The Effects of Community and Household Interventions on Birth Outcomes: Evidence from Indonesia

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Abstract

Developing countries have used different strategies to improve health outcomes, including maternal and child health. This paper compares the effectiveness of a household and a community based conditional cash transfer (CCT) programs that have been implemented in Indonesia. In comparable communities, under matching, both programs increase the use of trained attendants and facility-based delivery. Although neither program has a statistically significant effect on the incidence of low birth weight, the household CCT program is associated with a reduction in the reported incidence of preterm birth. These findings suggest that both types of CCT programs are effective in changing household behavior, but the household CCT program is more effective in improving birth outcomes.

JEL codes: I1, I3, O1

1 Introduction

Low birth weight is a global health problem that is closely related to the United Nations Millennium Development Goals (MDGs). Approximately 16% of all newborns in developing countries were born with low birth weight (SCN, 2004). Low birth weight, defined as birth weight less than 2,500 grams (5.5 lbs), contributes

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to adverse later outcomes, including neonatal mortality, stunting, and poor cognitive development and school performance which lead to lower earnings (Behrman and Rosenzweig, 2004; Almond et al., 2005). Thus, reducing the incidence of low birth weight in developing countries has substantial economic benefits, mainly by increasing productivity in adulthood, and improving the transmission of health to the next generation (Alderman and Behrman, 2006; Currie and Moretti, 2007). By improving birth outcomes, developing countries can increase the rate of human capital accumulation and economic growth.

Developing countries have used different strategies to improve birth outcomes. In this paper, I compare a targeted household-based program and a broad community-based intervention. The two interventions are rarely compared in spite of the widespread use of such programs. The household Conditional Cash Transfer (CCT) program has been used as an anti-poverty tool to increase investments in health and education in Mexico, Brazil, and many other countries. Household CCT programs have been shown to improve health-seeking behavior, and in some cases, these behavioral changes lead to improved outcomes (Fizbein et al., 2009). In spite of the success of household CCT in improving health indicators, household CCT programs are sometimes difficult to administer for reasons such as administrative complexity and supply availability (Schubert and Slater, 2006). Community-based development programs began as a strategy to empower communities and improve monitoring in development projects (Olken, 2007). More recently, Uganda and Indonesia have implemented community-based programs that target health indicators. This paper adds to the literature by comparing the effectiveness of two types of interventions in improving birth outcomes. The first program, the household CCT, targets individual households' health-seeking behavior while community-based programs target aggregate indicators. Household CCT programs provide additional resources directly to households, while community-based programs give communities resources to address supply and demand constraints. There is evidence that both types of programs are effective in attaining the targeted indicators in Indonesia (Olken et al., 2011; Alatas et al., 2011), but the two interventions are implemented in communities with different characteristics. Therefore, for a community with fixed characteristics, the type of intervention that is more effective is an empirical question.

Indonesia is ideal for this comparison because the household CCT program and the community-based program target the same indicators. Access to both programs are randomized at the sub-district level, and the programs share the same requirements. Both programs target expectant or lactating mothers, children under 5, and school-aged children. Both programs have been shown to increase prenatal visits (Olken et al., 2011; Alatas et al., 2011), but it has not been established whether these indicators translate into better birth outcomes. In this paper, the sample is restricted to communities with similar characteristics to compare the magnitude of the program effects. The comparable sub-districts in each program are selected using propensity score matching. Within matched communities, I estimate the effect of each program and the effect of the household CCT relative to the community CCT program.

Because low birth weight is difficult to measure, I include other outcomes that have been shown to be associated with low birth weight, as well as behavioral outcomes. In addition to low birth weight, other outcomes include birth weight, gestational age, preterm birth, and height for age z-score for children under 2. Gestational age and preterm birth, defined as infants delivered at less than 37 weeks of gestation, are correlated with low birth weight (Kramer, 1987). Height for age z-scores among children under 2 years old is also included because it is correlated with low birth weight (Barker, 1990). In addition to birth outcomes, behavioral outcomes are included to capture changes in women's health seeking behavior (Dow et al., 1999). Both programs require women to attend prenatal visits, so expectant mothers who participate should receive iron supplements, advice on nutrition, and better assessment of risk factors during pregnancy. These behavioral outcomes are inputs in the production of birth outcomes.

A comparison of the two programs suggests that both programs are effective in improving health-seeking behavior during pregnancy, but neither has any significant effect on low birth weight. However, under matching, the household CCT program is associated with stronger behavioral response and improvements in some birth outcomes. In particular, the household CCT program is more effective in increasing the number of prenatal visits, the use of trained delivery attendants, and facility-based delivery. For birth outcomes, the household CCT program is associated with a lower incidence of reported preterm birth, which is correlated with the incidence of low birth weight. These results suggest that the household CCT may be more effective in translating health-seeking behavior to better health outcomes, even though the program is more costly.

The remainder of the paper is organized as follows. Section 2 describes the household CCT and community CCT programs. Section 3 describes the data and estimation strategy. Section 4 presents the main results, followed by a brief discussion in section 5. Section 6 concludes.

2 Background

The Indonesian government views the household and community CCT programs as complementary social assistance programs that target women and children. The household CCT program is one of eight household-based social assistance programs, while the community CCT program is a part of a larger community-based program. The government used geographic targeting to pilot both programs in 5 provinces: West Java, East Java, North Sulawesi, Gorontalo, East Nusa Tenggara. The household CCT includes Jakarta, but it is excluded in the analysis for comparability. Both programs were piloted in 2007, with no overlap between the two programs.

For the pilot program, 80% of the poorest districts within each participating province were identified. The selection was based on malnutrition, school transition, and poverty rates. Randomization for the pilot was done at the sub-district level for both programs because many facilities, including secondary schools and community health centers, are provided at the sub-district level. The cluster design takes into account the possibility of local externalities resulting from the sub-district level treatment (Miguel and Kremer, 2004; Olken, 2007). Both programs target the same health and education indicators, which include prenatal visits, postnatal visits, immunization, and school attendance. Verification for both programs is conducted by trained facilitators. Facilitators collect monthly attendance sheets from schools in the villages, official school registers, and patient and service list from health care providers and community health workers.

2.1 Community CCT: *PNPM Generasi*[1]

Indonesia's community CCT program, *PNPM Generasi*, builds on an existing community-driven program, *PNPM* (National Program for Community Empowerment), and a previous development program, known as *Kecamatan* Development Project (KDP). *Generasi* has a budget of about US$20 million, and the program provides block grants and performance incentives at the village level. The program specifically targets short-term aggregate outcomes that are within the village's control, but the effects of the program on non-targeted indicators are important in determining the overall effectiveness of the program in improving children's health and educational outcomes. The program is demand-driven, since block grants are allocated by the

[1] *Program Nasional Pemberdayaan Masyarakat: Generasi Sehat dan Cerdas* (National Program for Community Empowerment: Healthy and Bright Generation)

communities. The funds may then be used to finance both demand and supply-side activities, which range from in-kind transfers to poor households and performance incentives for health care providers and teachers. The program seeks to improve outcomes among poor households, but individual participation is voluntary. Under this program, marginal improvements in aggregate outcomes likely come from improvements among households with limited access to health and education before the program.

Sub-districts were randomized into three treatment groups: a control group of 83 sub-districts that received no intervention, a treatment group of 88 sub-districts with no incentives and a treatment group of 93 sub-districts with incentives. The treatment arms were separated to test for income effect and incentive effect separately. The incentives link the following year's block grant to the current year's village performance relative to other villages in the same sub-district. These incentives increase the village's efforts both by encouraging a more effective allocation of the funds and increasing outreach to mothers and children. Competition between villages is done at the sub-district level to take into account differences across sub-districts. Each village's share of the incentives pool is determined by the village's performance on each indicator[2], the weight of each indicator and the predicted minimum achievement level. The predicted minimum achievement level is based on historical national data sets[3]. Both treatment arms are combined into one treatment group in this paper, so the estimated effect is a combination of the income effect and the incentive effect.

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[2] $ShareOfBonus_v = P_v/(\sum P_j)$ where $P_v = \Sigma[w_i \times (y_{vi} - m_{vi})]$. In this formula, y_{vi} represents village v's performance on indicator i, w_i represents the weight for indicator i, m_{vi} represents the predicted minimum achievement level for village v and indicator i, and P_v is the total number of bonus "points" earned by village v (Olken et al., 2010). The weights are shown in table A.1.

[3] Predicted levels are based on the Socio-economic survey, SUSENAS 2007 and census of villages, PODES 2003

2.2 Household CCT: *Program Keluarga Harapan*[4] (PKH)

Indonesia's household CCT program, PKH, was inspired by the success of Mexico's household CCT program, PROGRESA (now *Oportunidades*). The Indonesian government implemented PKH as a social assistance program targeted to poor families, with an initial budget of about US$40 million. PKH was piloted in sub-districts that were considered "supply-ready". This selection was done to ensure that local health and education facilities would be able to take in the additional uptake of patients and students. A lower threshold was set for sub-districts outside of the main island of Java because health and education services are more limited off-Java. 329 sub-districts were randomized into treatment and 259 sub-districts were in the control group. Within treated sub-districts, PKH targeted households classified as extremely poor by Statistics Indonesia (*Badan Pusat Statistik*, BPS). BPS used a proxy-means test to identify program beneficiary. From the pool of extremely poor households, households with expectant or lactating women, children under 5, and children 6-15 years old or children 16-18 years old who have not completed 9 years of education are eligible for PKH. Virtually all eligible households that were offered the program accepted.

Similar to other household CCT programs, PKH delivers a quarterly cash transfer to mothers, which is done through the nearest post office. The amount of transfer per household is based on household composition, ranging from a minimum transfer of *Rp.* 600,000 (~USD 60) to a maximum of *Rp.* 2,200,000 (~USD 220). The amount of the transfer is 15 to 20% of estimated consumption of poor households, which is in line with other household CCT programs. Each household receives the quarterly transfer so long as they meet the program's pre-specified requirements. The PKH district office checks for compliance before initiating quarterly payments. Non-compliant households will first receive a warning letter delivered by the facilitator.

[4] *Program Keluarga Harapan*: the Hopeful Family Program

A second breach will result in a 10% loss of benefit. A third breach will result in expulsion.

3 Data and Estimation

3.1 Data

The data comes from the household and health provider surveys conducted for the impact evaluation of both programs. Three waves of the survey were carried out for eligible community CCT areas, and two waves of the survey were carried out for eligible household CCT areas as part of the evaluation series. Wave I, the baseline round, was conducted in 2007 prior to program implementation. Wave II, the first follow-up survey for the community CCT, was conducted in 2008. Wave III was conducted in 2009 for both programs.

Households, villages, and sub-district clinics were surveyed for both the community and household CCT programs. Each wave of the community CCT survey sampled 2,313 villages. In the follow-up community CCT surveys, households in 50% of the randomly selected villages formed a panel. In the third wave of the community CCT survey, there are 12,306 households, with 6,708 children under the age of 3. The household CCT survey follows a panel of 14,326 households in 2,723 villages. 98% of households were re-interviewed at follow-up in wave III. The household CCT survey has 13,602 married women, and 5,616 children under the age of 3.

For both programs, villages, health facilities and schools were contacted again to form a panel. All sub-district health clinics (*Puskesmas*) were re-interviewed. In the third wave of the survey, there are 300 *Puskesmas* in community CCT areas, and 357 *Puskesmas* in household CCT areas. Midwives in the communities are also sampled, and a fraction were followed to form a panel for both the community and household CCT programs. The community survey includes questions on the availability of services in the village, as well as the distance to the nearest providers. This paper uses information from sub-district level health centers as well as village report to compare service availability in sub-districts in the two programs.

Following WHO guideline[5], this paper uses the availability of infrastructure, medical supplies, and the number of health workers to categorize supply-readiness at the sub-district level. The survey of sub-district clinics contains information on the availability of medical equipment and vaccines, as well as personnel availability. Medical equipment availability includes hemoglobin meter, forceps, speculum, tenaculum, uterus probe, OB/GYN exam table, clamps, oxygen concentrator, neonatal incubator, weighing scale, and vaccine carrier. Vaccine availability includes BCG (for tuberculosis), DPT (Diphtheria, Pertussis, and Tetanus), DPT-Hepatitis B combo, polio, hepatitis B, measles, and tetanus toxoid. For infrastructure availability, the village survey contains information on the availability of health facilities and personnel in the villages. This village-level information is then aggregated to the sub-district level.

The household survey contains a survey of ever married women, which is the main data source for this paper. This survey contains detailed pregnancy history in the 24 months prior to the survey. The survey includes the information on each birth such as prenatal care, delivery assistance, birth weight, gender, and postnatal care. Low birth weight is available conditional on the child being weighed at birth, so the probability of being weighed at birth is included to capture selection in reporting. Low birth weight is defined using the standard definition of birth weight under 2,500 grams. Infant death includes stillbirths and deaths up to 12 months. The survey also includes information on education, employment status, households' asset ownership, and per capita expenditure.

The outcome variable of interest, low birth weight, is likely measured with error,

[5] http://www.who.int/healthinfo/systems/SARA_OverviewPresentation.pdf

so other variables that have been shown to be correlated with low birth weight are included to check for the consistency of outcomes. Women are asked to report birth weight in grams and gestational age in weeks. In addition to these outcomes, preterm birth is included since it is correlated with low birth weight (Barker, 1990; Miceli et al., 2000). To capture the possibility of improved reporting of low birth weight, the probability of being weighed at birth is included as an additional outcome. Birth weight may also be measured with error, especially when women choose home birth. To address this measurement error, birth outcomes include height-for-age z-score among children under 24 months, which is also correlated with birth weight. The height-for-age z-score may better capture the program effect because children's anthropometric measures were taken during the survey. Because of the possibility of measurement error, the following birth outcomes are included: indicators for low birth weight, preterm birth, and being weighed at birth, as well as gestational age in weeks, birth weight in grams, and height-for-age z-score.

In addition to birth outcomes, women were also asked questions on prenatal and postnatal care. The questions include the number of visits, the services received, place of delivery, and delivery assistance. These behavioral outcomes are included because they serve as inputs in the production of birth outcomes. The outcomes of interest are: the number of prenatal and postnatal visits, as well as indicators for at least one tetanus vaccination during pregnancy, receiving iron pills during pregnancy, delivery attended by a health care professional, and delivery at a facility.

3.2 Estimation Strategy

In order to select similar sub-districts to compare the two programs, this paper uses propensity score matching. Sub-districts are eligible for the household CCT if they are considered supply-ready, so sub-districts that are randomized into the two programs are matched based on their supply-readiness. Additional community characteristics are also included to capture the socio-economic characteristics of the sub-districts. The following variables are used to match sub-districts in the household CCT program to sub-districts in the community CCT program: the sub-district's fraction of poor households, access to piped water, an indicator for agricultural communities, and distance to the nearest market. The supply readiness measures include distance to the nearest sub-district clinic, the availability of equipment and vaccines at the sub-district clinic, as well as the number of doctors, midwives, health posts, and schools.

Matching provides a causal inference when selection into treatment is based on observed characteristics (Heckman et al., 1998; Rosenbaum and Rubin, 1983). Matching's main assumption is that the outcome, Y, is independent of treatment, D, once the relevant characteristics, Z, are taken into account, or:

$$Y^0, Y^1 \perp D|Z$$

This assumption is plausible because eligibility for the household CCT program only depends on supply readiness. In this case, the matched sample contains sub-districts that share similar socio-economic characteristics and service availability. The outcomes of interest are aggregated to the sub-district level from individual-level data from the evaluation surveys. The estimated treatment on the treated parameter is the effect of the household CCT relative to the community CCT on behavioral outcomes and birth outcomes. In this case, the treatment group, $D = 1$, is sub-districts that are randomized into the household CCT, and the comparison group is similar sub-districts that are randomized into the community CCT.

This paper uses matching followed by difference-in-differences to estimate the treatment effect (Abadie, 2005; Heckman et al., 1997, 1998). The treatment on the treated parameter, $E[Y^1(1) - Y^0(1)|X, D = 1] = \hat{\beta}$, is given by the following:

$$\hat{\beta} = (\frac{1}{n}\Sigma_{i=1}^n X_{ki}\hat{\pi}(X_i)X_{ki}^{'})^{-1}\frac{1}{n}\Sigma_{i=1}^n X_{ki}\hat{\pi}(X_i)[Y(1) - Y(0)]$$

where $\hat{\pi}(X_i)$ is an estimator of the propensity score,$\pi_0(X) = P(D = 1|X)$, which is estimated using probit[6]. X_k is a deterministic function of X, and may contain a subset of variables in X. $Y(1) - Y(0)$ is the difference in outcomes post-intervention, $t = 1$, and pre-intervention, $t = 0$. The estimation of the standard errors follows the estimation proposed by Abadie (2005).

Although matching can be used to select sub-districts with similar characteristics, the households sampled in the two surveys are not directly comparable. As an alternative specification, a difference-in-differences model is also estimated at the individual level using Inverse Probability Weighting (IPW). The households in the household CCT sample are drawn from the near-poor and poor category, because this is the group that is most likely affected by the household CCT program. On the other hand, the community CCT randomly samples households because all households in the community are eligible for the program. To take this difference in sampling into account, the individual-level observations are re-weighted using individual characteristics, as well as sub-district characteristics to reflect the sampling frame. The individual characteristics include land ownership, education of the head of the household, home ownership, and per capita log expenditure. The weights are generated using probit[7]. For all the analysis, the Holm-Bonferroni method is used to adjust for the hypothesis testing of multiple outcomes (Holm, 1979). The first set of joint hypothesis is the behavioral outcomes and the second set is the birth outcomes.

[6]Using logit yields qualitatively similar results.
[7]The results are qualitatively similar when logit is used.

3.3 Summary Statistics

Matched sub-districts share similar baseline characteristics. Figure 1 shows the propensity score and common support region for sub-districts in the matched sample. Within the common-support region, the balancing property is satisfied. 15% of sub-districts in the household CCT sample are off the common-support region, which is unsurprising given the different designs of the two programs. Sub-districts that are off-support are more likely to be urban and have a shorter distance to the nearest sub-district clinic and market.

Table 1 presents the characteristics of matched sub-districts. Columns 1 and 2 present baseline means and column 3 presents baseline differences between sub-districts in the household CCT program and comparable sub-districts in the community CCT program. Panel A presents the supply readiness of the matched sub-districts. Sub-districts in the matched sample have access to similar numbers of health posts and sub-district health clinics. Since the household CCT program seeks sub-districts that are supply ready, sub-districts in the household CCT have access to more doctors and midwives in the matched sample. However, these baseline differences are not jointly significant. In addition, the matched sub-districts have similar vaccine and equipment availability.

Panel B presents the socio-economic characteristics of the matched sub-districts. Sub-districts in the matched sample share similar socio-economic characteristics at baseline. For both programs, about 50% of households in each sub-district are poor. Access to piped water is similarly low in the matched sample. Because the household CCT program is implemented in more urban communities, in the matched sample, sub-districts in the household CCT program are less likely to be in agriculture, and are closer to the nearest market. These baseline differences are jointly significant at the 10% level. In spite of these baseline differences, the propensity score matching has matched sub-districts with similar supply-readiness, which is the main criterion for inclusion into the household CCT program.

Baseline outcomes of interest for sub-districts in the household CCT program are similar to those in the community CCT program. In the matched sample, households in the household CCT program report fewer prenatal visits, tetanus toxoid vaccinations, and iron pills. However, the baseline differences in behavioral outcomes are not jointly significant. For birth outcomes, the matched sample is well balanced. Each baseline difference is not statistically significant and they are not jointly significant. Overall, in the matched sample, sub-districts in the household CCT program share similar observed characteristics with sub-districts in the community CCT program.

4 Results

Both programs seek to improve maternal and child health by requiring households to obtain health-care services, which serve as inputs in the production of birth outcomes. The first set of outcomes present changes in health-seeking behavior, followed by changes in birth outcomes. Table 2 presents a comparison of the household and community CCT programs using the entire, unmatched sample. Column 1 presents baseline means for the household CCT control group and column 2 presents the difference-in-difference estimates for the household CCT program. Similarly, columns 3 and 4 correspond to baseline means and estimates for the community CCT program. Both programs are effective in improving behavioral outcomes, particularly in the receipt of iron pills and post-natal visits. Both programs have no significant effect on the incidence of low birth weight, but the household CCT program is associated with a lower reported incidence of preterm birth. This simple comparison of the two programs suggests that they are both effective in improving behavioral outcomes, but the effect on reported preterm birth appears to be stronger in the household CCT program. Since the confidence intervals overlap for most of the outcomes of interest, it is unclear whether the household and community CCT programs yield different outcomes. In addition, this simple comparison does not take into account the difference in the program design.

Using matched sub-districts, table A.6 presents the effect of each program. Both programs are effective in increasing the use of trained delivery attendants and facility-based delivery. For birth outcomes, both programs are associated with increased gestational age and a higher probability of being weighed at birth. In addition, the household CCT program is associated with a reduction in the reported incidence of preterm birth. These results suggest that both programs are effective in improving health-seeking behavior and some birth outcomes, but the confidence intervals overlap for most outcomes.

Table 3 presents the effect of the household CCT program relative to the community CCT program at the sub-district level. The average outcomes for sub-districts randomized into the household CCT are listed in column 1, and column 2 presents average outcomes for sub-districts randomized into the community CCT. Column 3 presents the estimated treatment on the treated parameter under matching and column 4 presents the estimated effect under the weighted difference-in-difference model. Under matching, in column 3, the household CCT is associated with better health-seeking behavior and some improvements in birth outcomes. With the Holm-Bonferroni correction, the household CCT program is associated with a 0.5 additional prenatal visits, a 9 percentage-point increase in the use of a trained delivery attendant, and a 13 percentage-point higher probability of facility-based delivery compared to the community CCT program. The household CCT program is also associated with a lower reported incidence of preterm birth and a higher probability of being weighed at birth.

To take into account the longitudinal nature of the sub-district sample, column 4 of table 3 presents weighted difference-in-differences estimates using matched sub-districts. The household CCT program is associated with a 0.6 additional prenatal visits, a 10 percentage point increase in the use of a trained delivery attendant, and a 13 percentage-point higher probability of facility-based delivery relative to the community CCT program. Even though both programs have no significant effect on the reported incidence of low birth weight, the household CCT is associated with improvements in some birth outcomes: higher gestational age, lower reported incidence of preterm birth, and higher height-for-age z-score among children under 2. After adjusting for multiple hypothesis testing, the household CCT is associated with a 23 percentage point lower reported incidence of preterm birth and a 7 percentage point higher probability of being weighed at birth. These results suggest that even though the household CCT program has no significant effect on the reported incidence of low birth weight, these results provide suggestive evidence that the household CCT is more effective in improving behavioral outcomes, as well as some birth outcomes.

4.1 Robustness

For robustness, table 4 uses a restricted matched sample. Within the common support region, the number of observations in each program is most balanced among sub-districts with propensity score between 0.2 and 0.8. Therefore, for robustness, sub-districts with propensity scores of less than 0.2 or greater than 0.8 are excluded. Column 1 presents the average outcome in the household CCT program, and column 2 presents those in the community CCT program. Column 3 presents the average treatment on the treated using matching, and column 4 presents the weighted difference-in-differences estimates. The estimates are qualitatively similar to earlier results in table 3. In particular, compared to the community CCT program, the household CCT program is associated with a higher number of prenatal visits, increased use of trained delivery attendants, and facility-based delivery. For birth outcomes, the household CCT program is associated with a 24 percentage point reduction in the reported incidence of preterm birth and a 7 percentage point increase in the probability of being weighed at birth.

As an alternative specification to sub-district level matching, inverse probability weighting is used to estimate a difference-in-difference model using individual-level observations. The difference-in-difference estimate captures the effect of the household CCT program relative to the community CCT program. To take into account the different sampling schemes for the two programs, individual and sub-district characteristics are used to re-weight all individual observations. The weighted characteristics of the sub-districts are similar at baseline. Using the IPW weights, sub-districts in the two programs have approximately the same number of doctors, midwives, clinics, and health posts at baseline. In addition, the socio-economic characteristics of the sub-districts are similar at baseline.

Table 5 presents difference-in-difference estimates using IPW weights. Columns 1 and 2 present baseline means for the household CCT program and the community CCT program. Column 3 presents the weighted estimates. Using IPW, the household CCT program is also associated with improved health-seeking behavior and improvements in some birth outcomes relative to the community CCT program. For behavioral outcomes, the household CCT program is associated with increased prenatal visits, the use of trained delivery attendants, and facility-based delivery. For birth outcomes, the household CCT program is associated with a reduction in the reported incidence of low birth weight, an increase in height-for-age z-score among children under 2, and increased gestational age. The estimates under IPW are consistent with earlier matching estimates. These results suggest that among similar households, the more targeted household CCT program is associated with a stronger response in health-seeking behavior, as well as some birth outcomes.

5 Discussion

Community-based programs provide an alternative strategy in areas with more limited supply of services or low accountability. In terms of program effects at the household level, we expect CCT programs to generate stronger effects because participating households receive cash transfers they can use directly for health and education, while the resources through community-based programs are dispersed across more households. Household CCT programs have been implemented in many developing countries, and they have been shown to improve health outcomes, but the evidence on early life outcomes is mixed.

The results on height-for-age for children under 2 are consistent with Indonesia's household CCT impact evaluation (Alatas et al., 2011) that finds a positive but not statistically significant effect on height-for-age among children under 5 years. CCT programs have been shown to improve health outcomes among children under 24 months in Mexico and Colombia (Fizbein et al., 2009). Mexico's *Oportunidades* randomized trial led to a 127 gram increase in birth weight and a 4% decline in the incidence of low birth weight (Barber and Gertler, 2008, 2010), which is driven by improvements in prenatal quality. The program also led to a 1.1 standard deviation increase in height among children under 6 months (Rivera et al., 2004). In Colombia, CCT led to a 16% increase in height-for-age z-score for children under 24 months (Attanasio et al., 2005). However, there is no statistically significant effect in Brazil (Morris et al., 2004), Nicaragua (Macours et al., 2008) or Ecuador (Paxson and Schady, 2010) among children under 24 months. Similarly, the results of this paper suggest that the results of household CCT on health outcomes are mixed.

Community-based programs have been implemented to target health and education services, and they have been shown to improve children's health outcomes but there is no evidence of the effect on the incidence of low birth weight. In general, the results here are consistent with the community CCT impact evaluation (Olken et al., 2011). They find that the community CCT program is associated with a lower percentage of malnourished children (weight-for-age z-score) by 12%, but there is no significant effect on height-for-age. This contrasts with findings from a community-based program in Uganda. This program uses community report cards to improve accountability and quality of health care services. Björkman and Svensson (2009) find a 0.17 increase in z-score weight among infants less than 18 months and a 33% reduction in child deaths one year after program implementation.

Even though both the household and community CCT programs are cost-effective in Indonesia, the cost per targeted indicator is lower under the community-based program. The household CCT program costs about US$20 per point, while the community CCT program costs about US$8 to 11 per point (Olken et al., 2011). Similarly, in terms of cost-effectiveness, in the matched sample, it would cost about US$4 million to obtain a one percentage point increase in the use of trained delivery attendants, while the cost would be about US$2 million under the community CCT program. The results and the cost consideration suggest that the community CCT is effective in improving health-seeking behavior. However, the targeted and more resource-intensive household CCT appears to have generated a stronger response that lead to some improved birth outcomes.

6 Conclusion

In communities with similar supply-readiness, Indonesia's household CCT program is associated with a stronger response on birth outcomes although both the household and community CCT programs are effective in increasing health seeking behavior. The targeting in the household CCT program effectively reaches households that were most likely to benefit from early health investments, while the community CCT participants are self-selected. In spite of the stronger response associated with the household CCT, in terms of cost-effectiveness, community-based programs are cheaper and simpler to administer. In order to combine the relative cost-effectiveness of the community CCT program and the targeting of the household CCT program, it may be possible to incorporate some targeting component into the community CCT program without a considerable increase in cost.

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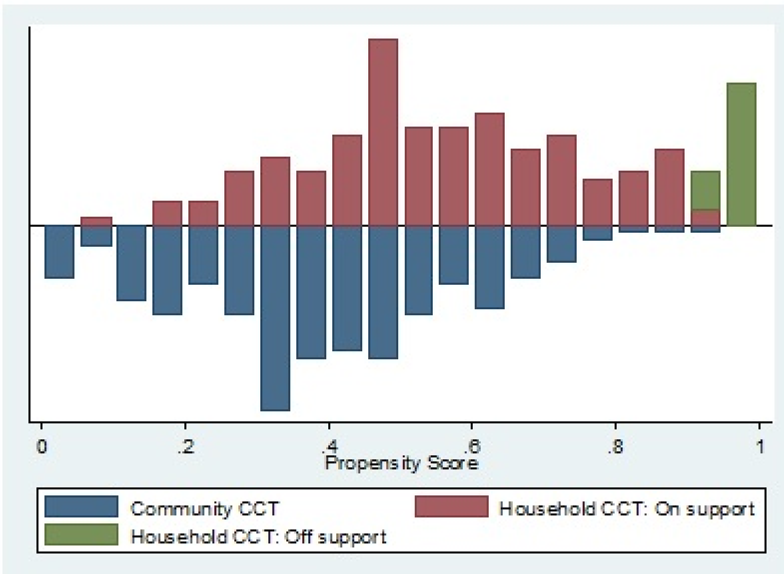
Tables and Figures

Figure 1: Propensity Score



Propensity score	Sample: Household CCT (PKH)	Sample: Community CCT (*Generasi*)
0.0-0.2	4	32
0.2-0.4	26	63
0.4-0.6	63	55
0.6-0.8	43	25
>0.8	43	3
Total	179	178

Notes: Probit regression used to obtain propensity scores. Baseline variables used for matching: sub-district's fraction of poor households, access to piped water, an indicator for agricultural communities, and distance to the nearest market. Supply readiness measures: distance to the nearest sub-district clinic, the availability of equipment and vaccines at the sub-district clinic, as well as the number of doctors, midwives, health posts, and schools.

Table 1: Matched Sample: Baseline Community Characteristics

	Household CCT Baseline Mean	Community CCT Baseline Mean	Difference
	(1)	(2)	(3)
Panel A. Supply Readiness			
Number of Doctors	0.674	0.559	0.115*
	(0.654)	(0.521)	(0.065)
Number of midwives	0.956	0.907	0.049*
	(0.244)	(0.255)	(0.027)
Number of health posts	37.535	35.140	2.395
	(20.883)	(15.079)	(2.022)
Number of sub-district	0.787	0.787	0.000
clinics	(0.411)	(0.411)	(0.045)
Panel B. Socio-Economic Characteristics			
Fraction poor	0.493	0.510	-0.016
	(0.163)	(0.181)	(0.018)
Piped water	0.118	0.122	-0.004
	(0.172)	(0.169)	(0.018)
Majority agriculture	0.923	0.964	-0.040***
	(0.132)	(0.099)	(0.0129)
Distance to nearest	3.657	5.331	-1.674***
market	(2.395)	(4.085)	(0.362)

Notes: Baseline characteristics of matched sub-districts. Panel A uses information from the village and sub-district clinic surveys. Panel B uses village-level response, aggregated to the sub-district level. Baseline differences in other supply readiness measures (equipment and vaccine availability) are not statistically significant. Baseline differences are not jointly significant. Standard errors in parentheses * p<0.1, **p<0.05, ***p<0.01.

Table 2: Full Sample: Unweighted Reduced Form Individual-Level Estimates

	Household CCT		Community CCT	
	Baseline Mean	Coefficient	Baseline Mean	Coefficient
	(1)	(2)	(3)	(4)
Panel A. Behavioral Outcomes				
Prenatal visits	6.417	0.570***	7.438	0.028
	(4.500)	(0.150)	(4.338)	(0.127)
Tetanus toxoid	0.736	-0.020	0.834	0.002
	(0.441)	(0.014)	(0.372)	(0.009)
Received iron	0.113	0.034**	0.152	0.029**
	(0.316)	(0.013)	(0.359)	(0.013)
Delivery by	0.600	0.094***	0.649	0.012
professional	(0.490)	(0.016)	(0.477)	(0.015)
Facility birth	0.416	0.115	0.352	-0.033
	(0.493)	(0.103)	(0.478)	(0.079)
Postnatal visits	1.339	0.118***	1.688	0.034***
	(2.301)	(0.014)	(2.443)	(0.008)
Panel B. Pregnancy Outcomes				
Miscarriage	0.025	0.012*	0.017	0.001
	(0.156)	(0.006)	(0.130)	(0.003)
Gestational age	36.052	0.370	36.045	-0.047
(weeks)	(4.619)	(0.251)	(4.236)	(0.144)
Preterm birth	0.600	-0.213***	0.630	0.011
	(0.491)	(0.025)	(0.483)	(0.017)
Weighed at birth	0.756	0.069***	0.777	0.008
	(0.429)	(0.015)	(0.417)	(0.013)
Birth weight	3,120	-8.30	3,163	-24.12
(grams)	(546.26)	(26.47)	(613.25)	(17.73)
Low birth weight	0.066	0.020*	0.088	0.002
	(0.249)	(0.012)	(0.283)	(0.008)
Height for age	-1.436	0.150	-1.260	0.096
z-score	(2.204)	(0.107)	(2.113)	(0.107)

Notes: Standard errors in parentheses * p<0.1, **p<0.05, ***p<0.01.

Table 3: Matching Estimates: Sub-District Level

	Household CCT Mean	Community CCT Mean	Matching Estimate	Weighted Difference
	(1)	(2)	(3)	(4)
Panel A. Behavioral Outcomes				
Prenatal visits	7.103	6.570	0.533**	0.603***
			(0.216)	(0.168)
Tetanus toxoid	0.764	0.795	-0.031*	-0.027*
			(0.017)	(0.015)
Iron	0.145	0.117	0.027	0.031**
			(0.017)	(0.014)
Delivery by professional	0.731	0.641	0.090***	0.097***
			(0.030)	(0.017)
Facility birth	0.567	0.437	0.130***	0.129***
			(0.036)	(0.018)
Postnatal visits	1.720	1.598	0.122	0.125
			(0.137)	(0.119)
Panel B. Birth Outcomes				
Gestational age (weeks)	36.348	35.822	0.525*	0.485*
			(0.278)	(0.270)
Preterm birth	0.363	0.600	-0.237***	-0.223***
			(0.028)	(0.0261)
Weighed at birth	0.826	0.765	0.061**	0.076***
			(0.025)	(0.014)
Birth weight (grams)	3,171	3,171	0.092	-4.97
			(29.67)	(24.91)
Low birth weight	0.086	0.082	0.004	0.010
			(0.015)	(0.013)
Height for age z-score	-1.117	-1.354	0.237*	0.247**
			(0.126)	(0.116)

Notes: Standard errors in parentheses * p<0.1, **p<0.05, ***p<0.01.

Table 4: Restricted Matched Sample: Sub-District Level Estimates

	Household CCT Mean	Community CCT Mean	Difference	Weighted Difference
	(1)	(2)	(3)	(4)
Panel A. Behavioral Outcomes				
Prenatal visits	7.139	6.599	0.540	0.638***
			(0.242)	(0.0569)
Tetanus toxoid	0.764	0.796	-0.032	-0.0295*
			(0.021)	(0.0166)
Iron	0.153	0.124	0.028	0.0294
			(0.021)	(0.0184)
Delivery by professional	0.728	0.647	0.081	0.0907***
			(0.035)	(0.0188)
Facility birth	0.573	0.442	0.131	0.132***
			(0.043)	(0.0220)
Postnatal visits	1.730	1.606	0.124	0.119
			(0.161)	(0.143)
Panel B. Birth Outcomes				
Gestational age (weeks)	36.601	35.835	0.766	0.754**
			(0.324)	(0.340)
Preterm birth	0.346	0.603	-0.257	-0.245***
			(0.033)	(0.0317)
Weighed at birth	0.826	0.764	0.063	0.0750***
			(0.031)	(0.0174)
Birth weight (grams)	3,153	3,168	-15.576	-20.21
			(33.840)	(28.33)
Low birth weight	0.088	0.084	0.004	0.00923
			(0.017)	(0.0147)
Height for age z-score	-1.108	-1.387	0.279	0.292**
			(0.148)	(0.127)

Notes: Standard errors in parentheses * p<0.1, **p<0.05, ***p<0.01.

Table 5: Individual-Level IPW Estimates

	Household CCT Baseline Mean (1)	Community CCT Baseline Mean (2)	Weighted Difference (3)
Panel A. Behavioral Outcomes			
Prenatal visits	6.650	7.544	0.281***
	(0.122)	(0.097)	(0.027)
Tetanus toxoid	0.804	0.818	-0.024*
	(0.011)	(0.009)	(0.013)
Iron	0.130	0.148	-0.046***
	(0.013)	(0.008)	(0.017)
Delivery by	0.642	0.657	0.140***
professional	(0.016)	(0.012)	(0.022)
Facility birth	0.432	0.380	0.051***
	(0.017)	(0.012)	(0.015)
Postnatal visits	1.868	1.625	0.0142
	(0.116)	(0.057)	(0.139)
Panel B. Birth Outcomes			
Gestational age	35.671	36.145	0.417**
(weeks)	(0.169)	(0.091)	(0.174)
Preterm birth	0.626	0.599	0.045*
	(0.015)	(0.013)	(0.026)
Weighed at birth	0.782	0.791	-0.007
	(0.013)	(0.010)	(0.032)
Birth weight	3,166.828	3,131.820	-6.163
(grams)	(27.609)	(23.219)	(24.24)
Low birth weight	0.092	0.085	-0.0380***
	(0.015)	(0.011)	(0.009)
Height for age	-1.364	-1.315	0.415***
z-score	(0.073)	(0.056)	(0.122)

Notes: Standard errors in parentheses * $p<0.1$, **$p<0.05$, ***$p<0.01$.

Table A.1: Targeted Indicators

Performance metric	Weight per measured achievement	Potential times per person per year	Potential points per person per year
1. Prenatal care visit	12	4	48
2. Iron tablets (30 pill packet)	7	3	21
3. Childbirth assisted by trained professional	100	1	100
4. Postnatal care visit	25	2	50
5. Immunization	4	12	48
6. Monthly weight increases	4	12	48
7. Monthly weighing	2	12	24
8. Vitamin A pill	10	2	20
9. Primary enrollment	25	1	25
10. Monthly primary attendance >= 85%	2	12	24
11. Middle school enrollment	50	1	50
12. Monthly middle school attendance >= 85%	5	12	60

Source: World Bank Report

Table A.2: Household CCT Cash Transfer

Fixed cash transfer	200,000	
Cash transfer per household with:		
	Child less than 6 years old	800,000
	Pregnant or lactating mother	800,000
	Child of primary school age (6-12)	400,000
	Child of secondary school age	800,000
Minimum transfer per household		600,000
Maximum transfer per household		2,200,000

Source: World Bank, Government of Indonesia: Ministry of Social Affairs (*Kemensos*)

Table A.3: Propensity Score Regression

Dependent variable:		P(Household CCT)
Equipment at sub-district clinic:	Haemoglobin meter	-0.883***
		(0.342)
	Forceps	-0.274

Table A.3: Propensity Score Regression

		(0.171)
	Speculum	-1.660**
		(0.808)
	Tenaculum	-0.0163
		(0.216)
	Uterus probe	-0.176
		(0.353)
	OB/GYN exam table	0.123
		(0.316)
	Clamps	-0.0989
		(0.422)
	Oxygen concentrator	0.00274
		(0.203)
	Neonatal incubator	0.0475
		(0.165)
	Weighing scale	-0.401
		(0.414)
	Vaccine carrier	-0.0526
		(0.397)
Vaccine availability:	BCG	-1.121**
		(0.571)
	DPT	0.394
		(0.331)
	DPT-Hep. B Combo	-0.260
		(0.549)

Table A.3: Propensity Score Regression

Polio	-0.588
	(0.944)
Hepatitis B	0.192
	(0.524)
Measles	-2.663
	(337.7)
Tetanus toxoid	0.116
	(0.566)

Table A.3: Propensity Score Regression

Distance to nearest clinic		-0.0684**
		(0.0303)
Number of doctors		0.0805
		(0.151)
Number of nurses		0.0732
		(0.0945)
Number of midwives		0.322
		(0.338)
Number of clinics		-0.109
		(0.193)
Number of private providers		-0.207
		(0.180)
Number of public hospitals		-0.183
		(0.318)
Number of health posts		0.00590
		(0.00570)
Number of schools		-0.00873
		(0.00681)
Socio-economic characteristics:	Fraction poor	0.505
		(0.544)
	Piped water	-0.543
		(0.458)
	Majority agriculture	-2.016***
		(0.684)
	Distance to nearest market	-0.102***

Table A.3: Propensity Score Regression

	(0.0307)

Notes: Probit regression used.

Standard errors in parentheses * p<0.1, **p<0.05, ***p<0.01.

Table A.4: Matched Sample: Baseline Clinic Characteristics

	Household CCT Baseline Mean	Community CCT Baseline Mean	Difference
	(1)	(2)	(3)
Panel A. Equipment Availability			
Haemoglobin meter	0.923	0.955	-0.0325
	(0.268)	(0.208)	(0.0266)
Forceps	0.361	0.421	-0.0601
	(0.482)	(0.495)	(0.0536)
Speculum	0.981	0.994	-0.0137
	(0.138)	(0.075)	(0.0124)
Tenaculum	0.806	0.820	-0.0138
	(0.396)	(0.385)	(0.0430)
Uterus probe	0.929	0.949	-0.0204
	(0.258)	(0.220)	(0.0264)
OB/GYN exam table	0.935	0.916	0.0198
	(0.246)	(0.279)	(0.0288)
Clamps	0.948	0.966	-0.0179
	(0.222)	(0.181)	(0.0224)

Table A.4: Matched Sample: Baseline Clinic Characteristics

Oxygen concentrator	0.794	0.764	0.0295
	(0.406)	(0.426)	(0.0456)
Neonatal incubator	0.406	0.461	-0.0542
	(0.493)	(0.500)	(0.0545)
Weighing scale	0.948	0.972	-0.0235
	(0.222)	(0.166)	(0.0217)
Vaccine carrier	0.961	0.961	0.000616
	(0.194)	(0.195)	(0.0213)
Panel B. Vaccine availability			
BCG	0.955	0.983	-0.0283
	(0.208)	(0.129)	(0.0193)
DPT	0.768	0.725	0.0430
	(0.424)	(0.448)	(0.0478)
DPT-Hep. B Combo	0.935	0.916	0.0198
	(0.246)	(0.279)	(0.0288)
Polio	0.987	0.989	-0.00167
	(0.113)	(0.106)	(0.0121)
Hepatitis B	0.935	0.927	0.00852
	(0.246)	(0.261)	(0.0278)
Measles	0.994	0.994	-0.000834
	(0.080)	(0.075)	(0.00855)

Table A.4: Matched Sample: Baseline Clinic Characteristics

Tetanus toxoid	0.974	0.972	0.00228
	(0.159)	(0.166)	(0.0178)

Standard errors in parentheses * p<0.1, **p<0.05, ***p<0.01.

Table A.5: Matched Sample: Baseline Behavioral and Birth Outcomes

	Household CCT Baseline Mean	Community CCT Baseline Mean	Difference
	(1)	(2)	(3)
Panel A. Behavioral Outcomes			
Prenatal visits	6.639	7.541	-0.928***
	(4.377)	(4.325)	(0.216)
Tetanus toxoid	0.795	0.824	-0.0285*
	(0.404)	(0.381)	(0.0158)
Iron	0.123	0.150	-0.0263*
	(0.329)	(0.357)	(0.0145)
Delivery by professional	0.643	0.661	-0.0092
	(0.479)	(0.474)	(0.0320)
Facility birth	0.435	0.387	0.0495
	(0.496)	(0.487)	(0.0354)
Postnatal visits	1.570	1.707	-0.104
	(2.524)	(2.457)	(0.113)
Panel B. Birth Outcomes			
Gestational age	35.861	36.060	0.251
(weeks)	(4.865)	(4.444)	(0.196)
Preterm birth	0.607	0.603	-0.00128
	(0.488)	(0.489)	(0.0276)
Weighed at birth	0.773	0.796	0.0255
	(0.419)	(0.403)	(0.0277)
Birth weight	3,166.026	3,163.001	9.152
(grams)	(564.246)	(541.003)	(26.92)
Low birth weight	0.080	0.075	-0.0112
	(0.271)	(0.263)	(0.0112)
Height for age	-1.324	-1.277	0.0359
z-score	(2.100)	(2.108)	(0.103)

Notes: Individual behavioral and birth outcomes aggregated to the sub-district level. Standard errors in parentheses * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table A.6: Matched Sample: Reduced Form Estimates

	Household CCT		Community CCT	
	Baseline Mean	Coefficient	Baseline Mean	Coefficient
	(1)	(2)	(3)	(4)
Panel A. Behavioral Outcomes				
Prenatal visits	6.639	0.528***	7.541	0.214
	(4.377)	(0.168)	(4.325)	(0.172)
Tetanus toxoid	0.795	-0.047***	0.824	0.002
	(0.404)	(0.018)	(0.381)	(0.009)
Received iron	0.123	0.027	0.150	0.115***
	(0.329)	(0.017)	(0.357)	(0.020)
Delivery by	0.643	0.100***	0.661	0.098***
professional	(0.479)	(0.020)	(0.474)	(0.019)
Facility birth	0.435	0.138***	0.387	0.046**
	(0.496)	(0.017)	(0.487)	(0.018)
Postnatal visits	1.570	0.140	1.707	-0.099
	(2.524)	(0.121)	(2.457)	(0.112)
Panel B. Pregnancy Outcomes				
Miscarriage	0.031	0.012	0.018	0.002
	(0.174)	(0.006)	(0.132)	(0.004)
Gestational age	35.861	1.163***	36.060	0.704***
(weeks)	(4.865)	(0.138)	(4.444)	(0.210)
Preterm birth	0.607	-0.243***	0.603	0.011
	(0.488)	(0.034)	(0.489)	(0.017)
Weighed at birth	0.773	0.074***	0.796	0.047***
	(0.419)	(0.017)	(0.403)	(0.015)
Birth weight	3,166	-7.53	3,163	-53.05**
(grams)	(564.24)	(29.37)	(541.00)	(25.86)
Low birth weight	0.080	0.017	0.075	0.003
	(0.271)	(0.014)	(0.263)	(0.010)
Height for age	-1.324	0.163	-1.277	0.085
z-score	(2.100)	(0.126)	(2.108)	(0.113)

Notes: The sample uses matched sub-districts. The estimation is done separately for each program. Standard errors in parentheses * p<0.1, **p<0.05, ***p<0.01.

Table A.7: IPW Sample: Baseline Community Characteristics

	Household CCT Baseline Mean	Community CCT Baseline Mean	Difference
	(1)	(2)	
Panel A. Supply Readiness			
Number of Doctors	0.598	0.608	0.0568
	(0.016)	(0.014)	(0.0764)
Number of midwives	0.923	0.919	-0.0197
	(0.008)	(0.006)	(0.0386)
Number of health posts	34.753	35.193	-0.904
	(0.474)	(0.350)	(2.137)
Number of sub-district clinics	0.712	0.764	0.0136
	(0.017)	(0.010)	(0.0640)
Panel B. Socio-Economic Characteristics			
Fraction poor	0.506	0.513	-0.00789
	(0.005)	(0.003)	(0.0194)
Piped water	0.124	0.123	0.0119
	(0.005)	(0.004)	(0.0273)
Majority agriculture	0.936	0.945	-0.0124
	(0.003)	(0.004)	(0.0188)
Distance to nearest market	4.433	4.840	-0.513
	(0.122)	(0.068)	(0.452)
Average sample weight	2.896	1.476	
	(3.636)	(0.967)	

Notes: Baseline characteristics of matched sub-districts. Panel A uses information from the village and sub-district clinic surveys. Panel B uses village-level response, aggregated to the sub-district level. Baseline differences in other supply readiness measures (equipment and vaccine availability) are not statistically significant. Baseline differences are not jointly significant. Standard errors in parentheses * $p<0.1$, ** $p<0.05$, *** $p<0.01$.