**THE UNIVERSITY OF ZAMBIA**
**SCHOOL OF PUBLIC HEALTH**

# CONTRIBUTION OF PRIVATE HEALTH FACILITIES TO MALARIA SURVEILLANCE IN SOUTHERN, COPPERBELT AND LUSAKA PROVINCES, OF ZAMBIA

BY

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**A dissertation submitted to the University of Zambia in partial fulfilment for a Degree of Master of Science in Epidemiology**

THE UNIVERSITY OF ZAMBIA
LUSAKA

## DECLARATION

I **Angela Gama** declare that this dissertation submitted hereby for the Degree of Masters of Science in Epidemiology (MSc. Epidemiology) is my own work and has not been submitted either wholly or part to another degree to this or any other University or Institution of higher education.

**Protocol Reference No. 2017-Jul-029**

**Ethics Committee Approval Date: 28th August 2017**

**Signed ……..Date ……**

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## APPROVAL

This dissertation by Angela Gama has been approved as fulfilling the requirements or partial fulfilment of the requirements for the award of Degree of Master of Science in Epidemiology by the University of Zambia.

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## ACKNOWLEDGEMENTS

Remarkable appreciations go to my supervisors Dr Gershom Chongwe and Dr Busiku Hamainza, for their time and valuable advice throughout the research. I wish to thank the CDC Field Epidemiology Training Program (FETP) resident advisor, Dr Ellen Yard and manager, Dr Nyambe Sinyange for their advice and contributions to my research.

My great appreciation goes to the Zambia Ministry of Health through US Centres for Disease Control and Prevention (CDC) and the United States President's Malaria Initiative (PMI) for funding my studies.

My special gratitude goes to Dr Elizabeth Chizema, Dr Anthony Yeta, and the National Malaria Elimination Centre staff for their support during the research and field placement. I wish to thank all the respondents from private health facilities who took part in answering the questionnaire.

I would like to acknowledge my God for his faithfulness throughout my studies. I want to thank my loving husband Emmanuel Butale, my adorable children Emmanuel, Tionge and Thabo who were supportive and understanding throughout my studies

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# ABSTRACT

Malaria is one of the leading causes of death in the world with Sub-Saharan Africa carrying 92 percent of malaria deaths. Malaria remains a serious public health problem in Zambia causing 12 percent of the reported deaths annually. Zambia has moved from accelerated malaria burden reduction to malaria elimination which requires the national malaria surveillance system to capture all the cases both from the public and private sector to ensure a complete and accurate picture of malaria incidence. However there is a gap in knowledge on the proportion of malaria cases in the Health Management Information System (HMIS) that are from private health facilities and factors that are associated with private facilities reporting malaria in HMIS.This study aimed to determine factors associated with private facilities reporting malaria in HMIS and the proportion of malaria cases in HMIS that were from private health facilities in Southern, Copperbelt and Lusaka Provinces, of Zambia.

This study was a cross sectional study design. HMIS data were used to examine the proportion of the malaria cases that were from the Private facilities in the year 2012 to 2017. A structured questionnaire was used to collect information from the heads of private health facilities (or individuals nominated by the heads of the facilities) on factors associated with private facilities participating in malaria surveillance in Southern, Copperbelt and Lusaka province.

In the year 2017, 36% (n=36/99) of the private health facilities in the Copperbelt, 15% (n=4/27) in Lusaka and 8% (n=1/13) in Southern province reported malaria in HMIS. Private health facilities in the Copperbelt, Lusaka and Southern province contributed 8 percent of all the malaria cases that were reported in the HMIS from 2012-2017. In multivariable logistic regression analysis, after adjusting for the confounding effects of the number of record clerks and doctors the private health facility had and having electricity back up, private facilities that had been operating for more than 20 years had three times increased odds of reporting malaria in HMIS (AOR=3.22, 95% CI: 1.23, 8.42; P-value 0.02) compared to those that had been operating for less than 20 years. Private facilities that were located in the Copperbelt province (AOR=2.20 95% CI: 1.35, 3.58; P-value <0.01) had two times greater odds of reporting malaria in HMIS compared to those that were located in Lusaka province. The private facilities that had staff who were aware about malaria surveillance had two times greater odds of reporting malaria in HMIS (AOR=2.06 95% CI: 1.38, 3.99; P-value <0.01) compared to those that were not aware.

The study has shown that the private sector clearly is seeing malaria cases and these need to be reported and part of the overall national surveillance system. The main factors associated with private health facilities reporting malaria in HMIS included, the private health facility operating more than 20 years, the staff being aware and trained in malaria surveillance and the private health facility having more than five nurses. Trainings of private providers on malaria surveillance is recommended to improve reporting in HMIS.

**Keywords:** Malaria Surveillance, Health Management Information System, Private health facilities, Copperbelt province, Lusaka province, Southern province

# CHAPTER 1

# BACKGROUND

## 1. Introduction

Malaria is a life-threatening disease caused by *Plasmodium* parasites transmitted to humans through the bite of the *Anopheles* mosquito. Malaria is one of the leading causes of death in the world causing 435 000 deaths in 2017, with World Health Organisation (WHO) African Region carrying 92 percent of the global malaria burden and 93 percent of malaria deaths (Anon 2018)

Malaria is one of the leading cause of death in Zambia causing 12 percent of the reported deaths annually, (Centers for Disease Control and Prevention, 2013). Zambia's efforts to reduce the burden posed by malaria and address other challenges to the health of its citizens are part of a broader agenda aimed at the attainment of significant and sustainable socio-economic development. The country's long-term development agenda is guided by the Vision 2030 Strategy, which identified malaria control as a key priority area.

Surveillance of malaria is important for ministries of health to determine the geographical distribution of malaria cases, the groups of people most affected and to monitor changing disease patterns (WHO, 2016). Strong malaria surveillance systems also help countries design effective health interventions and evaluate the impact of their malaria control programs (Centers for Disease Control and Prevention, 2016).

Many countries and regions worldwide, including Zambia, have in the past few years pledged to eliminate malaria, and this requires commitment from both government and private sectors (Colombo, 2008, WHO, 2016). In order for malaria elimination to be successful, it is important to have strong surveillance system capable of giving an accurate picture of malaria incidence over time and place, (WHO, 2012).

Most National Malaria Control Programmes routinely collect malaria incidence data for surveillance predominantly from government health facilities and this is the main dataset that is reported to Word Health Organization (WHO, 2015). In many countries, the private sector have a key role in providing malaria care but do not contribute data to the National Malaria Control Programmes, malaria surveillance system,(Mercado et al. 2017). This incomplete

reporting of malaria incidence can result in a very inaccurate picture of the distribution of malaria and a gross underestimate of the disease burden for the National Malaria Control Programme.

Incomplete reporting of malaria incidence greatly hinders allocation of appropriate resources within governments and impairs efficient targeting of malaria control interventions. It also constrains access to external funding where disease burdens are underestimated (Mercado et al. 2017). A complete and accurate picture of malaria incidence is critical to show reliable evidence that a country is moving towards elimination (Breman and Holloway, 2007).

### 1.1 Statement of the Problem

Malaria surveillance is currently weakest in countries with the highest malaria burden, rendering it difficult to accurately assess disease trends and plan interventions, (WHO, 2015). According to WHO, (2015), only about one tenth of the estimated 198 million cases that occurred globally in 2013 were detected and reported through national malaria surveillance systems. This problem with national malaria surveillance has continued worldwide, even in the year 2015, where malaria surveillance systems detected only 19 percent of the estimated 214 million new cases that occurred in 2015 and one of the attributing factors was that malaria surveillance data from private health facilities were not being captured in the routine surveillance, (WHO, 2016).

Malaria is a notifiable disease in Zambia (WHO, 2010) therefore, private facilities are required to report. However, there is a gap in knowledge on the number of private health facilities that report malaria and how much of the existing malaria cases in the Health Information System (HMIS) are from the private health sector. In addition, there is a gap in knowledge on the factors associated with private health facilities reporting malaria data to the national malaria surveillance system.

### 1.2 Study Justification

Despite key accomplishments made in malaria control, malaria continues as an important cause of morbidity and mortality in Zambia. Malaria affects more than 4 million Zambians annually, accounting for 30 percent of the outpatient department (OPD) attendance and responsible for approximately 2000 deaths in 2016, (HMIS, 2016).

The newly launched National Malaria Elimination Strategic Plan 2017 to 2021, (2017), major goal is to eliminate local malaria infection and disease by 2021 and surveillance is one of the key intervention. The strategic plan is premised in the use of epidemiological data to direct program implementation (NMEC, 2017) which will require all the cases both from the public and private sector reported in the HMIS to ensure a complete and accurate picture of malaria incidence.

This research investigated the proportion of malaria cases in the national HMIS reported by private health facilities from the year 2012 to 2017 and determined factors associated with private health facilities reporting malaria surveillance data. Zambia heads towards elimination, the findings of this research might be useful to plan for interventions to strengthen malaria surveillance in private health facilities by Ministry of Health (MOH) and NMEC.

## 1.3 General Objectives

To determine the contribution of private health facilities towards malaria surveillance in Southern, Copperbelt and Lusaka Provinces, of Zambia

### 1.3.1 Specific Objectives

1. To establish the proportion of the malaria cases in the national Health Management Information System (HMIS) that were from the private facilities in Southern, Copperbelt and Lusaka province of Zambia from the year 2012 to 2017.
2. To determine factors associated with reporting malaria to the HMIS by private health facilities in Southern, Copperbelt and Lusaka province

### 1.3.2 Research Questions

1. What proportion of the malaria cases in the national Health Management Information System (HMIS) were from private facilities in Southern, Copperbelt and Lusaka province of Zambia from the year 2012 to 2017
2. What factors are associated with reporting malaria to the HMIS by private health facilities in Southern, Copperbelt and Lusaka province

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

The literature review starts with a discussion of the related literature from a general viewpoint in which broad concepts and approaches relating to malaria surveillance. It then deals with more specific previous studies that concentrate more on the research questions that a closely related to the research problem at hand. The literature review covers the following issues:

1. Overview of Malaria
2. Epidemiology of malaria
3. Malaria surveillance
4. Contribution of the private health care facilities in malaria surveillance

## 2.2 Overview of Malaria

Malaria in humans is caused by intraerythrocytic parasitic protozoa of the genus *Plasmodium*, (WHO, 2014). An infected female Anopheles mosquito is commonly known for transmitting the disease. The mosquito bite introduces the parasites from the mosquito's saliva into a person's blood. The parasites travel to the liver where they mature and reproduce. Five species of *Plasmodium* can infect and be transmitted by humans, namely *p. Falciparum, p. vivax, p. ovale, p. malariae and p. Knowlesi*, (Caraballo, 2014). Most deaths are caused by *P. falciparum*, because *p. vivax, p. ovale,* and *P. malariae* generally cause a milder form of malaria while *p. Knowlesi* rarely causes disease in humans, (CDC, 2016). Malaria is typically diagnosed by the microscopic examination of blood using blood films, or with antigen-based rapid diagnostic tests or using polymerase chain reaction to detect the parasite's DNA.

Most common symptoms of malaria usually include fever, chills, nausea, vomiting general malaise, headache and fatigue. Symptoms usually begin ten to fifteen days after being bitten in severe cases it can cause yellow skin, seizures, coma, or death. If not properly treated, people may have recurrences of the disease months later, (WHO, 2016). In those who have recently survived an infection, reinfection usually causes milder symptoms. This partial resistance disappears over months to years if the person has no continuing exposure to malaria, (Caraballo, 2014).

## 2.3 Epidemiology of Malaria

According to the estimation by WHO (2018), in 2017 there were 219 million cases of malaria resulting in 435, 000 deaths, representing a reduction of 20 million malaria cases and 172, 000 deaths since 2000. Most malaria cases in 2017 were in the WHO African Region (200 million or 92%), followed by the WHO South-East Asia Region with five percent of the cases and the WHO Eastern Mediterranean Region with two percent. Fifteen countries in sub-Saharan Africa and India carried almost 80% of the global malaria burden with five countries accounting for almost half of all malaria cases worldwide: Nigeria (25%), Democratic Republic of the Congo (11%), Mozambique (5%), India (4%) and Uganda (4%) (Anon 2018)

It has been estimated by others that the number of cases at between 350 and 550 million are for falciparum malaria, (Olupot-Olupot and Maitland, 2013). The bulk of cases (65%) occur in children below 15 years old (Murray, *et al.,* 2012). About 125 million pregnant women are at risk of infection each year; in Sub-Saharan Africa, maternal malaria is associated with up to 200,000 estimated infant deaths yearly (Hartman, *et al.* 2010).

The geographic distribution of malaria within large regions is complex, and malaria-afflicted and malaria-free areas are often found close to each other, (Greenwood and Mutabingwa, 2002). Malaria is prevalent in tropical and subtropical regions because of rainfall, consistent high temperatures and high humidity, along with stagnant waters in which mosquito larvae readily mature, providing them with the environment they need for continuous breeding, (Jamieson, 2006). In drier areas, outbreaks of malaria have been predicted with reasonable accuracy by mapping rainfall, (Abeku, 2007). Malaria is more common in rural areas than in cities. For example, several cities in the Greater Mekong Subregion of Southeast Asia are essentially malaria-free, but the disease is prevalent in many rural regions, including along international borders and forest fringes, (Cui, *et al.,* 2012). In contrast, malaria in Africa is present in both rural and urban areas, though the risk is lower in the larger cities, (Machault, *et al.,* 2011).

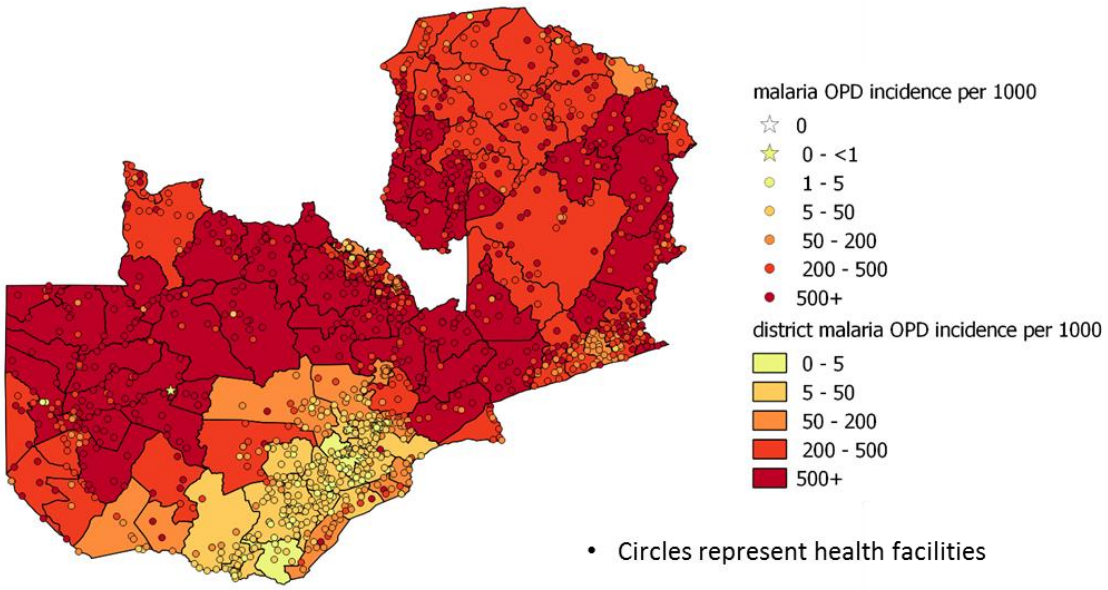
## 2.4 Malaria in Zambia

In Zambia, Malaria is caused by the four main *Plasmodium* species that infect humans, with *P. falciparum* accounting for 98 percent of all infections, (MOH, 2012). The malaria season

follows the rainfall patterns in Zambia; thus, mosquito population starts to increase soon after the rains start in September-November, and malaria peaks in April-May and falls off in June-July when the rains stop (Masaninga *et al.*, 2013).

During the last decade, under the previous (2005–2010) and the current (2011–2016) national malaria strategic plans (NMSPs), Zambia has made substantial progress in scale-up of proven malaria interventions. The interventions have included long-lasting insecticide-treated mosquito nets (LLINs), indoor residual spraying of insecticide (IRS), prevention during pregnancy with LLINs and intermittent preventive treatment (IPTp), and improved case management with diagnostic confirmation using rapid diagnostic tests (RDTs), microscopy, and treatment with artemisinin-based combination therapy (ACT) (MOH, 2016)

Despite significant progress made over the past decade, malaria continues to be a major issue in Zambia causing 2,000 deaths per year, (MOH-HMIS 2016). The incidence of malaria (map below) varies widely from under 50 cases/1,000 populations in some districts to above 500cases/1,000 population in others, (MOH-HMIS 2017). Prevalence of malaria in the most vulnerable age group (children under five years of age) varies from below 3 percent in some districts, such as urban Lusaka, to over 30 percent in the most rural provinces, (MOH-HMIS 2017).




*Source: National Health Information System 2017, (NMEC, 2017)*

*Figure 1: Malaria Incidence in Provinces, Districts, and Health Facility Catchment Areas in Zambia Based On 2017 HMIS Data*

According to the Zambia Malaria indicator survey (MIS-2015) showed that one in five or 19.4 percent of the children in Zambia are infected with malaria parasites compared with 14.9 percent in 2012. This increase was seen in rural and urban areas although the overall percentage of children infected in urban areas remained low at around 6.0 percent.

Lusaka Province has had quite low level of transmission and this has stayed very low and stable over several years. Southern Province has recently succeeded in reducing their malaria rates to similar amounts as those of Lusaka, 0.6 percent in 2015, down from 0.8percent in 2012. Many provinces reported an increase from 2012 to 2015, Muchinga recorded an increase of 22 percent and Copperbelt, an increase 10.5 percent.

**2.5 Malaria Surveillance**

The World Health Organization (WHO) defines malaria surveillance as the "continuous, systematic collection, analysis and interpretation of malaria data needed for the planning, implementation, and evaluation of malaria control programmes" (WHO, 2017). A malaria surveillance system consists of the tools, procedures, people and structures that generate information on malaria cases and deaths, which can be used for planning, monitoring and evaluating malaria control programmes (WHO, 2018)

According to WHO, (2008), three factors affect whether routinely reported malaria data accurately reflect patterns in malaria in countries with surveillance programmes, even ones that have relatively good statistical services. According to WHO (2015), first, information in routine surveillance systems may be incomplete which may result in overestimates of reporting completeness thereby underestimating malaria patterns; second, many malaria cases treated at private facilities are not included in the official statistics; third, in some developing countries, diagnosis is based predominantly on clinical presentation with only a small proportion of suspected malaria cases subjected to laboratory verification. The failure of surveillance systems in developing countries is often due to limited available resources, lack of knowledgeable staff, disorganization, and poor infrastructure for finding and reporting cases (Nsubuga, 2006)

Heymann, et al., (2006) pointed out that stronger public health surveillance systems in developing countries will allow public health officials to more accurately describe and assess the state of health problems. Reliable data can improve health promotion programs, and help policy makers and investors allocate resources effectively.

As Zambia pursues malaria elimination, enhanced surveillance systems with the involvement of the private sector was increasingly critical, (NMEC, 2017). In addition, engaging with the private sector in surveillance is an opportunity to grow the country's evidence base. The potential sensitivity of any passive surveillance system is limited by the treatment-seeking behaviour of the population (Schellenberg *et al.,* 1998), hence catchment area reporting which is inclusive of data from private health facilities could be used to measure the treatment-seeking behaviour of the population or could measure the change in the number of confirmed malaria cases.(NMEC, 2017).

**2.5 Contribution of the private health care facilities in malaria surveillance**

The private health sector includes any outlet, facility that provides clinical or diagnostic services and is not managed by a national or local government, (WHO. 2016). Private health facilities include for- and not-for-profit facilities owned by private business entities and civil society organizations (NMEC, 2017). These comprise health facilities at various levels and some institutions directly involved in the delivery of malaria treatment services. Formal

providers are often easier to include in national malaria surveillance systems because they are regulated by the government and are typically required to submit records of their services (World Health Organization 2015). In contrast, the informal sector may be more difficult to include because of a lack of regulation or enforcement, making it difficult to obtain records in a timely and coordinated manner (World Health Organization 2015). It is important to engage private sector stakeholders early in the development of malaria elimination strategies (Fernandoemai, 2012)

According to Erhart *et al.,* (2007) malaria cases (50–90%) detected by private sector were also missed by the health information system, although malaria has sharply decreased in Vietnam over the past 10 years, the current Health information system greatly underestimates the malaria burden. Involvement of the private sector and the establishment of sentinel sites might improve the quality of data and the relevance of health information system in malaria control. In 2006, for example, India's National Vector Borne Disease Control Programme (NVBDCP) reported approximately two million malaria cases based on surveillance carried out by India's primary health care system, (NVBDCP, 2017). However, a recent analysis indicates there is a 68 percent to 98 percent gap between India's reported malaria cases and the actual incidence of malaria (Kumar et al. 2007). The difference between the reported number of cases and the 'true' number of incidents may stem from the fact that the government health sector meets the needs of 20 percent of the population, leaving 80 percent of the population to seek health care in the private facilities (Kumar *et al* 2007). This is consistent with a recent WHO report which indicates that the real burden of malaria in India has been underestimated primarily due to reporting factors, (WHO, 2008). This underscores the importance of including private sector data to generate estimates that are more accurate.

An examination of the patterns of *Plasmodium vivax* and *Plasmodium falciparum* malaria based on data from a private comprehensive-care, multi-specialty hospital in Delhi indicated that a large number of *P. falciparum* malaria cases were treated at this single hospital, the national data reported a smaller number of malaria cases caused by *P. falciparum* for the region. This is a startling discrepancy and demonstrates clearly the importance of routinely collecting data from private health care facilities in order to delineate more fully patterns of malaria in India. Moreover, unless such data from private health care facilities are systematically integrated into surveillance programmes, the size of the malaria problem requiring health care services may be misestimated (Gupta et al. 2009).

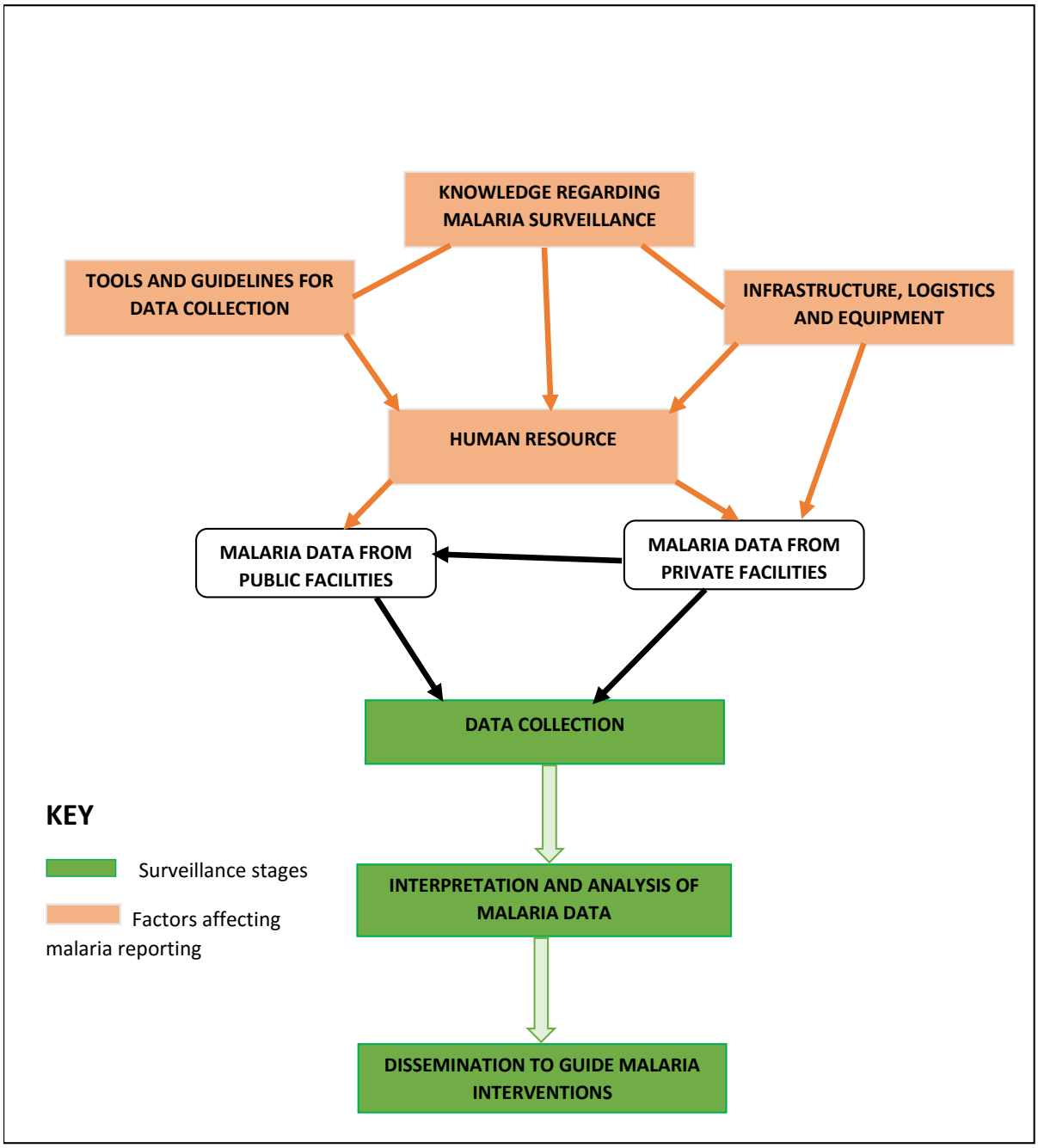
In 2015, a total of 36 malaria cases were reported from Sri Lanka. Of these, 24 (67%) were diagnosed in the Colombo District and 50 percent of them were diagnosed in private hospitals. The private sector being a major contributor in the detection of imported malaria cases in the country should be actively engaged in the national malaria surveillance system, (Fernando et al., 2016)

According to Revati, et al (2015), availability of a computer and the presence of a laboratory was identified as a significant determinants of the private facilities willingness to participate in routine disease surveillance systems. Lack of time was identified as the main barrier at the individual level alongside inadequately trained subordinate staff (Main extrinsic barriers included lack of cooperation between government and the private sector and legal issues involved in reporting data. In their findings, there was a general agreement among respondents that current surveillance efforts need strengthening. Over a third respondents from the private sector suggested that availability of detailed information and training about surveillance processes would facilitate reporting (Phalkey et al. 2015).

From the above literature, it is clear that the private health sector is an important partner for malaria surveillance. The purpose of the study was to determine the contribution of malaria cases from the private sector in HMIS and to understand factors associated with private health facilities reporting to the national malaria surveillance in Southern, Copperbelt and Lusaka province of Zambia.

### 2.7 Conceptual Framework

The conceptual framework shows the three stages of surveillance namely data collection, data analysis, interpretation, and dissemination of data to guide malaria interventions. At data, collection level the conceptual framework shows that there is need to collect data from both public and private health facilities in order for the data to be representative. According to Revati, et al (2015), there many factors that affect reporting of malaria in the surveillance system, firstly people involved in malaria surveillance need to have knowledge on surveillance and the need tools for reporting the surveillance data. During data collection, there is also need for equipment's such as computers and a system for keeping patients data and enough human resource to collect and analyse the data.




*Adapted from Centers for Disease Control and Prevention, 2016 and Revati, et al 2015.*

Figure 2: Conceptual framework on Factors Associated with Reporting Malaria in the Surveillance System

# CHAPTER 3

# METHOD

## 3.1 Study design and setting

The study was a cross sectional study design as the data were collected at a single point in time to investigate the contribution of private health facilities to malaria surveillance and the associated factors in reporting malaria surveillance data. There were 546 private health facilities registered with Health Professional council of Zambia, (HPCZ data, 2017). Out of 546 facilities on the list, 266 (49%) were in Lusaka, 164 (30%) in the Copperbelt, 36 (7%) in Southern province, 28 (5%) were in Central province, 19 (3%) in Northwestern province, 14 (3%) in Eastern province, 9 (2%) in Muchinga, 4 (1%) in Luapula province and 3 (1%) in Northern and 3 (1%) in Western province. A cross-sectional survey was done in Lusaka, Southern and Copperbelt provinces, where about 466 (85%) of all private healthcare facilities in Zambia are found.

## 3.2 Data collection plan and tools

Information on the number of private facilities that reported malaria, total suspected malaria cases tested, confirmed and clinical malaria cases were collected from the National Health Management Information System (HMIS) to establish the proportion of malaria cases that were from the Private facilities in Southern, Copperbelt, and Lusaka province of Zambia from the 2012 to 2017.

A structured questionnaire was used to collect information from the heads of private health facilities (or individuals nominated by the heads of the facilities) on factors associated with private facilities participating in malaria surveillance. The questionnaire had questions on whether the private health facility reports malaria in the HMIS. The private health facilities that reported malaria provided copies of the reports submitted to the district health office. Therefore, reporting malaria in HMIS in the study was defined as a private health facility that submitted their monthly reports to the district health office. The questionnaire also included questions on number of years the facility has been operating; if the facility had, someone trained in malaria surveillance and the respondent being aware about malaria surveillance. The

questionnaire was reviewed by the CDC field epidemiology resident advisor, epidemiologist from National Malaria Elimination Centre and the Head of Department of Epidemiology and Biostatistics from School of Public Health, University of Zambia. After this process, the questionnaire was piloted before it was administered. A soft copy of the questionnaire was created in Epi Info data version 7 software. In addition, data collectors were trained on how to use the questionnaires. At private health facilities, teams introduced themselves and explained the purpose of the survey. Informed consent was obtained from the head of the private health facilities and then the questionnaire was administered.

### 3.3 Sampling strategy

A list of health facilities obtained from the Health Professions Council of Zambia, the body responsible for the licensing and regulation of all private health facilities in the country was used as a sampling frame, (Chongwe et al., 2015). The in inclusion criteria in the study was all the private facilities registered with HPCZ located in Southern, Copperbelt and Lusaka province of Zambia.

The exclusion criteria in the study was all the private facilities that were not offering malaria services therefore, facilities such as the dental clinics and optician clinics were excluded. After this process, the remaining private facilities were 304 of which 179 were from Lusaka province, 99 from the Copperbelt province and 26 were from Southern province. Complete enumeration of the private facilities was used to determine the proportion of the malaria cases in HMIS that were from the private facilities in Southern, Copperbelt and Lusaka province of Zambia in the year 2015 and 2016.

To determine factors associated with reporting malaria to the HMIS by private health facilities in Southern, Copperbelt and Lusaka province, a sample size was determined using Open Epi. Assumptions for working sample size (Open Epi) was a margin of error of five percent, Confidence interval 95 percent, design effect of one and an expected frequency of 21 percent. Design effect of one was used for sample size calculation because of the stratification by province hence reducing the variability of results therefore the variation was assumed to similar to simple random selection. Expected frequency of 21 percent was from the WHO 2015 malaria report which reported that the malaria surveillance systems in WHO African region detected 21 percent of the cases that occurred in 2015 (WHO, 2016). Based on these assumptions, sample size for the study was estimated to be 139 private health facilities. Probability

proportion to size sampling was used to estimate the sample size in each province, which projected total sample size of eighty-two for Lusaka province, forty-five for Copperbelt and twelve for Southern province. Radom sampling in Microsoft excel was used to select the private health facilities in each province.

### 3.4 Data analysis

The completed questionnaires was entered and analysed in Epi Info version 7 software. For the first objective, frequency and proportions was expressed as percentages with corresponding 95 percent confidence intervals. A univariate analysis for descriptive statistics was performed followed by bivariate analysis to identify factors that are associated with private facilities reporting malaria data in national surveillance system (HMIS).

Odds ratio was calculated and 95 percent confidence intervals (CI) comparing reporting private health facilities and those that do not report. Variables that were found to be significant at unadjusted logistic regression were then fitted into the multivariable logistic regression to control for confounding and to come up with the final model of factors associated with private facilities reporting malaria in HMIS. P-value < 0.20 was used to select variables for inclusion into the initial multivariable logistic regression model. The final model was developed by investigator-led backwards elimination, dropping the least significant independent variable until all the remaining predictor variables were significant (p-value < 0.05).

#### *3.4.1 Definition of variables*

Definition of variables for factors associated with private health facilities reporting malaria data to HMIS was as follows:

**Dependent variable**: Private health facility Reporting malaria to the national Health Information System. This was considered as a dichotomous variable with two possible outcomes of reporting or not reporting.

**Table 1. List of the independent key variables**

| Variable | Definition | Measurements |
|---|---|---|
| Number of Years the Facility has been operating | The number of years that the private health facility has been operational | Continuous and categorical |
| **Location of the Private health facility**<br>• Copperbelt<br>• Lusaka<br>• Southern | The province the private health facility is located | Categorical<br>Lusaka= 1<br>Southern=2<br>Copperbelt =3 |
| **Type of the Private health facility**<br>• Privately owned<br>• Faith based<br>• Parastatal | Type of the Private health facility | Categorical<br>Privately owned=1<br>Faith based=2<br>Parastatal=3 |
| **Human Resources**<br>Number of:<br>• Doctor<br>• Record clerk<br>• nurse,<br>• pharmacist<br>• laboratory technologist | The number of doctor<br>Record clerk, nurse, pharmacist, laboratory technologist a Private health facility has. | Continuous |
| **Logistics and equipment**<br>• Laboratory<br>• Electricity back up,<br>• Computer<br>• Internet | Private health facility having, Electricity back up, Computer, internet | Categorical<br>Absent = 0<br>Present = 1 |
| **Patient Record keeping**<br>• Paper based<br>• Electronic records<br>• Both paper based and electronic | Records of patients are paper based or the have and electronic system | Categorical<br>YES<br>NO |
| **Number of personnel trained in surveillance** | The number of trained personnel in surveillance | Continuous |
| **Aware about malaria surveillance**<br>-Aware about malaria Surveillance | -The private health facility respondent/personnel being aware about malaria surveillance | No=0<br>Yes=1 |

Independent variables as defined in Table 1 was used to determine factors associated with private health facilities reporting in HMIS

### 3.9 Ethical considerations

Ethical clearance for the research was obtained from ERES Converge IRB. Authority to conduct the research was obtained from Zambia National Health Research Authority Board. Permission was sought from the Ministry of Health to use Health Information System. Informed consent was obtained from heads of private health facilities before administering the questionnaire. Confidentiality was guaranteed by ensuring that data collected was anonymous and not identifying private health facilities information by use of codes. Numbers and initials were used as identifiers for the records. People involved in data collection were oriented on how to handle data and ensure confidentiality. Collected data were secured and used only for the purpose of this study.

### 3.10 Limitation

The use of secondary data from the HMIS in the study limited control over the quality of the data that was collected. Despite this limitation, it is worth noting that routinely collected data in HMIS remains the basis for analysis of malaria information for control and prevention in Zambia. The study was able to establish the proportion of malaria cases from private facilities that directly reported in HMIS. The importance of these findings lies in their implications for improving malaria surveillance as the study showed that very few private facilities were reporting malaria in HMIS.

# CHAPTER 4

# RESULTS

This chapter displays the results of the study. The chapter begins by showing Malaria cases in HMIS from private facilities in the Southern, Copperbelt and Lusaka provinces, proportion of malaria cases in HMIS from private facilities, demographic characteristic of private facilities, univariate and multivariable logistic regression analysis on factors associated with private facilities reporting malaria in the HMIS.

## 4.1 Malaria cases in HMIS from Private facilities in the Southern, Copperbelt and Lusaka provinces

Information on malaria cases from private facilities was collected from the HMIS from 2012 to 2017. There were a total 99, 27 and 13 private facilities in HMIS in the Copperbelt, Lusaka, and Southern province respectively from 2012 to 2017. In 2017, 36% (n=36/99) of the private health facilities in the Copperbelt, 15% (n=4/27) in Lusaka and 8% (n=1/13) in Southern province reported malaria in the HMIS (Table 2). While malaria is supposed to be reported on a monthly basis, the findings showed that the reporting rate was less than 50% in the three provinces.

**Table 2. Private Facilities that reported Malaria in HMIS in Southern, Copperbelt and Lusaka provinces, 2012-2017**

| Year | Total No. of Private Health Facilities in HMIS | No. of Private Health Facilities that Reported In HMIS (%)[a] | Total number of expected reports in HMIS [b] | Total number of Reports submitted in HMIS (%)[c] |
|---|---|---|---|---|
| **Copperbelt** | | | | |
| 2012 | 99 | 44 (44) | 1188 | 459 (39) |
| 2013 | 99 | 43 (43) | 1188 | 456 (38) |
| 2014 | 99 | 43 (43) | 1188 | 304 (26) |
| 2015 | 99 | 36 (36) | 1188 | 558 (47) |
| 2016 | 99 | 36 (36) | 1188 | 539 (45) |
| 2017 | 99 | 36 (36) | 1188 | 322 (27) |
| **Lusaka** | | | | |
| 2012 | 27 | 1 (4) | 324 | 3 (1) |
| 2013 | 27 | 2 (7) | 324 | 18 (6) |
| 2014 | 27 | 5 (19) | 324 | 63 (19) |
| 2015 | 27 | 6 (22) | 324 | 57 (18) |
| 2016 | 27 | 3 (11) | 324 | 28 (9) |
| 2017 | 27 | 4 (15) | 324 | 47 (15) |
| **Southern** | | | | |
| 2012 | 13 | 2 (15) | 156 | 16 (10) |
| 2013 | 13 | 2 (15) | 156 | 18 (12) |
| 2014 | 13 | 2 (15) | 156 | 12 (8) |
| 2015 | 13 | 3 (23) | 156 | 17 (11) |
| 2016 | 13 | 2 (15) | 156 | 44 (28) |
| 2017 | 13 | 1 (8) | 156 | 12 (8) |

- *(%)[a] = No. of Private Health Facilities that Reported In HMIS/Total private facilities in HMIS*
- *Total number of expected Reports in HMIS [b]: total number of health facilities in*
- *HMIS* x *12 months*
- *Reporting rate- (%)[c] = Total number of Reports submitted in HMIS /Total number of expected reports in HMIS*

Table 3 shows that more than half of the malaria cases that were reported in HMIS in 2017 by private health facilities in Lusaka (2764/3363, 82%) and Copperbelt (n=18440/34339, 54%) provinces were clinical cases**.** The test positivity rate reduced in the year 2017 for the Copperbelt and Lusaka provinces; however for southern province it increased by 16% (Table 3).

**Table 3. Malaria cases from Private facilities in HMIS in Southern, Copperbelt and Lusaka provinces, 2012-2017**

| Year | Total tested Suspected Malaria Cases | Total Confirmed Malaria Cases (%)[a] | Test Positivity rate (%)[b] | Total Clinical Malaria Cases (%)[c] | Total Malaria Cases (Confirmed & Clinical) |
|---|---|---|---|---|---|
| **Copperbelt** | | | | | |
| 2012 | 48265 | 20094 (35) | 42 | 37888 (65) | 57982 |
| 2013 | 50964 | 22762 (43) | 45 | 30107 (57) | 52869 |
| 2014 | 54358 | 18935 (40) | 35 | 27880 (60) | 46815 |
| 2015 | 238464 | 102409 (59) | 43 | 70172 (41) | 172581 |
| 2016 | 307493 | 154864 (74) | 50 | 53428 (26) | 208292 |
| 2017 | 64204 | 15899 (46) | 25 | 18440 (54) | 34339 |
| **Lusaka** | | | | | |
| 2012 | 1 | 0 (0) | 0 | 17 (100) | 17 |
| 2013 | 369 | 134 (37) | 36 | 224 (63) | 358 |
| 2014 | 7465 | 2237 (69) | 30 | 1023 (31) | 3260 |
| 2015 | 6734 | 2095 (80) | 31 | 532 (20) | 2627 |
| 2016 | 7198 | 965 (52) | 13 | 904 (48) | 1869 |
| 2017 | 9267 | 599 (18) | 6 | 2764 (82) | 3363 |
| **Southern** | | | | | |
| 2012 | 69 | 57 (20) | 83 | 230 (80) | 287 |
| 2013 | 486 | 76 (96) | 16 | 3 (4) | 79 |
| 2014 | 362 | 66 (100) | 18 | 0 (0) | 66 |
| 2015 | 34 | 9 (3) | 26 | 280 (97) | 289 |
| 2016 | 175 | 32 (97) | 18 | 1 (3) | 33 |

| | | | | | |
|---|---|---|---|---|---|
| 2017 | 69 | 19 (100) | 28 | 0 (0) | 19 |

- *(%)[a]: % Confirmed malaria cases from private facilities = (total confirmed cases / Total malaria cases x 100)*
- *(%)[b]: % Test Positivity rate cases from private facilities = (total confirmed malaria/ Total tested suspected malaria cases x 100)*
- *(%)[c]: % Clinical malaria cases from private facilities = (total clinical cases / Total malaria cases x 100)*

**Note:**

- **Confirmed Malaria**: Suspected malaria case in which malaria parasites have been demonstrated in a patient's blood by microscopy or a rapid diagnostic test.
- **Clinical malaria:** Suspected malaria case without a diagnostic test to confirm malaria but nevertheless treated presumptively as malaria.
- **Total malaria cases:** (Confirmed malaria + Clinical malaria cases)

### 4.2 Proportion of Malaria Cases in HMIS from Private Facilities

Table 4 shows malaria cases from the three provinces that were from private health facilities in the year 2012 to 2017. The Copperbelt province reported the highest proportion (10%, 572878/5495107) of the malaria cases among the three provinces from 2012-2017.

**Table 4. Proportion of malaria cases in HMIS from Private facilities in Southern, Copperbelt and Lusaka province of Zambia**

| | **Proportion of malaria cases from Private Facilities % (n/N)[c]** | | | |
|---|---|---|---|---|
| **Year** | **Copperbelt Province** | **Lusaka Province** | **Southern Province** | **Overall (Copperbelt, Lusaka & Southern)** |
| 2012 | 7% (57982/872823) | 0% (17/216141) | 0% (287/145779) | **5% (58286/1234743)** |
| 2013 | 6% (52869/928267) | 0% (358/175777) | 0% (79/119327) | **4% (53306/1223371)** |
| 2014 | 5% (46815/891739) | 2% (3260/191213) | 0% (66/179552) | **4% (50141/1262504)** |
| 2015 | 20% (172581/844450) | 3% (2627/94707) | 1% (289/53493) | **18% (175497/992650)** |
| 2016 | 20% (208292/1023227) | 2% (1869/118455) | 0% (33/42222) | **18% (210194/1183904)** |
| 2017 | 4% (34339/934601) | 3% (3363/125876) | 0% (19/31751) | **3% (37721/1092228)** |
| 2012-2017 | 10% (572878/5495107) | 1% (11494/922169) | 0% (773/572124) | **8% (585145/6989400)** |

- ***(n/N)[c]: n= Total malaria cases from private health facility in the province***

  *N= Total malaria cases reported in the province from public and private health facility*

### 4.3 Factors Associated With Private Facilities Reporting Malaria in the HMIS

Data were collected from 139 private health facilities to establish the factors associated with reporting malaria in HMIS in Southern, Copperbelt and Lusaka province. The mean age for the respondents was 48.7 (SD ± 12.5), the oldest and youngest respondent was aged 81 and 23 years respectively. Out of the 139 private facilities visited, 45 (32%) were from the Copperbelt, 82 (58%) were from Lusaka and 12 (9%) were from Southern province (Table 5).

#### 4.3.1 Social Demographic Characteristics

Table 5 shows the baseline characteristics of the private facilities. Ninety percent (n=125/139) of the private facilities were privately owned, eight percent (n=11/139) were owned by faith based institutions and three percent (n = 2/139) were owned by parastatal (or semi-autonomous, government-supported) institutions. Fifty percent (n=70/139) of the private health facilities had been operating for 1-10 years. The patient records were paper based in 80% (n=112/139) of the private health facilities visited. Sixty-seven percent (n=93/139) of the private health facilities had laboratories and 75% (n=104/139) had computers. The majority of the private health facilities had less than five nurses (n=103/139, 74%), medical doctors (n=125/139, 90%) and laboratory technicians (n=134/139, 96%).

Very few (n=12/139, 9%) private facilities visited had someone trained in malaria surveillance. Fifty-four percent (n=79/139, 54%) of the respondents were aware malaria surveillance. Most (n=131/139, 74%) of the respondents agreed that reporting malaria data in HMIS benefits the private health facilities in their business and that it is important for them to report the malaria cases.

**Table 5: Characteristics of Private Health Facilities in Lusaka, Copperbelt and Southern Province (n=139)**

| Characteristic | Report Malaria in HMIS [n(%)] | | |
|---|---|---|---|
| | Yes (n=60) | No (n=79) | Total (n=139) |
| **Province** | | | |
| Copperbelt | 32 (53) | 13 (16) | 45 (32) |
| Lusaka* | 26 (43) | 56 (71) | 82 (58) |
| Southern | 2 (3) | 10 (13) | 12 (9) |
| **Type of facility** | | | |
| Privately owned | 51 (85) | 74 (94) | 125 (90) |
| Faith based | 7 (12) | 4 (5) | 11 (8) |
| Parastatal | 2 (3) | 1 (1) | 3 (2) |
| **Number of Years the Facility has been operating [**Median (IQR**)]** | | | 10 (5-22) |
| 1 – 10 | 20 (33) | 50 (63) | 70 (50) |
| 11 – 20 | 10 (17) | 13 (16) | 23 (17) |
| ≥21 | 30 (50) | 16 (20) | 46 (33) |
| **Record keeping** | | | |
| Paper based | 44 (73) | 68 (86) | 112 (80) |
| Both paper based and electronic | 15 (25) | 8 (10) | 23 (17) |
| Electronic | 1 (2) | 3 (4) | 4 (3) |
| **Diagnosis of Malaria** | | | |
| Rapid Diagnostic test (RDT) only | 16 (26) | 30 (38) | 46 (33) |
| Microscopy & RDT | 43 (72) | 46 (58) | 89 (64) |
| Clinical symptoms | 1 (2) | 2 (3) | 3 (2) |
| Quantum Magnetic Analysis | 0 (0) | 1 (1) | 1 (1) |
| **Number of Facility with Logistics and equipment** | | | |
| Electricity backup (n=139) | 48 (80) | 48 (61) | 96 (69) |
| Laboratory (n=139) | 41 (68) | 52 (66) | 93 (67) |
| Internet (n=139) | 37 (64) | 49 (62) | 86 (63) |
| Computer (n=139) | 46 (77) | 58 (73) | 104 (75) |
| **Number of Human Resource** | | | |
| Nurses [Median (IQR)] | | | 3 (1,5) |

| | | | |
|---|---|---|---|
| <5 | 31 (52) | 72 (91) | 103 (74) |
| ≥5 | 29 (48) | 7 (9) | 26 (26) |
| Medical Doctors [Median (IQR)] | | | 1 (1,2) |
| <5 | 51 (85) | 74 (94) | 125 (90) |
| 5 – 9 | 9 (15) | 5 (6) | 14 (10) |
| Clinical officers [Median (SD)] | | | 0 (1.2) |
| <5 | 58 (97) | 79 (100) | 137 (99) |
| 5 – 9 | 2 (3) | 0 (0) | 2 (1) |
| Laboratory Technologist [Median (IQR)] | | | 1 (0, 2) |
| <5 | 57 (95) | 77 (97) | 134 (96) |
| 5 – 9 | 3 (5) | 2 (3) | 5 (4) |
| Pharmacist [Median (IQR)] | | | 0 (0,1) |
| <5 | 56 (93) | 78 (99) | 134 (96) |
| 5 – 9 | 4 (7) | 1 (1) | 5 (4) |
| Record clerk [Median (IQR)] | | | 1 (0,2) |
| <5 | 53 (88) | 76 (96) | 129 (93) |
| 5 – 9 | 7 (12) | 3(4) | 10 (7) |
| **Malaria Surveillance** | | | |
| – Number of private facilities with Trained Personnel in Surveillance | 9 (15) | 3 (4) | 12 (9) |
| – Respondents that were aware about malaria surveillance | 43 (72) | 32 (41) | 75 (54) |
| – Respondents that are aware about HMIS | 49 (82) | 16 (20) | 65 (47) |
| – Reporting malaria in HMIS Benefit private health facilities in their business | 73 (89) | 58 (60) | 131 (74) |
| – Important for private health facilities to report malaria in HMIS | 51 (85) | 73 (92) | 124 (89) |

*IQR: Interquartile Range*

***Of the 30 private facilities that said that reported malaria in HMIS in Lusaka, 25 were not directly reporting malaria in HMIS but were submitting their reports to the Zonal clinic (public health facility) in their catchment area as they were not in the HMIS data base. The Zonal Clinics combined malaria cases from private facilities with the cases from the Zonal clinic when reporting in the HMIS*

Lack of information and training in surveillance was the most (n=74/139, 53%) common challenge that most private facilities have in reporting malaria data in the national surveillance system (Table 6)**.**

**Table 6. Challenges to Report Malaria in HMIS by Private Facilities (n=139*)***

| **Characteristic** | **Reporting Malaria in HMIS [n(%)]** | | |
|---|---|---|---|
| **Challenges** | **Yes (n=60)** | **No (n=79)** | **Total (n=139)** |
| - Lack of information and training in surveillance | 23 (38) | 51 (65) | 74 (53) |
| - Poor coordination between government private sector | 11 (18) | 18 (23) | 29 (21) |
| - Lack of clear guidelines for submitting data (no tools) | 6 (10) | 19 (24) | 25 (18) |
| - Lack of time | 7 (12) | 9 (11) | 16 (12) |
| - Private facilities are not given ITN for maternity and under 5years | 5 (8) | 10 (13) | 15 (11) |
| - No transport to take reports (reporting is paper based) | 1 (2) | 14 (18) | 15 (11) |
| - Lack of acknowledgment of efforts | 2 (3) | 8 (10) | 10 (7) |
| - Inadequate human resource | 0 (0) | 5 (5) | 5 (3) |
| - No feedback is provided after submitting reports | 3 (4) | 0 (0) | 3 (2) |
| - Poor record keeping in private facilities | 0 (0) | 1 (1) | 1 (1) |

### 4.4 Univariate Logistic Regression Analysis

Private facilities that had operated for more than 20 years was associated with an five times increased odds (OR=5.57, 95% CI: 2.71, 11.44), of reporting malaria in HMIS compared to those had operated for less than five years (Table 7). A Private health facility being located in the Copperbelt Province (OR=4.58, 95% CI: 2.35, 8.92) was also associated with reporting malaria in HMIS compared to those located in Lusaka Province. Private health facility that had a staff trained in surveillance (OR=8.10, 95% CI: 2.28, 28.79) and the staff being aware about malaria surveillance (OR=17.34 95% CI: 8.18, 36.78) was significantly associated with increased chance of reporting malaria in HMIS (Table 7).

**Table 7. Factors associated with Private health facilities reporting Malaria in the HMIS**

| Factors | Unadjusted OR(95% CI) | P-value |
|---|---|---|
| **Number of Years the Facility has been operating** | | |
| 1 – 10 | 1 | |
| 11 – 20 | 2.93 (1.26, 6.77) | 0.01 |
| ≥21 | 5.57 (2.71, 11.44) | **<0.01** |
| **Province** | | |
| Lusaka Province | 1 | |
| Southern Province | 0.76 (0.22, 2.60) | 0.67 |
| Copperbelt Province | 4.58 (2.35, 8.92) | **<0.01** |
| **Type of Facility** | | |
| Privately owned | 1 | |
| Parastatal | 8.03 (0.94, 68.20) | 0.06 |
| Faith based | 2.68 (0.77, 9.26) | 0.11 |
| **Electricity back up** | | |
| Absent | 1 | |
| Present | 2.54 (1.30, 4.92) | **0.01** |
| **Laboratory** | | |
| Absent | 1 | |
| Present | 1.18 (063, 2.20) | 0.60 |
| **Computer** | | |
| Absent | 1 | |
| Present | 1.53 (0.76, 3.11) | 0.23 |
| **Internet** | | |
| Absent | 1 | |
| Present | 1.01(0.54,1.87) | 0.98 |
| **Record keeping** | | |
| Paper based only | 1 | |
| Electronic only | 1.09 (0.24, 5.07) | 0.91 |
| Both paper based and electronic | 3.56 (1.53, 8.29) | **0.003** |

| | | |
|---|---|---|
| **Number of Human Resource** | | |
| Doctor | | |
| <5 | 1 | |
| 5 -10 | 3.4 (1.16, 10.07) | 0.025 |
| Nurses | | |
| <5 | 1 | |
| ≥5 | 7.80 (3.56, 17.11) | **<0.01** |
| Pharmacist | | |
| <5 | 1 | |
| 5 -10 | 6.17 (0.71, 53.90) | 0.10 |
| Record Clerk | | |
| <5 | 1 | |
| 5 -10 | 0.19 (0.51, 0.69) | **0.01** |
| **Has any of your staff been trained in surveillance** | | |
| No | 1 | |
| Yes | 8.10 (2.28, 28.79) | **<0.01** |
| **Aware about malaria surveillance** | | |
| No | 1 | |
| Yes | 17.34 (8.18, 36.78) | **<0.01** |

### 4.5 Multivariable Logistic Regression Analysis

In multivariable logistic regression analysis, after adjusting for the confounding effects of the number of record clerks and doctors the private health facility had and having electricity back up, private facilities that had been operating for more than 20 years had three times increased odds of reporting malaria in HMIS (OR=3.22, 95% CI: 1.23, 8.42; P-value 0.02) compared to those that had been operating for less than 20 years. Private facilities that were located in the Copperbelt province (OR=2.20 95% CI: 1.35, 3.58; P-value <0.01) had two times greater odds of reporting malaria in HMIS compared to those that were located in Lusaka province. The private facilities that had staff who were aware about malaria surveillance (OR=2.06 95% CI: 1.38, 3.99; P-value <0.01) had two times greater odds of reporting malaria in HMIS compared to those that were not aware Table 8).

**Table 8. Final model of Factors associated with Private health facilities reporting Malaria in the HMIS**

| Factors | Adjusted OR (95% CI) | P-value |
|---|---|---|
| **Number of Years the Facility has been operating** | | |
| 1 – 10 | 1 | |
| 11 – 20 | 0.74 (0.19, 2.81) | 0.66 |
| ≥21 | 3.22 (1.23, 8.42) | **0.02** |
| **Province** | | |
| Lusaka Province | 1 | |
| Southern Province | 0.43 (0.08, 2.43) | 0.33 |
| Copperbelt Province | 2.20 (1.35, 3.58) | **<0.01** |
| **Number of Nurses** | | |
| <5 | 1 | |
| ≥5 | 4.92 (2.03, 11.93) | **<0.01** |
| **Staff have been trained in surveillance** | | |
| No | 1 | |
| Yes | 4.34 (1.00, 18.85) | **0.05** |
| **Aware about malaria surveillance** | | |
| No | 1 | |
| Yes | 2.06 (1.38, 3.99) | **0.01** |

# CHAPTER 5

# DISCUSSION

This chapter discusses the results and interprets their implication. The discussion is structured starting with a discussion on proportion of malaria cases in HMIS from private facilities, demographic characteristics of private facilities and factors associated with private facilities reporting malaria in HMIS. The chapter also discusses the limitations of the study, the conclusion and finally the recommendations based on the findings of the study.

## 5.1 Proportion of malaria Cases in HMIS from Private Facilities

The private sector contribute in providing care for malaria patients thereby is a source of malaria data. The study found that private health facilities in Southern, Copperbelt and Lusaka province contributed eight percent of all the malaria cases that were reported in the HMIS from 2012-2017. A study done in Sri Lanka (Cathcart et al. 2017) showed that 33 percent of the reported cases of malaria were diagnosed in the private sector while studies in India (Kumar et al. 2007) found more than 50 percent. The difference might be due to difference in setting, for instance in India (Kumar et al. 2007) 80 percent of the population access medical services from private facilities however, in Zambia (Ministry of Health, 2017) private health facilities only account for 19 percent of the health facilities. Nevertheless, in the elimination phase every malaria case is important thus this finding has an important implication in that it points out that the private health sector is an important partner for malaria surveillance.

The study revealed that very few private facilities reported malaria in HMIS in the three provinces. These finding are consistent with those reported in Kenya, Uganda, South Africa, and other countries that also receive HMIS data from the private sector (Luoma et al., 2010, USAID, 2011, Weber and Matjila, 2007). In South Africa, studies have shown that only 26% of malaria cases diagnosed in the private sector are being reported (Weber & Matjila 2007). Epidemiological information is used to make decisions on interventions in Zambia; therefore, low reporting rate of malaria by private facilities in HMIS may result in underestimation of the actual malaria burden, which may result in implementing wrong interventions. Different strategies have been devised to improve private facilities reporting malaria. For instance in

Ghana, to increase private sector reporting, private health facilities such as hospitals and clinics are supervised by the district health directorate and the National Malaria Control Program sent data managers to the field to provide support on data issues to both public and private facilities (Global Fund for AIDS 2016). The National Malaria Control Program in Kenya provides support to the private sector through malaria case management trainings and subsidising malaria medicines to increase the affordability and availability of quality-assured medicines (Githinji et al. 2017).

The study also showed that the highest number of malaria cases from private facilities were seen in the Copperbelt province. Firstly, this probably is because the Copperbelt province, being the traditional centre for mining in Zambia, also has many private facilities owned by the mines and mine employees prefer to seek treatment from these facilities which are less congested than public facilities. For instance, the results showed that more than half of all the malaria cases in 2015, were from private health facilities in copper mining districts such as Kitwe, Mufulira and Luanshya. Secondly, Lusaka and Southern province are very low transmission provinces recording malaria incidence of less than 50 cases/1000 population while the Copperbelt is a moderate transmission area recording an incidence 345 cases/1000 population (National Malaria Elimination Centre, 2017) might have contributed to more cases being seen in the Copperbelt province.

National guidelines for diagnosis and treatment were modified in 2009–10 in Zambia to require parasitological confirmation by RDT or microscopy prior to malaria treatment (Masaninga et al. 2012). However, this study has revealed that private facilities are still reporting a lot of clinical cases of malaria with Lusaka province reporting the highest number of clinical malaria in 2017. Lusaka is a low transmission area, with a malaria test positivity among suspected incident cases less than 10 percent throughout the year, unconfirmed reported malaria cases are not likely to be actual malaria cases (Chisha et al. 2015). Misdiagnosing these individuals and giving them antimalarial treatment may result in not treating patients for the illness that prompted them to seek care thus increasing morbidity and mortality; In addition, presumptive treatment could increase the risk of the emergence of resistant parasite strains (Chisha et al. 2015). Compliance with national policies and treatment guidelines by private facilities is critical to attainment of the overall goal of malaria elimination in Zambia.

## 5.2 Characteristics of the Study Private Health Facilities

The study findings indicate that few private facilities had someone trained in malaria surveillance and half of the respondents from private facilities were not aware about malaria surveillance and the HMIS. The findings are also consistent with the study findings in India (Phalkey et al. 2015). Lack of information, training in surveillance and clear guidelines and tools for submitting data were further identified by most respondents from private facilities as a major challenge that private facilities have in reporting malaria in the HMIS. Considering this result, it can be concluded, that the lack of training in malaria surveillance of private facilities is an important reason of under reporting malaria in the HMIS.

Another important challenge reported by private facilities was poor coordination between the government and the private sector. One of the factors contributing to the poor coordination between the government and private sector is because in most countries, the national malaria programmes are established by the public sector , therefore the trainings are provided to the public providers with little or no involvement of the private providers (Bennett et al. 2017). As a result, trainings usually target the public sector only and the private sector are excluded. According to Global Fund (2016) technical updates on malaria emphasize the importance of involving the private sector to ensure effective malaria case management for all patients, as well as accurate malaria surveillance.

Training of private sector providers has been shown to improve adherence to national guidelines for anti-malarial prescription and improved prescription behaviours by private practitioners and may be one of the most operationally feasible and cost-effective approaches to improve case management and surveillance in private sector (Cathcart *et al.*, 2017, Bennett *et al.*, 2017, Meremikwu *et al.*, 2007, Brugha, Chandramohan and Zwi, 1999). Combinations of training with other interventions that reinforce each other are likely the most effective approach (Aung et al. 2015), and effectiveness is likely greatest when training is ongoing and integrated with social marketing approaches, referral systems and increased local regulatory oversight (Shah et al. 2011)

One of the important findings in the study was that most respondents from private facilities agreed that it is important for private health facilities to report malaria data in the surveillance

system. This finding may suggest willingness of the private sector to participate in a malaria surveillance system.

### 5.3 Factors associated with private facilities reporting malaria in the HMIS

Despite previous report indicating that having a computer was associated with reporting malaria to the HMIS (Phalkey et al. 2015), it was interesting that this was not the case in this study. This is probably because HMIS reporting in Zambia is largely paper based.

Human resource is also an important factor that affects reporting. For instance, the study found that private facilities that had more than five nurses had five times greater odds of reporting malaria in the HMIS compared to those than had less than five nurses. In most private facilities the responsibility of reporting in the HMIS was assigned to the chief nursing officer. Thus the nursing officers in private facilities that had more than five nurses might have had more time to prepare the reports compared to those that had fewer nurses.

Private facilities that were located in the Copperbelt province had a two times higher odds of reporting malaria in the HMIS compared to those in Lusaka Province. This could be due to the different systems in the three provinces. It was found that the private facilities in the Copperbelt directly report in the HMIS while for Lusaka province most private facilities reported their data to the public facility in the catchment area near their location. It is easier to monitor the private facilities that are reporting and the number of malaria cases when private facilities report directly in the HMIS.

Being aware about malaria surveillance was associated with the private health facility reporting data to the HMIS. In addition, having staff trained in surveillance was also associated with reporting. Several other studies have also reported strong associations between trained staff in surveillance and reporting (Chisha *et al.*, 2015, Bennett *et al.*, 2017, Bustreo, Harding and Axelsson, 2003, Ri *et al.*, 2016). Therefore, a great potential improvement in private sector reporting malaria in the HMIS might be achieved through training.

# CHAPTER 6

# CONCLUSION

## 6.1 Conclusion

The study has shown that the private sector clearly is seeing malaria cases and these need to be reported and part of the overall national surveillance system. The main factors associated with private health facilities reporting malaria in HMIS included the private health facility operating more than 20 years, the staff being aware of and trained in malaria surveillance and the private health facility having more than five nurses. Lack of information and training in malaria surveillance was identified as the main barrier for private facilities to report malaria in HMIS.

## 6.2 Recommendations

The following is recommend based on the findings from this study:

1. As Zambia is approaching malaria elimination it is essential that the National Malaria Elimination Centre (NMEC) facilitate linkages and routine interaction between the public providers and private providers. Linkages can be established through regular shared trainings, meetings at provincial or district levels to help build relationships and trust and will enable private providers to see themselves as valuable partners who are an essential piece of the elimination process.
2. NMEC should ensure frequent trainings of private providers, or include them in routine public sector training events. Trainings can provide private providers with information, updates on guidelines on malaria case management, surveillance and elimination effort and can act as a platform to discuss the challenges they face.

3. There is need to increase awareness on malaria surveillance and case management among the private sector. This could be done through malaria Information Communication Education (IEC) materials which can be designed for the private facilities
4. NMEC should discuss with key stakeholders such as Health profession Council of Zambia to determine appropriate and effective incentives and disincentives to encourage appropriate diagnosis, treatment and reporting of malaria by private providers.

5. Further research is recommended to understand how to effectively engage the private sector in malaria elimination efforts and to investigate the quality of private sector diagnosis, treatment and reporting.

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# LIST OF APPENDICES

## Appendix 1: Ethical clearance letter

33 Joseph Mwilwa Road
Rhodes Park, Lusaka
Tel: +260 955 155 633
+260 955 155 634
Cell: +260 966 765 503
Email: eresconverge@yahoo.co.uk

I.R.B. No. 00005948
F.W.A. No. 00011697

28th August, 2017

**Ref. No. 2017-Jul-029**

Principal Investigator
Ms. Angela Gama Butale
Ministry of Health
P.O. Box 30205
**LUSAKA.**

Dear Ms. Butale,

**RE: CONTRIBUTION OF PRIVATE HEALTH FACILITIES TO MALARIA SURVEILLANCE IN SOUTHERN, COPPERBELT AND LUSAKA PROVINCES OF ZAMBIA**

Reference is made to your resubmission dated 18th August, 2017. The IRB resolved to approve this study and your participation as Principal Investigator for a period of one year.

| Review Type | **Ordinary** | Approval No. **2017-Jul-029** |
|---|---|---|
| Approval and Expiry Date | Approval Date: 27th August, 2017 | Expiry Date: 26th August, 2018 |
| Protocol Version and Date | Version-Nil | 26th August, 2018 |
| Information Sheet, Consent Forms and Dates | • N/A | 26th August, 2018 |
| Consent form ID and Date | Version-Nil | 26th August, 2018 |
| Recruitment Materials | Nil | 26th August, 2018 |
| Other Study Documents | Checklist. | 26th August, 2018 |
| Number of participants approved for study | - | 26th August, 2018 |

Where Research Ethics and Science Converge

## Appendix 2: Authority to conduct research from National Health Research Authority

THE NATIONAL HEALTH RESEARCH AUTHORITY
C/O Ministry of Health
Haile Selaisse Avenue,
Ndeke House
P.O. Box 30205
LUSAKA

MH/101/23/10/1

**5 September 2017**

Ms. Angela Gama Butale

C/O Ministry of Health Headquarters

Directorate of Public Health ZNPHI

P.O. Box 30205

**LUSAKA**

### Re: Request for Authority to Conduct Research

The National Health Research Authority is in receipt of your request for authority to conduct research titled **"Contribution of private health facilities to malaria surveillance in Southern, Copperbelt, and Lusaka Provinces of Zambia."**

I wish to inform you that following submission of your request to the Authority, our review of the same and in view of the ethical clearance, this study has been **approved** on condition that:

1. The relevant Provincial and District Medical Officers where the study is being conducted are fully appraised;
2. Progress updates are provided to NHRA quarterly from the date of commencement of the study;
3. The final study report is cleared by the NHRA before any publication or dissemination within or outside the country;
4. After clearance for publication or dissemination by the NHRA, the final study report is shared with all relevant Provincial and District Directors of Health where the study was being conducted, University leadership, and all key respondents.

Yours sincerely,

Sandra Chilengi-Sakala
For/Director
**National Health Research Authority**

## Appendix 3: Consent Form

**THE UNIVERSITY OF ZAMBIA**
**SCHOOL OF MEDICINE**
**DEPARTMENT OF PUBLIC HEALTH**

**The Contribution of Private Health Facilities towards Malaria Surveillance in Lusaka, Copperbelt and Southern Province, Of Zambia**

**CONSENT FORM**

My name is Angela Gama Butale. I am a student pursuing a MSc. Public Health at the University of Zambia, School of Public Health. I am here to undertake a study on the contribution of private health facilities to malaria surveillance in Southern, Copperbelt and Lusaka Provinces, of Zambia. I would like to explain a few things about the study if you are interested before starting. You will be able to seek clarification where you do not understand. At the end, if you agree, you will be asked to sign this form or thumbprint in the presence of someone to indicate consent and you will be given a copy. May I continue sir/madam?

The main objective of the study is to determine the contribution of private health facilities to malaria surveillance and factors that are associated with private health facilities involvement in malaria surveillance.

You have been randomly selected to be part of the study. Participation in this study is voluntary. If you accept to take part in this study, you will have to answer the questions, I will ask you. If you do not understand any question, let me know so that I can explain further. If you feel uncomfortable answering any question, please let me know so that I can skip it and if you change your mind about participating in this study, you may stop me at any time. I however, encourage you to answer all questions as it is important to help address the problem of malaria surveillance. **Confidentiality will be guaranteed by ensuring that data collected is anonymous and not identifying private health facilities or participant information by use of codes.** Be assured this project is purely for academic purposes only.

There are no direct benefits to you for choosing to participate in this interview, however, you will be adding knowledge to the understanding of how to improve malaria surveillance in Zambia.

There are not anticipated risks and discomforts from partaking in this study.

**QUESTIONS**
In case of any queries regarding this study please feel free to approach the offices of the University of Zambia, School of public health at Ridgeway campus or contact Ms Angela Gama Butale on 0977649627, (physical address: Emmasdale Hill croft flat number. 12, Lusaka)

## Appendix 4: Questionnaire

THE UNIVERSITY OF ZAMBIA
SCHOOL OF MEDICINE
DEPARTMENT OF PUBLIC HEALTH

Contribution of Private Health Facilities to Malaria Surveillance in Lusaka, Copperbelt and Southern Province, Of Zambia

Questionnaire

**INTERVIEW INFORMATION** (*To be filled by the enumerator)*

ID Number: .....Date (dd/mm/yy): ...../...../.....

District: ..... Province: .....

Name of Interviewer: .....

1. What is your position in the private health facility?
   .....
2. Gender of interviewee (Tick only one box)
   Female ☐
   Male ☐

3. What is your age? _____Years
4. What type is your facility *(Tick only one box-read options)*
   a. Parastatal ☐
   b. Faith based ☐
   c. Company owned ☐
   d. Privately owned ☐
   e. Other ☐

If other please describe ----------

5. How long has the facility been operating? _____ Years
6. How many clinical staff work here?
   b. Clinical officers_____
   c. Nurses _____
   d. Laboratory Technologist _____
   e. Record clerk _____

1

APPROVED
27 AUG 2017
ERES CONVERGE
P/BAG 125, LUSAKA.

f) Other: ……..

7. Does the private health facility have a dedicated personnel to report surveillance data?

| | | |
|---|---|---|
| Yes | ☐ | *If Yes how many* …… |
| No | ☐ | |
| I don't know | ☐ | |

8. Does your Private health facility keep records of patient's?

| | | | |
|---|---|---|---|
| a. | Age | YES ☐ | NO ☐ |
| b. | Gender, | YES ☐ | NO ☐ |
| c. | Diagnosis, | YES ☐ | NO ☐ |
| d. | Malaria test results | YES ☐ | NO ☐ |
| e. | Other | YES ☐ | NO ☐ |

If other please describe……..

*Skip question 9 if the response is 'NO' for all the options to question 10*

9. Are the records electronic or paper-based?

| | |
|---|---|
| Electronic | ☐ |
| Paper-based | ☐ |

10. What does you facility use for the diagnosis of malaria (tick all that apply)?

| | | |
|---|---|---|
| a. | RDT | ☐ |
| b. | Microscope | ☐ |
| c. | I don't know | ☐ |
| d. | Other | ☐ |

If other please describe……

11. Does your Private health facility have the following?

| | | | |
|---|---|---|---|
| a. | Electricity back up | YES ☐ | NO ☐ |
| b. | Computer | YES ☐ | NO ☐ |
| c. | Internet | YES ☐ | NO ☐ |
| d. | Laboratory | YES ☐ | NO ☐ |

12. Have you ever heard about Malaria Surveillance?

c. HMIS is designed for decision making in health facilities and organizations ☐
d. I don't know ☐
e. Other ☐

If other describe

.....

.....

18. Do you think it is important for private health facilities to report malaria data in the national surveillance system?
    Yes ☐
    No ☐
    I don't know ☐
    If No, please explain? .....

19. Does reporting malaria data in the national surveillance system benefit private health facilities in their business?
    Yes ☐
    No ☐
    I don't know ☐

If yes describe how reporting malaria data in the national surveillance system benefit or helps private health facilities in their business?

.....

.....

20. What are some of the challenges that private health facilities have in reporting malaria data in the national surveillance system? (*Do not read out options/Tick all that apply*)
    a. Lack of time ☐
    b. Lack of Monetary/infrastructural incentives ☐
    c. Lack of motivation/routine (Attitude) ☐
    d. Lack of acknowledgment of efforts ☐
    e. Lack of infrastructure ☐
    f. Poor cooperation government/private sector ☐
    g. Lack of Information/awareness/training about surveillance ☐
    h. Lack of effective use of collected data ☐
    i. Lack of clear guidelines for submitting data ☐
    j. Others ☐

Yes ☐
No ☐
I don't know ☐

*Skip question 13 if the response is "No or I don't know" to question 12*

13. What do you know about Malaria surveillance*?(do not read options, only Tick all that applies)*
    a. Systematic collection of disease information ☐
    b. Analysis of disease information ☐
    c. Dissemination to allow action ☐
    d. Application of data for disease control ☐
    e. I don't know ☐
    f. Other ☐

If other, describe
……
……

14. How often did your private health facility report malaria surveillance data to HMIS in the years 2015 and 2016?

    a. Never (0 reports/year) ☐
    b. Sometimes (1 to 5 reports/year) ☐
    c. Most of the time (between 6 to 10 reports/year) ☐
    d. Always (above 10 reports/year) ☐

15. Has any of your staff been trained in malaria surveillance?
    Yes ☐
    No ☐
    I don't know ☐

If yes how many have been trained in malaria surveillance? .....

16. Do you know anything about the national Health Management Information System (HMIIS)?

    Yes ☐
    No ☐
    I don't know ☐

*If No or I don't know skip question 18*

17. What do you know about the Health Management System?(*do not read options, only Tick all that applies)*
    a. HMIS is a data collection system ☐
    b. HMIS is designed to support planning and management, ☐

If other please describe:

.....

.....

**END OF QUESTIONAIRE**

**THANK YOU VERY MUCH FOR YOUR TIME**

## Appendix 5: Letter from Ministry of Health

All Correspondence should be addressed to the
Permanent Secretary
Telephone: +260 211 253040/5
Fax: +260 211 253344

REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH

In reply please quote:

No.....
MH/53/2/43

NDEKE HOUSE
P. O. BOX 30205
LUSAKA

15th December 2017

Provincial Health Director – Lusaka, Copperbelt and Southern Provinces

**RE: FIELD EXERCISE ON PRIVATE HEALTH FACILITIES CONTRIBUTION TO MALARIA SURVEILLANCE**

Reference is made to the above captioned subject.

The Ministry of Health through the Zambia National Public Health (ZNPHI) is currently training Field Epidemiologists with support from the US Government's Centre for Disease Control and Prevention (CDC). As part of the training, the Field Epidemiology Training Program (FETP) resident are required to undertake field exercises to better inform the Ministry on critical areas that have an impact on service delivery and program implementation.

In this regard, a team from the National Elimination Centre (NMEC) including the FETP resident will be conducting an assessment of private health facilities providing services related to malaria diagnosis and treatment.

The main purpose of this activity is to ascertain capacity of private health facilities in the reporting of malaria cases into the Health Management Information System (HMIS). Three (3) provinces namely; Southern, Copperbelt and Lusaka Provinces have purposively been selected for this activity as they domicile the majority of private health facilities in Zambia.

This team will be visiting your provinces to conduct this activity from 18th December 2017 to 19th January 2018.

Kindly accord them your usual support.

Dr. Kennedy Malama
Permanent Secretary (A)
**MINISTRY OF HEALTH**