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Effect of a Community Health Worker Led Health Education Intervention on Latrine Coverage in Mwingi West Sub-County; Kenya: A Quasi-Experiment

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Abstract It is estimated that globally 2.4 billion people still lack access to improved sanitation and 946 million still practice open defecation. Every Kenyan has a right to adequate sanitation and the government of Kenya is committed to ensure that Kenyans enjoy adequate sanitation by the year 2030. Despite this commitment, latrine coverage in many parts of Kenya is low and the result is a high prevalence of hygiene and sanitation related illnesses. In Kitui County, open defecation is high at 30.9%. The aim of this study was to assess effect of Community Healthy Strategy (CHS) on latrine coverage in Mwingi West sub county, Kitui County-Kenya. The study was a pretest-post-test experiment with intervention and control sites. Mwingi West and Mwingi North sub-counties were intervention and control sites respectively. Participants in intervention site received health education on importance latrine construction and safe fecal disposal while control site did not. In each site, 1 pre-intervention and 2 post-intervention surveys were conducted with each survey having a sample size of 422 households. An observation checklist and a questionnaire were the main data collection tools. In the intervention site, CHS significantly increased latrine coverage from baseline to midterm survey and from baseline to end-term survey by 21% (Z=7.0128, P=0.0001) and 27.6% (Z=9.7189, P=0.0001) respectively. Compared to baseline, households in intervention site-midterm survey and intervention site-endterm survey were 4 times more likely to have a latrine (adj. OR: 4.356, P<0.0001, 95% CI: 2.975-6.379 and 3 times more likely to have a latrine (adj. OR: 3.391, P<0.0001, 95% CI: 2.686-4.280) respectively. No significant difference was observed on latrine coverage in the control site. CHS significantly increased latrine coverage in Mwingi West Sub-county. To declare Kenya an Open Defecation Free country and help the country meet the global sanitation related Sustainable Development Goals by 2030, county governments need to scale up implementation of CHS to cover areas which have not been covered.

Keywords: *Community Health Strategy, Community Health Workers, latrine coverage, sanitation*

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1. Introduction

Millennium Development Goal (MDG) 7, target 7C was to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation by the year 2015 [1]. Between 1990 and 2015, the proportion of global population using improved sanitation facility increased from 54 % to 68 % [2]. Slightly over 2.1 billion people gained access to improved sanitation since 1990, and the proportion of people practicing open defecation globally fell almost by half, from 24 % to 13 % [2]. Caucasus and Central Asia, Eastern Asia, Northern Africa and Western Asia cut by half the proportion of the population without access to improved sanitation. While Southern Asia had the lowest baseline coverage in 1990, at 22 %, it recorded the largest increase in the proportion using improved sanitation, reaching 47 per cent in 2015 [2]. However, by 2015, estimated 2.4 billion people were still using unimproved sanitation facilities, and a staggering 1 billion people (14% of the world population) have no access to toilets, latrines or any form of sanitation facility at all and therefore practiced open defecation [2] and [3]. In Sub Saharan Africa, baseline latrine coverage in 1990 was 24% and the region recorded a marginal increment of only 30% by 2015 [2]. A joint monitoring program conducted in Kenya established that only 32 % of the rural population had access to improved sanitation [4].

Open defecation is still widely practiced in Kenya despite the government's ambitious rural Kenya 2013 Open Defecation Free (ODF) campaign roadmap [4]. Though the overall national open defecation rate is about 14 percent, it masks massive regional disparities. In Turkana County open defecation is highest at 82.1%, Wajir-76.7%, Samburu 73.4%, West Pokot-67.1%, Mandera-66%, Marsabit-64.6%, Kwale 51.2%, Narok-48.4%,

Garissa-48.2%, Isiolo-44.2%, Homabay-38.8%, Kilifi-34% [5]. In Kitui County, where this study was conducted open defecation is also high at 30.9% [5]. Kenya also suffers from another unique sanitation problem, even in counties with lower rates of open defecation like Bungoma-3.3%, Embu-1.7%, Kakamenga-1.5%, and Kiambu-0.3%, children feaces is not properly disposed/contained, due to parental perception that children's faeces are harmless and children may fall in latrines hence they are not allowed to visit latrines. Some adults also continue to routinely defecate in the open at night and during the rainy season [4,5].

Lack of sanitation is a serious health risk, affecting billions of people around the world, particularly the poor and disadvantaged [6] & (Ekane et al., 2016). Sanitation in this context generally refers to the provision of services and facilities for the collection, handling, treatment, disposal and/or use of mainly human excreta, and the related hygiene and health behavioral aspects [7]. Lack of Sanitation compels people to practice open defecation and leads to high levels of environmental contamination and exposure to the risks of microbial infections, diarrheal diseases (including cholera), trachoma, schistosomiasis and hepatitis [6]. The disease burden associated with poor water, sanitation, and hygiene is estimated to account for 4.0% of all deaths and 5.7% of the total disease burden in disability-adjusted life years (DALYs) worldwide, principally through diarrheal diseases, schistosomiasis, trachoma, ascariasis, trichuriasis, and hookworm infection [6].Globally about 1.8 million people die every year due to diarrheal diseases, and children under the age of 5 years account for 90% of diarrheal deaths [6]. Moreover, 88% of diarrheal diseases are attributed to unsafe water supply, inadequate sanitation, and poor hygiene [6]. Unsafe water and sanitation is the second leading risk factor and contributor to all mortality and morbidity burden in Kenya [4]. Over 75 percent of the Kenya's disease burden is caused by poor personal hygiene, inadequate sanitation practices and unsafe drinking water [4]. In Kenya diarrhea diseases contributes to at least 40 % of deaths among under-five children. Approximately 19,500 Kenyans, including 17,100 children under the age of five years are dying each year from diarrhea in which 90 percent is directly attributed to poor water, sanitation and hygiene [4].

As we enter the age of the Sustainable Development Goals (SDGs), it is important to mention that the objective of SDG number six is to ensure availability and sustainable management of water and sanitation for all by the year 2030. Target 6.2 of the SDGs is to achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and these in vulnerable situations [8]. Achieving this target calls for innovative solutions. Community Health Strategy is one of the health care interventions developed in Kenya in the year 2006 to help improve health care at the community level [9]. In Mwingi West sub-county, CHS was initiated in 2011 by the Ministry of Public Health and Sanitation (MoPHS) in partnership with the African Medical and Research Foundation (AMREF)-Kenya [10]. Since inception of CHS in Mwingi west Sub County, no evaluation has been conducted to establish the effect of the intervention on latrine coverage despite the fact that one of the roles of Community Health Workers (CHWs) implementing the CHS is to promote proper sanitation and hygiene in the sub county. This observation, together with the high prevalence of open defecation (30.9%) in Kitui County justified the need to carry out this study. The aim was to assess the effect of CHS on latrine coverage in Mwingi West sub county; Kenya.

2. Materials and Methods

2.1. The Study Area

This was an experimental study with intervention and control site. Intervention site was Mwingi west sub-county and the control site was Mwingi North sub-county. Both sub counties are located in Kitui County.

2.2. The Intervention

CHS is a Community Health Worker (CHW) led intervention in which CHWs are the main service providers. Communities are subdivided into Community Units (CUs) and each CU is allocated CHWs who take charge of PHC service delivery. In Mwingi West sub-county, Community members were subdivided into ten CU's. CHWs working within each CU provided health education and promotion on hygiene and sanitation among other PHC services. This involved teaching community members on importance of practicing safe sanitation behaviors including constructing latrines to avoid open defecation. CHWs identified households without latrines and followed household heads to ensure that each household had a pit latrine.

2.3. The Research Design

This was a non-randomized prospective (pretest-posttest) experimental study in which 1 pre- test and 2 post-test time series household surveys were conducted in both intervention and control sites. Data was collected at 3 time points; a baseline survey was used to collect baseline data in both intervention site and control sites. First post intervention survey (midterm survey) data was collected 9 months after implementation of the CHS in intervention site. Second post intervention survey data (end term survey) was collected in both intervention and control sites 18 months after implementation of the CHS in intervention site.

2.4. Sample Size Determination

Fisher's formula for calculating a representative sample size of a population with more than 10,000 participants was used in determining sample size [11]. A representative sample size of 384 households was established. Thirty-eight households (10 percent of 384 households) were added into this sample in order to carter for non-response. A total sample size of 422 households was determined.

2.5. Sampling Procedure

Purposive and simple random sampling methods were employed. Purposive sampling was used to identify intervention and control sites. Mwingi west Sub County was purposively selected as intervention site based on the fact that the CHS program was to be implemented in the sub county. Mwingi north Sub County was also purposively sampled as the control site based on the following; CHS was not under implementation in the sub county, the sub county borders Mwingi West, and both sub-counties have many similarities which include similar ecological and climatic characteristics [12]. Simple random sampling was applied in all the pre-and post-intervention surveys in the study and control sites. This study was part of a larger study and more details on simple random sampling and data collection process can be found on another paper [13].

2.6. Variables in the Study

The independent variable in the study is the intervention-CHS, while the dependent variable was latrine coverage.

2.7. Study Validity and Reliability

A pilot study was conducted in Nzeluni in Mwingi west sub-county before the main study. Upon testing the pilot study data for reliability, the coefficient of internal consistency (Cronbach's *alpha*) was 0.864. This value was within the recommended range of 0.70-0.9517 [14] and therefore the data collection tools (questionnaire and observation checklist) were found to be reliable. Internal validity of the study was ensured by applying a sound methodology while external validity was ensured by use of a representative sample size.

2.8. Data Analysis and Presentation

Frequencies and percentages were used to provide descriptive statistics. Z score tests were used to determine if proportions of latrine coverage before and after the intervention were significantly different. To estimate net effect of CHS intervention on latrine coverage, Difference-in-Differences (DID) model, was used to compare the changes in latrine coverage over time between intervention and control groups as proposed by [15]. Binary logistic regression was used to control for potential confounders (socio-demographic characteristics) and establish the probability of a household having or not having a latrine with and without the CHS intervention. Data was presented using tables.

2.9. Study Limitations

Researchers were not able to account for possibility of other programs that could influence latrine coverage in the intervention site. However, there was an attempt to reduce the effect of confounding factors through; treating socio-demographic characteristics of both intervention and control sites as potential confounders and controlling them in the binary logistic regression model used in data analysis, by matching the control to the intervention sites by geographical location, and infrastructural characteristics, and by removing the difference in the outcome between intervention and control groups at the baseline by applying DiD model in estimating impact of CHS on latrine coverage.

2.10. Ethical Considerations

Ethical clearance for this study was provided by the National Council of Science and Technology (NCST) of the Government of Kenya (GoK).

3. Results

3.1. Socio-demographic Characteristics

The table on socio-demographic characteristics has been published in a different paper and is available online on http://pubs.sciepub.com/ajphr/4/6/4/ and in [13].

3.2. Effect of CHS on Latrine Coverage

3.2.1. Change in Latrine Coverage in Intervention and Control Sites

Z score tests indicate that in the intervention site; latrine coverage significantly increased from baseline survey (64.7%) to midterm survey (85.7%) by 21% (Z=7.0128, P<0.0001). The greatest significant increase was observed at end-term survey in which latrine coverage increased by 27.6% (Z=9.7189, P<0.0001) from 64.7% at baseline to 92.3% at end-term survey. In the control site, no significant increase was observed between baseline and midterm surveys and between base line and end-term surveys respectively. These statistics are summarized in Table 1.

Table 1. Change in Latrine Coverage in Intervention and Control Sites

Site	Baseline	Mid-term	End term	Mid-Term *Vs.* Baseline	End-term *Vs* Baseline
Intervention	269/416 (64.7%)	354/413 (85.7%)	385/417 (92.3%)	(21%) Z=7.0128, P<0.0001*	(27.6%) Z=9.7189, P<0.0001*
Control	256/411 (62.3%)	248/413 (60%)	265/420 (63.1%)	(-2.3%) Z=0.6593, P>0.05	(0.8%) Z=0.2408, P>0.05

3.2.2. Estimated Impact of CHS on Latrine Coverage in Intervention site Compared to Control

Estimated Impact of CHS on latrine coverage in intervention site compared to control was calculated using the DiD model. Compared to control, CHS increased latrine coverage in the intervention site by 26.8% over the 18 months implementation period of the CHS. This was calculated using the following equation;

DiD (%) = (92.3%-64.7%)-(63.1%-62.3%) = **26.8%.**

3.2.3. Odds of having a Latrine in the Household

Probability of having a latrine in the household with or without the CHS intervention was estimated using the

odds ratios. Compared to intervention arm-baseline survey, households in intervention arm midterm survey were 3 times and 4 times more likely to have a latrine in the crude and adjusted odds ratios respectively [(crude OR=3.279, P<0.0001; 95% CI: 2.331-4.612), Adj. OR=4.356, P<0.0001; 95%CI: 2.975-6.379)]. Households in intervention arm-endterm survey were 3 times more likely to have a latrine compared to households in intervention arm-baseline survey in both the crude and adjusted ORs [(crude OR=2.699, P<0.0001; 95% CI: 2.205-3.305), Adj. OR=3.391, P<0.0001; 95%CI: 2.686-4.280)].There was no significant difference in ORs observed in the odds of having a latrine in control-arm midterm survey compared to control arm-baseline survey. As well, no significant difference in ORs was observed between control arm -end term survey and control arm-baseline survey. These results are summarized in Table 2.

Table 2. Odds of having a Latrine in Intervention and Control Sites

Study sites	Surveys	Crude % Adj.	Sig	OR	95%CI
Intervention site	Midterm vs Baseline	Crude OR	0.0001*	3.279	2.331-4.612
		Adjusted OR	0.0001*	4.356	2.975-6.379
	End term Vs Baseline	Crude OR	0.0001*	2.699	2.205-3.305
		Adjusted OR	0.0001*	3.391	2.686-4.280
Control Site	Midterm vs Baseline	Crude OR	0. 510	0. 910	0. 688-1.204
		Adjusted OR	0. 625	0. 918	0. 652-1.293
	End term Vs Baseline	Crude OR	0. 806	1.018	0. 885-1.171
		Adjusted OR	0.290	1.098	0.924-1.304

4. Discussion

Three statistics best show the effect of CHS on latrine coverage. These are; the Z score tests testing change in latrine coverage in intervention and control sites between baseline survey, midterm survey and end-term surveys, the DiD statistic estimating the impact of CHS on latrine coverage in intervention site compared to control site, and the Odds Ratios (ORs) testing the probability of having a latrine in a household with or without the intervention. To start with, the Z score tests indicated a significant increase in the proportion of households with a latrine in intervention site midterm survey compared to intervention site baseline survey. The same test also confirmed a significant increase in the proportion of households with a latrine in intervention site endterm survey compared to intervention site baseline survey. Z score tests in control site did not show any significant increase in proportion of households with a latrine in either control site midterm survey compared to control site baseline survey or control site midterm survey compared to control site baseline survey. Though at this point no attempt was made to control for any confounding factors, the increase in latrine coverage in the intervention site could be attributed to the efforts of CHWs implementing the CHS. This is due to the fact that the major difference between intervention and control sites in regard to promotion of good sanitation practice was the CHS intervention.

The DiD statistic supports the Z score statistics. Compared to control site, CHS increased latrine coverage in intervention site by 26.8% over the 18 months of CHS implementation period. Similarly the Odds Ratios (ORs) also supported both the Z score statistics and the DiD statistics by indicating that households in intervention arm- midterm survey and intervention arm end term survey were 3 times more likely to have a latrine compared to households at intervention site baseline survey. After adjusting for socio-demographic characteristic (household income, maternal education, occupation, parity, and maternal age) as potential confounding factors, the odds of having a latrine in a household in intervention arm-midterm survey compared to the same odds in intervention arm baseline survey increased to 4, while the odds of having a latrine in intervention arm end term survey compared to intervention arm baseline survey remained at 3. No significant difference in the odds of a having a latrine was observed between control arm baseline, midterm and end term surveys. These statistics further support the Z score test statistics. The observed gradual increase in the proportion of households with a latrine in the intervention site midterm and end-term surveys could be attributed to the efforts of CHWs working in the CHS. CHWs health education on importance of proper sanitation and follow up to ensure that latrines were constructed in households without one was effective in increasing latrine coverage in intervention site.

Previous studies provide evidence suggesting that Community Based Health Care (CBHC) services are effective in promoting latrine coverage and improving sanitation practices at the community level. A United Nations Children Fund (UNICEF) survey conducted to evaluate effectiveness of Community Led Total Sanitation (CLTS) in promoting latrine construction in Liberia reported that latrine coverage increased significantly in intervention site compared to control site [16]. CLTS evaluation studies in India also reported that intervention sites where found to be more likely to have households using latrines compared to control sites [17] & [18]. Though evidence on effectiveness of the CHS in promoting hygiene and sanitation services in Africa is scarce, a recent study conducted in parts of Siaya, Garissa, and western Kenya indicates that the program was effective in promoting latrine use in intervention sites [19].

5. Conclusion and Recommendations

CHS significantly increased latrine coverage in the intervention site-Mwingi west sub county. To help rural communities adopt proper sanitation practices, County governments need to scale up implementation of the CHS especially in areas where the program has not yet been implemented. This will make Kenya an Open Defecation Free country and help the country meet the global sanitation related SDGs by year 2030.

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Competing Interests

The authors hereby declare that there was no competing interest in this study.

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