Introduction

Since its launch in 2004, Ethiopia's Health Extension Program (HEP) expanded primary health care services to 15 million households in Ethiopia by establishing one health post and deploying two health extension workers (HEWs) for every 5,000 households. However, as a result of difficult topography, HEWs' ability to interact with households at the desired frequencies was hindered, thus resulting in unmet targets for key maternal and newborn health service coverage.

As of December 2008, the Bill & Melinda Gates Foundation funded the Last Ten Kilometers Project (L10K) to improve coverage of 2.3 million households in 115 *woredas* (i.e. districts) of the four most populous regions of the country (i.e., Amhara, Oromiya, SNNP and Tigray). The Project works with 12 local civil society organizations (CSOs) to support 7,007 HEWs enhance their interaction skills with households and communities, as well as extend their reach by utilizing a network of 76,867 community health promoters (CHPs) to increase the demand, quality, utilization, equity and efficiency of maternal, newborn and child health (MNCH). Each CHP is trained and encouraged by HEWs to provide health education to 25–30 neighborhood households and to facilitate the utilization of the health services. The Project also mobilizes existing community institutions to serve as "*anchors*" to select, monitor and sustain the CHPs.

In addition to the foundation community strategy being implemented by L10K in all 115 *woredas*, the L10K Project is also testing four innovative second generation community strategies to assess their added value in improving MNCH outcomes. One of these second generation strategies is the community-based data for decision-making (CBDDM).

Initiated in September 2009 in 14 of the 115 L10K *woredas*, CBDDM fosters partnership between the grassroots public administration, HEWs, local institutes, and CHPs to systematically gather information to identify gaps in the utilization of MNCH services and facilitates community actions for solutions. Each CHP regularly monitors the households within her/ his catchment area and collects MNCH data using maps, thus prioritizing households for services, following pregnant women to childbirth, and then following the newborn to infancy. The CHPs monitor receipt of appropriate MNCH services, through the use of a checklist.

The MNCH surveillance data maintained by CHPs are collected and analyzed by the HEWs to identify barriers to the access to MNCH services which are then used to inform the community to identify and implement solutions.

The specific research questions answered by this study are:

1. Have there been improvements in household MNCH behaviors and practices? If so, are the improvements partly attributable to L10K?
2. Is there any added value of the CBDDM strategy over the L10K basic community strategy in improving household MNCH behaviors and practices?

Methodology

Community/kebele and individual level data from the Last Ten Kilometers Project (L10K) baseline survey (conducted in December 2008) and the midterm/follow-up survey (conducted in December 2010). The analysis excludes the 44 districts where the L10K basic strategy activities started in December 2009 (The sample size of the baseline and midterm survey are provided in Table 1).

The natural variability in the scope and intensity of the L10K project across communities is used to seek dose-response relationships between L10K intensity and MNCH outcomes to measure impact. Areas of higher intensity of L10K is expected to be associated with better MNCH outcomes. The CBDDM areas are compared with the other areas with only the foundational community strategy to assess its added value.

Community-level fixed-effects regression is then used to account for the non-random program placement (or intensity) bias. If program placement factors are systematically associated with the health outcomes of the community, it would over/under-estimate program effects.

The regression analysis controls for secular trend, age, education, marital status, parity, religion, distance to water source, distance to health facility, radio listenership, wealth quintile, distance to an emergency obstetric care (EOC) facility from the kebele, and influence of other NGOs.

**Table 1: Sample Sizes According to Sampling Strata and Units**

Sampling units	CBDDM		Total	
	Base-line	Follow-up	Baseline	Follow–up
Woreda (avg. 100,000 population)	14	14	67	67
Kebele/cluster (avg. 5,000 population)	27	76	137	214
No. of respondents	843	2,321	4,247	6,440
Women 15-49 yrs	540	912	2,740	2,568
Women with children 0-11 mo	324	911	1,644	2,567
Women with children 12-23 mo	270	912	1,370	2,556

Eleven components of the MNCH interventions were listed and for each component the HEW is asked the following questions: (1) Is this service supported by any private sector or NGO? (2) If so, is the private sector other than L10K? (3) Was any training provided by the private sector/NGO? (4) Was there any supportive supervision after the training? The L10K intensity score for each of the MNCH components ranged from 0 to 3. Component scores were aggregated to get L10K program intensity index the score of which ranges between 0 and 33 and the Cronbach's reliability alpha of the scale is 0.95. The index was recalibrated to range between 0 and 3.

Results

The analysis of the L10K program intensity indicates that HEWs from 73% of the L10K project kebeles reported at least some degree of support from the L10K project. The average intensity of exposure to the L10K program is 1.15 (about 38% of the maximum possible).

Moderate to substantial improvements ($p < 0.05$) in MNCH indicators are observed in the 71 L10K phase one woredas (Figure 1). Between the two survey periods, the contraceptive prevalence rate (CPR) increased from 30% to 41%; while the CPR based on health post as the only source for contraceptive increased from 19% to 26%. Improvements in the coverage of maternal health indicators between the baseline and midterm surveys are observed for antenatal care (i.e., ANC, from 50% to 69%), ANC from health posts (from 19% to 34%), two or more tetanus toxoid injects (TT2+) during pregnancy (from 39% to 47%), deliveries assisted by a HEW (from 4% to 6%), deliveries assisted by a health professional (from 11 to 15%), institutional deliveries (from 7% to 10%), postnatal care (i.e., PNC; from 8% to 23%), PNC in 48 hours (from 1% to 5%), and PNC by a HEW (from 9% to 20%). During the analysis period improvements in newborn health care practices is also observed in the L10K phase one woredas for harmful practices (i.e., applying butter to umbilical cord stump; from 31% to 23%), delay bathing the newborn by more than 6 hours (from 27% to 47%), giving colostrums to the baby (from 42% to 54%), exclusively breastfeeding the baby (from 64% to 55%).

Figure 1: Changes in MNCH outcomes in L10K Project Areas, 71 Phase one woredas
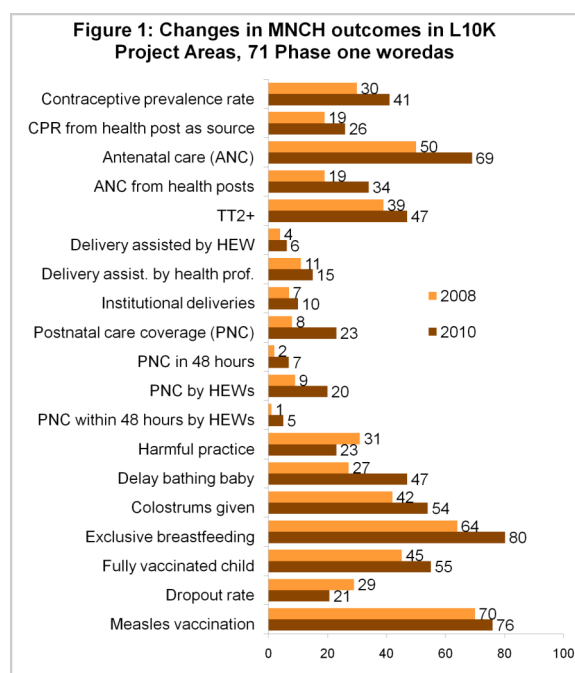
Results Cont.

Childhood immunization rates also improved in L10K phase one areas during the analysis period. Children between the ages of 12 to 23 months who are fully immunized increased from 45% during baseline survey to 55% in the midterm survey; measles vaccination rate also increased from 70% to 76%; while dropout rates between PENTA1 and PENTA 3 decreased from 29% to 21 percent during that period.

Table 2: Summary of the impact (adjusted) of L10K on selected MNCH outcomes expressed as increased odds (i.e., odds ratio)

MNCH Indicator	Impact of L10K	Added Value of CBDDM	Interaction with HEP*
CPR	1	1.3	+
CPR from health post	1.3	1.5	+
ANC	1.3	1.4	+
ANC from health post	1.6	1.4	+
TT2+ Injection	1.3	1	+
Health prof. assisted delivery	1	1	0
HEW assisted delivery	1.9	1.8	+
Institutional deliveries	0.8	1	0
PNC by health professional	1.2	1.6	+
PNC by HEW	1.6	2.1	+
PNC within 48 hours	1	1	+
PNC by HEW within 48 hours	2	1	+
Apply butter to cord	1	0.7	+
Delay bathing newborn	1	1.6	+
Colostrums given	1	1.3	0
Exclusive breast feeding	1	1	0
Fully immunized child	1.3	1	+

+ = Impact of L10K is higher when there is also improvement in HH visits by HEWs

(-) = Impact of L10K is negative when there is improved HH visits by HEWs

Next, multivariate analysis was done to assess whether the L10K program intensity is associated with the observed improvements in the MNCH outcomes is observed and whether the CBDDM strategy had any added value over the basic (foundational) L10K community strategy (only the impact of the L10K program from the multivariate analysis is given in Table 2). Woredas with relatively high L10K program intensity is associated with relative better improvements in MNCH outcomes ($p<0.05$)—L10K support improves the efficiency of the HEP to provide contraceptives from the health posts by 1.3 folds, ANC by 1.3 folds, ANC from health posts by 1.6 folds, TT vaccination by 1.3 folds, HEW assisted deliveries by almost 2 folds, PNC by health professional by 1.2 folds, PNC by HEW by 1.6 folds, PNC by HEW within 48 hours of delivery by 2 folds, within 48 hours , PNC by HEWs with 48 hours, and immunization by 1.3 folds. Paradoxically, L10K program intensity is associated with less likely to have institutional deliveries by 20%. L10K program intensity is not associated with the improvements in newborn health practices.

Results Cont.

Added value of the CBDDM strategy over the L10K foundational strategy is recorded by the multivariate analysis that compares CBDDM areas with other phase one areas indicating that the CBDDM improves contraceptive use and newborn health practices. The L10K supported improvements in ANC, deliveries assisted by HEWs, and PNC is higher in CBDDM areas (Table 2).

Significant interactions between L10K program intensity and the HEP in improving the MNCH outcomes are also recorded—indicating that effects of L10K on most of the MNCH outcomes considered are significantly higher when HEP intensity is also high and vice versa; i.e., L10K and HEP have synergistic effect, as expected (Table 2).

Conclusion

The L10K Project is improving the efficiency of the HEP to provide MNCH services. The CBDDM strategy adds value to the basic L10K community strategy, especially for newborn care. Nevertheless, L10K has no effect on improving the efficiency of the HEP to provide institutional deliveries and deliveries assisted by health professionals.

The perceived support of L10K by HEWs has significant population level effects, which are consistent with the L10K program strategy; therefore, the L10K program intensity measure can be considered valid.

Recommendations

- Efforts should be made to increase the intensity of L10K in the low intensity areas.
- Scale-up CBDDM tools elsewhere.
- Develop and test referral linkage strategies to increase deliveries assisted by health professionals and institutional deliveries.

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