

“Taking Care of Your Pregnancy”: A Mixed-Methods Study of Group Antenatal Care in Kakamega County, Kenya

Aleefia Somji

Management Sciences for Health

Kate Ramsey

SCOPE

Sean Dryer

Globally Minded Foundation

Fredrick Makokha

Kakamega Ministry of Health

Constance Ambasa

Independent consultant

Brittany Aryeh

Independent Consultant

Kathleen Booth

Columbia University

Serge Xueref

Management Sciences for Health

Seneca Moore

Independent Consultant

Ralpher Mwenesi

Kakamega Ministry of Health

Shafia Rashid (✉ srashid@msh.org)

Management Sciences for Health <https://orcid.org/0000-0002-6938-057X>

Research

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Abstract

Background: Traditional antenatal care (ANC) models often do not meet women's needs for information, counseling, and support, resulting in gaps in quality and coverage. Group ANC (GANC) provides an alternative, person-centered approach where pregnant women of similar gestational age meet with the same health provider for facilitated discussion. There are few studies that show associations between GANC and various outcomes.

Methods: We used mixed methods to evaluate a contextualized GANC model (Lea Mimba Pregnancy Clubs) and to understand implementation experiences at six health facilities in Kakamega County, Kenya. Between April 2018 and January 2019, we tracked 1,652 women who were assigned to 162 GANC cohorts to assess ANC retention. Using an intention-to-treat approach, we conducted baseline (N = 112) and endline surveys (N = 360) with women attending immunization visits to assess outcomes and used time diaries to assess wait times. At endline, we conducted 29 in-depth interviews (IDIs) and three focus group discussions with women who were currently and previously participating in GANC, and 15 IDIs with stakeholders.

Results: GANC was associated with enhanced social support, with some evidence for improved knowledge, adoption of healthy behaviors, enhanced self-efficacy, and improved experience of care. Quantitatively, we found strong associations with knowledge of danger signs, women who shared their feelings with other women, knowledge and competence of health workers, respect shown by ANC providers, overall quality of care, and birth preparations. No changes were seen in knowledge of positive behaviors, empowerment, several aspects of the experience of care, ANC retention, early ANC, and other healthy behaviors. Qualitatively, women and stakeholders noted improvements in interactions between health providers and women, improved counseling, increased feelings of empowerment to ask questions and speak freely, and strengthened social networks and enhanced social cohesion among women. Both wait times and counseling times increased in GANC compared to traditional ANC.

Conclusions: This is one of the few mixed-methods studies evaluating GANC and offers new measures for experience of care, empowerment, and adoption of healthy behaviors. While more research is required, GANC holds promise for enhancing women's experiences during pregnancy. Modifications are needed for sustainability and scalability.

Plain English Summary

Traditional one-on-one antenatal care (ANC) often does not provide women with the information and support they need to have a healthy pregnancy and delivery. Group ANC is an alternative model that brings together pregnant women with a health care provider over the course of their pregnancy. Research conducted in high-, middle-, and low-income countries shows promising effects of group ANC on knowledge, support, and practice of healthy behaviors. We implemented a group ANC model (called Lea Mimba Pregnancy Clubs) in one county in western Kenya. The model was adapted to the local context.

We studied the model's effects and acceptability for women of all age groups, health providers and managers, community health volunteers, and county officials by using surveys, interviews, and focus group discussions and tracking women participating in group ANC. Our results showed changes in some areas and no changes in other areas. We found that group ANC is associated with increased social support among women; improved interactions reported by women and stakeholders; and strengthened social networks. We also found that women gained some knowledge and reported an improvement in overall quality of care. More research is needed to further validate our results and to address challenges related to implementation of the model.

Introduction

Significant disparities remain in utilization of services and in the quality of care women receive during pregnancy and childbirth in low- and middle-income countries (LMICs). Increasing access to and utilization of high-quality antenatal care (ANC) is a key strategy in reducing maternal mortality and is associated with increased facility-based delivery [1–4] and postnatal care [5,6]. ANC visits provide screening and detection of early signs of disease, promote healthy behaviors, and link women to services necessary for a healthy pregnancy [7]. While most women in LMICs attend at least one ANC visit (85%) [8], only 62% [9] receive the World Health Organization (WHO) previously recommended minimum of four visits, and new guidelines issued in 2016 recommend at least eight visits [10]. Access to and utilization of ANC services remain low not only because of socioeconomic inequalities, but also due to problems with infrastructure, poor quality of care, and cultural barriers [11]. A synthesis of 85 qualitative studies found that costs associated with visits, lack of privacy, limited time spent with providers, and disrespectful care kept women from attending ANC visits [12]. One study in western Kenya found that the main barriers for using ANC were negative attitudes of clinic staff, long waiting times, and costs related to services and transportation [13].

A systematic scoping analysis showed that women desire a pregnancy experience that includes emotional and social support from health providers and their communities [11]. The WHO Quality of Care Framework for Maternal and Newborn Health further recognizes respectful care, emotional support, and effective communication as important elements in women's experience of care [14]. New models of care are needed to better respond to the needs of women for social support and improve coverage and quality of ANC. Introduced in high-income countries (HICs) as an innovative model for delivering quality care, group ANC (GANC) consists of regular meetings among small groups of women, usually of similar gestational age, facilitated by one or two skilled health providers who guide participants through clinical assessments, education activities, and support groups [15]. In HICs, GANC has been associated with higher satisfaction with care, increased social support, and enhanced relationships with providers [16–20]. Group care models have been introduced in several LMICs and demonstrated positive associations in knowledge of danger signs and adoption of healthy behaviors, such as birth preparedness, delivery in a health facility, breastfeeding initiation, and uptake of family planning [15,21–24]. Other studies [25–27] reported the establishment of social bonds between women participating in GANC and improved

relationships between women and health providers. Only one study examined the effect of GANC on empowerment, with mixed results [25].

Despite its promise, the effects and acceptability of GANC have not been well researched or understood, and WHO has recommended further study [14]. While evidence from HIC suggests that GANC increases satisfaction with care [28], this association has not been well studied in sub-Saharan Africa. In addition, only a few studies have explored the effects of GANC on ANC retention, namely studies in Kenya, Nigeria, Malawi, and Tanzania [25,29], where there were reported improvements. Evidence on social support is also limited, although research shows that continuous social and emotional support in childbirth affects outcomes for the mother and the newborn, including reductions in cesarean sections, antenatal hospital admissions, and mean number of hospitalization episodes [28], and is protective against postpartum depression [30]. Finally, only one recent study [31] has provided a theory of change to explain how GANC led to the expected effects.

Developing and testing a theory of change is important for future design and adaptation of GANC to achieve desired outcomes. This study designed a theory of change and tested novel measures to understand whether implementation of a person-centered GANC model leads to improved experience of care, empowerment, social support, and knowledge and practice of healthy behaviors in pregnancy and postpartum, including increased ANC retention, in Kakamega County, Kenya.

Methods

Our theory of change posited that our person-centered GANC model would build social and emotional support, thereby enabling open discussion of challenges and problem-solving with health providers and peers. Improved knowledge and social support would lead to improved self-efficacy/empowerment throughout the perinatal period. Additionally, women would perceive that care is improved and be more satisfied with ANC. Combined, these would lead to increased likelihood of early ANC, improved ANC retention, better birth preparations, delivery with a skilled provider, and adoption of postpartum family planning.

We used a case study approach [33] with mixed methods to evaluate the GANC model (Lea Mimba Pregnancy Clubs)—adapted to the context using human-centered design—and understand implementation experiences at six health facilities in Kakamega County. A case study allowed us to examine the mechanisms of change leading to the main measured effects, with the aim of guiding future research.

Study Setting

With a maternal mortality ratio of 362 per 100,000 live births and a neonatal mortality rate of 22.2 per 1,000 live births, Kakamega County lags behind the rest of the country [32]: only 45% of women receive at least four ANC visits, as recommended in national guidelines; just over 20% receive any care during the

first trimester of pregnancy; and slightly less than half (47%) deliver with a skilled birth attendant, versus a national average of 61% [32].

Lea Mimba (Taking Care of Your Pregnancy) Pregnancy Clubs were implemented in six health facilities representing urban, peri-urban, and rural sites located in the Lurambi and Malava sub-counties of Kakamega County, specifically one urban referral hospital (level 5), one peri-urban county hospital (level 4), and four peri-urban or rural health centers (level 3). The latter are staffed by midwives or nurses and clinical officers and provide inpatient and outpatient curative and preventive services. County hospitals offer these as well as specialized services (such as cesarean sections and x-rays), and county referral hospitals provide additional advanced care. Monthly ANC visits in the six facilities ranged from 127 to 787, and the number of ANC providers per facility ranged from 5 to 18 in April 2018.

Intervention Design

In collaboration with the national and county health governments, the Kenya Progressive Nurses' Association (KPNA), and the social impact company Scope (formerly M4ID) specializing in human-centered design, we co-designed the Lea Mimba Pregnancy clubs with women, providers, and health officials to include 8-10 women of similar gestational age, who meet with the same health provider; opening and closing rituals, which include singing; time for open discussion and guided discussion; passing of a ball to take turns speaking; pairing of women to take measurements and remind each other of the next appointment; self-checks, where each pair takes each other's weight and records the blood pressure and weight in calendar books; and individual consultation and exams.

Following the WHO-recommended eight-visit model [10] and national standards, we developed a GANC training curriculum, in consultation with Ministry of Health partners, using interactive and adult-learning approaches to train trainers for on-the-job training in project sites. KPNA staff provided peer-to-peer mentorship and supportive supervision. At the initial ANC (booking) visit, pregnant women chose whether to enroll in Lea Mimba and were assigned to a group based on their estimated delivery date. Staff sent phone reminders for pregnancy club sessions in advance; these reminders were often required only for initial sessions. Facility staff used study-specific registers to track women over time. Community health volunteers (CHVs) also supported follow-up for group appointments and encouraged women to attend ANC through community outreach. KPNA staff and facility nurses held community meetings with women participating in GANC to encourage ANC attendance, further discuss pregnancy-related concerns, and share opportunities for income generation.

Data Collection and Analysis

The study used quantitative and qualitative measures to assess changes in key outcomes (Table 1). We also documented implementation experiences in introducing and scaling up the GANC model. All interviews were conducted in English or Kiswahili. Five persons on the research team read through and analyzed the results based on the theory of change.

[Insert Table 1 here]

Quantitative measures

From April 2018 to March 2019, data on age, number of ANC visits attended, and weeks at first ANC visit were extracted from study registers and facility registers to track women attending group and individual ANC sessions across the six facilities. Women were included in the analysis if they met either of two criteria: (1) no one in the group has reported a visit more recent than January 31, 2019 (data was available through March), or (2) at least one member of the group has completed eight ANC visits. Only women in completed groups were included.

At baseline and endline, we also conducted cross-sectional surveys of women seeking postnatal care or immunization up to three months after delivery at study sites. For our measure of empowerment, we used the Pregnancy-Related Empowerment Scale previously used in Tanzania and Malawi [25]. We defined experience of care based on the three elements outlined in WHO's framework for the quality of maternal and newborn health care [14]: effective communication, respect and dignity, and emotional support. We measured these elements quantitatively. Using an intention-to-treat approach, at endline, we surveyed all women regardless of their participation in the Lea Mimba club. We sampled 112 respondents at baseline and 360 at endline and removed the 2 women whose age was missing from age-disaggregated data.

We analyzed all quantitative outcomes from facility registers and client surveys using univariate and multilevel logistic regression models for binary outcomes and multilevel linear regression models for continuous outcomes, allowing facility-level clustering to be accounted for in measures of uncertainty. Where multilevel models produced a singular model due to lack of clustering, simpler regression was performed. No corrections were applied for making multiple comparisons, so secondary and intermediate objectives should be interpreted with greater caution. All quantitative analysis was conducted using R version 3.5.1 (R Core Team, R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing, 2013).

Qualitative measures

At endline, we conducted 44 in-depth interviews (IDIs) and three focus group discussions (FGDs) using semi-structured interview guides. Twenty-nine IDIs were conducted with women who had delivered and completed at least four GANC visits, women who had delivered but did not complete four GANC visits, and women currently in GANC who had completed four GANC visits. We also conducted 15 IDIs with key stakeholders, including county and facility health managers, health workers providing GANC, and CHVs. FGDs were conducted with adolescents and women who did not complete four GANC visits across the six health facilities. Sites were selected purposefully based on ANC retention for all sampling, except for the CHV stakeholder interviews, where we purposefully selected CHVs based on early ANC1 performance. Women were contacted by phone and asked to participate in interviews at a community meeting place.

We analyzed the data using a codebook developed from the main themes in the interview guides and subsequently adapted the codebook based on reading of transcripts and joint coding of two transcripts. We double-coded 10% of the transcripts and conducted framework analysis to summarize and compare responses for each code. Three authors discussed the frameworks to agree on emerging themes and patterns.

Implementation experience

We examined the operational requirements and workflow considerations needed to adopt, sustain, and scale up the group ANC model through observations and formal and informal interviews with facility staff. Time diaries were used to record traditional and group ANC sessions to understand how time was impacted for both providers and clients. Client flow for traditional and group ANC was also mapped in each clinic to reveal changes in how group sessions were accommodated in the client flow through the clinic and identify opportunities for improvement. Participants were taken from a convenience sample of staff and clients in participating clinics. We also reviewed project documentation to identify facilitators and barriers to implementation and conducted interviews with KPNA project staff to document their observations of GANC, what worked well, challenges, and recommendations.

Ethical Approval

Ethical approval was obtained from the Jaramogi Oginga Odinga Teaching and Referral Hospital Ethical Review Committee. Each participant provided written consent before taking part in the study.

Results

Description of the Sample

Between April 2018 and January 2019, 1,652 women were enrolled in group ANC, out of 5,120 new ANC clients recorded in the national health management information system for the study sites. Of the 162 groups formed, 103 were completed at the time of data extraction, with a total of 1,145 women (Table 2). The mean number of women per group was 11.1. We conducted more qualitative interviews with women aged 20–24 who participated in GANC and fewer with adolescents and interviewed more female than male stakeholders.

Overall, demographics were similar between the baseline and endline samples, aside from a significant shift in the age distribution. At baseline, 44% of the sample was aged 20–24, which declined

to 27% at endline, and in the 25–34 age group, these proportions were 40% and 56%, respectively. The overall pattern for lifetime number of births is similar for two births and higher, but the percentage of primigravidae was lower at endline compared to baseline. Other changes in the demographics are consistent with a slightly older sample, including a decrease in the number of primigravidae, an increase in the percentage married, and a larger average household size. The proportion of women reporting

delivery at a facility increased from 89% at baseline to 92% at endline. At endline, only 36.1% of the sample had participated in GANC.

[Insert Table 2 here]

Outcomes

Our results were mixed. We saw the greatest change in the proportion of women who could identify three or more danger signs during pregnancy, but no change in reports about what a woman could do to improve her and her baby's health. We also saw changes in sharing of feelings and experiences with other women, a result strongly supported by our quantitative and qualitative findings. In addition, we found changes in women's ratings of knowledge and competence of health workers, respect shown by ANC providers, and overall quality of care, although we did not find changes in their perceptions of other aspects of quality of care. These results were supported by the qualitative results. Quantitatively, we did not find any statistically significant changes in empowerment, some aspects of respectful care, or adoption of healthy behaviors, with the exception of women who made two or more birth preparations. In contrast, our qualitative results found women participating in GANC reported both feelings of self-efficacy and being able to make a difference for the better.

[Insert Table 3 here]

Knowledge of healthy behaviors

We assessed changes in knowledge from survey data, interviews, and FGDs. The proportion of survey respondents able to identify three or more danger signs of complications during pregnancy more than tripled, from 7.1% at baseline to 26.4% at endline (OR: 4.58; 95% CI: 2.26–10.61) (Table 3). The change in knowledge of women able to identify three or more ways to improve their and their baby's health was not statistically significant between baseline and endline.

In qualitative interviews and discussions, women reported an overall increase in knowledge as a result of Lea Mimba, in particular gaining practical tips and information on how to care for themselves and their baby. Women reported that they not only learned essential information, but they also understood better why what they were doing was important for their health and for their baby and that this deeper understanding made them more willing to adopt healthy behaviors.

Even that part of taking drugs... we never knew the importance of taking these drugs... we would say the drugs are bad, they make someone nauseated when you take them. We were taught the importance of the drug that makes the baby grow well in the uterus.... Nowadays I can't miss taking it. *Adolescent, county hospital*

Women described learning not only from health providers but also from peers. Providers also described a mutual learning environment where they gained insights into cultural practices and beliefs, which helped

them understand women's situations. As a result, they were able to provide better counseling and communication.

To me personally it has opened my eyes, the interaction with these mothers has taught me a lot, we teach each other actually, because there are some things they know that we never knew; some things are taboo actually, so you try to know misconceptions so you try to rectify and they take it positively. *Health provider, county hospital*

Improved experience of care

We found improvements in women's reports about their experience of care between baseline and endline, particularly in knowledge and competence of health workers (OR: 2.52 95% CI: 1.57–4.02), respect shown by ANC providers (OR: 1.82, 95% CI: 1.16–2.85), and women's satisfaction with overall quality of care (OR: 1.62, 95% CI: 1.03–2.53) (Table 3). We saw an increase from 58.9% at baseline to 71.7% at endline of women who strongly agreed that they shared their feelings and experiences with other women (OR: 1.73, 95% CI: 1.1–2.7). We did not find any evidence that intent to use the same facility in a subsequent pregnancy changed between baseline and endline or that the proportion of respondents self-described as "very likely" to recommend the facility to other women changed. Similarly, we did not find evidence of changes in disrespect or humiliation.

Through qualitative data, women reported an improved experience of care in GANC as compared to traditional ANC—including improved communication, feelings of respect and dignity, and social and emotional support and solidarity.

Our service provider was very good. She was very free and open and in any case you had any problem and you are pregnant, you could still approach her and she would teach you. *Young woman, county hospital*

GANC participants described the social support, trust, and solidarity they gained by sharing experiences and giving each other strength and encouragement to cope. They described receiving support that was both practical, such as sharing transport, as well as emotional, such as dealing with the stress of a pregnancy complication. Most women described forming bonds with at least some of the women in their group and with the health provider. Discussions with their peers enabled them to solve problems together.

They are friends. When one tells her experience and another also talks about her experience, they help to sort out the problem...When one woman does not come, her friend will remind her of the next meeting, and she will make an effort of looking for her and asking her why she has not seen you. *CHV, health center*

Women valued these aspects of GANC and talked about how they maintained the relationships even outside the group sessions. A number of women talked about how the relationships would likely continue after the pregnancy. A few expressed disappointment when the health provider who was facilitating their sessions changed and was replaced by another, which may indicate that the women had developed a

bond with the provider. Health providers also seemed to gain some satisfaction from developing closer relationships with women and found it helped them provide better quality of care. In particular, women noted improved respectfulness from the health provider and a reduction in perceived discrimination. Adolescents in particular reported being treated more respectfully and felt at ease, free from discrimination and judgement.

Lea Mimba really encouraged mothers; when we used to attend, most of the nurses were friendly. In normal ANC clinics, you will find some nurses don't attend to you well, but in the Lea Mimba club, the nurses did not discriminate against anyone. When you go to other clinics you are told you are dirty, here you are attended to the way you are. *Adolescent, county hospital*

Qualitative data also revealed a range of challenges that affected women's experience of care. In particular, they experienced long wait times, leading to hunger, because other women in their group sometimes arrived late, or the health provider was not available, often with the result that sessions were not held as scheduled. Not all groups seemed to establish camaraderie, with some women noting they did not like the group or the other members.

Empowerment

We did not find evidence of changes in empowerment between baseline and endline in quantitative data, but women in qualitative interviews and discussions, especially adolescents, described increasing feelings of self-efficacy and confidence to adopt more healthy behaviors. Adolescent women reported that they became more empowered to do things they previously felt they could not do.

Yes, for me I never imagined I could take care of my pregnancy, I never saw myself taking care of a child and using family planning, I thought it was a lot of work. But after the Lea Mimba lessons, I can do all these things. *Adolescent, referral hospital*

While this was explicitly expressed only among adolescent age groups, for the groups in general, health providers described how women were more active in taking a role in their ANC experience, such as asking for services or tests, as expressed by this provider:

They really liked it [group ANC] and if you had not taken their pressure they are the ones who would remind you that sister you have not taken my pressure, teacher you have not weighed me. We used to teach them how to do some of these things...unlike the normal ANC where a mother walks in and you are the one who does everything for her, but now they are the ones doing these things for themselves. *Health provider, health center*

Adoption of healthy behaviors

Across facilities, 22.4% of women attended ANC1 \leq 12 weeks gestation, compared to data from the Demographic and Health Survey (DHS), which reported 19.7% of women had attended ANC <4 months [32]. These results should be treated with caution, as definitions of early ANC differ between our study

and the DHS. Figure 1 shows the retention of women who were enrolled in GANC: 96% of women enrolled during ANC1 attended at least one more ANC (group or individual), 76% attended at least four visits, and 8% attended eight.

Figure 1. Number of ANC sessions attended by women enrolled in group ANC

The mean number of ANC visits increased by 0.89 visits (95% CI: 0.47–1.42) between baseline (4.21) and endline (5.08). Among women under 25, the mean number of visits increased by 0.79 (95% CI: 0.27–1.34) between baseline (4.23) and endline (5.11). There was no evidence from client surveys that the reason women attended ANC changed over the course of implementation.

The proportion of women reporting two or more of any of the listed preparations (Table 4) increased from 33.0% at baseline to 48.9% at endline (OR: 1.94; 95% CI 1.24–3.05); however, changes in preparing items for the baby or delivery were not significant. In qualitative interviews and discussions, both women and health providers noted improved behaviors in preparing for childbirth. They reported buying items for the baby, saving money for transport once labor began, and packing a bag to take to the facility.

At least nowadays they come when they are prepared, they carry clothes for the baby, and she has a towel to wrap the baby, so I think that it has improved [behaviors]. *Health facility manager, health center*

...my first pregnancy...I did not save money to buy clothes for the baby and transport costs before the baby was delivered. But for this one, I was taught and I prepared myself early. I bought the baby's clothes early and saved some cash for delivery costs. *Older woman, county hospital*

In addition, women across all age groups and district and health facility staff described how participating in Lea Mimba helped women adopt positive behaviors for a healthy pregnancy and newborn baby. In particular, young and adolescent women indicated that the advice and information helped them make improvements and had a positive effect on their lives.

These sessions really helped me, because I was opting to abort but after the sessions I did not abort. Then I did not know anything like taking care of my pregnancy, but through attending the sessions I survived with the pregnancy. *Adolescent, health center*

And then you should not bathe the baby but just wipe, just wipe until the umbilical cord drops off. Let it heal, that is when you can start bathing her in much water. I did that but for those other ones I used to bathe them immediately and it used to take time for the umbilical cord to heal, so it was different for this other one. Those lessons really helped me. *Older woman, health center*

Our study also looked at the distribution of family planning methods at baseline and endline. We found no difference between women reporting family planning use at endline when compared to baseline, or in women reporting facility-based delivery. We also measured the proportion of women reporting delivery at a health facility and found no significant increase between baseline (89.3%) and endline (92.5%). In contrast, through interviews and focus groups, women of all ages spoke of the importance of delivery at

a facility; health providers and managers also perceived an increase in the use of facility-based delivery at the project sites.

[M]ost of these mothers...are used to being delivered by the traditional birth attendants, but after all these teachings; I can say that we have improved on deliveries. At least they have improved because they come to the hospital for deliveries. They no longer go to the traditional birth attendants. *Health provider, health center*

While additional qualitative analysis compared health behaviors of women who attended fewer than four and more than four GANC sessions, we found no major difference between the two groups, except that women who attended more than four sessions tended to explain in more detail the behaviors they adopted.

Implementation experience

We found a high level of fidelity to the contextualized model. There were, however, site-specific deviations related to women taking their own health measurements, depending on the willingness of the provider and availability of equipment. Participant and provider time diaries from traditional ANC (baseline) and GANC (endline) indicated that systemic and user factors, including human resources, infrastructure, and wait times, affected implementation. Some facilities were short-staffed, sometimes with only one health provider on duty, and other facilities (hospitals) experienced high staff turnover. Adequate space and privacy were not always available, with some facilities holding group sessions in corridors. While the design of the intervention intended to schedule the sessions in the afternoon, when facilities are often empty of regular patients, women reported that they typically arrived in the morning and waited until the provider was free. Health providers had to provide regular clinical services or respond to emergency situations in addition to GANC, often resulting in delays or cancellation of group sessions.

Women attending GANC spent substantially more time at the health facility as compared with their traditional ANC counterparts, not only due to increased time spent in facilitated discussions but also due to increased wait times. On average, at baseline women attending traditional ANC received approximately 6 minutes of individual counseling by health providers compared to 55 minutes of group sessions in GANC. The mean wait time during group ANC was 157 minutes as compared to 67 minutes in traditional ANC. Women would often wait for sessions to begin, attend the group session, and queue again for the individual clinical examination.

The frequency of community group meetings varied widely across project sites, with more difficulty reported for the referral hospital, mainly due to distance and other logistical factors. CHVs reported that women were able to develop savings programs and other types of income-generating activities to save money for delivery and other related costs.

Discussion

We examined our results according to our theory of change. Our study found GANC is associated with enhanced social support, with some evidence for (1) improved knowledge, (2) improved experience of care, (3) enhanced self-efficacy, and (4) adoption of healthy behaviors. These findings suggest that our understanding of the pathways through which GANC affects outcomes may be incomplete, and further research may be needed to generate new hypotheses. Our mixed results can be explained by several factors: a short implementation period (10 months) to transition ANC services at project sites to GANC and observe population-level effects; low adoption of GANC in our survey sample (while we intended for all ANC clients to shift to GANC, at endline only 36.1% had participated in GANC); and limitations in some of our quantitative measures to assess some elements of the theory of change.

The evidence for improvements in knowledge of healthy behaviors was inconclusive: while knowledge of danger signs tripled among GANC participants, no statistical difference was found in knowledge of positive health behaviors between baseline and endline. This contradicts what is generally found in the literature [17,23,34,35], which has reported improvements in all aspects of knowledge. A recent study in Nepal [31] also found that knowledge of danger signs significantly improved, but knowledge of birth preparation decreased, from baseline to endline. Our qualitative data revealed that participating women identified learning as the aspect they most valued in GANC; they appreciated the tips and information and an understanding of the “why” in addition to the “what.” We found similar findings elsewhere in the qualitative literature: a study in the United States [20] reported how women spoke of understanding, rather than just learning, information, and studies in Rwanda and Bangladesh [26,27] reported that women valued the improved knowledge they gained through interacting with others and in new ways. The lack of a change in knowledge of positive health behaviors needs further exploration—perhaps our curriculum emphasized recognition of danger signs over self-care, or our measure needs to be revised.

To date, there are no published studies from LMICs that quantitatively measure experience of care from GANC. Most of the literature on GANC in HICs has studied effects of GANC on satisfaction of care and found an increase [18–20] with the exception of one trial [17] in which the mean difference was not statistically significant. In our study, women reported improvements in knowledge and competence of health workers, respect shown by ANC providers, and women’s ratings of overall quality of care. However, we found no change in other elements of women’s experience, such as recommending the facility to other women, information and counseling from health providers, and the rate at which women reported experiencing disrespect or humiliation. Our qualitative data indicates that GANC may have supported more effective communication. Some women described their experiences as nondiscriminatory and respectful and felt sessions provided an open and safe space to discuss questions and concerns. These discrepancies in women’s experience of care may be due to cultural understanding of terms and/or social or courtesy biases.

While our study found mixed results of the effect of GANC on supporting effective communication and providing respectful and dignified care, we found strong evidence of the effect of GANC in providing women with social support. Club members described developing bonds with health providers and with other women that fostered trust, enabling them to jointly solve practical and emotional problems and

cope with pregnancy stresses. Health care providers also noted an improvement in their relationships with women. Studies in LMICs confirm this result: women valued the peer support and improved relationships with health providers and the support that came from these bonds [25–27,36,37]. This finding was perhaps due to the emphasis of our GANC model on fostering social bonds by linking women with other pregnant women at similar gestational ages, pairing individual women, and using interactive learning techniques to help women discuss problems and challenges.

We hypothesized that improved knowledge and social support would contribute to feelings of empowerment and self-efficacy among women participating in GANC; however, we found no difference in quantitative measures between baseline and endline for empowerment. We used a scale previously validated in Malawi and Tanzania but were unable to validate this in the county context prior to the study, which may explain this finding. The only quantitative study to date assessing the effect of GANC on women's empowerment [25] had mixed results: in Malawi, women in GANC had higher empowerment scores, while there was no statistically significant difference in Tanzania. We found only one qualitative study [31] assessing empowerment as a result of GANC, where women reported feeling empowered to speak up in a group setting. In our qualitative data women, most notably among adolescents, reported feelings of empowerment and self-efficacy to do things they felt they could not before they attended GANC. Health providers also described how women were more active in their ANC experience, and the shifted power dynamics may have been empowering for all. Our findings and the lack of literature in this area point to the need for further research.

Our theory of change posits that by establishing social connections and bonds that gave women strength and encouragement to cope, GANC may contribute to women's feelings of self-efficacy and adoption of positive health-seeking behaviors. We observed positive qualitative and quantitative results in one health-seeking behavior, birth planning: respondents were almost twice as likely to have made two birth preparations at endline compared to baseline. In our qualitative data, women reported practicing healthy behaviors, such as taking nutritional supplements and setting aside money for delivery costs. Studies in Ghana [23] and Iran [22] found similar results: women in GANC were more likely to practice healthy pregnancy-related behaviors and make preparations for childbirth.

We found no quantitative evidence that GANC led to changes in adoption of other behaviors, for example in use of family planning and facility delivery, though this has been documented elsewhere in the literature [21–24]. We hypothesize that non-use of family planning in our sample may be due to a low perceived risk of pregnancy before a return of menses, as a systematic review found [38]. Like the study in Nepal [31], we found no quantitative data showing an increase in facility delivery; the use of facilities for delivery at baseline was high (89%), making changes harder to see. In contrast, through our qualitative data, health providers, CHVs, and county staff reported that GANC led to a perceived increase in rates of facility delivery at project sites.

These mixed results in adoption of healthy behaviors may be due to the design of our instruments, which focused on whether a behavior had changed or not and did not capture why people behave in a certain

way or the underlying aspects that affect behavior (e.g., decision-making power, money, cultural beliefs); in other words, a limitation in our quantitative measure in asking women to list positive behaviors. The lack of congruity in our data may in part be explained by this limitation as well as the low percentage of women participating in GANC in our endline sample.

We found no statistically significant changes in ANC retention or early initiation of ANC. To date, few studies have assessed the effects of GANC on retention: studies in Malawi, Tanzania, Nigeria and Kenya [24,25,29] reported ANC4+ retention was higher in GANC than individual ANC; a study in Nepal [31], however, also found no change in ANC completion. No previous studies have examined the effect of GANC on early ANC initiation, and only one qualitative study has examined the role of the patient-provider relationship in seeking early ANC [39]. The relatively short implementation period might not have allowed sufficient time to observe population-level effects. Although early ANC initiation was encouraged through CHVs and community outreach, we did not expect to see immediate improvements in women presenting for early ANC during the project but may see improvements in subsequent pregnancies or after the intervention has been sustained for an extended time.

While our use of co-creation and co-design may have resulted in ensuring high fidelity to the GANC model, we still found a range of implementation challenges. Long wait times and staffing shortages may have negatively affected women's and health providers' experiences, leading to a less positive experience with GANC. We found few studies describing implementation experience; one study in India [15] reported similar challenges, including inadequate staffing, issues with scheduling, and long wait times. One systematic review [35] also underscored demand- and supply-related challenges, including those related to personnel, participant retention, and physical resources, that occurred as part of GANC implementation. WHO notes that GANC may reduce wait times, because staff can be more productive by counseling many women at the same time. We did not observe this in our study. GANC addresses only certain aspects that relate to women's experience of ANC and was not able to address broader systemic factors (financial costs, lack of transport, etc.), also reported by Musabyimana et al. in Rwanda [26]. While health providers referenced the increasing pressures associated with conducting GANC along with their other clinical duties, they were reluctant to shift routines to lessen pressures during early morning hours. Additional time and support may have been needed to adjust to the new model, since GANC represents a fundamental shift in how services are organized and how women and health providers interact.

Study Limitations

Interpretation of our results must be contextualized within several limitations. First, pregnant women who participated in GANC opted in for this intervention, despite the intervention design, which aimed to enroll all women; thus, the study may have enrolled women who were more eager to participate in ANC. Our survey sample were women who were attending immunization and who are, therefore, more likely to seek care (e.g., facility-based delivery, family planning) and are not comparable to the general population. Although we used independent consultants to conduct the endline, all survey and interview results were subject to recall and social desirability bias. At baseline, the number of surveys collected from several

facilities were low, which affected the ability to estimate facility-level mixed effects in our regression models. Certain subgroups, such as women aged under 15, are not well represented and were difficult to find. We rarely found information to estimate variation between clusters for sample size calculations, so our study may be underpowered. Our survey instrument may not have adequately captured the constructs we intended. Our short implementation period (10 months) limits our ability to see changes in our outcomes. Further, we cannot make any causal inference from our study due to the quasi-experimental design. Our intervention sites were non-random, and we did not have a comparison group. We cannot be certain how generalizable our findings may be to other health facilities in Kakamega County or other contexts. Rather, our study provides a specific case example and is best considered alongside other emerging research on GANC.

Conclusion

Our theory of change posited that improvements in knowledge and social support among women would lead to improved feelings of self-efficacy around pregnancy and delivery, which in turn would lead to improved experience of care and adoption of healthy behaviors. Our mixed findings suggest that our understanding of the pathways through which GANC affects outcomes may be incomplete. One alternative pathway to consider is that GANC may lead to changes in knowledge, social support, and experience of care, which in turn lead to improved self-efficacy, resulting in adoption of healthy behaviors. We suggest further development of quantitative and qualitative measures to assess empowerment and experience of care, and more research on GANC. Because GANC entails important changes in how services are delivered, management aspects, such as routines, scheduling, staffing, and infrastructure, must be carefully considered. Modifications are needed to address challenges and ensure sustainability and scalability. Nevertheless, our research has shown that GANC improved women's experience of care through improved counseling and social support. Traditional ANC must be transformed to provide women with high-quality standards-based care that is responsive to their needs for counseling, psychological support, and social connections with other women.

Abbreviations

ANC antenatal care

CHV community health volunteer

DHS Demographic and Health Survey

FGD focus group discussion

GANC group antenatal care

HICs high-income countries

IDI in-depth interview

KPNA Kenya Progressive Nurses' Association

LMICs low- and middle-income countries

WHO World Health Organization

Declarations

1. Ethical approval was obtained from the Jaramogi Oginga Odinga Teaching and Referral Hospital Ethical Review Committee. Each participant provided written consent before taking part in the study.
1. Availability of data and material: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.
1. Competing interests: The authors declare that they have no competing interests.
1. Funding: The Lea Mimba project was financially supported by the County Innovation Challenge Fund, part of the UK Department for International Development's (DfID's) Reducing Maternal and Neonatal Death in Kenya (2013-2018) program, and through the Special Initiative Fund of the board of directors of Management Sciences for Health (MSH). The donors had no role in the analysis of results and in the writing of the study.
1. Authors' contributions: FM, AS, and SR managed and supervised the study. KR, SR, FM, SX, and SM designed the intervention and study. KR and SR created the theory of change. CA and FM collected the endline data. FM managed and collected the cohort tracking data. SR, KR, KB, and BA analyzed and interpreted the qualitative data. SD analyzed and interpreted the quantitative data. SM analyzed and interpreted the workflow data. KR, BA, SR, AS, and SD triangulated the data. SR, AS, SD, KR, and BA wrote the article. All authors read and approved the final manuscript.
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1. Consent for publication: not applicable

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Tables

Table 1. Key outcomes and respective measures

Outcome	Quantitative Measures	Qualitative Measures
<p>Knowledge of healthy behaviors</p>	<p>Baseline and endline survey</p> <ul style="list-style-type: none"> ● Knowledge of danger signs/complications ● Knowledge of how to improve self and baby's health 	<p>IDIs with women currently in GANC</p> <p>IDIs with women who completed at least 4 GANC visits</p> <p>IDIs with women who did not attend at least 4 GANC visits</p> <p>FGDs with women who completed GANC</p> <p>FGDs with women who did not complete 4 group ANC sessions</p> <p>IDIs with health providers, facility managers, CHVs, and county health team</p> <p>Questions focusing on:</p> <p>What learning has made a difference in your life, if any</p> <p>Likes and dislikes about participating in or implementing pregnancy club</p>
<p>ANC experience of care (based on WHO framework: effective communication, respect and dignity, and emotional support)</p>	<p>Baseline and endline survey</p> <ul style="list-style-type: none"> ● Sharing feelings and experiences with other women ● Knowledge and competence of health workers ● Respect shown to respondent by ANC providers ● Trust in ANC providers ● Language ANC providers used toward respondent ● Information and counseling provided 	<p>IDIs with women currently in GANC</p> <p>IDIs with women who completed at least 4 GANC visits</p> <p>IDIs with women who did not attend at least 4 GANC visits</p> <p>FGDs with women who completed GANC</p> <p>FGDs with women who did not complete 4 group ANC sessions</p> <p>IDIs with health providers, facility managers, CHVs, and county health team</p> <p>Questions focusing on:</p> <p>Likes and dislikes about participating or implementing</p>

	<p>about pregnancy, delivery, and post-natal care</p> <ul style="list-style-type: none"> ● Overall quality of care 	<p>pregnancy club</p> <p>Describe relationships between women and with health providers</p> <p>Benefit of participating in pregnancy clubs</p>
Empowerment	<p>Baseline and endline survey</p> <ul style="list-style-type: none"> ● Adaptation of Pregnancy-Related Empowerment Scale (PRES) 	<p>IDIs with women currently in GANC</p> <p>IDIs with women who completed at least 4 GANC visits</p> <p>IDIs with women who did not attend at least 4 GANC visits</p> <p>FGDs with women who completed GANC</p> <p>FGDs with women who did not complete 4 group ANC sessions</p> <p>IDIs with health providers, facility managers, CHVs, and county health team</p> <p>Questions focusing on:</p> <p>Benefit of participating in pregnancy clubs</p> <p>Likes/dislikes about pregnancy club</p>
Adoption of healthy behaviors	<p>Baseline and endline survey</p> <ul style="list-style-type: none"> ● Birth preparations: women reporting they made preparations ● Family planning: current use ● Facility-based delivery: women reporting they delivered at a health facility <p>Group tracking</p>	<p>IDIs with women currently in GANC</p> <p>IDIs with women who completed at least 4 GANC visits</p> <p>IDIs with women who did not attend at least 4 GANC visits</p> <p>FGDs with women who completed GANC</p> <p>FGDs with women who did not complete 4 group ANC sessions</p>

- Early ANC
- Retention: number of ANC visits

IDIs with health providers, facility managers, CHVs, and county health team

Questions focusing on:

Benefit of participating in or implementing pregnancy clubs

Likes/dislikes about pregnancy clubs

Implementation experience

Time diaries for women and providers

Stakeholder IDIs (participating women, health facility managers, health providers, CHVs, and county health management team)

Questions focusing on:

Perceptions of how implementation of the pregnancy club took place in county/health facility

Additional support or materials to continue with the pregnancy club

Likes/dislikes about pregnancy club

Most and least important part of the pregnancy club

Changes to make the club better

Likes/dislikes about pregnancy club

Easy or difficult to participate in pregnancy club

Table 2. Characteristics of respondents

GANC Facility Registry		
Age	N = 1,650 (%)	
10–14	1 (0.06%)	
15–19	287 (17.4%)	
20–24	593 (35.9%)	
25–34	656 (39.8%)	
35+	113 (6.8%)	
Facility	N = 1,652 (%)	GANC cohorts completed (103)
Level 3	388 (23.5%)	19
Level 3	218 (13.2%)	13
Level 3	254 (15.4%)	19
Level 3	230 (13.9%)	16
Level 4	350 (21.2%)	23
Level 5	212 (12.8%)	13
Survey Respondents		
	Baseline (N = 112)	Endline (N = 360)
Age		
15–19	13 (11.6%)	39 (10.8%)
20–24	49 (43.6%)	97 (26.9%)
25–34	45 (40.2%)	201 (55.8%)
34+	5 (4.5%)	23 (6.4%)
Number of lifetime births		
1 birth	44 (39.3%)	93 (25.8%)
2 births	30 (26.8%)	106 (29.4%)
3 births	20 (17.9%)	79 (21.9%)
4 births	11 (9.8%)	43 (11.9%)
5 births	2 (1.8%)	22 (6.1%)
6+ births	5 (4.5%)	17 (4.8%)

Marital status		
Never married	18 (16.1%)	60 (16.7%)
Currently married	81 (72.3%)	286 (79.4%)
Separated	4 (3.5%)	3 (0.8%)
Divorced	0 (0.0%)	4 (1.1%)
Widowed	0 (0.0%)	2 (0.6%)
Partnered— living together	6 (5.4%)	1 (0.3%)
Partnered— not living together	3 (2.7%)	3 (0.8%)
N/A	0 (0.0%)	1 (0.3%)
Highest level of education		
None	3 (2.7%)	8 (2.2%)
Before Primary	9 (8.0%)	3 (0.8%)
Primary	38 (33.9%)	139 (38.6%)
Vocational	4 (3.6%)	3 (0.8%)
Secondary	(35.7%)	160 (44.4%)
Training Post-Secondary	(6.3%)	28 (7.8%)
University	(9.8%)	19 (5.3%)
Years of living in village or town		
<1 year	1 (.9%)	25 (6.9%)
1-2 years	47 (42.0%)	90 (25.0%)
3-5 years	25 (22.3%)	111 (30.8%)
6-10 years	16 (14.3%)	72 (20.0%)
11-20 years	17 (15.2%)	45 (12.5%)
21-30 years	5 (4.5%)	15 (4.2%)
>30 years	1 (0.9%)	2 (0.6%)

Religion			
Muslim	2 (1.8%)	5 (1.4%)	
Christian	97 (86.6%)	353 (98.1%)	
Traditional	12 (10.7%)	2 (0.6%)	
None	1 (0.9%)	0 (0.0%)	
Number of household members			
<3	4 (3.6%)	10 (2.8%)	
3–4	54 (48.2%)	147 (40.8%)	
5–6	30 (26.8%)	131 (36.4%)	
7–8	18 (16.1%)	49 (13.6%)	
>8	6 (5.4%)	23 (6.4%)	
Head of household by gender			
Man	98 (87.5%)	323 (89.7%)	
Woman	10 (8.9%)	35 (9.7%)	
Do not know	4 (3.6%)	2 (0.6%)	
Qualitative Respondents			
In-depth interviews (N = 29)			
Age	Women who have delivered and completed at least 4 Group ANC (N = 20)	Women who have delivered but did not complete 4 visits (N = 6)	Women who are currently in Group ANC and have completed 4 group visits (N = 3)
<20	8	2	1
20–24	8	2	2
25+	4	2	-
Facility level			
Level 3	10	6	2
Level 4	5	-	-
Level 5	5	-	1
Focus Group Discussion (N = 19)			

Group	Number of Participants
Young women (age 20–25)	8
Adolescents (15–19)	6
Older women (26+)	5
Stakeholder IDI (N = 15)	
Position	
Health facility manager	4 (male = 1; female = 3)
Health care provider	4 (male = 1; female = 3)
CHVs	4 (male = 1; female = 3)
County health official	3 (male = 1; female = 2)

Table 3. Summary of results

	Percentage		Odds Ratio (95% CI)
	Baseline	Endline	
Knowledge of healthy behaviors			
Women who could identify 3 or more danger signs of complications during pregnancy	7.1%	26.4%	4.58 (2.26–10.61)
Women who could identify 3 or more things a woman can do during pregnancy to improve her and her baby’s health	30.4%	37.5%	1.37 (0.87–2.19)
Qualitative themes: Knowing the why and not only the what; practical tips and information; mutual learning for women and health providers			
ANC experience of care: Percentage rating “excellent” or “very good” based on 5-point Likert scale			
Women who strongly agreed that they shared their feelings and experiences with other women	58.9%	71.7%	1.73 (1.1 – 2.7)
Knowledge and competence of health workers	57.2%	78.6%	2.52 (1.57–4.02)
Respect shown to respondent by ANC providers	59.8%	73.3%	1.82 (1.16–2.85)
Experienced disrespect and humiliation	7.1%	9.7%	1.40 (0.66–3.33)
Trust in ANC providers	58.1%	65.0%	1.23 (0.78–1.91)
Language ANC providers used toward respondent	57.2%	65.6%	1.39 (0.88–2.16)
Level of privacy and confidentiality observed during ANC	55.3%	62.0%	1.29 (0.79–2.22)
Intent to use same facility in a subsequent pregnancy	88.8%	93.2%	1.87 (0.39–9.47)
Very likely to recommend facility to other women	75%	90.8%	2.82 (0.39–9.47)
Overall quality of care	56.3%	68.3%	1.62 (1.03–2.53)

Qualitative themes: Sharing experiences to solve problems, giving each other strength and encouragement to cope, feeling that nurses create an open and safe space			
Empowerment and self-efficacy: Percentage who “strongly agree” based on a 5-point Likert scale			
You could ask your ANC provider about your pregnancy.	67.0%	63.1%	0.86 (0.54–1.36)
Since you began antenatal care, you have been making more decisions about your health.	74.1%	74.7%	1.02 (0.61–1.66)
You felt you had a right to ask questions when you don’t understand something about your pregnancy.	83.0%	76.4%	0.67 (0.37–1.16)
You were able to change things in your life that are not healthy for you or the baby.	75.0%	78.3%	1.21 (0.73–1.99)
You did what you could do to have a healthy baby.	92.9%	87.5%	0.54 (0.23–1.12)
You could talk to your partner about your pregnancy and planning for delivery.	85.6%	76.9%	0.56 (0.21–1.23)
Qualitative themes: Feelings of self-efficacy			
Adoption of healthy behaviors			
Number of ANC visits	4.21	5.08	95% CI: 0.47–1.42
Number of ANC visits among under 25 years of age	4.23	5.11	95% CI: 0.27–1.34
Birth preparations			
Women reporting that they made 2 or more of any of the listed preparations	33.0%	48.9%	1.94 (1.24–3.05)
Women reporting that they prepared items for the baby or delivery	64.3%	71.9%	1.61 (0.94–2.72)
Use of family planning	67.9%	60.6%	0.72 (0.26–2.02)
Use of facility for delivery	89.3%	92.5%	1.51

Early ANC: ANC1 ≤12 weeks gestation

No baseline information available

22.4%

Qualitative themes: Making a difference for the better

Table 4. Responses to question: What preparations did you make?

Response	Baseline (N = 112)	Endline (N = 360)
Saved money	56 (50%)	201 (55.8%)
Selected facility	4 (3.6%)	24 (6.7%)
Arranged transport	5 (4.5%)	50 (13.9%)
Prepared items for the baby/delivery	72 (64.3%)	259 (71.9%)
None	19 (17%)	44 (12.2%)
Do not know	1 (0.9%)	0 (0%)
Other	0 (0%)	6 (1.7%)
Not applicable	1 (0.9%)	1 (0.3%)

Note: Multiple responses were allowed.

Figures

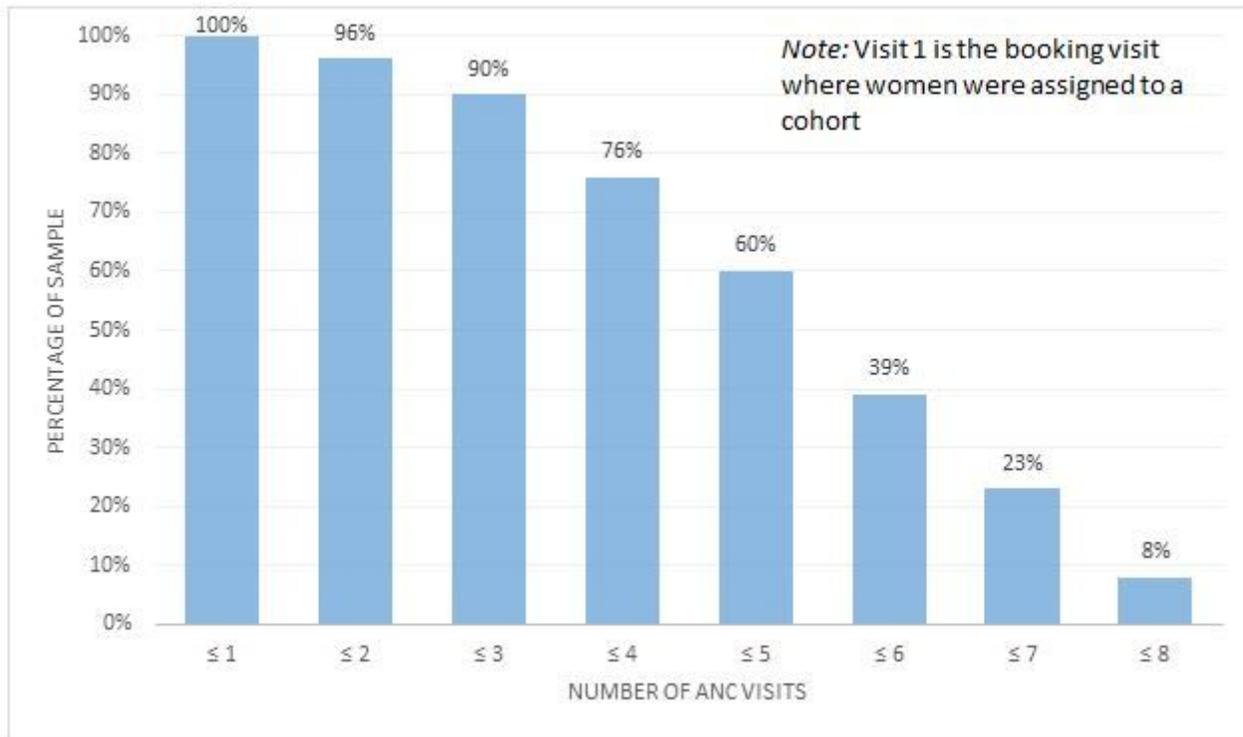


Figure 1

Number of ANC sessions attended by women enrolled in group ANC