SUB-SAHARAN AFRICAN SOCIAL AND HEALTH POLICIES AND THE POOR: THREE ESSAYS EXAMINING IMPACTS OF PUBLIC PROGRAMS ON MATERNAL HEALTH UTILIZATION, CHILDREN'S HEALTH, AND HOUSEHOLD COMPOSITION

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ABSTRACT

CAROLYN HUANG: Sub-Saharan African Social and Health Policies and the Poor: Three Essays Examining Impacts of Public Programs on Maternal Health Utilization, Children's Health, and Household Composition
(Under the direction of Sudhanshu Handa)

The poverty literature sheds much insight into the disproportionate disadvantages the poor face when compared to the non-poor. The poor are more likely to suffer from disease, lack access to basic health services which make death preventable, and face greater barriers to human capital investment which would allow them to break the intergenerational cycle of poverty. This research examines the potential of social and health programming to support poor and vulnerable populations in sub-Saharan Africa. In the first essay, a quasi-experimental comparison group design is used to examine the impacts of a Ghanaian community-focused heath quality improvement program on maternal health utilization. The program was found to be significantly associated with possession of health insurance, a finding that was robust even among women who lacked health decision-making autonomy. The second and third essays examine the impacts of one of sub-Saharan Africa's largest and rapidly expanding anti-poverty initiatives, social cash transfer schemes. The focus of the second essay is to determine whether the Kenya Cash Transfer for Orphans and Vulnerable Children (CT-OVC) is associated with health improvements, measured through proxy variables for malaria and pneumonia, among children 0-7 and under-5 years of age. The program provided cash grants to ultra-poor families supporting orphans and vulnerable children. The evaluation strategy included a cluster randomized longitudinal design. Using a generalized linear latent and mixed model with clustering at the household and location level, significant reductions in malaria and pneumonia symptoms were found among children 0-7 years of age, although insignificant findings for under-5s. The third chapter examines impacts on household structure, as they reflect

changes in welfare or basic household economic strategy. A difference-in-differences OLS model was used to find that the program was associated with a decrease in number of children ages 6-11 years of age and an influx of newcomers due to deaths of caretakers and/or family members of their original households. Altogether, the results indicate that these two social and health programs have made promising gains, although more could be done to bolster multidimensional welfare of their most vulnerable beneficiaries.

To my father, Huang Shun-Yih,
who endured an impoverished childhood, found opportunity through education,
but left his own Ph.D. to provide for his family.
Thanks, Dad.

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LIST OF ABBREVIATIONS

AIR	American Institutes for Research
ANC	Antenatal care
CHPS	Community-based Health and Planning Services
CCTs	Conditional Cash Transfers
CGP	Zambia Child Grant Program
CT-OVC	The Kenya Cash Transfer for Orphans and Vulnerable Children
DCS	Kenya Department of Children's Services
DD	Difference-in-differences
DFID	Department for International Development
DHS	Demographic Health Survey
GHS	Ghana Health Service
GLLAMM	Generalized Linear Latent and Mixed Model
GSS	Ghana Statistical Service
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IMR	Infant Mortality Rate
ICN	Improvement Collaborative Networks
IMHE	Institute for Health Metrics and Evaluation

ISSER	Institute of Statistical, Social and Economic Research
KMO	Kaiser-Meyer-Olkin
MDG	Millennium Development Goals
MCH	Maternal and Child Health
MICS	Multiple Indicator Cluster Survey
MMR	Maternal Mortality Rate
MNHR	Maternal and Newborn Health Referral Program
MoH	Ministry of Health
NCHS	National Catholic Health Services
NHIS	(Ghana) National Health Insurance Scheme
OVC	Orphans and Vulnerable Children
OPM	Oxford Policy Management
PCA	Principal Component Analysis
PFA!	Project FivesAlive!
PRAF	Programa de Asignación Familiar
PROGRESA	Programa de Educación, Salud y Alimentación
QI	Quality Improvement
RPS	Red de Protecion Social

SBA	Skilled birth attendant
SCTs	Social Cash Transfers
SSA	Sub-Saharan Africa
U5	Under 5 years of age
U5MR	Under-5s Mortality Rate
UNC-SPH	University of North Carolina at Chapel Hill- Gillings School of Public Health
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

CHAPTER 1: BEYOND THE HEALTH FACILITY AND INTO THE COMMUNITY: IMPACT OF A GHANAIAN HEALTH QUALITY IMPROVEMENT PROGRAM ON MATERNAL HEALTH SERVICE UTILIZATION AND PREPAREDNESS

1.1 Introduction

In sub-Saharan Africa, maternal and child survival are among the most pressing public health issues. The continent leads global maternal mortality estimates with 500 maternal deaths per 100,000 (WHO 2012). One in thirty-nine women face a lifetime risk of dying from complications of pregnancy and childbirth. The statistics on child survival in sub-Saharan Africa are equally dire. Global under-5 mortality estimates are 98 under-five deaths per 1,000 live births – compared to 53/1,000 among other developing countries (UN Inter-agency Group for Child Mortality Estimation, 2013).

The leading causes of maternal and child deaths in sub-Saharan Africa are treatable with quality maternal and child health care. For women, hemorrhaging, eclampsia, obstructed labor, and postpartum infections are mortality drivers that arise during childbearing or immediately thereafter (Overbosch et al. 2006; UNFPA, accessed 2014). These account for approximately 75% of maternal deaths in sub-Saharan, yet are detectable through regular and timely antenatal care (ANC) visits to a health provider and having a skilled birth attendant (SBA) at delivery (Khan et al. 2010). The WHO recommends four ANC visits to monitor mother and child health status during pregnancy, as well as delivery in a health facility by a skilled birth attendant (WHO, 1994; Raghupathy 1996; McClure et al. 2007, de-Browere et al. 1998; WHO 1999; Adamu & Salihu 2002). Because ANC alone cannot predict emergency complications that may arise unexpectedly during pregnancy, skilled delivery plays a critical role in saving mothers' lives (Mavalankar & Rosenfield 2005). SBA encapsulates both a skilled health professional – a doctor, midwife, or nurse – and an enabling environment (typically a health facility) equipped to respond to

complications during deliveries (Crissman et al. 2013; Campbell et al. 2006). Together, ANC, SBA, and facility delivery are the core of maternal health interventions.

The Millennium Development Goals galvanized global efforts to combat these health inequities and lead to reductions in the aggregate number of maternal and child deaths (UN 2013). However, progress is not equitable. Regional and country-level averages revealed that the poor are more likely to suffer worse social, economic, and health outcomes than the non-poor and gains in averages do not readily benefit the poor (Hobcraft et al. 1984; Castro-Leal et al. 1999; Filmer 2004; World Bank 2004; Gwatkin et al. 2005; Gwatkin et al. 2007; Jehu-Appiah et al. 2011).

Poverty obstructs knowledge of and access to health services that make the leading causes of maternal and child morbidity detectable and treatable. It presents financial or geographical barriers, prevents mothers from obtaining adequate nutrition during pregnancy, and is more likely to lead to delayed and emergency health care seeking – factors which increase the risk of death (Graham 1991; Cham et al. 2005; DHS 2008; Black et al. 2008; Magoma et al. 2010; Asundep 2013). Poverty exposes children to conditions and disease-borne vectors that make them more susceptible to malnutrition and stunting, premature birth, and illnesses associated with increased risks of under-5 mortality.

Poor women are less likely to use maternal health services or deliver in health facilities than non-poor women (Babalola 2009). Programs that seek to improve health conditions of its recipients must consider how poverty impedes and constrains access to program resources. Without addressing equity and access issues, global health policies can neither expect to improve the lives of the most underserved, nor achieve regional goals as were originally outlined by the MDGs.

This study seeks to examine whether a Ghanaian maternal and child health (MCH) intervention has an impact upon maternal health utilization and enabling factors, such as ANC visits, skilled birth attendance, emergency preparedness plan, and possession of health insurance. Serving the poor is not an explicit objective of the program, but is of special interest due to poverty's correlation with high mortality

burden, especially in rural areas. I use cluster-randomized quasi-experimental data from the Evaluation of the Maternal and Newborn Health Referral Project (MNHR) to determine whether demand-side community outreach programs such as these can reach the poor and improve maternal and child health outcomes. I examine whether the program influences maternal health utilization and other health behaviors compared to women from communities that did not receive the program. I also examine whether the program permits equity of access by reaching the poor.

1.2 Ghana Country Context

Given its historically high Under-5 (U5MR), infant (IMR), and maternal mortality rates (MMRs), the Government of Ghana has established maternal and child health survival as a public health priority. According to the latest estimates, Ghana made progress by reducing the U5M rate to 78/1,000 live births (World Bank, 2012) and MMR to 350/100,000 live births (World Bank, 2010), but progress has not been equal throughout the country.

Socioeconomic, demographic, health, and nutritional factors that are related to poverty are drivers of Ghana's aggregate adverse maternal and child health outcomes (Appoh 2005). Demographic indicators related to poverty such as regional residence are also correlated with illness severity and death. DHS estimates find that from1998 to 2008, more U5 deaths came from poor households, as compared to other wealth quintiles (103 deaths per 1,000 live births, as compared to 60 in richest quintiles). Moser et al. (2005) found that under-5 mortalities diminished by 16.9 percent at an aggregate level from 1993-98, but that these gains increased health inequalities between poor and non-poor.

The largest concentration of poor reside in rural areas and correspondingly, the Northern, Upper West, and Central regions of Ghana experience higher U5 mortalities than other regions (DHS 2008). The higher mortalities rates in the Northern Region may be, in part, attributable to greater poverty prevalence and less development than the rest of the country. Children living in poorer communities are also introduced to more environmentally-sourced disease vectors such as inadequate water supply,

sanitation, indoor air pollution, crowding, or poor housing conditions (Victora et al. 2003; Wagstaff et al. 2004; WHO 2002).

Recognizing that financial costs present a prohibitive barrier to health seeking, the Government of Ghana moved away from a user fee model and towards a universal health insurance scheme from 2003 to 2005. The National Health Insurance Scheme provides health services and approved drugs on the National Health Insurance Authority list. An addendum, the Maternal Health Care Program, extends coverage to pregnant women by providing six antenatal visits, facility delivery, and two postnatal visits (Witter et al. 2007; Mills et al. 2008; Dzakpasu et al. 2012; Singh et al. 2015). It is funded by a mixture of public revenues, civil servant Social Security Funds, and income-adjusted premiums which require a minimum of GH ₵7.20 or $5 per year (Jehu-Appiah et al. 2011). While enrollment is mandatory, in practice, only 69% of the national population had ever registered for NHIS and only 35% of the population is currently enrolled (GSS 2011; ISSER 2013).

Enrollment patterns reveal that coverage rates vary by region of residence, education, and wealth. Socioeconomic status is associated with health insurance enrollment. The poorest wealth quintiles have the lowest enrollment rates - 57.4% of women belonging to the lowest wealth quintile have ever been enrolled compared to 77.8% for the highest wealth quintile (GSS 2009; Sarpong et al. 2010; Jeh-Appiah et al 2011). The Central and Northern regions have the lowest insurance rates, respectively 58% and 68.2% (MICS 2011). Low educational achievement is associated with being uninsured; only 61% of women with no or low educational attainment have ever enrolled under NHIS compared to 78% of women with secondary education or higher (GSS 2011). Jehu-Appiah et al. (2011) also find that older age, higher education levels, female heads of households, and positive perceptions of NHIS increase the odds of enrolling and remaining enrolled in the NHIS.

Insurance enrollment increases access to and utilization of maternal health services and is therefore also an important policy lever. Insured pregnant women are more likely to use antenatal

services, give birth in a health facility, and have skilled birth attendants present as compared to uninsured women (Mills 2008; Singh et al. 2013; Dixon et al. 2014). NHIS enrollment is associated with an increase in facility delivery among the poorest and least educated in the Volta and Central regions (Penfold et al. 2007) and Brong Ahafo regions (Dzakpasu et al. 2012). Women who possessed health insurance for three or more years and during pregnancy were significantly more likely to have delivered in a health facility, as compared to women who were uninsured (Singh et al. 2013).

1.3 Project FivesAlive! Program Description

Project FivesAlive! (PFA!) began in 2008 as an effort to address MDG 4 and 5, which called for a two-thirds reduction in under-five mortality and a three-quarters reductions in maternal mortality by 2015. The program is a Bill and Melinda Gates funded collaboration with the Government of Ghana's Ministry of Health (MoH), Ghana Health Service (GHS), the Institute for Healthcare Improvement (IHI) based in the USA, and the National Catholic Health Services (NCHS) of Ghana. The University of North Carolina Gillings School of Public Health (UNC-SPH) and the Institute for Statistical, Social and Economic Research (ISSER) at the University of Ghana-Legon are its external evaluation partners.

PFA! utilizes a quality improvement approach which improves health service quality by diagnosing weaknesses and barriers at facilities and encouraging simple, low-cost, and locally-driven reformation. These simple interventions, "change ideas," are designed to facilitate the delivery or receipt of high impact interventions. Content may include data quality improvement (monitoring, reporting, and storage), or solutions to bottlenecks in service delivery (delays in receiving care). Improvement Collaborative Networks are created from health staff and management teams in each district. Members from each facility of the ICN then comprise a Quality Improvement team which develops and tests change ideas. The QI teams are responsible for attending learning sessions where they receive instruction from PFA! program officers on how to identify process failures, find actionable solutions, and implement monitoring and evaluation methods. The teams then disseminate learning session findings to their facilities, where the change ideas are implemented with the assistance of regular coaching visits. In total,

the QI process entails four learning sessions and multiple site visits depending on the needs of each facility. See Appendix for a list of change ideas which were implemented.

After four years of working exclusively with facilities and health workers, testimony from care providers and PFA! program managers revealed that breakdowns in rural referral systems were an ongoing contributor to high maternal and U5 mortalities. The collaborative was compelled to create an extension program, the Maternal and Newborn Health Referral project, which includes a strong community-focused component. The comparison group is comprised of facility-only QI team members, whereas the treatment group is comprised of facility and community members such as opinion leaders, elders, assemblymen, chiefs, traditional birth attendants, and spiritual leaders or traditional healers. Human capital training is at the core of the extension program, but a key feature also includes addressing community-level and demand-related barriers that cause women to delay seeking care. Like the main program, QI teams comprised of health professionals and community members gather to identify barriers and develop simple, low cost change ideas.

1.4 PFA! MNHR and the Causal Pathways of Behavioral Change

The maternal health utilization literature identifies three phases of care seeking and provision that determine the success of maternal survival in the onset of obstetric complication: timeliness in deciding to seek care, time to reach an adequate health care facility, and timeliness in receiving quality care at the facility (Thaddeus & Maine 1994). Project FivesAlive! MNHR operates at all three phases, where the community outreach program addresses the first two components and the main program addresses factors at the third. Figure 1 presents a conceptual framework of the causal mechanisms by which thie adapted from Tarekegn et al. (2014), which is derived from Andersen's determinants of health service utilization and the referral delays model in maternal health care utilization (Andersen & Newman 2005; Thaddeus 1994).

In Ghana, individual factors influence take-up of maternal health services. Women who are younger, more educated, wealthier, and have low parity are more likely to receive any ANC visits. Women most frequently sought care from nurses or midwives rather than doctors, auxiliary midwives, community health officers, or traditional birth attendants. Sociocultural factors play an influential role in timing of care seeking. A female's empowerment and autonomy within the household has been shown to be correlated with use of skilled delivery in African settings (Singh et al. 2012; Fotso et al. 2009). Religious or traditional households may require wives to seek permission from their husbands (the primary decision-maker) before she is allowed to seek health services (Adamu & Salihu 2002). Socio-culturally-rooted aversion to Westernized medicine and birth positioning preferences may lead women to deliver at home with a midwife or a traditional healer. A qualitative evaluation of the MNHR project found that the practice of declining or delaying referrals during health complications was prevalent among communities in this study due to the need to consult with family members and traditional healers or fears of dying en route to a referral facility (External Evaluation Team, 2015).

PFA! MNHR health workers gather within the communities to communicate with all women and their partners about facility delivery perceptions or anxieties, and address socio-cultural barriers (PFA! 2013). In talks given by community leaders, women are also encouraged to seek ANC and educated about the benefits of timely and regular ANC usage in ways that respect traditional customs. If not already covered under the National Health Insurance Scheme (NHIS), they are informed of its benefits. The provision of information is theorized to influence health service utilization by giving program participants information about treatment options, financial resources, and making them aware of the signs of serious complication (Ensor & Cooper 2004).

Rural residents are more likely to encounter a lack of reliable transportation options or financial support, and long travel distances (Crissman et al. 2013; DHS 2008; Overbosch et al. 2006). Poverty, which is prevalent among study communities, complicates care seeking by presenting direct financial barriers, making the opportunity cost of travel to the facility high, or influencing the individual to delay

care until complications progressed to severity. QI teams from both treatment arms established a reasonably-priced on-call system with local drivers to transport women during emergency complications. To overcome financial barriers, pooled funds created in a few intervention communities were made available to pregnant women.

Both treatment arms received facility-level interventions which included addressing waiting times and quality of care. These factors are associated with the third level of delay.

1.5 Methodology

The following sections detail the research design, sampling, data, and estimation strategy for this study.

1.5.1 Research Design

The evaluation design utilizes a pre-/post- quasi-experimental cluster longitudinal design. Pre-intervention baseline data was collected during May and June of 2012, in 3 districts from the Northern and Central regions. The program began a few months after, in August 2012. Midline data was collected in October/November of the following year. Some communities were introduced to the program later and had less than one year of participation.

The Northern and Central regions were selected for inclusion in the MNHR community-outreach program based on need (high maternal, infant, and neonatal mortality ratios and geographical barriers) and an absence of pre-existing or concurrent interventions. Two districts from each region were selected to participate in the MNHR program, while the third was assigned to comparison group status. Both treatment arms received PFA's main facility-based intervention. The primary difference is that the comparison group did not receive the MNHR community-based intervention. In the Northern Region, the intervention districts are Nanumba North and South, with Gushegu assigned to the comparison group. In the Central Region, Asikuma Odobea Brakwa and Assin North were assigned to intervention status, while Gomoa West was the comparison district.

1.5.2 Enumeration area (EA) sample selection

The study follows the same districts over time but clusters (communities or enumeration areas) were re-sampled during the follow up. This was due to concerns that the one year sampling time frame would lead to re-sampling of the same women who had recently had a pregnancy. A 30 by N cluster sample design was used and is a common evaluation design in child survival programs (Singh et al. 2015). 30 (15 treatment, 15 control) communities were sampled during each data collection, for a total of 60 communities. Table 1.1 presents the treatment arm balance of 8 community-level determinants of care utilization. Only the distance to hospital indicator was found to differ between treatment groups, where on average, treatment communities were 5.7 km at baseline and 7.6 km at midline farther than the comparison group.

1.5.3 Respondent sample selection

Individual study participants were selected from a list of women ages 15-49 compiled by community health workers. Each of the women on this list had given birth during the last 12 months. Seven recently pregnant women were randomly selected to be interviewed about their household-level characteristics, assets and wealth, decision-making power, health service usage, perceptions of health facilities, and knowledge of health practices. Two of the woman's nearest neighbors were also interviewed to measure community-level perceptions, knowledge, and attitude of health services. In total, the sample comprises 1,267 women from the baseline (424 women who had recently given birth, 843 neighbors) and 1,260 from the midline (420 who had recently given birth, 840 neighbors).

1.5.4 Data

Dependent and independent variables are discussed in greater detail in the following sections.

1.5.4.1 Dependent Variables

I examine the program's impacts on ANC visits, facility delivery, possession of health insurance, and emergency plan preparedness or complications readiness. All outcomes are binary. ANC visits was

coded as 1 if a woman had been pregnant in the last 3 years, or was currently pregnant in her ninth month and had received 4 or more ANC visits. Facility delivery was asked of women who had a previous pregnancy within the last 3 years and have delivered their most recent birth in a hospital, health center, or community health post. If they delivered at home, the home of a traditional birthing attendant, or non-facility, facility delivery was coded as 0. Health insurance possession was coded as 1 if the individual had some coverage within the last year. Emergency preparedness plan is defined as having a plan in case of complications.

1.5.4.2 Independent Variables

Demographic indicators capturing age, education, ethnicity, parity (number of previous births), religion, region of residence, and marital status were asked of interviewees. Age was separated into categories of 15-19, 20-24, 25-34, and 35-49. This was done to capture effects that may be experienced at different phases of life, as pregnancy is riskier at younger and older ages. Education was separated into levels – women with no schooling, preschool or primary, and secondary or higher. Ethnicity was binary, indicating whether the individual belonged to the dominant ethnic group of the region. The dominant ethnic groups are Akan in the Central Region and Mole Dagbani in the Northern Region. Parity was separated into categories of number of live births – 1, 2-3, and 4 or more. Religion was coded as 1 if the interviewee practices Muslim, traditional, or spiritualist beliefs, 0 if Christian denomination. Region of residence was coded as 1 for the Northern Region, 0 for Central. Marital status is a binary variable where 1 is if the woman is married or living together and 0 if divorced or separated, widowed, or has never been married or co-habited.

Socioeconomic indicators include employment status and wealth. Employment was separated into categorical variables – unpaid family worker, housewife, agricultural worker or unemployed; self-employed; and paid formal or informal work. I create two measures of poverty – an ordinal ranking of poverty based on possession of durable assets and a composite index based on poor living conditions. The former is a reflection of persistent poverty and measures poverty relative to others in the sample. The

latter captures living conditions which are known to be a cause or perpetuating factor of adverse welfare outcomes. These are living conditions to which the poor in Ghana are exposed.

The poverty ranking was constructed using principal component asset analysis of 33 components. The Kaiser-Meyer-Olkin measure (KMO) of sampling adequacy was first applied to determine whether the variables contain sufficient collinearity to warrant use of PCA. The KMO measure was 0.845 and the Bartlet test was significant ($p<0.001$), confirming the appropriate use of PCA. After individuals were ranked, the bottom quartile rankings were assigned 1 for poverty. All others were assigned 0.

The living conditions index used observable determinants of poverty in Ghana. These include poor toilet, fuel, and kitchen. Poor toilet use includes a bucket or pan, public toilet, another house, or bush or free range. Poor fuel source encompasses wood. Poor kitchen space includes outside or in front of the room or verandah. 1 is assigned to individuals who are exposed to all 3 living conditions, 0 to individuals who are exposed to 2 or fewer.

Health service accessibility indicators included presence of a midwife and travel distance to nearest facility. Midwife availability was coded as 1 if a midwife accessible during the entire year, 0 if available partially over the year or unknown. For models testing the impacts on facility delivery, distance to the closest health center or hospital was included. The ANC visit, emergency preparedness, and health insurance possession models used the distance to the closest health center, hospital, or CHPS.

I include a measure of women's autonomy, which was asked only of married women. Respondents were asked to select their decision-maker for issues pertaining to health care. Autonomy was coded as 1 if the respondent herself or her and her husband or partner jointly made decisions on her behalf. All other individuals were coded 0.

1.5.5 Estimation Strategy

The models were estimated for four binary outcome variables of interest: receiving four ANC visits, skilled birth attendance, having an emergency preparedness plan, and possession of insurance.. The basic model, for instance for ANC visits, is as follows:

$$\text{logit} \;\; E(Y_{ijl}) = \alpha + \beta_P(P) + \beta_{ij}V_{ij} + \theta_{l(j)}$$

Where Y is the outcome for an individual *i* in the *j* district, *l* community at midline;

P indicates treatment assignment where 1=treatment, 0=comparison;

V_{ij} are control and independent variables of interest, including health insurance;

$\theta_{l(j)}$ accounts for the correlation between individuals in the communities.

Similar models are specified for models 2-4. Model 4 omits the health insurance status control. A logit link is used and exponentiated coefficients are presented as odds ratios.

1.6 Results

Results are separated into discussion on community and individual characteristics and program impacts.

1.6.1 Community characteristics of the sample

Community leaders were asked about health service availability and local perceptions of delivery in hospitals. On average, more leaders perceived their communities to be poorer than other communities in Ghana. The majority of community leaders reported that community members had favorable perceptions of facility delivery – some, most, or all mothers-in-laws and husbands in the community were receptive. With regards to accessibility of health providers, few communities had any community health posts or hospitals located within them. A third of the communities had a health center nearby. There were a few significant differences in proximity to providers between treatment assigned communities. On average, baseline treatment communities were 5-6 kilometers farther from a health center or hospital than

control communities ($p<0.05$). Midline treatment communities were 7.6 kilometers farther than control communities ($p<0.05$). See Table 1.1.

1.6.2 Individual descriptive statistics

The analytical sample is comprised of married women who are on average, 29 years old and belong to the dominant ethnicity. 74% of women in the baseline and 63% in the midline are wives. 10% of the baseline sample were heads of the household, in comparison to 17% of the midline. Daughters comprised 11% of the sample in both waves. Few grandchildren were included in the study. With a third of the sample having recently given birth, the majority of women are married (80%). Nearly half of the sample had a parity of four children or older. Treatment assignment groups were fairly evenly balanced on parity levels (1, 2-3, or 4+).

The sample had varied educational attainment, possessing either little or a high level of schooling. The largest proportion of women in both treatment assignment groups had no primary school education (41-49%). Women who had received middle school education and higher were the second highest proportion. The intervention communities had more women who had received preschool or primary education and middle, secondary, or higher education. The same trends are observed for husband's education. Similarly, husbands and wives from the intervention group had higher incomes than their counterparts in the control group.

1.6.3 Program Impacts

Program impacts are broken down by significant outcomes of interest in the following sections.

1.6.3.1 Positive results for health insurance possession

Results for the primary outcomes of interest are presented in Table 1.3. The program was associated with greater odds of possessing health insurance after controlling for demographical, socioeconomic background, and distance to the facility. Women of dominant ethnic groups in the communities were likely to possess insurance. Women from the Northern region, who received only

primary education as compared to secondary, and are unpaid or self-employed were less likely to possess health insurance than those who were employed. Distance travels over 5 km were also associated with greater likelihood of health insurance possession.

1.6.3.2 Autonomy

Results are presented in Table 1.41 and 1.4.2. The program was not found to be a mediating or moderating factor for maternal health service utilization among women with low health decision-making autonomy. The program was positively associated with possession of health insurance, where treatment women were nearly twice as likely to possess it as compared to the comparison group. The comparison group was 1.9 times more likely to have an emergency preparedness plan than the treatment group (Table 1.4.1).

1.6.3.3 Impacts on the poor

Table 1.5.1 depicts the full models with poverty controls and poverty-treatment interaction effects. Odd numbered models include the asset poverty measure, while even numbered models include the living condition poverty measure.

No differential effects were detected on poverty and treatment status. The health insurance results appear to be robust with both types of poverty controls, where the treatment group was approximately 3 times more likely to have health insurance. Factors such as receiving only primary education, residing in the Northern Region, being an unpaid worker, and experiencing asset poverty were found to be negatively associated with possession of health insurance. Attributes such as belonging to the dominant ethnicity and having low parity were found to be positively associated with health insurance.

In Table 1.5.2, the results are stratified to reveal the effects on poverty groups. The health insurance results are consistent with the previous tables – it appears that the poor are also benefiting from the program equally as the non-poor. Individuals from comparison groups who experience asset poverty were 2.2 times more likely to have an emergency preparedness than treatment group individuals.

1.7 Discussion

This study used post-program data from a donor-funded health care quality improvement program implemented in six districts in Northern and Central Regions of Ghana. Project FivesAlive! Maternal and Newborn Referrals program had mixed impacts on women participating in the program. Women from treatment communities had received the community and facility-level interventions whereas the control group received the facility-level intervention only. The treatment group was more likely to possess health insurance than control communities after controlling for demographic, socioeconomic, and health service availability. These results were strong and consistent in the entire sample and in samples stratified by low health decision-making autonomy and poverty status, groups which are more likely to be associated with negative health outcomes due to marginalization. The results reveal promising improvements for maternal health outcomes, as health insurance is more likely to lead to delivery in health facilities. However, no impacts were measured on the key health service utilization variables – ANC visits, skilled birth delivery, or emergency preparedness planning. Control-assigned women lacking health decision-making autonomy and those experiencing asset poverty were more likely to have an emergency preparedness plan.

The program has clearly demonstrated equity in achieving health outcomes. The poor are just as likely to have health insurance as the non-poor. Likewise, women with no or low autonomy over health decision-making were just as likely to possess health insurance as women with full autonomy. These results are promising for promoting maternal health service access via outreach methods, indicating that health quality improvement initiatives working alongside the community have the potential to address access barriers arising from socioeconomic disparity.

The insignificant results on key maternal health utilization outcomes suggest that the facility-based intervention (comparison) may have had some spillover effects, for instance, on transportation systems and traveling costs which are known to be a primary access-related barrier. Our results on emergency preparedness planning appear to support this hypothesis. Another explanation may be the

duration of time that some communities participated in the program. Our study examines one year impacts; however, some communities did not receive one full year of the intervention. It is possible that outcomes requiring longer term behavior such as regular ANC usage or facility delivery, which requires a shift in fundamental provider-related attitudes, may require a longer observation window to detect changes.

Additionally, one limitation in the study's design is worthy of mention. Given the study's purpose of observing women who had recently given birth, it was implausible to conduct a longitudinal study on an individual or community-level basis. A primary concern with resampling within communities and the study time frame is that women who had been sampled in the baseline would be resampled, leading us to incorrectly conclude that no changes occurred as a result of the program. However, a single time period treatment-control design needs to establish that differences measured between intervention groups are attributable to the program and not other unobservable characteristics. In our analysis of community characteristics (Table 1.1), I find that the only statistically significant difference is on the indicator for distance to nearest hospital – the remaining six determinants of health care access are insignificant. I also investigated the efficacy of a constructed proxy baseline control measure that used matched district-level averages for each outcome. However, I abandon this approach after the small number of districts (6 in total) led us to conclude that the control measure was more problematic than helpful.

The importance of addressing demand-related barriers to health seeking is widely acknowledged in health services literature. In this study, I find that a maternal and child health quality improvement program with a strong community outreach component has the potential to influence the intermediate factors which lead to adequate maternal health utilization. However, facility-based interventions alone may be insufficient to address barriers that uniquely affect the poor and lead to low ANC utilization, facility delivery, and lack of emergency planning. Outreach programs may have the ability to address

community-level access issues relating to distance to facilities, cost-related barriers, or working operating within culturally-accepted norms.

Figure 1: Conceptual Framework

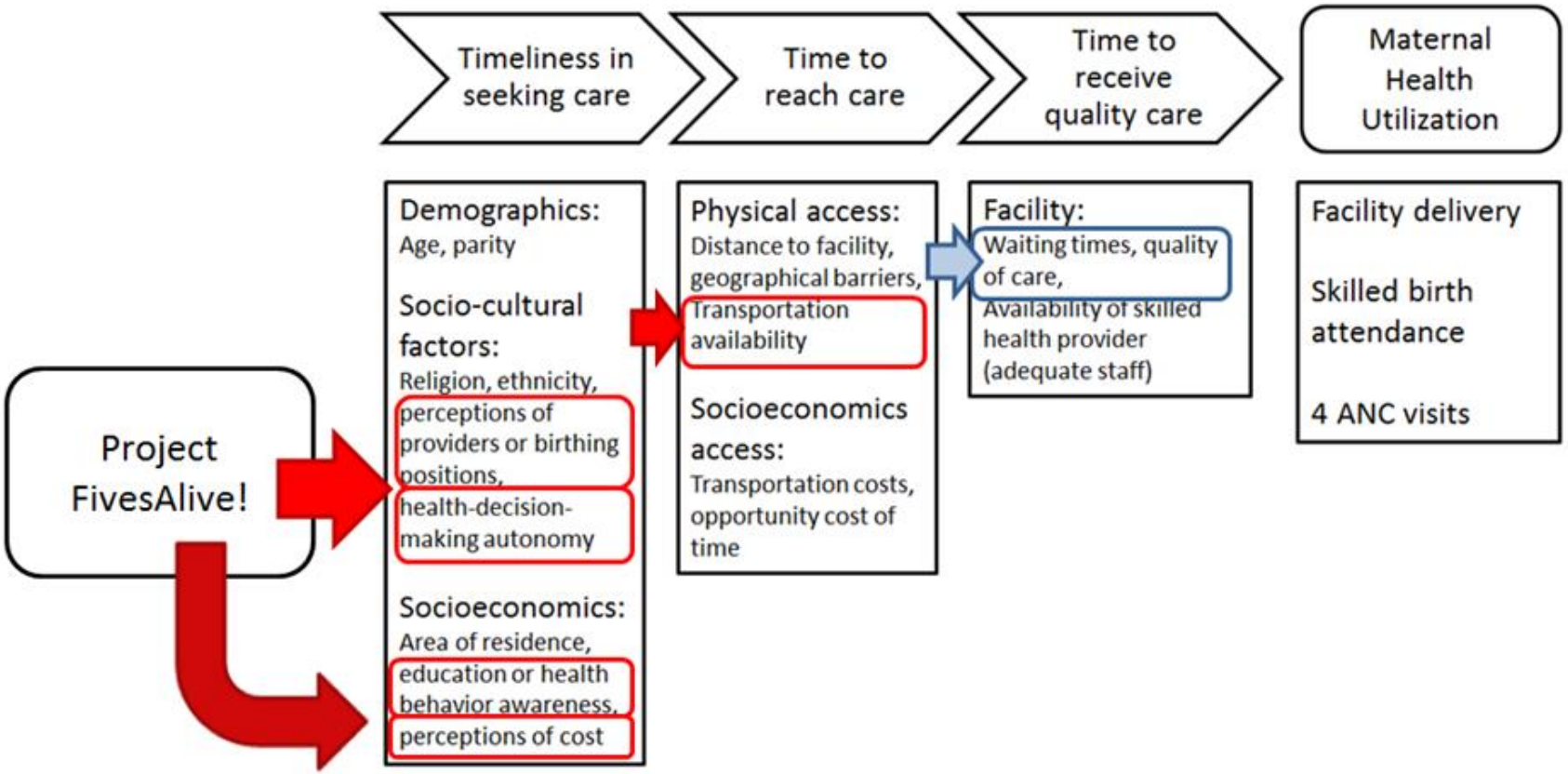

TABLE 1.1: Community characteristics

	Baseline sample				Midline sample			
	T	**C**	**Difference**	**p-value**	**T**	**C**	**Difference**	**p-value**
Community leader perception of wealth	0.67	0.68	0.01	0.93	0.77	0.70	-0.07	0.59
Midwife availability	0.65	0.58	0.06	0.60	0.58	0.56	-0.02	0.88
Number of CHPS facilities	0.16	0.23	0.06	0.57	0.15	0.19	0.03	0.77
Distance to nearest CHPS (km)	10.93	7.24	2.36	0.13	9.34	12.74	3.41	0.11
Number of Health centers	0.39	0.32	0.07	0.63	0.35	0.30	-0.05	0.70
Distance to nearest Health center (km)	10.36	4.93	-5.43	0.05	9.85	8.32	-1.53	0.33
Number of Hospitals	0.07	0.19	0.13	0.13	0.08	0.19	0.11	0.25
Distance to nearest hospital (km)	20.09	14.38	-5.71	0.04	20.96	13.32	-7.63	0.05
N	31	31			27	26		

TABLE 1.2.1: Mean values of key baseline variables, by wave and treatment assignment

	Baseline sample					
	T	n	C	n	Difference	p-value
Dependent variables						
Four ANC visits (1=yes, 0=no)	0.49	391	0.67	390	0.18	0.00
Facility Birth	0.57	408	0.44	392	-0.13	0.00
Emergency Preparedness Plan	0.25	506	0.31	464	0.06	0.02
Health insurance	0.81	314	0.73	310	-0.08	0.02
Independent Variables						
Individual-level variables						
Age	29.43	637	29.37	630	-0.06	0.88
Recently pregnant woman	0.34	637	0.33	630	-0.01	0.92
Relationship to head of household						
Head	0.10	637	0.17	630	0.07	0.00
Wife	0.74	637	0.61	630	-0.13	0.00
Daughter	0.11	637	0.14	630	0.03	0.11
Grandchild	0.01	637	0.02	630	0.01	0.19
Other	0.03	637	0.06	630	0.03	0.04
Christian	0.43	637	0.44	630	0.01	0.73
Dominant Ethnicity	0.61	637	0.99	630	0.38	0.00
Marital Status	0.84	637	0.82	630	-0.02	0.32
Education						
None	0.41	630	0.49	630	0.08	0.00
Preschool/primary	0.14	637	0.24	630	0.10	0.00
Middle/secondary or higher	0.38	637	0.22	630	-0.16	0.00
Husband's education						
None	0.42	530	0.61	509	0.19	0.00
Preschool/primary	0.04	530	0.09	509	0.05	0.00
Middle/secondary or higher	0.30	530	0.18	509	-0.12	0.00
Unknown	0.22	530	0.09	509	-0.13	0.00
Work status						
Unpaid/unemployed	0.50	637	0.51	630	0.01	0.55
Self-employed	0.44	637	0.47	630	0.03	0.30
Paid work	0.05	637	0.04	630	-0.01	0.29
Income						
Female	34.96	464	27.46	404	-7.50	0.18
Husband	130.06	233	80.65	114	-49.41	0.03
Parity 1	0.22	624	0.23	596	0.01	0.62
Parity 2-3	0.29	624	0.29	596	0.00	0.96
Party 4+	0.49	624	0.48	596	-0.01	0.71
Community-level variables						
Northern Region	0.49	637	0.5	630	0.01	0.84
Distance to facility						
CHPS	11.16	532	7.24	336	-3.92	0.00
Health facility	10.63	406	4.93	231	-5.70	0.00
Hospital	20.28	595	14.38	273	-5.90	0.00

TABLE 1.2.2: Mean values of key midline variables, by wave and treatment assignment

	Midline sample					
	T	n	C	n	Difference	p-value
Dependent variables						
Four ANC visits (1=yes, 0=no)	0.58	441	0.60	445	0.02	0.70
Facility Birth	0.54	499	0.60	499	0.06	0.06
Emergency Preparedness Plan	0.46	597	0.54	593	0.08	0.00
Health insurance	0.82	315	0.57	315	-0.25	0.00
Independent Variables						
Individual-level variables						
Age	28.47	630	28.43	630	-0.04	0.92
Recently pregnant woman	0.33	630	0.33	630	0.00	1.00
Relationship to head of household						
Head	0.17	630	0.13	630	-0.04	0.10
Wife	0.63	630	0.72	630	0.09	0.00
Daughter	0.11	630	0.08	630	-0.03	0.07
Grandchild	0.05	630	0.02	630	-0.03	0.00
Other	0.04	630	0.05	630	0.01	0.50
Christian	0.42	630	0.48	630	0.06	0.02
Dominant Ethnicity	0.67	630	0.92	630	0.25	0.00
Marital Status	0.87	630	0.87	630	0.00	0.80
Education						
None	0.41	630	0.49	630	0.08	0.00
Preschool/primary	0.22	630	0.20	630	-0.02	0.58
Middle/secondary or higher	0.38	630	0.31	630	-0.07	0.01
Husband's education						
None	0.33	544	0.42	543	0.09	0.00
Preschool/primary	0.1	544	0.1	543	0.00	0.91
Middle/secondary or higher	0.28	544	0.27	543	-0.01	0.80
Unknown	0.26	544	0.15	543	-0.11	0.00
Work status						
Unpaid/unemployed	0.65	630	0.65	630	0.00	0.91
Self-employed	0.31	630	0.31	630	0.00	0.76
Paid work	0.05	630	0.03	630	-0.02	0.32
Income						
Female	98.46	201	56.96	189	-41.50	0.01
Husband	297.68	111	184.25	95	-113.43	0.02
Parity 1	0.27	626	0.26	629	-0.01	0.57
Parity 2-3	0.32	626	0.31	629	-0.01	0.67
Party 4+	0.41	626	0.44	629	0.03	0.37
Community-level variables						
Northern Region	0.5	630	0.50	630	0.00	1.00
Distance to facility						
CHPS	8.77	525	12.57	525	3.80	0.00
Health facility	9.47	378	8.48	441	-0.99	0.00
Hospital	21.65	567	13.48	504	-8.17	0.00

TABLE 1.3: Program Impacts on likelihood of accessing maternal health services and preparations

	(1) Visits	(2) Visits	(3) SBA	(4) SBA	(7) Plan	(8) Plan	(5) Insure	(6) Insure
Intervention status	0.949	1.036	1.276	1.058	0.719	0.876	1.908	2.050**
	(-0.22)	(0.19)	(0.63)	(0.20)	(-1.25)	(-0.63)	(1.88)	(2.60)
Education – none		0.490**		0.506**		0.789		0.684
		(-2.85)		(-3.05)		(-1.04)		(-1.38)
Education - primary		0.336***		0.631*		0.760		0.479**
		(-4.36)		(-2.43)		(-1.34)		(-3.25)
Northern region		4.818***		1.507		0.524		0.336*
		(4.04)		(0.80)		(-1.89)		(-2.21)
Dominant ethnicity		1.837		1.874		2.152*		2.060**
		(1.84)		(1.42)		(2.56)		(2.62)
Parity 1		1.040		2.160**		0.917		1.617
		(0.19)		(2.64)		(-0.35)		(1.91)
Parity 2-3		1.662*		1.416		1.117		0.855
		(2.05)		(1.78)		(0.59)		(-0.75)
Non-Christian		1.471		0.770		0.936		0.975
		(1.35)		(-0.92)		(-0.27)		(-0.08)
Age (15-19)		0.506		0.482		0.742		0.912
		(-1.40)		(-1.39)		(-0.83)		(-0.18)
Age (20-24)		0.708		0.822		1.458		1.046
		(-1.18)		(-0.58)		(1.50)		(0.18)
Age (25-34)		0.822		0.764		0.987		1.059
		(-0.75)		(-1.00)		(-0.06)		(0.39)
Insured while pregnant		2.474		1.591		0.772		--
		(1.94)		(0.67)		(-0.61)		
Coverage – none		0.837		0.255***		0.478***		--
		(-0.73)		(-4.24)		(-4.26)		
Coverage - inconsistent		1.064		0.671		0.542***		--
		(0.25)		(-1.34)		(-3.57)		
Marital status		0.621		0.622		--		1.304
		(-1.61)		(-1.77)				(0.88)
Distance to facility		0.915		1.073		0.996		2.303**
		(-0.53)		(0.26)		(-0.02)		(2.88)
Work – unpaid		1.332		0.365		0.745		0.237**
		(0.76)		(-1.56)		(-1.09)		(-2.80)
Work – self-employed		1.948		0.421		1.067		0.394*
		(1.77)		(-1.36)		(0.25)		(-2.10)
Midwife presence		1.073		4.654***		1.115		
		(0.31)		(4.93)		(0.47)		
N	886	708	992	829	1190	984	1260	1043

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 1.4.1: Program impacts on women with low health decision-making autonomy

	(1) Visits	(2) SBA	(3) Planning	(4) Insurance
Intervention status	0.997	1.611	0.517*	1.985*
	(-0.01)	(1.17)	(-2.14)	(2.09)
Education – none	0.312*	0.482	1.134	0.388**
	(-2.08)	(-1.87)	(0.41)	(-2.72)
Education - primary	0.346*	0.611	1.021	0.474*
	(-2.42)	(-1.03)	(0.06)	(-2.24)
Northern region	3.698*	1.219	0.335*	0.493
	(2.31)	(0.30)	(-2.57)	(-1.28)
Dominant ethnicity	1.545	1.544	1.533	1.996*
	(1.08)	(0.79)	(1.26)	(2.22)
Parity 1	1.021	3.235*	0.829	1.053
	(0.05)	(2.57)	(-0.59)	(0.16)
Parity 2-3	1.888*	2.418*	1.447	0.745
	(2.39)	(2.57)	(1.47)	(-1.30)
Non-Christian	1.747	1.189	1.160	1.003
	(1.30)	(0.38)	(0.46)	(0.01)
Age (15-19)	0.922	0.268	1.196	1.104
	(-0.11)	(-1.40)	(0.35)	(0.15)
Age (20-24)	0.734	0.450	1.622	1.273
	(-0.74)	(-1.61)	(1.40)	(0.73)
Age (25-34)	0.718	0.466*	0.782	1.168
	(-0.97)	(-2.07)	(-0.71)	(0.61)
Insured while pregnant	1.528	2.121	0.515	
	(0.67)	(0.69)	(-1.31)	
Coverage – none	1.166	0.308**	0.511**	
	(0.47)	(-2.58)	(-2.61)	
Coverage – inconsistent	1.923	0.660	0.548**	
	(1.62)	(-0.89)	(-2.63)	
Distance to facility	1.139	0.727	0.907	3.053**
	(0.45)	(-1.04)	(-0.26)	(3.04)
Work – unpaid	0.00000137***	0.561	1.741	0.195*
	(-15.59)	(-0.49)	(1.06)	(-2.07)
Work – self-employed	0.00000235***	0.561	2.543	0.421
	(-15.57)	(-0.51)	(1.74)	(-1.14)
Midwife presence	1.184	7.485***	1.648	
	(0.44)	(4.61)	(1.60)	
N	356	402	532	550

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 1.4.2: Program impacts among women with low health decision-making autonomy (interaction terms)

	(1) Visits	(2) SBA	(3) Plan	(4) Insurance
Intervention status	1.054	1.754	0.617	1.931
	(0.16)	(1.48)	(-1.68)	(1.94)
Education – none	0.480**	0.490**	0.812	0.673
	(-2.78)	(-3.12)	(-0.94)	(-1.44)
Education – primary	0.348***	0.635*	0.768	0.467***
	(-4.34)	(-2.32)	(-1.29)	(-3.38)
Northern region	3.720***	1.623	0.523	0.342*
	(3.46)	(0.95)	(-1.87)	(-2.14)
Dominant ethnicity	1.806	1.995	2.041*	2.050**
	(1.83)	(1.53)	(2.44)	(2.66)
Parity 1	1.181	2.397**	0.870	1.539
	(0.69)	(2.91)	(-0.57)	(1.66)
Parity 2-3	1.712*	1.433	1.129	0.848
	(2.26)	(1.75)	(0.64)	(-0.81)
Non-Christian	1.434	0.812	0.934	0.987
	(1.28)	(-0.76)	(-0.28)	(-0.04)
Age (15-19)	0.551	0.478	0.774	0.887
	(-1.22)	(-1.44)	(-0.71)	(-0.23)
Age (20-24)	0.743	0.804	1.495	1.031
	(-0.98)	(-0.65)	(1.57)	(0.12)
Age (25-34)	0.820	0.770	0.968	1.054
	(-0.77)	(-0.98)	(-0.14)	(0.35)
Insured while pregnant	2.396	1.683	0.809	
	(1.90)	(0.76)	(-0.52)	
Coverage – none	0.845	0.256***	0.479***	
	(-0.72)	(-4.32)	(-4.18)	
Coverage – inconsistent	1.082	0.673	0.541***	
	(0.33)	(-1.33)	(-3.73)	
Distance to facility	0.908	1.027	0.909	2.284**
	(-0.51)	(0.11)	(-0.41)	(2.88)
Work – unpaid	1.221	0.349	0.775	0.239**
	(0.61)	(-1.53)	(-0.96)	(-2.77)
Work – self-employed	1.736	0.390	1.135	0.404*
	(1.65)	(-1.41)	(0.50)	(-2.04)
Midwife presence	1.078	4.313***	1.171	
	(0.33)	(4.93)	(0.69)	
Autonomy	0.665	2.109*	0.708	0.895
	(-1.30)	(2.24)	(-1.23)	(-0.44)
Autonomy * Treatment	0.953	0.394*	2.010*	1.139
	(-0.11)	(-2.17)	(1.99)	(0.35)
N	708	829	984	1043

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 1.5.1: Program impacts with asset poverty and living condition poverty controls

	(1) Visits (Asset)	(2) Visits (Living)	(3) SBA (Asset)	(4) SBA (Living)	(*) SBA (Living*)	(5) Plan (Asset)	(6) Plan (Living)	(7) HINS (Asset)	(8) HINS (Living)
T	1.058	0.986	0.909	0.808	1.148	0.934	0.941	3.368***	3.128**
	(0.31)	(-0.07)	(-0.36)	(-0.87)	(0.47)	(-0.33)	(-0.28)	(3.94)	(3.22)
Education – none	0.534*	0.420**	0.517**	0.516**	0.522**	0.794	0.778	0.879	0.806
	(-2.58)	(-2.95)	(-2.87)	(-2.79)	(-2.87)	(-1.00)	(-1.19)	(-0.48)	(-0.84)
Education – primary	0.340***	0.318***	0.633*	0.637*	0.632*	0.837	0.831	0.582*	0.577*
	(-4.24)	(-4.36)	(-2.44)	(-2.43)	(-2.54)	(-0.85)	(-0.90)	(-2.50)	(-2.54)
Northern region	4.632***	3.994***	1.582	1.757	1.693	0.507	0.589	0.415*	0.425*
	(4.03)	(3.55)	(0.90)	(1.10)	(1.02)	(-1.91)	(-1.37)	(-2.22)	(-2.17)
Dominant ethnicity	1.649	1.873	1.950	2.044	1.960	2.306*	2.567**	2.237*	2.673**
	(1.53)	(1.76)	(1.43)	(1.57)	(1.52)	(2.43)	(2.83)	(2.54)	(3.26)
Parity 1	1.002	1.076	2.061*	2.221**	2.035*	0.799	0.817	1.818*	2.086**
	(0.01)	(0.36)	(2.52)	(2.69)	(2.44)	(-1.02)	(-0.90)	(2.14)	(2.62)
Parity 2-3	1.646*	1.726*	1.399	1.396	1.389	0.941	0.950	0.881	0.912
	(1.98)	(2.28)	(1.72)	(1.66)	(1.65)	(-0.32)	(-0.28)	(-0.59)	(-0.42)
Non-Christian	1.516	1.434	0.772	0.770	0.768	0.820	0.813	0.880	0.864
	(1.47)	(1.22)	(-0.93)	(-0.91)	(-0.91)	(-0.75)	(-0.79)	(-0.43)	(-0.50)
Age (15-19)	0.524	0.480	0.484	0.454	0.511	0.850	0.864	0.692	0.663
	(-1.35)	(-1.51)	(-1.41)	(-1.51)	(-1.31)	(-0.52)	(-0.46)	(-0.70)	(-0.78)
Age (20-24)	0.704	0.687	0.801	0.795	0.816	1.744*	1.745*	0.816	0.822
	(-1.20)	(-1.27)	(-0.65)	(-0.68)	(-0.59)	(2.24)	(2.19)	(-0.72)	(-0.68)
Age (25-34)	0.823	0.826	0.757	0.762	0.788	1.166	1.150	1.068	1.072
	(-0.75)	(-0.73)	(-1.03)	(-1.00)	(-0.86)	(0.70)	(0.63)	(0.37)	(0.39)
Marital status	0.581	0.647	0.583	0.615	0.578*			1.277	1.485
	(-1.76)	(-1.44)	(-1.87)	(-1.79)	(-2.15)			(0.94)	(1.49)
Insured while pregnant	2.429	2.677*	1.507	1.579	1.683	1.071	1.099		
	(1.87)	(2.13)	(0.62)	(0.66)	(0.75)	(0.19)	(0.26)		
Coverage – none	0.880	0.812	0.251***	0.253***	0.258***	0.464**	0.473**		
	(-0.52)	(-0.83)	(-4.24)	(-4.20)	(-4.27)	(-3.05)	(-2.91)		
Coverage – inconsistent	1.044	1.011	0.645	0.657	0.675	0.509*	0.548*		
	(0.17)	(0.04)	(-1.49)	(-1.39)	(-1.31)	(-2.53)	(-2.21)		
Distance to facility	0.950	0.931	1.072	1.085	1.020	1.171	1.203	0.790	0.798
	(-0.31)	(-0.39)	(0.26)	(0.31)	(0.07)	(0.75)	(0.88)	(-0.88)	(-0.85)
Work – unpaid	1.392	1.378	0.372	0.364	0.393	0.850	0.785	0.460	0.407*
	(0.87)	(0.85)	(-1.55)	(-1.48)	(-1.38)	(-0.46)	(-0.64)	(-1.91)	(-2.10)
Work – self-employed	1.908	2.008	0.413	0.410	0.426	1.074	1.081	0.498	0.491
	(1.70)	(1.83)	(-1.38)	(-1.34)	(-1.28)	(0.20)	(0.21)	(-1.67)	(-1.64)
Midwife presence	1.036	1.199	4.546***	4.511***	4.601***	1.163	1.160		
	(0.16)	(0.74)	(4.91)	(5.06)	(5.06)	(0.70)	(0.68)		
Poor – asset	0.724		0.609			0.930		0.533*	
	(-1.37)		(-1.61)			(-0.27)		(-2.53)	
Poor * Treatment	0.869		1.773			0.594		0.973	
	(-0.45)		(1.32)			(-1.28)		(-0.08)	
Poor – living condition		1.871		0.532*			0.865		0.786
		(1.93)		(-2.26)			(-0.56)		(-0.91)
Poor * Treatment		1.288		2.010*			0.662		1.285
		(0.65)		(1.97)			(-1.30)		(0.74)
Poor – living conditions + poor water sourcing					2.357**				
					(2.65)				
Poorest * Treatment					0.903				
					(-0.17)				
N	708	708	829	829	829	985	985	1042	1042

Exponentiated coefficients; *t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 1.5.2: Impacts among the poor, samples stratified by type of poverty

	(1) Visits (Asset)	(2) Visits (Living)	(3) SBA (Asset)	(4) SBA (Living)	(5) Plan (Asset)	(6) Plan (Living)	(7) Ins (Asset)	(8) Ins (Living)
Intervention status	1.425	1.106	1.613	1.940	0.453*	0.727	2.652**	2.328*
	(1.08)	(0.27)	(1.10)	(1.37)	(-2.36)	(-0.60)	(3.03)	(2.41)
Education – none	0.637	0.945	0.955	1.156	1.220	1.071	0.547	0.781
	(-0.72)	(-0.12)	(-0.11)	(0.25)	(0.50)	(0.14)	(-1.38)	(-0.65)
Education – primary	0.488	0.468	0.808	0.617	0.717	0.804	0.448	0.791
	(-1.31)	(-1.34)	(-0.52)	(-0.93)	(-0.73)	(-0.49)	(-1.75)	(-0.54)
Northern region	10.92***	0.723	0.894	2.037	0.258*	1.083	0.857	0.569
	(3.29)	(-0.57)	(-0.19)	(0.82)	(-2.54)	(0.10)	(-0.29)	(-0.93)
Dominant ethnicity	3.964*	1.847	1.605	2.909	1.736	3.266	2.219*	2.035*
	(2.56)	(1.20)	(0.92)	(1.79)	(1.24)	(1.62)	(2.56)	(2.35)
Parity 1	0.603	1.121	3.545*	1.005	0.993	1.368	1.758	1.073
	(-0.95)	(0.30)	(2.42)	(0.01)	(-0.02)	(0.56)	(1.59)	(0.20)
Parity 2-3	2.746**	1.916	1.212	0.856	0.997	1.589	0.879	0.500*
	(2.80)	(1.94)	(0.56)	(-0.41)	(-0.01)	(1.10)	(-0.46)	(-2.20)
Non-Christian	2.138	1.484	1.497	0.925	1.349	0.868	0.749	0.801
	(1.69)	(1.11)	(0.91)	(-0.19)	(0.89)	(-0.37)	(-0.76)	(-0.69)
Age (15-19)	0.603	1.078	0.181	0.776	0.980	2.001	0.616	0.561
	(-0.50)	(0.08)	(-1.88)	(-0.27)	(-0.04)	(0.80)	(-0.79)	(-0.82)
Age (20-24)	0.732	1.156	0.867	1.633	2.069*	1.096	0.740	1.679
	(-0.56)	(0.24)	(-0.29)	(0.73)	(2.11)	(0.22)	(-0.77)	(1.43)
Age (25-34)	1.040	0.763	0.659	0.573	0.916	0.879	1.054	1.589
	(0.09)	(-0.71)	(-1.22)	(-1.40)	(-0.28)	(-0.35)	(0.30)	(1.70)
Insured while pregnant	2.038	1.380	1.413	3.877	0.457	0.808		
	(1.38)	(0.52)	(0.33)	(1.12)	(-1.51)	(-0.46)		
Coverage – none	0.952	0.339*	0.329*	0.490	0.424*	0.486		
	(-0.11)	(-2.16)	(-2.28)	(-1.56)	(-2.46)	(-1.74)		
Coverage – inconsistent	1.647	0.575	0.973	0.871	0.557	0.790		
	(1.07)	(-0.92)	(-0.06)	(-0.26)	(-1.70)	(-0.50)		
Marital status	0.215*	0.844	0.400*	0.296	0.985	2.253	0.778	0.822
	(-1.97)	(-0.30)	(-2.06)	(-1.96)	(-0.04)	(1.33)	(-0.68)	(-0.50)
Distance to facility	0.805	1.184	1.022	0.666	0.788	0.986	1.589	1.566
	(-0.58)	(0.57)	(0.05)	(-1.02)	(-0.66)	(-0.04)	(1.86)	(1.17)
Work – unpaid	258290.8***	0.949	0.170	0.000***	0.447	916473.5***	0.275	2.280
	(11.28)	(-0.06)	(-1.75)	(-14.07)	(-1.11)	(15.06)	(-1.52)	(1.01)
Work – self-employed	135133.6***	1.562	0.257	0.000***	0.707	1159371.7***	0.413	3.969
	(10.37)	(0.52)	(-1.32)	(-12.30)	(-0.48)	(15.01)	(-1.03)	(1.61)
Midwife presence	1.115	0.925	6.091***	6.507**	1.384	1.275		
	(0.24)	(-0.15)	(3.68)	(2.78)	(0.97)	(0.53)		
N	217	311	341	256	454	324	473	346

Exponentiated coefficients; *t* statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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CHAPTER 2: INVESTMENTS IN CHILDREN'S HEALTH AND THE KENYAN CASH TRANSFER FOR ORPHANS AND VULNERABLE CHILDREN: EVIDENCE FROM AN UNCONDITIONAL CASH TRANSFER SCHEME

2.1 Introduction

Young children (0-4) face the greatest risk of mortality from infectious diseases and under-nutrition. Acute infectious diseases are a pervading global health concern for children, accounting for roughly two-thirds of global child mortalities (Liu et al. 2012). Recent estimates find that malaria led to 627,000 child deaths in 2012, seventy-seven percent of which were in children under 5 years of age (WHO 2013). Pneumonia is also the leading infectious disease killer of children under 5 years old, with 1.1 million under-5s dying each year (WHO 2000; Liu et al. 2012).

Poor children from low resource countries also bear great risk of death from communicable diseases. The poor are more likely to be deprived of basic necessities such as sanitary living conditions, accessible clean water, and adequate nutrition (Pelletier & Frongillo 2003; Herrera et al. 1992; Mosley & Chen 1984). The first two factors increase exposure to vector-borne illnesses, while the latter is estimated to contribute towards 45% of all under-5 deaths (WHO 2013).

Older children (6-17 years) are less vulnerable to death, but infectious diseases carry long term socioeconomic consequences. In 2010, infectious diseases were estimated to account for 6.4 million disability-adjusted years among school children in sub-Saharan Africa (IMHE 2013). Time spent recovering from illness may result in decreased learning capacity, lower performance, and adverse schooling outcomes in school age children (Nankabirwa et al. 2013; Kvalsvig et al. 1991; Miguel & Kremer 2004; Bobonis et al. 2006). Poor educational outcomes may lead to declines in future wage and economic insecurity, which perpetuates the intergenerational transmission of poverty (Schultz 1988).

Simple and inexpensive interventions make death preventable and illness, detectable and treatable. However, poor families experience prohibitive barriers to obtaining health care. Financial and/or far travel distances contribute to delays in care seeking. These delays increase the likelihood of irreparable health deterioration or death. They are estimated to contribute to 70% of all under-5 child deaths (Victora et al. 2003; WHO 2005).

A rigorous, emerging literature finds that cash transfer schemes, both conditional and unconditional, improve welfare outcomes of the poor. Large-scale successes in Latin America have led to resounding policy adoption across the world and its consideration as a new paradigm for foreign aid. With cash transfer expansion on the rise, it is necessary to understand the program's potential to prevent and address multidimensional causes and symptoms of poverty for the most vulnerable members of the household.

This study seeks to examine whether cash transfers can address one of sub-Saharan Africa's most pressing global health issues pertaining to young children's health capital. I contribute to a small and inconclusive evidence base by using data from a cluster-randomized longitudinal evaluation of Kenya's largest social protection program, the Cash Transfer for Orphans and Vulnerable Children (CT-OVC). Children's health outcomes are measured by incidence of malaria or pneumonia and whether health services were sought during the child's illness. The program is associated with reductions in illness for school-aged children, but I find no significant impacts for young children. Health seeking is not significantly associated with assignment to treatment status.

2.1.1 Theory: child survival & cash transfers

Child mortality occurs when an accumulation of adverse social and economic factors operate through five common biological mechanisms (Mosley & Chen 1984). Poverty exacerbates the severity of these proximate health determinants, specifically, environmental contaminations and/or nutritional deficiency. Cooking practices and quality of cook stove and fuel usage lead to diminished air quality and

greater exposure to air pollution (DHS 2008). Toilet types and water sources, especially if uncovered, are potential disease vectors for malaria (WHO 2013). Poverty affects access to adequate nutrition, where the lack of such is known to aggravate the consequences of illness (Pelletier & Frongillo 2003).

Cash transfers promote health capital investment by offsetting barriers created by poverty. Income fluctuations, persistent poverty, or large economic shocks diminish a household's ability to maintain adequate consumption, invest in human capital, or accumulate assets. Regular and substantive cash payments increase the household's capability to prevent, manage, and cope with risk and exogenous shocks (Devereux & Handa 2011). In regards to upper respiratory infections, CT-OVC is theorized to operate by bolstering consumption and investment in any of the following: improved living conditions, purchase of nutritious foods or higher quality assets used on a daily basis (e.g., cook stove or fuel), or by increasing access to health services.

Few studies examine these casual mechanisms, and instead examine the broader question of whether cash transfers impact children's health. In the following section, I explore two related but distinct literatures on cash transfers and findings pertaining to children's illness.

2.1.2 Cash Transfers and Children's Health Impacts

Two types of cash transfer schemes exist, conditional and unconditional. Conditional cash transfers (CCTs) institute requirements for benefits, thus ensuring that desired investment behaviors are made with successful take up of the program. Conditions may include but are not limited to minimum school attendance requirements, receiving children's preventive health check-ups and vaccinations, or for mothers, receiving prenatal care visits. Several of the largest cash transfer schemes in Latin America are conditional, while social cash transfer schemes (SCTs) being implemented in sub-Saharan Africa are typically unconditional. Any number of reasons may explain the prevalence of unconditional transfer schemes in SSA, including the high financial cost and administrative burdens of monitoring and enforcement (Handa & Davis 2006). Research has shown that impacts are attainable even in the absence

of conditions (Baird et al. 2014), indicating that the beneficiary population's demand for human capital investment is quite sensitive to changes in income, thus making conditions unnecessary.

Conditional cash transfers are associated with reductions in illness among children. Newborns (0-35 months) from treatment households in Mexico's *Oportunidades* were 25 percentage points less likely to be ill as compared to control newborns (Gertler 2004). Protective effects increased the longer children were exposed. By 20 months, treatment receiving children were 40 percentage points less likely to be ill ($p<.05$). In Colombia's *Familia en Acción*, beneficiary children 48 months and younger living in rural areas were less likely to be afflicted by diarrhea by 10.6 ($p<.10$) and 10.9 ($p<.05$) percentage points (Attanasio et al. 2005). Similar reductions were found for incidence of respiratory disease, but were not statistically significant at the conventional confidence interval.

These positive health impacts may reveal more about the successful uptake of the program and the demand for cash than the household's natural behavior response. It is therefore difficult to extrapolate such findings to a different program and continent context. In sub-Saharan Africa, where cash transfer schemes are primarily unconditional, only a few studies examine children's health outcomes. The existing evidence discussed below presents inconclusive and mixed results.

After one year in Malawi's *Mchinji* Pilot Program, control group children of all ages (6-17) were 1.58 times more likely to experience sickness in the previous month as compared to the intervention group ($p<.01$) (Luseno et al. 2013). Luseno et al. is the only study that finds a strong protective program effect on children's health. Other studies from *Mchinji* and Zambia's *Child Grant Program (CGP)* fail to find significant results (Miller et al. 2008; AIR 2013).

Health falls under the broader sub-category of human capital investment, but was not the primary objective of CT-OVC. The program emphasizes continuous investment in children's schooling; households were told that they qualified based on the presence of school aged children. However, it would be reasonable to see improvements in older children's health, as it is a determinant of schooling

outcomes. Positive externalities at the household-level may also benefit the health of young children. Previous studies have found that beneficiary households engaged in investment behaviors such as spending more money on or increasing consumption of, children's education and nutrient-rich foods (The Kenya Evaluation Team 2012a, 2012b). Because food is shared among the household, young children would be likely to benefit from more nutritious foods and changes in other investment behaviors of household decision-makers.

This study also examines whether CT-OVC – by reducing or removing financial barriers – influences health seeking in the event of illness. Fewer studies focus on this question and the existing literature presents conflicting results. *Mchinji* intervention households were 10.98 times more likely to utilize health services after one year in the program ($p<0.01$) (Luseno et al. 2013). *CGP* intervention households were 14.2 percentage points *less* likely to seek care for acute respiratory illness ($p<0.05$) (AIR 2013). Researchers did not offer an explanation for why this might be, though it may be due to wording on the questionnaire. Coughing was used to measure acute respiratory illness and caretakers may have responded to symptoms of the common cold, which may not be considered serious enough to warrant care seeking. Results for health seeking with fever were positive, but were not statistically different than zero.

2.2 Background

The following sections provide contextual information about a few of the leading public health concerns in Kenya, as well as the Government of Kenya's largest social protection initiative.

2.2.1 Study setting

Kenya is located in East Africa and surrounded by the Indian Ocean, coastal and landlocked countries, and Lake Victoria. Though Kenya is one of the fastest growth economies in sub-Saharan Africa, nearly half of all Kenyans live below the poverty line (UNICEF). The country measures low on human progress indicators, possessing a Human Development Index ranking of 147 out of 187 countries (UNDP 2014). In the past two decades, the HIV/AIDS pandemic has played a devastating role in Kenya.

It is estimated that 1.6 million individuals are living with HIV and that the prevalence rate for adults 15-49 is 6% (National AIDS Council of Kenya, 2014). Life expectancies have decreased and over half the population is below 15 years of age (UNICEF).

Infectious diseases are also a leading public health issue. Malaria is prevalent, with an estimated 75% of the population at risk of infection (WHO 2013). Though malaria reporting is inconsistent, it is estimated to cause 20% of all U5 deaths (DHS 2008; Kenya MOH 2006). Acute respiratory infections are also a leading cause of child mortality, estimated to cause 16% of all child mortality in the country (DHS 2008; Black et al. 2010).

2.2.2 Description of the Intervention

The Cash Transfer for Orphans and Vulnerable Children (CT-OVC) is the largest social protection program in Kenya. It is designed to prevent the intergenerational transmission of poverty caused by HIV/AIDS by providing financial support to caretaking families of orphans. The program is a collaboration between the Government of Kenya's Department of Children's Services (DCS), with financial assistance from UNICEF and DFID. It was introduced as a pre-pilot during 2004 and has steadily expanded, with an estimated coverage to over 240,000 households as of 2014 (Mwasiaji 2015).

Enrollment into the program requires a two-step verification process which begins with community identification of households based on observable and known poverty indicators. Qualifications include the following: 1) having the presence of one OVC under the age of 18 who has at least one decreased parent, or who is chronically ill, or whose main caretaker is chronically ill; 2) being ultra-poor; and 3) not currently receiving assistance from any other social program. Ultra-poor poverty status is determined through means analysis of household-level socioeconomic indicators, such as low educational attainment or unemployment of adults, asset indicators like the possession of less than two acres of land, non-durable household infrastructure, drinking water which is sourced from its natural origin, or livestock possession. Qualifying households are invited to apply to the program. Applications

are verified at the district-level. Because selection is conducted at the district-level, selection bias arising from heterogeneity of households who might or might not apply into the program is a non-issue. Take-up is near universal due to the unconditional nature of the program,

Beneficiary households receive a cash transfer roughly equivalent to 20% of the household's total monthly expenditures (Ksh 1500 or USD $21 initially, adjusted to Ksh 2000 during 2011-12 due to inflation and declining values in currency). They are informed that the purpose of the program is to support the care of children through investments in health capital and schooling.

2.3 Study Design

The data comes from an evaluation of The Kenya's Cash Transfers for Orphans and Vulnerable Children. The evaluation strategy is a longitudinal, cluster randomized design. DCS identified seven districts across the country which would be included in a second wave expansion of the CT-OVC. Their selection process targeted districts with high poverty levels, HIV/AIDS impact, and no pre-existing OVC programs. From each district, four locations (the fourth geographical/administrative sub-units below provincial, district, and divisional levels) were selected. The districts are depicted in Figure 2.

Due to limited resources and infeasibility of enrolling all eligible households at once, a control group was constructed from locations that experienced delayed entry. Two locations from each district were randomized to the control group via lottery while two were randomly assigned to the intervention group. The control group is comprised of eligible households from clusters that were not enrolled into the program but were otherwise eligible and would have been enrolled had financial resources been available. Households from each location were assigned a computer generated number, sorted in ascending order by assigned number, and selected until the desired sample size was achieved. Power calculations were used to detect a change of 5% of school enrollment, 20% in curative health care, and 10% in per capita consumption. In total, 28 clusters were included in the study (14 control, 14 treatment).

The study sample frame comes from a list of all eligible households provided by DCS (OPM 2010). The control sample frame comes from a household list of randomly sampled census enumeration areas. Baseline data from 1,542 treatment and 755 control households were collected from March to August of 2007. The program began in July 2007. The follow up consisted of a resampling of 1,325 treatment and 583 control households, which occurred from March to July of 2009.

2.4 Methods

In the following sections, I provide an overview of the data, outcomes of interest, and measures which were included as controls – including those which were constructed. I examine the balance of mean baseline variables to determine whether the location-level randomization worked. Additional information about the identification strategy is presented, as well as a description of the analytical sample.

2.4.1 Data

The data comes from the evaluation of CT-OVC. A health module was asked of children ages 0-5 years in 2007 and 0-7 years in 2009. Our analysis focuses on children of all ages and 0-4 years of age. Our key outcomes of interest are incidence of illness (malaria and pneumonia) and whether care-seeking occurred during illness. Respondents are caretakers of the household who were asked whether the child had been ill with fever, hot body, or cough at any time in the last month. Measures for malaria and pneumonia were not based on clinical diagnosis, but were symptoms observed by caretakers. If the respondent affirmed that the child was sick within the past month, they were asked whether they sought treatment or advice from a health facility, pharmacy, or shop. If health care was sought from a non-ideal provider such as pharmacist, shop, or other person, care seeking was coded as 0. Both outcomes are coded as dichotomous variables.

Demographical indicators include sex (1 if child is male, 0 if female), age, orphan status, and relationship to head of household. Age is stratified into categories of under one year of age, one year to under three years of age, three years to under five, and 5-7 years of age to detect potential differences in

illness and health seeking. A child is classified as an orphan if either mother or father are deceased or their living status is unknown. Relationship to head of household was coded as 1 if the child is a child or grandchild of the head of household and 0 for all other blood, marriage, or non-blood relations.

Household head characteristics influence a child's survival. Head of household sex, age, and highest level of educational attainment are included as controls for theoretical and programmatic reasons. Children born to mothers with low educational attainment are associated with worse health outcomes due to socioeconomic disadvantage, lack of knowledge of good health practices, or wage discrimination (Addai 2000; Babalola 2009; Barrera 1990; Bicego & Boerma 1993; Cleland & Ginneken 1988; Caldwell 1982; Desai & Alva 1998; Das Gupta 1990; Mosley & Chen 1984; Schultz 1988; Thomas et al. 1990; Ware 1984). Female head of household is a binary variable while age of household head and household head education are discrete.

Living environment models are structured as binary variables. Households that used paraffin, kerosene, firewood, charcoal, residue, animal waste, or grasses were coded as using poor cook fuel. Acceptable cook fuels included electricity and gas. Drinking water that is sourced from an unprotected or open origin and sleeping without mosquito nets increase the likelihood of contracting malaria. Households that did not source their drinking water from natural sources obtained water via pipes into the dwelling or compound, public outdoor tap or borehole with pump, protected well or spring, mobile vendor, or purchased from a neighbor. Rural as opposed to urban area of residence increases the likelihood of contracting malaria due to the abundance of breeding sites (WHO 2013). This control was also included in the model. Type of toilet and cook stove quality could not be included in our analysis due to lack of variation among households.

Discrete controls for living environment were included in the models. A measure for crowding captures the child's susceptibility to transmittable disease or contagions. The crowding index is measured by the ratio of household size to number of rooms in the household's dwelling.

Wealth is a correlate to living environment conditions, education, and ability to access care. To capture the child's longer term economic security, I construct an asset index from nine livestock variables. Livestock ownership may include cattle (traditional zebu, traditional other, and hybrid), donkeys, camels, goats, sheep, pigs, or poultry. I run the Kaiser-Meyer-Olkin test (KMO) of sampling adequacy to determine whether PCA indices are appropriately constructed. The livestock indices met the .5 threshold of common variance. The livestock index for 2007 was .64 and .68 for 2009. A community-level indicator for food availability was also included in the analysis. Community leaders were asked whether food was more, same, or less available than previous years. Food insecurity was coded as 1 if food was less available and 0 for all other responses.

Diet influences the development of the immune system and a healthy diet may offer protective effects against contracting illness. A food expenditure variable adds the amount of money spent on 29 food items during the last week. It is a proxy for quantity of food consumed. A food variety composite index captures the total number of different types of food consumed to capture nutritional adequacy.

Community leaders were also asked where community members would go to access treatment for a child with simple malaria. Distance is a critical determinant to care-seeking (Okwaraji et al. 2012; Gabrysch et al. 2011; Mulholland et al. 2008; Stock 1983). If the distance was greater than 5 kilometers, distance was assigned a value of 1, for under 5 km, 0. This control was only used in the health seeking model.

2.4.2 Randomization

Summary statistics for 34 covariates are presented in Table 2.1. I examine the balance of household-level indicators between treatment arms to measure the effectiveness of randomization.

The treatment groups were balanced on socioeconomic and welfare characteristics such as monthly per capita adult expenditures and assets. On average, there were no statistically significant differences in poverty status. Differences were detected on demographical characteristics (head of household), food-related decision-making, and living environment conditions. On average, treatment

household decision makers receive 1.5 fewer years of education, are 6 years older, and 6 percentage points more likely to be female than controls households. Imbalances were also observed on diet, assets, and living conditions. However, no treatment arm was consistently better off than the other. Intervention households spent 47% less money on food, had slightly lower food variety, and were less likely to own a mosquito net than control households. Control households are more likely to use traditional cook stoves (5 pp), poor quality cook fuel (3 pp), source water from unprotected or natural origins (9 pp), and more likely to live more than 5 km from the nearest doctor.

2.4.3 Characteristics of the analytical sample

Descriptive statistics are presented in Table 2.2. The original analytical sample contained 1,138 children of all ages, but after restricting to complete cases with pre- and post- data, 921 children ages 0-7 years of age and 410 under-5 year olds remained in the incidence of illness sample. The health seeking sample contains 450 children 0-7 years and 210 under-5s.

The mean age of children from each treatment group is 2 years old. Roughly two-thirds of the sample is comprised of children ages 1-under 5 years old. Nearly all children are related to the household head by blood, as a child or grandchild and the sample is evenly divided by sex. Roughly 13% of the children have low height-for-age, which is a reflection of deficient health and nutritional status.

The children in this study are poor and most live in rural areas. Half of the sample resides in a female-headed household, where the head is on average, 54 years of age and has received 4.5 years of formal education. The majority of households use a traditional cook stove (71%) and poor quality cook fuel (92%). Half of the children live in households that source water from an unprotected source and do not use a mosquito net.

At the time of baseline, families in this study consumed little. Households spent approximately USD 9 per month on schooling expenditures and roughly USD 2.5 per day on food expenditures for the

entire household. Their diets reflect a lack of nutritional diversity, consisting mainly of starches (67%). Meats and fruits and vegetables comprise 3% and 1% of dietary intake.

2.5 Empirical Strategy

I use a three level generalized linear latent and mixed model (GLLAMM) to derive the average treatment effect of the program on the two binary outcomes of interest, contracting illness and health seeking when ill. Alternative estimation procedures were used (results presented in the Appendix), but GLLAMM offers an advantage in that it allows for nesting of hierarchical data when levels are suspected to influence the outcomes. For instance, factors related to the location and household of residence may cause correlation in individual-level outcomes. A difference-in-differences logistic model does not allow for clustering of data that GLLAMM estimation makes possible. This is preferred over a linear probability model with clustering at location and household levels, due to the latter's estimation of out-of-bound predictions. All models utilize 12 numerical integration points (nips) instead of the default 8 and adaptive quadrature instead of the default ordinary Gauss-Hermite quadrature unless otherwise specified. This was done to derive more robust standard errors (Rabe-Hesketh & Skrondal 2012). However, fewer than 12 nips were used when models had difficulty converging given sample restrictions. All results are presented as exponentiated coefficients and should be interpreted as an odds ratio.

The basic model below captures the impact of an individual *i* living in household *j* in *k* location and time *t's* likelihood of experiencing the outcome illness or health seeking:

$$\text{logit}\, E(Y_{ijk}) = \beta_0 + \beta_1 Year_t + \beta_2 Treatment_{ijk} + \beta_3 Y * T_{ijk} + \beta_4 X_{ijk} + \varepsilon_{jk} + \theta_k$$

where β_{year} captures the effect of trending between 2007 and 2009, β_{Treat} captures the effect of baseline differences between treatment arms. X_{ijk} represents all the individual, household, and living environment controls which were described in the data section, and $\varepsilon_{jk}$and θ_k capture the correlation arising between individuals living in the same households and households in the same location, respectively. The samples are stratified to 0-7 years old and then separately for children under-5 years of age.

The illness and health seeking models differ with the addition of a few controls. The illness models include the diet-related controls, including food expenditures and food variety. The health seeking models include controls for travel distance to health facilities that provide simple malaria and pneumonia treatment and total medical expenditures made during the last three months.

2.6 Results

Discussion of the results are separated into separate sections by the outcomes of interest, as well as a few extensions which are policy relevant questions about the program's impacts.

2.6.1 Incidence of Illness

The coefficients for the average treatment effects are presented in Table 2.3. In Columns 1 and 3, the reduced form model is presented; Columns 2 and 4 depict the full specifications including demographic, environmental, and economic controls. CT-OVC is associated with significant reductions in illness in children ages 0-7 years old. Control children were 1.8 times more likely to be ill than treatment children, ceteris paribus ($p<0.05$). As expected, the data confirms that infant children and between 1 year and under 3 years of age are more susceptible to illness than older children. In the full sample, girls were also 1.33 times more likely to be ill than boys ($p<0.05$). These differences were not significant in children under-5. Though children under-5 were impacted in the expected direction for the outcome of interest, the results were insignificant at the conventional confidence level.

2.6.2 Health Seeking

Table 2.4 presents the program's impacts on caretakers seeking health care for their ill children. The program has no significant impact on the health seeking of intervention children in either full or under-5 only sample. However, Column 4 suggests that children under-5 years of age were less likely to have care sought on their behalf. Children between 1 year and under 3 years of age were more likely to have care sought for them, which may be due to their increased likelihood of being ill as shown in Table 2.3. There are no differential effects of health seeking based on sex. Though results were not statistically

significant, non-orphans were more likely to be beneficiaries of health seeking. Age of the household head is significantly associated with health seeking in both samples, although an additional year of age was only slightly so. As expected, living in a rural area is associated with a decreased likelihood of seeking care which suggests that health providers are fewer or farther away. However, the measure for distance to treatment was not statistically significant.

2.7 Extensions

I examine whether characteristics of the individual or their household are associated with differential treatment effects, including a further exploration of the significant gender differential health outcomes. This analysis is presented in Tables 2.5.1, 2.5.2, 2.6, 2.7.1, and 2.7.2.

2.7.1 Gender differential effects

In the sample of children 0-7 years of age, boys were less likely to contract illness than girls. Tables 2.5.1 and 2.5.2 illustrate how children of different genders fare in treatment versus control households. Table 2.5.1 suggests that overall, intervention boys were less likely to experience illness than intervention girls. Table 2.5.2 contains the coefficient estimates when analytical samples are stratified by gender. Children of both sexes from intervention households were less likely to be ill as compared to control children, but the protective effect was more pronounced in boys. Boys from control households were 2.4 times more likely to be ill than boys of intervention households. Table 2.5.1 examines whether differences at the household level, including in living environment, diet, or food security, are associated with the gender differential health outcomes. No intermediate factors could be attributed the differential outcomes. For the care seeking analysis, I find no statistically significant difference between investment in boys or girls.

2.7.2 Orphan differential effects

A primary purpose of CT-OVC is to bolster the human capital investment of orphans and vulnerable children. I include orphan interaction effects to test whether orphans and non-orphans were

treated differently in the absence of the program. Our results indicate that orphans had better outcomes than non-orphans, though results were not statistically significant at the conventional confidence level. These estimates are depicted in Table 2.6.

2.7.3 Differential effects by household size and dependency ratio

The program provides a flat cash transfer to qualifying households, regardless of number of dependents or orphans or household size. I examine whether the transfer has different effects on households of different sizes and composition. For instance, do children of households that are larger or have higher dependency ratios fare worse than those of smaller size or with fewer children? Table 2.7.1 contains the results including a measure for the dependency ratio (ratio of children 14 years and under and adults 65 and over to working age adults 15-64 years old within a household). The analysis in Table 2.7.2 contains a measure for household size. A small household was defined as one containing 6 or fewer members. The results indicate that there are differences in health wellbeing between children of different household sizes or compositions. In fact, the treatment effect remains significant even controlling for dependency ratio.

2.8 Limitations

One data limitation may challenge the internal validity of our study. For instance, information on distance to the nurse was only available for one time period. In Kenya and other countries, seeking care from nurses may be more common than from doctors in cases dealing with malaria, pneumonia, or diarrhea. I instead use distance to simple malaria treatment as a proxy because simple malaria treatment is often adequate, whereas complicated cases requiring advanced treatment are less likely.

Post-election violence coincided with the follow up data collection, resulting in 18% attrition between the waves (an 86% response rate for the treatment group, 77% for control). Attrition mostly occurred from Kisumu and Nairobi, which experienced the most violence during that time. Handa et al. (2015) test whether systematic attrition exist within the data by interacting a measure for attrition against

socioeconomic, regional, and treatment assignment indicators and found no statistically significant differences. This, however, does not rule out systematic attrition on unobservable characteristics which could lead to bias in impact estimates. On the other hand, program targeting is supply-driven and take-up is universal, which reduces the risk that unobserved factors are determining enrollment into the program.

The differences at the baseline are also worth further explanation, as imbalances between the two groups may bias impact estimates if the groups are dissimilar on attributes other than assignment to treatment status. As discussed in previous sections, the randomization occurred at the location level. Within treatment locations, programmatic considerations led program managers to prioritize households headed by elderly females into the treatment arm when program resources exceeded the budget for each location. This led to differences between household demographical characteristics, for example on head of household attributes, but no differences between socioeconomic characteristics of treatment arms. It is important to note that while control households may be more diverse demographically, they were program eligible and would have otherwise been included in the program had program resources been available. To control for these differences, I include these household head characteristics in the analysis. Furthermore, a separate analysis using 34 economic, demographic, and infrastructure variables was conducted to examine whether balance was attained at the level of randomization (Handa et al. 2015). This analysis found no statistical differences between the 14 clusters of each treatment arm, suggesting that there are no selection issues at the location level.

2.9 Discussion

The findings are consistent with the cash transfer evidence from Zambia and Malawi. Program enrolled children ages 0-7 years old are enjoying protection against malaria or pneumonia ($p<0.05$). However, the impacts depend on age and sex - older children and males are benefiting more from the program's impact on health-related investments than under-5s. One factor that could explain the lack of effect for non-school age children (under-5s) is that the small sample size may be insufficient to detect significant differences between the treatment groups. Boys in the intervention households experience a

much stronger effect than girls, even after controlling for household-level differences. Consumption and expenditure data was not disaggregated at the individual-level, therefore the mechanism driving the health status differences could not be explored in greater detail. Additional analysis is needed to understand the source of these differences – for instance, if preferential treatment may be the cause.

The results for health seeking show protective but insignificant effects, which are similar to the results found in the Zambia study. While the program appears to be increasing the chances that treatment group children from the 0-7 years sample are receiving care when ill, the results did not meet the standard thresholds of statistical significance. The results from the under-5 health seeking respondents are inconclusive, likely due to the small analytical sample. However, the descriptive statistics indicate that program was associated with an increase in health expenditures. This suggests that while the program does not increase true curative care, health seeking through other providers such as private pharmacies may have increased.

2.10 Conclusion

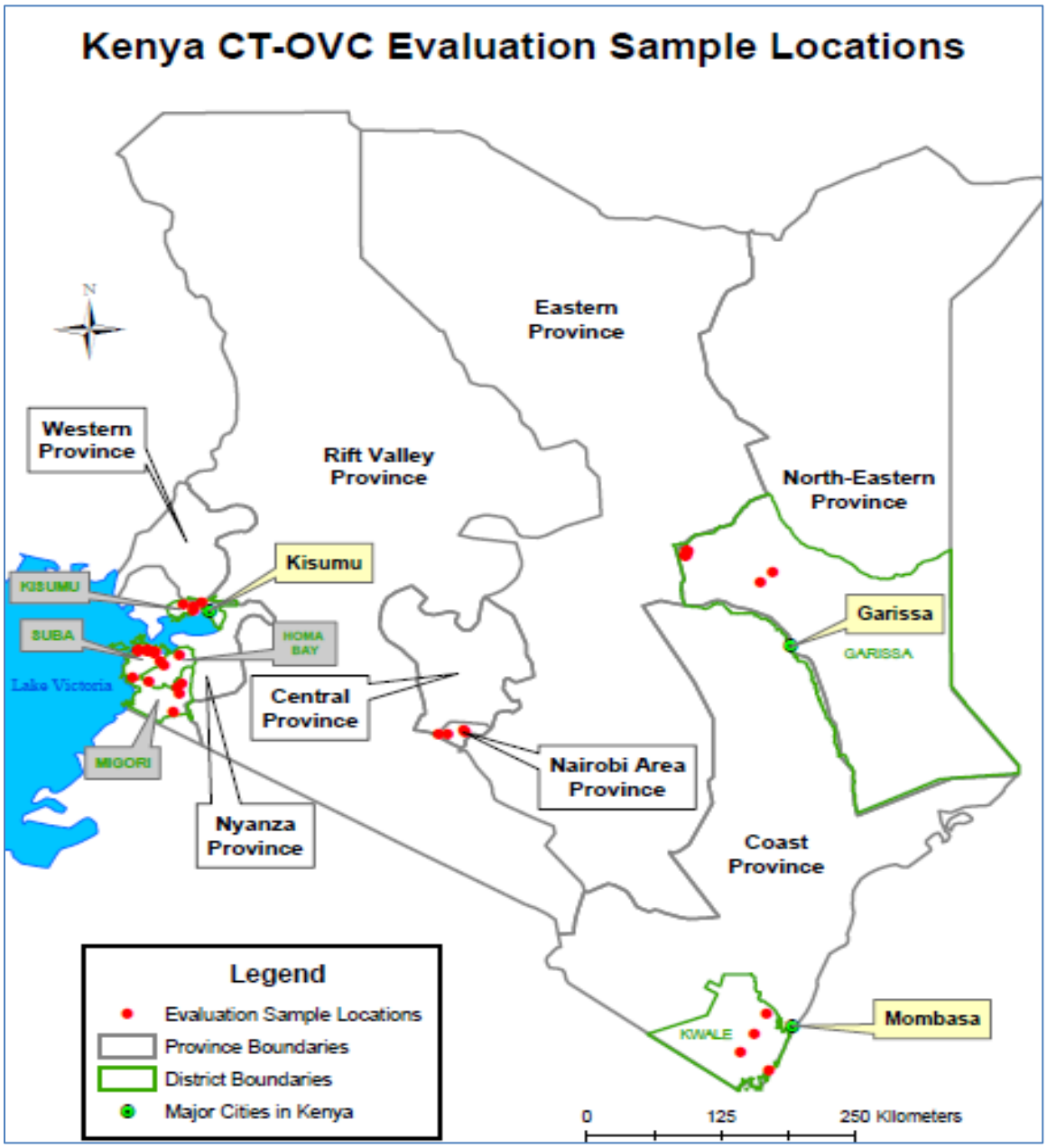
The Kenya CT-OVC is associated with positive impacts on children's upper respiratory illness for children 0-7 years old. These findings are significant because they are not the primary beneficiaries the program was designed to support. Children under-5 years of age comprised 19% of the sample of all children present during the baseline, while children 10-18 years of age comprised 48% of all children. Had data been available, another angle for exploration would be the comparison of health outcomes with children of this older age group to determine whether children of all ages were benefitting equally or those receiving investments in their education were receiving more benefit.

While the health seeking results were inconclusive, another theme that arises from the data is the reality of care seeking in Kenya. Many respondents sought care from non-ideal health providers such as friends, private pharmacists, and shops rather than facility-based providers. I was unable to determine whether this was due to the severity of the child's illness, quality issues at health facilities, or the lack of

knowledge pertaining standard care seeking practices. In all instances, a serious illness could not be diagnosed appropriately by non-ideal providers.

The Kenya CT-OVC has been associated with wide-ranging impacts, including delaying sexual debut (Handa et al. 2014), decreases in young age pregnancy (Handa et al. 2015), improvements in mental health (Kilburn et al.), increases in investment spending on food and health (The Kenya CT-OVC Evaluation Team, 2012b), improved school outcomes (The Kenya CT-OVC Evaluation Team, 2012a), and increased labor supply (Asfaw et al. 2014). The presence of reductions in children's morbidity illustrates that the program is capable of promoting multi-dimensional wellbeing, even in absence of conditionality. The literature from social cash transfer schemes across SSA illustrates that unconditional programs can be an important way to improve children's outcomes. While more could be done to promote care seeking and under-5 and girls' health, it is unknown how conditioning on health-related outcomes would impact the broad array of other investment behaviors. Nonetheless, this study indicates that social cash transfers provide a promising avenue to bolster the human capital investment behaviors of poor households.

Figure 2: Locations of Study Communities



Source: Handa (2012).

TABLE 2.1: Baseline equivalence of household-level covariates, by treatment arms

	T	n	C	n
Children's characteristics				
Age categories				
0-under 1	.07**	1256	.10	540
1-under 3	.26***	1256	.35	540
3-under 5	.23***	1256	.30	540
5-7 years old	2.19**	1256	2.36	540
Girls (average number)	1.28***	1256	1.51	540
Orphan (average number)	2.07	1256	1.97	540
Head of household characteristics				
Household head education	3.02***	1256	4.49	540
Household head age	62.06***	1256	56.29	540
Female headed household	.64**	1256	.58	540
Environmental factors				
Household size	5.61**	1256	5.92	5.92
Living environment - index	.05	1256	.04	540
Crowding Index	2.98	1256	3.13	540
Cook Stove (1=traditional stone)	.75**	1256	.80	540
Cook fuel, poor quality	.94**	1256	.97	540
No Toilet	.55	1256	.56	540
Water, unprotected/natural	.61***	1256	.70	540
Mosquito net	.47**	1256	.53	540
Investment behaviors				
Schooling expenditures, 12 mo	6760.63	1256	6179.77	540
Medical expenditures, 3 months	1641.66	1256	1125.40	540
Food expenditures, 1 week	965.23**	1256	1504.03	540
Food variety	10.52***	1256	11.21	540
Diet diversity score	4.59***	1256	4.81	540
Food groups as proportion of diet:				
Cereals, roots, tubers	.71	1256	.72	539
Fruits & veggies	.01	1256	.01	539
Legumes & nuts	.05	1256	.04	539
Meats, poultry, fish	.03	1256	.03	539
Fats & oils	.04*	1256	.04	539
Dairy	.07	1256	.07	539
Eggs	.003	1256	.003	539

Wealth				
Monthly Per capita adult expenditures	1545.15	1256	1445.16	540
Livestock - index	-.01	1256	-.07	540
Community-level characteristics				
Distance - malaria treatment				
1=0-5 km; 0=5 km+	.24	1219	.27	508
Distance - doctor*				
1=0-5 km; 0=5 km+	.68***	1253	.59	506
Rural (1=rural, 0=urban)	.82	1256	.83	540

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ denotes statistically significant differences between treatment arms.

TABLE 2.2: Descriptive statistics for analytical samples, by wave

	Under 5s				All children			
	W1	**n**	**W2**	**n**	**W1**	**n**	**W2**	**n**
Dependent variables								
Malaria/pneumonia	0.61	845	.54**	492	.59	962	.53***	962
Health Seeking if ill	0.82	493	0.87	235	0.81	545	0.86	449
Independent Variables								
Individual characteristics								
Age	2.12	845	3.11	492	2.47	962	4.43	962
Age categories								
0-under 1	0.15	845	0.002	492	0.14	962	0.001	962
1-under 3	0.4	845	0.25	492	0.36	962	0.13	962
3-under 5	0.44	845	0.74	492	0.39	962	0.38	962
5-7 years old	--	--	--	--	0.12	962	0.49	962
Sex (1=male, 0=female)	0.51	845	0.5	492	0.51	962	0.51	962
Orphan	0.47**	845	0.12*	492	0.5***	962	.19***	962
Relation to household head (1=child or grandchild, 0=other)	0.97	845	0.98	492	0.96	962	0.96	962
Low HAZ	0.13	759	.05**	450	0.12	859	0.3	881
Low BMIZ	0.04	761	0.04	454	0.03	861	.04**	646
Head of household characteristics								
Household head education	4.56***	845	4.71***	492	4.52***	962	4.52***	962
Household head age	53.53***	845	53.45***	492	53.96***	962	53.96***	962
Female headed household	.51**	845	0.51***	492	.51**	962	.51**	962
Environmental factors								
Household size	7.58***	845	7.85	492	7.52***	962	7.52	962
Living environment - index	0.2	845	0.31	492	0.24	962	0.28	962
Crowding Index	4.01*	845	4.1	492	4.02**	962	4.02**	962
Cook Stove (1=traditional stone)	.70***	845	0.71***	492	.71***	962	0.71***	962

Cook fuel, poor quality	.91***	845	0.91	492	.92***	962	.92***	962
No Toilet	.55**	845	0.56	492	0.55	962	0.55	962
Water, unprotected/natural	0.56***	845	.55***	492	.55***	962	.55***	962
Mosquito net	.55***	845	.56***	492	0.54***	962	.54***	962
Investment behaviors								
Schooling expenditures, 12 mo	7694.59***	845	9102.49	492	7527.17***	962	8333.82**	962
Medical expenditures, 12 mo	1109.32*	845	1532.37	492	1076.51*	962	1246.53*	962
Food expenditures	1153.94	845	1998.74	492	1148.34	962	1994.45**	962
Food variety	10.67	845	12.15**	492	10.67	962	12.15***	962
Diet diversity score	4.59	845	5.08**	492	4.59	962	5.08***	962
Food groups as proportion of diet:								
Cereals, roots, tubers	.68***	845	.46*	490	0.67***	962	0.46***	959
Fruits & veggies	0.01	845	.008*	490	0.01	962	0.008	959
Legumes & nuts	.05***	845	0.05	490	0.05***	962	0.05	959
Meats, poultry, fish	0.03	845	0.01	490	0.03	962	0.02	959
Fats & oils	0.04*	845	0.3	490	0.04**	962	0.3	959
Dairy	.09***	845	.08***	490	.09***	962	.07***	959
Eggs	0.002	845	0.001	490	0.002	962	.001*	959
Wealth								
Monthly Per capita adult expenditures	1212.44	845	1194.89	492	1219.16	962	1219.16	962
Livestock - index	0.09	845	.18*	492	0.09	962	0.13	962
Community-level characteristics								
Distance - malaria treatment 1=0-5 km; 0=5 km+	0.25**	811	.53***	438	0.25***	924	0.53***	867
Distance - doctor* 1=0-5 km; 0=5 km+	0.6	828	.75**	468	0.60	940	.75***	909
Rural (1=rural, 0=urban)	.73***	845	0.74***	492	.74***	962	.74***	962

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ denotes statistically significant differences between treatment arms.

TABLE 2.3: Treatment effects on children's illness: simple and full models

	All Children (0-7)		Children under 5	
	Reduced	Full	Reduced	Full
Intervention Effect	0.556*	0.556*	0.669	0.604
	(-2.45)	(-2.40)	(-1.16)	(-1.41)
Year	0.947	1.157	0.739	0.844
	(-0.28)	(0.68)	(-1.07)	(-0.48)
Treatment status	0.879	0.925	0.790	0.922
	(-0.60)	(-0.35)	(-0.81)	(-0.26)
Age in months, (under 1 year)		1.877*		1.335
		(2.10)		(0.76)
Age in months, (1 year – under 3)		2.062***		1.510
		(3.83)		(1.68)
Age in months, (3 years – under 5)		1.254		--
		(1.53)		
Sex		0.749*		0.693
		(-2.16)		(-1.78)
Orphan		0.982		0.854
		(-0.12)		(-0.66)
Child/grandchild		0.987		0.734
		(-0.05)		(-0.71)
Female household head		1.109		1.014
		(0.58)		(0.06)
Age of household head		1.005		0.999
		(0.84)		(-0.07)
Household head education		1.024		1.022
		(1.13)		(0.73)
Rural		1.689*		1.786
		(2.37)		(1.92)
Mosquito net		0.913		0.993
		(-0.55)		(-0.03)
Unprotected/ open water source		1.032		0.724
		(0.17)		(-1.30)
Poor cook fuel quality		0.739		0.691
		(-0.85)		(-0.77)
Crowding index		0.920*		0.931
		(-2.33)		(-1.43)
Asset/wealth index		0.909		0.875
		(-1.77)		(-1.56)
Food insecurity		1.277		1.214
		(1.44)		(0.80)
Food expenditures		1.000		1.000
		(0.06)		(0.79)
Food variety		1.019		1.047
		(1.01)		(1.65)
N	932	921	410	410

Exponentiated coefficients; *t* statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Children Under 5 Reduced estimated with 9 integration points. Children Under 5 Full estimated with 10 integration points.

TABLE 2.4: Treatment effects on health care seeking: simple and full models

	All children (0-7)		Children Under 5	
	Simple	Full	Simple	Full
Intervention Effect	1.426	1.203	0.752	0.620
	(0.96)	(0.45)	(-0.63)	(-0.94)
Year	0.778	1.032	0.974	0.782
	(-0.87)	(0.09)	(-0.07)	(-0.53)
Treatment status	1.129	0.992	2.308*	2.151*
	(0.40)	(-0.02)	(2.55)	(1.99)
Age in months,		1.003		0.406
(under 1 year)		(0.01)		(-1.75)
Age in months,		2.003*		0.801
(1 year – under 3)		(2.24)		(-0.64)
Age in months,		1.525		--
(3 years – under 5)		(1.68)		
Sex		0.935		0.858
		(-0.31)		(-0.59)
Orphan		0.613		0.593
		(-1.87)		(-1.61)
Child/grandchild		1.145		1.427
		(0.29)		(0.59)
Female household head		1.054		1.314
		(0.19)		(0.92)
Age of household head		1.021*		1.022*
		(2.05)		(2.01)
Household head education		0.987		0.999
		(-0.40)		(-0.02)
Rural		0.319**		0.492
		(-3.00)		(-1.81)
Mosquito net		1.091		1.409
		(0.33)		(1.08)
Unprotected/ open water source		1.069		1.090
		(0.24)		(0.30)
Poor cook fuel quality		0.421		0.339
		(-1.52)		(-1.80)
Crowding index		0.989		0.988
		(-0.19)		(-0.20)
Asset/wealth index		1.151		1.059
		(1.42)		(0.42)
Food insecurity		0.833		1.094
		(-0.63)		(0.26)
Food expenditures		1.000		1.000
		(-0.68)		(-0.86)
Food variety		1.012		0.996
		(0.38)		(-0.10)
Distance to treatment		0.949		0.955
		(-0.67)		(-0.50)
Medical expenditures		1.000*		1.000**
		(2.45)		(2.60)
N	481	450	224	210

Exponentiated coefficients; *t* statistics in parentheses, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.
Children Under 5 Reduced estimated with 10 integration points, Children Under 5 Full, estimated with 7 integration points.

TABLE 2.5.1: Sex & Treatment group interaction Models

	Illness		Care seeking	
	All (0-7)	Under 5	All (0-7)	Under 5
Intervention Effect	0.561*	0.604	1.205	0.625
	(-2.36)	(-1.41)	(0.45)	(-0.92)
Year	1.152	0.852	1.028	0.749
	(0.65)	(-0.46)	(0.08)	(-0.61)
Treatment status	0.743	0.780	1.081	3.186*
	(-1.11)	(-0.64)	(0.19)	(2.50)
Age in months,	1.905*	1.366	1.000	0.402
(under 1 year)	(2.14)	(0.81)	(-0.00)	(-1.76)
Age in months,	2.085***	1.534	1.992*	0.787
(1 year – under 3)	(3.88)	(1.73)	(2.22)	(-0.69)
Age in months,	1.256	--	1.521	--
(3 years – under 5)	(1.54)		(1.67)	
Sex	0.567*	0.564	1.049	1.452
	(-2.48)	(-1.63)	(0.14)	(0.88)
Orphan	0.981	0.850	0.615	0.614
	(-0.12)	(-0.68)	(-1.85)	(-1.49)
Child/grandchild	0.995	0.734	1.133	1.403
	(-0.02)	(-0.71)	(0.27)	(0.56)
Female household head	1.116	1.024	1.048	1.255
	(0.62)	(0.10)	(0.17)	(0.76)
Age of household head	1.005	1.000	1.021*	1.023*
	(0.85)	(-0.04)	(2.05)	(2.03)
Household head education	1.025	1.023	0.986	0.996
	(1.16)	(0.76)	(-0.41)	(-0.09)
Rural	1.702*	1.804	0.317**	0.466
	(2.39)	(1.95)	(-3.01)	(-1.93)
Mosquito net	0.910	0.997	1.094	1.401
	(-0.57)	(-0.01)	(0.35)	(1.06)
Unprotected/ open water source	1.040	0.728	1.063	1.052
	(0.21)	(-1.28)	(0.22)	(0.17)
Poor cook fuel quality	0.742	0.694	0.420	0.340
	(-0.84)	(-0.76)	(-1.52)	(-1.78)
Crowding index	0.920*	0.931	0.989	0.986
	(-2.31)	(-1.43)	(-0.19)	(-0.22)
Asset/wealth index	0.907	0.875	1.152	1.055
	(-1.80)	(-1.56)	(1.44)	(0.40)
Food insecurity	1.282	1.219	0.832	1.106
	(1.45)	(0.81)	(-0.63)	(0.29)
Food expenditures	1.000	1.000	1.000	1.000
	(0.08)	(0.77)	(-0.67)	(-0.79)
Food variety	1.020	1.048	1.012	0.997
	(1.02)	(1.66)	(0.38)	(-0.07)
Distance to treatment	--	--	0.949	0.950
			(-0.67)	(-0.56)
Medical expenditures	--	--	1.000*	1.000**
			(2.45)	(2.58)
Sex * Treatment	1.530	1.373	0.829	0.423
	(1.51)	(0.73)	(-0.42)	(-1.58)
N	921	410	450	210

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Both Fever models estimated with 10 integration points.

TABLE 2.5.2: Analytical sample stratified by sex

	(1) Boys only 0-7 years old	(2) Girls only 0-7 years old
Intervention Effect	0.409**	0.893
	(-2.79)	(-0.32)
Year	1.681	0.833
	(1.72)	(-0.59)
Treatment status	1.231	0.633
	(0.79)	(-1.49)
Age in months,	1.586	2.114
(under 1 year)	(1.21)	(1.64)
Age in months,	1.756*	2.277**
(1 year – under 3)	(2.32)	(2.87)
Age in months,	1.374	1.149
(3 years – under 5)	(1.66)	(0.64)
Sex	1.001	1.086
	(0.00)	(0.37)
Orphan	0.843	1.116
	(-0.54)	(0.30)
Child/grandchild	0.801	1.507
	(-1.13)	(1.76)
Female household head	1.018**	0.987
	(2.63)	(-1.58)
Age of household head	1.032	1.009
	(1.36)	(0.30)
Household head education	1.352	2.185**
	(1.20)	(2.71)
Rural	0.890	1.093
	(-0.59)	(0.38)
Mosquito net	1.239	0.756
	(1.03)	(-1.16)
Unprotected/ open water source	0.888	0.931
	(-0.31)	(-0.15)
Poor cook fuel quality	0.956	0.885*
	(-1.06)	(-2.48)
Crowding index	0.944	0.878
	(-0.90)	(-1.81)
Asset/wealth index	1.192	1.427
	(0.87)	(1.47)
Food insecurity	1.000	1.000
	(-1.18)	(0.68)
Food expenditures	0.999	1.056*
	(-0.04)	(2.11)
N	472	448

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 2.6: Orphan & Treatment group interaction Models

	Illness		Care Seeking	
	All (0-7)	Under 5	All (0-7)	Under 5
Intervention Effect	0.671	0.758	0.983	0.613
	(-1.51)	(-0.72)	(-0.04)	(-0.93)
Year	1.025	0.732	1.197	0.788
	(0.11)	(-0.86)	(0.50)	(-0.50)
Treatment status	0.687	0.680	1.393	2.186
	(-1.34)	(-1.04)	(0.79)	(1.78)
Age in months,	1.898*	1.367	0.983	0.405
(under 1 year)	(2.14)	(0.82)	(-0.04)	(-1.76)
Age in months,	2.080***	1.542	1.964*	0.799
(1 year – under 3)	(3.87)	(1.76)	(2.18)	(-0.64)
Age in months,	1.252		1.525	
(3 years – under 5)	(1.52)		(1.68)	
Sex	0.747*	0.689	0.944	0.858
	(-2.18)	(-1.81)	(-0.27)	(-0.59)
Orphan	0.656	0.503	1.019	0.616
	(-1.54)	(-1.64)	(0.04)	(-0.81)
Child/grandchild	0.964	0.719	1.235	1.434
	(-0.14)	(-0.76)	(0.46)	(0.59)
Female household head	1.127	1.037	1.022	1.312
	(0.68)	(0.15)	(0.08)	(0.92)
Age of household head	1.005	0.999	1.021*	1.022*
	(0.80)	(-0.13)	(2.11)	(2.01)
Household head education	1.024	1.022	0.986	1.000
	(1.11)	(0.74)	(-0.41)	(-0.01)
Rural	1.643*	1.741	0.328**	0.492
	(2.24)	(1.83)	(-2.93)	(-1.81)
Mosquito net	0.909	0.978	1.087	1.409
	(-0.58)	(-0.09)	(0.32)	(1.08)
Unprotected/ open water source	1.030	0.725	1.084	1.090
	(0.16)	(-1.30)	(0.29)	(0.29)
Poor cook fuel quality	0.768	0.715	0.396	0.338
	(-0.74)	(-0.70)	(-1.61)	(-1.80)
Crowding index	0.923*	0.931	0.985	0.988
	(-2.23)	(-1.42)	(-0.26)	(-0.20)
Asset/wealth index	0.909	0.874	1.152	1.059
	(-1.78)	(-1.56)	(1.43)	(0.42)
Food insecurity	1.274	1.221	0.805	1.092
	(1.42)	(0.82)	(-0.74)	(0.26)
Food expenditures	1.000	1.000	1.000	1.000
	(-0.08)	(0.72)	(-0.63)	(-0.86)
Food variety	1.020	1.048	1.011	0.996
	(1.04)	(1.67)	(0.35)	(-0.10)
Distance to treatment			0.954	0.956
			(-0.60)	(-0.49)
Medical expenditures			1.000*	1.000**
			(2.46)	(2.60)
Orphan * Treatment	1.797	2.147	0.478	0.950
	(1.81)	(1.55)	(-1.42)	(-0.08)
N	921	410	450	210

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Fever-Under 5 estimated with 10 integration points. Care seeking – Under 5 estimated with 9 integration points.

TABLE 2.7.1: Household composition & Treatment interaction Models

	Illness		Care seeking	
	0-7	Under 5	0-7	Under 5
Intervention Effect	0.563*	0.606	1.195	0.592
	(-2.33)	(-1.39)	(0.43)	(-1.03)
Year	1.121	0.804	1.038	0.792
	(0.52)	(-0.62)	(0.11)	(-0.50)
Treatment status	0.922	0.896	1.021	1.722
	(-0.28)	(-0.26)	(0.05)	(1.07)
Age in months,	1.870*	1.282	1.000	0.390
(under 1 year)	(2.08)	(0.65)	(0.00)	(-1.82)
Age in months,	2.075***	1.488	1.995*	0.802
(1 year – under 3)	(3.85)	(1.61)	(2.23)	(-0.63)
Age in months,	1.263		1.518	
(3 years – under 5)	(1.58)		(1.66)	
Sex	0.737*	0.666*	0.941	0.832
	(-2.28)	(-1.96)	(-0.28)	(-0.70)
Orphan	1.012	0.891	0.612	0.598
	(0.08)	(-0.47)	(-1.87)	(-1.58)
Child/grandchild	0.992	0.729	1.144	1.518
	(-0.03)	(-0.72)	(0.29)	(0.68)
Female household head	1.158	1.035	1.043	1.311
	(0.82)	(0.14)	(0.16)	(0.91)
Age of household head	1.006	0.998	1.020*	1.023*
	(0.93)	(-0.20)	(2.00)	(2.04)
Household head education	1.024	1.017	0.985	0.995
	(1.09)	(0.55)	(-0.44)	(-0.13)
Rural	1.830**	1.943*	0.318**	0.529
	(2.69)	(2.17)	(-2.99)	(-1.60)
Mosquito net	0.927	1.016	1.081	1.414
	(-0.45)	(0.07)	(0.30)	(1.08)
Unprotected/ open water source	1.013	0.706	1.075	1.054
	(0.07)	(-1.40)	(0.26)	(0.18)
Poor cookfuel quality	0.747	0.685	0.417	0.341
	(-0.82)	(-0.79)	(-1.53)	(-1.78)
Crowding index	0.918*	0.925	0.988	0.989
	(-2.37)	(-1.55)	(-0.21)	(-0.17)
Asset/wealth index	0.915	0.882	1.150	1.059
	(-1.66)	(-1.47)	(1.42)	(0.42)
Food insecurity	1.281	1.229	0.834	1.124
	(1.45)	(0.85)	(-0.62)	(0.34)
Food expenditures	1.000	1.000	1.000	1.000
	(0.06)	(0.80)	(-0.68)	(-0.89)
Food variety	1.017	1.045	1.012	0.994
	(0.89)	(1.56)	(0.39)	(-0.15)
Distance to treatment			0.950	0.963
			(-0.66)	(-0.41)
Medical Expenditures			1.000*	1.000**
			(2.45)	(2.62)
Dependency ratio	1.516	1.656	1.020	0.946
	(1.46)	(1.22)	(0.05)	(-0.13)
Dependency ratio * Treatment	0.970	1.019	0.955	1.434
	(-0.09)	(0.04)	(-0.10)	(0.71)
N	920	410	450	210

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Fever 0-7 and Care U5s estimated with 10 integration pts. Fever U5 ested with 6 integration points.

TABLE 2.7.2: Size of household & Treatment interaction Models

	Illness		Care seeking	
	0-7	Under 5	0-7	Under 5
Intervention Effect	0.561*	0.614	1.167	0.607
	(-2.36)	(-1.36)	(0.38)	(-0.98)
Year	1.143	0.813	1.051	0.772
	(0.62)	(-0.59)	(0.14)	(-0.55)
Treatment status	0.900	1.114	1.004	2.260*
	(-0.43)	(0.33)	(0.01)	(2.03)
Age in months,	1.962*	1.315	0.957	0.386
(under 1 year)	(2.25)	(0.72)	(-0.09)	(-1.84)
Age in months,	2.142***	1.479	1.925*	0.769
(1 year – under 3)	(4.01)	(1.59)	(2.11)	(-0.75)
Age in months,	1.289	--	1.480	--
(3 years – under 5)	(1.71)		(1.56)	
Sex	0.752*	0.714	0.930	0.856
	(-2.13)	(-1.65)	(-0.34)	(-0.59)
Orphan	0.916	0.828	0.648	0.619
	(-0.54)	(-0.78)	(-1.63)	(-1.47)
Child/grandchild	0.962	0.731	1.158	1.449
	(-0.15)	(-0.72)	(0.32)	(0.61)
Female household head	1.035	1.002	1.091	1.350
	(0.19)	(0.01)	(0.32)	(1.01)
Age of household head	1.008	1.001	1.019	1.021
	(1.24)	(0.11)	(1.86)	(1.85)
Household head education	1.026	1.021	0.987	0.998
	(1.19)	(0.69)	(-0.40)	(-0.06)
Rural	1.665*	1.807*	0.323**	0.480
	(2.30)	(1.98)	(-3.00)	(-1.87)
Mosquito net	0.933	1.003	1.063	1.411
	(-0.42)	(0.01)	(0.24)	(1.09)
Unprotected/ open water source	1.000	0.701	1.078	1.099
	(0.00)	(-1.44)	(0.27)	(0.32)
Poor cook fuel quality	0.777	0.703	0.405	0.333
	(-0.71)	(-0.74)	(-1.60)	(-1.82)
Crowding index	0.946	0.943	0.966	0.975
	(-1.48)	(-1.15)	(-0.56)	(-0.38)
Asset/wealth index	0.905	0.878	1.146	1.054
	(-1.86)	(-1.52)	(1.40)	(0.39)
Food insecurity	1.278	1.230	0.835	1.099
	(1.44)	(0.85)	(-0.62)	(0.28)
Food expenditures	1.000	1.000	1.000	1.000
	(0.18)	(0.81)	(-0.70)	(-0.83)
Food variety	1.020	1.047	1.010	0.993
	(1.06)	(1.62)	(0.31)	(-0.18)
Distance to treatment	--	--	0.949	0.956
			(-0.68)	(-0.49)
Medical expenditures	--	--	1.000*	1.000*
			(2.44)	(2.57)
Small household	1.711	2.318	0.670	0.865
	(1.73)	(1.86)	(-0.90)	(-0.28)
Small household * Treatment	0.968	0.385	1.092	0.800
	(-0.09)	(-1.76)	(0.16)	(-0.35)
N	921	410	450	210

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Fever Under 5 estimated using 6 integration points.

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CHAPTER 3: HOUSEHOLD COMPOSITION, FAMILY STRUCTURES, AND DEMOGRAPHICAL CHANGES IN KENYA'S UNCONDITIONAL CASH TRANSFER SCHEME

3.1 Introduction

The household is regarded as "the most important economic unit in virtually all West African societies" (Hopkins 1973; Guyer 1981). It is the locus of all essential decision-making throughout an individual's life course – from early childhood, to human capital investment, timing of marriage and fertility, to future labor productivity. The number and type of members residing in a household have implications for productive, consumption, risk management, and investment decisions made (Fafchamps & Quisumbing 2007). Household structure reveals fundamental insight into the household's economic strategy and security. Illness can bring a poor household with a high dependency ratio to extreme poverty. Increasing urban development has led to employment-driven migration of households and individuals when agricultural and economic shocks affect households (de Brauw et al. 2014).

Despite its influence on a family's socioeconomic conditions, household composition studies are under-examined in applied research. The purpose of this paper is to understand how changes in welfare affect household composition and structure among the poor, with special focus on how Kenya's Cash Transfer for Orphans and Vulnerable Children may be affecting the fundamental state of families.

3.2 Theory

Early studies in sociology, anthropology, demography, and economics theorize that household formation and change are heavily influenced by traditions of kinship and cultural norms. Household structure is a reflection of the dynamic processes of power and relationships between elder and youth. Elders control cornerstone life decisions of family members such as the timing of marriage, fertility,

formation of new households, and labor specialization of its members (Burch 1970). They are the gatekeepers of family trade, livelihood strategies, and culture (Becker 1981). Family, in its functional role, provides insurance against uncertain and limited information which threaten survival. In Cote d'Ivoire, Grimard (2000) found resilient ethnic cultural and social norms to be an important factor preventing the separation of new and young households from the main.

Modern economic theory hypothesizes that economies of scale may also exist. The household benefits from the addition of another member if the marginal benefit of that additional member's productive work exceeds their incremental costs of residing in that household. In developing countries such as Pakistan, some activities do not increase proportionally with household size – for instance, household chores such as washing clothes, cooking, or cleaning the house, which suggests the existence of economies of scale in residential cost-sharing (Fafchamps & Quisumbing 2003). Co-residence allows members to pool resources and labor and synergize productive efforts in the home or the market, which may be more beneficial to individuals during harder economic times than living alone (Fafchamps 2003; Fafchamps & Quisumbing 2007). Given weak insurance and credit markets and greater private risk-bearing during stark economic times, larger households are theorized to be better able to diversify risk and share in the production of goods (Winters et al. 2012).

Tradeoffs constrain the size of the household. For instance, the existence of rivalrous public goods – like food and housing space – whose consumption by one household member cannot be enjoyed by another curtails endless expansion. If labor and individually-held assets are substitutes to production, a household member may find greater returns to their labor outside of the household (Winters et al. 2012). Non-economic reasons for leaving the household may include personal preferences, like the demand for privacy, companionship, or consumption patterns (Fafschamps & Quisumbing 2007; Winters et al. 2012). Though theories of economies of scale have not been received universally (Deaton & Paxson 1998), there appears to be an overall acceptance of its existence (Lanjouw & Ravallion 1995; Gan & Vernon 2003; Fafchamps & Quisumbing 2007).

Additionally, it is theorized that where more developed, complete, and perfect labor markets exist (usually in and around urban areas), market prices and wages determine household production decisions (Chayanov 1926; Benjamin 1992). The sociological literature theorizes that incentives created through increased wage opportunities may encourage new and smaller households to form. Smaller households are better able to survive in urban areas because they are more mobile and able to adapt their housing and consumption needs to environmental conditions, which may explain why individuals choose to migrate for employment and remit money back to the household.

Economies of scale differ in urban areas with increased access to diverse goods and time-saving technologies, leading to less reliance on privately-produced services (Burch 1995; Burgess 1960). Smaller households can therefore purchase goods and services to meet their consumption and labor needs and do not need to rely upon household members producing such goods. Furthermore, migration to urban areas may be an economic risk-reduction strategy, as geographically dispersed households are better able to diversify their income sources. An income shock that is not correlated with the household's primary source of livelihood would be less likely to negatively impact all members at once (Winters et al. 2009).

Where labor markets do not exist or are underdeveloped (typically found in rural areas), labor is supplied by the family. In rural or harsher economic environments, household sizes are observed to be larger. This may be because households benefit from economies of scale in private and public production and as described earlier or that pooling of resources allows more members to mitigate risk and variability in income (Fafchamps & Quisumbing 2007; Binswanger & McIntire 1987). Traditional intergenerational structures may guide welfare, production, and consumption strategies, as there are fewer economic opportunities and incentives to leave the household.

3.3 Empirical Literature

Social programs that provide in-kind benefits or cash transfers can alter the household's time-allocation and investment behavior. Cash transfer schemes in developing countries focus primarily on

ameliorating the immediate consequences of poverty and hunger and preventing intergenerational poverty caused by underinvestment in children's human capital. The literature is replete with evidence of improvements in schooling, health, and consumption outcomes in both conditional and unconditional cash transfer schemes (Schultz 2004; Handa & Davis 2006; Adato & Basset 2009; Hoddinott & Skoufias, 2004; Maluccio 2010; Covarrubias et al. 2012; Kenya Evaluation Team 2012a, 2012b). However, few studies examine the household's behavioral responses in terms of demographic change and composition, and how household membership itself responds to program participation.

If cash transfers are capable of altering time-use and spending/investment behavior, one might expect to see household size minimize or remain unchanged. Evidence from the Latin American conditional cash transfers (CCT)s are mixed. Rubalcava & Teruel (2006) found that Mexico's PROGRESA promoted partitioning from the main household (new household formation) by lowering the capital costs of establishing a new household, but that no large net changes occurred in the extended household's size despite its change in structure.

Findings from Nicaragua's RPS indicated the opposite, with households changing in ways consistent with the theories of economies of scale. In a two year period, control households that were not receiving the program trended towards larger and more complex household structures, as compared to treatment households which were more likely to remain intact (Winters et al. 2009). Complexity in control household structures was due to an increase in migrants coming into the household and a decrease of migraters moving out, rather than because of changes in fertility. Control households were also more likely to receive young adult (15-29) and were associated with decrease in departure of older adult members.

Program implementers have also been concerned as to whether cash transfers incentivize childbearing in order to remain eligible. Stecklov et al. (2007) examined this issue in three conditional programs in Latin America. They found no changes in fertility among participants of PROGRESA and

RPS. However, they estimated a 2-4 percentage point increase in fertility among treatment households in Honduras' PRAF. They hypothesized that a time period of "openness" in PRAF's programmatic benefits allowed beneficiary households to adjust the level of benefits via fertility. The program therefore appeared to have accelerated the tempo of childbearing.

Other studies examine whether benefit structures of cash transfers lead to transfer-maximizing changes in household size. The literature from the South Africa social pension program is mixed. Pensions were associated with increases in household size via fostering of grandchildren, co-residence of non-pension residents, and increased employment among other able-bodied adults (Edmonds et al. 2005; Posel et al. 2006; Ardington et al. 2007; Ranchhod 2009). Other research finds no effects on household composition or size (Maitra & Ray 2003).

Few studies examine the impacts of unconditional social cash transfer schemes (SCTs) in sub-Saharan Africa. Evidence from Latin America is less transferrable to the SSA context due to different levels of development, cultural and socioeconomic circumstances, and program target groups. The programs found in Latin America are designed to support poor young families and tend to be conditional (an exception is Ecuador), whereas in SSA, programs tend to be unconditional and targeted towards poor, labor-constrained households or those with high numbers of orphans.

Winters et al. (2012)'s study on Malawi's Mchinji Cash Transfer program is one of the few examining household size and composition. They find no significant net differences in household size between control and treatment groups, but further analysis on leavers and arrivers indicate that averages hide actual movement within households. Control households were associated with an increase in number of older female children (12-17) while intervention households were 6 percentage points more likely to have additional young male adults (18-30). The arrival of younger males and an association with increased labor share suggests Mchinji had an impact on the productive strategies of treatment households.

The transfer may have increased investment in labor and offset capital costs of increasing agricultural production.

3.4 Methods

Program description, evaluation strategy, and randomization discussion are presented in Chapter 2, Sections 2, 3 and 4.3. In the following section, I review the measures used in this analysis, the empirical strategy which utilizes a difference-in-differences OLS, as well as characteristics of the analytical sample.

3.4.1 Data

Several variables capture the composition of the household. One classification defines household structure generationally (Burch 1980; Burch et al. 1987; Laslett & Wall (1972); Wall et al. (1983), Winters et al. 2009; Winters et al. 2012). I follow the labels as defined by Winters et al. 2009. Households are categorized into nuclear, vertical, and complex. Nuclear is assigned to households with two consecutive generations co-residing – typically, parents and children. Vertical is captured by three generations co-residing (e.g. grandparents, parents, and children). Finally, complex captures horizontal generational expansion, such as siblings, nephews, or nieces of parents. Each indicator is dichotomous.

The level indicators are discrete and measure the number of persons belonging to each generation. They provide information about the relationship to the head of household and their generational position. Level 1 includes household heads, spouses, siblings, and sibling in-laws. Level 2 measures the number of children of Level 1 members, children in-laws, stepchildren, nephews and nieces, and adopted children of blood or non-blood relation. Level 3 measures grandchildren of Level 1 members. Level 4 represents the parents or parents in-law of Level 1 members. Level 5 contains other members including servants, unspecified relations, or relationships unknown.

Other discrete demographical indicators include age ranges for household members, sex, and orphan (and type of orphan).

Welfare indicators include total weekly food expenditures, yearly school expenditures, and measures for diet. The food expenditure variable captures the amount of money spent on 29 food items during the last week. It is a proxy for quantity of food consumed. Food variety is a composite index capturing the total number of different types of food consumed to capture nutritional adequacy. Diet diversity is an index measuring foods from unique food groups.

Other variables reflect the socioeconomic status of the household. Head of household characteristics such as sex, age, and number of years of schooling have bearing on economic security of household dependents. These are discrete variables. Other measures provide insight into the household's observable welfare, such as number of rooms, wall, roof, or floor material, type of cook fuel, and access to electricity or water. Wall materials that are less durable include wood only, corrugated iron sheets, grass, palm, or tin. More durable structures are made of stone, brick, mud and wood, or mud and cement. Lower quality roof material include grass or palm. Poor flooring is made of dirt or earth. Poor cook fuel types are grasses, wood, or dung. Electricity, paraffin/kerosene, or gas were considered improved cook fuel. Poor water sourcing comes from unprotected or open origins, as compared to improved water sources such as water via pipes, public outdoor tap or borehole with pump, protected well or spring, mobile vendor, or purchased from a neighbor. Poor toilet quality is characterized by no toilet or repository in a pan or bucket. Each of these living environment and consumption variables are binary. A measure for crowding captures the density of living space as a ratio of household size to number of rooms in the dwelling. The community setting is defined as rural versus urban, which reveals the household's access to public resources, availability of markets, exposure to certain infectious disease vectors, etc.

3.4.2 Empirical Strategy

I use a difference -in-differences (DD) model to estimate program impacts on household composition. The difference-in-difference design was employed in several related household composition studies by Frankenberg et al. (2003); Rubalcava & Teruel (2006); and Winters et al. (2009). DD estimates the pre- and post-program effects and subtracts them to obtain the treatment effect. Its

advantage is that it controls for pre-program time invariant unobservables– for instance, type of household structure – which may lead to differences in observed outcomes. It is advantageous to control for such differences as they were observed in the baseline.

The basic model is as follows, for household *i* in community *j*, where Y is a count variable for household composition:

$$Y_{i,j} = \alpha_0 + \beta_1 P + \delta_0 t + \delta_1 (P * t) + \gamma_1 H_{i,j} + \varepsilon_{ij}$$

β_1 measures the baseline differences between treatment arms, δ_0 is the effect of time trends from 2007 to 2011, and γ_1 includes the coefficient estimates for a vector of household controls. The treatment effect is the primary parameter of interest, δ_1.

Clustering at the community level was conducted to determine whether it would lead to precision in standard errors. The rationale is to control for community-level factors that could affect households in one area but not others. For instance, economic shocks may disproportionately affect one community and lead to changes in household economic strategies or there may be community cultural differences in new household formation and fertility. A comparison between clustered and unclustered results showed negligible differences in standard errors, however, models are estimated with clustering by default.

3.4.3 Analytical Sample

The sample contains only households that participated in all three waves of the study. After restricting the sample, a total of 1,249 treatment and 533 control households were included for study. Table 3.1 shows the balance of key measures at baseline. Treatment households were characterized by older, female heads of household who received less schooling, differences which were statistically significant at the conventional level. Control households were slightly more likely to live in housing structures with poor wall and floor materials and use water from non-ideal sources. There were no

measurable differences in rural residence, number of rooms, roof material, cook fuel usage, and toilet access between the treatment groups.

Treatment household sizes are unvarying across the study time period, while slight increases occurred in control households (See Table 3.1). However, these differences were not sizable. The composition indicators reveal that structure is different between treatment arms. At baseline, control households are more likely to be nuclear or complex, whereas treatment households are more likely to be vertical. Treatment households are associated with more Level 3 persons (grandchildren), adults ages 50-65, and 66+ compared to control households, even though dependency ratios remain the same. This structure has often been referred to as the "missing generation structure," where the impact of HIV/AIDS has left grandparents as caretakers of their grandchildren. It appears that control households have more children of household heads than treatment households. These differences at baseline are controlled for in the difference-in-differences methodology employed. One final note is that investment preferences differ between the treatment arms at baseline. School expenditures among treatment households exceed that of the control group, but the control group enjoyed better diet diversity and variety and spent more on food.

3.5 Results

Figures 3 and 4 provide insight into the structural changes of households over time. Sample proportions are measured separately by type of structure and treatment arm. Control households appear to shift slightly away from nuclear structures during the entire study time period. However, these changes disappear in 2011, where sample proportions return back to levels observed at baseline. Treatment households trend away from nucleation, towards vertical and complex structures. Table 3.3 confirms this trend - verticalization is more likely to occur than nucleation, regardless of the baseline household structure. Vertical household structures are more likely to remain vertical as well.

The changes measured in treatment households are being driven by 2 types of movements. These compositional change impact estimates are presented in Table 3.4. The program is associated with fewer

children ages 6-11 years; they were 8 percentage points more likely to leave the household altogether. Treatment households are also significantly associated with in-migration of newcomers into households. Column 14 shows that these arrivers are associated with household structure complexification and an increase in the household's dependency ratio. The significant level indicators tell us that arrivers are likely to be spouses, children, grandchildren, or non-blood relations. Furthermore, arrivers are more likely to be 0-5 years of age, as compared to arrivers who are 25-49 years of age. Column 15 shows us that there are no differences of 0-5 membership based on treatment group.

To further explore the drivers of compositional change in treatment households, I examine the reasons individuals arrive into and depart from the household. These reasons are provided in greater detail and in sample proportions in Table 3.5. In Tables 3.6 and 3.7, the reasons are pooled together from 2009 and 2011 samples to identify whether specific reasons for in and out migration are associated with observable or underlying socioeconomic characteristics of the household. In Table 3.8, I examine individual characteristics from a subset of reasons for migrating in and out of treatment households.

Table 3.6 Columns 1, 4, and 11 show that treatment households are more likely to receive arrivers for work and individuals who experienced death of a caregiver or a family member. Control households are more likely to receive arrivers due to pregnancy than treatment households. Households receiving newcomers due to family-related deaths are more likely to be vertical in structure, rather than nuclear. The socioeconomic indicators reveal little about why individuals move in and out of treatment households. However, it appears that control households who receive arrivers due to pregnancy experience poor living conditions (water quality, toilet access, floor conditions, and diet diversity).

Table 3.7 examines the associations between household socioeconomic characteristics and reasons for moving out. Treatment households were more likely to have residents moving out due to pregnancy and break up of the household (shown in Table 3.7, column 7 and 11). Like control households that received newcomers due to pregnancy, treatment households experiencing poor living

conditions such as using poor quality cook fuel are associated with individuals who have left due to pregnancy. However, pregnancy results may be limited as sample sizes are small (n<20).

In Table 3.8, I run individual level regressions to explore the demographical characteristics of in-migraters in treatment households only. Individuals arriving due to work were most likely other non-relatives (e.g., servants). Those who arrived due to family death were more likely to be nephews or nieces of heads of households, male, orphans, and interestingly, aged 6-11 years old. It therefore appears that families are extending their support to OVC who were not part of the household during the qualification process.

The results on movement of children ages 6-11 years are nuanced. It appears unlikely that the absence of these children is due to natural transition into the next age group. In Table 3.4, the program was statistically associated with an 18 percentage point increase in arrivers, but no such corresponding impact on departers was measured. A proportionate increase in 12-17 year olds should be measured if the decreases in the group were due to aging. Table 3.1 shows slight increases in proportions belonging to this age group, but disproportionate to the decrease in 6-11 year olds. I attempt to examine this in greater detail in Table 3.9, by showing the individual characteristics associated with departing from treatment households, for the reasons of interest. 6-11 year olds are associated with death of a caregiver in 2009 but not in 2011 and with household dissolution during 2009 and 2011.

3.6 Discussion

Although household sizes are unaffected by the program, the analysis shows that households are changing compositionally. Treatment households are more likely to experience vertical or complex structural changes. Control households are more likely to preserve structure measured at baseline. The differences in treatment households are driven primarily by new residents, specifically school aged children, due to death of their caretakers and/or family members. However, members of treatment

households are also likely to move out due to break up of the household or pregnancy compared to the control group.

These results offer a different understanding of household structural changes than findings from Winters et al, which appear to be driven by differences in the household's functionality and economic strategy. Winters and colleagues find that among beneficiary households of the Mchinji program, adult men ages 18-30 years of age were more likely to join households. They hypothesized this was due to changes in productive and agricultural strategies of the household. I find that CT-OVC beneficiary households play a different functional role than Mchinji households - one that serves as a safety net for family and extends its support to orphans and vulnerable children who are the intended beneficiary population, but not the original targets identified in the beginning of the study. A positive externality of the program is that households are providing support to other vulnerable children without requiring additional program resources to do so.

A worthwhile question for additional examination would be to understand how resources are allocated within the program and whether these fostered children receive the same level of support as children who were originally targeted. However, intra-household allocation is difficult to measure and the program data as it currently stands does not capture investments or consumption at the individual level. This study illustrates that demographical and household compositional studies reveal much about the household's fluidity and how households respond to changes in welfare. Policy researchers should seek to fill the gap in the literature by examining economic strategies of the household, migration patterns of household members, as well as reasons for migrating in and out of households, and intra-household allocation.

TABLE 3.1: Household characteristics, by wave and treatment arm

	Wave 1 - 2007			Wave 2 – 2009			Wave 3 - 2011		
	T	C	p-value	T	C	p-value	T	C	p-value
Household size	5.53	5.82	0.03	5.53	6.08	0.00	5.66	5.89	0.10
Nuclear household, proportion	0.25	0.38	0.00	0.17	0.29	0.00	0.19	0.36	0.00
Vertical household, Proportion	0.54	0.33	0.00	0.56	0.37	0.00	0.57	0.35	0.00
Complex household, proportion	0.11	0.29	0.00	0.27	0.34	0.00	0.24	0.28	0.08
Number of persons in each household									
Level 1	1.39	1.47	0.03	1.42	1.51	0.02	1.40	1.50	0.00
Level 2	2.12	3.05	0.00	2.15	3.34	0.00	2.24	3.10	0.00
Level 3	1.68	0.95	0.00	1.88	1.17	0.00	1.94	1.17	0.00
Level 4	0.17	0.17	0.99	0.01	0.01	0.62	0.01	0.01	0.09
Level 5	0.05	0.04	0.46	0.05	0.05	0.76	0.07	0.10	0.22
Ages 0-5	.67	.86	0.00	0.66	0.89	0.00	0.65	.82	0.00
Ages 6-11	1.23	1.31	0.12	1.08	1.24	0.00	1.04	1.19	0.00
Ages 12-17	1.40	1.40	0.93	1.47	1.45	0.75	1.42	1.32	0.07
Ages 18-24	.72	.65	0.13	0.74	0.89	0.00	.86	.90	0.43
Ages 25-49	.57	.82	0.00	0.59	0.95	0.00	0.66	0.96	0.00
Ages 50-65	.54	.31	0.00	0.58	0.40	0.00	.57	.43	0.00
Ages 66+	.48	.39	0.02	.42	.25	0.00	0.47	0.28	0.00
Females	2.75	2.99	0.00	2.82	3.14	0.00	2.94	3.04	0.27
Males	2.78	2.81	0.74	2.71	2.94	0.01	2.72	2.85	0.15
Paternal Orphans	2.11	2.08	0.76	2.38	2.34	0.64	1.95	1.79	0.06
Maternal Orphans	1.51	1.11	0.00	1.73	1.28	0.00	1.33	0.96	0.00
Any orphan	2.55	2.42	0.13	1.35	1.00	0.00	0.93	0.68	0.00
Dependency Ratio	2.80	2.85	0.73	2.58	2.28	0.02	2.51	2.41	0.48
Arrivers	--	--	--	0.76	0.94	0.00	0.94	0.92	0.79
Departers	--	--	--	0.37	0.35	0.60	1.55	1.73	0.07
Discrete indicators, unless specified									
School expenditures (year)	6632.38	5545.75	0.13	8328.74	7291.88	0.19	12.107.27	12.047.29	0.95
Diet diversity	4.61	4.8	0.00	5.36	4.94	0.00	5.61	5.44	0.00
Food expenditures (monthly)	959.89	1494.3	0.05	1825.02	1677.07	0.00	2351.18	2262.73	0.20
Food variety	10.59	11.13	0.00	12.93	11.53	0.00	14.41	13.29	0.00
Received remittance (binary)	0.72 (n=352)	0.67 (n=103)	0.31	0.45 (n=352)	0.66 (n=103)	0.00	.27 (n=1249)	0.30 (n=533)	0.17
Remittance amount received	3073961 (n=352)	2665519 (103)	0.12	527682.6 (234)	873550.9 (92)	0.00	683.96 (n=1249)	1121.90 (n=533)	0.00
N	1249	533		1249	533		1249	533	

TABLE 3.2: Time invariant household characteristics

	T	C	p-value
Female headed household	0.65	0.59	0.01
Household head age	62.57	56.55	0.00
Highest grade	2.99	4.37	0.00
Rural	0.82	0.83	0.45
Rooms	2.31	2.27	0.44
Walls	0.74	0.87	0.00
Roof	0.22	0.22	0.85
Floor	0.66	0.79	0.00
Cook fuel	0.87	0.86	0.51
Electricity	0.06	0.04	0.09
No toilet	0.54	0.56	0.39
Water	0.61	0.70	0.00
Crowding	2.88	3.05	0.09
	1249	533	

Figure 3: Changes in Household Structure, 2007-2011

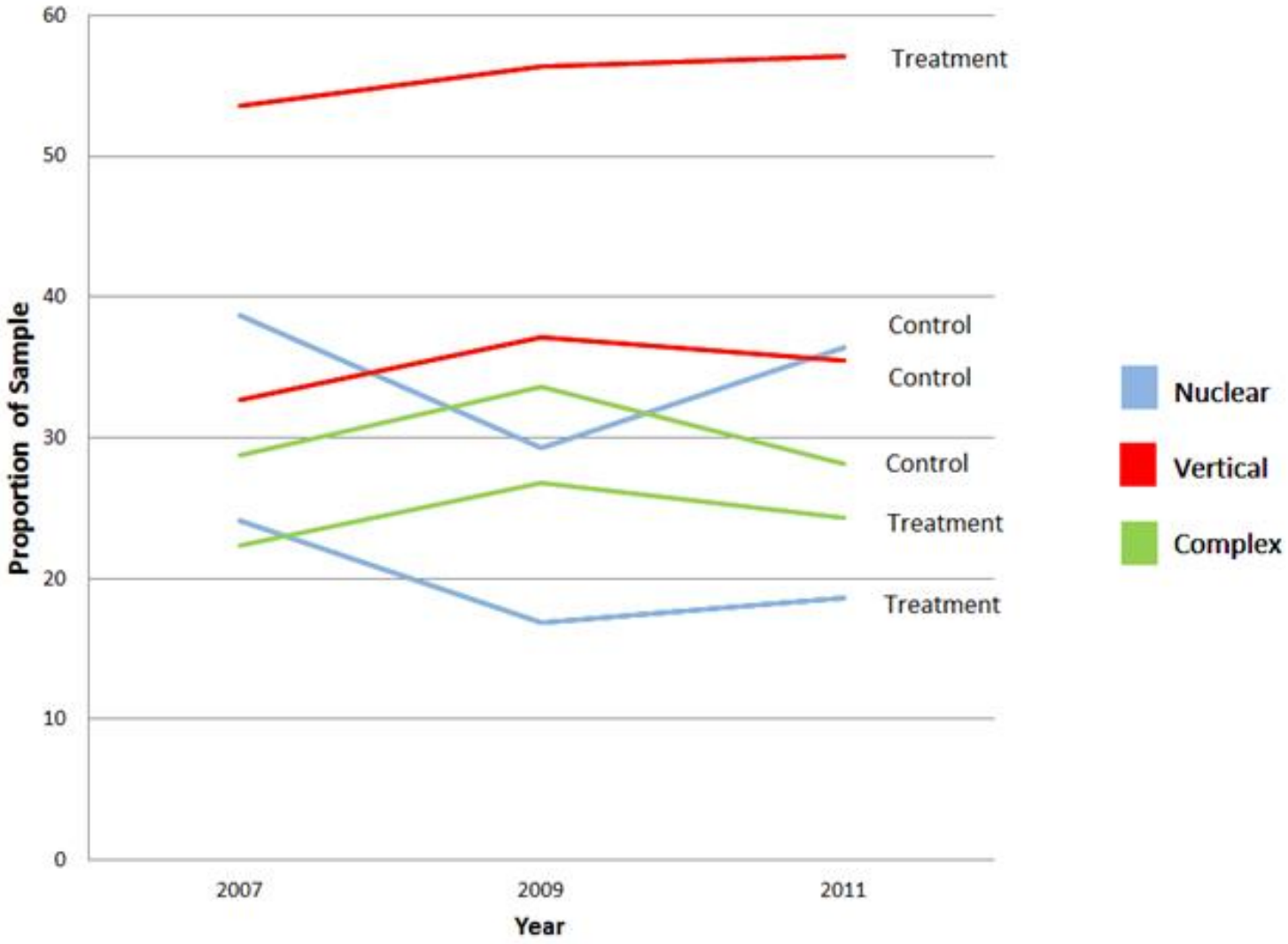

Figure 4: Household Structural changes from 2007-2011, in bar graphs

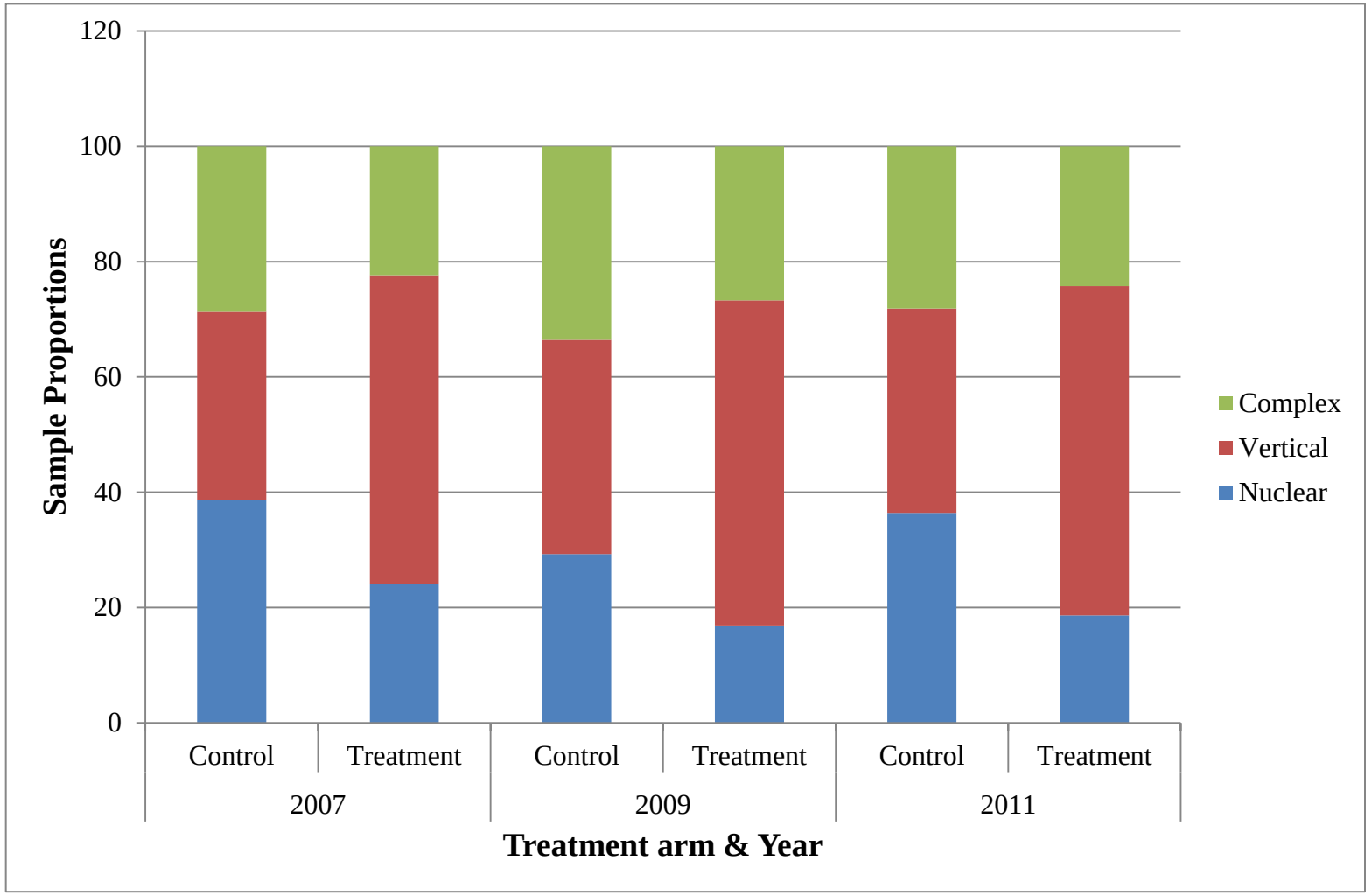

TABLE 3.3: Multinomial logit of changes in household structure in 2011, grouped by structure in 2007

	Nuclear 2007		Vertical 2007		Complex 2007	
	Vertical	Complex	Vertical	Complex	Vertical	Complex
Treatment	1.675*	1.581	3.748**	1.364	3.129**	2.551**
	(0.04)	(0.15)	(0.00)	(0.41)	(0.00)	(0.00)
Female household Head	2.194**	2.342*	0.689	0.957	2.854**	1.401
	(0.00)	(0.03)	(0.34)	(0.92)	(0.01)	(0.31)
Household head Age	1.021**	0.998	1.013	1.005	1.033*	1.008
	(0.00)	(0.80)	(0.26)	(0.73)	(0.00)	(0.32)
Household head, Highest education	1.011	1.001	0.919*	0.994	0.977	1.030
	(0.74)	(0.97)	(0.05)	(0.90)	(0.63)	(0.45)
Rural	1.971	1.418	0.500	0.327	0.220*	0.341*
	(0.17)	(0.54)	(0.28)	(0.12)	(0.01)	(0.05)
Per capita monthly Expenditure	1.000	1.000	1.000	1.000	0.999	1.000*
	(1.00)	(0.69)	(0.74)	(0.82)	(0.06)	(0.04)
Rooms	1.139	1.325	1.015	1.055	1.303	1.118
	(0.58)	(0.26)	(0.95)	(0.85)	(0.34)	(0.61)
Walls	0.540	0.456	1.154	0.636	0.656	0.845
	(0.21)	(0.16)	(0.76)	(0.37)	(0.45)	(0.74)
Cook fuel	1.173	1.392	1.003	2.165	1.036	0.445
	(0.74)	(0.52)	(1.00)	(0.34)	(0.95)	(0.13)
Electric lighting	0.671	0.710	0.664	0.889	0.393	1.288
	(0.61)	(0.63)	(0.63)	(0.90)	(0.24)	(0.72)
Poor toilet	0.885	1.064	0.907	0.790	1.321	1.378
	(0.67)	(0.85)	(0.78)	(0.55)	(0.46)	(0.32)
Water	1.323	1.001	1.219	1.203	1.980	1.715
	(0.30)	(1.00)	(0.60)	(0.67)	(0.07)	(0.08)
Crowding	0.900	0.894	1.036	1.084	0.933	0.937
	(0.38)	(0.36)	(0.77)	(0.57)	(0.62)	(0.53)
Dependency ratio	1.076	1.283**	1.050	1.253*	0.958	1.037
	(0.18)	(0.00)	(0.59)	(0.02)	(0.69)	(0.68)
School expenditure	1.000	1.000*	1.000	1.000	1.000	1.000
	(0.37)	(0.01)	(0.39)	(0.52)	(0.74)	(0.41)
Diet Diversity	0.919	1.453*	1.626*	1.391	1.050	0.844
	(0.60)	(0.04)	(0.01)	(0.14)	(0.82)	(0.34)
Food expenditure	0.999*	1.000	1.000	1.000	1.000	1.000
	(0.02)	(0.85)	(0.45)	(0.95)	(0.33)	(0.30)
Food variety	1.108	0.915	0.827**	0.899	1.013	0.992
	(0.11)	(0.21)	(0.00)	(0.14)	(0.86)	(0.90)
Orphan	0.813*	0.792*	1.065	0.909	0.954	1.003
	(0.02)	(0.02)	(0.67)	(0.55)	(0.71)	(0.98)
N	487		718		415	

Nuclear in 2011 is the referent category. Relative Risk ratios (odds ratios) shown, * $p<0.05$; ** $p<0.01$

TABLE 3.4: Impacts on household demographics between 2007 to 2011

	(1) HH size	(2) Age 0-5	(3) Age 6-11	(4) Age 12-17	(5) Age 18-24	(6) Age 25-49	(7) Age 50-65	(8) Age 66+	(9) Females	(10) Males
Treatment effect	-0.0200	-0.0186	-0.0781**	0.0193	0.0488	-0.0161	-0.00264	0.0204	0.0228	-0.0483
	(0.310)	(0.343)	(0.001)	(0.499)	(0.085)	(0.527)	(0.858)	(0.122)	(0.444)	(0.083)
Treatment arm	40.18	37.41	157.1**	-38.61	-98.09	32.21	5.450	-40.98	-45.99	97.18
	(0.310)	(0.344)	(0.001)	(0.500)	(0.085)	(0.529)	(0.854)	(0.122)	(0.444)	(0.082)
Time	-0.0323	-0.0440*	0.0320	-0.00897	-0.00592	0.0131	-0.00495	-0.0197	-0.0494	0.0191
	(0.109)	(0.026)	(0.144)	(0.716)	(0.804)	(0.526)	(0.704)	(0.071)	(0.127)	(0.441)
Vertical structure	-0.0314	0.0189	-0.277***	-0.0307	0.148**	-0.0784	0.117***	0.0811*	0.00197	-0.0358
	(0.119)	(0.754)	(0.001)	(0.682)	(0.009)	(0.159)	(0.001)	(0.023)	(0.980)	(0.647)
Complex structure	0.253***	-0.0406	-0.0800	0.256***	0.127	-0.0913*	0.0527	0.0285	0.195**	0.0761
	(0.000)	(0.371)	(0.261)	(0.000)	(0.067)	(0.017)	(0.075)	(0.248)	(0.004)	(0.267)
Dependency Ratio	-0.00594*	0.0526***	0.115***	-0.0269**	-0.115***	-0.0306***	-0.0354***	0.0330***	0.0242*	-0.0413***
	(0.020)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.028)	(0.001)
Level 1	0.949***	0.254***	0.200***	0.0607	0.186***	0.228***	-0.0216	0.0343	0.374***	0.580***
	(0.000)	(0.000)	(0.000)	(0.131)	(0.000)	(0.000)	(0.287)	(0.077)	(0.000)	(0.000)
Level 2	0.968***	0.243***	0.220***	0.159***	0.165***	0.195***	-0.000632	-0.0238***	0.493***	0.449***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.932)	(0.000)	(0.000)	(0.000)
Level 3	0.997***	0.245***	0.267***	0.179***	0.127***	0.107***	0.0176	0.0447***	0.533***	0.455***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.081)	(0.000)	(0.000)	(0.000)
Level 4	1.169***	0.149	0.268	0.109	-0.206	0.422***	0.0939	0.291**	1.133***	0.103
	(0.000)	(0.219)	(0.053)	(0.515)	(0.206)	(0.000)	(0.299)	(0.003)	(0.000)	(0.682)
Level 5	0.880***	0.326***	0.138*	-0.0143	0.198**	0.189***	-0.0715**	0.0921***	0.426***	0.393***
	(0.000)	(0.000)	(0.018)	(0.804)	(0.009)	(0.000)	(0.007)	(0.000)	(0.000)	(0.000)
Female headed HH	-0.0793***	0.0525	0.0664	0.0253	0.193**	0.0346	-0.224***	-0.224***	0.340***	-0.408***
	(0.000)	(0.369)	(0.233)	(0.713)	(0.001)	(0.449)	(0.000)	(0.000)	(0.000)	(0.000)
Head of HH age	-0.000725*	-0.00671***	-0.00582***	0.00305*	0.00401***	-0.00410***	-0.000249	0.00926***	-0.00183	0.00103
	(0.018)	(0.000)	(0.000)	(0.021)	(0.001)	(0.000)	(0.787)	(0.000)	(0.281)	(0.544)
Head of HH schooling	-0.000710	-0.00139	0.00372	0.00875	-0.00743	0.00596	0.00311	-0.0122***	0.00452	-0.00394
	(0.693)	(0.757)	(0.501)	(0.137)	(0.281)	(0.306)	(0.474)	(0.001)	(0.562)	(0.612)
Crowding Index	0.0320***	-0.0367**	0.0267*	0.0403*	0.0188	0.000396	0.00731	-0.0201***	-0.0433	0.0839***
	(0.000)	(0.003)	(0.038)	(0.032)	(0.194)	(0.976)	(0.374)	(0.000)	(0.051)	(0.000)
Poor Walls	0.0196	0.242***	0.0672	-0.108	-0.0490	-0.172**	0.0255	-0.00585	0.0774	-0.0723
	(0.280)	(0.000)	(0.274)	(0.234)	(0.498)	(0.001)	(0.595)	(0.892)	(0.308)	(0.357)
Poor Floor	-0.00113	-0.0856	-0.0568	-0.00707	0.0390	0.150**	0.0107	-0.0437	-0.0721	0.0823
	(0.948)	(0.081)	(0.341)	(0.904)	(0.533)	(0.004)	(0.767)	(0.178)	(0.376)	(0.302)
Poor Cook fuel	-0.0317	-0.158*	0.0972	0.202	-0.131	-0.194***	0.114**	0.0580	-0.241**	0.239*
	(0.214)	(0.036)	(0.103)	(0.066)	(0.057)	(0.001)	(0.010)	(0.074)	(0.010)	(0.019)
Electric lighting	-0.0631*	-0.0317	0.0394	-0.312**	0.000541	0.315*	-0.0943	0.0121	0.0691	-0.148
	(0.031)	(0.692)	(0.576)	(0.004)	(0.994)	(0.018)	(0.191)	(0.845)	(0.565)	(0.176)
Poor toilet	-0.00540	0.0934*	0.0733	-0.0155	-0.110**	0.0417	-0.0190	-0.0651*	0.0741	-0.0802
	(0.631)	(0.029)	(0.108)	(0.775)	(0.005)	(0.344)	(0.548)	(0.013)	(0.158)	(0.137)
Poor Water Source	-0.00630	-0.0665	-0.0210	0.101	0.0669	-0.0806*	0.0124	-0.0186	-0.0734	0.0622
	(0.635)	(0.083)	(0.648)	(0.061)	(0.169)	(0.024)	(0.652)	(0.436)	(0.199)	(0.281)
Food variety	0.00170	0.00329	-0.00354	0.00826	-0.0000988	-0.00466	0.00862**	-0.0108***	0.00132	0.000523
	(0.377)	(0.409)	(0.382)	(0.092)	(0.981)	(0.185)	(0.002)	(0.000)	(0.838)	(0.935)
Received Remittance	-0.0317**	0.00780	-0.0157	-0.0163	0.0476	-0.0697*	0.00255	0.0113	-0.00449	-0.0393
	(0.005)	(0.833)	(0.707)	(0.757)	(0.260)	(0.027)	(0.925)	(0.638)	(0.925)	(0.405)
Remittance Amount	3.24e-08*	-4.13e-08*	1.76e-08	6.20e-08**	-2.17e-09	2.56e-09	-1.75e-08	1.89e-09	6.29e-09	2.68e-08
	(0.044)	(0.028)	(0.311)	(0.006)	(0.913)	(0.886)	(0.065)	(0.850)	(0.832)	(0.231)
Constant	65.15	88.05*	-64.61	18.00	11.82	-25.87	10.33	39.67	99.73	-38.65
	(0.108)	(0.027)	(0.142)	(0.716)	(0.806)	(0.533)	(0.693)	(0.071)	(0.125)	(0.439)
N	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3.4 CONTINUED: Impacts on household demographics between 2007 to 2011

	(11) Paternal orphan	(12) Maternal orphan	(13) Orphan	(14) Arrivers	(15) Departers
Treatment effect	-0.0282	-0.0198	-0.0601	0.199**	-0.0673
	(0.513)	(0.603)	(0.197)	(0.009)	(0.443)
Treatment arm	56.73	40.04	120.9	-399.9**	135.1
	(0.513)	(0.601)	(0.197)	(0.009)	(0.443)
Time	-0.0284	-0.0665	-0.304***	-0.178*	0.562***
	(0.439)	(0.071)	(0.000)	(0.022)	(0.000)
Vertical structure	0.0200	0.150	0.0887	-0.0926	-0.293*
	(0.826)	(0.059)	(0.310)	(0.330)	(0.050)
Complex structure	0.296*	0.538***	0.504***	0.275***	0.112
	(0.011)	(0.000)	(0.000)	(0.000)	(0.239)
Dependency Ratio	-0.00185	-0.00421	-0.00205	0.0526***	0.485***
	(0.879)	(0.714)	(0.868)	(0.000)	(0.000)
Level 1	-0.382***	-0.136	-0.149*	0.294***	0.336***
	(0.000)	(0.058)	(0.011)	(0.000)	(0.000)
Level 2	-0.207***	-0.316***	-0.323***	0.191***	0.214**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.008)
Level 3	0.00374	-0.0633	-0.0890*	0.284***	0.279*
	(0.943)	(0.231)	(0.043)	(0.000)	(0.011)
Level 4	0.0484	-0.194	-0.457	0.679	0.757
	(0.829)	(0.393)	(0.057)	(0.090)	(0.243)
Level 5	-0.340***	-0.350***	-0.398***	0.194	0.277*
	(0.000)	(0.000)	(0.000)	(0.082)	(0.029)
Female headed HH	0.838***	-0.420***	0.0506	0.187**	-0.0933
	(0.000)	(0.000)	(0.388)	(0.004)	(0.360)
Head of HH age	-0.00396*	0.00225	-0.000809	0.00151	0.00983***
	(0.036)	(0.097)	(0.557)	(0.383)	(0.000)
Head of HH schooling	0.0252*	0.00449	0.00999	-0.0210*	0.00703
	(0.013)	(0.615)	(0.172)	(0.019)	(0.508)
Crowding Index	-0.00815	-0.0311	-0.000299	-0.177***	0.119***
	(0.774)	(0.315)	(0.991)	(0.000)	(0.000)
Poor Walls	-0.0285	0.0253	-0.0223	0.0949	-0.429**
	(0.769)	(0.780)	(0.814)	(0.282)	(0.003)
Poor Floor	0.0399	0.0117	0.0632	0.103	0.335*
	(0.551)	(0.874)	(0.364)	(0.170)	(0.014)
Poor Cook fuel	-0.0141	0.202*	0.0388	-0.0877	0.454***
	(0.898)	(0.018)	(0.619)	(0.244)	(0.001)
Electric lighting	-0.134	-0.122	-0.127	-0.0218	-0.123
	(0.292)	(0.590)	(0.531)	(0.876)	(0.297)
Poor toilet	-0.0231	-0.0700	-0.0539	0.143*	-0.158
	(0.768)	(0.288)	(0.378)	(0.020)	(0.062)
Poor Water Source	0.0680	0.0836	0.123*	0.0759	0.0169
	(0.419)	(0.174)	(0.038)	(0.279)	(0.850)
Food variety	0.0145*	0.0106	0.0180**	0.0104	0.0174*
	(0.042)	(0.163)	(0.007)	(0.117)	(0.035)
Received Remittance	-0.0142	0.0637	-0.0166	0.102	0.0607
	(0.839)	(0.240)	(0.784)	(0.089)	(0.429)
Remittance Amount	-2.54e-08	-5.75e-08*	4.65e-08	-0.00	-0.000*
	(0.435)	(0.037)	(0.278)	(0.067)	(0.040)
0-5 years of age	0.305***	0.248***	0.282***	0.412***	-0.341***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
6-11 years of age	0.583***	0.505***	0.487***	0.0393	-0.587***
	(0.000)	(0.000)	(0.000)	(0.531)	(0.000)
12-17 years of age	0.706***	0.617***	0.558***	0.0230	-0.316***
	(0.000)	(0.000)	(0.000)	(0.708)	(0.000)
18-24 years of age	0.300***	0.329***	0.302***	0.0145	-0.0388
	(0.000)	(0.000)	(0.000)	(0.832)	(0.666)
50-65 years of age	-0.0960	-0.0640	0.0161	0.0320	0.0993
	(0.169)	(0.281)	(0.748)	(0.593)	(0.150)
66+ years of age	0.00681	0.132	0.204**	-0.0411	-0.742***
	(0.940)	(0.076)	(0.006)	(0.614)	(0.000)
0-5 years * Treatment					
Constant	57.48	133.6	610.6***	356.3*	-0.0346
	(0.437)	(0.071)	(0.000)	(0.022)	(0.705)
N	1175	1175	1175	982	982

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3.5: Sample proportions of all residents

	2009		2011		2009		2011	
	T	C	T	C	T	C	T	C
	Residents, Never Moved							
Female	0.53	0.54						
N	5,055	2,224	(Same as 2009)					
	Reasons for Moving In				Reasons for Moving Out			
Female	0.57	0.55	0.54	0.52	0.49	0.53	0.51	0.52
Work	0.01	--	0.001	0.003	0.07	0.03	0.10	0.09
School	0.05	0.06	0.05	0.04	0.13	0.06	0.12	0.11
Live with relatives	0.17	0.20	0.27	0.28	0.39	0.44	0.39	0.35
Death, caregiver	0.21	0.13	0.22	0.19	0.009	0.02	0.004	0.01
Death, other	--	--	0.03	0.008	--	--	0.002	0.005
Death, individual	--	--	--	--	0.13	0.14	0.11	0.07
Marriage	0.05	0.05	0.06	0.07	0.08	0.08	0.11	0.14
Pregnancy	--	--	0.003	0.003	--	--	0.009	0.003
New Household	--	--	0.03	0.02	0.03	0.02	0.10	0.13
Illness recovery	0.00	--	0.002	0.003	0.01	0.01	0.002	0.006
Household dissolution	0.07	0.05	0.03	0.03	0.007	0.006	0.03	0.01
Born	0.23	0.34	0.24	0.31	--	--	--	--
Other/Unknown	0.20	0.17	0.05	0.04	0.14	0.19	0.04	0.04
N	697	347	1015	381	442	180	1,135	644

Other reasons include post-election violence and unknown.

TABLE 3.6: Probit of Reasons for Moving In & Household characteristics, Pooled sample

	(1) Work	(2) School	(3) Live with relatives	(4) Death-caregiver/fam	(5) Marriage	(6) Household dissolution
Treatment arm	0.621*	-0.0764	-0.140	0.220*	-0.0169	0.00361
	(0.038)	(0.539)	(0.216)	(0.025)	(0.855)	(0.979)
Female headed HH	0.0160	0.406**	-0.121	0.00431	-0.0174	-0.0474
	(0.942)	(0.005)	(0.190)	(0.957)	(0.869)	(0.766)
HH head age	0.00321	-0.00211	0.00175	0.00131	0.000863	-0.000889
	(0.587)	(0.488)	(0.438)	(0.616)	(0.727)	(0.860)
HH head schooling	0.0316	-0.0149	0.0377	-0.156**	0.0313	-0.0449
	(0.790)	(0.848)	(0.496)	(0.009)	(0.527)	(0.572)
Number of Rooms	0.178	0.224*	-0.142	0.0512	0.166	-0.650***
	(0.378)	(0.046)	(0.361)	(0.736)	(0.298)	(0.001)
Poor Walls	0.0328	-0.196	0.128	-0.426**	0.00751	0.0397
	(0.871)	(0.212)	(0.270)	(0.007)	(0.951)	(0.842)
Poor Floor	-0.563**	-0.412***	0.148	-0.0962	0.0364	0.391**
	(0.007)	(0.001)	(0.263)	(0.426)	(0.778)	(0.008)
Poor Cook fuel	0.253	0.352	0.105	0.0689	-0.188	0.0272
	(0.189)	(0.071)	(0.430)	(0.619)	(0.368)	(0.904)
Electric lighting	0.627***	0.286	-0.0160	-0.134	-0.310	0.0337
	(0.000)	(0.306)	(0.934)	(0.698)	(0.194)	(0.911)
Poor toilet	-0.108	0.0434	0.0290	0.0879	-0.0559	-0.186
	(0.599)	(0.721)	(0.754)	(0.407)	(0.573)	(0.220)
Poor Water Source	-0.0439	-0.135	0.114	0.185	-0.0494	-0.480***
	(0.826)	(0.219)	(0.233)	(0.086)	(0.636)	(0.001)
Poor Walls	0.0839	0.0482	0.00184	-0.0586	-0.0512	-0.0164
	(0.174)	(0.265)	(0.958)	(0.173)	(0.252)	(0.711)
Crowding Index	0.0273	0.00836	0.00896	0.0259*	-0.0318*	-0.0653*
	(0.156)	(0.575)	(0.490)	(0.038)	(0.023)	(0.023)
Vertical structure	0.0821	0.0912*	0.0453	0.121***	-0.0898***	0.0556
	(0.214)	(0.041)	(0.101)	(0.000)	(0.000)	(0.241)
Complex structure	0.103	0.0796*	0.0709*	0.116**	-0.0418	-0.0343
	(0.139)	(0.049)	(0.048)	(0.002)	(0.278)	(0.503)
Household size	-0.168*	-0.132***	-0.0467	-0.0802***	0.0798***	-0.0576
	(0.016)	(0.001)	(0.053)	(0.001)	(0.001)	(0.077)
Received remittance	-0.143	0.148	-0.0445	0.231*	-0.147	0.0975
	(0.451)	(0.176)	(0.612)	(0.018)	(0.233)	(0.537)
School expenditures	0.00	-0.00	0.00	0.000004*	-0.00	0.00
	(0.136)	(0.874)	(0.407)	(0.032)	(0.054)	(0.696)
Diet diversity	-0.115	0.0811	0.0343	-0.0421	-0.0353	-0.241*
	(0.272)	(0.191)	(0.527)	(0.514)	(0.550)	(0.012)
Food variety	0.0430	-0.0390*	0.00832	0.00994	0.0318	0.0373
	(0.130)	(0.042)	(0.583)	(0.563)	(0.054)	(0.176)
Constant	-2.840***	-1.316*	-1.121**	-0.557	-1.868***	0.303
	(0.000)	(0.022)	(0.004)	(0.241)	(0.000)	(0.694)
N	2360	2360	2360	2360	2360	2360

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3.6 CONTINUED: Probit of Reasons for Moving In, Pooled sample

	(7) Recovery from illness	(8) Follow family members	(9) New born	(10) Death – self	(11) Pregnancy	(12) Set up New household
Treatment arm	0.223	-0.0700	-0.102	0.132	-1.525***	-0.0469
	(0.313)	(0.696)	(0.287)	(0.391)	(0.000)	(0.922)
Female headed HH	0.406	0.0606	0.0278	-0.0231	5.147***	-1.380**
	(0.328)	(0.686)	(0.775)	(0.865)	(0.000)	(0.001)
HH head age	0.00262	-0.00144	-0.00664***	0.00572	0.00121	0.0435***
	(0.720)	(0.671)	(0.001)	(0.092)	(0.941)	(0.000)
HH head schooling	-0.170	0.176*	0.125*	-0.163	1.868***	-1.261**
	(0.392)	(0.020)	(0.014)	(0.057)	(0.000)	(0.003)
Number of Rooms	-0.228	-0.0303	0.270*	-0.213	-0.507	0.345
	(0.649)	(0.894)	(0.044)	(0.204)	(0.298)	(0.584)
Poor Walls	0.401	0.266	0.241*	-0.172	--	-0.286
	(0.196)	(0.311)	(0.033)	(0.315)		(0.494)
Poor Floor	0.560	-0.0310	-0.204*	0.294	3.648***	--
	(0.103)	(0.875)	(0.032)	(0.145)	(0.000)	
Poor Cook fuel	--	-0.159	-0.223*	0.0138	-0.667	-0.561
		(0.371)	(0.042)	(0.941)	(0.101)	(0.475)
Electric lighting	--	0.112	0.0541	-0.114	13.26***	--
		(0.563)	(0.791)	(0.521)	(0.000)	
Poor toilet	-0.140	-0.140	0.0574	-0.208	5.707***	-0.396
	(0.600)	(0.446)	(0.491)	(0.117)	(0.000)	(0.418)
Poor Water Source	-0.215	-0.0487	-0.0728	0.0625	4.506***	-0.343
	(0.310)	(0.771)	(0.409)	(0.626)	(0.000)	(0.375)
Poor Walls	0.159*	-0.143	0.0860**	-0.0540	0.878***	-0.958**
	(0.048)	(0.127)	(0.005)	(0.304)	(0.000)	(0.001)
Crowding Index	-0.0303	-0.0387	0.00996	-0.00321	-0.0229	-0.0817
	(0.578)	(0.112)	(0.397)	(0.875)	(0.711)	(0.219)
Vertical structure	-0.144*	-0.111*	-0.102***	-0.00170	0.239	-0.281**
	(0.017)	(0.038)	(0.000)	(0.957)	(0.426)	(0.005)
Complex structure	-0.155	0.0149	-0.165***	-0.0155	-0.424	-0.0419
	(0.194)	(0.791)	(0.000)	(0.775)	(0.055)	(0.760)
Household size	-0.0512	-0.00276	0.0950***	-0.0257	-0.194	0.519**
	(0.306)	(0.942)	(0.000)	(0.413)	(0.233)	(0.004)
Received remittance	--	-0.177	-0.158*	-0.0483	1.937*	--
		(0.360)	(0.037)	(0.712)	(0.018)	
School expenditures	0.00	-0.00001*	0.00	0.00	0.00	-0.00004*
	(0.428)	(0.017)	(0.662)	(0.984)	(0.461)	(0.030)
Diet diversity	0.308*	-0.0212	0.00128	0.115	0.881**	0.479
	(0.026)	(0.843)	(0.977)	(0.211)	(0.003)	(0.263)
Food variety	0.00153	0.0243	-0.00739	-0.0336	-0.155*	-0.165
	(0.967)	(0.299)	(0.638)	(0.171)	(0.019)	(0.108)
Constant	-4.782***	-1.490**	-0.855*	-1.519**	-30.67***	-1.739
	(0.000)	(0.006)	(0.021)	(0.005)	(0.000)	(0.338)
N	1477	2360	2360	2360	1849	1213

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3.7: Probit of Reasons for Moving Out & Household characteristics, Pooled sample

	(1) Work	(2) School	(3) Live with relatives	(4) Death of caregiver	(5) Death – self
Treatment arm	-0.0148	0.107	-0.00653	-0.116	0.112
	(0.867)	(0.222)	(0.921)	(0.478)	(0.138)
Female headed HH	-0.102	0.0543	-0.0382	0.192	-0.144
	(0.173)	(0.529)	(0.520)	(0.300)	(0.100)
HH head age	0.00192	0.00258	0.00210	0.00316	-0.00220
	(0.351)	(0.340)	(0.209)	(0.358)	(0.263)
HH head schooling	0.0331	0.00250	-0.00776	-0.0111	-0.161**
	(0.482)	(0.960)	(0.837)	(0.898)	(0.001)
Number of Rooms	-0.261	0.106	-0.0124	0.328	0.129
	(0.101)	(0.409)	(0.906)	(0.148)	(0.363)
Poor Walls	0.107	-0.321*	-0.0572	-0.165	-0.0870
	(0.296)	(0.024)	(0.519)	(0.513)	(0.390)
Poor Floor	0.0502	0.00977	-0.110	-0.122	0.0406
	(0.683)	(0.928)	(0.195)	(0.559)	(0.752)
Poor Cook fuel	-0.0153	0.0811	-0.0156	-0.234	-0.137
	(0.929)	(0.580)	(0.880)	(0.260)	(0.213)
Electric lighting	-0.123	-0.0732	-0.346**	--	0.256
	(0.458)	(0.475)	(0.002)		(0.277)
Poor toilet	0.165*	0.108	-0.0461	-0.0301	0.0412
	(0.042)	(0.239)	(0.485)	(0.851)	(0.555)
Poor Water Source	-0.0880	0.147	0.0607	-0.226	-0.0459
	(0.406)	(0.062)	(0.382)	(0.120)	(0.533)
Poor Walls	-0.0247	-0.0209	0.0121	0.0140	-0.0771**
	(0.387)	(0.476)	(0.631)	(0.856)	(0.008)
Crowding Index	0.0138	0.0391***	0.00557	-0.00193	-0.0237*
	(0.118)	(0.000)	(0.454)	(0.926)	(0.011)
Vertical structure	-0.0243	0.0184	0.0180	0.0219	0.00525
	(0.353)	(0.536)	(0.425)	(0.743)	(0.817)
Complex structure	-0.0434	0.0208	-0.0156	0.191**	0.109***
	(0.113)	(0.611)	(0.675)	(0.008)	(0.001)
Household size	0.0279	-0.0247	-0.0504**	-0.0364	0.0643***
	(0.175)	(0.312)	(0.007)	(0.556)	(0.000)
Received remittance	-0.0315	-0.0532	0.198***	-0.0345	-0.219**
	(0.734)	(0.591)	(0.000)	(0.821)	(0.001)
School expenditures	0.00000273	0.000000683	-0.000000436	0.00000178	0.00000105
	(0.130)	(0.771)	(0.760)	(0.612)	(0.502)
Diet diversity	-0.0623	0.0208	0.0562	0.0760	-0.000974
	(0.286)	(0.741)	(0.143)	(0.350)	(0.982)
Food variety	0.0197	0.0171	-0.00674	-0.0435	-0.00204
	(0.147)	(0.362)	(0.560)	(0.209)	(0.864)
Constant	-1.339**	-2.157***	-0.358	-2.189***	-0.618
	(0.001)	(0.000)	(0.233)	(0.001)	(0.060)
N	3081	3081	3081	2948	3081

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3.7 CONTINUED: Probit of Reasons for Moving Out, Pooled sample

	(6) Marriage	(7) Household dissolution	(8) Recovery from illness	(9) Follow other family members	(10) New HH formation	(11) Pregnancy
Treatment arm	-0.125	0.337*	-0.102	-0.0243	-0.159	0.552**
	(0.116)	(0.037)	(0.532)	(0.834)	(0.180)	(0.009)
Female headed HH	0.0573	-0.160	0.0650	-0.0728	0.186	0.349
	(0.465)	(0.383)	(0.745)	(0.611)	(0.106)	(0.215)
HH head age	-0.00239	-0.0117	0.00504	-0.000923	-0.00189	-0.0124**
	(0.177)	(0.064)	(0.118)	(0.757)	(0.452)	(0.002)
HH head schooling	-0.0102	0.105	-0.0432	-0.125	0.120*	-0.207
	(0.795)	(0.147)	(0.587)	(0.058)	(0.013)	(0.069)
Number of Rooms	0.0214	0.0725	0.587	0.202	-0.170	-0.298
	(0.857)	(0.689)	(0.147)	(0.399)	(0.248)	(0.268)
Poor Walls	0.0762	0.273	-0.497	0.149	0.152	--
	(0.450)	(0.122)	(0.074)	(0.467)	(0.357)	
Poor Floor	-0.0689	0.212	-0.0648	-0.181	0.214	0.328
	(0.431)	(0.227)	(0.825)	(0.334)	(0.157)	(0.156)
Poor Cook fuel	0.0118	-0.0428	-0.227	0.187	0.102	0.617*
	(0.946)	(0.878)	(0.371)	(0.434)	(0.615)	(0.018)
Electric lighting	0.197	0.210	--	0.193	0.371	0.994**
	(0.258)	(0.423)		(0.336)	(0.052)	(0.001)
Poor toilet	0.0828	-0.198	-0.282	-0.157	-0.161	0.0778
	(0.278)	(0.240)	(0.092)	(0.302)	(0.158)	(0.773)
Poor Water Source	-0.0297	-0.0347	-0.162	-0.164	-0.00596	0.139
	(0.671)	(0.842)	(0.307)	(0.319)	(0.952)	(0.562)
Poor Walls	0.0173	0.0751	-0.00477	-0.133**	0.0687	-0.125*
	(0.474)	(0.239)	(0.924)	(0.008)	(0.072)	(0.031)
Crowding Index	-0.0141	-0.00669	-0.0233	0.000130	-0.0206	0.0707*
	(0.190)	(0.773)	(0.325)	(0.993)	(0.171)	(0.038)
Vertical structure	-0.0218	0.0308	-0.0297	0.0459	-0.0281	0.0978
	(0.367)	(0.603)	(0.696)	(0.166)	(0.402)	(0.302)
Complex structure	-0.0517	-0.0326	0.189**	-0.0550	-0.0808	-0.357
	(0.142)	(0.631)	(0.006)	(0.373)	(0.084)	(0.245)
Household size	0.0285	-0.0229	-0.00486	0.0317	0.00359	-0.148
	(0.087)	(0.663)	(0.931)	(0.219)	(0.905)	(0.193)
Received remittance	0.0259	-0.578**	0.179	-0.270*	-0.00485	0.146
	(0.744)	(0.004)	(0.323)	(0.022)	(0.962)	(0.477)
School expenditures	0.00	0.00	0.00	-0.000008*	0.00	0.00
	(0.328)	(0.571)	(0.141)	(0.025)	(0.832)	(0.163)
Diet diversity	0.0577	-0.0623	-0.218	-0.171	-0.0362	0.113
	(0.272)	(0.568)	(0.079)	(0.097)	(0.504)	(0.537)
Food variety	-0.0228	0.0112	0.0677*	0.0206	-0.00504	-0.0288
	(0.074)	(0.687)	(0.029)	(0.435)	(0.752)	(0.503)
Constant	-1.004**	-1.715	-2.604**	-0.690	-1.417***	-2.317*
	(0.003)	(0.053)	(0.003)	(0.228)	(0.000)	(0.014)
N	3081	3081	2948	3081	3081	2589

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3.8: Characteristics of Arriving Residents in Treatment Households

	(1) Work	(2) Family death	(3) Pregnancy
Spouse	-0.00382	-0.0352	0.000518
	(0.732)	(0.476)	(0.924)
Child	-0.0118	-0.0881**	0.00360
	(0.118)	(0.009)	(0.327)
Son/daughter – in-law	-0.0121	-0.104	-0.00287
	(0.371)	(0.084)	(0.663)
Grandchild	-0.0108	0.0451	0.00100
	(0.081)	(0.101)	(0.739)
Parent	-0.0165	-0.147	-0.00101
	(0.755)	(0.531)	(0.969)
Sibling	-0.0165	0.0143	-0.000643
	(0.436)	(0.879)	(0.950)
Stepchild	-0.0172	0.00102	0.000389
	(0.538)	(0.993)	(0.977)
Nephew/niece	-0.0158	0.125*	0.0133*
	(0.171)	(0.015)	(0.018)
Adopted – blood relation	-0.0175	0.111	0.000438
	(0.672)	(0.542)	(0.983)
Fostered blood relation	-0.0167	-0.0233	-0.000812
	(0.590)	(0.865)	(0.957)
Foster unrelated	-0.0184	0.00647	0.00151
	(0.728)	(0.978)	(0.953)
Other relative	0.0121	-0.168*	-0.000830
	(0.450)	(0.018)	(0.915)
Other non-relative	0.411***	-0.236	0.000548
	(0.000)	(0.127)	(0.974)
Female	-0.000683	-0.0397***	0.00139
	(0.722)	(0.000)	(0.136)
0-5 years old in 2011	-0.00162	-0.0240*	0.000266
	(0.538)	(0.040)	(0.835)
6-11 years old in 2011	0.000473	0.0227*	-0.00184
	(0.842)	(0.031)	(0.111)
12-17 years old in 2011	0.0000584	-0.000496	-0.00205
	(0.979)	(0.960)	(0.058)
18-24 years old in 2011	-0.00143	-0.00771	0.00147
	(0.549)	(0.467)	(0.205)
25-49 years old in 2011	0.000842	-0.00407	-0.00138
	(0.769)	(0.748)	(0.322)
50-65 years old in 2011	-0.00312	0.000204	-0.00179
	(0.482)	(0.992)	(0.406)
66+ years old in 2011	-0.00216	-0.0122	-0.000672
	(0.643)	(0.553)	(0.766)
Orphan	-0.000954	0.0698***	0.000403
	(0.596)	(0.000)	(0.645)
Constant	0.0237**	0.346***	0.00107
	(0.002)	(0.000)	(0.776)
N	1528	1528	1528

p-values in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3.9: Multinomial logits of treatment leaver characteristics

	(1) Death caregiver	(2) HH break up
Spouse	4.216*	-0.917
	(0.03)	(0.41)
Child	-0.265	0.212
	(0.74)	(0.88)
Son or daughter in law	1.208	93.507**
	(0.47)	(0.00)
Grandchild	1.287	37.655**
	(0.36)	(0.00)
Brother/sister	10.292**	1.052
	(0.00)	(0.61)
Stepchild	18.330**	21.355**
	(0.00)	(0.00)
Nephew/Niece	-5.251**	-1.932
	(0.00)	(0.61)
Other relative	8.682**	37.289**
	(0.00)	(0.00)
Female	0.675	-18.257**
	(0.20)	(0.00)
0-2 years old in 2009	3.946**	-18.561**
	(0.00)	(0.00)
6-11 years old in 2009	**7.981****	**6.684****
	(0.00)	(0.00)
12-17 years old in 2009	-4.585**	13.528**
	(0.00)	(0.00)
18-24 years old in 2009	1.988**	16.822**
	(0.00)	(0.00)
25-49 years old in 2009	-13.938**	-25.442**
	(0.00)	(0.00)
50-65 years old in 2009	-19.915**	-8.229**
	(0.00)	(0.00)
66+ years old in 2009	-33.453**	-37.321**
	(0.00)	(0.00)
0-5 years old in 2011	-3.704**	-8.011**
	(0.00)	(0.00)
6-11 years old in 2011	**-8.313****	**14.472****
	(0.00)	(0.00)
12-17 years old in 2011	2.793**	-1.869**
	(0.00)	(0.00)
18-24 years old in 2011	0.163	9.618**
	(0.78)	(0.00)
25-49 years old in 2011	6.183**	10.785**
	(0.00)	(0.00)
50-65 years old in 2011	1.325	14.543**
	(0.36)	(0.00)
66+ years old in 2011	9.249**	21.683**
	(0.00)	(0.00)
Orphan	3.631**	-2.058**
	(0.00)	(0.00)
Constant	-24.761**	-55.816**
	(0.00)	(0.00)
	265	218

Referent category is all other reasons for leaving the household. *p*-values in parentheses,
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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APPENDIX

APPENDIX 1: SUMMARY OF CHANGE IDEAS TESTED

Primary Driver	Change Ideas	Stakeholder
Socio-cultural barriers	During the early ANC period, health providers counsel and conduct site visits of the health facility to orient women and reduce their fears and anxieties about facility delivery or possible referral to hospital. Health professionals show the women a new delivery bed to motivate them to deliver at the facility. Health staff identify anemic pregnant women during ANC and educate them about good nutrition practices. They also task volunteers to include education about nutrition during home visits.	Health professionals
	Education at ANC and through radio programs to explain the need for blood donation and encourage those coming for ANC to bring a donor to donate at the same time laboratory tests are done for the woman.	Health staff
	Sub-district health committee members to promote care-seeking for ANC, skilled delivery, and male involvement in ANC and skilled delivery care seeking.	Health professionals & community
	Health staff announce at ANC and CWC that women can register and leave their ANC cards at the facility if carrying the card home is a barrier to early registration. Staff and client	Health professionals

Source: Project FivesAlive! Maternal and Neonatal (MNH) Referral Work Technical Report. Second Quarter: May to July 2013

Primary Driver	Change Ideas	Stakeholder
	make a joint decision about keeping ANC card at the health facility until such a time that the client is comfortable keeping her card at home.	
	Use existing community groups (mother-to-mother support groups, TBAs, CBVs, adolescent meetings, communal labor), traditional leaders, and existing mechanisms/structures such as durbars, prayer camps, church, mosque, FM station, and community information centres to reach communities for health promotion on the importance of early ANC, birth preparedness plan, skilled delivery, early care seeking, referral, and other topics as needed. Special motivation for TBAs who bring primips for facility delivery; have family conversation on the importance of facility delivery. Fine the husband 50GHC and a cock if the wife delivers in the house. Plan: assemblyman to get notice from District Assembly and bring to chief's palace to enforce the fine and announce it to community.	Community and health staff Health staff Community
	Form men's fun club and use gospel rock shows to get men to listen to convincing messages. Conduct intensive home visits to talk to men. Meet with key opinion leaders, assemblymen. CBVs reach out to men in their farms.	Health staff & community
	Financial risk pooling for pre-financing emergency transport (fueling of motorbikes for	Community

Source: Project FivesAlive! Maternal and Neonatal (MNH) Referral Work Technical Report. Second Quarter: May to July 2013

Primary Driver	Change Ideas	Stakeholder
Transport & communication **Transport & communication**	transporting emergency maternal & newborns cases): • Contributions are collected from each house in a community. The motorbike owner pre-finances the fuel at the time of emergency and is reimbursed later from the emergency transport fund. • Monthly church collection to cater for those who cannot pay taxi fare.	
	• Engage chiefs, community leaders, social and religious groups to assume greater responsibility in liaising with motor-king, motor-bike, and vehicle owners in the communities to make their motors or vehicles available for transporting maternal and neonatal referrals to health facilities. Disseminate to community members the willingness of motor and vehicle owners to volunteer this service using religious & other social gatherings. • QI teams contact transport owners directly and not through the community leadership.	Community & health staff
	Send patients on their own personal motorbikes to the next level if the ambulance delays more than 30 minutes after calling them.	Health staff

Source: Project FivesAlive! Maternal and Neonatal (MNH) Referral Work Technical Report. Second Quarter: May to July 2013

Primary Driver	Change Ideas	Stakeholder
	District Director of Health Service facilitates finding emergency transportation solutions by dialoguing with National Ambulance Service (NAS), district assemblies, private transport owners, and unions and community leaders; jointly identify local, sustainable solutions for transport for health emergencies (drivers, repairs, upkeep and maintenance, etc.).	Management & leadership
	Update list and contact numbers of taxi drivers, talk to GPRTU leadership and share with them the current response time to emergency calls, and hold a meeting with the drivers to improve drivers' response to emergency calls.	Health staff & community
	Health staff, HEW, or volunteers conduct follow-up visits to the homes of those referred to find out if they complied and what the feedback on final diagnosis is.	Health staff
	During first ANC visits, ensure that all pregnant women and their families develop and agree on a Birth Preparedness Plan and Transport Plan, including securing the necessary permissions for skilled delivery, funds available for transportation and upkeep while in health facility, and preparedness for referral to hospital should the need arise.	Health staff & individual/family
	Furnish all facilities in the district with the phone numbers of the district ambulance service, and selected community drivers to call for means of transport for MNH referrals.	Management & leadership

Source: Project FivesAlive! Maternal and Neonatal (MNH) Referral Work Technical Report. Second Quarter: May to July 2013

Primary Driver	Change Ideas	Stakeholder
	Mobilize communal labor to do minor repairs of roads linking community to the health facility, using local resources.	Community
	Re-operate services at the CHPS. Have the community members come and clean while also providing outreach services there as a mobile clinic. *Modification: Operate a mobile clinic at the site monthly.*	Health staff
	Weekly pick-up of feedback forms from the DHMT	Health staff
	The midwives/labor ward nurses to call Yendi Hospital using their landline to follow up on the cases sent to Yendi for feedback.	Health staff
	Compile the phone numbers of maternity, emergency, and children's ward so that prior call can be made.	Health staff
	Hospital health information officer collects completed feedback forms, weekly, on all referrals received in the various wards and sends to the DHMT to pass on to the respective referring facilities. Facilities referring without the necessary documentation are noted and feedback given for them to improve.	Hospital & DHMT
	Procure low-cost telephones (Vodafone landlines) for all health facilities in the district to communicate with referral facility when sending a case. Along with this, compile phone numbers	Management & leadership

Source: Project FivesAlive! Maternal and Neonatal (MNH) Referral Work Technical Report. Second Quarter: May to July 2013

Primary Driver	Change Ideas	Stakeholder
	of facilities in-charges in the district and share with the district hospital.	
Inadequate clinical skills & management	Organize periodic customer care orientation/training for health care providers.	Health Staff
	Provider-patient communication: engage and communicate directly with patients/family about the condition being referred, allay their fears, and get family to accept for patient to go straight to the next level while a family member goes back to the house to prepare and meet at the referral facility.	Health staff
	Staff training on counseling skills. During the team's monthly meeting, the staff discuss and brainstorm about how to improve the conversations with patients and relatives around referrals. Also, the In-charge will have other staff shadow his conversation with a client to learn how to do it well.	Health staff
	TBAs give a card to clients they are referring to the HC in order to reduce the delay in being tended to at the facility.	Community & Health staff
	Make feedback form available at the health facility and train staff on how to complete it to improve giving written feedback to lower-referring facilities.	Management /leadership & health staff
	Supply spirit prepared by the hospital pharmacist to mothers at the cost of GHC1; midwife demonstrates to mothers how to apply	Management /leadership & health staff

Source: Project FivesAlive! Maternal and Neonatal (MNH) Referral Work Technical Report. Second Quarter: May to July 2013

Primary Driver	Change Ideas	Stakeholder
	spirit on cord; and provide education on general cord care during ANC.	
	• Use TBA's monthly meeting to train them and CBVs on maternal & neonatal danger signs and task them to refer when they identify such complications. Target and educate healing camps, LCS as well. • Identify TBAs/volunteers/LCS to engage one-on-one on the danger signs in pregnancy/labor/neonates. • Use social gatherings like monthly women's meeting in churches, durbars to educate pregnant women on danger signs.	Health staff Health staff
Governance and accountability	Support standardized systems for referral procedures by removing barriers hindering staff's ability to adhere. For staff to accompany MNH clients to next level, provide the following support: • Means of transport to the referral point. • Negotiate fuel with the family if taking the H/C means. • In-charge to provide staff with pocket money to support him/her while at referral point. • Accommodation if needed.	Management & leadership and health staff
	Get the blood grouping covered by insurance, so all women who attend ANC know their blood type.	Management & leadership

Source: Project FivesAlive! Maternal and Neonatal (MNH) Referral Work Technical Report. Second Quarter: May to July 2013

APPENDIX 2

APPENDIX 2.1: Baseline equivalence of individual-level characteristics, by treatment arms

	Under 5s				All children			
	T	**n**	**C**	**n**	**T**	**n**	**C**	**n**
Dependent variables								
Malaria/pneumonia	.59	538	.63	307	.57	617	.62	345
Health Seeking if ill	.83	309	.80	184	.82	342	.80	203
Independent Variables								
Individual characteristics								
Age	2.15	538	2.08	307	2.52	617	2.40	345
Age categories								
0-under 1	.15	538	.16	307	.13	617	.14	345
1-under 3	.41	538	.40	307	.35	617	.36	345
3-under 5	.44	538	.44	307	.39	617	.39	345
5-7 years old	--	--	--	--	.13	617	.11	345
Sex (1=male, 0=female)	.52	538	.49	307	.53	617	.48	345
Orphan	.50**	538	.41	307	.54***	617	.43	345
Relation to household head (1=child or grandchild, 0=other)	.97	538	.97	307	.96	617	.97	345
Low HAZ	.13	483	.13	276	--	--	--	--
Low BMIZ	.03	483	.04	278	--	--	--	--
Head of household characteristics								
Household head education	3.82***	538	5.85	307	3.80***	617	5.82	345
Household head age	55.40***	538	50.23	307	55.90***	617	50.48	345
Female headed household	.54**	538	.45	307	.54**	617	.46	345
Environmental factors								
Household size	7.79***	538	7.21	307	7.73***	617	7.15	345
Living environment - index	.24	538	.14	307	.29	617	.15	345

Crowding Index	4.12*	538	3.81	307	4.14**	617	3.80	345
Cook Stove (1=traditional stone)	.65***	538	.80	307	.66***	617	.8	345
Cook fuel, poor quality	.89***	538	.95	307	.89***	617	.96	345
No Toilet	.52*	538	.60	307	.53	617	.58	345
Water, unprotected/natural	.51***	538	.66	307	.50***	617	.66	345
Mosquito net	.50***	538	.62	307	.51***	617	.61	345
Investment behaviors								
Schooling expenditures, 12 months	8732.61***	538	5875.53	307	8452.80**	617	5871.76	345
Food expenditures	1073.40	538	1295.08	307	1092.93	617	1247.44	345
Food variety	10.51	538	10.94	307	10.52	617	10.93	345
Diet diversity score	4.54	538	4.68	307	4.55	617	4.67	345
Food groups as proportion of diet:								
Cereals, roots, tubers	.65***	538	.73	307	.64***	617	.73	345
Fruits & veggies	.01	538	.02	307	.01	617	.01	345
Legumes & nuts	.05***	538	.04	307	.05***	617	.04	345
Meats, poultry, fish	.03	538	.03	307	.03	617	.03	345
Fats & oils	.05*	538	.04	307	.05**	617	.04	345
Dairy	.09***	538	.07	307	.10***	617	.07	345
Eggs	.002	538	.002	307	.002	617	.002	345
Wealth								
Monthly Per capita adult expenditures	1211.82	538	1213.51	307	1222.84	617	1212.57	345
Livestock - index	.12	538	.03	307	.14	617	.02	345
Community-level characteristics								
Distance - malaria treatment 1=0-5 km; 0=5 km+	.22**	527	.30	284	.22***	602	.30	322
Distance - doctor* 1=0-5 km; 0=5 km+	.61	538	.56	290	.62	617	.58	323
Rural (1=rural, 0=urban)	.67***	538	.83	307	.68***	617	.83	345

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 2.2: Alternative estimation methods depicting treatment effects on children's illness: simple and full logistic and cluster-robust OLS models

	All children (0-7)				Children Under 5			
	Logit	Logit Full	OLS	OLS Full	Logit	Logit Full	OLS	OLS Full
Intervention Effect	1.144	1.079	0.050	0.0202	0.762	0.626	-0.0772	-.0.097
	(0.54)	(0.27)	(0.43)	(0.17)	(-0.75)	(-1.12)	(-0.56)	(-0.75)
Year	0.844	0.902	-0.052	-0.026	0.972	0.750	-0.003	-0.074
	(-0.88)	(-0.44)	(-0.57)	(-0.29)	(-0.10)	(-0.76)	(-0.03)	(-0.76)
Treatment status	1.083	1.076	0.019	0.013	1.799*	1.870*	0.153	0.131
	(0.47)	(0.37)	(0.22)	(0.19)	(2.38)	(2.13)	(1.89)	(1.84)
Location		1.000		0.000		1.000		0.000
		(0.44)		(0.32)		(0.48)		(0.42)
Age in months, (under 1 year)		1.187		0.039		0.567		-0.130
		(0.54)		(0.60)		(-1.43)		(-1.76)
Age in months, (1 year – under 3)		1.625*		0.111**		0.892		-0.026
		(2.37)		(2.86)		(-0.41)		(-0.42)
Age in months, (3 years – under 5)		1.336		0.067*		--		--
		(1.69)		(2.48)				
Sex		0.995		-0.002		0.970		-0.005
		(-0.04)		(-0.07)		(-0.15)		(-0.13)
Orphan		0.747		-0.067		0.695		-0.079
		(-1.81)		(-1.75)		(-1.44)		(-1.56)
Child/grandchild		1.131		0.033		1.186		0.050
		(0.44)		(0.43)		(0.38)		(0.44)
Female household head		0.962		-0.008		1.048		0.013
		(-0.27)		(-0.19)		(0.21)		(0.20)
Age of household head		1.012***		0.004**		1.013*		0.003**
		(3.49)		(3.46)		(2.53)		(2.81)
Household head education		0.998		-0.000		1.004		0.002
		(-0.13)		(-0.05)		(0.15)		(0.23)
Rural		0.495**		-0.167**		0.541		-0.143
		(-3.27)		(-2.78)		(-1.92)		(-1.82)
Mosquito net		1.109		0.023		1.230		0.042
		(0.63)		(0.38)		(0.82)		(0.63)
Unprotected/ open water source		1.079		0.018		1.046		0.011
		(0.51)		(0.45)		(0.20)		(0.30)
Poor cook fuel quality		0.516*		-0.148		0.394*		-0.188
		(-2.09)		(-2.01)		(-2.04)		(-1.68)
Crowding index		0.993		-0.002		0.991		-0.002
		(-0.21)		(-0.17)		(-0.20)		(-0.13)
Asset/wealth index		0.964		-0.008		0.938		-0.013
		(-0.90)		(-0.70)		(-0.98)		(-0.94)
Food insecurity		0.849		-0.039		1.065		0.011
		(-0.90)		(-0.81)		(0.23)		(0.21)
Food expenditures		1.000		-0.000				0.000***
		(-0.53)		(-0.93)		(-0.70)		(-3.00)
Food variety		1.013		0.003		1.031		0.007
		(0.69)		(0.72)		(1.01)		(1.04)
Medical expenditures		1.000**		0.000***		1.000**		0.000***
		(2.82)		(4.46)		(2.81)		(4.84)
Distance to treatment		0.937		-0.015		0.919		-0.020
		(-1.30)		(-0.86)		(-1.13)		(-0.92)
N	568	502	536	502	265	235	250	235

Exponentiated coefficients; *t* statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 2.3: Alternative estimation methods depicting treatment effects on health care seeking: simple and full logistic and cluster-robust OLS models

	All children (0-7)				Children Under 5			
	Logit	Logit Full	OLS	OLS Full	Logit	Logit Full	OLS	OLS Full
Intervention Effect	1.144	1.079	0.050	0.0202	0.762	0.626	-0.0772	-.0.097
	(0.54)	(0.27)	(0.43)	(0.17)	(-0.75)	(-1.12)	(-0.56)	(-0.75)
Year	0.844	0.902	-0.052	-0.026	0.972	0.750	-0.003	-0.074
	(-0.88)	(-0.44)	(-0.57)	(-0.29)	(-0.10)	(-0.76)	(-0.03)	(-0.76)
Treatment status	1.083	1.076	0.019	0.013	1.799*	1.870*	0.153	0.131
	(0.47)	(0.37)	(0.22)	(0.19)	(2.38)	(2.13)	(1.89)	(1.84)
Location		1.000		0.000		1.000		0.000
		(0.44)		(0.32)		(0.48)		(0.42)
Age in months,		1.187		0.039		0.567		-0.130
(under 1 year)		(0.54)		(0.60)		(-1.43)		(-1.76)
Age in months,		1.625*		0.111**		0.892		-0.026
(1 year – under 3)		(2.37)		(2.86)		(-0.41)		(-0.42)
Age in months,		1.336		0.067*		--		--
(3 years – under 5)		(1.69)		(2.48)				
Sex		0.995		-0.002		0.970		-0.005
		(-0.04)		(-0.07)		(-0.15)		(-0.13)
Orphan		0.747		-0.067		0.695		-0.079
		(-1.81)		(-1.75)		(-1.44)		(-1.56)
Child/grandchild		1.131		0.033		1.186		0.050
		(0.44)		(0.43)		(0.38)		(0.44)
Female household head		0.962		-0.008		1.048		0.013
		(-0.27)		(-0.19)		(0.21)		(0.20)
Age of household head		1.012***		0.004**		1.013*		0.003**
		(3.49)		(3.46)		(2.53)		(2.81)
Household head education		0.998		-0.000		1.004		0.002
		(-0.13)		(-0.05)		(0.15)		(0.23)
Rural		0.495**		-0.167**		0.541		-0.143
		(-3.27)		(-2.78)		(-1.92)		(-1.82)
Mosquito net		1.109		0.023		1.230		0.042
		(0.63)		(0.38)		(0.82)		(0.63)
Unprotected/ open water		1.079		0.018		1.046		0.011
source		(0.51)		(0.45)		(0.20)		(0.30)
Poor cook fuel quality		0.516*		-0.148		0.394*		-0.188
		(-2.09)		(-2.01)		(-2.04)		(-1.68)
Crowding index		0.993		-0.002		0.991		-0.002
		(-0.21)		(-0.17)		(-0.20)		(-0.13)
Asset/wealth index		0.964		-0.008		0.938		-0.013
		(-0.90)		(-0.70)		(-0.98)		(-0.94)
Food insecurity		0.849		-0.039		1.065		0.011
		(-0.90)		(-0.81)		(0.23)		(0.21)
Food expenditures		1.000		-0.000				0.000***
		(-0.53)		(-0.93)		(-0.70)		(-3.00)
Food variety		1.013		0.003		1.031		0.007
		(0.69)		(0.72)		(1.01)		(1.04)
Medical expenditures		1.000**		0.000***		1.000**		0.000***
		(2.82)		(4.46)		(2.81)		(4.84)
Distance to treatment		0.937		-0.015		0.919		-0.020
		(-1.30)		(-0.86)		(-1.13)		(-0.92)
N	568	502	536	502	265	235	250	235

Exponentiated coefficients; *t* statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 2.4: Effect of household characteristics on likelihood of contracting fever

	Dependency Ratio	Interaction Effect	Transfer size	Interaction Effect
Year	1.176	1.164	1.159	1.158
	(1.00)	(0.94)	(0.91)	(0.90)
Treatment status	0.992	0.844	0.987	0.998
	(-0.06)	(-0.94)	(-0.10)	(-0.01)
Treatment effect	0.647*	0.651*	0.662*	0.662*
	(-2.33)	(-2.30)	(-2.21)	(-2.21)
Age in months,	1.417	1.405	1.464	1.463
(under 1 year)	(1.65)	(1.61)	(1.80)	(1.80)
Age in months,	1.601***	1.595***	1.645***	1.644***
(1 year – under 3)	(3.51)	(3.48)	(3.71)	(3.70)
Age in months,	1.162	1.158	1.180	1.180
	(1.38)	(1.36)	(1.53)	(1.53)
Sex	0.852	0.854	0.853	0.854
	(-1.80)	(-1.78)	(-1.79)	(-1.78)
Orphan	0.918	0.917	0.881	0.881
	(-0.79)	(-0.80)	(-1.17)	(-1.16)
Child/grandchild	1.027	1.031	1.023	1.022
	(0.16)	(0.18)	(0.13)	(0.13)
Female Household head	1.087	1.082	1.037	1.036
	(0.87)	(0.82)	(0.37)	(0.36)
Age of household head	0.996	0.996	0.997	0.997
	(-1.71)	(-1.71)	(-1.23)	(-1.22)
Household head Education	1.003	1.002	1.000	1.000
	(0.27)	(0.19)	(-0.00)	(-0.01)
Rural	1.857***	1.859***	1.843***	1.845***
	(4.87)	(4.88)	(4.81)	(4.81)
Mosquito net	1.034	1.029	1.045	1.045
	(0.30)	(0.27)	(0.40)	(0.40)
Unprotected/open water source	0.921	0.921	0.906	0.907
	(-0.80)	(-0.79)	(-0.95)	(-0.95)
Poor cook fuel quality	0.894	0.907	0.884	0.883
	(-0.59)	(-0.51)	(-0.65)	(-0.66)
Poor toilet quality	0.654***	0.648***	0.645***	0.645***
	(-4.11)	(-4.19)	(-4.23)	(-4.23)
Crowding index	0.941**	0.942**	0.944*	0.944*
	(-2.77)	(-2.71)	(-2.57)	(-2.57)
Asset/infrastructure	0.984	0.985	0.979	0.979
wealth index	(-0.64)	(-0.62)	(-0.83)	(-0.83)
Food insecurity	1.241*	1.244*	1.240	1.240
	(1.96)	(1.98)	(1.95)	(1.96)
Food expenditure	1.000	1.000	1.000	1.000
	(-0.73)	(-0.78)	(-0.64)	(-0.64)
Food variety index	1.020	1.020	1.020	1.020
	(1.57)	(1.60)	(1.57)	(1.56)
Dependency Ratio	1.117*	0.995		
	(2.19)	(-0.05)		
Dependency Ratio * Treatment		1.169		
		(1.37)		
Small household size			1.287*	1.327
			(2.23)	(1.55)
Small household size * Treatment				0.955
				(-0.21)
N	1100	1100	1100	1100

Exponentiated coefficients; *t* statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$