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National Quantification of Anti Malaria Commodities

July 2019-June 2021

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July 2019
Addis Ababa, Ethiopia

Executive Summary

The Ethiopian Pharmaceutical Supply Agency (EPSA) and Federal Ministry of Health with comprehensive support of USAID Global Health Supply Chain –Procurement and Supply Management and other stakeholders conducted national antimalaria commodities quantification. The objective of the quantification is to prepare two years (July 2019- June 2021) forecast and one year supply plan for antimalaria commodities used for diagnosis and treatment of malaria. The result of the quantification will be used in planning, mobilizing, and securing financial resources for the forecasting period and in establishing estimated requirements for procurement. The quantification described in this report includes consumption, and morbidity/services-based forecast. The results from each of these forecasts were compared and the team agreed to take mix of the mentioned methods. After calculating the forecast, a supply plan was developed based on quantities on order, stocks on hand, program minimum and maximum stock levels, lead time, buffer stocks and seasonality indexes. The final result of the quantification exercise was a two year forecast requirement (July 2019-June 2021) and one year supply plan (July 2019-June 2020), including specific quantities of each product that are required, with a proposed arrival date. The results of the forecast are shown in detail in different sections of this document. Summary of the forecast costs of the different sub categories of products are shown in table I below.

Table I: Summary of Forecast Result Cost, July 2019- June 2021

Product Category	Unit	Estimated Cost in USD	
		July 2019 to June 2020	July 2020 to June 2021
Medicines			
Artemether + lumefantrine (20 +120)Mg 6X1 dispersible tablet	Dose	85,022.49	76,688.42
Artemether + lumefantrine (20 +120)Mg 6X2 dispersible tablet	Dose	177,640.17	160,227.53
Artemether + lumefantrine (20 +120)Mg 6X3 tablet	Dose	82,521.46	74,432.54
Artemether + lumefantrine (20 +120)Mg 6X4 tablet	Dose	1,548,856.25	1,397,034.30
Artesunate 50 mg suppository	2	21,705.60	21,705.60
Artesunate 60 mg vial injection	Vial	629,168.76	589,267.68
Chloroquine 50mg Base 5ml syrup, 60ml	bottle	92,010.75	81,889.56
Chloroquine 150mg Base tablet	100	471,367.81	419,517.35
Primaquine 7.5mg tablet	100	926,813.41	873,921.16
Quinine Sulphate 300mg tablet	100	145,541.33	129,531.79
Total Cost		4,180,648.01	3,824,215.91
Total Cost with 19.75%		5,006,326.00	4,579,498.55
Rapid Diagnostic Kit (RDT)	25	1,569,308.40	1,644,145.80
Total Cost with 19.75%		1,879,246.81	1,968,864.60
Microscopy related commodities		\$3,150,039	\$2,599,253
Total Cost with 19.75%		\$3,772,172	\$3,112,605

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We are also grateful to workshop participants (Annex I) and quantification team (Annex II) for their valuable contributions to this national quantification of Anti-Malarial commodities.

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Acronyms

ACT	Artemisinin Combination Therapy
AL	Artemeter-Lumfantrine
CHAI	Clinton Health Access Initiative
CSA	Central Statistics Agency
DHS	Demographic Health Survey
EPHI	Ethiopian Public Health Institute
FMHACA	Food, Medicine, and Healthcare Administration and Control Authority
FMoH	Federal Ministry of Health
GHSC	Global Health Supply Chain
HF	Health Facility
HCMIS	Health Commodity Management Information System
HMIS	Health Management Information System
HRP2	Histidine Rich Protein 2
ICAP	International Center for AIDS Care and Treatment Programs
IPLS	Integrated Pharmaceuticals Logistics System
JSI	John Snow Inc
MSH	Management Sciences for Health
NMCP	National Malaria Control Program
NSP	National Strategic Plan
EPISA	Ethiopian Pharmaceuticals Supply Agency
PMI	President's Malaria Initiative
PSM	Procurement and Supply Management
RDT	Rapid Diagnostics Test
RHB	Regional Health Bureau
USAID	United States Agency for International Development
WHO	World Health Organization

CHAPTER ONE

This chapter contains background, objective of the quantification, scope of the quantification, methodology of the quantification, and the organization of the quantification report.

1.1. Background

Malaria is one of the major diseases affecting about 60% of the population of Ethiopia. It is caused by four species of the Plasmodium parasite (*P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*). *Plasmodium falciparum* and *P. vivax* are the two most dominant malaria parasites in Ethiopia. They are prevalent in all malaria endemic areas in the country which accounts 3/4th of the country's landmass. Relative frequency varies in time and space within a given geographical range.

Malaria transmission in Ethiopia mainly occurs up to the 2000m elevation but can also occasionally affect areas up to 2300m elevation. The levels of malaria risk and transmission intensity within these geographical ranges, however, show marked seasonal, inter-annual and spatial variability because of large differences in climate (temperature, rainfall, and relative humidity), topography (altitude, surface hydrology, land vegetation cover, and land use, etc.) and human settlement and population movement patterns.

In most parts of the country, the peak periods of malaria incidence occur from September to December, following the main rainy seasons (June–September), and from March to May, during and after the small rainy seasons (February–March). However, the main rainy season in some south and south west lowlands is February–March resulting in malaria peaks in April–May. Due to the unstable and seasonal pattern of malaria transmission, the protective immunity of the population is generally low, and all age groups are at risk of infection and disease. In Ethiopia, most malaria cases are observed in persons over five years of age, although children under five and pregnant women are most vulnerable to the severe effects of the disease.

The huge initiatives the country has applied to scale up the malaria prevention and control activities in the past decade nationwide, has resulted in reduction in the number of cases as well as severity of the disease. This achievement was possible due to consistent availability of

commodities for malaria prevention and control through the supply chain system. Access to malaria commodities is critical to reaching universal health coverage and is also recognized as a key building block of a strong health system. In Ethiopia, anti-malarial drugs are procured using funds from different sources. The main sources of fund for procurement of anti-malarial drugs are the Government fund, the Global Fund, and PMI. The country's procurement of malaria products is predominantly handled by EPSA. Effective quantification is necessary to guide uninterrupted supply and allocation of these commodities.

Malaria has a significant impediment to social and economic development in Ethiopia. In endemic areas, malaria has affected the population during planting and harvesting seasons, cutting down productive capacity at a time when there is the greatest need for agricultural work. The disease has also been associated with loss of earnings, low school attendance, and high treatment cost. Therefore, an effective supply chain is required to mitigate the social and economic impact of malaria and maintain the country's achievements and future plans towards elimination of malaria.

I.2. Objective

The objective of the quantification is to prepare two years (July 2019- June 2021) forecast and one year supply plan for antimalaria commodities used for diagnosis and treatment of malaria. The result of the quantification will be used in planning, mobilizing, and securing financial resources for the forecasting period and in establishing estimated requirements for procurement.

I.3. Scope of the Quantification

The scope of this quantification is national level demand forecasts of antimalaria medicines, malaria rapid diagnostic test kits (RDTs), and reagents and equipment for malaria microscopy, for the coming two years (July 2019 – June 2021).

I.4. Quantification Process and Methods

Quantification team composed of EPSA, FMOH, GHSC-PSM and AIDSFree was established to plan and lead the quantification. The team collected and organized relevant data for the quantification. A workshop was then called to build assumptions and perform quantification

exercise. Appropriate documents like National Malaria Guidelines, NSP, DHS, HMIS, UNHCR Fact sheet (Plan), Microplan, CHAI assessment report, CRMC report, Quantification report 2016, CSA, MIS, results were referred to extract inputs for the quantification. The data's obtained from different sources were presented to workshop participants and detail technical discussions were made in separate small groups. After group discussion, final agreed up on inputs were presented back to the larger group.

Subsequently, the quantification team members then produced consumption based and morbidity based forecast by using the agreed upon data, compared the results from each, and determined the final forecast consumption for the 2 years forecast period. After the final forecast output 15% emergency stock was added based on the request from Program. After calculating the forecast consumption, a supply plan was developed based on quantities on order, stocks on hand, program minimum and maximum stock levels, and available funding.

I.5. Organizations of the Report

The report organized in five chapters: Chapter one: Introduction – this chapter have a background, objective of the quantification, scope of the quantification, methodology of the quantification, and the organization of the quantification report. Chapter two encompasses the forecast assumption of antimalaria medicines and forecast output by Consumption based and Morbidity based approach. Chapter three covers the forecast assumption of RDTs, microscope and microscopic reagents and forecast output by service based approach. Finally, the last chapter deals with the challenges and recommendation of the quantification.

CHAPTER TWO

In this chapter; service based and consumption-based assumptions for antimalaria medicines will be discussed and the final forecast result of medicines will be portrayed.

2.1. Morbidity Based Medicines Forecast

The cases served during 2009E.C (2016/2017) were 1,759,435 as per HMIS report and this has been adjusted considering underreporting of cases by 15% (WHO 2018 global malaria report). This has been taken as a baseline for the forecast because of incompleteness of the 2010 (2017/2018) and 2011 (2018/2019) HMIS data. As per the national malaria strategic plan 2017-2020; there is a plan to reduce malaria cases by 40% from 2016 baseline by 2020. However, the current yearly performance reported in HMIS indicates that 11% reduction is seen from 2009E.C which is in line with the target set for 40% reduction of cases in the NSP. Considering this fact, the case reduction rate was assumed to continue with 11% for the two years forecast period.

The 2009E.C (2016/2017) baseline data only included 40% of malaria case reports from development projects, and this is assumed to continue for the two years forecast period resulting in 60% malaria cases adjustment for development corridor services. The HMIS report does not include malaria case reports from refugee camps, but this forecast exercise has included the demand of these sites.

As per the CSA data, the annual estimated proportion of pregnant women in Ethiopia is 3.36%. The same proportion was taken to assume the number of pregnant women from the total malaria cases. According to the national malaria treatment guideline pregnant women who are in their first trimester will take Quinine tablet, and this proportion has been assumed to be one third of the pregnant women.

Table 2: Assumptions for Malaria Case Estimation, July 2019- June 2021

Malaria Cases	Assumptions	July 2019- June 2020	July 2020- June 2021
Malaria Cases for General Population		999,584	824,554

P.falciparum proportion	77%	769,680	634,906
P.vivax Proportion	23%	229,904	189,647
Malaria during pregnancy	3.36%	25,877	21,346
Pregnant women with malaria who are on the first trimester (for Quinine)	0.33	8,626	7,115

2.1.1. Patients Age and Weight Proportion

According to the national malaria treatment guideline, the doses of medicines used for the treatment of malaria should be based on the age and weight of patients. To identify the age and weight proportion of patients, the assessment done by Clinton Health Access Initiative (CHAI) on 2014 and the last two years (2017/2018 and 2018/2019) distribution report of AL combinations by EPSA have been compared and found to be consistent (Table 3).

Table 3: Proportion of patients by age category

Age Category	July 2019-June 2020	July 2020-June 2021
Less than 3 years	8.95%	8.95%
3-7 years	10.15%	10.15%
8-10years	5.28%	5.28%
10 years and above	75.62%	75.62%
Total Population	100%	100%

2.1.2. Proportion of P.falciparum and P.vivax

According to HMIS 2009 E.C case report adjusted for underreporting, the proportion of *P.falciparum* and *P.vivax* is 77% and 23%, respectively. This proportion was assumed to continue throughout the two years forecast period.

For the treatment of P.Vivax, a bottle of Chloroquine syrup has been considered for children less than ten years and 10 tables of Chloroquine tablet is assumed for patients greater than ten years of age.

According to the national malaria treatment guideline, single dose Primaquine is recommended after AL treatment for *P.falciparum* and also 14 days of Primaquine after P.Vivax treatment and both scenarios have been reflected in the two years forecast.

2.1.3. Severe Malaria Cases

The 2009E.C (2016/2017) HMIS report shows the proportion of severe malaria from the total malaria cases was 1.6% and this proportion is considered to remain constant throughout the two years forecast period. The same report indicates that among the severe cases, 20% were children under six years of age. This age group are the candidates for Artesunate suppository which is a pre-referral treatment of severe malaria. As indicated in the NSP, 70% of malaria cases will be treated at health post level. This proportion was also assumed to apply for the severe malaria cases of under six years age children (Table 4). The dosage of Artesunate injection based on weight category has been depicted on Table 5 below.

Table 4: Assumptions for Severe Malaria Cases

Malaria Cases	Assumptions	July 2019- June 2020	July 2020- June 2021
Malaria Cases for general population		999,584	824,554
Severe (1.6% of all cases)	1.60%	15,993	13,193
No of children with severe dx under 6	20.0%	3,199	2,639
Treatment Seeking to Health Posts	70.0%	2,239	1,847
100% of those visited HP referred from HP	100.0%	2,239	1,847

Table 5: Assumption for Artesunate Injection for Severe Malaria Cases

Age proportion (%)	weight range (kg)		Av. weight (kg)	dose/kg	dose in mg	rounded up single dose in vials	# of vials for 1st day (3 doses)	# of Vials for 2 more treatment days (i.e one dose per day)	Total vials per patient for 3 days (72 hrs)	Average
8.95	5	14	10	3	30	1	3	2	5	4
10.15	15	24	20	2.4	48	1	3	2	5	4
5.28	25	34	30	2.4	72	2	6	4	10	8
75.62	60		60	2.4	144	3	9	6	15	12

2.1.4. Assumptions for Workers in Development Projects and Refugee Camps

Most of the development projects (dams, irrigation sites, and sugar factories) are located in malarious areas of the country. In addition, it is estimated that three fourth (74%) of refugee camps in Ethiopia are found in malarious risk areas. In Ethiopia, the refugee camps are located in malaria risk area of the country, hence the risk of malaria for people living in these sites are assumed to be 100%. The febrile episode was taken as 1.2 per year as per the GF Gap Analysis document) throughout the forecast periods.

The proportion of treatment seeking behavior from total febrile cases have been projected from malaria national strategic plan (NSP). Based on NSP data, treatment seeking behavior was assumed to be 95%, 98% respective for July 2019 to June 2020 and July 2020 to June 2021. As per the NSP all febrile cases who seeks treatment will be tested for malaria.

Because of the high risk of malaria in these sites, a higher positivity rate is expected in comparison with the general population. Therefore, 56% positivity rate is assumed throughout the forecast period considering the average of slide and RDT positivity reported on HMIS 2009E.C from regions where these sites are located (Amhara, Benishangul Gumuz, Gambella, Tigray).

The proportion of *P.falciparum* and *P.vivax* for cases from development projects and refugee camps is taken to be 81.47% and 18.53%, respectively. This is derived by analyzing the proportion reported on HMIS 2009E.C (2016/2017) from regions where these sites are located (Amhara, Benishangul Gumuz, Gambella, Tigray).

Proportion of severe malaria cases among patients at development projects and refugee camps is considered to be the same as the general population (1.6%). It was also assumed that 3.36% malaria cases will be pregnant women among malaria cases in refugee camps the same as the general population, but no malaria cases among pregnant women are considered for workers in development projects. The detail assumptions are depicted in the table 6 below.

Table 6: Assumptions for Workers in Development Projects, July 2019- June 2021

Cases	Assumption	July 2019-June 2020	July 2020-June 2021
Workers at development projects		1,800,000	1,800,000
Febrile episodes per person per year	1.2	2,160,000	2,160,000

Fever episodes seeking treatment (%)		95.00%	98.00%
Fever episodes seeking treatment (#)		2,052,000	2,116,800
Tested for malaria (%)		100%	100%
Tested for malaria (#)		2,052,000	2,116,800
Positivity rate among workers in the development corners	56%	1,149,120	1,185,408
Proportion of malaria cases in development projects not captured by HMIS	60%	689,472	711,245
P.falciparum	81.47%	936,188	965,752
P.vivax	18.53%	212,932	219,656
Severe	1.60%	18,386	18,967

Table 7: Assumptions for Patients at Refugee Camps, July 2019- June 2021

Cases	Assumption	July 2019- June 2020	July 2020-June 2021
Total number of Refugees in Ethiopia		860,000	860,000
Refugees living in malarious area	74%	636,400	636,400
Febrile episode	1.2	763,680	763,680
Treatment seeking (%)		95%	98%
Diagnosed		725,496	748,406
Lab tested for malaria (%)		100%	100%
Confirmed malaria cases	56% Positivity	406,278	419,108
Total confirmed cases not reported		406,278	419,108
P.falciparum	81.47%	330,994	341,447
P.vivax	18.53%	75,283	77,661
Severe	1.60%	6,500	6,706
Malaria during pregnancy	3.36%	11,128	11,479
Pregnant women with malaria who are on the first trimester (for Quinine)	0.33	3,709	3,826

2.1.5. Forecasted Quantities of Medicine Based on Morbidity

The service-based forecast output of medicines for the two years has been depicted below.

Table 8: Service-Based Forecast Output for Medicines, July 2019- June 2021

Item Description	Unit	Forecasted Quantity	
		July 2019-June 2020	July 2020-June 2021
Artemether + Lumefantrine - 20mg + 120mg (6x1) - Tablet (Dispersible)	Dose	181,196	172,840
Artemether + Lumefantrine - 20mg + 120mg (6x2) - Tablet (Dispersible)	Dose	205,489	196,013
Artemether + Lumefantrine - 20mg + 120mg (6x3) – Tablet	Dose	106,895	101,965
Artemether + Lumefantrine - 20mg + 120mg (6x4) – Tablet	Dose	1,530,943	1,460,344
Artesunate - 100mg - Suppository	2	1,710	1,416
Artesunate - 60mg/ml in 1ml Ampoule – Injection	vial	419,508	398,820
Chloroquine Phosphate - 150mg - Tablet	100	41,915	39,395
Chloroquine Phosphate - 50mg base/5ml – Syrup	60	98,959	93,009
Primaquine Phosphate - 7.5mg base - Tablet	100	162,942	153,643
Quinine Sulphate - 300mg – Tablet	100	5,181	4,596

2.2. Consumption Based Medicine Forecast

2.2.1. Assumption for Consumption Based Forecast

Five years (2014/15-2018/19) issue data collected in order to project the Future forecast for 2019/20 and 2020/21. Unfortunately, it is difficult to get actual dispensed-to-user data to produce consumption-based forecast of commodity needs. Hence, for this exercise, Issue data from EPSA branches to Service delivery Points (SDP) was used as a proxy consumption. Since the system operates on a “pull” basis, all or most of the issued products are assumed to be for replenishment and are consumed by clients.

Source of data:

- 2016/17 quantification Document
 - The issue data for 2014/15 and 2015/16 was obtained from EPSA central issue data to Hubs and RHBs due to the reason that the program was transit to integration

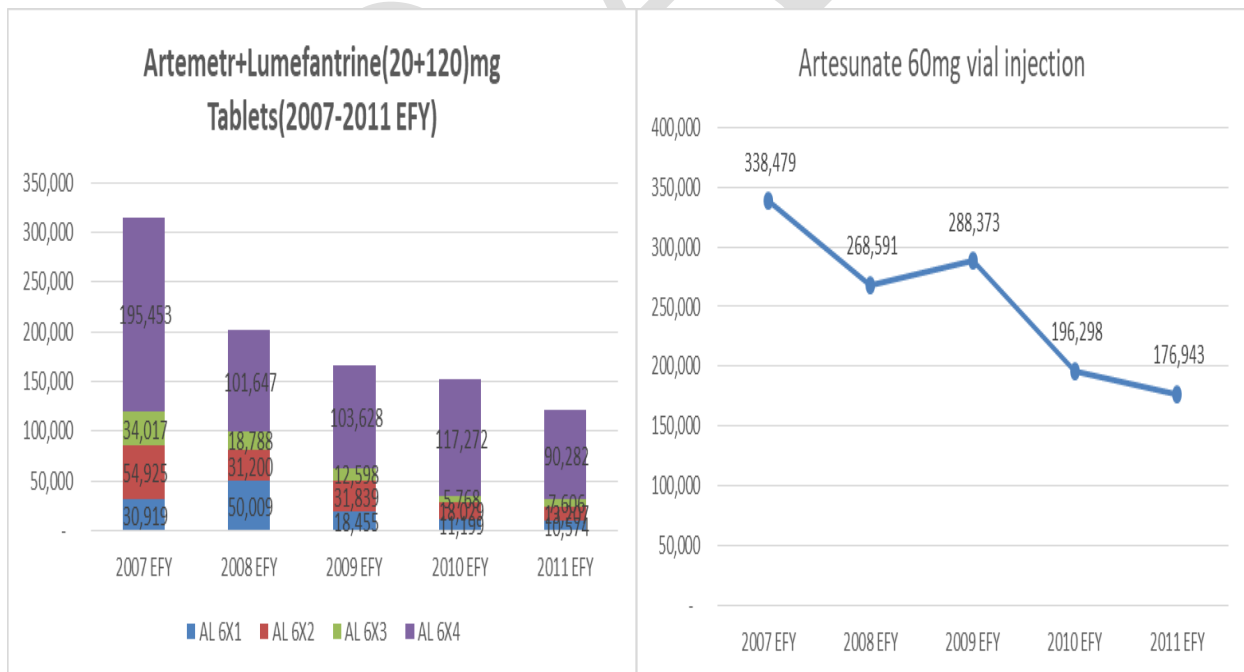
- Hubs to facilities issue data from HCMIS(Vitas) and Dashboard
 - Date for data collection: Ethiopia Fiscal Year (July1-June 30)

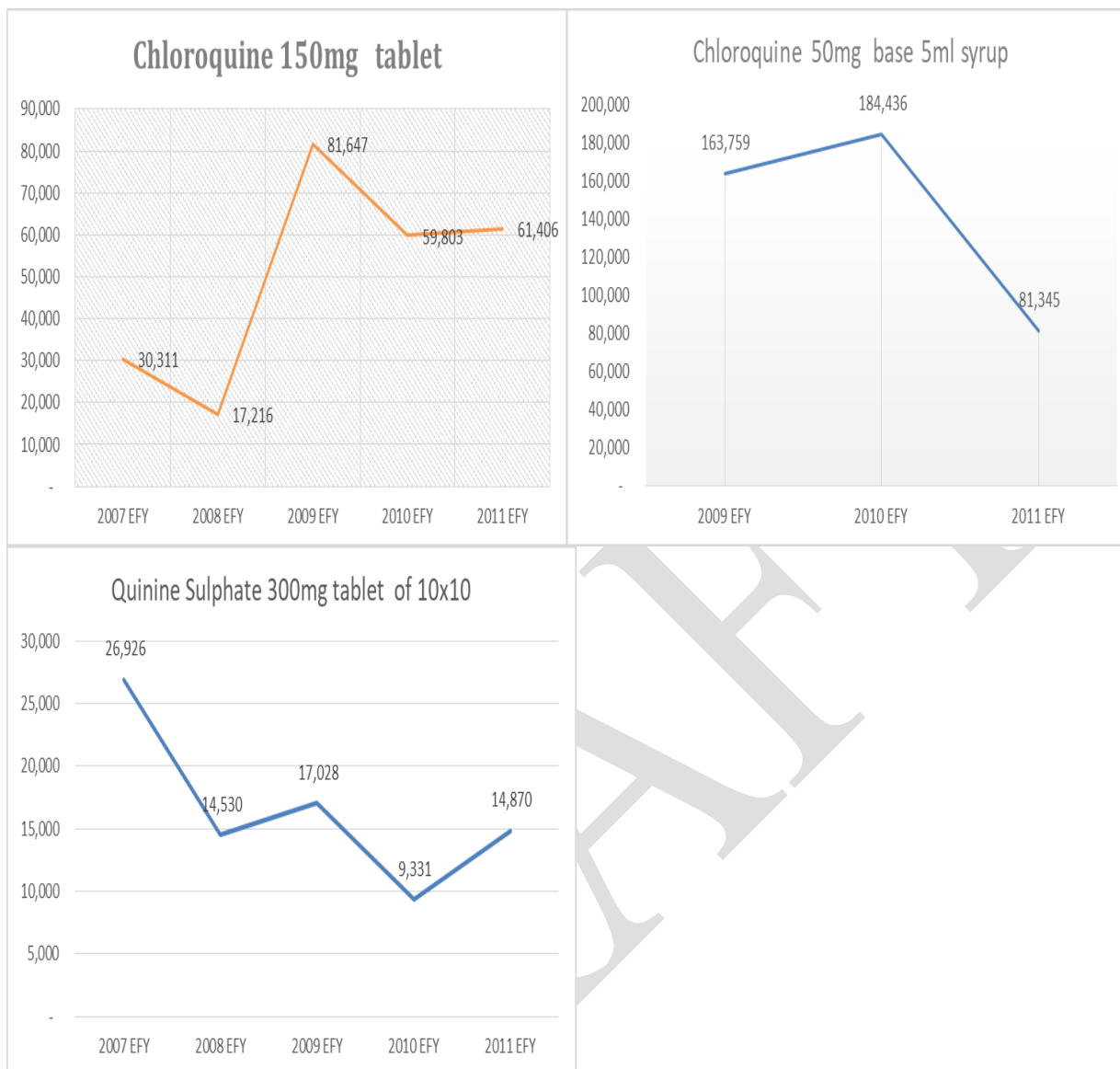
The forecasting team agreed up on the following Assumption:

- Days Out of stock for Artesunate 60mg vial injection and Chloroquine 50mg base 5ml syrup was Adjusted due to the reason that these items were significantly stocked out
- Linear Projection were used to determine the needs of 2019/20 and 2020/21 years by considering that there will be decrease in malaria incidence with 40% by 2020, according to the NSP. Hence 11% reduction considered for each year.
- The consumption did not consider Artesunate Suppository since the item have no consumption history
- Since the system operates on a “pull” basis, all or most of the issued products are assumed to be for replenishment and are consumed by clients

2.2.2. Consumption Trend for Five Years (2014/15-2018/19)

Figure I: Five Years (2014/15-2018/19) Trends of Consumption of Anti-malaria Medicine





2.2.3. Forecasted Quantities of Medicine Based on Consumption

Requirements of the Anti-Malaria medicine for the year July 2019- June 2021 determined based on the Consumption data is presented in Table 9.

Table 9: Projected Demand Based on Issue Data for Medicines

S.N	Item Description	Unit	July 2019-June 2020	July 2020-June 2021
1	Artemether + lumefantrine (20 +120) mg 6XI tablet	Dose	297,396	268,244
2	Artemether + lumefantrine (20 +120) mg	Dose	337,270	304,210

	6X2 tablet			
3	Artemether + lumefantrine (20 +120) mg 6X3 tablet	Dose	175,447	158,249
4	Artemether + lumefantrine (20 +120) mg 6X4 tablet	Dose	2,512,745	2,266,441
5	Artesunate 60mg vial injection	vial	225,408	204,939
6	Chloroquine 150mg tablet	10x10	54,651	48,640
7	Chloroquine 50mg base 5ml syrup	60ml	131,163	116,735
9	Primaquine 7.5mg tablet	1000	16,727	18,400
8	Quinine Sulphate 300mg tablet	10x10	11,585	10,506

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CHAPTER THREE

In this chapter; service-based targets and assumptions for malaria rapid diagnostics tests (RDTs) and microscopic reagents and consumption based for RDT is discussed. The forecast output by both methods will be depicted and the final forecast result will be portrayed.

3. RDTs, Microscopy and Microscopy Reagents Forecast

3.1. Service Based Forecast for RDTs

Malaria diagnosis can be done either by microscopy or Rapid diagnostic test (RDT). Microscopy is gold standard for diagnosing malaria parasite. RDT is performed in areas where there is no trained laboratory staff, specifically at health posts. RDT is easy to perform and is developed to diagnose either *P. falciparum* malaria specific or pan-malaria specific species. It is the pan malaria specific that is suitable for countries like Ethiopia where there are more than 1 parasite species. RDT performs based on the immunochromatographic detection of antigen HRP2 or pLDH which are produced by the parasite during their growth and development in red cell.

3.1.1. Assumptions for General Population

The Target population for RDTs and microscopy was assumed by considering service based forecast target based on the information obtained from HMIS. Proportion of tests to be done by RDT and microscopy was agreed to be 70% and 30% respectively. The detail data found in the table 10 below.

Table 10: Target population for RDTs and Microscopy-Service Data

S.N	Assumptions	July 2019- June 2020	July 2020-June 2021
	Total number of fever cases diagnosed by RDT/microscopy outpatient, HMIS report	6,746,990	6,922,411
1	HMIS completeness for RDT & microscopy was only 85%, so adjusted by 15% increase	7,937,635	8,144,013
	Expected cases for refugee population (UNHCR)	860,000	860,000
2	Only 74% of refugee population are at risk	636,400	636,400
3	Tests at elimination kebeles (1 index case per 50 persons test). 50 Kebeles out of 4,343 kebeles report less or equal to 1 case per week increase by 30% and 50% in 2021 & 2022	32,500	42,250
	Workers at development projects	1,800,000	1,800,000

	Workers at development project develop Fever Episodes 1.2 ,i.e, 1 person 1.2 times diagnosed	2,160,000	2,160,000
4	40% of workers at development area included in HMIS report, so only 60% of workers at development project are considered	1,296,000	1,296,000
	Total number of malaria suspected tests	8,711,890	8,897,061
	Factors decreasing malaria incidence with vector control (30%,40%, 50%), thus reduced malaria cases	2,613,567	3,558,824
5	Number of tests after vector control deduction	6,098,323	5,338,237
	% diagnostic coverage by microscopy	30%	30%
	% diagnostic coverage by RDT	70%	70%
6	Buffer 15%	914,748	800,735
7	Total diagnostics need	7,013,071	6,138,972
8	Total RDT (70% total diagnostics) after adding 7% wastage and 5% for training	5,498,248	4,812,954
9	Total microscopy (30%) after adding 10% wastage	2,314,313	2,025,861

3.1.2. Assumptions of RDT's Specific to Elimination Woredas

Federal ministry of health has a plan to eliminate *P.vivax* in 239 woredas by 2020. The 2019/2020 MOH plan shows that 650 total cases of malaria from 50 Kebeles will be targeted in the elimination woredas. According to the ministry's national elimination roadmap, there is a plan to test 50 persons per each confirmed malaria cases. The plan also shows there will be increase of 30% and 50% cases in subsequent years. Detail data depicted in table 11 below.

Table 11: RDTs for Elimination Woredas

	July 2019-June 2020	July 2020-June 2021
Cases	650	650
Target for Reactive Case Detection		30%
Number of Reactive Case Detection	650	845
Household families per case	50	50
Total Number of tests	32,500	42,250

3.1.3. Service-Based Forecast Output for RDTs

The result of the two years forecast for RDTs using service-based forecast is depicted in table 12 below.

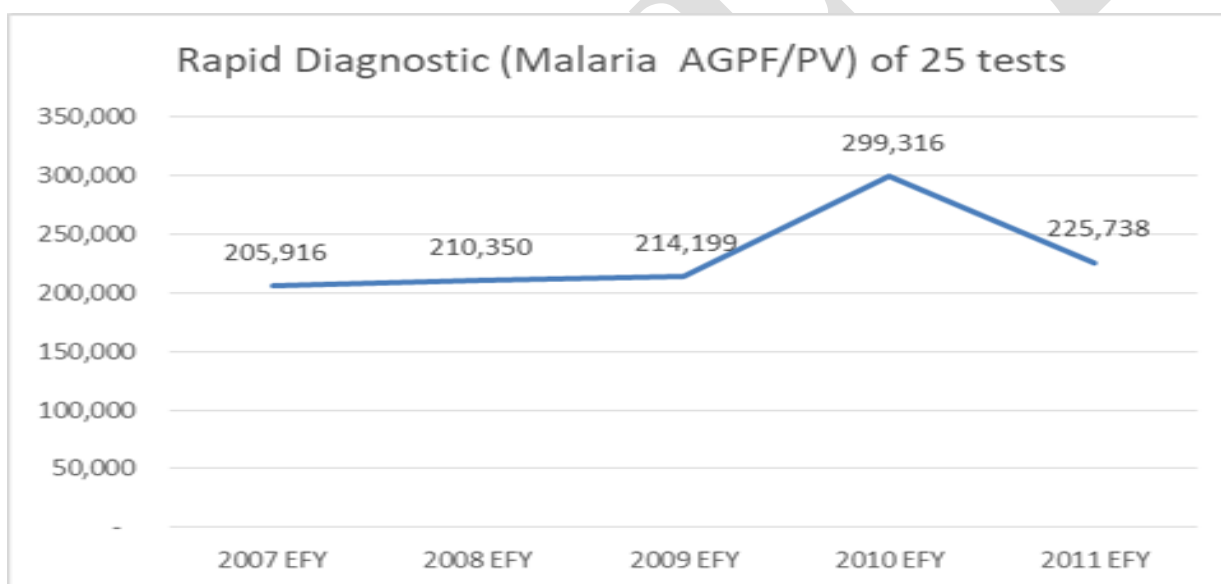
Table 12: Service-based forecast of RDTs

Description	Unit	Forecasted Quantity	
		July 2019-June 2020	July 2020-June 2021
Rapid diagnostic test (RDT)	25 test	249,988	218,952

3.2. ConsumptionBased RDT Forecast

Linear Projection were used to determine the needs of 2019/20 and 2020/21 years. Since the system operates on a “pull” basis, all or most of the issued products are assumed to be for replenishment and are consumed by clients

Figure 2: Consumption Trend for five years (2014/15-2018/19)



3.2.1. Forecasted Quantities of RDT Based on Consumption

Requirement of RDT for the year July 2019- June 2021 determined based on the consumption data is presented in table 13.

Table 13: Forecasted Quantities of RDT Based on Consumption Data

S.N	Item Description	Unit	July 2019-June 2020	July 2020-June 2021
I	Rapid Diagnostic (Malaria AGPF/PV)	25	269,690	282,548

3.3. Assumptions for Microscopy, Service-Based Forecast Output

- Usage rate per test for all chemicals, reagents and supplies have been discussed and agreed upon by the team.
- The numbers of health facilities for the forecast years have been taken from EPSA summary SDP update data June 2018, considering this number 4022 to be consistent throughout the forecast period.
- Since there is a capacity limitation in country on using the powdered microscopy reagents by reconstitution, the quantification team agreed to forecast pre-prepared reagents for microscopic test throughout the forecast period. Additionally, it was decided that 5% reconstituted reagents will be prepared at regional laboratories that can be used for regional labs training purpose and emergency gap filling for few facilities that will be unreachable through the formal stock solution distribution.
- Because quality of procurement of pre-prepared reagents was the main cause of problem for availability reagents at health facilities, we recommend that EPSA and EPHI make agreement to check the quality of Giemsa to procure and EPHI approves the reagent before procurement by receiving representative sample. Quality check also will be done randomly before the actual distribution to facilities.
- Some supplies are calculated per test per year over the next three years; while some other items are calculated per number of health facilities.
- To improve the diagnosis of malaria at health facilities, it is crucial to capacitate health facilities with microscopes. A detailed gap analysis is very important to know the health facilities that need microscope, but the team has agreed to continue with last year plan to procure 154 microscopes in each forecast year. During the previous quantification, there was a plan to procure 334 microscopes that will support any microscope gap at testing facilities. During the 2019 ICAP procured 180 microscopes. Therefore, the quantification team decided to quantify 154 microscopes in each forecast year to fill deficits at testing sites.

Table 14: Total numbers of health facilities and regional laboratories, July 2019- June 2021

Description	July 2019-June 2020	July 2020-June 2021
Total number of health facilities	4022	4022

3.3.1. Microscopy Forecast output

Microscopy is Gold Standard for malaria diagnosis and the test is performed at health centers and higher health facilities where there is trained microscopist or laboratory personnel. Commodity need for microscopy is shown Table 15 and additional 5% commodities for microscopy which in this case will be reconstituted locally at regional labs, quantity and list of commodities presented in Table 16.

Table 15: Forecast of Commodities for Microscopy Performing Facilities

S.No	Item Description	Unit	Total Quantity	
			July 2019-June 2020	July 2020-June 2021
1	Giemsa Stock solution: 0.8% w/v, 500ml (Azur eosin)	500ml	8,044	8,044
2	Absolute methanol (99.8%) of 100 ml	100ml	4,022	4,022
3	Frosted Microscope Slides, 75 x 25 x 1mm, case of 50 boxes of 50 pieces/box) Frosted end	50	101,830	89,138
4	Blood lancets, disposable, sterile retractable blood lancets, pack of 200 pieces	Pack	12,729	11,142
5	Oil immersion of 100 ml refractive index of 1.515	100ml	4,022	4,022
6	Glove: nitrile, powderless Latex-free; Nonsterile; Textured surface; Beaded cuff; Medium size of 100 pieces (50 pairs)	Pack	50,915	44,569
7	Glove: nitrile, powderless Latex-free; Nonsterile; Textured surface; Beaded cuff; Small size of 100 pieces (50 pairs)	Pack	50,915	44,569
8	Glove: nitrile, powderless Latex-free; Nonsterile; Textured surface; Beaded cuff; Large size of 100 pieces (50 pairs)	Pack	50,915	44,569
9	Cotton Absorbent Wool - 100gm	Roll	25,457	22,284
10	Gauze: Spongy roll of 100 gram	Roll	50,915	44,569

11	Lens Cleaning Solution: Optical lens; removes oil and smudges from objectives or any optical surface; Nonflammable; 2 oz. of 100ml	Bottle	4,022	4,022
12	Lens - Cleaning Tissues; Lint-free; 4 x 6 in. W (10.1 x 15.2cm); Sheets per book: 50	Pack	4,022	4,022
13	Filter paper: Qualitative; High Grade, Cellulose fiber; Particle retention: 20 to 25um; Porosity: coarse; quick filtration speed: Flow rate: fast 160ml/min.; Circles; 5.5cm dia. of 100 pieces	Pack	203,660	178,276
14	Alcohol denatured 70% solution (Ethanol)	Liter	25,457	22,284
15	Biohazard Bag: For biohazard and infectious waste; With biohazard symbol; Gauge: 1.1 mil; LLDPE Film; Meet A.S.T.M. dart test requirements; Color: red; Size: 23 x 23; Capacity: 7 to 10 gal. of 100 pieces	Pack	48,264	48,264
16	Safety Box (Sharp Container): for container of sharps, 15 L, cardboard for incineration	pack	24,132	24,132
17	Staining Jar Coplin, glass, for slides with removable stainless-steel rack can holds 10 slides including lid or cover	Each	8,044	-
18	Drying rack: for slides drying, vertical, wooden, holds 10 slides	Piece	8,044	-
19	Light source LED compact, adjustable, variable brightness 110 to 120 volt	Each	1,341	1,341
20	Microscope halogen bulb 20wt, 60 volt	Each	8,044	8,044
21	Forceps: Forged, surgical grade, stainless-steel; Corrosion resistant treating; Serrated Tips; Length: 4.5 in. (11.4cm)	Each	4,022	4,022
22	Tally counter: 2-key, 4 digits, hand-operated for use in microscopic examinations	Each	4,022	-

23	Funnel: plastic, Large autoclavable to 120 deg for graduated cylinder 100 mm diameter, Stem large	Each	8,044 -	
24	Washing bottle 250 ml	Each	6,704	6,703
25	Mechanical Timer: (interval with alarm), three-line display, three-channel timing with individual start, visual and audible alarms, timing max range of 99hours, 59 minutes, 59 seconds; stopwatch ranging 1 second to 99 hours, 59 minutes, 59 seconds	Each	8,044 -	
29	Microscope Slide drying tray, cardboard tray (holds 20 slides) for horizontal slide drying	Each	8,044 -	
30	Slide box: Hinged plastic slide box (holds 100 slides), with cork layer in bottom part, 21x17x3cm, Stackable, hold 3 x 1 in. and 75 x 25mm slides, Numbered slide partitions correspond to numbered index, Stackable with hinged lid;	1	4,022 -	
31	Microscope: Body: Aluminum die-casting metal frame, Protective covering; Optical System: Infinity optical system ; Illumination System: Built-in transmitted illumination system, LED Power Consumption 0.5 W (nominal values); Focusing : Stage height movement (coarse movement stroke: 15 mm), coarse adjustment limit stopper, Torque adjustment for coarse adjustment knob, Fine focus knob (minimum adjustment gradations: 2.5 µm); Revolving Nosepiece: Fixed quadruple nosepiece; Stage: Wire movement mechanical fixed stage, Traveling range: 76 mm	Each		

(X) x 30 mm (Y), Specimen holder, Specimen position scale; Observation Tube: 30° inclined binocular tube, Interpupillary distance adjustment range: 48 – 75 mm, Eyepoint adjustment: 370.0 – 432.9 mm; Objectives: Plan achromat, anti-fungus; 4x NA: 0.10 W.D.: 27.8 mm; 4x NA: 0.10 W.D.: 27.8 mm; 10x NA: 0.25 W.D.: 8.0 mm; 40x NA: 0.65 W.D.: 0.6 mm; 100xOil NA: 1.25 W.D.: 0.13 mm; Eyepiece (10x): Field Number (FN): 20 (anti-fungus); Optional Accessories: Reflection mirror (CH20-MM), 15x eyepiece (WHSZI5X-H: FN 12, anti-fungus), Dedicated Dark field stop, wooden case, Eyepiece micrometer, Weight: Approx. 5.9 kg; Rated Voltage/Electric Current: AC 100–240 V 50/60 Hz 0.4 A; Power Consumption: Less than 2 W		154	154
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Table 16: Forecast of Commodities for Reconstitution of Reagents at Regional Laboratories

S.No	Item Description	Unit of issues	Forecasted Quantity	
			July 2019-June 2020	July 2020-June 2021
1	Absolute methanol (99.8%) of 100 ml Methanol 1ltr ACS grade	500ml	76	67
2	Buffer tablet: PH 7.0-7.4 (for 1,000ml) (box of 50), Appearance White flat tablets, Average weight range: 753-789mg, Tablet diameter: 11.5 mm (average), Average tablet hardness: 6kp min,	50	25	22
3	Giemsa powder of 25 grams /	25gm	25	22
4	Glycerol, of 100 ml	100ml	382	334

5	Lens Cleaning Solution: Optical lens; removes oil and smudges from objectives or any optical surface; Nonflammable; 2 oz. of 100ml	Bottle	636	557
6	Oil immersion of 100 ml refractive index of 1.515	Bottle	127	111
7	Alcohol denatured 70% solution (Ethanol)	Liter	763,723	668,534
8	Frosted Microscope Slides, 75 x 25 x 1mm, case of 50 boxes of 50 pieces/box) Frosted end	50	5,091	4,457
9	Examination glove; Non-Sterile; ambidextrous, Medium size of 100 pieces(50pairs)	50	2,546	2,228
10	Examination glove; Non-Sterile; ambidextrous, Large size of 100 pieces(50pairs)	50	2,546	2,228
11	Examination glove; Non-Sterile; ambidextrous, Small size of 100 pieces(50pairs)	50	2,546	2,228
12	Cotton Absorbent Wool - 100gm	Roll	1,273	1,114
13	Gauze: Spongy roll of 100 gram	Roll	2,546	2,228
14	Amber bottle 500 ml, each	500ml	202	202
15	Lens - Cleaning Tissues; Lint-free; 4 x 6 in. W (10.1 x 15.2cm); Sheets per book: 50	Pack	2546	2228
16	Filter paper: Qualitative; High Grade, Cellulose fiber; Particle retention: 20 to 25um; Porosity: coarse; quick filtration speed: Flow rate: fast 160ml/min.; Circles; 5.5cm dia. of 100 pieces	Pack	52	52
18	Labeling sticker of 10 pcs (Pk)	1	338	338
17	Biohazard Bag: For biohazard and infectious waste; With biohazard symbol; Gauge: 1.1 mil; LLDPE Film; Meet A.S.T.M. dart test requirements; Color: red; Size: 23 x 23; Capacity: 7 to 10 gal. of 100 pieces	Pack	78	78
19	Safety Box (Sharp Container): for container of sharps, 15 L, cardboard for incineration	Each	325	325
21	Slide box: Hinged plastic slide box (holds 100 slides), with cork layer in bottom part, 21x17x3cm, Stackable, hold 3 x 1 in. and 75 x 25mm slides, Numbered slide partitions correspond to numbered index, Stackable with hinged lid;	1	65	-
22	Staining Jar Coplin, glass, for slides with removable stainless-steel rack can holds 10 slides including lid or cover	Each	26	26
23	Drying rack: for slides drying, vertical, wooden, holds 10 slides	Piece	26	-
24	Forceps: Forged, surgical grade, stainless-steel; Corrosion resistant treating; Serrated Tips; Length: 4.5 in. (11.4cm)	Each	26	-
25	Tally counter: 2-key, 4 digits, hand-operated for use in microscopic examinations	Each	26	-
26	Funnel: plastic, Large autoclavable to 120 deg for graduated cylinder 100 mm diameter, Stem large	Each	39	-

27	Washing bottle 250 ml	Each	26	-
28	Mechanical Timer: (interval with alarm), three-line display, three-channel timing with individual start, visual and audible alarms, timing max range of 99hours, 59 minutes, 59 seconds; stopwatch ranging 1 second to 99 hours, 59 minutes, 59 seconds	Each	26	-
29	Measuring Cylinder: plastic, graduated, spout, capacity 100-500 ml	Each	65	65
30	Measuring cylinder: plastic, graduated, spout, capacity 1000 ml	Each	26	26
31	Measuring cylinder; plastic, graduated, spout, capacity 10-100 ml	Each	65	65
32	Microscope Slide drying tray , cardboard tray (holds 20 slides) for horizontal slide drying	1	26	-
33	Shaker with magnetic stirrer	1	13	-
34	Digital Analytical Balance high precision; Stored menu settings; Rugged; Durable; Battery backup for use in field; With glass draft shield; Maximum load: 210g; Readability: 0.0001g	1	13	-
35	Weighing paper: Disposable; of 100 pieces	100 pieces	39	39
36	Spoon, Sterile; Disposable; Capacity: 1 tsp.; Length: 7 in.; Flat bottom; Polystyrene; Extralong handle of 12 pcs	1	65	-

CHAPTER FOUR

4.1. Final Reconciled Result for Medicines & RDTs

After analyzing the result of the two methods i.e.: Morbidity and Consumption method, it was agreed to take the result of the consumption-based forecast for all products, except for artesunate injection (average of the two methods considered) and primaquine (morbidity method considered). For Artesunate Suppository the forecasted amount is too small for distribution to all health post located in malarious areas. Hence the quantity calculated by taking into account 70% (malarious area) of health posts (17,000) will take 2 pack of the suppositories per year.

Five percent wastage rate is applied on the service based forecast and 15% buffer stock is considered for the emergency cases (Elino, IDP, etc.) for both methods.

Line by line comparison between service based and consumption based forecast results has been done and the table below shows the two results and the selected forecast for each item.

Table 17: Forecast Reconciliation Between Service and Consumption Based forecast, July 2019- June 2021

Product	Units	Service-based Forecast considering 5% wastage & 15% Emergency		Consumption-based Forecast considering 15% Emergency		Final Agreement
		July 2019- June 2020	July 2020- June 2021	July 2019- June 2020	July 2020- June 2021	
Artemether + Lumefantrine - 20mg + 120mg (6x1) - Tablet (Dispersible)	Dose	217,435	172,840	342,005	308,481	Consumption based forecast to be taken since it aligns more with what's on ground
Artemether + Lumefantrine - 20mg + 120mg (6x2) - Tablet (Dispersible)	Dose	246,587	196,013	387,861	349,842	
Artemether + Lumefantrine - 20mg + 120mg (6x3) - Tablet	Dose	128,274	101,965	201,764	181,987	
Artemether + Lumefantrine - 20mg + 120mg (6x4) - Tablet	Dose	1,837,131	1,460,344	2,889,657	2,606,407	
Artesunate - 100mg - Suppository	2	28,560	28,560	-	-	Morbidity method taken since there is no data on consumption

Artesunate - 60mg/ml in 1ml Ampoule - Injection	Each	503,410	478,584	259,219	235,680	Average of consumption-based & morbidity based forecast was taken to align more with what's on the ground
Chloroquine Phosphate - 150mg - Tablet	100	50,298	47,274	62,849	55,936	Consumption based forecast to be taken since it aligns more with what's on ground
Chloroquine Phosphate - 50mg base/5ml - Syrup	60	118,751	111,611	150,837	134,245	Consumption based forecast to be taken since it align more with what's on ground
Primaquine Phosphate - 7.5mg base - Tablet	100	195,530	184,372	192,361	211,589	Morbidity has been taken because elimination roll out and scale up is being implemented starting from 201 I.E.C and consumption doesn't clearly show that
Quinine Sulphate - 300mg - Tablet	100	6,217	5,516	24,420	21,734	Consumption based forecast is taken since it aligns more with what's on ground
Rapid Diagnostic (Malaria AGPF/PV)	25			310,140	324,930	Consumption based forecast is taken since it aligns more with what's on ground

After the reconciliation is done between service and consumption based forecasts, the final forecasted quantity and price of anti-malarial medicines and RDTs are portrayed in the table below.

Table 18: Final Reconciled Result of Medicines and RDTs, for the July 2019 to June 2021

Item Description	Unit	Forecasted Quantity	
		July 2019- June 2020	July 2020- June 2021
Artemether + Lumefantrine - 20mg + 120mg (6x1) - Tablet (Dispersible)	Dose	342,005	308,481
Artemether + Lumefantrine - 20mg + 120mg (6x2) - Tablet (Dispersible)	Dose	387,861	349,842
Artemether + Lumefantrine - 20mg + 120mg (6x3) - Tablet	Dose	201,764	181,987
Artemether + Lumefantrine - 20mg + 120mg (6x4) - Tablet	Dose	2,889,657	2,606,407
Artesunate - 100mg - Suppository	2	28,560	28,560
Artesunate - 60mg/ml in 1ml Ampoule - Injection	Each	381,314	357,132
Chloroquine Phosphate - 150mg - Tablet	100	62,849	55,936
Chloroquine Phosphate - 50mg base/5ml - Syrup	60	150,837	134,245
Primaquine Phosphate - 7.5mg base - Tablet	100	195,530	184,372
Quinine Sulphate - 300mg - Tablet	100	24,420	21,734
Rapid Diagnostic (Malaria AGPF/PV)	25	310,140	324,930

NB: For Microscopy since only service based forecast method was used, there will not be reconciliation.

CHAPTER FIVE

5.1. Supply Plan for Medicines and RDT

The following assumptions considered for the supply plan:

- Seasonality index by quarter

Quarter	Jan-Mar	April-June	July-Sep	Oct-December
SI	0.807	0.896	1.064	1.234

- 6 month minimum stock level and 13 month maximum stock level
- 8.5 month lead time for procurements by EPSA and 11 month lead time for procurement by GHSC-PSM.
- 19.75% procurement and supply management related costs considered. 1% for QC, 9% for freight, 1% for insurance, 1.75% for bank service charge, 2% for procurement and 5% for distribution.

Table 19: Supply Plan for Medicines & RDT

Product	Unit	Receive Date	Quantity	Total Requirement	Supplier	Funding Source
Artesunate (w/ 2 Solvents) 60 mg Vial	1	5/31/2020	348,625	489,305	GHSC-PSM	PMI
Artesunate (w/ 2 Solvents) 60 mg Vial	1	1/31/2021	140,680			
Quinine Sulphate 300mg tab	100	2/29/2020	12,096	24,066	GHSC-PSM	PMI
Quinine Sulphate 300mg tab	100	6/30/2020	5,880			
Quinine Sulphate 300mg tab	100	3/31/2021	6,090			
Artemether + lumefantrine (20+120)Mg 6X1 tab	30	3/31/2020	5,610	12,106	EPSA	GF
Artemether + lumefantrine (20+120)Mg 6X1 tab	30	6/30/2020	3,892			
Artemether + lumefantrine (20+120)Mg 6X1 tab	30	12/31/2020	2,604			
Artemether + lumefantrine (20+120)Mg 6X2 tab	30	3/31/2020	6,564	13,834	EPSA	GF
Artemether + lumefantrine (20+120)Mg 6X2 tab	30	6/30/2020	4,329			
Artemether + lumefantrine (20+120)Mg 6X2 tab	30	12/31/2020	2,941			
Artemether + lumefantrine (20+120)Mg 6X3 tab	30	3/31/2020	5,144	8,445	EPSA	GF
Artemether + lumefantrine (20+120)Mg 6X3 tab	30	6/30/2020	1,779			

Artemether + lumefantrine (20+120)Mg 6X3 tab	30	12/31/2020	1,522			
Artemether + lumefantrine (20+120)Mg 6X4 tab	30	6/30/2020	32,895	99,886	EPSA	GF
Artemether + lumefantrine (20+120)Mg 6X4 tab	30	12/31/2020	21,890			
Artemether + lumefantrine (20+120)Mg 6X4 tab	30	3/31/2020	23,384			
Artemether + lumefantrine (20+120)Mg 6X4 tab	30	3/31/2021	21,717			
Chloroquine 50mg, 5ml syrup, 60ML	1	6/30/2020	68,957	68,957	GHSC-PSM	PMI
Primaquine 7.5mg Tab	100	10/31/2019	192,421	388,831	EPSA	GF
Primaquine 7.5mg Tab	100	3/31/2020	77,097			
Primaquine 7.5mg Tab	100	6/30/2020	72,560			
Primaquine 7.5mg Tab	100	12/31/2020	46,753			
Rapid Diagnostic (Malaria AGPF/PV)	25	3/31/2020	108,622	326,580	EPSA	GF
Rapid Diagnostic (Malaria AGPF/PV)	25	6/30/2020	136,083			
Rapid Diagnostic (Malaria AGPF/PV)	25	12/31/2020	81,875			
Artesunate 100MG/supp	2	8/31/2020	28,560	28,560	GHSC-PSM	PMI

CHAPTER SIX

In this chapter the challenges during this quantification and future recommendations will be discussed.

6.1. Challenges

There is observed improvement in the anti-malaria drugs and commodity supplies system in the country. However, there are still some challenges in the system. These include: -

- 2009 E.C(2016/2017) HMIS service data was used for this quantification exercise, since the 2010 (2017/2019) HMIS/DHIS₂ data was incomplete.
- Issues related to completeness of data for quantification;
- High variation among different data sources (HMIS and issue data);
- Unavailability of consolidated case reports from development corridors, pastoralists, migrant workers even though they have a significant impact on the quantification of all the products;
- There is no actual consumption data from health facilities. Because of this Issue data from central EPSA to hubs was used.
- Absence and/or shortage of precise data on age category of population for AL weight band, parasite prevalence proportion, fever episode, number of HFs who have functional microscope.

6.2. Recommendations

To ensure this quantification translates into continuous antimalaria commodities availability in the country, a number of recommendations are provided. These recommendations are actions that will create the right platform for improved implementation of logistics management tasks and activities.

- The Logistics Management Information System for Malaria products should be strengthened at all levels of the supply chain.
- There is a need to strengthen HMIS so that the right data items are collected and reported in line with the ultimate use of the data.

- Case and consumption reporting from development corridors, pastoralists, and migrant workers should be strengthened
- Fever episodes per person per year for the general population should be assessed
- Various age categories should be assessed.
- Data should be collected from health facilities on the number of functional laboratory microscopes.
- Adherence to standard treatment guidelines should be increased by creating awareness through different channels.

DRAFT

Annexes

I. List of Workshop Participants

1	Abiy Kiflom	EPSA
2	Aexyv Gizachew	GHSC-PSM
3	Alemtsehay Berhanu	Abt/PHSP
4	Andualalem Oumer	Smart Chain/GF
5	Anteneh Tsige	FMOH/GHSC-PSM
6	Bokretion Gidey	EPHI
7	Degu Mahari	FMOH
8	Dr. Kebede Etana	FMOH
9	Dr. Negash Seyoum	ICAP
10	Dr. Yonas Petros	Abt/PHSP
11	Esubalew Belayeneh	EPSA
12	Feleke Belachew	ICAP
13	Fikadu Deme	GHSC-PSM
14	Genet Alemu	EPSA
15	Liezl Channing	GF LFA
16	Mebrahtom Haile	FMOH
17	Muluemebet Tesfaye	EPSA
18	Nigusu Gudeta	GHSC-PSM
19	Raey Yohannes	EPSA/GHSC-PSM
20	Solomon Berhie	PSA
21	Solomon Kinde	EPHA
22	Tadesse Dessie	JSI/AIDSFree
23	Teketel Ahadu	EPSA
24	Tesfaye Mekonen	PSA
25	Tesfaye Seifu	GHSC-PSM
26	Tigist Kassahun	EPSA
27	Tilahun Berhane	JSI/AIDSFree
28	Tsion Tsegaye	EPSA
29	Zebiba Mekonen	GHSC-PSM
30	Zerihun Fekade	EPSA

II. List of Quantification Team members

S.N	Participant Name	Organization
1	Abiy Kiflom	EPSA
2	Alexyv Gizachew	GHSC-PSM
3	Andualalem Oumer	Smart Chain/GF
4	Anteneh Tsige	FMOH/GHSC-PSM
5	Esubalew Belayeneh	EPSA
6	Fikadu Deme	GHSC-PSM
7	Genet Alemu	EPSA
8	Nigusu Gudeta	GHSC-PSM
9	Raey Yohannes	EPSA/GHSC-PSM
10	Tadesse Dessie	JSI/AIDSFree
11	Tigist Kassahun	EPSA
12	Tilahun Berhane	JSI/AIDSFree
13	Tsion Tsegaye	EPSA
14	Zebiba Mekonen	GHSC-PSM
15	Zerihun Fekade	EPSA