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Evaluation of the Initiative to Strengthen Nurses' Expanded Programme on Immunization Pre-Service Training in Kenya

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MCSP is a global USAID initiative to introduce and support high-impact health interventions in 25 priority countries to help prevent child and maternal deaths. MCSP supports programming in maternal, newborn, and child health, immunization, family planning and reproductive health, nutrition, health systems strengthening, water/sanitation/hygiene, malaria, prevention of mother-to-child transmission of HIV, and pediatric HIV care and treatment. MCSP will tackle these issues through approaches that also focus on household and community mobilization, gender integration, and digital health, among others.

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Table of Contents

Acknowledgements	iv
Abbreviations	v
Executive Summary	vi
Introduction.....	1
Background.....	1
Expanded Programme on Immunization In-Service Training for Nurses in Kenya.....	1
Initiatives to Strengthen Expanded Programme on Immunization Pre-Service Training in Kenya.....	2
Purpose of the Study.....	2
Study Questions	2
Methods and Materials	3
Study Sites.....	3
Study Population.....	4
Sample Selection.....	4
Data Collection Tools.....	5
Ensuring the Safety and Confidentiality of Participants.....	5
Data Management and Analysis	5
Limitations.....	6
Dissemination of Findings.....	6
Findings	7
Quality of Training at Pre-Service Training Institutions and Clinical Practicum Sites	7
Capacity of Nursing Graduates	9
Graduates' Perceptions of the Expanded Programme on Immunization Training They Received during Pre-Service Education	10
Facility Managers' Perception of Graduates' Skills, Knowledge, and Attitudes.....	11
Subcounty Supervisors' Perception of Graduates' Skills, Knowledge, and Attitudes.....	12
Conclusion and Recommendations	13
Appendix.....	14

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Abbreviations

EPI	Expanded Programme on Immunization
KMTC	Kenya Medical Training College
MCH	Maternal and Child Health
MCSP	Maternal and Child Survival Program
MLM	Midlevel Manager
MOH	Ministry of Health
OPV	Oral Polio Vaccine
USAID	United States Agency for International Development
VVM	Vaccine Vial Monitor
WHO	World Health Organization

Executive Summary

In 2008, the Kenya Ministry of Health (MOH) embarked on a process to strengthen pre-service training for the Expanded Programme on Immunization (EPI) using the World Health Organization's (WHO) prototype curriculum. Partnering with the WHO, UNICEF and the United States Agency for International Development's (USAID) Maternal and Child Health Integrated Program (later became USAID's Maternal and Child Survival Program [MCSP]), the MOH developed an immunization manual for medical and nursing students, conducted midlevel managers trainings for tutors of the pre-service education institutions (public, private, and faith-based) across the country, provided them with copies of the updated EPI prototype curriculum and manual, and assisted the pre-service training institutions to improve their clinical practicums for immunization.

Between March and April 2017, MCSP conducted an assessment of the outcomes of the pre-service training initiative. MCSP undertook a desk review of the nursing curricula; observed the tutors in their classrooms, students in their clinical practicum sites, and nursing school graduates during their immunization sessions; and conducted in-depth interviews with nursing graduates, health facility managers, and subcounty EPI supervisors. The study examined the content of the nursing curriculum, tutors' knowledge and skills, student nurses' experiences at the clinical practicum sites, graduate nurses' skills and knowledge, nursing graduates' perceptions of their training, and managers and subcounty supervisors' perceptions of the knowledge, skills, and attitudes of nursing graduates.

Thirteen of 14 pre-service training institutions were found to have adapted at least the priority EPI topics recommended in the EPI prototype curriculum to their nursing training curricula. Most tutors were found to have sufficient knowledge and skills for teaching EPI content in the classroom. However, most pre-service training institutions lacked EPI equipment, commodities, and tools in the skills labs for demonstrations and lacked updated reference manuals.

Most public clinical practicum sites sampled were found to have environments that were conducive to learning and students had the opportunity to get hands-on EPI experience. However, private and faith-based placement sites did not have EPI-recommended cold chain equipment, were overcrowded with students, and did not have enough vaccination clients to allow students to sufficiently practice. Across all types of practicum sites in the study, two-thirds gave students the opportunity to practice dropout tracking and only one-third gave students hands-on experience in coverage monitoring.

During the immunization sessions, most graduate nurses were respectful to mothers/caregivers, gave the right vaccines to the right children, and maintained the cold chain. However, almost half (48%) of the graduate nurses did not wash their hands before starting the vaccination sessions (because there was no running water or soap in the health facilities), more than half (59%) did not check the vaccine vial monitors and expiry dates of the vaccines before vaccination, and more than half (52%) did not explain the possible side effects and their remedies to the mothers/caregivers.

Ninety percent of the nursing graduates knew how to use the permanent registers to identify defaulters, and 72% understood the concept of missed opportunities for vaccination. However, almost half (49%) did not know the correct contraindications of vaccination, almost two-thirds (62%) were unfamiliar with the trivalent to bivalent oral polio vaccine switch, almost two-thirds (62%) could not describe the difference between oral and inactivated polio vaccine, one-third (34%) could not interpret the stages of vaccine vial monitor, nearly three-quarters (72%) did not know how to estimate the EPI target, over three-quarters (79%) did not know how to calculate coverage and dropout rates, and 90% did not know how to plot coverage rates on the coverage monitoring chart.

Almost all nursing graduates thought that the EPI content taught in the classroom and the skills learned during their clinical practicums were relevant to the immunization services provided in the health facilities.

However, their pre-service training did not teach them about any recent changes to vaccination guidelines (such as those related to fridge tags) or changes in the EPI schedule, including new vaccines (rotavirus, inactivated polio vaccine, and measles second dose).

The managers of the health facilities where the nursing graduates were posted stated that the nurses came to health facilities prepared to immunize children, but not prepared for proper recordkeeping. They lacked knowledge and skills required to prepare summary reports and calculate coverage and dropout rates. The managers added that the nurses from public Kenya Medical Training Colleges appeared to be more competent than those from the private and faith-based universities, who needed to work under close supervision. The subcounty EPI supervisors believed nursing graduates had sufficient immunization knowledge and basic vaccination skills. However, they also noted gaps around new vaccines and the use of fridge tags, and stated that new nurses needed on-the-job training and mentorship for one or two weeks. Almost half (41%) of the health facility managers and subcounty EPI supervisors thought that the nursing graduates had the capacity to perform immunization work with some initial on-the-job training/mentorship, without in-service training.

The findings of this study will be useful for further improving the EPI pre-service training in Kenya. They will also be useful for other countries in the region looking to strengthen their EPI pre-service training. MCSP plans to foster cross-learning on the Kenya pre-service training experience with other countries in the region.

Introduction

Background

The World Health Organization (WHO) Regional Office for Africa developed a prototype pre-service training curriculum for the Expanded Programme on Immunization (EPI) in 2007 for the countries in the region.¹ The EPI topics in the updated prototype curriculum for nurse-midwives include immunization systems and operations; immunization policies, norms, and standards; immunization strategies and innovative approaches; target diseases for immunization and disease surveillance; the immunological basis for vaccination and current vaccines; how to administer EPI vaccines and vitamin A; cold chain and vaccine handling; logistics support; immunization safety; how to organize an immunization session; conducting an immunization session; communication for immunization programs; introduction to immunization program management; planning immunization activities and financial management; supervision by program managers; monitoring immunization program and data management; and evaluation of immunization programs. For each topic, the EPI prototype curriculum suggests lesson objectives and subobjectives, allocated time, teaching methods, teaching materials, practicums, references, and student assessments. If a pre-service training institution cannot cover all suggested topics, the prototype curriculum recommends a list of priority topics: immunization strategies and innovative approaches, target diseases for immunization and disease surveillance, the immunological basis for vaccination and current vaccines, cold chain and vaccine management, immunization safety, conducting an immunization session, communication for immunization programs, introduction to immunization program management, and monitoring immunization.

In 2008, the Nursing Council of Kenya, the controlling authority of the nurse-midwives curriculum, mandated that nursing training colleges adapt the EPI content of prototype curriculum to their nursing training curriculum. Public pre-service training institutions known as Kenya Medical Training Colleges (KMTCs) educate the majority of the health care professionals (doctors, nurses and technologists) in Kenya. However, in recent years, many private and faith-based pre-service institutions have begun offering health care courses to meet the growing demand for health care professionals in the country.² There is a wide difference in the EPI content of the in-service training conducted by Ministry of Health (MOH), which is generally the most up-to-date, and that of the pre-service training institutions.³ A 2011 assessment found five major challenges in implementing the EPI prototype curriculum in KMTCs: inadequately trained pre-service teachers for EPI, lack of updated EPI reference materials, lack of detailed lesson plans, lack of supervision of students by the tutors at the clinical placement sites, and failure to update the pre-service training curricula with changes to the EPI (such as the addition of new vaccines).⁴

Expanded Programme on Immunization In-Service Training for Nurses in Kenya

The Kenya MOH, usually with technical and financial support from partners, conducts the EPI in-service training for maternal and child health nurses using WHO modules.⁵ The in-service training is costly and, as indicated in the WHO prototype curriculum, most low- and middle-income country MOHs cannot afford to continue it using their own funding when donor support is phased out.⁶ The EPI in-service training is mostly provided to the health workers of public health facilities, but the immunization providers of private and faith-based facilities are often left out. The 2013 devolution of functions and funds to the county governments exacerbated the problem because the county governments lack the capacity and resources to train health workers.

¹ WHO, UNICEF, Gavi, USAID, NESI. 2007. Prototype curriculum on immunization for nursing and midwifery school in the WHO African countries. Brazzaville, Congo: WHO.

² Peano S. 2014. The challenge of expanding quality education for all in developing countries. *Private sector and Development* (20).

³ Tsega AY et al. 2014. Immunization training needs in Malawi. *East African Med J.* 91(9):298-302.

⁴ Juma M et al. 2015. Technical competencies of nurse tutors on EPI in KMTc.

⁵ WHO. 2017. Immunization Training Resources. Retrieved from www.who.int/immunization/documents/training on November 9, 2017.

⁶ WHO, UNICEF, Gavi, USAID & NESI (2007). Prototype curriculum on immunization for nursing and midwifery school in the WHO African countries. Brazzaville, Congo: WHO.

Initiatives to Strengthen Expanded Programme on Immunization Pre-Service Training in Kenya

The Kenya MOH, based on the assessment recommendations of 2011, has worked since 2012 with the WHO, UNICEF and USAID's Maternal and Child Health Integrated Program (later became the Maternal and Child Survival Program [MCSP]) to strengthen EPI pre-service training. Initiatives included the development of an updated immunization manual for medical and nursing students, midlevel managers (MLM) trainings for nurse tutors at pre-service education institutions (public, private, and faith-based) and providing support to pre-service training institutions to improve student practicums.

Purpose of the Study

This study evaluated the outcomes of the EPI pre-service training initiatives in Kenya in terms of nursing graduates' knowledge, skills, and attitudes regarding routine immunization services after completion of their pre-service education.

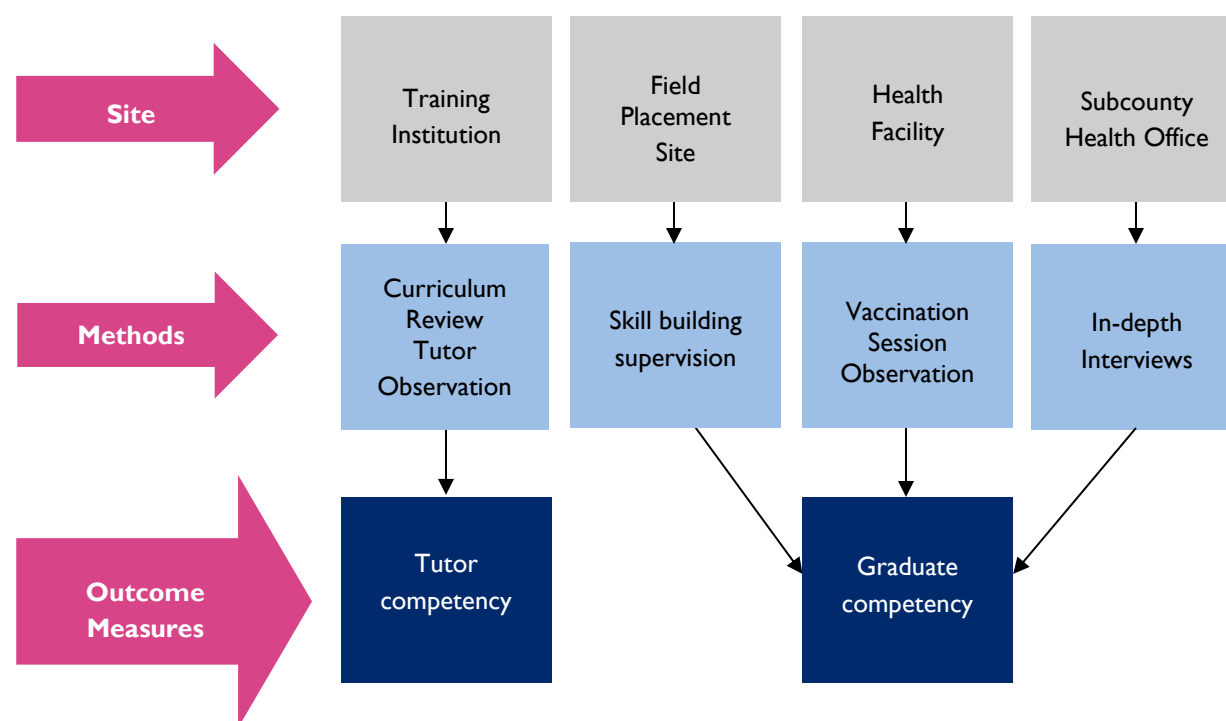
Study Questions

This study addressed the following questions:

- To what extent has the WHO EPI prototype curriculum been adapted by pre-service education institutions?
- Do pre-service training institution tutors follow the recommended methods and content when teaching EPI topics?
- Are nursing students able to practice EPI-related activities during their clinical placements, and do they receive guidance and supervision from on-site supervisors and school tutors?
- Are nursing graduates skilled and knowledgeable in immunization once posted to health facilities after completing their pre-service education?
- What are the perceptions of nursing graduates of the EPI training they received during their pre-service education?
- What feedback do facility managers and subcounty EPI supervisors have regarding the immunization knowledge, skills, and attitudes of new nurses?

Methods and Materials

Figure 1. Study design



This qualitative and quantitative cross-sectional study was conducted between March and April 2017 at pre-service education institutions, student field practicum sites, health facilities, and the subcounty health office (see Figure 1). In the pre-service education institutions, two local consultants hired by MCSP reviewed the nursing curriculum and observed tutors in the classroom. In the field practicum sites, the consultants observed students' skill-building practicums and their supervision by the tutors and on-site supervisors. In the health facilities, the consultants observed nurses providing immunization services as part of routine service delivery, and interviewed them to get their feedback on the EPI training they received during their pre-service education. The consultants also interviewed health facility managers and subcounty EPI supervisors to get their feedback on the knowledge, skills, and attitudes of the nurses.

MCSP immunization technical advisors based in Washington, DC, and Kenya designed the methods and tools for the study, trained the local consultants, and supervised them during data collection. A Washington-based MCSP senior immunization technical advisor analyzed the data and prepared the report.

Study Sites

This study was conducted in nine counties (Migori, Kisumu, Kakamega, Kisii, Homa Bay, Bomet, Bungoma, Transzoia, Elgeyo Marakwet) of Western Kenya. Uasin Gishu County was not included in the study but was visited because a selected pre-service training institution used one of its health facilities as a clinical practicum site, and nursing graduates were posted to five other health facilities there. In total, 14 pre-service education institutions (seven public, three faith-based, four private), 23 field placement sites, and 29 health facilities were included (see Table 1).

Study Population

The study population included 14 nurse tutors at pre-service education institutions, 28 nursing graduates in health facilities, 21 health facility managers, and 16 subcounty EPI supervisors (see Table 2).

Table 1. Number of pre-service education institutions, placement sites, and health facilities included in the study, by county

County	# Pre-service education institutions			# Placement sites	# Health facilities
	Public (KMTC)	Faith-based	Private		
Migori	1	0	0	1	1
Kisumu	1	0	1	2	4
Kakamega	1	0	1	4	5
Kisi	1	1	0	3	5
Homa Bay	1	0	1	4	4
Bomet	0	2	0	4	4
Bungoma	1	0	0	2	2
Transzoia	1	0	0	1	0
Elgeyo Marakwet	0	0	1	1	0
Uasin Gishu	0	0	0	1	5
Total	7	3	4	23	29

Table 2. Number of tutors, nursing graduates, facility managers, and subcounty EPI supervisors included in the study

County	# Nurse tutors	# Nursing graduates	# Facility managers	# Subcounty supervisors
Migori	1	2	1	1
Kisumu	2	4	4	2
Kakamega	2	3	5	3
Kisi	2	5	2	2
Hombay	2	4	2	2
Bomet	2	4	1	1
Bungoma	1	2	2	2
Transzoia	1	0	0	0
Elgeyo Marakwet	1	0	0	1
Uasin Gishu	0	4	4	2
Total	14	28	21	16

Sample Selection

The pre-service institutions selected were a convenience sample of institutions that the data collectors could reach and observe given a 1-month data collection time frame. Nurse tutors were included if they were teachers at pre-service education institutions who received EPI MLM training between 2012 and 2016 and taught student nurses theoretically in the classroom, and practically at the field practicum sites. They were

excluded if they had not received MLM training. Data collectors visited all field practicum sites of the selected training institutions. Facilities included were a convenience sample of locations where nursing graduates were posted. Nursing graduates were included if they were nurses who had graduated from pre-service training institutions and were posted in health facilities to provide preventive health services including immunization. They were excluded if they had received any in-service training. Facility managers were included if they were health officers or nurses who were the officers in-charge at their health facility. The data collectors interviewed all nursing graduates and facility managers who met the criteria and were present at the facility at the time of data collection. The subcounty EPI supervisors were included if they were the EPI focal person at the subcounty responsible for supervising EPI work in the health facilities.

Data Collection Tools

The following data collection tools were used in this study (see Appendices):

- Curriculum review form
- Form for observation of nurse tutors in the classroom
- Form for observation of students at field practicum sites
- Form for observation of nursing graduates conducting immunization sessions
- Form for in-depth interviews with the nursing graduates
- Form for in-depth interviews with facility managers
- Form for in-depth interviews with subcounty EPI supervisors
- Consent form for participants

The forms were pre-tested with the relevant study population in counties not included in the study. Minor changes in the form were done based on pre-test experience.

Ensuring the Safety and Confidentiality of Participants

The study protocol was exempted from human subjects oversight by the John Snow Inc. (the MCSP implementing partner for immunization) institutional review board, and the decision was also certified by the Jhpiego (the lead implementing partner for MCSP) institutional review board. The protocol and tools received approval from the institutional review board of Maseno University in Kenya.

The interviewers obtained consent from all study participants before administering the questionnaires. The participants' names were collected, and information they provided was kept confidential during data collection, storage, and analysis. The data collection tools and analyzed data were kept secured in a locked cabinet. Data analysis was done in the MCSP Washington, DC, office using computers protected by password.

Data Management and Analysis

The MCSP Kenya immunization technical advisors checked the forms for completeness and accuracy daily and sought clarification from the data collectors if required. The completed forms were sent to the Washington-based senior immunization technical advisor for analysis. The quantitative data from the EPI session observations were analyzed using Excel. The qualitative data from the classroom and practicum site observations and the in-depth interviews were coded based on the themes that emerged from the analysis. The information from the classroom observations, observations of EPI sessions, and opinions of facility managers and subcounty supervisors were triangulated to assess the quality of EPI training.

Limitations

The pre-service institutions included in the study were purposefully selected based on whether their tutors participated in EPI MLM training. As a result, the findings cannot be generalized to all institutions in Kenya. Additionally, the presence of the data collectors may have introduced observation bias if the participants modified their behavior because they knew they were being observed. However, sufficient time was spent at data collection sites to maximize the time spent on observations. Finally, the nursing graduates may have received an EPI briefing or on-the job training from their supervisors after they were posted in the health facilities, which may have improved their EPI knowledge and skills after they left their pre-service training. The study's use of multiple viewpoints (tutors, graduates, and managers/supervisors) served to limit any potential bias by allowing the researchers to triangulate the quality of pre-service training.

Dissemination of Findings

The findings of this study will be shared with the MOH, pre-service training institutions, the Nursing Council of Kenya, and other partners in Kenya to inform further improvement of the EPI curriculum and/or the training of nurses during pre-service education. The findings will directly benefit tutors and future students, and will also indirectly benefit the communities that will receive better immunization services from the competent nurses. The findings will also be shared with other countries in the region to guide their efforts to strengthen EPI training during pre-service education.

Findings

Quality of Training at Pre-Service Training Institutions and Clinical Practicum Sites

Expanded Programme on Immunization Topics Included in the Nursing Curriculum

Five of the seven KMTCS were found to have adapted all EPI topics suggested in the WHO prototype curriculum, but one institution adapted the priority EPI topics. One institution's curriculum could not be reviewed as the person responsible was absent during data collection. Among the three faith-based institutions, two adapted the priority EPI topics, although they spent a disproportionate amount of time on cold chain compared to the other priority topics, and one adapted all the topics. Among the four private institutions, two adapted all the suggested EPI topics, one adapted priority topics loaded heavily with cold chain topics, and one did not have a written curriculum available.

Expanded Programme on Immunization Equipment and Supplies in the Skills Lab

Of the seven KMTCS, one had an old but functioning EPI fridge, a vaccine carrier, and a safety box in the skills lab. Two had nonfunctioning EPI fridges, vaccine carriers and safety boxes, and three did not have fridges, but had vaccine carriers, safety boxes, and auto-disable syringes. One did not have a skills lab due to lack of space. None of the faith-based or private institutions had EPI equipment or commodities in the skills lab.

Updated Expanded Programme on Immunization Manuals in the Pre-Service Education Institutions

Three of seven KMTCS had a copy of the updated EPI prototype curriculum available at the time of study, but none of the faith-based or private institutions did. Probing revealed that a hard copy of the updated EPI prototype curriculum and manual (and a flash drive containing the manual and EPI prototype curriculum) were given to the tutors during their MLM trainings. However, the trained tutors may not have shared them with the institution's other tutors or may have since transferred to another institution.

Expanded Programme on Immunization Reference Materials in the Library

None of the pre-service education institutions (public, faith-based or private) had an EPI manual available in the library for the students to use. One public institution had a copy of an EPI manual from 1982 and another had a copy of Immunization Essentials⁷

Competency of Tutors in the Classroom

Twelve of 14 tutors (86%) observed in the classroom explained the learning objectives for the topic to the students. One tutor from a public institution and one from a private institution did not. Thirteen of 14 tutors (93%) used the training methods suggested in the curriculum, covered all necessary content for the topic, and reinforced learning by asking students key knowledge questions. The one who did not was from a private institution. Only nine of the 14 tutors evaluated students according to the learning objectives at the end the class (see Table 3).

⁷ USAID. 2003. Immunization essentials: a practical field guide. Washington, DC: USAID.

Table 3. Competency of nurse tutors in teaching EPI content as observed in the classroom
Suitability of Clinical Practicum Sites

Skills / Knowledge of Tutors	Number of Tutors (N=14)	Percentage
Explained learning objectives	12	86%
Used suggested teaching methods	13	93%
Covered required content for the topic	13	93%
Reinforced learning by asking questions	13	93%
Evaluated students by learning objectives	9	64%

Twenty-one of 23 sites (91%) were found to be suitable as the field practicum sites, having living accommodation for students, a qualified maternal and child health (MCH) nurse or clinical officer, immunization services, an EPI cold room and equipment, and a sufficient number of clients for students to observe or practice vaccination. Two private placement sites were deemed unsuitable because they did not have an EPI-trained MCH nurse. Twenty-two (96%) practicum sites were visited periodically by the tutors from the pre-service training institutions to oversee students' skill learning.

In all 23 practicum sites, students were given hands-on experience handling vaccines in an EPI cold room; removing, placing, and arranging vaccines in the refrigerator; packing and unpacking the vaccine carrier; and recording the refrigerator temperature. However, the refrigerators used by the private field practicum sites were different than the EPI refrigerators. Consequently, students in these practicum sites did not have experience with the standard EPI cold chain equipment.

Either before or upon their arrival at the clinical practicum sites, tutors or on-site supervisors instructed students to be respectful to mothers/caregivers during vaccination sessions. They were observed greeting mothers, creating rapport, and acting politely. In 22 (96%) practicum sites, the students were observed providing health education to mothers/caregivers (see Table 4).

Table 4. Suitability of student field placement sites

EPI skills learning	Number of placement sites (N=23)	Percentage
Had all necessary EPI components for a field placement site	21	91%
Site staff mentored students	21	91%
Tutors supervised students at the placement site	22	96%
Students had hands-on experience in the EPI cold room	23	100%
Students were instructed to be respectful to mothers/caregivers	23	100%
Students practiced providing health education	22	96%
Students provided hands-on experience during immunization sessions	23	100%
Students provided hands-on experience with defaulter tracking	15	65%
Students provided hands-on experience with coverage monitoring	9	39%
Site staff signed student log books	18	78%

At all practicum sites, students were given hands-on experience during immunization sessions. Fifteen practicum sites (65%) also provided hands-on experience identifying defaulters in the permanent register. Only nine practicum sites (39%), showed students how to calculate coverage rates and plot them on the monitoring chart. At 18 practicum sites (78%), facility staff signed the students' log books to verify their practicum activities.

Capacity of Nursing Graduates

All 29 nursing graduates were observed being respectful to mothers/caregivers during immunization services by greeting them, building rapport, and treating them with respect (see Table 5).

Infection Prevention Practices

A little more than half (52%) of the nursing graduates washed their hands with soap and water or used hand sanitizer before starting the immunization sessions. The remaining 14 (48%) did not wash their hands, and in these cases, the health facilities where they worked did not have running water and soap nor hand sanitizer. Twenty-six nurses (90%) followed the no-touch technique during vaccination. Twenty-eight (97%) discarded used syringes and needles in a safety box immediately, without recapping.

Table 5. Observed skills and attitudes of nursing graduates during immunization sessions

Skills and attitudes of nursing graduates during immunization sessions	# graduates (N=29)	% graduates
Greeted mothers/caregivers	29	100%
Treated mothers/caregivers politely	29	100%
Washed hands before starting immunization session	15	52%
Used conditioned ice pack for vaccine carrier	23	79%
Checked vaccine vial monitor (VVM) before vaccination	12	41%
Checked expiry date of vaccines before vaccination	12	41%
Checked records to determine vaccines due/correct dose number	27	93%
Followed logical sequence in vaccination	27	93%
Used no-touch technique during vaccination	26	90%
Used correct diluent	19	100*%
Kept diluent cold	19	100*%
Disposed used syringe into safety box immediately, without recapping	28	97%
Explained possible side effects and remedies	14	48%
Told mother/caregiver when to return for the next vaccine/dose	27	93%
Tallied vaccine after each vaccination	25	86%
Entered vaccination date on the card	29	100%
Entered vaccination date in permanent register	28	97%

*N=19 nurses who delivered vaccines that required a diluent during the session

Immunization Practices

More than three-fourths (79%) of nursing graduates conditioned the ice packs for the vaccine carriers. Less than half (41%) checked the VVM and expiry dates of the vaccines before administering them. Twenty-seven (93%) checked the mother and child booklet and permanent register to determine the right vaccines dose number before administering vaccines, and also followed the logical sequence in vaccinating the children (rotavirus, then OPV, then penta, pneumococcal vaccine 10, and inactivated polio vaccine). All 19 nurses who vaccinated children eligible for BCG (TB) or measles vaccines used the correct and cold diluents for mixing the vaccines. A little less than half (48%) explained possible side effects and their remedies to mothers/caregivers. Twenty-seven (93%) told the mothers/caregivers when to return for the next vaccine. Twenty-five (86%) tallied the vaccines in the tally sheet appropriately. All of them entered the date of vaccination in the mother and child booklet, and 28 (97%) entered it in the permanent register.

Immunization Knowledge

Table 6. Nursing graduates' immunization knowledge

Immunization knowledge	# Graduates who could correctly explain (N=29)	% Graduates who could correctly explain
Contraindication of immunization	15	51%
Missed opportunity for vaccination	21	72%
Trivalent OPV to bivalent OPV switch	11	38%
Difference between OPV and inactivated polio vaccine	11	38%
Stages and interpretation of VVM	19	66%
Identification of defaulters	26	90%
Estimation EPI target population	8	28%
Calculation of coverage and dropout rates	6	21%
Plotting coverage rates in the monitoring chart	3	10%

Over half (51%) of the graduates could list the correct contraindications of immunization. Nearly three-fourths (72%) knew what a missed opportunity vaccination was. Over one-third (38%) could explain the trivalent OPV and bivalent OPV switch and the difference between OPV and inactivated polio vaccine. Two-thirds (66%) could interpret the stages of the VVM. Twenty-six (90%) knew how to identify the defaulters in the permanent register, but only eight (28%) knew how to estimate the EPI target population. A little less than one-quarter (21%) knew how to calculate the coverage and dropout rates, and only one in 10 (10%) knew how to plot the coverage rate in the coverage monitoring chart (see Table 6).

Graduates' Perceptions of the Expanded Programme on Immunization Training They Received during Pre-Service Education

Almost all nursing graduates stated that the EPI content they received in the classroom and at their clinical practicum sites was relevant to the immunization services they provide in the health facilities.

Most nurses mentioned that information they received on vaccines, cold chain, service delivery strategies, and

I received information that was up to date at the time of my pre –service education but life is dynamic and ever-changing. However, we need to learn to deliver the services.

-A nursing graduate

recordkeeping was up-to-date at the time of their pre-service education, but they noticed a few changes since then. For example, new vaccines (rotavirus, inactivated polio vaccine, or measles second dose) have been added to the immunization schedule, ice packs are now supposed to be conditioned for immunization sessions, and new temperature monitoring devices (fridge tags) have been introduced. For these changes, the supervisors provided on-the-job-training and nurses gained confidence through practice at the health facility. Some nurses stated that there was no or little demonstration of the use of EPI commodities in the classroom and equipment was missing from the skills labs. However, they had the opportunity to handle the equipment and provide services at the clinical practicum sites. Nevertheless, some nurses explained that the clinical practice areas in the practicum sites were congested with many students, and that there were not enough clients, so they had to compete with each other to observe and practice skills. Some nurses stated that the duration of their EPI practicum was not adequate. The WHO EPI prototype curriculum recommends eight weeks of practicum.

Nurses felt that students should get more practical training in documentation, including how to estimate target populations, how to calculate coverage and dropout rates, and how to plot graphs on the coverage monitoring chart.

I acquired knowledge and some skills how to vaccinate children during pre-service training but I was not confident so I needed mentorship to perform the task.

-A nursing graduate

Regarding the teaching methods of the tutors in their schools, nurses stated they primarily revolved around lectures, question and answer sessions, group work, role-play, and some practice, such as giving BCG vaccination. There were limited EPI demonstrations in the classrooms and skills labs.

Most nurses stated that there was an on-site MCH nurse or clinical officer to support and mentor them at their practicum site, and they received adequate supervision by their tutors from the schools. However, a few stated that the tutors' supervision should be improved.

Facility Managers' Perception of Graduates' Skills, Knowledge, and Attitudes

Two-thirds (67%) of the managers thought that new nurses arrived with up-to-date EPI knowledge, particularly those whose field practicum were in government health facilities. Others felt that graduates did not all acquire necessary information during their pre-service training on certain topics, including new vaccines, contraindications, and fridge tags. Additionally, managers remarked that nurses frequently lacked required knowledge and skills to prepare summary reports and calculate coverage and dropout rates. Managers stated that graduates of public institutions (KMTCs) appeared to be more competent than those from the private or faith-based universities, who needed to work under close supervision and took more time to gain confidence. Because some new nurses lacked confidence, they needed to be mentored for 1 or 2 weeks.

Managers noted that despite the pre-service training, the nurses still needed to be oriented before they assumed their responsibilities. However, more than half (52%) of the managers thought that nurses were capable of performing EPI activities without in-service training. Others felt that nurses should have in-service training, especially in documentation (preparing summary reports, estimating target populations, calculating coverage rates, and plotting monitoring charts). Almost all the managers believed that nursing graduates were respectful to mothers/caregivers and had received adequate training on communicating with them.

Nursing graduates can perform EPI activities without in-service training provided there is someone experienced at the facility who can support new graduates.

-A nursing graduate

Nursing graduates treat mothers as clients. No reports of cruelty have been reported or noted.

-A health facility manager

Subcounty Supervisors' Perception of Graduates' Skills, Knowledge, and Attitudes

Over half of the subcounty EPI supervisors stated that the nursing graduates were conversant in EPI, with the exception of new vaccines, and most felt new nurses had basic skills for vaccinating the children. Others thought new nurses did not arrive with adequate knowledge in the areas of cold chain maintenance, target estimation, coverage calculations, dropout rate calculations, and monitoring charts. For these things, they needed on-the-job training and mentorship for one or two weeks after their arrival. Once again, supervisors felt that nurses graduating from the KMTCs arrived more prepared than those from private or faith-based universities.

Seven of 17 (41%) subcounty EPI supervisors thought that, after the initial on-the-job training and mentorship, new nurses were capable of performing immunization work without in-service training. Others expressed a need for in-service training, particularly around cold chain maintenance, new vaccines and technologies, and documentation.

Almost all supervisors believed that nursing graduates were respectful to mothers/caregivers, except for a few isolated cases.

Nursing schools should be furnished with EPI equipment to demonstrate to the students, and the lectures should get themselves up to date with current EPI vaccines, equipment, and tools.

-A subcountry EPI supervisor

The level of competency of nursing graduates depends on the pre-service education institutions they graduate from. Graduates from KMTCs are more competent than graduates from private universities.

-A subcountry EPI supervisor

Conclusion and Recommendations

This study found considerable improvement in nurses' EPI pre-service training compared to the assessment conducted in 2011. An EPI pre-service manual for nursing and medical students has been developed, pre-service tutors have been trained and provided with a copy of the updated prototype curriculum and manual, tutors are knowledgeable about EPI topics, 13 of 14 pre-service training institutions have adapted the updated curriculum (including all recommended or priority topics), the duration of the EPI field practicum has been increased to 8 weeks by most institutions, and students are supervised by school tutors and on-site supervisors during their practicums. Consequently, as the findings of the study indicate, nursing graduates from schools using the updated EPI prototype curriculum finish pre-service training with the requisite knowledge, skills, and attitudes to successfully vaccinate children. However, they may require an initial 1 or 2 weeks of on-the-job training or mentorship in the health facilities where they are posted. Private and faith-based pre-service training institutions should work to ensure students are exposed to standard EPI equipment and commodities, and are placed in clinical practicum sites that have an EPI-trained MCH nurse to mentor the students and a sufficient number of clients to allow the students to observe or practice vaccination. Additionally, few of the pre-service training institutions of any type had a copy of the updated EPI prototype curriculum and EPI reference manual for tutors or an EPI reference manual for students to use in the school library.

Tutors at pre-service training institutions may not be keeping themselves up-to-date with the recent changes in EPI, since students have not received information on new vaccines included immunization schedule, new vaccination strategies (trivalent OPV to bivalent OPV switch), or new devices (fridge tags). Students have also not gained sufficient knowledge and skills in the area of EPI documentation (estimating EPI targets, calculating coverage and dropout rates, and plotting coverage monitoring charts).

The pre-service training institutions may consider the following to improve EPI pre-service training:

- EPI commodities (including auto-disable syringes, safety boxes, and fridge tags) and documentation tools (including tally sheets, permanent registers, summary forms, and monitoring charts) should be demonstrated in the classroom. In addition to theoretical instruction, students should be given an opportunity to practice documentation in the classroom, particularly EPI target estimation, coverage and dropout rate calculation, and coverage monitoring chart plotting, which were found to be major gaps.
- The skills lab should have appropriate EPI equipment and commodities available for students to practice with.
- Pre-service education institutions should select clinical practicum sites with an EPI-trained MCH nurse or clinical officer and consider the student-to-client ratio. If necessary, more placement sites should be selected so that all students have opportunities to gain hands-on experience.
- Tutors of pre-service education institutions, in collaboration with the EPI office of the MOH, should keep themselves up-to-date with recent EPI information by accessing legitimate sources, such as WHO EPI training modules or in-country up-to-date EPI training manuals.
- Professional associations (such as a nurse-midwives association) should offer continuing medical education for nurses, and pre-service education institutions should make it a requirement for tutors so that they remain up-to-date with recent changes.
- Pre-service education institutions should download up-to-date EPI training manuals and make them available in the school library for students.

Appendix A Annex I: Nurses Curriculum, Skills Lab, and Library Review Form

Name of the County and Subcounty: _____/_____

Name of the pre-service education institution: _____

Ownership of the institution: Public/Faith-based/Private

Date of visit: ____/____/____

1. List EPI topics included in the Nurses curriculum used by the pre-service training institution.

2. List EPI Equipment and commodities available in the skills lab of the institution?

3. Is there a copy of the updated EPI manual available in the institution? Yes/No

4. Is any other EPI reference material used by the tutors of the institution?

5. Is there a copy of updated EPI reference manual available in the Library?

Appendix BprevAnnex 2: Classroom Observation Form

Name of the county/subcounty: _____/_____

Name of the training institution: _____ public/private/faith-based _____

EPI topic taught in the class: _____ Date of visit: ____/____/____

1. Are the learning objectives for the topic introduced by the tutor for the students in the class room?

Yes ____ No ____

Comment:

2. Are the teaching aids used by the tutor (e.g. overhead projector, flip chart, chalk board, samples of EPI equipment and vaccines) in the class room?

Yes ____ No ____

Comment

3. Are the teaching methods used by the tutor participatory (e.g., question and answer, group work, demonstration, exercise)?

Yes ____ No ____

Comment

4. Are the key contents of the topic covered by the tutor in the classroom?

Yes ____ No ____

Comment

5. What is the overall knowledge level of the tutor on the topics?

Excellent ____ Good ____ Fair ____

Comment

6. Does the tutor reinforce student's learning by encouraging students to ask question, and/or asking student to ask questions to check if they understood the contents, and clarified again the key points if needed?

Yes ____ No ____

Comment

7. Does the tutor evaluate with students if the objectives of the topic achieved at the end of the class?

Yes ____ No ____

Comment

8. Any other observations:
-
-

Name of the data collector: _____ Signature: _____

Verified by: _____ Signature: _____

Appendix CprevAnnex 3: Clinical Placement Site Observation Form

Name of the county/subcounty: _____/_____

Name of the training institution: _____ public/private/faith-based _____

Name of the placement site: _____ Date of visit: ____/____/____

1. Is the site appropriate for clinical placement for the students (for example, living accommodation for students, and availability of on-site EPI-trained staff, availability of EPI equipment, availability of EPI services, and duration of placement etc.)?

Yes ____ No ____

Comment:

2. Are the students supervised/mentored by the on- site facility staff (such as MCH Nurse/Clinical Officer) during the field placement?

Yes ____ No ____

Comment:

3. Are the students given opportunity to get hands-on experience in the EPI cold room (e.g., vaccine management in the refrigerator, recording temperature in the chart, packing/unpacking vaccines)?

Yes ____ No ____

Comment:

4. Are the students given opportunity to get hands-on experience in the immunization session (e.g., preparation for the session, cold chain maintenance, administering vaccines, recordkeeping, waste management)?

Yes ____ No ____

Comment:

5. Do the students get orientation to be respectful to the mothers/care givers in the immunization session?

Yes ____ No ____

Comment:

6. Do the students get hands-on experience for giving health education to mothers / caregivers?

Yes ____ No ____

Comment:

7. Do the students get hands-on experience for tracking defaulters using information from the permanent register?

Yes ____ No ____

Comment:

8. Do the students get hands-on experience on monitoring coverage (e.g., estimation of target, calculation of vaccination coverage and dropout rates, and entering coverage data into the monitoring chart)?

Yes ____ No ____

Comment:

9. Does the on-site supervisor sign off the student's logbook at the end of clinical placement?

Yes ____ No ____

Comment:

10. Any other comments:

Name of data collector: _____ Signature: _____

Verified by: _____ Signature: _____

Appendix Dprev Annex 4: Vaccination Session Observation Form

Name of the county: _____ Name of the subcounty: _____

Name of the facility: _____ Date of visit: ____/____/____

Observe/ask and mark yes or no as appropriate. Add comments as appropriate

Observe:

1. Does the vaccinator wash hands before vaccination?

Yes ____ No ____

Comment:

2. Does the vaccinator greet the mother/caregiver?

Yes ____ No ____

Comment:

3. Does the vaccinator check records (card and register) before vaccination?

Yes ____ No ____

Comment:

4. Are Vaccines stored in a Vaccine Carrier with conditioned ice pack during the session?

Yes ____ No ____

Comment:

5. Does the vaccinator check VVM before vaccination?

Yes ____ No ____

Comment:

6. Does the vaccinator check vaccine vials for expiry date before vaccination?

Yes ____ No ____

Comment:

7. Does the vaccinator follow no-touch technique during vaccination?

Yes ____ No ____

Comment:

8. Does the vaccinator placed the used syringe with needles in the safety box without recapping?

Yes ____ No ____

Comment:

9. Does the vaccinator follow the correct immunization schedule for vaccination?

Yes ____ No ____

Comment:

10. Does the vaccinator follow the right sequence during vaccination?

Yes ____ No ____

Comment:

11. Is correct diluent used for mixing the BCG and measles vaccine?

Yes ____ No ____

Comment:

12. Are the diluents kept cold?

Yes ____ No ____

Comment:

13. Is the vaccinator respectful to the mothers/caregivers?

Yes ____ No ____

Comment:

14. Does the vaccinator explain the possible side effects and remedies to the mothers/caregivers?

Yes ____ No ____

Comment:

15. Does the vaccinator tell mothers/caregivers when to return for next dose?

Yes ____ No ____

Comment:

16. Does the vaccinator mark tally sheet after each vaccination?

Yes ____ No ____

Comment:

17. Does the vaccinator enter date of vaccination in the mother and child booklet?

Yes ____ No ____

Comment:

18. Does the vaccinator enter date of vaccination in the EPI permanent register?

Yes ____ No ____

Comment:

Ask the vaccinator the following questions:

19. Does the vaccinator know contraindication for vaccination?

Yes ____ No ____

Comment:

20. Does the vaccinator know about the missed opportunity for immunization?

Yes ____ No ____

Comment:

21. Does the vaccinator know about the trivalent OPV to bivalent OPV switch?

Yes ____ No ____

Comment:

22. Does the vaccinator know the difference between OPV and inactivated polio vaccine?

Yes ____ No ____

Comment:

23. Does the vaccinator know about measles second dose?

Yes ____ No ____

Comment:

24. Does the vaccinator know the use of fridge-tag?

Yes ____ No ____

Comment:

25. Can the vaccinator interpret the stages of VVM?

Yes ____ No ____

Comment:

26. Does the vaccinator know how to track defaulters from the permanent register?

Yes ____ No ____

Comment:

27. Does the vaccinator know how to estimate EPI targets?

Yes ____ No ____

Comment:

28. Does the vaccinator know how to calculate the coverage rates?

Yes ____ No ____

Comment:

29. Does the vaccinator know how to calculate the dropout rates?

Yes ____ No ____

Comment:

30. Does the vaccinator know how to enter coverage data in the monitoring chart?

Yes ____ No ____

Comment:

31. Any other observation:

Name of data collector: _____ Signature: _____

Verified by: _____ Signature: _____

Appendix EprevAnnex 5: Graduates In-Depth Interview Guide

Name of the county/subcounty: _____/_____

Name of the facility: _____ Date of interview: ____/____/____

1. Kindly share your opinion on the relevance of EPI contents you were taught in your pre-service education compared with your current EPI-related works at the health facility. Please elaborate.

2. Give your opinion whether you were given most up-to-date information on EPI (vaccines, vaccination schedule, cold chain, service delivery strategies, recordkeeping and monitoring coverage, etc.) during pre-service education. Please elaborate.

3. Give your opinion on the adequacy of contents in theory and skill learning practices on EPI during your pre-service education. Please elaborate.

4. Give your opinion on the methods of teaching (lecture, group work, practical demonstration, exercise, role-play etc.) during your pre-service education. Please elaborate.

5. Give your opinion on the clinical placement (duration, site, on-site supervision/mentoring, scope for practice etc.) during your pre-service education. Please elaborate.

6. Looking back, do you feel you were adequately prepared with knowledge to provide EPI services in a health facility? Please elaborate.

7. Looking back, do you feel you were adequately prepared with skills to provide EPI services in a health facility? Please elaborate.

8. Give any other opinion:

Name of data collector: _____ Signature: _____

Verified by: _____ Signature: _____

Appendix FprevAnnex 6: Facility Manager/Subcounty Supervisor In-Depth Interview Guide

Name of the county: _____ Name of the facility: _____

Interview with Health Facility Manager/Subcounty EPI Supervisor (circle one as appropriate)

Date of interview: ____/____/____

1. What is your general opinion about the new graduates posted in your health facilities? Please elaborate.

2. Give your opinion on the new graduates' knowledge and skills on EPI. Please elaborate.

3. Based on your observation do you think that the new graduates are capable to provide routine EPI services without in-service training? Please elaborate.

Yes ____ No ____

Comment:

4. Based on your observation do you think the new graduates have the most up-to-date knowledge on EPI? Please elaborate.

Yes ____ No ____

Comment:

5. Based on your observation, do you think that the new graduates are respectful to mothers/care givers in the vaccination session? Please elaborate.

Yes ____ No ____

Comment:

6. What challenges do you face related to immunization services in this facility?

7. What can be done to make the immunization services better in the health facilities?

8. Any other comment:

Name of data collector: _____ Signature: _____

Verified by: _____ Signature: _____

Appendix FprevAnnex 7: Research Consent Form

RESEARCH CONSENT FORM

Study Title: Study to Evaluate the Outcome of Revised EPI Training in the Pre-service Education for Nurses in Kenya

Hello, my name is _____. I am from MCSP, a project working with the Ministry of Health to improve health services in Kenya. We are carrying out a study to measure the quality of immunization pre-service training and services provided by the graduate nurses. We ask you to help us in our work because this will help us plan how to improve the immunization training for health workers and services for the people who live in these areas. You do not have to help, it is your choice.

If you say yes, we will ask you to answer questions about the immunization training and services in this area and about yourself. It will take about 40 minutes. Your name will not be recorded and no identifying information about you will appear in any reports. You may be uncomfortable answering a few questions. You do not have to answer all the questions and you may stop at any time.

There is a risk that someone outside the study will see your information. We will do our best to keep your information safe by not writing down your name and keeping the information in a safe place.

We will not pay you to help us and you will not benefit directly from taking part. We will use the information to help us improve the immunization training and services in this area.

This study has been reviewed and approved by the Institutional Review Board of John Snow Inc. and the Kenyatta National Hospital University of Nairobi Ethics Review Committee. If you have any questions about your rights as a participant, you may contact Dr. Evans Mokaya.

CONSENT

I have read the consent, or had the consent document read to me, and **I DO agree to participate in this study:**

[] Yes [] No

Name of the participant

Date: ____/____/____
dd/mm/yyyy

Signature of person obtaining consent

Date: ____/____/____
dd/mm/yyyy