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**EXAMINING THE ECONOMIC COSTS OF DELIVERING A PAN-AFRICAN LEADERSHIP,
MANAGEMENT, AND GOVERNANCE PROGRAM FOR PUBLIC SECTOR MALARIA
MANAGERS**

TIMOTHY WOKABI CHEGE



**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION IN HEALTHCARE
MANAGEMENT STRATHMORE UNIVERSITY**

**STRATHMORE UNIVERSITY BUSINESS SCHOOL
STRATHMORE UNIVERSITY
NAIROBI, KENYA**

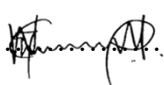
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DECLARATION

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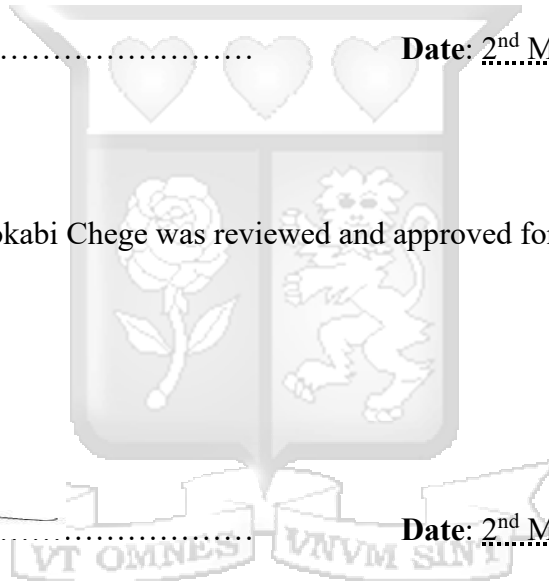
Sign:..... Date: 2nd May 2025

Approval

The proposal of Timothy Wokabi Chege was reviewed and approved for examination by the following:

Prof. Francis Wafula
Associate Professor
Strathmore University

Sign:..... Date: 2nd May 2025



ACKNOWLEDGMENT

I am deeply grateful to the Almighty God for His provision, compassion, and guidance, which have made the success of this study possible. My heartfelt appreciation goes to Prof. Francis Wafula, my supervisor, for his invaluable guidance and support during the development of this proposal. I also extend my sincere thanks to the faculty at Strathmore School of Business and my colleagues for their encouragement and assistance throughout this journey. This work was based on a project funded by the Bill and Melinda Gates foundation. I am grateful to the Principal Investigator, Dr, Ben Ngoye, and the co-Principal Investigator, Prof. Gilbert Kokwaro, for allowing me to use the data from the project for my work. Finally, I am profoundly thankful to my family for their unwavering love, encouragement, and understanding, which have been my greatest source of strength and inspiration.



ABSTRACT

Efforts to eliminate malaria require public health systems leaders and managers to have better capacity to harness and manage resources and use them to execute priority, evidence-informed interventions. However, this has not been the case across many sub-Saharan African countries. Health systems leaders and managers, including those for disease programs like malaria and HIV, have tended to be senior healthcare workers with strong technical competencies in medical areas, but limited managerial capacity. Through funding from the Bill and Melinda Gates Foundation, Strathmore University mounted a novel Leadership, Management and Governance (LMG) program for malaria managers from National Malaria Control Programs (NMCPs) and ministries of health across six African countries, namely Kenya, Mali, Cameroon, Côte d'Ivoire, Rwanda, Ghana between 2022 and 2024. The program specifically targeted senior malaria program managers at the NMCPs, aligning with the African Union's goal of moving the continent towards malaria elimination. The training was designed as a blended learning approach consisting on in-person and virtual sessions. Using an ingredient costing framework, both financial and economic costs were analyzed across startup and implementation phases. The total economic cost of delivering the program stood at USD 1.69 million for 206 participants, translating to a unit cost of USD 8,225 per trainee. In-person training consumed over 50% of total costs, driven by hospitality, travel, and human resource costs. Kenya had the highest per-person cost at USD 13,389, nearly 25% above the six-country average, being where coordination was centralized, while virtual delivery models halved costs in some cases. Sensitivity analysis revealed minimal volatility across discounting and useful life assumptions, reinforcing the robustness of estimates. These findings underscore a lesson that leadership training is not cheap, but it is transformative. Strategic design, localized delivery, and hybrid models can deliver cost-effective LMG training for health managers. The findings offer a roadmap for health ministries and funders to scale leadership development in malaria programs sustainably, while keeping an eye on both outcomes and efficiency.

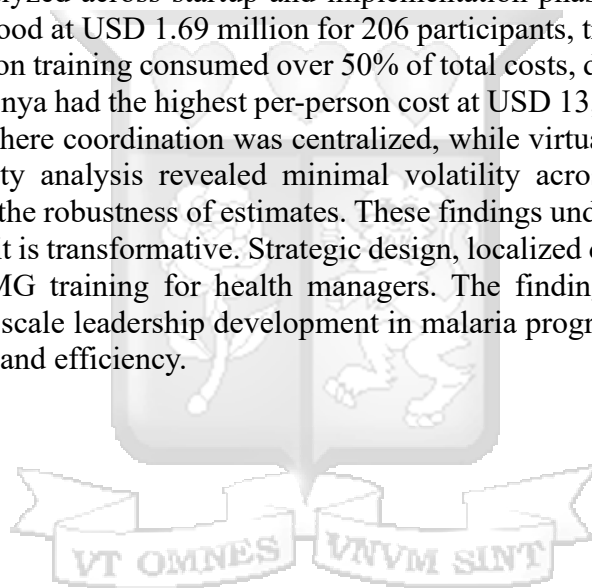


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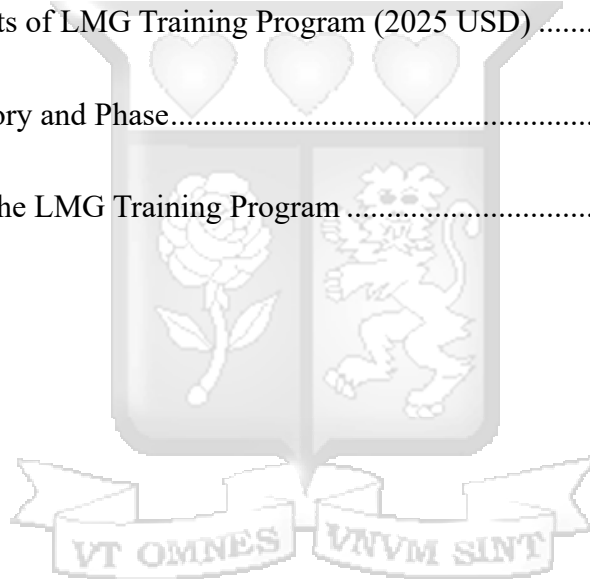
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LIST OF ABBREVIATIONS

IBC	Ingredients Based Costing
HR	Human Resources
LMG	Leadership, Management, and Governance
LMICs	Low-income or middle-income countries
MOH	Ministry of Health
NMCP	National Malaria Control Program
PI	Principal Investigator
SU-IHM	Strathmore University's Institute of Healthcare Management
SSA	sub-Saharan Africa
WHO	World Health Organization



DEFINITION OF TERMS

1. **Leadership, management, and governance (LMG) training-** a structured program designed to enhance the leadership, management, and governance skills of individuals working in health systems, in this case, malaria control activities enabling them to improve decision-making, resource allocation, and overall organizational performance.
2. **Economic cost-** represents the opportunity costs of inputs or resources, encompassing more than just direct financial expenses – includes the estimated value of goods and services provided without monetary transactions, such as donated items and volunteer time.
3. **Financial cost** - refers to the actual monetary expenditure on purchased goods and services, including payments for salaries, materials, transportation, and venue rentals.
4. **Direct costs-** expenses directly associated with the implementation of an activity or program, such as trainer fees, participant allowances, and materials.
5. **Indirect costs-** costs that are not directly attributable to a specific activity but are necessary for its implementation, such as administrative support and opportunity costs of personnel time.
6. **Unit cost-** the cost incurred for producing a single unit of output, such as the cost per trainee, per workshop, or per coaching session, calculated by dividing total costs by the number of outputs.
7. **Opportunity cost-** the value of the next best alternative foregone when resources are used for a particular activity or program, such as the time health personnel spend attending training instead of providing patient care.
8. **Ingredients costing-** a cost accounting approach where the cost of an intervention or service is determined by identifying and valuing each individual resource used.
9. **Sensitivity analysis-** a method used to assess the impact of changes in key parameters (such as discount rates, time allocation) on cost estimates, ensuring the robustness of results.

CHAPTER ONE

INTRODUCTION OF THE STUDY

1.1. Background to study

Health system challenges remain a major barrier to delivering effective and equitable healthcare in low- and middle-income countries (LMICs), particularly in Africa. While efforts have been made to improve access to healthcare services, the burden of disease remains high. Communicable diseases such as malaria and tuberculosis continue to pose significant health threats, while non-communicable diseases, including cancer and cardiovascular conditions, are on the rise. Addressing these health challenges requires not only advancements in medical interventions but also strengthened health system leadership and governance to ensure efficient resource allocation and effective policy implementation.

1.1.1. Burden of Malaria

Malaria remains a major health challenge, particularly in low-income countries, despite significant progress over the past two decades. In 2022, global malaria cases surged to 249 million, a notable increase from 233 million in 2019, largely due to disruptions occasioned by the COVID-19 pandemic. The disruptions caused 11 million additional cases in 2020, with a further increase of five million cases in 2022, signifying a considerable reversal in the fight against malaria (WHO, 2023). Malaria-related mortality followed a similar pattern, with over 600,000 deaths reported in 2022. Eleven (11) out of the 12 high-burden malaria countries are in sub-Saharan Africa (SSA) (Target Malaria, 2023). This underscores the urgent need for resilient health systems to sustain long-term malaria eradication efforts.

1.1.2. Health system weaknesses and the role of leadership and governance

Health systems in low-income countries face numerous challenges, including inadequate financing, inefficient resource use, and weak governance (Oleribe et al., 2019). Leadership and governance, identified by the World Health Organization (WHO) as one of the six building blocks of robust health systems, plays a critical role in overcoming these obstacles (World Health Organization., 2010). Strong leadership fosters transparency, accountability, and efficient use of resources, all of which contribute to improved health outcomes. Unfortunately, leadership and governance remain an underfunded and underemphasized component of low- and middle-income country health systems (Oleribe et al., 2019).

1.1.3. The need for leadership and management training in malaria control

As the global focus shifts from malaria control to elimination, investments in leadership and management training programs are becoming increasingly critical (Wirth et al., 2018). These programs aim to equip healthcare leaders with the skills needed to manage resources effectively, develop strategic health policies, and lead efforts to eliminate malaria. The type of leadership training required depends on the role of the personnel and the level at which they operate. Policymakers and health system managers need specialized training to monitor and adapt interventions, while front-line workers, entomologists, and scientists require targeted training to support field operations (Chung et al., 2020b).

However, these training programs are costly, especially in low-income countries where resources are limited. For example, executive leadership programs offered by global institutions can cost upwards of \$20,000 (MacklinConnection, 2024a), with the least expensive programs in Kenya starting at around \$1,000 (Laimoon, 2024a). Moreover, many such programs are generalized and lack a focus on the unique needs of healthcare systems in Sub-Saharan Africa (SSA), particularly in areas such as malaria control and elimination.

1.1.4. Existing LMG training initiatives for malaria control in Africa

To address the gap, Strathmore University's Institute of Healthcare Management (SU-IHM), through the support of the Bill and Melinda Gates Foundation developed a Leadership, Management, and Governance (LMG) training program targeting senior leaders within the National Malaria Control Program (NMCP) and Ministries of Health (MoH) in six high-burden malaria countries: Kenya, Mali, Cameroon, Côte d'Ivoire, Rwanda, and Ghana. The program sought to enhance leadership capabilities in managing malaria programs towards malaria elimination, with a focus on personal leadership, leading teams, leading programs and leading organizations. The training was delivered through a combination of in-person sessions (two modules), virtual sessions (two modules), and one-on-one coaching sessions, targeting a total of 200 leaders. The program aimed to improve competencies of malaria managers to lead teams and the malaria programs towards the goal of malaria elimination.

The closest comparable training initiative was the LMG/NMCP Capacity Building Project, which had been launched roughly 10 years prior, providing technical assistance to NMCPs in countries like Burundi, Cameroon, Côte d'Ivoire and Guinea through Senior Technical Advisors (STAs). This program began with Organizational Capacity Assessments (OCA) to identify capacity gaps, followed by

Leadership Development Program Plus (LDP+) workshops, financial and human resource management training, and tailored mentorship sessions. Additionally, Senior Technical Advisors (STAs) were embedded within NMCPs for up to four years, providing continuous coaching and technical assistance in organizational reform and Global Fund grant management. Over four years, NMCPs demonstrated significant improvements in internal coordination, leadership, human resources, financial management, and collaboration with malaria partners (USAID, 2019).

Although the program made significant contributions to NMCP capacity-building, it did not conduct a structured economic cost analysis to quantify its financial and economic costs. Furthermore, there was no application for an Activity-Based Costing (ABC) framework to systematically allocating costs to specific training activities, limiting insights into cost drivers and resource optimization.

1.1.5. Costing and economic analysis of LMG training

Despite the recognition of leadership and governance as critical components of health system strengthening, limited research exists on the economic costs of training programs designed to build these capacities. Where cost estimates have been conducted, most evaluations focus primarily on direct expenses such as trainer fees, venue rentals, training materials, and travel costs. These assessments, often carried out by implementing institutions, primarily serve to determine the financial requirements of training (Laimoon, 2024b; MacklinConnection, 2024b). However, these only represent a portion of the actual cost, as indirect costs and opportunity costs also play a significant role in determining the overall economic burden of such programs (Turner et al., 2023).

Indirect costs include administrative expenses related to program coordination, monitoring, and evaluation, as well as investments in technology and communication infrastructure necessary for virtual training components. Additionally, there are substantial opportunity costs, which refer to the value of alternative uses of time and resources that are forgone due to participation in training. For instance, NMCP staff attending multi-day training sessions may be unable to perform routine malaria surveillance, case management, or stakeholder engagement activities, potentially delaying the implementation of critical malaria control interventions. Similarly, the absence of frontline healthcare workers from their duties to participate in leadership training could lead to service delivery gaps, affecting patient care.

Failing to account for these indirect and opportunity costs risks underestimating the true economic burden of LMG training programs. A comprehensive economic costing approach is necessary to provide

a more accurate assessment of the resources required and to determine the cost-effectiveness and sustainability of such investments.

1.1.6. Need for an economic cost analysis of LMG training

Given the high cost of leadership training programs and the need to optimize resource allocation, it is essential to conduct a structured economic cost analysis of the LMG program. Such an analysis will provide valuable insights into budgeting and planning future iterations of the program. More important, such cost analysis will help in the design of future models of sustainable training programs that incorporate modern technologies (such as virtual synchronized or asynchronized approaches, blended versions incorporating virtual and face-to-face session) to reduce costs and also ensure that managers are not away from their workplaces for periods longer than is necessary. While many academic institutions only focus on the financial costs of such programs, these methods tend to be overly simplistic, ignoring the opportunity costs and other indirect inputs that go into delivering such a program. Such economic cost analyses help to highlight the true value and scalability of leadership training in the context of malaria elimination.

1.2. Problem Statement

Despite notable progress in malaria control, the disease continues to be a significant challenge in low-income nations, particularly in SSA, where 11 out of the 12 countries with the highest burden are found (Target Malaria, 2023). The global disruptions caused by the COVID-19 pandemic have exacerbated the situation, leading to an increase in malaria cases from 233 million in 2019 to 249 million in 2022, along with an alarming rise in malaria-related fatalities, which exceeded 600,000 in 2022 (WHO, 2023). This setback highlights the necessity for resilient health systems that emphasize effective leadership and governance, a critical component of the WHO's health systems framework, to support long-term malaria elimination initiatives (World Health Organization., 2010).

Training in leadership and governance within the health systems of low-income or middle-income countries (LMICs) often suffers from inadequate funding and prioritization, despite its potential to improve transparency, accountability, and resource utilization, all essential for tackling malaria (Oleribe et al., 2019). As global efforts to eradicate malaria progress, the demand for focused leadership and management training initiatives become increasingly critical. Successful malaria elimination approaches rely on robust leadership at every level, including policymakers, health managers, frontline workers,

and researchers. Achieving this goal necessitates specialized training designed to meet the unique demands of malaria control. Regrettably, the expenses associated with these specialized training initiatives can be prohibitively high (Laimoon, 2024a; MacklinConnection, 2024a), particularly in settings with limited resources, and many existing programs do not concentrate on the specific requirements of malaria management in SSA.

SU-IHM sought to fill this gap by introducing an LMG training program specifically aimed at senior leaders in NMCPs across six high-burden malaria countries in SSA. This initiative yielded encouraging results, enhancing resource mobilization, stakeholder participation, and collaboration among countries. However, the high financial requirements associated with such programs raise concerns about their long-term sustainability.

Existing cost evaluations of LMG training programs primarily focus on direct expenses, such as trainer fees, venue rentals, training materials, and travel costs. While these are essential considerations, they only represent a fraction of the true economic burden of training initiatives. Indirect costs, including administrative expenses, technological infrastructure for virtual learning, and long-term program monitoring, remain largely unaccounted for. Additionally, opportunity costs such as the time NMCP staff spend in training instead of conducting malaria surveillance, case management, or stakeholder engagement can significantly impact program implementation and service delivery (Turner et al., 2023).

Failing to identify and measure these hidden costs limits the ability to assess the actual financial and economic implications of LMG training programs. Without a comprehensive economic analysis, policymakers and funding agencies may struggle to justify continued investment in leadership training for malaria control. Moreover, indirect costs could act as a barrier to scaling up leadership and governance capacity, ultimately hindering efforts to strengthen health systems and achieve malaria elimination.

This study addressed gaps in existing literature by conducting a structured economic cost analysis of the SU-IHM LMG training program. Conceptually, it expanded the discourse beyond financial costs to include indirect and opportunity costs, offering a holistic view of the economic burden of leadership training. Contextually, it provides new insights specific to malaria control in SSA, where such analyses are scarce. Methodologically, this study advances beyond conventional cost assessments by employing an ingredient costing framework, which systematically allocates costs to specific training activities, thereby enhancing the precision of cost estimates.

1.3. Research Objectives

1.3.1 General objective

To estimate the economic costs of an LMG training program for malaria managers in sub-Saharan Africa using the ingredients costing approach.

1.3.2 Specific objectives

- i. To identify and categorize all activities involved in implementing the LMG training program, documenting the resources required and key cost drivers for each activity.
- ii. To estimate the total economic costs incurred by primary implementers of the LMG training program.
- iii. To calculate unit costs for essential components of the LMG training program and provide insights for optimizing future budgeting and scale-up efforts.

1.4. Research questions

- i. What are the key activities involved in implementing the LMG training program for NMCPs, and what resources and cost drivers are associated with each activity?
- ii. What are the total economic costs incurred by the primary implementers of the LMG training program, including direct, indirect, and opportunity costs?
- iii. What are the unit costs of essential components of the LMG training program, and how can these be optimized to inform future budgeting and scale-up efforts?

1.5. Scope of the study

This study aimed to estimate the economic costs of the LMG training program for National Malaria Control Programs in six high-burden malaria countries in Sub-Saharan Africa: Kenya, Mali, Cameroon, Côte d'Ivoire, Rwanda, and Ghana. The study explored the financial and economic costs incurred in implementing the program to provide information for policymakers and stakeholders involved in malaria control.

The study examined how the LMG training program was designed and implemented, analyzing key activities, resource utilization, and cost drivers in the first phase of the study. The target population for this study were NMCP officials, Ministry of Health representatives, and personnel involved in training administration. The study relied on expenditure records, and attendance data to assess resource use and program efficiency. The study duration covered training activities conducted from the program's inception through its most recent implementation cycle, ensuring a comprehensive evaluation of financial trends over time.

This study focused only on economic costs and will not evaluate the effectiveness or impact of the LMG training on malaria program outcomes. The study also relied on available financial data, meaning that costs related to in-kind contributions or unrecorded support was not fully captured.

1.6. Significance of the study

This study is significant in multiple dimensions of policy, practice, and theory as it provides critical insights into the economic costs of implementing the LMG training program. This initiative is designed to strengthen leadership within NMCPs across Africa, where malaria remains a major public health challenge. Understanding the full economic costs of such programs is crucial for sustainable health system strengthening, particularly in resource-constrained settings.

1.6.1 Policy significance

The findings from this study will inform policy decisions by providing empirical evidence on the financial requirements of leadership training in malaria control. Policymakers in ministries of health and funding agencies will gain a clearer understanding of the cost implications of investing in leadership capacity development. This information can support the integration of structured LMG training into national malaria strategies, ensuring that leadership and governance receive adequate funding alongside clinical and preventive interventions. Additionally, the study's findings can guide in designing cost-effective funding mechanisms that prioritize leadership as an important driver of malaria elimination.

1.6.2 Practical significance

At the programmatic level, this study will provide valuable data on major cost drivers, categorization of training activities, and unit cost estimates for critical program components. This detailed cost

information will enable NMCPs, ministries of health, and implementing organizations to optimize resource allocation and improve the cost-efficiency of leadership training models. Identifying the financial commitments required for different aspects of the program such as in-person training, virtual learning, coaching, and follow-up support would enable the stakeholders to tailor future leadership initiatives to fit available resources while maximizing impact. Additionally, the study will highlight indirect and opportunity costs that are often overlooked in traditional financial evaluations, ensuring a more comprehensive approach to budgeting and planning.

1.6.3 Theoretical significance

From a theoretical perspective, this study contributes to the body of knowledge on economic costing in health system strengthening by applying a structured economic analysis to leadership and governance training. While leadership is widely recognized as an important pillar of resilient health systems, there is limited research on the financial and economic implications of investing in leadership development within disease-specific programs such as malaria control. This study addresses this gap by advancing the application of ingredients-based costing in evaluating leadership training, offering methodological insights that can be adapted for similar studies in other health domains. Furthermore, by linking economic costs to program sustainability and scalability, this research strengthens the evidence base for integrating leadership and governance as an essential component of health system resilience. Ultimately, the study's findings will serve as a foundation for future cost-effectiveness analyses, enabling stakeholders to assess the long-term value of leadership training in achieving malaria elimination goals.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter presents a literature review on leadership and management training, exploring its general application and specific role in malaria control, along with an analysis of the associated costs. It begins with a theoretical review, outlining the theories, models, and frameworks that anchor the research study. Next, the chapter examines related empirical literature in alignment with the research objectives. It then identifies gaps in the existing research based on the reviewed literature. Finally, the chapter concludes with a conceptual framework, visually illustrating how the costing was achieved.

2.2. Theoretical Review

A theoretical framework provides a foundational review of the existing theories related to a particular phenomenon, guiding the researcher in explaining the phenomenon, establishing connections, and making predictions. It reflects the researcher's understanding of the theories and models relevant to the research problem and the broader field of study (Waithera Kiaritha, 2015). This study is grounded in the theory of cost and the activity-based costing framework.

2.2.1 Costing analysis in healthcare

Cost analysis in healthcare is anchored in the economic theory of cost, which distinguishes between fixed costs (such as infrastructure) and variable costs (such as medical supplies), as well as direct (attributable) and indirect (shared) costs (Drummond et al., 2015). Critically, the concept of opportunity cost the value of the next-best alternative foregone underscores the need to account for all resources consumed, even those not monetized (such as volunteer labor or patient time) (WHO, 2019). This theoretical foundation aligns with the Global Health Reference Case, which mandates comprehensive costing to reflect true societal resource use (Vassall et al., 2017).

2.2.1.1 Financial vs. Economic Costs: A Policy-Critical Distinction

In health systems, financial costs (explicit expenditures like salaries and drugs) often dominate budgeting but risk excluding economic costs (implicit value of resources like donated equipment or patient productivity losses) (Adam et al., 2003). For example, a vaccination program's financial cost may underrepresent its true economic burden if volunteer health workers are unpaid (Wilkinson et al., 2016). The reference case resolves this by requiring *both* perspectives: (i) Financial costing informs budget holders (such as ministries of health) and (ii) Economic costing guides societal resource allocation (Vassall et al., 2017).

2.2.1.2. The Concept of Shadow Pricing: Valuing the intangible

When market prices are absent (such as donated supplies, informal caregiving), shadow pricing assigns proxy values to ensure economic cost completeness. For instance, unpaid community health worker time can be valued using local wage rates (Drummond et al., 2015)). This practice, emphasized in the reference case, avoids systemic undervaluation of programs reliant on non-monetized inputs (Vassall et al., 2017). Critics caution against arbitrary assumptions (Frick, 2009), but triangulation with primary data (such as time-motion studies) and sensitivity analyses mitigate this risk (WHO, 2014). In this study, sensitivity analyses were conducted to test the impact of varying selected uncertain parameters.

2.2.1.3 Ingredients-Based Costing Approach

The ingredient-based costing approach operates key theoretical concepts by applying a structured and reproducible methodology (see

Table 0.1). Anchored in the reference case, ingredients costing systematically identifies, quantifies, and assigns value to all resources required for health service delivery. These resources, or “ingredients,” are categorized into three groups: direct ingredients such as staff time, medications, and equipment; indirect ingredients including shared overheads like utilities allocated by floor space; and patient-borne ingredients, such as transport costs and lost wages (Marseille et al., 2015)



Table 0.1. Ingredients Costing Steps

Step	Description
1. Identify	Catalog all resources (for example personnel, supplies, infrastructure).
2. Quantify	Measure units (for example staff hours via time-motion studies, drug doses dispensed).
3. Value	Assign financial (market prices) or economic (shadow prices) values.
4. Allocate	Distribute shared costs using defensible ratios (for example % of staff time).
5. Analyze	Conduct sensitivity analyses key assumptions (for example $\pm 20\%$ price variance).

Adapted from (Vassall et al., 2017)

This study's costing analysis of LMG training for malaria program leaders adopts this standardized costing methodology outlined in Vassall et al. (2017), which involves identifying, quantifying, and valuing all resources (such as personnel, supplies, infrastructure) required for service delivery. This approach aligns with ingredients-based costing principles described in broader health economics literature (Drummond et al., 2015). The integration of this theory and method enables a comprehensive understanding of the resources required to deliver LMG training in LMICs, while offering practical evidence for budgeting, planning, and policy formulation.

From a theoretical standpoint, the study emphasizes the importance of opportunity costs. The time malaria program leaders devote to training is diverted from other essential public health functions, such as fieldwork or routine service delivery. Assigning monetary value to this time typically through shadow pricing based on average health manager salaries ensures a complete reflection of the economic cost of training, beyond the more apparent financial expenditures (Drummond et al., 2015). The analysis also distinguishes between economic and financial costs. While financial costs, such as facilitator fees and venue rentals, are essential for budget planning, economic costs capture less visible but equally significant inputs such as participant travel expenses and donated training materials (WHO, 2019). For example, when a partner organization donates laptops for virtual training sessions, their market value is incorporated through shadow pricing to reflect the true cost of resource use.

Methodologically, the study applied the IBC framework in a step-by-step manner tailored to LMG training. The ingredients were first identified and categorized into direct costs (such as trainer salaries, training manuals, e-learning platform subscriptions), indirect costs (such as administrative support, facility usage), and participant-borne costs (such as travel, accommodation, per diems). Shared costs

such as overheads and utilities were allocated proportionally, based on training duration such as approving monthly facility costs according to the number of training days.

This methodological rigor aligned with the Reference Case's emphasis on transparency and comparability, allowing policymakers to benchmark the cost of LMG training against similar leadership development programs such as those for HIV program managers in Uganda or Nigeria (Vassall et al., 2017). The framework thus provides a standardized yet adaptable approach for cost estimation in resource-constrained settings.

Finally, the study responds to critiques of Activity-Based Costing, which has been found to be too complex or data-intensive for many LMIC contexts (Adam et al., 2003) ingredients costing provides a more feasible alternative, using simplified allocation methods such as ratios based on trainee days rather than requiring detailed activity tracking. This pragmatic approach increases its applicability in health systems where data availability may be limited or fragmented.

In conclusion, this costing study of LMG training for malaria leaders synthesizes economic theory, practical costing methodology, and contextual sensitivity to LMIC realities. It offers a replicable and policy-relevant model for evaluating the costs of leadership development in global health. Adhering to the standards of the Global Health Reference Case while responding to the operational needs of ministries and donors, allowed the study to contribute to evidence-based strategies for strengthening malaria governance, an essential step toward achieving Sustainable Development Goal 3.3 on ending malaria (WHO, 2011).

2.3 Empirical Literature

This section examines evidence on LMG training programs through two lenses: implementation approaches and cost structures. First, it analyzes global and African-specific training models from traditional classroom instruction to experiential and blended learning, highlighting their effectiveness in strengthening health systems leadership. Second, it evaluates economic considerations, revealing significant gaps in understanding full program costs in resource-limited settings. The synthesis demonstrates how program design choices (delivery methods, facilitator sourcing) impact both outcomes and affordability while identifying the urgent need for rigorous cost analyses of LMG initiatives in malaria control contexts.

2.3.1 Delivery and activities in LMG training programs in health systems

Leadership and management training programs play a crucial role in developing effective leaders capable of enhancing health systems' performance. (Lambert, 2003)) states that “How we define leadership frames how people will participate in it”. These training programs vary widely in format, methodology, and scope, depending on the specific goals, target audience, and organizational context. Globally, they generally fall into three main types: traditional classroom-based training, experiential learning, and online or blended learning models.

2.3.1.1 Global and regional program designs

To meet the particular difficulties faced by the healthcare sector, leadership development programs around the world have modified a number of models. Programs like the Leadership Course offered by the American College of Surgeons in the US concentrate on developing certain skills, such as change management and team building, and are tailored to the particular requirements of medical professionals (Sonnino, 2016). Leadership training in sub-Saharan Africa frequently concentrates on problems specific to health systems in environments with limited resources (Bates, 2018; Foster et al., 2018; Gross et al., 2018; Johnson et al., 2021). For example, training for managers of noncommunicable diseases in Rwanda sought to improve management and leadership abilities by creating a standardized curriculum that supports public health paradigms, increases self-efficacy, and gives participants the information they need to successfully advocate for and carry out NCD initiatives (Muhimpundu et al., 2019). Interprofessional and action-based learning are becoming more and more integrated into African programs, emphasizing the skill sets necessary for efficient health governance, such as resource mobilization and conflict resolution (Mubuuke et al., 2023).

2.3.1.2. Traditional classroom-based training

Traditional classroom-based training is still widely used because it provides a controlled setting where students can learn fundamental concepts through talks, debates, and group projects (Paul & Jefferson, 2019). Studies have pointed out some of its drawbacks, though, including a decreased level of practical engagement that may make it more difficult for participants to apply their theoretical knowledge in practical situations (Pounder, 2003). As suggested by (Agboola Sogunro, 2004), this method is

frequently supplemented by interactive sessions to enhance skill transfer through exercises in groups and role-playing.

2.3.1.3 Experiential and action-based learning

Experiential learning approaches focus on hands-on experiences, simulations, and practical scenarios, promoting increased engagement and better retention of skills. (Kong, 2021) found that experiential programs, which involve simulations and role-play, enable leaders to address real-life issues within controlled environments, thereby enhancing their problem-solving and decision-making skills. Action-based learning, involving projects related to workplace challenges, has been shown to significantly boost knowledge retention and the effectiveness of leadership (Myrsiades, 2001). Such initiatives are particularly beneficial in healthcare systems, where leaders gain valuable experience from real-world challenges pertinent to their roles.

2.3.1.4 Blended and online learning

Blended learning programs, integrating online and face-to-face training, have become popular due to their flexibility and accessibility. Online components offer theoretical knowledge, while in-person sessions facilitate practical application through interactive activities (Nkomo & Nat, 2021). Gherghel et al. (2023) highlighted the advantages of online training in fostering autonomous learning but warned that solely online programs might restrict opportunities for peer feedback (Gherghel et al., 2023).

2.3.1.5 Program design and implementation models.

Certain leadership initiatives in the healthcare sector utilize comprehensive models that encompass needs assessments, curriculum development, and ongoing evaluation. The approach of the AFREhealth network illustrates this design; it identified shortcomings in leadership skills, particularly concerning project management and strategic decision-making (Mubuuke et al., 2023). The curriculum was developed with specific modules to address these gaps, combining principles of adult learning with online education to engage a diverse group of health professionals. This approach ensured the program was pertinent to the participants' professional environments while enhancing their leadership and management skills.

2.3.1.6 Evaluation and continuous improvement

Successful training initiatives incorporate thorough evaluation mechanisms to assess both short-term results and long-lasting effects. Follow-up surveys, performance evaluations, and feedback from mentors are common practices used to measure participants' ability to implement new skills (Ajumobi et al., 2021). Furthermore, programs like those conducted by USAID for malaria management highlight the importance of a continuous learning strategy, with technical advisors giving ongoing mentorship and reinforcement of training at the workplace level. This strategy proves especially effective in maintaining learning outcomes and empowering health leaders to apply their training effectively in their home countries (USAID, 2019).

2.3.1.7 LMG training for national malaria control managers in Africa

The Leadership, Management, and Governance for National Malaria Control Program (LMG/NMCP) Capacity Building Project stands out as the closest initiative to the training program under this study. The project was designed to enhance the leadership, management, and governance capacities of National Malaria Control Programs (NMCPs) across several African countries (USAID, 2019). It began with Organizational Capacity Assessments (OCAs) to identify critical gaps in organizational capacity. Based on these assessments, the program implemented Leadership Development Program Plus (LDP+) workshops and provided targeted training in financial and human resource management. To ensure sustained capacity development, Senior Technical Advisors (STAs) were embedded within NMCPs for up to four years, offering ongoing coaching and support in key areas such as organizational reform and Global Fund grant management.

In conclusion, both global and regional models for leadership training emphasize that blending theoretical education with practical experience is vital for developing effective leaders in health systems. In the context of malaria control, where both technical knowledge and leadership capabilities are critical, a blended training strategy that incorporates experiential learning, action-based projects, and ongoing evaluation is particularly well-suited to foster enduring leadership capacity.

2.3.2 Costs and unit costs of LMG training programs

Analyzing the costs of LMG training programs is crucial for evaluating their viability, particularly in settings with limited resources. There is a scarcity of literature concerning the exact costs and unit costs

associated with LMG training; however, existing research highlights the considerable expenses involved, especially when programs are comprehensive, tailored, or reliant on international support. These studies shed light on the elements affecting costs and propose methods to optimize resource allocation in LMG initiatives.

2.3.2.1 Economic costs of training

Economic costs represent the total value of resources used in an activity, including both direct financial expenditures and indirect costs such as opportunity costs. These costs are measured through categorization into direct costs (such as salaries, materials, trainer fees) and indirect costs (such as administrative overhead, lost productivity), along with opportunity cost estimation and allocation using market prices, shadow prices, and activity-based costing respectively (Turner et al., 2023).

Direct training costs refer to expenses directly incurred in program delivery, such as trainer fees, course materials, travel expenses, and external training services. Indirect training costs support the overall training function but are not tied to a specific session. These include salaries and benefits of training staff, facility costs, equipment, and technology infrastructure. For instance, the salaries of personnel in a dedicated training department would be considered indirect training costs. Opportunity costs arise from the productivity loss when individuals participate in training instead of performing their regular duties. For example, a malaria program manager attending a training session may be temporarily unavailable for malaria control activities, leading to a potential impact on program operations (FasterCapital, 2024). However, due to the limited availability of literature detailing these cost components, there is insufficient data to assess their exact financial implications.

In the context of LMG training, economic costs encompass direct expenses such as trainer fees, venue rentals, and training materials, as well as indirect costs like administrative support and the opportunity cost of health managers attending training instead of performing their regular duties. A comprehensive economic evaluation of LMG training should capture these elements to provide policymakers with insights into the program's cost-effectiveness and sustainability.

2.3.2.2 Overall costs and unit costs of LMG training programs

Estimates of the overall and unit costs of LMG training programs demonstrate significant fluctuations based on program structure, geographical location, and the expertise of facilitators. For example, a

leadership program in Zimbabwe that lasted two years and included training for local facilitators incurred a total cost of \$381,134, with an average annual expense of \$26,450 per district in its second year as local facilitators began to take on more responsibilities (Chung et al., 2020b). Costs varied significantly depending on the extent of external involvement; district-level expenses were around \$30,000 when local staff were used, while they could reach as high as \$50,000 with the inclusion of international consultants. This example demonstrates how utilizing local facilitators can help decrease costs over time.

2.3.2.3 Determinants of training costs

Several factors affect the costs associated with LMG programs, such as the degree of customization, the qualifications of trainers, and the mode of delivery. Programs designed to meet unique organizational requirements generally are more costly. Additionally, programs featuring highly qualified or international consultants tend to incur higher expenses compared to those that employ local trainers (MacklinConnection, 2024a). The mode of delivery also affects costs, with online training usually being less expensive than in-person training, which necessitates expenses for venue rentals and travel logistics (Hartzler et al., 2022). These aspects illustrate how both program design and logistical considerations influence the financial demands of LMG training.

2.3.2.4 High initial costs in design and setup

Many LMG programs experience substantial upfront expenses during their design and setup stages, primarily due to the expenses associated with developing curricula, acquiring resources, and recruiting facilitators. The Zimbabwe program indicated higher costs during its initial phases, which were reduced over time as the program framework became more established and local facilitators assumed greater roles (Chung et al., 2020b). This suggests that, for programs that recur, initial expenditures can lead to long-term cost effectiveness by enhancing local capacity.

2.3.2.5 Variability across institutions and countries

Costs also show considerable differences among institutions and countries. High-income institutions like Wharton charge up to \$20,000 for a 9–12-month executive training program (MacklinConnection, 2024a), while leadership courses in Kenya may begin at around KES 103,224 (\$798) (Laimoon, 2024a).

This discrepancy emphasizes the necessity for cost assessments tailored to specific contexts in LMICs, where sustainable training solutions are essential for expanding program reach.

Gaining an understanding of the economic costs associated with LMG training is essential for directing future investments and assessing the program's overall worth. This review of training costs offers crucial data for upcoming cost-effectiveness assessments, allowing stakeholders to evaluate the influence of leadership training on malaria control outcomes. Capturing direct, indirect, and opportunity costs will allow such evaluations guide decisions regarding the expansion of leadership programs within health systems in resource-limited areas.

In conclusion, although the information on LMG training costs is still scarce, current studies point to significant variability influenced by program structure, instructor qualifications, and delivery methods. The insights indicate that costs can be controlled by refining program designs, such as incorporating local facilitators and utilizing online training, which is particularly relevant in low- and middle-income country contexts. Addressing the existing gap in cost data is vital for enhancing the affordability and accessibility of leadership training and facilitating the objective of elimination of malaria in regions heavily impacted by the disease.

2.4 Summary of Literature and Research Gaps

The existing literature regarding the cost implications of LMG training programs emphasizes the significance of these initiatives while also recognizing the limitations in our understanding of their costs. The financial requirements associated with training can differ based on factors like the customization of the program, the qualifications of the trainers, and the methods of delivery. Programs designed to meet specific organizational demands or those conducted by well-qualified trainers tend to have higher costs. Conversely, programs that leverage local facilitators and online formats present more budget-friendly options. Nonetheless, while some research sheds light on these cost determinants, there is a scarcity of in-depth evaluations that presents the complete economic effects of LMG training.

An important observation is that several LMG programs face substantial initial expenses during the design and implementation stages, which include vital elements like curriculum creation, resource acquisition, and trainer hiring (Chung et al., 2020b). Although these initial costs can be considerable, they may lead to long-term efficiencies if the program structure supports sustainability through locally led efforts. Furthermore, significant cost discrepancies exist among various regions and institutions, with

leadership training in LMICs often being more affordable than similar programs in high-income nations (Laimoon, 2024a; MacklinConnection, 2024a). This emphasizes the necessity for context-sensitive cost assessments to enhance the accessibility and scalability of LMG programs in LMICs.

However, despite the insights currently available, there are several research deficiencies in this field. To begin with, existing research where training was done in different countries, there is limited evidence that the training activities were specifically adapted to address unique country or regional needs. Tailoring the program design to reflect local challenges and health systems could improve its relevance and effectiveness. Additionally, existing studies rarely provide comprehensive economic evaluations that take into account both direct and indirect costs, including opportunity costs and overhead expenditures. Addressing these expenses in a thorough way would lead to a deeper understanding of the actual economic effects of LMG programs.

Additionally, there is a notable absence of detailed unit costs for specific program activities in the literature. Current studies typically present aggregated costs but lack detailed data, such as expenses per participant, per coaching session, or per training method (in-person, virtual, blended), which restricts the capacity for in-depth cost-effectiveness assessments. Detailed unit cost information would enable activity-based comparisons and help pinpoint the most financially efficient elements of LMG training programs.

Moreover, while a few studies offer general cost data, limited research is available on how costs differ by region, delivery model, or local context. This is especially important in LMICs, where budget limitations necessitate cost-effective approaches. Investigating the influence of local facilitators, blended learning strategies, or region-specific program frameworks could improve affordability and scalability in these areas.

Lastly, there are few assessments of the long-term cost-effectiveness of LMG programs across multiple cycles. Longitudinal studies are required to follow both costs and results throughout program iterations, providing insights into the enduring sustainability and return on investment of LMG training initiatives. Such research is particularly crucial for health sectors where sustained leadership is vital for tackling ongoing issues, such as malaria control. **Table 0.2** gives a summary of the literature review and the research gaps identified.

Table 0.2. Summary of literature and research gaps

Author(s)	Topic	Findings	Research Gaps	Focus on This Study
(USAID, 2019)	LMG training for malaria control in Africa	The program enhanced leadership and management capacities in NMCPs through Organizational Capacity Assessments (OCAs) and embedding Senior Technical Advisors (STAs) for sustained support.	Limited evidence that the training activities were specifically adapted to unique country or regional needs.	Evaluating the economic costs of LMG training in different countries to ensure tailored, context-specific program designs.
(MacklinConnection, 2024)	Cost of executive leadership training	High-end executive leadership training programs can cost over \$20,000, making them inaccessible to many LMIC institutions.	Limited research on cost-effective alternatives for LMG training in malaria-endemic regions.	Developing scalable and cost-effective LMG training models in LMICs.
(Hartzler et al., 2022)	Cost determinants of leadership training programs	Training costs vary based on customization, trainer qualifications, and delivery methods. Local facilitators and online formats are more cost-efficient than international trainers and in-person training.	Limited evaluations of total economic effects, including indirect costs like opportunity costs and overhead expenditures.	Comprehensive economic costing of LMG training, incorporating direct, indirect, and opportunity costs.
(Chung et al., 2020)	Unit costs of leadership training programs	Significant initial costs (such as curriculum development, resource acquisition) can lead to long-term efficiencies through	The absence of detailed unit cost data for specific program activities limits the ability to perform activity-based cost	Breakdown of unit costs per training activity, enabling activity-based costing (ABC) comparisons.

		sustainable, locally led structures.	comparisons and cost-effectiveness evaluations.	
General literature review	Long-term cost-effectiveness of LMG programs	Few assessments of the cost-effectiveness of LMG training across multiple cycles.	Need for longitudinal studies to track costs and outcomes over multiple training cycles.	Evaluating long-term financial feasibility of LMG training for malaria control.

This study aims to fill these gaps by performing a thorough economic cost analysis of an LMG training program implemented across several African countries. This analysis will encompass both direct and indirect expenses, yield detailed unit cost assessments for specific program activities, and examine the economic consequences within the distinctive context of LMIC health systems. Evaluating these costs at various stages of the program and investigating inter-country cost differences, the study will deliver valuable insights into the scalability, affordability, and long-term feasibility of LMG training in resource-constrained environments.

2.5 Conceptual Framework

The conceptual framework (**Error! Reference source not found.**) for this study is grounded in economic theories and costing methodologies, specifically the “Reference Case for Estimating the Costs of Global Health Services and Interventions” (Vassall et al., 2017), costing steps by (Drummond et al., 2015) and ingredients approach, to evaluate the economic costs of the LMG training program. This framework provides a systematic approach for identifying, allocating, and analyzing costs associated with LMG training, ensuring a comprehensive understanding of financial, indirect, and opportunity costs.

The framework follows a stepwise approach that begins with an in-depth assessment of training processes, followed by the identification of core training activities, cost classification, and cost allocation, ultimately leading to a detailed economic evaluation of LMG training programs. The components of this framework are outlined below:

1) Study training processes.

The first step involves examining the structure of the LMG training program, including its various delivery methods and key stakeholders. This includes:

- Conducting a detailed assessment of training components such as in-person workshops, virtual webinars, coaching sessions, and stakeholder engagements.
- Identifying key stakeholders involved in the training process, including NMCP staff, policymakers, facilitators, administrators, and supporting organizations.

2) Identify core training activities.

To ensure an accurate cost allocation, the training process is broken down into distinct cost-driving activities, such activities would include:

- Curriculum development – content creation, expert consultations, and instructional design.
- Training delivery – approach (including development of virtual learning platform if applicable), venue costs, facilitator fees, participant support, and logistics.
- Coaching and mentoring – time spent by facilitators and experts on one-on-one sessions and group sessions.
- Administrative support – coordination, scheduling, communication, and reporting.

3) Identify traceable costs.

The framework classifies costs into three main categories to capture both direct and indirect cost implications:

- Direct costs, including training materials, facilitator fees, travel expenses, and venue costs.
- Indirect costs, such as technology investments for virtual training, administrative support, and evaluation activities.
- Opportunity costs, representing the time NMCP staff spend on training instead of malaria control activities, which could impact service delivery, surveillance, and intervention planning. Applying shadow pricing to these quantify opportunity costs, ensuring that time and resource trade-offs are accurately captured.

4) Assign costs to activities.

Once costs have been identified, they are allocated to specific training activities to ensure accurate cost distribution. This involves:

- Assigning fixed costs, such as program design, IT infrastructure, and core administrative expenses, to relevant activities.
- Distributing shared costs, such as stakeholder engagement and administrative overheads, based on the proportion of resource utilization.

5) Determine per-activity cost allocation.

After cost assignments, per-activity cost rates are computed to provide a detailed breakdown of expenses at different levels. This will include calculating the cost per unit of training activity, such as cost per trained NMCP staff, cost per training session, or cost per country implementation.

6) Apply costs to training outputs.

The final step involves using the activity-based cost rates to estimate the total economic cost of the LMG training program. This step will provide the following:

- Use activity-based cost rates to calculate the total economic cost of the LMG training program.
- Comparative cost estimates across different countries, training formats, and program components.

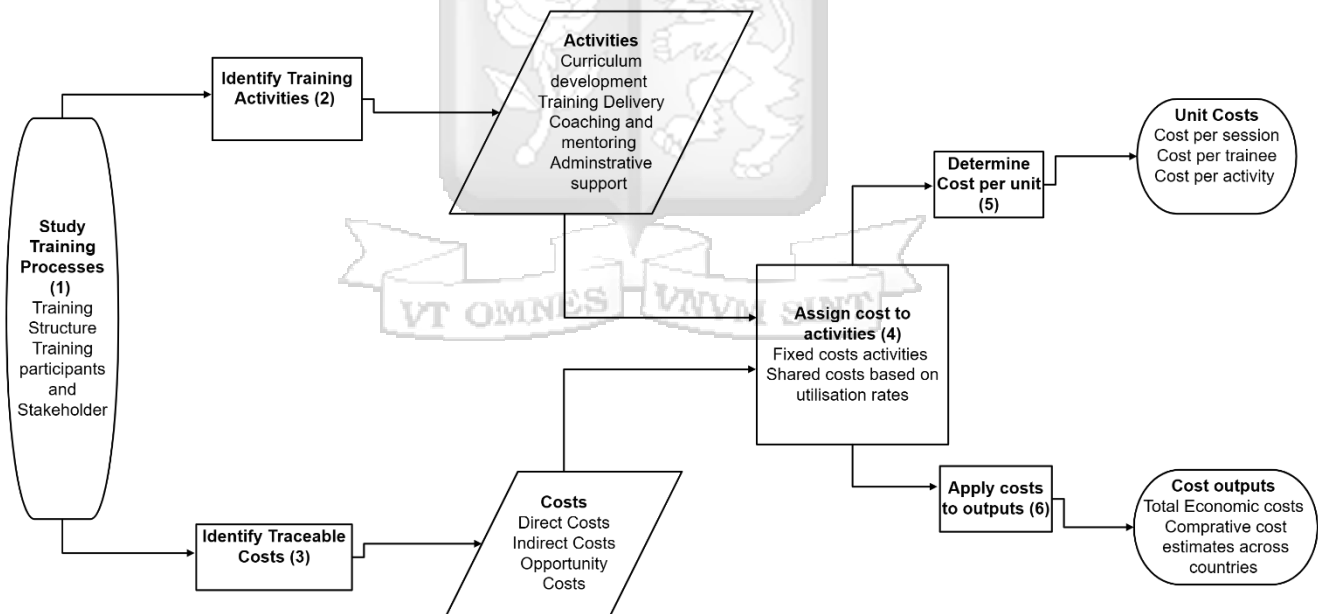


Figure 0.1. Conceptual framework

2.6 Operationalization of variables

This study aimed to estimate the economic costs of the LMG training program by breaking down each program component into specific activities and analyzing their associated costs. Using an ABC

approach, the table below outlines the operationalization of variables, detailing the measurement process, data collection tools, and analysis methods.

Table 0.3. Operationalization of variables

Objective	Variable	Measurement	Data Collection Tool	Data Analysis
To identify and categorize all activities in the LMG program	Program activities	List of activities with descriptions	Program documentation	Activity categorization
To identify resources required for each activity	Resource identification	Qualitative and quantitative data	Resource inventory	Descriptive statistics and content analysis
To measure utilization of resources in each identified activity	Resource utilization	Quantitative data	Activity logs, time tracking	Descriptive statistics
To assign costs to each activity using the ABC method	Cost assignment	Quantitative data	Cost records, ABC framework	Cost allocation analysis
To determine the economic value of resources, including opportunity costs	Economic valuation	Adjusted economic cost values	Market prices, financial records, shadow pricing	Economic cost calculation
To calculate unit costs for critical components of the program	Unit cost calculation	Cost per participant or activity	Cost summaries, resource utilization data	Unit cost analysis

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter outlines the methods employed to address the research problem, focusing on the cost evaluation of the LMG training program. It details the target population, sampling protocols utilized to identify data sources, sample size, and data collection techniques that will be applied to gather information on program costs. Additionally, the chapter discusses procedures that will be adopted for analysis, including cost categorization and allocation methodologies, and explains how the results will be presented to provide actionable insights. Finally, it addresses the ethical considerations associated with data collection and handling, ensuring the study adheres to the highest standards of research integrity and participant confidentiality.

3.2. Research Philosophy

This study adopted a positivist research philosophy, which is most appropriate for quantitative research that seeks to objectively measure economic costs. Positivism is grounded in the belief that reality is observable, measurable, and independent of human perception, making it well-suited for an economic cost analysis of the LMG training program (Creswell, 2018). Under this philosophy, the study applied activity-based costing methodology to systematically quantify the direct, indirect, and opportunity costs of LMG training. The research was based on empirical data collection, structured cost classifications, and statistical analysis, ensuring objectivity, replicability, and generalizability of the findings.

3.3. Research Design

This study adopted a descriptive research design, which is appropriate for studies that seek to systematically describe and quantify phenomena without manipulating variables. A descriptive design allows for an objective and structured estimation of financial and economic costs associated with implementing the LMG training program.

Within this framework, the study employed a retrospective costing approach, following the Reference Case for Estimating the Costs of Global Health Services and Interventions (GHCC, 2017). This ensured methodological rigor and enables reliable and comparable cost data across different contexts. The study took a supply-side perspective, capturing the financial and economic costs incurred by key implementing

agencies, including the Ministry of Health, National Malaria Control Programs, and Strathmore University.

3.4 Design of LMG Training Program

The LMG training program was funded by the Bill and Melinda Gates Foundation, and implemented by the Institute of Healthcare Management, Strathmore University. The design of the training was a blended training approach consisting of face-to-face and virtual sessions covering four modules delivered over a period of six months. Modules 1 and 4 were face-to-face with module 1 delivered in each participating country, while module 4 was delivered at Strathmore University (Kenya). Modules 2 and 3 were virtual. In addition, there were coaching and mentorship sessions organized around personal leadership and institutional improvement projects.

For the purposes of this study, the program was divided into two distinct phases: the startup phase and the implementation phase. As noted by Chege et al. (2022), this classification allows clearer organization of activities and also facilitates the costing exercise to treat startup phases as capital costs. This is because the activities undertaken during startup phases have a useful life exceeding one year i.e., do not require to be done afresh every year, they were annuitized. Details regarding the assumed useful life of startup activities and the discount rates used in the annuitization process are provided in the data analysis section below. A summary of the startup and implementation phase activities is presented in **Table 0.1**.

Table 0.1. LMG Training Program Activities

<i>Phase</i>	<i>Activity</i>
<i>Start-up phase</i>	Curriculum development
	Inception meetings
	Staff recruitment
	Faculty selection
	Procurement
<i>Implementation Phase</i>	Participant selection
	Training
	Coaching
	Graduation
	General management

3.5 Population and Sampling

This study relied exclusively on secondary data sources to estimate the economic costs of the LMG training program across six high-burden malaria countries: Kenya, Rwanda, Ghana, Mali, Côte d'Ivoire, and Cameroon. The analysis covered the entire implementation period from November 2021 to December 2023, ensuring a comprehensive evaluation of resource utilization and cost allocation.

The target population consisted of all financial and administrative records associated with the LMG training program, including expenditure reports, procurement records, attendance logs, budget documents, and accounting ledgers from key implementing institutions. This included data from Strathmore University's Institute of Healthcare Management, National Malaria Control Programs, and other relevant stakeholders involved in funding and executing the program.

A purposive sampling approach was applied to select relevant financial records and administrative datasets that capture direct costs (such as training materials, facilitator fees, travel expenses), indirect costs (such as administrative support, IT infrastructure, logistical coordination), and opportunity costs (such as time allocation of personnel involved in training activities).

3.6 Data Collection Methods

The data collection process for this study focused on identifying, categorizing, and assigning value to all resources utilized during the start-up and implementation phases of the LMG training program. The study relied exclusively on secondary data sources, ensuring a comprehensive and objective assessment of financial and economic costs.

A key component of data collection involved a review of expenditure records from SU-IHM and the participating NMCPs. These records were analyzed to document costs related to personnel, training materials, travel, procurement, venue rentals, and other direct expenses incurred during the program.

In addition to direct financial costs, the study also examined budget reports, procurement documents, administrative records, and training attendance logs to assess resource utilization and indirect cost allocations. To estimate opportunity costs, personnel time allocations recorded in financial reports and program documents were used to quantify the economic value of staff time spent on training versus alternative malaria control activities.

To capture participant engagement levels, attendance records from training sessions, online learning platforms, and coaching activities were analyzed. This allowed for an assessment of resource utilization intensity, particularly in distinguishing between different training formats (in-person workshops, virtual webinars, and coaching sessions). This data was crucial for calculating unit costs per participant or per training session, ensuring a more precise breakdown in economic expenditures.

Where financial data is incomplete or unavailable, market prices and reported resource utilization (quantities used) were used to estimate costs. Shadow pricing techniques were applied to quantify productivity losses associated with training participation. This was done by considering the time spent on training, and the salaries of participants. The salaries were derived from estimates of public sector managers in the six countries.

To ensure comparability and accuracy, all collected cost data were adjusted for inflation and standardized to 2025 values using the Kenyan GDP deflator. Additionally, currency conversions were aligned with the exchange rates applicable at the time each cost was incurred, ensuring that financial values remain consistent and reflective of the economic conditions during implementation of the program.

3.7 Data Analysis

The data analysis process followed a structured approach to ensure an accurate and comprehensive estimation of the financial and economic costs associated with the LMG training program. This involved cost categorization, Activity-Based Costing, capital cost adjustments, unit cost calculations, sensitivity analysis, and cost modeling using Microsoft Excel.

The first step in the analysis was categorizing costs into financial and economic costs. Financial costs, such as trainer fees, venue rentals, training materials, and travel expenses, were identified as costs that are directly incurred in program implementation. Economic costs include administrative support, infrastructure, and opportunity costs, which capture the economic value of resources used in training that are not directly paid for but impact malaria control efforts.

Once costs were categorized, ingredients costing methodology was applied to allocate costs to specific training activities, including curriculum development, workshops, coaching sessions, and administrative functions. This method ensured that indirect costs are accurately distributed, providing a detailed cost structure for each component of the training program.

To properly account for long-term investments, capital costs were annualized over their estimated useful life. Capital costs, such as training-related technology costs, were discounted at a 3% rate to reflect their economic impact over time. Sensitivity analysis was conducted to test alternative discount rates and assess how cost variations influence overall estimates.

To estimate the typical annual economic costs of the LMG training program, start-up phase costs were annualized over a useful life of three years using a 3% discount rate. These annualized start-up costs were then added to the implementation phase costs projected for 2025. The three-year useful life was selected as a reasonable estimate of the period over which the initial design and setup investments would continue to support program delivery without requiring significant reinvestment.

Following annual cost estimation, unit costs for different program components were derived to provide actionable insights for decision-makers. The analysis determined cost per trainee, per session, and per coaching activity by dividing the annualized costs by the number of participants (n). This breakdown will support evidence-based decisions regarding program scalability, efficiency, and financial sustainability.

A sensitivity analysis was carried out to account for variability in two parameters, i.e., the useful life of startup costs and the discount rate. This was done to enhance the robustness of cost estimates and provide a better understanding of potential uncertainties in the economic evaluation.

All cost modeling and calculations were performed using Microsoft Excel, ensuring transparency, accuracy, and replicability of the cost estimates. MS Excel facilitated data organization, formula-based calculations, and sensitivity analysis, allowing for flexible scenario modeling to assess different cost assumptions and policy implications.

3.8 Research Quality

To ensure the reliability, validity, and objectivity of this study, multiple methodological safeguards were implemented.

Validity was reinforced by following standardized guidelines from the “*Reference Case for Estimating the Costs of Global Health Services*” (Vassall et al., 2017), which provides a rigorous framework for cost estimation in global health research. This ensured that the study followed best practices in cost data collection, categorization, and analysis.

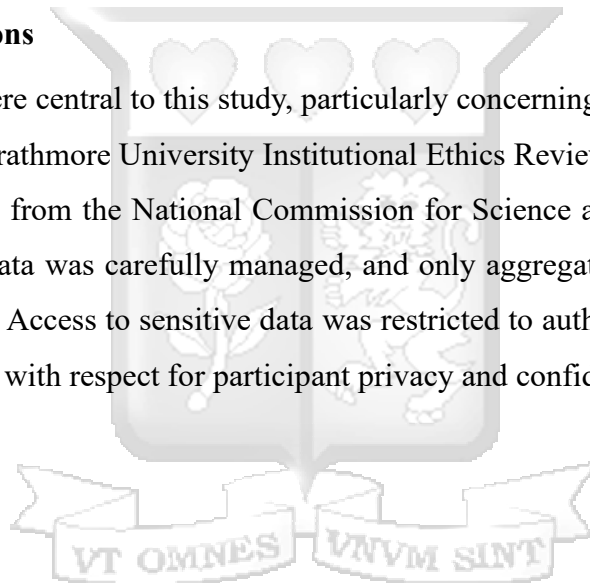
Reliability was achieved through data triangulation, where multiple sources of secondary data including expenditure records, procurement reports, and training attendance logs were cross verified for consistency. This approach minimizes errors and enhances the robustness of the findings.

Objectivity was maintained by applying the Activity-Based Costing framework, which ensures transparent and systematic cost allocation. Using standardized cost classification and allocation techniques allowed the study to minimize subjective bias, providing an accurate and data-driven economic assessment of the LMG training program.

This structured approach ensured that the study's findings remain credible, reproducible, and useful for policymakers and stakeholders involved in malaria leadership training programs.

3.9 Ethical Considerations

Ethical considerations were central to this study, particularly concerning data security. Ethical approval was obtained from the Strathmore University Institutional Ethics Review Committee (SU-IERC) and a research license obtained from the National Commission for Science and Technology and Innovation (NACOSTI). Financial data was carefully managed, and only aggregated findings will be reported to safeguard confidentiality. Access to sensitive data was restricted to authorized personnel, ensuring that all findings are presented with respect for participant privacy and confidentiality.



CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1. Introduction

This chapter presents the findings of the economic cost analysis of the LMG training program. It details the total economic costs of implementing the program, disaggregated by startup and implementation phases, and categorizes expenses into direct, indirect, and opportunity costs. The analysis further examines cost variations by funding sources, estimates unit costs per participant and country, and concludes with a sensitivity analysis to assess the impact of key assumptions on overall cost estimates.

4.2. Overview of Program Activities

The costing analysis was structured around a comprehensive set of activities spanning the startup and implementation phases of the LMG training program. During the startup phase, activities included curriculum development, inception meetings in the six participating countries, staff recruitment, faculty selection, and procurement of necessary equipment and software to support hybrid learning. Major cost elements in this phase were personnel time, travel (flights and accommodation), venues, meals, and equipment. The implementation phase involved participant selection, delivery of the training through in-person and virtual sessions, personalized coaching sessions, a formal graduation ceremony, and ongoing project management and coordination. Costs in this phase were driven by travel, facilitation, per diems, IT support, and venue hire. Each of these activities formed a distinct cost component, and the economic costing exercise involved estimating the full financial and opportunity costs associated with them. **Table 0.1** summarizes these activities across both phases.

Table 0.1. Description of LMG Training Program by Phase

Phase	Activity	Details	Cost item
Start-up phase	Curriculum development	- Developed by faculty over a three-day workshop. - Curriculum was based on health system pillars (4 modules).	- Faculty time - Venue - Meals
	Inception meetings	Principal investigators (PIs) and faculty flew to target countries (Rwanda, Ghana, Mali, Cote d'Ivoire, Cameroon) to meet officials for buy-in.	- Time (PIs, faculty, officials), - Flight tickets - Hotel costs - Venue costs

Phase	Activity	Details	Cost item
Implementation Phase	Staff recruitment	PI and HR recruited a project manager, IT support, grant accountant, and 2 lead coaches.	• Time (PIs, HR) • Refreshments
	Faculty selection	Faculty members were selected primarily from Strathmore University.	• Time (faculty members)
	Procurement	Procurement of key items such as software, tablets, and materials to develop a hybrid class (Oak room).	• Time (procurement officer)
	Participant selection	35 leaders selected from each country (31 from Rwanda), including senior leaders from NMCPs, the private sector, FBOs, and MoH.	• Time (coordinators, faculty members)
	Training	• 4-modules delivered in-person (5-days) and virtually (9 days). • Participants got tablets and data allowance for virtual learning.	• Time (faculty, participants, IT support), • Flight tickets, hotel, • Facilitation costs • Per diems • Venue hire
	Coaching	• Preceded by Personal Leadership Development (PLD) class, using Clarity 4D personality tests. • 7 coaches facilitated (4 coaching sessions per participant).	• Time (coaches, participants), • Flight tickets, hotel, • Facilitation costs • Venue hire
	Graduation	Marked the culmination of the program. Participants converged at Strathmore for the final module and graduation ceremony.	• Materials • Supplies • Time • Venue and meals
	General management	Day-to-day project coordination and oversight by Strathmore project technical and admin team, and country coordinators.	• Time • Venues

4.3. Costs of LMG Training Program

The total economic cost of implementing the LMG training program across the six countries was USD 1,685,008 (**Table 0.2**), with the implementation phase accounting for 96% of the cost and the startup phase consuming 4%. Within the startup phase, inception meetings (USD 28,382, 39% of startup costs) and the setup of a hybrid class and recording studio (USD 19,474, 27%) emerged as the most resource-intensive activities, while staff recruitment and procurement made up a smaller share. In the implementation phase, in-person training was the largest cost driver at USD 857,073 (53% of implementation costs), followed by general project management at USD 551,908 (35%). Virtual training, though significantly less expensive than in-person delivery, still represented 7% of implementation costs. Notably, coaching and graduation activities incurred relatively modest costs, highlighting a concentration of spending on core instructional delivery and oversight. Annualized costs placed nearly all expenditures (98%) within the implementation phase, underscoring its scale and operational intensity.

Table 0.2. Economic Costs of LMG Training Program (2025 USD)

	Costs (2025 USD)	% of Phase	% of Total
Startup Phase			
Curriculum development	13,702	19%	1%
Inception meetings	28,382	39%	2%
Staff recruitment	2,180	3%	<1%
Faculty selection	4,360	5%	<1%
Procurement	4,827	7%	<1%
Re-designing a lecture theatre for hybrid training and recording studio	19,474	27%	1%
Total Startup Costs	72,925	100%	4%
Implementation Phase			
Participant selection	5,722	0.4%	<1%
Training- in person	857,073	53%	51%
Training- Virtual	106,386	7%	6%
Coaching	63,541	4%	4%

Graduation	27,454	2%	2%
General Management	551,908	34%	33%
Total Implementation Costs	1,612,084	100%	96%
Grand Total Economic Costs	1,696,137		100%
Annualized Costs			
Annualized Startup Costs	25,781		2%
Annual Implementation Costs	1,612,084		98%
Total annual Costs	1,637,865		100%

4.4. Costs by Category and Phase

A detailed breakdown of the economic costs by cost category and phase reveals notable differences in resource allocation between the startup and implementation phases. As shown in **Table 0.3**, personnel costs dominated spending, comprising 65% of the total cost (USD 1,043,731), with the bulk of costs being incurred during implementation. This reflects the labor-intensive nature of delivering multi-country training and coaching. Equipment costs (USD 6,252), representing 24% of startup costs but none during implementation, were mainly tied to initial investments in hybrid learning infrastructure. Hospitality costs, including venue and catering expenses, accounted for 18% of total costs (USD 283,866), almost entirely incurred during the implementation phase. Travel-related expenses (USD 12,961) constituted 11% of the overall budget, underscoring the geographical spread of the program and the in-person delivery model. Allowances and materials accounted for modest shares of the budget (5% and 1% respectively), while costs for translation and technology were minimal. These trends suggest that human resources and logistical operations, particularly those tied to physical delivery, were the main cost drivers.

Table 0.3. Cost by Category and Phase

Cost Category	Startup Phase (2025 USD)	%	Implementation Phase (2025 USD)	%	Total (2025 USD)	%
Equipment	6,252	24	-	-	6,252	<1

Personnel	14,780	57	1,043,731	65	1,058,511	65
Allowances	1,671	6	83,829	5	85,501	5
Travel	1,962	8	179,620	11	181,582	11
Materials and supplies	-	-	12,961	1	12,961	1
Technology	-	-	276	<1	276	<1
Hospitality	1,116	4	283,866	18	284,982	17
Translation	-	-	7,801	<1	7,801	<1
Total	25,781	100	1,612,084	100	1,637,865	100

4.5. Costs by Cost Type and Source of Funding

The economic and financial costs of the LMG training program were co-funded by a development partner and the NMCPs of the six participating countries. As shown in **Figure 0.1**, the bulk of the total program costs (USD 1.64 million) were covered by the primary funding partner, contributing USD 1.5 million of which USD 667,516 were economic costs and USD 802,969 were financial outlays. This accounted for 90% of the total costs, with the remaining 10% contributed in-kind by the NMCPs through economic (non-monetary) inputs such as staff time, facilities, or logistical support. Each NMCP contributed between 2–3% of the total economic cost, with Rwanda and Cameroon reporting the highest contributions at USD 28,831 each. Notably, no financial costs were reported by NMCPs, indicating their contributions were non-cash. This cost-sharing structure highlights the significance of partner-led investment in program delivery, while also showcasing local stakeholder engagement through in-kind support. Presenting these funding patterns provides insights into the collaborative nature of program financing and can guide future resource mobilization efforts.

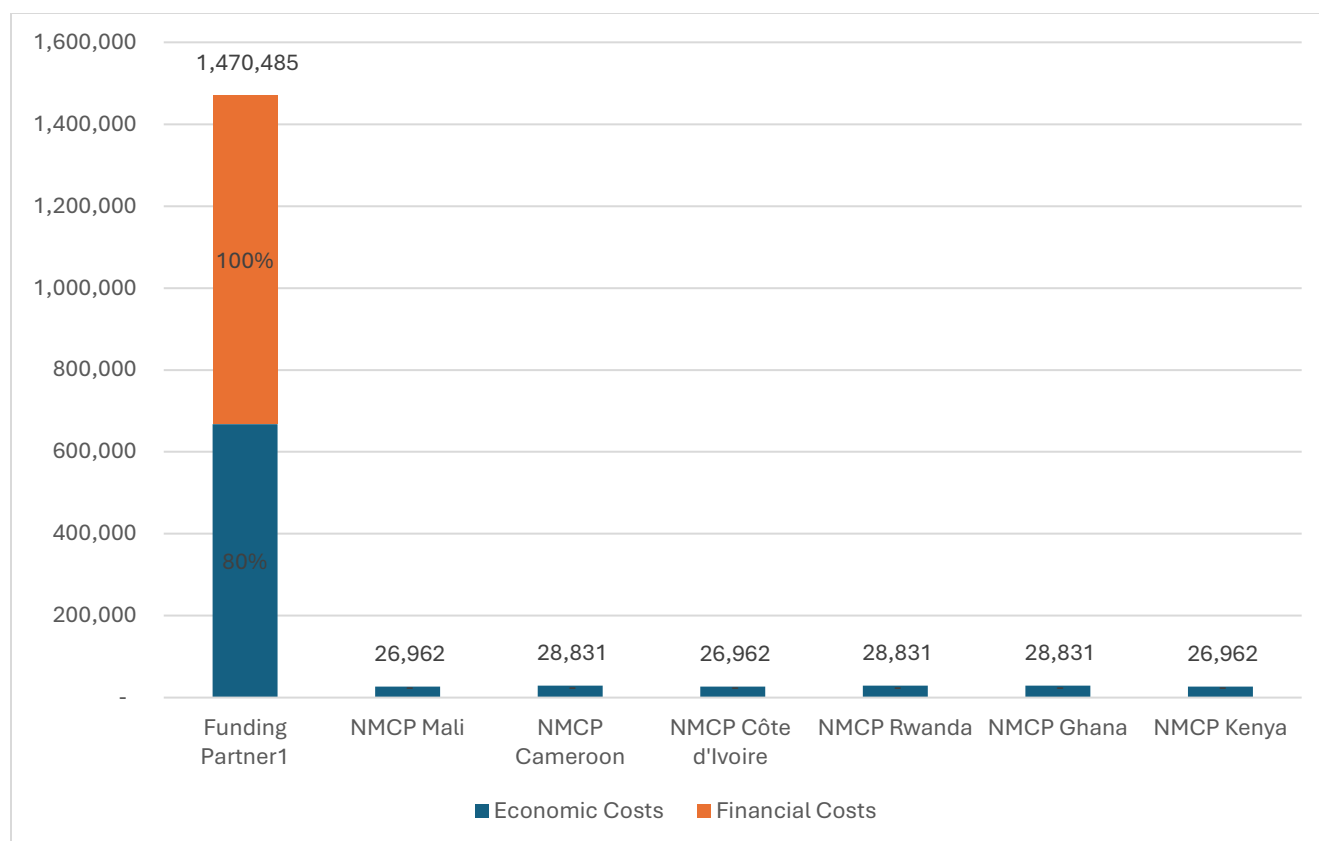


Figure 0.1. Costs by Cost Type and Source of Funding

4.6. Unit Costs of the LMG Training Program

The unit cost analysis provides important insights into the per-participant expenditures across the six countries involved in the LMG training program. As shown in **Table 0.4**, the average cost per LMG trainee was approximately USD 7,951, with country-level variations reflecting differences in delivery modalities, logistical complexities, and local cost structures. Kenya reported the highest cost per participant at USD 9,196, followed by Ghana (USD 8,856) and Rwanda (USD 7,849). In contrast, Mali had the lowest cost per trainee at USD 6,753. Disaggregating by training modality, in-person training had a higher average unit cost (USD 7,126) than virtual training (USD 3,482), highlighting the relative cost-efficiency of online delivery. Coaching costs also varied widely, with Kenya again reporting the highest per-session cost (USD 4,967) and Cameroon the lowest (USD 2,714). This was due to the fact that most coaching sessions in Kenya were done in person. These trends underscore the financial impact of delivery format and location, offering useful insights for optimizing future program scale-up.

Table 0.4. Unit Costs of the LMG Training Program

	Mali	Cameroon	Côte d'Ivoire	Rwanda	Ghana	Kenya	Total
<i>Number of Pax</i>	35	35	35	31	35	35	206
Total In-person Training Costs	206,407	235,970	239,623	219,831	279,170	286,938	1,467,937
<i>Cost per Training-In person</i>	5,897	6,742	6,846	7,091	7,976	8,198	7,126
Total Virtual Training Costs	131,749	102,704	110,357	88,798	101,898	181,744	717,250
<i>Cost per Training-Virtual</i>	3,764	2,934	3,153	2,864	2,911	5,193	3,482
Total Coaching Costs	121,865	95,006	106,138	80,486	97,057	173,854	674,406
<i>Cost Per Coaching Session</i>	3,482	2,714	3,033	2,596	2,773	4,967	3,274
Total LMG Training Costs	236,365	265,222	261,125	243,323	309,958	321,871	1,637,865
<i>Cost Per LMG Trainee</i>	6,753	7,578	7,461	7,849	8,856	9,196	7,951

4.7. Sensitivity Analysis

A one-way sensitivity analysis was done to assess how variations in assumptions affect unit cost estimates of the program. Two parameters were adjusted: the useful life of startup costs and the discount rate. When the useful life of startup costs was varied between 1 and 5 years, the annualized cost per participant ranged from USD 8,190 to USD 7,903, indicating that spreading startup costs over a longer period slightly reduces the unit cost. Similarly, adjusting the discounting rate between 1% and 5% yielded a narrow range of per-participant costs, from USD 7,944 to USD 7,57 (Figure 0.2). These results suggest that the unit cost estimates are relatively stable and not highly sensitive to reasonable changes in these economic assumptions, thereby enhancing the robustness and reliability of the cost analysis.

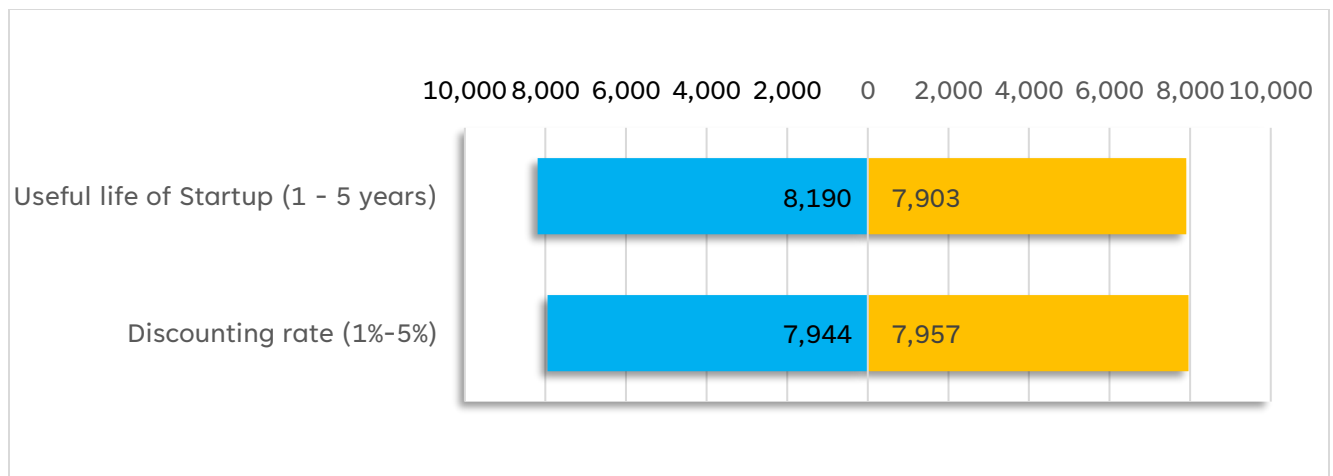


Figure 0.2. One-way Sensitivity Analysis



CHAPTER FIVE

DISCUSSION, SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1. Introduction

This chapter synthesizes the findings of the study, interprets their implications, and outlines actionable recommendations for policymakers and program implementers. The discussion contextualizes the economic costs of the LMG training program within broader health system strengthening efforts, while the conclusion underscores its significance for malaria control in resource-limited settings. The chapter also acknowledges study limitations and identifies areas for future research to enhance the effectiveness and sustainability of leadership training initiatives. Finally, targeted recommendations categorized into managerial and policy interventions provide a roadmap for optimizing program design, delivery, and financing.

5.2. Discussion of Findings

This study aimed to estimate the economic costs of delivering a Pan-African LMG training program for malaria program managers in six high-burden countries in sub-Saharan Africa. The findings provide perspectives into the financial and economic implications of such training initiatives, which are essential for strengthening health systems and advancing malaria elimination efforts. Below, the results are discussed in relation to the study objectives, existing literature, and broader implications for policy and practice.

5.2.1. Economic costs of the LMG training program

The total economic cost of implementing the LMG training program across six countries was estimated at USD 1,685,008, with the implementation phase accounting for 96% of the total costs. This finding aligns with existing literature, which highlights that leadership training programs, particularly those involving multi-country participation and hybrid delivery models, incur significant operational expenses (Hartzler et al., 2023). The dominance of implementation-phase costs underscores the resource-intensive nature of delivering structured training, including in-person workshops, virtual sessions, and coaching, as well as the administrative overhead required for coordination.

The in-person training component emerged as the largest cost driver (USD 857,073, 53% of implementation costs), reflecting expenses related to venue rentals, travel, and facilitator fees. This is consistent with studies by Chung et al. (2020b), who found that face-to-face training in Zimbabwe was

more costly than virtual alternatives due to logistical demands. Conversely, virtual training was more cost-efficient (USD 106,386, 7% of implementation costs), supporting the argument that digital platforms can reduce expenses while maintaining educational quality (Gherghel et al., 2023). However, the higher engagement and perceived effectiveness of in-person sessions may justify their additional costs, particularly for complex topics like leadership and governance.

Opportunity costs, though often overlooked in traditional financial assessments, were a notable component of the economic burden. The time spent by NMCP staff in training instead of malaria control activities represents a trade-off that could impact program implementation. This finding reinforces the importance of incorporating opportunity costs into economic evaluations, as emphasized by Turner et al. (2023).

5.2.2. Cost variations by country and training modality

The study revealed significant variations in unit costs across the six participating countries. Kenya recorded the highest cost per participant (USD 9,196), while Mali reported the lowest (USD 6,753). These disparities align with findings from Chung et al. (2020b), whose evaluation of malaria leadership training in Zimbabwe similarly identified location-specific logistical demands and delivery methods as key cost drivers. While the structure of the training was standardized across all countries, the cost differences between Kenya and Mali are likely due to a few contextual factors. In Kenya, Module 1 was held at Strathmore University, while Module 4 took place in a coastal town away from the capital specifically Mombasa. The costs of flying participants to Mombasa and accommodating them for four days contributed to the higher expenses. Additionally, Kenya served as the central coordination hub for the training across all countries, and the associated administrative and logistical costs may have further added to the overall expenditure. In contrast, Mali's lower costs may be explained by leaner administrative structures and the use of localized facilitation.

The cost per coaching session also varied significantly, ranging from USD 2,706 in Cameroon to USD 4,958 in Kenya. This pattern aligns with findings from blended learning programs for health workers (Hartzler et al., 2022), which show that standardized virtual coaching can reduce costs by 30–40% compared to in-person models. In Kenya, coaching was primarily delivered face-to-face, which likely contributed to the higher costs. These findings highlight the potential of regional resource-sharing such as pooled virtual platforms or train-the-trainer networks as a strategy to reduce cost disparities across countries.

5.2.3. Funding structure and sustainability

The study found that 90% of the program costs were funded by a primary donor, with the remaining 10% provided in-kind by NMCPs. This funding structure was by design, as the program was primarily donor-supported. However, the program's heavy reliance on external funding raises concerns about its long-term sustainability, especially in resource-limited settings. Similar issues were observed in the LMG/NMCP Capacity Building Project (USAID, 2019), where initiatives dependent on donor funding faced challenges in maintaining momentum once external support ended. To improve sustainability, future programs should consider blended financing models, including increased domestic resource mobilization and stronger public-private partnerships. To support sustainability, Strathmore University is piloting the integration of LMG training elements into existing programs and exploring the development of a more affordable virtual version of the LMG course.

5.3. Summary of Findings

This study examined the economic costs of delivering a Pan-African LMG training program for malaria program managers across six high-burden countries in sub-Saharan Africa. The findings reveal that the total economic cost of the program amounted to USD 1,685,008, with the implementation phase accounting for the majority (96%) of expenditures. The largest cost drivers were in-person training (USD 857,073, 53% of implementation costs) and general project management (USD 551,908, 35%), reflecting the logistical and administrative demands of multi-country leadership training. In contrast, virtual training was significantly more cost-efficient (USD 106,386, 7%), suggesting that blended learning models could optimize resource use without compromising quality.

The analysis also highlighted variations in unit costs per participant, which averaged USD 7,951 but ranged from USD 6,753 in Mali to USD 9,196 in Kenya, influenced by differences in delivery formats and local cost structures. Coaching costs further demonstrated variability, from USD 2,714 per session in Cameroon to USD 4,967 in Kenya, indicating potential efficiencies through standardized approaches.

A critical observation was the substantial opportunity cost associated with diverting National Malaria Control Program (NMCP) staff from routine duties to training, reinforcing the need to balance capacity-building with operational demands. Additionally, the program's heavy reliance on external funding (90% of costs) raises sustainability concerns, emphasizing the importance of diversified financing strategies for long-term scalability.

Methodologically, the study advanced the application of activity-based costing in health leadership training, providing a detailed breakdown of expenses by activity (such as curriculum development, coaching, virtual sessions). This granular approach offers policymakers and implementers actionable insights for optimizing resource allocation in future iterations of the program.

In summary, while LMG training represents a significant investment, its costs can be mitigated through strategic use of virtual delivery, local facilitators, and sustainable financing. These findings contribute to the broader discourse on health system strengthening, offering a roadmap for cost-effective leadership development in malaria control and other public health initiatives.

5.4. Reflecting on theoretical foundations

This study's costing analysis of the LMG training program is rooted in the economic theory of cost and operationalized through the ingredients-based costing framework, guided by the principles of the Global Health Reference Case. Together, these theoretical foundations provided a structured yet flexible approach to dissecting the financial and economic dimensions of leadership development in malaria programs, while addressing the unique complexities of LMIC contexts.

The economic theory of cost, with its emphasis on distinguishing fixed and variable costs, offered a critical lens for categorizing the resources invested in LMG training. Fixed costs, such as the initial curriculum development and procurement of hybrid learning infrastructure, were amortized across the program's lifespan, while variable costs, including per-participant expenses for training materials and data allowances, reflected the scalable nature of the intervention. Central to this analysis was the concept of opportunity cost, which compelled the study to account for resources not typically captured in financial ledgers. For instance, the time malaria program leaders spent in training diverted from fieldwork or routine service delivery was quantified through shadow pricing, using local health manager salaries to assign a monetary value to this foregone productivity. This approach ensured the economic cost of training extended beyond mere budgetary expenditures, capturing the true societal investment required to build leadership capacity (Drummond et al., 2015; WHO, 2019)

A cornerstone of the analysis was the distinction between financial and economic costs, a duality emphasized in the Global Health Reference Case (Vassall et al., 2017). Financial costs, such as facilitator fees and venue rentals, provided ministries of health with the tangible figures needed for short-term budgeting. However, the study's adherence to economic costing principles revealed a fuller picture. This

dual perspective proved indispensable in LMIC settings, where programs often rely on donated resources and informal labor. For example, unpaid lectures by NGO experts, shadow-priced at \$50 per hour, highlighted the hidden economic investments required to deliver high-quality training a nuance traditional budgeting might overlook (Wilkinson et al., 2016).

The ingredients-based costing methodology served as the bridge between theory and practice. The exercise of following the methodology's five-step process identifying, quantifying, valuing, allocating, and analyzing resources allowed the study to systematically dissect the LMG program's cost structure. Direct ingredients, such as trainer salaries and tablets, were cataloged alongside indirect costs like administrative overhead, allocated proportionally using trainee-day ratios. Participant-borne expenses, including travel and accommodation, were integrated to reflect the full societal burden of training. This structured approach not only enhanced transparency but also addressed a key critique of activity-based costing which has been criticized for its data-intensive activity tracking in resource-constrained settings (Adam et al., 2003).

The rigor of this methodology, however, did not preclude challenges. Valuing intangible outcomes, such as the long-term benefits of improved stakeholder collaboration, required triangulation with participant feedback. Similarly, fluctuating wage rates and infrastructure costs across the six implementation countries necessitated sensitivity analyses to test the robustness of assumptions. These challenges underscored the need for dynamic costing models capable of capturing leadership's evolving value over time, an area ripe for future research.

Ultimately, the study's theoretical grounding yielded policy-relevant insights. By distinguishing financial (USD3,900 per trainee) and economic (USD 4,340 per trainee) costs, the analysis provided ministries and donors with a nuanced understanding of LMG training's resource implications. The standardized IBC framework further enabled cross-country comparisons, revealing, for instance, that coaching sessions delivered three times the return on investment of generic workshops a finding critical for optimizing future program design.

In conclusion, this study illustrates how the interplay of economic theory and pragmatic costing methods can advance global health priorities. Adhering to the Global Health Reference Case while adapting to LMIC realities, allowed the analysis not only quantified the costs of leadership development but also underscored its role as a strategic investment in health system resilience. As countries strive toward

malaria elimination, such theoretically grounded, methodologically transparent costing studies will remain essential for translating leadership potential into measurable impact.

5.5. Conclusion

This study provides a comprehensive economic analysis of LMG training program for malaria program managers in six high-burden African countries, offering critical insights into the financial and operational realities of implementing such initiatives. The findings underscore that while leadership training is a vital component of health system strengthening, it requires substantial investment, particularly in in-person delivery, which accounted for over half of the total costs. However, the comparative efficiency of virtual training suggests that blended learning models could enhance affordability without sacrificing impact.

The variations in unit costs across countries highlight the influence of local factors, such as logistical demands and delivery methods, on program expenses. Additionally, the significant opportunity costs identified emphasize the need to balance training participation with essential malaria control activities, ensuring that capacity-building efforts do not inadvertently disrupt service delivery.

Applying activity-based costing allows this study to not only quantify the true economic burden of LMG training but also provides a methodological framework for future cost analyses in global health leadership programs. The insights generated can guide policymakers and implementers in optimizing resource allocation, improving cost-efficiency, and ultimately strengthening health systems for sustainable malaria elimination and beyond.

In conclusion, this research reaffirms the value of leadership development in public health while advocating for strategic, data-driven approaches to maximize both impact and financial sustainability. The lessons learned extend beyond malaria control, offering a blueprint for cost-effective capacity-building in other health domains across resource-limited settings.

5.6. Recommendations

To enhance the efficiency, sustainability, and impact of LMG training programs, the following recommendations are proposed, categorized into managerial (for program implementers) and policy (for governments, funders, and institutional stakeholders) actions.

5.6.1. Managerial Recommendations

- 1) **Optimize training delivery models.**

- a) Increase the use of virtual and blended learning to reduce costs associated with in-person sessions (venue rentals, travel, and per diems) while maintaining interactive elements like live discussions and case studies.
 - b) Standardize coaching approaches to minimize cost variations across countries, potentially through train-the-trainer models or digital mentorship platforms.
- 2) Strengthen local capacity for cost efficiency.**
- a) Prioritize local facilitators and institutions to deliver training, reducing reliance on international consultants and lowering logistical expenses.
 - b) Invest in sustainable technology infrastructure (such as e-learning platforms) to support scalable virtual training.
- 3) Monitor and minimize opportunity costs.**
- a) Implement flexible training schedules to minimize disruptions to routine malaria control activities.
 - b) Track participant time allocation to assess trade-offs between training and core responsibilities, adjusting program design as needed.
- 4) Improve cost tracking and transparency.**
- a) Adopt activity-based costing frameworks in program budgeting to identify key cost drivers and inefficiencies.
 - b) Maintain detailed expenditure records to support future cost-effectiveness analysis.

5.6.2. Policy Recommendations

- 1) Diversify funding mechanisms for sustainability.**
- a) Governments should integrate LMG training budgets into national malaria strategies to reduce dependence on external donors.
 - b) Explore public-private partnerships and domestic resource mobilization to fund leadership development.
- 2) Scale cost-effective models for wider impact.**
- a) Policymakers should promote regional training hubs to standardize content, share resources, and lower per-participant costs across countries.
 - b) Funders such as Global Fund should incentivize blended learning approaches in grant requirements to maximize reach and efficiency.
- 3) Link training investments to measurable outcomes.**

- a) Require impact evaluations to correlate LMG training with improvements in malaria program performance (such as case management, surveillance quality).
 - b) Develop longitudinal cost-effectiveness studies to justify sustained investment in leadership development.
- 4) **Institutionalize leadership training in health systems.**
- a) Ministries of Health should formalize LMG curricula in professional development pathways for health managers.
 - b) Align training with national accreditation systems to enhance participation and recognition.

5.7. Areas of further research

This study highlights several critical areas requiring further research to strengthen the evidence base for LMG training programs in malaria-endemic regions. Future investigations should examine the long-term cost-effectiveness of such training by linking economic costs to measurable improvements in malaria program performance through longitudinal studies. Comparative analyses of different delivery models (in-person, virtual, and hybrid) could identify optimal approaches balancing cost, engagement, and skill retention, while contextual adaptation studies may reveal how to tailor programs to local health system needs without compromising efficiency. Research into innovative financing mechanisms is needed to transition from donor dependence to sustainable local funding models. More precise methodologies for quantifying opportunity costs, such as time-motion studies, would better capture the trade-offs between training participation and routine health service delivery. Finally, systems-thinking approaches could illuminate how to effectively integrate LMG training within broader health system strengthening initiatives.

5.8. Limitation of the study

While this study provides valuable information into the economic costs of LMG training programs, several limitations should be acknowledged. First, the analysis relied primarily on secondary data from program records, which may not have captured all relevant cost components, particularly indirect and opportunity costs. Second, the study focused on six high-burden malaria countries in sub-Saharan Africa, limiting the generalizability of findings to other regions or disease contexts. Third, the relatively short implementation period (2021–2023) may not fully reflect the long-term financial requirements or sustainability challenges of such programs. Finally, the study did not assess the qualitative aspects of training effectiveness, such as leadership skill acquisition or behavioral changes among participants,

which could influence cost-benefit interpretations. These limitations highlight opportunities for future research to incorporate primary data collection, extend the evaluation timeframe, and integrate both quantitative and qualitative measures of program impact.



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APPENDICES

Appendix A: Data Collection Tool

Costing data collection tool

Section	Question/variable	Response/details	Validation and notes ¹
General program information	Program name		
	Country of implementation		
	Implementation period (start and end dates)		
	Program phases (such as start-up, implementation)		
Personnel	Job titles of staff involved		
	Time allocation to the program (% of working hours)		
	Monthly salaries and benefits		
Materials and supplies	Description of materials (such as manuals, tablets)		
	Quantity used		
	Unit cost (local currency)		
Infrastructure and equipment	Description (such as rented venues, IT equipment)		
	Duration of use		

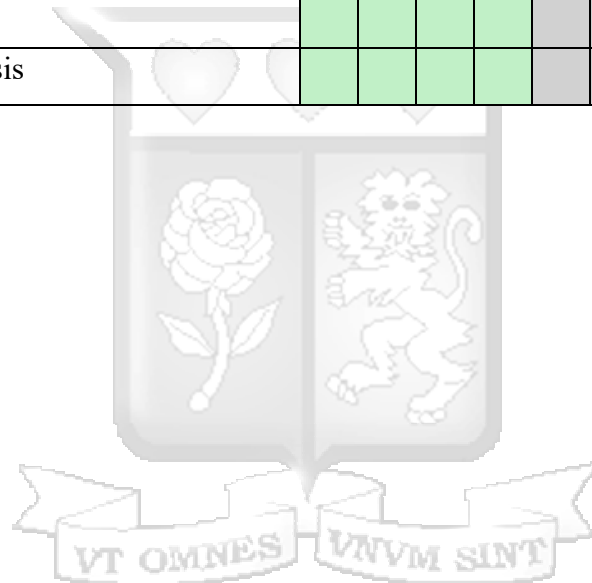
¹ Notes on data discrepancies, supporting documents (e.g., financial reports, invoices)

Section	Question/variable	Response/details	Validation and notes ¹
	Rental or purchase cost		
Direct costs	Training delivery costs (such as workshops, coaching sessions)		
	Participant allowances (such as per diem, travel costs)		
	Communication costs (such as internet, software licenses)		
Indirect costs	Administrative support costs		
	Opportunity costs (such as participant time spent away from regular duties)		
Capital costs	Description of capital items (such as office furniture, audiovisual equipment)		
	Estimated useful life (years)		
	Annualized cost (including discount rate)		
Activity-based allocation	Description of training activity (such as curriculum development, coaching)		
	Resources allocated to each activity		
Participant data	Number of participants per session		
	Mode of participation (in-person, virtual)		
	Attendance records		

Appendix B: Timeline of Activities

Workplan

Month/Year	Mar 2025				April 2025				May 2025			
Activity/week	1	2	3	4	1	2	3	4	1	2	3	4
Seek ethical approval												
Data collection												
Data analysis												
Draft findings and preliminary report												
Writing the thesis (draft)												
Internal review												
Finalize and submit thesis												



Appendix C: Ethics Approval Letter



19th March 2025

Mr Chege Timothy,
tchege@strathmore.edu

Dear Mr Chege,

RE: Examining the Economic Costs of Delivering a Pan-African Leadership, Management, and Governance Program for Malaria Program Managers

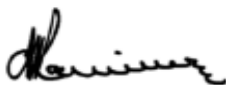
This is to inform you that SU-ISERC has reviewed and approved your above SU-masters proposal. Your application reference number is SU-ISERC2788/25. The approval period is from 19th March 2025 to 18th March 2026.

This approval is subject to compliance with the following requirements:

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
- iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 72 hours of notification.
- iv. Any changes anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 72 hours.
- v. Clearance for the export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days of completion of the study to SU-ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke/> and obtain other clearances needed.

Yours sincerely,



Mr Ambrose Rachier,
Chairperson; SU-ISERC

Appendix D: NACOSTI Research License

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
RefNo: 827274	Date of Issue: 04/April/2025
RESEARCH LICENSE	
	
This is to Certify that Mr.. Timothy Wokabi Chege of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Examining the Economic Costs of Delivering a Pan-African Leadership, Management, and Governance Program for Malaria Program Managers for the period ending : 04/April/2026.	
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