celebrate the Chinese lunar new year.[15] The timing of major social events in the lunar calendar combined with dates of birth in the western calendar makes sure that children in the prenatal period are exposed to most social events in the year prior to the birth year (t=0), while most social events in the birth year (t=1) occur after the child's birth.

Even if funerals are most often unplanned and held throughout a year, they demonstrate a seasonal pattern in our sample — a disproportionate share of them are between November and the following January (Figure 3.2) — due to the demographic characteristics that more people die in winter than in other seasons. This fact ensures a clean identification using the number of funerals.

[15] Though child birth generally occurs in a good year, the timing of pregnancy also determines the timing of delivery and may demonstrate other seasonal, climate, and weather patterns. Therefore, in both left Figure 3.2 and all empirical estimations we exclude child birth ceremonies from the positive shock category. The results are not much affected compared to estimations with childbirth events, probably because childbirth is much less costly than other events. Observed from the guest size and gift size recorded in the gift books, only closest relatives come to celebrate childbirth, and most gifts are inexpensive in monetary terms (mostly in the form of red bags).

Considering that the normal gestation period is 38-42 weeks, the clustering of social events toward the end of the lunar year guarantees that children born before the end of the following September had prenatal exposure to most of these social events. The earlier the birth date, the later in the fetal period a child is exposed to clustered social events. However, none of the children born between October and December directly experienced the clustered social event shocks in the prior year. In the robustness checks, we restrict our sample to children born between February and September.

Main Empirical Results on the Squeeze Effects

Before testing squeeze effects, we run separate regressions of the number of funerals and other social events on all available household and child characteristics[16] to make sure social events held by others in the reference groups are random to individual household's characteristics. Fortunately, in both regressions all covariates show insignificant coefficients. To save space, the results are available upon request.

Building upon the findings in Figure 3.1 and Table 3.2, we run separate regressions on two child health outcome variables — height-for-age z-score and stunting — in low and high income groups. The specification is the same as in equation (4) except that it excludes the interaction terms of Deaton RD. Table 3.3 reports the regression results for the key variables of interest, the number of funerals (or other ceremonies) exposed to in the prenatal period and after birth, respectively. Children born to mothers in low income groups, who are exposed to more funerals or other ceremonies during their pregnancies, show lower height-

[16] These variables include household characteristics (ceremony frequency before and after a child's birth, predicted per capita income, head sex, mother's education, parental health behavior at the time of the child's birth including smoking and drinking, household size, presence of grandparents, presence of parents, ethnicity, mother's height, other major shocks and so on), child characteristics (age dummy, sex, birth season, birth order), year fixed effects, village fixed effects and year X village fixed effects.

for-age z-scores and display higher rates of stunting. Doubling the poorer families' exposure to costly social events in the network on average corresponds to a height-for-age z-score that is .54 standard deviation lower and a stunting probability that is .48 standard deviation higher. In contrast, the health outcomes of children born to richer families do not appear to be vulnerable to social event shocks experienced in the year prior to their birth. More social events experienced by children in rich families are even associated with an insignificantly better height-for-age z-score. For them, more social events in the neighborhood mean more social capital than social burden and the ability to mobilize more resources toward children.

Unlike *in utero* exposures, the number of social events exposed to after birth have little to do with child health outcomes. The findings in Table 3.3 indicate that the health outcomes of children born to poor families are associated with the number of social events held in their village in the year before their births.

One might question this arbitrary division of the sample into low and high income groups. In Table 3.4, we regress the two health outcome variables on the whole sample by interacting the Deaton RD measure with the incidence of funerals or other non-funeral ceremonies at the village level in the year prior to and in the year after a child's birth. Regardless of whether we use the number of funerals or the number of non-funeral ceremonies, the interaction terms of *in utero* exposures to the number of social shocks incurred prior to birth with the Deaton RD measure are statistically significant, negative in the regression on height-for-age z-scores and positive in regressions on stunting rates. In comparison, the squeeze effects identified by number of funerals show larger marginal effects than identified by number of non-funeral events. This is consistent with our earlier expectation that *in utero* exposures to bad year social events are more detrimental to early child development than good year social events. Moreover, none of the coefficients for the interaction term between the

Deaton RD measure and the number of funerals or non-funeral ceremonies after birth is significant. Considering that a larger value of the RD measure means a lower status, the significant interaction terms mean that children from households with lower economic status who are prenatally exposed to social event shocks are more likely to be shorter and develop higher rates of stunting than those from higher-status households.

Panel A of Table 3.4 presents baseline estimations with no covariates. The results are very similar to estimations in the following panels where covariates are included. In Panel B of Table 3.4, the estimations with year fixed effects and administrative village fixed effects are presented. Panel C of Table 3.4, our preferred specification, further includes administrative village x year fixed effects. All these panels find significant squeeze effects on health outcomes towards the poorer segment.

In terms of statistical inference, the above estimations cluster the standard errors at the village level, but given that there are only 18 villages in the data, standard clustering methods may underestimate standard errors to some extent. The estimations with a bootstrapped-based correction given the small number of clusters (Cameron, Gelbach and Miller, 2008) are also reported in Panel C of Table 3.4. As expected, the significance level decreases for the parameter of the interaction term between economic status and *in utero* number of social events, our key results change little and are robust to the small number of clusters.

Since the mean and distribution of RD index over the three-wave survey are known, the first derivative of equation (4) with respect to the number of social events tells us the proportion of households suffering from net *squeeze effects*. Specifically, when non-funeral funerals are included, all households suffer from net *squeeze effects*. Even when only funerals are included, at least households with Deaton RD values above or equal 1/3 suffers significantly from squeeze effects. In other words, the cutoff point for net *squeeze effects* applies to a majority of local households. Moreover, the interaction term between number of events and relative economic status shows that the marginal effect of funerals is more detrimental than that of non-funeral events to child health.

Robustness Checks and Other Findings

If the main driving force of stunting is *in utero* exposure to malnutrition, we should expect the effects to mainly impose chronic restriction of a child's potential growth, but not to be captured by acute undernutrition measures. Though reported widely in the previous analyses (for example, Black et al., 2008), it is recognized that underweight may indicate both wasting (i.e., low weight-for-height, indicating acute weight loss) and stunting (i.e., low height-for-age, indicating chronic malnutrition). We find in Table 3.5 that results for underweight are somewhat significant but mixed, so it is worthwhile to disentangle the potential confounded effects. In the same table, estimations on wasting show that the squeeze effects are not embodied in the contemporaneous nutritional status measure – weight-for-height z-score. The result strengthens our argument that the fetal origins effect is the main driving force behind bad child health outcomes. Therefore, only results on chronic health outcomes are presented in the remaining robustness checks and findings.

In addition to running separate regressions using positive and negative shocks to check the potential bias of unobserved factors, we also run a falsification test on the *squeeze effects* by lagging the variable on the number of funerals and non-funeral ceremonies by one year. In other words, in this test the variable labeled "# of social events before birth" actually corresponds to the number of social events held in a village two years ahead of a child's birth, which ought to be unrelated to prenatal health status, rather than in the year prior to birth. If some unobserved factors instead of the squeeze effect drive the result, we would expect the coefficient to remain significant in the falsification test. Results show that all the coefficients for the interaction terms in Table 3.6 are statistically insignificant. Thus, the number of funerals / non-funeral ceremonies in years other than the year prior to a child's birth does not seem to affect child health outcomes.

Though the timing of social events in three typical villages informs us the general pattern of events' distribution towards December and January, we do not know the exact months of ceremonies in the other fifteen villages. Therefore, we cannot match them with the months of mothers' pregnancies. Instead, we simply count the number of all ceremonies held by other families in the home village in the year prior to a child's birth and use it as a measure of fetal exposures to social shocks. This simple procedure may result in measurement errors. For example, if a child is born between October and December of this year, then ceremonies held in the last year won't directly affect the child's *in utero* development. As a robustness check, we restrict our sample to those children born between February and September. Children in this sample are definitely conceived in the lunar year (between February and the following January) prior to their birth, and the feature of social events' clustering towards the end of the lunar year further ensures direct exposures. Table 3.7 repeats the main regressions in Table 3.4 on the restricted sample. The coefficients for the interaction terms between the Deaton RD measure and the number of funerals or non-funeral ceremonies prior to birth are statistically significant and have the expected sign. The findings are consistent with those reported in Table 3.4.

Although people are familiar with each other within villages, villagers from the same family clan may still be likely to interact more frequently among themselves than with people from other clans. If this tendency holds true, then using villages as reference groups would likely bias the regression results. We therefore classify households whose heads share the same surnames as being in the same family clan or network. Households belonging to a larger surname network tend to participate in more social events.

Table 3.8 presents the regression results of this robustness check. The regressions follow the same specifications as in Table 3.4 except that we replace villages with surname networks as a reference group. Specifications in Panel A use the number of funerals within surname networks. The coefficients for the first interaction term are largely statistically significant, showing that funerals held in surname networks tend to lower the height-for-age z-score and increase the probability of stunting for children from lower-status households. As shown by the significant coefficients in the height-for-age z-score regression in Panel B, when using the number of non-funeral ceremonies as an indicator of social spending, the *squeeze effects* still show up. It is noted that none of the interaction terms between RD measures and the number of funerals or non-funeral ceremonies after birth is significant. Overall, regressions based on two different reference groups yield largely consistent results — prenatal exposures to social event shocks have an unintended negative consequence on the health outcomes of children born to lower-status families.

The literature on the fetal origins hypothesis has shown that mortality selection associated with extreme natural shocks may mask the identification of long-term negative impact on health (Mu and Zhang, 2011). In the event of severe shocks, the most fragile fraction of the population is more likely to die first. As a result, the survivor population tends to be healthier than the general population in the absence of shocks. In other words, the presence of mortality selection will make it harder to discern the adverse effect of fetal origins. The population in the 18 villages in our sample was not subject to any major natural shocks. The social events, albeit a heavy fiscal burden for the poor, are unlikely to lead to excess mortality. The presence of excess mortality, if any, will only strengthen our results because the selection effect tends to trump the scarring effect (Pearson, 1912; Bozzoli et al., 2010).

Another potential selection problem is that children may have moved to cities with their migrant parents, thereby leaving behind an unhealthy group of children in the villages. Although many young people have taken migratory jobs throughout most of the year, they generally leave their children behind with grandparents in their home villages because of the high cost of urban living compared to rural Guizhou and discrimination against migrants' children in urban schools. More importantly, our surveys were conducted right before the Chinese New year when almost all migrants return home and children are at home for their winter school break. Comparing the list of respondents' names from the 2006 survey with that of the 2009 survey, we do not find any attrition.

The height-for-age z-score and stunting status are computed based on the WHO standard. The Chinese population is on average shorter and lighter in weight than the world average, thereby likely approaching the cutoff value. The China CDC publishes its own cutoff values for the Chinese population. In Table 3.9, we report the main results with the same specifications as those in Table 3.4, replacing the WHO standard with the CDC standard. Both the sign and the magnitude of prenatal *squeeze effects* are quite similar to those based on the WHO standard. Once again, we do not find a noticeable effect of exposures to social shocks after birth.

In the above tables, we do not distinguish between the different impacts on boys and girls. In the human biology literature, it has been widely documented that boys are more susceptible to an adverse nutritional environment in early life than girls. To examine the potential gender difference, in Table 3.10, we run separate regressions on the health outcomes of boys and girls. Panel A reports the results using the number of funerals as a proxy for social spending, while Panel B uses non-funeral ceremonies to represent social events. We find that boys from lower status households who are prenatally exposed to the same number of funerals display worse height-for-age z-score than those from higher status families. However, prenatal exposures to social events do not seem to affect girls' health outcomes. In contrast, postnatal exposures to social events impose negative, albeit insignificant, impact on girls, while no such effect is found for boys. The findings are largely consistent with the literature that girls are more robust than boys in early life and the fact that unavailable ultrasound technology prevents local parents from gender biased resource allocation before childbirth.

Finally, since height-for-age z-scores can be both positive and negative, we cannot directly take a logarithm on them. Instead, in our main regression, we simply use the original z-scores as a dependent variable, although most of the right-hand variables are in logarithmic form. To explore whether this linear-log specification yields drastically different results, following Hoddinott and Kinsey (2001) we transform the z-scores into percentiles according to international standards and then take the logarithm of the percentile. In general, the results on the *squeeze effects* of *in utero* exposures to social shocks remain largely the same as those calculated using z-scores. To save space, the results under this specification are not reported but available upon request.

4. Conclusions

It has been widely noted that improvement in nutritional status among the poor in developing countries lags far behind income growth. Banerjee and Duflo (2007) and Deaton (2010) have asked: Why don't the poor eat more with their extra income?

In this paper, we argue that social spending can squeeze out food consumption, which in turn compromises nutritional status. In developing countries, most of the poor live in a close community where they know each other well. Their consumption decisions are shaped not only by their own preferences and budget constraints, but also by peers in their communities. When peer pressure and relative status are of importance, people tend to spend more on visible goods and activities (like social festivals) at the expense of less visible goods, including food.

Gift exchange is almost a universal phenomenon in developing countries. One important feature of gift exchange is reciprocity. In many rural areas, it is a social norm to attend neighbors' weddings, funerals, and other major ceremonies. Because of the reciprocal nature of gift exchange and "mandatory" participation, gift giving places a much heavier burden on the poor than on the rich. In order to afford a gift, the poor often have to forgo the consumption of meat, eggs, and other food items for weeks after attending a social event. Such a squeeze on food intake can extract an unintended long-term toll on the children of women pregnant at the time. In contrast, because they have financial slack and food consumption accounts for a small share of their budget, the rich do not need to worry about food consumption when engaged in conspicuous spending behavior.

Using a unique census-type household survey collected in remote mountainous villages in China, we are able to clearly define reference groups and empirically examine the impact of social spending on food consumption and nutritional status. We find that children born to households with lower income status develop shorter and lighter physical stature if their home villages held a greater number of social events in the year prior to their births.

A question thus arises: Given the negative impact of social spending on child health outcomes, why don't the pregnant women avoid attending fellow villagers' social festivals in the first place? There are several possible explanations. First, people may not be aware of the negative health consequence of prenatal exposures to social events. To our knowledge, this paper is one of the first to provide empirical evidence showing the existence of such an effect. It is likely that a more informed mother will be more careful in making a choice between eating adequate and healthy foods and attending a neighbor's social event.

Second, when rewards for higher status are high and punishment for lower status is grave, people, in particular the poor, will intensify their competition in status goods consumption (Hopkins and Kornienko, 2004). In China, sex ratios have become increasingly unbalanced. As a result, the marriage market competition has intensified greatly over the past several decades. Under such a marriage market squeeze, the poor have to vigorously signal their wealth through bigger houses, more generous bride price payments, lavish wedding banquets, and active participation in social events within their community. In fact, the competition in social spending is more intense among the poorer segment of the population in rural China (Brown et al., 2011; Chen et al., 2011).

In this paper, we have focused mainly on child health outcomes. *In utero* exposures to adverse events may also affect educational achievement and earning potentials in later life (Almond and Currie, 2011). As predicted by the fetal origins hypothesis, people who are exposed to a malnourished environment before birth are likely to develop a series of chronic diseases in adult life. As a future research project, it would be interesting to continue to follow the population in the studied villages over a longer period of time and quantify the impact of *in utero* exposures to social events on educational achievement, earnings, and health outcomes in later stages of life.

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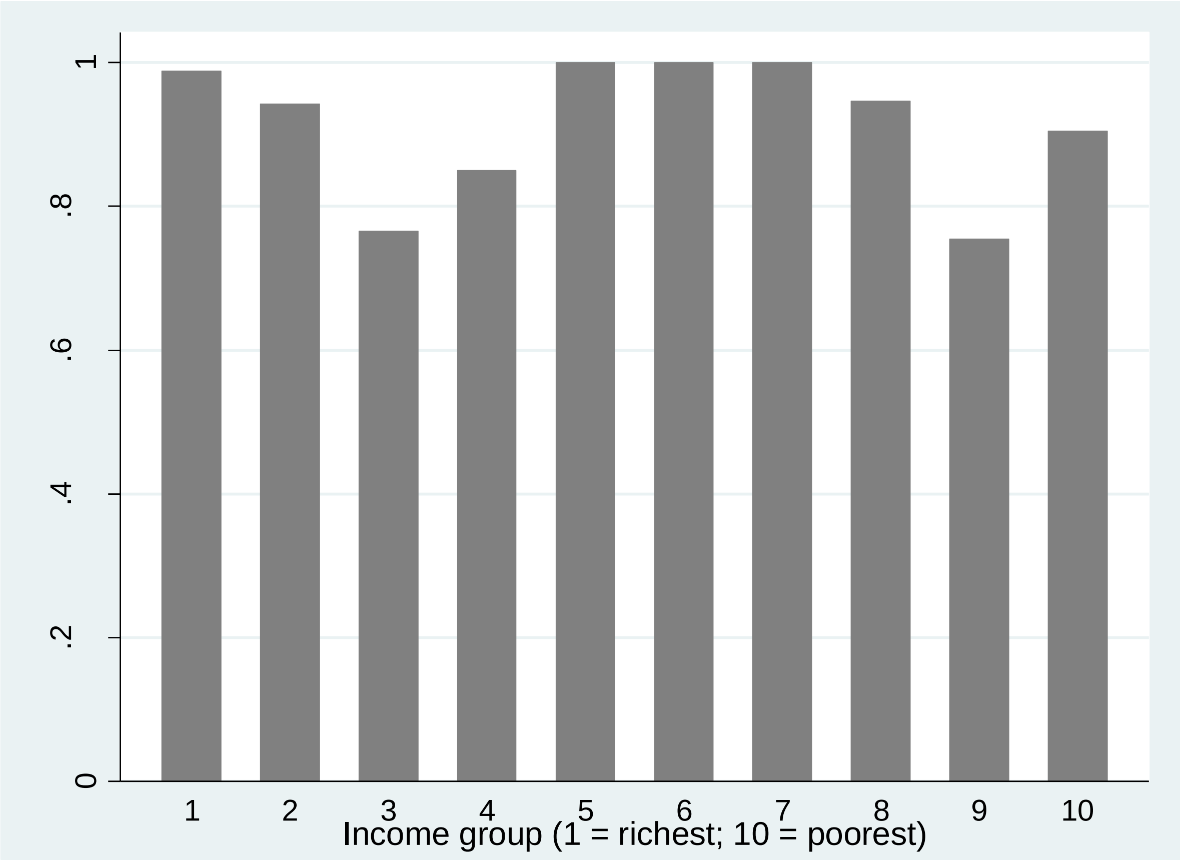
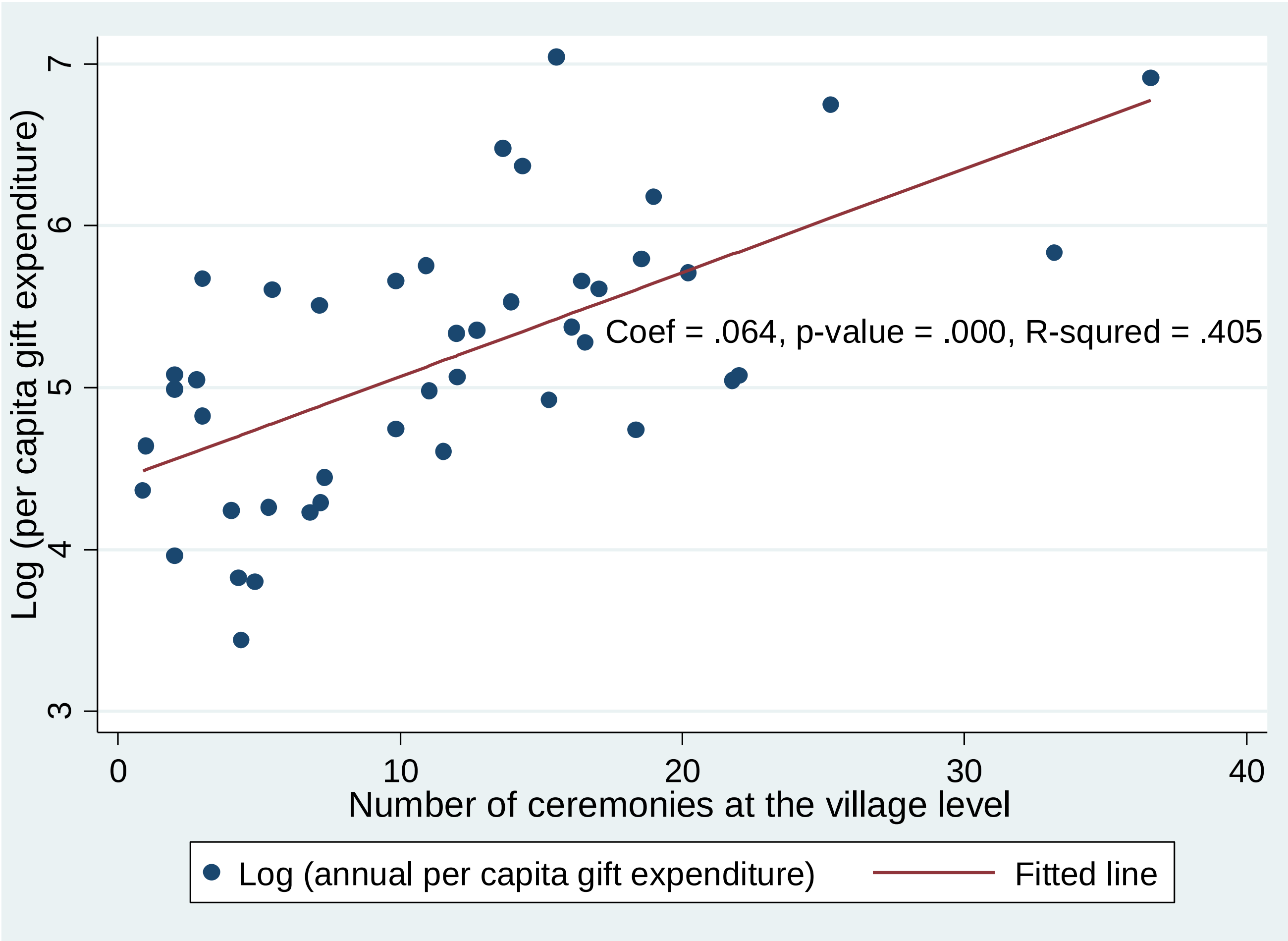
Figure 2.1—Income level and funeral attendance rate



Sources: Authors' gift record data

Notes: By each year and each village, all the households are divided into 10 groups by per capita income. The vertical axis represents the participation rate of funerals by income groups.

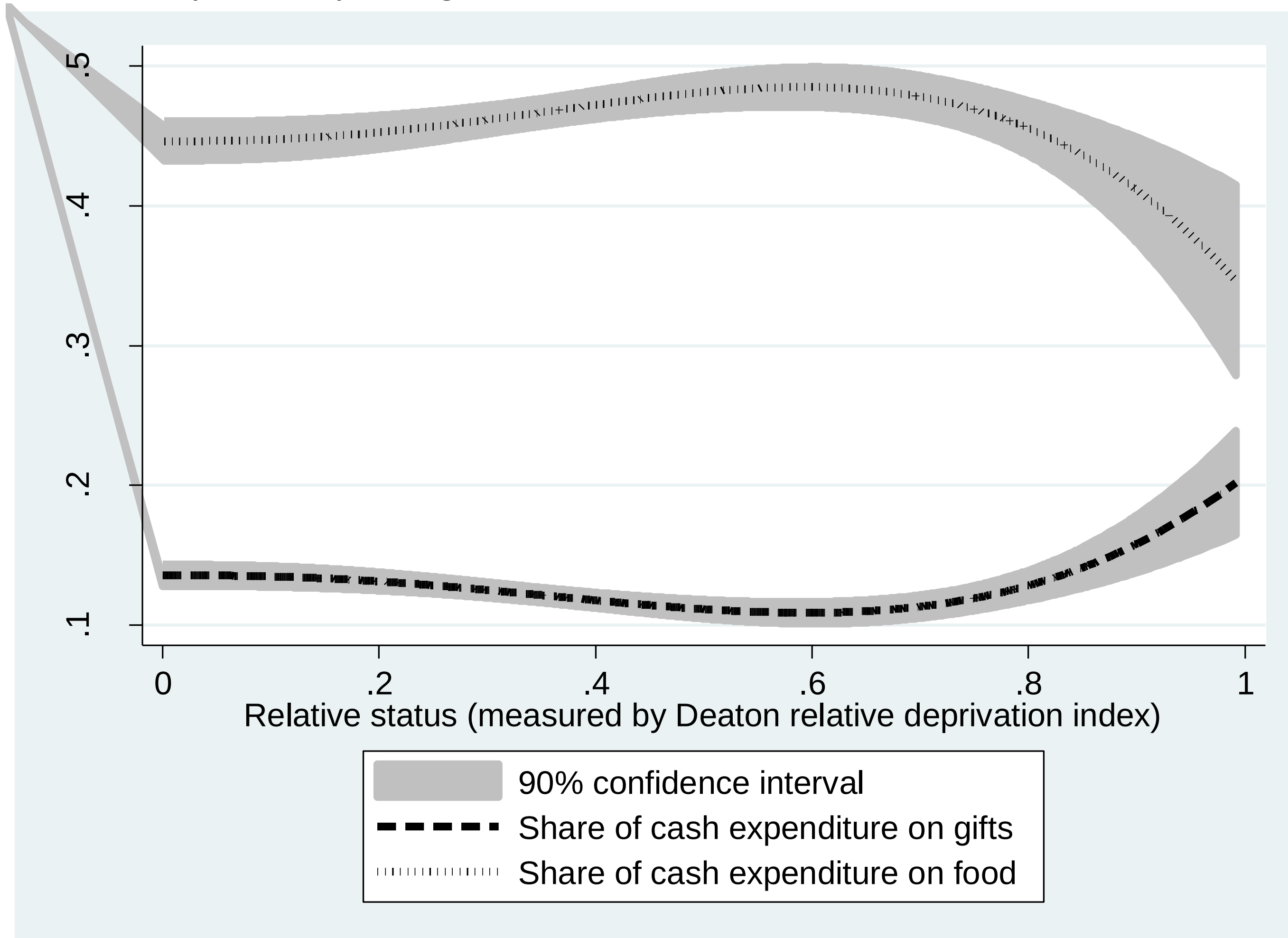
Figure 2.2—Average per capita gift expenditure and number of ceremonies at the village level



Sources: Authors' survey data

Notes: The figure is computed based on our three-wave household survey data in 2004, 2006 and 2009 in Guizhou province. The horizontal axis stands for the number of ceremonies at the village level in the three years, while the vertical axis represent the average per capita gift expenditure (log) at the village level in the corresponding year.

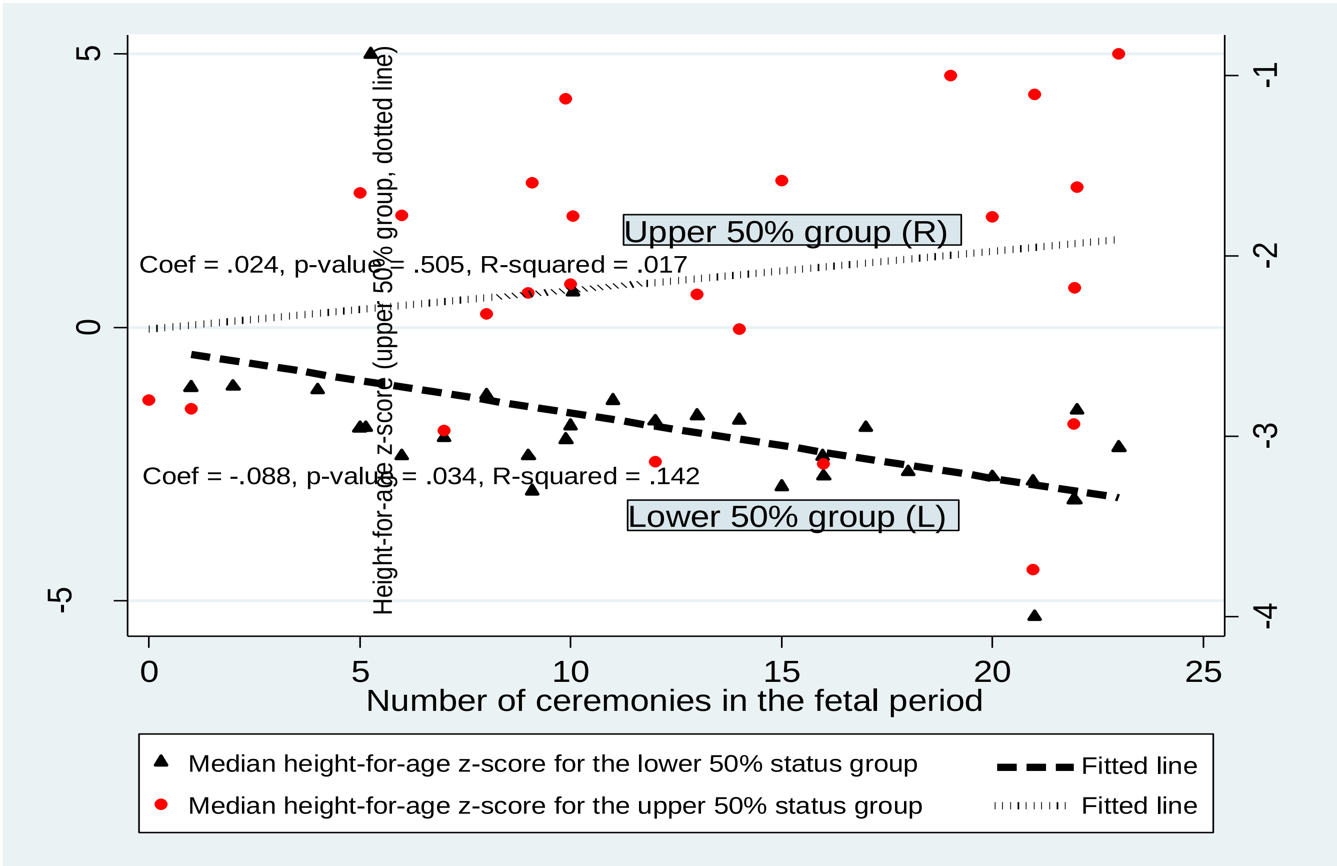
Figure 2.3—Share of cash expenditure spent on gifts and food



Sources: Authors' survey data

Notes: The Deaton index ranges from 0 to 1 with 1 corresponding to the lowest status and 0 to the highest status. All households surveyed in 2004, 2006 and 2009 are used to generate this figure.

Figure 3.1—Number of ceremonies and height-for-age z-score by income status

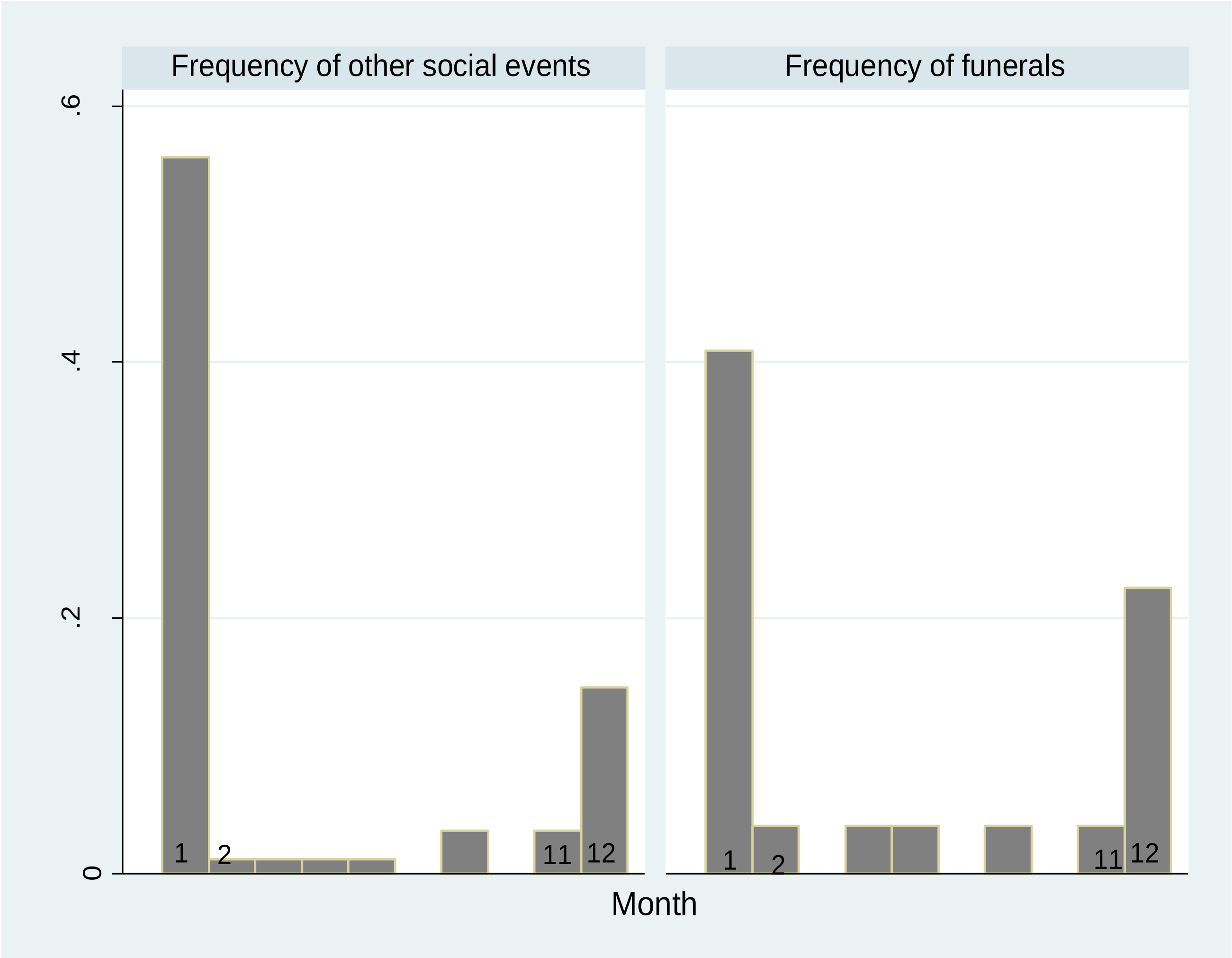


Source: Authors' survey data

Notes: L = left; R = right

The high and low-income groups are divided based on the difference between household average income status and village average income status over the three wave survey between 2004 and 2009. The anthropometric information for children born in the period 2004-2008 is taken from the 2009 survey. The vertical axis represents the average height-for-age z-score corresponding to the number of ceremonies at the village level between 2003 and 2007.

Figure 3.2—Distribution of ceremonies by month



Sources: Authors' gift record data
Notes: Information on all ceremonies between 2004 and 2009 was collected from all households in three out of eighteen villages in rural Guizhou. Childbirths and funerals are excluded from the left figure.

Table 2.1 Summary statistics on major economic indicators of Guizhou household survey in 2004, 2006 and 2009

	2004	2006	2009
Per capita real annual income (in RMB)	1404	1817	2855
Income below poverty line of US $1.25 per day using 2005 PPP (%) (P0)	71.3	64.1	52.7
Income below official national poverty line of RMB 892 per year (%) (P0)	37.3	36.3	22.4
Poverty-gap below poverty line of RMB 892 (P1)	14.5	15.0	10.1
Squared poverty-gap below poverty line of RMB 892 (P2)	7.5	8.3	6.4
Income inequality (Gini)	43.1	48.2	55.2
(Mean) Deaton relative deprivation index	0.423	0.432	0.495
Share of consumption (%)			
Food	47.8	42.2	35.5
Gift and festival spending	7.9	13.9	15.2
Cash and in-kind food consumption (in RMB)			
Grain	312.9	300.9	273.7
Condiment (salt, vegetable oil and animal oil)	134.9	138.8	115.8
Vegetable, fruit, tea, drink, cigarette and tobacco	134.1	236.1	229.0
Vegetable and fruit	-	126.9	170.8
Tea, drink, cigarette and tobacco	-	109.2	58.2
Meat, egg and dairy product	76.3	94.9	60.0

Source: Authors' survey data

Notes:

[1] RMB = yuan renminbi. PPP = purchasing power parity. P0, P1 and P2 denote the standard Foster-Greer-Thorbecke poverty measures. In particular, P0 measures the headcount ratio, P1 measures the average poverty gap, and P2 measures the squared poverty gap.

[2] The 2005 PPP exchange rate is at the "China-rural" level. See http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp. The Poverty lines for 2004-2009 are adjusted according to the published annual inflation rate in various issues of *China Statistic Year Book,* published by China's National Bureau of Statistics.

[3] The poverty line of RMB 892 per year in terms of PPP equals US $0.61 per day.

[4] Deaton Relative Deprivation Index (Deaton, 2001) measures household-specific relative status in a village. It is valued between 0 and 1. The larger the number, the lower the relative status, and the more relatively deprived a household is.

[4] All items of food consumption adjusted for inflation based on *China Statistical Year Book*. All values are in RMB.

[5] "-" denotes that no information was collected in the category. Compared with the 2004 survey, in the 2006 and 2009 household survey more detailed information was collected on subcategories of food consumption.

Table 2.2 Summary statistics on major ceremonies in three villages

Year	Female wedding		Male wedding		Funeral		All ceremonies		Gift giving per occasion by income group (in RMB)			% of villagers attending funerals
	Gift size (RMB)	# of ceremonies	Gift size (RMB)	# of ceremonies	Gift size (RMB)	# of ceremonies	Gift size (RMB)	# of ceremonies	botto m 25%	middl e 50%	top 25%	
2004	41.6	0.77	54.1	1.65	41.5	3.19	45.8	9.29	49.8	44.1	45.5	100%
2005	59.9	0.77	47.8	1.47	40.4	2.03	50.2	9.82	47.9	53.1	47.1	100%
2006	71.8	0.94	55.7	0.94	30.7	2.13	43.7	12.18	53.4	38.7	43.2	95.1%
2007	59.9	1.13	41.2	2.06	54.7	4.30	57.9	9.00	63.0	50.2	62.6	99.1%
2008	60.5	1.31	63.5	1.75	92.5	3.32	71.9	9.38	67.3	75.4	66.1	98.6%

Source: Authors' gift record data

Notes:

RMB = yuan renminbi.

[1] The gift spending data were based on gift records kept in all the households in three villages collected in the 2009 survey. They have been adjusted into constant 2004 price (RMB) using the rural consumer price index published in *China Statistic Yearbook* (China National Bureau of Statistics, various issues). A household's income status is based on its income standing in a village in a given year. Because the income data are available only for three years when surveys were conducted, we use household income surveyed in 2006 to proxy income status in 2005, and income data in 2009 to proxy income status in 2007 and 2008.

[2] The gift books record all the gifts received and the corresponding names of gift givers in different occasions. Based on these names, we can compute the participation rate for major events, such as funerals, within each village.

Table 2.3 Squeeze effects of ceremonies on cash expenditure on food and gifts

	R1	R2	R3	R4
	ln(cash food expenditure)	Ln(cash gift expenditure)	ln(cash food expenditure)	Ln(cash gift expenditure)
	Panel A: funerals (SUR)		*Panel B: non-funeral ceremonies (SUR)*	
Deaton RD * # of *events*	-0.253**	0.417**	-0.177**	0.099
	(0.106)	(0.199)	(0.088)	(0.169)
# of *events*	0.132**	0.315***	0.014	-0.053
	(0.058)	(0.110)	(0.049)	(0.095)
Year and village fixed effects	Yes	Yes	Yes	Yes
(Pseudo) R-square	0.222	0.410	0.223	0.389
N	1899	1899	1899	1899

Source: Authors' survey data

Notes:

SUR = seemingly unrelated regression. RD = relative deprivation index

"# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

[1] The SUR estimation represents simultaneous regressions on cash expenditure spent on food and gifts.

[2] The number of non-funeral ceremonies refers to all major ceremonies excluding funerals held by others villagers in a village in the year prior to a child's birth. The number of funerals refers to funerals held by others villagers in a village in the year prior to a child's birth.

[3] Robust standard errors are in parentheses. The estimations are clustered at the village level. The symbols *, **, and *** indicate confidence levels at 90%, 95%, and 99%, respectively.

Table 3.1 Height-for-age z-scores, stunting rate (%), and underweight rate (%)

	Total			Boys			Girls		
Birth year	Z-score	Stunting (%)	Underweight (%)	Z-score	Stunting (%)	Underweight (%)	Z-score	Stunting (%)	Underweight (%)
				WHO standard					
2004	-1.93	45.59	16.18	-2.01	48.72	15.39	-1.82	41.38	17.24
2005	-2.10	40.39	13.46	-2.16	40.00	13.33	-2.01	40.91	13.64
2006	-2.23	53.19	17.02	-2.48	56.00	12.00	-1.99	50.00	22.73
2007	-1.88	33.96	16.98	-2.09	41.38	17.24	-1.58	25.00	16.67
2008	-2.55	45.00	16.67	-2.38	40.48	14.29	-2.91	55.56	22.22
				China CDC standard					
2004	-2.48	55.88	23.53	-2.55	53.85	28.21	-2.39	58.62	17.10
2005	-2.53	50.00	13.46	-2.60	53.33	13.33	-2.40	45.46	13.64
2006	-2.53	59.57	19.15	-2.77	64.00	16.00	-2.29	54.55	22.32
2007	-2.22	47.17	16.98	-2.37	51.72	17.24	-2.00	41.67	16.19
2008	-2.61	46.67	13.33	-2.37	42.86	9.52	-2.94	55.56	22.22

Source: Authors' survey data

Notes:

WHO = World Health Organization. CDC = Center for Disease Control.

Children's anthropometric indicators were taken from the 2009 survey. Stunting is defined as height-for-age z-score less than two standard deviations (SD) of the WHO standard or the China CDC standard. Underweight is defined as weight-for-age z-score less than two SD of the WHO standard or the China CDC standard.

Table 3.2 Ceremony frequency and height-for-age z-scores by income group – simple Difference-in-Difference

Ceremony frequency Income status	Frequent (1)	Less frequent (2)	(1)-(2)		Difference-in-Difference
		Birth year: 2004			
Lower 50%	-2.89	-1.66	-1.23	(3)	
Upper 50%	-1.04	-1.25	0.21	(4)	(3)-(4)= -1.44
		Birth year: 2005			
Lower 50%	-2.41	-1.98	-0.43	(3)	
Upper 50%	-2.01	-1.64	-0.37	(4)	(3)-(4)= -0.06
		Birth year: 2006			
Lower 50%	-3.06	-2.71	-0.35	(3)	
Upper 50%	-1.44	-1.41	-0.03	(4)	(3)-(4)= -0.32
		Birth year: 2007			
Lower 50%	-2.92	-0.42	-2.50	(3)	
Upper 50%	-2.12	-1.57	-0.55	(4)	(3)-(4)= -1.95
		Birth year: 2008			
Lower 50%	-3.27	-2.86	-0.41	(3)	
Upper 50%	-2.66	-2.18	-0.48	(4)	(3)-(4)= 0.07
		Birth year: 2004-2008			
Lower 50%	-2.87	-1.87	-1.00	(3)	
Upper 50%	-1.84	-1.70	-0.14	(4)	(3)-(4)= ***-0.86* (0.48)***

Source: Authors' survey data

Notes:

The groups of "frequent" and "less frequent" are defined based on whether the number of ceremonies in a village is below or above the median number of ceremonies in our sample for a given year. The "Lower 50%" and "upper 50%" income groups are defined according to a household's average income status compared with the village average income status over the three wave survey between 2004 and 2009. In the last row, all the cohorts born from 2004 through 2008 are combined. The standard errors are presented in parentheses.

The symbols * indicates confidence interval at the 90% level.

Table 3.3 Exposures to ceremonies and child health outcomes by income group

	R1-high	R2-low	R3-high	R4-low	R5-high	R6-low	R7-high	R8-low
	Height-for-age z-score (*ols)*		Stunting (*linear probability)*		Height-for-age z-score (*ols)*		Stunting (*linear probability)*	
	Panel A: funerals				*Panel B: non-funeral ceremonies*			
# of events *before* birth	0.331	-1.119	-0.203**	0.239**	-0.006	-1.716***	-0.084	0.413***
	(0.302)	(0.732)	(0.091)	(0.100)	(0.411)	(0.416)	(0.125)	(0.129)
# of events *after* birth	0.195	-0.166	-0.06	0.022	-0.278	0.565	0.108	-0.141
	(0.385)	(0.450)	(0.082)	(0.126)	(0.409)	(0.365)	(0.134)	(0.128)
(Pseudo) R-square	0.417	0.219	0.388	0.245	0.414	0.257	0.358	0.286
N	117	117	117	117	117	117	117	117

Source: Authors' survey data
Notes: OLS = ordinary least squares. RD = relative deprivation index.
"# of Events" means funerals for the left panel and non-funeral ceremonies for the right panel.
[1] All the regression analyses since Table 3.3 are conducted at the child level.
[2] Due to the small sample size, we divide the sample into high income group (R1, R3 and R5) and low income group (R2, R4 and R6) according to the difference between a household's income status during prenatal period and the average village income status. Sample size=117=234/2.
[3] The number of non-funeral ceremonies and number of funerals refer to the total number of ceremonies (excluding funerals) and funerals held by other villagers in a village in the year prior to or after a child's birth. The health outcome measures are based on the World Health Organization standard.
[4] Household level characteristics (ceremony frequency before and after a child's birth, predicted per capita income, head sex, mother's education, parental health behavior at the time of the child's birth including smoking and drinking, household size, presence of grandparents, presence of parents, ethnicity, mother's height, other major shocks and so on), child characteristics (age dummy, sex, birth season, birth order), year fixed effects, village fixed effects and year X village fixed effects are also included but not reported here. The estimations are clustered at the village level.
[5] Robust standard errors are in parentheses. The symbols *, **, and *** indicate confidence levels at 90%, 95%, and 99%, respectively.

Table 3.4 *Main results:* Exposures to ceremonies and child health

	R1: Height-for-age z-score (*ols*)	R2: Stunting (*linear probability*)	R3: Height-for-age z-score (*ols*)	R4: Stunting (*linear probability*)
	Funerals		*Non-funeral ceremonies*	
	Panel A: no covariates			
Deaton RD * # of events *before* birth	-2.095***	0.412*	-2.120***	0.547**
	(0.731)	(0.218)	(0.750)	(0.248)
Deaton RD * # of events *after* birth	0.567	-0.259	0.988	-0.456**
	(0.780)	(0.227)	(0.652)	(0.220)
(Pseudo) R-square	0.035	0.040	0.042	0.062
AIC	1071	364	1070	358
	Panel B: village fixed effects and year fixed effects included			
Deaton RD * # of events *before* birth	-2.078***	0.508**	-1.913***	0.509**
	(0.711)	(0.231)	(0.693)	(0.205)
Deaton RD * # of events *after* birth	0.349	-0.131	0.886	-0.34
	(0.629)	(0.212)	(0.711)	(0.276)
(Pseudo) R-square	0.228	0.208	0.253	0.219
AIC	576	239	592	188
	Panel C: village, year fixed effects and village X year fixed effects included (Second brackets show p-values for clustered SEs/Wild bootstrap procedure)			
Deaton RD * # of events *before* birth	-2.079	0.430	-1.886	0.423
	(0.803)**	(0.234)*	(0.640)***	(0.209)**
	(0.041)**	(0.092)*	(0.047)**	(0.040)**
Deaton RD * # of events *after* birth	0.441	-0.132	0.803	-0.314
	(0.765)	(0.219)	(0.726)	(0.287)
	(0.526)	(0.604)	(0.208)	(0.246)
# of events *before* birth	0.710	-0.138	-0.026	-0.017
	(0.465)	(0.140)	(0.411)	(0.151)
	(0.112)	(0.211)	(0.643)	(0.221)
# of events *after* birth	-0.167	0.056	-0.429	0.142
	(0.478)	(0.134)	(0.400)	(0.147)
	(0.723)	(0.683)	(0.245)	(0.089)*
(Pseudo) R-square	0.252	0.237	0.286	0.257
AIC	996	345	986	338
N	234	234	234	234

Source: Authors' survey data

Notes: OLS = ordinary least squares. RD = relative deprivation index. AIC = Akaike information criterion.

[1] "# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

[2] To save space, Panels A-B do not present results for # of events before and after birth.

[3] Panel C includes village * year fixed effects (standard errors shown in the first brackets) and further adjusts standard errors (adjusted p-values shown in the second brackets) via Cluster Bootstrap Procedure in Cameron, Gelbach, and Miller (2008).

[4] Other notes follow [1]-[4] for Table 3.3.

Table 3.5 Falsification test on squeeze effects: acute versus chronic under-nutrition

	R1	R2	R3	R4
	Underweight (*linear probability*)	Weight-for-height z-score (*ols*)	Underweight (*linear probability*)	Weight-for-height z-score (*ols*)
	Panel A: funerals		*Panel B: non-funeral ceremonies*	
Deaton RD * # of events *before* birth	0.418*	0.255	0.033	0.285
	(0.210)	(1.167)	(0.156)	(1.193)
Deaton RD * # of events *after* birth	-0.042	-0.390	0.027	0.131
	(0.170)	(1.270)	(0.138)	(0.927)
# of events *before* birth	-0.193*	0.994	0.096	0.292
	(0.106)	(0.594)	(0.114)	(0.716)
# of events *after* birth	-0.07	0.064	-0.035	0.113
	(0.098)	(0.579)	(0.088)	(0.537)
(Pseudo) R-square	0.168	0.234	0.15	0.217
N	234	231	234	231

Source: Authors' survey data

Notes:

OLS = ordinary least squares. RD = relative deprivation index. AIC = Akaike information criterion.

"# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

This falsification test uses contemporaneous health measure - weight-for-height z-score (wasting).

Wasting is defined as weight-for-height z-score less than two standard deviations (SD) of the referred standard. Underweight may indicate stunting and/or wasting. However, *In Utero* exposure to costly social events is expected to affect chronic health outcomes, such as stunting status, rather than acute undernutrition status, such as weight-for-height z-score or wasting status. Estimation results in this table confirm the presence of squeeze effects on chronic restriction of child growth – stunting.

See notes [2]-[4] for Table 3.3.

Table 3.6 Falsification test on squeeze effects: non-exposed ceremonies and child health outcomes

	R1	R2	R3	R4
	Height-for-age z-score *(ols)*	Stunting (*linear probability)*	Height-for-age z-score *(ols)*	Stunting (*linear probability)*
	Panel A: funerals		*Panel B: non-funeral ceremonies*	
Deaton RD * # of events *before* birth	-0.136	0.055	-0.222	0.192
	(0.731)	(0.276)	(0.976)	(0.306)
Deaton RD * # of events *after* birth	0.069	-0.058	-0.418	-0.096
	(0.843)	(0.238)	(0.987)	(0.295)
# of events *before* birth	0.255	-0.120	-0.012	-0.053
	(0.584)	(0.157)	(0.511)	(0.150)
# of events *after* birth	-0.123	0.044	-0.130	0.102
	(0.614)	(0.155)	(0.451)	(0.143)
(Pseudo) R-square	0.236	0.229	0.266	0.239
N	234	234	234	234

Source: Authors' survey data

Notes: RD = relative deprivation index.

"# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

The specification is similar to that of Table 3.4 except that we lag the number of funerals and of other major ceremonies for each age cohort by one year.

See notes [2]-[4] for Table 3.3.

Table 3.7 Robust check: Exposures to ceremonies and health of children born between February and September

	R1	R2	R3	R4
	Height-for-age z-score (ols)	Stunting (linear probability)	Height-for-age z-score (ols)	Stunting (linear probability)
	Panel A: funerals		*Panel B: non-funeral ceremonies*	
Deaton RD * # of events *before* birth	-3.196***	0.889***	-2.393*	0.574*
	(0.954)	(0.309)	(1.211)	(0.328)
Deaton RD * # of events *after* birth	-0.021	-0.057	-0.043	-0.171
	(0.782)	(0.307)	(0.923)	(0.301)
# of events *before* birth	0.786	-0.388**	0.574	-0.157
	(0.615)	(0.150)	(0.710)	(0.170)
# of events *after* birth	0.239	0.026	-0.408	0.11
	(0.488)	(0.181)	(0.542)	(0.127)
(Pseudo) R-square	0.265	0.333	0.276	0.317
N	146	146	146	146

Source: Authors' survey data

Notes: RD = relative deprivation index.

"# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

The specification is the same as that of Table 3.4 except that we restrict our sample to children who were born between February and September.

See notes [2]-[4] for Table 3.3.

Table 3.8 Robust check: Exposures to ceremonies and child health outcomes using alternative reference groups

	R1	R2	R3	R4
	Surname Networks			
	Height-for-age z score (*ols*)	Stunting (*linear probability*)	Height-for-age z score (*ols*)	Stunting (*linear probability*)
	Panel A: funerals		*Panel B: non-funeral ceremonies*	
Deaton RD * # of events	-2.124**	0.322	-1.767***	0.408*
before birth	(0.955)	(0.295)	(0.658)	(0.236)
Deaton RD * # of events	0.798	-0.15	0.94	-0.331
after birth	(0.870)	(0.242)	(0.727)	(0.282)
# of events *before* birth	0.618	-0.184	0.056	-0.047
	(0.492)	(0.151)	(0.385)	(0.147)
# of events *after* birth	-0.307	0.081	-0.272	0.111
	(0.495)	(0.141)	(0.362)	(0.139)
(Pseudo) R-square	0.253	0.231	0.274	0.248
N	232	232	232	232

Source: Authors' survey data

Notes:

RD = relative deprivation index.

"# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

The specification is the same as that of Table 3.4 except that we replace villages with surname networks as reference groups. Surname networks are confined to the boundaries of a village.

See notes [2]-[4] for Table 3.3.

Table 3.9 Robust Check: Exposures to ceremonies and child health outcomes using the China CDC standard

	R1	R2	R3	R4
	Height-for-age z-score (*ols)*	Stunting (*linear probability)*	Height-for-age z-score (*ols)*	Stunting (*linear probability)*
	Panel A: funerals		*Panel B: non-funeral ceremonies*	
Deaton RD * # of events *before* birth	-1.950**	0.539**	-1.885***	0.951***
	(0.733)	(0.234)	(0.596)	(0.274)
Deaton RD * # of events *after* birth	0.479	0.159	0.857	-0.386
	(0.709)	(0.185)	(0.701)	(0.290)
# of events *before* birth	0.62	-0.301**	-0.033	-0.320*
	(0.402)	(0.120)	(0.381)	(0.177)
# of events *after* birth	-0.123	-0.129	-0.441	0.107
	(0.450)	(0.127)	(0.380)	(0.155)
(Pseudo) R-square	0.253	0.24	0.292	0.277
N	233	233	233	233

Source: Authors' survey data

Notes: See notes [2]-[4] for Table 3.3.

"# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

Table 3.10 Other findings: Exposures to ceremonies and child health outcomes by gender

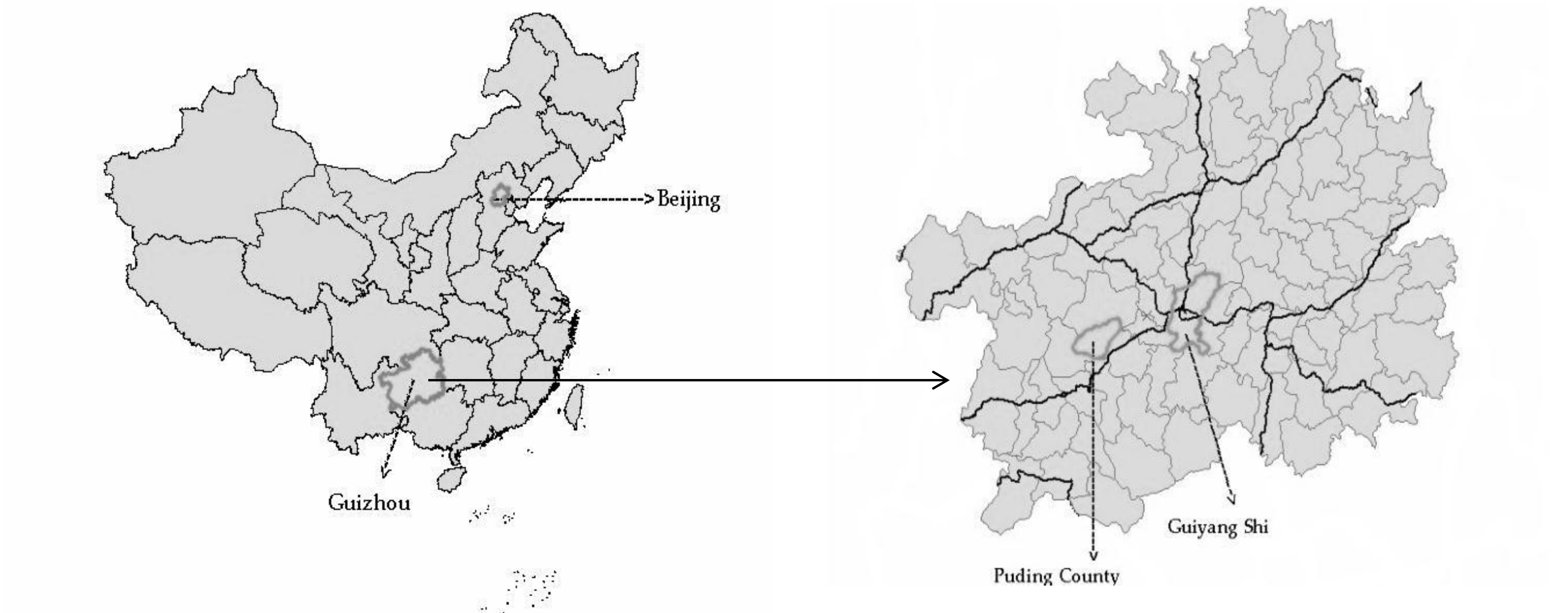
	R1-boy	R2-girl	R3-boy	R4-girl	R5-boy	R6-girl	R7-boy	R8-girl
	Height-for-age z score *(ols)*		Stunting (*linear probability)*		Height-for-age z score *(ols)*		Stunting (*linear probability)*	
	Panel A: funerals				*Panel B: non-funeral ceremonies*			
Deaton RD * # of *events* before birth	-3.283**	-0.477	0.17	0.59	-1.856*	-0.167	0.222	-0.106
	(1.585)	(0.902)	(0.356)	(0.445)	(1.064)	(2.078)	(0.321)	(0.751)
Deaton RD * # of *events* after birth	1.626	-0.816	-0.172	0.219	0.448	0.454	-0.158	0.576
	(1.369)	(1.102)	(0.236)	(0.472)	(1.328)	(2.267)	(0.356)	(0.719)
# of *events* before birth	1.350*	-0.405	-0.18	-0.273	0.104	-1.141	0.024	0.21
	(0.781)	(0.549)	(0.181)	(0.227)	(0.634)	(1.077)	(0.185)	(0.430)
# of *events* after birth	-1.333*	0.976	0.256	-0.187	-0.449	0.013	0.186	-0.295
	(0.718)	(0.709)	(0.153)	(0.253)	(0.706)	(1.202)	(0.152)	(0.365)
(Pseudo) R-square	0.35	0.447	0.37	0.417	0.352	0.468	0.384	0.413
N	138	95	138	95	138	95	138	95

Source: Authors' survey data

Notes: See notes [2]-[4] for Table 3.3.

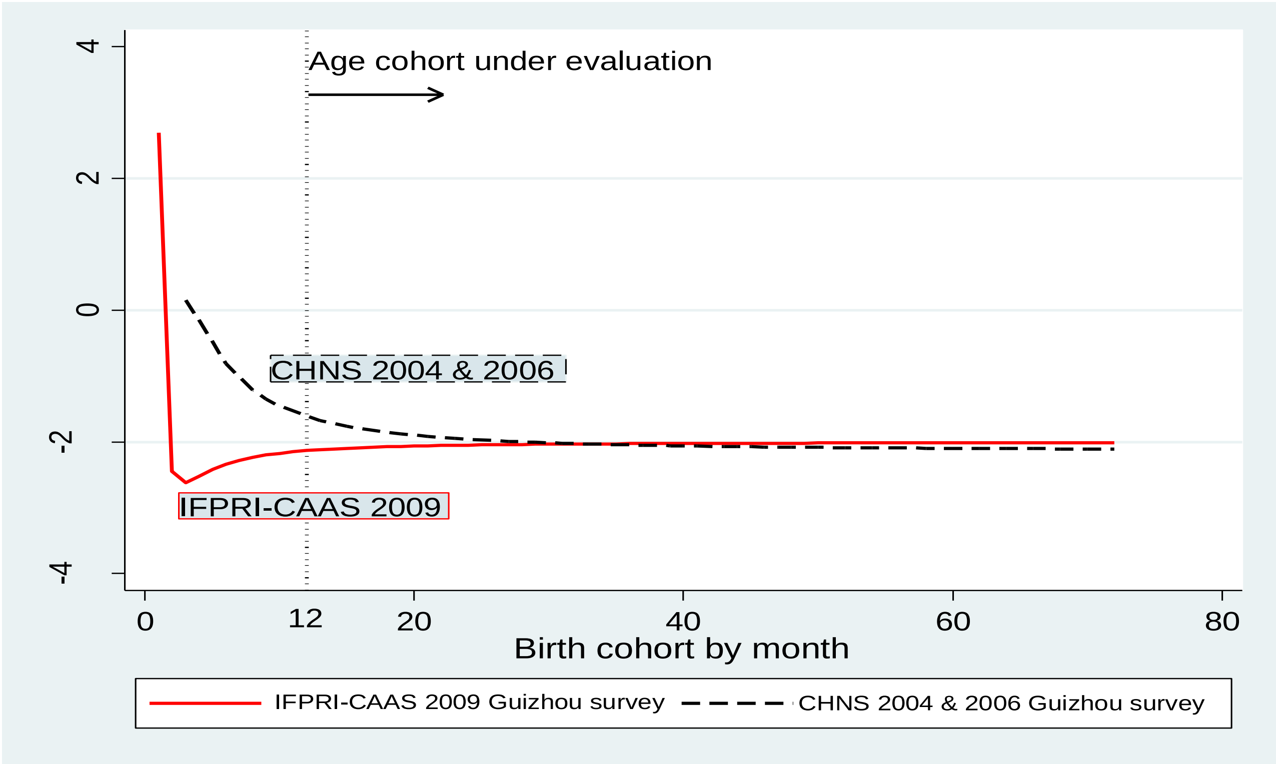
"# of Events" means funerals in the left panel and non-funeral ceremonies in the right panel.

Appendix: Supplementary Figures
Figure A.1—Location of the surveyed region



Source: Michigan China Data Center

Figure A.2—Height-for-age z-score for CHNS Guizhou data and our IFPRI-CAAS sample



Sources: Our IFPRI-CAAS 2009 wave Guizhou survey has a sample size of N=276 in the age range of 1-72 months. To closely match our sample, CHNS 2004 & 2006 subsample from Guizhou province is the best option available. The CHNS data comes from an ongoing international collaborative project between the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention, available at http://www.cpc.unc.edu/projects/china. Both waves of the latter survey were conducted in 9 provinces. In total, there are 137 children in the age range of 1-72 months in rural Guizhou.

Notes: CHNS = China Health and Nutrition Survey. IFPRI = International Food Policy Research Institute. CAAS = Chinese Academy of Agricultural Sciences. This paper evaluates the impact of prenatal exposure to social events for children between 12-72 months. The patterns of z-score between the two datasets after the 12th month are very similar. Moreover, our IFPRI-CAAS survey possesses the advantage of a census survey, which better represents the demographic pattern in China, for example, that of an unbalanced sex ratio. Specifically, the *China 1% Population Survey 2005* indicates that the sex ratio at birth (boys: girls) in Guizhou province is 128:100 (Zhu et al., 2009), and in rural Guizhou this ratio is even higher. This fact is captured in our IFPRI-CAAS sample but not in the CHNS sample. The sex ratio between 1 and 72 months in the IFPRI-CAAS sample is around 139:100, while the ratio is 70:100 in the CHNS 2004 and 2006 Guizhou sample.

Appendix: Supplementary Table

Table A.1—Summary statistics of key variables

	Mean	Median	SD
Height-for-age z-score	-2.160	-1.967	2.089
Stunting status	0.436	0	0.497
Underweight status	0.161	0	0.368
Deaton relative income status (during fetal period)	0.521	0.521	0.260
Deaton relative income status (during birth year)	0.505	0.494	0.260
Number of funerals (during fetal period)	3.025	3	2.045
Number of funerals (during birth year)	2.621	2	2.112
Number of non-funeral events (during fetal period)	10.794	10	5.359
Number of non-funeral events (during birth year)	10.423	10.5	5.908
Per capita income (log)	7.397	7.492	1.314
Household head gender	0.960	1	0.196
Household head education	5.215	5	2.863
Birth order	1.421	1	0.629
Household size	4.579	4	1.625
Minority status	0.350	0	0.478
Child gender	0.589	1	0.493
Presence of mother in a family	0.782	1	0.414
Presence of father in a family	0.746	1	0.436
Presence of grandparents in a family	0.318	0	0.467
Whether parents smoke	0.579	1	0.495
Mother’s height	149.603	151	15.980
Mother’s bmi	22.714	21.929	4.143
Birth season	2.602	3	1.129

Source: Authors’ survey data

Notes: Sample includes children who were aged one to five in 2009.