

Improving Coverage of Postnatal Care in Rural Ethiopia Using A Community-based, Collaborative Quality Improvement Approach

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Introduction: Ethiopia has high maternal and neonatal mortality and low use of skilled maternity care. The Maternal and Newborn Health in Ethiopia Partnership (MaNHEP), a 3.5-year learning project, used a community collaborative quality improvement approach to improve maternal and newborn health care during the birth-to-48-hour period. This study examines how the promotion of community maternal and newborn health (CMNH) family meetings and labor and birth notification contributed to increased postnatal care within 48 hours by skilled providers or health extension workers.

Methods: Baseline and endline surveys, monthly quality improvement data, and MaNHEP's CMNH change package, a compendium of the most effective changes developed and tested by communities, were reviewed. Logistic regression assessed factors associated with postnatal care receipt. Monthly postnatal care receipt was plotted with control charts.

Results: The baseline ($n = 1027$) and endline ($n = 1019$) surveys showed significant increases in postnatal care, from 5% to 51% and from 15% to 47% in the Amhara and Oromiya regions, respectively (both $P < .001$). Notification of health extension workers for labor and birth within 48 hours was closely linked with receipt of postnatal care. Women with any antenatal care were 1.7 times more likely to have had a postnatal care visit (odds ratio [OR], 1.67; 95% confidence interval [CI], 1.10-2.54; $P < .001$). Women who had additionally attended 2 or more CMNH meetings with family members and had access to a health extension worker's mobile phone number were 4.9 times more likely to have received postnatal care (OR, 4.86; 95% CI, 2.67-8.86; $P < .001$).

Discussion: The increase in postnatal care far exceeds the 7% postnatal care coverage rate reported in the 2011 Ethiopian Demographic and Health Survey (EDHS). This result was linked to ideas generated by community quality improvement teams for labor and birth notification and cooperation with community-level health workers to promote antenatal care and CMNH family meetings.

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INTRODUCTION

Background

Globally, about 4 million neonates die every year. Of these, 3 million die within the first week of life and 1.2 million die in the first day following birth.¹ Furthermore, an estimated 287,000 maternal deaths occur each year, mostly in developing countries,² due to obstetric complications occurring within 24 hours of birth.³

The 2009 World Health Organization/United Nations Children's Fund (WHO/UNICEF) Joint Statement, "Home Visits for the Newborn Child: A Strategy to Deliver Effective Elements of Care to Newborns and Increase Newborn Survival," incorporated recommendations from South Asian trials (Bangladesh and India), which showed that neonatal mortality in high-mortality settings can be substantially reduced through community-based maternal and newborn health care programs.^{4,5} These studies note that pregnancy identification and birth notification—coupled with early postnatal home visits by community health workers for counseling, newborn

assessment, and care—can prevent 30% to 60% of newborn deaths in high-mortality settings under controlled conditions. Postnatal care within 48 hours of birth, when the mother and newborn are at greatest risk of dying, is recommended.^{4,6-8} Postnatal care provides the mother with key information on how to care for herself and her newborn throughout the postnatal period and beyond.⁹ Among the 69 countries where more than 95% of all maternal and child deaths occurs—as identified by the Countdown to 2015 Initiative—only 1 in 5 women received postnatal care.¹⁰ Analysis of the recent demographic and health surveys in 23 African countries showed that women who have antenatal care are more likely to give birth with a skilled attendant and receive postnatal care.¹¹ Interventions to reduce neonatal mortality should begin during pregnancy to promote birth preparedness, encourage birth with a skilled attendant, and provide education on care of the newborn.¹¹

Despite remarkable progress to reduce mortality of children under 5 years of age in Ethiopia, little change has occurred in neonatal mortality, which accounts for 42% of all under-5 deaths. The 2000, 2005, and 2011 Ethiopian Demographic and Health Surveys (EDHS) reported neonatal mortality rates of 49, 39, and 37 per 1000 live births, respectively. The decline in neonatal mortality rates by 24% over 11 years

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Quick Points

- ◆ An initial postnatal care visit from skilled or semiskilled providers is recommended during the first 48 hours after birth, when the greatest number of maternal and newborn deaths occur; yet, only an estimated 20% of mothers and newborns in high-mortality countries receive this care.
- ◆ In Ethiopia, postnatal care coverage has remained below 10% since 2000, with health extension workers providing less than 1%. Improvements have been challenging.
- ◆ Using a community collaborative improvement approach, the Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) documented 3- to 10-fold increases in postnatal care coverage by a skilled provider or health extension worker over a 2-year period.
- ◆ Labor and birth notification to a health extension worker was a key strategy for increasing postnatal care provision by health extension workers who were responsible for the majority of the increase in coverage.
- ◆ Use of trained traditional birth attendants (TBAs) and community health development agents, particularly for home-based educational Community Maternal and Newborn Health (CMNH) family meetings, also appears to be a significant factor for increased postnatal care coverage. Women who attended CMNH meetings with family members were twice as likely to have received postnatal care compared to women who attended none.

is substantially less than the decline in infant (39%) and child (60%) mortality over the same period.¹³⁻¹⁵

Use of maternal and newborn health care services is low in Ethiopia. According to the 2011 EDHS, only 34% of women who gave birth in the 5 years preceding the survey received any antenatal care from a skilled provider (eg, physician, midwife, nurse), and 9% received antenatal care from a health extension worker. Only 10% of women gave birth in a health facility or with a skilled birth attendant, and less than 1% gave birth with a health extension worker. Of note, only 7% of women received postnatal care within 48 hours of birth (6% from a skilled provider, <1% from a health extension worker). Substantially fewer mothers and newborns living in rural areas received postnatal care, compared to those living in urban areas (3% vs 32%).¹⁵ Low use of postnatal care services by rural Ethiopian women may be due to the tradition of a 40-day period of confinement to protect the mother and newborn from malevolent spirits.¹⁶⁻¹⁸ However, other community-based projects in Ethiopia and elsewhere have achieved mixed results in terms of improving postnatal care coverage; none have achieved postnatal care coverage greater than 32%.^{19,20}

Over the past decade, the Ethiopian Federal Ministry of Health has taken important steps to improve maternal and newborn care through its health extension program. The health extension program aims to provide equitable access to promotive, preventive, and selected curative health care services through government-salaried health extension workers. These workers operate 2 per *kebele* (village) health post, for a population of about 5000 per pair.¹⁷ While the potential of the health extension program to reduce maternal and newborn morbidity and mortality is recognized, program implementation at scale, especially in remote rural areas, remains a major challenge.²²

Maternal and Newborn Health in Ethiopia Partnership

The Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) was 3.5-year learning project funded by the Bill

and Melinda Gates Foundation. Working under the leadership of the Ethiopian Federal Ministry of Health and the Amhara and Oromiya Regional Health Bureaus, MaNHEP was implemented from 2010 to 2013 by Emory University in collaboration with JSI Research and Training Institute, Inc; University Research Company, LLC; and Addis Ababa University. The project aimed to demonstrate a community-oriented model to improve maternal and newborn health around the time of birth and to position this model for national scale-up.²¹ The MaNHEP intervention had 3 main components. The first component was training health extension workers, community health development agents, and traditional birth attendants (TBAs) in maternal and newborn care. These workers then trained pregnant women in their second and third trimesters and their family caregivers in maternal and newborn care through community maternal and newborn health (CMNH) family meetings. The importance of postnatal care was included in these meetings.²¹⁻²³ The second component was collaborative quality improvement focusing on promotion of pregnancy identification, antenatal care registration, CMNH family meeting attendance, labor and birth notification to a health extension worker, and postnatal care by a health extension worker within 48 hours of birth. The third component was behavior change communications in which the importance of postnatal care was also emphasized.^{23,24,27} MaNHEP was implemented in 51 *kebeles* within 6 districts (*woredas*) for a total population of about 350,000.

In this article, we describe the extent to which MaNHEP succeeded in increasing women's receipt of postnatal care from a health extension worker within 48 hours of birth; the relative contribution of antenatal care, CMNH family meeting attendance, and labor and birth notification—areas targeted by MaNHEP's collaborative quality improvement approach—to women's receipt of postnatal care; and the trend in postnatal care coverage over 24 months.²⁶ Last, we explore how MaNHEP's interventions, including local ideas generated by MaNHEP's quality improvement teams, may have led to the observed results.

METHODS

Outcome Definition

MaNHEP focused on postnatal care within 48 hours after birth. The indicator of success was defined as the proportion of postpartum women visited by a skilled provider or health extension worker within 48 hours of birth. If the health provider was only present at birth, this did not count as a postnatal care visit. The provider had to return to the woman's home, or the woman had to go to the health facility to count as a postnatal care visit.

Data Sources

To describe the extent to which women received postnatal care, we used data from MaNHEP's baseline and endline cross-sectional surveys. The baseline and endline surveys, conducted from June through August 2010 and from May through July 2012, included systematic samples of 1027 and 1019 women who gave birth the year before the survey, respectively.^{24,25} The samples were drawn from each region, Amhara and Oromiya, and MaNHEP's 51 *kebeles*. Relevant to this study, in both surveys women were asked about their sociodemographic characteristics; antenatal, birth, and postnatal service use; CMNH family meeting attendance; and labor and birth notification. We used simple descriptive statistics to calculate the proportion of women who used postnatal care by type of provider and timing of the first postnatal care visit. We used the bivariate Fisher's exact test to determine if there were significant regional differences. These data were analyzed in SAS version 9.3.²⁶

To determine the factors associated with women's receipt of postnatal care, we used the endline survey data only. We conducted a logistic regression to assess the relative contribution of antenatal care, CMNH family meeting attendance, and labor and birth notification to receipt of care. We also assessed the relative contribution of selected ideas generated by MaNHEP's quality improvement teams that were related to labor and birth notification: household having a health extension worker's mobile phone number, household having access to a friend's or neighbor's mobile phone, and household informing the health extension worker after birth occurs. We defined antenatal care as a woman having received at least one antenatal care visit from a skilled provider or health extension worker (vs no care from these workers). We defined CMNH family meeting attendance as a woman having attended 2 or more meetings, either alone or with a family member (vs 0-1 meetings). Exposure to CMNH family meetings was defined in this way because the first meeting is an introduction and orientation.²² We defined labor and birth notification as a woman or family notifying a skilled provider or health extension worker (vs no notification of these workers). Sociodemographic variables and type of birth attendant used (ie, skilled providers, health extension workers, or trained TBAs/community health and development agents vs untrained providers or no providers) were included as control variables.

To describe the trend in women's receipt of postnatal care from a health extension worker over time, by region we used MaNHEP's quality improvement database. This database con-

tains monthly data from November 2010 to October 2012 obtained from the health extension workers' monthly health-post report. These data were crosschecked against the MaNHEP master list of identified pregnant women, as well as the health extension workers' antenatal care, birth, and postnatal care registries. Because about half of women do not report their births at all or do not do so in a timely manner, we used the estimated number of births (projection from census data for the site) as the denominator²⁷ for each site to calculate the indicator. This provides a conservative estimate (ie, it assumes that women who do not report do not receive postnatal care). The mean percentage of women who received a postnatal care visit from a health extension worker each month across the 51 project *kebeles* was plotted on a statistical process control chart (C-chart) each month, over a total of 24 months. The C-chart is used in quality improvement projects to assess performance over time and includes a line for the mean value, as well as upper and lower control limits at plus-3 and minus-3 standard deviations of the mean. Observations above 3 standard deviations of the mean value indicate an improvement in the receipt of postnatal care. The C-chart analysis was conducted using Microsoft Excel.²⁸⁻³⁰

To explore local ideas that may have led to the observed results, we reviewed the content of MaNHEP's quality improvement team reports. These reports document successful and unsuccessful ideas for increasing receipt of postnatal care that were tested in the projects' 51 *kebeles*. MaNHEP worked with quality improvement teams and quality improvement coaches to determine the most effective ideas through a group process that involved synthesizing similar ideas and ranking ideas in relation to the results (1 = least effective; 5 = most effective). The most effective or best ideas for improving postnatal care coverage were compiled into a MaNHEP document—the CMNH change package—to be distributed to new areas.³¹

Ethical Considerations

The MaNHEP project protocol was reviewed and found to be exempt by both Emory University and Addis Ababa University institutional review boards. The protocol was approved by the Federal Ministry of Health and the Amhara and Oromiya Regional Health Bureaus in 2010, before project implementation.

RESULTS

Extent to Which MaNHEP Succeeded in Increasing Women's Receipt of Postnatal Care

Receipt of postnatal care from a skilled provider or health extension worker within 48 hours of birth increased significantly from baseline to endline in both regions: from 5% to 51% in Amhara and from 15% to 47% in Oromiya, respectively (both $P < .001$) (Table 1). This increase was most dramatic for the Amhara region, which began with a lower baseline compared with Oromiya ($P < .001$). At endline, however, the proportion of women who received postnatal care from a skilled provider or health extension worker did not vary significantly by region ($P = .31$). Receipt of postnatal care from a health extension worker only (and not a skilled provider) showed

| Characteristics | Table 1. Postnatal Care of Women Who Gave Birth During the Year Before the Baseline (2010) and Endline Surveys (2012), by Region | | | | | | | | | | | | | |
|--|--|----------------------|--------------------------------|--|----------------------|----------------------|--------------------------------|--|-----------------------|-----------------------|--------------------------------|--------|-------------------|-----|
| | Amhara | | | | Oromiya | | | | Total | | | | Amhara vs Oromiya | |
| | B (n = 493) n (%) | E (n = 479) n (%) | B vs E P Value ^a | | B (n = 534) n (%) | E (n = 540) n (%) | B vs E P Value ^a | | B (n = 1027) n (%) | E (n = 1019) n (%) | B vs E P Value ^a | | B | E |
| Postnatal care visit from skilled provider or health extension worker ^b | 25 (5.1) | 243 (50.7) | < .001 | | 82 (15.4) | 254 (47.4) | < .001 | | 107 (10.5) | 497 (49.0) | < .001 | < .001 | | .31 |
| Postnatal care visit from health extension worker ^b | 19 (3.9) | 207 (43.2) | < .001 | | 41 (7.7) | 189 (35.3) | < .001 | | 60 (5.8) | 396 (39.1) | < .001 | .01 | | .01 |

Abbreviations: B, baseline; E, endline.

^aTwo-sided Fisher's exact P values ($\alpha = .05$) were used.

^bPostnatal care was defined as care received for either the mother or newborn within 48 hours after birth. Missing values did not exceed 5 for any cell.

similar improvements: from 4% to 43% in Amhara and from 8% to 35% in Oromiya, respectively (both $P < .001$). Receipt of postnatal care from health extension worker varied significantly by region at both baseline and endline, and it was lower in Amhara than Oromiya at baseline but higher in Amhara than in Oromiya at endline (both $P = .01$).

Factors Associated With Women's Receipt of Postnatal Care

Descriptive Analysis

Women's characteristics, including sociodemographics, CMNH family meeting attendance, antenatal care, and birth service use, are described in detail elsewhere.^{21,22} However, characteristics related to labor and birth notification, particularly regarding the use of mobile phones, are first presented in this study. Simple bivariate analyses demonstrated regional differences: Women in Oromiya were more likely to live in households that owned a mobile phone (30% vs 24% in Amhara; $P = .03$) and were more likely to have a health extension worker's mobile phone number, either in their own phone or in a neighbor's or friend's phone (27% vs 19% in Amhara; $P = .01$). Women in Oromiya were also more likely to have informed a health extension worker after their birth occurred (77% vs 65% in Amhara; $P < .001$).

Regression Analysis

The logistic regression model (Table 2) shows that women who resided in the Amhara region were only slightly more likely than women in Oromiya to have received a postnatal care visit (OR, 1.38; 95% CI, 1.01-1.87; $P = .04$). Women's age, parity, history of an infant death, and educational status were all not significantly associated with the outcome.

Women who received any antenatal care from a skilled provider or health extension worker were 1.7 times more likely to have received postnatal care from these providers (OR, 1.67; 95% CI, 1.10-2.54; $P = .02$).

Women who attended 2 or more CMNH family meetings with their family members were nearly twice as likely to have received postnatal care from a skilled provider or health extension worker within 48 hours of birth, compared to women who attended less than 2 meetings (OR, 1.81; 95% CI, 1.31-2.49; $P < .001$). There was no statistically significant difference in postnatal care utilization comparing women who attended 2 or more CMNH family meetings without their family members to women who attended less than 2 meetings (OR, 1.20; 95% CI, 0.79-1.82; $P = .38$).

Women who had a health extension worker's mobile-phone number on a household, friend's, or neighbor's phone were 1.6 times more likely to have received postnatal care from a skilled provider or health extension worker within 48 hours of birth, even after controlling for household mobile phone ownership (OR, 1.61; 95% CI, 1.14-2.26; $P = .01$). Household mobile phone ownership itself was not significantly associated with this outcome (OR, 1.16; 95% CI, 0.84-1.61; $P = .36$).

Using the regression model to compare women with all 3 of the factors of interest (vs women with none of them) demonstrated that women with antenatal care who attended

Table 2. Factors Associated With Receipt of a Postnatal Care Visit for Mother or Newborn From a Skilled Provider or Health Extension Worker Within 48 hours of Birth in the Amhara and Oromiya Regions, Ethiopia (n = 958)^a

| Characteristics | OR (95% CI) | P Value |
|--|--------------------|---------|
| Woman has a health extension worker's mobile phone number | 1.61 (1.14, 2.26) | .01 |
| CMNH family meetings | – | .001 |
| ≥ 2 meetings, alone (vs < 2) | 1.20 (0.79, 1.82) | .38 |
| ≥ 2 meetings, with family (vs < 2) | 1.81 (1.31, 2.49) | < .001 |
| Region (Amhara vs Oromiya) | 1.38 (1.01, 1.87) | .04 |
| Age | 1.02 (0.98, 1.05) | .43 |
| Parity | 0.97 (0.87, 1.08) | .57 |
| History of infant death | 1.26 (0.88, 1.81) | .21 |
| Education | – | .14 |
| Any primary (vs none) | 1.41 (1.00, 1.98) | .05 |
| Any secondary or higher (vs none) | 1.34 (0.52, 3.47) | .55 |
| Household mobile phone ownership (any vs none) | 1.16 (0.84, 1.61) | .36 |
| Any antenatal care from a skilled provider or health extension worker | 1.67 (1.10, 2.54) | .02 |
| Birth provider | – | < .001 |
| Skilled (vs untrained/none) | 4.03 (2.54, 6.40) | < .001 |
| Health extension worker (vs untrained/none) | 8.90 (5.10, 15.52) | < .001 |
| TBA/community health and development agent (vs untrained/none) | 1.16 (0.81, 1.66) | .41 |

Abbreviations: CI, confidence interval; CMNH, community maternal and newborn health; OR, odds ratio; TBA, traditional birth attendant.

^aOf the 1019 women in the endline survey, 61 had missing data for at least one of the above variables and were excluded from the regression model.

2 or more CMNH family meetings and had access to a health extension worker's mobile phone number were nearly 5 times as likely to have received postnatal care (OR, 4.86; 95% CI, 2.67-8.86; $P < .001$).

In addition to these factors, women whose most recent birth was attended by a health extension worker were nearly 9 times more likely to have received postnatal care (OR, 8.90; 95% CI, 5.10-15.52; $P < .001$), while those who had been attended by a skilled provider were 4 times more likely to have received postnatal care (OR, 4.03; 95% CI, 2.54-6.40; $P < .001$), both compared to women who were attended by untrained family, neighbors, or no one. In contrast, women whose births had been attended by a trained TBA or community health development agent were not more likely to have received postnatal care compared with those attended by an untrained provider or no one (OR, 1.16; 95% CI, 0.81-1.66; $P = .41$).

Trend in Postnatal Care Coverage Over 24 Months

On average, approximately 32% of women received postnatal care from a health extension worker within 48 hours of birth (Figure 1). This represents an average increase from 1% in November 2010 to 36% in October 2012. There are more than 8 consecutive data points above the mean from May 2011 to February 2012. This indicates that there is a special variation or cause of the observed increase, such as CMNH family meeting attendance or local testing of quality improvement ideas to improve coverage.

For a health extension worker to visit a woman within 48 hours of birth, the worker must be informed of the woman's labor or birth in a timely manner. The pattern for women's timely notification to a health extension worker (Figure 2)

mirrors their receipt of postnatal care (Figure 1). On average, 34% of women notified a health extension worker during labor or within 48 hours of birth. This represents an average increase from 3% in November 2010 to 36% in October 2012. Of women who notified the health extension worker in a timely manner, 94% received postnatal care from the health extension worker.

The pattern and incremental increase in the mean proportion of women receiving postnatal care within 48 hours from a health extension worker varied by region (Figure 3). By October 2012, the mean proportion was higher for Oromiya women (38%) compared with Amhara women (27%). In the Oromiya region, 8 consecutive data points above the centerline (after June 2011) suggest that the CMNH family meetings and ideas tested by the quality improvement teams led to real improvement in processes involved in achieving postnatal care coverage. In Amhara, one data point exceeds the upper control limit on one occasion (August 2011), indicating some special cause(s) for that month's increase in postnatal care.

How MaNHEP's Intervention, Including Local Ideas Generated by MaNHEP's Quality Improvement Teams, May Have Led to the Observed Results

Across the 51 *kebeles*, women and family caregivers attended MaNHEP CMNH family meetings that were conducted by guide teams comprised of community health development agents and TBAs. Across these same *kebeles*, MaNHEP quality improvement teams comprised of community stakeholders, health extension workers, community health development agents, and TBAs identified and tested ideas to improve labor and birth notification so that a health

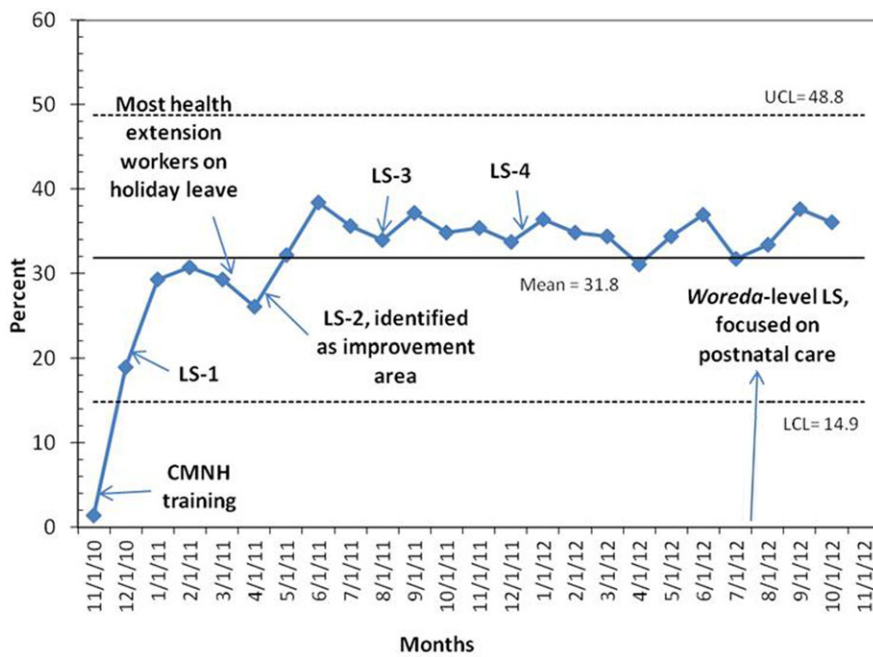


Figure 1. Percentage of Postpartum Women Who Were Visited by a Health Extension Worker Within 48 Hours After Birth, November 2010 to October 2012

Abbreviations: CMNH, community maternal and newborn health; LS, learning session; UCL, upper control limit.

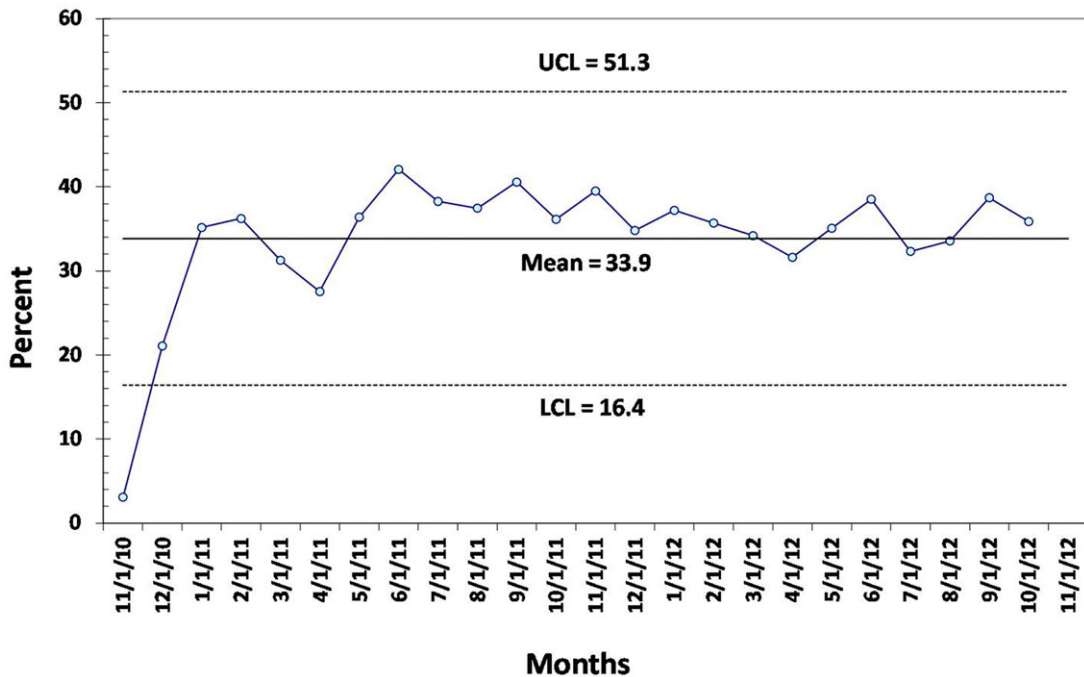


Figure 2. Percentage of Postpartum Women Who Notified Health Extension Workers During Labor or Within 2 Days After Birth, November 2010 to October, 2012

Abbreviations: LCL, lower control limit; UCL, upper control limit.

extension worker could provide postnatal care within 48 hours of birth. Table 3 shows ideas that were tested and used by 88% to 100% of the quality improvement teams. The average rate of perceived usefulness ranged from 4.3 to 4.7 (1 = not useful; 5 = very useful).

DISCUSSION

The MaNHEP surveys and quality improvement team data both indicate substantial increases in postnatal care within 48 hours by a skilled provider or health extension worker over the life of the project. From 2010 to 2012, there was a 3- and

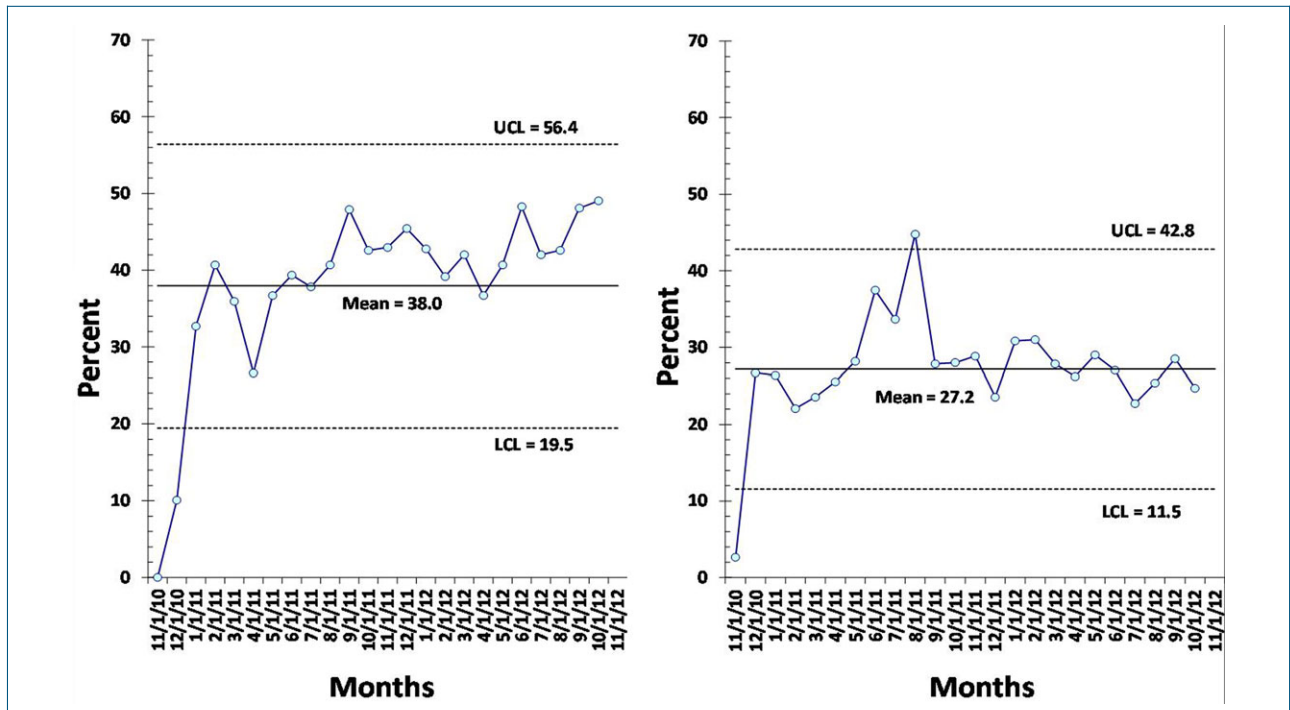


Figure 3. Percentage of Postpartum Women Who Were Visited by Health Extension Workers Within 48 Hours After Birth by Region (Oromiya and Amhara), November 2010 to October 2012^a

Abbreviations: UCL, upper control limit; LCL, lower control limit. ^a Data for Oromiya region is presented on the left. Data for Amhara region is presented on the right.

Table 3. Use of Change Ideas in the Community Maternal and Newborn Health Change Package to Notify Health Extension Workers of Labor or Birth

| Change Concepts | Change Idea | Where It Was Used (n = 51) | Average Score of Usefulness |
|--|---|---------------------------------------|-----------------------------|
| Build family awareness of the benefit of notifying and seeking care from health extension workers. | Encourage husband or other family members (mother, sister-in-law, son) to notify health extension worker when labor starts. | 51 (100%) <i>kebeles</i> ^a | 4.6 (0.12) |
| Organize volunteers to notify health extension workers. | Identify volunteer from surrounding community to notify health extension worker. | 49 (96.1%) <i>kebeles</i> | 4.7 (0.09) |
| Use technologies and other communication mechanisms. | Call health extension worker using mobile telephone. | 50 (98.0%) <i>kebeles</i> | 4.6 (0.11) |
| | Provide written communication to health extension workers | 46 (88.2%) <i>kebeles</i> | 4.3 (0.15) |

^a A *kebele* is a village.

10-fold increase in postnatal care coverage in the Oromiya and Amhara regions, respectively. Furthermore, this high level of coverage appears to have been sustained over time, as the increases in postnatal care that occurred during the first 5 months of the project were maintained for the remainder of the 2-year period. This increase in postnatal care far exceeds the corresponding 2011 EDHS national postnatal care coverage figure of 7%.¹⁶

The relatively short 2-year time period during which postnatal care coverage increased in the project sites is of note. Since 2000, Ethiopia has documented only modest improvement in coverage of postnatal care by health extension work-

ers or skilled providers, from 2% in 2000 to 5% in 2005 to 7% in 2011.^{13–15,32}

A substantial proportion of the increase in postnatal care coverage observed in the MaNHEP project was due to care provided by health extension workers. The endline survey demonstrated that 49% of women had received postnatal care: 39% from health extension workers and 10% from skilled providers. The findings from the endline (a randomized household survey) are consistent with findings from the monthly data collected by community quality improvement teams, which showed that the average percent of women who received postnatal care within 48 hours of birth from a health

extension worker was 32% by October 2012. Given severe shortages in skilled providers, the use of health extension workers to increase service utilization is a key strategy of Ethiopia's health extension program. The efforts of quality improvement teams focused on a process proceeding from pregnancy identification and registration with health extension workers for antenatal care to CMNH family meeting attendance to labor and birth notification to health extension workers and finally receipt of postnatal care. Thus, improved postnatal care coverage likely reflects successes in all previous care steps in the process. One key step in this process of care was timely notification of the health extension worker of labor or birth; health extension workers managed to visit nearly all of the postpartum women who notified them either during labor or within 48 hours after birth.

The quality improvement teams developed, tested, and widely implemented effective change ideas for labor and birth notification; these were closely tied to improvements in the receipt of postnatal care from health extension workers. For example, the use of a mobile phone for notification was widely adopted across MaNHEP quality improvement teams, and the endline survey indicated that women who reported having a health extension worker's mobile phone number in a household, or a friend's or neighbors' phone, were significantly more likely to have received postnatal care, even after controlling for household mobile phone ownership and other sociodemographic and prior service utilization characteristics.

Use of TBAs and community health development agents, particularly for CMNH family meetings, appears to be a significant factor in increased postnatal care coverage. Women's participation in 2 or more CMNH family meetings, particularly with a family member, was independently associated with the receipt of postnatal care—even after controlling for sociodemographic characteristics, receipt of antenatal care, and birth care from a skilled provider or health extension worker.

These findings demonstrate the importance of involving family members—as well as neighbors and friends—in maternal and newborn health interventions, which is consistent with results from a broader evaluation of the MaNHEP project.²² The findings in this study also demonstrate the contribution of CMNH family meetings and labor and birth notification as an important supplement to routine antenatal care: Women with antenatal care were 1.7 times more likely to have had postnatal care, but women who had additionally attended CMNH family meetings and had access to a health extension worker's mobile phone number were nearly 5 times as likely to have had postnatal care.

Participation in CMNH family meetings was also significantly associated with birth care from a skilled provider or health extension worker, which was in turn the single largest factor associated with the receipt of postnatal care from these providers.²² Thus, participation in CMNH family meetings appears to encourage a continuum of care from skilled providers and health extension workers for both birth and postnatal care.

In addition to success in improving the process of care as a team, other cultural factors may have explained observed regional differences in postnatal care coverage. For example, relative openness toward accepting nonfamily visitors soon af-

ter birth, as well as cooperation with traditional leaders, may have facilitated higher postnatal care coverage in the Oromiya region compared to the Amhara region.

The baseline and endline surveys were cross-sectional and based on women's self-report. Results may be limited by recall bias, and the random selection of women in the surveys would not adequately control for confounding factors. Furthermore, while women's use of birth care providers was included in the regression model as a control variable, it is also an important outcome in and of itself. Its inclusion in the model likely diminished the effect of CMNH family meeting attendance and access to a health extension worker's mobile phone number.²² Additionally, while the sample size for this study was too small to directly link increased use of postnatal care to morbidity and mortality outcomes, a separate verbal autopsy study indicated that significant decreases in newborn perinatal mortality occurred in project sites.²¹ Given the body of evidence linking postnatal care visits to reductions in morbidity and mortality, the substantial increases in postnatal care likely contributed to these mortality reductions.^{4-8,12}

The community quality improvement data had the benefit of being longitudinal. However, the quality improvement team data was limited by women whose pregnancies had been identified. Unidentified women (about 50%) may have differed from these women in terms of sociodemographic and service utilization factors. We used a conservative approach, relying on census projections as our denominator of all estimated births. We also assumed that unidentified women received no postnatal care. This would cause our reported postnatal care coverage to appear lower than it actually was. Furthermore, while the quality improvement team data was collected by community members with varying educational status, the consistency of the community quality-improvement teams' data with the MaNHEP endline survey indicates that community members can collect reliable and accurate service utilization data. This is particularly salient as data on postnatal care is severely limited in many developing countries.

CONCLUSION

In Ethiopia, as in other countries with large rural populations and predominance of home birth, improving postnatal care coverage is a challenge. However, these results indicate that the use of community-based and community-led approaches holds great promise for increasing postnatal care coverage. In particular, the collaborative quality improvement process built community ownership of maternal and newborn health issues and promoted the development of relevant solutions. The involvement of family members, neighbors, and friends in CMNH family meetings and quality improvement activities—as well as in the notification of health workers at the time of birth—provided a key supplement to routine antenatal care for increasing postnatal care. Because MaNHEP operated under the leadership of the Ethiopian Federal Ministry of Health, and with close collaboration of *woreda* and *kebele* health offices, the community-based collaborative quality improvement approach emerged as an integral way to coordinate activities and bridge ties with the community. In particular, this was through the use of health worker teams that united government and community health

workers and families, quality improvement teams that promoted interactions between community stakeholders, and supportive supervision from coaches at various levels of the health system,

The findings in this study are likely applicable to other high-mortality settings, particularly in sub-Saharan Africa. However, more research that uses community-based, collaborative quality improvement approaches is needed, particularly for increasing postnatal care from skilled providers or qualified government health worker cadres.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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