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Household Responses to Information on Child Nutrition: Experimental Evidence from Malawi

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Abstract

This paper provides evidence on household responses to the relaxation of one barrier constraining adoption of health practices - lack of information - in a resource constrained setting. It examines the effects of a randomized intervention in Malawi which provides mothers with information on infant nutrition and health. It finds that the intervention results in increases in household food consumption, particularly of protein-rich foods by children. The increased household consumption is funded by increased father's labor supply, constituting evidence that changes in the perceived child health production function affect adult labor supply. Improved consumption also results in better child health.

Keywords: Infant Health, Health Information, Cluster Randomized Control Trial

JEL classification: D10, I15, I18, O12, O15

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1. Introduction

Malnutrition is a severe and prevalent problem in developing countries: around one third of children below the age of five are stunted in growth (Onis *et al.* 2000). Malnutrition in infanthood not only decreases welfare, but is also associated with poor cognitive and educational performance and low productivity later on in life.[5] A number of factors, including lack of information, credit and liquidity constraints, may contribute to such high malnutrition rates.[6] Relaxing these constraints may thus result in improvements in health, as has been corroborated by various experimental and quasi-experimental studies. Very little attention, however, has been paid to how margins of household behaviour other than health are affected by the relaxation of these constraints. Investigating how health interventions affect household behaviour and wellbeing both in the short- and long-run, for instance through labor supply and human capital investments, would enrich our understanding of the wider economic effects of such interventions.

The objective of this paper is to understand how households respond to the relaxation of one constraint - lack of information. The particular type of information considered is related to ways to improve children's nutritional status. Two ways in which households might adjust in response to the information are either by changing the composition of consumption while keeping the total amount consumed the same, or by changing both the composition and total amount of consumption. Our paper finds support for the latter. Indeed, using a simple theoretical model, we show that the provision of information on child nutrition increases household consumption, and accordingly, labor supply. Within the context of a cluster randomized trial in rural Malawi we find that, consistent with the theory, the provision of information on child nutrition increases both household consumption and adult labor supply. Although the relationship between adult labor supply and information on child nutrition belongs to basic economic reasoning, neither the economics nor medical literatures have, to our knowledge, shed light on this before. More generally, our paper shows that non-health outcomes (such as labor supply) are linked to parents' perceptions of the child health production function.

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5 See Behrman 1996, Strauss and Thomas 1998, Glewwe *et al.* 2001, Alderman *et al.* 2001, Schultz 2005, Hoddinott *et al.* 2008, Maluccio *et al.* 2009, Barham 2012.

6 For a discussion of these factors, see Strauss and Thomas (1998) and Dupas (2011a).

Importantly for policy, we find that the provision of information results in significant improvements in young children's health as measured by height, a widely used indicator of long-term health. An important contribution of the paper is to investigate how these improvements are realised. We find direct evidence of improvements in maternal knowledge of child nutrition, and our findings suggest that this results in better infant feeding practices: children benefit from an improved diet (both solid and liquid intake) which is also reflected in an increase in total household consumption (particularly of protein-rich foods, and of fruit and vegetables). These preventative health investments appear to be funded by increases in adult labor supply, particularly that of fathers. Overall, the findings are consistent with households learning that some relatively costly foods are more nutritious and beneficial than they previously believed, and adjusting their labor supply behaviour so as to facilitate increases in their children's intake of them.

We find that women are more likely to talk to friends about child health and nutrition in intervention areas, suggesting that the intervention made child-nutrition related issues more salient in these communities. We thus investigate whether the intervention had any spillover effects on children not directly exposed to the intervention, i.e. older children who were born before the intervention started. We find evidence of spillovers, both within and across households in terms of increased food intake, but not in terms of medium or long term health. This is in some ways not surprising as health is less malleable at older ages.

Our work fits into the growing literature on the importance of information for health. A recent review by Dupas (2011a) suggests that the provision of health-related information can have significant impacts on health behaviour. For instance, providing specific information - such as arsenic or fecal concentration in water (Madajewicz *et al.* 2007; Jalan and Somanathan 2008) - affects relevant practices; Dupas (2011b) shows that teenage girls change their sexual behaviour in response to information on the risks of contracting HIV. There is also evidence that information campaigns about specific prevention practices can affect household behaviour - such as the promotion of oral rehydration therapy (Levine *et al.* 2004), and hand washing (Wilson and Chandler 1993). Our work departs from these studies not only by considering a broader and more multifaceted type of information (ways to improve child nutrition), but also by studying the effects of this information on a wider range of household behaviours - with a particular focus on labor supply - than those directly targeted by the intervention.

Our work also contributes to the literature evaluating the effects of interventions providing health information on child health. Morrow *et al.* (1999) and Haider *et al.* (2000) have studied effects of similar interventions on health practices (specifically exclusive breastfeeding) within small scale randomized controlled trials in Mexico and Bangladesh respectively. Further, a set of mostly non-experimental studies has investigated the effects of similar interventions on health outcomes, finding improvements in child weight-for-age, an indicator of medium-term health status (Alderman 2007, Linnemayr and Alderman 2011, Galasso and Umapathi 2009).[7] This paper builds on this literature by considering the effects on child health (both short- and long-run indicators), health practices, and other margins of household behaviour, all identified within a randomized controlled trial.

The rest of the paper is structured as follows. Section 2 provides some background on rural Malawi and describes the experimental design, section 3 describes the theoretical framework, while section 4 sets out the empirical model and data. Our main results are presented in section 5, and section 6 contains an analysis of spillovers. Section 7 considers alternative potential explanations behind our findings, and section 8 concludes. The Appendix contains some analytical derivations and additional tables.

2. Background and Intervention

2.1 Background

Malnutrition in the early years (0-5) has important, potentially devastating, short- and long-run effects. It leaves children vulnerable to other illnesses and diseases, threatening their very survival (Bhutta *et al*. 2008), and also affects longer term outcomes such as schooling, adult health and productivity (Glewwe *et al.* 2001, Maluccio *et al.* 2011). It is one of the major public health and development challenges facing Malawi, one of the poorest countries in Sub-Saharan Africa. The Malawi Demographic and Health Survey (DHS) Report for 2004 indicates an under-five mortality rate of 133 per 1000, and under-nutrition is an important factor in a significant proportion of these deaths: Pelletier *et al*. (1994) estimate that 34% of all deaths that occur before age 5 in Malawi are related to malnutrition (moderate or severe). Stunting, in other words being too short for one's age, is a primary manifestation of chronic

[7] Related to this point, Thomas et al (1991) find that most of the impact of maternal education on child height in Brazil can be explained by access to information (reading papers, watching television, and listening to radio).

malnutrition in early childhood. In Malawi, 48% of children younger than 5 are stunted, a rate that is the second highest in sub-Saharan Africa, and one of the highest in the world. It is 24 times the level expected in a healthy, well-nourished population. Further, 22% of children under the age of 5 are underweight for their age, which is 11 times the level expected in a healthy, well-nourished population.

In terms of nutritional input, exclusive breastfeeding is recommended for children below the age of 6 months (UNICEF and World Health Organization, WHO), but it is uncommon in Malawi: despite very high rates of breastfeeding, just under half of infants under six months of age are also given water and/or foods.[8] Porridge diluted with unsterilized water and thus contaminated, is often given in large amounts to infants as young as one week, partially displacing breastmilk (Kerr *et al*. 2007). Further, though there is a risk of vertical transmission of HIV through breastfeeding, reducing this risk by choosing not to breastfeed is not a viable option in rural Africa, where formula feeds are expensive and not commonly available and local water supplies are unlikely to be safe.[9] In terms of complementary foods, evidence from the medical literature suggests that the early introduction of complementary foods and water can lead to gastrointestinal infections and growth faltering (Haider *et al.* 1996, Kalanda *et al*. 2006). Further, the WHO recommends that infants aged 6 months and over should be given foods rich in energy, proteins and micronutrients such as iron, calcium, zinc, vitamins A and C and folate. This requires a diverse and varied diet, since commonly eaten staples (such as maize flour) rarely have sufficient protein and micronutrients required for healthy growth and development (WHO, 2000).

It is against this background that, in the early noughties, a research and development project called MaiMwana (Chichewa for "Mother and Child") was set up in the Mchinji District, in the Central region of Malawi.[10] Its aim was to design, implement and evaluate effective, sustainable and scalable interventions to improve the health of mothers and infants. Socio-economic conditions in Mchinji are comparable to or poorer than the average for Malawi (in

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[8] 53% of children under the age of 6 months are exclusively breastfed, as is recommended by WHO and UNICEF. 17% of infants under 6 months of age are given a combination of breast milk and water. Additionally, 7% of infants under 6 months are given liquids other than water, and 22% receive solid food in addition to breast milk and/or water. 1% of infants under 6 months of age are fully weaned. 90% of children age 10-23 months are still given breast milk (DHS, 2004).

[9] In 2004, the prevalence of HIV in the district where the intervention took place, Mchinji, was 6.4% (Thornton, 2008).

[10] Mai Mwana is a Malawian trust established in 2002, as a collaboration between the Department of Paediatrics, Kamuzu Central Hospital, the Mchinji District Hospital and the UCL Centre for International Health and Development. See http://www.maimwana.malawi.net/MaiMwana/Home.html

parentheses in what follows), with literacy rates of just over 60% (64%), poor quality flooring materials used by 85% (78%) of households, piped water access for 10% (20%) of households, and electricity access for just 2% (7%) of households.[11]

2.2 The Intervention

In 2005, MaiMwana established an infant feeding counselling intervention in the District (still ongoing), to impart information and advice on infant feeding to the mothers of babies aged less than six months. The information is provided by trained volunteers ("counsellors" hereon) nominated by local leaders. Each counsellor covers an average population of 1,000 individuals, identifying and visiting all pregnant women five times in their homes: once before giving birth (3rd trimester of pregnancy) and four times afterwards (baby's age 1 week, 1 month, 3 months, 5 months). In practice, on average 60% of eligible women are visited by the counsellors.[12]

In terms of the content of the visits, exclusive breastfeeding is encouraged from the first one; breastfeeding positioning and attachment, and any practical problems mothers are having are dealt with (including referral to a health facility if necessary) in all visits subsequent to the birth (visits 2-5). Information on weaning is provided from when the baby is 1 month old (visits 3-5).[13] Information on weaning foods is provided during the last visit, including suggestions of suitable locally available nutritious foods, the importance of a varied diet (particularly, the inclusion of protein- and micronutrient-rich foods, including eggs[14]) and instructions on how to prepare foods (e.g. give the child mashed vegetables rather than vegetable broth; pound fish before cooking it) so as to conserve nutrients and ease digestion. We note that the intervention we consider targets the very first years of life, a critical period for growth and development during which nutritional interventions are likely to be most beneficial (Shrimpton *et al*. 2001, Victora *et al*. 2010).

[11] Source: Malawi Population and Housing Census, 2008.
[12] Possible reasons why 40% of eligible mothers were not visited include the counsellors' time availability.
[13] Though the intervention is strongly focused on nutrition, it also covers other issues such as birth preparedness (visit 1), HIV testing and counselling (visit 1), vaccinations (visits 2-5), and family planning (visits 1-2). Our conversations with programme implementers suggest that the family planning aspect of the intervention did not work well, as volunteers generally felt too uncomfortable discussing the topic. We will present results on family planning in section 7.2.
[14] Local custom discourages the feeding of eggs to young infants.

2.2.1 Experimental Design

The evaluation is based on a cluster randomized controlled trial designed as follows (see Lewycka *et al*. 2010). The District was divided into 48 parts, each containing a population of approximately 8,000 individuals. Starting from the centre of each part and working outwards, up to 3,000 individuals were chosen to be included in the "study area", which we call zone from here on. On average, three counsellors cover each zone. The remaining 5,000 individuals living beyond this zone create a natural buffer area between zones. The buffer areas were created so as to limit contamination between neighbouring zones, each of which may be receiving a different intervention or none at all. 12 zones were randomly selected to receive the infant feeding counselling intervention, while a further 12 serve as control zones.[15,16]

2.2.2 Sample Description

The sample was drawn from a census of all women of reproductive age conducted by Mai Mwana in the study areas in 2004, before the intervention started, and is referred to hereon as the baseline census.[17] A random sample of 2,496 women across the 24 zones (104 in each zone) was drawn from this baseline census. This census also contains basic socio-economic and demographic characteristics for these women and their households and is our main source of descriptive statistics at baseline (i.e. pre-intervention). We see from the left hand column of Table 1 that women in this sample are 24.5 years old on average, and just over 61% of them are married. Over 70% have some primary schooling, but the proportion with any secondary schooling drops sharply to 6%. Practically all households are involved in agriculture, and approximately 66% of women report agriculture as their main activity. Households are very poor, as indicated by the housing materials and asset holdings, and are large, with close to 6 members on average. A further important point to take from this panel in the table is that the sample is well-balanced across intervention and control areas, with small imbalances detected on 3 out of 25 variables (2 of which are at the 10% level of significance only).

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[15] The remaining 24 zones were randomly assigned to receive a participatory women's group intervention, in which reproductive age women are encouraged to form groups, which meet regularly to discuss issues related to pregnancy, child birth and neo-natal health. Some groups may discuss nutrition but it was not the focus of the intervention (see Rosato *et al.* 2006 and Rosato *et al.* 2009 for a summary of some of the issues discussed in these groups). For these reasons, we focus solely on the infant feeding counselling intervention in this paper.

[16] Mai Mwana Project also improved health facilities across the District, which benefitted both intervention and control zones equally.

[17] The baseline census is described in Lewycka *et al*. (2010).

[TABLE 1 HERE]

The analysis in the paper is based on two years of survey data collected in 2008-09 and 2009-10, respectively 3.5 and 4.5 years after the intervention started in July 2005.[18,19] In the 2008-09 ("first", hereon) survey, we interviewed around two thirds of the sample drawn of women of child bearing age (aged 17-43 at the time of survey). Reassuringly, this rate is very similar across intervention and control zones, at 65% and 67% respectively.[20] The balance on a range of observed baseline characteristics is maintained, as shown in the right hand panel of Table 1, indicating that attrition was not significantly different between intervention and control zones.[21] We detect small imbalances on just 2 variables (the number of sleeping rooms, also detected for the full sample, and whether or not a household owns an oxcart, though ownership is low at 6%).

The 2009-10 ("second") survey followed those women (and their households) who had been successfully interviewed in the first survey. 91% of these were reached: 92.5% and 90% in intervention and control areas respectively. The balance for this sample, again based on observed baseline characteristics, though not displayed here, is very similar to that displayed in the last three columns of Table 1, with the exception of a small imbalance in woman's marital status.

The two surveys contain detailed information on household consumption; consumption of liquids and solids for each child in the household (≤6 years); breastfeeding practices (≤2 years); self-reported health for all individuals in the household[22]; weights and heights of

[18] We take the intervention start date to be July 2005, in line with Lewycka *et al.* (2010). This is the date by which the first 6-month cycle had been fully completed.

[19] Data collection was carried out by MaiMwana in collaboration with the authors. The data are publicly available through www.data-archive.ac.uk.

[20] This was lower than planned due to an unexpected drop of the British Pound against the Malawi Kwacha, resulting in data collection having to be cut short. This particularly affected attempts to interview women who had moved away from the village where they lived in 2004. In fact, Table A1 in the Appendix indicates that those women that were not found are less likely to be farmers, and more likely to be students and younger than 16 years in 2004 which seems to indicate that they might have migrated to other villages/urban areas for marriage or better work opportunities. For the purpose of this paper, the most important issue is that the attrition seems to have preserved the balance of observable characteristics between intervention and control (Table 1). Along the same lines, the observable characteristics of those that attrited in control are very similar to the ones of those who attrited in intervention areas as Table A2 in the Appendix shows. The two significant differences at 5% level already existed in the sample initially drawn (first three columns of Table 1).

[21] There are other indications that our findings are not affected by differential attrition. We come back to this in section 7.3.

[22] The main respondent reported on the health status of household members.

children (≤6 years), and their mothers' heights[23]; education (≥6 years) and labor supply (≥6 years); and the main respondent's knowledge on nutrition. In addition to the household surveys, detailed information was collected on market level food prices, with repeat visits to the same markets in different months to attenuate any seasonality effects.[24]

3. Conceptual Framework

In order to understand how information might affect household decisions, we set up a simple theoretical model in which households have 1 adult and 1 child. The adult chooses simultaneously the amount to spend on child consumption, C, the amount to spend on adult consumption, A, and the amount of time to spend on leisure L (or on labor supply, T-L, since T is total time endowment of the adult). The aim of the model is to understand how the intervention may affect consumption and adult labor supply. The household's optimization problem is to choose C, A and L to maximise:

$$Max\ U(A,L) + G(H) \qquad (1)$$
$$st: H = h(\theta C) \qquad (2)$$
$$pA + C \leq w(T - L) \qquad (3)$$

where *U(.,.)* captures the utility from adult consumption and leisure, *G(.)* captures the utility from child health, *h*(.) is the child health production function which depends on the child's consumption and θ is a parameter reflecting the household's efficiency in child health production: for a given amount of child consumption, C, a larger θ corresponds to better child health, H.[25] In this framework, we think of the information provided to the mother by the counsellor as raising the value of θ, either because it directly increases knowledge about child nutrition, or because it raises the salience of child nutrition in these areas, with the result that better child nutrition becomes a priority for the parent. We assume, as is standard, that *U(.,.),G(.),* and *h(.)* are increasing and concave in their arguments and that the second order

[23] In the second survey, the heights of children aged between 6 and 7 years were also measured. However, their weights were not measured because some children in this age range could be heavier than the maximum allowed by the scale.

[24] All data were collected using Personal Digital Assistants (PDAs) with in-built consistency checks, which we believe resulted in improved accuracy relative to paper questionnaires.

[25] Since we observe outcomes shortly after the intervention takes place, we abstract from dynamic considerations in this simple set-up and refer to Grossman (1972) for dynamic considerations of a health production function.

condition to attain an interior maximum is satisfied.[26,27] This simple model allows us to derive three key predictions:

Prediction 1: *Providing information on child nutrition to the parent increases child consumption:* ***dC/dθ>0.***

To show this, we differentiate the first order conditions with respect to θ (see Appendix) and find that the sign of $\frac{dC}{d\theta}$ is the same as the sign of the total derivative of the first order condition for C with respect to θ, $\theta C[G^{''}(h^{'})^2 + h^{''}G^{'}] + G^{'}h^{'}$. Consequently, $\frac{dC}{d\theta} > 0,$ unless one of the following holds: (1) G'' , which is negative and has a large magnitude , (2) h'' , which is negative and has a large magnitude, or (3) θC is very large. None of these conditions seem likely to hold in our setting. Very negative values of G'' (alternatively h'') imply that additional increases in child consumption decrease the marginal utility from child health (alternatively the marginal productivity of child consumption) very rapidly; high values of θC are associated with high values of child health. Any of these would be plausible only in contexts where child health is already sufficiently high, unlike in our setting where child health is poor, which indeed motivated this intervention in the first place.

Prediction 2: *Providing information on child nutrition reduces parental leisure and, hence, increases labor supply:* ***dL/dθ<0****.*

The derivation of this prediction is in the Appendix, which shows that a key assumption for this is that $U_{LA}^{''} > 0$, that is the marginal utility of leisure increases with (adult) consumption, which is rather intuitive and adopted by Becker (1965) and Mortensen (1967), amongst others.

Prediction 3: *Total household consumption will increase.*

This follows from the budget constraint, which is necessarily binding at the optimum, and the fact that labor supply increases following the intervention.

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[26] The assumption that U(.,.) and G(.) are separable allow us to abstract from the signs and magnitudes of the cross-partial derivatives of the household utility function with respect to A and H, as well as H and L. Given that the empirical literature has not shed light on these cross partial derivatives, allowing for such non-separabilities would complicate the model without improving its predictive power.

[27] We assume that the household cannot borrow, which is consistent with well-known liquidity constraints in developing countries, as discussed for instance in Dupas (2011a).

Therefore, under assumptions which we believe to be very reasonable in this setting, receiving information on child nutrition increases consumption, both of the child and the household, and increases the labor supply of adults. We now turn to testing these predictions using the data described in Section 2.

4. Empirical Framework

4.1 Estimation

The randomized experiment provides us with a credible source of identification to estimate the effects predicted by the theoretical framework above. To do so, we estimate OLS regressions of the form

$$Y_{izt} = \alpha + \beta_1 T_z + \gamma X_{izt} + \mu_t + u_{izt} \qquad (4)$$

where Y_{izt} includes outcomes for household (or individual) i, living in zone z at time t (i refers interchangeably to either individual or household, depending on the outcome being considered).[28] In line with the theory above, the particular dimensions of household behaviour likely to be affected include household and child consumption, labor supply, and child health; T_z is a dummy variable which equals 1 if the individual/household was living in 2004 in a zone that later received the intervention; X_{izt} is a vector of individual-level variables such as age, age-squared, gender, education and marital status, and zone-level variables such as proportions of women with Chewa ethnicity, and with primary or secondary schooling, and distance to the closest trading centre. μ_t is a vector of month-time dummies indicating the month of the interview, and u_{izt} is an error term which is uncorrelated with the error term of others living in other zones ($E[u_{izt}u_{jwq}] = 0$ if $i \neq j, z \neq w$), but which may be correlated (in an unrestricted way) with that of others living in the same zone, independently of the period ($E[u_{izt}u_{jzq}] \neq 0$). This, in essence, assumes that there may be spillovers within zones, but not across zones, and is supported by the large buffer areas put in place between study areas in adjacent zones, as discussed in section 2.2.1.

The treatment indicator, T_z, is defined on the basis of the zone of residence of the main respondent in our survey as at 2004, and independently of whether the mother of a young child received the counsellor's visit. This means that the parameter identified is an intention-to-treat parameter. Defining T_z on the basis of baseline (2004) residence avoids 2 biases: the

[28] A number of the outcomes are binary measures. We re-ran these using Probit models; results are very similar and not reported.

first might arise from counsellors choosing to visit some mothers and not others (and vice versa, with some mothers choosing not to receive the visits), which would render actual participation endogenous; the second bias might occur if women have migrated to intervention zones from control zones so as to benefit from the intervention. An additional reason for defining T_z on the basis of baseline residence is that the intervention may generate spillovers within the zone to households not eligible for the intervention. Focusing solely on those who received a visit from the counsellor would not give a full picture of the intervention effects, a point which we come back to in section 6 when we measure spillovers.

Although the identification of the treatment effect relies on the randomization, one potential source of bias is that the intervention may have reduced infant mortality in intervention areas.[29] However, this is only likely to be relevant for outcomes relating to children's health, where this differential mortality might alter the (unobserved) distribution of health endowments of children in our sample. Under the assumption that weaker children are the ones more likely to die, this would imply that the average child health endowment is relatively poorer in intervention areas. Consequently, we may be *underestimating* the effect of the intervention on children's health. If the intervention affected fertility, this could alter the composition of children in intervention and control zones, leading to bias.[30] However, as we show in section 7.2, the intervention does not appear to have affected either fertility or family planning, suggesting that this is not an issue in our context.

In terms of inference, standard statistical formulae for clustered standard errors based on asymptotic theory (cluster-correlated Huber-White estimator) have been shown to provide standard error estimates that are too small if the number of clusters (zones here) is small (less than 30) (Donald and Lang 2001, Wooldrige 2004, Duflo, Mullainathan, and Bertrand 2004, and Cameron, Gelbach and Miller 2008).[31] This is a potential issue here, as there are just 24 zones. Cameron *et al.* (2008) recommend instead a wild cluster bootstrap-t procedure to estimate the correct p-value for hypotheses tests of significance. Their Monte Carlo simulations suggest that this method performs relatively well compared to the cluster-

[29] Our sample is much too small to estimate the effect of the intervention on infant mortality.
[30] Note that the characteristics of households across intervention and control zones are not affected by this, as the sample inclusion criterion is on the basis of households containing a woman of reproductive age, independent of her fertility decision.
[31] Cameron *et al.* (2008) indicate 30 as a rule of thumb for when the number of clusters can be considered small, but they indicate that in general it will depend on the level of intra-cluster correlation and the number of observations per cluster.

correlated Huber-White estimator, which over-rejects the null hypothesis of no effect. We utilize this bootstrap procedure for inference in this paper. In all estimation tables, we report the clustered standard error computed using standard formulae based on asymptotic theory, as well as the p-value of a t-test of the null that the coefficient is zero computed using the wild-bootstrap cluster-t procedure.

4.2 Outcome Measures

In line with the predictions of the theoretical model, our outcomes of interest include household and child consumption, labor supply, and child health and morbidity, which are detailed here. We pool data from the 2008-09 and 2009-10 surveys for the analysis. Note that descriptive statistics pertaining to all of the outcomes in this section are provided later on in the discussion of results (section 5). Note also before proceeding that for outcomes in the main analysis of section 5, our sample of children includes only those who were born after the intervention started (in July 2005) and whose mothers would have been potentially exposed to the intervention. These children are aged 0 to 4.5 years (as the second survey took place approximately 4.5 years after the start of the intervention).

4.2.1 Household Consumption

We have information at the household level on the quantities consumed and purchased of over 25 different food items in the week preceding the survey, and the amounts spent on them. Information was also collected on expenditures on items such as fuel and transport (over the past month), and clothing, health and education (all over the past year).[32] In 2009-10, information was also collected on conversion factors from the most-frequented markets and trading centres, which are used to convert non-standard measurement units (such as a heap of tomatoes) into standard measurement units (such as kilograms).

Food consumption aggregates are computed by summing up food expenditures and adding on the values of non-purchased food. To impute the latter, we first use conversion factors to convert quantities measured in non-standard units to standard units, and then use median unit values to impute their value.[33] Total household monthly non-durable consumption is then

[32] The recall period for these items in the 2009-10 survey was modified to only record expenditures since the 2008-09 survey. This was done so as to avoid double-counting of purchases, since the time gap between the two surveys was less than a year (between 9 and 11 months).

[33] Median unit values are computed by dividing expenditure on a certain good by the quantity purchased, and taking the median at the zone level. In the small number of cases where there were insufficient observations within a zone to reliably compute the median, it was taken at the district level instead. This method of

computed as the sum of food consumption and the non-food expenditures outlined above (all converted to monthly terms). Finally, we obtain per-capita consumption values by dividing the relevant value by household size.

4.2.2 Child Consumption

We have information on child-specific intake of liquids and solid foods, focusing on diet variety. For children under the age of 2, there are three measures of liquid intake - whether or not (s)he had maternal milk, other milk, or water in the 3 days prior to the survey. For the second survey, there are also data on whether or not certain foods were consumed in the 3 days prior to the survey by all children aged less than 6 years. We use these data to create three categories of solid food intake: the number of cereals (porridge and nsima, thus can take integer values between 0 and 2[34]), the number of protein-rich foods (meat, fish, eggs and beans, thus taking values between 0 and 4), and whether fruit and vegetables, or both, were consumed (taking values between 0 and 2).[35]

4.2.3 Adult Labor Supply

Labor supply is measured in three ways: whether or not an individual is engaged in an income-generating activity; whether or not an individual has a secondary income-generating activity; and the total number of hours worked in the week preceding the survey (number of days worked in the week preceding the survey multiplied by the number of hours worked per day; set to zero for those not working). We distinguish between all adults (aged 15 and over), and adults with dependent children (under the age of 15), as the latter are potentially the more likely to be directly affected by the intervention.

4.2.4 Child Health

Both physical growth and morbidity are used as indicators of child health. Physical growth is measured by height and weight: we compute standardized height-for-age z-scores, weight-

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imputation is similar to that used by Attanasio *et al.* (2010). As a robustness check, we also valued consumption using the market prices rather than the median unit values. This is not our preferred method, since most households rarely purchase the foods they commonly consume from the markets. Reassuringly, though, both methods yield a food consumption share of total non-durable consumption of 0.86.

[34] Nsima is a thick paste made from maize flour which is a staple food in Malawi. Apart from being difficult to digest, nsima does not contain all of the nutrients required by infants. MaiMwana therefore recommends porridge rather than nsima for infants.

[35] So for instance, the measure for number of proteins consumed is the sum of the four dummy variables indicating whether a child consumed meat, eggs, fish and beans. It takes a value of 4 if all four foods are consumed, 3 if only 3 of them are consumed, and so on.

for-age z-scores, and weight-for-height z-scores.[36,37] As already mentioned, height and weight are robust indicators of a child's growth and development, and a child's height has been shown to be correlated with outcomes later on in life. The second measure of child health, morbidity, is maternal-reported[38], and includes the prevalence of diarrhoea, fast breathing, fever, chills, and vomiting in the 15 days prior to the survey.

5. Results

5.1 Consumption Responses

The theoretical model showed that increases in consumption can be expected to occur as a result of the intervention, despite the intervention not providing any monetary or in-kind resources. Table 2 reports the effects on per capita monthly consumption. Note that in estimating results, we pool data from the 2008-09 and 2009-10 surveys and control for month/year dummies. The table shows that the intervention substantially increased per-capita non-durable consumption by 500 MK (USD 3.56). Food consumption, which comprises 83% of total non-durable consumption, accounts for the majority of this increase at 408 MK. Within food consumption, the bulk of this increase is concentrated among proteins and fruit and vegetables, each of which increases by 1/3 compared to control areas.

Factors that probably contributed to the substantial increase in consumption are the time span of the intervention (it had been already up and running for three years when consumption was first measured), and the fact that there was scope to substantially increase labor supply (as our results below attest to). Moreover, nutrition seems to have become more salient in intervention areas (as we will show in section 6).

[TABLE 2 HERE]

We next take a look at the effects of the intervention on food intake at the child-level. It is worth reiterating that in this section, we focus only on the outcomes of children born after the

[36] Height was measured using a SECA Leicester Height Measure for children aged 2 through 6 (who should be able to stand straight), and using a SECA Measuring Mat for children less than 2 (measured while lying down, as recommended by the WHO). Weight was measured using a Salter weighing scale.

[37] These are created using STATA macros supplied by the World Health Organization. A stunted (underweight) child has a height-(weight-)for-age Z-score that is below -2 SD based on the WHO/CDC/NCHS reference population. A wasted child has a weight-for-height Z-score that is below -2 SD based on the WHO/CDC/NCHS reference population.

[38] It is reported by the mother in 92% of cases and, in the remainder, by another woman in the household.

intervention started, and whose mothers were eligible to receive counsellor visits, putting them at between around 0 and 4.5 years.[39,40]

Virtually all children aged less than 6 months (99.4%) are breastfed. In terms of other liquid intake, there is a reduction in the probability that an infant aged less than 6 months consumes water or non-maternal milk. These results, shown in Table 3, suggest that exclusive breastfeeding most likely increased, in line with the information provided by the counsellors. The Table also shows that the intervention did not lead to an increase in the intake of breast milk for children between 6 months and 2 years, suggesting that any improvement in child health or nutritional status (considered further on) for children older than 6 months is unlikely due to an increase in the intake of breast milk after the first six months of life.

[TABLE 3 HERE]

Considering the effects of the intervention on children's food intake, in Table 4, we find that children older than six months consume a greater variety of foods, particularly protein-rich ones and staples.[41]

[TABLE 4 HERE]

5.2 How is the increased consumption funded?

The large increases in consumption just observed are particularly startling when considered against the fact that the intervention did not provide any monetary or in-kind resources. A natural question is how this increase in consumption, which is accompanied by an improvement in children's diets, is being funded. Prediction 2 of the model in section 3 shows that increased labor supply has an important role to play. To investigate whether this is the case, we consider the effects of the intervention on three margins of adult labor supply: whether or not an individual works at all (i.e. has an income generating activity), whether

[39] More precisely, the eldest child born since the intervention started is 53 months of age.

[40] In a later section measuring spillovers, we also consider effects on those born before the intervention started, and who would not have been exposed to the intervention as babies.

[41] Because the intervention promotes exclusive breastfeeding for children below 6 months, one would expect that the intake of solid food would decrease for this group. Indeed, we find negative coefficients but the sample is very small (151) and hence the estimates are not statistically significant. Note that information on solid food intake was only collected in the second survey.

(s)he has a second job, and the total number of hours worked per week. The upper panel of Table 5 displays the results for all adult men, before breaking them down by those with dependent children and those without. It shows that men are 6.6 percentage points more likely to take on a second job, a very large increase given that only 12% of men have more than one job (in control zones). We do not find any statistically significant effects on the other two margins though the point estimate for number hours worked (3.76) is non-negligible when compared to the mean in control zones (25.7). If the underlying factor driving the increases in labor supply is to fund better diets for children, then one would expect observed increases to be concentrated among parents.[42] In line with this, we find that fathers have much larger labor supply adjustments: they are 8 percentage points more likely to have a second job in intervention than in control zones, and work over 5 hours more per week. The fact that these effects are observed for fathers and not for non-fathers indicates that the labor supply responses are driven by the intervention and not by other factors such as differential labor market conditions.

[TABLE 5 HERE]

The lower panel of Table 5 displays the results for women, and breaks these down by those with and without dependent children. There is no evidence of any significant impact of the intervention on any of the three measures of labor supply for women.[43] This holds even when we break the sample down by mothers and non-mothers.[44]

5.3 Has children's health improved?

A key question of policy interest is whether the adjustments on various margins of household behaviour (increased consumption and labor supply) feed through to improvements in child health, which is what we look at in this section. We consider effects on children's physical growth (Table 6) and morbidity (Table 7), again for children born since the intervention started (i.e. between 0 and 4.5 years).

[42] In line with ILO convention, our surveys define a (dependent) child as someone below the age of 15. In our context, it is also the age after which fertility tends to rise sharply.

[43] Average labor supply values for men and women are relatively similar in control zones across the three measures. This is also the case in the DHS 2004.

[44] Note though that while the coefficient on whether or not a mother works is negative and fairly sizeable, the intra-cluster correlation is also large and hence the estimates are imprecise.

Starting from a very low nutritional status (56% of children are stunted, and 16% are underweight in control zones), we find that the intervention increases children's height by a 0.20 standard deviation of the WHO reference population (which is equivalent to a 13% increase using the standard deviation of our sample, which is 50% larger than the standard deviation of the WHO reference population). As expected, this increase in height is much smaller than the one obtained with more intensive interventions, i.e., those that provide food directly. A recent meta-analysis concluded that provision of complementary food (which is probably a more intensive intervention that the one we are considering) in food-insecure populations resulted in an average increase of 0.41 standard deviations of age-adjusted height (Bhutta *et al.* 2008).

We detect no changes in weight-for-age z-scores.[45] Consequently, we observe a reduction in weight-for-height among this group, though from a base that is already 'too high' (0.66 standard deviations above the WHO reference population in the control zones). Thus the negative coefficient does not reflect a negative outcome. On the contrary, it suggests that children are now on a healthier growth path and closer to the WHO norm.[46]

[TABLE 6 HERE]

We also detect a large drop in the percentage of maternal reported cases of diarrhoea (in 15 days prior to the survey) among children aged less than 6 months (a 5 percentage point drop from a base of almost 13%). This is consistent with the negative impact of the intervention on water intake shown earlier.

[TABLE 7 HERE]

Clearly, we cannot disentangle whether the improvement in physical growth is due to the reduction in the intake of liquids other than breast milk when the child was less than 6 months, or to the improvement in child food intake after age 6 months, or a combination of

[45] According to the medical literature, height and weight do not necessarily evolve in parallel. Victora *et al.* (2010) indicate that the faltering patterns of height-for-age are very different from those of weight-for-age. Victora (1992) shows that in Africa and Latin America, the relationship between malnutrition due to low height is only very weakly related to malnutrition caused by low weight, unlike in Asia where the relationship is much stronger.

[46] The height-for-age z-score is missing for 9% of children in intervention areas, and 12% in control areas. These missing values are either because the child could not be located or refused to be measured (72%), or because the values are outliers according to the WHO subroutine (28%).

the two. However, what is of interest for this paper is that households responded to the information provided by using their resources more effectively to improve child health.

6. Spillovers on older children

The analysis so far has considered the effects on children directly exposed to the intervention, that is, children born after the intervention started (July 2005) and consequently whose mothers were eligible to receive the full cycle of five visits from the counsellor. However the intervention may also have had spillovers on older children living within intervention zones ("indirectly exposed children"). These spillovers could occur within and/or across households. A within (intra) household externality could be generated if an older child, born before the intervention started, has a younger sibling born after the intervention started, and whose mother was thus visited by a counsellor. A between (inter) household externality could occur in households which were not visited by a counsellor at all (because they had no child born since July 2005), if household members interact with others in the village visited by the counsellor and obtain information from them.

We start this part of the analysis by providing direct evidence that the intervention generated interest in child nutrition within the village, beyond households with eligible women only. We do this by considering whether women are more likely to talk about child nutrition with others in the village. Columns (1) and (2) of Table 8 show that the intervention increased the probability that respondents in intervention areas talked one-on-one to a friend about child nutrition in the week preceding the survey.[47] As expected, the point estimate is larger for those women directly exposed to the intervention (i.e. with a child born after July 2005) than for those indirectly exposed. Interestingly, the p-value for the indirectly exposed is smaller, most likely because of the smaller intra-cluster correlation. Columns (3) and (4) indicate that respondents not only talk more about nutrition, but are also more likely to absorb the information, as indicated by increases in their knowledge on nutrition (38% of a standard deviation on the knowledge score for the directly exposed group, and 32% for the indirectly exposed).[48,49]

[47] This most likely resulted in child nutrition becoming more salient. See Bordalo *et al.* (2011) for the empirical relevance of salience.

[48] Note that the intra-cluster correlations are quite high and consequently the P-values are 0.12 (0.25) for the directly (indirectly) exposed despite the large effects that we estimate.

49 The sample size reported in the knowledge score column (Table 8) is smaller because we do not pool both waves, but we combine the questions of wave 1 and 2 in a single score.

[TABLE 8 HERE]

We next turn to investigate whether this increased awareness of nutrition-related issues resulted in improvements in child outcomes for other children in these areas. In order to directly estimate the extent of spillovers on older children, we estimate equation (1) on the sample of children born before the intervention started. We note before proceeding that this analysis pertains to children aged around 3.5 through 6 years.[50] We first estimate the effect on the intake of foods, shown in Table 9 below. We observe an increase, significant at the 10% level, in the intake of protein-rich and staple foods. However, these estimates do not distinguish within and across household spillovers.

[TABLE 9 HERE]

When we disaggregate this sample further into individuals with and without a directly exposed sibling (that is, with or without a sibling born after the intervention started), we find evidence of within household spillovers in the intake of protein-rich foods by older children (left hand column). The identification of across household spillovers is complicated somewhat by the smaller sample size. All the same, the point estimates (in the right hand column for each type of food) are all positive and the increase in the intake of staples is statistically significant at 10%, providing some weak evidence of across household spillovers.

[TABLE 10 HERE]

We next consider the extent of spillovers on physical growth and morbidity, and find no evidence that these improvements in children's food intake yielded any improvement in their physical growth, or reductions in morbidity, as can be seen from Tables 11 and 12.[51] This is in some ways not surprising: the increased intake of nutritious foods is likely to have started after the child's younger sibling was born (when the mother received visits). Consequently, the older child was unlikely to have been exposed to the intervention during the 'critical growth period' (first two years) when nutrition is most effective at improving physical

[50] The analysis for food consumption is for children aged around 4.5 through 6 (as this outcome is only observed in survey 2); the health analysis is for those aged around 3.5 through 6 (as it is observed in both surveys, and the youngest child born before the intervention began would have been around 3.5 years of age at the time of the first survey). Notes to specific tables contain further details on the exact samples.
[51] No additional insights are obtained if we divide the Table among those that had a sibling born after July 2005, and those that do not.

growth (Shrimpton *et al.* 2001, Victora 2010). For similar reasons, it is perhaps not too surprising that there are no effects on reported cases of diarrhoea or vomiting.

[TABLES 11 AND 12 HERE]

7. Alternative Explanations

7.1 Adult Health

The theoretical framework suggests that consumption and labor supply increase because the productivity of consumption (in terms of child health) increased due to the intervention. However, an alternative explanation for these results is that the increases in adult labor supply are driven by improvements in adult health that are somehow generated by the intervention. We believe this to be unlikely because the advice provided is specifically targeted at children's nutrition, which is unlikely to yield similar improvements in adult health. All the same, to address this more directly, in Table 13, we test whether the intervention affects adult health, separately for males and females and across a range of self-reported measures: we find no evidence that it does.

[TABLE 13 HERE]

7.2 Fertility and Family Planning

An alternative explanation for the findings is that the intervention decreased fertility in intervention zones, potentially yielding an increase in child quality (Becker and Tomes, 1976). A reduction in fertility could be generated through two channels: first, indirectly, by reducing infant mortality[52] and as a result inducing households to reduce their demand for children; or second, directly, through the family planning component of the intervention.

To investigate these potential fertility effects, we examine the effect of the intervention on the use of modern family planning methods, as well as the number of children born to women in our sample since the intervention started. The latter is computed from data from the Mai Mwana Health Surveillance System, one purpose of which was to measure the physical

[52] The sample was not designed to estimate this impact with sufficient power.

growth of all children born in the 24 zones since 2005 at age 1 month and 7 months.[53] Results are displayed in Table 14. We note that the coefficients are small and far from significant at conventional levels, despite the low levels of intra-cluster correlation.[54] The lack of effects on family planning is consistent with conversations with program officers, who indicated that this component was not effective because counsellors were uncomfortable discussing this issue.

[TABLE 14 HERE]

7.3 Attrition and Internal Validity

One concern is that our results may be biased due to the significant attrition between the baseline (2004) and the 2008-09 surveys. While we showed in Section 2 that both the sample drawn and that successfully interviewed are well-balanced according to observed characteristics (Table 1), a concern might remain that there may be differences in unobservable variables, which may be biasing our findings. In this section we refer to two pieces of indirect evidence shown earlier, which greatly reduce concerns that our key findings are driven by biases due to attrition.[55] First, in Table 11 we showed that children born before the intervention started have, if anything, *lower* nutritional status in intervention than in control zones after the intervention. Under the assumption that the direction of the bias caused by attrition is the same for older and younger children, this suggests that any bias resulting from attrition would in fact lead us to *underestimate* the effect of the intervention.

A second piece of indirect evidence that mitigates concerns about attrition comes from the finding in Table 5 that the intervention increased the labor supply of fathers but not of other men. The fact that the labor supply response is restricted to men with child-rearing

[53] This source therefore provides a more complete picture of births in the study areas than cross-sectional surveys. Nevertheless, there may still be selection from differential mortality of infants in the first month life as a result of the intervention.

[54] We also note that if the main driver of our results were a decrease in fertility, then it would be difficult to explain the increase in male labor supply shown in section 5.2.

[55] Another potential source of bias is that the randomization did not succeed in balancing all of the unobservable characteristics, perhaps because just 24 clusters were randomized. The two pieces of evidence we provide here are useful to also alleviate concerns about this source of bias.

responsibilities strengthens the argument that its purpose is to fund the increase in household consumption triggered by the intervention.[56]

8. Conclusion

In this paper, we investigate how households respond to information on child nutrition. To do this, we exploit a randomized experiment in rural Malawi, where households in randomly selected zones (groups of villages) received information and advice on issues related to child nutrition from local counsellors. Using a simple theoretical model, we show that this information should induce households to increase consumption (both child and household) and adult labor supply.

In line with the predictions of the model, our empirical results show that households act on improved nutrition-related information not only by changing the composition of consumption but also by increasing total consumption - for both children and the household. This is particularly startling given that the intervention did not provide any monetary or in-kind resources. The increased consumption, which yielded improvements in children's height, is funded by increases in fathers' labor supply, at both the extensive and intensive margins. This finding of a non-health outcome, labor supply, being linked to how parents perceive the child health production function, is a new and interesting finding in this literature.

It is important to have in mind that the provision of information was not a one-off event in the intervention areas, but a sustained activity, still in place, that motivated and reminded households of the importance of child nutrition on an ongoing basis. Indeed, the intervention generated interest on child nutrition within the village, beyond just households directly affected, making child health and nutrition related issues more salient in these communities. This also generated positive spillovers in food consumption of older children, particularly within the household.

[56] The fact that there is no increase in labor supply for non-fathers also alleviates concerns that labor market conditions are different across intervention and control areas.

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Appendix 1: Attrition

Table A1 below compares baseline characteristics for those who we found and interviewed in the 2008 survey with those who attrited. We see that those who attrited were younger, less likely to be married, are better educated. Further, they were more likely to be in school in 2004, and less likely to be working. Their households were also likely to be slightly less poor. For the purpose of this paper, the most important issue is that the attrition seems to have preserved the balance of observable characteristics between treatment and control (Table 1). Along the same lines, the observable characteristics of those that attrited in control are very similar to the ones of those who attrited in intervention areas as Table A2 shows. The two significant differences at 5% level already existed in the sample initially drawn (first three columns of Table 1).

[TABLE A1 AND TABLE A2 HERE]

Appendix 2: Proofs

After replacing with the binding constraints in the objective function we find that the problem is equivalent to : $Max\ F(C, L, \theta)$

$$\text{where } F(C, L, \theta) = U\left(\frac{w(T-L)-C}{p}, L\right) + G(h(\theta C))$$

First order conditions are:

$$F_C^{'}(C, L, \theta) = -\left(\frac{1}{p}\right) U_A^{'}\left(\frac{w(T-L)-C}{p}, L\right) + G^{'}\big(h(\theta C)\big)h^{'}(\theta C)\theta = 0$$

$$F_L^{'}(C, L, \theta): \ -\left(\frac{w}{p}\right) U_A^{'}\left(\frac{w(T-L)-C}{p}, L\right) + U_L^{'}\left(\frac{w(T-L)-C}{p}, L\right) = 0$$

We note that $F_{L\theta}^{''} = 0$ since the utility function is additively separable in child health.

Differentiating the two first order conditions

$$\begin{bmatrix} F_{CC}^{''} & F_{CL}^{''} \\ F_{CL}^{''} & F_{LL}^{''} \end{bmatrix} \begin{bmatrix} dC \\ dL \end{bmatrix} = \begin{bmatrix} -F_{C\theta}^{''} \\ -F_{L\theta}^{''} \end{bmatrix} d\theta$$

we find that:

$$\frac{dC}{d\theta} = \frac{\begin{vmatrix} -F''_{C\theta} & F''_{CL} \\ -F''_{L\theta} & F''_{LL} \end{vmatrix}}{\begin{vmatrix} F''_{CC} & F''_{CL} \\ F''_{CL} & F''_{LL} \end{vmatrix}} = \frac{F''_{C\theta}(-F''_{LL})}{|SOC_2|} \; with |SOC_2| = \begin{vmatrix} F''_{CC} & F''_{CL} \\ F''_{CL} & F''_{LL} \end{vmatrix}$$

and that:

$$\frac{dL}{d\theta} = -\frac{F''_{CL}}{F''_{LL}}\frac{dC}{d\theta}$$

$Since\ -F''_{LL} = -U''_{LL} > 0$ and $|SOC_2| > 0$ the sign of $\frac{dC}{d\theta}$ is the same as the sign of $F''_{C\theta}$.

Moreover from the first order conditions we show easily that:

$$F''_{C\theta} = C\theta[G''(h')^2 + h''G'] + G'h'.$$

Therefore we have shown that the sign of $\frac{dC}{d\theta}$ is the same as $C\theta[G''(h')^2 + h''G'] + G'h'$ **QED.**

Assuming in line with Becker, 1965,that $U''_{LA} > 0$ we can write $F''_{CL} = \frac{1}{p}\left(\frac{w}{p}U''_{AA} - U''_{LA}\right)$<0 and show easily using $\frac{dL}{d\theta} = -\frac{F''_{CL}}{F''_{LL}}\frac{dC}{d\theta}$ that $sign\left(\frac{dL}{d\theta}\right) = -sign(\frac{dC}{d\theta})$.

Therefore $sign\left(\frac{dL}{d\theta}\right)$ is negative if $sign(\frac{dC}{d\theta})$ is positive. **QED**

Table 1: Baseline Sample Balance

	Full Sample			Interviewed Sample		
	Control Group	Difference: Treatment - Control	p-value	Control Group	Difference: Treatment - Control	p-value
Woman's Characteristics						
Married (dv = 1)	0.616	-0.021	0.368	0.661	-0.034	0.176
Some Primary Schooling or Higher	0.706	0.033	0.356	0.682	0.04	0.352
Some Secondary Schooling or Higher	0.066	0.01	0.503	0.06	-0.007	0.563
Age (years)	24.577	-0.186	0.636	25.492	-0.429	0.368
Chewa	0.948	-0.044	0.274	0.957	-0.05	0.256
Christian	0.977	0.006	0.499	0.979	0.008	0.304
Farmer	0.661	-0.075	0.093+	0.688	-0.06	0.124
Student	0.236	0.015	0.413	0.204	0.022	0.206
Small Business/Rural Artisan	0.036	0.03	0.094+	0.037	0.024	0.242
Household Characteristics						
Agricultural household	0.995	-0.005	0.39	0.995	0.002	0.593
Main Flooring Material: Dirt, sand or dung	0.914	-0.041	0.211	0.916	-0.027	0.525
Main roofing Material: Natural Material	0.853	-0.018	0.689	0.857	-0.004	0.971
HH Members Work on Own Agricultural Land	0.942	-0.057	0.111	0.95	-0.056	0.94
Piped water	0.011	0.04	0.229	0.009	0.032	0.394
Traditional pit toilet (dv = 1)	0.772	0.054	0.225	0.791	0.054	0.248
# of hh members	5.772	0.065	0.812	5.848	0.132	0.863
# of sleeping rooms	2.116	0.199	0.027*	2.152	0.166	0.096+
HH has electricity	0.002	0.007	0.125	0.002	0.004	0.384
HH has radio	0.629	0.03	0.36	0.641	0.015	0.741
HH has bicycle	0.508	0.016	0.659	0.512	0.008	0.895
HH has motorcycle	0.008	0.001	0.872	0.007	0.002	0.767
HH has car	0.006	-0.002	0.54	0.007	-0.003	0.336
HH has paraffin lamp	0.926	0.032	0.196	0.926	0.036	0.14
HH has oxcart	0.058	-0.015	0.169	0.059	-0.022	0.066+
N	1249	1248		846	814	

Notes to Table: + indicates significant at the 10% level, * indicates significant at the 5% level. p-values reported here are computed using the wild cluster bootstrap-t procedure as in Cameron et al (2008), explained in section 4.1. Full Sample includes all women (and their households) originally drawn to be opart of the 2008-09 survey. Interviewed Sample includes women (and their households) actually interviewed in 2008-09 (and used in the analysis).

Table 2: Household Consumption

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
				Per Capita Monthly Food Consumption for:			
	Total Non-durable	**Food**	**Health**	**Cereals**	**Proteins**	**Fruit and Vegetables**	**Other Foods**
T_z	502.889**	408.037*	6.053+	2.78	113.671*	224.985+	64.440*
Standard Error	[165.785]	[144.746]	[2.949]	[46.617]	[40.631]	[97.743]	[24.633]
Wild Cluster Bootstrap p-value	{0.004}	{0.03}	{0.06}	{0.935}	{0.011}	{0.052}	{0.018}
Observations	3190	3200	3199	3205	3202	3204	3204
R-squared	0.05	0.06	0.01	0.11	0.02	0.17	0.02
IntraCluster Correlation	0.0951	0.111	0.0225	0.0741	0.0415	0.172	0.0526
Mean Control Areas	2146	1784	17.11	606	349.8	679.7	149.7

Notes to Table: Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. Regression includes month-year dummies to control for seasonality. All coefficients in terms of Malawi Kwacha. (The average exchange rate to the US Dollar was approx. 140MK = 1 US$ at the time of the surveys). "Total Non-Durable" is the sum of food consumption and expenditures on items such as transport, education, health, etc, "Food" is food consumption (including food which is not bought), "Health" is the per-capita expenditure (in MK) on health care, "Cereals" includes consumption of rice, maize flour and bread, "Proteins" includes consumption of milk, eggs, meat, fish and pulses "Fruit and Vegetables" includes consumption of green maize, cassava, green leaves, tomatoes, onions, pumpkins, potatoes, bananas, masuku, mango, ground nuts and other fruits and vegetables, "Other Foods" includes cooking oil, sugar, salt, alcohol and other foods.

Table 3: Intake of Liquids by Children Aged < 24 months.

	[1]	[2]	[3]	[4]	[5]	[6]
	Water		**Milk other than maternal**		**Breastmilk**	
	< 6 months	**6-24 months**	**< 6 months**	**6-24 months**	**< 6 months**	**6-24 months**
T_z	-0.127+	0.011	-0.066+	-0.04	-0.004	-0.049*
Standard Error	[0.066]	[0.016]	[0.037]	[0.040]	[0.011]	[0.020]
Wild Cluster Bootstrap p-value	{0.06}	{0.553}	{0.086}	{0.38}	{0.789}	{0.02}
Observations	359	950	151	510	361	999
R-squared	0.24	0.04	0.08	0.02	0.02	0.11
IntraCluster Correlation	0.0242	0.0243	0.06	0.0592	0	0.0122
Mean, Control	0.488	0.953	0.101	0.203	0.994	0.925

Notes to Table: All regressions include controls for age, age-squared, gender and dummies for the month of interview. Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. Samples pooled for both waves. Samples for columns 1, 3 and 5 includes children aged less than 6 months and whose mothers were potentially undergoing the intervention at the time of the survey. Samples in columns 2, 4 and 6 includes children born after July 2005, and aged 6 to 53 months at time of survey. "Water" is an indicator for whether the child had any water in the 3 days prior to the survey, "Milk other than maternal" is an indicator (measured in wave 2 only) for whether the child had milk other than breastmilk in the 3 days prior to the survey; "Breastmilk" is an indicator for whether the child was being breastfed at the time of the survey.

Table 4: Effects on Child Solid Food Intake

	Number of Foods	Number of Protein-Rich	Number of Staples	Number of Fruit and Veg
	[1]	[2]	[3]	[4]
T_z	0.436+	0.316+	0.106+	0.009
Standard Error	[0.241]	[0.151]	[0.058]	[0.064]
Wild Cluster Bootstrap p-value	{0.086}	{0.052}	{0.062}	{0.895}
Observations	1276	1282	1285	1284
R-squared	0.14	0.07	0.05	0.2
IntraCluster Correlation	0.103	0.0929	0.0743	0.0856
Mean, Control	5.109	1.175	1.729	1.659
Total	8	4	2	2

Notes to Table: All regressions include controls for age, age-squared, gender, wealth at baseline, education of the main respondent and median zone distance to closest trading centre and dummies for the month of interview.Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. Sample contains all children born after July 2005, and who were aged between 6 and 53 months at time of survey. "Number of Foods" is the number of foods (between 1 and 8) taken by the child during the 3 days prior to the survey, "Number of Protein-Rich" takes integer values between 0 and 4 depending on the intake of meat, fish, eggs and beans, "Number of Staples" takes integer values between 0 and 2 depending on intake of nsima and porridge, "Number of Fruit and Veg" takes integer values between 0 and 2.

Table 5: Effects on Labour Supply

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Works	**Has at least 2 jobs**	**Weekly Hours Worked**	**Works**	**Has at least 2 jobs**	**Weekly Hours Worked**	**Works**	**Has at least 2 jobs**	**Weekly Hours Worked**
		All Males			**Fathers**			**Non-Fathers**	
T_z	0.055	0.061*	3.757	0.071	0.080*	5.370+	0.023	0.03	0.836
Standard Error	[0.066]	[0.028]	[2.508]	[0.061]	[0.035]	[3.033]	[0.099]	[0.022]	[2.636]
Wild Cluster Bootstrap p-value	{0.523}	{0.06}	{0.17}	{0.28}	{0.044}	{0.094}	{0.87}	{0.25}	{0.77}
Observations	3956	3953	3637	2380	2378	2160	1602	1601	1501
R-squared	0.15	0.06	0.18	0.05	0.03	0.05	0.1	0.06	0.2
IntraCluster Correlation	0.208	0.0357	0.0998	0.408	0.0464	0.142	0.291	0.0409	0.139
Mean, Control	0.836	0.122	25.74	0.913	0.166	30.26	0.717	0.052	18.86
		All Females			**Mothers**			**Non-Mothers**	
T_z	-0.035	0.032	-0.801	-0.064	0.038	-1.024	0.021	0.017	-0.69
Standard Error	[0.071]	[0.023]	[2.684]	[0.071]	[0.029]	[3.013]	[0.090]	[0.015]	[2.557]
Wild Cluster Bootstrap p-value	(0.67}	{0.198}	{0.86}	{0.41}	{0.221}	{0.713}	{0.79}	{0.32}	{0.83}
Observations	4445	4443	4134	3015	3013	2787	1440	1440	1356
R-squared	0.12	0.05	0.14	0.05	0.03	0.05	0.09	0.05	0.18
IntraCluster Correlation	0.214	0.0249	0.144	0.312	0.0309	0.187	0.229	0.0131	0.129
Mean, Control	0.861	0.108	24.54	0.938	0.135	27.64	0.687	0.0482	17.73

Notes to Table: All regressions include controls for age, age-squared, marital status, education and dummies for the month of interview. Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. The sample in the top-left panel ("All Males") includes all males aged 15-65 years; that in the bottom-left ("All Females") includes all females aged 15-65 years; that in the top-centre panel ("Fathers") includes all males aged 15-65 years with a child aged <15 years; that in the bottom-centre panel ("Mothers") includes all females aged 15-65 years with a child aged < 15 years; that in the top-right ("Non-Fathers") includes all males aged 15-65 years without a child aged < 15 years, while that in the bottom-right panel ("Non-Mothers") includes all females aged 15-65 years without a child aged < 15 years. "Works" in an indicator of whether individual had an income-generating activity at the time of the survey, "Has at least 2 jobs" is an indicator for whether individual has 2 income generating activities, "Weekly Hours worked" give the total hours worked in the week prior to the survey on both income generating activities.

Table 6: Intervention Effects on Child Physical Growth

	[1]	[2]	[3]	[4]	[5]	[6]
	Height For Age		**Weight for Age**		**Weight for Height**	
Age at measurement -->	**<6 months**	**> 6 months**	**<6 months**	**> 6 months**	**<6 months**	**> 6 months**
T_z	0.136	0.204*	-0.133	0.004	-0.369	-0.221**
Standard Error	[0.28]	[0.11]	[0.17]	[0.10]	[0.33]	[0.088]
Wild Cluster Bootstrap p-value	{0.691}	{0.066}	{0.47}	{0.969}	{0.354}	{0.06}
Observations	324	2192	339	2265	319	2217
R-squared	0.05	0.04	0.03	0.02	0.07	0.01
IntraCluster Correlation	0.0482	0.0218	0.048	0.0303	0.197	0.0267
Z-Scores, Control	-0.56	-2.343	0.00828	-0.841	0.633	0.659

Notes to Table: Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. All regressions include controls for age, age-squared, gender and dummies for the month of interview. Sample in columns 1, 3 and 5 includes children born after June 2005 and who were < 6 months and whose mothers were potentially undergoing the intervention at the time of measurement. Sample in columns 2, 4 and 6 includes children born after July 2005 and who were aged between 6 and 53 months at time of measurement. "Height-for-Age", "Weight-for-Age" and "Weight-for_Height" are standardised z-scores relative to the WHO reference population.

Table 7: Intervention Effects on Child Morbidity

	[1]	[2]	[3]	[4]	[5]
	Suffered Diarrhoea	**Suffered from Vomiting**	**Suffered from Fast Breathing**	**Suffered Fever**	**Suffered from Chills**
			< 6 months		
T_z	-0.049+	-0.055	0.035	0.01	-0.001
Standard Error	[0.027]	[0.040]	[0.052]	[0.073]	[0.050]
Wild Cluster Bootstrap p-value	{0.066}	{0.234}	{0.527}	{0.943}	{0.949}
Observations	376	376	376	376	376
R-squared	0.06	0.06	0.06	0.08	0.03
IntraCluster Correlation	0	0.0259	0.0367	0.0661	0.0746
Mean, Control	0.129	0.169	0.124	0.421	0.101
			> 6 months		
T_z	0.014	-0.012	0.018	0.022	0.016
Standard Error	[0.037]	[0.052]	[0.053]	[0.064]	[0.053]
Wild Cluster Bootstrap p-value	{0.661}	{0.799}	{0.821}	{0.741}	{0.779}
Observations	2362	2366	2363	2371	2370
R-squared	0.11	0.01	0.02	0.01	0.01
IntraCluster Correlation	0.0337	0.081	0.139	0.0804	0.112
Mean, Control	0.251	0.207	0.101	0.507	0.149

Notes to Table: Notes to table: Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. All regressions include controls for age, quadratic in age, gender and dummies for the month of interview. Sample in columns 1 and 3 includes children born after June 2005 and who were < 6 months and whose mothers were potentially undergoing the intervention at the time of survey. Sample in columns 2 and 4 includes children born after July 2005 and who were aged between 6 and 53 months at time of survey. Each column represents a different dependent variable which takes value 1 if the the child has suffered the condition specified in the column heading in the 15 days previous to the survey as reported by the main respondent, 0 otherwise.

Table 8. Results on nutrition knowledge score and probability of having a chat with a friend about nutrition

	Chat with a Friend		Knowledge score	
	Directly Exposed	Indirectly Exposed	Directly Exposed	Indirectly Exposed
T_z	0.193	0.098+	0.383	0.313
Standard Error	[0.098]	[0.044]	[0.217]	[0.218]
Wild Cluster Bootstrap p-value	{0.116}	{0.074}	{0.156}	{0.268}
Observations	2,007	818	1085	432
R-squared	0.048	0.026	0.08	0.08
IntraCluster Correlation	0.209	0.072	0.199	0.127
Mean, Control	0.2	0.121	-0.00844	-0.317

Notes to Table: All regressions include controls for age, quadratic in age, education and chewa ethinicity at zone level in 2004, and dummies for the month of interview. Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. Sample includes all female main respondents. The sample for the knowledge score includes only households present in both waves of the survey, and covers women aged 15-63 years. Knowledge score is computed as follows: Each question was scored 1 if the respondent gave the correct answer and 0 if she didn't. A total of 8 questions were asked, 3 in wave 1 and 5 in wave 2. All correct answers were summed up to give a total score, which was normalised by subtracting the mean and dividing by the standard deviation of the whole sample. Chat with a friend is an indicator for whether the respondent spoke with a friend on a one-to-one basis about any child nutrition issues in the week preceding the survey. "Directly Exposed" indicates households with at least one child born after July 2005. "Indirectly Exposed" households are those without any child born after July 2005, but who may potentially be indirectly exposed to the intervention. For Chats, sample includes women aged 17-43 years old (when available, both waves responses are included). For knowledge, both waves samples are combined into the score.

Table 9: Spillovers in Food Intake of Children Born Before Intervention

	[1]	[2]	[3]	[4]
	Number of Foods	**Number of Protein-Rich**	**Number of Staples**	**Number of Fruit and Veg**
T_z	0.441	0.281+	0.135+	0.003
Standard Error	[0.254]	[0.143]	[0.079]	[0.077]
Wild Cluster Bootstrap p-value	{0.15}	{0.066}	{0.092}	{0.993}
Observations	841	843	846	841
R-squared	0.11	0.09	0.07	0.08
IntraCluster Correlation	0.173	0.103	0.198	0.184
Mean, Control	5.355	1.252	1.744	1.793
Maximum	8	4	2	2

Notes to Table: All regressions include controls for age, quadratic in age, gender, wealth at baseline, education of the main respondent and median zone distance to closest trading centre and dummies for the month of interview. Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. Sample includes children born before July 2005 and aged between 51 and 84 months. "Number of Foods" is the number of foods (between 1 and 8) taken by the child during the 3 days prior to the survey, "Number of Protein-Rich" takes integer values between 0 and 4 depending on the intake of meat, fish, eggs and beans, "Number of Staples" takes integer values between 0 and 2 depending on intake of nsima and porridge, "Number of Fruit and Veg" takes integer values between 0 and 2.

Table 10: Spillovers in Food Intake of Children Born Before Intervention With and Without Younger Siblings

	Number of Foods		Number of Protein-Rich		Number of Staples		Number of Fruit and Veg	
	Born after the intervention started							
	Has younger sibling born after intervention started	No sibling born after intervention started	Has younger sibling born after intervention started	No sibling born after intervention started	Has younger sibling born after intervention started	No sibling born after intervention started	Has younger sibling born after intervention started	No sibling born after intervention started
T_z	0.485	0.347	0.333**	0.142	0.143	0.129+	-0.012	0.054
Standard Error	[0.276]	[0.297]	[0.156]	[0.200]	[0.089]	[0.066]	[0.077]	[0.107]
Wild Cluster Bootstrap p-value	{0.108}	{0.354}	{0.072}	{0.480}	{0.138}	{0.086}	{0.899}	{0.637}
Observations	640	201	642	201	644	202	640	201
R-squared	0.12	0.13	0.1	0.13	0.09	0.06	0.08	0.13
IntraCluster Correlation	0.197	0.142	0.113	0.108	0.251	0.0363	0.168	0.224
Mean, Control	5.313	5.505	1.185	1.495	1.746	1.737	1.811	1.726

Notes to Table: All regressions include controls for age, quadratic in age, gender, wealth at baseline, education of the main respondent and median zone distance to closest trading centre and dummies for the month of interview. Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. Sample in columns 1, 3, 5 and 7 includes children born before July 2005 and aged between 51 and 84 months and have a younger sibling born after July 2005; sample in columns 2, 4, 6 and 8 includes children born before July 2005 and aged between 51 and 84 months who have no younger sibling born after July 2005. "Number of Foods" is the number of foods (between 1 and 8) taken by the child during the 3 days prior to the survey, "Number of Protein-Rich" takes integer values between 0 and 4 depending on the intake of meat, fish, eggs and beans, "Number of Staples" takes integer values between 0 and 2 depending on intake of nsima and porridge, "Number of Fruit and Veg" takes integer values between 0 and 2.

Table 11: Spillovers in Physical Growth of Children Born Before Intervention

	[1]	[2]	[3]
	Height For Age	**Weight for Age**	**Weight for Height**
T_z	-0.266	-0.142	-0.0381
Standard Error	[0.14]	[0.16]	[0.15]
Wild Cluster Bootstrap p-value	{0.10}	{0.458}	{0.809}
Observations	588	596	582
R-squared	0.05	0.02	0.04
IntraCluster Correlation	0.0447	0.0524	0.044
Z-Scores, Control	-2.051	-1.004	0.371

Notes to Table: Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. All regressions include controls for age, age-squared, gender and dummies for the month of interview. Sample includes children born before July 2005 and who were aged between 41 and 59 months at time of measurement. "Height-for-Age", "Weight-for-Age" and "Weight-for_Height" are standardised z-scores relative to the WHO reference population.

Table 12: Spillovers in Morbidity of Children Born Before Intervention

	[1]	[2]	[3]	[4]	[5]
	Suffered Diarrhoea	**Suffered from Vomiting**	**Suffered from Fast Breathing**	**Suffered Fever**	**Suffered from Chills**
T_z	0.004	-0.042	-0.008	-0.018	-0.033
Standard Error	[0.030]	[0.047]	[0.052]	[0.057]	[0.070]
Wild Cluster Bootstrap p-value	{0.889}	{0.426}	{0.861}	{0.793}	{0.661}
Observations	664	664	662	665	665
R-squared	0.02	0.05	0.04	0.03	0.05
IntraCluster Correlation	0.0157	0.0657	0.125	0.0508	0.23
Mean, Control	0.102	0.199	0.108	0.489	0.174

Notes to Table: Notes to table: Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. All regressions include controls for age, quadratic in age, gender and dummies for the month of interview. Sample includes children born after July 2005 and who were aged between 41 and 59 months at time of survey. Each column represents a different dependent variable which takes value 1 if the the child has suffered the condition specified in the column heading in the 15 days previous to the survey as reported by the main respondent, 0 otherwise.

Table 13: Effects on Adult Health

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Walk 5 kms Easily	**Carry a 20 kg Load Easily**	**Unable to Carry Out Daily Activities**	**Suffered Diarrhoea**	**Suffered Fever**	**Suffered from Cough**	**Suffered from Chills**	**Suffered from Vomiting**	**Suffered from any Illness symptom**
					Males				
T_z	-0.066	-0.004	0.073*	-0.002	0.060	0.009	0.022	0.011	0.054
Standard Error	[0.051]	[0.031]	[0.038]	[0.012]	[0.045]	[0.055]	[0.030]	[0.017]	[0.060]
Wild Cluster Bootstrap p-value	{0.270}	{0.895}	{0.068}	{0.867}	{0.186}	{0.905}	{0.471}	{0.579}	{0.368}
Observations	3809	3809	3816	3751	3752	3758	3748	3760	3744
R-squared	0.088	0.086	0.015	0.001	0.01	0.004	0.005	0.005	0.01
IntraCluster Correlation	0.109	0.052	0.039	0.008	0.059	0.077	0.053	0.016	0.085
Mean, Control	0.87	0.893	0.35	0.0649	0.285	0.275	0.102	0.121	0.501
					Females				
T_z	-0.078	0.001	0.056	-0.006	0.071	-0.004	0.014	0.015	0.050
Standard Error	[0.052]	[0.033]	[0.042]	[0.014]	[0.043]	[0.055]	[0.040]	[0.035]	[0.054]
Wild Cluster Bootstrap p-value	{0.202}	{0.981}	{0.220}	{0.639}	{0.120}	{0.911}	{0.711}	{0.697}	{0.375}
Observations	4,296	4,295	4,295	4,252	4,252	4,256	4,246	4,241	4,241
R-squared	0.122	0.153	0.021	0.009	0.015	0.009	0.01	0.008	0.018
IntraCluster Correlation	0.102	0.0579	0.0411	0.0102	0.0476	0.0796	0.0764	0.0466	0.0721
Mean, Control	0.87	0.893	0.35	0.0649	0.285	0.275	0.102	0.121	0.501

Notes to Table: All regressions include controls for age, age-squared, gender, and dummies for the month of interview. Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. Each column represents a different dependent variable which takes value 1 if the column heading is correct according to the main respondent and 0 otherwise. In Columns [1 and [2], the dependent variable takes value 1 if the adult member can do what is specified in the column heading, 0 otherwise. In columns [3]-[9], the dependent variable takes value 1 if the the adult member has suffered the condition specified in the column heading in the 15 days previous to the survey as reported by the main respondent, 0 otherwise.

Table 14: Intervention Effects on Family Planning and Fertility

	[1]	[2]	[3]	[4]
	Use of any modern family planning method	**Number of children since July 2005**	**Had at least one child since July 2005**	**Had at least two children since July 2005**
T_z	0.0162	-0.047	-0.034	-0.012
Standard Error	[0.0409]	[0.046]	[0.030]	[0.022]
Wild Cluster Bootstrap p-value	{0.693}	{0.354}	{0.334}	{0.587}
Observations	2,809	1657	1657	1657
R-squared	0.055	0.07	0.08	0.02
IntraCluster Correlation	0.036	0.014	0.0107	0.0169
Mean, Control	0.379	0.583	0.474	0.107

Notes to Table: Standard errors computed using the cluster-correlated Huber-White estimator are reported in brackets, with clustering at the level of the zone; wild cluster bootstrap-t p-values in curly brackets. ** p<0.01, * p<0.05, + p<0.1. All regressions includes controls for age, quadratic in age, and (family planning regression only) for dummies for the month of interview. "Number of children since July 2005" is the number of children born to the main respondent and surveyed at age 1 month since July 2005; "Had at least one (two) child(ren) since 2005" is an indicator which equals 1 if main respondent has had at least 1(2) child(ren) since July 2005. Column [1] sample includes women 17-43 years old (when available, both waves responses are included). Sample in columns 3 and 4 includes all women surveyed as main respondents in the 2008 survey, and comes from the Mai Mwana Health Surveillance System, which measures at age 1 month all children born to these women since the start of the intervention

Table A1. Differences in characterisitcs between those that attrited and those who did not

	Non-attrited	Difference Attrited - Not Attrited	p-value
Woman's Characteristics in 2004			
Married (dv = 1)	0.646	-0.113	0.002**
Some Primary Schooling or Higher	0.703	0.054	0.068+
Some Secondary Schooling or Higher	0.055	0.042	0.012*
Age (years)	25.174	-1.909	0.002**
Chewa	0.934	-0.021	0.116
Christian	0.982	-0.008	0.176
Farmer	0.661	-0.104	0.002**
Student	0.213	0.087	0.000**
Small Business/Rural Artisan	0.05	0.005	0.649
Age less than 16 in 2004	0.142	0.068	0.002**
Household Characteristics in 2004			
Agricultural household	0.996	-0.01	0.09+
Main Flooring Material: Dirt, sand or dung	0.91	-0.046	0.016*
Main roofing Material: Natural Material	0.86	-0.044	0.062+
HH Members Work on Own Agricultural Land	0.925	-0.032	0.058+
Piped water	0.026	0.014	0.104
Traditional pit toilet (dv = 1)	0.818	-0.053	0.06+
# of hh members	5.838	-0.091	0.577
# of sleeping rooms	2.215	0.002	0.987
HH has electricity	0.004	0.002	0.643
HH has radio	0.645	-0.002	0.913
HH has bicycle	0.511	0.015	0.551
HH has motorcycle	0.006	0.006	0.194
HH has car	0.006	-0.002	0.394
HH has paraffin lamp	0.947	-0.016	0.03**
HH has oxcart	0.048	0.007	0.41
N	1595	902	

Notes to Table: + indicates significant at the 10% level, * indicates significant at the 5% level. p-values reported here are computed using the wild cluster bootstrap-t procedure as in Cameron et al (2008), explained in section 4.1. Non-attrited refers to women (and their households) actually interviewed in 2008-09 (and used in the analysis). Attrited refers to women (and their households) drawn to be part of the sample in 2008-09, but who were not interviewed.

Table A2: Comparison of women that attrited, by intervention and control

	Attrited in wave 1			Attrited in wave 2		
	Control Group	Difference Treatment - Control	p-value	Control Group	Difference Treatment - Control	p-value
Woman's Characteristics						
Married (dv = 1)	0.534	-0.002	0.961	0.567	-0.017	0.722
Some Primary Schooling or Higher	0.750	0.013	0.801	0.743	0.029	0.531
Some Secondary Schooling or Higher	0.080	0.033	0.202	0.076	0.030	0.214
Age (years)	23.174	0.200	0.753	23.385	-0.112	0.866
Chewa	0.931	-0.036	0.375	0.931	-0.028	0.462
Christian	0.972	0.004	0.760	0.971	0.006	0.647
Farmer	0.610	-0.102	0.090+	0.621	-0.105	0.074+
Student	0.294	0.012	0.793	0.290	0.016	0.704
Small Business/Rural Artisan	0.032	0.043	0.025*	0.027	0.045	0.006**
Household Characteristics						
Agricultural household	0.995	-0.017	0.106	0.996	-0.015	0.100
Main Flooring Material: Dirt, sand or dung	0.899	-0.070	0.112	0.893	-0.057	0.145
Main roofing Material: Natural Material	0.839	-0.047	0.415	0.829	-0.030	0.566
HH Members Work on Own Agricultural Land	0.929	-0.070	0.126	0.933	-0.068	0.096+
Piped water	0.014	0.050	0.192	0.011	0.047	0.173
Traditional pit toilet (dv = 1)	0.732	0.065	0.285	0.735	0.079	0.183
# of hh members	5.770	-0.035	0.889	5.775	-0.039	0.869
# of sleeping rooms	2.085	0.257	0.015*	2.086	0.246	0.017*
HH has electricity	0.000	0.013	0.129	0.000	0.011	0.130
HH has radio	0.610	0.065	0.093+	0.608	0.062	0.106
HH has bicycle	0.509	0.031	0.460	0.510	0.028	0.417
HH has motorcycle	0.009	0.006	0.535	0.008	0.006	0.482
HH has car	0.002	0.002	0.584	0.004	0.000	0.997
HH has paraffin lamp	0.913	0.036	0.259	0.905	0.046	0.138
HH has oxcart	0.055	0.001	0.973	0.061	-0.006	0.659
N	436	468		530	527	

Notes to Table: + indicates significant at the 10% level, * indicates significant at the 5% level. p-values reported here are computed using the wild cluster bootstrap-t procedure as in Cameron et al (2008), explained in section 4.1. Sample in LHS panel includes households who attrited between 2004 and 2008-09, while the RHS panel includes households that attrited between 2004 and 2009-10.