

Effectiveness of Nurse-Led Behavior Change Intervention in Addressing First Maternal Delay in Nakuru County, Kenya

Grace J. Kibet¹, Damaris A. Ochanda², Tecla P. Sum³

¹Department of Community Health Nursing, School of Nursing and Midwifery, Moi University, Eldoret, Kenya.

e-mail: gracekibett@yahoo.com

²School of Nursing, Midwifery and Paramedical Science, Masinde Muliro University of Science and Technology, Kakamega, Kenya.

e-mail: dochanda@mmust.ac.ke

³Department of Paramedical Sciences, Masinde Muliro University of Science and Technology, Kakamega, Kenya.

e-mail: tsum@mmust.ac.ke

Received August 19, 2025, accepted September 28, 2025, published April 1, 2026.

ABSTRACT

Context: Globally, about 700 mothers die daily during pregnancy, labor, and childbirth, a steadily increasing trend, where 40% of the cases have been linked to the first maternal delay. Pregnant mothers who experience first delay are at risk of facing several health problems, accelerating other forms of maternal delays.

Aim: The study aimed to evaluate the effectiveness of a nurse-led behavior change intervention in addressing first maternal delay in Nakuru County, Kenya.

Methods: The study employed a pre- and post-quasi-experimental design, utilizing a standard, structured questionnaire as a data collection tool for both the intervention and control groups. A total of 211 antenatal mothers were included in the study during pre-posttest, where 105 consented pregnant mothers at 28-30 gestational weeks, from 4 level 3 health center facilities received intervention (nurse-led behavior change intervention plus standard routine antenatal care (ANC)), while the remaining 106 consented pregnant mothers represented control group in the other 4 level 3 health facilities, they continued with their standard routine antenatal care only. The two arms of the study were studied for a period of 3 months.

Results: The proportion of first maternal delay experienced among the intervention group during the baseline assessment was 78.1%, while the control group had 86.8%. However, after the study period utilizing nurse-led health education, those participants in the intervention group, experienced drastic reduction in first maternal delay experience to 0.95% (AOR, 0.004 and a p value <0.001), showing the transformative change.

Conclusion: The nurse-led behavior change intervention significantly reduced the first maternal delay experience among study participants in the intervention group compared to the controls, specifically targeting the time taken to decide to seek care in an emergency during antenatal or childbirth, resulting in improvements in maternal and neonatal health. The study recommended that health authorities in both national and county governments integrate nurse-led behavior change interventions into the standard antenatal care practice for all pregnant mothers to aid in improving maternal outcomes.

Keywords: Behavior change, first maternal delay, intervention, nurse led

Citation: Kibet, G. J., Ochanda, D. A., & Sum, T. P. (2026). Effectiveness of nurse-led behavior change intervention in addressing first maternal delay in Nakuru County, Kenya. *Evidence-Based Nursing Research*, 8(1), 29-40. <https://doi.org/10.47104/ebnrojs3.v8i2.430>

1. Introduction

First maternal delay is the delay in time taken (more than 1 hour) to decide to seek care in an event of an emergency during pregnancy or childbirth leading to adverse health outcomes (Dahlström, 2022). Delay is a negative behavior that requires urgent intervention to enable prompt action without postponement (Collins, 2025). Previous studies have linked maternal delay with increasing rates of maternal deaths (Riese & Dhakal, 2023).

According to the *World Health Organization* (2025), about 260,000 mothers died globally in 2023 during pregnancy, delivery, or the post-natal period. African countries doubled the maternal mortality rate (MMR) at 531 per 100,000 live births (LBs), accounting for 92% of global maternal deaths. Sub-Saharan African (SSA)

countries, including South Sudan, Chad, and Nigeria, are among the leading contributors to maternal mortality, with rates of 1223, 1063, and 1047 per 100,000 live births, respectively (Oyedele & Lawal, 2025), making it a significant global health concern (Khalil et al., 2023).

In addition, 40% of all preventable deaths have been linked to first maternal delay, an unacceptably high proportion (WHO, 2025), prompting an urgent need to improve maternal health care (Ersboll & Pal, 2025) to preserve the well-being of the mother, a critical ingredient of future generations (Błachnio & Kuryś-Szyncel, 2022). The three types of maternal delay by Thaddeus and Maine, (1994) included: Delay in decision to seek care (first maternal delay); delay in arrival at a health facility (second maternal delay); and delay in the provision of adequate care (third maternal delay) (Mohammed et al., 2020).

The current WHO set targets by the year 2030, is to achieve “ZERO” preventable maternal death and MMR of less than 70 and not more than 140 per 100,000 LBs

¹Correspondence author: Grace Jephumba Kibet

(World Health Organization, 2023). To achieve this target, first, maternal delay needs to be dealt with using workable interventions, to provide the right care, at the right time, with support of high-quality care during antenatal care (ANC) and delivery (Jarelnape et al., 2023).

However, *Healthcare Access in Rural Community*. (2021) reported that "an increase in supply of resources in the health facility does not always result in greater accessibility and service utilization. Underutilization of health facilities may lead to missed opportunities for early detection and prevention of obstetric risks and subsequent deaths (Amungulu et al., 2023). According to Karimi et al. (2020), the occurrence of maternal death would negatively impact the health, social, and economic outcomes of the whole family and the nation at large.

Effective communication by healthcare providers (HCPs) in healthcare facilities was essential for managing obstetric emergencies and ensuring continuity of care (Coupe et al., 2022), with a focus on behavior change interventions (Public Health Division, 2023). According to Porat-Dahlerbruch et al. (2025), nurse practitioners (NPs) helps in utilizing workable interventions, as they are uniquely placed to reduce health disparities, improve healthcare utilization, and promote favorable health outcomes. Nurse practitioners play a significant role similar to that of a midwife, aiding in the prevention of preventable deaths through patient-centered care, which is their primary component (Bradford, 2021).

The utilization of nurse-led interventions has continued to flourish in the healthcare system, witnessing a positive transformation in terms of setting new standards for person-centered care and making positive changes towards a better future for all, making it a more effective option to address the first maternal delay (Randall, et al., 2017). The use of nurse-led behavior change intervention in addressing first maternal delay had not been utilized before in this county. This study, therefore, evaluated the effectiveness of nurse-led behavior change intervention in addressing first maternal delay in Nakuru County, Kenya.

2. Significance of the study

This study evaluated the outcomes of nurse-led behavior change intervention in addressing contributors to first maternal delay in the real-world setting. This evaluation was needed because Kenya was identified with an increasing maternal death rate of 55% in the year 2017-2022, with MMR of 530/100,000 LBs, and ranked as the 10th globally (World Health Organization, 2023). The country initiated free maternity services in 2013 to help alleviate the cost of maternity services in the public sector and improve maternal health coverage. Later, Linda mama, through National Health Insurance Fund (NHIF) in 2016, was introduced to an expanded package beyond the public sector, but MMR was still realized in the country (Oyugi, 2023).

Several studies linked increasing death rate and complications to women with limited decision-making power, since they were less likely to access essential antenatal, skill delivery, and post-natal care, which were vital in reducing maternal mortality (Haile et al., 2024). Therefore, the findings of this study will greatly help in

alleviating contributors leading to first maternal delay, which was putting the life of the mother to a narrow point of maternal death or near-miss event. The narrative that had to change, for this study, was geared towards overturning it.

This study would help in realizing the potential power of utilizing nurse practitioners as a lead person in the implementation of interventions geared toward taking care of mothers, for evidence has supported the notion that nurse practitioners provide care that is comparable to physicians in terms of quality, utilization, and satisfaction metrics (Savard et al., 2025). The intervention also emphasizes that, to combat maternal mortality, the focus of care for mothers needs to be provided through the sharing of health messages instructing mothers to report immediately to a health facility in the event of recognizing danger signs (Fernandes, 2020).

The intervention empowered mothers through health education, informing their decision-making process and enabling them to make independent care-seeking decisions. This intervention led to early and timely antenatal and delivery services, which facilitated the early detection and management of complications, thereby promoting maternal health and its outcomes (Mutowo et al., 2021).

Additionally, it helps the health officials in understanding the reasons why pregnant mothers were dying and hence recommended the utilization of evidenced based practice in preventing death caused by first maternal delay, adapting nurse-led behavior change intervention as a strategy to reduce and combat first maternal delay and improve maternal care, which would aid in realizing set WHO, SDG No. 3 target one by 2030, saving future generations. Lastly, the study findings will help inform the development and review of the curriculum, contributing to the growing body of knowledge and evidence-based practice in health initiatives. Ultimately, the findings obtained in this study will serve as a baseline for future studies related to maternal health in the study area.

3. Aim of the study

The study aims to evaluate the effectiveness of nurse-led behavior change intervention in addressing first maternal delay in Nakuru County, Kenya.

3.1. Research hypothesis

H₀: Nurse-led behavior change intervention is not effective in reducing first maternal delay in Nakuru County.

3.2. Operational definitions

Behavior is the way in which one acts or conducts oneself, especially towards others.

Change is the act or process through which something becomes different. In this study, delay is the targeted behavior of change, thus acting immediately without postponement.

First Delay is described in this study as a process where the mother takes much time in decision-making to seek care at the health facility in case of an emergency/complication, or who assists them to make a decision.

Nurse-led behavior change intervention is the action where the nurse is taking the lead using intervention (health messages) targeting negative behavior change by interfering with the outcome, especially of a condition or a process (to prevent harm or improve functioning).

4. Subjects & Methods

4.1. Research Design

The researcher employed a pre-post quasi-experimental study design in both the intervention and control groups. By using this design, the researcher measured and analyzed the baseline level of the dependent variable (the time taken to make decision to seek care) before intervention and then assessed how it changed after the intervention process.

A quasi-experimental type of study design ensured reliability, as it was essential when the researcher needed to administer a test to assess changes in behavior or attitudes. In this study design, the participants in the intervention group were subjected to an intervention utilizing a nurse-led behavior change intervention, in addition to standard routine ANC care, to determine its effect on behavior change (the time taken to decide to seek care). In contrast, the control group continued with their standard routine ANC care to determine its effectiveness.

Although random assignment was not applicable in this study design, matched allocation assignment was used to select respondents who met the inclusion criteria to participate in the study in both the intervention and control arms, thereby addressing issues with confounders. Additionally, the researcher-initiated restrictions throughout the study period in both arms of the study. The intervention and control groups selected were from far-distant geographical areas and had limited access to service delivery points to avoid issues with possible contamination.

4.2. Study Setting

Initially, Nakuru County was randomly selected from a list of the top maternal mortality contributors in the five capital cities in Kenya, considering any interventions in place, thereby eliminating the four cities: Nairobi, Mombasa, Kisumu, and Eldoret. This county is among the 47 Counties in the Country, Kenya, lying within the Great Rift Valley.

The county currently has a total of 674 Health facilities, including 26 hospitals, 630 primary care facilities, and 249 community health units. Among them, 465 health facilities offer ANC services, as listed in Table 1.

Multistage cluster sampling was employed to cluster the Sub-Counties and level 3 health facilities, selecting the study site. A total of 24 level 3 public health facilities were distributed amongst 11 Sub-Counties, where a third of these study sites (8 level 3 health facilities) were randomly selected from the sample frame to participate in the study. The study facilities included Rongai, Upper Solai, Kabatini, Kapkures, Lanet, Sachangwan, Rhonda, and Mau Narok health centers, with 211 study participants

allocated across these sites to ensure a vast region for both control and intervention arms, considering the estimated number of pregnancies at a given point in time.

It was essential to determine the approximate number of pregnant women within a study area, as this information informs emergency planning and response to better address the specific needs of that study population (*Karanja-Chege, et al., 2025*). The outcome variable for this study was the first maternal delay, which was measured as an average of 174 study subjects during the baseline assessment.

Table (1): The number of health facilities offering ANC services in Nakuru County.

Level of the facility	Public	NGO/FBO	Private	Total
5	1	0	0	1
4	15	5	16	36
3	24	15	32	71
2	156	14	4	174
1	0	6	177	183
Total	196	40	229	465

4.3. Subjects

The target population for this study consisted of pregnant mothers aged 18 to 49 years, at 28-32 weeks of gestation, who attended the ANC clinic in the selected health facilities. Those pregnant mothers who met the criteria and voluntarily consented to participate in the study were followed up in the same facility within the study period, until delivery (the exit point). Each selected facility recruited one ANC nurse purposively to assist in the study implementation process.

The study employed the Fleiss formula, a statistical method for rates and proportions, as described in 1981, for determining its sample size. This method was deemed the most suitable for comparing two proportions, as noted in other studies (*Ghazi, 2020*). The normal distribution at power of 80%, was considered standard achievement for intervention process, where p_1 and p_2 are the expected sample proportions of the two groups ($p_1 =$ expected sample proportion of ANC mothers making prompt decision in the intervention group was 55% = 0.55 and $p_2 =$ expected sample proportion of ANC mothers delay in decision making in the control group was 35% = 0.35).

A total sample size of 202 participants was required, and to account for the attrition rate, 10% was added to the minimum sample size $(202) = 21$. Therefore, the total number of respondents was $202 + 21 = 223$. Since the ratio was 1:1, respondents were distributed across 8 study sites, with intervention facilities at each site. This equation resulted in 112 respondents in the intervention arms and 112 in the control arms of the study. During the baseline study, seven participants from the intervention group and six from the control group did not fully complete the questionnaires and therefore did not continue with the study. The 105 and 106 (intervention and control arms, respectively) completed the post-intervention interview (exit point) with a 100% response rate.

To start with, ANC mothers were recruited using a purposive sampling technique, utilizing the Ministry of Health (MOH) 206 ANC register and considering those in attendance. This recruitment was achieved first by determining if they had ever experienced any form of emergency/complication during their previous pregnancies and the actions they took, estimating the time taken for a response, and questioning when and how they reached the

health facility. Those who had delayed seeking care and had met the criterion were included in the study. The recruited mothers were then given an informed consent form and signed it after further explanation of the study's purpose. ANC mothers excluded from this study if they did not consent to participate in the study, as well as those who were not willing to continue with the clinic at the selected health facilities.

Table (2): Distribution of study sample per health facilities (n=224).

Level 3 Health Facility	Intervention Group		Level 3 Health Facility	Control Group	
	Estimated No. of pregnant women	Sample		Estimated No. of pregnant women	Sample
Rongai Health Centre	896	32	Sachangwan Health Centre	439	16
Kapkures Health Centre	889	32	Lanet Health Centre	856	30
Upper Solai Health Centre	449	16	Rhonda Health Centre	800	28
Kabatini Health Centre	587	21	Mau Narok health centre	778	27
Total Sample	2821	101	Total sample	2873	101
Miscellaneous (10%)		11	Miscellaneous (10%)		11
Total		112	Total		112

Source: KDHS-Nakuru Data, 2023

4.4. Tools of Data Collection

4.4. Structured Interview Questionnaire

The selection of this questionnaire was guided by the study's objectives as well as the nature of the data to be collected. The study utilized this instrument at baseline and end-line (post-intervention) to collect quantitative data from the study participants.

Sections A and B of the questionnaire were adapted and modified from the existing national standardized Ministry of Health (MOH) ANC register, MOH 405, which is employed at all ANC clinics revised in 2016 (*Ministry of Public Health and Sanitation and Ministry of Medical Services, n. d.*). Section A included the socio-demographic characteristic of the ANC mothers while section B entails the structure of the obstetric history. Section C, targeting the first maternal delay, which was adapted from the questionnaire used in a study conducted by *Riese and Dhakal (2023)*, which was modified to suit the study's objectives. The two major questions borrowed from this section in the measurement of the first delay included:

First, “during your previous or current pregnancy, do you think the decision to come to this facility to seek care/delivery was taken at the right time?” if the response is “yes”, then “no delay” but if the response is “no”, or gives reasons that she “wanted to come earlier but waited for symptom to subside or took longer” was categorized as “delay.

The second question was focused on the decision to seek care: "At what stage did you (or someone else) decide you would come/be sent to the facility?" If either "after 1 hour or more of complication" showed evidence of the first delay, while “less than 1 hour” in the question were categorized as "no delay". The tool prepared was used to measure the proportion of delay in making a decision to seek care, considering the time taken to decide on a pregnancy-related complication or an emergency. In this study, any time above 1 hour (>1 hour) was considered the first maternal delay. This scoring measured the proportion

of first maternal delay among ANC mothers during entry (baseline) and exit point (end-line) assessments in both groups (intervention and control).

4.5. Procedures

The study was conducted after approval and clearance from the relevant authorities to include: Masinde Muliro University of Science and Technology Institutional Scientific and Ethics Review Committee (MMUST-ISERC) - *MMU/COR:40312VOL6(01)*; National Commission for Science and Technology (NACOSTI) - *NACOSTI/P/25/416331* and an official data collection permission letter from County Government of Nakuru County - *NCG/PSM/2/13 VOL.1(70)*; County Commissioner of Nakuru County – *CC.SR.EDU.12/1/2/VOL.VIII/65*; Ministry of Education Nakuru County – *CDE/NKU/GEN/4/1/21 VOL.IV/111* and also the Chief Executive Officer of Health (CEOH) Nakuru County through the County IERC – *CGN/CDPH/RES/2025/1137*.

Written informed consent was obtained from the ANC mothers before data collection. This was done after introducing the purpose of the study and providing information about participants' rights to withdraw from the study at any time with no penalty. They were informed that the data obtained would be anonymized (the names of the participants were not written in the questionnaire and would not be recorded during the interview session). Debriefing was conducted before and after data collection to clarify any issues that arose during the study.

The interviewers were assured that the information collected would be handled privately and confidentially throughout all phases of the research activities and would not be used against them in any way. Additionally, the research findings obtained were not to be linked to any participant. In addition, the collected information was stored safely in lockable cabinets, and all the soft copies obtained were secured using a password known only to the researchers.

To ensure the validity and reliability of the tool, Cronbach's Alpha test was done to assess whether the research tool provides a good measure for the study (Sago, 2023). Cronbach's Alpha test is one of the most commonly used statistical tools for assessing the reliability of research instruments. Its coefficient measures internal consistency for a set of items, showing how well they collectively capture the intended construct (Saputra, 2025). The sample for the pilot-test used in this study comprised 10%, where 23 ANC mothers were randomly selected, considering those who had the same characteristics as the respondents in the study area. The questionnaire was organized according to the COM-B structured components, targeting first maternal delay. Reliability test was done utilizing Cronbach's Alpha test using SPSS Version 29.

The Cronbach's Alpha coefficient was 0.723, indicating strong and acceptable internal consistency of the questionnaire. The findings also show that items within different sections effectively contribute to the survey's internal consistency, with all of them having a Cronbach's Alpha coefficient greater than 0.7. In addition to the test conducted, there was a need to minimize deviations from the true measurements. Therefore, the researcher trained three research assistants and eight nurses on the use of data collection tools. More so, the researcher ensured close supervision of research assistants during data collection. The validity of the tools was also ensured through subject matter experts reviewing the content of the questionnaire, and adequate supervision was provided during implementation.

The researcher's research assistants were trained to serve as mentors to the staff working in the selected ANC clinic and assist with data collection. They also assisted in interviewing post-natal mothers at the exit point, for both ANC mothers who were introduced to nurse-led behavior change interventions as instructed, following the planned intervention implementation framework, and those at the control facilities. The identified nurses working at the ANC clinic in the intervention facilities were also trained for 2 days to provide them with insight into the implementation process using the developed nurse-led behavior change educational training guideline/manual.

The provided training manual was developed based on the MOH protocols and as directed by the modified capacity, opportunity, motivation, and behavior change (COM-B) model that aided in behavior change. The researcher introduced the COM-B model to aid in changing the negative targeted behavior (first maternal delay). According to West and Michie (2021), the COM-B model has been tested and proven to provide a systematic and transparent approach to identify and change targeted behaviors. This technique has also been considered the most effective and has been applied successfully in changing behavior in other health-related fields (Coupe *et al.*, 2022); hence, it is believed to bridge the gap and help prevent maternal deaths attributed to the first maternal delay. Therefore, the researcher incorporated this model into the activities undertaken in the nurse-led behavior change intervention through health education during the

intervention process. Eight (8) ANC nurses were each purposively selected from 8 designated health facilities to assist in delivery of nurse-led behavior change intervention through health education during the intervention process.

The content of the nurse-led behavior change intervention entailed; sensitization on the current service delivery model, considering the safe motherhood guidelines, and targeted ANC elements. The trained nurses were issued a guiding tool containing a key nurse-led behavior change framework for reference during the initial and follow-up keynotes.

The study was conducted in three stages:

Stage One: Baseline Assessment. This stage aimed to evaluate the background information and determine the decision-making process among ANC mothers, which was collected using a structured questionnaire.

Stage Two: Implementation Process (Introduction of the nurse-led behavior change intervention). Upon signing the consent form, mothers were introduced to the cohort support group, and their first meeting took place. According to Mwaisaka *et al.* (2025), group or cohort ANC was a structured program that facilitated shared learning, social support, and personalized care within a group setting, addressing the diverse needs of pregnant mothers through interactive discussions, health assessments, and individualized care plans. The researcher took the lead in implementing the targeted activities, assisted by the ANC nurses. Analyzing the role of nurse-led behavior change intervention in influencing desired action was important in promoting maternal health during pregnancy and/or delivery in Nakuru County.

The two arms of the study (control and intervention) were examined in a parallel design, where the intervention group received treatment (a nurse-led behavior change intervention) in addition to routine standard care. These helped the study to assess the effectiveness of the contribution of nurse-led behavior change intervention to establish an outcome targeting prompt and immediate decision/ and action (no first maternal delay). The nurses conducted three monthly ANC cohort visits, then followed up with the participants till delivery. The control groups continued with their normal standard routine care and were evaluated upon delivery at the maternity ward or at the post-natal clinic (exit point). Supervision of all activities in the selected health facilities was done by the principal investigator (PI) and the research assistants (RAs). The PI, together with the RAs, holds monthly meetings with the nurses to discuss activities undertaken during each month of implementation.

Nurse-led behavior change intervention was a health education intervention structured as per the COM-B model focusing on capacity building, enhanced opportunity through environmental restructuring and motivation uplift, with the aim of empowering ANC mothers to be able to make prompt and early decision to respond to their health needs. The content involved: Safe motherhood, decision making process and decision makers, maternal delay and remedy, danger signs, and birth preparedness. It was delivered monthly in three sessions.

Stage Three: End-line (Exit) process was done by carrying out an end-line assessment, done after the mother delivered, either at the post-natal ward to those participants who delivered in the study facility and at the post-natal clinic to those who delivered elsewhere, to determine effectiveness of the intervention conducted by the research assistants, nurses, and the PI. This was assessed by comparing the differences obtained after intervention in the intervention group with those in the pre-intervention period for both study arms.

4.6. Limitations of the study

This research employed a before-and-after quasi-experimental study design, which lacked randomization. The study participants were followed longitudinally; therefore, the outcome (behavior change) might be influenced by the Hawthorne effect. However, to mitigate this, the researcher ensured a matched allocation of study facilities, considering similar geographical representation, protocols, and facility characteristics.

The study intervention period was intended to be 3 months; unfortunately, most of the study participants delivered a few days before the estimated time of delivery (EDD). This was because EDD is just an estimate, not a precise prediction of when labor will start. This was supported by the fact that approximately 5% of mothers do give birth on the due date, but rather from 37 weeks, where the fetus is counted as a term baby, ready to be delivered anytime (*Petitjean-Barkulis, 2023*). However, the researcher was able to cover all the content planned for the study period before the exit point.

Consequently, the analysis of data may have underestimated the burden of the first maternal delay attributed to the exclusion criterion used to select study subjects. This underestimation was mitigated by doing the baseline survey.

4.7. Data Analysis

Regular verification and validation of the data were conducted for 211 questionnaires from the study participants. They were checked and resolved by the researcher and research assistants before data entry. The data was then cleaned, organized, and protected by placing a password known only to the PI, and was kept under lock and key. The software used to analyze the data for this study was the Statistical Package for the Social Sciences (SPSS) version 29.0.

To determine the effectiveness of the intervention, which was generally measured by a system's ability to meet its requirements from a particular viewpoint (outcome evaluation), the measure of effectiveness (ME) and the contribution of nurse-led behavior change in addressing the first maternal delay were drawn from the quantitative data. Therefore, GEE, survival analysis using the Kaplan-Meier estimating plot, and hypothesis testing were employed to assess the effectiveness of a nurse-led behavior change intervention in reducing first maternal delay. Variables with an AOR <1 and a p-value ≤ 0.05 were considered significant. Additionally, a difference-in-differences (DID) analysis was conducted to compare

changes in outcomes over time between the intervention and control groups.

5. Results

Table 3 represents the comparison of socio-demographic characteristics of the study participants. A total of 211 participants participated in this study. The intervention group consisted of 105 study participants, while the control group 106 participants. In both groups, the majority of the participants were between the ages of 25-30 years, accounting for 39.1% and 34.0% in the intervention and control groups, respectively. There was no significant difference in mothers educational background between the intervention and control groups, with 62(59%) of women in the intervention group completing secondary school, compared to 50(47.2%) in the control group, followed by 18(17%) women who did not complete secondary education in the intervention group compared to 15(14.2%) in the controls.

Marital status was a common feature between the interventions and controls, with the majority being married, 81.9% and 78.3% and the least were widowed, 0% and 1.9% respectively. The husbands' educational background was also similar in the two groups, with 48.6% and 38.7% completing secondary education. The least educated were those with no education, at 0% and 1.9% in the intervention and control groups, respectively.

The mothers' occupations between the intervention and control groups reveals that 54(51.4%) women having no occupation, compared to 50(47.2%) in the control group, respectively. None (0%) in the intervention group had no other occupations, while 6(5.7%) in the control group did. However, 17(16.2%) and 16(15.1%) had formal employment in the intervention and control groups, respectively. Concerning the husbands' occupations, in the intervention group, those who were dependent on farming were 27(25.7%) and 21(19.8%) in the controls. There was no statistically significant difference between the two groups in terms of all socio-demographic variables.

Table 4 presents the comparison of obstetric history of the study participants. From both the intervention and control groups, most participants were multigravidas, at 86.7% and 92.5%, respectively. In relation to miscarriages experienced, a similar number of participants, 81, had no history of miscarriage from both groups with non-statistically significant difference between the two groups at $p < 0.05$.

Attendance of ANC ($p=0.002$) and frequency of attendance ($p=0.005$) were significant findings among the study participants, where 89(84.8%) attended ANC and 19(18.1%) completing over 4 ANC visits in the intervention group compared to 103(97.2%) attended the ANC, 32(30.2%) completing 4 ANC visit in the control group. In both the intervention and control groups, 66.7% of the participants attended 1 to 3 ANC visits in their previous pregnancies. The proportions of mothers who had planned their pregnancies between the intervention and control groups were 50(47.6%) and 65(61.3%), respectively.

Table 5 demonstrates the comparison of first maternal delay in both study and control groups pre and post intervention. The proportions of first maternal delay significantly dropped from 78.1% to 1.0% at $p < 0.001$ as shown in Table 5. At the same time, the control group shows a statistically significant increase from 86.8% to 95.3% post intervention at $p = 0.022$ as shown in Table 5, showing the effectiveness of intervention.

Table 6 shows a difference in difference (DID) analysis was done to assess the effectiveness of nurse-led behavior change intervention in addressing first maternal delay among ANC mothers who had experienced maternal delay previously, where the intervention group ($n=105$) was introduced with nurse-led intervention plus standard routine ANC care, and the controls ($n=106$) utilized standard routine ANC care only.

During baseline assessment, the overall first maternal delay reported among the intervention group were 82 and the control group 92 participants. Comparison of the intervention and the control groups after 3 months was noted, and the changes in the first maternal delay in each group were demonstrated, as shown in Table 6

$$\underline{DID = (1 - 82) - (101 - 92) = (-81) - (9) = -90}$$

Figure 1 shows an indication that, after controlling for the time trend in the control group, the nurse-led behavior change intervention reduced the number of mothers experiencing maternal delay by 90 cases, more than it did in the control group, suggesting a larger negative effect of the intervention.

Table 7 reveals a significant difference in the time taken to decide to seek care after experiencing a danger sign at the post-intervention stage of the study between the intervention and control groups (p value < 0.001). In the intervention group, 57% ($n = 60$) decided promptly (immediately or within 30 minutes) to seek care, while 0.9% ($n = 1$) in the control group decided promptly to seek care. Contrary, 84.9% ($n=90$) of participants in the control group delayed seeking care, yet 0% (none) of the interventions delayed seeking care post-intervention.

Figure 2 illustrates the survival rate analysis considering prompt decision to seek care versus waiting time at the facility. The figure presents the Cox-Proportional Hazard (CPH) regression estimates, showing a statistically significant association between the time taken to decide to seek care and adverse effects, considering waiting time at the facility ($HR = 0.036$, $CI = (0.012, 0.113)$, $p < 0.001$). This reflects that, participants in the intervention group had a reduced hazard rate of experiencing adverse effect leading to risk of maternal mortality and morbidity or near-miss event by 96.4% compared to those in control group even when exposed to long waiting time at the facility, indicating a strong and statistical significance protective effect of the nurse-led

behavior change intervention with confidence interval of less than 1, a strong evidence of risk reduction.

Table 8 presents the frequency of study participants who experience first maternal delay among the intervention and control group during post intervention study period. From the results 1 participant in the intervention group experienced first maternal delay while 104 did not, compared to 101 who experienced first maternal delay while 5 did not in the control group.

Table 9 presents the significant association found between participants enrolled in the intervention group, utilizing a nurse-led behavior change intervention, and not experiencing the first maternal delay ($AOR = 0.004$, $p < 0.0001$). This indicates the effectiveness of the intervention. The significant change in first maternal delay for those who utilized a nurse-led behavior change intervention, as determined by the chi-square McNemar test, was $p < 0.0001$, compared to those who received standard routine ANC care only, indicating that the difference was statistically highly significant.

6. Discussion

This study was initiated by the fact that maternal mortality rate (MMR) was high in the study area (375/100000LBs), and that most of these maternal mortalities were attributed to the first maternal delay, which was preventable if targeted interventions and actions were directed towards maternal care-seeking decision-making during ANC, hence would help in reducing deaths associated with the first maternal delay and aid in promoting adequate maternal and neonatal health hence help achieve SDG No. 3, target 1 of reducing preventable maternal mortality by the year 2030. The study was aimed at evaluating the effectiveness of nurse-led behavior change in addressing first maternal delay in Nakuru County, Kenya.

From this study, during the baseline assessment, the proportion of first maternal delay experienced by ANC mothers among the intervention group was more than three fourths, while the control group had more than four fifths. These high rates projected in this study, justifies the barriers ANC mothers encounter in terms of deciding to seek care and the past negative experiences in the health facility (*Amungulu, et al., 2023; Haile, et al., 2024*). Other studies presented significant lower rates compared to our study findings to include: 72%, 44%, 41.2%, 23.3%, and 21.8% in low and middle income countries (LMICs) (*Amante et al., 2025; Debela, et al., 2024*) respectively for majorly Ethiopia and Sierra Leone Countries. The differences in findings with other studies may be due to variations in study methodologies, study populations, cultural barriers, and the level of health facilities used, which could contribute to such discrepancies.

Table (3): Comparison of study and control groups’ socio-demographic characteristics (n=211).

Variables	Interventions n=105		Controls n=106		p-value
	Frequency	%	Frequency	%	
Age					
18-24	31	29.5	32	30.2	0.355
25-30	41	39.1	36	34.0	
31-36	20	19.0	21	19.8	
37+	13	12.4	17	16.0	
Mother’s Educational background					
None	1	1.0	2	1.9	0.125
Primary not completed	6	5.7	2	1.9	
Primary completed	5	4.8	19	17.9	
Secondary not completed	18	17.1	15	14.2	
Secondary completed	62	59.0	50	47.2	
Tertiary-college/university	13	12.4	18	17.0	
Marital status					
Married	86	81.9	83	78.3	0.275
Single	18	17.1	17	16.0	
Widowed	0	0.0	2	1.9	
Divorced/ separated	1	1.0	4	3.8	
Husbands Educational background					
None	0	0.0	2	1.9	0.539
Primary not completed	2	1.9	3	2.8	
Primary completed	5	4.8	3	2.8	
Secondary not completed	5	4.8	8	7.5	
Secondary completed	51	48.6	41	38.7	
Tertiary-college/university	23	21.9	26	24.5	
Mother’s Occupation					
None	54	51.4	50	47.2	0.075
Formal employment	16	15.2	17	16.0	
Farmer	7	6.7	12	11.3	
Business	28	26.7	21	19.8	
Other	0	0.0	6	5.7	
Husband’s Occupation					
None	3	2.9	4	3.8	0.764
Farmer	27	25.7	21	19.8	
Formal Employment	17	16.2	16	15.1	
Business	37	35.2	37	34.9	
Other	2	1.9	5	4.7	

During the post-intervention period, the first maternal day dropped significantly and drastically from more than three fourths to one percent of the ANC mothers who utilized a nurse-led behavior change intervention. At the same time, the control group face a significant increase in the maternal delay experience, indicating a substantial improvement in person-care-seeking decision-making, promoting prompt decision-making processes in the event of an emergency or complication among the study group subjects. These results demonstrated the effectiveness of the intervention in reducing first maternal delay, suggesting a meaningful shift in maternal health decision-making power, producing a marked decline in the first maternal delay experience. This finding was in line with a study by Savard *et al.* (2025) who revealed that, for an intervention to be utilized well, there is a need to use nurse practitioners, for they influence policies supporting evidence-based nursing practice, providing better balance between health promotion, prevention, and patient-centered care. In addition, Htay and Whitehead, (2021) suggested that, to reduce medical staff workload, there was need to optimize

the cost-effectiveness and efficiency of healthcare services by utilizing nurse practitioners thus improving the overall patient satisfaction. Therefore, for a successful implementation of evidence-based practice, APNs has to take the lead.

The provision of training and mentorship across teams (nurses and ANC mothers) supported a shared understanding and sense of integration, connectedness, and ownership, and the adoption of behavior change among mothers helped reduce the incidence of first maternal delay experiences. In addition, the marked improvement in the intervention arm of the study was attributed to the health education provided by trained nurses with the aim of empower the participants to be their decision-makers in times of needs, utilizing the COM-B model educational plan.

Nurse-led behavior change intervention was helpful in preventing cases of maternal mortality caused by first maternal delay, for it has shown it's effective in reducing cases of first maternal delay in the study area, hence can be utilized as a preventive measure to improve the quality of

Table (4): Comparison of study and control groups' Obstetric history (n=211).

Variable	Interventions n=105		Controls n=106		P-value
	Frequency	%	Frequency	%	
Number of pregnancies					
Multigravida (2-4)	91	86.7	98	92.5	0.169
Grand multigravida (5+)	14	13.3	8	7.5	
Miscarriages					
0	81	77.1	81	76.4	0.992
1	23	21.9	24	22.6	
2+	1	1.0	1	0.9	
ANC Attendance					
Yes	89	84.8	103	97.2	0.002
No	16	15.2	3	2.8	
Frequency of ANC Visits					
0	16	15.2	4	3.8	0.005
1-3	70	66.7	70	66.7	
4+	19	18.1	32	30.2	
Planning of Pregnancy					
Yes	50	47.6	65	61.3	0.046
No	55	52.4	41	38.7	

Table (5): Proportions of First Maternal Delay experienced between pre and post study both intervention and control group (n=211).

First Maternal delay	Intervention, n=105				P-value (within group)	Controls n=106				P-value (within group)
	Pre		Post			Pre		Post		
	No.	%	No.	%		No.	%	No.	%	
Yes	82	78.1	1	1.0	<0.001	92	86.8	101	95.3	0.022
No	23	21.9	104	99.0		14	13.2	5	4.7	

Table (6): Frequency of study participants with first maternal delay, and effectiveness of intervention using DID analysis.

Group	Before intervention	After Intervention	Change in the First maternal delay
Intervention	82	1	-81
Control	92	101	9

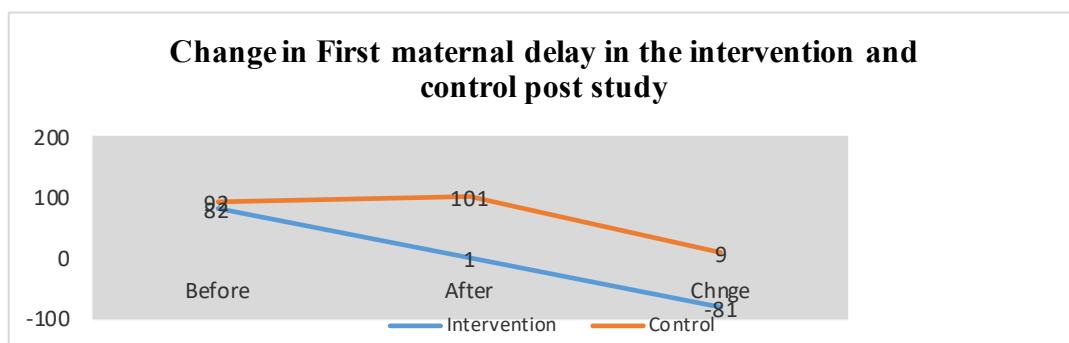


Figure (1): Comparison of change in first maternal delay in intervention and control arms (n=211).

Table (7): Comparison between intervention and control group in time taken to decide to seek care at end-line period (n=211).

Group	Time to decide to seek care									P-value (between groups)
	Prompt care			Delayed care			NA			
	No.	%	CI	No.	%	CI	No.	%	CI	
Intervention	60	57.1	0.473–0.664	0	0.0	0.00–0.035	45	42.9	0.336–0.527	<0.001
Control arm	1	0.9	0.020–0.049	90	84.9	0.768–0.905	15	14.2	0.088–0.221	

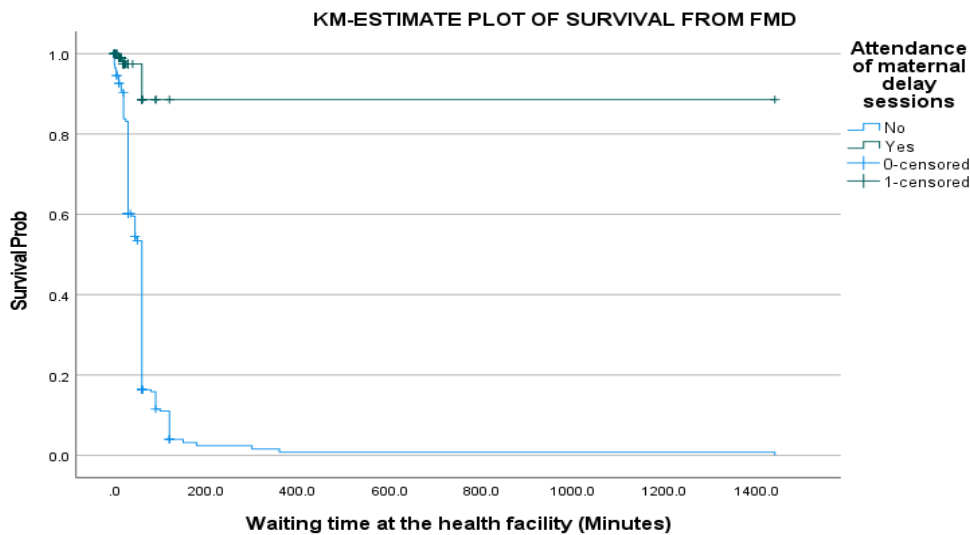


Figure (2): Kaplan-Meier estimate plot of waiting time in the facility after prompt decision-making to seek care.

Table (8): Frequency of first maternal delay experience during the end-line study periods among the groups (n=211).

Group	Delay/yes	Delay/no	Total
Intervention	1	104	105
Control	101	5	106
Total	102	109	211

Table (9): Association between first maternal delay and nurse led behavior change intervention.

Group	Delay		No delay		AOR (CI)	p-value
	No.	%	No.	%		
Intervention group	1	0.95	104	98.11	0.004 (0.001-0.014)	0.001
Control group	102	97.14	5	0.94		

life of both the mothers during antenatal, childbirth, and post-natal periods. This was supported by *Fernandes (2020)*, who suggested that focusing care on antenatal mothers was beneficial by providing them with health promotional information that would help them respond to health emergencies early, thereby facilitating a prompt response. In addition, according to *Regis College (2024)*, the effectiveness of behavior change intervention plans effectively minimizes negative behaviors and ensures optimal healthy results.

The changes seen in the intervention group were normally attributable to the advancement and uptake of health messages, led by nurses through health education provided over time, showing a strong association between the intervention and the impact of behavior change, as supported by *Abdus-Salam et al. (2021)*. Moreover, *Clear, (2025)*, pointed out that, “in commonly observed phenomena, it requires a minimum of about 21 days for an old mental image to dissolve and a new one to jell, with observation that, behavior change takes about 12 weeks (90 Days) for an outcome to be observed’, which was replicated by the findings of this study.

The content provided to the ANC mothers during the intervention period helped equip them to be self-reliant in making timely personal care-seeking decisions, thereby improving their chances of survival, even in times when faced with long waiting times at the facility. Because the mothers in the intervention group had a higher percentage

of survival compared to the controls, despite being exposed to the same waiting time, this indicates the effectiveness of the intervention in increasing the chance of survival. Furthermore, *Debela et al. (2024)* provided insight into the understanding that an educated mother would consult about emergency obstetric care and understand how labor starts, thus making appropriate decision-making early compared to those who are not educated, which propels the need for health education.

Finally, the null hypothesis was rejected at a 5% level of significance, suggesting that the nurse-led behavior change intervention was highly effective in reducing first maternal delay among ANC mothers in the intervention group. Therefore, it can be considered healthful in preventing preventable maternal and neonatal mortality and morbidity linked to first maternal delay.

7. Conclusion

This study established that, nurse-led behavior change intervention was effective in reducing first maternal delay. The intervention effectively helped mothers make prompt care-seeking decisions after recognizing danger signs or other related complications, thereby saving time. This intervention helped them become a steppingstone and a cornerstone for good maternal health.

8. Recommendations

The Ministry of Health (MOH) at both the National and County levels is tasked with developing policies that support mothers' autonomy and decision-making power, to be implemented in all health facilities.

Health care workers to adopt health messages that target individual factors and educate mothers, targeting negative behavior change

Health authorities should integrate nurse-led behavior change interventions into antenatal care programs, where a nurse practitioner takes the lead in helping other nurses disseminate information on maternal care plans.

Further, the MOH is to adopt and deploy APNs, in their new role, as they come in with specialized training, expertise care at primary health care settings

Pilot the proposed nurse-led behavior change intervention framework for its potential effectiveness which has proven to aid in the decision-making process and reduce first maternal delay

9. References

Abdus-Salam, R. A., Adeniyi, A. A., & Bello, F. A. (2021). Antenatal clinic waiting time, patient satisfaction, and preference for staggered appointment—A cross-sectional study. *Journal of Patient Experience*, 8, 23743735211060802.

<https://doi.org/10.1177/23743735211060802>

Amante, G. T., Feyissa, G. D., Desalegn, M., Merddassa, E., & Dereje, M. (2025). Maternal delays and associated factors in utilizing institutional delivery in East Wallaga Zone, Oromia, Ethiopia. MedRxiv. The preprint server for Health Sciences.

<https://doi.org/10.1101/2025.02.04.25321654>

Amungulu, M. E., Nghitanwa, E. M., & Mbapaha, C. (2023). An investigation of factors affecting the utilization of antenatal care services among women in post-natal wards in two Namibian hospitals in the Khomas region. *Journal of Public Health in Africa*, 14(3), 2154.

<https://doi.org/10.4081/jphia.2023.2154>

Blachnio, A., & Kuryś-Szyncel, K. (2022). I am a mother because I wanted to—I am a grandmother because others see me that way—Motherhood as a critical life event for ageing women. *International Journal of Environmental Research and Public Health*, 19(24), 16381.

<https://doi.org/10.3390/ijerph192416381>

Bradford, H. (2021). The essential role of nurse practitioners and midwives on maternal mortality review committees. *Nursing for Women's Health* 25(2), 107–111.

<https://doi.org/10.1016/j.nwh.2021.01.005>

Clear, J. (2025). How long does it take to form a habit (Backed by Science). <https://jamesclear.com/new-habit>

Collins. (2025). All related terms of DELAY – Collins English Dictionary. Available at: <https://www.collinsdictionary.com/dictionary/english/delay/related>

Coupe, N., Cotterill, S., & Peters, S. (2022). Enhancing community weight loss groups in a low socioeconomic status area: Application of the COM-B model and Behavior

Change Wheel. *Health Expectations: An International Journal of Public Participation in Health Care and Health Policy*, 25(5), 2043–2055.

<https://doi.org/10.1111/hex.13325>

Dahlström, S. (2022). Addressing the first delay in maternal and newborn health: A case study on the Mayuge District in Uganda. Student Independent Thesis Basic Level.

Debela, D. E., Aschalew, Z., Bante, A., Yihune, M., Gomora, D., Hussein, F., Sahile, A., & Mersha, A. (2024). Maternal delay for institutional delivery and associated factors among postnatal mothers at Southeastern Ethiopia: A cross-sectional study. *BMC Pregnancy and Childbirth*, 24(1), 206.

<https://doi.org/10.1186/s12884-024-06416-z>

Ersboll, C., & Pal, K. K. (2025). Health and healthcare system. Why action and innovation in maternal health must be accelerated. World Economic Forum.

Fernandes, E. (2020). An American crisis: An analysis of maternal mortality across the U.S. Assumption. Available at: <https://digitalcommons.assumption.edu/honorstheses/68/>

Ghazi, H. F. (2020). Sample size made easy. Research Gate. <https://doi.org/10.13140/RG.2.2.28801.89442>

Haile, A., Lonsako, A. A., Kebede, F. A., Adisu, A., Elias, A., & Kasse, T. (2024). Women autonomy in health care decision making and associated factors among postpartum women in Southern Ethiopia: A cross-sectional study. *Health Science Reports*, 7(12).

<https://doi.org/10.1002/hsr2.70245>

Healthcare Access in Rural Community. (2021). Rural health information hub. In Healthcare Access in Rural Communities.

<https://www.ruralhealthinfo.org/topics/healthcare-access>

Htay, M., & Whitehead, D. (2021). The effectiveness of the role of advanced nurse practitioners compared to physician-led or usual care: A systematic review. *International Journal of Nursing Studies Advances*, 3.

<https://doi.org/10.1016/j.ijnsa.2021.100034>

Jarelnape, A. A., Ali, Z. T., Fadlala, A. A., Sagiron, E. I., Osman, A. M., Abdelazeem, E., Balola, H., & Albagawi, B. (2023). The influence of nursing interventions on patient outcomes: A systematic review. *Saudi Journal of Health Systems Research*, 4(1), 1–7.

<https://doi.org/10.1159/000534482>

Karanja-Chege, C., Agweyu, A., Were, F., van Hensbroek, M. B., & Ogallo, W. (2025). Addressing the challenges of estimating the target population in calculation of routine infant immunization coverage in Kenya. *PLOS Global Public Health*, 5(7), e0004298.

<https://doi.org/10.1371/journal.pgph.0004298>

Karimi, J., Kagiri, H., Karumbi, J., & Gitonga, J. (2020). Improving quality of care: The key to ending preventable maternal and neonatal mortality insights from the Kenya harmonized health facility assessment 2018. Executive Statement. *Policy Brief, 1*. Available at: <https://www.countdown2030.org/wp-content/uploads/2023/02/Maternal-Newborn-Health.pdf>

- Khalil, A., Samara, A., O'Brien, P., Coutinho, C. M., Quintana, S. M., & Ladhani, S. N. (2023).** A call to action: The global failure to effectively tackle maternal mortality rates. *The Lancet Global Health*, 11(8), e1165–e1167. [https://doi.org/10.1016/S2214-109X\(23\)00247-4](https://doi.org/10.1016/S2214-109X(23)00247-4)
- Ministry of Public Health and Sanitation and Ministry of Medical Services (n. d.).** *National Guidelines for Quality Obstetrics and Perinatal Care*. Available at: http://guidelines.health.go.ke:8000/media/National_Guidelines_for_Quality_Obstetrics_and_Perinatal_Care.pdf
- Mohammed, M. M., El Gelany, S., Eladwy, A. R., Ali, E. I., Gadelrab, M. T., Ibrahim, E. M., Khalifa, E. M., Abdelhakium, A. K., Fares, H., Yousef, A. M., Hassan, H., Goma, K., Ibrahim, M. H., Gamal, A., Khairy, M., Shaban, A., Amer, S., Abdelraheim, A. R., & Abdallah, A. A. (2020).** A ten-year analysis of maternal deaths in a tertiary hospital using the three delays model. *BMC Pregnancy and Childbirth*, 20(1), 585. <https://doi.org/10.1186/s12884-020-03262-7>
- Mutowo, J., Yazbek, M., van der Wath, A., & Maree, C. (2021).** Barriers to using antenatal care services in a rural district in Zimbabwe. *International Journal of Africa Nursing Sciences*, 15, 100319. <https://doi.org/10.1016/j.ijans.2021.100319>
- Mwaisaka, J., Owira, P., Olum, M., Manguro, G., Njeru, R., Mwaura, S., Hyre, A., Temmerman, M., Noguchi, L., & Suhowatsky, S. (2025).** Maximizing group antenatal care (G-ANC) coverage in health facilities: Study protocol for implementation research in Machakos County, Kenya. *Gates Open Research*, 9(1), 1–10. <https://doi.org/10.12688/gatesopenres.16278.1>
- Oyedele, O. K., & Lawal, T. V. (2025).** Global dominance of non-institutional delivery and the risky impact on maternal mortality spike in 25 Sub-Saharan African Countries. *Global Health Research and Policy*, 10(1), 10. <https://doi.org/10.1186/s41256-025-00409-x>
- Oyugi, B. (2023).** Kenya introduced free maternal health services a decade ago - it's been a success, saving lives. Vaccines Work. Gavi. Available at: <https://www.gavi.org/vaccineswork/kenya-introduced-free-maternal-health-services-decade-ago-its-been-success-saving>
- Petitjean-Barkulis, C. (2023).** What experts want you to know about your due date. *Motherly*. Available at: <https://www.mother.ly/pregnancy/pregnancy-due-date-accuracy/#:~:text=%E2%80%9CTo%20me%2C%20due%20dates%20are,due%20date%20as%20a%20guesstimate>
- Porat-Dahlerbruch, J., Clark, R., Dutchess, B., Blumenthal, N. P., & Ellen, M. E. (2025).** Factors affecting integration of the nurse practitioner workforce into health systems: A Delphi consensus study. *BMC Health Services Research*, 25(1), 786. <https://doi.org/10.1186/s12913-025-12929-w>
- Public Health Division (2023).** Introduction to behavior change. Birmingham City Council. https://www.birmingham.gov.uk/download/downloads/id/25837/behaviour_change_-_champions_plus.pdf
- Randall, S., Crawford, T., Currie, J., River, J., & Betihavas, V. (2017).** Impact of community based nurse-led clinics on patient outcomes, patient satisfaction, patient access and cost effectiveness: A systematic review. *International Journal of Nursing Studies*, 73, 24–33. <https://doi.org/10.1016/j.ijnurstu.2017.05.008>
- Regis College (2024)** Behavior intervention: Definition, strategies, and resources. Regis. Available at: <https://online.regiscollege.edu/blog/behavior-intervention-definition-strategies>
- Riese, S., & Dhakal, R. (2023).** Understanding the three delays among postpartum women at health facilities in Nepal: Further analysis of the Nepal Health Facility Survey 2021. DHS Further Analysis Reports No. 144 Rockville, Maryland, USA: ICF.
- Sago. (2023).** The significance of validity and reliability in quantitative research (p. 1). Available at: <https://sago.com/en/resources/blog/the-significance-of-validity-and-reliability-in-quantitative-research/>
- Saputra, F. (2025).** Instrument reliability analysis. *Journal Indonesia Social Sains*, 6(3), 791–806. <https://doi.org/10.59141/jiss.v6i3.1669>
- Savard, I., Costanzo, G. S., Henderson, C., Gray, D. C., Rogers, M., & Kilpatrick, K. (2025).** Unlocking the potential of primary healthcare nurse practitioners globally: A concept analysis of their added value. *Nursing Outlook*, 73(2), 102358. <https://doi.org/10.1016/j.outlook.2025.102358>
- Thaddeus, S., & Maine, D. (1994).** Too far to walk: Maternal mortality in context. *Social Science and Medicine* 38(8), 1091-1110. [https://doi.org/10.1016/0277-9536\(94\)90226-7](https://doi.org/10.1016/0277-9536(94)90226-7)
- West, R., & Michie, S. (2021).** A brief introduction to the COM-B Model of Behavior and the PRIME Theory of Motivation. *Qeios*, 2(4), 1–7. <https://doi.org/10.32388/WW04E6.2>
- World Health Organization. (2025).** Maternal mortality. Available at: <https://www.who.int/news-room/factsheets/detail/maternal-mortality>
- World Health Organization. (2023).** Maternal mortality: The urgency of a systemic and multi-sectoral approach in mitigating maternal deaths in Africa. Analytical Fact Sheet, March, 1–11. Available at: https://www.developmentaid.org/api/frontend/cms/file/2025/02/iAHO_Maternal_Mortality_Regional_Factsheet.pdf