



Influence of Community-Led Notification Systems on Promoting Universal Birth and Death Registration in Elgeyo Marakwet County, Kenya

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DOI: <https://doi.org/10.68050/JAMS.2026.844>

Received: 14 October 2026; Accepted: 20 October 2026; Published: 26 October 2026

ABSTRACT

Timely notification of births and deaths is the first link in the civil registration chain, yet its contribution to completed registration is rarely tested separately from other interventions. In Elgeyo Marakwet County, Kenya, birth registration coverage is approximately 62 percent and death registration about 25 percent, and community-led notification mechanisms have been introduced to close the gap. This study examined the influence of community-led notification systems, comprising community notification centres, volunteer notification agents, reporting hotlines and door-to-door notification services, on universal birth and death registration in the county, guided by the Diffusion of Innovations Theory, the Health Belief Model and Community Participation Theory. It adopted a convergent parallel mixed-methods design. Quantitative data were collected from 392 household heads (a 98.2 percent response rate) in Keiyo North and Keiyo South sub-counties, selected through multistage sampling, and qualitative data from nine key informant interviews (of 12 targeted) with civil registration officers, Community Health Promoters and assistant chiefs. Quantitative data were analyzed using descriptive statistics, Pearson correlation, and simple, multiple and hierarchical linear regression; qualitative data were analyzed thematically and integrated with the quantitative results through a joint display. Respondents held positive perceptions of notification systems ($M = 4.12$, $SD = 0.885$), rating door-to-door services highest ($M = 4.26$) and reporting hotlines lowest ($M = 3.94$). Notification systems correlated positively and significantly with universal registration ($r = .240$, $p < .01$) and were a significant predictor when modelled alone ($\beta = .240$, $p < .001$, $R^2 = .058$), but added no independent explanatory power once the other three community-led interventions were controlled for ($\beta = -.009$, $p = .872$; 95% CI for $B = -0.14$ to 0.12 ; change in $R^2 < .001$). Interview themes showed that Community Health Promoters were the most consistent notifiers, that poor roads, weak network coverage and unpaid volunteer work limited effectiveness, and that home deaths were notified far less reliably than births. The study concludes that notification systems are associated with perceived registration mainly alongside other interventions, that the cross-sectional, perception-based data cannot show whether they work through those interventions, and that their value appears constrained by infrastructure and volunteer support. The findings are limited by the two-sub-county sample, the perception-based measure of registration and the incomplete interview sample. It recommends investing in sub-location notification points, transport and airtime support for notifiers, and embedding notification within an integrated county registration strategy.

Keywords: community-led notification systems, vital event notification, civil registration, birth registration & death registration.

INTRODUCTION

Background to the Study

Universal Birth and Death Registration, commonly referred to as Civil Registration and Vital Statistics (CRVS), depends on a chain that begins long before a certificate is issued: a birth or death must first be identified and notified to the registration authority, and only then registered (Tahsina et al., 2022). Where that



first link is weak, events that occur at home or in remote settlements never enter the system. For this reason, efforts to strengthen CRVS in low- and middle-income countries have increasingly focused on moving from passive systems, which wait for households to come forward, to active systems that reach the household level, with community health agents at the core of many birth and death reporting efforts (Nichols et al., 2019).

Evidence from several settings suggests that community-based notification can raise registration. In southern India, an initiative that combined active surveillance for vital events by lay informants with publicity campaigns, family education and assistance with registration improved birth and death registration at subdistrict level (Mony et al., 2011). In a pilot in two rural sub-districts of Bangladesh, a notification system that drew on facility-based providers, community health workers, local government authorities and community key informants, supported by a mobile application and a call centre, captured over 87 percent of births in the survey areas, although notifications from health facilities were very low (Tahsina et al., 2022). A systematic review of policies in 25 countries similarly found a positive change in registration in 21 of the 24 articles that reported policy effects, with combination approaches that pair supply-side and demand-side components most consistently associated with improvement (Suthar et al., 2019).

In Kenya, efforts to improve civil registration have included policy reforms, digitization of records and the integration of registration services within health facilities, yet disparities persist across regions, and rural and hard-to-reach areas continue to record lower registration. In Elgeyo Marakwet County, whose terrain stretches across a highland plateau, the steep Elgeyo Escarpment and the Kerio Valley, distance to registration offices is a persistent barrier, and community-led notification mechanisms have been introduced to close the “last mile” gap. These include community notification centres, volunteer notification agents, community reporting hotlines and door-to-door notification services. Their effectiveness, however, remains insufficiently documented, particularly with regard to whether they independently influence registration once other community-led strategies are accounted for.

This study draws on three theoretical perspectives, selected for their distinct explanatory contributions rather than as an interdependent set. The Diffusion of Innovations Theory (Rogers, 2003) treats notification systems as communication channels through which information on vital events and registration procedures flows between households, communities and the registration authority. The Health Belief Model (Rosenstock, 1974) explains how accessible notification mechanisms lower the perceived barriers, such as distance and administrative complexity, that lead households to delay reporting. Community Participation Theory (Arnstein, 1969) offers a lens on whether volunteer notifiers are supported as genuine partners or left in a tokenistic role. Together, they frame the analysis presented in this paper.

Statement of the Problem

Birth and death registration are essential components of a functional civil registration system, providing legal identity and enabling access to services such as healthcare, education and social protection, while death registration supports public health surveillance and planning. Community-led interventions involving health workers, local informants and local leaders can improve registration coverage by increasing awareness, facilitating notification and linking households to formal systems (Mony et al., 2011; Nichols et al., 2019).

Despite these lessons, Elgeyo Marakwet County continues to face significant challenges in achieving comprehensive birth and death registration. According to the Elgeyo Marakwet County Government (2023), birth registration coverage is approximately 62 percent, well below the national average of 78 percent, while death registration is critically low at about 25 percent. This means that nearly four out of ten children lack legal identity, and three out of four deaths go unrecorded in the county, limiting public health surveillance, resource allocation and the evaluation of health interventions. Although the county has implemented facility-based registration, mobile outreach and community sensitization programmes, there has been limited systematic evaluation of how specific community-led interventions, notification systems among them, contribute to improving these rates.

The wider evidence is also thin on this question. The systematic review by Nichols et al. (2019) found that



only one of the reviewed articles described a process in which community vital events tracking was linked to official registers, which means that most of the evidence describes tracking activity rather than its translation into registration. Studies that evaluate notification directly, such as the Bangladesh pilot (Tahsina et al., 2022), assessed how many events were notified and how quickly rather than whether notification translated into completed registration, and multi-component programmes such as the one in southern India (Mony et al., 2011) cannot isolate the contribution of the notification component. There are therefore two undetermined aspects of the Elgeyo Marakwet case with serious practical implications: first, whether community-led notification systems retain an independent statistical influence on registration once other community-led interventions are accounted for, and second, which notification mechanisms are perceived to work, and what constrains them, in a rural, infrastructure-limited setting. This paper addresses this gap by evaluating the influence of community-led notification systems on universal birth and death registration in Elgeyo Marakwet County. The intervention is reported here as part of a broader study that also examined community awareness campaigns, community leaders' engagement and Community Health Promoter (CHP) integration.

Objective of the Study

This paper was guided by the following objective:

To examine the influence of community-led notification systems on promoting universal birth and death registration in Elgeyo Marakwet County, Kenya.

Research Hypothesis

H0₁: Community-led notification systems have no statistically significant influence on promoting universal birth and death registration in Elgeyo Marakwet County, Kenya.

LITERATURE REVIEW

Conceptual Review

For the purposes of this article, a community-led notification system is defined as a decentralized reporting arrangement in which community members, community leaders or health workers identify births and deaths and notify civil registration authorities, facilitating timely registration, especially in hard-to-reach areas. The construct comprises four mechanisms: community notification centres, volunteer notification agents, community reporting hotlines and door-to-door notification services. It is narrower than community mobilization in general. It concerns the reporting pathway through which knowledge of an event travels from a household to the registrar, rather than the persuasion of households to register.

Notification must also be distinguished from registration. Notification reports that a birth or death has occurred; registration is the legal recording of that event and the issuance of a certificate (Tahsina et al., 2022). The distinction is practical as well as conceptual: respondents in the pilot of this study's questionnaire confused the two terms, and the instructions had to be revised to separate them. Universal birth and death registration, the dependent variable, is understood as the extent to which births and deaths are captured completely in the civil registration system, within the legally required period and equitably across households, and sustained over time. In this study it is measured through respondents' perceptions (see Variables and Measurement) and is therefore referred to as perceived universal registration where the distinction matters.

Empirical Review

This section examines findings from prior field-based and data-driven studies on how community-based notification supports the registration of births and deaths, drawing on documented evidence of what has been tested, observed and learned in practice.



Community-Led Notification Systems and Universal Birth and Death Registration

Nichols et al. (2019) conducted a systematic review of programmes in which community health agents tracked births and deaths, examining their design features, the quality of the resulting data and the factors affecting performance. They found that nearly all the reviewed articles (86 percent) described some form of household visitation by community agents, and that programme costs, the relationship of agents to the community and the use of mobile devices were also commonly described. Only one article described a process in which vital events tracking was linked to official registers. The review therefore establishes that community-based tracking is feasible but offers little evidence on whether tracking translates into registration, and, as a review of programme descriptions, it cannot quantify how much notification contributes to registration outcomes. The current study addresses this gap by measuring the association between notification systems and registration outcomes in Elgeyo Marakwet County and testing it through regression analysis.

Tahsina et al. (2022) piloted a notification system in two rural sub-districts of Bangladesh in 2016, using a mobile application and a call centre through which facility-based providers, community health workers who routinely visit households, local government authorities and community key informants could notify births and deaths. The system generated 13,377 notifications from all channels, including duplicate reports; project workers verified 92 percent of the births and 93 percent of the deaths through household visits; and, when matched with a household survey, the system captured over 87 percent of births, although facility notifications were very low. The study shows that community and health-system notification can be organized at scale, but its outcomes were the proportion of events identified and the timeliness of notification in a project-supported digital pilot, not completed registration. The current study addresses these gaps by examining the perceived influence of notification on both birth and death registration in a setting where notification relies largely on manual and volunteer-based processes.

Mony et al. (2011) described the Strengthening of Local Vital Event Registration initiative, in which a non-governmental organization worked with government departments at subdistrict level in southern India. The initiative combined supply-side measures, such as sensitization of officials, training of hospital staff and data-sharing partnerships, with active surveillance for vital events by lay informants and demand-side measures such as publicity campaigns, family education and help with registration. It improved the registration of births and deaths at subdistrict level, and registration was significantly associated with gender, socioeconomic status and geography. Because notification by lay informants was one element of a multi-component package in a single subdistrict, the report cannot show how much of the improvement is attributable to notification. The current study addresses this gap by isolating community-led notification as a distinct variable and testing its influence alongside the other community-led interventions.

Suthar et al. (2019) systematically reviewed 35 articles documenting policies to improve birth and death registration in 25 countries, classifying policies as supply, demand, incentive, penalty or combination approaches. Of the 24 articles that reported effects on registration, 21 found a positive change, and combination approaches containing at least a supply and a demand component were consistently associated with improvement. The experience summarized in the review included community notification arrangements, such as text-message notification by community registration officers in Rufiji District, Tanzania, with village executive officers following up households that had not obtained certificates, and paper village registers kept by village headpersons in Malawi. The authors noted that human and financial resource requirements were not quantified and that publication bias was a threat to the evidence. Because the review synthesized national-level policy experience, it does not show how community-led notification performs at county level, or whether it adds anything once other community interventions are in place. The current study addresses this gap by modelling notification systems together with three other community-led interventions in a Kenyan devolved county.

Theoretical Framework

This study draws on the Diffusion of Innovations Theory (Rogers, 2003), the Health Belief Model (Rosenstock, 1974) and Community Participation Theory (Arnstein, 1969), applied as complementary rather



than competing explanations of how community-led notification systems may shape registration behaviour.

The Diffusion of Innovations Theory is directly applicable to this study in explaining how notification systems facilitate the spread of registration practice through social networks. In Rogers' framework, the adoption of an innovation depends on the communication channels through which information flows and on attributes of the innovation such as its relative advantage, compatibility, complexity, trialability and observability. Community-led notification systems, including volunteer agents and door-to-door services, are the channels through which information on births, deaths and registration procedures moves between households and the registration authority. In data interpretation, higher ratings of notification mechanisms are expected to correlate with higher registration, and the regression analysis tests whether notification retains this predictive effect independently or whether it is absorbed by closely related interventions, such as Community Health Promoter outreach, that the theory would treat as part of the same network of interpersonal channels.

The Health Belief Model contributes an explanation of why notification mechanisms may matter at the household level. Households that recognize the importance of registration may still delay because of perceived barriers, notably the distance to a registration office and the administrative effort involved. A notification centre close to the sub-location, or an agent who visits the household, lowers these barriers and can also act as a cue to action when a notifier raises the event at the doorstep. Accordingly, favourable ratings of notification mechanisms are interpreted as reduced perceived barriers, expected to correlate positively with registration outcomes.

Community Participation Theory distinguishes genuine partnership and delegated power from tokenism. Volunteer notifiers who are trained, equipped and recognized within the registration system resemble partners; volunteers who are expected to report events without transport, communication tools or compensation approach a tokenistic arrangement, and the theory would predict weaker and less durable effects. The qualitative findings in this paper are read against that proposition.

Research Gap

Three gaps can be distinguished from the literature reviewed above. First, global evidence such as Nichols et al. (2019) and Tahsina et al. (2022) shows that community and health-system notification is feasible and can capture a large share of events, but it reports tracking and notification yield rather than completed registration, leaving open whether notification translates into registration when birth and death registration are considered jointly. Second, multi-component programme evaluations and policy syntheses, exemplified by Mony et al. (2011) and Suthar et al. (2019), cannot establish whether notification retains an independent influence once other interventions operate alongside it. Third, the evidence base documents little about how notification performs in a rural Kenyan devolved county, where it relies on volunteers, manual records and uneven network coverage rather than on project-supported digital platforms. As such, to the author's knowledge, no published study has tested the independent and relative contribution of community-led notification systems to universal birth and death registration in a Kenyan devolved county while modelling the other community-led interventions simultaneously, which is the gap this paper addresses.

RESEARCH METHODOLOGY

Research Design

The study adopted a descriptive survey design nested within a convergent parallel mixed-methods framework, in which quantitative and qualitative data were collected concurrently, analyzed separately, and integrated at the interpretation stage (Creswell & Plano Clark, 2017). This design was selected because the research question required both a statistical assessment of the strength and direction of the relationship between community-led notification systems and universal registration, and a qualitative account of how notification works in practice. While the study examines "influence," the design supports statistical association and prediction rather than strict causality: correlation and regression analyses identify significant predictors and patterns of association, but causal claims would require a quasi-experimental design with control groups, so



“influence” is interpreted throughout as a statistically significant predictive relationship within the limits of a descriptive survey design.

Study Area and Target Population

The study was conducted in the Keiyo North and Keiyo South sub-counties of Elgeyo Marakwet County, an area characterized by demanding topography and underdeveloped infrastructure. The two sub-counties were purposively selected because they represent the county's most geographically diverse terrain, spanning both highland plateau and Kerio Valley settings, had the lowest civil registration rates in the county, and hosted active Community Health Promoter programmes and community-led notification initiatives, providing sufficient variation in the independent variables. The target population comprised household heads in the two sub-counties, whose combined population of 219,926 (Kenya National Bureau of Statistics [KNBS], 2019) corresponds to an estimated 52,363 households at 4.2 persons per household, together with civil registration officers, assistant chiefs and Community Health Promoters directly involved in registration-related activity.

Sampling

The Yamane (1967) formula, applied at a 95 percent confidence level to the estimated 52,363 households, yielded a sample of 397, which was rounded up to 399 household heads to allow for non-response; they were selected through multistage sampling combining stratification by sub-county with simple random selection of households within each ward. Of the 399 questionnaires distributed, 392 were completed and returned, a response rate of 98.2 percent. A purposive sample of 12 key informants, comprising four assistant chiefs, four Community Health Promoters and four civil registration officers, was targeted for in-depth interviews on the basis of their direct involvement in civil registration and their capacity to provide expert, contextualized perspectives. Nine interviews were completed (four civil registration officers, three Community Health Promoters and two assistant chiefs), a completion rate of 75 percent, with the remaining interviews lost to scheduling conflicts and competing administrative priorities. Because the household survey covered only two purposively selected sub-counties and the interview sample fell short of its target, the findings are read as applying to those areas and informants; both points are taken up under Limitations of the Study.

Variables and Measurement

Community-led notification systems, the independent variable examined in this paper, were operationalized through five Likert-scale statements covering the accessibility of community notification centres, the effectiveness of volunteer notification agents, the role of community reporting hotlines, the contribution of door-to-door notification services, and the overall ability of notification systems to reduce registration delays.

The dependent variable, perceived universal birth and death registration, was measured through five statements covering the completeness of birth registration, the completeness of death registration, timeliness of registration, equitable access to registration services, and the sustainability of registration practices. Three further community-led interventions, community awareness campaigns, community leaders' engagement and Community Health Promoter integration, were measured alongside the variable reported here and were included as statistical controls in the multiple regression model, but fall outside this paper's central research question.

Composite scores were computed in SPSS as the unweighted mean of the five items in each scale, so that every composite keeps the original 1 to 5 response metric and the aggregate means in Tables 1 and 2 are directly comparable with the item means. All statements were positively worded, so no items were reverse-coded. The composites for the three control interventions were constructed in the same way. Registration outcomes were not verified against any documentary or administrative source: no birth or death certificates, registers or notification logs were inspected. The county coverage figures (about 62 percent for births and 25 percent for deaths) come from the county planning report cited in the Statement of the Problem and serve only as context, not as a criterion against which the survey ratings were checked.



Validity of the perception-based registration measure

Universal registration was measured through respondents' perceptions, not through documentary or administrative data, and it is treated throughout as perceived registration performance in the respondent's community rather than as measured coverage. The ratings are uniformly high (item means from 3.89 to 4.21), which sits uneasily with the county coverage figures cited in the Statement of the Problem (about 62 percent for births and 25 percent for deaths; Elgeyo Marakwet County Government, 2023). A mean of 3.89 for the statement that death registration is complete and comprehensive means that most respondents agreed, whereas administrative estimates suggest that about three in four deaths go unrecorded. The data cannot separate the possible explanations. The county figures are administrative estimates for the whole county, whereas respondents rated their own community; household heads can judge completeness only from the events they know about, which excludes those that were never reported; respondents confused notification with registration in the pilot and some may have done so in the main survey; and agreement-biased and socially desirable responding is a recognized risk in self-completed Likert surveys.

The validity evidence for the registration scale is correspondingly limited. Content validity and component-extraction evidence are reported for the notification scale under Data Collection and Analysis; for the registration scale the study reports pilot reliability ($\alpha = 0.834$) it offers no criterion evidence because responses were not checked against certificates or registers. Collecting such indicators is the most direct way to establish whether perceived registration tracks actual registration, and it is recommended for follow-up work. Until then, the findings speak to perceived registration, and they cannot be used to estimate coverage.

Item overlap between the two scales was also reviewed. Three items blur the line between predictor and outcome. The notification item stating that notification systems reduce delays in registration and the registration item on registration within the legally required time frame both address the timeliness of registration. The notification item stating that door-to-door services increase registration coverage is worded as an outcome and overlaps with the two completeness items in the registration scale. The registration item stating that current community-led interventions have improved registration sustainability asks respondents to credit community-led interventions, the predictor in this paper, for the outcome. Overlap of this kind can inflate the bivariate association through shared item content, and because both scales were completed by the same respondents in the same format, shared method variance may inflate it further (Podsakoff et al., 2003). Overlap of this kind would, if anything, favour a stronger rather than a null unique effect of notification, so it is unlikely to explain the multiple regression result, but it qualifies the interpretation of the correlation ($r = .240$) and is addressed in the sensitivity analysis reported in the Results.

Data Collection and Analysis

Quantitative data were collected between January and March 2026 using a structured questionnaire, administered by eight trained research assistants through the drop-and-pick method, combining demographic items with five-point Likert-scale items (1 = Strongly Disagree to 5 = Strongly Agree) for the independent and dependent variables. Qualitative data were collected through semi-structured key informant interviews. Content validity was established through expert review, yielding a content validity index of 0.936 for the notification scale, and principal component analysis returned an extraction value of 0.713 for the construct, above the 0.60 benchmark. Pilot testing conducted in neighbouring West Pokot County returned a Cronbach's alpha coefficient of 0.780 for the notification scale and 0.834 for the dependent variable, both above the 0.70 threshold recommended by Taber (2018) for a reliable research instrument.

Quantitative analysis was conducted in IBM SPSS Version 29, with descriptive statistics summarizing the distribution of responses on each item, Pearson correlation testing the strength and direction of association between notification systems and universal registration, simple linear regression estimating the variable's contribution in isolation, and multiple linear regression testing whether it retained independent predictive value once the other community-led interventions were controlled for, which is the test that directly addresses hypothesis H0₁. Statistical significance was set at $\alpha = 0.05$. Qualitative data from key informant interviews were analyzed thematically following the six-phase framework of Braun and Clarke (2006), with NVivo



software, to enrich and triangulate the quantitative findings (Mugenda & Mugenda, 2019; Kothari & Garg, 2022).

Regression results are reported with unstandardized (B) and standardized (β) coefficients, standard errors and 95% confidence intervals for every predictor in the multiple regression model. The incremental contribution of notification systems was assessed through hierarchical regression in which community awareness campaigns, community leaders' engagement and CHP integration were entered in Step 1 and notification systems were added in Step 2, with the change in R^2 and its F test reported; because the predictors are correlated, the reverse order, with notification systems entered first, is also reported. The proposition that notification operates through CHP integration was not tested formally: a test requires a mediation analysis with a bootstrapped indirect effect (Hayes, 2022), and the temporal ordering that mediation presupposes cannot be established from a cross-sectional survey. Statements about that pathway are therefore worded as hypotheses.

Integration of the two strands took place at the interpretation stage through a joint display (Fetters et al., 2013), in which each quantitative result was set beside the interview theme that bore on it and the pair was classified as convergence (the sources agree), complementarity or expansion (the interviews add explanation or raise a hypothesis that the survey cannot test) or discordance (the sources disagree).

Ethical Considerations

The study obtained approval from the Mount Kenya University Ethics Review Committee and a National Commission for Science, Technology and Innovation (NACOSTI) research permit prior to data collection, alongside courtesy approvals from the County Commissioner's office and local administrative leaders.

Participation was voluntary and based on written informed consent; respondents were briefed on the study's purpose and their right to withdraw at any stage without penalty. Questionnaires and interview guides did not collect directly identifying information, demographic data were reported only in aggregate, and all research instruments and electronic data were stored securely and accessible only to the researcher, in line with the Kenya Data Protection Act, 2019.

RESULTS AND DISCUSSION

Descriptive Analysis: Community-Led Notification Systems

Respondents evaluated five statements relating to community notification centres, volunteer notification agents, community reporting hotlines, door-to-door notification services, and the overall ability of notification systems to reduce registration delays. The findings are summarized in Table 1.

Table 1: Community-Led Notification Systems and Universal Birth and Death Registration

Statement	Mean	Std. Dev.
Community notification centres make it easier to report births and deaths.	4.23	0.821
Volunteer notification agents effectively report vital events to authorities.	4.01	0.832
Community reporting hotlines improve timely notification of births and deaths.	3.94	0.934
Door-to-door notification services increase registration coverage.	4.26	0.907
Community-led notification systems reduce delays in registration.	4.18	0.932
Aggregate Mean	4.12	0.885

Source: Research Data (2026)

The descriptive results in Table 1 indicate that respondents held moderately to strongly positive perceptions of community-led notification systems, with an aggregate mean of 4.12 ($SD = 0.885$). The highest-rated item was that door-to-door notification services increase registration coverage ($M = 4.26$, $SD = 0.907$), a finding of particular significance in a county whose mountainous and frequently isolated geography makes the distance to



a registration office a central barrier. Household visitation is also described in 86 percent of the articles in the review by Nichols et al. (2019) of programmes in which community agents track vital events, and active searching for events by lay informants formed part of the package that improved registration in southern India (Mony et al., 2011). Community notification centres received the second-highest rating ($M = 4.23$, $SD = 0.821$), followed by the statement that notification systems reduce delays in registration ($M = 4.18$, $SD = 0.932$), which is consistent with the Health Belief Model's proposition that bringing reporting closer to the household lowers the perceived barriers to acting.

Volunteer notification agents received a moderate rating ($M = 4.01$, $SD = 0.832$), and community reporting hotlines the lowest ($M = 3.94$, $SD = 0.934$). The lower rating for hotlines may reflect infrastructure constraints in rural areas, since the key informants described unreliable network signal as a limit on hotline use. The contrast with Bangladesh is instructive: a mobile application and call centre captured over 87 percent of births there (Tahsina et al., 2022), but that was a project-supported pilot in which notifications were verified through household visits, whereas the notification channels in Elgeyo Marakwet operate without that support. The higher standard deviations for hotlines (0.934), delay reduction (0.932) and door-to-door services (0.907) indicate greater variability in respondents' experiences, suggesting that the quality and consistency of these mechanisms differ across parts of the county. Overall, the aggregate mean of 4.12 is consistent with, though it does not test, the Diffusion of Innovations Theory (Rogers, 2003), in which notification mechanisms represent the communication channels through which information on vital events moves from households to the registration authority.

Descriptive Analysis: Universal Birth and Death Registration

Respondents also rated five statements on the state of universal birth and death registration in the county, as shown in Table 2.

Table 2: Universal Birth and Death Registration

Statement	Mean	Std. Dev.
Birth registration in this community is complete and comprehensive.	4.01	1.035
Death registration in this community is complete and comprehensive.	3.89	0.999
Births and deaths are registered within the legally required timeframe.	4.02	0.949
Registration services are equitably accessible to all households.	4.13	0.906
Current community-led interventions have improved registration sustainability.	4.21	0.804
Aggregate Mean	4.05	0.939

Source: Research Data (2026)

The aggregate mean of 4.05 ($SD = 0.939$) indicates a moderately positive but still incomplete picture of registration. Death registration was rated as the least complete ($M = 3.89$, $SD = 0.999$), below birth registration ($M = 4.01$, $SD = 1.035$), a pattern that matters for notification because, as the qualitative findings below show, the notification chain for home deaths was described as the weakest link.

These ratings should be read with the measurement caveats set out under Variables and Measurement. Respondents on average agreed that registration is complete ($M = 4.01$ for births and 3.89 for deaths), whereas county coverage is about 62 percent for births and 25 percent for deaths, so the scale captures perceived performance and cannot be used to estimate coverage. The contrast between the two is itself informative and is taken up in the integrated discussion below.

Correlation Analysis

Pearson correlation analysis, conducted as part of the wider study covering four community-led interventions, established that community-led notification systems had a positive and statistically significant association with



universal birth and death registration ($r = 0.240$, $p < 0.01$), providing initial support for rejecting H_{01} at the bivariate level. Notification systems were also positively and significantly correlated with each of the other three interventions, most strongly with community leaders' engagement ($r = 0.547$) and Community Health Promoter integration ($r = 0.508$), suggesting that the interventions are operationally interrelated rather than independent. Table 3 summarizes these results.

Table 3: Pearson Correlation Results

Variable	r	p-value	N	Sig.
Community-Led Notification Systems × Universal Birth and Death Registration	.240**	< .001	392	Sig.
Community-Led Notification Systems × Community Awareness Campaigns (inter-correlation)	.439**	< .001	392	Sig.
Community-Led Notification Systems × Community Leaders' Engagement (inter-correlation)	.547**	< .001	392	Sig.
Community-Led Notification Systems × CHP Integration (inter-correlation)	.508**	< .001	392	Sig.

**Correlation is significant at the 0.01 level (2-tailed). Source: Research Data (2026)

Simple and Multiple Regression Analysis

Simple linear regression showed that, considered in isolation, community-led notification systems were a statistically significant but modest predictor of universal birth and death registration, explaining 5.8 percent of its variance (adjusted $R^2 = .056$; $B = 0.311$, 95% CI [0.185, 0.437]; Table 4).

Table 4: Simple Linear Regression Results

Predictor	B	Std. Error	95% CI for B	Beta	t	p	R ²
Community-Led Notification Systems	0.311	0.064	[.185, .437]	0.24	4.862	< .001	0.058

Dependent variable: perceived universal birth and death registration. The standard error and confidence interval were derived from the reported B and t (df = 390). Source: Research Data (2026)

A multiple linear regression model, which jointly examined all four community-led interventions studied in the wider research, explained 18.6 percent of the variation in universal birth and death registration ($R^2 = 0.186$; adjusted $R^2 = 0.178$; $F(4, 387) = 22.148$, $p < 0.001$), confirming that the interventions collectively and significantly predict registration outcomes. Diagnostic tests indicated that the assumptions of the model were satisfied: residuals were approximately normally distributed (Kolmogorov-Smirnov = .042, $p = .089$; Shapiro-Wilk = .992, $p = .067$), variances were equal (Levene's statistic = 1.234, $p = .296$), multicollinearity was not a concern (tolerance = .579 and VIF = 1.727 for notification systems, with VIF no higher than 1.956 for any predictor), and the residuals showed no first-order autocorrelation (Durbin-Watson = 1.892). Table 5 presents the full model and Table 6 the hierarchical analysis.

Table 5: Multiple Regression Model Predicting Perceived Universal Birth and Death Registration

Predictor	B	Std. Error	95% CI for B	Beta	t	p	VIF
Constant	1.777	0.283	[1.221, 2.333]		6.268	0	
Community-Led Notification Systems	-0.011	0.066	[-.141, .119]	-0.009	-0.161	0.872	1.727
Community Awareness Campaigns	0.175	0.041	[.094, .256]	0.229	4.286	0	1.497
Community Leaders' Engagement	0.002	0.076	[-.147, .151]	0.002	0.03	0.976	1.786



Community Health Promoter Integration	0.368	0.074	[.222, .514]	0.292	4.975	0	1.956
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Dependent variable: perceived universal birth and death registration. $R = .432$; $R^2 = .186$; adjusted $R^2 = .178$; standard error of the estimate = .656; $F(4, 387) = 22.148$, $p < .001$. The 95% confidence interval for notification systems is calculated from the reported B and standard error. Source: Research Data (2026)

Table 6: Hierarchical Regression of Perceived Universal Birth and Death Registration

Order and step	Predictors entered	R^2	Adj. R^2	ΔR^2	F change (df)	p
A. Step 1	Awareness campaigns, leaders' engagement, CHP integration	0.186	0.18	0.186	29.54 (3, 388)	< .001
A. Step 2	+ Notification systems	0.186	0.178	< .001	0.03 (1, 387)	0.872
B. Step 1	Notification systems	0.058	0.056	0.058	23.64 (1, 390)	< .001
B. Step 2	+ Awareness campaigns, leaders' engagement, CHP integration	.186	0.178	0.128	20.29 (3, 387)	< .001

Order A enters the three other interventions first and notification systems last; Order B enters notification systems first. Step 2 of Order A (change in $R^2 = .00005$, F change = t^2 for notification systems) and the Step 1 values of Order A are derived from the reported full-model R^2 and the t value for notification systems ($\Delta R^2 = t^2(1 - R^2)/df$). Source: Research Data (2026)

As shown in Table 5, community-led notification systems did not retain statistical significance once the other three interventions were controlled for ($B = -0.011$, 95% CI [-0.141, 0.119]; $\beta = -0.009$, $t = -0.161$, $p = 0.872$), so H_{01} cannot be rejected on the basis of the multiple regression model. CHP integration ($\beta = 0.292$, $p < 0.001$) and community awareness campaigns ($\beta = 0.229$, $p < 0.001$) were the significant predictors. The hierarchical analysis in Table 6 shows the same pattern from both directions. Notification systems alone explained 5.8 percent of the variance, but added after the other three interventions they raised R^2 by less than .001 (F change(1, 387) = 0.03, $p = .872$), whereas adding the other three interventions to notification systems raised R^2 by .128 (F change(3, 387) = 20.29, $p < .001$). Essentially all of the variance that notification systems explain on their own is therefore also explained by the other interventions, and notification adds nothing measurable to what they explain.

The confidence interval is informative as well as the p-value. In standardized terms the interval for notification systems runs from roughly -0.12 to 0.10, so the data are compatible with no unique effect and exclude a unique effect larger than about one-tenth of a standard deviation in either direction; the non-significant result is not simply the product of an imprecise estimate. The result does not mean that notification systems are unimportant or without practical value: notification is the first link in the registration chain, and in a perception-based model whose predictors overlap heavily a null unique coefficient says only that notification cannot be separated statistically from the interventions it is delivered with. Their bivariate correlation ($r = 0.240$) and simple-regression coefficient ($\beta = 0.240$, $p < 0.001$) show a positive association with perceived registration. What the model shows is that this association cannot be distinguished from the variance that notification shares with the other interventions, most notably community leaders' engagement ($r = 0.547$) and CHP integration ($r = 0.508$). Several explanations fit that pattern. Notification may work partly through those interventions, as the interview evidence on CHPs suggests; the interventions may be delivered together in the same communities, so that ratings reflect a general impression of how well a community is served; or the scale items may overlap in content, as discussed under Variables and Measurement. The regression cannot choose between them, and the proposition that notification operates through CHP integration was not tested formally. A formal test would require a mediation analysis with a bootstrapped indirect effect, and even then a cross-sectional survey could not establish the causal order that mediation presupposes. The pattern is therefore best read as notification and CHP integration overlapping statistically, with the Diffusion of Innovations Theory offering one account of why (channels carry information that opinion leaders and trusted agents help to put into practice), not as evidence for that account.



Three cautions apply. First, the model explains 18.6 percent of the variation in registration, so most of the variation remains unexplained and the coefficient for any single predictor should be read with care; the predictors are correlated (VIF no higher than 1.956, which is within conventional limits) but the unique contribution of each is harder to estimate when they overlap. Second, the qualitative findings suggest a further reason why an average effect may be hard to detect: the performance of notification mechanisms depends on roads, transport and network coverage that are unevenly distributed across the county, so the same mechanism may work well in one sub-location and poorly in another. The present data cannot test this explanation directly, and the findings describe association rather than causation. Third, both variables are respondents' perceptions collected in the same instrument, so the associations may partly reflect shared method variance and a general tendency to rate local services favourably.

Qualitative Findings

Analysis of the nine key informant interviews revealed four themes that explain and qualify the quantitative findings.

Theme 1: Community Health Promoters as the Most Consistent Notification Agents

Informants consistently identified CHPs as the most reliable source of birth and death notification at household level. A civil registration officer explained that the registration office relies on village-level informants, usually CHPs or nyumba kumi members, who alert the sub-county office when an event occurs, and that CHPs hold household information that the office could not otherwise obtain. A CHP described a routine of trying to report every birth attended to the registration office within 48 hours and of asking, during home visits, whether births have been registered and whether any deaths have occurred since the previous visit, an approach that works because households trust the CHP. This theme resonates with Nichols et al. (2019), who found that nearly all the reviewed programmes (86 percent of articles) used some form of household visitation by community agents, and it offers one plausible reason why notification systems and CHP integration overlap statistically, although the interviews describe CHP practice and cannot show that notification works through CHP integration.

Theme 2: Infrastructural Barriers Limiting Notification Effectiveness

Despite the recognized value of CHP-led notification, informants described poor roads, lack of transport, limited mobile network coverage and inadequate documentation tools as limits on speed, reliability and reach. A CHP noted that a birth in a remote homestead may be impossible to report quickly without transport, that hotlines are unreliable because network signal is poor in many areas, and that a notification centre closer to the sub-location would shorten the delay. Another CHP pointed out that paper registers can be lost or damaged and that there is no dependable means of reporting urgent cases where there is no network. This theme suggests that the effectiveness of notification depends on enabling infrastructure. The survey did not measure infrastructure, so this remains a hypothesis about why the average effect is weak and not a tested result.

Theme 3: Differential Notification of Births and Deaths

Informants reported that notification works better for births than for deaths. A civil registration officer observed that mothers are usually connected to the health system, so births are notified reasonably well, whereas deaths at home are notified much more weakly, with families sometimes delaying until a death certificate is needed for administrative purposes, and described strengthening the notification chain for home deaths as the biggest challenge. Assistant chiefs added that some community members fear that reporting a death will draw unwanted attention from authorities, for example in cases involving land disputes or debts, and that this resistance persists even when leaders encourage registration. This theme is consistent with the lower rating that respondents gave to the completeness of death registration ($M = 3.89$) compared with birth registration ($M = 4.01$), and it indicates that death notification faces cultural and legal fears and lacks the institutional trigger that facility births provide.



Theme 4: Volunteer Motivation as a Sustainability Challenge

Informants identified volunteer motivation as a central threat to the sustainability of notification. CHPs explained that they are volunteers without compensation, that adding registration tasks to their health duties is difficult, and that without fuel or fare allowances their outreach to remote households is limited. A civil registration officer described volunteer notification agents as a consistent source of field notifications when trained and supported, but noted that retention and motivation are challenges, particularly for death notifications, which carry sensitive cultural dimensions. Assistant chiefs observed that the nyumba kumi structure is useful because each elder is responsible for about ten households, but that some elders are inactive and that in some villages the structure exists only on paper. Read through Community Participation Theory, these accounts describe volunteers who are asked to act as partners without the resources that genuine partnership requires, which points to formalizing the notifier role, providing incentives, and investing in transport, communication devices and documentation tools.

Integration of Quantitative and Qualitative Findings

Table 7 sets each main quantitative result beside the interview theme that bears on it. Of the six pairings, three converge (one of them only on direction), one is complementary, two extend the survey by raising hypotheses that it cannot test, and two show discordance, both concerning the level of perceived performance and not its pattern.

Table 7: Joint Display of Quantitative Results and Interview Themes

Quantitative finding	Interview evidence	Integrated interpretation
Notification correlates with CHP integration ($r = .508$) and leaders' engagement ($r = .547$); it has no unique effect in the regression ($\beta = -.009$), while CHP integration is a significant predictor ($\beta = .292$).	Theme 1: CHPs were described as the most consistent notifiers; one reported births to the registration office within 48 hours and asked about registrations and deaths on home visits, relying on household trust.	Convergence. The interviews supply a concrete channel for the statistical overlap. They describe practice only and cannot show that notification works through CHP integration, which remains untested.
Hotlines were the lowest-rated mechanism ($M = 3.94$, $SD = 0.934$).	Theme 2: hotlines are unreliable where network signal is poor; a notification centre nearer the sub-location would shorten delays.	Convergence. Both sources point to connectivity as the constraint on hotline-based notification.
Door-to-door services ($M = 4.26$) and notification centres ($M = 4.23$) were the highest-rated mechanisms.	Theme 1: household visits work because households trust the CHP. Theme 2: remote homesteads cannot be reached quickly without transport.	Complementarity. Mechanisms that bring reporting to the household are valued because they cut distance, but their reach depends on transport support.
Death registration was rated lower ($M = 3.89$) than birth registration ($M = 4.01$), yet both ratings are high against county coverage of about 62 percent (births) and 25 percent (deaths).	Theme 3: births are notified through the health system, whereas home deaths are notified weakly; families delay until a certificate is needed and some fear attention from authorities.	Convergence on direction, discordance on level. The interviews explain why deaths lag births but do not support the high absolute ratings, which supports reading the scale as perceived performance, not coverage.
The model explains 18.6 percent of the variance; the unique effect of notification is close to zero (standardized CI roughly -0.11 to 0.09).	Theme 2: the performance of notification depends on roads, transport and network coverage that vary across the county.	Expansion (hypothesis). Uneven infrastructure could mask effects that appear only in some sub-locations when averaged county-wide. The survey did not measure infrastructure or test an interaction.



Notification systems were rated favourably overall (M = 4.12) and the sustainability item was rated 4.21, yet notification added no independent explanatory power.	Theme 4: CHPs are unpaid and lack fuel or fare allowances; retention and motivation are problems; in some villages the nyumba kumi structure exists only on paper.	Expansion and discordance. Favourable views of the mechanisms can coexist with weak delivery capacity, in line with a tokenistic reading under Community Participation Theory; the sustainability rating is not corroborated by the interviews.
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Source: Research Data (2026)

The integrated reading has three parts. First, the two strands agree on where the pressure points lie: connectivity limits hotlines, transport limits household reach, and home deaths are notified less reliably than births. Second, the strands agree that CHPs are central to notification, which explains why notification and CHP integration overlap statistically, but they do not show that the one operates through the other. Third, the strands disagree on how complete registration is: respondents rated it highly, whereas the interviews and the county coverage figures describe substantial gaps, especially for deaths. This disagreement is the main reason for treating the registration measure as perceived performance. The interpretations in Table 7 rest on nine interviews and on a survey with the limitations set out below, so they are offered as hypotheses for further testing.

LIMITATIONS OF THE STUDY

Several limitations qualify the findings and should be kept in view when interpreting them.

Sampling and generalizability

The quantitative sample was drawn from two of the county's sub-counties, Keiyo North and Keiyo South, selected purposively because they had the lowest registration rates, the most varied terrain and active CHP and notification programmes. The choice suited the research question, but the findings describe areas where programmes are comparatively active and registration comparatively low, and they cannot be generalized to the other sub-counties of Elgeyo Marakwet, to the county as a whole or to other Kenyan counties without caution. Choosing sites partly on the level of the outcome may also have narrowed its range and so weakened the associations observed. Within the two sub-counties only household heads were surveyed, so the views of other household members, including mothers who are often the first to notify a birth, were not captured.

Measurement of registration

Registration was measured through respondents' perceptions, and no objective indicator such as certificate holding among children under five was collected. The high ratings contrast with the county coverage figures, the scale was validated mainly through content review and pilot reliability, two scales contain conceptually overlapping items, and both were completed by the same respondents in the same format. The results therefore describe perceived registration. The absence of a unique effect of notification on perceived registration should not be read as evidence that notification does not raise actual registration.

Design and inference

The survey was cross-sectional and descriptive, so the associations cannot be interpreted causally, and the possibility that notification operates through CHP integration was not tested formally. Unmeasured factors such as distance to the registration office, household education and place of birth or death may confound the associations, and the model leaves 81.4 percent of the variance unexplained.

Qualitative sample

Nine of the 12 targeted interviews were completed (75 percent): all four civil registration officers, three of the four CHPs and two of the four assistant chiefs. The missing interviews were lost to scheduling conflicts and



competing duties and were not missing at random; assistant chiefs were the most under-represented group, and the account in Theme 3 of fear of reporting deaths rests on two assistant chiefs and one officer, so it needs corroboration. Busy or remote officials may also be those with the most field exposure. Thematic saturation was not assessed, and although relatively homogeneous groups often reach saturation within about 12 interviews (Guest et al., 2006), a shortfall of three spread across three informant types leaves open whether every relevant theme was reached. Informants were officials and volunteer notifiers, not household members or people whose events went unregistered, and officers and CHPs have a stake in the programme being seen as effective, so their accounts may be shaped by social desirability. The themes are best read as plausible explanations that may transfer to similar settings, not as representative accounts.

Integration

The joint display is an interpretive device. The qualitative strand is much smaller than the quantitative strand, so the two cannot be weighted equally, and the classifications in Table 7 reflect the researcher's judgement.

CONCLUSION

Based on the findings, the study concludes that community-led notification systems are valued by households in Elgeyo Marakwet County, with door-to-door services and community notification centres perceived as the most useful mechanisms and reporting hotlines as the least, and that notification systems are positively and significantly associated with perceived universal birth and death registration at the bivariate level. However, because this effect did not remain statistically significant once community awareness campaigns, community leaders' engagement and Community Health Promoter integration were controlled for, the data are consistent with notification systems contributing to perceived registration primarily in combination with other interventions rather than as an independent driver on their own, although the cross-sectional, perception-based design cannot show how.

The study further concludes that the practical value of notification systems is currently constrained by infrastructure and by the lack of support for those who run them. Poor roads, limited transport, weak network coverage, paper-based records and unpaid volunteer work reduce the speed and reliability of reporting, and the notification chain for home deaths is weaker than for births. These constraints should be addressed before the independent contribution of notification systems can be more conclusively established. The findings reflect two purposively selected sub-counties of Elgeyo Marakwet and nine key informants, and should be treated as a starting point for planning in comparably under-registered Kenyan counties and not as evidence that can be generalized to them.

RECOMMENDATIONS

Recommendations to County Authorities

Arising from these findings, the study recommends that the County Government of Elgeyo Marakwet, together with national telecommunications and infrastructure partners and in collaboration with the Civil Registration Services Department, should strengthen the infrastructure and support base underpinning community-led notification systems. This should include establishing additional notification points at sub-location level, providing transport facilitation and airtime or data support for volunteer notification agents, and advocating for improved mobile network coverage in low-connectivity areas. A needs assessment and the siting of new notification points should be completed within six months, volunteer facilitation support rolled out within nine months, and advocacy for improved network coverage sustained over the following twelve to twenty-four months. Implementation will require budgetary allocation for volunteer stipends and transport, partnership with mobile network operators or the relevant government connectivity programme, and monitoring data on notification volumes. Success should be measured through the number of functional notification points per sub-location, the volunteer retention rate, and the reduction in the average time lag between the occurrence of a vital event and the receipt of its notification.



The study also recommends that the Civil Registration Services Department, with the County Commissioner's office and the county health department, should embed notification within existing community structures rather than run it as a stand-alone intervention, by building notification and referral into CHP home-visit schedules and the standing baraza and nyumba kumi arrangements, and by establishing a specific protocol for notifying home deaths that involves chiefs, assistant chiefs and CHPs and is accompanied by public messaging that addresses fears of adverse consequences from reporting a death.

Recommendations to Development Partners

Development partners and non-governmental organizations supporting civil registration strengthening in rural counties should prioritize funding for the enabling conditions of notification, namely transport, airtime, communication devices and durable documentation tools such as improved registers or simple mobile reporting forms, over the creation of new notification channels, given the interview evidence that infrastructure and volunteer support constrain notification and the survey finding that notification added little explanatory power independently of the other community-led interventions. Support should favour mechanisms that suit local connectivity, such as door-to-door services and sub-location notification centres, before hotline-based systems are scaled, and should include monitoring of volunteer retention so that the sustainability of notification can be judged and improved.

Recommendations for Future Research

Future studies should adopt longitudinal or quasi-experimental designs, such as before-and-after or matched-comparison designs across sub-counties, to test the causal effect of notification systems over time and to test formally, for example through mediation analysis, whether their contribution operates through Community Health Promoter integration and awareness campaigns, a possibility this study's findings raise but cannot establish, or independently over a longer implementation period. Research that disaggregates the construct by mechanism, comparing notification centres, volunteer agents, hotlines and door-to-door services directly, would clarify which carries the most value. Studies should also examine digital and mobile notification platforms in settings with limited connectivity, and the socio-cultural and legal fears that suppress the notification of home deaths. They should also include objective indicators of registration, such as the proportion of children under five with a birth certificate, to validate perception-based measures, and a larger and more complete set of key informant interviews that includes household members.

Ethical Approval

This study obtained approval from the Mount Kenya University Ethics Review Committee and a National Commission for Science, Technology and Innovation (NACOSTI) research permit prior to data collection, alongside courtesy approvals from the County Commissioner's office and local administrative leaders. All participants gave written informed consent after being briefed on the study's purpose, procedures, and their right to withdraw at any stage without penalty.

Conflict of Interest

The author declares no conflict of interest in relation to this study.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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