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Evaluation of a nursing training in 'problem solving for better health' program in Lesotho

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Dissertation

**EVALUATION OF A NURSING TRAINING IN ‘PROBLEM SOLVING
FOR BETTER HEALTH’ PROGRAM IN LESOTHO**

by

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“Whatever is worth doing at all, is worth doing well”

– Philip Stanhope

DEDICATION

To my parents, Dr. Samuel Donyina-Ameyaw and Mrs. Christiana Donyina-Ameyaw,
without whom this program could not have begun or ended. Nyame nhyira mo!

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To God: For everything You are, everything You have been, and everything You continue to be.

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To Sebastian Bach: You are irreplaceable.

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FOR BETTER HEALTH’ PROGRAM IN LESOTHO**

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ABSTRACT

Background: Problem Solving for Better Health (PSBH) aims to strengthen healthcare systems through a ‘bottom up’ approach, optimizing use of existing resources to solve problems in low-resource contexts. Between November 2021 and June 2022, the Government of Lesotho sought to train about 900 nurses in PSBH (PSBHN), collaborating with the Lesotho-Boston Health Alliance. This dissertation evaluated PSBHN implementation.

Methods: A mixed-methods single group pre-test, post-test design guided by the RE-AIM framework was employed. Change in problem-solving efficacy among nurses was assessed with Problem-Solving Inventory at baseline and 3–6 months post-training. We assigned quality scores for nurses’ planned quality improvement projects at training and assessed extent of project implementation 3–6-months later. We conducted in-depth interviews with the PSBHN implementers and nurses to understand experiences with PSBHN. Costs of implementation from a limited societal perspective and scenarios for future scale-up were estimated. We used Stata17, NVivo12 and Excel16 for data analyses.

Results: A total of 89 of the planned 900 nurses were trained (10%). Approximately 66% of nurses achieved a medium quality score for the project designed at training; 31% scored

high. At follow up, no significant change in problem solving efficacy was observed ($p=0.658$), but nearly 50% of nurses had initiated their projects, with a 35% increase in project initiation odds for every one-unit increase in project quality score ($p<0.014$). Qualitatively, coworker and manager support, along with personal drive enabled nurses. Both trainees and the implementation team reported challenges related to funding and resources, competing interests, and lack of stakeholder support. The total financial and economic implementation costs were US\$36,413 and US\$41,784, respectively. A four-year scale-up was estimated at US\$665,142 in 2023 present value, representing 0.4% of the 2023 government's health sector budget. Two scale-up alternatives were considered: a minimal case scenario at US\$222,428 and an ambitious case scenario, US\$987,897, both in 2023 present value.

Conclusion: Implementing costs are a modest proportion of the health budget, but challenges should be addressed to improve reach, adoption, and implementation effectiveness. Efforts to improve the quality of trainees' planned projects and address barriers faced in the workplace could strengthen PSBHN implementation in Lesotho.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BP	Blood Pressure
CEmONC	Comprehensive Emergency Obstetric and Newborn Care
CHAL	Christian Health Association of Lesotho
CINAHL	Cumulative Index to Nursing and Allied Health Literature
Covid19	Coronavirus Disease 2019
DHF	Dreyfus Health Foundation
DHMT	District Health Management Team
FY	Fiscal Year
GDP	Gross Domestic Product
GNI	Gross National Income
HIV	Human Immunodeficiency Virus
IDI	In-depth Interview
LMIC	Low- and Middle-Income Country
LPN	Licensed Practical Nurse
MOH	Ministry of Health
NHIS	National Health Insurance Scheme
PSBH	Problem Solving for Better Health
PSBHN	Problem Solving for Better Health-Nursing
PSI	Problem Solving Inventory
QI	Quality Improvement
QIPER	Quality Improvement Project Evaluation Rubric
RN	Registered Nurse
SMART	Specific, Measurable, Achievable, Relevant, and Time-bound
SSA	Sub-Saharan Africa
WHO	World Health Organization

CHAPTER ONE

Introduction

This chapter introduces what ‘Problem Solving for Better Health’ is and its importance in society. It also gives a background about Lesotho and its health indicators. The study objectives are introduced and gaps in the literature that this dissertation aims to close are discussed. The geographic setting, cultural context, political environment, economic indicators, and health structure of Lesotho is also reviewed to understand the study setting.

1.1 Study Aim and Relevance to Public Health

The neo-classical economic theory which emerged in the 1900s focusing on allocating limited productive resources efficiently, and on economic growth in the long-term, recognizes the concentration of investment in cities and its trickle down benefits from urban industrial growth to improve rural poverty.^{1,2} However, for developing countries, this theory validates actions that have led to the continuous widening of inequalities between urban and rural regions with more resources concentrated in the urban regions and rural ones found wanting.¹

Problem Solving for Better Health (PSBH) is a program designed to teach and motivate communities to make use of existing resources and develop solutions within the existing infrastructure for sustainability — one that areas with low resources like rural regions can capitalize on.³ The aim of this dissertation is to evaluate the implementation of the training of nurses in PSBH in Lesotho to understand how the program is implemented, the experiences of implementers and recipients of the program, and how

the program can be improved as the Government of Lesotho plans to scale it up to all nurses and other health professionals.

Gaining knowledge about the implementation effectiveness of this program will provide information that can be used to enhance the rollout of the program if it is implemented in other low resource settings. This information will also serve as guidance for resource-constrained communities — which not only applies to developing countries, but also within developed countries where there are growing inequalities and inequities to health services among people of different socio-economic and demographic status.^{4,5} By understanding how PSBH works and why, utilization of existing resources in these settings can be maximized and more health care professionals can be trained in the methodology of the program. The result will be a more efficient and better patient care and satisfaction, improved health indicators, and increased strengthening of healthcare systems in these regions. This evaluation and its methods will also serve as an example for future evaluations in the effort to propagate stronger scientific evidence that improves the implementation of quality improvement programs.

The main objectives of this dissertation are:

- **Objective One:** To understand the degree to which the program met its intended goals.
- **Objective Two:** To understand the experiences of trained nurses and implementors of Problem Solving for Better Health.
- **Objective Three:** To estimate the implementation costs for the Problem Solving for Better Health Program training of nurses in Lesotho and inform future scale up

to all nurses.

- **Objective Four:** To generate programmatic recommendations for the Government of Lesotho and Donors.

1.2 Background and Study Significance

1.2.1 Background

The Kingdom of Lesotho is a small southern African country with a total population of about 2.2 million people and a life expectancy of 52 years in men and 56 among women.^{6,7} According to the WHO, in 2019, the neonatal, infant and under-5 mortality rates in Lesotho were 43, 68 and 86 per 1000 live births respectively, compared to the surrounding country of South Africa, with rates of 11, 28 and 34 deaths per 1000 live births in 2019.^{8,9} Also, with a maternal mortality ratio of more than five times that of South Africa in 2019 (i.e., 544 per 100,000 live births in Lesotho versus 105 per 100,000 live births in South Africa), it remains clear that the health system in Lesotho is struggling.^{9,10} Infectious diseases have also had a significant contribution to morbidity and mortality in the country — from 2000 to 2020, the prevalence of HIV in Lesotho has remained between 20% to 25% among adults between the ages of 15–49 years, making it the third highest in the world (Global prevalence in 2020 was 0.7% versus 21.1% in Lesotho).^{11,12} In 2019, there were 654/100,000 new cases of tuberculosis and 57/100,000 deaths from the disease.¹³ The prevalence and incidence of noncommunicable diseases have also increased.^{14,15} Deaths from cardiovascular, cancer, diabetes and chronic respiratory diseases made up 43% of all causes of deaths among aged 30 to 70 in 2019,

just about a 10% decrease from 2015.¹³ In addition, a quarter of the population was said to be undernourished in 2019.¹³

Over several years, the Government of Lesotho, together with donors, has worked extensively to improve the health of the population by strengthening the robustness of its health care system and also improving on the healthcare delivery system.¹² The government had previously invested 13.4% of its Gross Domestic Product (GDP) in healthcare, a percentage that was close to the Abuja declaration goal of 15%.^{12,16} Some of the strides that were made from these efforts led to substantial improvements in some health indicators, like the establishment of a cancer treatment center, intense HIV/AIDS Campaign and institution of free primary health care in conjunction with the Christian Health Association of Lesotho.¹² In addition to these were other improved relevant outcomes such as the proportion of births attended to by skilled birth attendants which increased from 78% to 87% between 2014 and 2018, and proportion of pregnant women receiving prenatal care which was 91% in 2018.¹⁵

Maternal and newborn health indicators provide direct evidence of the strength of a health system and how well it is functioning.¹⁷ This is seen by the journey of a woman through pregnancy, birth, postpartum and the newborn stage where she experiences many phases of the health system, primary to tertiary care, with influence from social health determinants.¹⁷ Despite the increased births attended to by skilled birth attendants and increase in prenatal care, maternal mortality ratios and neonatal mortality rates as discussed above remain high, and only 85% of newborns are protected against tetanus, an infection that can be prevented through appropriate care from prenatal services.¹³ This

may be a reflection of poor quality of service delivered, as reported in the Comprehensive Emergency Obstetric and Newborn Care (CEmONC) assessment in 2015.¹⁸ In this assessment, 89% of all maternal mortalities occurred in health facilities without CEmONC certification.¹⁸ CEmONC services that ensure safe delivery were provided in only 30% out of the 20 secondary hospitals in 2015.¹⁸

A major constraint on the health system is the limited human resource capacity. There are about 200 medical doctors only in the country creating a low doctor to population ratio of 1:10,000.^{12,18} For context, there are about 8:10,000 doctor to population ratio in South Africa.¹⁹ About 45% of established healthcare positions are unfilled, with loss of doctors to foreign countries by brain-drain and less than 25% of physicians being indigenes of Lesotho.²⁰ The nurse to population ratio is also low, at about 6:10,000.¹ In South Africa, the average nurse to population ratio is 10:10,000.²² Maseru, the capital of Lesotho, tends to have majority of the healthcare resource allocation, leading to disproportionate and insufficient access to care in the other districts.¹⁸

Financial resources are also limited and underutilized. The economy of Lesotho has faced several problems especially in the aftermath of the COVID-19 pandemic.²³ Some reasons for this are infrastructural project delays, high fuel and food prices, layoffs, and an increased level of public expenditure obstructing the development of the private sector.²³ According to the IMF, in the fiscal year (FY) 2022/2023, inflation in Lesotho was 2 percentage points (8.4%) above that of the previous year, and public debt was 59.8% of GDP in FY2022/2023 fiscal year, which was a 2.8 percentage point increase

from that of FY2019/2020.²³

Moreover, a review of the health expenditure by the World Bank in 2017 found the underutilization of the monetary allocations to various health departments was also a major concern.¹⁸ In this review, the government of Lesotho had increased its health financing by 12.3%, with an increase for example by 135% to the District Health Management Teams (DHMTs) who are responsible for financing primary care facilities, as part of the government's effort to decentralize healthcare delivery.¹⁸ However, the DHMTs on average used only about 80% of their budgets, with some using as little as 65% of their budgets in a given year, which translates to poor health outcomes.¹³ This low budget absorption is as a result of long approval mechanisms, especially the time lags between requests for health procurement from the MOH and their approval by the Department of Health Planning and Statistics.²⁴ Other causes identified were process bottle necks and poor interdepartmental communication.²⁴ This is what Smith et al., the first author being one of the pioneers of PSBH, meant when they said: "Although the resources available for health are limited, those that exist are seldom fully utilized and are often wasted or misused".³ Even when substantial funds are spent to address certain diseases, with a frail and under-resourced health system, it is possible that little benefit will be reaped from those investments.²⁵

The Government of Lesotho has continued to collaborate with donors to decentralize care and strengthen its healthcare systems by increasing resources and encouraging full utilization of what is available. One such collaborator is an American Not-For-Profit Organization called the Dreyfus Health Foundation (DHF) which funds

the training of individuals across the world in ‘Problem Solving for Better Health’ (PSBH) aimed at empowering and challenging health workers to address social and health problems within their communities, leading to healthcare systems strengthening.^{3,26}

PSBH was developed in 1989 by Barry Smith, a neuroscientist and physician at the Rogosin Institute in the DHF.^{3,27} Problem solving is explained by Heppner and Krauskopf as the process of taking in information, processing that information to formulate plans for solutions, and carrying out those plans.²⁸ In resource constrained settings, such an initiative has been well received and has substantially improved health indicators like reduction in HIV/AIDS prevalence in Lesotho, increase in the quality of life among people in communities, as well as reducing nurse burn out, increasing retention in the workforce, increasing professional confidence and improving critical skills in problem solving.^{21,27,29}

PSBH trains personnel to make utmost use of existing resources to solve problems within their workplace.³ It has been utilized in about thirty-two countries across all continents.³ It is a two and a half day training that helps individuals identify the root causes and contributing factors of a problem faced at work that is within their power to tackle, and are challenged to develop solutions using a systematic method in a 5-step process to address the problem:²⁷

- 1: Define the problem (nature, size, cause, contributing factors)
- 2: Prioritize the problem (take a realistic piece of the problem)

- 3: Define a solution (ask a good question — specific, measurable, achievable, relevant/realistic, timebound to frame the project)
- 4: Create an action plan (design methodology and evaluation)
- 5: Take action to implement the project

They are then empowered to initiate personal or group projects to tackle the problem, making use of all currently available resources to improve health, a ‘bottom up’ approach, rather than the traditional approach of depending solely on authority or “top-down” directions for change.²⁷ After the two and a half day training, participants are followed intermittently by the implementation team to provide guidance and continued support for project implementation.

1.2.2 Study Significance

A grantee of DHF called The Lesotho Boston Health Alliance (LeBoHA) is a non-Governmental Organization that is a trust of Boston Medical Center (BMC) and supported by BMC faculty. This organization is locally led by the Basothos with a BMC faculty as the director. LeBoHA has worked closely with the Government of Lesotho and Lesotho Ministry of Health, leading the training of many health professionals in PSBH in the country. Despite this PSBH implementation in Lesotho never being formally evaluated, the LeBoHA initiative received positive feedback from the Government and the Ministry of Health Quality Assurance Unit in 2020, leading them to request training for all government-employed registered nurses and licensed practical nurses (n=~900).³⁰

Nurses play a very important role in healthcare delivery around the world and are often the initial point of contact, as well as the direct portal between the healthcare

system and a patient and their family.²⁷ Nurses make up about 80% of the workforce in healthcare, with variations across the world.³¹ The role of nurses have not only been that of providing care and comfort, as nurses have done traditionally, but includes that of treatment of patients, promoting health, teaching, researching and serving as leaders of healthcare institutions and organizations.^{32,33} There is, however, a general consensus of a shortage of nurses across the world.^{31,34} One approach that can be taken to optimize the use of existing nurses in such healthcare systems to improve health indicators is to encourage nurses to take up more roles and independent tasks in promoting health, planning and forming policies.²⁷

The DHF demonstrated the importance of keeping nurses engaged by officially launching the Problem Solving for Better Health Nursing (PSBHN) in 2002, which was viewed as key to the success of community based health initiatives.²⁷ Experienced nurses, physicians or other international facilitators served as educators for the implementation of the workshop, after which nurses developed projects to be completed by 6 months, and encouraged to have projects that are in alignment with their institutional goals and framework to increase program sustainability.

As of 2005, PSBHN had since its inception in 2002 been implemented in over 14 countries across the world including Brazil, Lesotho, Cameroon, Poland, China and Zambia.²⁷ From 80 nursing workshops that had occurred between 2002 and 2005, over 3,000 participants were trained from which 2,000 projects were developed and out of these, 1,000 were sustained.^{27,35} Some past studies have reported success of PSBH based on the success of the projects that were implemented after the trainings and on the

outcomes of health indicators that resulted. For example, in Bulgaria in 1997, a high disability rate among employees of Trolley Bus Transport was attributed to unhealthy lifestyles that led to increased rate of absenteeism and sick leave expenses.²⁷ Using PSBHN methodology in an occupational health education program led to a reduction of temporary disability by 15% within a year and an increase in health lifestyle knowledge by 20%.²⁷ Other examples where PSBHN methods were used successfully in projects include a 15% reduction in tuberculosis treatment failure rate within a year in Indonesia in 2003, which led the WHO to fund similar projects on tuberculosis reduction in three other provinces, as well as an 80% reduction in the incidence of malaria in Kenya in a 6 month period between October 2004 to February 2005, using retired nurses in the community.^{27,36,37}

Despite all the positive feedback PSBH and PSBHN has received over the two decades they have been used globally, to the best of our knowledge, their *implementation* has never been evaluated rigorously.^{3,27} Hoyt, in a 2007 cross-sectional study, showed the results of a preliminary evaluation based on data collected from nurses after a workshop using mixed methods — it yielded information on participants' self-reported understanding of the five step methodology of the training, how they saw the usefulness of the PSBHN process in their work, education setting and personal life, and how it has influenced their leadership skills or motivated them to be change agents.²⁷ This evaluation found that about 80% of 151 nurses reported having 'very good' understanding about the problem statement and how to ask a good question, and about 55% having a 'very good' plan of action, whereas around 30% rated their plan of action

as ‘fair’.²⁷ Approximately 80% of these nurses rated the PSBHN program as ‘very useful’ in their educational setting and personal life.²⁷ Before this workshop, 45% of 151 nurses trained answered ‘No’ to seeing themselves as potential change agents, however, after the workshop, almost a 100% of them answered ‘Yes’ to seeing themselves as potential change agents.²⁷ One trained nursing student said “*Before the workshop I did not understand the nursing role in the community. I now know that the nurse can act as a bridge between the people and community organizations. I also learned how to solve a health problem in the community beginning with a small and clearly stated problem*”.²⁷ This preliminary report concluded by recommending a more rigorous evaluation of the program. Another qualitative study in 2021 used a semi-structured interview guide to interview 22 out of 86 healthcare workers who received PSBH training in Lesotho to understand their personal, interpersonal and systemic levels of experience.³⁸ Participants from this study had a positive impression about PSBH as it provided them a new way of viewing problems.³⁸

While these studies show that trainees had positive perspectives of the PSBH workshops, neither capture the experience of the trainees after they have tried to utilize the PSBH methodologies back in their workplace. Additionally, the experiences of the project implementation team members have also not been addressed in the literature to the best of our knowledge. Costs to implement PSBH has also not been addressed by the literature.

This dissertation aims to fill this gap by evaluating the implementation of the training of nurses in Lesotho to provide information about how the participants of

PSBHN respond to the inputs of the program to provide the positive outcomes that have been demonstrated over several years. At the end of this evaluation, we will generate information for the government of Lesotho to better understand the PSBHN program's effectiveness among nurses, how it works, problems encountered during implementation, and how the program can be improved as the government continues to scale up the program to all nurses and other health professional cadres. The results will also inform the efforts of other resource limited countries that might be using or planning to use PSBHN as a strategy to strengthen their healthcare systems. The DrPH candidate's role was to lead the evaluation of the first year of implementation by developing the study design, evaluation questions, data collection methods, analysis, and dissemination of findings.

1.3 STUDY SETTING

1.3.1 Geographic Context

Lesotho is a mountainous southern African Country, surrounded completely by South Africa.³⁹ It is the only country worldwide that is completely above 1500 meters high, hence landing the nicknames 'The Kingdom in the Sky', 'The Roof of Africa' or 'The Switzerland of Africa' with over 80% of its land lying above 1800 meters high.³⁹ The country covers about 30,000 square meters and is slightly smaller than the State of Maryland in the United States.⁴⁰ Its natural resources are water, agriculture, diamonds and grazing land, and it has one of Africa's longest rivers called 'The Orange River' spanning 1,300km across the whole country.³⁹ Lesotho is divided into three geographical regions — Highlands, Lowlands and the Foothills, it has limited water on its surface, and

has no forests.^{39,41} Due to its landlocked status by South Africa, it is dependent on the latter, with the Durban port in South Africa being the nearest major shipping port.⁴² Despite covering a negligible area of the country, water is Lesotho's main natural resource and is vital to the country's economy.³⁹ The main source of power is hydroelectricity which not only serves Lesotho but is exported to South Africa as well.^{39,43}

1.3.2 Political Setting

Having gained independence on October 4, 1966 from the British, Lesotho has had a constitutional monarchy system of governance.³⁹ The king who is mainly a ceremonial figure is the head of state and a prime minister is elected as head of government.³⁹ Although he holds no executive power, the king controls all the land which is strictly apportioned to citizens of Lesotho only. Foreigners are proscribed from owning land in the country.³⁹ The capital city, Maseru, is located in the western part of Lesotho. There are ten administrative districts in the country, each with its own capital, referred to as the 'Camptown'. The districts are sub-divided into 80 constituencies which have 129 communities.^{44,45}

1.3.3 Demographic Context

The current estimated population of Lesotho is 2,164,813, with a sex distribution of about 98 males to 100 females.^{6,45} About 71% of the entire population lives in rural areas, with the highest population density in the western half of the country due to the land being more arable there.⁴⁶ About 99.7% of the population are indigenous and the

other 0.3% is made up mainly of Europeans and Asians.⁴⁶ The indigenes are almost purely homogenous, comprising Bantu-speaking people known as Basotho.^{39,47} The official languages are Sesotho and English. Lesotho is a Christian majority country with 45% of the population identifying as Roman Catholics and another 45% Anglican, Evangelical and other Christian groups.⁴⁷

1.3.4 Cultural Context

The ethnic structure of Lesotho is composed almost entirely of Basotho who descended from Bantu-speaking people meaning that cultural practices are uniform throughout the various regions of the country.^{39,46} The Basotho live in villages usually on high mountains due to risk of flooding in valleys.⁴⁸ These villages are usually well structured, having a “headman” or chief who serves under the chief of the entire area.⁴⁸ Each family has a group of huts known as kraal and a group of these kraals together make a village.⁴⁸ Each hut in a kraal serves a different purpose, for example, there is a hut for cooking, one for sleeping and some for storage.⁴⁸ Much like many other African cultures, the Basotho are communal in socializing children. The elderly typically gather children around fires at night to tell them stories and teach them songs rich in their history and tradition as a way to pass on their culture from generation to generation.⁴⁹

1.3.5 Economic Indicators

Agriculture is a major source of income for most Basothos with boys and men typically tending animals while women work in the fields. Popular crops are corn, sorghum, wheat, beans, peas, tomatoes, onions, cabbage and peaches.^{39,48,49} In addition to

the domesticated animals for meat, horses are reared, and the Basotho pony is the best means of transport in the mountains.⁴⁸ Crop failures and water shortages that resulted from frequent droughts led to 20% of its population needing emergency food assistance in 2019.⁵⁰ These frequent droughts also led to food insecurity in about 500,000 people, forcing down their household purchasing power in 2019 by 37%.⁵⁰ In 2021, there was an expansion in the country's economy by 3%.⁵⁰ However, there was a decline in the per capita income due to COVID 19.⁵⁰ A 2.3% growth in the economy is expected in 2023, and an inflation projection, 5.9% because of an increase in the inflation of food prices.⁵⁰

1.3.6 Health Structure

The health system in Lesotho is made up of three levels. First is a village network made up of over 5000 community health workers who are volunteers.⁵¹ This level also includes the traditional birth attendants, water minders and distribution agents who have supported the health system over many years in reducing disease burden like polio.⁵¹ The next level consists of the clinics and health centers that are usually manned by nurse clinicians who are able to diagnose and prescribe, as well as nurses and nurse assistants, providing services to about 6000 to 10,000 people.⁵¹ This level is responsible for antenatal and postnatal services, childhood vaccinations, consulting for family planning and basic services for curative purposes.⁵¹ The third level in the health structure are the hospitals, made up of the district and general hospitals, two private hospitals and a military hospital that is run privately.⁵¹ Each of the ten administrative districts have a district hospital that networks with the health facilities and the local clinics.⁵² Tertiary hospitals are only located in Maseru, the capital.⁵² This level of care can also serve as a

referral center.⁵¹ It is run by physicians, specialists, and nurses, and generally provides healthcare and emergency services to the people, including specialized care.⁵¹

Public hospitals are run by the Ministry of Health and make up 57% of hospitals in Lesotho, 38% of which are non-profit while 5% are for profit.⁵³ The Christian Hospital Association of Lesotho (CHAL), a non-profit organization, has been funded predominantly by the government since 2017, but is privately operated.⁵² The health system is funded by the government and international donors.⁵⁴ In 2019, Lesotho spent 11.2% of its GDP on health expenditure.⁵⁴

Chapter Summary

In summary, the poor health indicators in the Kingdom of Lesotho are exacerbated by limited health resources. Problem Solving for Better Health (PSBH) is a program that utilizes a bottom-up approach, equipping health care personnel such as nurses to make use of already available resources to solve problems in their workplaces. PSBH has been used in several countries across the world with projects that have been developed after receiving this training noted to improve health outcomes. However, what it is about PSBH that is effective and how it works has not been thoroughly studied in previous work. This dissertation aims to address this gap.

CHAPTER TWO

**THEORETICAL FOUNDATIONS OF PROBLEM-SOLVING AND ITS
APPLICATION IN THE HEALTHCARE OF LOW- AND MIDDLE-INCOME
COUNTRIES: A LITERATURE REVIEW**

Introduction

This chapter reviews and summarizes the literature on problem solving theory in general to showcase why problem-solving is important, and how it has been applied in healthcare in resource limited settings like low- and middle-income countries. Attention is also given to evaluation studies of problem-solving interventions in this region among nurses, and the gaps identified in the literature for which this dissertation seeks to close are discussed. This literature review is an important step in the dissertation to provide the theoretical basis and understanding of our research. Studies on the theories of problem solving are so vast that the DrPH candidate has simplified them for the purpose and scope of the dissertation. The candidate conducted a comprehensive literature search in four main electronic databases, namely CINAHL, PubMed, Web of Science and Embase and used the search terms “theoretical model or theory”, “problem solving or problem-solving skills”, “health facility or health delivery”, “low income or low and middle income or middle income”, “country or countries” and “intervention or projects or programs”. Terms to evaluate problem solving interventions in the region were also searched separately. Google Scholar and open google search via snowballing whereby articles are identified through references from already identified articles was used.⁵⁵

2.1 Theoretical Foundation of Problem Solving

2.1.1 What is problem solving?

Problem solving is a term used in everyday language and actions, both major and trivial activities, subconsciously and consciously. It has been studied extensively in philosophy from the time of Socrates, Plato and Aristotle, to psychology in the works of Wundt and Brentano, as well as in Mathematics in the works of Polya.⁵⁶⁻⁵⁹ How has this term been defined by scholars and what does it really mean? Scholars have generally not differed in their description of what problem solving is. Jonassen and Hung state that problem solving is the ability to construct and apply mental representations in one's mind in search of solutions to the problems one encounters.⁶⁰ Schoppek and Fischer also described problem solving simply as the process of looking for solutions, and separately talks about complex problem solving which similar to another author's description, refers to the process of being able to overcome barriers between your current state and preferred end point by using behavioral and/or cognitive means in several steps.^{61,62} Pretz et al. state that problem solving is a set of several processes involving judgement where one determines whether there is a problem, reasoning where a decision is made among alternatives, and self-monitoring whereby the problem solver finally determines if their approach was effective.⁶³ Michael Martinez in an article in 1998 also defined problem solving as "the process of moving toward a goal when the path to that goal is uncertain".⁶⁴ He further iterates that knowing how to do something cannot be described as problem solving irrespective of its complexity unless there is a new level of challenge introduced into it.⁶⁴ Martinez, like Pretz, also points out that since one could make a false

move in the process of problem solving, it is important to continuously monitor progress made in order to switch strategies if need be.^{63,64} All of these authors' descriptions of problem solving in a nutshell refer to identifying an unstable state, and going through one strategy chosen among different strategies, to reach a desired end point that creates an innate desired equilibrium in the problem solver.

2.1.2 Methods of Problem Solving

Different ways to solve a problem were identified in the literature. Some include verbalization or 'thinking out loud' which may happen retrospectively or concurrently (called externalization), silent problem solving more suited for insight problems¹, and sketching more suited for spatial problem² solving.⁶⁸⁻⁷⁰ Behaviorists have also described two types of problem solving methodologies; 'trial and error' which is using different methods to tackle a problem until the solution is arrived at; and when learned responses are applied to solve problems in a more systematic manner.⁷¹ Other types of problem solving were outlined by Wang and Chew as shown in table 2.1 below:

¹ Insight problem solving: Insight problem solving involves conceptually restructuring one's initial concept of the problem to unravel the solution.^{65,66}

² Spatial problem solving: Knowing your position in space and being able to steer accordingly, for e.g., knowing the difference between the letters 'b' and 'd', 'was' and 'saw' and more practically 'left' from 'right', being able to follow directions and finding your way in an unfamiliar environment.⁶⁷

Table 2.1 Approaches to problem solving from Wang and Chew, 2010 publication

Approach	Description
Direct Facts	Finding a direct solution path based on known solutions.
Heuristics	Adopting rule of thumb or the most possible solutions.
Analogy	Reducing a new problem to an existing or similar one for which solutions have already been
Hill climbing	Making any move that approaches closer to the problem goal step by step.
Algorithmic deduction	Applying a known and well-defined solution for a problem.
Exhaustive search	Using a systematic search for all possible solutions.
Divide-and-conquer	Solving a whole problem via decomposing it into a set of subproblems.
Analysis and synthesis	Reducing a given problem to a known category and then finding particular solutions.

Different problem-solving models have also been proposed by different authors. One of the first formal proposed models for problem solving was by Graham Wallas in 1926 consisting of 4 steps: preparation, incubation, inspiration and verification.⁷³ Subsequently, other models have been proposed by several different authors, like the 5 steps by Dewey in 1933 i.e., to confront the problem, diagnose/define the problem, invent several solutions, conjecture consequences of solutions and lastly test consequences.⁷⁴ Polya in 1954 suggested 4 steps — understand the problem, devise a plan, carry out the plan, look backward to evaluate; Krulik and Rudnick in 1980 with 5 steps to read, explore, select strategy, solve, review and extend.^{75,76} Regardless of which model is used, it is clear that all these models are different versions of the same concept and link back to the definitions and description of problem solving, which is to study the problem, choose the best among several possibilities, evaluate the results and learn from the experience for similar problems in the future.

2.1.3 Characteristics of a problem solver

As Dostál puts it, "every problem is bound to a problematic situation, however not every problematic situation turns into a problem".⁷⁷ For a problem to arise, an individual must first be aware of its existence, and the ability to deal with the problem depends heavily on being able to estimate the level of difficulty required to solve it, identifying its root cause and analyzing different solutions while working through obstacles faced.^{61,77} Different people perceive problems and their importance differently, partly due to a lack of knowledge about a situation making it hard to perceive a problem, as well as different individual connections and backgrounds.⁷⁷ Even after recognizing a problem, the level of importance one attributes to the problem determines their willingness to solve it.⁷⁷ In such situations, Dostál explains that if there is an escape route, a typical person would choose that if there is no motivation to solve the problem.⁷⁷ Other authors have emphasized the significance of motivation on one's willingness to solve a problem and this, according to the authors, can be stimulated by having an aroused interest, self-confidence and perception of the probability that they will be able to achieve the desired solution.^{78,79}

According to Wang et al. in 2010, problem solvers tend to recognize the goals of the problem accurately, are persistent, able to research efficiently and able to reflect and revisit points in their problem solving journey.⁷² This study further reveals that people have varying capacities to solve problems as the chance of succeeding depends on certain traits of the individual. Traits such as the wealth of knowledge they possess about the situation, the sharpness of their memory, their ability to categorize or make

representations of the problem, their synthesis of all the information available, concentration, motivation and their ability to analyze situations accurately.⁷² Bransford and Stein agree with Wang et al. on the belief that having specific knowledge in a field affects one's ability to solve problems.⁸⁰ The latter however contrasts at the same time with Wang et al. in the sense that there is not one person who is a 'good problem solver', but believe that the same person who is a good problem solver in one case, can be a terrible one in another, all highly influenced by their level of prior knowledge built in that particular discipline.⁸⁰

2.2 Application of Problem-Solving Techniques in the Healthcare of Low- and Middle-Income Countries (LMICs)

Several problems arise within the healthcare system and different personnel and authorities have handled these problems with various solutions by going through many of the methods described above, some successfully, others unsuccessfully. Healthcare improvement strategies face similar barriers across the globe, but the mechanisms of those problems and the extent of their effects on health systems differ with low resource areas bearing the brunt.⁸¹ Problem solving projects in resource poor areas must therefore involve all levels of healthcare in order to strengthen it.⁸² Several different types of problem solving interventions have been used in LMICs to address these barriers to promote better health. We will discuss the most common techniques used like task shifting, telemedicine, establishment of health insurance, and implementation of quality improvement projects.

2.2.1 Task Shifting

Low human resource is a contributor to limited health access and poor quality of care, and this has been addressed in some LMICs through task-shifting.⁸³⁻⁸⁶ Task-shifting is the process whereby there is reallocation or redistribution of human resources to address the problem of healthcare worker shortages.⁸⁷ When a gap is identified between provision of care and available providers, people that can be outsourced are used to fill that gap. In one systematic literature review on task shifting, nonspecialized personnel rather than specialist level of training were used to provide services to people who were mentally ill, had neurological problems and substance use disorders with included articles being from several LMICs including Burundi, Uganda, Rwanda and Kenya.⁸⁶ These nonspecialized personnel comprised of teachers, people with primary or secondary education, and sometimes illiterates.⁸⁶ The study concluded that compared to specialist healthcare providers like doctors, the use of nonspecialized personnel improved the general health of the sample in their study in terms of reduction in perinatal depression, post-traumatic stress disorders and disorders of alcohol use.⁸⁶ The study however also concluded that they could not determine which interventions were more effective in reducing these disorders while using those nonspecialized personnel to provide care.⁸⁶

Ogedegbe et al. performed a systematic literature review using only randomized controlled trials to evaluate how effective existing task shifting activities are in low and middle income countries in managing cardiovascular risk factors.⁸³ In this study, even though 2771 articles were identified initially, only three articles met the preset criteria for analysis, with 98% of the articles being excluded initially because they were not

randomized controlled trials.⁸³ One of the three studies was conducted in Nigeria and showed significant improvement in medication adherence for BP control in rural areas.⁸⁸ The other two articles, one conducted in Nigeria and China, and the other conducted in Iran, found reduction in BP in intervention vs control, and improvement in blood glucose control, respectively.^{89,90} Other studies have also established that making use of workers with varying levels of competency including traditional birth attendants in cluster randomized studies, and community health volunteers in a systematic literature review led to improved health, especially in rural areas.^{91,92}

These articles, especially the systematic literature review on randomized controlled trials by Ogedegbe et al., provide strong evidence in the hierarchy of research evidence that task shifting in resource limited regions have overall been a good problem-solving strategy to address low human resource in the healthcare setting, until these positions can be filled by specialized personnel. We must however not throw caution to the wind when redistributing these roles as certain activities like prescribing medications and provision of medical testing must be redistributed to persons with some level of health training.

2.2.2 Telemedicine

In LMICs, problems such as lack of infrastructure, poor human resources and affordability have affected the ability of many people to access healthcare, not to mention that which is of good quality.⁹³ Telemedicine, though a relatively new approach in resource limited regions, has shown significant improvement in tackling limitations of access to care, management of scarce resource, and continuity of care.⁹⁴⁻⁹⁶ Telemedicine

can be defined as “the use of electronic information and communications technologies to provide and support healthcare when distance separates the participants”.⁹⁷ Telemedicine has been used in different settings for provider to provider communication and to provide education to healthcare providers.^{98,99} However, this discussion is limited to the use of telemedicine for direct patient care.

In a systematic literature review on telemedicine use in LMICs during the Coronavirus pandemic, Mahmoud et al. identified 54 articles that pooled together 6,966 healthcare professionals and 36,877 healthcare users.⁹⁵ In this study, the authors found that not only did people utilize telemedicine to improve access to health, but also to minimize the spread of infections to the already limited number of healthcare personnel available.⁹⁵ Though this study was able to pool together a large number of participants, they did not include CINAHL as one of their database searches.¹⁰⁰ CINAHL is a compilation of literature from Nurses and Allied Health, and should the authors have included this in their search, perhaps they could have arrived at stronger evidence to support their findings, especially because there were many nurses involved in provision of care during the COVID-19 pandemic.¹⁰⁰

Mobile phones and apps have demonstrated promising results in some low-resource settings in small studies. One pilot study in Botswana, found mobile phones were useful for cervical cancer screening, dermatology, oral medicine and radiology, and the results informed country’s decision to scale the study up.¹⁰¹ In this study, mobile phones were used to send pictures to specialists for diagnosis which showed strong concordance and accuracy in diagnosis compared to in-person diagnoses, speaking to the

successful use of telemedicine in improving access to care.^{102–105} In Nepal, a smartphone app containing questions with high likelihood ratios for the occurrence of epilepsy was successfully used by non-medical health professionals to diagnose epilepsy which showed good sensitivity and specificity when compared to the gold standard of diagnosing epilepsy, therefore increasing the identification of untreated epilepsy.¹⁰⁶

Contrary to these successes, a systematic literature review published in 2023 on the effectiveness and acceptability of telehealth interventions for adolescents living with HIV in LMICs which made use of eight major databases (Ebscohost, CINAHL, ERIC, MEDLINE, PubMed, SCOPUS, Science Direct, and Sabinet) and Google Scholar found that there was no strong evidence for using telehealth to improve health outcomes in those adolescents.¹⁰⁷ This study used 11 articles and 1544 participants and the technology interventions included social media like WhatsApp, Facebook and Mxit, and SMS messaging.¹⁰⁷ However, this study found that such intervention strategies were generally acceptable by the adolescents.¹⁰⁷

Not only has telemedicine been used in these settings for chronic diseases but it has also been utilized to address problems in emergency settings. In a systematic literature review by Winders et al., using 46 articles that met their inclusion criteria, the researchers found that 36 of these articles used telemedicine in routine emergency care, and 10 addressed complex humanitarian emergencies.¹⁰⁸ All of those articles reported positive results on the use of telemedicine in emergency settings in LMICs.¹⁰⁸ Out of these articles, 7 were randomized controlled trials, 21 observational cohorts and 18 observational pre/post design although about 85% of them were noted to be of low or

very low GRADE quality.¹⁰⁸ The articles included the use of sim card data in geospatial analysis of about three million sim cards during the 2010 Haiti earthquake and cholera outbreak to assess the magnitude and spread of cholera, and the feasibility of using mobile phone data to track the movement of people during humanitarian crises, and in predictions of spread of disease.^{109,110} Other articles included in this systematic literature review made use of tools to report outbreaks, individual symptoms and health information during outbreaks like malaria in South Africa in 2017, the EBOLA outbreak in Liberia in 2015 and Sierra Leone in 2014, as well as tools for other disease surveillances in Sudan and Kenya.^{111–115} Although all these were noted to provide improvement overall, it must not be overlooked that when an internet diagnostic tool was compared to final clinical diagnosis at a pediatric intensive unit in India, the diagnostic tool missed 27 diagnoses like septicemia and seizures in 39 of their subjects.¹¹⁶ Thus, using telemedicine must not be considered a final solution in addressing barriers to healthcare in LMICs, but only as a process to aid in bridging that gap, and in that process, like described by several theorists above, continuously evaluated and enhanced.

2.2.3 Health Insurance

High out of pocket expenditure for emergency health care, high hospital expenditure, being more vulnerable to diseases and high socioeconomic inequalities in accessing and affording medical care are major problems found in LMICs for which health insurance was established to address.^{117,118} Most people without health insurance in LMICs have been noted to be hesitant in seeking care even for acute illnesses.¹¹⁸ Seeing that the health spending per capita is 63 times higher in low income countries

compared to high income countries, but the gross national income (GNI) per capita is 29 times higher in rich income countries compared to low income countries, several international conferences such as that in Berlin in 2005, Paris in 2007 and regional conference in South Africa in 2009 have advocated for social health insurance and social health protection.¹¹⁸

The health insurance system in Namibia has been noted as one of the most well-organized in Africa, divided into closed funding which are funds paid by the institutions of those in an employed system, and open funds for those not in an employee system.^{118,119} There is, however, a discrepancy seen as only 5% of individuals in the lowest socioeconomic quintile had any form of insurance with those in the higher quintiles having more health benefits.¹¹⁸ This negates the point of the health insurance scheme as it further divides the gap between health finance and access to healthcare, showing that health insurance provided in this manner may not be the best solution and specifically, does not address inequities in the access to healthcare service.

In Ghana, the National Health Insurance Scheme (NHIS) was introduced in 2005 by the government to fund costs for basic health care services for all its residents, away from the “cash and carry” system that was introduced in 1985 which meant regardless of whether there was an emergency, payment for service was expected before care was delivered.^{118,120} The implementation of the NHIS led to an increase in the number of people seeking curative services, reduction in the average out of pocket expenditure from 357,262 cedis to 199,488 cedis ($p = 0.08$), and a reduction in 50% of out-of-pocket spending by hospitalized people from 87% to 43% ($p < 0.01$).¹¹⁸ However due to its rapid

increase in use and coverage to all the population, sustainability remains a threat as the insurance revenue remains constant.¹¹⁸ Funding for the NHIS comes from a 2.5% levy on goods and services, 2.5 percentage point of monthly social security contribution from all registered employees, the NHIS insurance fund investments and premiums paid by those working in the informal sectors who are registered.¹²⁰ Persons exempt from making any premium payments from the informal sector are children under 18 years, pregnant women seeking pre and post-natal care as well as delivery care, indigents as classified by the Ministry of Social Welfare, persons living with a disability or mental disorder, previous employees now on pension (starts from age 60 years), and the elderly from 70 years.¹²⁰ As this health insurance policy attempts to provide care to all, we see that without an increased and continuous flow of funding, sustainability will be in question with rising registration. In a setting like Ghana where about 80% of all Ghanaians workers are in the informal sector with only a few registered, this type of national health insurance makes it difficult to track premiums.¹²¹ With the increased uptake of such health insurance schemes also comes high patient burden inadvertently leading to poorer quality of services.¹²² Perhaps in such situations, community-based health insurance schemes, owned by the community and with a smaller number of subscribers may be the solution to health care financing as they can be closely and adequately monitored.

2.2.4 Quality Improvement (QI) Projects

To address the problem of health care quality provided using the current resources and infrastructure that are present, quality improvement projects have been explored. QI projects have been applied to different levels of healthcare, ranging from the community

level to tertiary and referral hospitals.¹²³ Different QI methods studied by Marquez and Lucas in 2020 looking at QI interventions in LMIC ranged from the use of electronic medical records to process mapping and audits.^{123,124} Some of the QI projects discussed by Marquez and Lucas, as well as other projects by other authors that best reflects QI projects in LMICs from each continent are selected and summarized in table 2.2.¹²³

Table 2.2 Summary of selected QI projects of Low- and Middle-Income Countries

Title, First author, (year of publication)	QI method	Results
An electronic medical record system for ambulatory care of HIV-infected patients in Kenya Siika (2005)	Mosoriot Medical Record System (MMRS) installed in a primary care healthcare centre in rural Kenya to support the AMPATH (Academic Model for the Prevention and Treatment of HIV/AIDS)	<ul style="list-style-type: none"> -Electronic medical record input data for 60000 patients and over 150,000 visits in four years. For HIV care, 8000 patients, 3300 of whom were currently receiving anti-retroviral drugs. -Comparing the clinic before and after adoption of the MMRS showed patient visits were 22% shorter, provider time per patient was reduced by 58% ($P < 0.001$), and patients spent 38% less time waiting in the clinic ($P < 0.06$). -Clinic personnel spent 50% less time interacting with patients, 67% less time interacting with each other, and more time in personal activities. -The MMRS also vastly simplified the generation of mandatory reports to the Ministry of Health
Statewide implementation of a quality improvement initiative for reproductive, maternal, newborn and child health and nutrition in Bihar, India Creanga (2020) ¹²⁵	<ul style="list-style-type: none"> -Review of program documents to identify QI strategies already employed and determine coverage. -Analysis of data from two public facilities to know what essential equipment and supplies were available as well as human resource distribution. -Four-phase provider mentoring and training intervention covering 319 facilities to examine changes in emergency obstetric and 	<ul style="list-style-type: none"> -Upgrade in facility infrastructure, improved clinical staff distribution, and higher availability of equipment and supplies over time, mainly in higher-level facilities. -Performance of key practices (e.g., adequate administration of uterotonics <1 minute after birth, initiation of skin-to-skin care <5 minutes after birth) significantly improved ($P < 0.05$). -Out of all the women seeking antenatal care, the proportion obtaining key screenings (e.g., weight, blood pressure measurements) in public facilities increased over time ($P < 0.05$). -A 6-percentage point decline in home deliveries during 2016–2017 was

	newborn care (EmONC) practices	complimented by a higher increase of deliveries in public than private facilities (5- vs 1-percentage point; $P < 0.05$).
Bridging the Gap Between Emergency Response and Health Systems Strengthening: The Role of Improvement Teams in Integrating Zika Counseling in Family Planning Services in Honduras Arnold (2020) ¹²⁶	<p>-Preparation of normative guidelines for Zika-related care for women of reproductive age who are suspected to or confirmed to have Zika infection during preconception, prenatal, postnatal, and postpartum stages and for infants/children with suspected congenital syndrome associated with Zika.</p> <p>-Coaching support by central and regional-level QI coaches for training who then trained other health care providers in a 2 and half day workshop facility level workshop using the normative guidelines</p> <p>-Support for monitoring of performance indicators, facilitation of peer-to-peer learning among QI teams to scale up learning about how to improve Zika-related care</p> <p>-With the support of the USAID, development of collaborative improvement projects to implement Zika counseling in family planning services and screening of newborns for microcephaly.</p>	Initial exit interviews showed poor knowledge of clients. Flipcharts with standard Zika information about signs and symptoms, transmission methods (including sexual transmission), prevention and complications were then introduced, leading to a 100% indicator. Ensuing exit interviews showed important Zika knowledge still lacking. Other media like information, education, and communication techniques, such as group talks, posters, and involving teenagers to educate their peers for learning promotion was initiated.
Improving HIV Counseling and Testing in Tuberculosis Service Delivery in Ukraine : Profile of a Pilot Quality Improvement Team and Its Scale-Up Journey Pollard, 2020 ¹²⁷	Implementers developed a flowchart to identify problem areas within the delivery of HIV Counselling and Testing services for patients who are diagnosed with or suspected of have TB with the aim to improve HIV Counselling and Testing and enrollment in care.	<p>-After providing HIV counseling training to TB providers, the percentage rate of patients who received pretest counseling grew to almost 95% from a little below 60% over three years.</p> <p>-At the start of the initiative, 15% of clients identified to be HIV positive were on Antiretroviral therapy (ART). After 2 years of the initiative, 83% were on ART.</p> <p>- At the start of the initiative, a little over 40% of TB clients were receiving HIV testing, and after three years, 100% were receiving testing</p>

Other than these QI projects developed to address identified problems, other QI projects were designed to teach healthcare workers and empower them with skills to solve any problem that was present or yet to arise. Such problem-solving interventions use different steps and methodologies as already discussed under methods of problem solving. A search of the literature found very few evaluation studies on these QI projects that specifically address general problem-solving skills among nurses in LMICs. A summary of the methods and problem-solving methodology from the literature is outlined in table 2.3.

Table 2.3 Evaluation studies for various nursing problem solving interventions

Study	Study Design	Problem Solving Type
Authors: Ahmady S, Shahbazi S. Title: Impact of social problem-solving training on critical thinking and decision making of nursing students. ¹²⁸	Quasi-experiment	Social problem-solving training
Authors: Uys LR, Van Rhyn LL, Gwele NS, McInerney P, Tanga T. Title: Problem-solving competency of nursing graduates. ¹²⁹	Qualitative	Problem-based learning
Authors: Makhathini JT, Uys LR. Title: An evaluation of the problem-solving ability of diplomates from a comprehensive nursing programme. ¹³⁰	Ex post facto	Problem based learning
Authors: Lee MB, Brysiewicz P. Title: Enhancing problem solving and nursing diagnosis in year III Bachelor of Nursing students. ¹³¹	Quasi experiment	9-step problem solving process
Authors: Masango-Muzindutsi Z, Haskins L, Wilford A, Horwood C.	Qualitative	Action based learning

Title: Using an action learning methodology to develop skills of health managers: experiences from KwaZulu-Natal, South Africa. ¹³²		
Authors: Pimmer C, Abiodun R, Daniels F, Chipps J. Title: “I felt a sense of belonging somewhere”. Supporting graduates’ job transitions with WhatsApp groups. ¹³³	Qualitative	Conversational Learning
Authors: Chandler GE, Wilson D. Title: Solution-focused nursing in a crisis situation improves patient outcomes. ¹³⁴	Experience Narrative	Solution focused
Author: Hoyt P. Title: An international approach to Problem Solving for Better Health Nursing™ (PSBHN). ²⁷	Mixed Methods	Problem Solving for Better Health
Authors: Yoon GH, Ogden SN, Nkabane-Nkholongo EL, Mantoetse Jobo, Chelsea McGuire, Sebaka Malope, Pamela Hoyt-Hudson, Barry H Smith, Barry H Smith Title: Health System Strengthening Using Problem Solving for Better Health in Lesotho. ³⁸	Qualitative	Problem Solving for Better Health

A quasi-experiment in 2020 looking at how social problem solving training³ will impact the decision making and critical thinking of nursing students in Borujen Nursing School in Iran found significant improvement in problem solving skills among those who received training on social problem solving skills.¹²⁸ In this study, the intervention group received training from an assistant professor of the university with substantial experience in teaching courses in problem solving. Training was held in 8 sessions over two months, using “small group discussion, brainstorming, case-based discussion, and reaching the solution in small four member groups” with all training sessions based on the social

³ Social problem-solving is defined as “the self-directed cognitive behavioral process by which a person attempts to identify or discover effective or adaptive ways of coping with problematic situations encountered in everyday living” (D’Zurilla, 1986; D’Zurilla & Goldfried, 1971; D’Zurilla & Nezu, 1982)

problem-solving model.¹³⁵ The analysis showed a positive impact in terms of social problem solving skills, decision making and critical thinking skills for students in the intervention arm, $p < 0.05$.¹²⁸ Total sample size of this study was 40, with 20 students in each arm.¹²⁸

Uys et al. used qualitative methods to evaluate the competence that graduate nurses from problem-based learning (PBL) nursing institutions in South Africa had in solving actual clinical problems after school, compared to nurse graduates who received training from a non-problem learning based program.¹²⁹ Interviews were conducted with 49 nurse graduates and 29 of their supervisors for triangulation of the data.¹²⁹ This study was based on the theoretical framework from the Benner's levels of practice which breaks one's level of expertise to "novice, advanced beginner, competent, proficient, and expert"¹³⁶. The study found that 83% of graduates from PBL universities were advanced beginner or competent, with the remaining 17% at a proficient level. In contrast, none of the non-PBL graduates reached a proficient level in problem solving; 44% of them were novice level, and 55% were advanced beginner or competent level for problem solving.

Makhathini et al. also evaluated a similar problem-solving program in South Africa.¹³⁰ This study compared the problem-solving ability of nurses in a comprehensive nursing program (a 4-year program) to that of nurses in a 3 year basic nursing course (where it is assumed problem based learning is not taught), and also compared the problem solving ability of the fourth year nurse in a comprehensive program to a first year also in a comprehensive program, and then lastly evaluated the overall problem solving ability of a nurse in a comprehensive nursing program.¹³⁰ The problem solving

ability was identified by “the recognition that a problem-situation exists and that a reaction is needed, generation of possible solutions to resolve the situation, selection and implementation of a course of action from alternatives and departure from routine procedures if necessary”. The results showed a higher overall problem solving ability as nurses moved from first to fourth year, and for nurses in comprehensive problem based learning institutions compared to those in the basic nursing course.¹³⁰

On the contrary, the results from Lee et al. differed from Makhathini et al. just described, in that even though they both used triple jump assessment methods⁴ in their study, for the former where problem-based learning was taught to third year Bachelor of Nursing students in a large university in South Africa through extra lessons on problem solving, the nurses in Lee et al. had systematic hardship in the performance of problem-solving activities.¹³¹ These nurses could not connect the lessons received in the classroom with the end of semester exam and had difficulties addressing specific patient problems.

Another evaluation study in KwaZulu-Natal, South Africa took place in 2013 by Masango-Muzindutsi et al. to evaluate a project that used action learning to progress the skills of health managers in neonatal units with the aim of learning about the participants’ experiences with this type of learning.¹³² Using in-depth interviews, participants reported their problem solving and critical thinking skills were developed as a result of this learning methodology.¹³²

⁴ Three step method assessment whereby participants first individually review the problem provided them and provide preliminary solutions, they then conduct research on the problem to learn more about it and its possible solutions, then thirdly participants put all they have learnt together, re-assess their preliminary solution from step 1, and provide a final solution.¹³⁷

Pimmer et al. in 2019 published a study that also took place in South Africa whereby social media was used as a platform to create an avenue in which newly graduated nurses incorporated the experience of their colleagues and information provided to them by the group moderators (the latter being representatives from the department of health) to face their everyday challenges.¹³³ This study was based on Conversational Learning with incorporation of reflective practice. Contrary to the traditional way of learning where there is emphasis on abstract and conceptual knowledge, conversational learning places value on one's emotions, sensual and physical engagement during the conversation as a learning process.¹³⁸ By engaging, listening and reflecting on other people's experiences through conversations, an individual learns from those lived experiences and becomes more equipped and organized to face similar problems they may encounter.

A different type of problem-solving strategy emerged from experience during a health emergency in Liberia called 'solution focused problem solving'.¹³⁴ During the Ebola crisis in 2014 in Liberia where there was "always too much to do, and a constant stream of extremely compromised patients, with very limited resources, the overworked staff used this type of solution focused problem solving method solely to meet the immediate physical patient needs".¹³⁴ Significant patient improvements were seen when this method took effect, example, a patient who was dehydrated, anorexic and lethargic from the effects of Ebola suddenly built resilience to stay alive when he was connected with his family and his care was extended to involve his social network.¹³⁴ This solution-focused method also led to nurse empowerment where they were able to question the

status quo of their activities to strengthen their care to patients before the status quo created obvious problems.¹³⁴

Hoyt, in a publication presenting a cross-sectional study in 2007, showed results of a preliminary evaluation that was done on nurses after a workshop using mixed methods — it yielded information on participants’ self-reported understanding of the five step methodology of the training, how they saw the usefulness of the PSBHN process in their work, education setting and personal life, and how it has influenced their leadership skills or motivated them to be change agents.²⁷ This evaluation found that about 80% of 151 nurses reported having ‘very good’ understanding about the problem statement and how to ask a good question, and about 55% having a ‘very good’ plan of action, whereas around 30% rated their plan of action as ‘fair’.²⁷ Approximately 80% of these nurses rated the PSBHN program as being ‘very useful’ in their educational setting and personal life.²⁷ Before this workshop, 45% of 151 nurses trained answered ‘No’ to seeing themselves as potential change agents, however, after the workshop, almost a 100% of them answered ‘Yes’ to seeing themselves as potential change agents.²⁷ One trained nursing student said *“Before the workshop I did not understand the nursing role in the community. I now know that the nurse can act as a bridge between the people and community organizations. I also learned how to solve a health problem in the community beginning with a small and clearly stated problem”*.²⁷ This preliminary report concluded by recommending a more rigorous evaluation of the program.

Another qualitative study in 2021 used semi-structured interview guide to interview 22 out of 86 healthcare workers who received PSBH training in Lesotho to

understand their personal, interpersonal and systemic levels of experience.³⁸ Participants from this study had positive impression about PSBH as it provided them a new way of viewing problems.³⁸

CONCLUSION

This chapter provides an overview of why problem solving is important, research and theories about problem solving, characteristics of a good problem solver and different ways that problems can be solved, all of which come to play to successfully solve a problem. These findings help us understand our results better and inform future participants for PSBHN. As discussed, different problem-solving strategies have emerged to improve healthcare in LMICs, namely task shifting, telemedicine, establishment of health insurance, and implementation of quality improvement projects. PSBH as a program falls under QI projects aimed to improve the skills of healthcare workers in resource limited settings in solving a myriad of problems they face in their workplace.

The evaluation methods used for the problem-solving interventions made use of several research designs as shown in table 2.3. However, most of the studies discussed were evaluation of other problem-solving interventions and not PSBH. For the two that evaluated PSBH — both were cross-sectional designs which do not capture changes over time and are highly prone to selection bias.¹³⁹ Neither of these studies capture the experience of the trainees over time after they have tried to utilize the PSBH methodologies on the ground. The experiences of the project implementation team members in implementing PSBHN have also not been addressed in the literature to the best of our knowledge. Even though participants from both studies discussed how

effective they subjectively thought PSBH was after they had received training, neither of the studies used validated assessment tools to objectively establish this effect. Costs of implementation of PSBH has also not been established in any previous publication to the best of our knowledge. These identified gaps are what this dissertation seeks to bridge and to contribute to the scientific pool of literature.

CHAPTER THREE

RESEARCH DESIGN AND METHODS

Introduction

This chapter describes the research methods used to evaluate PSBHN. It covers the research objectives, as well as specific sub-questions to answer the objectives, describes the data collection process, theoretical framework, and steps that were taken to ensure quality data collection and protection.

3.1 Research Objectives and Questions

The main research question of this project was:

How effective was the implementation of Problem Solving for Better Health training among nurses in Lesotho?

Four broad objectives, each with several specific questions, were used to answer the main research question as follows:

Objective One: To understand the degree to which the program met its intended goals.

- a. What was the reach and distribution of nurses trained across Lesotho?
- b. What extent did knowledge and self-efficacy about problem-solving change among trained nurses after 3–6 months of receiving training?
- c. What degree were trained nurses able to apply the skills gained from the workshop to solve problems they identified and to what level of completion?

Objective Two: To understand the experiences of trained nurses and implementers of Problem Solving for Better Health.

- a. What were the projects trained nurses designed to implement once they returned to their workplace and why?
- b. What were the barriers and facilitators trained nurses faced in implementing their project plans once they returned to their workplace?
- c. What were the barriers and facilitators to implementation of the Problem Solving for Better Health for nurses in Lesotho experienced by the project implementation team?
- d. What improvements do PSBHN project implementation team and trained nurses suggest, to inform future changes to the Problem Solving for Better Health Program?

Objective Three: To estimate the implementation costs for the Problem Solving for Better Health training program of nurses in Lesotho and inform future scale up to all nurses.

- a. What were the full costs of implementing the Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective?
- b. What was the cost per nurse trained on Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective?
- c. What financial impact would scale up of the Problem Solving for Better health Program to all nurses have on the national budget in Lesotho?

Objective Four: To generate programmatic recommendations for the Government of Lesotho and Donors

- a. What were the lessons learned from evaluating the implementation of ‘Problem Solving for Better Health training in Lesotho’?
- b. What recommendations can be made from training nurses on ‘Problem Solving for Better Health’ in Lesotho?

3.2 Study Design and Data Collection

From November 2021 to June 2022, three PSBHN training sessions were implemented in four districts: Mafetang, Qacha Nek, Thaba Tseka and Quthing. This study was of a prospective cohort type with a single group pre-test post-test (O X O) implementation effectiveness design type 3.¹⁴⁰⁻¹⁴² By using this design, we tried to capture any changes that occurred within the group before program implementation and after, to study the trends in the main outcome — self efficacy. We used concurrent triangulation mixed methods in three main research strategies¹⁴³:

- a. Quantitative surveys collected from nurse participants over 3–6 months after the end of the training to ascertain any change in self-efficacy (main study outcome)
- b. Qualitative surveys using semi-structured individual interviews with a subset of trained nurses and members of the project implementation team to learn about their experiences from receiving training and from the implementation of the program, respectively. These semi-structured interviews allowed for new questions to be explored depending on what a participant said.

- c. Program administrative data to collect costing information to determine program implementation costs.

3.2.1 Theoretical Framework

The RE-AIM framework has its elements meaning Reach, Effectiveness, Adoption, Implementation, and Maintenance.¹⁴⁴ It was first used in a publication about two decades ago and has since been used in many programs at different stages of research throughout planning to evaluation and reviewing of reports, and in different research types like policies, programs and environmental change.¹⁴⁵ The logical sequence that this framework follows is 1) Adoption which looks at the number or proportion of settings or agents who are willing to start the program/initiative, 2) Reach which measures the number or proportion of people participating in the initiative, 3) Implementation measuring the fidelity to all parts of an intervention protocol, as well as time and cost of intervention, 4) Efficacy or effectiveness looking at the intervention's impact on outcomes such as quality of life, economic outcomes and possible negative effects, 5) Maintenance which measures the level at which programs or policies become institutionalized and with individuals, it measures a program's long term effects (i.e., 6 months or more after the last intervention contact) on outcomes.¹⁴⁶

Different studies have used one, some or all of the elements of this framework.¹⁴⁶ For this study, all the elements of RE-AIM was used to inform the evaluation design and evaluation questions. The two primary evaluation outcomes of interest using this framework were *Reach* and *Effectiveness* informing questions in the first objective. Secondary outcomes were *Adoption*, *Implementation* and *Maintenance*, directing

questions in objectives one, two, three and four. Below are the RE-AIM Components informing the various objectives/questions:

- **Reach:** Proportion of nurses trained and distribution across country
- **Effectiveness:** Change in self-efficacy, change in problem-solving skills, quality of project plans developed by nurses after training in PSBH
- **Adoption:** Proportion of nurses who initiated their projects by applying the skills acquired from the workshop
- **Implementation:** Costs of intervention and costs per nurse trained in PSBHN from the implementers' perspectives, challenges and facilitators faced by nurses and program implementers, suggestions for improvement on PSBHN training
- **Maintenance:** Nurses' willingness to continuously use PSBHN methodology in their daily activities, implementers' steps to incorporate PSBHN into the health institutions in Lesotho

3.2.2. Data Sources, Indicators and Data Collection Methods by Research Objective

- a. Objective One: To understand the degree to which the program met its intended goals.

Table 3.1 Evaluation Question indicators and source for data collection for Objective 1.

RE-AIM	Evaluation Question	Indicator	Data Source
Reach	What was the reach and distribution of nurses trained across Lesotho?	-Percentage of nurses who received PSBHN training -Percentage of nurses who received PSBHN training per district in Lesotho	-Attendance Sheet -Attendance Sheet

		-Percentage of nurses trained per demographic factors	-Demographic Survey
Effectiveness	To what extent did knowledge and self-efficacy about problem-solving change among trained nurses after 3-6 months of receiving training?	-Percentage of projects developed by trained nurses rated by high, medium, or low quality according to the PSBHN training curriculum -Change in trained nurses' reported self-efficacy before and after receiving training -Stated change in problem solving skills comparing before and after receiving PSBHN training	-Project Evaluation Rubric -Problem Solving Inventory -Transcripts from In-depth interviews with trained nurses
Adoption	To what degree were trained nurses able to apply the skills gained from the workshop to solve problems they identified and to what level of completion?	-Percentage of trained nurses who initiated their projects by the 3-6 months follow up period -Percentage of projects designed by trained nurses at different stages of completion 3-6 months after receiving training	-Project follow up survey

Data Collection Methods

- **Attendance Sheet (Appendix A)**

This was a registration sheet with columns for participants' names, sex, type of clinician, hospital they work at, phone numbers, emails, and signature. This sheet was developed and used by the LeBoHA team for previous trainings. The information was collected by the program implementation team from all participants attending the two and a half day PSBHN training at the beginning of each session, hence three attendance sheets in total. These nurses were then assigned study IDs that were used to complete all other survey data. Contact numbers were collected to assist the evaluation team contact participants to complete all other surveys and interviews in the follow up period.

- **Demographic Survey (Appendix B)**

This was a structured survey developed by the DrPH candidate to capture demographic information of trained nurses so we can have a better explanation and understanding of some changes seen during analysis. This survey collected information about the sex of the nurse, age, marital status, highest educational level, district within which the nurse practices, whether they have received PSBHN training before in the past, the type of facility they work in (i.e., whether Government or CHAL), the length of time they have been practicing in their current facility, and the length of time for which they have been practicing as a nurse. This survey was completed by the nurses using their assigned study IDs. Collection of this information was based on other literature which showed that these demographic features could influence one's confidence and self-efficacy, hence it would be useful to know to control or explore in the analysis.¹⁴⁷ The demographic surveys were collected by the LeBoHA evaluation manager electronically. The link to complete the survey was sent by WhatsApp to the nurses at the beginning of the workshop, to be completed by the last day, giving them ample time to have them completed. Participants who had not completed this data after the last day of the workshop were sent reminders in the follow up period to do so. Participants completed this survey once throughout the span of the study and estimated time to complete it was about 2 minutes.

- **Project Evaluation Rubric (Appendix C)**

The DrPH candidate designed a rubric to rate the level of quality of the trained nurses' designed projects, which provided us with information about the knowledge they

gained from the workshop on problem solving. The development of the rubric was based on the PSBHN curriculum and informed by an adaptation of a Quality Improvement Project Evaluation Rubric (QIPER) that was developed to assess “trainees’ ability to design and conduct quality improvement projects”.¹⁴⁸ QIPER has six domains that assesses the “competence in designing, implementing, analyzing results of, and reporting” quality improvement or patient safety projects (Figure 3.1).¹⁴⁸

The initial rubric developed was a simple 1–3 scoring system which assessed whether the designed project was related to the nurses’ daily activities, whether it was aligned with the MOH objectives, whether the plan was feasible, whether the project designed had the good question, data collection methods and evaluation methods clearly stated, whether the developed project had a potential to improve health indicators, a feasible budget and the level of complexity of the project. After extensive discussion with some committee members, it was advised that having a single scoring system across all categories was a better approach to having a 1–3 scoring system for each category. We then developed another rubric with a scaling system more closely aligned to that of QIPER in Figure 3.1 above.¹⁴⁸ This scoring system after pre-testing on a sample of designed projects from a pilot study of health professionals who were trained before the beginning of PSBHN revealed difficulty and how subjective having a broad scoring scale system was — e.g., it was difficult for there to be agreement on what one considered as being above expectation, meeting expectation, or below expectation. The committee with the data experts then decided to revise the initial rubric with the scoring system.

Rating Scale	Definition	
Below expectations	Element was not addressed, had significant errors, was quite unclear and/or incomplete	
Near expectations	Element was addressed, but had minimal errors, was somewhat unclear and/or incomplete	
Meets expectations	Element was addressed satisfactorily, without errors and with sufficient clarity and completeness	
Exceeds expectations	Element meets expectations and shows advanced understanding, application or goes above and beyond in some way.	
Domain Name	Domain Description	Example Item
1. Definition of problem (3 items)	Problem clearly described within context with evidence of literature review and/or other local data describing the problem	Describes the significance of the problem within a larger context (eg, local VAMC, clinic, national)
2. Project design (4 items)	Identifies relevant factors contributing to problem, potential facilitators, and challenges to implementation through the appropriate use of QI tools and includes a description of stakeholder consultation	Appropriate utilization of QI tools given project purpose (eg, fishbone, value stream mapping, process mapping)
3. Intervention (3 items)	The intervention has a logical connection to the problem, accounts for context and target population, and the potential impact of the problem is ideal for multiple reasons	Potential impact is ideal for multiple reasons, such as high yield/low effort, innovative, cost-effective, and/or sustainable
4. Data collection and analysis (3 items)	Describes sources, instruments, timing, and indicators of improvement used in the intervention and uses appropriate analytic methods	Indicators of improvement (eg, process or outcome measures) are the most appropriate to assess change given the project aim
5. Results (4 items)	Summarizes trends in data and describes associations between intervention, outcomes, and contextual factors and any unexpected benefits or problems with the intervention	Describes associations between intervention, outcomes, and relevant contextual or confounding factors
6. Conclusions and implications (3 items)	The conclusions drawn from the data are logical, persuasive, and based on findings; conclusion discusses implications, limitations, and biases	Discusses potential limitations, and biases, and provides rationale for findings
Abbreviations: QI, quality improvement; QIPER, Quality Improvement Project Evaluation Rubric; VAMC, Veterans Affairs Medical Center.		

Figure 3.1 Quality Improvement Project Evaluation Rubric (QIPER) Domain and Scale Definitions.

In our final rubric, we assessed all 5 steps in the PSBHN problem solving methodology under five criteria: problem statement (nature, size, cause and contributing factors to problem), a ‘good question’ (whether it has a SMART⁵ objective), action plan (what, who, where, when, how many times, evaluation plan to assess progress), projected impact of the project on health indicators, consideration for sustainability, and the feasibility of implementing the project (timeline, budget, and how realistic the sustainability plan is). The scoring system was based on simple points scoring system where having each part present was one point. For example, for ‘problem statement’ category, a participant would score a total of 4 points if all nature, size, cause and contributing factor was present; one point for each part of ‘SMART’ with respect to the good question; 7 points total for the action plan where one score was given for whether the action plans outlined by the participant, i.e., the ‘what’ they plan on doing, contained all steps needed to address the stated objective in the good question, one point for whether who was performing which action plan was stated, one point for whether location where actions were to be taking place was stated, a point for when these actions were planned to occur, a point for how many times an action was planned to occur or how long it was planned to occur, a point for whether each action step outlined contained a who, what, where, when, and frequency/duration, and a point for whether the participant had an evaluation plan that would adequately assess the action plan; a point for whether the designed project would have any impact on health indicators or work efficiency; a point for whether there was any mention or consideration for sustainability

⁵ SMART: Specific, Measurable, Achievable, Relevant/Realistic, Time-bound¹⁴⁹

of their project; a total of 3 points for how feasible or reasonable the project objective and action plans were, where a point was scored for how reasonable or feasible the timeline, budget, and sustainability plan was.

The maximum possible project quality score was 21, with scores from 0–7 assessed as low quality, 8–14 medium quality and 15 to 21 high quality. This scoring scale was informed from the literature^{150,151} Two independent raters used this rubric to grade each project designed by a participant once. Intraclass correlation (ICC) estimates and their 95% confidence Intervals were calculated using STATA 17 based on single-measurement, consistency of agreement, 2-way mixed effects model with ICC= 0.75 with 95% CI = 0.62–0.84, indicating good inter-rater reliability based on previous literature.¹⁵²

Project plans were collected by the implementation team at the end of trainings. Nurses who did not have their plans ready at the end of the training had them submitted in a follow up by the program officer who was a part of the implementation team.

- **Problem Solving Inventory (Appendix D)**

The problem solving inventory (PSI) is a self-reporting instrument developed in 1982 and revised in 2002 (Figure 3.2).¹⁵³ It was designed to assess an individual's problem solving ability.¹⁵³ This inventory has been used across several populations and cultures and in hundreds of research projects, making it one of the most widely used inventories in problem solving.^{154,155} It has a six point Likert scale ranging from 1- strongly agree to 6- strongly disagree and a total of 32 questions.¹⁵³ Questions that are set up in the negative tense (n=15) were reversed so all responses are in the same direction for analysis. The

instrument is divided under three main categories:

- Problem solving confidence which assesses an individual's self-assurance and belief in solving problems. This domain has been shown in research to be associated positively with personal agency and curiosity and negatively with anxiety and anger.¹⁵⁴ The total minimum score possible under this domain is 11 which signifies the best problem-solving confidence, while the highest score, 66, signifies the worst problem-solving confidence.
- Approach-Avoidance style which assesses an individual's tendency to approach or avoid problems. Its total minimum score is 16, signifying the best behavior, while the highest score is 96, indicating the worst behavior.
- Personal Control, assessing an individual's self-control when it comes to problem solving. Total scores range from a minimum score of 5, indicating the best personal control to the highest score, 30, which indicates the worst personal control.

	1	2	3	4	5	6
1.I am usually able to think up creative and effective alternatives to solve a problem						
2.I have the ability to solve most problems even though initially no solution is immediately apparent						
3.Many problems I face are too complex for me to solve						
4.I make decisions and am happy with them later						
5.When I make plans to solve a problem, I am almost certain that I can make them work						
6.Given enough time and effort, I believe I can solve most problems that confront me						
7.When faced with a novel situation I have confidence that I can handle problems that may arise						
8.I trust my ability to solve new and difficult problems						
9.After making a decision, the outcome I expected usually matches the actual outcome						
10.When confronted with a problem, I am unsure of whether I can handle the situation						
11.When I become aware of a problem, one of the first things I do is to try to find out exactly what the problem is						
12.When a solution to a problem was unsuccessful, I do not examine why it didn't work						
13.When I am confronted with a complex problem, I do not bother to develop a strategy to collect information so I can define exactly what the problem is						
14.After I have solved a problem, I do not analyze what went right or what went wrong						
15.After I have tried to solve a problem with a certain course of action, I take time and compare the actual outcome to what I thought should have happened						
16.When I have a problem, I think up as many possible ways to handle it as I can until I can't come up with any more ideas						
17.When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation						
18.When confronted with a problem, I tend to do the first thing that I can think of to solve it						
19.When deciding on an idea or possible solution to a problem, I do not take time to consider the chances of each alternative being successful						
20.When confronted with a problem, I stop and think about it before deciding on a next step						
21.I generally go with a first good idea that comes to my mind						
22.When making a decision, I weigh the consequences of each alternative and compare them against each other						
23.I try to predict the overall result of carrying out a particular course of action						
24.When I try to think up possible solutions to a problem, I do not come up with very many alternatives						
25.I have a systematic method for comparing alternatives and making decisions						
26.When confronted with a problem, I do not usually examine what sort of external things my environment may be contributing to my problem						
27.When I am confused by a problem, one of the first things I do is survey the situation and consider all the relevant pieces of information						
28.When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation						
29.Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead						
30.Even though I work on a problem, sometimes I feel like I am groping or wandering, and am not getting down to the real issue						
31.I make snap judgments and later regret them						
32.Sometimes I get so charged up emotionally that I am unable to consider many ways of dealing with my problems						

Figure 3.2 Problem Solving Inventory Instrument.

The total problem-solving efficacy score is a sum of a participant's scores from all three categories with 32 being the lowest score (high efficacy) and 192 the highest (low efficacy). From the literature, its internal consistency was found to be as follows: problem-solving confidence, $\alpha = .85$; approach-avoidance style, $\alpha = .84$; personal control, $\alpha = .72$; and total inventory, $\alpha = .90$.¹⁵³ The test-retest reliabilities were as

follows: problem-solving confidence, $r = .85$; approach-avoidance style, $r = .88$; personal control, $r = .83$; and the total inventory, $r = .89$.¹⁵³

This instrument was adopted to measure the self-efficacy at baseline (i.e., just before the beginning of a workshop at the training grounds), and 3 – 6 months after the workshop to study the trends over time. Questions in the PSI are set up such that the lower the number, the better the self-efficacy. This data was collected by the evaluation manager from the LeBoHA team after trained nurses had completed them.

The initial design for use of the PSI was to collect this information at 4 time points: preworkshop, immediately after the workshop on the last day, three months after the workshop and six months after the workshop. For the initial training in Tsaba-Theka (Paray), immediate post workshop PSI data was collected. However, subsequently, due to time constraints and logistical difficulties, it could not be collected from the other participants in other districts. The 3rd and 6th month data points were also combined into a 3–6-month period due to nonresponse by participants at those specific times but within the period.

- **Project Follow Up Survey (Appendix E)**

The follow up survey used by the LeBoHA team for previous PSBH trainings was used to collect information about whether the trained nurses had initiated their projects and at what level of completion. It was completed by trained nurses 6 months after receiving training to determine whether they had no aspect, few aspects (1/4 completion), some aspects (1/2 completion), most aspects (3/4 completion) or all aspects of the project

completed. The surveys were collected by the program officer from the LeBoHA team electronically.

b. Objective Two: To understand the experiences of trained nurses and implementers of Problem Solving for Better Health

Table 3.2 Evaluation Question indicators and source for data collection for Objective 2

RE-AIM	Evaluation Question	Indicator	Data Source
Implementation	What were the projects trained nurses designed to implement once they returned to their workplace and why?	Projects designed by trained nurses and stated reasons for designing those projects	Transcript from in-depth interviews with trained nurses
Implementation	What were the barriers and facilitators trained nurses faced in implementing their project plans once they returned to their workplace?	Stated barriers and facilitators to project implementation by trained nurses	Transcript from in-depth interviews with trained nurses
Implementation	What were the barriers and facilitators to implementation of the Problem Solving for Better Health for nurses in Lesotho experienced by the project implementation team?	Stated barriers and facilitators to PSBHN implementation by the project implementation team	Transcript from in-depth interviews with program implementation team members
Implementation	What improvements do PSBHN implementation team and trained nurses suggest, to inform future changes to the Problem Solving for Better Health Program?	Improvement suggestions to inform future changes to PSBHN given by trained nurses and project implementation team members	Transcript from in-depth interviews with trained nurses and program implementation members

Data Collection Methods

- **In-depth Interviews with trained nurses**

In-depth interviews (IDI) were conducted from July 2022 to December 2022, between 3 to 6 months after PSBHN training with a sample of trained nurses to learn about their experiences after receiving PSBHN. The IDIs were used to study what, if any, change in

problem solving skills nurses experienced after receiving training (under objective one), what projects the nurses designed and why, enablers and barriers faced during implementation phase of those designed projects, and also collected information about any improvements for PSBHN program. They were also asked whether they used any personal money to receive any part of the PSBHN training (for objective 3). These interviews were conducted by the DrPH candidate who has experience conducting such interviews. Interviews lasted about 45 to 60 minutes over zoom, WhatsApp video or audio, depending on the preference of the nurse. Permission was given by all participants to record their interviews. Recordings were done using Voice Memo App on a MacBook if the interview occurred on WhatsApp or recorded on Zoom if interview occurred on that platform. Each participant received internet data worth 160L (~\$10) as a token of appreciation to cover the time spent in the interview.

- **In-depth Interviews with the PSBHN project implementation team**

IDIs with project implementation team members were conducted from November 2022 to December 2022, each lasting 30 to 60 minutes. Implementers of the project included personnel from the LeBoHA team namely the program officer, finance director, nurse manager, finance director's assistant, and the monitoring and evaluation manager. Other members of the implementation team included a peer mentor per each district training, and a district appointee, appointed by a District Health Management team office, to act as a liaison between one district and the LeBoHA team for easier organization. Peer mentors were registered nurses selected by the nursing director and trained in the PSBHN methodology, followed by a two-day leadership training. These peer mentors were

selected from various districts based on whether they a) Serve as a role model to others, b) Are an influencer, c) Are a member of a nursing association, d) Have renewed registration with the regulation body, and e) Have general good professional integrity. Qualifications for these criteria were determined by the nurse manager at the workplace, after receiving the request for these personnel from the nursing director.

The project implementation team members from LeBoHA were responsible for the day-to-day activities and organization of the PSBHN trainings from preparation to follow up period to provide advice to participants facing challenges. Interviews with project implementation team members were conducted by the DrPH candidate over Zoom approximately 5 to 6 months after the last workshop. All participants gave permission for their interviews to be recorded for analysis. Interviews covered their specific role played in the PSBHN implementation process, the amount of time spent in playing those roles, enablers and barriers faced during implementation, and recommendations for improvement of PSBHN. They were also asked whether there was any donated labor, time and/or donated items that were used or needed for the PSBHN program implementation (for objective 3).

- **Interview guide Development**

The DrPH candidate developed the semi-structured interview guide used to interview all participants, i.e., trained nurses and project implementation team members. The development of this guide was informed by the objectives of the research and ‘Adoption’ from the RE-AIM theory by exploring factors that influenced trained nurses’ willingness

to apply the PSBHN methodology into implementing their projects.¹⁵⁶ ‘Maintenance’ also guided questions on sustainability and stakeholder engagement.¹⁵⁶ Probes were used to dive deeper into a response when the researcher deemed it necessary. Two questions (Question 8. under the nurses’ guide, and question 7. under the project implementation team guide) were developed to study the costs of implementation. Table 3.3 outlines a summary of the interview guide.

Table 3.3 Semi-Structured interview guide

Nurse Guideline
<ol style="list-style-type: none"> 1. Please tell me in detail about the project you designed at the workshop. 2. Tell me about a specific time that something made it easier for you to implement your project. 3. Tell me about a specific challenge you faced while implementing your project. 4. Think of a leader or manager you work with. Please tell me a story about how that person helped or didn’t help you with the project. 5. Please tell me a story about a leader or manager who made it particularly difficult for you to implement your project. 6. How would you describe your current problem-solving skills, comparing them to before receiving PSBHN training? 7. What suggestions do you have for improvement of the PSBHN program? 8. Did you use any personal money in any aspects of receiving the training? If so, can you tell me what you spent?
Implementer Guideline
<ol style="list-style-type: none"> 1. How would you describe your role in the Problem Solving for Better Health (PSBH) Nursing Program? 2. What three things made it easy for you to implement the program? 3. What three things would you change about the program implementation/ training facilitation process? 4. Tell me about a major challenge you faced in implementing or organizing the PSBHN trainings? 5. How would you describe the engagement of the Ministry of Health, Government Officials and District Health Management Teams in organizing and implementing this program? 6. What suggestions do you have for improvement of the PSBHN program? 7. During the program organization and implementation, were there any donated labor and time, or any other donated items used? If so, can you tell me what they were?

- c. Objective Three: To estimate the implementation costs for the Problem Solving for Better Health training Program of nurses in Lesotho and inform future scale up to all nurses.

Table 3.4 Evaluation Question Indicators and source data collection for Objective 3

RE-AIM	Evaluation Question	Indicator	Data Source
Implementation	What were the full costs of implementing the Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective?	Amount of money spent by project implementation team and nurses to receive training, and value of free labor and donated items used by program implementers to prepare, implement and for follow up PSBHN activities (not including evaluation activity costs and not including time of trained nurses in receiving training)	-Administrative financial data on total costs covering PSBHN preparation, implementation, and follow-up costs within the study period - US Bureau for Labor Statistics -Local personnel salary website -Transcripts from In-depth Interviews with program implementers and trained nurses
Implementation	What was the cost per nurse trained on Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective?	Amount of money spent to cover the costs incurred to train one nurse	-Administrative financial data on total costs covering PSBHN preparation, implementation, and follow-up costs within the study period -Estimated economic costs for PSBHN implementation -Attendance sheet for number of nurses trained
Maintenance	What financial impact would scale up of the Problem Solving for Better Health Program to all nurses have on the national budget in Lesotho?	Percentage of national budget that scale up of PSBHN to all untrained nurses will take	- Administrative costing data on PSBHN preparation, implementation, and follow-up costs -LeBoHA team -Attendance sheet for number of nurses trained -Proposed budget for the Lesotho Ministry of Health activities

Data Collection Methods

- **Administrative Costing Data**

The candidate prepared an empty Excel spreadsheet for the LeBoHA finance director with headings for costs covering nurses' transportation to PSBHN workshops, communications, food, printing, shipping, accommodation, materials like pens, venue for workshops and salaries of the project implementation team members. The LeBoHA finance director shared the cost estimates on the excel spreadsheet by email containing a summary of the project costs categorized by preparation, implementation, and follow up period with the DrPH candidate. The costing data shared was entered into the spreadsheet directly by the finance director and finance director's assistant. Initial estimates were fine-tuned over time with communication between the DrPH candidate, financial director, financial director's assistant, program officer and the LeBoHA monitoring and evaluation manager.

One week was used to prepare for each two and a half day training session. Each training session took place over two and a half days (rounded to 3 days for costing purposes), and the follow up period was 6 months after each training session. All costs were provided to the DrPH candidate in local currency, Loti (LSL). The estimated program costs, therefore, covered the period from October 2021 to December 2022. Three trainings took place, first in Thaba Tseka (Paray), then in Quthing. The third was a training combining nurses from two districts (Mafetang and Quthing).

To supplement the financial data, during the IDIs, information about whether participants used any personal money, as well as donated labor and/or time, was collected

to facilitate an estimate of economic costs, where possible, for a limited societal perspective.¹⁵⁷ This is because an economic perspective seeks to estimate all the actual resources used in an activity, not what is paid for.¹⁵⁸ Identified personnel who did not receive monetary reimbursements included a US based registered nurse (RN) and a local liaison both of whom helped with the preparation and implementation phases of the training that occurred in one district. Also included in the economic costs was the time provided by a peer mentor who was present for only the training sessions on all training days for each district which was not compensated for. Estimated salaries for these volunteers were retrieved from the US Bureau for Labor Statistics for the US based RN, and from a local Lesotho website which estimates salaries of personnel per their positions.^{159,160}

- **LeBoHA Team**

The LeBoHA team, who are in close communication with the Lesotho MOH provided their best estimate of the number of nurses per district in Lesotho. This stated number, together with the attendance sheet, was used to calculate the number of untrained nurses for the calculation of the cost projections to train untrained nurses in Lesotho.

- **Budget for Lesotho Ministry of Health**

Each fiscal year the Government of Lesotho prepares a budget for spending. The budget prepared for the coming year begins in about April/May of the current year by the

Ministry of Finance.¹⁶¹ We extracted this budget from the publicly available MOH 2023–2024 budget.¹⁶²

d. Objective Four: To generate programmatic recommendations for the Government of Lesotho and Donors

Table 3.5 Evaluation Question Indicators and source data collection for Objective 4

RE-AIM	Evaluation Question	Indicator	Data Source
Implementation	What were the lessons learned from evaluating the implementation of the ‘Problem Solving for Better Health training in Lesotho’?	A compilation of the lessons learned from evaluating the implementation of PSBHN	Written narrative by the DrPH candidate
Maintenance	What recommendations can be made from training nurses on ‘Problem Solving for Better Health’ in Lesotho?	A set of recommendations compiled from the findings of the evaluation of PSBHN	Compilation of the literature review and findings of the evaluation

Data Collection Methods

The DrPH candidate narrated the experience of the evaluation team and lessons learned during the evaluation process and wrote recommendations from a compilation of the findings from the evaluation.

3.3 Sample Size and Sampling

3.3.1 Nurses

Using an online sample size calculator⁶, the calculated sample size needed to detect a 3% increase in self-efficacy based on previous literature, with an alpha set at 0.05 for a

⁶ <https://clincalc.com/stats/samplesize.aspx>

study power of 80% was $n=222$.^{147,163} Based on an average response rate in a 2014 Demographic Health Survey in Lesotho of 97% and an estimated attrition rate of 3%, the sample size needed to observe the desired project difference with statistical significance was $n=229$.¹⁶⁴ In anticipation of a lower-than-expected response rate which would introduce a type II error in the study, we inflated the sample by 10% putting the estimated sample size at 250. We projected 25 nurses would be trained each month in a one-year period. However, due to certain barriers that emerged during the training, (discussed in detail in chapter 5), this did not occur. All trained nurses, thereafter, were recruited to the study.

The final sample size for the IDIs was determined at the point where saturation was reached, i.e., the point at which the researcher could not find additional data beyond which conclusions could be derived.¹⁶⁵ Saturation in qualitative research is important because it indicates that the sample size achieved is enough to provide valid results.¹⁶⁶ In general, saturation has been reached with a minimum of 5 participants and maximum of about 40 in other studies.^{167,168} With this in mind, we conducted interviews with a target of at least 20 interviews, or when saturation is reached, whichever came first. Per the literature, a final sample size can be determined at the end of the study when data analysis occurs concurrently as data is collected, until saturation is reached.¹⁶⁹

We used maximum variation sampling to select nurses for interviews to gain understanding from different nurses by sex and district so as to capture a wide range of viewpoints from all trained nurses.¹⁷⁰ After each training session, the program officer created a WhatsApp group of nurses per district for follow up purposes. The DrPH

candidate was given access to these groups providing direct access to the trained nurses. Private WhatsApp messages were then used to reach selected nurses from the sample of trained nurses. If a nurse did not respond, two reminders were sent, the first one week after initial invite and second sent two weeks after first reminder. If there was no response, it was considered a decline, and another nurse was approached. Interviews continued with continual recruitment until saturation was reached.

3.3.2 Project Implementation team members

Purposive sampling was used to identify members of the project implementation team. This approach enabled us to identify and select individuals who had experienced and were involved in the implementation of the projects, and whose accounts added richness to our efforts to address the research objectives.¹⁷¹ A list of emails of the project implementation team members was provided by the program officer to the DrPH candidate which was used to contact all of team members. If there was no response after two weeks, a follow up email was sent. If no response was received for another two weeks, it was considered as a decline. All interviews were conducted by the DrPH candidate.

3.4 Data Management

3.4.1 Data collectors

The data collectors in this study were the DrPH candidate and personnel from the LeBoHA team, namely a monitoring and evaluation manager, program officer, finance director, assistant to finance director and a nurse manager. All data collectors have

previous training and experience in both quantitative and qualitative data collection methods and in research ethics.

3.4.2 Pre-testing of Study Instruments

The demographic survey and project evaluation rubric were pretested on a sample of health professionals who received PSBH training months before the beginning of PSBHN. Findings from the pretesting and input from the DrPH committee members informed changes that were made on the demographic survey. Changes made on the demographic survey included some wordings of selected questions, e.g., “gender” was changed to “sex”. In terms of the project evaluation rubric, the initial design contained questions that were ambiguous and too open to subjective interpretation and grading. After the pretesting, this problem was made bare, and the design was changed to more objective parameters with a definite scoring system. The Problem-Solving Inventory to measure self-efficacy is a validated and reliable tool used in many countries and across cultures and were, therefore, not pretested. The project follow-up survey and attendance sheets were adopted from what the LeBoHA team had been using for previous PSBH trainings with no problems, hence, they were also not pretested.

3.4.3 Data handling and confidentiality

All interactions with participants for data collection took place privately. Only the DrPH candidate, program officer and monitoring and evaluation manager had access to data collected by participants and participant study IDs for research purpose. All data collected in Lesotho were shared with the candidate for analysis purposes only and

marked to be destroyed after the minimum legal amount of time allowed by research regulations of Boston University Institutional Review Board. All recorded interviews will be temporarily stored, together with the data used for the analysis, and marked for destruction after the minimum legal amount of time allowed by the study regulations.

3.4.4 Data Quality Control

For data quality control purposes, the DrPH candidate was in continuous communication with the local data collectors throughout this project. Data that had been collected was reviewed as it was received, and any inconsistencies or deviations addressed. For example, it was noted earlier on that the initial demographic data collection from the first location, Thaba Tseka (Paray), did not make use of study IDs. This was immediately rectified by the team for subsequent data collection.

3.5 Data Analysis

Data from both qualitative and quantitative surveys were triangulated to cross-validate the results generated using both types of data collection methods. Triangulation is a process in which a combination of observers, theories or methods are used in research to overcome fundamental biases that may occur because a single observer or method was used. The type of triangulation used in this study was Methodological Triangulation.^{172,173} This involves making use of different data collection methods, in our case using quantitative methods through surveys and qualitative using IDIs, to provide better understanding of the results and help mitigate the weaknesses from single methods by mixing methods.¹⁷²

3.5.1 Quantitative Data Analysis

All survey data were entered into Excel Version 16.72 by the DrPH candidate and imported into Stata for analysis with Stata 17.^{174,175} Means, frequencies and percentages were used to describe the data. QQ plots and histograms of the data showed normality, which was not perfect, however, majority of the data points lay roughly close to the 45-degree line that assuming a normal distribution of our data was not considered a violation. Examining the means of the PSI data with their standard deviations also supported this assumption. We therefore assumed a normal distribution of our data and used parametric tests for analysis. The hypothesis of the study was as follows:

- Ho: There is no difference in self-efficacy among nurses between ‘before they received training in PSBHN’ and ‘3–6 months after they received training’.
- Ha: There is a difference in self-efficacy among nurses between ‘before they received training in PSBHN’ and ‘3–6 months after they received training’.

Paired t-tests were used to test for change in mean PSI scores at baseline and 3–6 months after the end of the training. Multiple imputation was done to address the large number of missing data in the post PSI scores at 3–6 months after the end of training. We also used chi square tests to assess for any differences between participants who provided both baseline and post PSI scores, and participants who only provided baseline scores. Project initiation was coded into a binary outcome, i.e., 0= project not started and 1=project started. Bivariate analyses were done to identify demographic variables significantly associated with initiation of project designed by nurses, which were then included in a multivariable logistic regression analysis to estimate associations between

starting projects and project quality scores. We set the statistical significance level to 0.05.

3.5.2 Costing Data Analysis

Financial data was organized and analyzed using Microsoft Excel Version 16.76.¹⁷⁴ We provided three analyses for a) financial costs, which were based on the costs that were incurred during the implementation of the PSBHN program, b) economic costs, which took into account all labor or time used in the implementation of PSBHN that were not covered monetarily, and c) projected economic costs, which cover estimated intervention costs for training the remaining number of nurses who were not trained during our program. We proposed timeframes believed to be appropriate for the program based on our calculations to guide policymakers with practical information beyond the costs incurred in our study alone.

All financial and economic costs were estimated by month in the local Maloti currency and converted to US dollars using a monthly exchange rate for that period.¹⁷⁶ After conversion, a US Inflation Calculator was applied to the total costs per month to estimate costs in real US dollars.¹⁷⁷ All costs in 2022 were then discounted using an annual discount rate of 3% to estimate the present value of the total costs for 2021.

Financial cost analysis:

These costs were based on all expenditures involved in implementing the project within the program time frame of 15 months (from October 2021 to December 2022), encompassing preparation period, training sessions and follow up period. The costs were analyzed based on fixed and variable costs. Fixed costs included personnel salaries, costs

for internet, phone calls, venue secured for the training, transportation, accommodation, and shipping/courier costs. The variable costs were printing and photocopying, materials provided to nurses like pens, and food provided at the training sessions, all of which varied by number of attendants. The financial cost per nurse trained was then estimated based on the total financial cost of intervention and total number of nurses trained.

Economic Cost analysis:

These costs included the financial costs discussed above, plus the estimated monetary value for volunteers who were involved in the program implementation, i.e., the US based registered nurse (RN), local liaison and peer mentor. The monetary value for their time was estimated and included in the overall costs.^{159,160} Economic cost per nurse trained was calculated based on the total economic cost of intervention and total number of nurses trained.

Projected Economic Costs for Future Scale-Up:

In addition to the estimates of financial and economic cost of the actual intervention, we forecasted the basic costs to train all nurses who had not been reached by our program (n= 811), Table 3.6. We estimated that this basic cost would be the most reasonable cost projection and recommend as the one to adequately provide scale up to all nurses in Lesotho, most efficiently. We defined this case as our best estimates of quantities of inputs and costs, given available current information. It makes use of the current funders and assumes that training sessions will be a priority to the MOH with no interruptions in the scheduled dates.

For this analysis, we assumed a similar period for preparation and follow up

events as that of our study, i.e., 7 days for preparation, and 6 months follow up period. Similar levels of personnel used in our PSBHN project were used in our projections, assuming no change in efficiency over time. However, the US RN volunteer was eliminated from our analysis and replaced by local personnel to foster sustainability and reduce costs. The costs of salaries for all personnel in our program were also accounted for in our cost projections (that is, we did not anticipate the need of further volunteers in the training as we accounted for all personnel that should be needed for the training).

We also considered the possibility of an increase in the number of nurses in the workforce per year and those who leave the workforce for retirement, by choice or by death. In 2010, the number of nurses/1000 people in Lesotho was 0.7, rising to 3.3 in 2018.³ Assuming a steady growth of nurses per year, we estimated that the rate of growth of nurses per year using $\Delta y/\Delta x$, was 30%. Our best estimate for the percentage of nurses who go on retirement per year was made by the LeBoHA team at 2%, with no clear percentage for the deceased and dropouts from resignations. We assumed an extra 1% rate for outgoing nurses per year to cover dropouts and deceased, making the total percentage of nurses entering and leaving the workforce equal at 3%, hence creating an equilibrium with no extra adjustments to be made in the analysis.

We acknowledged that variable costs would be higher for districts like Qacha's Nek, Thaba Tseka, Mokhotlong and Quthing which are furthest away from the capital, most related to transportation. To estimate the costs for transportation to use for the projections, we used the average costs of transportation from our training for districts whose locations showed a wide range potential for higher costing districts farthest away,

i.e., Qacha Nek, Thaba Tseka and Quthing. By so doing, we adjusted for the different transportation costs of different districts. Cost projections were made with estimated salary and goods inflation costs for each year in local Lesotho currency (Loti).

All costs were initially in Lesotho currency (Loti) to which we applied an average Lesotho goods inflation rate over the last 5 years of 5.85% to estimate the salaries and other costs in our projections per year.¹⁷⁸ The average rate in the last 5 years was calculated because of the wide variation in inflation over the years. The actual observed average percentage increase of nurses' salaries per time was 5% every 31 months, hence 1.94% per year.¹⁷⁹ We used the average goods inflation of 5.85% for our basic cost estimates. All annual nominal costs were converted to US dollars using an expected constant real exchange rate equal to the rate in 2023.¹⁷⁶ We then deflated the costs by expected US inflation and discounted at 3% to estimate the 2023 PV in US dollars.

This approach centers on providing training for every nurse in Lesotho who has not already received training in our study, i.e., 2021–2022 period. It provides training for 20 nurses per session as this number is based on the average number of people who were trained in 2021–2022. The duration of training days would be the same as that of our project, i.e., 2 and a half days (rounded to 3 days for presentation and budgetary purposes). For the training schedule, all nurses eligible for training in a district would be trained, before moving to the next district. This approach may help to reduce the burden of costs when it comes to the team travel and costs in setting up and preparations that are incurred for each different district training. Training would begin in the district furthest away from the capital and move to surrounding districts, reaching Maseru last; the

sequence of training proposed is Mokhotlong first, followed by Butha-Buthe, then Leribe, Berea, Thaba Tseka, Qacha Nek, Quthing, Mohale's Hoek, Mafetang, and Maseru for equity.

Using Table 3.6 and having 20 nurses per training, training duration for this scenario would be 47 months. For one training per month, there would be a total of 12 trainings per year, leading to a total study duration expected to be 4 years (2024–2027). The specific changes made in this scenario compared to that of our PSBHN intervention are the removal of the USA nurse volunteer, the increase of peer mentors from 1 to 3 based on the local team's experience with the project as finding the peer mentors very useful. The number of local liaisons would be increased from 1 as noted in our program, to 3 people. The local liaison would be expected to support and learn alongside the LeBoHA program manager, including the 6 month follow up period, as an effort towards sustainability for future trainings.

Sensitivity Analyses:

To allow for alternate options by decision makers, we performed scenario-based sensitivity analyses to provide two other alternatives for scale up: the minimal case and ambitious case scenarios.

- *Minimal Case Scenario:*

We defined this as the use of the least amount of resources with the least cost estimate projections. It assumes a scarcity of human and financial resources, with other more urgent national priorities. With limited resources, the focus will be placed on training

30% of nurses per district in the districts that had no nurses trained in our PSBHN project (n=6). This percentage was based on the average percentage of nurses trained per district in 2021–2022. The training duration would be the same as that of our PSBHN project, i.e., 3 days, and would have 4 training sessions per year. A total of 10 training sessions would be required to train the projected 30% of the districts left to be trained (i.e., 180 nurses). Training would begin from the district furthest away from Maseru because we seek to equip personnel with problem solving skills who have the least resources available, compared to that of the capital. The sequence of training will occur as follows: Mokhotlong, Butha-Buthe, Leribe, Berea, Mohale’s Hoek, Maseru. From the list of estimated nurses per district, and targeting roughly 20 nurses for each training session, we expect the training period to last 16 months. We project one training session in Mokhotlong, Butha-Buthe, and Mohale’s Hoek, two each in Leribe and Berea, and 3 in Maseru. For 4 trainings per year to cover 16 months of training and follow up, this study period will be 4 years (2024–2027). The rate of salary increase per year used was the observed of 1.94%, and that for inflation of goods used was 5.85%.^{178,179} We proposed one district liaison and one peer mentor per training, just like there was in our PSBHN training. We also removed the USA RN volunteer and the finance assistant from the personnel. All other inputs remained the same as the training in 2021–2022.

- *Ambitious Case Scenario:*

This was defined as the scenario where there are appropriate and generous funding for training every single nurse in the country. In this scenario, the duration of training

sessions would be 5 days, rather than 3 from previous trainings. This change was based on the IDI data from our study where we found many trained nurses and project implementers stated that the duration for the training was too short with a suggestion of an average duration of 5 days (chapter 5). In this scenario, we do not anticipate any roadblocks affecting the scheduling and or implementation of the trainings. We project to start training from the district furthest away from the capital, then move to surrounding districts after all nurses in a district is trained, Maseru being the last. The sequence of training proposed is Mokhotlong, Butha-Buthe, Leribe, Berea, Thaba Tseka, Qacha Nek, Quthing, Mohale's Hoek, Mafetang, and Maseru. We propose this sequence because we seek to equip personnel with problem solving skills who have the least resources available, compared to that of the capital and its surrounding districts. As indicated by Table 3.6, the training would be provided to 20 nurses at each session, with training duration of 47 months, including follow up. With a training session occurring each month, hence 12 trainings per year, the duration of study expected is 4 years: 2024–2027. The changes made in terms of personnel are the removal of the USA RN volunteer, adding four district liaisons, four peer mentors and keeping intact all the local personnel from LeBoHA involved in 2021–2022. All other costs remained the same. We applied the goods inflation rate of 5.85% to increases in salaries as well.

Table 3.6 Assumptions made for Base, Minimal, and Ambitious case scenarios.

Base Case	Minimal Case	Ambitious Case
<ul style="list-style-type: none"> • No US based Registered Nurse • Three peer mentors • Three district local liaisons • Occurrence of twelve training sessions per year • 20 nurses to be trained per each training session • Three-day training sessions • Training period is 4 years (2024–2027) • Personnel salaries and goods incorporate an inflation rate of 5.85% • All nurses in Lesotho would be trained by the end of the training period 	<ul style="list-style-type: none"> • No US based RN • One peer mentor • One district local liaison • No financial director’s assistant • Occurrence of four training sessions per year • 20 nurses to be trained per each training session • Three-day training sessions • Training period is 4 years (2024–2027) • Personnel salaries expected inflation rate of 1.94% • Other goods incorporate an inflation rate of 5.85% • 30% of nurses per each district would be trained by the end of the study period 	<ul style="list-style-type: none"> • No US based RN • Four peer mentors • Four district local liaison • Occurrence of twelve training sessions per year • 20 nurses to be trained per each training session • Five-day training sessions • Training period 4 years (2024–2027) • Personnel salaries and goods incorporate an inflation rate of 5.85% • All nurses in Lesotho would be trained by the end of the study period

3.5.3 Qualitative Data Analysis

Triangulation of data sources was done to facilitate validation of the information from all the data sources.¹⁸⁰ All recordings were transcribed using rev.com and analyzed with NVivo 12 using theoretical thematic analysis method.¹⁸¹ Coding was done by two readers. Major codes were developed after the first reader continuously read through all the transcripts as they were collected, then randomly selected four transcripts to read three times to generate themes that were organized based on the study objectives. After reading through a transcript, each reader placed identified themes under each code independently. Subsequently, both readers discussed all themes and quotes as a group. To ensure interrater reliability, a) A clear codebook was established by the first coder guided by the study

objectives as directed under thematic analysis method¹⁸¹ b) Both readers read through the transcripts line by line placing codes under themes in the codebook. Any codes that were assigned to more than one theme was discussed between the two readers, extensively guided by the stated definitions of the themes in the codebook until agreement was met, leading to modifications and adjustment of the codebook c) All codes were discussed by both readers by reading through the transcripts horizontally, i.e., across codes instead of by transcript d) Where the same codes were placed under different themes, the two readers discussed the text until agreement was met.

Illustrative quotes were identified to shed light on the themes that emerged in the results section. Sources of the quotes were presented under the results section for the nurses, but not for the project implementation team members due to the latter's limited sample size, to emphasize confidentiality and anonymity.

3.6 Informed Consent and Ethical Considerations

3.6.1 Adult Consent

The adult informed consent form was read to all participants at the beginning of each workshop. Verbal consent was obtained by the DrPH candidate before each interview was started or recorded with permission. Verbal consent was sought as this research presented no more than minimal risk of harm to the subjects and involved no procedures for which written consent would normally be required outside of the research. Any questions participants asked were addressed and confirmation of understanding sought before consent was given. The full version of the adult consent

form was approved by the Boston University IRB and the Lesotho research ethics committee.

3.6.2 Study Risks

There were no major risks for participating in this study. Time to be used for an alternate activity may however have been lost while involved in completing the surveys and interviews. To minimize this, the research surveys and interview guides were designed to be concise to minimize the time needed for their completion. Participants may have felt discomfort with certain questions asked. Any question a participant felt uncomfortable answering was skipped with no consequence to them. Compared to the knowledge that will be gained from this evaluation and the impact the results will make in improving future PSBHN programs to improve problem-solving skills for use in the healthcare setting in low resourced countries to potentially improve poor health indicators, the time involved in completing a survey or in-depth interview is of very minimum harm.

3.6.3 Study Benefits

There were no direct benefits to participants for being in this study. However, there was potential benefit to science and society by:

- Providing an understanding of the PSBHN program's effectiveness among nurses, how it works, problems encountered during implementation, and how the program can be improved and scaled up to all nurses.

- Informing and directing other low resourced countries that might be using or planning to use PSBHN as a strategy to strengthen their healthcare systems using the results of the study.

3.6.4 Conflict of Interest

Neither the DrPH Candidate (Principal Investigator) nor any of the DrPH committee members had any conflict of interest to disclose or any financial interests from the outcome of the results of this study.

3.6.5 Institutional and Local Ethics Approval

- Institutional Approval

Boston University Institutional Review Board on September 22nd, 2021 approved this study with IRB number H-41915.

- Local Ethics Approval

On December 23rd, 2021, the study received approval from the Lesotho National Research Ethics Committee.

3.7 Methods Limitations

The follow-up period of the nurses was 3 to 6 months, which may have been too short to observe any changes that might happen because of the study after the follow up period.¹⁸² The initial design was to collect PSI data at four data points, i.e., at baseline before training, immediately after training, three months after training and six months after training. Due to logistical difficulties, time constraints and loss to follow up, only

two data points were useful for analysis for the outcome, self-efficacy, which were the baseline data and 3–6 months after training, except for the initial training in Thaba-Tseka where immediate post-training data was collected. There was no comparison or control group in this study, making it difficult to attribute any changes that occurred specifically to the PSBH training, and lack of these also introduce potential bias of history and maturation.¹⁸³ Most of the survey questions were self-reported by participants, making them more subjective than objective and prone to reporting bias.¹⁸⁴ The use of some objective measures to triangulate the data could help mitigate this bias. There was also the risk for social desirability bias from the IDIs.¹⁸⁵ To encourage openness, participants were assured of their confidentiality before the start of the interviews, no personal identifiers were collected during the interview and participants who did not want to be on video went off camera with no consequence to them. Having a baseline PSI assessment could have introduced a testing threat to the study, so the post PSI testing that occurred 3–6 months after the end of the training could help produce a wash out phase where the effects of the initial testing would dissipate, minimizing its effects on subsequent measurements.¹⁸⁶

3.8 Dissemination of Findings

We will disseminate the results from this research in the following ways:

- DRPH dissertation would be presented to the Boston University School of Public Health, Department of Leadership, Policy, and Management as a written document and defense presentation

- Final recommendations would be presented to the Lesotho Ministry of Health
- Results would be presented to the Dreyfus Health Foundation (Research Donors)
- Results would be presented to the LeBoHA Director and Staff
- Results would be published in a scientific journal

Summary

This evaluation was a prospective cohort study, with a single group pre-test post-test (O X O) implementation effectiveness design type 3, using mixed methods for triangulation of data. The objectives of this study were understanding the degree to which the program met its intended goals, understanding the experiences of trained nurses and project implementation team members with PSBHN, estimating the implementation costs for the PSBHN training of nurses in Lesotho and scale up costs to all nurses in Lesotho, and generating programmatic recommendations for the Government of Lesotho and Donors. The theoretical framework used for this study was RE-AIM. Surveys completed by trained nurses for quantitative analysis were attendance sheet, demographic surveys, Problem Solving Inventory, and project status. Participants had the quality of their projects assessed by using a rubric developed by the evaluation team. In-depth-interviews were done with a subset of the trained nurses identified by maximum variation sampling, and with program implementers sampled purposively. Financial data was provided to the evaluation team by the finance director from the LeBoHA team. Data analysis was done with Stata 17, inductive analysis of qualitative data with NVivo 12, and Microsoft Excel version 16.72 for financial data. Some study limitations that were introduced because of the study's methods were: single group pre and posttest design with no comparative

group, reporting bias, and social desirability bias. Attempts to mitigate these were done through triangulation of data, statistical analyses, and making participants comfortable and unpressured during interviews.

CHAPTER FOUR

USING MIXED METHODS TO UNDERSTAND THE IMPLEMENTATION

OF PROBLEM SOLVING FOR BETTER HEALTH

Abstract

Background: Historically, healthcare resources have been concentrated in urban areas, leaving rural regions with poor health outcomes. Problem Solving for Better Health (PSBH) is a quality improvement program that aims to strengthen healthcare systems in resource-limited regions by training personnel to make the most of existing resources to solve workplace problems. From November 2021 to June 2022, the Government of Lesotho collaborated with the Lesotho-Boston Health Alliance to train approximately 900 nurses in PSBH (PSBHN). This study assessed the program's effectiveness in achieving its intended goals.

Design and Methods: This was a mixed-methods implementation effectiveness Type 3 study using a single-group pre-test post-test, guided by the RE-AIM theory. Nurses completed the Problem-Solving Inventory (PSI) before and 3–6 months after training to measure changes in their problem-solving efficacy. Quality scores were assigned to nurses' planned quality improvement projects at the training, and the extent of project implementation was assessed 3–6 months later. One district provided PSI scores immediately after training before they returned to their workplaces. In-depth interviews with trained nurses explored changes in their knowledge, problem-solving efficacy, and skills. Using STATA17, paired T-tests were used to analyze changes in mean PSI scores, and logistic regressions for predictors of project initiation. Qualitative data was with NVivo12.

Results: Out of the planned 900 nurses, 89 were trained (10%), and 83 participated in the study. They represented various regions, with 26.6% from Mafetang, 40.5% from Qacha Nek, 15.2% from Thaba-Tseka, and 17.7% from Quthing. About 66% of nurses achieved a medium quality score for their projects, while 31% scored high. Among 79 participants, 49.4% reported initiating their projects. A lower post PSI score shows improvement in problem solving efficacy. The mean PSI score of participants at baseline was 80.4 (sd

21.0); mean scores on Problem Solving Confidence, Approach Avoidance, and Personal Control before training were 26.1 (sd 9.3), 39.5 (sd 11.7) and 14.9 (sd 5.1), respectively. The mean PSI score of participants 3–6 months post-training after stakeholder follow up was 78.5 (sd 21.0); mean scores on Problem Solving Confidence, Approach Avoidance, and Personal Control after training were 24.8 (sd 9.0), 40.2 (sd 10.8) and 13.5 (sd 5.5), respectively. None were statistically significant. Immediate post training PSI scores was provided by nurses trained in Thaba-Tseka (n=12). All PSI categories comparing baseline to the immediate post training PSI scores in this sub-analysis where there had been no stakeholder follow up showed reduction in problem solving efficacy. A one-unit increase in project quality score increased the odds of project initiation by 35.0%, OR 1.35, 95% CI [1.06 – 1.72], $p < 0.014$. Nurses reported improved knowledge, confidence and communication skills, better resource utilization, enhanced problem-solving approaches, and increased emotional maturity in solving problems.

Conclusion: Knowledge on PSBH methods was improved after the workshop, however, the subset analysis with immediate post PSI data showed low improvement in self-efficacy at that time. PSBHN, though not significantly, improved problem-solving self-efficacy among trained nurses after stakeholder follow up, 3–6 months after. Support from key stakeholders after training is required for better reach, implementation, and adoption.

Introduction

This chapter presents the findings, discussion, limitations, strengths, and conclusions for objective one to assess the degree to which the program met its intended goals:

1. What was the reach and distribution of nurses trained across Lesotho?
2. What extent did knowledge and self-efficacy about problem-solving change among trained nurses after 3–6 months of receiving training?
3. What degree were trained nurses able apply the skills gained from the workshop to solve problems they identified and to what level of completion?

4.1 Background

The neo-classical economic theory which emerged in the 1900s focusing on allocating limited productive resources efficiently, and economic growth in the long-term recognizes the concentration of investment in cities and its trickle down benefits from urban industrial growth to improve rural poverty.^{1,2} This, for developing countries, has validated actions that have led to the continuous widening of inequalities between urban and rural regions with more resources concentrated in the urban regions compared to the rural.¹ Problem Solving for Better Health (PSBH) is a program designed to teach and motivate communities to make use of existing resources and develop solutions within the existing infrastructure for sustainability — one that resource deprived areas like rural regions can capitalize on.³

PSBH methodology has been utilized in about thirty-two countries across all continents.³ It consists of a two and a half day training program of personnel aimed at empowering participants to identify and resolve challenges in their workplace.

Participants are trained to identify the root causes and contributing factors of a problem within their daily work and challenged to develop solutions using a systematic method in a 5-step process to address the problem. They are empowered to initiate personal or group projects to tackle the problem, making use of all currently available resources to improve health, in a ‘bottom up’ approach, rather than the traditional approach of depending solely on authority for change.²⁷

The 5 Step Process in the PSBH model is:²⁷

- 1: Define the problem (nature, size, cause, contributing factors)
- 2: Prioritize the problem (take a realistic piece of the problem)
- 3: Define a solution (ask a good question-*specific, measurable, achievable, relevant/realistic, timebound* to frame the project)
- 4: Create an action plan (design methodology and evaluation)
- 5: Take action to implement the project

The overall theory is that, through this bottom-up empowerment and problem-solving workshop, there will be incremental improvements in health service delivery and ultimately the health system.

4.1.1 Why nurses?

Nurses play a very important role in healthcare delivery around the world and are usually the initial point of contact, as well as the direct portal between the health care system and a patient and their family.²⁷ According to the WHO, out of 57 countries globally having a critical shortage of health workers, 36 of them (63%) are in sub-

Saharan Africa.¹⁸⁷ In 2017, the average nurse to population ratio was 1:1000 people in Sub-Saharan Africa (SSA), with countries like South Africa, Ethiopia, Mauritania and Democratic Republic of Congo averaging 1 per 1000, whereas countries like Ghana, Algeria and Namibia average 2 per 1000.¹⁸⁸ Libya has the highest reported number at 7 nurses per 1000 people.¹⁸⁸ For perspective, compared to other parts of the world, the United States of America and Australia have 15, Canada and Brazil have 10, Norway has 18, France has 11, China and Thailand have 3, and India, 2, all per 1000 people.¹⁸⁸

Despite these shortages, nurses still make up about 45% to 60% of the entire health workforce in SSA.¹⁸⁹ They have historically taken up extra roles and more hours to make up for low resources. In the absence of an adequate number of health care professionals, nurses have had to rise to perform advanced roles as a doctor, pharmacist and laboratory scientist in addition to their nursing responsibilities.¹⁹⁰ In order to optimize the use of existing nurses in healthcare systems to make improvements in health indicators, nurses in these settings need to be engaged and encouraged to take up more roles and independent tasks in promoting health, planning and in forming policies.²⁷ With increased responsibility comes the need for good problem solving skills.¹⁹¹

4.1.2 PSBH in Lesotho

The Government of Lesotho has continued to collaborate with donors to decentralize care and strengthen their health care systems by improving resources and encouraging full utilization of what is available. One of such collaborators is an American Not-For-Profit Organization called the Dreyfus Health Foundation (DHF), established in 1988 to fund the training of individuals across the world, empowering and challenging them to

address social and health problems within their communities.²⁶ The DHF demonstrated the importance of keeping nurses engaged by officially launching the Problem Solving for Better Health Nursing (PSBHN) in 2002 as they recognized that the success of community based health initiatives depended on nurses.²⁷ Experienced nurses, physicians or other international facilitators served as educators for the implementation of the workshop, after which nurses developed projects to be completed by 6 months. These nurses were encouraged to have projects in alignment with their institutional goals and framework to increase program sustainability.

A grantee of DHF called The Lesotho Boston Health Alliance (LeBoHA) is a non-Governmental Organization that is a trust of Boston Medical Center (BMC) and backed by BMC faculty. This organization is locally led by Basotho people with a BMC faculty as the director. LeBoHA has worked closely with the Government of Lesotho and Lesotho Ministry of Health, leading the training of many health professionals in PSBH in the country. Despite never being formally evaluated, this initiative in 2020 received positive feedback from the Government and the Ministry of Health Quality Assurance Unit, leading them to request training for all government-employed registered nurses and licensed practical nurses (n=~900).³⁰

Even though PSBH methodology has been utilized in about thirty-two countries across all continents, its *implementation* has not been rigorously evaluated to the best of our knowledge even though evaluation of projects borne out of PSBH have reported great success.^{3,27} It is essential to determine the effective qualities of the program and the optimal conditions for its success in order to efficiently scale it up to other settings and

other professionals.¹⁷ Hoyt in a publication in 2007 showed results of a preliminary evaluation that was done on nurses after a workshop using mixed methods — it yielded information on participants' self-reported understanding of the five step methodology of the training, how they saw the usefulness of the PSBHN process in their work, education setting and personal life, and how it influenced their leadership skills or motivated them to be change agents.²⁷ This evaluation found that about 80% of 151 nurses reported having 'very good' understanding about the problem statement and how to ask a good question, and about 55% had a 'very good' plan of action, whereas around 30% rated their plan of action as 'fair'.²⁷ Approximately 80% of these nurses rated the PSBHN program as 'very useful' in their educational setting and personal life.²⁷ Before this workshop, 45% of 151 nurses trained, answered 'No' to seeing themselves as potential change agents, however, after the workshop almost a 100% of them answered 'Yes' to seeing themselves as potential change agents.²⁷ This preliminary report concluded by recommending that a more rigorous evaluation of the program be conducted.

A qualitative study in 2021 used a semi-structured interview guide to interview 22 out of 86 healthcare workers who received PSBH training in Lesotho to understand their personal, interpersonal, and systemic levels of experience.³⁸ Participants from this study had a positive impression about PSBH as it provided them a new way of viewing problems.³⁸

Neither of these studies, however, capture the experience of the trainees over time after they have tried to utilize the PSBH methodologies on the ground. This study aims to fill this gap by following trained nurses before and after they received PSBHN study to

gather information about how they responded to the inputs of the program to provide the outcomes that have been demonstrated over several years. It also aims to inform policy changes regarding problem solving in the health sector in the country. In this chapter, we answer the questions:

1. What was the reach and distribution of nurses trained across Lesotho?
2. What extent did knowledge and self-efficacy about problem-solving change among trained nurses after 3–6 months of receiving training?
3. What degree were trained nurses able apply the skills gained from the workshop to solve problems they identified and to what level of completion?

4.1.3 Training

Training in PSBHN occurred from November 2021 to June 2022 with follow up of trained nurses by the project implementation team occurring after training until December 2022. Nurses were introduced to the study through the collaboration of LeBoHA and the District Health Management Teams through the MOH. A recruitment script approved by the Boston University Institutional Review Board served as a guide for recruitment. Schedules of location for training were approved by the MOH who released nurses for the training. Implementers of the training were personnel from LeBoHA, peer mentors who were nurses that had been trained in PSBH and leadership prior to PSBHN, and a nurse appointed by the District Health Management Team to act as a liaison to support LeBoHA with organization in their district. Training took place in 2 and a half days. Participants were introduced to PSBH methods on day one and asked

to think about a project from their workplace that needs solving. Throughout the days of training, participants applied the methodology to develop and refine a clear project to improve their workplace. On the last day, training in emotional intelligence was given and participants were tasked to implement the projects they had designed within the following six months. The implementation team followed up with participants up to 6 months after they had received training to check on the status of their projects and to provide any necessary guidance needed.

4.1.4 Theoretical framework

The RE-AIM framework has its elements meaning Reach, Effectiveness, Adoption, implementation, and Maintenance.¹⁹² Different studies have used one, some or all of the elements of this framework.^{146,192} The main umbrella of this study used all elements of the framework with other parts described elsewhere (unpublished). In this study, we make use of the individual level elements — *Reach*: Proportion of nurses trained and distribution across country, *Effectiveness*: Change in self-efficacy, change in problem-solving skills, quality of project plans developed by nurses after training in PSBH, and *Adoption*: Proportion of nurses who initiated their projects by applying the skills acquired from the workshop. Table 4.1 summarizes the use of RE-AIM in this study.

Table 4.1 Summary of Indicators used to assess the RE-AIM Dimensions for Objective one with Data Sources.

RE-AIM	Evaluation Question	Indicator	Data Source
Reach	What was the reach and distribution of nurses trained across Lesotho?	-Percentage of nurses who received PSBHN training	-Attendance Sheet
		-Percentage of nurses who received PSBHN training stratified by district	-Attendance Sheet
		-Percentage of nurses trained per demographic factors	-Demographic Survey
Effectiveness	To what extent did knowledge and self-efficacy about problem-solving change among trained nurses after 3–6 months of receiving training?	-Percentage of projects developed by trained nurses rated by high, medium, or low quality according to the PSBHN training curriculum	-Project Evaluation Rubric
		-Change in trained nurses' reported self-efficacy before and after receiving training	-Problem Solving Inventory
		-Stated change in problem solving skills comparing before and after receiving PSBHN training	-Transcripts from In-depth interviews with trained nurses
Adoption	To what degree were trained nurses able to apply the skills gained from the workshop to solve problems they identified and to what level of completion?	-Percentage of trained nurses who initiated their projects by the 3–6 months follow up period	-Project follow up survey
		-Percentage of projects designed by trained nurses at different stages of completion 3–6 months after receiving training	

4.2 Methods

4.2.1 Design

From November 2021 to June 2022, three PSBHN training sessions were implemented in four districts: Mafetang, Qacha Nek, Thaba Tseka and Quthing. This study was a prospective cohort study with a single group pre-test post-test (O X O)

implementation effectiveness design type 3.¹⁴⁰⁻¹⁴² By using this design, we tried to capture any changes that occurred within the group before program implementation and after, to study the trends in the main outcome — self efficacy.

4.2.2 Data Collection Surveys

Quantitative surveys were collected from all nurses attending the workshop before, and 3–6 months after they had received training. The surveys collected were: a) daily attendance which was a registration sheet with columns for participants' names, sex, type of clinician, hospital they work at, phone numbers, emails, and signature. This sheet was developed and used by the LeBoHA team for previous trainings; b) demographic survey which was a structured survey developed by the author to capture demographic information of trained nurses. This survey collected information about the sex of the nurse, age, marital status, highest educational level, district within which the nurse practices, whether they have received PSBHN training before in the past, the type of facility they work in (i.e., whether Government or CHAL), the length of time they have been practicing in their current facility and the length of time for which they have been practicing as a nurse. Collection of this information was based the literature which showed that these demographic features could influence one's confidence and self-efficacy, hence would be useful to know to control or explore in the analysis.¹⁴⁷ Nurses completed these surveys using their assigned study IDs. c) a rubric to assess the quality of projects developed by the trained nurses and assessed by two independent raters; d) change in self-efficacy which was self-reported using the Problem-Solving Inventory (PSI) instrument completed by nurses on the first day of training before any instruction

was given, and then within 3–6 months after the last day of training session;¹⁵³ e) follow up surveys for status of the project were completed by participants six months after training to determine whether they had no aspect, few aspects (1/4 completion), some aspects (1/2 completion), most aspects (3/4 completion) or all aspects of their projects started. This was to assess the degree to which trained nurses used skills gained from the workshop to solve problems and the extent of completion of the projects.

We conducted semi-structured in-depth interviews (IDIs) with a subset of trained nurses from July 2022 to December 2022 (which was between 3 to 6 months after the end of PSBHN training) to explore knowledge, self- confidence and self-efficacy change after receiving training. Interviews occurred via zoom, WhatsApp video or WhatsApp audio per participant preference. Each participant received internet data worth 160L (~\$10) as a token of appreciation to cover the time spent in the interview. Interviews lasted for about 45–60 minutes each and were recorded after participant consent either on zoom if the interview occurred on zoom, or with Voice Memo App on a MacBook if the interview occurred on WhatsApp.

4.2.3 Instruments

1. The problem-solving inventory (PSI) is a self-reporting instrument developed in 1982 and revised in 2002.¹⁵³ It assesses an individual's problem solving abilities, and was used to assess nurses' self-efficacy before and after training in this study.¹⁵³ This instrument has been used across several populations and cultures and in hundreds of research projects, making it one of the most widely used inventories in problem solving.^{154,155} It is divided into 3 subcategories:

- Problem solving confidence which assesses an individual's self-assurance and belief in solving problems. This domain has been shown in research to be associated positively with personal agency and curiosity and negatively with anxiety and anger.¹⁵⁴ The total minimum score possible under this domain is 11 which signifies the best problem-solving confidence, while the highest score, 66, signifies the worst problem-solving confidence.
- Approach-Avoidance style which assesses an individual's tendency to approach or avoid problems. Its total minimum score is 16, signifying the best behavior, while the highest score is 96, indicating the worst behavior.
- Personal Control, assessing an individual's self-control when it comes to problem solving. Total scores range from a minimum score of 5, indicating the best personal control and the highest score, 30, which indicates the worst personal control.

The instrument is divided into six Likert scores ranging from 1- strongly agree to 6- strongly disagree. Total Problem-solving efficacy score is a sum of a participant's scores from all three categories with 32 being the lowest score and 192 the highest, and questions are set up such that the lower the number, the better the self-efficacy. Questions set up in the negative tense (n=15) were reversed. From the literature, its internal consistency was found to be as follows: problem-solving confidence, $\alpha = .85$; approach-avoidance style, $\alpha = .84$; personal control, $\alpha = .72$; and total inventory, $\alpha = .90$., and test-retest reliabilities were as follows: problem-solving confidence, $r = .85$; approach-avoidance style, $r = .88$; personal control, $r = .83$; and the total inventory, $r = .89$.¹⁵³

2. This rubric was designed by the DrPH candidate based on the PSBHN curriculum and informed by an adaptation of a Quality Improvement Project Evaluation Rubric (QIPER) that was developed to assess “trainees’ ability to design and conduct quality improvement projects”.¹⁴⁸ QIPER has six domains that assesses the “competence in designing, implementing, analyzing results of, and reporting” quality improvement or patient safety projects.¹⁴⁸ Our evaluation rubric was designed to rate the level of quality of the trained nurses’ designed projects, which provided us with information about the knowledge they gained from the workshop on problem solving. This rubric assessed all 5 steps in the PSBHN problem solving methodology under four criteria: problem statement (nature, size, cause and contributing factors to problem), a ‘good question’ (whether it has a SMART⁷ objective), action plan (what, who, where, when, how many times, evaluation plan to assess progress), projected impact of project on health indicators, consideration of sustainability, and the feasibility of implementing the project (timeline, budget, and how realistic the sustainability plan is). This rubric was piloted on a sample of health workers who were trained by LeBoHA prior to the start of PSBHN and changes made. The scoring system developed was informed by the literature.^{150,151} The maximum possible project quality score was 21, with scores from 0–7 assessed as low quality, 8–14 medium quality, and 15 to 21, high quality. The process and details of rubric development will be described elsewhere in Akolbire et al. (unpublished literature). Two independent raters used

⁷ SMART: Specific, Measurable, Achievable, Relevant/Realistic, Time-bound¹⁴⁹

this rubric to grade each project designed by a participant once. Intraclass correlation (ICC) estimates and their 95% confidence Intervals were calculated using STATA 17 based on single-measurement, consistency of agreement, 2-way mixed effects model with ICC= 0.75 with 95% CI = 0.62–0.84, indicating good inter-rater reliability based on previous literature.¹⁵²

4.2.4 Sample size and sampling

Eligible participants were any Government/CHAL (Christian Health Association of Lesotho) Registered Nurses (RN) and Licensed Practical Nurses (LPNs) in Lesotho, at least 18 years old, and able to communicate in English.

Using an online sample size calculator, the calculated sample size needed to detect a 3% increase in self-efficacy based on previous literature, with an alpha set at 0.05 for a study power of 80% was $n=222$.^{147,163} Based on an average response rate in a 2014 Demographic Health Survey in Lesotho of 97%¹⁶⁴ and an estimated attrition rate of 3%, the sample size needed to observe the desired project difference with statistical significance was $n=229$. In anticipation for a lower-than-expected response rate which would introduce a type II error in the study, we inflated the sample by 10% putting the estimated sample size at 250. We projected 25 nurses would be trained each month in a one-year period. All trained nurses were recruited to the study.

The final sample size for the IDIs was determined at the point where saturation was reached, i.e., the point at which the researcher could not find additional data beyond which conclusions could be derived.¹⁶⁵ Saturation in qualitative research is important because it indicates that the sample size achieved is enough to provide valid results.¹⁶⁶ In

general, saturation has been reached with a minimum of 5 participants and maximum of about 40 in other studies.^{167,168} With this in mind, we conducted interviews with a target of at least 20 interviews, or when saturation is reached, whichever came first. Per the literature, a final sample size can be determined at the end of the study when data analysis occurs concurrently as data is collected, until saturation is reached.¹⁶⁹

We used maximum variation sampling to select nurses for interviews to gain understanding from different nurses by sex and district so as to capture a wide range of viewpoints from all trained nurses.¹⁷⁰ After each training session, the program officer created a WhatsApp group of nurses per district for follow up purposes. The DrPH candidate was given access to these groups providing direct access to the trained nurses. Private WhatsApp messages were then used to reach selected nurses from the sample of trained nurses. If a nurse did not respond, two reminders were sent, the first one week after initial invite and second sent two weeks after first reminder. If there was no response, it was considered a decline, and another nurse was approached. Interviews continued with continual recruitment until saturation was reached.

4.2.5 Data Analysis

- Quantitative Data

Each participant was assigned a unique study ID. Data was entered into Excel Version 16.72 by the DrPH candidate, and imported analysis with Stata 17.^{174,175} Means, frequencies and percentages were used to describe the data. QQ plots and histograms of the data showed normality was not perfect, however majority of the data points lay roughly close to the 45-degree line that assuming a normal distribution of our data was

not considered a violation. Examining the means of the PSI data with their standard deviations also supported this assumption. We therefore assumed a normal distribution of our data and used parametric tests for analysis. The hypothesis of the study was as follows:

- Ho: There is no difference in self-efficacy among nurses between ‘before they received training in PSBHN’ and 3–6 months after they received training.
- Ha: There is a difference in self-efficacy among nurses between ‘before they received training in PSBHN’ and ‘3–6 months after they received training’.

Paired t-tests were used to test for change in mean PSI scores at baseline and 3–6 months after receiving training. Multiple imputation was done to address the large number of missing data in the post PSI scores at 3–6 months after receiving training. We also used chi square tests to assess for any differences between participants who provided both baseline and post PSI scores, and participants who only had baseline scores. Project initiation was coded into a binary outcome, i.e., 0= project not started and 1=project started. Bivariate analyses were done to identify demographic variables significantly associated with initiation of project which were then included in a multivariable logistic regression analysis to estimate associations between starting projects and project quality scores. We set the statistical significance level to 0.05.

- Qualitative Data

All recordings were transcribed using rev.com and analyzed with NVIVO 12 using theoretical thematic analysis method.¹⁸¹ Coding was done by two readers. Major codes were developed after the first reader continuously read through all the transcripts as they

were collected, then randomly selected four transcripts to read three times to generate themes that were organized based on the study objectives. After reading through a transcript, each reader placed identified themes under each code independently. Subsequently, both readers discussed all themes and quotes as a group. To ensure interrater reliability, a) A clear codebook was established by the first coder guided by the study objectives as directed under thematic analysis method¹⁸¹ b) Both readers read through the transcripts line by line placing codes under themes in the codebook. Any codes that were assigned to more than one theme were discussed between the two readers, extensively guided by the stated definitions of the themes in the codebook until agreement was met, leading to modifications and adjustment of the codebook c) All codes were discussed by both readers by reading through the transcripts horizontally, i.e., across codes instead of by transcript d) Where the same codes were placed under different themes, the two readers discussed the text until agreement was met.

Illustrative quotes were identified to shed light on the themes that emerged in the results section, with the sources of quotes indicated.

4.2.6 Ethical Clearance

This study was approved by Boston University IRB (IRB Number: H-41915) and the National Research Ethics Committee in Lesotho (Lesotho-ID172-2021).

4.3 Results

Results are presented in the order of the study objectives for clarity:

4.3.1 What was the reach and distribution of nurses trained across Lesotho?

Out of the estimated 900 nurses in Lesotho, our program trained 89 (10%) with 83% of those who were trained responding to initial surveys to partake in the evaluation process. Out of the 83 nurses, 26.6% were from Mafetang (MQ), 40.5% Qacha Nek (QAC), 15.2% Thaba-Tseka (PRY) and 17.7% Quthing (MQ). Figure 1 illustrates the distribution of the trained nurses in Lesotho with respect to the capital, Maseru.

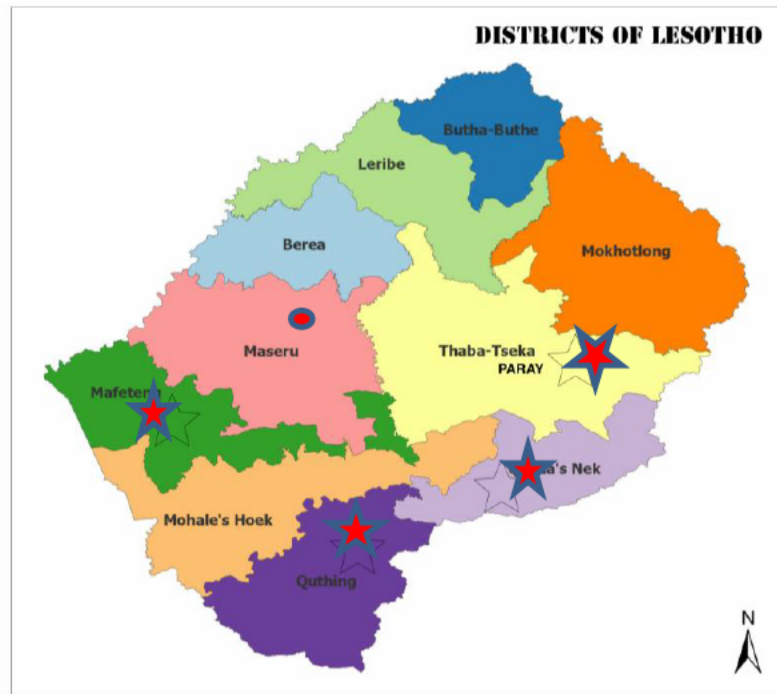


Figure 4.1 Districts in Lesotho with red stars showing locations training occurred and red circle indicating the capital of Lesotho, Maseru

Over 40% of the participants were from 30 to less than 40 years old, and majority were females (71%) (Table 4.2). The mean number of years participants had worked as nurses was about 9 years with a range of 1 to 33 years. Nurses from Government hospitals made up the majority compared to nurses from the Christian Health Association of Lesotho who made up 39%. Only one participant had received the training before.

Table 4.2 shows a summary of all the demographic data. The demographic data for the training in Thaba Tseka (Paray) could not be used for analysis (n=12) because they were completed without Study IDs, hence we could not link them to any other data.

Table 4.2 Summary of Demographic Data for the PSBH-N Training in Lesotho, 2021–2022

<i>Characteristic</i>	<i>Value</i>
Total Participants	83
Age in years n (%)	
<30	18 (21.7)
30–<40	34 (41.0)
40–<50	8 (9.6)
≥ 50	5 (6.0)
Missing	18 (21.7)
Sex n (%)	
Female	59 (71.1)
Male	24 (28.9)
Marital status n (%)	
Single	21 (25.3)
Married	39 (47.0)
Divorced/Separated	5 (6.0)
Widow/Widower	2 (2.4)
Missing	16 (19.3)
Highest level of education n (%)	
Certificate	8 (9.6)
Diploma	43 (51.8)
Bachelor	14 (16.9)
Postgraduate	2 (2.4)
Missing	16 (19.3)
Mean number of years working as a nurse (sd)	8.7 (6.6)
Mean number of years working in current facility (sd)	6.6 (7.1)
Current district nurse is working n (%)	
Thaba Tseka	12 (14.5)
Qacha	32 (38.6)
Quthing	14 (16.9)
Mafeteng	21 (25.3)
Missing	4 (4.8)
Type of facility n (%)	
Government	41 (49.4)
CHAL	26 (31.3)
Missing	16 (19.3)
Attendance n (%)	
Three days	52 (62.7)
Two days	19 (22.9)
One day	5 (6.0)
Missing	7 (8.4)

Trained in PSBHN before n (%)	
Yes	1 (1.2)
No/Unsure	66 (79.5)
Missing	16 (19.3)
Status of project n (%)	
Never started	38 (45.8)
Started few parts	12 (14.5)
Started some parts	8 (9.6)
Started most parts	20 (24.1)
Started all parts	1 (1.2)
Missing	4 (4.8)
(Percentages may not be up to 100% due to rounding)	

For the IDIs, there were a total of 41 interview requests sent, with 19 responses received (46.3% response rate). Out of the 19 interviews conducted, there were 2 that could not be used due to technical difficulties from the recorded audio, making 17 transcripts available for analysis.

4.3.2 To what extent did knowledge and self-efficacy about problem-solving change among trained nurses after 3–6 months of receiving training?

- Quality of projects designed to assess knowledge

The projects designed by nurses ranged from topics aimed at addressing health issues in infectious diseases, maternal and child health, noncommunicable diseases and other topics for work efficiency. Table 4.3 below provides a list of the topics of projects designed. Topics that were similar to each other are presented once.

Table 4.3 List of projects developed by nurses in Lesotho trained in PSBHN 2021–2022

<p>Infectious Diseases</p> <ul style="list-style-type: none"> • Reducing Tuberculosis Susceptibility rates • Reducing new HIV Infections in infants • Reducing the number of Tuberculosis contact children who are not initiated on and do not adhere to Tuberculosis Preventive Treatment
--

- Factors influencing HIV Disclosure Process Reluctance among Art Teen Club Members at Kolo HC.
- Reducing Lost to follow-up of Ante-Retroviral Therapy clinic at Samaria Health Centre
- Reducing Tuberculosis mortality rate and increased detection of new TB infections
- Reducing the number of people who will contract Tuberculosis
- Improving the pharmacological management of Tuberculosis Presumptive cases
- Improving index partner testing of HIV diagnosed patients
- Reduction in the Number of Children who are Exposed to HIV
- Improving the Reliability of COVID Screening at Paray Hospital
- Effectiveness of Covid-19 Screening Protocols of Maintenance Staff at Paray Mission Hospital
- Decreasing the Death Rate Among Covid positive patients with underlying chronic conditions
- Overview of male patients declining HIV testing services at Paray Mission Hospital
- Improving COVID vaccination at Masuoaneng clinic
- Reducing nosocomial infections and combat hospital-acquired infections
- Reducing Tuberculosis infected defaulters at Tebellong Hospital
- Reducing high rate of sexually transmitted infections at Machabeng OPD
- Reducing the death rate among men aged 69 and over with severe CCF and COPD

Non-communicable Diseases

- Imparting knowledge on cervical cancer screening
- Reducing the number of hypertensive patients with uncontrolled hypertension
- Reducing misdiagnosis of eye conditions
- Reducing post-operative length of stay in the Surgical Department at Paray Hospital
- Reduction of readmission with chronic illnesses in the female patient ward
- Improving adherence to treatment for chronic diseases in the men's clinic at Paray Hospital
- Improving Cervical cancer screening status at Hermitage Health Center
- Reducing the number of postoperative complications in the ophthalmology department at Machabeng hospital
- Increasing the number of psychiatric clients utilizing mental health services at Tebellong hospital
- Improving management of hypertension at Rankakala hospital

Maternal and Child Health

- Increasing the number of women aged 35 years delivering at the health center
- Addressing why women aged 20 – 40 years deliver at home
- Improving the management of children from the ages of a month to 12 years in care well Mafeteng
- Factors contributing to low hospital birth deliveries at Mount Olivet health center

- Improving immunization of children under 5 years old
- Addressing the high rate of teenage pregnancy in adolescent at Mphaki Health Centre
- Promotion of proper blood test results for Antenatal care of women who come to the labour ward at maternity, Quthing hospital
- Increasing PREP coverage of pregnant women at St Matthews Health Center
- Combating teenage pregnancy and lack of knowledge at St. Gabriel Health Center catchment area communities.
- Decreasing the percentage of teenage pregnancies among 14–19 year olds
- Improving under-5 immunization rates
- Malnutrition death rate reduction at Paray Paediatrics
- Reducing the number of Antenatal care mothers from the health facilities surrounding Machabeng Hospital who present to maternity and MCH without the baseline test results
- Reduction of Malnutrition cases among children of Tebellong Hospital
- Improving good quality care in the paediatric ward at Machabeng hospital
- Reducing the number of new born babies with low Apgar scores
- Strengthening the knowledge and the importance of delivering in the health facility to reduce the number of women coming with puerperal sepsis
- Reducing labour complications and unnecessary Caesarean section at Machabeng hospital
- Reduction of dropouts from immunization Schedule for under 5 children at Sehlabathebe Hospital
- Increasing MR1 immunization coverage at Mohlapiso H/C

Others

- Reducing poor wound healing at Lehcoop Health Center
- Improving the quality of work in female wards in Mafeteng Hospital
- Reducing Overcrowding of patients at Mafeteng OPD
- Reducing the time ward attendants spend doing procedures out of their scope
- Improving ICT department work efficiency in Paray Mission Hospital
- Reduction of Number of Patients Not Provided with Comprehensive Social Welfare Services
- Reduction of Non-compliance to quality management system at Paray Lab
- Reducing the number of patients not getting their prescribed medication on time
- Promoting adherence to weekly meeting schedule in the ART Department at Paray Hospital
- Improving poor documentation on admission charts in Maternity at Paray Mission Hospital
- Improving meeting minutes submission in the Outpatient Department of Paray Hospital.
- Overview of Out of Stocks of Essential Items in Pharmacy
- Misdiagnosis of patients leads to devastating results which cut through every healthcare worker's conscience at Sekake Health center.
- Stress burnout on nurses at the Operating Theater in Machabeng Hospital
- Reducing the number of patients receiving poor nursing care
- Reducing misdiagnosis of patients at Sekake health

Using the rubric we designed to assess knowledge acquired from the workshop where the maximum possible project quality score was 21, the mean score of the project quality determined by both raters was 12.7, minimum score 4, maximum score 20. There was a bimodal distribution of the project quality scores with the highest number of nurses scoring either 12 or 15, (n=8 [12.5%]). Table 4.4 summarizes the rest of the project quality level using the mean grade from both raters.

Table 4.4 The Distribution of Quality Scores of Projects designed by trained nurses by level

Project Quality Level	Frequency (%)
Low Quality (0–7)	2 (3.1)
Medium Quality (8–14)	42 (65.6)
High quality (15–21)	20 (31.3)

From the qualitative interviews, knowledge acquisition on how to solve problems was a recurring theme. Participants described improvement in knowledge with respect to different aspects of problem solving. One aspect was their approach when tackling problems. Some participants stated that after PSBHN, they learnt to use a systematic approach as a strategy when dealing with problems. Two nurses expressed this by saying,

“From the workshop, I’ve learned that we don’t need to sit down and complain about it. Look at the problem, look at the causes of the problem, then sit down to look at how I can solve the problem.” #QAC6

“I think now I have a different approach. I can now be able to quantify my problems rather than previously, where I would be aware of a certain problem and try to solve it without anything tangible, to an extent that I would end up not knowing what to solve because things are just way broad. I didn’t even measure what the problem was.” #QAC5

Another participant, in addition to knowledge about how to approach a problem, also learned about the importance of good communication when solving a problem in a

group. This was expressed as follows:

“Before I went to the workshop, my problem-solving skills included the fact that, I make a decision, and everybody should follow. But from the workshop, I learned that communication is key. I learned that people need to be engaged. Yes, I'm the manager; yes, I make the decisions, but as much as I'm the manager, as much as I have to make decisions, there are some points where I can engage staff members because as much as I am going to take the decision, the decision is going to be applied to them. If they are not part of that decision making, they are going to be resistant. As a manager, I have to communicate. As a manager, I have to engage people and most importantly, I learned about setting goals and breaking down the mechanisms of how I'm going to achieve that goal. But normally I would just say 'I'm going to do this', but if you asked me the 'how' part, I don't even know how, or you find that I start with step five instead of starting with step one”. #MQ2

We also found that nurses learned how to be efficient in solving problems at the training. One way they expressed gain in knowledge in this way was by their current use of existing resources to solve problems, even without the need for additional monetary input.

“At problem solving for better health, we learnt that we can still solve our problems with the available resources. Not only including money even though money is loved by many people.” #QAC3

The above quotes were among answers provided by nurses when asked about their impressions of PSBHN.

- Self-efficacy change

PSI scores were completed to reflect change in self efficacy of participants, before and after training. Even though we targeted to train 20 nurses per month within one year, this could not occur due to challenges discussed in unpublished data (outlined in chapter 5). Out of the 83 participants who responded to the survey, there were 33 participants

with both pre- and post-training data, 39 participants with only pre-training data and the rest with neither. Due to the limited sample size and missing data, we checked for any statistically significant difference between participants in the above groups. We found that there were no statistically significant differences between these groups per their demographic indicators, except for the facility they worked in (Government vs CHAL). Among participants who completed both pre and post PSI assessments, 39% were Government nurses vs. 61% from CHAL. For those who only completed pre training information, 76% were Government nurses and 24% , CHAL nurses [χ^2 9.8, $p = 0.007$]. These results are shown in Table 4.5 below.

Table 4.5 Chi-square Distribution of Demographic Variables comparing Differences between Participants who completed both the Pre- and Post-training PSI vs. those who only completed Pre-training PSI.

Variable	Participants with both before and after PSI Scores (%)	Participants with only Pre-Training PSI Scores	P-value
Age group			0.642
<30	28.6	29.0	
30–<40	57.1	45.2	
40–<50	7.1	19.4	
≥ 50	7.1	6.5	
Sex			0.203
Female	66.7	78.6	
Male	33.3	21.4	
Marital Status			0.654
Single	25.0	36.4	
Married	60.7	54.5	
Divorced/Separated	7.1	9.1	
Widow/Widower	7.1	0	
Years working as a nurse			0.654
<5	35.7	33.3	
5–<10	28.6	27.3	
10–<20	28.6	24.2	
20– <30	7.1	12.2	
≥ 30	0	3.0	

Years working in current facility			0.744
<5	50.0	54.5	
5–<10	14.3	21.2	
10–<20	28.6	18.2	
20– <30	3.6	6.1	
≥ 30	3.6	0	
Current district nurse is working in			0.111
Thaba Tseka	12.5	19.5	
Qacha	56.3	24.4	
Quthing	9.4	24.4	
Mafeteng	21.9	31.7	
Type of facility			0.007**
Government	39.3	75.8	
CHAL	60.7	24.2	
Attendance			0.640
Three days	70.0	64.1	
Two days	26.7	25.6	
One day	3.3	10.3	
Trained before			0.493
Yes	3.6	0	
No/Unsure	96.4	100	
Project Status			0.663
Never started	53.1	40.0	
Started few parts	12.5	17.5	
Started some parts	12.5	10.0	
Started most parts	18.8	32.5	
Started all parts	3.1	0	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In our before and after assessment, having a lower score post training indicates an improvement in self- efficacy in solving problems, hence lower post training scores are more favorable for the study. Table 4.6 shows the paired t-test results of the PSI scores comparing pre-training scores to 3–6 months post training scores. A total of 33 observations had the full data for this analysis.

Table 4.6 Paired t-test for Before and 3–6 Months After Training PSI Assessment Scores

PSI Category	Mean	Mean Difference	Std. dev	95% Conf. Interval of diff	p-value
Problem solving confidence post	24.76	-1.30	8.97	-3.05 – 5.65	0.546
Problem solving confidence pre	26.06		9.31		
Approach Avoidance post	40.24	0.79	10.75	-3.81 – 5.39	0.729
Approach Avoidance pre	39.45		11.70		
Personal Control post	13.54	-1.30	5.51	-4.13 – 1.52	0.355
Personal Control pre	14.85		5.06		
Total PSI Score post	78.54	-1.82	20.52	-10.12 – 6.48	0.658
Total PSI Score pre	80.36		21.01		

The mean total PSI score of participants before training was 80.36 (sd 21.01) and the mean scores on Problem Solving Confidence, Approach Avoidance, and Personal Control before training were 26.06 (sd 9.31), 39.45 (sd 11.70) and 14.85 (sd 5.06), respectively. The mean total PSI score of participants after training was 78.54 (sd 21.01) and the mean scores on Problem Solving Confidence, Approach Avoidance, and Personal Control after training were 24.76 (sd 8.97), 40.24 (sd 10.75) and 13.54 (sd 5.51) respectively. Except for the ‘Approach Avoidance’ category, all categories including the total PSI showed a reduction in the post training scores, a favorable response. None of the mean changes were statistically significant.

We conducted sensitivity analysis using multiple imputation for missing data. Following Von Hippel’s rule, the number of imputations that were required was 159.¹⁹³ We imputed using 200 after rounding to the nearest hundred. Table 4.7 shows the results:

Table 4.7 Paired t-test PSI Assessment Scores after Multiple Imputation of Missing Data for Before and 3–6 Months after Training

PSI Category	Mean	Mean Difference	Std. dev	95% Conf. Interval of diff	p-value
Problem solving confidence post	24.15	-0.26	10.81	-0.46 – (-0.06)	0.009**
Problem solving confidence pre	24.41		8.10		
Approach Avoidance post	39.52	1.65	12.94	1.42 – 1.87	0.000***
Approach Avoidance pre	37.87		10.42		
Personal Control post	13.16	-1.29	6.73	-1.43 – (-1.15)	0.000***
Personal Control pre	14.44		5.39		
Total PSI Score post	78.54	-1.82	20.20	-2.37 – (-1.26)	0.000***
Total PSI Score pre	80.36		20.69		

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

From the multiple imputation, the mean change in total problem-solving score remained the same in the output from the data with missing value (total pre training mean 80.36, total post training mean 78.54). However, in the multiple imputation, the confidence interval was small, and the p-value was < 0.001 , making it statistically significant.

At the training that occurred in Thaba-Tseka — the only training for which we had pre- and immediate post-training self- efficacy scores — only 12 of the 25 participants were nurses. In this small sample of 12 nurses, as reflected in Table 4.8, the mean difference in the PSI scores get significantly worse across all domains except for Problem Solving Confidence where we see no significant difference.

Table 4.8 Paired t-test showing Baseline versus Immediate post training PSI Assessment Scores from Participants trained in Thaba-Tseka.

PSI Category	Mean	Mean Difference	Std. dev	95% Conf. Interval of diff	p-value
Problem solving confidence immediate post	27.00	1.25	5.74	-3.19 – 5.70	0.549
Problem solving confidence pre	25.75		8.66		
Approach Avoidance imm post	50.67	8.75	5.33	1.97 – 15.53	0.016*
Approach Avoidance pre	41.92		11.14		
Personal Control imm post	20.75	6.08	3.41	3.42 – 8.74	0.000***
Personal Control pre	14.67		5.07		
Total PSI Score imm post	98.42	16.08	10.19	5.52 – 26.64	0.006**
Total PSI Score pre	82.33		18.08		

Imm: immediate

**** p<0.05; * p<0.01; *** p<0.001**

Interviews with nurses also brought out themes that described an increase in self efficacy to solve problems after training. Whereas some nurses reported an improvement in solving problems on their own without involving other stakeholders, others described increased confidence in collaborating with other stakeholders to solve them. One nurse expressed a belief in their own capabilities to solve problems and self-enablement by saying,

“I was very impressed to attend this workshop because it showed or taught me that it's not every problem that you cannot solve. Before, I would think that somebody from outside was needed to solve the problem for you, but the training made me realize that I myself in the facility can make a difference, and not wait for someone outside to help me with the problem that I'm facing at the facility.” #MQ3

These sentiments were echoed by another nurse as follows:

“For my professional growth I liked it a lot because now I can solve or try to solve the problems that are within my reach without involving any other stakeholders of which might take time for things to be done.” #QAC

In another interview, a nurse described an improvement perseverance and lack of avoidance of a problem after receiving training. They said,

“I can say that currently I'm able to deal with different problems. Since the time I came from the workshop, I'm able to sit down, deal with the challenge and review how I dealt with the challenge. Before then, I would only say I'm going to try to solve the problem. If the problem doesn't get solved, I'll just leave it there. But now, currently, I try solving the problem until the problem is solved.” #QAC10

Personal control was also a theme that emerged from the nurses' interviews. The emotional intelligence lectures provided as part of PSBHN was praised as a contributing factor to their emotional maturity and patience when solving problems, especially with other team members. Two nurses stated that:

“I think they have improved [referring to problem solving skills] compared to before receiving the training. Before receiving the training, I didn't feel like I could have that patience of listening that much to someone who doesn't understand the way of dealing with the patient. I felt like I could do that thing instead of trying to make someone understand to do the right thing. Now, I do understand that I have to be patient with my colleagues. I have to sit them down, let them understand why we have to do certain things in certain ways.” #PRYI

“After the training we did, a short presentation was done on emotional intelligence. We were taught about how to deal with the emotions, how to act as the boss and how to act as a junior. So currently when I'm facing problems within staff, I'm able to sit down with them and listen to them. Where I'm wrong, I would admit that no, I was wrong here, I'm sorry guys, which is what I didn't do before I went for training. At the moment, again, when I say that we are not performing good in a certain indicator, I would sit down and form the quality improvement plan and sit down with the staff to see how we can improve that. We are also able to do the review meetings to improve our quality.” #QAC10

Data from the surveys and interviews above provided rich insight into the changes participants experienced after the PSBHN training.

4.3.3 To what degree were trained nurses able to use the skills gained from the workshop to solve problems they identified and to what level of completion?

The degree to which trained nurses used their skills was assessed by whether they were able to initiate projects and the level of completion was assessed by the stage at which they were with their projects to completion. Out of the total number of the 83 participants, 49% of them reported that they had started their project, whereas 46% reported not starting any aspect of their project. Out of those who had started their projects, 14% had started a few parts, 10% some parts, 24% most parts, and 1% (1 person) had started all the parts of their projects. Table 4.2 above shows the distribution of project status. We assessed whether there was a difference between participants who had started their projects or not with regards to the quality of their projects. Bivariate analyses (not shown) done on the demographic data and set at 0.1 statistical significance level (due to small sample size) found sex and facility type to be associated with project initiation, hence included in the regression model for control. These variables were adjusted in a multivariable logistic regression examining the quality of project (i.e., mean from both raters) as a predictor for whether the project was begun or not. Table 4.9 shows the regression model:

Table 4.9 Adjusted Multivariable Logistic Regression showing predictors of a participant starting their project

Covariates	OR	Std Err	P> z 	95% Confidence Interval
Project Quality	1.35	0.16*	0.014	1.06 – 1.72
Female vs Male	5.76	5.32	0.059	0.94 – 35.24
Government vs CHAL	1.02	0.70	0.978	0.26 – 3.91
Constant	0.01	0.01	0.006	0.00 – 0.23

* p<0.05; ** p<0.01; *** p<0.001

The odds of a participant starting the designed project is increased by 35% for every one-unit difference in the project quality score which is an assessment of knowledge gained from their workshop, adjusting for sex and type of facility, OR 1.35, 95% CI [1.06 – 1.72], $p = 0.014$. The odds of a female starting her project was about 6 times higher than a male starting, keeping project quality and facility type constant. However, this difference was not statistically significant ($p = 0.059$). Whether or not a participant started their project did not have any significant difference on whether the participant was from a Government of CHAL facility.

The qualitative data also helped answer this objective question. When trained nurses were asked about how they would describe their problem-solving skills, comparing before the training to after, participants reported an improvement in their problem-solving skills following the training, except for one person who stated they did not notice any change in their skills. The application of problem-solving skills was described by some nurses when it came to implementing their projects. One nurse whose project was to increase the detection of presumptive TB cases described how she applied her skills with respect to her project by explaining how she went through steps so her colleagues can make use of the nebulizing machine to improve health outcomes:

“We have also demonstrated how to use the machine [nebulizer] but I realized that as time went on, as much as we had demonstrated the use of the machine, people were still not using it. I was wondering what I could do. Then I realized I could take a piece of paper and write the steps of how to use the machine and put that paper close to the machine so that when someone uses the machine, she can use the referral close on the wall.”
#MQ2

Another nurse developed a project to tackle post operative eye complications. From the

workshop, she described how she applied those skills in bringing together her surgical team from different departments to improve care quality:

“Now some of the conditions, I include even the medical doctors to come and help me to discuss the patients’ conditions so that they can help to give the patients better management. Also, some of the times I communicated with the anesthetic nurse to find out if there were any procedures that needed to be done. So, in terms of communication and involving other departments and other specialties, it [referring to PSBHN] has helped me a lot. It has improved the patient's quality care and the prognosis of the diseases we are treating here.” #QAC8

Teamwork, as seen in the previous quote, was a recurring theme by several nurses as they got the support to start or continue their projects, and when absent, led to the non-initiation of projects. Some ways that teamwork helped support nurses with their projects are evident in the following statements:

“It [referring to training of other colleagues] was helpful because mostly you will find that my problem was somebody's problem last time, so they already had the solution. They gave me a platform to know what I was going to do. They already gave me the solutions to some problems.” #MQ1

“After the training, we had a WhatsApp group. We discussed our challenges. We gave guidance to one another. So that was the best part that we used to improve.” #QAC7

The opposite, where lack of teamwork was associated with participants not starting their projects, can also be observed in the following statements:

“What I can say is that I haven't heard from any other person who did a project. I don't know, but to the people that I have been talking with, they have not started to do the projects yet. I have not heard anyone who did the project. So to be honest, I did not ask how they can help me.” #PRY2

“As for now there is no one whom we have been in contact with, because we are working at different facilities of which there is a very long distance between us [referring to other trained nurses]. So we haven't been serious about discussing this matter. I don't want to lie, we didn't take it seriously

for the first time until LeBoHA came back to us again inquiring about the project. I don't know how far they are.... Yeah, we talk because we know each other, but we don't discuss things in detail. We just check on each other, 'what is happening?'. 'Did Ntate contact you about your project?', and it's a laughing matter you know... but we don't discuss the real business. #QAC5

These quotes and survey analysis pooled together provided us with an understanding of the application of knowledge and skills gained at the workshop, and the self- efficacy change.

4.4 Discussion

Out of the planned 900 nurses, 89 nurses were trained in this study (10%), with 83 responding to the surveys. Three trainings occurred covering four districts outside of the capital Maseru, namely, Qacha Nek, Tsaba Theka (Paray), and the third training involving nurses from Quthing and Mafetang. We found that 97% of nurses had either medium or high-quality scores for the projects they designed based on PSBHN methodology, which was a proxy for knowledge acquired from the training. IDIs supported this finding — nurses stated that they had an increase in their knowledge in problem solving by knowing how to approach problems in a systematic manner, knowing the importance of good communication skills when solving problems in a team, and learning how to be efficient when solving problems by making use of pre-existing resources. Participants also expressed an increase in their problem-solving confidence through the IDIs regarding solving problems in collaboration with others. They also reported an improved approach in tackling problems after the training, and a growth in

emotional maturity and patience when addressing problems with others. The PSI showed an improvement in self-efficacy in solving problems in all categories, except the approach avoidance. These were however not statistically significant, possibly due to our small sample size and high percentage of missing data for the outcome value for which we did sensitivity analysis with multiple imputation. This imputation was in the same direction as our sample, but statistically significant. The sub-analysis of the twelve participants who, in addition to the baseline and 3–6 months PSI data, also provided PSI data immediately after completing the training showed a statistically significant decrease in their total problem-solving efficacy at that point. While this seems counter-intuitive, considering the sample size is small and this was the first training, we must be cautious in our interpretation. Alternatively, it may simply take applying the knowledge back in the workplace, for self-efficacy to be realized, as we found that majority of the participants had increase in knowledge after receiving training.

We found that 46% of participants were able to use their skills to start their projects and out of this number, 34% of them had started some or most parts of their projects. We also found that the odds of starting the designed project was increased by 35% for every unit increase in the score of the project quality. Interviewed nurses also provided examples of how they applied their skills to implement their projects. Others mentioned team support from their fellow trainees as a factor that helped them in initiating their projects, while those who expressed lack of this team support faced challenges in initiating the implementation of their projects.

The essence of PSBHN is to use already available resources to solve problems in

low resource settings. Our study trained nurses from four districts located apart from the capital of Lesotho, namely Qacha Nek, Tsaba Theka (Paray), Quthing and Mafetang. Quality improvement activities in low resource settings like those four districts agree with previous studies about the importance of improving quality of care in regions distant from the cities. Baker et al. in a study in Tanzania re-iterated the need for prioritizing health service quality in rural areas when their study found very low coverage and access for postpartum care, third stage of labor, and poor health facility readiness in three rural districts in Tanzania.¹⁹⁴ Leatherman et al. at a conference looking at the evidence of quality improvement projects in low resource settings had their attendees concluding that such projects are likely to use the limited resources provided by governments and initiatives from the global community to achieve their shared aims.⁸¹ They further state when the projects lead to improvement in quality, it can serve as an encouragement for further investments in the healthcare of developing countries.⁸¹ However, as it is important to further such interventions to improve health quality and access to care in these regions, another study points out that only focusing on this without involving the support of the healthcare system through engagement is not of much value, and suggested both occur simultaneously.⁸²

In the PSI assessment, our pre-training PSI scores were generally lower (indicating good problem-solving efficacy) than that in another study. For example in Kocoglu et al. where problem solving among first line nurse managers was studied in Turkey, the average total PSI score was 88.4 at baseline.¹⁹⁵ In a cross-sectional study assessing nurses' perception of empowerment and problem solving abilities comparing

nurses in two hospitals which also took place in Turkey, their mean total PSI score was 90.16.¹⁴⁷ In our study, our baseline score was 80.36, leading to a potential ceiling effect where it would be nearly impossible to increase scores in a meaningful way.¹⁹⁶ Dunning et al. published on flawed self-assessment where people were generally found to assess themselves better than they actually are when compared with objective measures.¹⁹⁷ If our participants saw themselves as good problem solvers before the intervention, this meant there was little room for improvement in such participants, compared to those who would score themselves as less effective problem solvers, which made room for improvement. On the other hand, it is also true that if they score themselves low at baseline, they may be inclined to do so again after training. Notwithstanding, even though our PSI change was not statistically significant (multiple imputation was), our improvement in scores though minimum (~1 unit), was similar to that of Kocoglu et al. where the latter also found improvement in their study.¹⁹⁵ Their total PSI change comparing baseline PSI (taken two weeks before the training) and 6 months after training was an increase of ~7 units.¹⁹⁵ Our study also differs from their study with respect to the ‘approach avoidance’ sub-category where the latter also found improvement, but we did not.¹⁹⁵

A study in Tanzania by Ersdal et al. found a statistically significant increase in knowledge and skills after a simulated training in neonatal resuscitation.¹⁹⁸ However, it also found that this improvement was not transferred to the clinical setting, making it clear that knowledge does not always translate to clinical practice.¹⁹⁸ Our study supports their finding in that even though we found an improvement in knowledge based on the

rubric assessment and IDIs, and an improvement in skills gained from the training based on the IDIs, majority of the nurses did not initiate their projects. Becker et al. offsets this challenge in their project by training local midwives on neonatal resuscitation on the ground while the emergency was happening, real life events in the heat, which led to better clinical outcomes.¹⁹⁹

Lack of teamwork and team support also played a role in not applying skills gained to start projects. Other studies have shown that team work has become one of the major ways institutions solve problems, moving away from the tradition of letting employees perform tasks individually.²⁰⁰ WhatsApp groups for collaboration was mentioned in our study. Other studies have also found value in team work made possible via social media apps like WhatsApp, concluding this avenue helped provide a platform and support for the marginalized while providing emotional support and a sense of belonging.^{133,201} Other barriers that explain why participants could not initiate their projects are described elsewhere in Akolbire et al., unpublished data (Chapter 5).

4.5 Conclusion

Nurses believed PSBHN had a positive impact on their problem-solving skills based on the IDIs, and minimal based on the surveys which may be attributed to the high percentage of missing data and small sample size, limiting our ability to find a significant difference. Sensitivity analysis with multiple imputations done showed statistical significance and the difference in PSI scores in the same direction as that of our sample statistics. All trainings were held in districts outside of the capital to help build a strong

foundation among nurses in using limited resources to solve problems, to improve the health of populations in these regions. Knowledge, self-confidence in problem solving and approach to how problems are solved were improved after receiving PSBHN per IDIs. There was a limitation in participants applying their skills on the field as majority of them had not started their projects, partly due to lack of teamwork and support. We suggest close in-person follow up by implementers and teamwork on projects to improve the use of the skills gained for higher success rates in project implementation and better health outcomes.

4.6 Limitations

IDIs may have introduced social desirability bias in our qualitative findings. There was a lot of missing data for the main outcome of the study, self-efficacy, which reduced the power of our study and the ability to detect small differences in the pre and post data. This may have been due to lack of incentives to complete the surveys. We tested the direction of our data in a sensitivity analysis using multiple imputation. We do not believe there was systematic or information bias as there was broadly no significant difference between participants who completed both baseline and post training PSI and those who only completed baseline without post training PSI assessment. The surveys were all self-reported, which could have introduced recall bias. Using a single group pre and post design for this study exposed our results to bias of history and maturation. We recommend further studies assessing problem solving abilities with more objective measures and stronger study designs with control groups.

CHAPTER FIVE

**EXPERIENCES OF PROBLEM SOLVING FOR BETTER HEALTH TRAINING
IN LESOTHO FROM THE PERSPECTIVES OF TRAINED NURSES AND
PROJECT IMPLEMENTATION TEAM**

Introduction

This chapter provides the findings of Objective 2 in this dissertation, which describes the experiences of trained nurses and the PSBHN project implementation team. We discuss the background and methods as it pertains to this objective and present the results and discussion thereafter. The costs of implementation, which are also considered to be part of the experience of participants with the project, are discussed in chapter 6.

Abstract

Background: In Lesotho, the scarcity of healthcare resources contributes to poor service quality. Problem Solving for Better Health (PSBH) is a program that trains healthcare personnel to maximize existing resources for problem-solving. This study explored the experiences of trained nurses and the project implementation team during PSBH implementation.

Methods: Between November 2021 and June 2022, 89 nurses received PSBH training. Semi-structured interviews were conducted with 19 trained nurses and 5 project implementation team members, selected through maximum variation and purposive sampling, respectively. Interviews took place from July 2022 to December 2022, at least six months after training, to assess their experiences, identify facilitators, recognize barriers, and collect suggestions for future improvement of PSBH. Data was analyzed inductively using NVivo 12 with thematic analysis.

Results: Nurses conducted projects addressing various health issues to reduce morbidity and mortality in Lesotho. They used strategies like public education and colleague refresher courses for project implementation. Facilitators for nurses included support from

coworkers and nurse managers, as well as personal drive. Challenges encompassed inadequate stakeholder and coworker support, resource shortages and competing interests. Implementers benefitted from coworker support, available training resources, and support from select stakeholders, while facing financial limitations, competing interests, and limited stakeholder backing. Stakeholder engagement and decentralization were suggested to sustain PSBH in Lesotho. Recommendations for enhancing PSBH involved extending workshop training duration for improved learning and selective nurse training.

Conclusion: Strong stakeholder engagement is crucial to support PSBH training, project completion, and sustainability. Hospital commitment to offering regular refresher courses to nurses is essential. Further research on the cost-effectiveness of training nurse managers with the standard two-and-a-half-day session versus training all nurses for at least five days, compared to a control group with no training, is recommended.

5.1 BACKGROUND

The Kingdom of Lesotho is a small southern African country with a total population of about 2.2 million people and a life expectancy of 52 years in men and 56 among women.^{6,7} According to the WHO, in 2019, the neonatal, infant and under-5 mortality rates in Lesotho were 43, 68 and 86 per 1000 live births respectively, compared to the surrounding country of South Africa, with rates of 11, 28 and 34 deaths per 1000 live births in 2019.^{8,9} Also, with a maternal mortality ratio of more than five times that of South Africa in 2019 (i.e., 544 per 100,000 live births in Lesotho versus 105 per 100,000 live births in South Africa), it remains clear that the health system in Lesotho is struggling.^{9,10} Infectious diseases have also had a significant contribution to morbidity and mortality in the country — from 2000 to 2020, the prevalence of HIV in Lesotho has remained between 20% to 25% among adults between the ages of 15–49 years, making it the third highest in the world (Global prevalence in 2020 was 0.7% versus 21.1% in Lesotho).^{11,12} In 2019, there were 654/100,000 new cases of tuberculosis and 57/100,000 deaths from the disease.¹³ The prevalence and incidence of noncommunicable diseases have also increased.^{14,15} Deaths from cardiovascular, cancer, diabetes and chronic respiratory diseases made up 43% of all causes of deaths among 30- to 70-year-olds in 2019, just about a 10% decrease from 2015.¹³ In addition, a quarter of the population was said to be undernourished in 2019.¹³

A major contributor to poor quality of health is the extent of low health resources in Lesotho. There are about only 200 medical doctors in the country creating a low doctor to population ratio of 1:10,000.^{12,18} About 45% of established healthcare positions are

unfilled, with loss of doctors to foreign countries by brain-drain and less than 25% of physicians being indigenes of Lesotho.²⁰ The nurse to population ratio is also low, at about 6:10,000.¹ Maseru, the capital of Lesotho, tends to have majority of the healthcare resource allocation, leading to disproportionate and insufficient access to care in the other districts.¹⁸ The Government of Lesotho, therefore, has continued to collaborate with donors to decentralize care and strengthen its health care systems by increasing resources and encouraging full utilization of what is available. One such collaborator is an American Not-For-Profit Organization called the Dreyfus Health Foundation (DHF) which funds the training of individuals across the world in 'Problem Solving for Better Health' (PSBH) aimed at empowering and challenging health workers to address social and health problems within their communities, leading to healthcare systems strengthening.^{3,26}

Problem solving is explained by Heppner and Krauskopf as the process of taking in information, being able to process that information to formulate plans for solutions, and carrying out those plans.²⁸ In resource-constrained settings, such an initiative has been well received and been proclaimed to substantially improve health indicators like reducing HIV/AIDS prevalence in Lesotho, increasing the quality of life among people in communities, as well as reducing nurse burn out, increasing retention in the workforce, increasing professional confidence and improving critical skills in problem solving.^{21,27,29}

PSBH trains personnel to make utmost use of existing resources to solve problems within their workplace.³ It is a two and a half day training that helps individuals identify the root causes and contributing factors of a problem faced at work that is within their

power to tackle, and are challenged to develop solutions using a systematic method in a 5-step process to address the problem:²⁷

- 1: Define the problem (nature, size, cause, contributing factors)
- 2: Prioritize the problem (take a realistic piece of the problem)
- 3: Define a solution (ask a good question-*specific, measurable, achievable, relevant/realistic, timebound* to frame the project)
- 4: Create an action plan (design methodology and evaluation)
- 5: Take action to implement the project

They are then empowered to initiate personal or group projects to tackle the problem, making use of all currently available resources to improve health, a ‘bottom up’ approach, rather than the traditional approach of depending solely on authority or “top-down” directions for change.²⁷ After the two and a half day training, participants are followed intermittently by the implementation team to provide guidance and continued support for project implementation.

Nurses play a very important role in healthcare delivery around the world and are usually the initial point of contact, as well as the direct portal between the health care system and a patient and their family.²⁷ They make up about 80% of the workforce in healthcare, with variations across the world.³¹ In recent years, the role of nurses has not only been that of providing care and comfort, as nurses have done traditionally, but now includes that of treatment of patients, promoting health, teaching, researching and serving as leaders of health care institutions and organizations.^{32,33} A study done in Australia in 2011 found that nurses spent up to 81% of their time by the third year of working

(increased from 76.4% in the first year) in direct and indirect care, medication tasks and professional education to promote physical and mental health.^{32,202} There is a general consensus of a shortage of nurses across the world.^{31,34} One approach that can be taken to optimize the use of existing nurses in such healthcare systems to improve health indicators is to encourage nurses to take up more roles and independent tasks in promoting health, planning and forming policies.²⁷

The DHF demonstrated the importance of keeping nurses engaged by officially launching the Problem Solving for Better Health Nursing (PSBHN) in 2002, which was viewed as key to the success of community based health initiatives.²⁷ Experienced nurses, physicians or other international facilitators served as educators for the implementation of the workshop, after which nurses developed projects to be completed by 6 months, and encouraged to have projects that are in alignment with their institutional goals and framework to increase program sustainability. A grantee of DHF called The Lesotho Boston Health Alliance (LeBoHA) is a non-Governmental Organization that is a trust of Boston Medical Center (BMC) and supported by BMC faculty. This organization is locally led by the Basothos with a BMC faculty as the director. LeBoHA has worked closely with the Government of Lesotho and Lesotho Ministry of Health, leading the training of many health professionals in PSBH in the country. Despite never being formally evaluated, the LeBoHA initiative received positive feedback from the Government and the Ministry of Health Quality Assurance Unit in 2020, leading them to request training for all government-employed registered nurses and licensed practical nurses (n=~900).³⁰

Despite all the positive feedback PSBH and PSBHN has had over the years, its *implementation* has never been rigorously evaluated to the best of our knowledge, even though they have been in existence globally for at least two decades.^{3,27} Hoyt in a publication in a cross-sectional study in 2007 showed results of a preliminary evaluation that was done on nurses after a workshop using mixed methods — it yielded information on participants’ self-reported understanding of the five step methodology of the training, how they saw the usefulness of the PSBHN process in their work, education setting and personal life, and how it has influenced their leadership skills or motivated them to be change agents.²⁷ This evaluation found that about 80% of 151 nurses reported having ‘very good’ understanding about the problem statement and how to ask a good question, and about 55% having a ‘very good’ plan of action, whereas around 30% rated their plan of action as ‘fair’.²⁷ Approximately 80% of these nurses rated the PSBHN program as being ‘very useful’ in their educational setting and personal life.²⁷ Before this workshop, 45% of 151 nurses trained answered ‘No’ to seeing themselves as potential change agents, however, after the workshop, almost a 100% of them answered ‘Yes’ to seeing themselves as potential change agents.²⁷ One trained nursing student said “*Before the workshop I did not understand the nursing role in the community. I now know that the nurse can act as a bridge between the people and community organizations. I also learned how to solve a health problem in the community beginning with a small and clearly stated problem*”.²⁷ This preliminary report concluded by recommending a more rigorous evaluation of the program.

Another qualitative study in 2021 used a semi-structured interview guide to

interview 22 out of 86 healthcare workers who received PSBH training in Lesotho to understand their personal, interpersonal and systemic levels of experience.³⁸ Participants from this study had a positive impression about PSBH as it provided them a new way of viewing problems.³⁸

Neither of these studies capture the experience of the trainees over time after they have tried to utilize the PSBH methodologies on the ground. The experiences of the project implementation team members have also not been addressed in the literature to the best of my knowledge. It is essential to know what about PSBHN program is working from the perspectives of both receivers and implementers of the program, and under which conditions it works in order to efficiently scale it up to other settings and professionals.¹⁷ This study seeks to close this gap identified in the literature.

5.2 METHODS

From November 2021 to June 2022, three PSBHN training sessions were implemented for nurses from four districts in Lesotho: Mafetang, Qacha Nek, Thaba Tseka and Quthing. The overall project began in October 2021 with preparation activities and ended in December 2022 with a 6 month follow up period after each training. The training was provided by project implementation team members made up of the program officer, monitoring and evaluation officer, a nurse manager, financial director and assistant, peer mentor, and a local liaison who was present for one district training. The training occurred for two and a half days, during which trained nurses developed projects to solve problems they identified at their workplace. After training, the nurses were tasked to implement the projects they developed and were followed for 6 months after the

training by the program officer to provide guidance and encouragement for the trained nurses to complete their projects. Other findings from the follow up are discussed in chapter 3.

Within 3 to 6 months after receiving training, we conducted qualitative surveys using semi-structured individual interviews with a subset of trained nurses and members of the project implementation team to learn about their experiences from receiving training/undergoing their projects, and from the implementation of the PSBHN program, respectively. These semi-structured interviews allowed for new questions to be explored depending on what a participant said.²⁰³ Such information of the experiences from trained nurses and program implementation team members provide us with knowledge about the quality of the delivery of service, responsiveness of participants to the program, and knowledge about the different aspects of the program that has contributed to its outcomes.²⁰⁴ These data are also critical to important stakeholders like funders, Government of Lesotho, other evaluators and other policy makers in resource limited settings about the project integrity and template for replication. To provide this information, this chapter addresses objective 2 of the dissertation: To understand the experiences of trained nurses while carrying out their projects developed from the workshop, and the experiences of the project implementation team while implementing the Problem Solving for Better Health Program.

This objective was addressed with the following questions:

- What are the projects trained nurses designed to implement once they returned to their workplace and why?

- What were the barriers and facilitators to implementation of the Problem Solving for Better Health for nurses in Lesotho experienced by the project implementation team?
- What were the barriers and facilitators trained nurses faced in implementing their project plans once they returned to their workplace?
- What improvements do PSBHN project implementation team and trained nurses suggest, to inform future changes to the Problem Solving for Better Health Program?

5.2.1 Theoretical Framework

In this study, we made use of Adoption, Implementation and Maintenance from the RE-AIM theory to guide the evaluation objectives as stated above, and in the development of the IDI questions.¹⁴⁵ The RE-AIM framework has its elements consisting of Reach, Effectiveness, Adoption, Implementation, and Maintenance.¹⁹² Different studies have used one, some or all of the elements of this framework.^{146,192} It was first published about two decades ago and has since been used in many programs at different stages of research throughout planning to evaluation and reviewing of reports, and in different research types like policies, programs and environmental change.¹⁴⁵ The logical sequence that this framework follows is 1) Adoption, which looks at the number or proportion of settings or agents who are willing to start the program/initiative and barriers affecting this, 2) Reach, which measures the number or proportion of people participating in the initiative, 3) Implementation, measuring the fidelity to all parts of an intervention protocol, factors influencing implementation or lack of, as well as time and cost of the

intervention, 4) Efficacy or effectiveness, which analyzes the intervention's impact on outcomes such as quality of life, economic outcomes and possible negative effects, 5) Maintenance, which measures the level at which programs or policies become institutionalized; with individuals, it measures a program's long term effects (i.e., 6 months or more after the last intervention contact) on outcomes.^{146,156} The RE-AIM framework components were used to guide the identification of evaluation questions, the development of instruments and indicators, and the analysis. Table 5.1 summarizes how RE-AIM was used in our study objectives.

Table 5.1 Evaluation Question indicators and sources for data collection.

RE-AIM	Evaluation Question	Indicator	Data Source
Implementation	What were the projects trained nurses designed to implement once they returned to their workplace and why?	Projects designed by trained nurses and stated reasons for designing those projects	Transcripts from in-depth interviews with trained nurses
Implementation	What were the barriers and facilitators trained nurses faced in implementing their project plans once they returned to their workplace?	Stated barriers and facilitators to project implementation by trained nurses	Transcripts from in-depth interviews with trained nurses
Implementation	What were the barriers and facilitators to implementation of the Problem Solving for Better Health for nurses in Lesotho?	Stated barriers and facilitators to project implementation by the project implementation team	Transcripts from in-depth interviews with project implementation team members
Implementation	What improvements do project implementors and trained nurses suggest, to inform future changes to the Problem Solving for Better Health Program?	Improvement suggestions to inform future changes to PSBHN given by trained nurses and project implementation team members	Transcripts from in-depth interviews with trained nurses and project implementation team

5.2.2 Interview guide development

The DrPH candidate developed the semi-structured interview guide used to interview all participants, i.e., trained nurses and project implementation team members. The

development of this guide was informed by the objectives of the research and ‘Adoption’ from the RE-AIM theory by exploring factors that influenced trained nurses’ willingness to apply the PSBHN methodology into implementing their projects. ‘Maintenance’ also guided questions on sustainability and stakeholder engagement.¹⁵⁶ Table 5.2 outlines a summary of the basic interview guide. Probes were used to dive deeper into a response when the researcher deemed it necessary. Two questions (Question 8. under the nurses’ guide, and question 7. under the project implementation team guide) were developed to study the costs of implementation which is presented in chapter 6.

Table 5.2 Semi-Structured interview Guide for In-depth Interviews with Trained Nurses and Project Implementation Team Members

Nurse Guideline
<ol style="list-style-type: none"> 1. Please tell me in detail about the project you designed at the workshop. 2. Tell me about a specific time that something made it easier for you to implement your project. 3. Tell me about a specific challenge you faced while implementing your project? 4. Think of a leader or manager you work with. Please tell me a story about how that person helped or didn’t help you with the project? 5. Please tell me a story about a leader or manager who made it particularly difficult for you to implement your project. 6. How would you describe your current problem-solving skills, comparing them to before receiving PSBHN training? 7. What suggestions do you have for improvement of the PSBHN program? 8. Did you use any personal money in any aspects of receiving the training? If so, can you tell me what you spent?
Implementer Guideline
<ol style="list-style-type: none"> 1. How would you describe your role in the Problem Solving for Better Health (PSBH) Nursing Program? 2. What three things made it easy for you to implement the program? 3. What three things would you change about the program implementation/ training facilitation process? 4. Tell me about a major challenge you faced in implementing or organizing the PSBHN trainings? 5. How would you describe the engagement of the Ministry of Health, Government Officials and District Health Management Teams in organizing and implementing this program? 6. What suggestions do you have for improvement of the PSBHN program? 7. During the program organization and implementation, were there any donated labor and time, or any other donated items used? If so, can you tell me what they were?

5.2.3 In-depth Interviews with the PSBHN project implementation team

IDI with project implementation team members were conducted from November 2022 to December 2022, each lasting about 30 to 60 minutes. Implementers of the project included personnel from the LeBoHA team namely the program officer, finance director, nurse manager, finance director's assistant, and the monitoring and evaluation officer. Other members of the implementation team included a peer mentor per each district training, and a district appointee, appointed by a District Health Management team office, to act as a liaison between one district and LeBoHA team for easier organization. Peer mentors were registered nurses selected by the nursing director and trained in the PSBHN methodology, followed by a two-day leadership training. These peer mentors were selected from various districts based on a) Serves as a role model to others, b) Is an influencer, c) Is a member of a nursing association, d) Has renewed registration with the regulation body, and e) Has general good professional integrity. Qualifications for these criteria were determined by the nurse manager at the workplace, after receiving the request for these personnel from the nursing director.

The project implementation team members from LeBoHA were responsible for the day-to-day activities and organization of the PSBHN trainings from preparation to follow up period to provide advice to participants facing challenges. Interviews with project implementation team members were conducted by the DrPH candidate over Zoom approximately 5 to 6 months after the last workshop. All participants gave permission for their interviews to be recorded for analysis.

Purposive sampling was used to identify members of the project implementation

team. This approach enabled us to identify and select individuals who had experienced and were involved in the implementation of the projects, and whose accounts add richness to our efforts to address the research objectives.¹⁷¹ A list of emails of the project implementation team members was provided by the program officer to the DrPH candidate which was used to contact all of them. If there was no response after two weeks, a follow up email was sent. If no response was received for another two weeks, it was considered as a decline. All interviews were conducted by the DrPH candidate.

5.2.4 In-depth Interviews with trained nurses

In-depth interviews (IDI) were conducted from July 2022 to December 2022, between 3 to 6 months after the nurses had received PSBHN training. All interviews were conducted by the DrPH candidate who has experience conducting such interviews. Interviews lasted for about 45 to 60 minutes over Zoom, WhatsApp video or audio, depending on the preference of the nurse. Permission was given by all participants to have their interviews recorded for analysis. Recordings were done using Voice Memo App on a MacBook if the interview occurred on WhatsApp or recorded on Zoom if the interview occurred on Zoom. Each participant received internet data worth 160L (~\$10) as a token of appreciation to cover the time spent in the interview.

The final sample size for the IDIs was determined at the point where saturation was reached, i.e., the point at which the researcher could not find additional data beyond which conclusions can be derived.¹⁶⁵ Saturation in qualitative research is important because it indicates that the sample size achieved is enough to provide valid results.¹⁶⁶ In general, saturation has been reached with a minimum of 5 participants and maximum of

about 40 in other studies.^{167,168} With this in mind we conducted interviews with a target of at least 20 interviews, or when saturation is reached, whichever came first. Per the literature, a final sample size can be determined at the end of the study when data analysis occurs concurrently as data is collected, until saturation is reached.¹⁶⁹

We used maximum variation sampling to select nurses for interviews to gain understanding from different nurses by sex and district so as to capture a wide range of viewpoints from all trained nurses.¹⁷⁰ After each training session, the program officer created a WhatsApp group of nurses per district for follow up purposes (The DrPH candidate was given access to these groups gaining direct access to the trained nurses). Private WhatsApp messages were then used to reach selected nurses from the sample of trained nurses. If a nurse did not respond, two reminders were sent, the first one week after initial invite and second sent two weeks after first reminder. If there was no response, it was considered a decline, and another nurse was approached. Interviews continued with continual recruitment until saturation was reached.

5.2.5 Data Analysis

Triangulation of data sources was done to facilitate validation of the information from all the data sources.¹⁸⁰ All recordings were transcribed using rev.com and analyzed with NVIVO 12 using theoretical thematic analysis method.¹⁸¹ Coding was done by two readers. Major codes were developed after the first reader continuously read through all the transcripts as they were collected, then randomly selected four transcripts to read three times to generate themes that were organized based on the study objectives. After reading through a transcript, each reader placed identified themes under each code

independently. Subsequently, both readers discussed all themes and quotes as a group. To ensure interrater reliability, a) A clear codebook was established by the first coder guided by the study objectives as directed under thematic analysis method¹⁸¹ b) Both readers read through the transcripts line by line placing codes under themes in the codebook. Any codes that were assigned to more than one theme was discussed between the two readers, extensively guided by the stated definitions of the themes in the codebook until agreement was met, leading to modifications and adjustment of the codebook c) All codes were discussed by both readers by reading through the transcripts horizontally, i.e., across codes instead of by transcript d) Where the same codes were placed under different themes, the two readers discussed the text until agreement was met. Illustrative quotes were identified to shed light on the themes that emerged in the results section. Sources of the quotes were presented under the results section for the nurses, but not for the project implementation team members due to the latter's limited sample size, so as to emphasize confidentiality and anonymity.

5.3 REFLEXIVITY

The DrPH candidate and the second coder were not involved in the implementation arm of the project. They both hail from Africa but have no connection with the Government of Lesotho. The candidate had no previous contact with the Director of LeBoHA until after the beginning of this evaluation project. This chapter is a part of other objectives in the candidate's dissertation. The research design and research questions to evaluate this project were developed by the candidate under the supervision of her doctoral dissertation committee of which the LeBoHA director is a second chair,

and the LeBoHA monitoring and evaluation officer, the fifth chair. The second coder has no connection with any of the LeBoHA team members or PSBH program and has no conflicts of interest to declare.

5.4 ETHICAL CONSIDERATIONS

This study was approved by Boston University IRB (IRB Number: H-41915) and the National Research Ethics Committee in Lesotho (Lesotho-ID172-2021). Verbal informed consent was captured from each participant before commencing data collection.

5.5 RESULTS

We first present the results of the IDIs with the project implementation team members, and then that of the trained nurses. The results are presented according to the flow of interview guide. Personal demographic questions were not collected from any of the interviewed participants to prevent discomfort and to encourage trust in providing information to the DrPH candidate anonymously.

5.5.1 IDI with Project implementation Team Members

Overall, five interviews were conducted from among the project implementation team out of 11 requests sent. Project implementation team members who were interviewed included members from LeBoHA, i.e., the finance director, program officer and the monitoring and evaluation officer. The program officer's stated role was to oversee the coordination of the PSBHN trainings, dealt with logistics and the general organization of trainings, as well as monitoring and evaluation of projects within LeBoHA. The finance

director's stated responsibilities included accounting and financial reporting, working as a cofacilitator by assisting nurses at the training with questions, and acting as the main training facilitator in some cases. The role of the monitoring and evaluation officer was also to facilitate some of the evaluation modules of the PSBHN training. Additional members of the project implementation team interviewed included a peer mentor who was a previous PSBH trainee and had successfully completed their project, acting as a mentor to the new trainees, and a DHMT locally appointed liaison in one of the districts who helped organize the training in that district with the LeBoHA team. All participants stated they had been involved in implementing the PSBHN for its entire duration. The stated percentage of the time each person spent on implementing PSBHN were as follows: a. Program officer – 100%, b. Peer mentor – 50%, c. DHMT locally appointed liaison – 22%–30%, d. Monitoring and evaluation officer – 20%, and Finance director – 10%.

Implementation team members described their experiences during the process of implementation by 1) commenting on enablers and challenges faced, 2) sharing their thoughts on how the program can be sustained, and 3) providing their recommendations for improvement of the program going forward.

5.5.1.1 Enablers

Factors that the implementation team identified as making it easier for them to implement PSBHN were their coworkers, availability of resources, and the support from certain stakeholders. The following discusses each of these further:

Coworker support

Implementation team members stated that the presence and energy from their coworkers served as an enabler, adding that this energy tended to be contagious and encouraging for the former to do their job of implementing the projects. Apart from the energy that the interviewed team members stated as an enabler from coworkers, the presence of the peer mentors was also specifically identified to be very helpful for local buy-in, facilitation and for easier communication when nurses were being trained in districts speaking different language from that of the LeBoHA team members. Speaking about the peer mentors, one interviewed implementation team member said,

“... It simplifies things in a way as they were from all the facilities in the country... it was easier to have someone on the ground level to speak the language that those nurses had. So when we did the workshop, it just made everything smooth sailing. Also, when I was just carrying out the logistics, preparing for the trainings, I had someone to help me just coordinate everything from the office while they were there.”

Availability of resources

Implementation team members also identified availability of resources as an enabler. Some of the resources mentioned included logistics for training like training materials that included but not limited to training manuals with the curriculum, and training directions. Participants also noted that being able to use transport provided by some hospital facilities to convey nurses to the PSBHN training grounds made implementing the program easier. The latter was described by a participant as follow:

“...lucky that some facilities did volunteer to provide transport for the participants. Some didn't. Unfortunately, we had to reimburse some of the participants. I think sometimes it was just a matter of mere luck from facilities donating transport”.

Stakeholder Support

Stakeholder support was a key enabler. Team members mentioned at least one stakeholder whose support was helpful to them. Some stakeholders team members identified were a. Hospital administrators who provided monetary funds for lunch and transport for some nurses to receive training, b. MOH officials who gave permission for the trainings to occur and were present for some trainings, c. Nurse manager in the DHMT of one district who was instrumental in making the nurses in that district available for the training, and d. Nurse director from the MOH who made it “*easy to be able to communicate with the nurse managers in the different districts*”. Two participants described the involvement of the MOH as follows:

“The stakeholders in the Ministry of Health. It was at some point very handy in terms of assisting us in implementation because before we go to the district, we have to first ask for permission through the Minister of Health. So, at some point, yes, they were very helpful in assisting in implementation of the program.”

“The engagement can be because they acknowledge this and they release the trainees for those trainings. I would say they to a great extent played a part.... They would be there putting people together. They would be there at times. Some of them would be there, especially during the opening and closing of the workshops, they would always be there.”

5.5.1.2 Challenges

Project implementation team members also discussed some factors that made it difficult for them to facilitate and organize the PSBHN program to train the nurses. Some of these challenges cut across several interviewed members which were monetary restrictions, competing interests, and lack of stakeholder support.

Money Restrictions

One implementation team member mentioned they had to use their personal or office airtime to organize the workshop in their district for PSBHN. Another team member emphasized the expensive nature of the entire implementation of PSBHN, stating increased distance from the Maseru, capital of Lesotho, as a direct correlation with increased cost. The mountainous nature of the country also made it difficult to reach certain areas as it implied more money for transport to such regions, hence, negatively affecting in-person monitoring and follow up of participants after they had received training.

“Districts are different, and they come with different challenges. So sometimes challenge is; some cost more, some cost less. And you know, you'll find that the further they are, the more challenging it gets from Maseru...it costs more to set up a workshop...PSBH requires a lot of money, especially in terms of monitoring, considering that we need to conduct onsite visitations and they are more effective. So, it's no secret that our country is mountainous and just to get to some facilities, it's not easy. You find that for some facilities, we never paid a visit at all, and that affects the performance of the participant. In some cases they require us to come and conduct training on site so that maybe the stakeholders can understand what their products are about and it's difficult. It's also an issue of costs.”

Competing Interests

Almost all implementation team members stated reasons why competing interests were a challenge for successful implementation. One implementation team member having a busy schedule with work in addition to other responsibilities made it difficult to incorporate the activities of implementation as well. Other team members had challenges when it came to scheduling the trainings and described how the trainings were continuously rescheduled either by the MOH or the health facilities who were to release

nurses for training, mainly due to COVID vaccination campaigns. Table 5.3 below provides some quotes on how implementation team members described competing interests as a challenge.

Table 5.3 Quotes from Project Implementation Team describing Competing Interests

<p>“In the district we have several officers; I think they should have given this to somebody who would have more time than me. I think I had several roles to play in the district. Apart from being in the TB program, I was in several committees that have some plans to implement, so I was quite busy. [However] there were other people who were less busy than I was. I think the district authority, when they selected one to take part in this, they should have selected somebody who is less busy.”</p>
<p>“I think the other element was that the focus from 2020 until now have been on COVID and then after COVID, it was on vaccines. So they [MOH] will always be busy. You can’t get hold of them. They’ll be in this meeting, out from this meeting to the other meeting. You are not a priority.”</p>
<p>“The challenge during the organization that I saw was securing time and the participants. Often, you would set a date for the trainings only to find that the facilities themselves where these people work or the employers themselves where they employ have other issues or have other issues pending. And those dates will keep on being postponed or they rather will not be available at that time. The timing wasn’t always as we would otherwise want it. Because then there are other people and other things to take into consideration, which is understandable.”</p>
<p>“I think the biggest one was rescheduling of trainings after the nurse director gave some facilities the specific dates that the trainings were meant to happen in advance. But some of them still wanted to reschedule due to either they are having vaccinations, or the Ministry of Health having written a saving grant saying to halt all trainings due to whatever they are trying to conduct. So that was a challenge... Most of the time they were trying to vaccinate and trying to reach a certain goal. So sometimes for instance, we had to stop all trainings so that they could vaccinate people. It was a state of emergency type of thing and they had to prioritize in certain instances.”</p>

Lack of stakeholder support

The main stakeholder whose lack of support led the implementation team to face major challenges was the MOH/DHMT. Though the MOH was credited with providing some support by allowing the nurses to receive PSBHN training and approval of the trainings, more was expected by the implementation team in terms of the MOH’s involvement in implementation activities, following up on trained nurses, and provision of some resources like transportation for participants to the training grounds. Some team members noted that these activities were the responsibilities of these stakeholders, but the

stakeholders did not fulfil their duties as was expected of them. Implementation team members believed that with stronger involvement of these stakeholders, costs would have been better handled for more efficient program implementation.

“...in certain instances where you find that some participants are not even provided with transport by their own health centers due to either lack of petrol or something, if the Ministry could just intervene in those cases, then it could really assist us in costs where participants move from one place to the other...There was support but it was just not satisfactory. It was just not at the level that it should have been...As much as it is still part of the ministry or like the quality assurance unit, we trained, and we had hoped for them to play such a massive role considering the fact that they oversee all forms of quality assurance products in the country. And PSBH being a quality assurance program needed them. So that’s kind of sad.”

5.5.1.3 Sustainability

This was a topic that implementation team members discussed passionately during the interviews and expressed much importance to its relevance as they saw it as a crucial step in PSBHN’s future success. Discussion about sustainability focused on ways that PSBHN can be sustained without substantial input from the LeBoHA team, and for ownership responsibilities of the program activities to be organized and implemented by the MOH and various hospital facilities. Strong stakeholder engagement was the theme that emerged in the discussion of sustaining the project and the major stakeholder pointed out was the MOH. Not only was their involvement for future sustainability emphasized but interviewed implementation team members identified that their involvement would also encourage successful implementation and completion of the projects designed by trained nurses. MOH and DHMT through appointment of various local liaisons to join the LeBoHA implementation team in facilitating the training for nurses was described as a

step in gaining ownership and transfer of training responsibilities from LeBoHA. Also, participants explained that the MOH had the power to provide time for trained nurses to work on their projects to increase success of training and continuation of projects developed in the various workplaces for better health outcomes, but this was not being used. The process for establishing this engagement was well communicated by one of the implementers as follows:

“I foresee the challenge of the issue of sustainability when the Government or the Ministry of health is not playing the key role in it. Even the sustainability of the projects without us being there, that they could be able to do projects without us being there. So the issue is of sustainability.....I think getting a buy in firstly from the leadership in the Ministry of Health headquarters and then getting a buy in from the District Management Teams and also the facility management...But then to ensure that we have sustainability is getting a buy in from all levels of management to where the participant can be given, maybe certain hours within her or his working hours, maybe two hours, to work on the project. Quality Assurance department or wing within the Ministry of Health, if one or two of them can be engaged in terms of being a facilitator also. Also when supervising, we go on supervision and mentoring with her or with him. Also within the district, we pick one person from the DHMT whom we also train with and whom can be able to facilitate or to mentor and supervise the participant. So I think if we can engage them in that level from the Ministry of Health and district level, it would assist.”

As illustrated by this quote by the project implementation team member, facilities and DHMTs within the MOH are expected to play very active roles in the implementation of the PSBHN program, gradually assuming full ownership.

5.5.1.4 Recommendations for Improvement

Implementers’ recommendations to improve the PSBHN program were mainly addressed at ways in which the challenges faced can be eliminated, and facilitators, encouraged. Discussed recommendations were better stakeholder engagement and

decentralization of PSBHN for sustainability, a change in the selection criteria for choosing who receives the training, and a change in the duration of the trainings.

Stakeholder Engagement and Decentralization

Implementation team members suggested the need to decentralize PSBHN going forward, so that MOH and district health departments assume ownership of the training. This stakeholder engagement was clearly captured under the sustainability section, and to add to the decentralization to the districts, an implementer said:

“After we have been capacitated as the district, I think we should have been able to do things from the district and then maybe report back to the central team. So I would say decentralizing the powers... decentralizing it makes it easier for us to implement in the district than when we have to do things from central level.”

Stakeholder engagement was not only captured in terms of sustainability of PSBHN alone but was also discussed as important for successful implementation of nurses’ projects after training. Here, the stakeholders identified were the nurse managers at the nurses’ respective facilities. Team members stated these nurse managers can ensure the success of the program by providing close supervision. Furthermore, team members suggested that if PSBHN were incorporated into the requirements for nursing performances, there would be higher compliance with the trained nurses’ initiation and completion of their projects. One implementer said,

“I think it’s the supervision from the part of the supervisors of the trainees at the workplace and their commitment. It’s the supervision and the commitment and the performance management power. Because, if it were taken to be part of the performance management of the nurses themselves at their workplace, then it would be monitored. And if their supervisors had a buy-in and take the responsibility to actually make it a point that they see to it that the project is being implemented, then it would be easy

for us to see the project will be implemented. But without the other arm of the system helping in making sure that the projects are being implemented, it makes it difficult.... Making it part of the expectations or their goals at the employer-employee level.”

Another program implementation team member also brought out how important it is in making the trained nurses somewhat responsible and accountable for implementing their projects

“PSBH is a voluntary thing that requires people to volunteer to address challenges they have. And sometimes the problem with that is that people are not even willing to try to do the approach. And if this was like some form of course, maybe for the nurses to get through whatever stage of studying, I think the numbers would be better.”

Selection Criteria

The choice of nurses who should participate in the training was another theme that emerged in the analysis under recommendations. Nurses who received training were not selected by any criteria as the target was to train all nurses in the country; we have no data to understand how nurses were prioritized for selection. Team members stated that the current selection criteria should be changed to exclude junior nurses. Implementation team members thought choosing and training more experienced nurses would proffer better chance of success of the PSBHN program in terms of nurses being able to implement their developed projects.

“I think also for it to be much effective; we need to have people who are a bit senior. For example... if the task is allocated to someone who is a bit senior, like the nursing officer or the senior nursing officer, that would make it easier because that person has some authority. The colleague that I was working with was a bit junior and in the hospital side of it, she depended so much on me to help her make the management allow her to do the project....she was still the junior nurse...I think the selection criteria; I wasn't aware of the selection criteria. Maybe if the selection criteria should include somebody who has a bit senior position...it makes

it easier for that person to collaborate with the district management or the hospital management”.

Another selection criterion team members proposed other than choosing a more senior nurse was to identify nurses who are motivated and ones who express interest in receiving training. Such identified nurses, per the implementation team, would be more committed to undertake their projects for better implementation outcomes.

“I think when trying to select maybe the participants for the training, we need to be very observant and try to clarify the kind of people that are needed. Because not all people like this academic side....I think as a manager, the manager knows inspired people. I think the invitation needs to be very straightforward. What kind of people or what are the qualities that are needed for this training? Because if you bring someone that you know exactly is not interested, it’s great challenge.”

From the discussion, it was noted that this suggestion stemmed from the frustration of some nurses’ inability to implement their projects after returning to their facilities.

Training Duration

Majority of the implementation team members recommended that the duration of the training for the nurses at the workshop was inadequate and needed to be extended. However, one implementation team member disagreed with extending the duration of training, stating that a lack of commitment and buy in by the nurses’ employers, and a lack of vigorous follow up by the project implementation team are among the reasons why participants may feel unprepared to tackle their projects after the workshop.

“The participants themselves most of the time would at the end of the workshop say, ‘we think this has been too short. Maybe the length of time needs to be reviewed’. From my personal perspective, I don't think non implementation of the projects has anything to do with the length of the time. I feel it has a lot more with the issues that I raised of commitment, performance management, buy-in from the employers or the employers’

follow up of the implementation or monitoring of the implementation from the part of the employers. Maybe even from the part of the facilitators. We need to be more intentional and robust in terms of monitoring and evaluation concerns. But like I said, there are many things at stake.”

Nonetheless, as mentioned above, most of the project implementation team members were proponents of extending the number of days used in training nurses as they thought the two-and-a-half-day training was not enough for the material and content of PSBHN and thought this affected the success of completion of projects nurses developed to an extent. The argument made by one of the project implementation team members in support for extension of the number of days was that one needs time to think clearer to make better decisions concerning their projects. This team member said,

“All I can say is that this training is very important. It needs some time. Three days is not enough. It needs some time. So that one could think about this, one could make clear decisions and think. That way we can be able to make a good project. Because three days is not enough. I think that's the part that can be changed.”

Another proponent for the extension of the duration of the training days proposed that 5 days, as opposed to two and half days which is currently the status quo, would be a better choice for the duration. This program implementation team member during the interview expressed that this topic was one they had given much thought to and compared this standard duration with previous trainings that had occurred in Lesotho for village health workers which was 5 days. From what the team member had gathered, financial costs were the restricting factor to continuing a 5-day training. If resource were not a problem, the team member believed that the 5-day duration training would be a better fit, especially considering the differing levels of education within the nursing profession and level that PSBHN operates as it involves an aspect of research, monitoring and

evaluation, which requires more time for nurses who are not conversant with research to catch up. This implementation team member however also noted that the MOH has influence in the number of days trainings can be done — since nurses had to forego their clinical duties for trainings and this puts limitation on the number of days they can be out, especially in regions with very limited access to healthcare workers.

“There are things that I would change in terms of the days that we have to hold trainings. We had two and a half days in conducting those trainings. But it's a lot. PSBN, it's kind of a research, kind of a project that one needs to develop. And with the level of education of nurses, because some hold certificates, some are diplomas, some are degrees, and even the kind of programs that they did, there are only a few that did research. So you had to start on the ground before they could understand. So I think if it was not because of the financial aspects of it, I would stretch out throughout five days, which I think would be possible for them in terms of understanding...I think the main factor is finances...Also, there are some competing activities where the Minister of Health would say that at least the workshop should be three days... But when we compared it to the previous PSBH, I wasn't there when it first rolled out, but it was five days. Because they were training the village health workers who basically did not have any particular qualifications.”

We now present the findings from the interviews with the trained nurses that aimed to learn about their experiences with PSBHN.

5.5.2 IDIs WITH TRAINED NURSES

There were a total of 41 interview requests sent, with 19 responses received. Out of the 19 interviews conducted, there were 2 that could not be used due to technical difficulties from the recorded audio, making 17 transcripts available for analysis. Table 5.4 summarizes the data collection distribution of interviewed nurses by district and sex:

Table 5.4 Distribution of Interviewed Nurses from PSBHN Training by District and Sex

District	Number of interviews conducted from sample of nurses trained	Total number of nurses trained who disclosed district
Thaba-Tsaka (PRY)	4 (2 unused data) ⁸ 2 females	12 7 females, 5 males
Qacha-Nek (QAC)	8 6 females, 2 males	32 19 females, 13 males
Mafetang/Quthing (MQ)	7 6 females, 1 male	35 31 females, 4 males

The major themes that emerged under the experiences of trained nurses were: 1) the types of projects they had chosen; 2) project implementation strategies; 3) enablers that made it easier for them to implement their projects; 4) challenges faced while implementing the projects 5) sustainability and 6) recommendations for improvement of PSBHN. Other experiences expressed by nurses in terms of benefits and improvement in their problem-solving skills they experienced from the training are described in chapter 4.

5.5.2.1 Types of projects chosen

There was a diverse set of project topics that participants identified as problems within their workplace needing attention. These included topics in infectious diseases like poor identification of presumptive cases of Tuberculosis, nonadherence of HIV infected youth to Highly Active Antiretroviral Therapy (HAART), and nonadherence of pregnant women to HIV pre-exposure prophylaxis. In terms of maternal and child health, some topics included malnutrition in children under 5 years old, high number of home birth deliveries and understanding the high number of unsafe termination of pregnancies. Projects that targeted noncommunicable diseases included management of uncontrolled

⁸ Unused data due to technical difficulties with recorded audio

hypertension, addressing low rates of cervical cancer screening, and reducing post-operative blindness.

Most participants stated that their motivation to undertake their projects were influenced by the high morbidity and mortality rates they had observed in those specific subject areas.

Two participants described their motivations as such:

“What initially made me interested in this particular [project] was that so many patients keep coming, and they are misdiagnosed as cough because intensive case finding, like taking sputum were not done. So, you’ll find that a patient, when you review the patient’s records, the patient has been coming here at least five times this year. But now in November is when we are taking action to identify and look at other causes... And the last minute that we are trying to do other tests like check TB, check other things that can cause cough, you find that we end up losing the patient because we didn’t test those patients early in time. And the other reason is that TB, Lesotho is ranked number three in the world with people who are killed by TB.” #MQ2

“I was interested in this project because I have realized that we have increased maternal mortality and other complication that arises while the pregnant women deliver at home. So, it is very important for us to make them know or have the knowledge about the importance of delivering at the facility to avoid those complications and maternal death.” #MQ3

“The major reason [for selecting this topic] was the rate of cervical cancer in Lesotho at large, the mortality rate and the morbidity rate as well as the rate at which it was screened at the health center. Our screening rate was very low, so I thought maybe I should prioritize it because it was the only indicator where we were performing badly.” #QAC10

On the other hand, not all nurses chose topics based on the need from their district health facilities. Some trained nurses expressed a struggle in selecting a topic for their projects because they were unaware of the content and expectations of PSBHN prior to attendance. They chose a topic by themselves at the workshop that had to be changed later because after returning to their facility, they realized there was a more pressing issue

to be tackled than what they had initially selected and worked on:

“... it's a team right, the clinic is a team. Maybe the problem that I may write in the workshop has a less impact on the community or the clinic itself. So if the person who is going to the workshop already has a problem that is discussed with the clinic at large, I think we could have come up with the better problem. Because for example, we only knew what we were going to do when we reached the workshop. If I already discussed with the team here at the clinic, we have a problem here. Which one do you think we should choose? At least we could have talked about it, discussed it. I had to start the project when I came here because my first project was talking about the women who are delivering at home. Then the team made me aware that the percentage of women who are delivering at home is less as compared to these people who are not adhering [to anti-retroviral drugs]”, #MQ1

5.5.2.2 Implementation Strategies

All strategies developed by trained nurses to solve the problem they identified involved either education to the patients (or their families/communities), refresher courses to their fellow nurses, or both. Trained nurses stated one of the contributing factors to morbidity/mortality in their chosen topic was knowledge/skill deficit among their colleagues and chose refresher trainings as a medium to remind their colleagues of what to do to help improve health indicators in their facilities. They also expressed the need to educate their patients, families and/or community to make them aware of ways to improve their health in those health conditions. For example, one participant from Qacha said:

“I'm going to do the health education to nurses on malnutrition or proper nutrition. And then I'm going to do the training of nurses on how to do nutritional assessment for all under five children, including all its parameters because there are some who do not know what to improve in a nutritional assessment. And then the other thing is all admitted under five children, either admitted with malnutrition or not, the nutritional assessment; I'm going to emphasize the importance of a nutritional

assessment for all those children, even if they're not admitted with malnutrition related case.” #QAC3

Another participant also expressed similar sentiments with respect to refresher training for their colleagues, saying:

“Well one other strategy was that we as the healthcare personnel at this facility, need to remind ourselves on how we can eliminate the transmission of HIV from mother to child. That is health monthly meetings to review our knowledge and our progress on the project.” #MQ7

In terms of educating the patients, families or community, participants used different approaches that they deemed relevant to their setting. For example, some participants chose educating patients on a personal level, some chose community level education, and others chose environmental level. These were said by the participants as follows:

“I provided health education to pregnant ladies and involved their partners. I also told the pregnant mothers that they can come to the shelters, they can come with their guardian or whoever they want to come with.” #MQ6

“I have already implemented, I have met with the nutritionist, so that during her outreaches she teaches villagers, and involves all the community stakeholders, the chiefs, the village healthcare workers, the counselors. During those outreaches, she's already continuing with that education. Then even as in the hospital for all admitted children, we include the nutrition health education.” #QAC3

“Some of the strategies; we have enrolled into going to the local radio station to have a program there to talk with the women to have their views on why they opt for unsafe termination of pregnancy.... Also, we are holding the gatherings...we have many institutions, the colleges. So we go there to talk with the adolescents there.” #PRY2

5.5.2.3 Project enablers

Participants expressed several different factors that helped facilitate the implementation of their chosen projects. Themes that were recurrent in terms of such

facilitators included support from coworkers, personal drive, and stakeholder support.

Coworker support

Some nurses emphasized that the buy-in by their coworkers and collaboration with them to implement their projects was instrumental in achieving success. Some participants had their coworkers provide guidance when bottlenecks were met, and other coworkers continued to implement the project even in their absence. One nurse stated:

“It (referring to an enabler) was the support from my coworkers because even though I was not at work every day, Monday to Friday, when I was not there, they were able to partake and continue with the activities.”
#MQ4

Another reiterated,

“What has helped me is communicating my frustrations to my colleague. Due to teamwork that we have at the place where we work, they will come up with a possible solution.” #MQ2

Personal Drive

Whereas some nurses felt teamwork was what made undertaking their projects easier, others mentioned their own personal drive as what they would ultimately rely on to push their projects forward. One participant whose project was aimed at improving nursing documentation said,

“I think my personality helped me do most of the things because most of the work here is I [unintelligible] for the interview of the patients when they were discharged from the hospital, I would go and ask the nurses, can you please tell me if there's any patient who is being discharged? So I go there with the forms, the patients fill the forms, I take back the forms.”
#QAC6

This interviewed nurse believed that had it not been for their own personal motivation, another person in their shoes may not have achieved the level of

success they did, if the other were unmotivated.

Stakeholder support

Stakeholder support was the third major recurring theme that emerged among the trained nurses as an enabler. Stakeholders that were captured in the interviews included the LeBoHA (implementation) team, nurses' work managers and District Health Management Teams (DHMT). Some interviewed nurses pointed out how the mentorship and timely response to questions by the LeBoHA team helped provide guidance and self-confidence in continuing their projects. Two trained nurses, one from Qacha district, and the other from the Mafetang/Quthing training session expressed this, respectively, as follows:

“With the help of the facilitators, it made it easier because they were always available. Whenever I had a problem, I know I will hit them a text anytime and I'll get a very quick response. The guidance was one of the very important things that made it easier for me to implement the project because like you know, we already have other duties at work. So, it was never too easy. But the support; I can say it really helped me to end up going for this project and implement it until the final stage.” #QAC7

“The mentorship I get from the project coordinator made it easy for me because if I encounter a problem I normally communicate [that] there's this problem, I don't know. There will be times that you feel like maybe this is a hard project, maybe I have to start another project. But if I communicate my challenges with my mentor that we met at the workshop, the LeBoHA people, after discussing the problem, I'll find out that no, this problem is not as huge as I think it is. If I break it down into pieces, yes this can be achievable. I have not reached that point where I can say no this is not doable.” #MQ2

After receiving training, nurses returned to their various facilities, reporting to their superiors their experiences and selected projects for approval to implement. Support from such nurse managers was found to be helpful in the smooth initiation and

implementation of the projects. Some nurse managers also joined the implementation efforts while providing encouragement. MQ3 stated this clearly that,

“My nurse in charge has helped me to continue this project because she was supporting me in any way. She was always asking ‘how is the project doing? How many deliveries do we have this month?’, and that made me realize that this person is caring... because I was not doing it alone in terms of the health education. She was also being a part of giving health education during the health education session... It was not only done by myself.”

A handful of trained nurses in the interviews mentioned that the support from DHMT, mainly surrounding direction of choosing a topic or reminders to start a project served as an enabler. One nurse, however, noted that the DHMT contributed more in terms of transport. This nurse stated they were allowed to join the DHMT outreach transport to their shared location where the former was able to provide an outreach to the target population of their project.

“... sometimes we have the car from the DHMT. It's true, it's not coming every time, but I think when it comes, I can use that opportunity, or they can use that opportunity to go for outreaches because that specific car is for outreaches. So, when we are having that outreach, I can say we can use that opportunity to do public gathering on the same day with the outreach.” #MQ3

5.5.2.4 Project challenges

Some factors that served as enablers also served as challenges when they were lacking for some participants. This included lack of stakeholder and coworker support, lack of resource, competing interests, and time with the last two tending to somewhat overlap occasionally.

Lack of stakeholder and coworker support

The main support that nurses felt was lacking was that of their managers, coworkers

and the DHMT. Some nurses were not able to initiate their projects because they had not been given the go ahead by their superiors at work, a pre-requisite for projects to officially start. Trained nurses were to report their experience to their superiors and have their blessing so projects could begin. One nurse, being a nurse manager herself, could not initiate her project because she still needed her hospital manager's approval:

"I haven't started yet, but I have written that project. I sent it to the focal person to review where I'm still following the steps that we have been trained about, so that I can send it to hospital nursing manager. So by the time I was sending it, he said 'I have a lot on my table so wait'. He kept postponing me. So because at the health center there are so many things that I as the manager have to do, I kept it that way, waiting for the answer from the nursing manager." #PRY1

Other nurses felt their coworkers did not want to claim ownership of the projects because they had not received the training themselves. For this reason, the coworkers felt that they were not affected by the training. A nurse manager passionately expressed having a tough time trying to indulge her colleagues in her project implementation efforts by saying:

"With the projects, I don't know how. I feel like if people were not involved in the training, even when you come from the workshop, give them feedback and start to tell them there is a new project we are going to do, the project starts with this and that, they don't feel like they are part of that. They feel like I'm the only one who can do that. They don't want, they're not interested.... the supporting staff, the other staff feel like no, if that was given to a manager who am I to do that." #MQ2

Speaking of the DHMT, most trained nurses stated they did not reach out to the DHMT for support. Some, because they believed their projects were facility based and did not think to involve DHMT while other nurses who were in communication with the DHMT stated the DHMT did not have any impact on

their projects. In retrospect, some nurses believed the DHMT involvement could have helped them make good strides towards a more successful project implementation. Trained nurses believed that if the community members had seen the DHMT actively involved in the projects, it would have offered more legitimacy to their educational messaging and material to the public.

“I think the support from DHMT would also be helpful, especially in that challenge of transport. I think if they would have come, I would be so supported. But they didn't. The Nme from DHMT once said that they will come and see how my project is doing, but I did not see them even once.... I think they should be involved in some public gatherings because the community, when you work with some people seeing you every day or your face every day and talking to them about the same thing, sometimes they don't take it seriously. But when they see someone from DHMT speaking another language, I think they will be motivated and see that this is very important. Because now they always see me, they can see me at the facility, they see me at the community. They know that, oh, [name] is going to talk about home deliveries, we already know. But when they see someone from the DHMT is talking about the same thing, I think they will see that this is very important.” #MQ3

Lack of resources

Lack of resources like monetary funds and transport to convey nurses to the workshop was also one that nurses identified as a challenge. Not having sufficient funding made it difficult for some nurses to incentivize the community or their coworkers to support their projects. It also hampered access of some nurses to their target population for project implementation, for instance, acquisition of airtime for phone calls. As most participants had community education as part of their implementation strategy, lack of transportation also dealt a major blow to their project success. One nurse whose project was to increase adherence of antiretroviral therapy among children transitioning to teenage age said,

“I think the only limitation that really kicked me out was I wanted to get assistance from other associations in terms of funds. Like the plan was when the project transpires, there are times when you are going to need parents to come watch their children. So, I needed to have funds to sponsor the activities like food, packages, or transport as well, so that parents could understand that they have not just come out for nothing”, #MQ5

Another nurse who was working on reducing home deliveries of babies said that,

“The challenges that I was experiencing during this project is that I didn't reach. The plan that I had while I was at the workshop is that I would do the public gatherings monthly. But there was no transport for doing the public gatherings. And then another challenge is that these ladies, when you ask them why they delivered at home, some of them said it is far from their homes to come to facility. They have a transport problem... Some of them, when they called that toll free number [number provided for free transport for delivery at a health facility], they said it's not easy for them to go and collect them.” #MQ3

Competing Interests and lack of time

Some trained nurses cited their busy schedules and limited number of personnel at their workplace as a major challenge, making it difficult to find time to work on their projects as they had to juggle caring for the large number of patients per day, their families, and their PSBHN projects, making prioritization an issue. Vaccination campaigns were also cited as a competing interest. The PSBHN training and projects to be implemented were occurring in the heat of the COVID 19 pandemic, such that priority was given to vaccination against COVID at expense of their personal projects. The quotes below capture the issue of time and competing interests whose sources are nurses from all the districts trained. This shows the ubiquitous nature of this problem as it was experienced by nurses from all districts.

“The problem is time.... because here the facility, there is a lot to be done. Seeing patients, consultation of the patients, documentation of their

information either on hard copy and soft copies in the computer and in the registers. So, all that stuff consume time. When I come back from work, family things that I have to do. But I think I can still squeeze everything in with time. As with time I can still squeeze everything.” #PRY1

“The other challenge is the workload...this workload interferes with some of the implementations of the project. Let's say I have a plan of health education with a parent or caregivers of admitted children. And then as I arrive in the morning, there are too many patients. In that case I have to prioritize [between] health education or attend to the patients. In my case, the patient is going to be the priority, then health education may come late. So if I continue with that, I might postpone the health education until some of the patients are discharged. So I have missed them.” #QAC3

“I haven't done the monthly data review because there was a time where there were vaccination campaigns. October there was a vaccination campaign and June and November. So during campaigns, the data that I set for monthly review, you'll find that people are out at the community offering vaccinations. So you'll find that at a clinic there are only few people so the meeting cannot be productive the way I wanted it to be.” #MQ2

“I didn't manage to do the onsite training for nurses only because of our busy schedules and we were in the midst of doing immunization campaigns, so most of the nurses were not there.” #MQ4

5.5.2.5 Sustainability of projects

Most nurses described a willingness to initiate their projects, with some considering how incorporate their project implementation plans into the daily activities at work, owing to the success they achieved in health indicators after completing their project. Others, despite not completed their projects, still expressed the importance of using the PSBHN method long term not only in the field of their projects, but all problem areas going forward. Below are quotes reflecting this point:

“I had a lot of things on my mind. And that's to an extent that I see that this project, if it can be implemented, if it can impact, if it can be adopted,

so that even if I'm not around, it can still continue. That's what I really need. And most importantly, I'm not willing to stop because problems arise each and every day. It's just that now I'm working with this one. Once I see that it's okay, then I'll work on other projects because this is very, very important. I have learned a lot of things in this workshop. It was one of its kind.” #QAC7

“I think what I could have done is to assign someone in the cervical cancer screening department. Before then, there was not a specific person assigned to do the cervical cancer screening. But as we speak at the monthly stage, we do have someone assigned to do that. So, no one felt obliged to go through cervical cancer screening.... we have already reached the target and we are way beyond the target. So the project is still going well, even after we reached the target. That's why we are still [unclear] the campaign, the Cervical Cancer screening campaign in the next two weeks.” #QAC10

5.5.2.6 Recommendations for improvement

Though a small number of nurses stated the PSBH training should be kept as is and had no recommendations for improvement, a good number of them had some suggestions for future changes that they believed would lead to better successful outcomes. These recommendations encompassed the duration of the PSBHN training period, selection criterion for which nurses to receive PSBHN training, the number of nurses receiving training at a time, and provision of motivation to participants to encourage better participation and completion of projects developed.

Training Duration

The most popular recommendation given was the extension of the duration of training. Nurses acknowledged that the 2 and a half days (most nurses referred to this as 3 days) was not enough to understand and be prepared for the implementation of their projects. Some nurses said that their lack of research skills, being away from school for some years, and the loaded curriculum of PSBHN demand more time for proper

understanding of the PSBHN concepts. Proposed duration of training as favored by some nurses ranged from four days to two weeks. Table 5.5 showcases some quotes to reflect this:

Table 5.5 Nurse Participants' Quotes about short duration of Training Sessions

Quotes	Source
"I remember we were trained for only three days, and we had to do almost everything under pressure. And the workshop was very important itself, such that it needed more time for training so that we could deeply understand everything that we were trained on. So, I found three days very short for such a training".	MQ7
"I think the duration of the training. It was for three days only because people didn't come there with the mentality of a project. On the second day, it was then that they were understanding the meaning of problem-solving projects. So, if they could extend the timing for a week so that everyone understands, then when we come back to our colleagues, we can still be able to let them understand the information, help them to [do the] projects. It depends on our understanding. Our level of understanding is different. So, the longer period of training can improve our level of understanding".	PRY1
"The timing for the workshop was really short. I think we went there for three days, but I think we needed more time. Four to five days, I think, or a week. Other than that, it was perfect".	QAC10
"I think I can point out the time that was allocated, it was short, whereas the content was big. So, some of us had to go the extra mile to seek understanding from those who had already been trained by LeBoHA before. Meaning we didn't have much time to understand whatever was said there".	QAC5
"One could find just some more days because the information is just too much. So, I think if maybe it can take two weeks. I really think that one can be important".	QAC7

Selection criteria for nurse participants

Another suggestion that came through the interviews was the selection criteria used to pick nurses who came for training from the various districts. Some nurses stated that choosing people with some interest in research may likely lead to better outcomes as they would be more inclined to implement their projects unlike most of the actual attendees who had little interest in research. Another nurse also agreed with the DHMT selection criteria for only nurse managers in her district rather than junior nurses as a better approach because they (i.e., the nurse managers) would have a better understanding of the

concepts thought and would also have more authority over initiating the projects. Below are some statements from participants expressing these thoughts.

“Yes, because in my district, the DHMT insisted that to the workshop they want to send only managers because they have realized that if they don't send managers, other people don't feel the ownership of the project, because at the end of the day, if I send a junior nurse, the DHMT will still call me. Ask me how is the junior nurse still implementing? So, they say to cut that behavior, they have to send the managers themselves. Because the managers have a better understanding that this has to be done.” #MQ2

“The only thing that I wish could have been done differently, could have been when they distributed the workshop to the MOH/DHMT. They could have asked for people who really love projects, or research. Because sometimes yes, when you call any person to come in, they may not even be computer literates. Much of this work that we are doing has much to do with literacy of computers. So, if the next approach would be in those lines, then I want to believe the facility could for a moment sit down, which people, who do you think is the right candidate with that? So they could now know, we can appoint a certain individual to go on our behalf.” #MQ5

“It's true that we hate research, but there are some people who are very interested in researching. So I think if we tell them that there's going to be research, so one will volunteer saying, 'I'll go to that kind of a workshop'.” #MQ6

Participant Number

Some nurses thought there were too many nurse participants at the training, compared to the number of facilitators. This was believed to have led to a less efficient use of time at the training sessions adversely affecting understanding the concepts. With a few facilitators and more participants, there was a high number of smaller groups during teamwork activities. As a result, there were long wait times for facilitators to moderate group discussions and address group concerns or questions. Interviewed nurses therefore recommended a smaller class size, to permit more time with the facilitators for better

learning outcomes, as opposed to their experience of having about six/seven groups of eight participants and only three facilitators. One nurse said,

“They have to be not only three people, not only three people who are training us because we are many. They have to be more, so that they can try to be everywhere in those groups. Because they were only three, when they are on this group, the other group may need something, or that thing of not being adequate. For example, like nurse patient ratio, something like that. [Unclear] there for everyone so that we can understand because our mentality of understanding and level of understanding is different. People don't really understand very quickly. Especially if you are one of those [who] stopped attending school or last went to school five years or ten or more years prior. So, when she or he is taken back to school, you have to have time and to understand everything to try to [unclear] the mind”. #PRY1

Another nurse expressed the same sentiments, but this time blamed the combination of nurses from two districts for one training as the cause for the high number of trainees at a time. This refers to the training for nurses from Mafetang and Quthing districts which was merged as one training session.

“And also, yes, with a limited number of facilities. We were many facilities there.... two districts with many facilities each, three days with each facility having to present its proposal ...So that was too many activities in a short period of time. I remember one day we even had to knock off later than usual. So, with that, I think next time we should reduce the number of facilities, and the number of districts, maybe each district have its own training.” #MQ7

Motivation

Due to limitations in financial funding and logistic difficulties, follow up of trained nurses was done by only the program officer of LeBoHA every Friday throughout the study period. Some interviewed nurses recommended improving motivation for trained nurses to be more enthusiastic about the implementation and PSBHN in general via in person follow up from the implementation team. Another suggestion made in terms of

motivation was to receive certification or accreditation after project completion, to serve as an incentive for nurses to complete their projects.

“I think one of the things that can be maintained is that they [implementation team] should visit our facilities and see each one of the facilities, what project they have, and perform follow ups on the project that they have in the facility...I think, you know when we are being visited by [program officer] they can see how our project is doing and where our challenge is. I think that one can be very helpful.” #MQ3

“...Any part of any form of incentive because we know we are not all the same, that we get motivated by seeing that this is good, and this can help go far, but other forms of motivation and incentives. They can really trigger or help one too. As much as he is doing his daily job, it can also go for PSBH...first, certification, accreditation after this because we worked very hard when [unclear] reviewing some materials about stress and burn out management. So if you're not even accredited, really to others it might seem like it's a waste of time. Let me put it that way.” #QAC7

5.6 DISCUSSION

5.6.1 Summary

This chapter delved extensively into experiences of trained nurses and implementers in a one-year training of PSBHN in Lesotho. Nurses chose a varied number of topics ranging from infectious diseases to noncommunicable diseases, targeting both children and adults of all ages that they believed were problems at their workplace. Participants were motivated to choose their projects based on the high morbidity and/or mortality they experience in those fields at work. Most of the projects involved nurses providing health education directly to patients and their families, and to the community at large including chiefs, village health workers and community stakeholders through outreaches and the media. Refresher courses to fellow nurses at the workplace were also

used as an implementation strategy due to lack of knowledge/skill in performing tasks needed to solve the identified problems. Trained nurses and project implementation team members both discussed facilitators and challenges they encountered with PSBHN, sustainability steps and recommendations for improvements of PSBHN. Both groups identified coworkers, some stakeholders like MOH and nurse managers as facilitators. Factors that were identified as barriers by both groups were lack of some stakeholder and coworker support, lack of resource in terms of transport and monetary funds and competing interests like busy work schedules and Covid 19 vaccination campaigns. Participants acknowledged the need for measures to make PSBHN sustainable through stakeholder engagement and decentralization of PSBHN activities to DHMT and MOH as well as adoption of the methods in their daily activities. Other recommendations to improve the PSBHN training were extension of the training period, choosing nurse managers or allowing nurses who are interested in research to volunteer for participation, limiting the number of participants per workshop, and in person follow up of trained nurses to serve as motivation. Other suggestions were for nurses to be informed ahead of time what the content of PSBHN is, so they can be prepared with a project beforehand through involvement with their colleagues from their facilities.

5.6.2 Project topics and implementation

The topics chosen by participants relate to key health challenges in the country and the region at large. For example about 33% of under 5 children in Lesotho are stunted, with the country losing 7.13% of their GDP to chronic malnutrition.²⁰⁵ In a publication by Kopo et al., it was noted that about 2.1 million people from 15 to 24 years

of age were living with HIV in Southern and Eastern Africa.²⁰⁶ It further mentions the poor rates of viral suppression among this age group when compared to adults, as well as higher risk of dying and being lost from care.²⁰⁶ Hence choosing projects that tackle these conditions supports initiatives to improve poor health care indicators.

The different population levels that trained nurses chose for health education highlights the importance of tackling all the stages of the socio-ecologic model for disease prevention, acknowledging that health is affected by not only the individual and their choices, but has an interaction with their families, communities, physical, social and political environments.²⁰⁷

Refresher courses to update medical knowledge of nurses is already a requirement by the Lesotho Nursing Council. In October 2012, this council launched a Continuing Professional Development Program (CPD) which states all “Nurses, midwives and nursing assistants recognized by the Lesotho Nursing Council will be expected to obtain a minimum of 12 CPD points each year prior to renewing their practicing license”.^{208,209} Per trained nurses’ experience, their fellow nurses still needed some refresher trainings despite the CPD requirements. This suggests the CPD requirement alone is not enough. There is therefore a need to take an extra step in providing ongoing refresher courses for nurses within each department at their respective health facilities to keep all nurses up to date with current guidelines and management recommendations.

5.6.3 Enablers and Challenges

The importance of learning about the experiences of both trained nurses while implementing their projects and the project implementation team members is to identify

areas for improvement or encouragement to increase the number of successful projects, to reduce disease burden in the country. Our findings for enablers and challenges are similar to that of other studies that also found strong clinical leadership and coworker support as enablers, and the lack of ownership by coworkers as a barrier.^{210,211} Likewise, Gustafson et al. (2003) reported that the commitment, involvement and accountability of leadership was key to successful implementation.²¹² Such leadership support as stated by Kanter can be garnered if leadership is continually kept involved and informed about the project.²¹³ In PSBHN, the relevant stakeholders were informed about the projects by the implementation team. However strong competing interests with COVID vaccinations was a viable contender. Competing interests on the part of participants with their busy schedules found in our study was also seen in another study, which identified some unintended negative effects such added projects have on trainees such as perceived increased workload.²¹⁴

The lack of resources like monetary funds and transport to convey nurses to the workshop was also an important challenge to both nurses and project implementation team members. Similar findings were seen in other studies; In a study that occurred in Mali in 2017 which discussed how final year nursing students are placed in a mandatory health facility in a rural area, the authors found that health facilities that students were placed were usually ones that were easy to reach, putting ones further away at a disadvantage.²¹⁵ Another study by Gumede et al. published in 2021 about the perceptions of students, graduates and managers on the engagement of future healthcare professionals in rural Sub-Saharan Africa found that long distance and poor transport inhibited their

reach to rural areas.²¹⁶ In 2021, an estimated 70.5% of all Basothos lived in rural areas putting them at disadvantage in terms of access to quality health care.²¹⁷ This places emphasis on the need for monetary support and transport to reach people living in such areas.

One systematic literature review on the effectiveness of continuous quality improvement for developing professionals found that when participants knew ahead of time that they would discuss implementation of improvement initiatives, it led to a statistically significant improvement of at least half of the clinical process outcome.²¹⁸ Based on this, a needs assessment by the yet to be trained nurse done with their superiors and coworkers at their respective health facilities to identify topics of grave concern at the facility prior to attending the workshop can facilitate the support of their superiors, and a sense of project ownership by coworkers, leading to easier buy-in and support during implementation of the projects after PSBHN training and shorter wait times for project approvals by superiors.

5.6.4 Sustainability

To improve sustainability of the project, stakeholder engagement with key stakeholders like the MOH, DHMT, Lesotho Nursing Council, hospital administrators and nurse managers are essential. Our study highlights decentralization as one of the answers to sustainability of PSBHN. However, Cabral in a publication on decentralization pointed out that decentralization in Africa has generally not made an impact in service delivery and has consisted “mostly of de-concentration of administrative functions, rather than true devolution of powers” where ‘de-concentration’

is described as “mere relocation of execution to the local level with decision-making power remaining at the centre”.²¹⁹ Cabral recommended more structural transformation for a chance at success in decentralization efforts.²¹⁹ A systematic literature review in 2016 which aimed at studying how implemented health interventions in Sub Saharan Africa are sustained reported community ownership and mobilization before and after the intervention as crucial in facilitating sustainability.²²⁰ For future PSBHN, engagement of the key stakeholders at all levels of intervention, from preparation through evaluation processes should help sustain the program.

5.6.5 Recommendations for improvement

To improve future trainings, prolonging the duration of the workshop from two and a half days to at least four days to two weeks was suggested. Our study took place on some occasions from 8am to beyond 5pm as stated by one trained nurse. Chang et al. in a feeding skills training for nursing assistants had training for two consecutive days, with a three-hour in-service training and one-hour hands on, each teaching session lasting 1.5 hours and had statistically significant desirable outcomes.²²¹ Hill et al. found that 1–3 hour, and 4–8 hour training sessions were found to be more beneficial in training than longer sessions.²¹⁸ There are limited studies on the recommended length of workshops for utmost effectiveness of outcomes. One Op-Ed however suggested tailoring the workshop design and length to the setting.²²² We recommend a trial of training for a average of 5 days in the future to establish scientific results on its cost-effectiveness outcomes. This however needs the approval of the MOH to release nurses and arrange for backup for

nurses at their facilities while they are away for training. Extending the number of days for training will also need more funding.

There were no set criteria used to select nurses for this training as the aim was to reach all nurses in the country. There was however a set of criteria that was used to select which nurses to be trained to serve as peer mentors which were as follows: The nurse must be one who a) Serves as a role model to others, b) Is an influencer, c) Is a member of a nursing association, d) Has renewed registration with the regulation body, and e) Has general good professional integrity. Qualifications for these criteria were determined by the nurse manager at the workplace, after receiving the request for these personnel from the nursing director. The author could not find any accepted set of criteria used to select participants to optimize reach and adoption. Given that participants were to choose a problem from the workplace within their power to solve, and some participants could not initiate their projects because they were waiting on their superiors to give the go ahead suggests to us most of the projects designed by participants were not within their immediate power. Nurse managers have more decision making authority, making it simpler to begin a project and allocate resources for its implementation.²²³ They are more likely to gain the support of upper management, they can provide mentorship to junior nurses and train the latter in PSBHN methodology, as well as easily gaining support from junior nurses to implement the project.²²³ Lasty, they also have the leadership and management skills to effectively implement the projects in a more efficient way.²²³ Training nurse managers rather than the general cohort of nurses may be more cost effective for the country. Other than nurse managers, nurses can be identified by the

criteria laid out above that was used to identify peer mentors, rather than targeting all nurses. The downside to this would be a violation of the essence of PSBHN, which is to empower all nurses in a bottom-up approach for problem solving to improve health challenges.

Lastly, incorporating PSBHN methodology into the nursing requirements for accreditation as suggested by some nurse participants can be an approach in which case trained nurses may be forced to implement their projects. Doing so may however have negative effects as found in a qualitative study published in 2020 that explored perceptions of health care providers about accreditation.²¹¹ This study found that such accreditations increases psychosocial risks during the process of getting the accreditation, i.e., “increased working hours, increased working pace, perceived time pressure, and conflicting information” affecting their health, health of families and that of their patients.²¹¹

5.7 CONCLUSION

Trained nurses and project implementation team members of PSBHN in Lesotho worked to address health problems to improve health indicators in the country. Implementation strategies mainly used by nurses were health education to patients and community and refresher courses to other nurses. Factors that served as enablers for both groups also served as challenges when they were lacking. Strong and continuous stakeholder engagement mainly with the MOH, DHMTs, Lesotho Nursing Council, hospital administrators and nurse managers prior to, during and after the training sessions can help improve outcomes and encourage sustainability of the PSBHN methodologies and projects developed by trained participants. A study to assess the cost effectiveness of

training nurse managers or selected group of nurses in the two and half days vs. all nurses of any rank in a 5-day workshop can be pursued in future studies while paying close attention to any unintended effects on the participants when given added responsibilities for project implementation. We recommend a needs assessment by nurses before they attend the PSBHN training program, so that all nurses and their managers are involved in the decision making for the problem topic, creating a sense of ownership and partnership among all workers in the facility to achieve a common goal. Finally, more resource is needed to reach all districts in the country, and engagement of the MOH for support in provision of resources, training, and supervision of trained nurses for better outcomes.

5.8 LIMITATIONS

One-on-one in-depth interviews tend to introduce social desirability biases.¹⁸⁵ To encourage openness, participants were assured of their confidentiality before the start of the interviews, no personal identifiers were collected during the interview and participants who did not want to be on video went off camera with no consequence to them. Interviews occurred 3–6 months after the training for nurses and 5–6 months after the last training for the project implementation team members which may have introduced recall bias.²²⁴ Open ended questions to provide more details about a topic, followed by probes for specific examples related to the topic were methods we used to limit recall bias. Incentives provided for participation for IDI with trained nurses were all solely airtime to cover costs of interviews. The small sample size of qualitative studies limits generalizability. To address this, maximum variation and purposive sampling were used to select participants for interviewing, to increase sample representativeness of the

population. Analysis of qualitative interviews has potential for bias due to preconceived ideas that may exist. To address this, a second reader coded 53% of the transcripts and disagreements for coding were discussed until an agreement was made. The same interview guide was used for all interviews to ensure consistency of questions asked. Lastly, the positions of the nurses interviewed were not known. Future research can address this limitation to help put more context and generate better understanding of the quotes.

CHAPTER SIX

COSTS OF IMPLEMENTATION OF PROBLEM SOLVING FOR BETTER HEALTH AMONG TRAINED NURSES IN LESOTHO WITH SCALE UP ESTIMATES TO TRAIN ALL NURSES FROM A LIMITED SOCIETAL PERSPECTIVE

Introduction

This section focuses on achieving objective 3, which is to estimate the financial and economic costs involved in implementing Problem Solving for Better Health in our project presented from a limited societal perspective. This entailed a consideration of all known costs, including the value of donated labor and/or items used project implementation. Additionally, this chapter endeavors to estimate the basic costs of scaling up the training program to all nurses in Lesotho. This includes considering the cost of two alternative scale up options for stakeholders.

Abstract

Background: This evaluation of the Problem Solving for Better Health program among nurses in Lesotho (PSBHN) was a prospective cohort study that used mixed methods for triangulation of data and found improvement in self efficacy in solving problems, though not statistically significant, design of various projects by trained nurses to reduce morbidity and mortality in Lesotho, as well as understanding of the experiences of trained nurses and project implementation team members with the program. The aim of this chapter was to estimate the costs to implementers of implementing this project, and to provide estimated cost projections for policy makers and other stakeholders to inform scale up of the project to all nurses in Lesotho.

Methods and results: We estimated the financial and economic costs of implementing PSBH from a limited societal perspective, and forecasted the costs involved in training all

nurses in Lesotho from 2024–2027, including conducting scenario-based sensitivity analyses. Microsoft Excel Version 16.76 was used for data analysis. Our best estimate for the projected 4-year estimated costs was presented as a ‘base case’. We also estimated the cost of two other alternatives, one less expensive that would use fewer resources, the ‘minimal case scenario’, and the other a more expensive model that represents an ‘ambitious case scenario’ with unlimited resources. Overall, the total estimated financial and economic costs of implementing PSBH were US\$36,413 and US\$41,784, respectively. The financial and economic costs of training one nurse was US\$409 and US\$469, respectively. For the 4-year projected basic cost of scale up, the present value in 2023 of our best estimate was US\$665,142 to train 811 nurses. The 2023 present values of the two other alternatives were as follows: the minimal case scenario was US\$222,428 to train 180 nurses, and the ambitious case scenario was US\$987,897 to train 811 nurses. The cost of our base case scenario represents only 0.4% of the 2023 Lesotho Government Health sector budget allocation to finance quality improvement programs.

Conclusion: Increased funding support from various stakeholders is needed to scale up training to all nurses in Lesotho. The cost to implement PSBHN to improve the health of Lesotho’s citizens is modest, compared to the costs of morbidity and mortality.

6.1 BACKGROUND

The neo-classical economic theories which emerged in the 1900s focusing on allocating limited productive resources efficiently, as well as economic growth in the long-term, recognizes the concentration of investment in cities and its trickle down benefits from urban industrial growth to improve rural poverty.^{1,2} However, for developing countries, this theory serves to validate actions that have led to the continuous widening of inequalities between urban and rural regions with more resources concentrated in the urban regions and those in rural ones found wanting.¹

There are only about 200 medical doctors in Lesotho, with a low doctor to population ratio of 3.3 per 1000 people in 2018.^{12,18,54} About 45% of established healthcare positions are unfilled, with loss of doctors to foreign countries by brain-drain and less than 25% of physicians being indigenes of Lesotho.²⁰ The nurse to population ratio is also low, at 0.5 per 1000 people in 2018.⁵⁴ Maseru, the capital of Lesotho, tends to have a majority of the healthcare resource allocation, leading to disproportionate and insufficient access to care in the other districts.¹⁸

Financial constraints also contribute to low resources available in the country. The economy of Lesotho has faced several problems especially in the aftermath of the COVID-19 pandemic.²³ Some reasons for this are infrastructural project delays, high fuel and food prices, layoffs, and an increased level of public expenditure obstructing the development of the private sector.²³ According to the IMF, in the fiscal year (FY) 2022/2023, inflation in Lesotho was 2 percentage points (8.4%) above that of the previous year and public debt, 59.8% of GDP in FY2022/2023 fiscal year which was a

2.8 percentage point increase from that of FY2019/2020.²³

Nonetheless, a 2017 review of Lesotho's health expenditures by the World Bank found that lack of finances within the health sector was not necessarily the only issue.¹⁸ Indeed, the underutilization of the monetary allocations to various health departments was a major problem.¹⁸ The government of Lesotho was noted to have increased its health financing by 12.3%, with an increase for example by 135% to the District Health Management Teams (DHMTs) who are responsible for financing primary care facilities, as part of the government's effort to decentralize health care delivery.¹⁸ However, the DHMTs on average used only about 80% of their budgets, with some only being able to use up to 65% of their budgets in a given year, which translated into poor health outcomes.¹³ This low budget absorption is as a result of long approval mechanisms, especially the time lags between when requests for health procurement are made from the MOH and when they are approved by the Department of Health Planning and Statistics.²⁴ Other causes were process bottle necks and poor interdepartmental communication.²⁴ This is what Smith et al., the first author of a key article and one of the pioneers of PSBH, meant when they said: "*Although the resources available for health are limited, those that exist are seldom fully utilized and are often wasted or misused*".^{3,225}

Even when substantial funds are spent to address certain diseases, with a frail and under-resourced health system, it is possible that little benefit will be reaped from those investments.²⁵ The government of Lesotho has, therefore, continued to collaborate with donors to decentralize care and strengthen their health care systems by improving their resources and encouraging full utilization of what is available. One of such collaborators

is an American Not-For-Profit Organization called the Dreyfus Health Foundation (DHF), established in 1988 to fund the Problem Solving for Better Health (PSBH) training of individuals across the world, empowering and challenging them to address social and health problems within their communities.²⁶ In resource constrained settings, such an initiative has been well received and been shown to substantially improve health indicators like reduction in HIV/AIDS prevalence in Lesotho, increase in the quality of life among people in communities, as well as reducing nurse burn out, increasing retention in the workforce, increasing professional confidence and improving critical skills in problem solving.^{21,27,29}

PSBH is a program designed to teach and motivate communities to make use of existing resources and develop solutions within the existing infrastructure for sustainability — one that areas with low resources like Lesotho can capitalize on.³ The program consists of a two and a half day training program of personnel aimed at empowering participants to identify and resolve challenges in their workplace. Participants are trained to identify the root causes and contributing factors of a problem that is within their daily work and challenged to develop solutions using a systematic method in a 5-step process to address the problem. They are empowered to initiate projects to tackle the problem, making use of all currently available resources to improve health, a ‘bottom up’ approach, rather than the “top-down” approach of depending solely on authority for change.²⁷ This methodology was used to train a sample of nurses in Lesotho (PSBHN). Evaluation of the implementation effectiveness was addressed in previous chapters 4 and 5.

In this study, we focus on the costing aspect of the PSBHN program from a limited societal perspective, which is described by Kim et al. as a perspective that takes into consideration not only the funder's perspective of costs, but also the participant's out of pocket costs for transport, and unpaid volunteer time.¹⁵⁷ In this limited societal perspective, we excluded the productivity loss and the time spent by participants to attend the workshop and implement their projects. We initially present the financial costs which show the actual cost to implement the program. We then present the economic costs, which encompasses the estimated value of the donated time and labor of project implementers. Thirdly, we present our best estimate of the cost to scale up PSBHN training to all nurses in a base case scenario for a 4-year project. Lastly, we used a scenario-based sensitivity analysis to present two other alternatives to stakeholders and policy makers.

6.2 METHODS

PSBHN was a prospective cohort study. From November 2021 to June 2022, three PSBHN training sessions were implemented for nurses from four districts in Lesotho: Mafetang, Qacha Nek, Thaba Tseka and Quthing. The overall project began in October 2021 with preparation activities and ended in December 2022 with a 6 month follow up period after each training. Training was provided by project implementation team members made up of the program officer, monitoring and evaluation officer, a nurse manager, financial director and assistant, peer mentor, and a local liaison who was present for one district training. Training occurred for two and a half days, during which trained nurses developed projects to solve problems they identified at their workplace.

After training, the nurses were tasked to implement the projects they developed and were followed up with six months after training by the program officer to provide guidance and encouragement for the trained nurses to complete their projects. Mixed methods were used to learn more about the implementation of the program which were presented in chapters four and five.

We estimated the costs to implement this PSBHN program for the nurses from a limited societal perspective. Such information can supplement other useful data related to the quality of the delivery of service, responsiveness of participants to the program, and other aspects of the program that contributed to its outcomes.²⁰⁴ Cost data may also be critical to important stakeholders like funders, Government of Lesotho, other evaluators and other policy makers in resource limited settings as they consider models for scale-up. To provide this information, this chapter addresses the following objectives: To estimate the implementation costs for the Problem Solving for Better Health Program training of nurses in Lesotho to inform future scale up to all nurses.

- a. What are the full costs of implementing the Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective?
- b. What is the cost per nurse trained of the Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective?
- c. What financial impact would scale up of the Problem Solving for Better health Program to all nurses have on the national budget in Lesotho?

6.2.1 Theoretical Framework

In this chapter, we made use of Implementation, and Maintenance from the RE-AIM theory to guide the evaluation objectives and the development of in-depth interview questions.¹⁴⁵ Table 6.1 shows how RE-AIM was used in our study objectives. For the development of the in-depth interviews, questions posed to nurses and project implementation team members for the costing analysis, respectively, were:

- a. Did you use any personal money in any aspects of receiving the training? If so, can you tell me what you spent?
- b. During the program organization and implementation, were there any donated labor and time, or any other donated items used? If so, can you tell me what they were?

Table 6.1 Evaluation Question indicators and sources for data collection for Objective 3

RE-AIM	Evaluation Question	Indicator	Data Source
Implementation	What are the full financial costs of implementing the Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective, with consideration for economic resources used where possible?	Amount of money spent, and value of labor and donated items used by program implementers to prepare, implement and for follow up PSBHN activities (not including evaluation activity costs)	-Administrative financial data on total costs covering PSBHN preparation, implementation, and follow-up costs within the study period -Transcripts from In-depth Interviews with program implementers and trained nurses
Implementation	What is the cost per nurse trained of the Problem Solving for Better Health Program for nurses in Lesotho from the perspective of the implementers?	Amount of money spent to cover the costs incurred to train one nurse	-Administrative financial data on total costs covering PSBHN preparation, implementation, and follow-up costs within the study period -Attendance sheet for number of nurses trained

Maintenance	What financial impact would scale up of the Problem Solving for Better health Program to all nurses have on the national budget in Lesotho?	Percentage of national budget that scale up of PSBHN to all untrained nurses will take	- Administrative financial data on PSBHN preparation, implementation, and follow-up costs -LeBoHA Director -Attendance sheet for number of nurses trained -Proposed budget for the Lesotho Ministry of Health activities
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6.2.2 Data Collection

The candidate prepared an Excel spreadsheet that outlined costs covering program and nurses' transportation to PSBHN workshops, communications, food, printing, shipping, accommodation, materials like pens, venue for workshops, and salaries of the project implementation team members. Costs were categorized by preparation vs. implementation. The LeBoHA finance director then provided the relevant costs, with reference to the spreadsheet. The cost data were entered into the spreadsheet directly by the finance director and finance director's assistant. Initial estimates were fine-tuned over time in communications between the DrPH candidate, financial director, financial director's assistant, program officer and the LeBoHA monitoring and evaluation officer. We also collected details on the time spent to implement PSBHN to enable estimation of the cost of personnel time.

One week was used to prepare for each two and a half day training session. Each training session took place over two and a half days (rounded to 3 days for costing purpose); the follow up period was 6 months after each training session. All costs were provided to the DrPH candidate in local currency, Loti (LSL). The estimated program costs covered the period from October 2021 to December 2022, during which time a total of 89 nurses were trained. Three trainings took place first in Thaba Tseka (Paray), and

then in Quthing. The third training included nurses from two districts (Mafetang and Quthing).

Financial costs

Personnel costs encompassed the salaries of the program officer, nurse manager, monitoring and evaluation officer, financial director, and financial director's assistant. Each salary month was estimated to be 22 days on average. The costs related to training included: the venue secured for the training per day; food provided at the training sessions, which varied per total number of attendees; transportation, which involved lump sums paid to nurses for their costs incurred to travel to the training premises, and back to their homes when training was over; and accommodation costs per day of training.

Additional direct costs were related to: printing and photocopying materials for the training; materials such as paper and pens; monthly internet fees; shipping and courier services (presented as a lump sum); monthly mobile phone airtime data for phone calls among implementation team members; and once-weekly follow up calls to trained nurses by the program officer. All costs, except for salaries, used an estimated 30 days per month when daily costs were estimated.

Economic Costs

To supplement the financial data, the IDIs asked about whether participants used any personal money, as well as donated labor and/or time in order to facilitate an estimate of economic costs, where possible. This is because an economic perspective seeks to estimate all the actual resources used in an activity, not only what is paid for directly.¹⁵⁸ Personnel who did not receive monetary reimbursements included a US based registered

nurse (RN) and a local liaison, both of whom helped with the preparation and implementation phases of the training that occurred in one district. We also included in the economic cost analysis the uncompensated time provided by a peer mentor who was present at training sessions. The estimated salaries of these volunteers were retrieved from the US Bureau for Labor Statistics for the US based RN, and from a local Lesotho website which estimates salaries of personnel per their positions.^{159,160}

Costs for scale up

Based on the cost of implementing the PSBHN study, cost projections were made to cover training for the nurses who remained to be trained in Lesotho. This was done in collaboration with the LeBoHA team (Table 6.2), who provided their best estimates of number of nurses per district in the country. A “base case” scenario is presented as our most reasonable and recommended estimate to scale up training to all nurses in Lesotho. In addition to the base case, we estimated two other alternatives, a “minimal case scenario”, whereby limited resources are utilized for scale up, and an “ambitious case scenario”, which presumes no limitations on resources. Table 6.2 shows the estimated number of nurses per district, trained in PSBHN and untrained, that were used in the cost projection for scale up. It estimates the total number of nurses by district, the numbers that were already trained, and the numbers that remain to be trained. This estimate was provided to the DrPH candidate by the LeBoHA team.

Table 6.2 Estimated number of nurses per district in Lesotho trained and untrained

Districts	Number of nurses	Number of nurses trained (with 4 missing data for districts and 6 nonresponses to study)	Number of nurses not yet trained in this project
Maseru	203	0	203
Butha-Buthe	63	0	63
Leribe	130	0	130
Berea	95	0	95
Mafeteng	80	21	59
Mohale's Hoek	78	0	78
Quthing	51	14	37
Qacha's Nek	68	32	36
Mokhotlong	49	0	49
Thaba-Tseka	83	12	71
TOTAL	900	89	811

6.2.3 Data Analysis

Financial data was organized and analyzed using Microsoft Excel Version 16.76.¹⁷⁴ We provide three analyses for a) financial costs, which were based on the costs that were incurred during the implementation of the PSBHN program, b) economic costs, which took into account all labor or time used in the implementation of PSBHN that were not covered monetarily, and c) projected economic costs, which cover estimated intervention costs for training the nurses who were not trained during the previous program. We used timeframes believed to be appropriate for the program, to guide policymakers with practical information beyond the costs incurred in our study alone. All costs were estimated in monthly increments in the local Maloti currency and converted to US dollars using a monthly exchange rate for that period.¹⁷⁶ After conversion, a US Inflation Calculator was applied to the total costs per month to estimate costs in real 2021

US dollars.¹⁷⁷ These annual costs were then discounted using an annual discount rate of 3% to estimate the present value of the total costs in 2021 US dollars.

Financial cost analysis:

These costs were based on all expenditures involved in implementing the project within the program time frame of 15 months (from October 2021 to December 2022), encompassing preparation period, training sessions, and follow up period. The costs were analyzed based on fixed and variable costs. Fixed costs included personnel salaries, costs for internet, phone calls, venue secured for the training, transportation, accommodation, and shipping/courier costs. The variable costs were printing and photocopying, materials provided to nurses like pens, and food provided at the training sessions, all of which varied by number of attendants. The financial cost per nurse trained was then estimated based on the total financial cost of intervention and total number of nurses trained.

Economic Cost analysis:

These costs included the financial costs discussed above, plus the estimated monetary value for volunteers who were involved in the program implementation, i.e., the US based registered nurse (RN), local liaison and peer mentor. The monetary value of their time was estimated and included in the overall costs.^{159,160} The economic cost per nurse trained was calculated using the total economic cost of intervention and total number of nurses trained.

Projected Economic Costs for Future Scale-Up:

In addition to the estimates of financial and economic cost of the actual intervention, we forecasted the basic costs to train all nurses who had not been reached by

our program (n= 811), table 6.2. We estimated the most reasonable cost projection, the base case, which we recommend as the most efficient one to scale up to the program to all nurses in Lesotho. We defined this case as our best estimate of quantities of inputs and costs, given available current information. It makes use of the current funders and assumes that training sessions will be a priority to the MOH with no interruptions in the scheduled dates.

For this analysis, we assumed a similar period for preparation and follow up events as that of our study, i.e., 7 days for preparation, and 6 months follow up period. Similar levels of personnel used in our PSBHN project were used in our projections, assuming no change in efficiency over time. However, the US RN volunteer was eliminated from our analysis and replaced by local personnel to foster sustainability and reduce costs. The costs of salaries for all personnel in our program were also accounted for in our cost projections (that is, we did not add further volunteers in the training above and beyond those used in the original program).

We also considered the possibility of an increase in the number of nurses in the workforce per year and those who leave the workforce for retirement, by choice or by death. In 2010, the number of nurses/1000 people in Lesotho was 0.7, rising to 3.3 in 2018.³ Assuming a steady growth of nurses per year, we estimated that the rate of growth of nurses per year using $\Delta y/\Delta x$, was 30%. Our best estimate of the percentage of nurses who retire each year was made by the LeBoHA team at 2%, with no clear percentage for the deceased and dropouts from resignations. We assumed an extra 1% rate of outgoing nurses per year to cover dropouts and deaths, which yielded a 3% rate for the total

percentage of nurses entering and leaving the workforce, hence creating an equilibrium with no extra adjustments to be made in the analysis.

We acknowledged that variable costs would be higher for districts like Qacha's Nek, Thaba Tseka, Mokhotlong and Quthing which are furthest away from the capital, mainly related to transportation costs. To estimate the costs for transportation to use for the projections, we used the average costs of transportation from the 2021–2022 PSBHN training for districts whose locations showed a wide range potential for higher costing districts farthest away, i.e., Qacha Nek, Thaba Tseka and Quthing. In doing so, we adjusted for the different transportation costs of different districts. Cost projections were made with estimated salary and goods inflation costs for each year in local Lesotho currency (Loti).

All costs were initially expressed in Lesotho currency (Loti), to which we applied an average Lesotho goods inflation rate over the last 5 years of 5.85% to estimate the salaries and other costs in our yearly projections.¹⁷⁸ The average rate in the last 5 years was calculated because of the wide variation in inflation over the years. The actual observed average percentage increase of nurses' salaries per time was 5% every 31 months, hence 1.94% per year.¹⁷⁹ We used the average goods inflation of 5.85% for our basic cost estimates. All annual nominal costs were converted to US dollars using an expected constant real exchange rate equal to the rate in 2023.¹⁷⁶ We then deflated the costs by expected US inflation and discounted annual values at 3% to estimate the 2023 PV in US dollars.

This approach centers on providing training for every nurse in Lesotho who has

not already received training in the 2021–2022 period. It provides training for 20 nurses per session as this number is based on the average number of people who were trained in 2021–2022. The duration of training days would be the same as that of our project, i.e., 2 and a half days (rounded to 3 days for presentation and budgetary purposes). For the training schedule, all nurses eligible for training in a district would be trained, before moving to the next district. This approach may help to reduce the burden of costs when it comes to the team travel and costs in setting up and preparations that are incurred for each different district training. Training would begin in the district furthest away from the capital and move to surrounding districts, reaching Maseru last; the sequence of training proposed is Mokhotlong first, followed by Butha-Buthe, then Leribe, Berea, Thaba Tseka, Qacha Nek, Quthing, Mohale’s Hoek, Mafetang, and Maseru, for equity.

Using Table 6.2 and estimating 20 nurses per training, the training duration for this scenario would be 47 months. For one training per month, there would be a total of 12 trainings per year, leading to a total study duration of 4 years (2024–2027). The specific changes made in this scenario from the original PSBHN intervention are the removal of the USA nurse volunteer and the increase of peer mentors from 1 to 3 (based on the local team’s experience, which found the peer mentors very useful). The number of local liaisons would be increased from 1 as noted in our program, to 3 people. The local liaison would be expected to support and learn alongside the LeBoHA program manager, including during the 6 month follow up period, as an investment towards sustainability for future trainings. For the base case scenario, we applied the goods inflation rate of 5.85% to that of salaries as well.

Sensitivity Analyses:

To allow for alternate options by decision makers, we performed scenario-based sensitivity analyses to provide two other alternatives for scale up: the minimal case and ambitious case scenarios.

- *Minimal Case Scenario:*

We defined this as the use of the least amount of resources with the least cost estimate projections. It assumes a scarcity of human and financial resources, with other more urgent national priorities, like the events that occurred during the 2021–2022 implementation where priorities were focused on containing and vaccinating citizens during the COVID 19 pandemic. With limited resources, the focus would be on training 30% of nurses per district in the districts that had no nurses trained in our PSBHN project. This percentage was based on the average percentage of nurses trained per district in 2021–2022, leaving six districts that had no nurses trained. The training duration would be the same as that of our PSBHN project, i.e., 3 days, and would have 4 training sessions per year. A total of 10 training sessions would be required to train the projected 30% of the districts left to be trained (i.e., 180 nurses). Training would begin from the district furthest away from Maseru because we seek to equip personnel with problem solving skills who have the least resources available, compared to that of the capital. The sequence of training would occur as follows: Mokhotlong, Butha-Buthe, Leribe, Berea, Mohale’s Hoek, Maseru. From the list of estimated nurses per district, and targeting roughly 20 nurses for each training session, we expect the training period to last 16 months. We project one training session in Mokhotlong, Butha-Buthe, and Mohle’s

Hoek, two each in Leribe and Berea, and 3 in Maseru. For 4 trainings per year to cover 16 months of training and follow up, the program period would be 4 years (2024–2027). The rate of salary increase per year used was the observed of 1.94%, and that for inflation of goods used was 5.85%.^{178,179} We proposed one district liaison and one peer mentor per training, just like there was in our PSBHN training. We also removed the USA RN volunteer and the finance assistant from the personnel. All other inputs remained the same as the training in 2021–2022.

- Ambitious Case Scenario:

This is defined as the scenario where there is appropriate and generous funding for training every single nurse in the country. In this scenario, the duration of training sessions would be 5 days, rather than 3 from previous trainings. This change is based on the IDI data from our study where we learned that many trained nurses and project implementers believed the duration of the training was too short, and suggested (on average) a duration of 5 days (chapter 5). In this scenario, we do not anticipate any roadblocks affecting the scheduling and or implementation of the trainings. We project to start training from the district furthest away from the capital, then move to surrounding districts after all nurses in a district is trained, Maseru being the last. The sequence of training proposed is Mokhotlong, Butha-Buthe, Leribe, Berea, Thaba Tseka, Qacha Nek, Quthing, Mohale’s Hoek, Mafetang, and Maseru. We propose this sequence because, as before, we seek to equip personnel with the least resources the fastest. As indicated by Table 6.2, the training would be provided to 20 nurses at each session, with training duration of 47 months, including follow up. With a training session occurring each

month, hence 12 trainings per year, the duration of the program is expected to be 4 years: 2024–2027. The changes made in terms of personnel are the removal of the USA RN volunteer, adding four district liaisons, four peer mentors and keeping intact all the local personnel from LeBoHA involved in 2021–2022. All other costs remain the same. We applied the goods inflation rate of 5.85% to increases in salaries as well.

Table 6.3 Assumptions made for Base, Minimal, and Ambitious case scenarios

Base Case	Minimal Case	Ambitious Case
<ul style="list-style-type: none"> • No US based Registered Nurse • Three peer mentors • Three district local liaisons • Occurrence of twelve training sessions per year • 20 nurses to be trained per each training session • Three-day training sessions • Training period is 4 years (2024–2027) • Personnel salaries and goods incorporate an inflation rate of 5.85% • All nurses in Lesotho would be trained by the end of the training period 	<ul style="list-style-type: none"> • No US based Registered Nurse • One peer mentor • One district local liaison • No financial director’s assistant • Occurrence of four training sessions per year • 20 nurses to be trained per each training session • Three-day training sessions • Training period is 4 years (2024–2027) • Personnel salaries expected inflation rate of 1.94% • Other goods incorporate an inflation rate of 5.85% • 30% of nurses per each district would be trained by the end of the study period 	<ul style="list-style-type: none"> • No US based Registered Nurse • Four peer mentors • Four district local liaisons • Occurrence of twelve training sessions per year • 20 nurses to be trained per each training session • Five-day training sessions • Training period 4 years (2024–2027) • Personnel salaries and goods incorporate an inflation rate of 5.85% • All nurses in Lesotho would be trained by the end of the study period

6.3 RESULTS

The total nominal financial cost for 2021 was US\$7,527 for October 2021 to December 2021 (three months coverage). The real US\$ cost for the entire year in 2022 was US\$27,123 (Table 6.4). Overall, the nominal financial cost for the whole training in 2021–2022 was US\$36,413. The financial cost per nurse trained was US\$409. In the line items in Table 6.5, we found that personnel salaries, venue, and food costs made up

majority of the expenditure. Salaries made up about 46% of the overall costs of implementation, followed by accommodation and food costs at about 24% each. Reflecting the relatively large initial investment in the training, fixed costs made up 76% of the overall costs.

The economic cost was US\$41,784, 15% more than the total financial cost, mainly due to the monetary value of the time from the US based RN volunteer that was incorporated into this part of the analysis. The value of this time accounted for 11% of the total economic costs (Table 6.5). Fixed costs again made up most of the costs, with variable costs making up only about 22% of the total economic costs. The economic cost per nurse trained was US\$469. For context, this overall economic cost would represent 0.02% of the Lesotho government budget allocation for the Health sector to finance programs for 2023 of ~US\$177million (LSL 3.2 billion) ^{162,226}

Regarding the projected 2024–2027 cost analyses, the cost in real 2023 US\$ cost of the base case scenario is US\$679,264 to train 811 nurses. The real 2023 US\$ costs for the minimal and ambitious case scenarios are US\$ 229,101 to train 180 nurses and US\$1,017,534 to train 811 nurses, respectively. For each scenario, personnel salaries formed about a third of the total costs, followed closely by food, and then accommodation costs (Table 6.6).

Table 6.4 FINANCIAL COSTS SUMMARY OF PSBHN INTERVENTION 2021–2022			
Parameters	2021	2022	
Total number of days for preparation	7	14	
Total number of days for training	3	6	
Total number of days for follow up	4	48	
Lesotho In country Costs (US\$)⁹			
Personnel Salaries			Comments
Preparation	3,535	7196	7 days for each workshop (3 workshops total) for all implementation personnel
Training	1431	2888	3 days per workshop (3 workshops total) for all implementation personnel
Monitoring	230	1556	Weekly checks by program manager (average 4 days per mon
Training sessions			
Transportation	0	853	Transport for all attendees, including travel to training venue
Accommodation	585	8220	Hotel expenses for all attendees on training days
Food	1474	7070	Food for all attendees on training days
Venue	139	389	Training site fees
Communication			
Internet	38	78	Used by program implementers
Mobile phone call credit	59	348	Used by program manager every Friday to follow up on trained nurses
Other Direct Costs			
Courier/Shipping	0	89	Local services
Photocopy/printing	35	192	Materials for nurse participants
Materials(pens)	2	9	For nurse participants
Total Nominal Costs	7,527	28,886	
Total costs: Real 2021 US\$¹⁰	7,527	27,123	
Present Value: 2021 US\$¹¹	33,860		

⁹ All costs in Lesotho currency (LSL) were converted to US\$ using average monthly exchange rates for corresponding years¹⁷⁶

¹⁰ Consumer Price Index (CPI) :6.5%²²⁷

¹¹ Discount Rate 3%

Table 6.5 Fixed and Variable Costs for PSBHN Training, 2021–2022 in US\$.

	Financial Costs 2021–2022		Economic Costs 2021–2022	
Fixed Costs	Costs	% of total	Costs	% of total
<i>Personnel Salaries</i>		46.3%		52.1%
Project manager	3,233	8.9%	3,233	7.7%
M&E manager	2,652	7.3%	2,652	6.3%
Finance director	3,126	8.6%	3,126	7.5%
Finance assistant	1,661	4.6%	1,661	4.0%
Nurse manager	6,161	16.9%	6,161	14.7%
Peer mentor			344	0.8%
Local liaison			253	0.6%
US Nurse volunteer (RN)			4,377	10.5%
<i>Direct costs</i>		29.4%		25.7%
Internet	116	0.3%	116	0.3%
Mobile phone call credit	406	1.1%	406	1.0%
Venue for training	528	1.5%	528	1.3%
Transportation	853	2.3%	853	2.0%
Accommodation	8,805	24.2%	8,805	21.1%
Variable Costs				
<i>Direct Costs</i>		24.3%		22.1%
Courier/Shipping Services	89	0.2%	89	0.2%
Photocopy/printing	227	0.6%	227	0.5%
Materials(pens)	10	0.0%	10	0.0%
Food	8,544	23.5%	8,941	21.4%
Total cost of program	36,413	100.0%	41,784	100.0%
Cost per nurse trained	409		469	

Table 6.6 Breakdown of Costs for Scenario Based Sensitivity Analysis in US\$, 2024–2027.

Line Items	BASE CASE		MINIMAL CASE		AMBITIOUS CASE	
	Costs	% of total	Costs	% of total	Costs	% of total
<i>Personnel Salaries</i>	309,910	43.5%	83,281	34.7%	401,661	37.6%
<i>Training sessions</i>						
Transportation	53,203	7.5%	20,762	8.6%	88,672	8.3%
Accommodation	121,601	17.1%	47,454	19.7%	202,668	19.0%
Food	193,946	27.2%	75,686	31.5%	323,244	30.3%
Venue	7,306	1.0%	2,851	1.2%	12,177	1.1%
<i>Communication</i>						
Internet	6,477	0.9%	2,528	1.1%	6,477	0.6%
Mobile phone call credit	1,485	0.2%	506	0.2%	1,485	0.1%
<i>Other Direct Costs</i>						
Courier/Shipping	11,177	1.6%	4,362	1.8%	18,628	1.7%
Photocopy/printing	6,995	1.0%	2,730	1.1%	11,659	1.1%
Materials(pens)	311	0.0%	121	0.1%	518	0.0%
<i>Nominal Cost Total</i>¹²:	712,412	100.0%	240,281	100.0%	1,067,190	100.0%
<i>Total Costs: Real 2023 US\$</i>¹³:	679,264		229,101		1,017,534	
<i>Present Value: 2023 US\$</i>¹⁴	665,142		222,428		987,897	

¹² All costs in Lesotho currency (LSL) were converted to US\$ using average 2023 exchange rate¹⁷⁶

¹³ Consumer Price Index (CPI) 2023: 4.8%²²⁷

¹⁴ Discount rate: 3%

6.4 DISCUSSION

The overall nominal financial cost used to implement the PSBHN program from a limited societal perspective was US\$36,413. The overall economic cost of program implementation was US\$41,784. The estimated 2023 present value for our recommended base case for all nurses to be trained at the end of the training period of 2024–2027 is US\$665,142 (to train 811 nurses). The estimated 2023 present value for other alternatives offered are US\$222,428 to train 180 nurses in minimal case scenario and US\$987,897 to train 811 nurses in the ambitious case scenario.

Our base cost, which is the base case scenario would train the same number of nurses as the ambitious case scenario but would cost 50% less than the latter. This is largely due to the use of more personnel in the ambitious case scenario to increase the likelihood for sustainability and puts less burden of training on a few implementers. It also reflects the provision of training for 5 days in the ambitious scenario, compared to the 3 days assumed by the base case scenario. On the other hand, the base scenario cost would provide a similar level of training to nurses over time using fewer human resources and keep the same number of days as the project implementation team is already familiar with, making it more efficient. An advantage of the ambitious case scenario is that it would avoid the chance of facing some project implementation challenges such as fast paced training with minimum time to understand the concepts.

The forecasted economic cost per nurse trained in the base case scenario is approximately US\$764 in 2023 PV, compared to the economic cost per nurse trained in our PSBHN project (for 2021–2022), which was estimated at US\$469. The cost

difference can be attributed to real price increases for goods and salaries over time, as well as the increase in personnel to enhance the chances of sustainability and also for the trained nurses to complete their projects.¹⁷⁸ With more personnel to implement the program, there would be better follow up of trained nurses, hence a high PSBHN facilitator to nurse ratio, which has been shown in other studies to improve learning outcomes.^{228,229}

On 27th February, 2023, the Minister of Finance and Planning delivered a speech related to the budget to the Parliament of Lesotho and in it, ~US\$177million (M3.2 billion) was budgeted to finance programs in the health sector.^{162,226} This was to allow for procuring critical hospital equipment, deploying health workforce to critical areas in the country, and also towards implementing programs that prevent diseases, one that would encompass PSBHN. For the remaining 811 nurses to be trained in the country, the total economic costs we propose in our base case only comprises 0.4% of the budget allocated by the finance minister for such programs as discussed above.³⁰

Two other alternatives were presented to policy makers to forecast costs to train the rest of the nurses in Lesotho who were not trained in our project. The most expensive of the alternatives was the ambitious case scenario, one that would reach all nurses in the country with training for five days to increase the chance of better understanding of the PSBH methods by the nurses as noted in chapter five. The minimal case scenario only trains a percentage of all nurses in each district with scarce resources. Reinke, in 1994, published an article on the considerations of effectiveness, efficiency and equity.²³⁰ In this article, the author notes that when a program is narrow-based, in our case the

minimal case scenario, it may be considered more efficient, as scarce resources are used to provide the best outcomes in such situations.²³⁰ This, however, risks overworking limited manpower, which may compromise overall quality. On the other hand, the author notes that expanding the program into difficult areas is more likely to be costly, like our ambitious scenario.²³⁰ These difficult to reach areas, though, are more likely to include the most disadvantaged people who are not served equitably under the status quo.²³⁰ By estimating the basic cost scenario of the program, as well as two alternatives, funders may now make a more informed decision regarding the best fit for the country's current financial situation and narrative.

For our most expensive estimate, the ambitious scenario, the projected economic cost was a 2023 present value of US\$987,897 for 2024–2027 with consideration for inflation.¹⁷⁸ In 2014, an estimated US\$200 million in economic costs was lost in Lesotho as a result of malnutrition alone, which was equal to 7.13 percent of GDP in 2014, not to consider other health conditions.²³¹ Undertaking these trainings, therefore, provides an increased value compared to the alternative of doing nothing. This indicates that investing in PSBHN is a good investment in health in Lesotho, and the African region at large.

6.5 CONCLUSION

The costs for implementation of the project to improve the health of its citizens is meagre compared to the costs of disease burden in Lesotho. Different channels, as well as the Government of Lesotho, need to prioritize training the untrained nurses with one of our alternatives, to improve health indicators in the country.

6.6 LIMITATIONS

There are several assumptions made in all the scale up projections (outlined in table 6.3) which need to be satisfied, to achieve the desired implementation outcomes projected. This may be limiting in real life and would require strong commitment by all project implementation team members and the government of Lesotho. These costs projections were also provided based on estimates provided by the financial director and financial director's assistant to the best of their ability. It is possible that some costs may not have been captured due to limited receipts after purchases and transactions in general in Sub-Saharan Africa. One other major limitation of this research is that the researcher did not have the ability to extract the financial data independently. During further monetary allocations for project scale up, all these potential factors need to be considered.

CHAPTER SEVEN

PROGRAM RECOMMENDATIONS AND CONCLUSIONS

Introduction

This chapter provides a synthesis of the literature review and results from the study. Based on these findings, we make programmatic recommendations for key stakeholders, i.e., the Ministry of Health of Lesotho, Dreyfus Foundation, LeBoHA, Boston University, other researchers, and all governments and policy makers of resource limited regions. We also present potential challenges that may pose as barriers to implementing the recommendations made, as well as the possible solutions to those challenges. We also reflect on the experience of the evaluation team and lessons learned. Finally, we present the conclusion of the dissertation.

7.1 Final Recommendations

7.1.1 Summary of our findings

From our literature review, we found that different problem-solving strategies have emerged in Low- and Middle-Income Countries (LMICs), some of which include task shifting, telemedicine, health insurance and quality improvement projects (chapter two). After going through the literature for evaluation of problem solving QI projects, we found only two studies that evaluated PSBH, both of which were single cross-sectional studies which are unable to capture changes over time.^{38,232,233} We also found that neither of these evaluation articles studied the experiences of the providers of PSBH or those of the recipients of the program after they had attempted to apply the PSBH methodology at

their workplace. All data in these evaluation studies made use of no validated assessment tools for objective measures. Costs of implementation of PSBH had also not been published in the literature. After identifying these gaps, this dissertation was designed to bridge and fill the scientific literature with some answers.

The purpose of the dissertation was, therefore, to evaluate the implementation of the training of nurses in Problem Solving for Better Health (PSBH) in Lesotho to understand how the program is implemented, the experiences of implementers and recipients of the program, and how the program can be improved as the Government of Lesotho plans to scale it up to all nurses and potentially other health professionals. Our main research question was to find out how effective the implementation of PSBH among nurses (PSBHN) in Lesotho was. To answer this, we developed four broad objectives:

Objective One: To understand the degree to which the program met its intended goals.

- a. What was the reach and distribution of nurses trained across Lesotho?
- b. What extent did knowledge and self-efficacy about problem-solving change among trained nurses after 3–6 months of receiving training?
- c. What degree were trained nurses able to apply the skills gained from the workshop to solve problems they identified and to what level of completion?

Objective Two: To understand the experiences of trained nurses and implementers of Problem Solving for Better Health.

- a. What were the projects trained nurses designed to implement once they returned to their workplace and why?

- b. What were the barriers and facilitators trained nurses faced in implementing their project plans once they returned to their workplace?
- c. What were the barriers and facilitators to implementation of the Problem Solving for Better Health for nurses in Lesotho experienced by the project implementation team?
- d. What improvements do PSBHN project implementation team and trained nurses suggest, to inform future changes to the Problem Solving for Better Health Program?

Objective Three: To estimate the implementation costs for the Problem Solving for Better Health Program training of nurses in Lesotho and inform future scale up to all nurses.

- a. What were the full financial costs of implementing the Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective, with consideration for economic resources used where possible?
- b. What was the cost per nurse trained of the Problem Solving for Better Health Program for nurses in Lesotho from a limited societal perspective?
- c. What financial impact would scale up of the Problem Solving for Better health Program to all nurses have on the national budget in Lesotho?

Objective Four: To generate programmatic recommendations for the Government of Lesotho and Donors

- a. What were the lessons learned from evaluating the implementation of the

‘Problem Solving for Better Health training in Lesotho’?

- b. What recommendations can be made from training nurses on ‘Problem Solving for Better Health’ in Lesotho?

Providing recommendations from what this study found is important to provide understanding and guidance on the process involved in the utilization of available resources in resource limited regions, leading to better patient care and satisfaction, improved health indicators, and increased strengthening of health care systems in these regions. In this chapter, we address the fourth objective of our study.

From the results section, we found that all PSBHN trainings occurred in resource limited regions, away from the capital, Maseru. Trained nurses stated they had improved knowledge about problem solving using available resources. Problem solving confidence and efficacy was minimally improved 3–6 months after the workshop even though this change was not statistically significant. However, data from nurses who provided immediate post training self-efficacy scores, (n=12), showed that their overall problem-solving efficacy was statistically significantly worse after receiving training compared to before receiving training. Considering the sample size of this sub-analysis is small and this was the first training that occurred, we must be cautious in our interpretation. Alternatively, it may simply take applying the knowledge back in the workplace, for self-efficacy to be realized, as we found that majority of the participants had increase in knowledge after receiving training.

We were unable to reach our intended sample size, because we had a low response rate and smaller than estimated sample size. These resulted from training cancellations

due to competing interests from vaccinations in the wake of the COVID19 pandemic.

With a low sample size, the power to detect a substantial change was compromised.²³⁴

Most of the trained nurses chose to provide refresher courses to their colleagues and education to their patients and the community as the main implementation strategies to address the problems they identified at their workplace. We also found that some nurses were not able to start their projects. Key reasons for this development were the lack of stakeholder support from the Ministry of health, hospital managers as well as nurse managers, lack of teamwork and lack of time.

Additionally, both interviewed project implementation team members and interviewed trained nurses believed that the duration of the training was short for the weight of materials to be studied and suggested it be longer. Some also suggested training nurse managers who already had the willpower and connections to bring together workforces to implement projects designed, rather than training all nurses to improve the percentage of successful project implementation following workshops, and subsequently improve health indicators. In-person follow up was suggested to provide stronger mentorship and direction in project implementation by the nurses.

Both trained nurses and project implementation team members agreed that for PSBH to be maintained and continuously adopted, key stakeholders like the District Health management Teams (DHMT), Ministry of Health, and the hospital administrators need to be engaged in all phases of program implementation, to truly decentralize the trainings from LeBoHA to the local implementors.

The financial and economic costs used to train nurses in our project were estimated to

be US\$36,413 and US\$41,784, respectively from a limited societal perspective, where costs of unpaid volunteers and out of pocket payment by nurse participants for transport to the training grounds were accounted for. The financial and economic costs of training one nurse was US\$409 and US\$469, respectively. Our best estimates of the basic costs to scale up training to all nurses in Lesotho was US\$665,142 in 2023 present value. This amount would train 811 in the years from 2024–2027. Our forecasted cost analysis for program scale-up included alternatives for policy makers to consider in addition to our base case scenario. These were: a minimal case scenario which would cost US\$222,428 to train 180 nurses from 2024–2027, and an ambitious case scenario which would cost US\$987,897 to train 811 nurses. Our base case estimated costs accounted for only 0.4% of the 2023 Lesotho Government Health sector budget allocation to finance quality improvement programs.

7.1.2 Recommendations

1. Annual stakeholder meeting for PSBHN implementation planning

Throughout the study, it was clear that when the DHMT or MOH in general engaged in the project, particularly when they provided resources like transportation for community outreaches, participants felt supported and enabled to carry out their PSBHN duties (chapter five). Health care administrators' support also saw same (chapter five). We recommend that the Ministry of Health (proposed main organizers of this recommendation), together with the leaders of the various DHMTs and hospital administrators have an annual meeting. LeBlanc and Norsik in an article

published in 2019 on planning and leading effective meetings demonstrated that having meetings that are planned and executed well leads to a good return on the time invested in the meeting.²³⁵ Such meetings, as noted in the literature create an avenue for new ideas to be generated, problems to be detected and solved as well as tasks assigned and consults on difficult matters sought.²³⁵⁻²³⁷

The purpose of this meeting would be to engage all stakeholders to schedule PSBHN programs, using the input of all these stakeholders, while taking into consideration the presence of other competing interests and prevention of double booking and scheduling conflicts. This meeting will not only provide a layout of the year's programs but will serve as an avenue to discuss the PSBH implementation events from the previous year, its successes and failures, and ways forward to improve upon. Not only that, but by so doing, all stakeholders are engaged right from the stage of planning to ensure sustainability and local ownership of the program as evidenced by Iwelunmor et al. in a systematic literature review about sustainability of health interventions in Sub-Saharan Africa which found that community ownership and mobilization before and after the intervention was a necessary step in facilitating sustainability.²²⁰ It must be re-iterated that even with the small sample size, we found a small increase, though insignificant statistically, in problem solving efficacy, and we also saw from our study that participants tackled various projects to reduce the morbidity and mortality in the country (chapters 4 and 5). Investing time and personnel for this purpose is therefore worth the cost to save lives, as my Alma Matta would say, 'millions at a time'.²³⁸

2. Increase in funding

As much as time and human personnel are important to expand PSBH, without adequate monetary support, implementation of all its components would be compromised. Due to financial constraints, PSBHN is implemented for two and a half days among a population who, in qualitative interviews, explain they are not necessarily conversant with the research nature of PSBH and have been out of school for a long time, both of which make it difficult or challenging to grasp certain concepts (chapter five). Another effect of financial constraints was the combination of two districts in one training, leading to respondents' perception that there were too many people being trained by too few implementation team members (chapter five).

Follow-up after training by the project implementation team to provide guidance and mentorship for trained nurses to implement their projects was limited to phone calls rather than in-person that most trained nurses found would have been more valuable (chapters five and six). The in-person follow up was limited by lack of financial resources (chapter five).

Reaching and training nurses who live and work further away from the capital was also limited by monetary funding. The cost of such outreach was stated by the project implementation team to be more expensive partly due to the mountainous nature of Lesotho and the need for more resources to reach those areas (chapter five).

A study by Olufadewa et al. in 2021 noted that due to “irregular funding”, healthcare programs occurring in many LMICs are not sustained.²³⁹ This study further states that even though there is a need for increased funding to LMICs from High Income ones, a

shift away from foreign driven investment to locally driven ones is a better choice.²³⁹ The COVID-19 pandemic has led several countries facing a high burden of debt and a widened gap between the needs and the actual amount available to be spent in the health sector.²⁴⁰ According to a World Bank report published in June 2023, about forty-one governments are estimated to spend less in health from now till 2027, compared to the time before the pandemic.²⁴¹ Nonetheless, this report iterated that due to governments prioritizing health expenditure in the first two years of the pandemic, major advancement was seen in terms of combatting the disease — a success story of health improvement when health care expenditure was prioritized in the setting of very limited resources.²⁴¹

In chapter six, we estimated basic costs for a four-year program that would train all nurses in Lesotho who were not captured in our study. This amount in 2023 present value is US\$665,142 and accounts for only 0.4% of the 2023 Lesotho Government Health sector budget allocation to finance quality improvement programs. We also provided two other alternatives based on very limited vs very abundant resources for policy makers (chapter six). If more funding were available, more intensive follow up and guidance of trained nurses can be done to motivate them for better implementation of their projects. As suggested by the trained nurses and project implementation team members (chapter five), perhaps, the number of training days could be extended to five instead of the two and a half for all nurses in the country, irrespective of background of research or number of years of being away from school, could be trained. This would ease the burden that nurses felt after receiving training, where they believed the material provided was too dense, making it difficult to grasp easily over a short period of time (chapter five). Hard

to reach areas which are more likely to have disadvantaged people could also be reach for a more equitable distribution.²³⁰

Therefore, we call upon key stakeholders like the Government of Lesotho and Dreyfus Foundation and other affluent individual citizens, Lesotho, and the global world to invest more financially to support the project implementation of PSBH in Lesotho, to appropriately implement it in all districts with good quality.

3. Health Institution controlled healthcare Refresher training

Based on our findings, we recommend that all healthcare institutions in resource limited settings take initiatives to provide quarterly refresher medical training to their nurses, to update their knowledge on their duties and use of tools to improve health within the department they work in. Many trained nurses asserted that their colleagues lacked the skill or knowledge in performing their tasks, hence the trained nurses targeted provision of refresher courses to their colleagues to improve care (chapter five). If health care institutions took ownership of these trainings and provided them formally, their employees might take such training seriously and engage more actively. There is evidence in the literature that continuous medical education is necessary to maintain and build lasting knowledge and skills for clinical practice that is safe.^{242,243}

Ongoing evaluations of these refresher trainings can be done through weekly or monthly assessments for knowledge gained. Due to the limited time most nurses have, these educational trainings can be provided through institutions' subscription to major medical educational materials like 'Up to Date' or equivalent local options.^{1,2} By so doing, nurses can read at their own specified time and direct studies by themselves, rather

than organizing major meetings for refresher trainings. Even though the nursing regulation requires yearly ongoing educational credit for renewal of nursing license, these refresher courses should be provided and made available throughout the year for continuous studies.

4. District Health Management Team Training (DHMT) for Sustainability

In chapter five, we found that both project implementation team members and trained nurses emphasized on the importance of sustainability for the program. We propose a three-phase teaching and learning training whereby the DHMT leaders of different districts appoint local liaisons to be trained by LeBoHA on the implementation process for PSBH. The three-phases of this proposal are observation, guided practice, and independent performance. We recommend that these local liaisons, in the first phase, observe the LeBoHA team implement some trainings, then in the second phase implement with LeBoHA rather than observing, then in the third phase implement some trainings all by themselves, with LeBoHA only acting as supervisors ensuring fidelity to PSBHN implementation. These steps will lead to local ownership of PSBHN at the district level. This is like the pyramidal training step used in other trainings which has been well received by participants in an acceptability assessment.²⁴⁵ Other ways the local liaisons can be trained include the use of interactive lessons, group discussions, classroom or online lectures to support and enhance learning, whichever fits a particular context. These means of training have been explored in a systematic literature review where the effectiveness of training community health workers for cardiovascular disease management in LMICs improved knowledge and knowledge retention post-training.²⁴⁶

5. Extensive follow up and mentorship post-training

We propose that the MOH provides adequate and extensive follow up on nurses after they return to their workplaces to implement their projects. Most nurses and project implementation team members stated that the two and a half day training was not enough for the amount of material that needed to be covered (Chapter five). Nonetheless, in chapter four, we found that 97% of participants had their projects designed either having a medium or high-quality score. Still in chapter four, participants who had immediate post training PSI scores (i.e., only in Thaba-Tseka), showed statistically significantly overall reduced problem-solving efficacy (Chapter four) immediately after receiving training. This underscores the fact that even though the material was noted to be heavy by the participants, requiring time to digest, knowledge acquired was good. The self-efficacy and confidence to solve problems after receiving the training however was markedly reduced, perhaps because of the perception of having so much material taught and how to use this. After participants had received follow up by the LeBoHA team, the 3–6 months post-training PSI scores showed small improvement in problem solving efficacy, which was however not statistically significant. We believe this improvement was due to the motivation follow up and mentorship by the LeBoHA team gave. By providing and investing in intensive follow up and mentorship of nurses, as an encouragement and to provide guidance, nurses will likely feel more confident implementing their designed projects as evidenced in chapter five where some nurses stated they felt mentorship by LeBoHA helped them implement their projects. Manzi et al., in an article in 2017, which looked at mentorship and coaching used to strengthen healthcare systems in Ghana,

Tanzania, Mozambique, Rwanda and Zambia found that coaching and mentorship activities used in similar context healthcare settings improved clinical care quality, “data-driven decision making, leadership, accountability and staff satisfaction”.²⁴⁷

6. Further evaluation studies of the implementation of PSBHN

We recommend that researchers build upon our study to further evaluate the implementation of PSBHN using stronger methods. We identified several limitations to our study which included the low power to identify a significant change because of the small sample size, no comparison group to be able to attribute any change specifically to the project and the majority of the assessment tools being self-reported which could have introduced reporting bias. Furthermore those lost to follow up lead to unavailability of the intended data points to show the outcome trends, IDIs could have introduced social desirability bias and collection of data 3–6 months after the training had potential for introducing recall bias (chapters four, five and six).^{184,222,232,243n} More evaluation studies that can help mitigate these limitations will provide stronger evidence for the effectiveness of the implementation of PSBHN. Long term follow-up studies beyond 6 months post-training can also be done to study the long-term effects after providing training in PSBH which has not yet been captured due to our short follow up period of 6 months.

7. Provision of certification of completion of PSBHN project designed

As suggested by some of the participants we interviewed (chapter five), we recommend that the leadership of PSBHN provides a certification of completion to all trained nurses who can complete all aspects of their projects developed after training. This will acknowledge their hard work, and serve as an incentive and encouragement to others, to strive to have theirs completed as well. Providing certification is a non-monetary and reasonable incentive, identified in the literature as one that be given at a low or no cost at all.²⁴⁹

In summary, our programmatic recommendations based on our study results and grounded in the literature are as follows: a. The MOH should take the initiative to set up an annual stakeholder meeting for PSBHN implementation planning, b. Key stakeholders like the MOH, Dreyfus Foundation, and local as well as foreign philanthropists should increase PSBHN funding for improved health outcomes, c. Healthcare institutions should establish a quarterly refresher training for their healthcare workers within their facility, d. DHMT training for sustainability, e. Provide extensive follow up and mentorship, f. Researchers should undertake further PSBHN implementation evaluation projects using stronger methods, and e. The leaders of PSBHN should provide certification to all nurses who complete their designed projects.

*7.1.3 Potential barriers to implementing recommendations above and possible solutions
to combat barriers*

Following or implementing any kind of recommendations can be faced with potential barriers. Some of the barriers identified to implement these recommendations and ways they can be overcome are as follows:

1. Annual Stakeholder meeting for PSBHN implementation Planning

Poor communication between the stakeholders may lead to lack of interest, unclear purpose, and unclear aim of the meeting with limited involvement by all parties. To overcome this, effective communication through various channels is encouraged. Reminders and provision of meeting agenda to groups and necessary individuals via multiple channels including but not limited to emails, text messages, phone calls, official letters and face to face will help to maximize reach and potential engagement.

Conflicting priorities, competing interests and busy schedules by the stakeholders may also hinder effective collaboration by the key stakeholders. Planning the meeting well ahead of time, putting into consideration the available time and preferred dates, as well as working with the offices of those involved to find a mutual time all participants can be available can help mitigate scheduling conflicts. Being open to virtual meetings for those who cannot make it in-person is also a consideration to boost involvement from key groups and personnel.

Other stakeholders may be resistant to change or to the adoption of PSBH methodology as it may be seen as additional burden or workload. Open non-judgmental discussions should be encouraged with all stakeholders with concerns heard and

addressed. Respect should be provided to everyone with a different perspective. Working with them on a continual basis to find common ground and a shared goal will aid in forming a united front towards the success of the project.

Lastly, lack of accountability and follow up could occur after the meeting if there is no follow up plan put in place or shared responsibilities by each stakeholder. Specific tasks assigned to individuals or groups with clear deadlines should be communicated to all parties. Follow up on progress and updates should also be done on a regular basis. Mechanisms to track and report progress must also be established in real time. All these can help keep the project implementation on course, continuously engage all stakeholders, and maintain interests and momentum.

2. Increase in Funding

Budget constraints pose a major barrier to increasing funding for the project from all possible sources. All recommendations made above are dependent on monetary funds to be able to adequately undertake them, especially providing intensive follow up and mentorship to nurses after they return to their workplaces. Competing interests, for example, can limit the amount of funding that can be made available towards this project. These can be counteracted by demonstrating a return on investment and potential cost savings from contributing to this initiative. Effectively outlining the potential of this project to improve patient outcomes and health of their citizens is also a way to break this barrier. Lastly, inciting the community by showing them the potential health impact this project can make can have the citizens hold their policy makers accountable in investing.

Another barrier to increasing funds is the stringent rules laid out by some external funding agents and the limited number of external grants. Collaboration with other research institutions, foundations and creating partnerships with private-public organizations, corporates and philanthropies could all create different inflow of monetary funds. Putting together clear documentation of the project objectives, detailed budget, timeline and expected outcomes and project deliverables, highlighting the potential project impact and benefits can help to erase any reluctance and convince funders to accept proposals and to provide more funding towards this project.

3. Health Institution controlled healthcare Refresher training

The time constraints of nurses is a major barrier to their ability to invest and use new educational materials. Nurses have very busy schedules and demanding workloads. Even though the recommendation is for online studying in a self-paced manner, they might still struggle to utilize them based on their limited time and other responsibilities. Provision of incentives such as recognition of nurses who complete certain educational milestones, provision of completion certificates, and monthly short multiple choice educational assessments will foster an environment that places value on continuous education and interests in professional growth.

Limited resources are also a barrier as institutional subscriptions and provision of incentives involves money and time. We encourage continuous search for external funding as well as proposals to the Ministry of Health. Bargaining with the subscription agencies can also be done for discounts.

Lastly, some nurses may resist this change due to lack of understanding of its importance, and sometimes due to complacency in their own knowledge. Involving the nurses in each department in the planning and decision to embark on this journey may limit resistance. Also sharing success stories and clearly showcasing the benefits of these refresher trainings can help stimulate involvement and support.

4. Further evaluation studies of the implementation of PSBHN

Limited resources again are a limiting factor to conducting quality evaluation studies to further understand the implementation of PSBHN. To conduct such studies, there is the need for adequate funding, expertise, and time. Incentives may also be needed to prevent loss to follow up. Creating partnerships with other research institutions can help find personnel willing to provide their expertise. Collaboration with governments and other organizations including external resources can help provide people for technical support in conduction of the studies, and monetary assistance.

As described in the reflections above, data collection can be time-consuming and complex, and limited data from data sources can affect the reliability and validity of the findings. The use of standard evaluation tools and surveys, and involvement of experts in the field from the start can direct stronger data collection methods and identify appropriate data sources. Engagement of statisticians and data technologists can also provide aid in using data management systems to streamline the data collection process, clean the data and facilitate analysis.

5. Provision of certification of completion of PSBHN project developed

The main barrier identified to this is limited resource to make the certificates and have them sealed by the MOH to increase validity of certification. Ways to address and increase resource and funding for the project has been outlined under the other sections above.

7.2 Ethical Considerations

None of these proposed recommendations have any major ethical implications. It must only be noted that, having nurses take time off work from their workplace for training must be done in a stepwise fashion, so not all nurses from one health facility are away for the training at one time. While nurses are away for their projects, they must still receive their full salaries for that month and not considered to be clocked out as they in the time of receiving training are using their valuable time

7.3 Reflections and Lessons Learned

This section provides a reflection of the experience of the evaluation team and lessons learned.

7.3.1 Positive Experiences

One of the most rewarding aspects of evaluating this project was the collaboration between the local stakeholders and the evaluation team. Right from the get-go, a robust LeBoHA team that was ready to help on the ground to collect data. The team members were the program officer, evaluation manager, finance director and assistant, and nurse

manager. The team worked to collect data from participants and to provide training of PSBHN. Most of them were very responsive and timely in answering questions and addressed concerns raised to the best of their ability, bearing in mind some limitations that existed like time intervals and high work demands. Through our interactions, shared knowledge was encouraged with both parties benefitting from the mutual exchange of knowledge.

7.3.2 Limitations and Difficulties faced

1. PSBHN training cancellation and rescheduling

The initial design of this project was for 10 workshops to occur in 10 different districts in Lesotho. However as discussed in chapter five, due to COVID 19 pandemic and vaccination campaigns, most of these workshops had to be postponed, cancelled, and rescheduled, leaving 3 training sessions conducted for nurses from four districts. This affected the sample size of our project and our statistical power to detect a significant difference in our main outcome, self-efficacy to solve problems.

2. Loss to follow up

As noted in chapter four, there were only 33 participants who provided both baseline and post training problem solving inventory survey information out of the 83 participants recruited in the study. This posed a major challenge. In response, the team contemplated hiring other data collectors on the ground to physically follow up with participants to provide follow up for data, however, this was in the era of COVID 19 pandemic and physical interaction limitations were required. Incentives were also considered at this time to encourage participants to complete follow up data collection.

Yet, due to financial challenges and limited funding, this could not be brought to fruition.

3. Financial Data

This data was the last to be collected. Due to the cultural context, it was difficult to have receipts provided for many sales. Apart from the salaries of personnel that were provided initially, many of the other direct costs and indirect costs were based on best estimates with the finance director and their assistant as actual tracking and documentation of those costs were not available. Several follow ups related to this data had to be made with assistance from the program officer before a final compilation of the data was possible.

Even though these difficulties were faced, the dissertation committee was very robust and knowledgeable about research, especially studies based in low- and middle-income countries. As challenges occurred, they provided guidance at every phase of the dissertation to make utmost use of the available data and use more rigorous data analysis methods to minimize bias.

7.3.3 Lessons learned

The disruption of the trainings by Covid19 shows that research during catastrophes must always be open to adaptability. We learned that one must have contingency plans when developing research in settings like Lesotho, in the instance that the original plan fails. Having a low sample size reduced the power of our study and the chance of finding any statistically significant changes in our main outcome — self efficacy. In similar settings, over-recruitment may be important to obtain enough participants for a study.

Having other plans in place like budget allocation for incentives and over-recruitment can also help make future research in settings like Lesotho more resilient to challenges of sample size.

7.4 Conclusion

The recommendations provided to all stakeholders also offer practical guidelines for all other researchers. Implementation of these recommendations, bearing in mind the potential barriers, and the suggestions to address these barriers have the potential to improve the overall health of people in resource limited regions. These recommendations outlined also serve as a foundation and example to other researchers for which they can build upon for further research. They do not only benefit the ill, the weak and the dying, but also the strong and healthy citizens of the world, to put in place measures and quality health systems to improve the quality of their lives and to prevent premature deaths.

7.5 Strengths

The design of this study and development of research questions and objectives were grounded in theory (i.e., the RE-AIM theory).¹⁴⁶ We used concurrent triangulation mixed methods where both qualitative and quantitative data were taken and analyzed parallel to each other to improve validity of the results from the data. Even though there was a small sample size for the quantitative analysis, we tested the direction of our data in a sensitivity analysis using multiple imputation. IDIs were conducted privately, and no personal identifiers were collected during these interviews to minimize reporting and social desirability bias. The same interview guide was used for all trained nurses as well

as the project implementation team members to ensure uniformity of data collection. Our best estimates for costing data were done, with scenario-based sensitivity analysis from a limited societal perspective. The DrPH candidate, who was the lead principal investigator for this evaluation study was not part of the implementation arm of the project and had no benefits from the success or failure of the program.

7.6 Final Remarks

Embarking on this dissertation journey has provided me with important insight into problem solving, particularly within the genre of healthcare in resource limited areas. I would like to say a big thank you to God, my family, dissertation committee, LeBoHA team, colleagues, and all participants of this study for their support throughout the research process. I would also like to acknowledge that these recommendations would need to be explored and refined further in the ever-evolving quality improvement projects to solve problems in resource limited regions.



In Lumine Tuo Videbimus Lumen (Psalm 36:9).

APPENDICES

Appendix A (Attendance Sheet)



Lesotho Boston Health Alliance

Florida 580 • Maseru 100 • Lesotho

Phone: +266 22324262

Dept. of Family Medicine • Dowling 5 South • I BMC Place • Boston, MA 02118

Phone: +1 617-414-6264 • Fax: +1 617-414-1261

4 th April 2022		PSBN TRAINING				QACHA'S MEK TRAINING	
Name	Sex	Designation	Hospital	Cell#	Email	Signature	

Appendix B (Demographic Survey)

Demographic Survey

S_t_u_d_y_I_D_# _____

Q1. What is your sex?

Male

Female

Other

Q2. What is your age?

Q3. What is your highest degree or level of qualification?

Certificate

Diploma

Bachelor's degree (e.g. BA, BS)

Master's degree (e.g. MA, MS, MEd)

Doctorate or professional degree (e.g. MD, DDS, PhD)

Q4. What is your marital status

Single (never married)

Married

Widowed

Divorced

Separated

Q5. Have you ever received training in 'Problem Solving for Better Health'?

Yes

No

Not sure

Q6. What is your nurse position/title?

Nursing Assistant

Registered nurse- nursing sister

Registered nurse- Nursing Officer

Nursing services Manager

Coordinator nursing

Head clinical nursing service

Nursing Director

Q7. How long have you been a nurse?

Q8. Which district do you currently work?

Berea

Butha-Buthe

Leribe

Mafetang

Maseru

Mohale's Hoek

Mokhotlong

Qacha's Nek

Quthing

Thaba-Tseka

Q9. What type of health facility do you currently work in?

Government facility

Christian Health Association of Lesotho (CHAL)

b. How long have you been working in this current facility?

Appendix C (Project Evaluation Rubric)

CRITERIA	ASSESSED DOMAINS	DESCRIPTION	EXAMPLE	MAXIMUM SCORE
Problem Statement (Max Score 4)				
	Nature	What is the problem? Actual issue needing intervention stated clearly	<i>Lack of proficiency in 2nd year nursing students in performing their procedures</i>	1
	Size	Measure of extent of problem	<i>70% of 2nd year nursing students</i>	1
	Cause	Direct cause/causes of problem clearly stated	<i>Poor modeling by nursing sisters, Infrequent hospital visitation by nurse educators, Insufficient demonstration of nursing procedures.</i>	1
	Contributing factors	Indirect/Secondary factors/events causing or aggravating the occurrence of the problem	<i>Lack of standardized evaluation criterion, Insufficient equipment</i>	1
			MAX	4
Good Question (Max Score 5)				
		Good Question has a SMART objective to as a colution to the problem	<i>Will three times a week visitation of four hours in X Hospital medical wards for demonstration and supervision of the second year nursing students by nurse educators from September 16, 1999 to February 17, 2000 help decrease the percentage of second year nursing students not proficient in performing intramuscular injection from 70% to 10%?</i>	
	Specific	Action plan details exactly what action is to be taken among what target population to solve problem. It is stated with clarity what solution is (i.e. no ambiguity or vagueness)	<i>Three times a week visitation of four hours in X Hospital medical wards for demonstration and supervision of the students by nurse educators</i>	1
	Measurable	What are we measuring and how do we know what we are addressing has occurred? Within stated good question, are we able to clearly assess for successful occurrence of action being targeted for improvement? Percentage change can be calculated from this measure from before intervention and after intervention - evidence that this objective has been achieved can therefore be clearly measured	<i>Nurses performing intramuscular injections can be observed and recorded as performed or not performed, and change of number of intramuscular injections performed before intervention and after intervention can be calculated to let researcher know whether their objective was reached or not</i>	1
	Achievable	Within the stated good question, is the actual action/ main solution realistic, all things being equal to the best of your assessment	<i>Three times a week visitation by nurse educators for four hours is realistic and an be done OR</i>	1
	Relevant	Is the main solution stated in the 'good question' linked to the 'nature of problem' and does the solution help to solve the stated problem to some extent	<i>Giving intramuscular injections is a procedure performed by second year nursing students. Training second year nurses on giving intramuscular injections is relevant to and is linked to the main problem that 'second year nurses are not performing their procedures'</i>	1
	Time Bound	The 'good question' has a solution to be implemented within a stated time frame. Any statement indicating time is acceptable. E.g. in months, years, between dates, events	<i>From September 16, 1999 to February 17, 2000, in 5 months, by Valentine's day next year</i>	1
			MAX	5

Action Plan (Max Score 7)		Project Action Plan clearly laid out with various steps, describe who will be performing the actions, when the actions will be performed, with whom the actions will be performed, where actions will take place, how long each action is anticipated to take, and measure of impact the solution seeks to achieve	<i>Step 1: Nursing Officer Maama will meet with the nurse educators at the medical ward morning meetings for an hour to discuss schedule for visitations on September 16, 1999 Step 2. Topics to be taught second year nursing students will be outlined by Nursing Officer Steven on day 2 after nurses meeting</i>	
Who		At least one activity to be done contains the person performing the action	<i>Nursing Officer Maama meeting nurse educators</i>	1
Where		Location for at least one activity listed is clearly stated	<i>At the medical ward morning meetings</i>	1
Frequency OR Duration		Number of times action will be done OR the length of time each action is anticipated to last, for at least one activity in the action plan	<i>Meetings will be held bi-weekly OR Departmental meetings will be held for an hour</i>	1
When		Time/Date of when activities are to occur clearly mentioned	<i>On September 16, 1999, a meeting will occur, On Christmas day, surveys will be collected, in August trainings will begin, etc</i>	1
What are they doing		Action plan has steps outlined to achieve objective stated in the 'good question'		
Completed		Action plan contains a list of activities that cover everything that needs to be done in order to achieve the goal stated in the 'good question'	<i>1. Meeting with nurse educators 2. Topics to be taught second year students outlined 3. Dates for visitations scheduled and nurse educators assigned students to train 4. Trainings take place 5. Second year nurses are observed and number of procedures done recorded</i>	1
Detailed		When appropriate, all activities listed in the action plan to be taken has the elements of who, where, frequency/duration, what is to be done in them, and when they are to happen	<i>1. Nursing Officer Maama with meet with nurse educators in the ward office for an hour to discuss curriculum to be used for second year nursing students' training on September 16th, 1999 2. Topics to be taught the second year students will be outlined by Nursing Officer Steven at a one time sitting on September 20th, 1999(where in this case is not relevant) 3. Dates for visitations will be scheduled by nurse educators by Nursing officer Maama with the nurse educators in ward office on September 31st, 1999 in a 3 hour meeting, etc</i>	1
Evaluation		Stated evaluation methods addresses most of the components of the project	<i>Weekly chart check on all intramuscular injections given and the proportion that were performed by second year nursing students recorded by nurse in-charge of ward and presented to nursing school educators and students</i>	1
			MAX	7
Impact/sustainability (Max Score 3)				
Improve staff workflow (efficiency)/Improve patient care	merge 29, 30	Will this project improve workflow efficiency in the hospital or among the staff	<i>Nursing students will gain the appropriate skills in giving intramuscular injections well and can take on this procedure while other senior nurses work on other more complex procedures/This project will improve patient health when intramuscular injection is given appropriately and will minimize or eliminate any adverse outcomes as a result of injection given in the wrong place or with a bad technique due to not performing enough IM injections as second year students</i>	1
Mention of sustainability		Any mention of a sustainability plan within project	<i>This project will be sustained by ... (any de</i>	1
			MAX	2
Feasibility (Max Score 4)				
Timeline is realistic		Are timelines stated in 'good question' a realistic timeframe for all the activities listed in the action plan to be achieved, assessed for results and evaluated	<i>Five months is realistic to implement this project, assess for results and evaluate project</i>	1
Budget is realistic		All required items and numbers of the items to be used for project outlined. Those that are already available stated, and those that are needed also indicated as needed, with costs for latter provided. Costs should be assessed for whether stated amounts are reasonable for item needed. Required items also assessed for how reasonable they are to achieve objectives- whether too many, or too little	<i>All required items and numbers needed for project listed and those needed are costed and within reason</i>	1
Sustainability plan is followed		The stated sustainability plan is reasonable and makes logical sense to sustain project if followed	<i>The head of the nurse educators will meet with the nursing officer in charge of the medical ward to set a policy making nurse educator visitations to second year nursing students a compulsory part of the nursing teaching curriculum</i>	1
			MAX	3
TOTAL SCORES				23

Appendix D (Problem Solving Inventory- PSI)

	1	2	3	4	5	6
1.I am usually able to think up creative and effective alternatives to solve a problem						
2.I have the ability to solve most problems even though initially no solution is immediately apparent						
3.Many problems I face are too complex for me to solve						
4.I make decisions and am happy with them later						
5.When I make plans to solve a problem, I am almost certain that I can make them work						
6.Given enough time and effort, I believe I can solve most problems that confront me						
7.When faced with a novel situation I have confidence that I can handle problems that may arise						
8.I trust my ability to solve new and difficult problems						
9.After making a decision, the outcome I expected usually matches the actual outcome						
10.When confronted with a problem, I am unsure of whether I can handle the situation						
11.When I become aware of a problem, one of the first things I do is to try to find out exactly what the problem is						
12.When a solution to a problem was unsuccessful, I do not examine why it didn't work						
13.When I am confronted with a complex problem, I do not bother to develop a strategy to collect information so I can define exactly what the problem is						
14.After I have solved a problem, I do not analyze what went right or what went wrong						
15.After I have tried to solve a problem with a certain course of action, I take time and compare the actual outcome to what I thought should have happened						
16.When I have a problem, I think up as many possible ways to handle it as I can until I can't come up with any more ideas						
17.When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation						
18.When confronted with a problem, I tend to do the first thing that I can think of to solve it						
19.When deciding on an idea or possible solution to a problem, I do not take time to consider the chances of each alternative being successful						
20.When confronted with a problem, I stop and think about it before deciding on a next step						
21.I generally go with a first good idea that comes to my mind						
22.When making a decision, I weigh the consequences of each alternative and compare them against each other						
23.I try to predict the overall result of carrying out a particular course of action						
24.When I try to think up possible solutions to a problem, I do not come up with very many alternatives						
25.I have a systematic method for comparing alternatives and making decisions						
26.When confronted with a problem, I do not usually examine what sort of external things my environment may be contributing to my problem						
27.When I am confused by a problem, one of the first things I do is survey the situation and consider all the relevant pieces of information						
28.When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation						
29.Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead						
30.Even though I work on a problem, sometimes I feel like I am groping or wandering, and am not getting down to the real issue						
31.I make snap judgments and later regret them						
32.Sometimes I get so charged up emotionally that I am unable to consider many ways of dealing with my problems						

Appendix E (Project Follow-Up Survey)

<h2 style="color: #28a745;">PSBH PROJECT STATUS</h2>
PROJECT TITLE

Report Date : _____	Prepared By : _____
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PROJECT SUMMARY:

Task	How successful has this project been since the workshop					Date Completed/Projected date for completion
	Never did anything related to this task since the workshop	Has started a few aspects of this task	Has started some aspects of this task	Has started most aspects of this task	Has started and completed every aspect of this task	

Issues being faced	Assigned to	Date Assigned

Appendix F (Project Logic Model)

				OUTCOMES			
SITUATION	INPUTS	ACTIVITIES	OUTPUTS	SHORT-TERM	MEDIUM TERM	LONG TERM	IMPACT
Challenges -Staff limitations in following up after workshop -Lack of motivation with time noted	-Human resource -Stakeholders -Funding -Training logistics (participant packet, name tag, attendance sheet, flip charts, markers, tapes, pens/pencils) -Time -Transport -Training locations -Print outs -Workshop curriculum	-Engage stakeholders -Assign facilitators and co-facilitators to locations -Curriculum reviewed and adapted -Schedule workshops -Secure workshop location -Manage travel -Conduct facilitators' meeting -Train nurses -Encourage completion of projects and building of self-confidence -Print evaluation surveys -Pay salaries -MoH provide support for program -Quality Assurance Unit provides support for projects	-Stakeholders are continuously engaged -Nurses are trained in all regions across the country -New curriculum is developed -Workshops are scheduled -Facilitators' meetings are conducted -Trainees are encouraged to complete their projects -All print outs have been done -Salaries are paid to staff and consultants -MoH support is provided -Quality Assurance Unit support is provided	-Increased knowledge about PSBH -Good quality of project plans are developed -Improved perceptions and attitudes about solving problems -Nurses identify a problem they can solve -Increased self-efficacy in implementing project -Individuals identify reasonable solutions to the problem -Individuals develop small-scale problem-solving projects -Individuals have increased confidence in their ability solve problems -Increased satisfaction with the workshop content	-Improved skills to implement their projects -Nurses complete their project plans -Increase in the number of people who talk positively about the project -Nurses break barriers to complete project Improved leadership skills of nurses Improved management abilities of nurses Role of MoH and Quality Assurance Unit defined	-Cost-effective solutions to problems made -Less burnout of healthcare workers - Less turnover of staff -Less brain-drain to South Africa -Maintained uptake of PSBH methodology -Increased number of sustained projects -Decreased incidence of adverse health outcomes	Increased life expectancy and more people able to work Decreased negative economic impact Economic growth
Assumptions -Facilitators and Co-facilitators are familiar with PSBH and have received all necessary leadership trainings				External Factors -High (or low?) nurse to patient ratio (10.2 nurses/10,000 population) -Low resource communities			

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