Unitaid

FORECAST REPORT

GLOBAL MALARIA DIAGNOSTIC AND ARTEMISININ TREATMENT COMMODITIES DEMAND FORECAST

2017 – 2020

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CLINTON HEALTH ACCESS INITIATIVE

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UCSF University of California San Francisco

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ABBREVIATIONS

ACT(s)	artemisinin-based combination therapy/therapies
AMFm	Affordable Medicines Facility for malaria
AL	artemether-lumefantrine
API	active pharmaceutical ingredient
ASAQ/AS+AQ	artesunate-amodiaquine
ASMQ	artesunate-mefloquine
ASPY	artesunate-pyronaridine
ASSP/AS+SP	artesunate-sulfadoxine pyrimethamine
B	Billion
BCG	Boston Consulting Group
CHAI	Clinton Health Access Initiative
CPM	Co-Payment Mechanism (Private Sector Co-Payment Mechanism)
DHA-PPQ	dihydroartemisinin piperaquine
EC	Economic Community
FY	fiscal year
The Global Fund	Global Fund to fight AIDS, Tuberculosis, and Malaria
IMF	International Monetary Fund
LLIN	long lasting insecticidal nets
M	Million
MTs	metric tons
MIT	Massachusetts Institute of Technology
MMV	Medicines for Malaria Venture
MOP(s)	(PMI's) Malaria Operational Plan(s)
NMCP(s)	National Malaria Control Program(s)
PMI	The President's Malaria Initiative
PSCM	Private Sector Co-payment Mechanism (see CPM)
QAACT(s)	quality-assured artemisinin-based combination therapy/therapies
QAINJAS	quality-assured injectable artesunate
QARDT(s)	quality-assured malaria rapid diagnostic test(s) [defined by the WHO procurement criteria for RDTs]
RDT(s)	(malaria) rapid diagnostic test/tests
UCSF	University of California, San Francisco
US	The United States of America
USAID	United States Agency for International Development
WHO	World Health Organization
WHO-GMP	World Health Organization – Global Malaria Program
WHO-PQ	World Health Organization – Pre-Qualified
WMR	World Malaria Report

EXECUTIVE SUMMARY

Recent years have witnessed a dramatic decline in the burden of malaria in endemic countries. The scale-up of effective tools to diagnose and treat malaria has played a significant role in this public health achievement, and continued availability of proven products for malaria case management is essential to sustaining and extending the gains. However, markets for malaria treatments and diagnostics face a number of challenging market dynamics that have in the past generated inconsistent product supply, volatile demand, significant price swings, and suboptimal allocation of resources. Given the size of the market for malaria case management commodities and its importance to public health, finding ways to ensure greater stability in this market is critical for a broad array of stakeholders including policymakers, market participants – and most importantly – malaria patients.

The Malaria Diagnostics and Artemisinin Treatment Commodities Forecasting Consortium ("the Forecasting Consortium") was established by Unitaid to provide better information to policymakers, market participants, and other stakeholders about the size of and trends in the global markets for malaria case management commodities. The Forecasting Consortium comprises the Clinton Health Access Initiative, Inc. (CHAI), IMS Health, and University of California San Francisco (UCSF) Global Health Sciences, is funded by Unitaid, and reports to a Steering Committee made up of Unitaid, the Global Fund to fight AIDS, Tuberculosis, and Malaria (Global Fund), the World Health Organization's Global Malaria Program (WHO-GMP), the President's Malaria Initiative (PMI), and Medicines for Malaria Venture (MMV).

This forecast represents the third in a new series of projections that will be made over the next year. The forecast presented in this report provides an update to the baseline projection of the size of the malaria commodity market that was presented in the prior published report (www.unitaid.eu/en/actforecasting) and shifts the forecast period from 2016 – 2019 to 2017 – 2020. Future reports will update and extend the baseline forecast, and also assess scenarios and events that could impact the market. This forecasting consortium builds on previous models for estimating the size of the market for artemisinin-based combination therapies (ACTs), including WHO-prequalified ACTs (quality-assured ACTs; QAACTs) and ACTs that are not WHO-prequalified (non-quality assured ACTs;

non-QAACTs), introduces new information around other categories of antimalarial medicines, such as quality-assured injectable artesunate (QAINJAS) and oral artemisinin monotherapies, and estimates the size of the market for malaria rapid diagnostic tests (RDTs).

Two key points about nomenclature warrant emphasis. 1) This forecasting report distinguishes three terms that often are used interchangeably but mean very different things: "need", "demand," and "procurement". For this report, "need" represents our projection of the total number of febrile cases where the patient carries malaria parasites currently detectable by microscopy or rapid diagnostic tests (including cases where the fever may be caused by a separate infection); "demand" represents the number of cases where a consumer would seek treatment for a suspected case of malaria-caused fever (including cases where the fever is not caused by malaria); and "procurement" represents the number of quality-assured products that we estimate will be ordered by public or private sector purchasers in the given timeframe. 2) For our demand forecasts, we have divided the private sector into formal and informal channels, with the formal private sector including private not-for-profit and for-profit hospitals and clinics, and pharmacies, and the informal private sector including private drug shops, vendors and general retailers that sell medicines. For our QAACT procurement forecasts, we've divided the private sector market by those settings where the Global Fund co-payment mechanism allows for marketing of subsidized ACTs in the private sector, and those settings where co-paid ACTs are not formally part of the private sector market landscape (the premium private sector). By differentiating these concepts in our terminology we hope to clarify how evolving market dynamics are impacting different decisions around malaria case management.

KEY FINDINGS

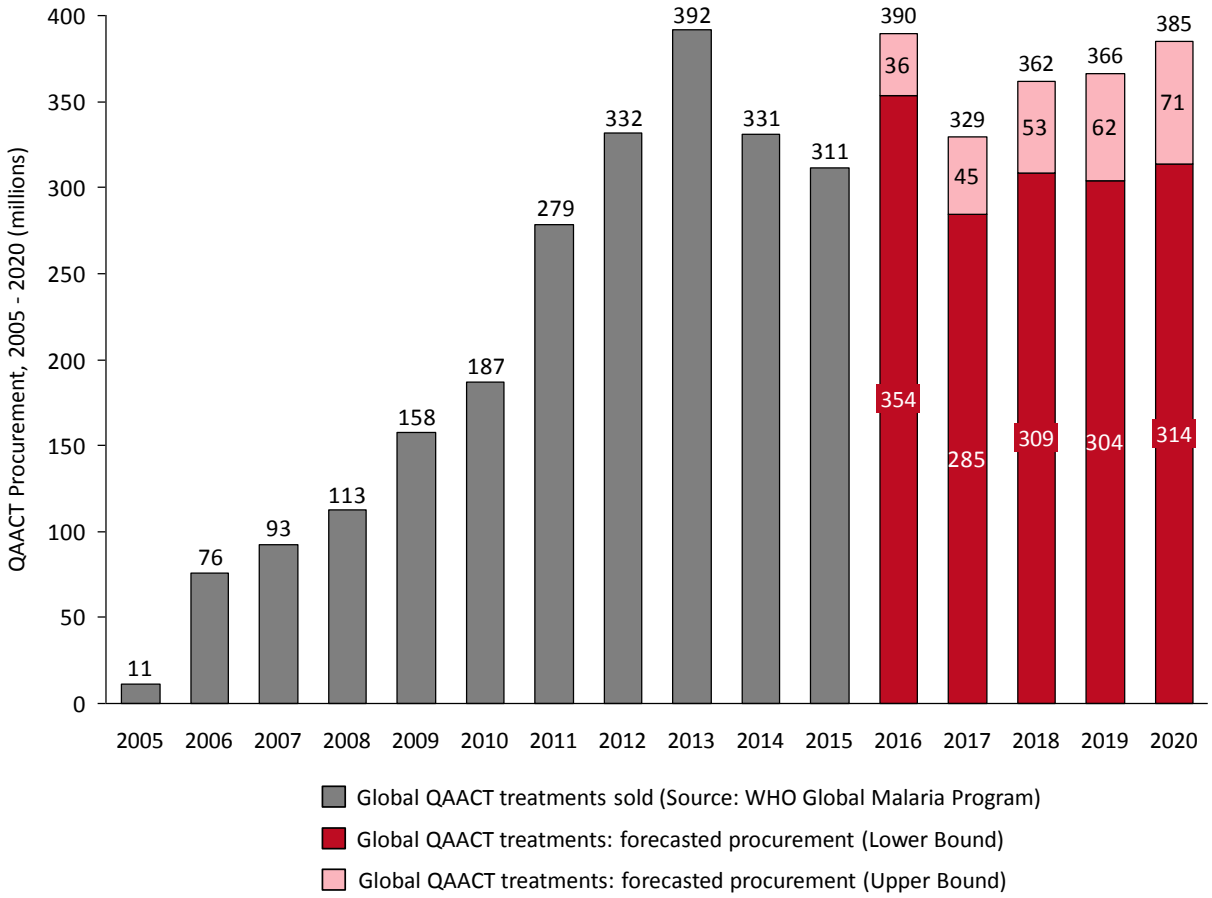
This report forecasts need, demand, and procurement of artemisinin-based malaria treatments and demand and procurement of malaria RDTs. Throughout the report, we define need as the number of treatments that are required to treat all febrile individuals who have a *Plasmodium falciparum* malaria infection at a parasite density that is detectable by diagnostic methods currently used in most settings (microscopy and RDTs), regardless of whether the febrile individual seeks treatment. We define demand as the number of treatments or point-of-care diagnostics that are required to meet consumer demand

for malaria diagnosis and treatment of suspected *P. falciparum* malaria. Furthermore, we define procurement as the number of quality-assured diagnostics or *P. falciparum* malaria treatments that will be procured from manufacturers by public or private sector purchasers. Our procurement forecast is based on current procurement commitments by Global Fund grantees (principal recipients) and PMI, and projections of future funding for and spending on each commodity, both of which are affected by the availability of funding and changes in national strategic plans. For our demand and need forecasts, owing to a lack of timely source data across all settings, some assumptions are based on data from a limited set of countries, but applied to a much larger set of countries.

Procurement

Although 2017 will see the lowest global procurement volumes for quality-assured ACTs (QAACTs) since 2011, the global market for QAACTs is projected to rebound from 285 million (M) treatments procured in 2017, to 314M treatments in 2020. This growth assumes that the countries currently participating in the private sector Co-Payment Mechanism (CPM) (Ghana, Kenya, Madagascar, Nigeria, Tanzania, and Uganda) will continue to do so during the forecast period. The growth will be driven by a projected increase in PMI funding in 2018, and expanded use of QAACTs in the premium private sector.

QAACT market: Historical and forecast growth, 2005 – 2020 (millions)

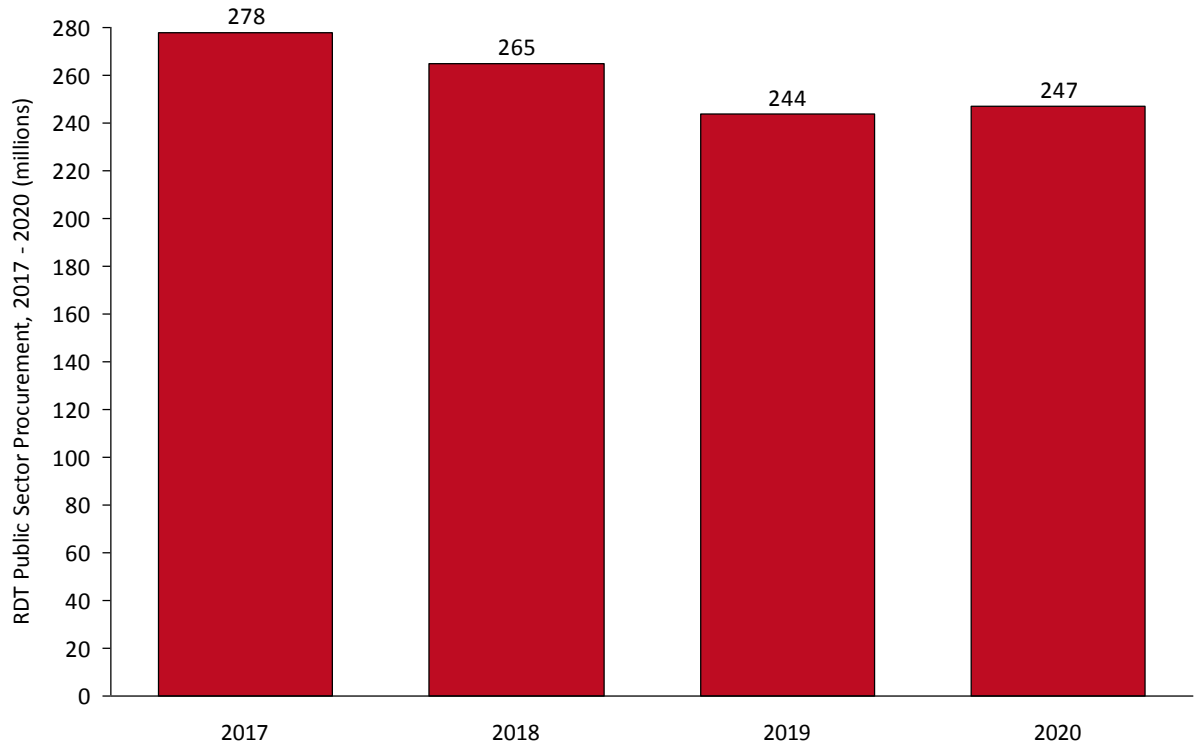


The share of orders among QAACT drug combinations is unlikely to change significantly during the next four years. There are currently five WHO-pre-qualified (WHO-PQ) suppliers for artesunate-amodiaquine fixed dose combinations (ASAQ), three WHO-PQ suppliers for artesunate-amodiaquine co-blisters (AS+AQ) seven WHO-PQ suppliers for artemether-lumefantrine (AL), two WHO-PQ suppliers for dispersible AL, and one WHO-PQ supplier for each of dihydroartemisinin-piperaquine (DHA-PPQ), artesunate-pyronaridine (ASPY), artesunate-sulfadoxine-pyrimethamine (AS+SP), and artesunate-mefloquine (ASMQ). AL will continue to dominate the market for QAACTs through 2020.

In the non-subsidized private sector (the premium private market), QAACT procurement is projected to increase over the next few years from 47M treatments in 2017 to 72M treatments in 2020.

Public sector procurement for quality-assured injectable artesunate will remain flat at 27M 60mg vials in 2017 and 28M in 2018, before declining slightly to 26M and 25M 60mg vials in 2019 and 2020, respectively. The decrease in projected quality-assured injectable artesunate procurement between 2018 and 2019 is driven by a slight decrease in projected funding of QAINJAS as severe malaria burden decreases.

RDT procurement, Public Sector, 2017 - 2020 (millions)



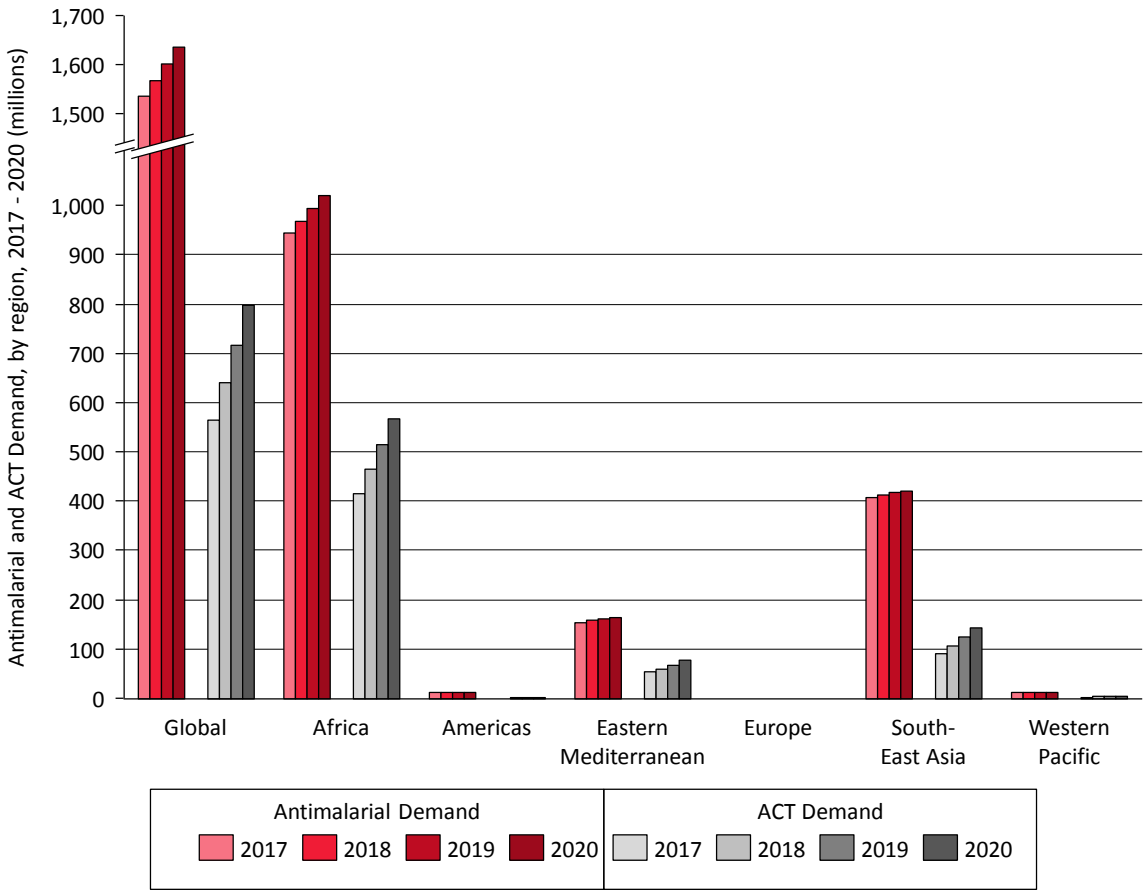
Procurement of RDTs has grown sharply in recent years, and our forecast projects this trend to soften, due to a decrease in projected funding available through the Global Fund for malaria, with the percentage of funding earmarked for RDT procurement remaining stable for each country. We estimate

global public sector procurement of RDTs at 278M tests in 2017, declining to 265M in 2018. Modelled estimates of RDT procurement in the public sectorare projected to further decline in 2019 (244M) before rising slightly in 2020 (247M).

Demand

The global demand for antimalarial medicines is estimated to be over 1.5B antimalarial treatment courses in 2017, and is forecast to grow to over 1.6B treatments by 2020. ACTs (QAACTs and non-QAACTs) currently comprise roughly 37% of this demand in 2017, with their share expanding to 49% of antimalarial demand by 2020.

Antimalarial and ACT Demand, by region, 2017 - 2020 (millions)



Consumer demand for QAACTs, meaning the number of treatments consumers would seek to obtain and use if they were available, is projected to rise over the timeframe, reflecting population growth in endemic areas and a shift away from other non-ACT antimalarials. Consumer demand for QAACTs in 2017 is projected to be 420M treatments, rising (assuming continued product availability) to 572M treatments in 2020. The majority of this demand (>75%) will be generated through the public channel.

Over the next four years, private sector demand for ACTs (QAACTs and non-QAACTs) will grow faster than public sector ACT demand. In most countries, diagnosis coverage in the private sector is sparse, and thus, greater efforts are needed to address the growing need for appropriate malaria case management in the private sector.

Demand for non-QAACTs is estimated at 146M treatments in 2017, rising to 226M treatments in 2020. Most of this demand will be in the private channel, split relatively evenly between the formal and informal private sector channels.

Among QAACT product combinations, AL will continue to have the highest market share, with consumer demand rising from 323M treatments in 2017 to 438M treatments in 2020. ASAQ is projected to remain in second place, with demand growing from 90M treatments in 2017 to 122M in 2020. Demand for artesunate-sulfadoxine pyrimethamine (AS+SP) is expected to increase from 6M treatments in 2017 to 9M treatments in 2020, following the general trend in ACT demand growth.

Demand for RDTs is expected to grow over this timeframe as well, from 699M tests in 2017 to 836M in 2020. Although the private formal and informal sectors combined account for over a quarter of global demand, most of this demand will be in the public sector, and most of the growth in RDT demand will come from countries in sub-Saharan Africa.

Demand for oral artemisinin monotherapies continues to decline; we forecast demand for oral artemisinin monotherapies will drop from 518,000 treatments in 2017 to 240,000 treatments in 2020.

Artemisinin demand is expected to slightly grow from 176 metric tons (MT) in 2017 to 196MT in 2018, 205MT in 2019, and to 221MT in 2020. The growth in artemisinin demand is driven by a forecasted increase in QAACTs procured with the projected increased funds available from PMI for QAACT procurement in 2018, and a continued increase of ACTs (both QAACTs and non QAACTs) in the non-subsidized private sector. ACTs comprise the majority of global artemisinin API demand (97%), with QAACTs accounting for a large share (53-61%) of API demand.

Need

Our projections suggest that there were 15.3 billion (B) fevers in 2017 among-at-risk populations, and that 948M fevers occurred in people who were parasitemic. Not all of these fevers, however, were necessarily caused by malaria; some parasitemic individuals may have developed partial immunity to

malaria parasites, and their fevers may simply be attributable to another infection. Alternatively, in cases of untreated malaria infection, a single infection may have caused more than one incident fever, and thus these estimates may include infections that are, unfortunately, counted more than once.

We estimate that approximately 665M of the 948M total "need" is among African populations, due to the much higher level of parasitemia on that continent.

The estimate of this "need" is expected to rise between 2017 and 2020, largely with population growth. Fevers in parasitemic populations are projected to increase from 948M to 1B cases over this timeframe. Significant reductions in this measure of "need" will require additional large and sustained reductions in malaria prevalence in areas of risk and/or elimination of malaria from large areas (i.e., shrinking the malaria map) – both of which are longer-term objectives.

Implications

The markets for malaria diagnostics and treatment commodities are likely to remain very large and important over the near term. International funding for QAACT procurement remains robust but is expected to plateau, and, depending on how programs respond to the Global Fund's call for malaria funding requests (especially with regard to funding to support continuation of the private sector co-payment mechanism), we could even see a decline in overall spending for QAACT procurement. The decline in public sector RDT procurement and use suggests that although effective treatments are currently allocated in a more rational manner than historical patterns of presumptive treatment for malaria have allowed, gaps in funding or programmatic support are likely to have an undesirable impact on the use of RDTs; given malaria prevalence in most endemic regions, the volume of tests should outpace the volume of treatments. The sharp decline in demand for oral artemisinin monotherapy treatments suggests progress in one of the malaria community's key strategies to forestall the development and spread of artemisinin-resistant malaria parasites. Continued efforts to sustain support for effective case management commodities promise not only to reduce the burden of disease in the near term but to enable continued progress toward elimination of this disease.

METHODS AND DATA UPDATES SINCE THE PREVIOUS REPORT

Since the publication of the previous report, some significant updates have been made to the source data and the forecasting methods. Chief among the data and methodological updates have been:

RDT Demand: RDT shares were calculated at the country level, based on market specific data from the latest World Malaria Report (WMR). The recent WMR showed that the trend in suspected malaria cases receiving a diagnostic test (in Africa) has grown significantly since 2011, with a ~17% annual increase. We assume that the testing growth is predominantly driven by RDTs, and have therefore applied this growth rate to the RDT share in all countries in the African region (with a cap at 100%). We applied the regional uptake curves to all other countries; based on historical growth, these trends were assumed to be flat.

ACT / QA usage: We have adjusted assumptions around QAACT treatment demand by ACT type in the Indian public sector, with the uptake of AL (replacing AS+SP) in that market.

Injectable/Rectal artemisinin monotherapies: We adjusted assumptions around national trends in the private sector demand for these products. Growth of the private sector injectable/rectal artemisinin monotherapies was decoupled from the oral artemisinin market growth, and based on historical trends in the IMS data. We applied regional historical trends to all countries in a particular region.

We updated source data to incorporate PMI's 2016 procurement data into our analysis and application of historical procurement trends, and updated Global Fund grant disbursement data to ensure that our projections of available funding for commodity procurement through the end of the current funding cycle were accurate. New Global Fund funding envelopes have not yet been incorporated into the models as (1) we expect that national programs will prioritize procurement of life-saving commodities, leading to potentially minor changes in procurement volumes, and (2) we will update these data in future iterations of this report as funding requests are submitted and reviewed.

1. INTRODUCTION

Since their launch and adoption as the WHO-recommended treatment for uncomplicated malaria over a decade ago, the global market for quality-assured artemisinin-based combination therapies (QAACTs) has expanded dramatically. Artemisinin, the key component of artemisinin-based combination therapies (ACTs), can be readily extracted from the leaves of the sweet wormwood plant (*Artemisia annua*), and cultivated *A. annua* remains the major source of artemisinin for these life-saving antimalarial medicines. The market's reliance on a vegetal artemisinin source, with all that that confers (e.g., long production cycles dictated by growing seasons, varying crop yields, competition for cultivation acreage from other in-demand cash crops, small volume growers, an inflexible supply chain that cannot easily adjust to changes in market demand), has at times resulted in supply constraints, and at other times, an abundance of supply. These supply swings, resulting from uncertain or unforeseen demand, have led to dramatic oscillations in artemisinin prices. In 2010, the Affordable Medicines Facility for malaria (AMFm), a private-sector subsidy mechanism was launched with the goal to increase access to appropriate, low priced antimalarial medicines in the retail/private sector. The introduction of this QAACT scale-up mechanism increased the uncertainty around QAACT demand and whether artemisinin supply would be sufficient to meet it.

Given past uncertainties in the artemisinin market, ongoing and future shifts in the funding landscape for malaria diagnostics and treatments, changes in disease epidemiology, and the impact of key interventions and tools, demand forecasting for QAACTs and rapid diagnostic tests (RDTs) continues to be important for many stakeholders invested in malaria diagnostic and treatment access. After a sustained period of growth, QAACT demand has reached a volume that has stabilized artemisinin prices. However, the relatively-low current prices of artemisinin may drive farmers toward planting alternative cash crops, leading to a potential decline in the planted *A. annua* acreage, and another period of artemisinin price fluctuations. Meanwhile, several large-volume countries plan to continue subsidizing QAACTs through the Private Sector Co-Payment mechanism (CPM) until 2017, but the picture of support for private-sector QAACT co-payment subsidies beyond 2017 remains unclear. At the same time, countries are scaling up confirmatory diagnostic testing in the public sector, particularly with RDTs,

meaning that many public sector entities are facing the challenge of funding large RDT procurement volumes while also continuing to pay for the high costs of treatment. Improved market intelligence can help countries and donors develop new strategies to prevent supply shortages and stabilize prices. Such market intelligence would have broad utility for stakeholders throughout the supply chain, including the *A. annua* farmers, semi-synthetic artemisinin producers, the artemisinin extractors, the manufacturers of RDTs, artemisinin based active pharmaceutical ingredients (APIs), and finished products containing these APIs, the National Malaria Control Programs (NMCPs) and donors

This project is the second phase of the Unitaid ACT forecasting project, expanding the scope of the previous work to forecast the ACT and artemisinin monotherapy for uncomplicated and severe malaria need, demand, and procurement, as well as RDT demand, and procurement, and artemisinin API demand. We have defined these outputs as follows:

Definition of Outputs

ACT Need – The number of treatments that are required to treat all febrile individuals who have a *Plasmodium falciparum* malaria infection at a parasite density that is detectable by diagnostic methods currently used in most settings (microscopy and RDTs), regardless of whether the febrile individual seeks treatment.

ACT Demand – The number of treatments that are required to meet consumer demand for treatment of suspected *P. falciparum* malaria with an ACT.

QAACT Procurement – The number of quality-assured artemisinin combination therapy treatments that will be procured from manufacturers by public or private sector purchasers.

Artemisinin Monotherapy Demand – The number of artemisinin monotherapy treatments (including Injectable and rectal artesunate) that are required to meet consumer demand for treatment of

suspected *P. falciparum* malaria, or severe malaria.

Injectable Artesunate Procurement – The number of injectable artesunate treatments that will be procured from manufacturers by public sector purchasers.

RDT Demand – The number of RDTs that are required to meet the consumer demand for rapid test diagnosis of suspected malaria (e.g., a proxy: the number of patients who sought treatment and received an antimalarial treatment could be equated to the catchment population for rapid diagnostic testing).

RDT procurement – The number of RDTs that will be procured by public or private sector purchasers.

Artemisinin Demand – Metric tons of artemisinin required to meet public sector procurement volumes and private sector demand for all artemisinin-based antimalarial medicines.

Demand has been projected across three access channels: public sector, formal private sector, and informal private sector, where the formal private sector includes private not-for-profit and for-profit hospitals, clinics, and pharmacies, and the informal private sector includes private drug shops, vendors and general retailers that sell medicines. QAACT procurement has been projected across three market categories as well: public sector, subsidized private sector market, and the non-subsidized (premium) private sector market.

These forecast reports will generally cover a four to five year forecast period, with this report forecasting the outputs listed above, at a global level, covering 2017 – 2020. For a detailed description of the methods used to generate the forecasts presented in this report, please refer to the separately published report, where these methods are outlined in detail: https://www.unitaid.eu/project/global-malaria-diagnostic-artemisinin-treatment-commodities-demand-forecast/.

2. FORECAST OUTPUTS 2017 – 2020

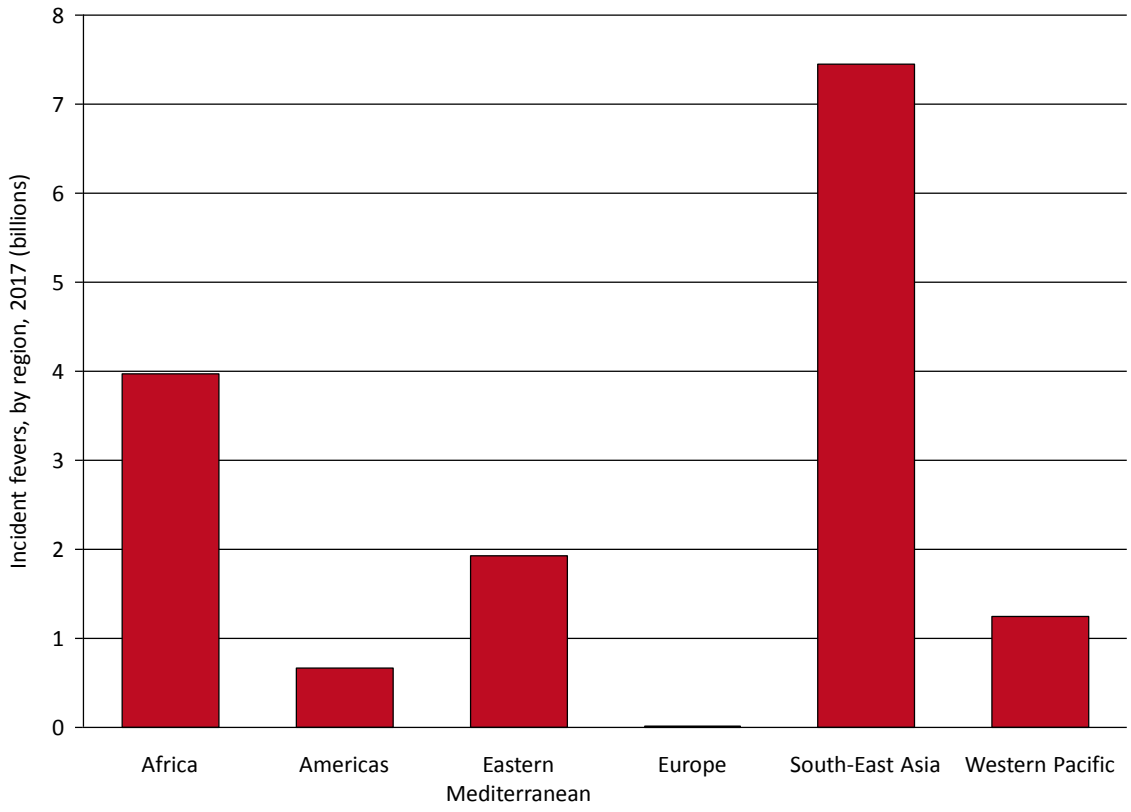
ACT Need

Using a decision-tree algorithm, based on febrile incidence extracted from national population-representative household surveys (see separately published methods for further details), we have estimated the number of malaria infections among febrile patients across the malaria-endemic world. Our method aims to project the number of febrile individuals who have a malaria infection at a parasite level detectable by diagnostic methods currently used in most settings (microscopy and RDTs), regardless of their treatment-seeking status or whether they fit the case definition. In some settings, without the insight that diagnostic testing can provide, many of these individuals would not necessarily be identified as incident malaria cases as their febrile illness might be primarily caused by concomitant infection (e.g., typhoid).

To provide further context for the analysis of our ACT need outputs, it is first worth viewing our global estimates for annual incident febrile illness. It is important to note that our estimates, derived from the same decision-tree algorithm described in the methods, are not a tabulation of the number of individuals who experience a febrile episode per year, but rather, an estimate of the number of fevers that occur per year within malaria-at-risk populations, and thus these figures are typically much larger than the size of the general population in a given country. Unlike methods used in some of the previously published literature (1), we have not based our assumptions on a basic framework with which we tabulate the number of fevers by age group in a given malaria-transmission setting. Instead, we have produced estimates based on extrapolation of data from household surveys reporting fevers across all age cohorts, by fitting the data to account for potential seasonality of febrile illness during survey data collection periods conducted at different times across numerous years.

Our model estimates that in 2017, there were around 15.3 billion (B) incident fevers among the malaria-at-risk populations within the 89 countries included in our model (Figure 1).

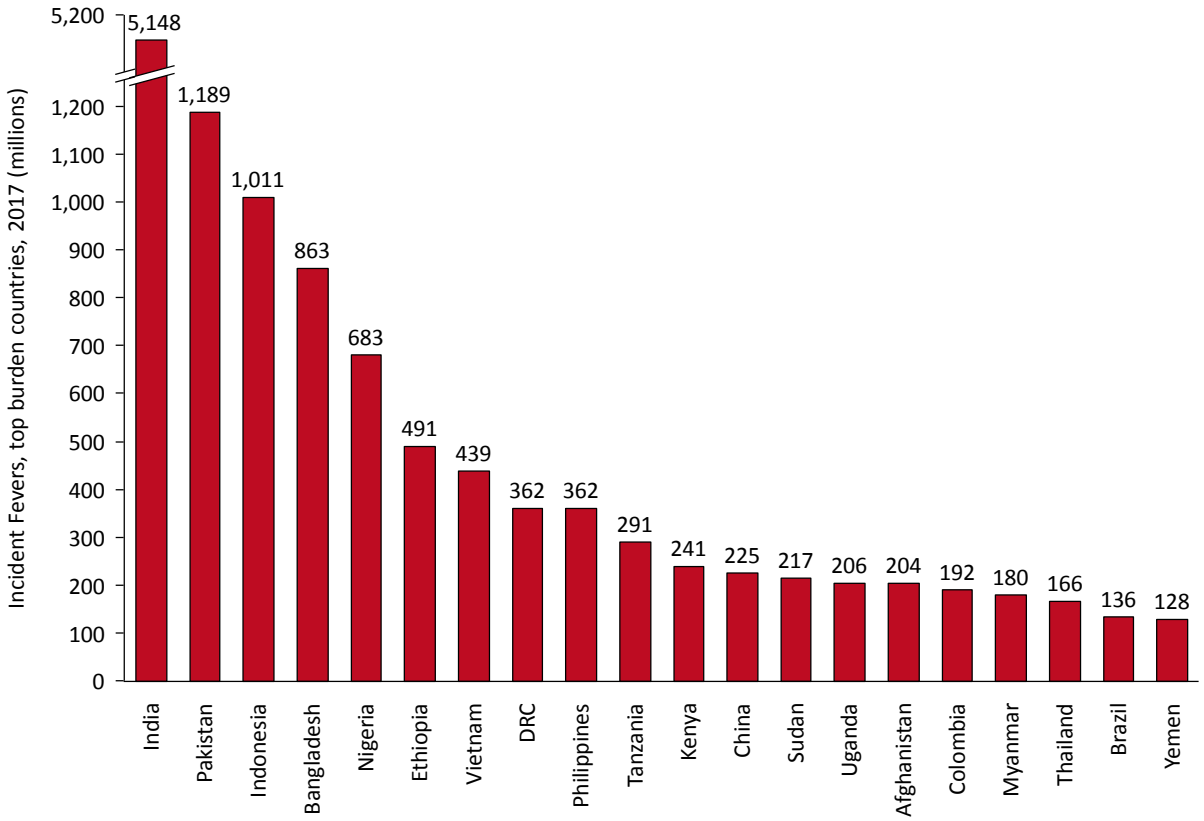
Figure 1 Incident fevers among malaria-at-risk populations, by region, 2017 (billions)



Adopting population-weighted 2010 global *P. falciparum* prevalence estimates obtained from the Malaria Atlas Project (MAP; we used population-weighted 2015 *P. falciparum* prevalence estimates from MAP for all countries in sub-Saharan Africa), we estimate that nearly half of all incident fevers in *P. falciparum* malaria at-risk populations occur in South-East Asia, a region comprising 8 countries – Bangladesh, Bhutan, India, Indonesia, Myanmar, Nepal, Thailand, and Timor-Leste – with a weighted average fever-adjusted malaria prevalence of 3% (using the WHO's regional classification scheme, see Table 1, Appendix; Cambodia, Viet Nam, Lao PDR, and Malaysia are included in the "Western Pacific" region). Africa represents the second largest regional burden for incident fevers, with nearly 4.0B fevers estimated in 2017, but also represents the highest average burden for fever-adjusted malaria prevalence: nearly 17%. All other regions comprise fewer annual incident fevers than South-East Asia and Africa, with fever-adjusted prevalence of approximately 2% or less.

At the national level, our estimates for the burden of incident febrile illness track closely with rankings by overall population census among countries with *P. falciparum* malaria at-risk populations (Figure 2).

Figure 2 Incident fevers among *P. falciparum* malaria at-risk populations, top burden countries, 2017 (millions)

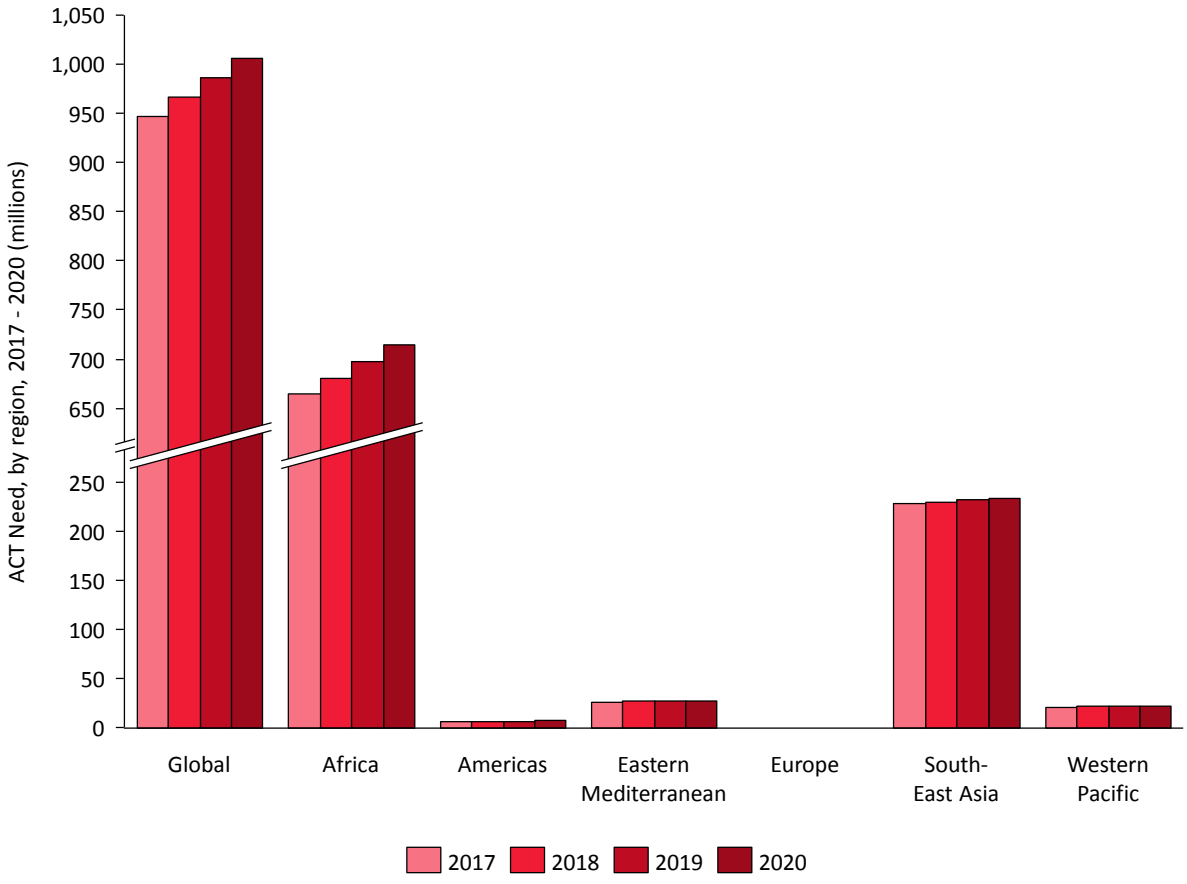


Note: China includes only Hainan and Yunnan provinces

Applying adjusted malaria prevalence to the 2017 fever estimates results in an estimate of 948 million (M) incident fevers with microscopy/RDT-detectable malaria infection. If, in 2017, all such febrile cases were to be treated with an ACT (assuming all such events could be identified and treated appropriately), then a total of 948M ACTs would be required to meet this need (Figure 3). Our current model does not account for the de-novo combined impact of multiple malaria control interventions on prevalence as the data to support such a model is currently unavailable. The model does iterate the effect of increased

ACT usage on malaria prevalence (and thus incident fevers), but this effect results in only a slight decline in malaria prevalence throughout the African, American, and South-East Asian regions during the five-year forecast period. Thus, with the projected growth in populations-at-risk over this period, our estimates for incident fevers with concomitant microscopy/RDT-detectable malaria infection result in an increasing trend for ACT need. Future iterations of this forecast will incorporate de-novo trends in malaria prevalence as comprehensive data supporting such analysis becomes available.

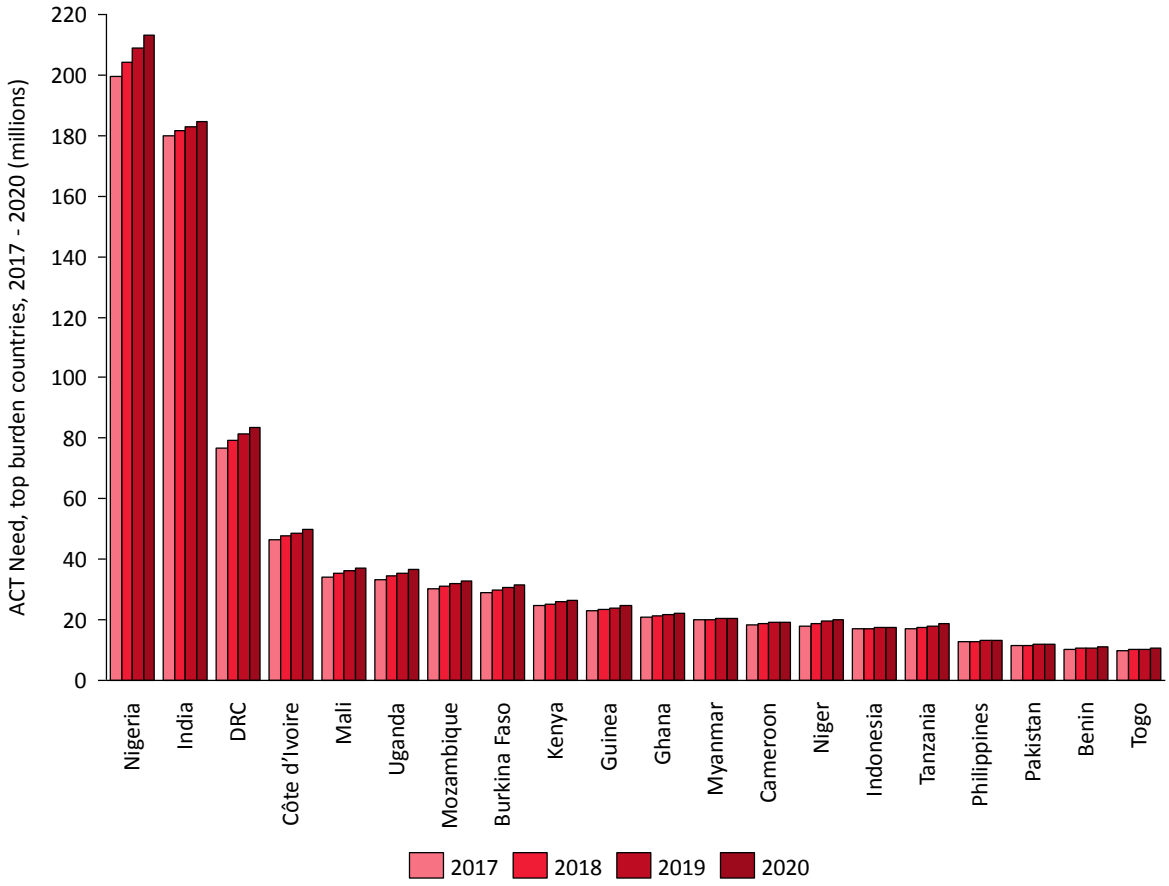
Figure 3 ACT need, by region, 2017 - 2020 (millions)



Although we estimate that South-East Asia has nearly twice as many annual incident fevers than Africa, Africa's malaria burden (and thus ACT need) is significantly higher than that in South-East Asia, owing to the African region's fever-adjusted prevalence being nearly more than fivefold than that in the South-East Asian region.

At the national level, we estimate that Nigeria has the largest overall number of incident fevers that have concomitant microscopy/RDT-detectable malaria infection (and thus, the largest national ACT need) (Figure 4). While malaria prevalence in India is relatively low and is mixed between *P. falciparum* and *P. vivax* infections (n.b. – all of the data sources and analyses in this report are focused on *P. falciparum* malaria), sheer volume of febrile illnesses and non-trivial falciparum-malaria prevalence leads to substantial figures for ACT need in this nation. The other high burden ACT need nations follow suit on the interaction between the annual volume of incident febrile illnesses and malaria prevalence.

Figure 4 ACT need, top burden countries, 2017 - 2020 (millions)



Discussion: ACT need

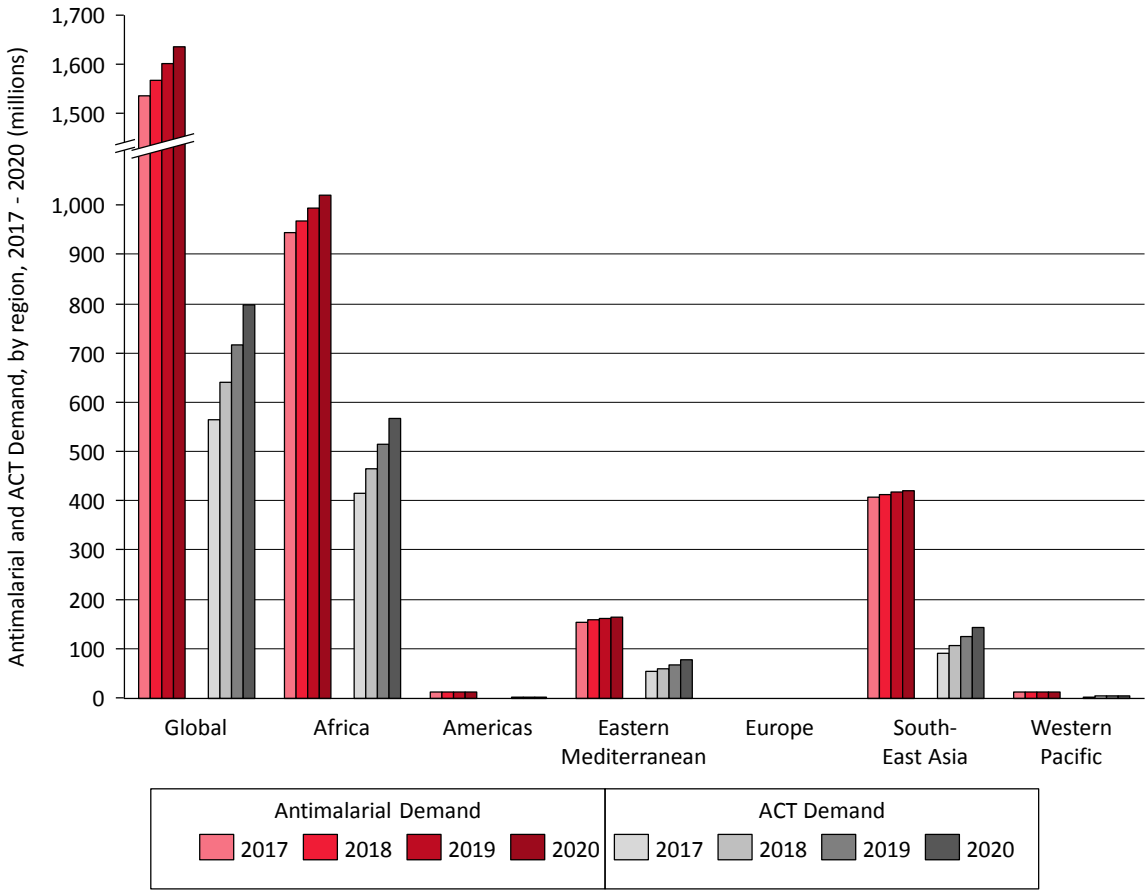
We defined ACT need as the number of antimalarial medicines required to treat all febrile illness concurrent with a detectable (by microscopy or RDT) *P. falciparum* malaria infection, regardless of whether (a) the individual with the febrile illness sought treatment for that illness, (b) whether a febrile individual, having sought treatment, received any sort of diagnostic test to determine the cause of that illness, and (c) whether the tested individual actually received a course of antimalarial treatment (or, more specifically, an ACT). It is important to note that these ACT need estimates are based on extrapolation from limited historical fever and prevalence data and are not an estimate for likely reported cases. In some settings, our methods, using overall population at risk, febrile incidence and finally falciparum malaria prevalence, may result in an estimate for ACT need that far exceeds estimates of cases, owing to a number of potential factors including but perhaps not limited to: changing dynamics in malaria prevalence, or imprecision in extrapolating malaria prevalence among febrile illness from total population malaria prevalence, or inherent imprecision in our incident fever estimates, or multiple accounting of malaria-incident fevers that may have resulted from a single malaria infection. We would suggest that the ACT need figure of 948 in 2017 should be interpreted as a high ceiling to the overall need for antimalarial medicines, rather than as a guide to a necessary volume of ACTs that must be achieved by manufacturers and whose procurement must be funded by governments and donor agencies. The point of presenting this figure is to demonstrate that a fairly large reservoir for potential malaria treatment need exists, and that while annual QAACT production currently exceeds case estimates, it comprises approximately a third of the potential need for QAACTs if every febrile illness was tested and every malaria positive test were to be treated with an QAACT.

ACT Demand

The Forecasting Consortium's antimalarial/ACT need and demand model, based on extrapolation of data from national population-representative household surveys, produces estimates for a number of outputs, including annual incident fevers, the portion of those incident fevers that are likely to have a concomitant microscopy/RDT-detectable malaria infection, and the demand for diagnostic testing. The model uses household survey data on antimalarial treatment in febrile children and an extrapolation to similar treatment in adults to arrive at global demand estimates for antimalarial treatments (including

ACTs). Using the model's forecast for global antimalarial demand (1.5B in 2017, growing to 1.6B in 2020) and ACT (QAACTs and non-QAACTs) demand (566M in 2017, growing to 799M in 2020) as a baseline (Figure 5), the baseline forecast has been segmented to provide more detail into the dynamics of global artemisinin demand. In terms of the geographical distribution of ACT demand, Africa represents the largest source of ACT demand with 417M treatments in 2017, growing to 570M treatments in 2020, and accounting for approximately 71% to 74% of global demand for ACTs. Furthermore, twenty countries comprise over 80% of global ACT demand (Angola, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, DRC, Ethiopia, Ghana, India, Kenya, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sudan, Tanzania, Uganda, and Zambia).

Figure 5 ACT demand, by region, 2017 - 2020 (millions)

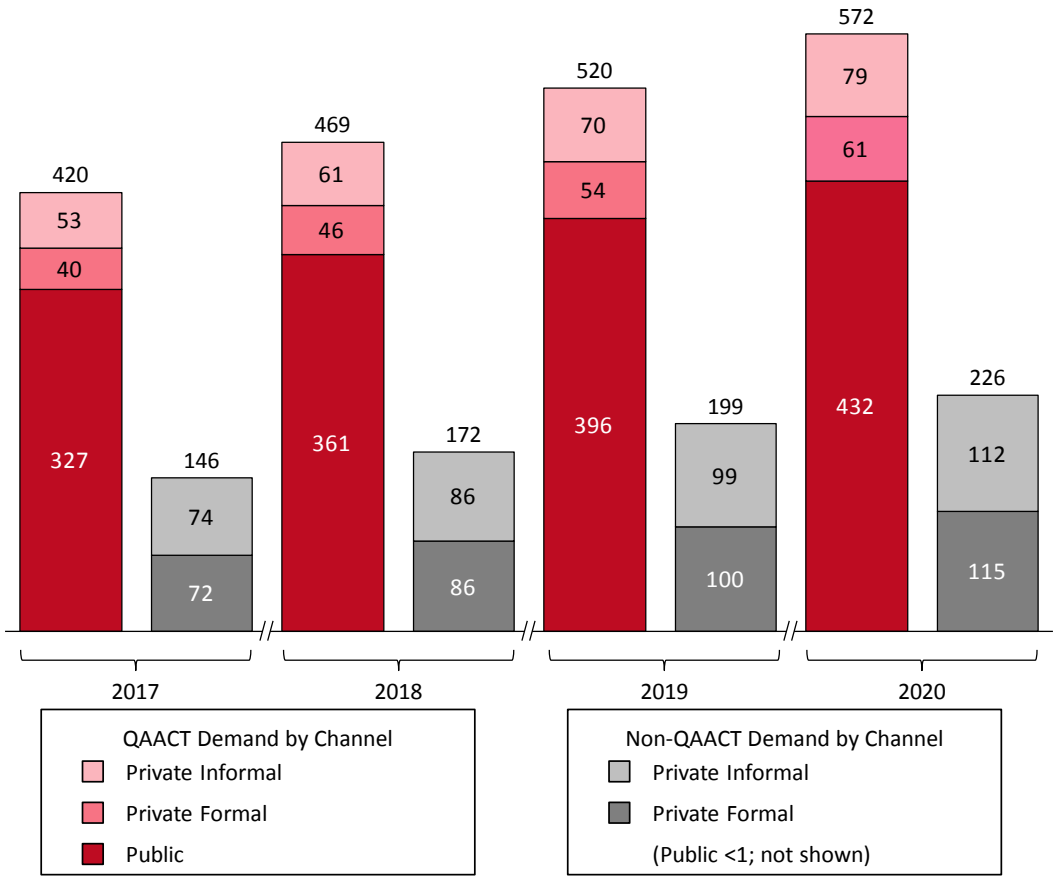


The public sector remains the main source of global ACT demand, accounting for 58% of total ACT demand in 2017 (Figure 6). However, we expect that over the next four years, private sector ACT

demand will grow faster than public sector demand, which will reduce the public sector's share of global ACT demand to 54% in 2020. Segmenting the two private channels, the informal private channel contributed the larger share of global ACT demand in 2017 (22%) while the formal private channel accounted for 20% of global ACT demand in 2017.

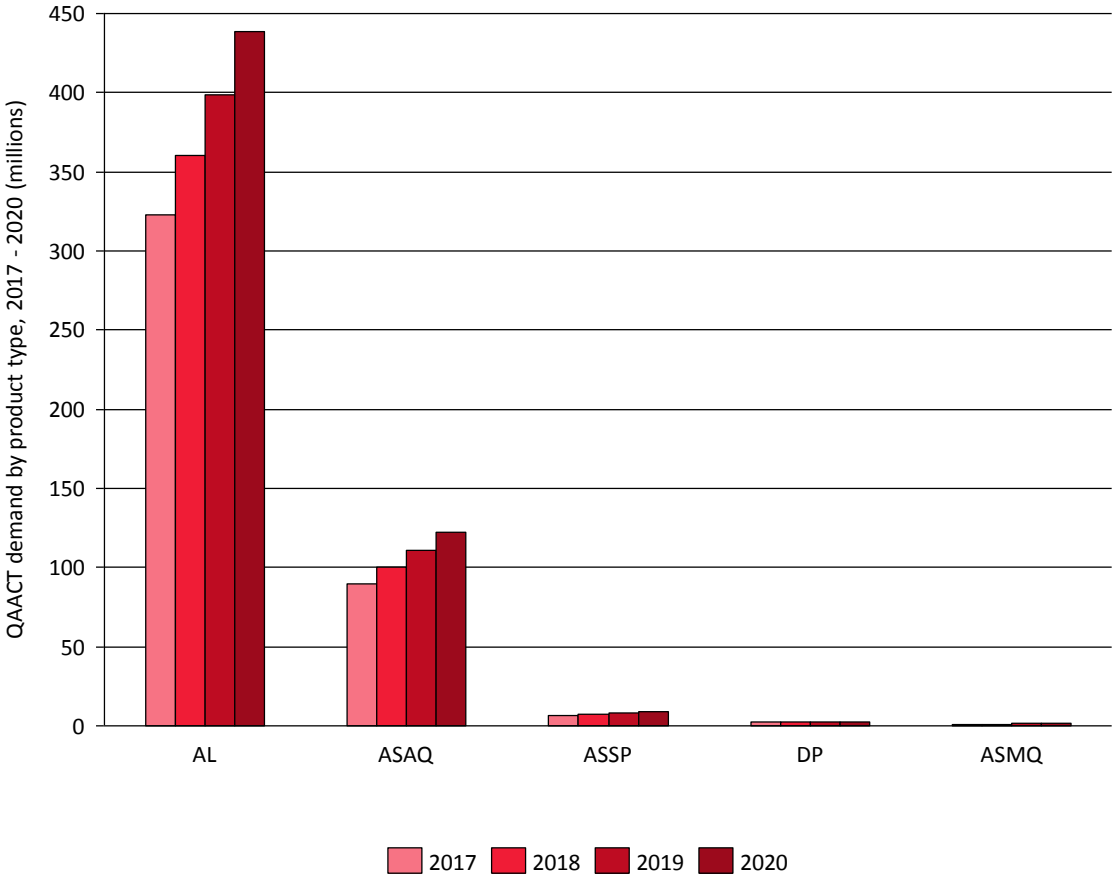
By applying estimates of QAACT use in the private sector, based on available IMShealth data and ACTwatch country-level data, we have further segmented ACT demand estimates into QAACT and non-QAACT demand across each of these three channels (Figure 6). While in some settings (e.g., Viet Nam) the public sector ACTs are non-QAACTs (volumes are relatively small), the majority of demand in the public sector is assumed to be for QAACTs. We used IMS sales data and ACTwatch data (from 2013/2014) to segment demand in the formal private and informal private channels by quality-assured drug classification. Based on these data, we project that in 2017, non-QAACTs make up approximately 30% of total private sector ACT demand in ex-AMFm countries (Ghana, Kenya, Madagascar, Niger, Nigeria, Tanzania and Zanzibar, Uganda) and 76% of total private sector ACT demand in non-AMFm countries.

Figure 6 ACT global demand, by quality-assured drug classification and distribution channel, 2017 - 2020 (millions)



Further segmenting our global QAACT demand forecast by specific product types (Figure 7), AL will continue to comprise the majority of QAACT demand across all sectors, with demand forecast to grow to 438M treatments in 2020, while demand for quality-assured ASAQ will expand from 90M treatments in 2017 to 122M in 2020. We forecast quality-assured AS+SP demand to grow from 6M in 2017 to 9M treatments in 2020, following general growth trends in QAACT demand in countries where AS+SP is included in treatment guidelines.

Figure 7 QAACT global demand, by product type, 2017 - 2020 (millions)



Discussion: ACT demand

Using IMS's extensive private sector sales data, our analysis presents the first comprehensive, data-driven estimates around the portion of global ACT demand that is fulfilled by non-QAACTs. While the data supporting this analysis has limitations, the combination of IMS and ACTwatch data has allowed us to apply some basic assumptions around the use of QAACTs vs. non-QAACTs in the private and public sector, as well as the market share trends for various oral, parenteral, and rectal artemisinin monotherapies. We estimate that non-QAACTs comprise 26% to 28% of global ACT demand.

Although population growth may be the main driver of the growth for our current model's ACT demand output, another significant driver is the use of ACTs by febrile patients who have no microscopy/RDT-detectable malaria. ACT over-treatment contributes significantly to ACT demand volume in the absence of effective strategies to reduce ACT use among febrile patients who are not diagnosed or those that receive a negative diagnosis.

Our underlying model for antimalarial and ACT demand applies treatment data collected from household surveys to an algorithm, also based on household survey data, that projects incident fevers and subsequent treatment seeking behaviour and treatment algorithms. The model is not currently able to incorporate underlying changes in malaria prevalence, other than the gradual changes to malaria prevalence conferred by increasing ACT access and use in malaria-positive patients. Given the limitations of the model, the main driver to ACT demand is thus population growth, which is positive, and hence, the model outputs positive growth trends for ACT demand over time.

QAACT Procurement

The model that we use to estimate global QAACT procurement is based on the following data inputs:

- Estimates of the available financing from the Global Fund to fight AIDS, Tuberculosis, and Malaria (the Global Fund) or administered by the Global Fund, and USAID's President's Malaria Initiative (PMI) for public sector procurement of QAACTs, which account for ~98% of the donor-funded QAACT market;
- Public sector procurement plan data for select high volume countries that procure QAACTs through the use of funds from the Global Fund;
- Historical QAACT spending on Global Fund grants;
- Historical QAACT orders placed through Global Fund funding;
- Historical QAACT procurement through USAID's PMI;

- Weighted average of currently reported QAACT prices;

- For the private sector in countries taking part in the Global Fund's Private Sector Co-Payment Mechanism (CPM), which supports a subsidized, private sector market for QAACTs, estimates of CPM funding, procurement based on historical funding / procurement, and co-payment plans where known;

- For the premium private sector in countries not taking part in CPM (we have assumed that countries taking part in the CPM have majority of the private sector QAACT procurement through the CPM, and have not quantified the premium private sector in those countries), the QAACT portion of ACT demand in the private sector, based on the QAACT portion of ACT volumes calculated from private sector sales volumes tabulated by IMS, and applied to outputs from the ACT demand model (described above).

Our approach, detailed in the forecast methodology, uses Global Fund data on historical trends in grant disbursements to estimate the average pace and value of future malaria grant disbursements at the national level. We then use national procurement plans or historical orders' data from Global Fund's PQR database (in countries where we do not have planned procurement data) to extrapolate historical spending (or use planned spending) on ACTs as a percentage of total malaria programmatic funding, to arrive at annual estimates for funds available for QAACT procurement. Applying these estimates on QAACT funding and incorporating price assumptions and associated procurement costs (based on publicly available Global Fund data, historical PMI procurement and funding data, and data from NMCPs), we arrive at projections for QAACT volumes at a national level.

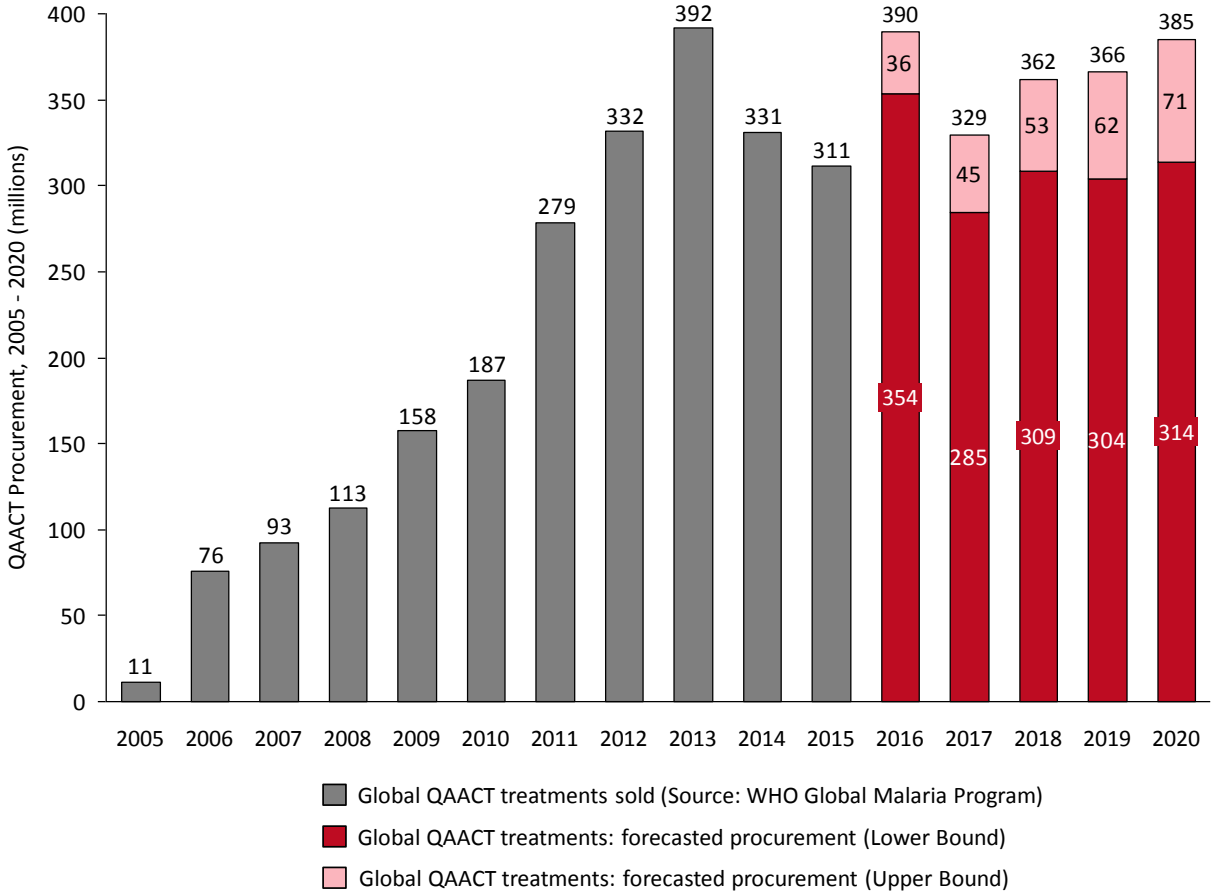
Historically, the US Government's President's Malaria Initiative (PMI) helped coordinate country-level efforts in the provision and rapid scale-up of QAACTs. Given programmatic flexibilities in the treatment commodity procurement space, PMI has also been successful in filling developing gaps in treatment coverage. We therefore apply trends in national QAACT procurement over the past few years to the forecast years to forecast procurement via PMI funds.

With regard to the Global Fund-mediated CPM mechanism, while financial commitments for the continuation of CPM QAACT procurement are unclear beyond 2017, we have assumed that in CPM-participating countries, subsidized private sector QAACT treatment volumes in 2018, 2019, and 2020 will be equivalent to 2017 estimations. On QAACT procurement volumes in the premium private sector,

there is very little available data; we have developed lower-bound and upper-bound assumptions to address this uncertainty and to frame our QAACT procurement forecast for the premium private market.

Our lower bound QAACT procurement forecast (which we also consider the base case) projects 285M QAACTs to be procured across all channels in 2017, with this figure growing to 309M in 2018, and remaining stable in 2019 and 2020 at 304M and 314M respectively (Figure 8). Our upper bound case forecasts 329M QAACTs to be procured in 2017, with this number increasing to 362M in 2018, remaining stable at 366M in 2019, and growing to 385M in 2020. The underlying driver for the difference in the lower and upper bound projections is a varying assumption on the QAACT procurement in the premium private sector (based on varying assumptions on the QAACT share of the total ACTs in the premium private sector).

Figure 8 QAACT market: Historical and forecast growth, 2005 – 2020 (millions)



In 2017, QAACT procurement is forecast to be the highest in the public sector followed by the private subsidized sector (CPM) and the premium private sector (Figure 9). Although the prices of QAACTs have come down substantially, they cost much more than other sub-optimal antimalarials, which explains the relatively low procurement volumes in the private non-subsidized sector (premium private sector). The increase in QAACT procurement from 2017 to 2018 is driven by an increase in public sector procurement following the additional PMI funding that will become available starting in 2018, and a projected increase, based on analysis of market trends in non-CPM private sector markets, in use of QAACTs in the premium private sector. The total QAACT procurement in 2019 will remain in line with 2018 with the decrease in public sector procurement being counteracted by the increase in the premium private sector QAACT procurement. The decrease in public sector QAACT procurement in 2019 (Figure 9) is

driven by a projected decrease in total malaria funding available in 2019 through the Global Fund, with the percentage of funding earmarked for QAACT procurement remaining stable for each country, leading to projected lower spend on QAACT procurement in 2019. There will be a slight increase in QAACT procurement in 2020 due to growth in the premium private sector QAACT procurement.

The African region will continue to constitute the majority of QAACT treatments procured in the public sector as all twenty countries comprising over 90% of global ACT demand are located in this region (Figure 10). AL and ASAQ will continue to dominate the product mix for procured QAACTs, accounting for over 99% of all QAACT procurement volume, with AL taking the lion's share of the QAACT market (76%) and ASAQ picking up almost all of the remainder (Figure 11). AS+SP, DHA-PPQ, and ASMQ will continue to be minor players in the QAACT procurement market (Figure 12); annual procurement volumes for QA-AS+SP will be approximately 1.58M treatments in 2017, and will expand to 1.61M by 2020. DHA-PPQ will decline during this period, from 163,000 treatments to some 90,600 per year, due to reductions in geographies where the quality assured drug is used, while ASMQ volumes will hold steady around 30,000 treatments per year.

Figure 9 QAACT procurement, by channel, 2017 - 2020 (millions)

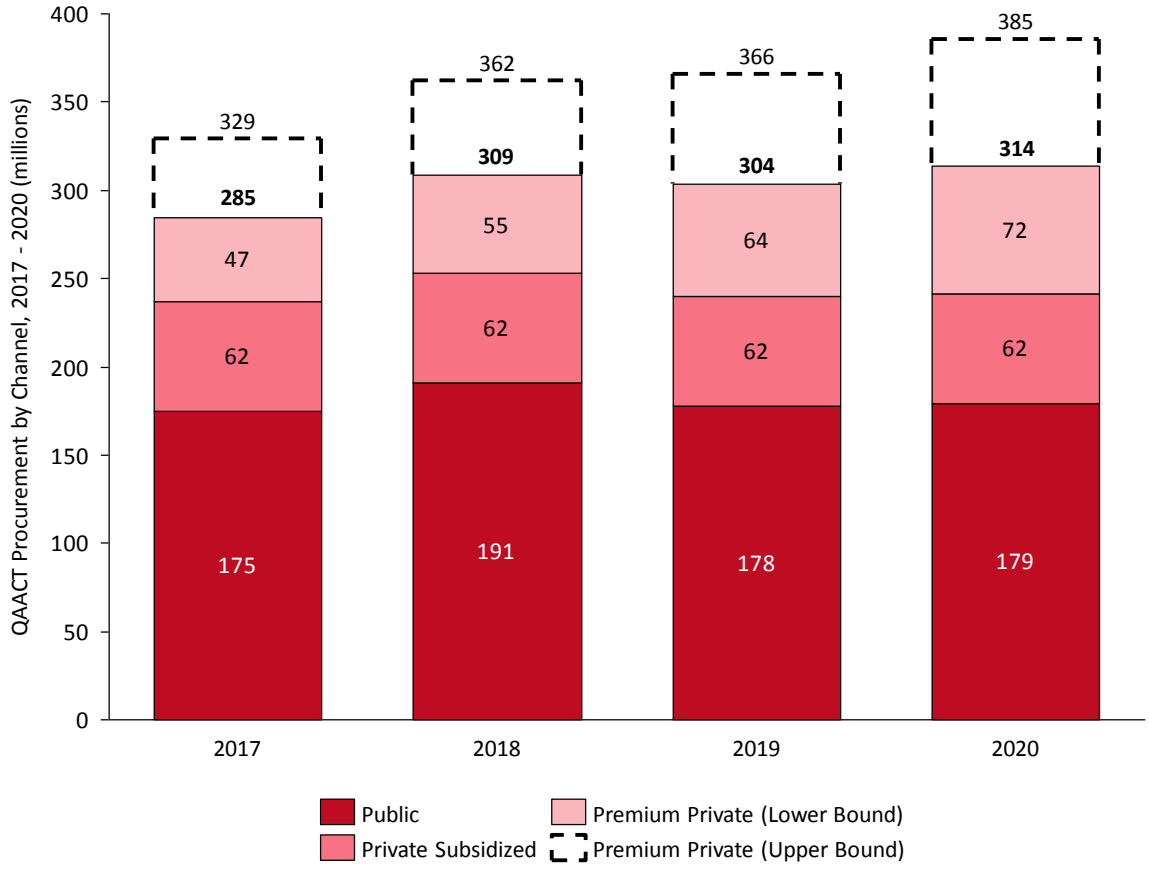


Figure 10 QAACT public sector procurement, by region (Africa and others), 2017 – 2020 (millions)

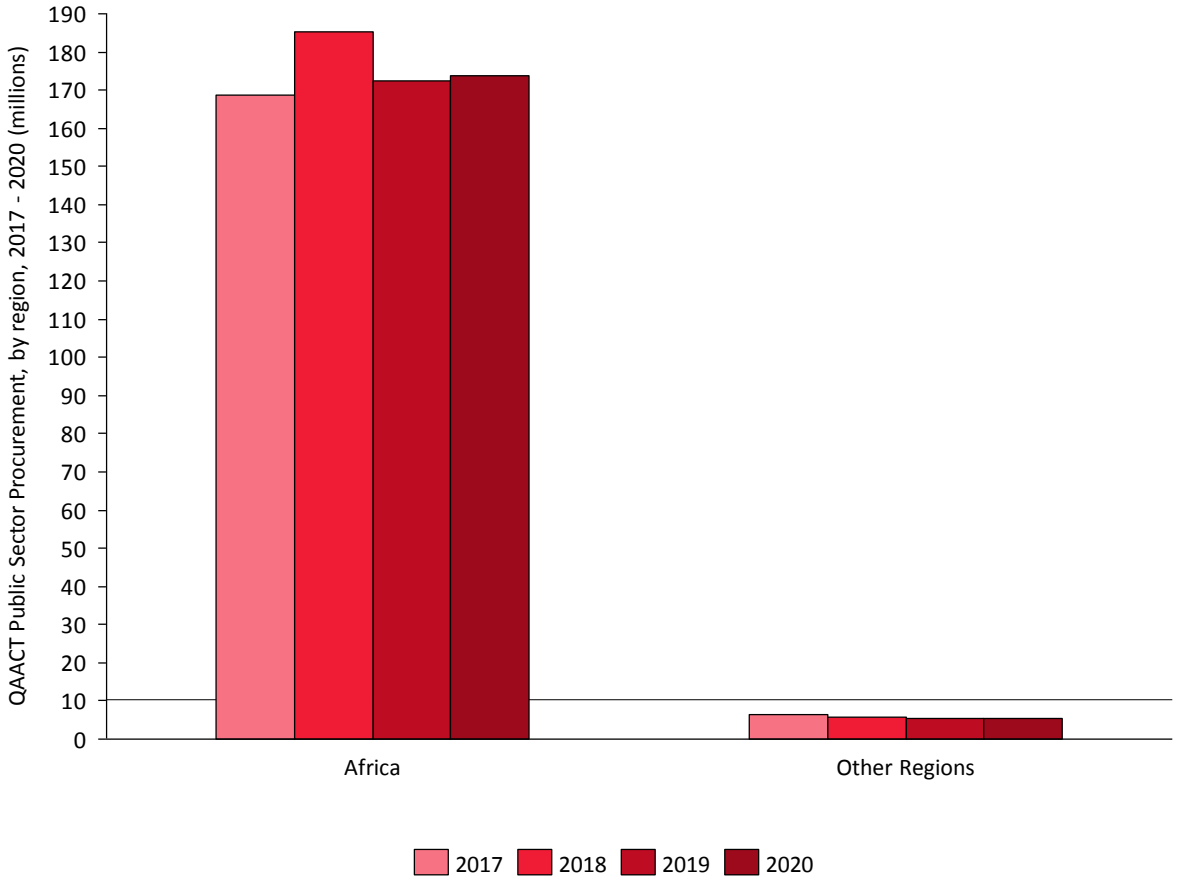


Figure 11 QAACT procurement, by product type, 2017 – 2020 (millions)

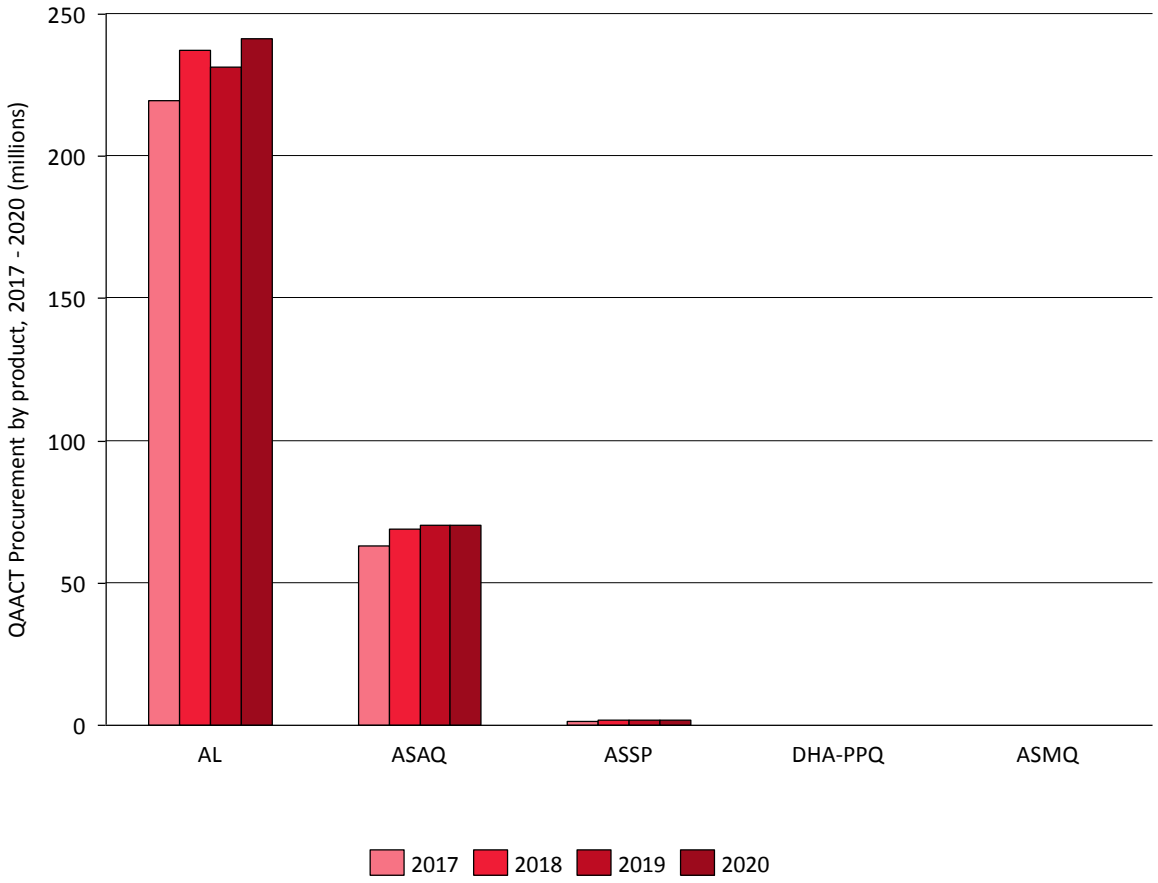
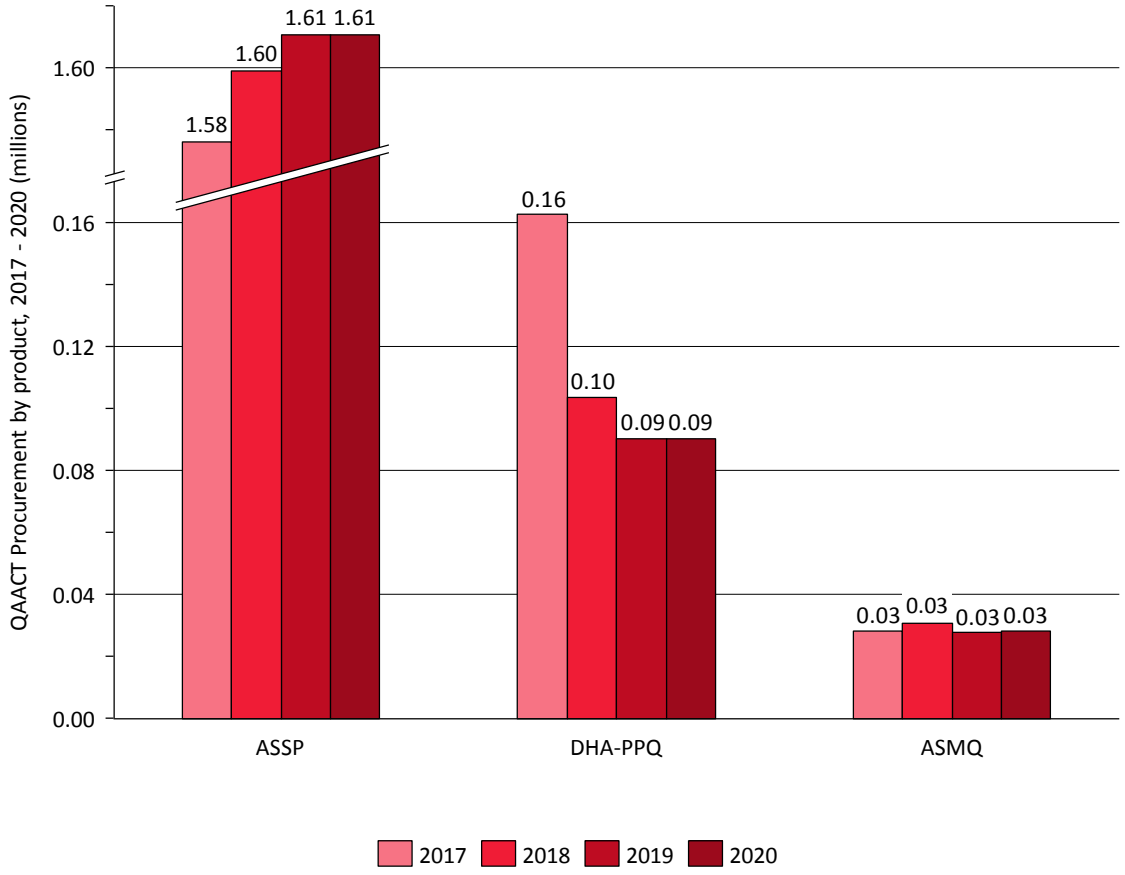


Figure 12 QAACT procurement, by product type (low-volume QAACT products), 2017 – 2020 (millions)



While our model has incorporated as many data as were available to us, it still relies upon extrapolation and assumptions that are based on historical data that might not be predictive of future trends, i.e., the historical disbursement rates and QAACT spending rates are not necessarily predictive of future trends; financial information from grant applications and procurement plans from past Global Fund grants does not necessarily reflect actual procurement volumes using those funds.

Global Fund grants have a three-year lifespan, and grant start and end dates are staggered according to when countries/principal recipients applied for the grant. We have adopted the non-synchronized

Global Fund grant timelines and incorporated estimates for the timing of the next round of funding, at the national level.

Discussion: QAACT procurement

Most QAACTs are procured using funds from donor organizations such as the Global Fund or PMI, and therefore our procurement forecasts are based on projections for available funding. With the transition to the Global Fund's New Funding Model in 2014, countries now have more stable expectations around funding envelopes, and the annual disbursement mechanism supports more regular procurement of essential medicines. However, with the launch of the New Funding Model, historical funding allocations for treatment and diagnostics procurement may no longer reflect contemporary priorities and challenges, and while departures from historical trends may lead to forecast imprecision in a forecast based in part on analysis of historical trends, until new data is obtained, application of historical trends provides the most straightforward analytical approach. In addition, some countries entered this funding cycle with prior existing funds while others were facing funding gaps that required acute attention. Thus, some countries have planned procurement to cover their needs for two years of a three-year funding cycle, with the aim of renewing funding for continuous procurement prior to the third year in the cycle. Our current procurement estimates are based on analysis of current funding streams and procurement commitments, and as such, may shift in the future if high-volume countries submit new proposals that change their procurement strategy.

One of the interesting effects of the Global Fund's New Funding Model is that it has perhaps shifted the financial-geographical-product balance in the QAACT market. In 2010 – 2013, when the AMFm was ongoing, approximately 80% of Global Fund funding for QAACTs was targeted at a handful of countries, most of them using AL as their recommended first-line therapy for uncomplicated malaria. With the transition of the AMFm to the CPM program, QAACT procurement funding for this handful of countries has declined and the introduction of the funding envelopes has made procurement plans from other high-burden countries more prominent, some of them adopting ASAQ as their recommended first-line therapy. However, the broader distribution of funding for procurement of QAACTs across all Global Fund recipient countries has not had much impact on uptake of non-AL or ASAQ QAACTs, with AS+SP, DHA-

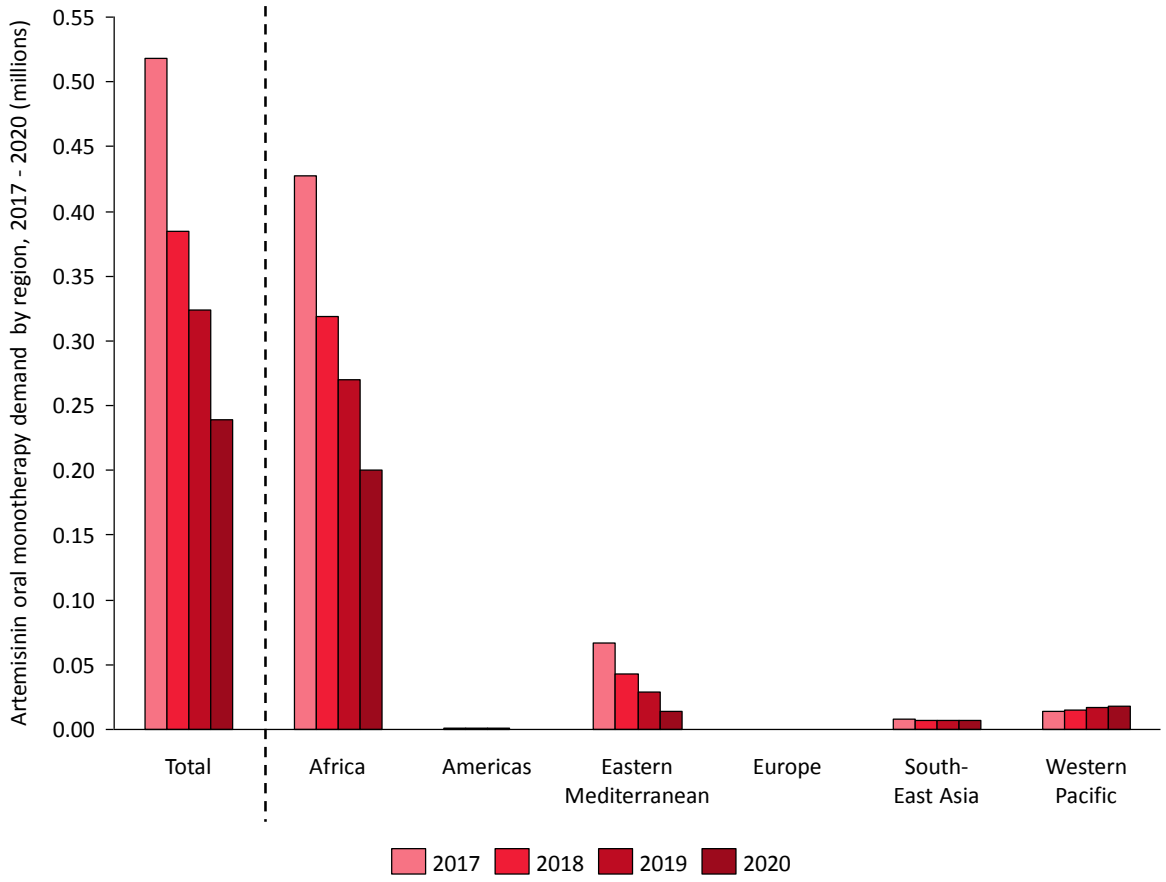
PPQ, and ASMQ markets comprising comparatively small volumes and facing limited growth potential in the study period.

Our demand model and procurement models produce different estimates for QAACT demand (420M in 2017, growing to 572M in 2020) and QAACT procurement (285M to 329M in 2017, and 314M to 385M in 2020) over the forecast period. This is the result of fundamental differences in what each model estimates and the source data they use. The demand model outputs estimates for ACTs (both QAACTs and non-QAACTs), and is based on analysis of historical trends using data derived from household surveys. Therefore, the demand model projects growth in ACT and QAACT demand. The procurement model makes projections based on historical procurement (i.e. order data) trends of QAACTs, with country-level procurement plan data used only for select high volume countries. There are obvious uncertainties inherent in this method, and the impact of these uncertainties will be explored in a follow-on forecast report where we model sensitivities of QAACT procurement to changes in funding cycles. Given the continuing expansion in ACT use in recent years, these projections demonstrate that QAACT procurement is unlikely to keep pace with demand, leaving a demand gap that will likely be filled by non-QAACTs.

Artemisinin Monotherapy Demand

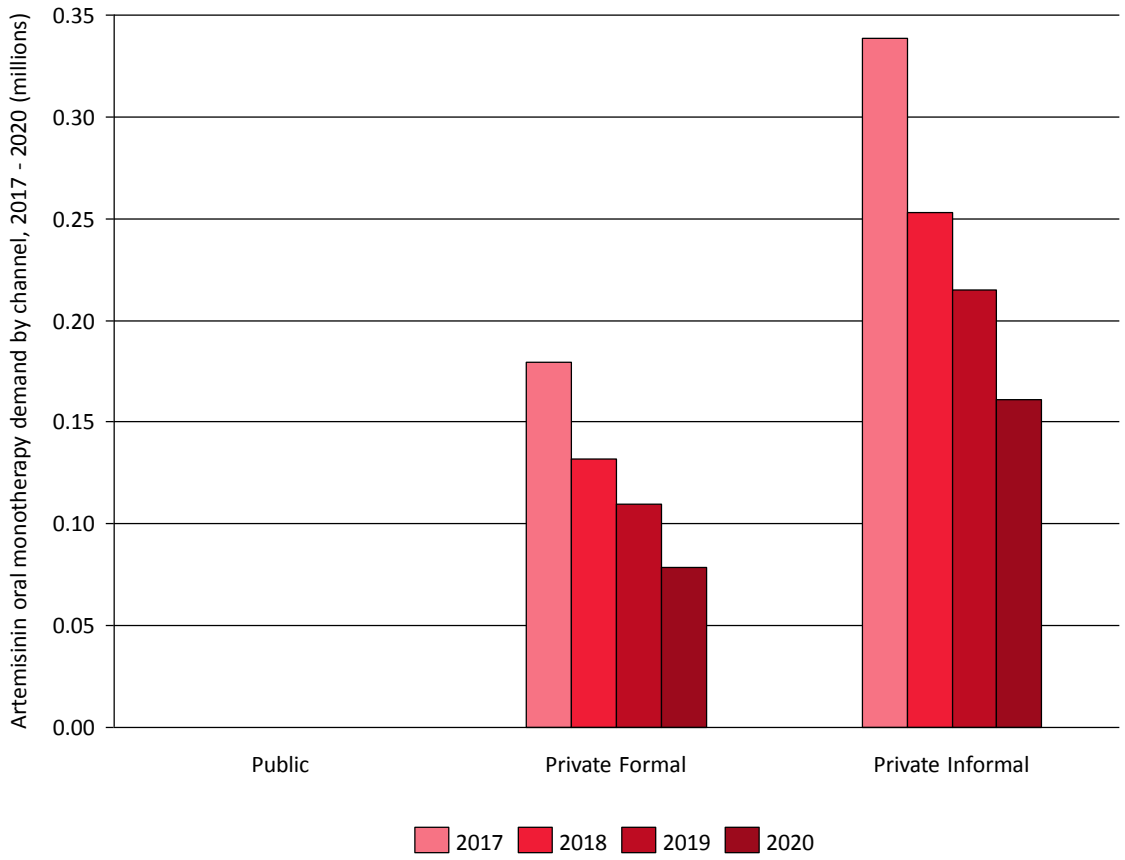
Despite guidance from the WHO for the market withdrawal of oral artemisinin-based therapies to halt the spread of artemisinin resistance, there is still evidence, observed through sales data collected by IMS, of continued, albeit declining, sales of oral artemisinin monotherapies (Figure 13). Oral artemisinin monotherapy use is forecasted to decrease in all regions as a result of efforts to phase out these medicines. We forecast demand for oral artemisinin monotherapy, which is highest in Africa, will decline in this region from 427,000 treatments in 2017, to 200,000 in 2020.

Figure 13 Oral artemisinin monotherapy global demand, by region, 2017 – 2020 (millions)



We have assumed that there is little to no use of oral artemisinin monotherapies in the public sector (Figure 14). We used IMS data to calculate the proportion of oral artemisinin monotherapy out of the total oral artemisinin demand in the private sector; this proportion has been applied to both the formal private and informal private channels. This results in a forecast demand of approximately 240,000 oral artemisinin monotherapies across both private sector channels in 2020.

Figure 14 Oral artemisinin monotherapy global demand by channel, 2017 – 2020 (millions)



The lack of available data to support estimation of public sector demand for injectable or rectal artemisinin-derivative products precludes us from making any robust projections on their demand in the public sector at this time. However, we have forecasted public sector injectable artemisinin procurement in this report (see "QA Injectable Artesunate Procurement", below). We forecast private sector demand for injectable artemisinin-derivative products is 33M in 2017 and will remain relatively flat, at 34M in 2020 (Figure 15). We forecast that private sector demand for rectal artemisinin-derivative products will similarly remain flat, at 4M total suppositories (units: 80mg. artemether; 100mg. artesunate) throughout the 2017 to 2020 forecast period (Figure 16). To estimate the demand for parenteral and rectal formulations of artemisinin in the private sector, we have used IMS private sector

sales data to calculate the share of these forms as a proportion of total ACTs, based on average historic sales across a range of countries (historical sales data is from 2010 through 2015, and for countries where historical data is unavailable, we have applied a fixed ratio between injectable or rectal formulation volumes and oral ACT volumes based on aggregate 2015 data), and applied product uptake based on 2014 and 2015 sales volumes. ACT demand is generally expanding, and previous outputs from our model had pegged injectable and rectal artemisinin product growth to the general growth in ACT demand; we have revised our demand forecast model such that growth of the private sector injectable/rectal artemisinin monotherapies has been decoupled from the oral artemisinin market growth, and based on historical trends. We applied regional historical trends to all countries in a particular region, and uptake is limited to demand in countries that have adopted these medicines. As a result of this methodological change, a baseline demand output has been generated, with forecast year outputs projecting relatively flat growth based on historical trends for these products.

Figure 15 Injectable artemisinin demand, Private Sector, 2017 - 2020 (Standard Units, millions)

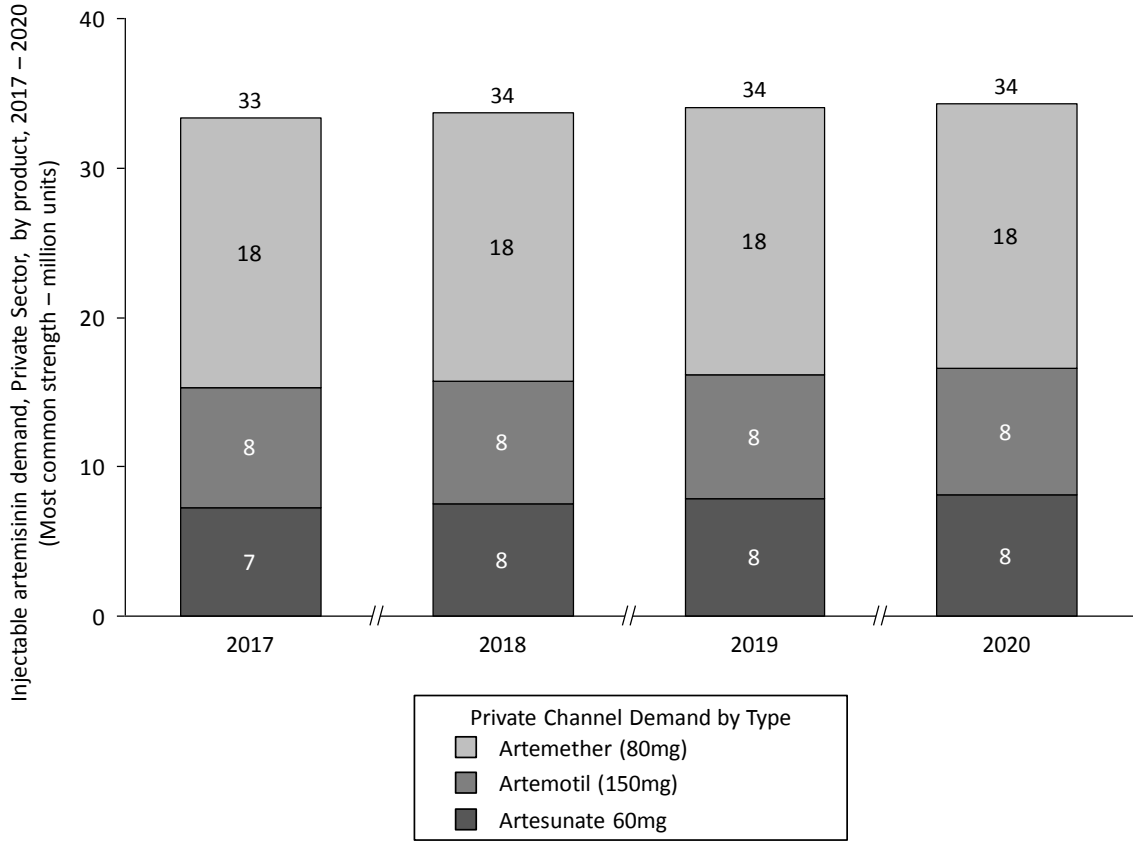
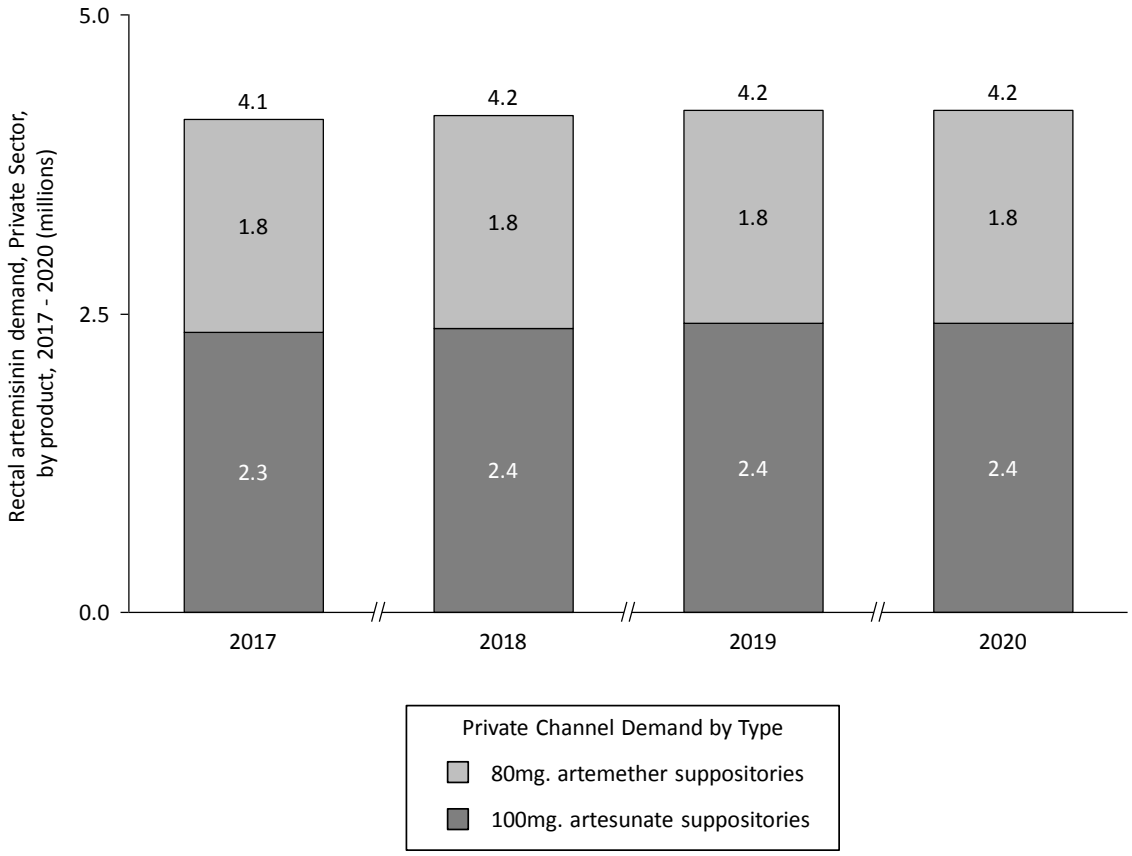


Figure 16 Global rectal artemisinin demand, Private Sector, by product, 2017 – 2020 (millions)



Discussion: Artemisinin monotherapy demand

Despite guidance from the WHO for the withdrawal of oral artemisinin-based therapy to halt the spread of artemisinin resistance (2), oral artemisinin monotherapies are still manufactured, sold, and administered across the globe. However, there is good news on this front: we expect that demand for these unfavourable medicines will continue to decline. With on-going efforts to reduce their usage, we forecast demand for oral artemisinin monotherapies will drop from 518,000 treatments in 2017 to 240,000 treatments in 2020. Since historical trends have been used to forecast future monotherapy demand, this figure is likely to be heavily impacted by regulatory initiatives that aim to reduce the usage

of oral artemisinin monotherapies. The estimated demand volumes for injectable/rectal artesunate may exceed severe malaria caseloads, as it is likely that there is off-label use for these products.

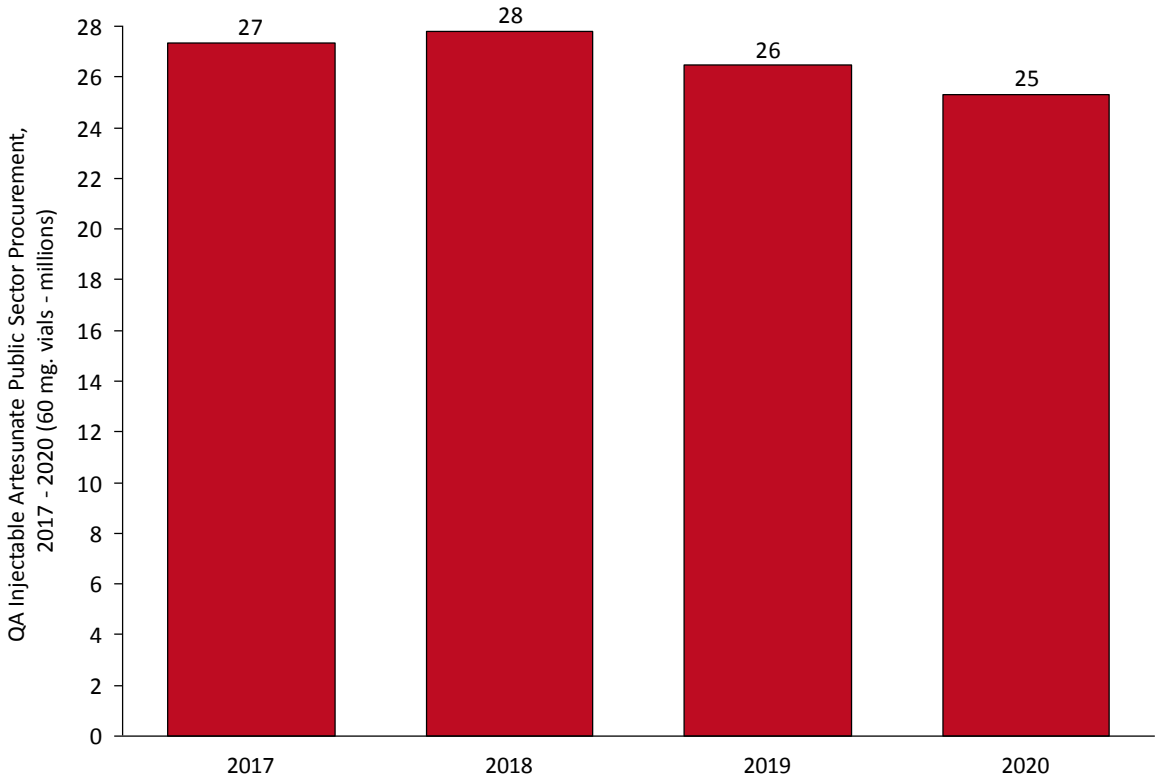
QA-Injectable Artesunate Procurement

Since the publication of the seminal SEAQUAMAT and AQUAMAT clinical trials, which demonstrated that replacing administration of quinine with injectable artesunate, in treatment of patients with severe malaria, resulted in 34.7% and 22.5% reductions in in-hospital adult and child mortality respectively (3,4), there has been a concerted effort to engage National Malaria Control Programs and advocate for the revision of treatment guidelines toward recommending injectable artesunate as the preferred treatment for severe malaria.

Because the market for quality assured injectable artesunate (QAINJAS) remains fairly young, there are few data on which to base assumptions around product uptake. Therefore, we have used current Global Fund procurement plans from high burden countries, as well as data from PMI and Unitaid, to build our forecast projections. We do not currently estimate the private sector procurement of QAINJAS but expect that it will be a small fraction of that in the public sector.

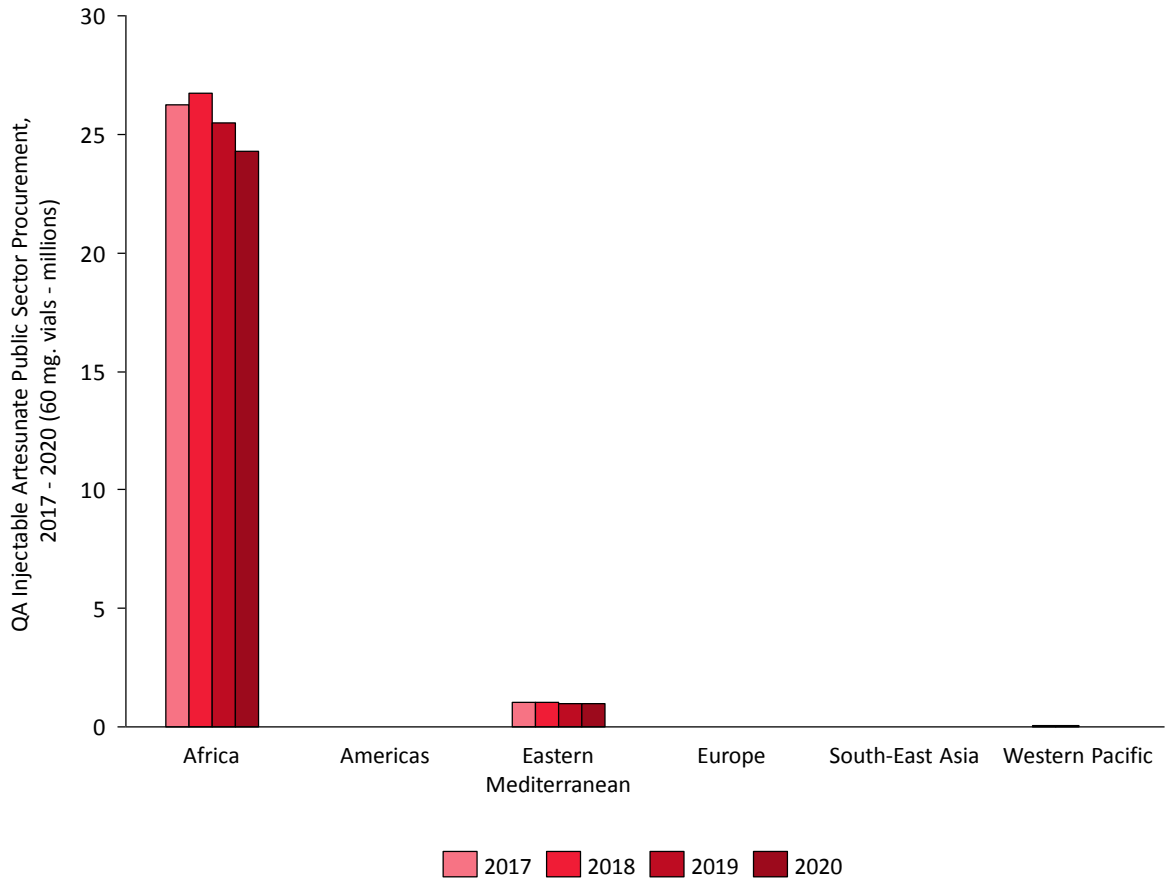
We forecast public sector QAINJAS procurement to be 27M 60 mg. vials in 2017, 28M 60 mg. vials in 2018, with this figure slightly declining to 26M and 25M 60 mg. vials of QAINJAS in 2019 and 2020, respectively (Figure 17). The projected decrease in QAINJAS procurement between 2018 and 2020 is driven by a decrease in projected funding available through the Global Fund for malaria, with the percentage of funding earmarked for QAINJAS procurement remaining stable for each country. Procurement through other donors is expected to remain flat.

Figure 17 QAINJAS public sector procurement, 2017 - 2020 (60 mg. vials - millions)



The African region will procure the majority of QAINJAS in the public sector (Figure 18). The Eastern Mediterranean region will also procure a significant volume of QAINJAS; however, this is procurement that will come largely from countries on the African continent – Sudan and South Sudan.

Figure 18 QAINJAS public sector procurement, by region, 2017 - 2020 (60 mg. vials - millions)



Discussion: QAINJAS procurement

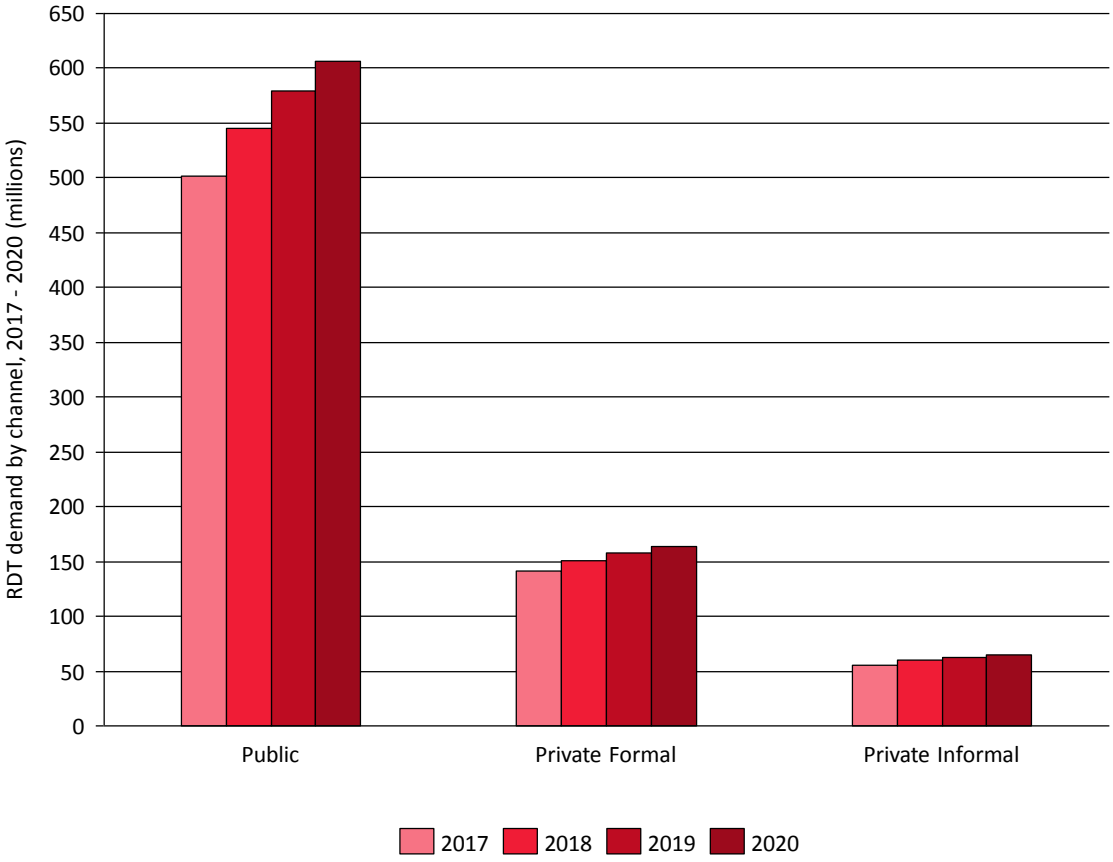
Over the past few years, there has been a significant push to switch the first-line therapy for severe malaria from injectable quinine to injectable artesunate. These efforts included a Unitaid-funded project led by the Medicines for Malaria Venture. In addition to these efforts, a number of countries have revised treatment guidelines, leading to an increase in procurement of QAINJAS. We currently forecast a two-year plateau in QAINJAS procurement, owing to flattened growth in the countries that have adopted this product, and our focus on forecasting this product only for countries that have adopted it to date, and a lack of information on which countries will adopt this product in the coming years. It is

important to note that the model projecting QAINJAS demand is different from the model supporting our procurement forecasts, and therefore outputs between the two may not align. Owing to the recent Global Fund expert review panel approval of a quality assured rectal artesunate (QARAS) product, and pending its inclusion in new malaria program funding requests currently being drafted and submitted to the Global Fund, we will project public sector procurement for QARAS in subsequent reports.

RDT Demand

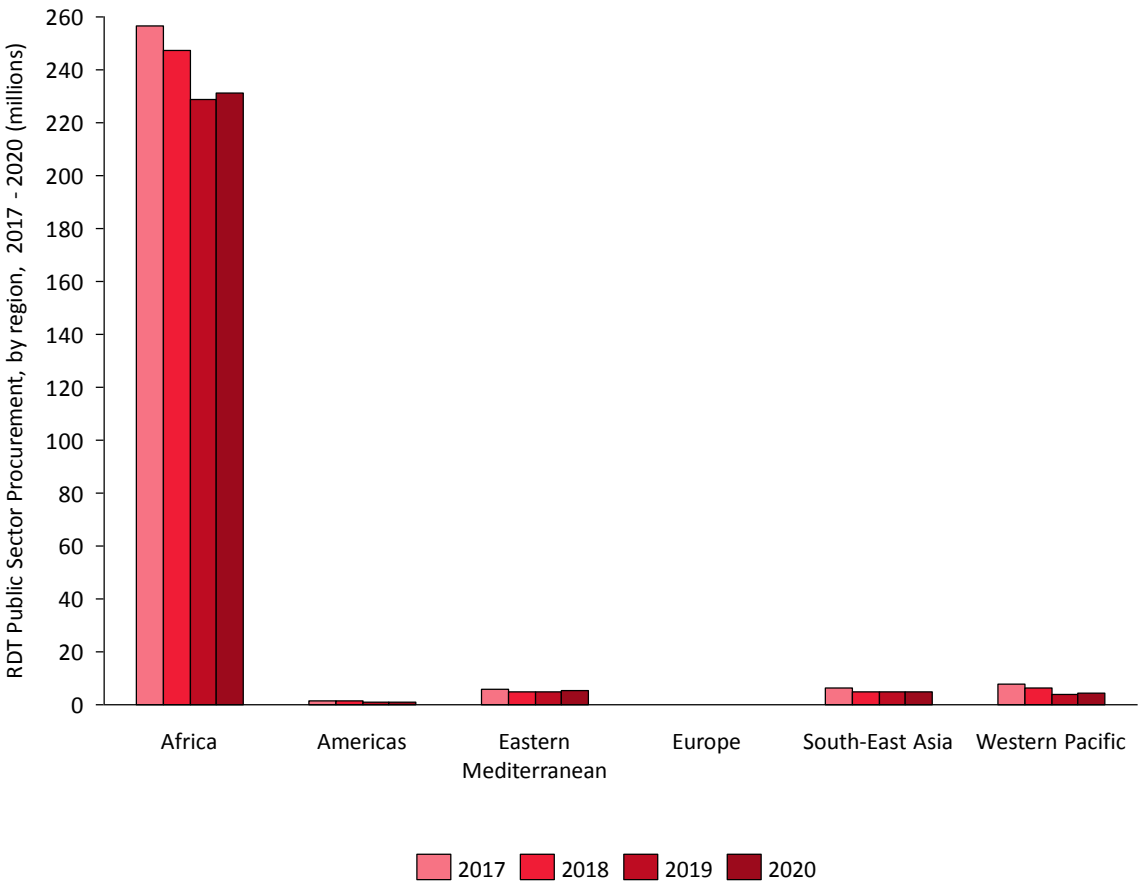
The antimalarial/ACT need and demand model includes fever testing by channel as an output. We have combined this with information from the 2016 World Malaria Report on the proportion of diagnosed cases that are examined using RDTs to estimate the number of tests carried out with RDTs. Due to the lack of information on RDT usage across the different channels we have applied the same calculated proportion across all three channels. Global demand for RDTs is estimated to be 699M tests in 2017, and will increase to 836M tests in 2020 with the continued growth of RDT usage in the public sector and increasing efforts to expand RDT access in the private sector. Overall, the majority of RDT testing is forecast to take place in the public sector, reaching 607M tests in 2020, and accounting for approximately 72% of all RDT testing (Figure 19). Without the addition of new interventions focused on RDT uptake in the private sector, RDT use in this channel is likely to remain flat.

Figure 19 RDT global demand, by channel, 2017 - 2020 (millions)



RDT demand is highest in Africa, where we forecast it will reach 568M tests, across all treatment channels, in 2020 (Figure 20). This reflects the high number of tests carried out in this region as well as the relatively higher share of RDT testing in the Africa region compared to other regions: 68% RDT share in Africa vs. 51% average across all regions.

Figure 20 RDT global demand by region, 2017 – 2020 (millions)



Discussion: RDT demand

Global demand for RDTs will grow from 699M tests in 2017 to 836M tests in 2020, owing to continued efforts to increase RDT uptake in the public sector and expand RDT use in the private sector. We estimate that 72% of all RDTs are currently used in the public sector. We forecast demand for RDTs in the public sector will expand from 502M RDTs in 2017 to nearly 607M in 2020. Expansion of RDT availability and use in the informal private sector remains a challenge, though some countries, like Tanzania and Nigeria, are beginning to make inroads in this sector. Comparing our RDT demand forecast to our RDT procurement forecast exposes different outcomes based on two differing approaches. The RDT demand forecast is based on historical data on diagnostic testing as well as historical share of RDT use among diagnostic testing methods. Assumptions based on these data are projected forward in our

patient-based decision tree model to estimate the number of incident febrile treatment-seeking episodes that are tested with an RDT per year. The forecast demand is significantly higher than our procurement forecast as the demand estimates rely on test data from household surveys, and extend data on the portion of diagnostic tests conducted using an RDT across all sectors, while the procurement estimates focus on historical orders and procurement plans for the public sector, and do not include estimates of private sector RDT use.

RDT Public Sector Procurement

As is the case with QAINJAS procurement, the past few years have witnessed rapid growth in the malaria RDT market. Our forecast model uses a similar approach as that used for QAACTs with the key data inputs being available funding for the procurement of RDTs and RDT procurement plans or historical procurement data (from the Global Fund and PMI). For the private sector, we have applied the RDT share of testing (calculated from the 2015 World Malaria Report) to the private sector test forecast outputs from the demand model (described above).

Despite recent expansion in the use of RDTs in the public sector, we forecast global public sector RDT procurement will peak at 278M in 2017, and begin a decline, reaching 265M in 2018, and 244M RDTs in 2019, before rebounding a bit to reach 247M RDTs in 2020 (Figure 21). Africa represents the largest region for global RDT demand, and the decline in public sector RDT procurement in this region is the result of a slightly tighter funding landscape. The 2017 peak is driven by what we assume will be increased planned procurement in Africa (Figure 22). Conversely, during the coming funding cycle, the decrease in RDT procurement from 2018 to 2019 is driven by a decrease in projected funding available through the Global Fund for malaria, with the percentage of funding earmarked for RDT procurement remaining stable for each country. PMI funded RDT procurement is projected to remain stable aside of an increase starting in 2018 when the additional PMI funding becomes available.

Figure 21 RDT public sector procurement, 2017 - 2020 (millions)

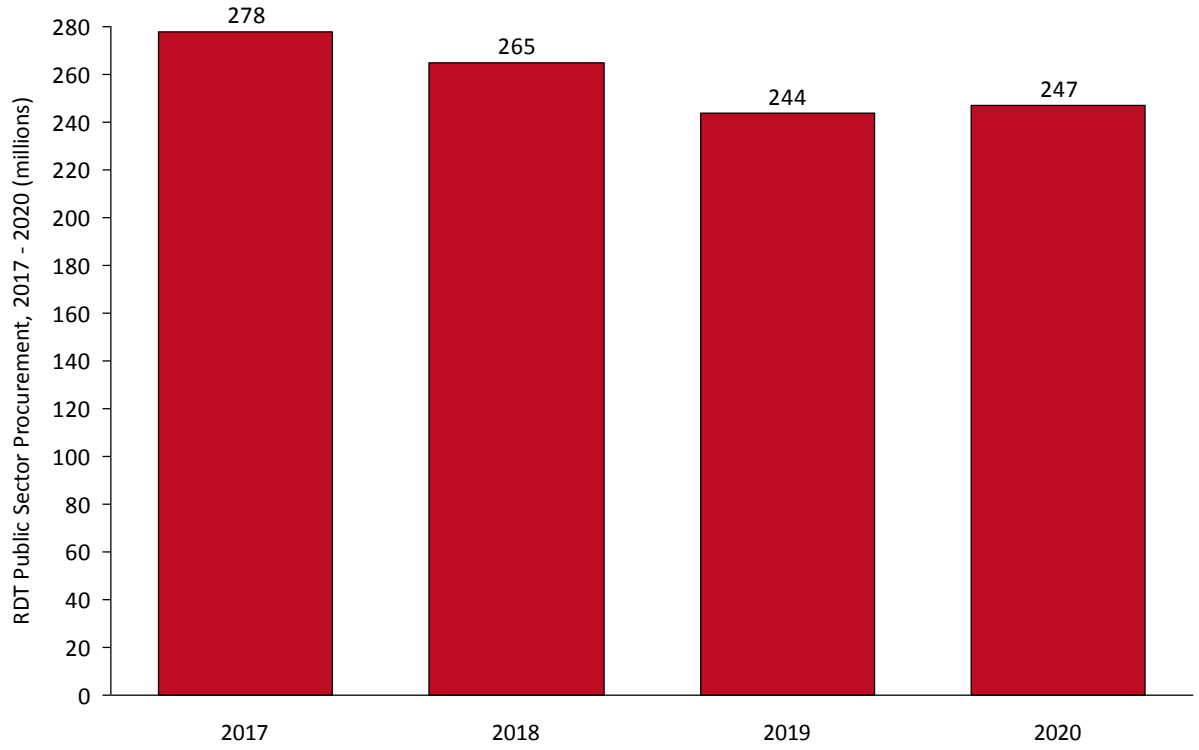
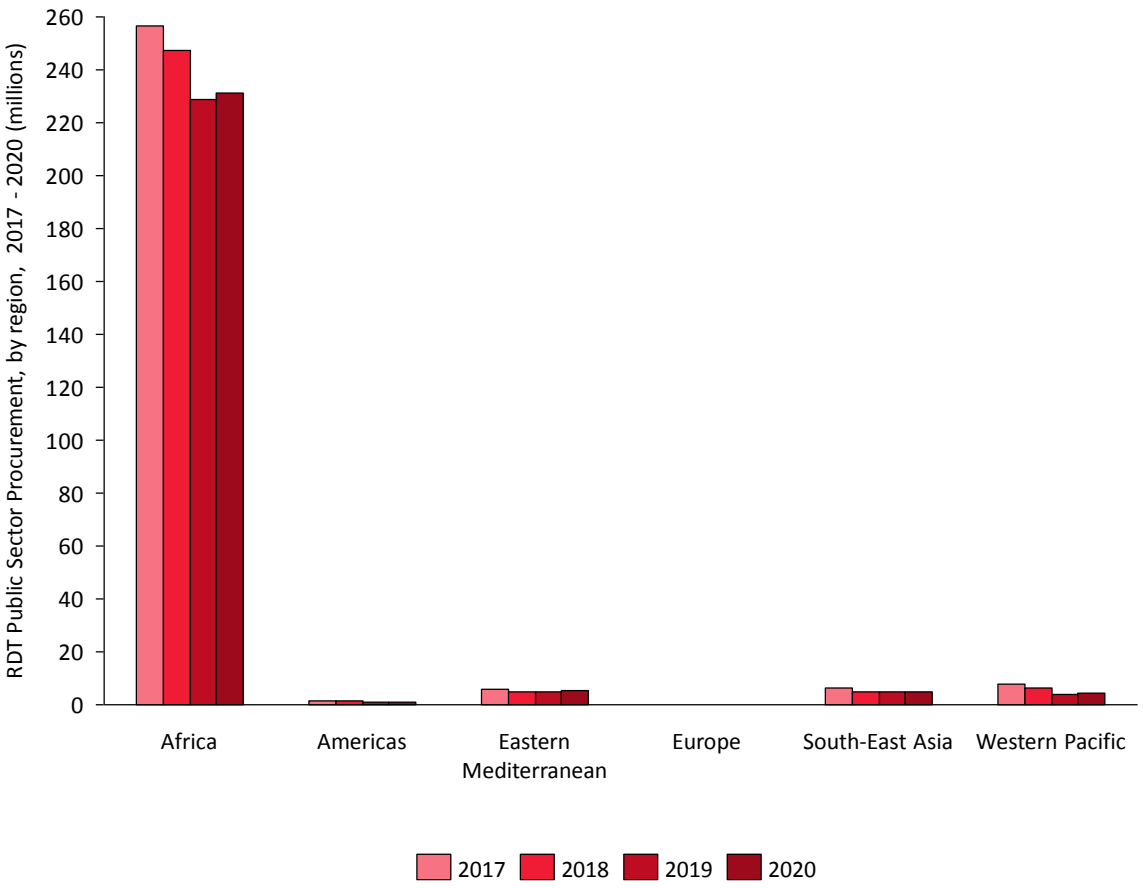


Figure 22 RDT public sector procurement by region, 2017 - 2020 (millions)



Discussion: RDT procurement

Public Sector RDT procurement will peak in 2017, driven by an anticipated increase in Global Fund grant disbursements as the current funding cycle comes to a close, and increasing funding allocations toward RDT procurement. Because we have little information on funding allocations and country procurement plans supporting RDT procurement and expansion in the private sector, the uncertainty in our private sector RDT procurement estimates precludes their inclusion in this report at this time, and we will revisit their inclusion in future reports given access to data that can reduce the uncertainty in those forecasts. Our forecast relies on recent historical procurement and funding allocations to estimate future procurement. Therefore, while it does incorporate ongoing initiatives that have been driving uptake of

RDTs in some settings for the past few years, it does not generalize trends in recent RDT uptake across all countries in the model, and therefore, may underestimate procurement if additional high-volume countries shift their procurement and case management strategies toward expanding RDT use more broadly.

Artemisinin Demand for API

Global demand for artemisinin can be calculated by tabulating the number of QAACT treatments that will be procured (taking into account the dosage/strength of each commodity) in a given year, summing this figure with projections of demand for non-QAACTs, injectable artesunate, and artemisinin monotherapies, and converting these estimates to API demand using the process yields commonly associated with industrial conversion of raw artemisinin to its various derivative products (process yields obtained in communication with industry experts):

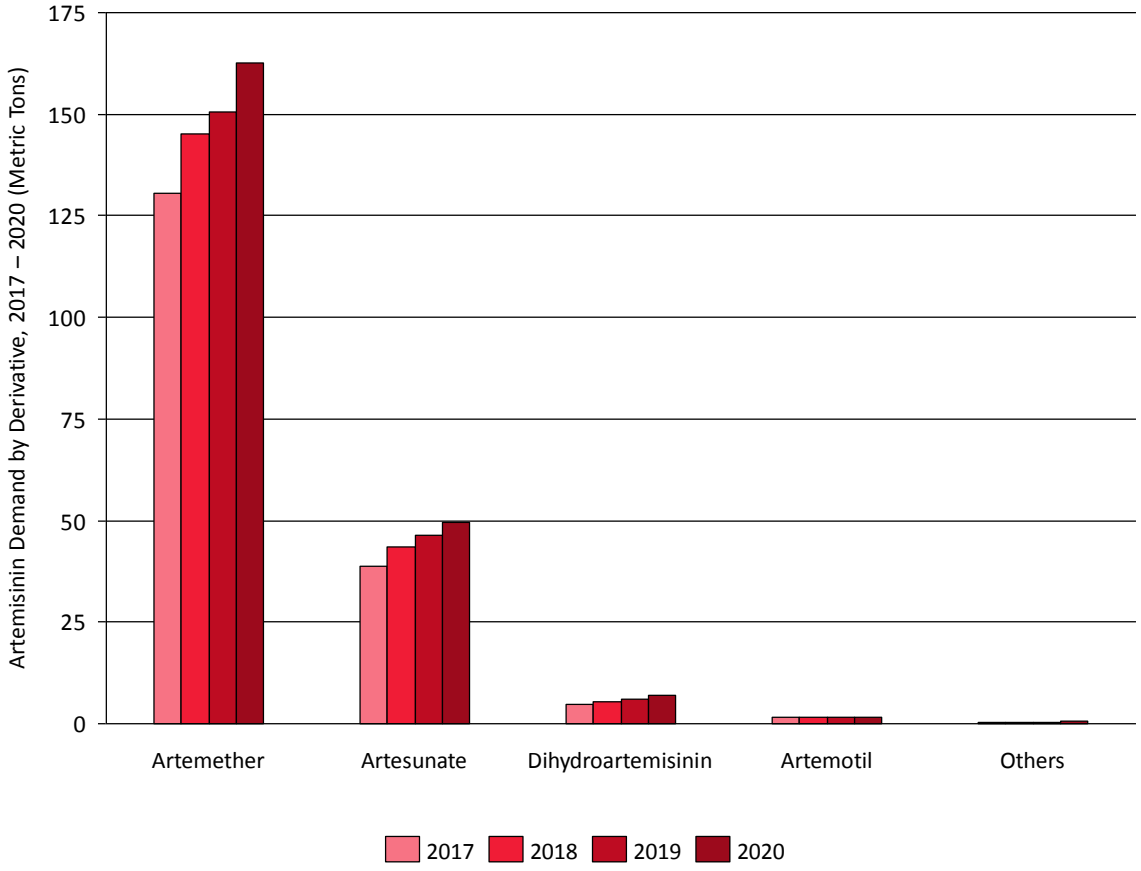
Efficiency of conversion from Artemisinin to Artemisinin Derivative	
Artemether	85%
Artesunate	106%
Dihydroartemisinin	80%

In addition to the efficiency of conversion from artemisinin to artemisinin derivative, our artemisinin demand calculation also accounts for a 5% material loss that occurs during conversion of artemisinin derivative APIs to oral, parenteral, or rectal formulations, and during packaging of such treatments.

Among artemisinin derivatives, artemether has the highest demand, driven by AL being the most widely used ACT (Figure 23). We forecast global demand for artemisinin will slightly grow from 176 metric tons (MTs) in 2017 to 196MTs in 2018, before increasing to 205MTs in 2019, and 221MTs in 2020, respectively (Figure 24). We have assumed that the efficiencies in converting artemisinin to its derivative products will remain constant throughout the forecast period, and as such, the change in global demand

for artemisinin is a function of change in procurement of QAACTs and demand for non-QAACTs, injectable artesunate and other artemisinin monotherapies.

Figure 23 Artemisinin demand by derivative, 2017 – 2020 (metric tons)



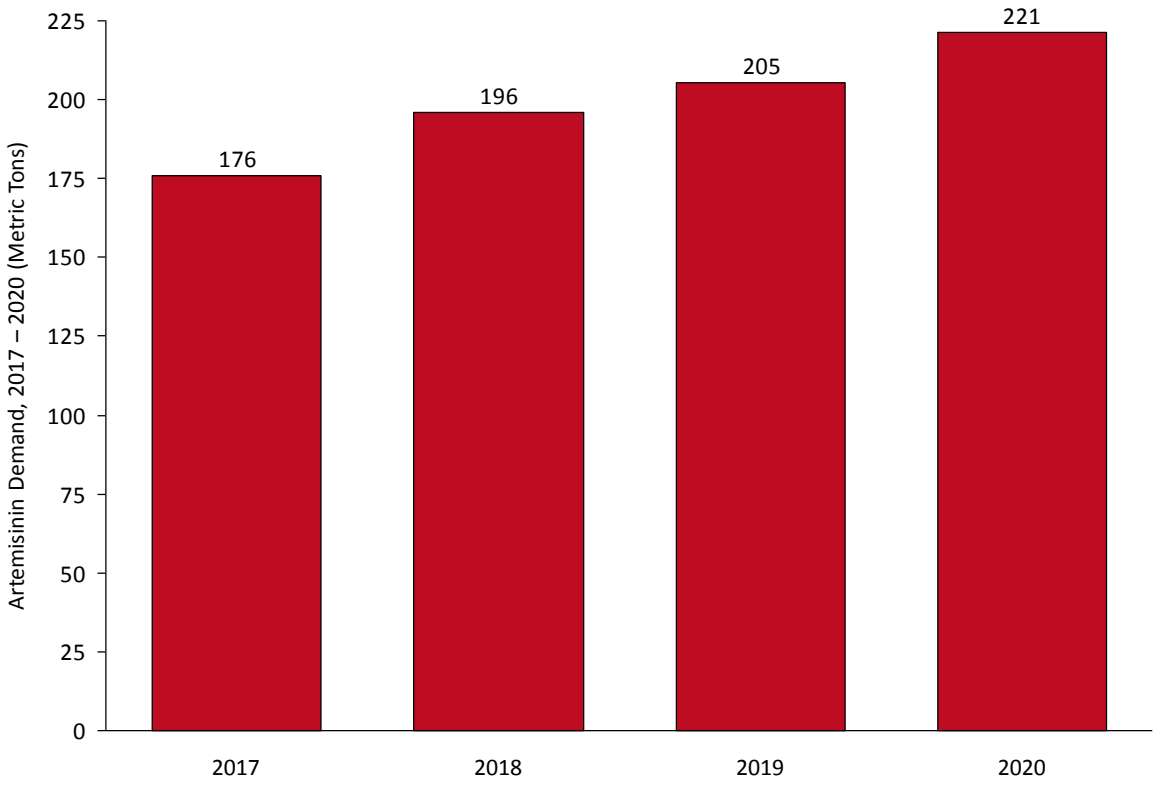
Discussion: Artemisinin demand

We have leveraged our ACT, oral artemisinin monotherapies, and injectable/rectal artesunate forecasts to estimate the global demand for artemisinin, and forecast 176MTs of artemisinin was required to meet global demand for artemisinin-containing medicines in 2017. We forecast demand for artemisinin to increase to 196MTs in 2018 driven by an increase of ACTs (both QAACTs and non QAACTs) in the non-subsidized private sector, and expect to see an increase to 205MTs in 2019 and 221MTs in 2020 owing to the rebound in QAACT procurement in 2018 with the influx of

PMI's additional funding for malaria programs, and sustained growth in demand for all other artemisinin containing medicines, including non-QAACTs. ACTs comprise approximately 97% of global artemisinin demand, with QAACTs commanding approximately 53% to 61% of global artemisinin demand. The ACT share of artemisinin demand is only bound to increase as oral artemisinin monotherapies are phased out of use.

The demand for artemisinin can be influenced by numerous potential events (e.g., reduction in ACT demand with the introduction of ubiquitous, effective case management; increased demand resulting from increased frequency of delayed parasite clearance in ACT-treated patients that leads to an extension in the duration of therapy). We may explore such scenarios and their impact on RDT, ACT, and artemisinin demand in a future forecast report.

Figure 24 Artemisinin demand for API, 2017 – 2020 (metric tons)



4. CLOSING

This report presents the third iteration in a series of publicly published comprehensive global forecast for demand and procurement for malaria rapid diagnostic tests, need, demand, and procurement for artemisinin-based malaria treatments, and resulting artemisinin API demand. As the data presented in this report are considered, it is important to keep in mind some of the caveats and weaknesses around our forecast models and forecasting in general. Each of the models used to project our forecasts do so through extrapolation of historical trends. They use periodical, historical data to project future demand for tests, antimalarials, and ACTs, and as such rely on trend analysis that in some instances may not accurately project rapid changes introduced into the market with the uptake of new initiatives or priorities. The model we have built is dynamic and allows for further exploration of the interactions between these commodities as global demand and procurement volumes shift. Unitaid and the Forecasting Consortium intend to periodically publish revised forecasts that will enable improved projections based on additional data that will be collected on an ongoing basis; owing to the recent Global Fund expert review panel approval of a quality assured rectal artesunate (QARAS) product, we will project public sector procurement for QARAS in subsequent reports.

5. APPENDIX: DATA TABLES

Table 1 List of countries by WHO region

Region	Country
Africa	Angola
	Benin
	Botswana
	Burkina Faso
	Burundi
	Cameroon
	Central African Republic
	Chad
	Comoros
	Congo
	Côte d'Ivoire
	Democratic Republic of the Congo
	Equatorial Guinea
	Eritrea
	Ethiopia
	Gabon
	Gambia
	Ghana
	Guinea
	Guinea-Bissau
	Kenya
	Liberia
	Madagascar
	Malawi
	Mali
	Mauritania
	Mozambique
	Namibia
	Niger
	Nigeria
	Rwanda
	Sao Tome and Principe
	Senegal
	Sierra Leone
	Swaziland
	Tanzania
	Togo
	Uganda

	Zambia
	Zimbabwe
Americas	Belize
	Bolivia
	Brazil
	Colombia
	Costa Rica
	Dominican Republic
	Ecuador
	French Guiana
	Guatemala
	Guyana
	Haiti
	Honduras
	Mexico
	Nicaragua
	Panama
	Peru
	Suriname
	Venezuela
Eastern Mediterranean	Afghanistan
	Djibouti
	Iran
	Oman
	Pakistan
	Saudi Arabia
	Somalia
	South Sudan
	Sudan
	Yemen
Europe	Tajikistan
	Turkmenistan
South-East Asia	Bangladesh
	Bhutan
	India
	Indonesia
	Myanmar
	Nepal
	Thailand
	Timor-Leste
Western Pacific	Australia
	Brunei Darussalam
	Cambodia
	China
	Lao PDR
	Malaysia

	Papua New Guinea Philippines Solomon Islands Vanuatu Vietnam

Table 2 Incident Fevers among malaria-at-risk populations, by geographical region, 2017 – 2020

Region	2017	2018	2019	2020
Africa	3,967,395,170	4,072,634,937	4,179,429,990	4,288,041,401
Americas	668,497,574	675,414,582	682,206,437	688,879,087
Eastern Mediterranean	1,928,867,228	1,968,597,059	2,008,166,869	2,047,545,887
Europe	20,493,118	20,854,778	21,211,072	21,561,737
South-East Asia	7,454,010,748	7,534,439,428	7,613,845,426	7,691,821,549
Western Pacific	1,246,475,975	1,260,178,047	1,273,596,708	1,286,737,158
TOTAL	**15,285,739,813**	**15,532,118,830**	**15,778,456,503**	**16,024,586,819**

Table 3 ACT Need (Incident fevers with likely malaria infection, among malaria-at-risk populations), by geographical region, 2017 – 2020

Region	2017	2018	2019	2020
Africa	664,661,311	681,324,459	698,139,568	715,234,247
Americas	7,058,153	7,116,933	7,174,028	7,230,066
Eastern Mediterranean	26,537,651	27,094,923	27,645,043	28,191,009
Europe	25,503	25,578	25,651	25,720
South-East Asia	228,191,295	230,125,767	232,048,384	233,920,483
Western Pacific	21,590,910	21,867,174	22,137,872	22,405,661
TOTAL	**948,064,823**	**967,554,835**	**987,170,546**	**1,007,007,186**

Table 4 ACT Demand by Channel, by Region, 2017 – 2020 (Baseline)

Channel	Region	2017	2018	2019	2020
Public	Africa	267,688,777	294,520,820	322,164,020	350,695,362
	Americas	600,772	955,385	1,316,444	1,683,833
	Eastern Mediterranean	29,924,627	33,016,797	36,222,962	39,542,822
	Europe	42,243	45,958	49,739	53,596
	South-East Asia	27,360,291	30,732,627	34,164,056	37,646,194
	Western Pacific	1,773,065	2,039,308	2,310,614	2,586,540
	Public Total	327,389,776	361,310,894	396,227,836	432,208,348
Private Formal	Africa	51,003,899	58,231,255	65,779,446	73,645,771
	Americas	140,967	213,100	286,634	361,542
	Eastern Mediterranean	11,793,031	14,303,231	16,904,278	19,594,422
	Europe	13,399	15,231	17,106	19,027
	South-East Asia	48,146,161	58,748,087	69,554,839	80,549,119
	Western Pacific	795,720	963,748	1,134,960	1,309,030
	Private Formal Total	**111,893,176**	**132,474,652**	**153,677,262**	**175,478,910**
Private Informal	Africa	98,763,786	113,605,827	129,115,778	145,290,869
	Americas	171,253	261,377	353,294	446,958
	Eastern Mediterranean	12,090,883	14,063,870	16,116,213	18,247,635
	Europe	13,902	16,044	18,240	20,489
	South-East Asia	15,177,087	18,680,189	22,254,494	25,897,964
	Western Pacific	797,933	960,842	1,127,442	1,297,513
	Private Informal Total	**127,014,843**	**147,588,148**	**168,985,461**	**191,201,429**
Total *(across channels)*	Africa	417,456,462	466,357,902	517,059,244	569,632,002
	Americas	912,992	1,429,862	1,956,372	2,492,333
	Eastern Mediterranean	53,808,541	61,383,898	69,243,453	77,384,880
	Europe	69,544	77,233	85,084	93,113
	South-East Asia	90,683,538	108,160,903	125,973,390	144,093,277
	Western Pacific	3,366,719	3,963,898	4,573,015	5,193,084
Grand Total		**566,297,796**	**641,373,694**	**718,890,559**	**798,888,688**

Table 5 QAACT demand by channel, by region, by ACT type, 2017 - 2020 (Baseline - Lower bound)

Channel	Region	ACT Type	2017	2018	2019	2020
Public	**Africa**	AL	194,003,743	212,755,972	231,976,966	251,729,096
		ASAQ	73,180,946	81,206,667	89,573,212	98,295,193
		ASSP	500,705	554,433	609,721	666,569
		DHA-PPQ	-	-	-	-
		ASMQ	3,384	3,747	4,121	4,505
		Africa	***267,688,777***	***294,520,820***	***322,164,020***	***350,695,362***
	Americas	AL	129,583	204,654	280,589	357,385
		ASAQ	138	220	303	387
		ASSP	54,948	87,970	121,775	156,345
		DHA-PPQ	-	-	-	-
		ASMQ	416,103	662,540	913,778	1,169,716
		Americas	***600,772***	***955,385***	***1,316,444***	***1,683,833***
	Eastern Mediterranean	AL	19,966,503	21,832,472	23,771,196	25,779,559
		ASAQ	4,173,016	4,547,252	4,930,879	5,328,303
		ASSP	5,785,052	6,637,010	7,520,818	8,434,884
		DHA-PPQ	-	-	-	-
		ASMQ	56	63	69	76
		Eastern Mediterranean	***29,924,627***	***33,016,797***	***36,222,962***	***39,542,822***
	Europe	AL	34,948	37,747	40,598	43,513
		ASAQ	-	-	-	-
		ASSP	7,295	8,211	9,140	10,084
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Europe	***42,243***	***45,958***	***49,739***	***53,596***
	South-East Asia	AL	25,136,918	28,139,991	31,198,391	34,302,328
		ASAQ	1,990,608	2,287,292	2,587,769	2,893,461
		ASSP	1,613	2,015	2,424	2,841
		DHA-PPQ	-	-	-	-
		ASMQ	231,152	303,329	375,472	447,564
		South-East Asia	***27,360,291***	***30,732,627***	***34,164,056***	***37,646,194***
	Western Pacific	AL	1,093,866	1,262,034	1,434,227	1,610,069
		ASAQ	326,686	363,371	400,118	436,875
		ASSP	3,497	4,005	4,525	5,056
		DHA-PPQ	-	-	-	-
		ASMQ	58,619	77,966	97,735	117,963
		Western Pacific	***1,482,667***	***1,707,376***	***1,936,606***	***2,169,963***
	Public Total *(all regions)*	AL	***240,365,561***	***264,232,871***	***288,701,968***	***313,821,950***
		ASAQ	***79,671,393***	***88,404,803***	***97,492,280***	***106,954,218***
		ASSP	***6,353,109***	***7,293,644***	***8,268,405***	***9,275,779***
		DHA-PPQ	***-***	***-***	***-***	***-***
		ASMQ	***709,315***	***1,047,644***	***1,391,175***	***1,739,825***
	Public Total		***327,099,378***	***360,978,962***	***395,853,828***	***431,791,771***
Private	**Africa**	AL	59,321,636	68,167,753	77,387,549	86,990,542
		ASAQ	9,344,831	10,955,471	12,636,092	14,397,656
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Africa	***68,666,467***	***79,123,225***	***90,023,641***	***101,388,198***
	Americas	AL	71,603	108,932	146,925	185,785
		ASAQ	1,170	1,766	2,374	2,998
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-

		Americas	***72,774***	***110,699***	***149,299***	***188,783***
	Eastern Mediterranean	AL	3,538,366	4,043,064	4,565,299	5,112,076
		ASAQ	575,179	646,542	719,765	796,571
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Eastern Mediterranean	***4,113,544***	***4,689,606***	***5,285,064***	***5,908,647***
	Europe	AL	6,333	7,258	8,199	9,172
		ASAQ	31	39	47	55
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Europe	***6,363***	***7,297***	***8,246***	***9,227***
	South-East Asia	AL	18,877,646	23,044,262	27,292,184	31,616,259
		ASAQ	1,518	2,146	2,773	3,402
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	2,526	3,079	3,643	4,217
		South-East Asia	***18,881,690***	***23,049,487***	***27,298,599***	***31,623,878***
	Western Pacific	AL	322,356	395,371	469,941	546,588
		ASAQ	4,820	5,713	6,619	7,542
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Western Pacific	***327,176***	***401,085***	***476,560***	***554,130***
	Private Total *(all regions)*	AL	***82,137,939***	***95,766,640***	***109,870,098***	***124,460,421***
		ASAQ	***9,927,549***	***11,611,677***	***13,367,669***	***15,208,225***
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	***2,526***	***3,079***	***3,643***	***4,217***
	Private Total		***92,068,014***	***107,381,397***	***123,241,409***	***139,672,863***
TOTAL (across channels)	**Africa**	AL	253,325,378	280,923,726	309,364,515	338,719,638
		ASAQ	82,525,777	92,162,138	102,209,304	112,692,848
		ASSP	500,705	554,433	609,721	666,569
		DHA-PPQ	-	-	-	-
		ASMQ	3,384	3,747	4,121	4,505
		Africa	***336,355,244***	***373,644,044***	***412,187,661***	***452,083,560***
	Americas	AL	201,187	313,587	427,514	543,170
		ASAQ	1,309	1,986	2,677	3,384
		ASSP	54,948	87,970	121,775	156,345
		DHA-PPQ	-	-	-	-
		ASMQ	416,103	662,540	913,778	1,169,716
		Americas	***673,546***	***1,066,084***	***1,465,744***	***1,872,616***
	Eastern Mediterranean	AL	23,504,869	25,875,536	28,336,495	30,891,635
		ASAQ	4,748,194	5,193,794	5,650,644	6,124,874
		ASSP	5,785,052	6,637,010	7,520,818	8,434,884
		DHA-PPQ	-	-	-	-
		ASMQ	56	63	69	76
		Eastern Mediterranean	***34,038,172***	***37,706,402***	***41,508,026***	***45,451,469***
	Europe	AL	41,281	45,005	48,798	52,685
		ASAQ	31	39	47	55
		ASSP	7,295	8,211	9,140	10,084
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Europe	***48,607***	***53,255***	***57,985***	***62,823***
	South-East Asia	AL	44,014,564	51,184,253	58,490,575	65,918,587
		ASAQ	1,992,126	2,289,438	2,590,541	2,896,863
		ASSP	1,613	2,015	2,424	2,841

		DHA-PPQ	-	-	-	-
		ASMQ	233,678	306,407	379,115	451,780
		South-East Asia	***46,241,981***	***53,782,113***	***61,462,656***	***69,270,072***
	Western Pacific	AL	1,416,221	1,657,405	1,904,169	2,156,657
		ASAQ	331,506	369,085	406,737	444,417
		ASSP	3,497	4,005	4,525	5,056
		DHA-PPQ	-	-	-	-
		ASMQ	58,619	77,966	97,735	117,963
		Western Pacific	***1,809,843***	***2,108,460***	***2,413,166***	***2,724,093***
	Total	AL	***322,503,500***	***359,999,511***	***398,572,066***	***438,282,371***
	(all regions)	ASAQ	***89,598,942***	***100,016,480***	***110,859,949***	***122,162,443***
		ASSP	***6,353,109***	***7,293,644***	***8,268,405***	***9,275,779***
		DHA-PPQ*	-	-	-	-
		ASMQ	***711,840***	***1,050,723***	***1,394,818***	***1,744,041***
GRAND TOTAL (excluding DHA-PPQ)			***419,167,392***	***468,360,359***	***519,095,237***	***571,464,634***
GRAND TOTAL (including DHA-PPQ)			***421,698,463***	***471,052,250***	***521,787,129***	***574,156,526***

**DHA-PPQ split by region NA.*

Table 6 QAACT demand by channel, by region, by ACT type, 2017 - 2020 (Baseline - Upper bound)

Channel	Region	ACT Type	2017	2018	2019	2020
Public	**Africa**	AL	194,003,743	212,755,972	231,976,966	251,729,096
		ASAQ	73,180,946	81,206,667	89,573,212	98,295,193
		ASSP	500,705	554,433	609,721	666,569
		DHA-PPQ	-	-	-	-
		ASMQ	3,384	3,747	4,121	4,505
		Africa	***267,688,777***	***294,520,820***	***322,164,020***	***350,695,362***
	Americas	AL	129,583	204,654	280,589	357,385
		ASAQ	138	220	303	387
		ASSP	54,948	87,970	121,775	156,345
		DHA-PPQ	-	-	-	-
		ASMQ	416,103	662,540	913,778	1,169,716
		Americas	***600,772***	***955,385***	***1,316,444***	***1,683,833***
	Eastern Mediterranean	AL	19,966,503	21,832,472	23,771,196	25,779,559
		ASAQ	4,173,016	4,547,252	4,930,879	5,328,303
		ASSP	5,785,052	6,637,010	7,520,818	8,434,884
		DHA-PPQ	-	-	-	-
		ASMQ	56	63	69	76
		Eastern Mediterranean	***29,924,627***	***33,016,797***	***36,222,962***	***39,542,822***
	Europe	AL	34,948	37,747	40,598	43,513
		ASAQ	-	-	-	-
		ASSP	7,295	8,211	9,140	10,084
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Europe	***42,243***	***45,958***	***49,739***	***53,596***
	South-East Asia	AL	25,136,918	28,139,991	31,198,391	34,302,328
		ASAQ	1,990,608	2,287,292	2,587,769	2,893,461
		ASSP	1,613	2,015	2,424	2,841
		DHA-PPQ	-	-	-	-
		ASMQ	231,152	303,329	375,472	447,564
		South-East Asia	***27,360,291***	***30,732,627***	***34,164,056***	***37,646,194***
	Western Pacific	AL	1,093,866	1,262,034	1,434,227	1,610,069
		ASAQ	326,686	363,371	400,118	436,875
		ASSP	3,497	4,005	4,525	5,056
		DHA-PPQ	-	-	-	-
		ASMQ	58,619	77,966	97,735	117,963

		Western Pacific	***1,482,667***	***1,707,376***	***1,936,606***	***2,169,963***
	Public Total	AL	***240,365,561***	***264,232,871***	***288,701,968***	***313,821,950***
	(all regions)	ASAQ	***79,671,393***	***88,404,803***	***97,492,280***	***106,954,218***
		ASSP	***6,353,109***	***7,293,644***	***8,268,405***	***9,275,779***
		DHA-PPQ	-	-	-	-
		ASMQ	***709,315***	***1,047,644***	***1,391,175***	***1,739,825***
	Public Total		***327,099,378***	***360,978,962***	***395,853,828***	***431,791,771***
Private	**Africa**	AL	72,886,175	83,466,961	94,497,714	105,985,521
		ASAQ	13,159,872	15,442,305	17,828,793	20,329,084
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Africa	***86,046,047***	***98,909,266***	***112,326,507***	***126,314,605***
	Americas	AL	145,281	220,366	296,876	374,925
		ASAQ	2,449	3,682	4,941	6,229
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Americas	***147,730***	***224,048***	***301,817***	***381,154***
	Eastern Mediterranean	AL	10,411,850	12,539,297	14,742,877	17,025,790
		ASAQ	1,021,995	1,148,698	1,279,162	1,415,235
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Eastern Mediterranean	***11,433,844***	***13,687,996***	***16,022,039***	***18,441,025***
	Europe	AL	13,431	15,327	17,263	19,251
		ASAQ	57	71	86	100
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Europe	***13,488***	***15,398***	***17,348***	***19,351***
	South-East Asia	AL	40,521,164	49,475,311	58,603,313	67,892,061
		ASAQ	2,690	3,790	4,890	5,991
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	5,367	6,538	7,732	8,947
		South-East Asia	***40,529,221***	***49,485,639***	***58,615,934***	***67,906,999***
	Western Pacific	AL	620,323	743,679	869,913	999,227
		ASAQ	99,066	129,338	159,753	190,266
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	68,376	86,634	105,177	123,982
		Western Pacific	***787,765***	***959,651***	***1,134,843***	***1,313,475***
	Private Total	AL	***124,598,223***	***146,460,941***	***169,027,955***	***192,296,774***
	(all regions)	ASAQ	***14,286,129***	***16,727,885***	***19,277,624***	***21,946,906***
		ASSP	-	-	-	-
		DHA-PPQ	-	-	-	-
		ASMQ	***73,742***	***93,172***	***112,909***	***132,929***
	Private Total		***138,958,094***	***163,281,998***	***188,418,488***	***214,376,610***
TOTAL (across channels)	**Africa**	AL	266,889,917	296,222,933	326,474,680	357,714,617
		ASAQ	86,340,818	96,648,972	107,402,005	118,624,277
		ASSP	500,705	554,433	609,721	666,569
		DHA-PPQ	-	-	-	-
		ASMQ	3,384	3,747	4,121	4,505
		Africa	***353,734,824***	***393,430,086***	***434,490,527***	***477,009,968***
	Americas	AL	274,864	425,020	577,465	732,310
		ASAQ	2,588	3,902	5,244	6,615
		ASSP	54,948	87,970	121,775	156,345
		DHA-PPQ	-	-	-	-
		ASMQ	416,103	662,540	913,778	1,169,716

		Americas	***748,503***	***1,179,433***	***1,618,262***	***2,064,987***
	Eastern Mediterranean	AL	30,378,353	34,371,769	38,514,073	42,805,349
		ASAQ	5,195,010	5,695,951	6,210,041	6,743,538
		ASSP	5,785,052	6,637,010	7,520,818	8,434,884
		DHA-PPQ	-	-	-	-
		ASMQ	56	63	69	76
		Eastern Mediterranean	***41,358,471***	***46,704,792***	***52,245,001***	***57,983,848***
	Europe	AL	48,380	53,074	57,861	62,763
		ASAQ	57	71	86	100
		ASSP	7,295	8,211	9,140	10,084
		DHA-PPQ	-	-	-	-
		ASMQ	-	-	-	-
		Europe	***55,731***	***61,356***	***67,087***	***72,947***
	South-East Asia	AL	65,658,082	77,615,302	89,801,704	102,194,389
		ASAQ	1,993,298	2,291,082	2,592,658	2,899,452
		ASSP	1,613	2,015	2,424	2,841
		DHA-PPQ	-	-	-	-
		ASMQ	236,519	309,867	383,204	456,511
		South-East Asia	***67,889,512***	***80,218,266***	***92,779,991***	***105,553,193***
	Western Pacific	AL	1,714,189	2,005,713	2,304,141	2,609,296
		ASAQ	425,752	492,709	559,871	627,141
		ASSP	3,497	4,005	4,525	5,056
		DHA-PPQ	-	-	-	-
		ASMQ	126,995	164,600	202,912	241,945
		Western Pacific	***2,270,432***	***2,667,027***	***3,071,449***	***3,483,438***
	Total *(all regions)*	AL	***364,963,784***	***410,693,812***	***457,729,923***	***506,118,723***
		ASAQ	***93,957,522***	***105,132,687***	***116,769,905***	***128,901,124***
		ASSP	***6,353,109***	***7,293,644***	***8,268,405***	***9,275,779***
		DHA-PPQ*	-	-	-	-
		ASMQ	***783,057***	***1,140,816***	***1,504,084***	***1,872,754***
GRAND TOTAL (excluding DHA-PPQ)			***466,057,472***	***524,260,960***	***584,272,316***	***646,168,381***
GRAND TOTAL (including DHA-PPQ)			**468,588,543**	**526,952,851**	**586,964,208**	**648,860,273**

**DHA-PPQ split by region NA.*

Table 7 QAACT procurement by channel, by region, by ACT type, 2017 - 2020 (Baseline - Lower bound)

Channel	Region	ACT Type	2017	2018	2019	2020
Public	**Africa**	AL	116,496,300	127,893,200	114,647,600	117,079,500
		ASAQ	52,092,500	57,345,200	57,707,000	56,819,500
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Public Total		***168,588,800***	***185,238,500***	***172,354,600***	***173,899,000***
	Americas	AL	4,400	4,800	4,800	4,800
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Public Total		***4,400***	***4,800***	***4,800***	***4,800***
	Eastern Mediterranean	AL	1,657,100	1,890,700	1,890,000	1,890,000
		ASAQ	1,434,500	1,240,400	1,091,100	1,100,200
		ASSP	1,576,200	1,599,000	1,610,900	1,610,900

		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Med. Public Total		***4,667,800***	***4,730,100***	***4,591,900***	***4,601,000***
	Europe	AL	100	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Public Total		***100***	***-***	***-***	***-***
	South-East Asia	AL	953,800	659,100	635,500	636,500
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	South-East Asia Public Total		***953,800***	***659,100***	***635,500***	***635,500***
	Western Pacific	AL	649,400	220,700	73,200	68,000
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	163,000	103,800	90,600	90,600
		ASMQ	25,700	27,800	24,300	24,300
	Western Pacific Public Total		***838,000***	***352,300***	***188,100***	***182,800***
	Public Total	AL	***119,761,200***	***130,668,500***	***117,251,000***	***119,678,800***
	(all regions)	ASAQ	***53,527,100***	***58,585,600***	***58,798,100***	***57,919,700***
		ASSP	***1,576,200***	***1,599,000***	***1,610,900***	***1,610,900***
		DP	***163,000***	***103,800***	***90,600***	***90,600***
		ASMQ	***25,700***	***27,800***	***24,300***	***24,300***
	PUBLIC TOTAL		***175,053,000***	***190,984,700***	***177,774,900***	***179,324,200***
Private Subsidized	**Africa**	AL	57,820,100	57,820,100	57,820,100	57,820,100
		ASAQ	4,413,100	4,413,100	4,413,100	4,413,100
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Pvt. Sub. Total		***62,233,200***	***62,233,200***	***62,233,200***	***62,233,200***
	Americas	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Pvt. Sub. Total		***-***	***-***	***-***	***-***
	Eastern Mediterranean	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Med. Pvt. Sub. Total		***-***	***-***	***-***	***-***
	Europe	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Pvt. Sub. Total		***-***	***-***	***-***	***-***
	South-East Asia	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-

		DP	-	-	-	-
		ASMQ	-	-	-	-
	South-East Asia Pvt. Sub. Total		**-**	**-**	**-**	**-**
	Western Pacific	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Western Pacific Pvt. Sub. Total		**-**	**-**	**-**	**-**
	Private Subsidized	AL	***57,820,100***	***57,820,100***	***57,820,100***	***57,820,100***
	Total	ASAQ	***4,413,100***	***4,413,100***	***4,413,100***	***4,413,100***
	(all regions)	ASSP				
		DP				
		ASMQ				
	PRIVATE SUBSIDIZED TOTAL		***62,233,200***	***62,233,200***	***62,233,200***	***62,233,200***
Premium Private	**Africa**	AL	18,983,700	21,347,000	23,812,900	26,396,000
		ASAQ	4,561,500	5,356,000	6,186,500	7,063,500
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Pre. Pvt. Total		***23,545,100***	***26,703,100***	***29,999,500***	***33,459,600***
	Americas	AL	71,600	108,900	146,900	185,800
		ASAQ	1,200	1,800	2,400	3,000
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Pre. Pvt. Total		***72,800***	***110,700***	***149,300***	***188,800***
	Eastern	AL	3,538,400	4,043,100	4,565,300	5,112,100
	Mediterranean	ASAQ	575,200	646,500	719,800	796,600
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Med. Pre. Pvt. Total		***4,113,500***	***4,689,600***	***5,285,100***	***5,908,600***
	Europe	AL	6,300	7,300	8,200	9,200
		ASAQ	-	-	-	100
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Pre. Pvt. Total		***6,400***	***7,300***	***8,200***	***9,200***
	South-East Asia	AL	18,877,600	23,044,300	27,292,200	31,616,200
		ASAQ	1,500	2,100	2,800	3,400
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	2,500	3,100	3,600	4,200
	South-East Asia Pre. Pvt. Total		***19,255,400***	***23,505,000***	***27,837,600***	***32,247,800***
	Western Pacific	AL	322,400	395,400	470,000	546,600
		ASAQ	4,800	5,700	6,600	7,500
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Western Pacific Pre. Pvt. Total		***327,200***	***401,100***	***476,600***	***554,100***
	Premium Private	AL	***41,800,000***	***48,945,900***	***56,295,500***	***63,865,900***
	Total	ASAQ	***5,144,200***	***6,012,200***	***6,918,100***	***7,874,100***
	(all regions)	ASSP	**-**	**-**	**-**	**-**

		DP	-	-	-	-
		ASMQ	***2,500***	***3,100***	***3,600***	***4,200***
	PREMIUM PRIVATE TOTAL		***47,320,400***	***55,416,800***	***63,756,200***	***72,368,100***
TOTAL (across channels)	**Africa**	AL	193,300,100	207,060,300	196,280,600	201,295,600
		ASAQ	61,067,100	67,114,300	68,306,600	68,296,100
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Total		***254,367,100***	***274,174,800***	***264,587,300***	***269,591,800***
	Americas	AL	76,000	113,700	151,700	190,600
		ASAQ	1,200	1,800	2,400	3,000
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Total		***77,200***	***115,500***	***154,100***	***193,600***
	Eastern Mediterranean	AL	5,195,500	5,933,800	6,455,300	7,002,100
		ASAQ	2,009,700	1,886,900	1,810,900	1,896,800
		ASSP	1,576,200	1,599,000	1,610,900	1,610,900
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Med. Total		***8,781,300***	***9,419,700***	***9,877,000***	***10,509,600***
	Europe	AL	6,400	7,300	8,200	9,200
		ASAQ	-	-	-	100
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Total		***6,500***	***7,300***	***8,200***	***9,200***
	South-East Asia	AL	19,831,400	23,703,400	27,927,700	32,252,700
		ASAQ	1,500	2,100	2,800	3,400
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	2,500	3,100	3,600	4,200
	South-East Asia Total		***20,209,200***	***24,164,100***	***28,473,100***	***32,884,300***
	Western Pacific	AL	971,800	616,100	543,200	614,600
		ASAQ	4,800	5,700	6,600	7,500
		ASSP	-	-	-	-
		DP	163,000	103,800	90,600	90,600
		ASMQ	25,700	27,800	24,300	24,300
	Western Pacific Total		***1,165,200***	***753,400***	***664,700***	***736,900***
	Total	AL	***219,381,200***	***237,434,600***	***231,366,700***	***241,364,800***
	(all regions)	ASAQ	***63,084,300***	***69,010,800***	***70,129,300***	***70,206,900***
		ASSP	***1,576,200***	***1,599,000***	***1,610,900***	***1,610,900***
		DP	***163,000***	***103,800***	***90,600***	***90,600***
		ASMQ	***28,200***	***30,900***	***27,900***	***28,500***
GRAND TOTAL			***284,606,600***	***308,634,700***	***303,764,300***	***313,925,500***

Table 8 QAACT procurement by channel, by region, by ACT type, 2017 - 2020 (Baseline - Upper bound)

Channel	Region	ACT Type	2017	2018	2019	2020
Public	**Africa**	AL	116,496,300	127,893,200	114,647,600	117,079,500
		ASAQ	52,092,500	57,345,200	57,707,000	56,819,500
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Public Total		***168,588,800***	***185,238,500***	***172,354,600***	***173,899,000***
	Americas	AL	4,400	4,800	4,800	4,800
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Public Total		***4,400***	***4,800***	***4,800***	***4,800***
	Eastern	AL	1,657,100	1,890,700	1,890,000	1,890,000
	Mediterranean	ASAQ	1,434,500	1,240,400	1,091,100	1,100,200
		ASSP	1,576,200	1,599,000	1,610,900	1,610,900
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Med. Public Total		***4,667,800***	***4,730,100***	***4,591,900***	***4,601,000***
	Europe	AL	100	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Public Total		***100***	***-***	***-***	***-***
	South-East Asia	AL	953,800	659,100	635,500	636,500
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	South-East Asia Public Total		***953,800***	***659,100***	***635,500***	***635,500***
	Western Pacific	AL	649,400	220,700	73,200	68,000
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	163,000	103,800	90,600	90,600
		ASMQ	25,700	27,800	24,300	24,300
	Western Pacific Public Total		***838,000***	***352,300***	***188,100***	***182,800***
	Public Total	AL	***119,761,200***	***130,668,500***	***117,251,000***	***119,678,800***
	(all regions)	ASAQ	***53,527,100***	***58,585,600***	***58,798,100***	***57,919,700***
		ASSP	***1,576,200***	***1,599,000***	***1,610,900***	***1,610,900***
		DP	***163,000***	***103,800***	***90,600***	***90,600***
		ASMQ	***25,700***	***27,800***	***24,300***	***24,300***
	PUBLIC TOTAL		***175,053,000***	***190,984,700***	***177,774,900***	***179,324,200***
Private Subsidized	**Africa**	AL	57,820,100	57,820,100	57,820,100	57,820,100
		ASAQ	4,413,100	4,413,100	4,413,100	4,413,100
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Pvt. Sub. Total		***62,233,200***	***62,233,200***	***62,233,200***	***62,233,200***

	Americas	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Pvt. Sub. Total		**-**	**-**	**-**	**-**
	Eastern Mediterranean	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Mediterranean Pvt. Sub. Total		**-**	**-**	**-**	**-**
	Europe	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Pvt. Sub. Total		**-**	**-**	**-**	**-**
	South-East Asia	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	South-East Asia Pvt. Sub. Total		**-**	**-**	**-**	**-**
	Western Pacific	AL	-	-	-	-
		ASAQ	-	-	-	-
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Western Pacific Pvt. Sub. Total		**-**	**-**	**-**	**-**
	Private Subsidized Total (all regions)	AL	***57,820,100***	***57,820,100***	***57,820,100***	***57,820,100***
		ASAQ	***4,413,100***	***4,413,100***	***4,413,100***	***4,413,100***
		ASSP				
		DP				
		ASMQ				
	PRIVATE SUBSIDIZED TOTAL		***62,233,200***	***62,233,200***	***62,233,200***	***62,233,200***
Premium Private	**Africa**	AL	30,060,500	33,779,600	37,661,700	41,720,800
		ASAQ	8,081,300	9,499,800	10,986,400	12,550,400
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Pre. Pvt. Total		***38,141,700***	***43,279,400***	***48,648,000***	***54,271,300***
	Americas	AL	145,300	220,400	296,900	374,900
		ASAQ	2,400	3,700	4,900	6,200
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Pre. Pvt. Total		***147,700***	***224,000***	***301,800***	***381,100***
	Eastern Mediterranean	AL	10,411,800	12,539,300	14,742,900	17,025,800
		ASAQ	1,022,000	1,148,700	1,279,200	1,415,200
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Med. Pre. Pvt. Total		***11,433,800***	***13,688,000***	***16,022,000***	***18,441,000***

	Europe	AL	13,400	15,300	17,300	19,300
		ASAQ	100	100	100	100
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Pre. Pvt. Total		***13,500***	***15,400***	***17,300***	***19,400***
	South-East Asia	AL	40,521,200	49,475,300	58,603,300	67,892,000
		ASAQ	2,700	3,800	4,900	6,000
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	5,400	6,500	7,700	8,900
	South-East Asia Pre. Pvt. Total		***41,323,300***	***50,453,000***	***59,760,000***	***69,230,900***
	Western Pacific	AL	620,300	743,700	869,900	999,200
		ASAQ	99,100	129,300	159,800	190,300
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	68,400	86,600	105,200	124,000
	Western Pacific Pre. Pvt. Total		***787,800***	***959,700***	***1,134,900***	***1,313,500***
	Premium Private Total (all regions)	AL	***81,772,500***	***96,773,600***	***112,191,900***	***128,032,100***
		ASAQ	***9,207,500***	***10,785,400***	***12,435,200***	***14,168,300***
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	***73,800***	***93,100***	***112,900***	***132,900***
	PREMIUM PRIVATE TOTAL		***91,847,900***	***108,619,500***	***125,884,100***	***143,657,200***
TOTAL (across channels)	**Africa**	AL	204,376,900	219,492,900	210,129,400	216,620,400
		ASAQ	64,586,900	71,258,100	73,106,500	73,783,000
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Africa Total		***268,963,700***	***290,751,100***	***283,235,800***	***290,403,500***
	Americas	AL	149,700	225,200	301,700	379,700
		ASAQ	2,400	3,700	4,900	6,200
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Americas Total		***152,100***	***228,800***	***306,600***	***385,900***
	Eastern Mediterranean	AL	12,068,900	14,430,000	16,632,900	18,915,800
		ASAQ	2,456,500	2,389,100	2,370,300	2,515,400
		ASSP	1,576,200	1,599,000	1,610,900	1,610,900
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Eastern Mediterranean Total		***16,101,600***	***18,418,100***	***20,613,900***	***23,042,000***
	Europe	AL	13,500	15,300	17,300	19,300
		ASAQ	100	100	100	100
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	-	-	-	-
	Europe Total		***13,600***	***15,400***	***17,300***	***19,400***
	South-East Asia	AL	41,475,000	50,134,400	59,238,800	68,528,500
		ASAQ	2,700	3,800	4,900	6,000
		ASSP	-	-	-	-
		DP	-	-	-	-
		ASMQ	5,400	6,500	7,700	8,900
	South-East Asia Total		***42,277,100***	***51,112,100***	***60,395,500***	***69,867,400***

	Western Pacific	AL	1,269,700	964,400	943,100	1,067,200
		ASAQ	99,100	129,300	159,800	190,300
		ASSP	-	-	-	-
		DP	163,000	103,800	90,600	90,600
		ASMQ	94,100	114,400	129,500	148,300
	Western Pacific Total		***1,625,800***	***1,312,000***	***1,323,000***	***1,496,300***
	Total	AL	***259,353,700***	***285,262,200***	***287,263,200***	***305,530,900***
	(all regions)	ASAQ	***67,147,700***	***73,784,100***	***75,646,500***	***76,501,000***
		ASSP	***1,576,200***	***1,599,000***	***1,610,900***	***1,610,900***
		DP	***163,000***	***103,800***	***90,600***	***90,600***
		ASMQ	***99,500***	***120,900***	***137,200***	***157,200***
GRAND TOTAL			***329,134,100***	***361,837,500***	***365,892,200***	***385,214,600***

Table 9 Oral artemisinin monotherapy demand by region and channel, 2017 – 2020

Channel	Region	2017	2018	2019	2020
Public	Africa	-	-	-	-
	Americas	-	-	-	-
	Eastern Mediterranean	-	-	-	-
	Europe	-	-	-	-
	South-East Asia	-	-	-	-
	Western Pacific	-	-	-	-
	Public Total	**-**	**-**	**-**	**-**
Private Formal	Africa	139,460	101,689	83,765	58,860
	Americas	531	443	358	180
	Eastern Mediterranean	27,936	17,974	12,518	6,186
	Europe	50	32	21	9
	South-East Asia	4,332	3,828	3,782	3,672
	Western Pacific	7,327	7,957	8,934	9,841
	Private Formal Total	**179,637**	**131,923**	**109,377**	**78,748**
Private Informal	Africa	288,037	216,973	186,051	141,157
	Americas	645	544	441	223
	Eastern Mediterranean	39,094	24,672	16,764	7,700
	Europe	52	33	23	10
	South-East Asia	3,963	3,622	3,553	3,335
	Western Pacific	6,774	7,100	7,809	8,433
	Private Formal Total	**338,564**	**252,944**	**214,640**	**160,859**
Total *(across channels)*	Africa	427,497	318,662	269,816	200,017
	Americas	1,175	987	798	403
	Eastern Mediterranean	67,030	42,646	29,282	13,886
	Europe	103	65	44	20
	South-East Asia	8,295	7,450	7,335	7,007
	Western Pacific	14,101	15,056	16,742	18,274
Grand Total		**518,201**	**384,867**	**324,017**	**239,607**

Table 10 Private sector Injectable artemisinin demand, by region, 2017 – 2020 (Standard Units: Artemether 80 mg, Artemotil 150 mg, AS 60 mg)

Region	Product Type	2017	2018	2019	2020
Africa	Artemotil	11,589	11,816	12,043	12,271
	AS	4,920,174	5,079,950	5,242,161	5,406,806
	Artemether	14,572,723	14,644,795	14,708,649	14,764,285
	Africa	***19,504,486***	***19,736,561***	***19,962,853***	***20,183,362***
Americas	Artemotil	32	32	33	33
	AS	13,846	14,117	14,389	14,660
	Artemether	-	-	-	-
	Americas	***13,877***	***14,149***	***14,421***	***14,694***
Eastern Mediterranean	Artemotil	3,156	3,218	3,280	3,342
	AS	1,779,385	1,892,137	2,007,884	2,126,625
	Artemether	2,665,844	2,455,303	2,234,654	2,003,896
	Eastern Mediterranean	***4,448,386***	***4,350,658***	***4,245,817***	***4,133,863***
Europe	Artemotil	5	5	5	5
	AS	2,116	2,157	2,199	2,240
	Artemether	-	-	-	-
	Europe	***2,121***	***2,162***	***2,204***	***2,245***
South-East Asia	Artemotil	7,999,495	8,156,348	8,313,201	8,470,054
	AS	421,733	430,003	438,272	446,541
	Artemether	825,387	841,571	857,755	873,939
	South-East Asia	***9,246,615***	***9,427,921***	***9,609,227***	***9,790,534***
Western Pacific	Artemotil	208	212	216	220
	AS	129,192	131,725	134,259	136,792
	Artemether	34,744	35,426	36,107	36,788
	Western Pacific	***164,144***	***167,363***	***170,581***	***173,800***
Private Total *(all regions)*	Artemotil	8,014,484	8,171,631	8,328,778	8,485,925
	AS	7,266,446	7,550,089	7,839,162	8,133,665
	Artemether	18,098,698	17,977,095	17,837,165	17,678,908

Table 11 Private sector Rectal artemisinin demand, by region, by formulation, 2017 – 2020

Region	Formulation	2017	2018	2019	2020
Africa	80mg. artemether	1,566,591	1,568,215	1,569,715	1,569,715
	100 mg. artesunate	2,076,502	2,111,309	2,146,604	2,146,604
Americas	80mg. artemether	1,928	1,947	1,967	1,967
	100 mg. artesunate	2,345	2,368	2,392	2,392
Eastern Mediterranean	80mg. artemether	192,334	194,257	196,200	196,200
	100 mg. artesunate	233,935	236,275	238,637	238,637
Europe	80mg. artemether	295	298	301	301
	100 mg. artesunate	358	362	366	366
South-East Asia	80mg. artemether	8,783	8,871	8,960	8,960
	100 mg. artesunate	10,683	10,790	10,898	10,898
Western Pacific	80mg. artemether	12,662	12,788	12,916	12,916
	100 mg. artesunate	15,400	15,554	15,710	15,710
Private Total	**80mg. artemether**	**1,782,592**	**1,786,377**	**1,790,059**	**1,790,059**
	100 mg. artesunate	**2,339,224**	**2,376,658**	**2,414,607**	**2,414,607**

Table 12 QA Injectable artesunate public sector procurement by region, 2017 – 2020 (60 mg. vials)

Region	2017	2018	2019	2020
Africa	26,244,200	26,723,600	25,463,800	24,280,200
Americas	-	-	-	-
Eastern Mediterranean	1,010,500	1,018,200	961,700	983,000
Europe	200	100	100	100
South-East Asia	16,700	14,500	7,700	7,700
Western Pacific	72,600	33,000	19,200	19,200
TOTAL	**27,344,200**	**27,789,300**	**26,452,400**	**25,290,100**

Table 13 RDT demand by channel, by region, 2017 – 2020

Channel	Region	2017	2018	2019	2020
Public	Africa	430,543,557	471,096,318	502,061,251	527,240,563
	Americas	484,835	489,905	494,899	499,812
	Eastern Mediterranean	53,734,203	56,533,643	59,137,046	60,985,293
	Europe	-	-	-	-
	South-East Asia	13,779,131	13,922,631	14,064,705	14,203,976
	Western Pacific	3,520,385	3,573,572	3,625,977	3,677,067
	Public Total	**502,062,111**	**545,616,068**	**579,383,878**	**606,606,711**
Private Formal	Africa	91,132,693	99,485,539	105,993,820	111,351,177
	Americas	75,721	76,540	77,348	78,142
	Eastern Mediterranean	18,395,231	19,043,706	19,693,848	20,214,581
	Europe	-	-	-	-
	South-East Asia	29,213,204	29,529,985	29,843,964	30,151,719
	Western Pacific	2,111,165	2,143,229	2,174,848	2,205,674
	Private Formal Total	**140,928,014**	**150,278,999**	**157,783,828**	**164,001,293**
Private Informal	Africa	46,528,802	50,295,972	52,982,283	55,062,647
	Americas	26,082	26,369	26,651	26,929
	Eastern Mediterranean	5,681,799	5,951,122	6,206,808	6,395,807
	Europe	-	-	-	-
	South-East Asia	2,595,318	2,625,046	2,654,453	2,683,480
	Western Pacific	840,975	853,984	866,858	879,560
	Private Informal Total	**55,672,976**	**59,752,493**	**62,737,053**	**65,048,423**
Total	Africa	568,205,052	620,877,829	661,037,354	693,654,388
(across channels)	Americas	586,638	592,814	598,897	604,882
	Eastern Mediterranean	77,811,234	81,528,471	85,037,703	87,595,681
	Europe	-	-	-	-
	South-East Asia	45,587,653	46,077,662	46,563,122	47,039,174
	Western Pacific	6,472,525	6,570,785	6,667,683	6,762,301
GRAND TOTAL		**698,663,101**	**755,647,560**	**799,904,759**	**835,656,427**

Table 14 RDT public sector procurement, by region, 2017 – 2020

Region	2017	2018	2019	2020
Africa	256,646,500	247,344,600	228,901,600	231,459,600
Americas	1,664,900	1,548,900	1,050,000	1,051,000
Eastern Mediterranean	5,710,100	5,107,700	5,045,400	5,131,700
Europe	45,900	21,600	21,600	21,600
South-East Asia	6,100,100	4,786,000	4,685,700	4,689,100
Western Pacific	7,764,400	6,127,100	4,112,200	4,449,400
TOTAL	**277,931,900**	**264,936,000**	**243,816,600**	**246,802,400**

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