

The Impacts of Quality Improvement on Maternal and Newborn Health: Preliminary Findings from a Health System Integrated Intervention in Three Regions in Ethiopia.

Authors:

Ashley K Hagaman*¹, Kavita Singh^{1,2}, Ilene Speizer^{1,2}, Befikadu Bitewulign³, Mehiret Abate³, Haregeweyni Alemu³, Abiy Seifu Estifanos⁴, Zewdie Mulissa³, Hema Magge³

*Presenting author

Affiliations:

¹ Carolina Population Center, University of North Carolina at Chapel Hill

² Department of Maternal and Child Health, Gillings School of Global Public Health, University of North Carolina at Chapel Hill

³ Institute for Healthcare Improvement, Addis Ababa, Ethiopia

⁴ Department of Reproductive Health, School of Public Health, Addis Ababa University, Ethiopia

Short Abstract:

Quality improvement (QI) methods are efficacious in improving healthcare delivery using sustainable, collaborative, and cost-effective approaches. Ethiopia's government has prioritized quality of care to improve in maternal and neonatal health outcomes. This study assesses the preliminary impacts of a first phase, quasi-experimental, QI health systems intervention on maternal and child health outcomes in three pilot districts in Ethiopia. The intervention identified, trained, and coached QI teams to develop and test change ideas to improve service delivery. We use an interrupted time-series approach to evaluate the effects of the QI intervention across a 27-month period. Outcome indicators, extracted at the facility-level from Ethiopia's Health Management Information System, included: proportion of mothers receiving four antenatal care visits, skilled delivery, syphilis testing, early postnatal care, and proportion of low birth weight infants receiving Kangaroo Mother Care. Preliminary findings indicate early promise of quality improvement on some maternal and newborn health outcomes.

Extended Abstract:

Introduction:

Quality improvement (QI) methods are intended to enhance the delivery of effective health interventions using sustainable, collaborative, and cost-effective approaches. Quality is also considered a key element in efforts to better health outcomes and ensure greater efficiency in health care delivery (WHO, 2017). QI interventions have demonstrated modest success in improving some maternal and infant health outcomes (Singh, Speizer et al. 2013, Singh, Brodish et al. 2016, Waiswa, Manzi et al. 2017). While these studies indicate promise, they also demonstrate a need for further refinement and testing of these strategies, particularly in low-income contexts. Despite great achievements in reducing maternal and neonatal deaths in the last two decades, Ethiopia continues to have high maternal mortality with 412 maternal deaths per 100,000 live births and neonatal mortality with 29 neonatal deaths per 1000 live births (DHS, 2017). In commitments to continue improving maternal and child health, Ethiopia's government has prioritized quality and equity as one of four pillars of the Health Sector Transformation Plan (HSTP). QI methods may well be one important strategy to achieve these goals. The Institute of Healthcare Improvement (IHI) is supporting the Federal Ministry of Health in Ethiopia (FMOH) in implementing a comprehensive QI initiative focusing on quality planning, building capability in quality management and improvement at all health system levels, and designing and testing a scalable district-wide approach for health improvement with a focus on maternal and newborn health. UNC-Chapel Hill and Addis Ababa University serve as the external evaluation partners to this initiative.

In this paper we evaluate whether the QI initiative is leading to changes in key maternal and newborn health outcomes during its pilot phase in 3 districts across 3 regions of Ethiopia: Oromia, Tigray, and SNNP. A key element of the QI initiative is the training of QI teams to implement locally-derived, systems-embedded, change ideas or "interventions". These interventions are intended to improve service delivery and create demand for services. Project staff make site visits to coach and mentor teams as they implement and monitor the change ideas. In this paper we employ an innovative multivariable time series analysis to understand, if and how, the intervention is leading to improved maternal and newborn health outcomes during the initial phase. We also assess if particular components should be considered when bringing the intervention to scale at the national level.

Methods:

The QI initiative and program implementation: Alongside the Federal Ministry of Health, the program established governmental district-wide learning collaboratives and provided them with structured, systematic, QI and relevant clinical skills training. The pilot phase established three learning collaboratives (one in each primary hospital catchment area, including all government health facilities in a woreda). Each collaborative forms quality improvement teams (QITs) that work with support from the woreda leadership. QITs were assembled within a primary hospital, and each health center in its referral network. Each health center team included health extension workers from their linked health posts. Health posts are managed by a health extension worker and provide basic health services at the smallest administrative level. Health centers are nurse-led and provide primary health care services, including uncomplicated deliveries. Primary hospitals are the first point of contact with physicians and provide care for complications including caesarian section, and blood transfusions. QIT participants included facility heads, MNH clinical staff, data officers, and health extension workers. The pilot phase was implemented in one collaborative in 4 agrarian and 1 pastoralist region to represent diversity in the country. These data are from the first three completed collaboratives, including 20 QITs. QITs attended four structured workshops (e.g., learning sessions) over 18 months for training in QI followed by the implementation of

team-initiated QI ‘changes’ and troubleshooting. In between the learning sessions, intensive coaching visits were made by project staff to supervise and mentor the QITs. The results presented in this paper use data from the pilot phase, including between 9-13 months of pre-intervention data per facility, and follow outcomes until August 2018, totaling 540 facility months across all pilot facilities. The QI program was considered to reach full implementation between the 2nd and 3rd learning session, which was the time when the project team felt that the QITs obtained sufficient understanding and implementation capabilities.

Outcomes: As in many low-income settings, over and under-reporting is a chronic concern with facility-level health data. In line with QI goals, the intervention also serves to increase the quality and validity of government-reported health data. The first step was a data validation process to resolve over and under-reporting that is a chronic concern with facility-level data. This was done by comparing data reported by the FMoH on relevant outcomes to the source facility registers on these outcomes from May 2016 onwards; registry data were not available before May 2016. Thus, May 2016 was the beginning date for the pre-intervention data, which were continually extracted from Ministry of Health reports for at least six months after the last learning session (August 2018). In this paper, we present results of the intervention on the following maternal and newborn health outcomes: skilled delivery (the proportion of births attended by a skilled birth attendant); four antenatal care visits (ANC) completed (the proportion of pregnant women who have four ANC visits by 36 weeks of pregnancy); early PNC (the proportion of women who receive postnatal care (PNC) within 48 hours of delivery); syphilis testing (proportion of ANC users who have been tested for syphilis); and proportion of low birth weight infants placed in Kangaroo Mother Care. Outcome variables were calculated using census-derived population estimates to calculate the denominators of number of expected pregnancies and number of expected live births as per the definitions in the national Health Management Information System (HMIS)(Commission; 2008).

Change Ideas: QITs developed change ideas targeting these maternal and child health indicators. Multiple change ideas targeting one or more priority areas were defined and tested within each QIT team at their respective facilities. Information for each change idea was systematically documented into a database and included the date initiated, the implementation strategy, and specific goals, targets, and timelines as part of QI coaching. We dichotomized changes tested so that, if any change was developed and tested for a particular target indicator, the facility was coded as having tested a change in that month.

Facility-level variables: Variables related to the collaborative teams’ facilities were collected from a baseline assessment. These included facility type (health center vs. hospital), its catchment population, the number of staff working within each facility, the number of coaching visits (an indicator of intervention intensity), the geographic region of each facility.

Analysis: The quasi-experimental design of the intervention, whereby each facility serves as its own control over time, allows us to leverage an interrupted time series approach. This strategy uses a segmented multivariable regression to detect whether the intervention (e.g., the change ideas tested) is associated with a significant trend shift in the outcome variable of interest (e.g., proportion of women receiving postnatal care within 48 hours of delivery, etc). The ‘interruption’ (e.g., the intervention), was considered present after the project met full implementation so that the pre-trend uses approximately 13 months of data per facility and the post-trend uses about 15 months. The model includes a binary covariate indicating if changes were tested targeting a particular outcome indicator (category) and an interaction term for change tested and time. Changes targeting different categories were each modeled in separate multivariable time series regressions. Significant beta coefficients indicate a one-time jump in the outcome value after the intervention and a sustained change in the trend of the outcome over time respectively. We also include a marker of intervention intensity (number of coaching visits). Each model adjusts for facility type, catchment population, and the geographic woreda.

Preliminary Results:

A description of the intervention facilities and their characteristics is provided in Table 1. Health centers and hospitals serve as the administrative and referral center to an average of 3.7 health posts. QIT facilities employed about 53 staff (including health workers, technicians, and cleaning staff) on average and were responsible for serving populations of around 38,500. The intervention provided around 21 coaching visits to each site.

Table 2 includes examples of change ideas tested within the program and the health indicators that were targeted. QITs tested changes targeting the majority of indicators and tested on average three different ideas within each category. Table 3 illustrates the adjusted multivariate regressions of each change category tested on maternal and child health comes expected to be altered by the improvements in quality. Our preliminary results indicate that there is a significant positive immediate jump in syphilis testing coverage after the implementation of quality improvement changes for antenatal care. However, this effect does not appear to be sustained over time (β : 0.902, sd: 0.312). Additionally, interventions targeting syphilis directly did not have a significant effect on syphilis testing coverage. Among the other outcomes, no other significant changes were found within the 15 months following the interventions. However, positive impacts are found from the intervention intensity (e.g., more total coaching visits) on skilled delivery, attending at least four ANC visits, and low birthweight infants initiating Kangaroo Mother Care. These preliminary findings indicate early promise of quality improvement on key maternal and newborn health outcomes.

Table 1. Program and facility-level characteristics

Variable	N (n=20)	% or mean	Range (if applicable)
Health center (versus hospital)	17	85.0	
Health posts per center		3.7	1 – 10
Mean number of staff		52.6	16 – 159
Mean number of coaching visits		21.2	12 – 34
<i>QITs per Collaborative</i>			
Bokoji/Lemmu Bilbilu	8	40.0	
Tanqua Abergele	6	30.0	
Daguna Fango	6	30.0	
Catchment population (per 1000)		38.5	12.3 – 236.6

Table 2. Description of the change categories and numbers of PHCUs testing each change

Change Category	Examples of change ideas	QITs implementing change (n=20)	Mean changes tested (range)*
ANC	Host a community pregnant women's forum for experience sharing, help with health care navigation, and education	19	2.7 (1 – 5)
Syphilis	Task shifting of syphilis testing from lab technicians to midwives, nurses and health officers, when technicians not available	13	2.5 (1 – 4)
Skilled delivery	Offer visits and tours of delivery rooms to pregnant mothers to develop relationships and engage them in care early	14	2.3 (1 – 4)
PNC	Text/call community health workers to remind them to visit mother at her home within 48 hours of birth	19	3.4 (1 – 6)

*Does not include facilities that did not test a change within the respective category.

Table 3. Multivariate regression results of selected outcomes: coefficients and standard deviations for the change categories and trend following the intervention

Target indicator of changes tested	Model Number and Outcome Indicators							
	(1) Syphilis Testing β(sd)	(2) Syphilis Testing β(sd)	(3) Skilled Delivery β(sd)	(4) Skilled Delivery β(sd)	(5) Attending 4 ANC β(sd)	(6) Receiving PNC β(sd)	(7) Receiving PNC β(sd)	(8) LBW on KMC β(sd)
Syphilis change tested	0.297 (0.277)							
Syphilis change trend	-0.0142 (0.0116)							
ANC change tested		0.902** (0.312)		-0.0247 (0.148)	0.177 (0.162)	-0.247 (0.177)		-0.0105 (0.0117)
ANC change trend		-0.049*** (0.0149)		0.00127 (0.00724)	-0.00295 (0.00764)	0.0130 (0.00853)		7.61e-05 (0.000537)
SBA change tested			-0.0319 (0.139)					
SBA change trend			0.00264 (0.00582)					
PNC change tested							-0.253 (0.158)	
PNC change trend							0.0116 (0.00734)	
Coaching Visits	0.260 (0.198)	0.346 (0.184)	0.330** (0.101)	0.334*** (0.101)	0.274** (0.0883)	0.0881 (0.109)	0.121 (0.109)	0.0191*** (0.00566)

Standard errors in parentheses. Each model adjusted for facility type, catchment population, and Woreda.

LBW=low birth weight; KMC=Kangaroo Mother Care

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

References:

- Central Statistical Agency and ICF. 2016. Ethiopia Demographic and Health Survey. Addis Ababa, Ethiopia.
- WHO. Nobody's Business. Strengthening Health Systems to Improve Health Outcomes. WHO's Framework for Action. Geneva: WHO, 2007
- Federal Democratic Republic of Ethiopia Population Census Commission. 2008. "Summary and Statistical report of the 2007 population and housing census." Addis Ababa, Ethiopia.
- Federal Democratic Republic of Ethiopia Ethiopia Ministry of Health. 2015. "Health Sector Transformation Plan." Addis Ababa, Ethiopia.
- Singh, K., P. Brodish, I. Speizer, P. Barker, I. Amenga-Etego, I. Dasoberi, E. Kanyoke, E. A. Boadu, E. Yabang and S. Sodji-Tettey 2016. "Can a quality improvement project impact maternal and child health outcomes at scale in northern Ghana?" Health research policy and systems **14**(1): 45.
- Singh, K., I. Speizer, S. Handa, R. O. Boadu, S. Atinbire, P. M. Barker and N. A. Twum-Danso. 2013. "Impact evaluation of a quality improvement intervention on maternal and child health outcomes in Northern Ghana: early assessment of a national scale-up project." International journal for quality in health care **25**(5): 477-487.
- Waiswa, P., F. Manzi, G. Mbaruku, A. Rowe, M. Marx, G. Tomson, T. Marchant, B. Willey, J. Schellenberg and S. Peterson. 2017. "Effects of the EQUIP quasi-experimental study testing a collaborative quality improvement approach for maternal and newborn health care in Tanzania and Uganda." Implementation Science **12**(1): 89.