Unitaid

FORECAST REPORT

GLOBAL MALARIA DIAGNOSTIC AND ARTEMISININ TREATMENT COMMODITIES DEMAND FORECAST

2017 – 2021

May 11, 2018

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 fourth and final report in a series of market projections, and provides an update to the baseline estimate of the size of the malaria commodity market that was presented in the prior published report (https://unitaid.eu/assets/Unitaid-ACT-Forecasting_Report-5_May-2017.pdf). In addition, this report covers the potential impact of changes to the Global Fund's Private Sector Co-Payment Mechanism (CPM) on Artemisinin Combination Therapy (ACT) markets, provides estimates for the public sector procurement of quality-assured rectal artesunate suppositories for treatment of severe malaria, and extends the forecast period from 2017 through 2021.This Forecasting Consortium builds on previous models for estimating the size of the market for 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* (*P. 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.

Need

Our projections suggest that there were 16.0 billion (B) fevers in 2017 among malaria-at-risk populations, and that 999 million (M) 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.

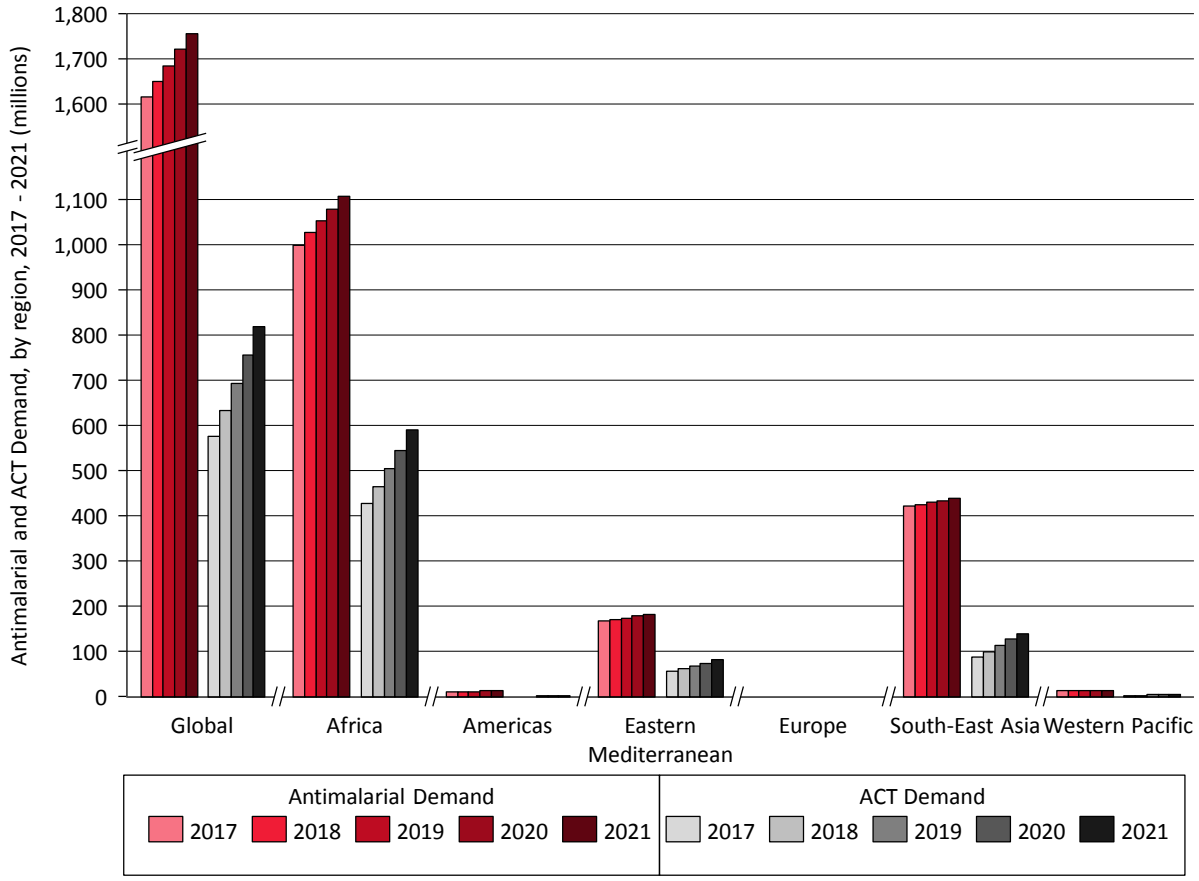
We estimate that approximately 707M of the 999M total “need” is among African populations, due to the much higher level of parasitemia on that continent.

The estimate of this “need” is expected to rise between 2017 and 2021, largely with population growth. Fevers in parasitemic populations are projected to increase from 999M to 1.1B 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.

Demand

The global demand for antimalarial medicines is estimated to be over 1.6B antimalarial treatment courses in 2017, and is forecast to grow to over 1.7B treatments by 2021. ACTs (QAACTs and non-QAACTs) currently comprise roughly 36% of this demand in 2017, with their share projected to expand to 47% of antimalarial demand by 2021.

Antimalarial and ACT Demand, by region, 2017 - 2021 (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 forecast period, 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 428M treatments, rising (assuming

continued product availability) to 539M treatments in 2021. The majority of this demand (>78%) 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 147M treatments in 2017, rising to 250M treatments in 2021. Most of this demand will be in the private channel, split relatively evenly between the formal and informal settings. Among QAACT product combinations, artemether-lumefantrine (AL) will continue to have the highest market share, with consumer demand rising from 328M treatments in 2017 to 433M treatments in 2021. Artesunate-amodiaquine (ASAQ) is projected to remain in second place, with demand growing from 93M treatments in 2017 to 126M in 2021.

Demand for RDTs is expected to grow over this timeframe as well, from 754M tests in 2017 to 953M in 2021. 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 526,000 treatments in 2017 to 175,000 treatments in 2021.

Artemisinin demand is expected to grow from 176 metric tons (MT) in 2017 to 218MT in 2021. The growth in artemisinin demand is driven by 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 (50-62%) of API demand.

Procurement

Although 2017 will see the lowest global procurement volumes for quality-assured ACTs (QAACTs) since 2011, the potential absence of Nigeria's further investment in the Private Sector Co-Payment Mechanism, coupled with CPM volume reductions in other countries, will drive a further decline in the global market for QAACTs. QAACT volume, projected around 286 million (M) treatments procured in 2017, will decline to 268M treatments in 2019 before rebounding to 278M treatments in 2021. This trend assumes that of the countries currently participating in the private sector Co-Payment Mechanism (CPM) (Ghana, Kenya, Madagascar, Nigeria, Tanzania, and Uganda), Nigeria will no longer fund CPM procurement in 2018 and beyond, Uganda will face volume reductions in mid-2019 and beyond, Tanzania will implement a progressive plan to reduce subsidy payments on procurement, and that other countries (where information is currently limited) will continue to procure QAACTs are 2017 levels during the forecast period.

The decline in QAACT procurement will be somewhat offset by a projected increase in PMI funding in 2018, and expanded use of QAACTs in the premium private sector. Our upper bound projections for this market includes more aggressive assumptions behind QAACT use in the premium private sector, and assumes that Nigeria and Uganda will dedicate funds toward CPM QAACT procurement to achieve procurement of 50% of the estimated need in Nigeria, and 100% of estimated need in Uganda. The product share among QAACT drug combinations is unlikely to change significantly during the next four years. The current list of WHO-pre-qualified (WHO-PQ) ACTs includes the following:

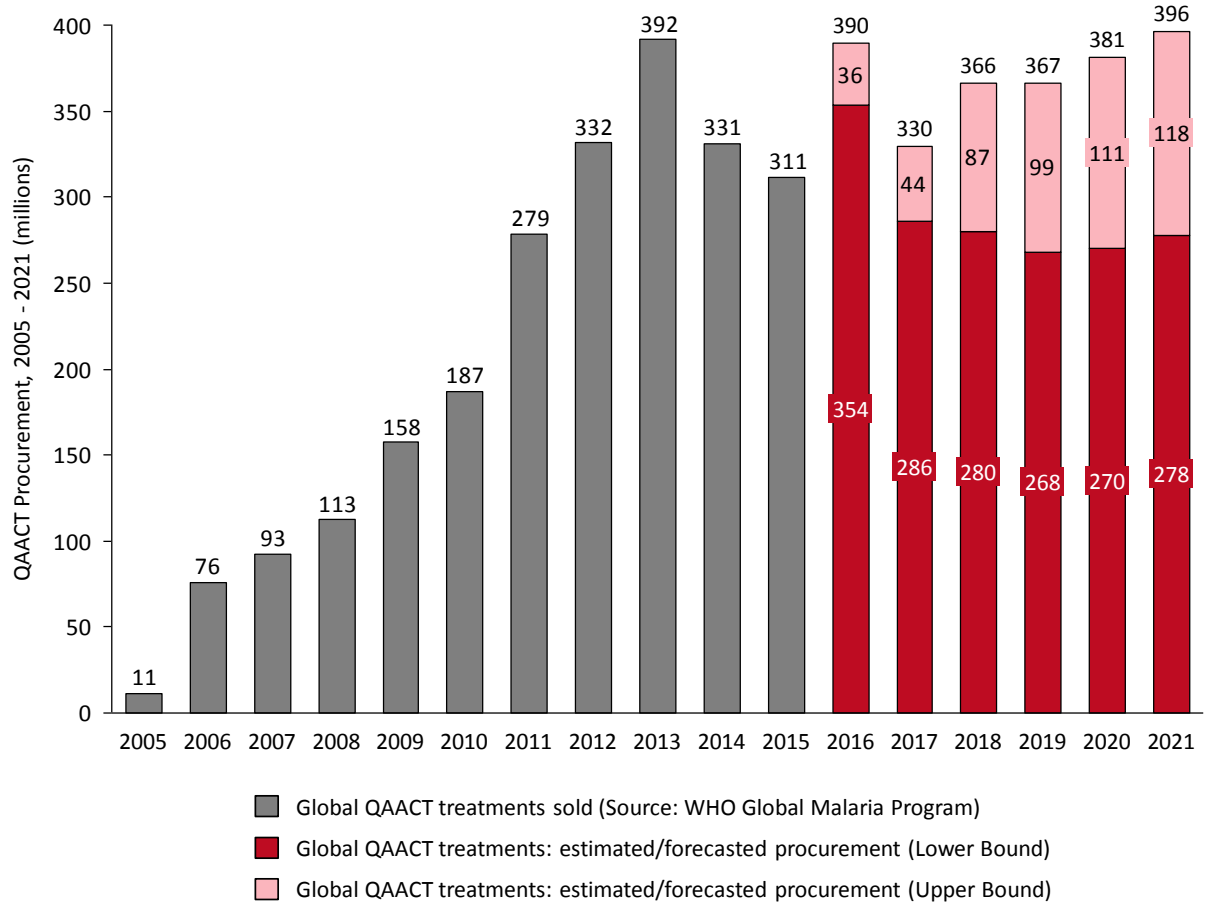
- five artesunate-amodiaquine fixed-dose combination (FDC) products (ASAQ);
- seven artemether (20 mg)-lumefantrine (120 mg) non-dispersible FDC products (AL);
- three AL (40 mg/240 mg) FDC products;
- two AL (60mg/360mg) FDC products;
- three AL (80mg/480mg) FDC products;
- four dispersible AL (20mg/120 mg) FDC products;
- two FDC products of dihydroartemisinin-piperaquine (DHA-PPQ);
- two FDC products of artesunate-mefloquine (ASMQ);

- one artesunate-pyronaridine (ASPY) FDC product; and
- one artesunate-sulfadoxine-pyrimethamine (AS+SP) co-blister pack.

AL will continue to dominate the market for QAACTs through 2021.

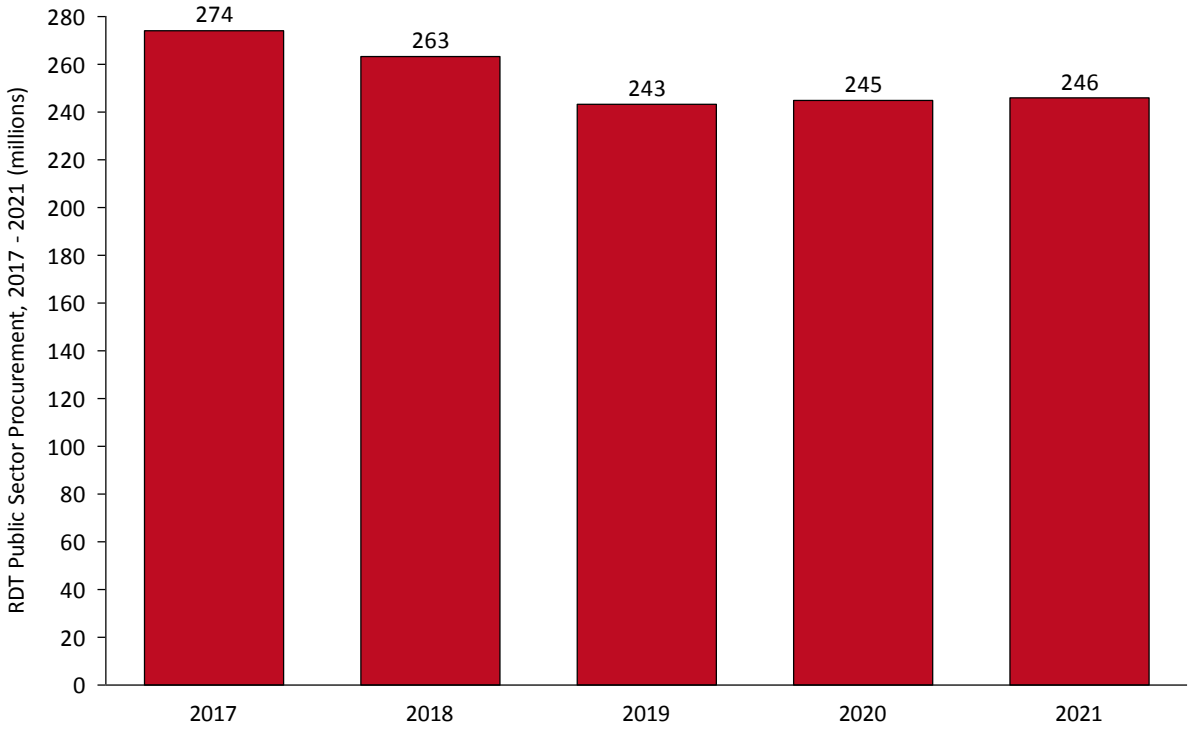
In the non-subsidized private sector (the premium private market), QAACT procurement is projected to increase over the next few years from 47M treatments in 2017 to 73M treatments in 2021.

QAACT market: Historical and forecast growth, 2005 – 2021 (millions)



Public sector procurement for QAINJAS, the WHO-recommended treatment for severe malaria, will remain relatively stable between 29M 60 mg. vials in 2017 and 27M in 2021. The slight decrease in projected QAINJAS procurement between 2017 and 2019 is driven by a slight decrease in projected funding of QAINJAS as severe malaria burden decreases. Public sector procurement for quality-assured rectal artesunate suppositories, the WHO-recommended pre-referral treatment for severe malaria patients who have poor access to adequate health care, is estimated to grow from 288,000 100 mg. suppositories in 2017 to 573,000 in 2021, owing to the launch of quality-assured products, and adoption of WHO guidelines in a number of sub-Saharan African countries.

RDT procurement, Public Sector, 2017 - 2021 (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

interventions, and the percentage of funding earmarked for RDT procurement remaining stable. We estimate global public sector procurement of RDTs at 274M tests in 2017, declining to 243M in 2019. Modelled estimates of RDT procurement in the public sector are projected to remain relatively flat between 2019 and 2021, reaching 246M in 2021.

Implications

The markets for malaria diagnostics and treatment commodities are likely to remain very large and important during the next four years. International funding for QAACT procurement remains robust but is expected to decline owing to reductions in participation in, or funding of, the CPM, and, depending on how programs respond to the Global Fund's call for malaria funding requests, we could even see a steep 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 continued 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

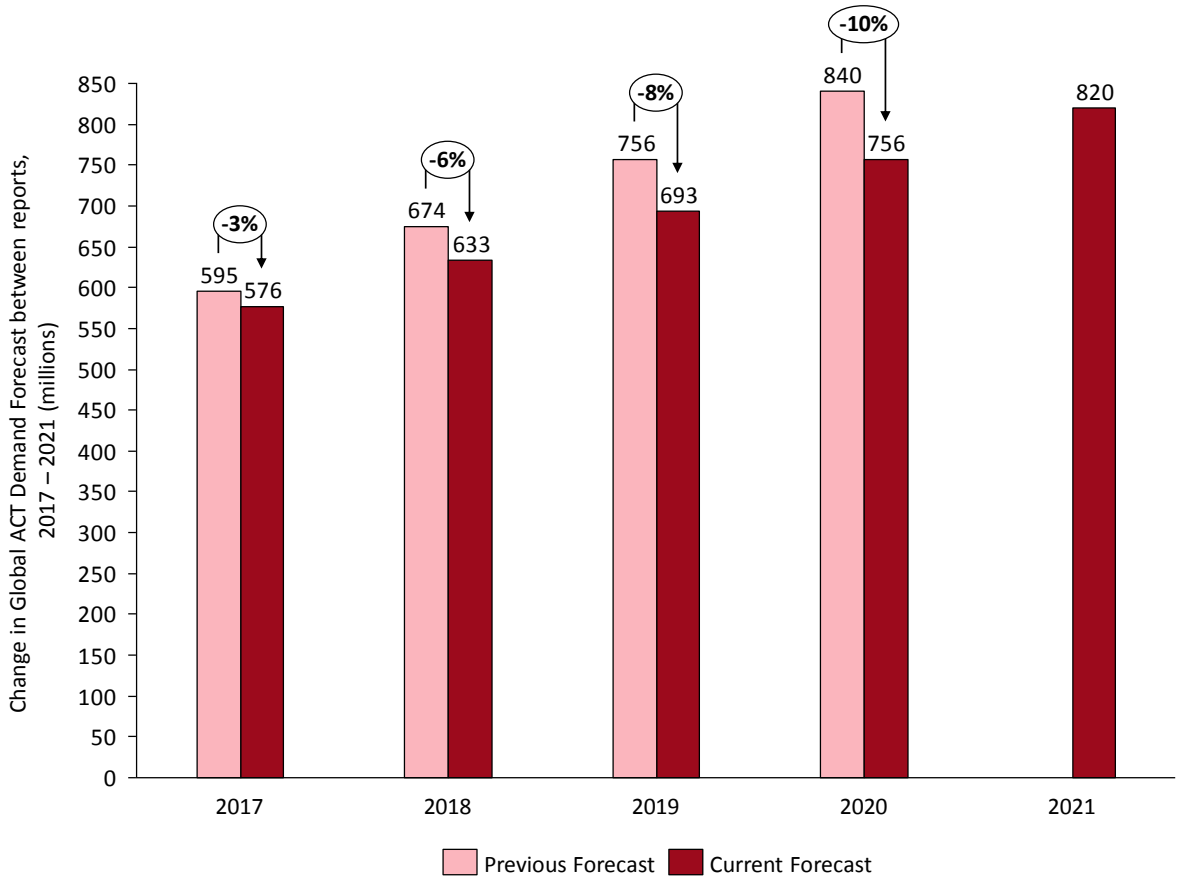
Since the publication of the previous report, some minor updates have been made to the source data: we updated source data for the fevers, need, and demand models based on recent data from domestic household surveys.

Major updates to the methods include:

- An update to the ACT growth trend that we apply to our demand model. Previous ACT growth (year-on-year expansion of the use of ACTs among antimalarial treatments) was assumed to be 4% based on aggregate growth curves of ACT share since adoption of ACTs in national treatment guidelines. This assumption was adjusted down to 2.81% and was based on analysis of oral ACT volume growth in private sector markets representing a significant portion of sales (IMS data from francophone West Africa and South Asia). We used the same 2.81% growth assumption for ACT share in the public sector based on analysis of aggregate growth since the adoption of ACTs in national treatment guidelines.

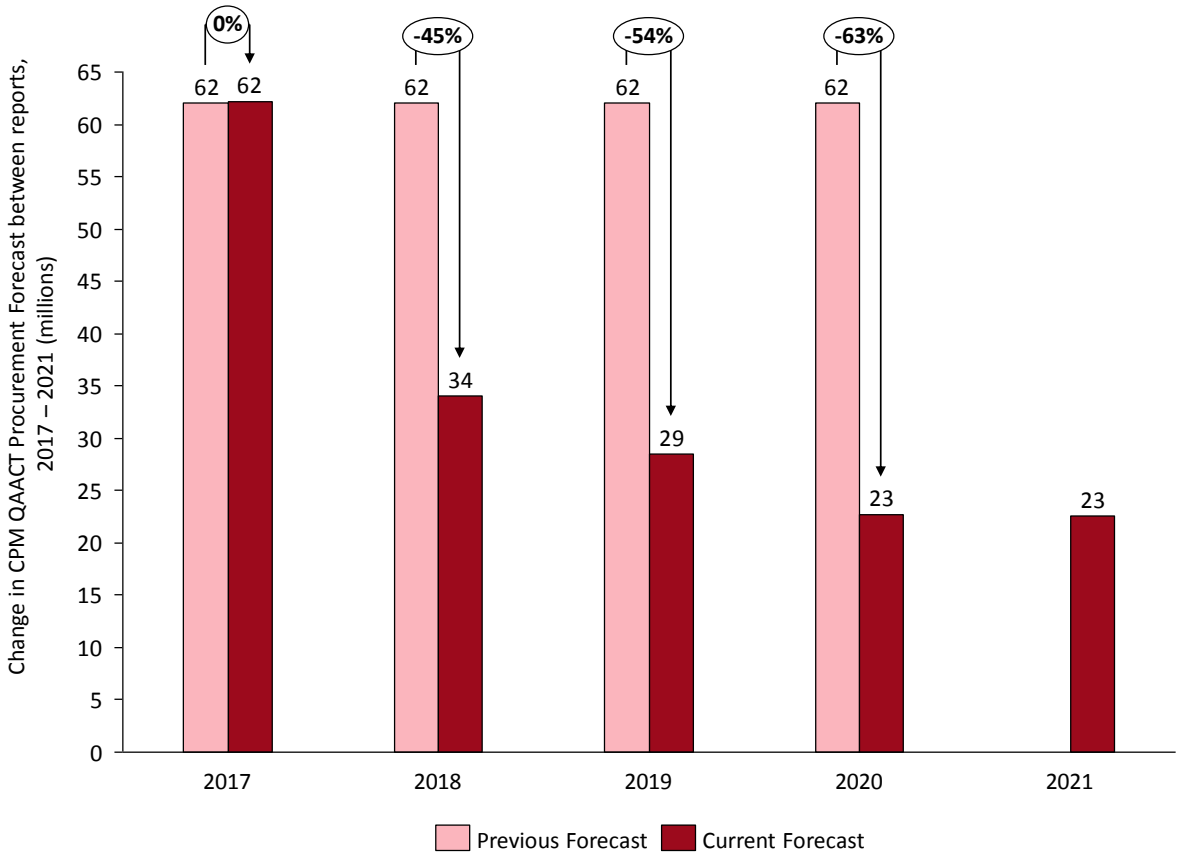
  This change in the ACT growth assumption has resulted in a compounded 3% to 10% decline in our ACT demand estimates, as compared to our previous forecast.

Change in ACT Demand from the Previous Forecast, 2017 – 2021



- We have updated the ACT procurement model to incorporate upcoming changes to procurement through the Global Fund's private sector co-payment mechanism. Although, at time of report drafting, not all CPM-participating countries have submitted a funding request to the GF, we have used preliminary details from submitted funding requests to generate revised figures for ACT procurement. These details are presented later in the report, but generally reflect a declining trend in CPM QAACT funding, leading to a projected 45% to 63% decrease from our previous forecast for CPM QAACT procurement.

Change in CPM QAACT Procurement from the Previous Forecast, 2017 – 2021



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, support for the continuation of private-sector QAACT co-payment subsidies under the Private Sector Co-Payment mechanism (CPM) in 2018-2021 remains unclear; funding for this program will be reduced in some countries, when compared to the funding allocated in previous years, and unless novel donors pledge to support ongoing CPM activities in Nigeria,

the Nigerian CPM program is likely to terminate at the end of 2017. The resulting decline in QAACT demand could potentially drive artemisinin prices even lower. 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 generally cover a four to five year forecast period, with this report forecasting the outputs listed above, at a global level, covering 2017 – 2021. 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://unitaid.eu/assets/ACT-and-RDT-Methodology-UNITAID.pdf.

2. FORECAST OUTPUTS 2017 – 2021

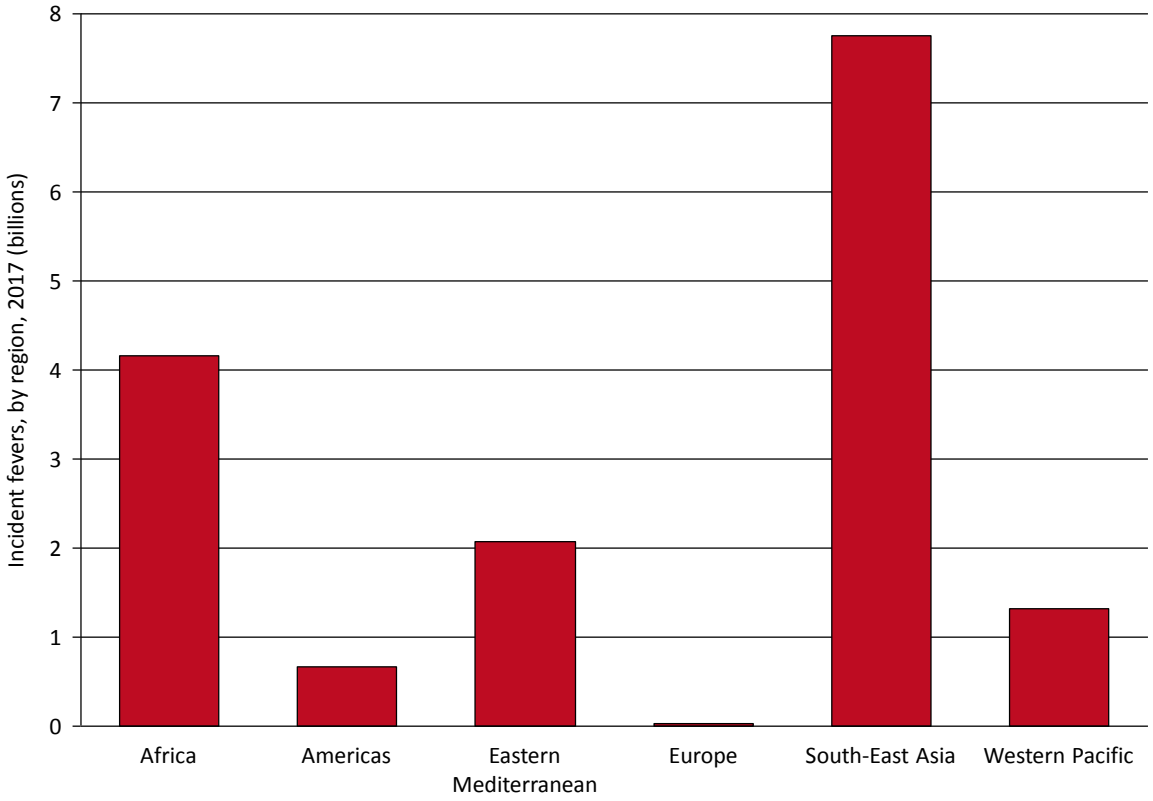
ACT Need

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 16 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)

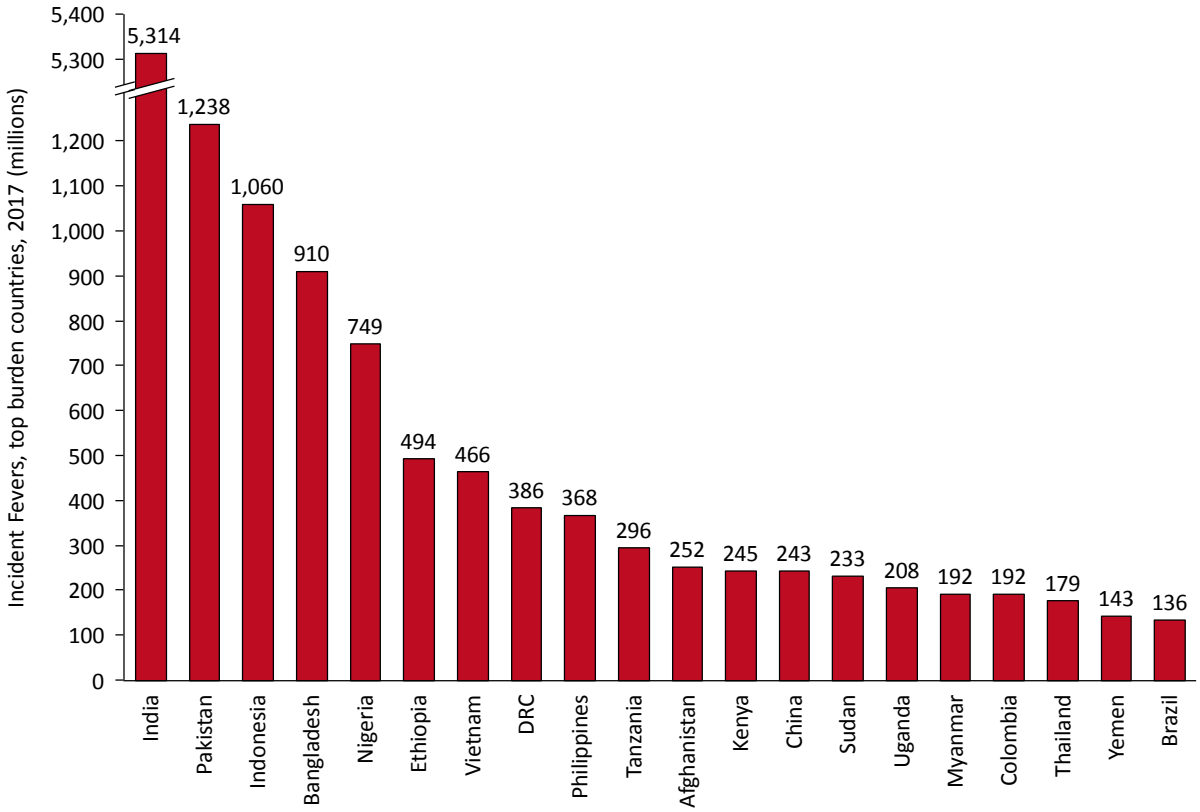


Adopting population-weighted 2010 global *P. falciparum* prevalence estimates obtained from the Malaria Atlas Project (MAP; we used population-weighted 2015 *P. falciparum* prevalence estimates from MAP for all countries in sub-Saharan Africa), we estimate that nearly half of all incident fevers in *P. 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 4.2B 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)

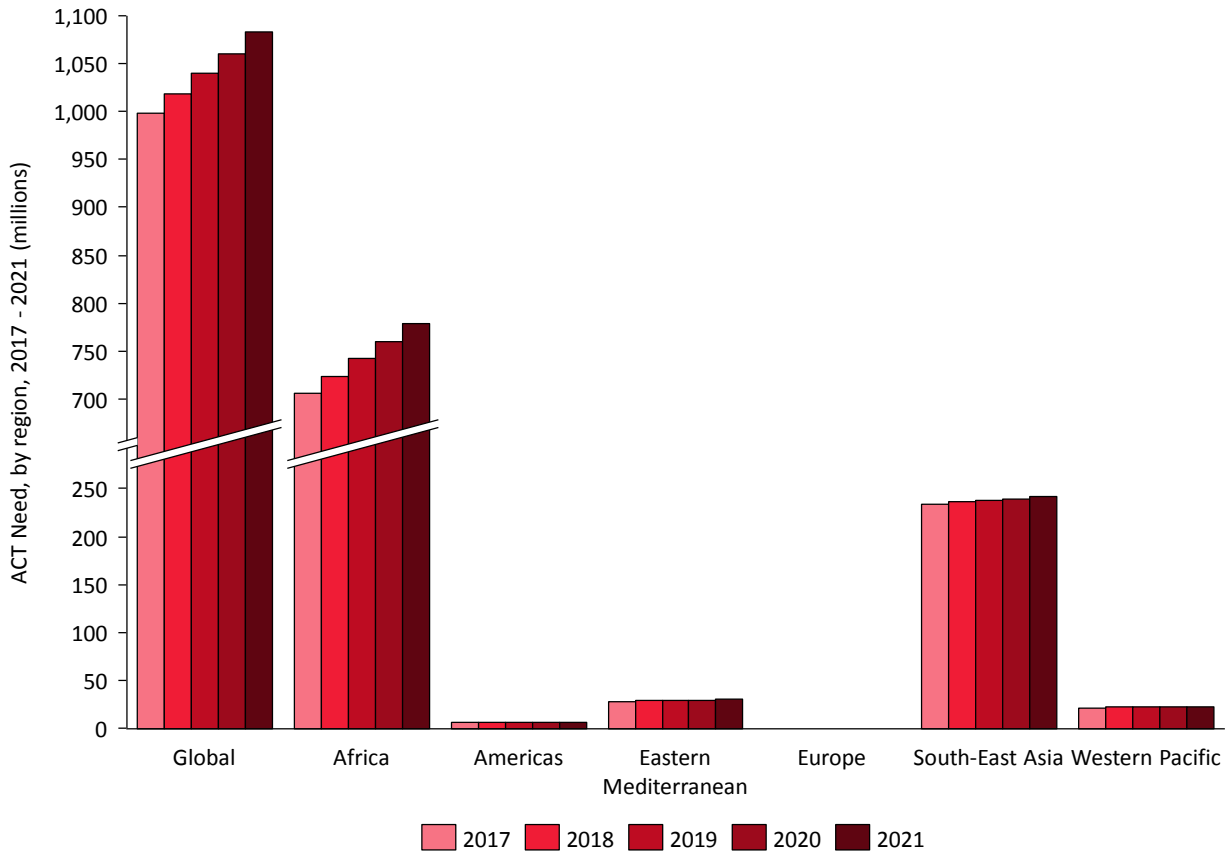


Note: China includes only Hainan and Yunnan provinces

Applying adjusted malaria prevalence to the 2017 fever estimates results in an estimate of 999 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 999M 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.

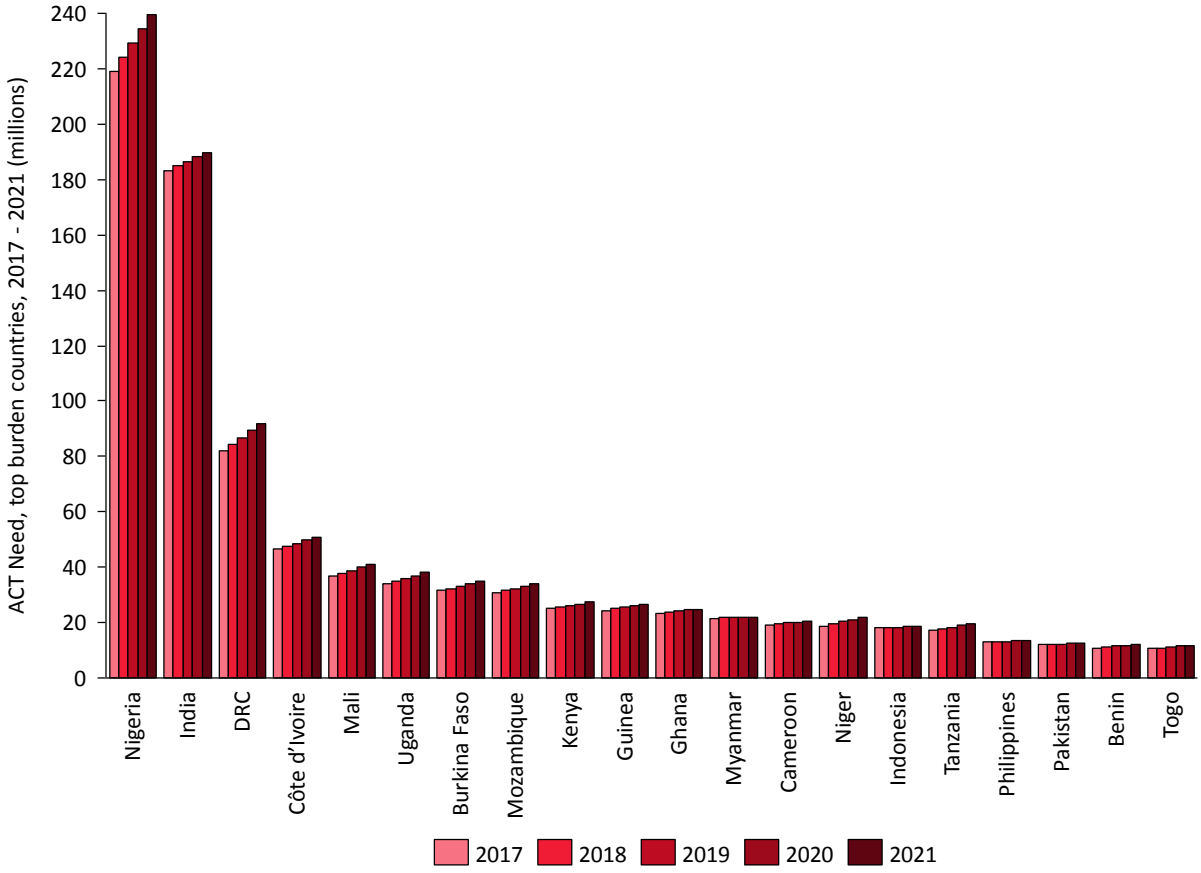
Figure 3 ACT need, by region, 2017 - 2021 (millions)



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 - 2021 (millions)



Discussion: ACT need

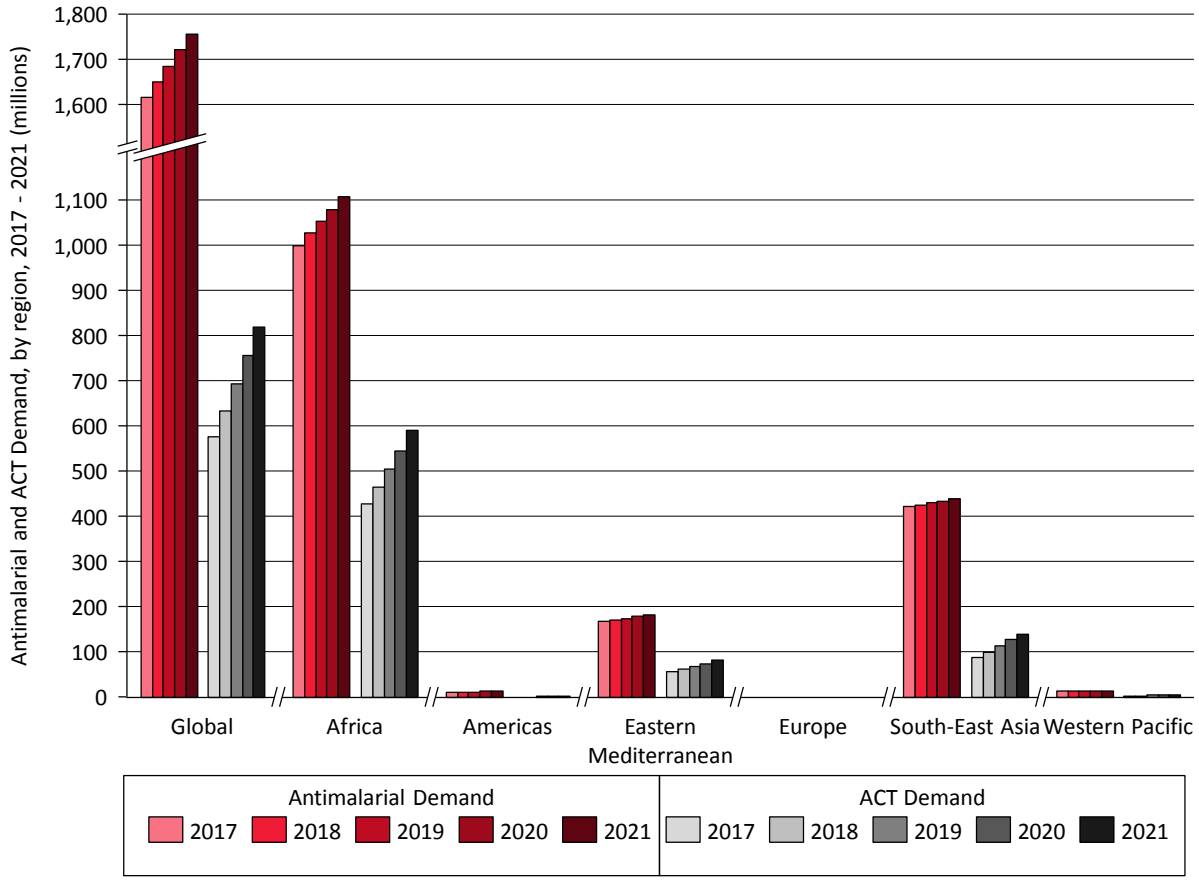
We defined ACT need as the number of antimalarial medicines required to treat all febrile illness concurrent with a detectable (by microscopy or RDT) *P. falciparum* malaria infection, regardless of whether (a) the individual with the febrile illness sought treatment for that illness, (b) whether a febrile 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 999M 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 (1.6B in 2017, growing to 1.7B in 2021) and ACT (QAACTs and non-QAACTs) demand (576M in 2017, growing to 820M in 2021) 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 427M treatments in 2017, growing to 589M treatments in 2021, and accounting for approximately 72% 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 - 2021 (millions)

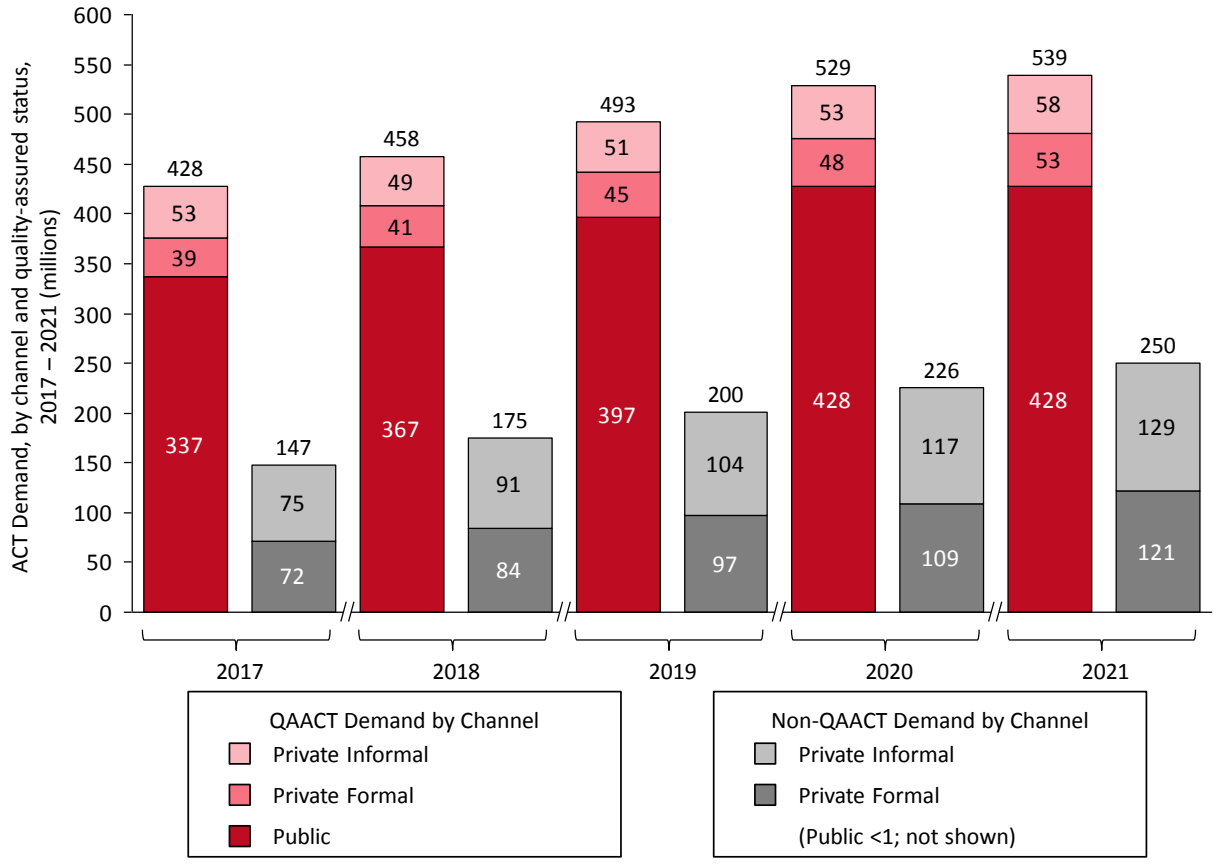


The public sector remains the main source of global ACT demand, accounting for 59% of total ACT demand in 2017 (Figure 6). However, we expect that over the next four years, private sector ACT demand will grow faster than public sector demand, which will reduce the public sector's share of global ACT demand to 54% in 2021. 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 19% 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 through 2015) to segment demand in the formal

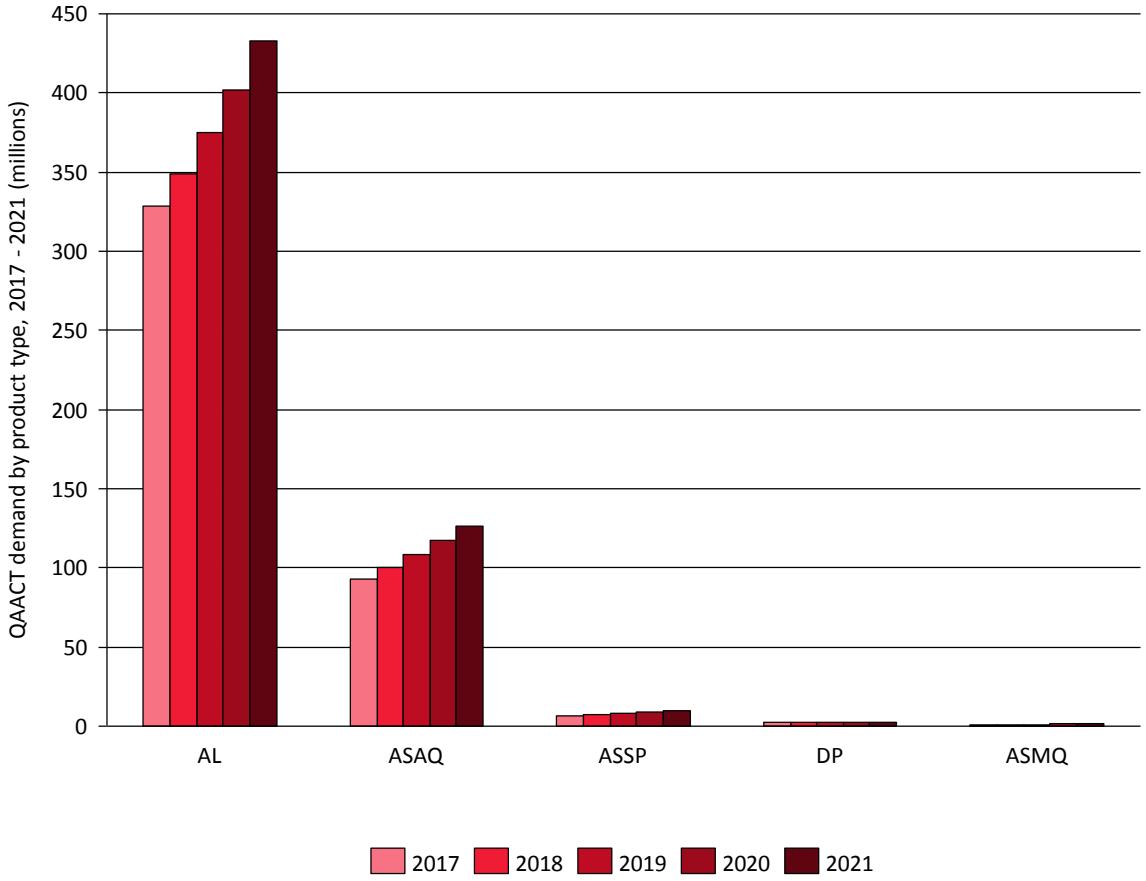
private and informal private channels by quality-assured drug classification. Based on these data, we project that in 2017, non-QAACTs make up approximately 30% of total private sector ACT demand in ex-AMFm countries (Ghana, Kenya, Madagascar, Niger, Nigeria, Tanzania and Zanzibar, Uganda) and 76% of total private sector ACT demand in non-AMFm countries.

Figure 6 ACT global demand, by quality-assured drug classification and distribution channel, 2017 - 2021 (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 432M treatments in 2021, while demand for quality-assured ASAQ will expand from 93M treatments in 2017 to 126M in 2021.

Figure 7 QAACT global demand, by product type, 2017 - 2021 (millions)



Discussion: ACT demand

Using IMS's extensive private sector sales data, our analysis presents 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 30% of global ACT demand.

Although population growth and our annual 2.81% growth assumption behind ACT market share may be the main drivers 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. Negative drivers to ACT demand would include continuing trends in decreasing malaria incidence, which could in turn be influenced by scale-up of ongoing interventions (e.g., seasonal malaria chemoprevention (SMC), and vector control measures such as novel insecticide-treated bednets, and the potential adoption of ivermectin treatments in both human subjects and agricultural herd animals). The Access-SMC Partnership (a Unitaid-funded SMC project comprised of organizations including Malaria Consortium, Catholic Relief Services, MMV, the London School of Hygiene and Tropical Medicine, Speak up Africa, and Management Sciences for Health) recently presented findings from SMC projects conducted between 2015 and 2017, at the WHO Technical Consultation on Universal Access to Core Malaria Interventions, in February 2018. In their report, they estimate that between 2015 and 2016, ACCESS-SMC programs may have averted 6M malaria cases. Assuming that each averted case represents an ACT treatment that is no longer needed for the population in this setting, continued deployment of current SMC programs across all target regions could reduce demand (and procurement) of ACTs by 3M or more, per year. This figure would increase with expansion of SMC programs to new settings, or increased coverage of, and compliance with, SMC in existing targeted areas.

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 for countries taking part in the CPM, the majority of the private sector QAACT procurement is through the CPM, and have not quantified procurement of QAACTs in 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.

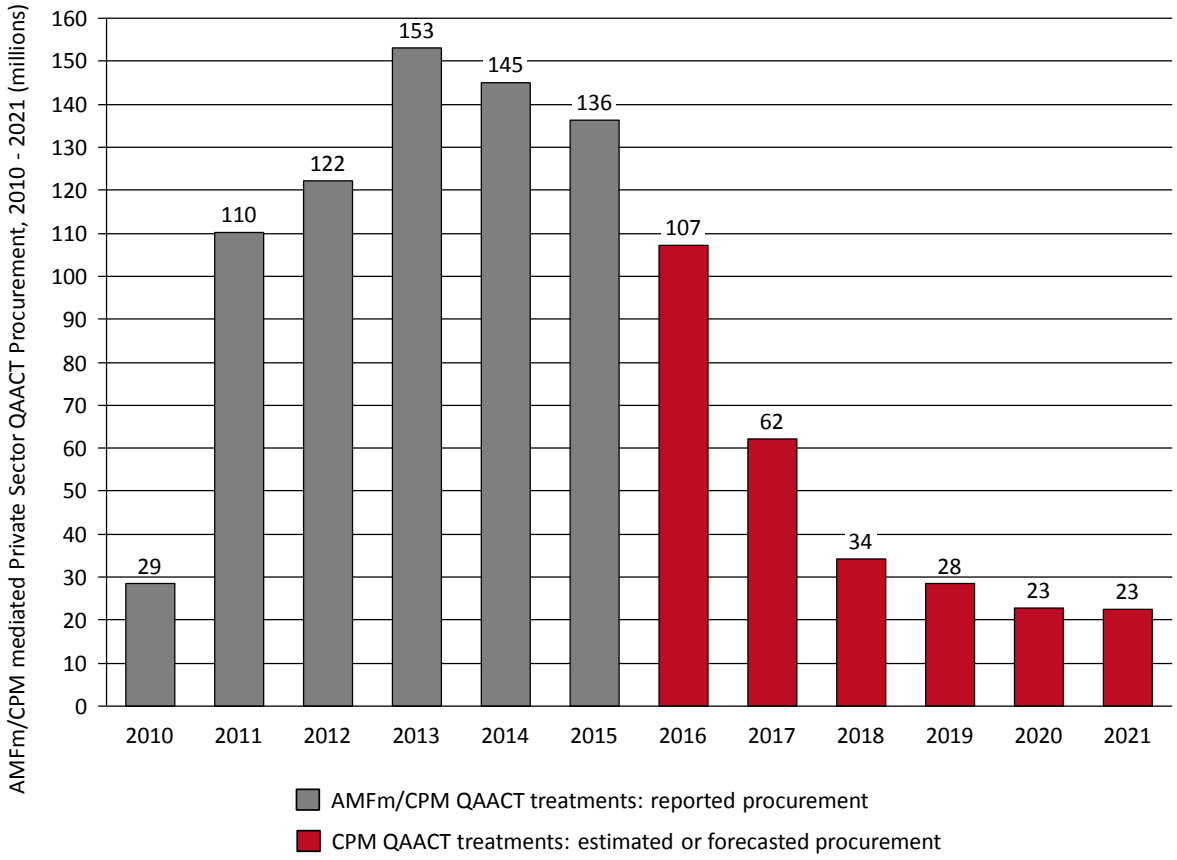
Historically, the US Government's President's Malaria Initiative (PMI) helped coordinate country-level efforts in the provision and rapid scale-up of QAACTs. Given programmatic flexibilities in the treatment commodity procurement space, PMI has also been successful in filling developing gaps in treatment 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 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.

QAACT Procurement through the Private Sector Co-Payment Mechanism, 2018 – 2021

The Private Sector Co-Payment Mechanism has transformed from the Affordable Medicines Facility for malaria (2010 – 2013), to a funded allocation under Global Fund grants (2014 – present). With the general reduction in Global Fund funding envelopes for most countries in the lead up to the 2018 – 2020 funding round, countries have had to balance their continued participation in the CPM program against other programmatic needs. While financial commitments for the continuation of CPM QAACT procurement remain somewhat unclear beyond 2017, we have assumed that, at the time of this report's drafting, CPM-participating countries that have submitted 2018-2020 funding requests to the Global Fund will follow the allocations, as detailed in their funding requests, for subsidized private sector QAACT treatment volumes in 2018, 2019, and 2020. Our forecast does not include QAACT volumes that would be

procured using fund that are outlined in Global Fund funding requests as above the funding allocation for each country. For the CPM-participating countries that have not submitted 2018-2020 funding requests to the Global Fund, at the time of this report's drafting, we have assumed that subsidized private sector QAACT treatment volumes for 2018, 2019, and 2020 will be equivalent to 2017 estimations. We have extended the forecast for CPM QAACT procurement through 2021 under the assumption that countries opting to continue support for the program in 2018-2020 will likely continue to support this program beyond 2020.

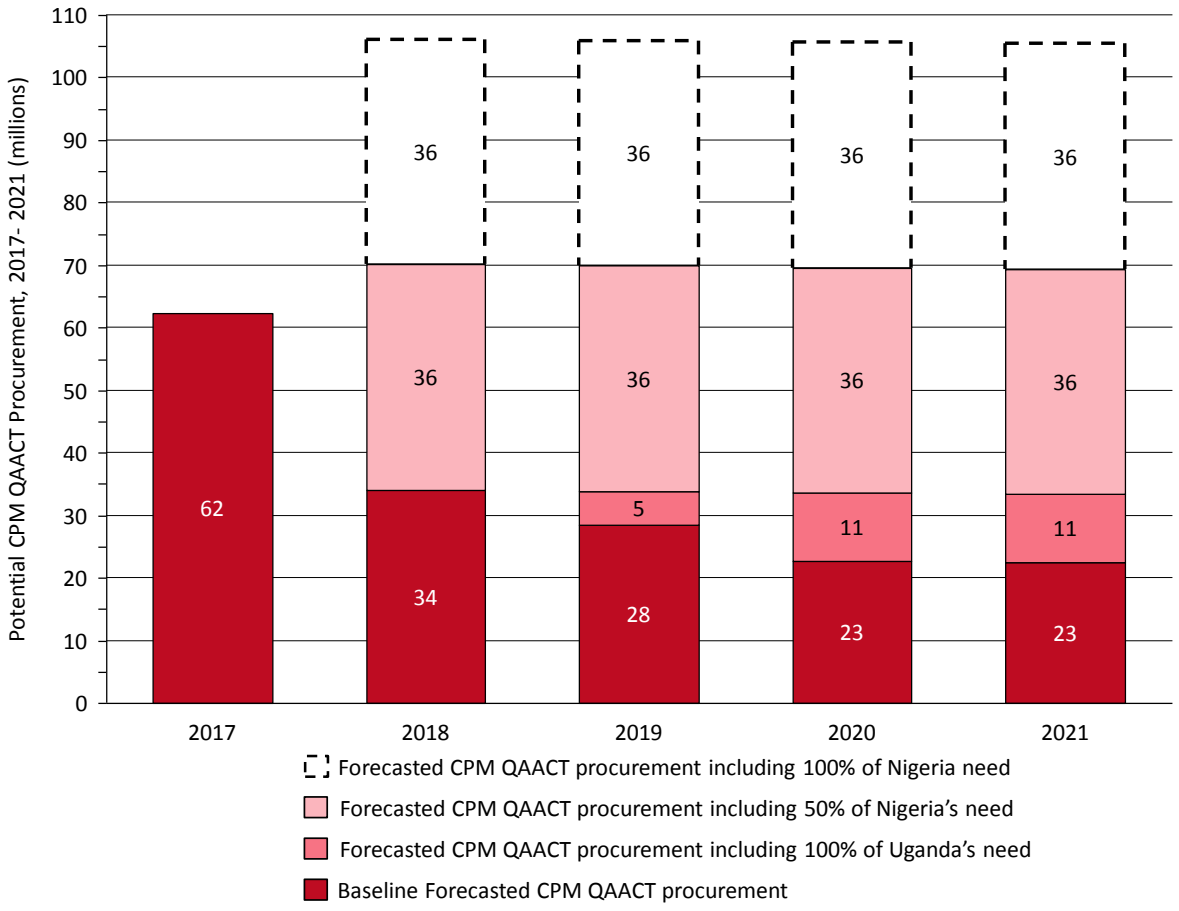
Figure 8 Historical and Forecast CPM QAACT Procurement, 2010 – 2021 (millions)



The need to balance malaria program priorities under more restrictive budgets has led to a significant reduction in total allocated funds for the CPM over the 2018 – 2020 forecast period, and a continuation of a diminishing trend in QAACT procurement volumes since their peak in

2013 (Figure 8). Funding allocations have not yet been finalized through grant signing at the Global Fund, but even if budgets are modified to increase procurement volumes, or if other donors contribute above-allocation funds to supplement currently-budgeted QAACT procurement, QAACT volumes would still be significantly below their peak during the early AMFm years; QAACT volumes for the CPM would only return to levels above 100 M treatments per year in the event that Nigeria received funding for its full programmatic need (Figure 9). While there may be developments that would result in such large quantities of CPM QAACTs being funded, we believe that such efforts have a limited likelihood for success, and therefore present a conservative outlook for the CPM market from 2018 – 2021.

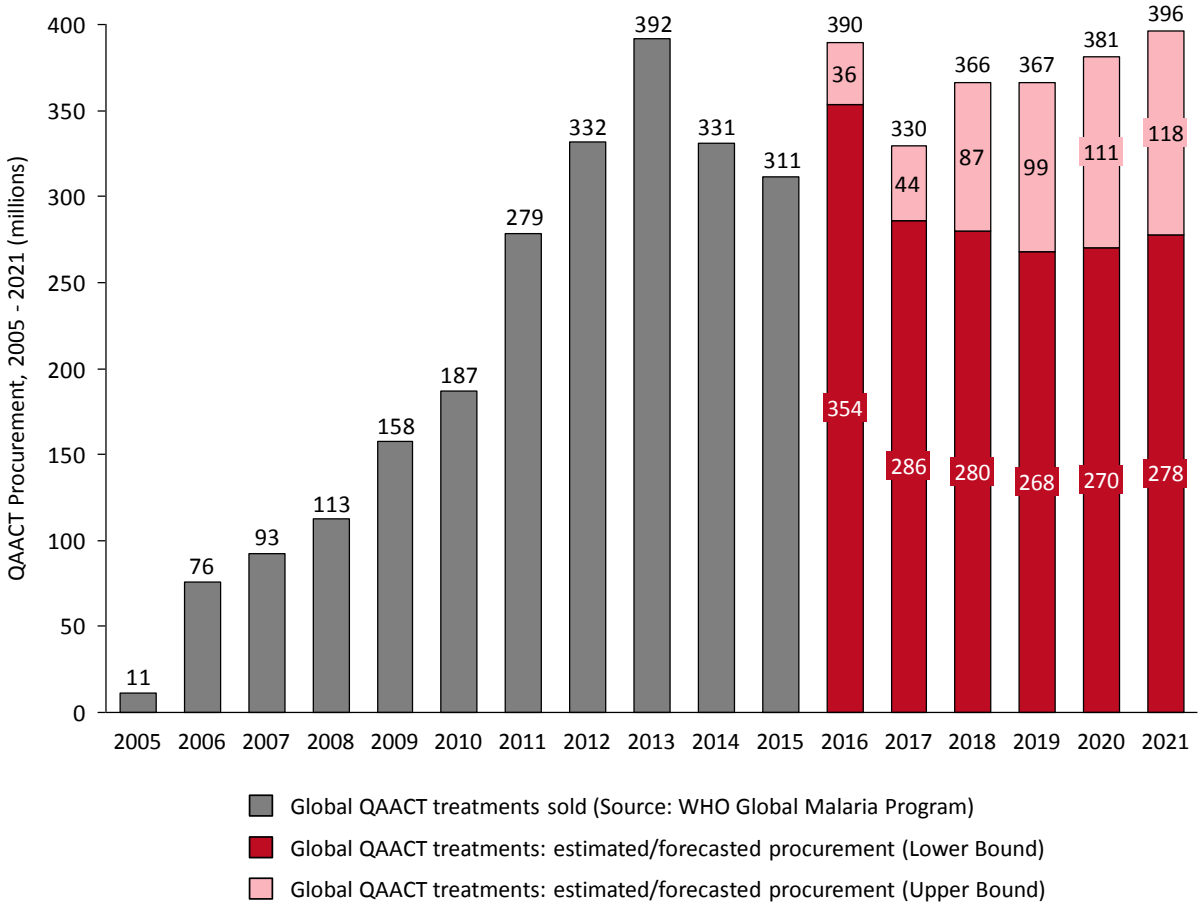
Figure 9 Potential CPM QAACT Procurement, 2017 – 2021 (millions)



QAACT Procurement Forecast Outputs 2018 – 2021

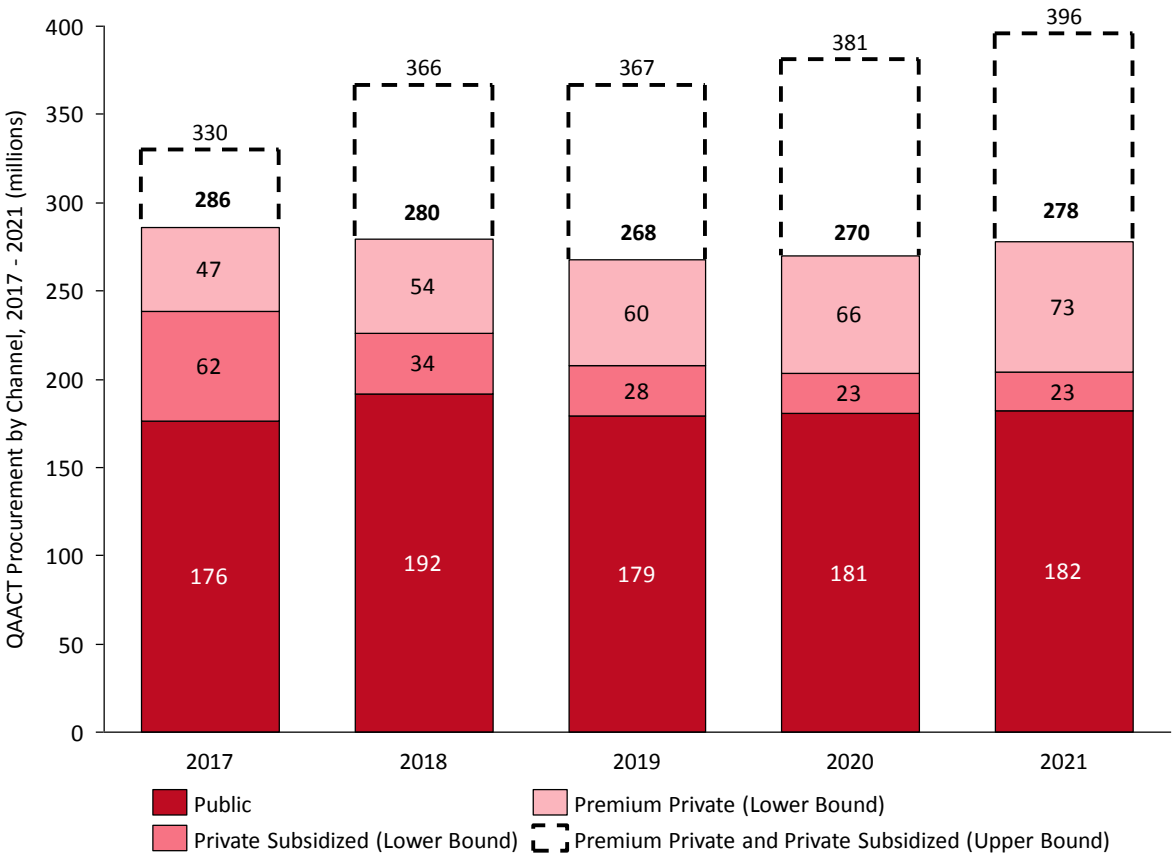
Our lower bound QAACT procurement forecast (which we also consider the base case) projects 286M QAACTs to be procured across all channels in 2017, with this figure declining to 268M in 2019, before rebounding to 278M in 2021 (Figure 10). Our upper bound forecast estimates 330M QAACTs will be procured in 2017, with this number increasing to 367M in 2019 before growing to 396M in 2021. The underlying drivers 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), and the potential for expanded volumes under the CPM in Nigeria and Uganda.

Figure 10 QAACT market: Historical and forecast growth, 2005 – 2021 (millions)



In 2017, QAACT procurement is forecast to be the highest in the public sector (176M QAACTs) followed by the private subsidized sector (CPM; 62M QAACTs) and the premium private sector (47M QAACTs) (Figure 11). 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). Despite 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, the reduction in CPM procurement will overcome QAACT growth, leading to a decrease in QAACT procurement from 286M in 2017 to 280M in 2018. This decrease will continue into 2019, and unless additional funding for QAACT procurement is made available either by donors or domestic sources, the downward trend in QAACT procurement will only begin to reverse with expansion of QAACT use in the premium private sector and public sector in 2020 and 2021.

Figure 11 QAACT procurement, by channel, 2017 - 2021 (millions)



The African region will continue to constitute the majority of QAACT treatments procured in the public sector as nineteen of the twenty countries comprising over 90% of global ACT demand are located in this region (Figure 12). 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 (73% to 76%) and ASAQ picking up almost all of the remainder (Figure 13). AS+SP, DHA-PPQ, and ASMQ will continue to be minor players in the QAACT procurement market (Figure 14); annual procurement volumes for QA-AS+SP will be approximately 1.55M treatments in 2017, and will decrease to 1.44M by 2021. QA DHA-PPQ will decline during this period, from 127,000 treatments to some 71,000 per year, due to reductions in geographies where the quality-assured drug is used, while ASMQ volumes will hold steady around 23,000 treatments per year. We have not forecast artesunate-pyronaridine

volumes in this report because it has not yet been included as a recommended treatment for malaria in the most recent WHO treatment guidelines.

Figure 12 QAACT public sector procurement, by region (Africa and others), 2017 – 2021 (millions)

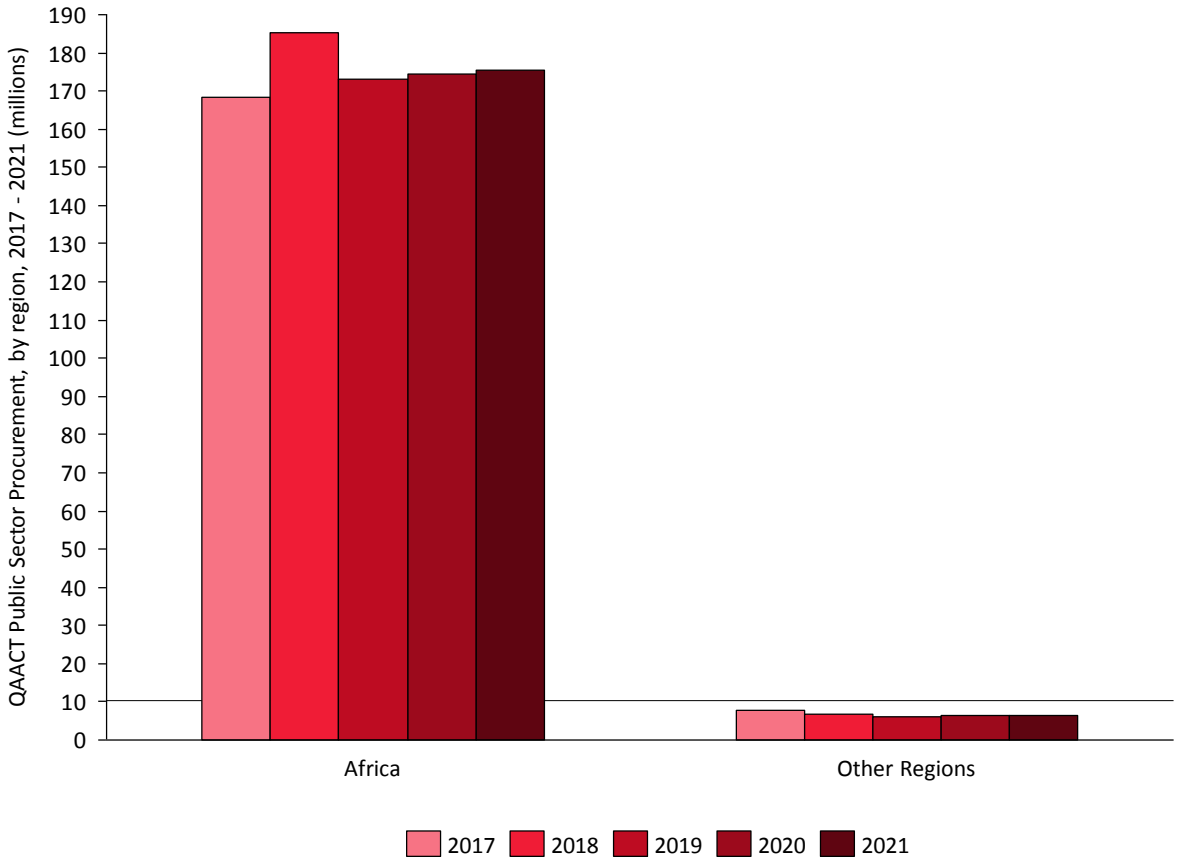


Figure 13 QAACT procurement, by product type, 2017 – 2021 (millions)

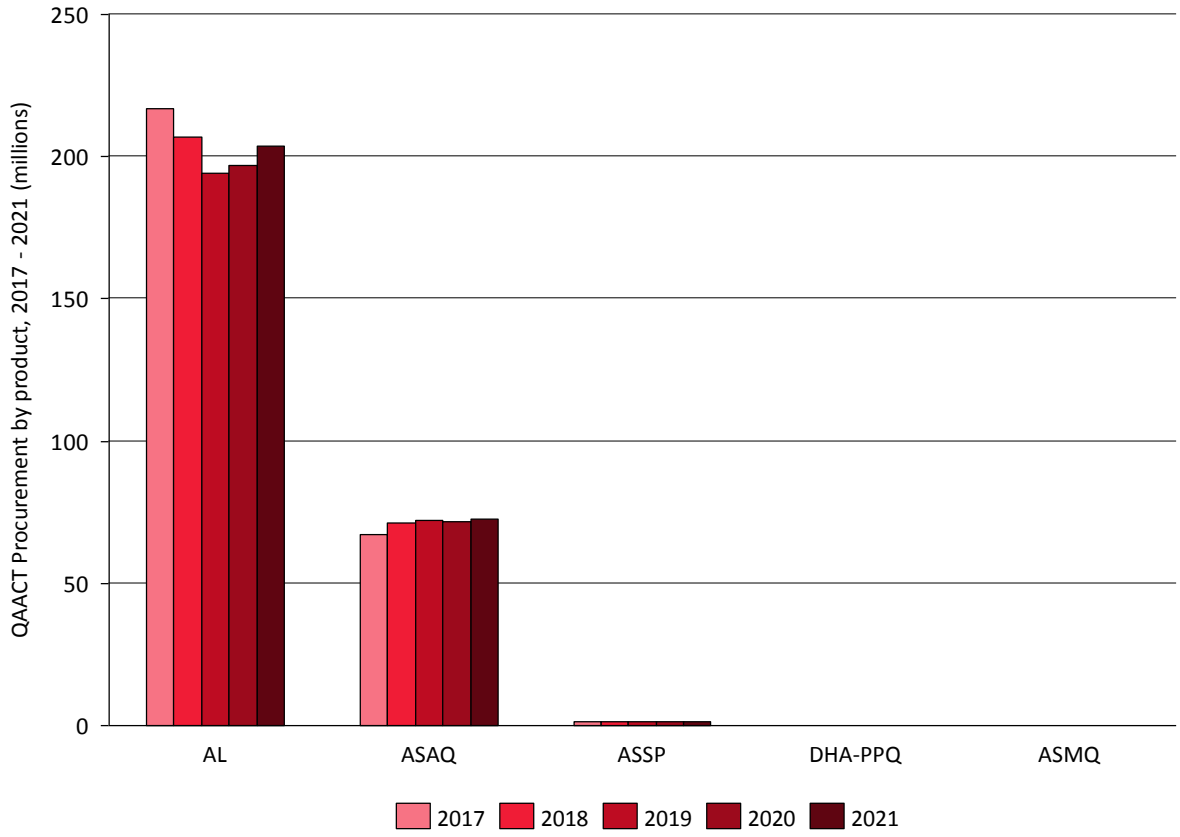
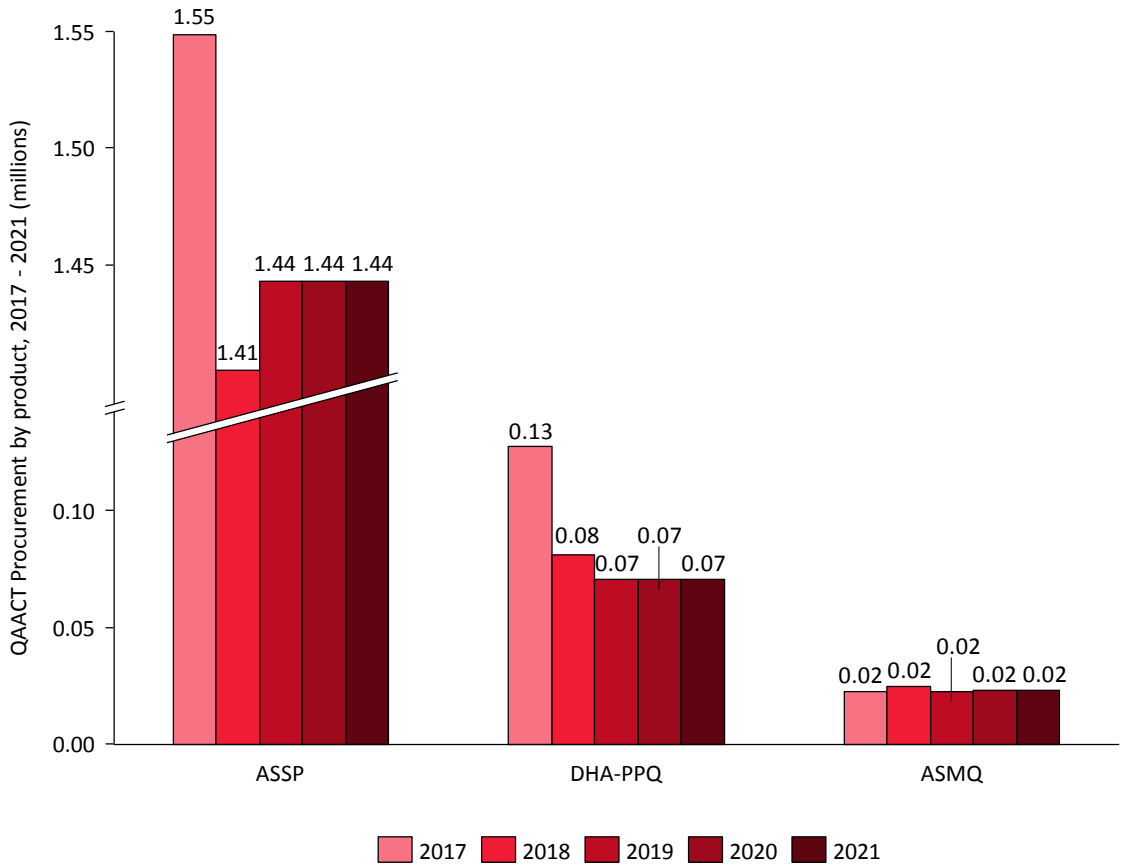


Figure 14 QAACT procurement, by product type (low-volume QAACT products), 2017 – 2021 (millions)



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, and is not necessarily predictive of future allocations in the upcoming funding cycle.

Discussion: Impact of CPM QAACT Procurement Decline

To achieve a better understanding of how the decline in QAACT procurement volume will affect local ACT markets in CPM countries, we conducted in-person interviews with sixteen first-line buyers (representing an aggregate volume of 35,396,948 QAACTs procured through the CPM in 2016), in three CPM countries where the program will undergo significant changes (Nigeria, Tanzania, and Uganda). During these interviews, we asked a series of questions about the importer's impressions of the current private sector ACT market in their country, and asked how their business case and market strategy would change under two hypothetical scenarios: (1) the volume limits or the subsidies for QAACTs under the CPM were reduced significantly, and (2) The CPM program was terminated completely. We have summarized the aggregate findings from our discussions with these sixteen importers, by country, below.

Nigeria

In 2018, Nigeria will likely face the most drastic change in QAACT treatment access in the private sector since the introduction of AMFm. In their 2018 funding request to the Global Fund, Nigeria budgeted financing for procurement of 50% of their private sector QAACT need through the CPM, but designated this funding as an above-allocation allotment, which means that unless an outside donor finances CPM QAACT procurement in Nigeria, there will be zero QAACTs procured through the CPM in Nigeria in 2018 – 2020. Although a concerted effort may lead to funding solutions that would enable continuation of the program in some form in Nigeria, at the time of drafting this report, it seems unlikely that an outside donor will step in to fund the continuation of this program, even at the level of 50% procurement need; a 3-year budget exceeding $82M.

We interviewed seven Nigerian importers; most of them procured only QAACTs through the CPM, though a few also bought non-QAACTs, specifically the higher dose FDCs (e.g., 80/480 mg. AL) because of their advantage for niche marketing in the private sector. One importer that we interviewed also distributed small volumes (approximately 500,000 treatments per year) of their own branded, high-dose FDC AL product, sourced from a non-QAACT manufacturer based in China. The importers unanimously agreed that if the CPM program were to continue, they would continue to participate and buy subsidized QAACTs as they deemed there was always

going to be a market for these medicines. However, if the subsidy is reduced to the point where the importer cost is greater than ~$0.45 per treatment (which some importers cited as the approximate cost of a non-QAACT), then non-QAACTs would begin to erode QAACT market share. The erosion of QAACT market share would be driven by competitive pricing of non-QAACTs, and the perceived superior convenience of the non-QAACT high-dose FDC AL packs offered in the private sector. All of the importers expressed concerns about a hypothetical (but likely) scenario where the CPM is terminated in Nigeria. Among their concerns if the CPM was terminated:

- Through the CPM program, importers have built strong relationships with individual suppliers. The importers worry that suppliers will look to reduce the number of importers that they sell to in country, or that they would no longer sell QAACT products to them, preferring to distribute QAACTs through their own subsidiaries

- The CPM program includes a 20% waiver on the import duties for QAACTs. If the program ends, this waiver would disappear, increasing the cost of importing QAACTs into the country

- Rural consumers are less able to afford the cost of non-subsidized QAACTs than urban consumers. The cost of distributing products to rural areas is high, and because most importers purchase goods on credit (with an expectation of enough profitable returns to cover losses and expenses), and rural consumers wouldn't be able to pay the high costs of unsubsidized QAACTs, consumers in rural areas would lose access to QAACTs in the private sector

- In 2017, deliveries of CPM QAACTs have been delayed well into the third quarter of the year. With QAACTs stocked out across the private sector, the price of non-subsidized QAACTs (e.g., Novartis's Coartem) ranged between $2.80 and $3.40 per treatment pack, and many of the importers filled demand by selling non-QAACTs at a price point (~$1.40) between the low subsidized QAACT retail prices (~$0.42 - $0.56) and the high non-subsidized QAACT prices. If the CPM is terminated, the importers expect ACT prices to increase across the board, and although some importers will not consider selling non-QAACTs (and will likely drop out of the market), others said that they will fill demand by selling significantly more non-QAACTs

- The investments made in developing the AMFm green leaf logo as a brand, and establishing consumer knowledge of and trust in products with the green leaf logo will be lost, and consumers will return to purchasing malaria treatments that they are more familiar with from past practices.

In conclusion for Nigeria, it seems likely that the termination of the CPM will lead to a reduction in access to QAACTs from the private sector across the country, with QAACTs likely only available, at great out-of-pocket expense, in high wealth urban communities. The vacuum of QAACT access will likely be filled by non-QAACTs that are registered by Nigerian regulatory authorities (NAFDAC). Consumers will likely stick to ACTs if they can afford them, but a significant portion of consumers will not be able to afford ACTs and will revert to alternative antimalarials or traditional medicines.

Tanzania

In Tanzania, the NMCP has planned for CPM procurement of their full estimated need over three years, but the subsidy level will decline from 70% in year 1 to 60% in year 2, and finally 50% in year 3. We interviewed three importers representing 38% of CPM QAACTs procured in 2016. These importers stated that there is little demand for antimalarials that are not ACTs, and there is little to distinguish between QAACTs and non-QAACTs as providers and consumers know that all products sold are licensed and registered in Tanzania, and are thus all considered to have assured quality. Some consumers prefer products with the green leaf logo, and distributors / customers might be willing to pay a small premium (~5%) for these CPM QAACTs. However, the main factor differentiating the QA vs. non-QA products is their price, and importers believe this price differential will drive the uptake of non-QAACTs if the availability of CPM QAACTs is reduced.

Although (at the time of drafting this report) it looks like Tanzania will continue to provide CPM QAACTs during the upcoming 2018-2020 funding cycle, Tanzanian importers are worried that termination of the CPM would remove the downward price pressure imposed by CPM QAACTs in the private sector, and could also cause non-QAACT prices to drift upwards. If this is the case, significant portions of the population would have limited access to appropriate antimalarial medicines.

Uganda

In Uganda, the program has only allocated funds to cover 50% of programmatic need, but procurement (under a 70% subsidy rate) will be heavily weighted for year 1, with funds likely to stretch through the middle of year 2. We interviewed six importers representing 42% of CPM QAACTs procured from January 2016 through May 2017. All of the importers stated that they would stay in the market as long as the CPM is running, but that customer loyalty to QAACTs, or even ACTs in general, is price sensitive and therefore questionable. In the event of a cessation of the CPM program, Ugandan importers believe that non-QAACTs will replace QAACT market share, and that consumers will not revert to using chloroquine or SP. Importers stated that QAACTs would need to be priced equivalently to or below the cost of non-QAACTs (citing non-QAACTs prices about 30% to 40% below the cost of QAACTs) for importers to buy them outside of the CPM, and co-payments under the CPM need to remain cost-advantageous for QAACTs over non-QAACTs, otherwise importers would begin to lean toward filling their demand with non-QAACTs.

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 have had 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, and the recent funding replenishment and resulting adjustments to country-specific funding envelopes, 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 the current funding cycle with prior existing funds while others were facing funding gaps that required acute attention. In the new Global Fund replenishment cycle, nearly all countries are now on a similar schedule with regard to the start and end of the funding cycle, and while many of the details on funding allocations and commitments are currently unknown, we have based our procurement estimates on analysis of current funding streams and procurement commitments applied to

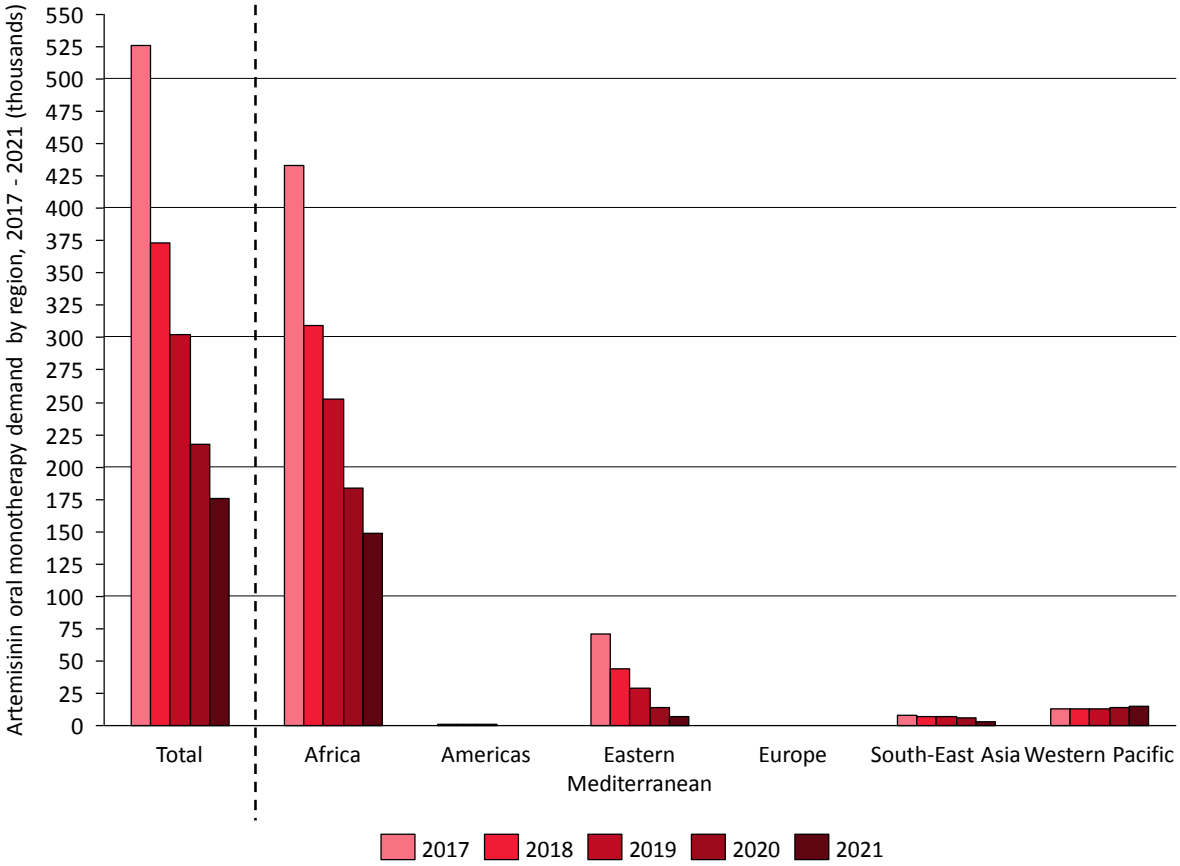
future funding envelopes, and as such, actual procurement totals may differ from projections if high-volume countries deviate from their historical procurement strategy.

Our demand model and procurement models produce different estimates for QAACT demand (428M in 2017, growing to 539M in 2021) and QAACT procurement (286M to 330M in 2017, and 278M to 396M in 2021) 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 non-QAACT 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. 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. In regions where SMC is effectively deployed, ACT procurement is likely to decrease owing to the reduced need for treatments in areas where malaria incidence has been reduced by successful SMC coverage. Because the continued impact of SMC programs remains uncertain (e.g., to what extent countries will continue these programs, and what the coverage will be), we have not included the impact of ongoing SMC programs as a potential variable in our projections of QAACT procurement volumes.

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 15). Oral artemisinin monotherapy use is forecasted to decrease in all regions as a result of efforts to phase out these medicines. We have assumed that there is little to no use of oral artemisinin monotherapies in the public sector and forecast global demand for oral artemisinin monotherapies will decline from 526,000 treatments in 2017 to 175,000 in 2021. In Africa, where artemisinin monotherapy use is highest, use will decline from an estimated 433,000 treatments in 2017, to 149,000 in 2021.

Figure 15 Oral artemisinin monotherapy global demand, by region, 2017 – 2021 (thousands)



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 both public sector injectable artemisinin procurement and public sector rectal artesunate procurement in this report (see "QA Artesunate Procurement", below). We forecast private sector demand for injectable artemisinin-derivative products is 35M in 2017 and will remain relatively flat, at 35M in 2021 (Figure 16). We forecast that private sector demand for rectal artemisinin-derivative products will similarly remain flat, at 4M total suppositories (units: 80 mg. artemether; 100 mg. artesunate) throughout the 2017 to 2021 forecast period (Figure 17). 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 16 Injectable artemisinin demand, Private Sector, 2017 - 2021 (Standard Units, millions)

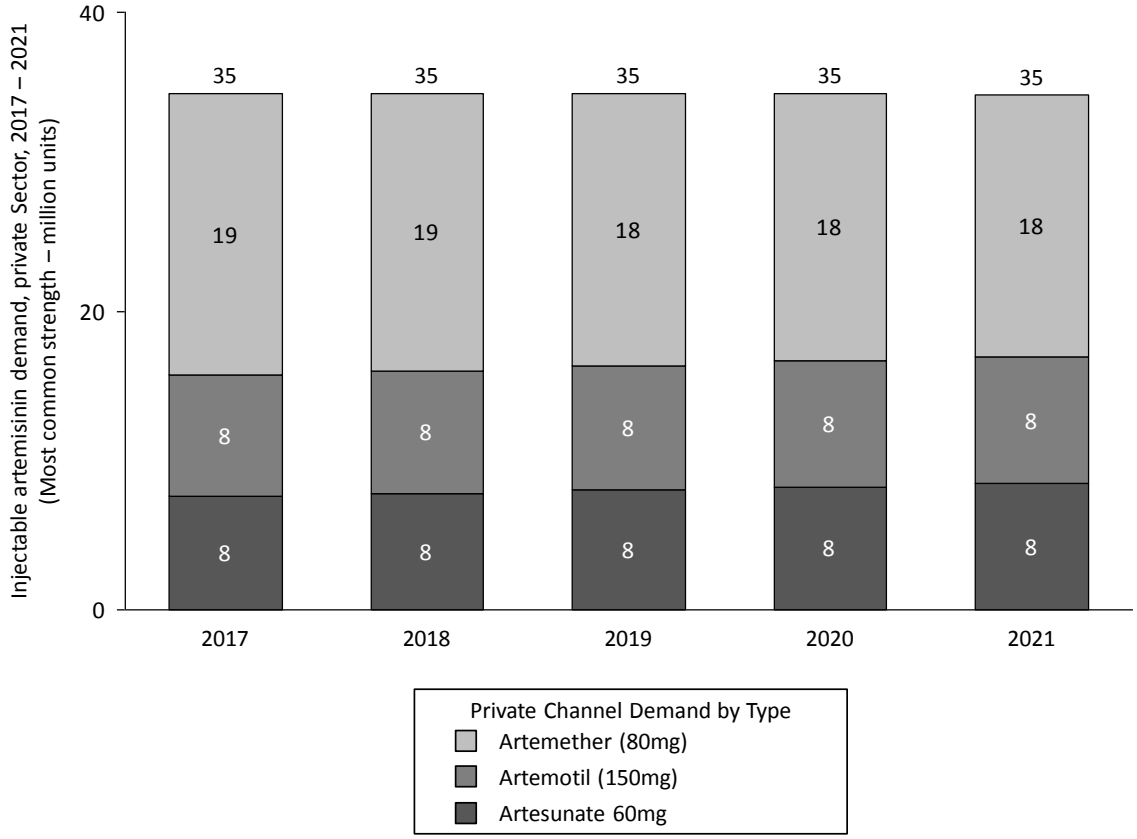
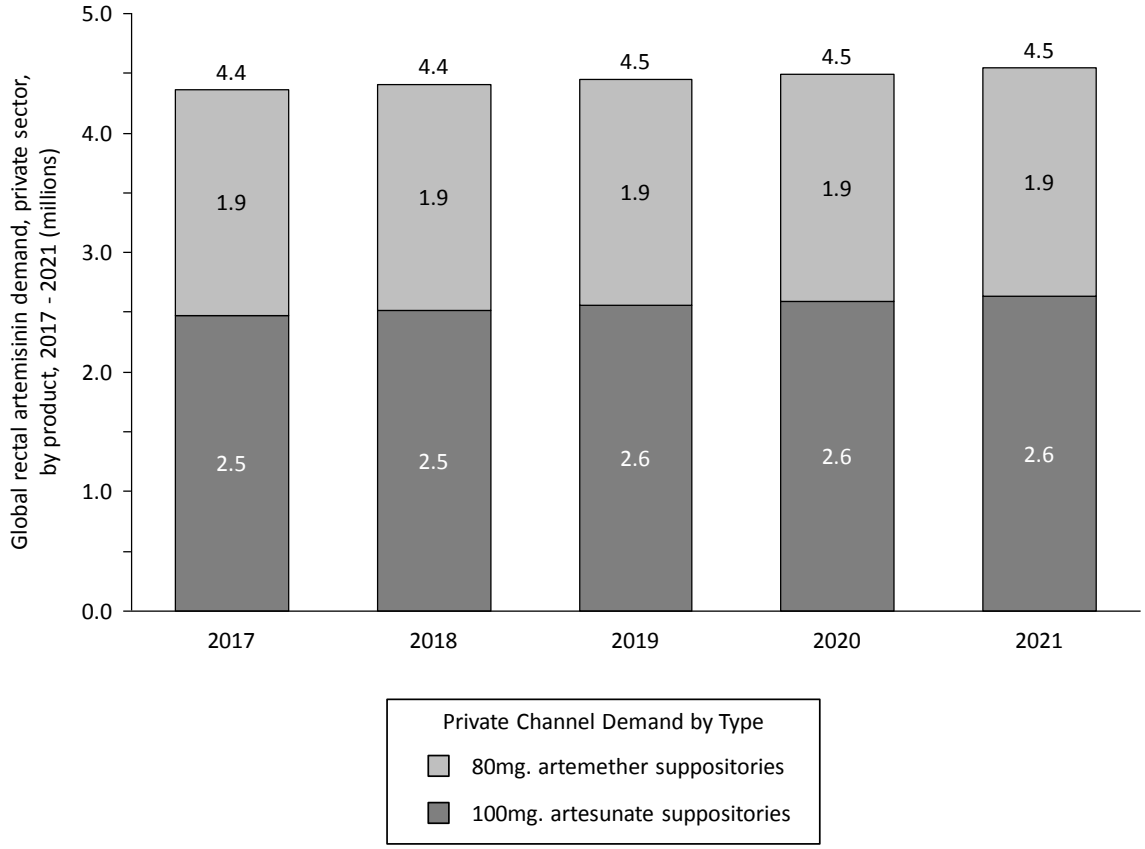


Figure 17 Rectal artemisinin demand, Private Sector, by product, 2017 – 2021 (millions)



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 526,000 treatments in 2017 to 175,000 treatments in 2021. 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.

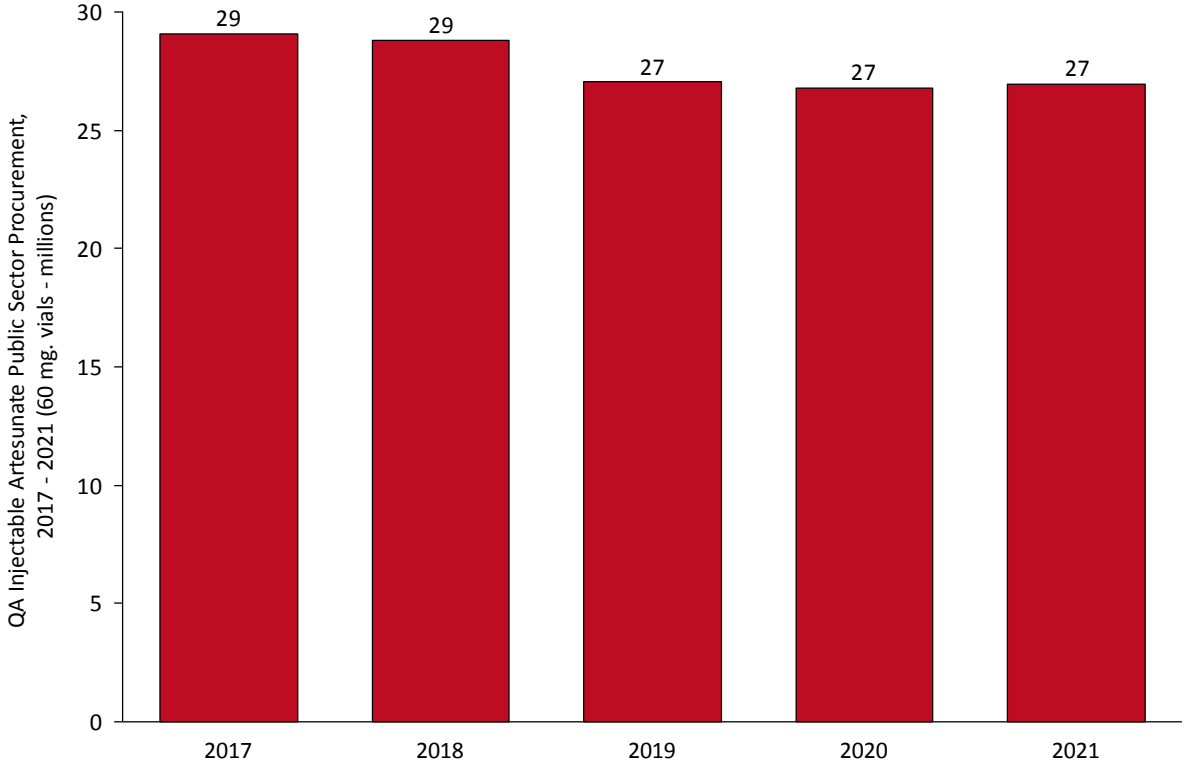
QA Artesunate Procurement for Treatment of Severe Malaria

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 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.

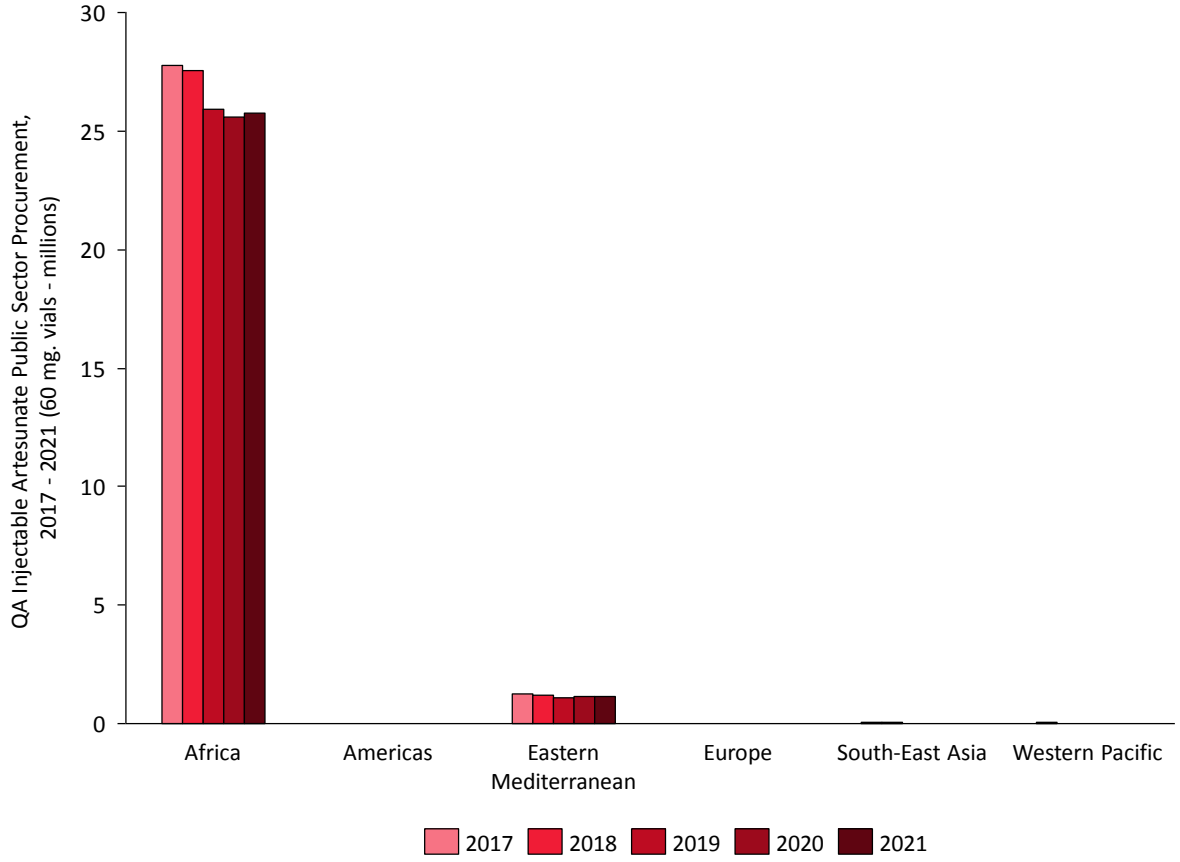
We forecast public sector QAINJAS procurement to be 29M 60 mg. vials in 2017 and holding steady at 27M 60 mg. vials in 2021 (Figure 18). The projected decrease in QAINJAS procurement between 2018 and 2020 is driven by a decrease in projected funding available through the Global Fund for malaria, with the percentage of funding earmarked for QAINJAS procurement remaining stable for each country. Procurement through other donors is expected to remain flat.

Figure 18 QAINJAS public sector procurement, 2017 - 2021 (60 mg. vials - millions)



The African region will procure the majority of QAINJAS in the public sector (Figure 19). 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.

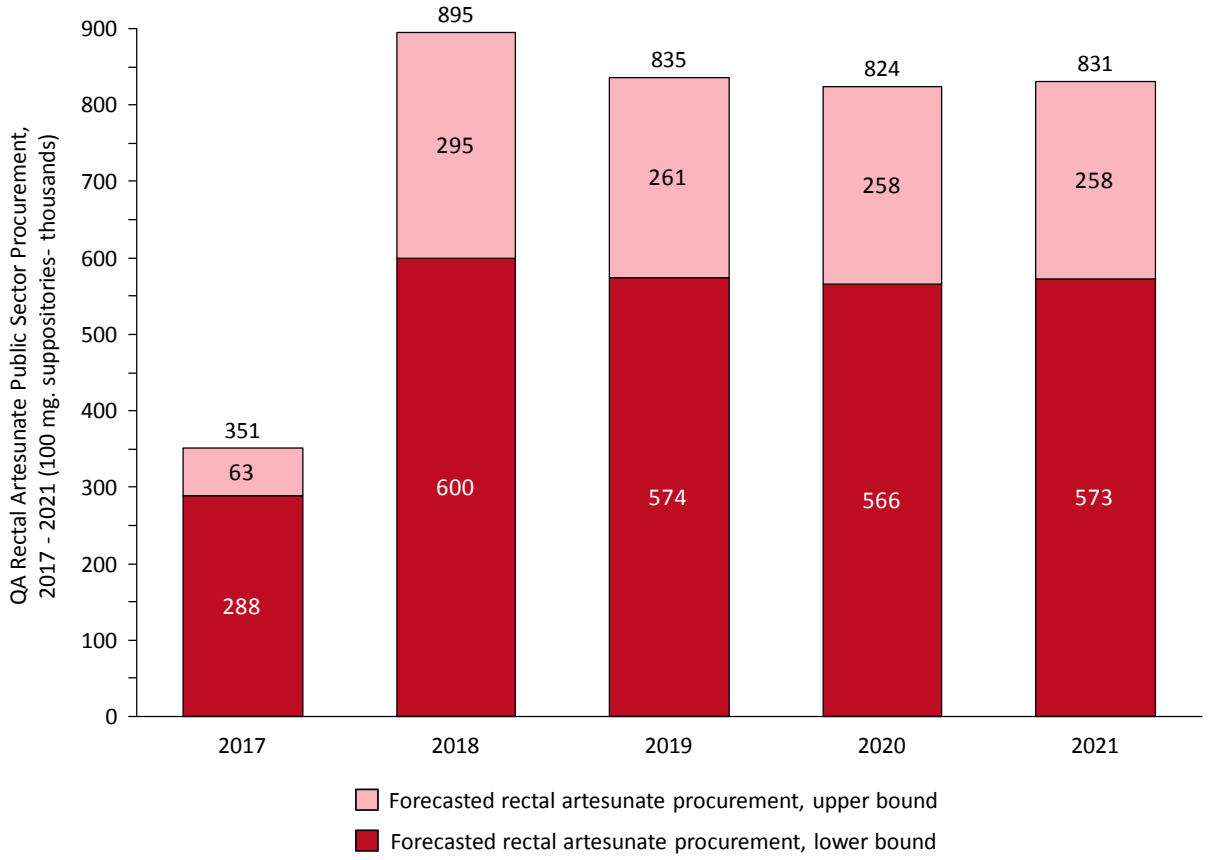
Figure 19 QAINJAS public sector procurement, by region, 2017 - 2021 (60 mg. vials - millions)



In February 2018, the World Health Organization prequalified Cipla's 100 mg rectal artesunate suppository (QARAS), allowing malaria programs and Global Fund grant recipients to procure QARAS, driving uptake of a quality-assured rectal artesunate that are funded by Global Fund grants. To date, only 28 countries (all in sub-Saharan Africa) currently include rectal artesunate within their national treatment guidelines for treatment of severe malaria (and of these 28 countries, only 16 of them currently have guidelines that match those established by the WHO). Because QARAS has not been available prior to this development, and historical national procurements of rectal artesunate (RAS) have been inconsistent in both periodicity and order volumes, forecasting public sector procurement for these products is fraught with uncertainties. Our approach for QARAS forecasting was to consider that (1) countries that have currently established guidelines for use of RAS will be the first adopters of this product, and that (2) country procurement volumes will be in proportion to their projected volumes for QAINJAS

procurement. Analyzing national historical RAS procurement volumes across all countries with RAS guidelines, and comparing them to historical volumes of QAINJAS treatments projected for these countries, yielded the assumption that RAS volumes accounted for, on average, approximately 11.4% of QAINJAS volumes. Using this assumption, we defined two boundaries between which our forecast for QARAS product volumes may be framed: an upper bound based on the assumption that only countries that have established treatment guidelines will order QARAS, and a lower bound based on the assumption that only countries that have established treatment guidelines, and that have ordered RAS in the past ten years, will adopt QARAS during the forecast period. This approach was validated based on planned RAS procurement volumes for 2017 and 2018 that are currently known. The uptake of RAS in countries that do not currently have established treatment guidelines for RAS was not modelled.

Figure 20 QARAS Public Sector Procurement, 2017 - 2021 (100 mg. suppositories - thousands)



Using this approach, we project that 288,000 to 351,000 100 mg. QARAS suppositories will be procured in 2017. Our estimates for QARAS procurement will rise to a peak of 600,000 to 895,000 treatments in 2018, before stabilizing at approximately 573,000 – 831,000 in 2021 (Figure 20). These estimates carry a number of caveats, including, the lack of projections for growth in procurement as additional countries – which have not yet established treatment guidelines but who might eventually do so – procure QARAS in the future; extrapolations based on limited and incomplete data sets; and that historical trends may not be predictive of future trends given that this is a completely new drug with a novel administrative route.

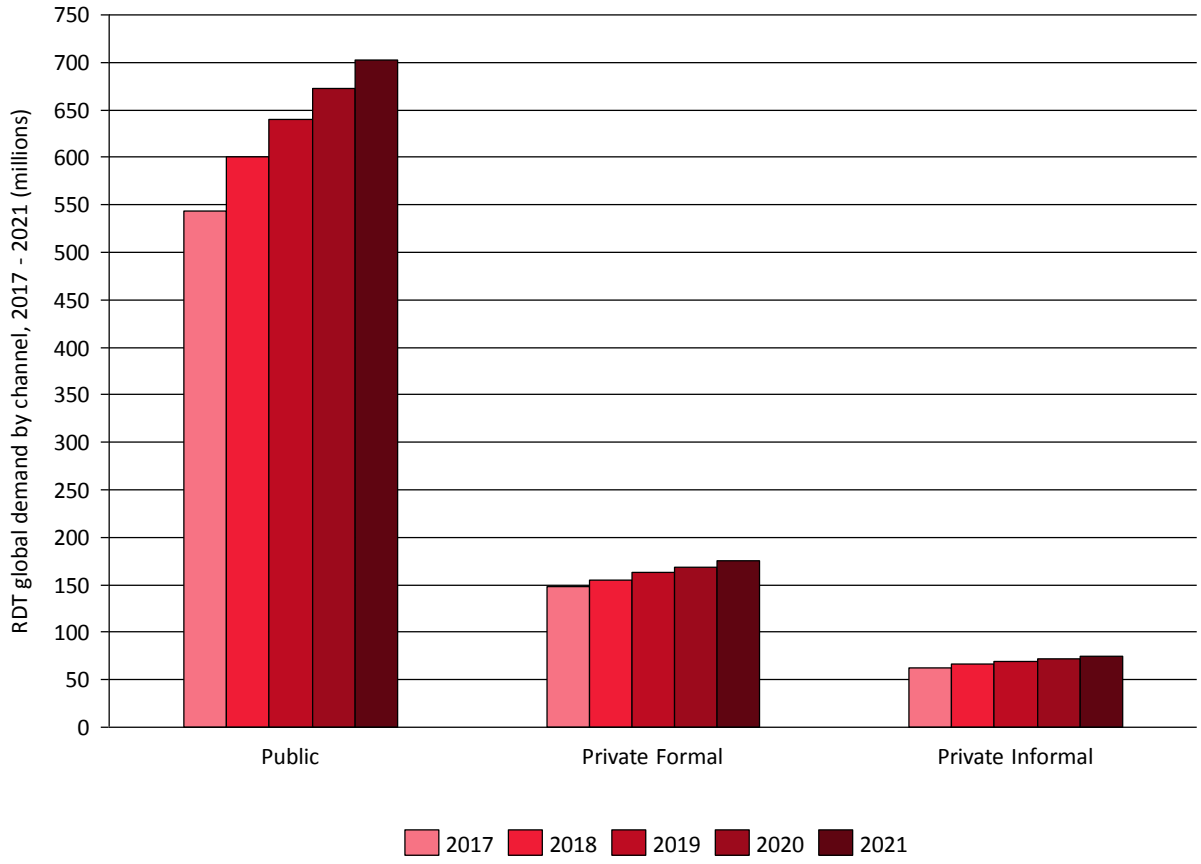
Discussion: QA-AS procurement

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 QARAS product, and pending its inclusion in new malaria program funding requests currently being reviewed by the Global Fund, we expect that QARAS procurement volumes will be fairly low. QARAS fills a specific niche role as a pre-referral treatment for severe malaria, and it remains to be seen how programs will successfully deploy this tool to save the lives of patients suffering from severe malaria.

RDT Demand

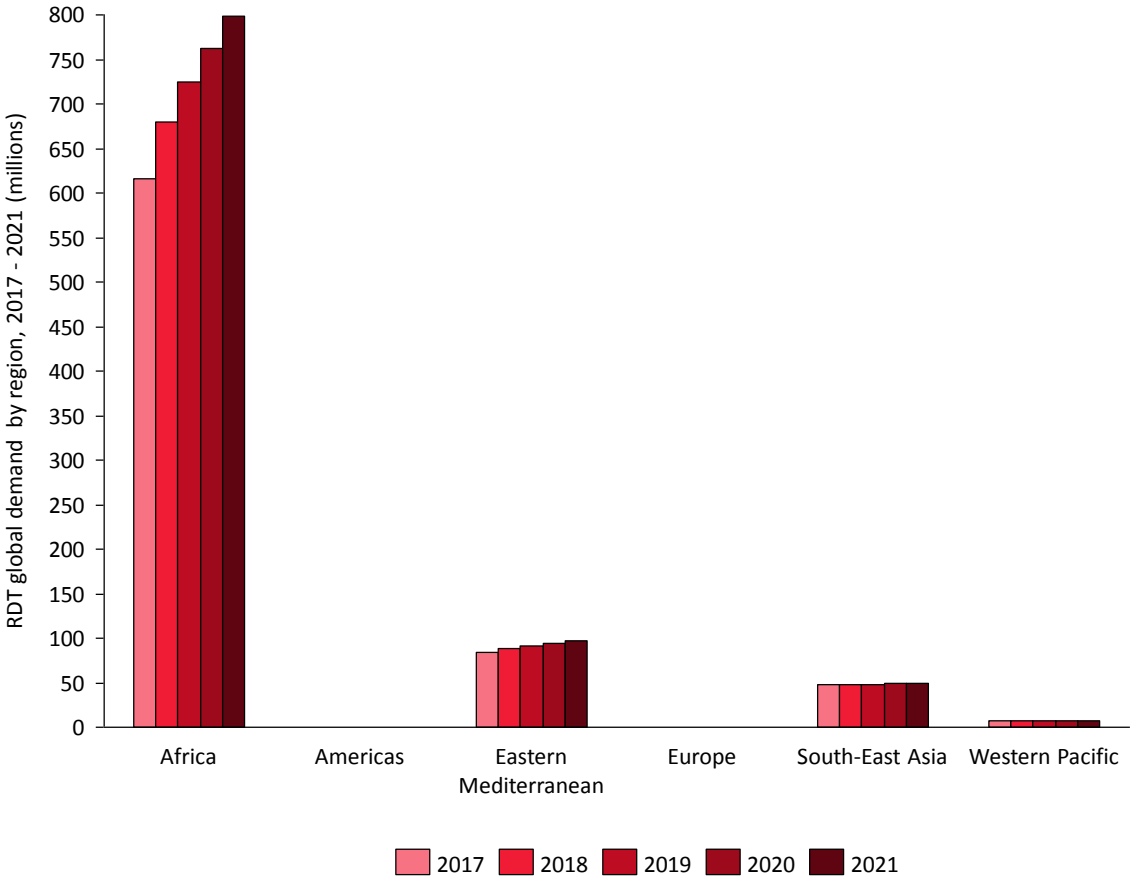
The antimalarial/ACT need and demand model includes fever testing by channel as an output. We have combined this with information from the 2016 World Malaria Report on the proportion of diagnosed cases that are examined using RDTs to estimate the number of tests carried out with RDTs. Due to the lack 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 754M tests in 2017, and will increase to 952M tests in 2021 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 demand is forecast to take place in the public sector, reaching 703M tests in 2021, and accounting for approximately 74% of all RDT testing (Figure 21). 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 21 RDT global demand, by channel, 2017 - 2021 (millions)



RDT demand is highest in Africa, where we forecast it will reach 799M tests, across all treatment channels, in 2021 (Figure 22). 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 22 RDT global demand by region, 2017 – 2021 (millions)



Discussion: RDT demand

Although some countries (e.g., Tanzania, Nigeria), are beginning to make inroads into the informal private sector markets, expansion of RDT availability and use in this sector remains a challenge (recently the picture has become less clear in Tanzania, where testing in accredited drug dispensing outlets is facing pushback). 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 274M RDTs in 2017, and begin a decline to 243M RDTs in 2019, and remaining relatively flat, at 246M RDTs in 2021 (Figure 23). 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 24). 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 23 RDT public sector procurement, 2017 - 2021 (millions)

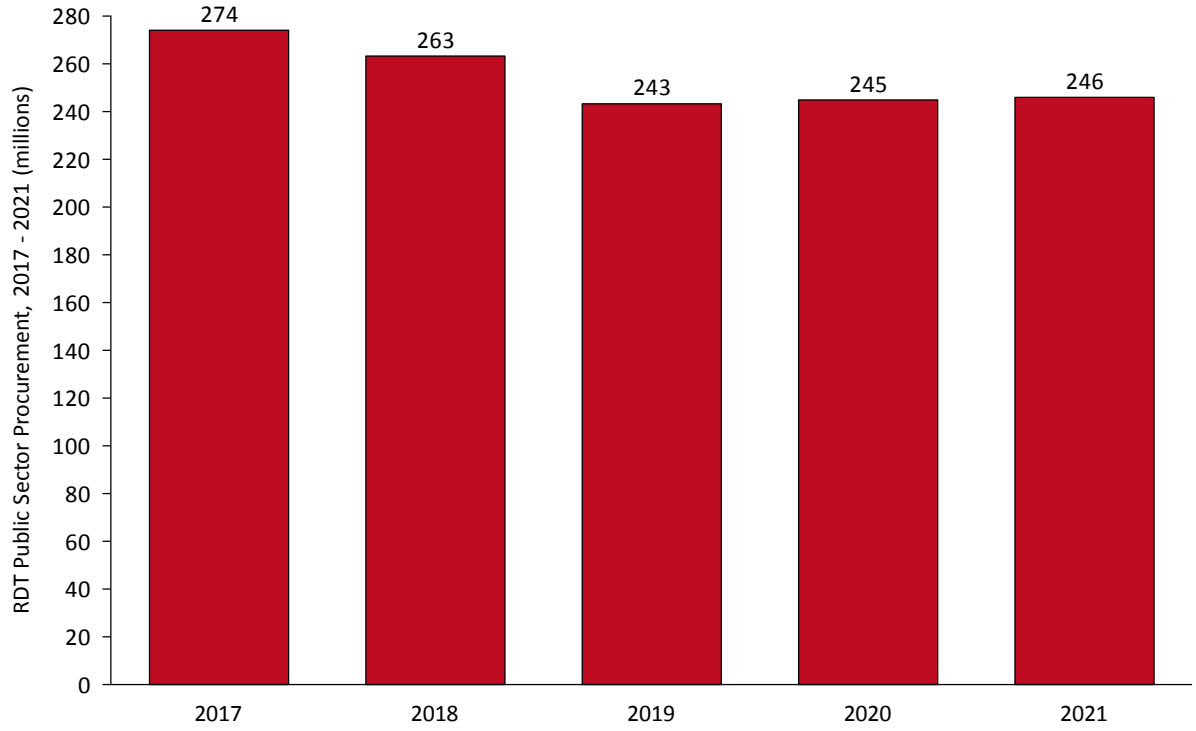
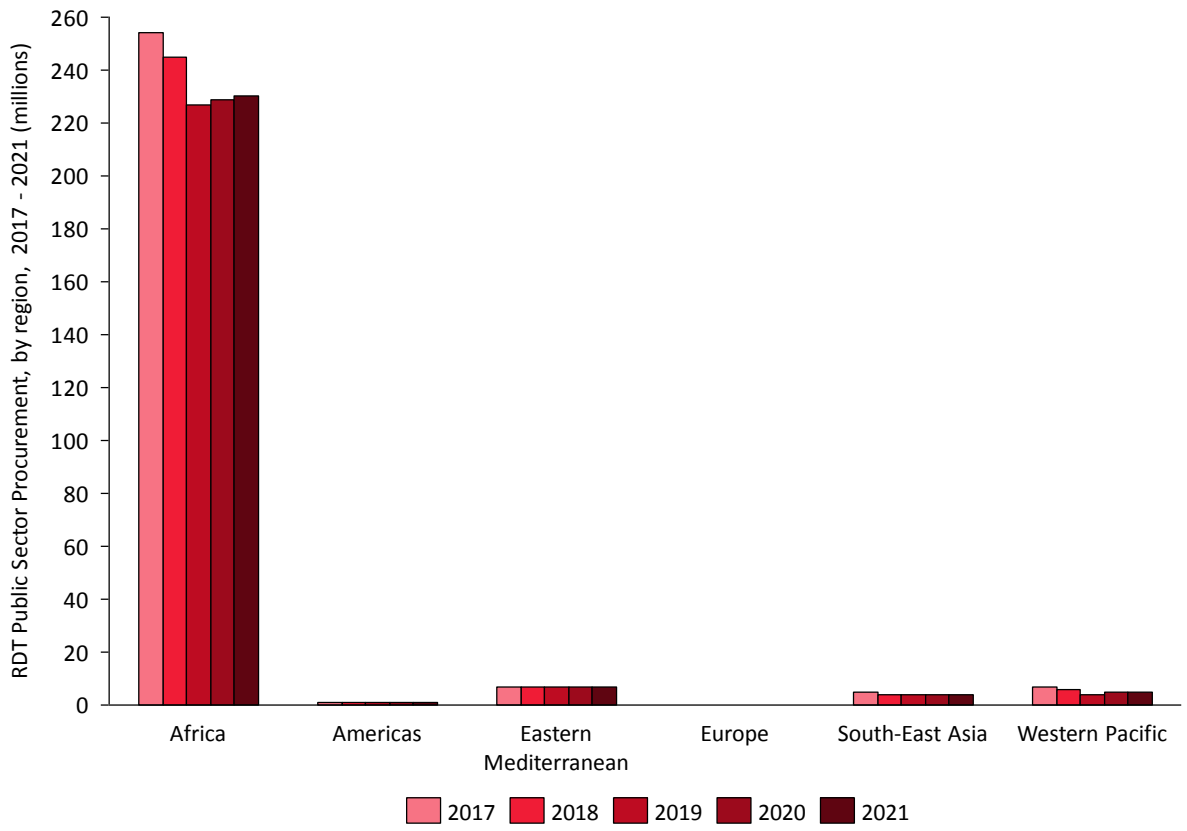


Figure 24 RDT public sector procurement by region, 2017 - 20210 (millions)



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

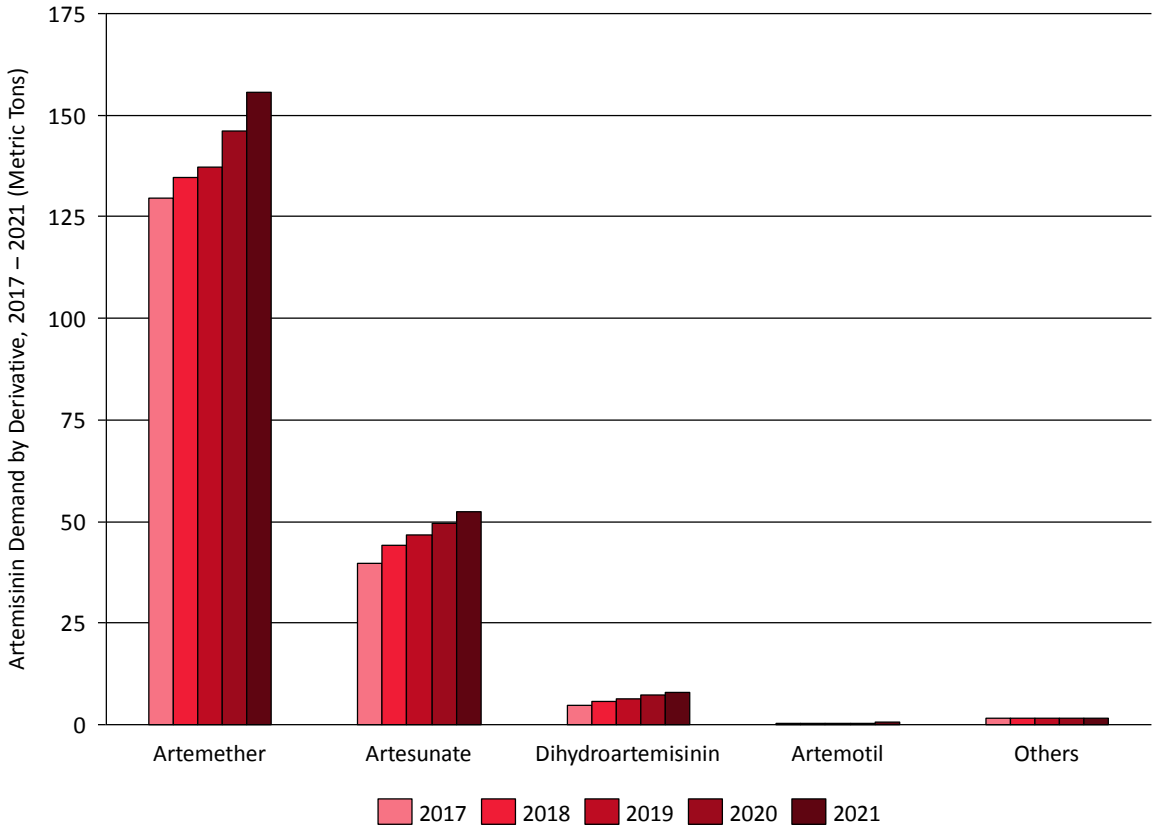
Global demand for artemisinin can be calculated by tabulating the number of QAACT treatments that will be procured (taking into account the dosage/strength of each commodity) in a given year, summing this figure with projections of demand for non-QAACTs, injectable artesunate, and artemisinin monotherapies, 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 25). We forecast global demand for artemisinin will steadily grow from 176 metric tons (MTs) in 2017 to 218 MTs in 2021 (Figure 26). 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 25 Artemisinin demand by derivative, 2017 – 2021 (metric tons)

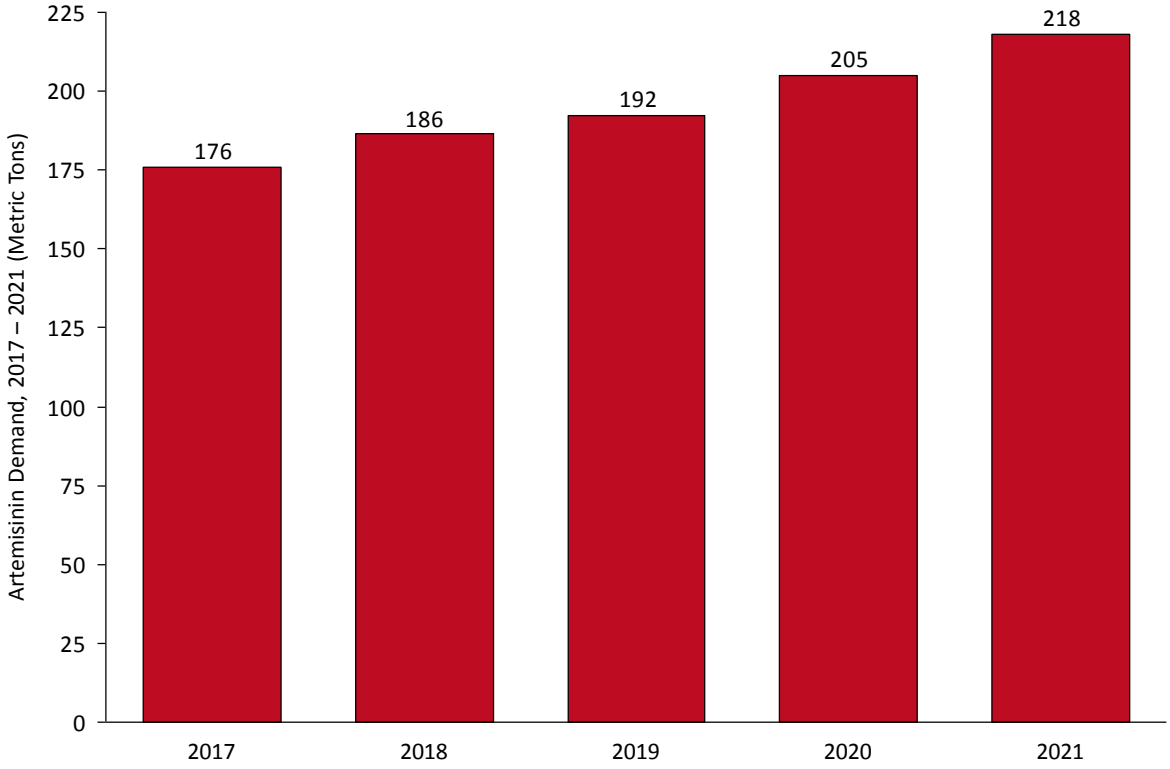


Discussion: Artemisinin demand

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, driven by an increase of ACTs (both QAACTs and non QAACTs) in the non-subsidized private sector, and expect to see an increase to 218MTs in 2021 owing to 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 50% to 63% 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).

Figure 26 Artemisinin demand for API, 2017 – 2021 (metric tons)



4. CLOSING

This report presents the final in a series of publicly published comprehensive global forecasts for demand and procurement of 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. With the publication of this report, Unitaid and the Forecasting Consortium conclude this series of reports forecasting global markets for malaria diagnostics and artemisinin treatments.

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 – 2021

Region	2017	2018	2019	2020	2021
Africa	4,156,567,330	4,266,789,053	4,378,636,968	4,492,395,496	4,608,381,377
Americas	668,506,560	675,423,598	682,215,507	688,888,219	696,056,980
Eastern Mediterranean	2,073,967,259	2,116,752,162	2,159,354,582	2,201,756,664	2,244,013,761
Europe	24,485,827	24,917,585	25,342,897	25,761,458	25,550,060
South-East Asia	7,748,005,476	7,831,536,696	7,914,000,775	7,994,981,439	8,075,457,327
Western Pacific	1,311,732,726	1,326,069,880	1,340,104,617	1,353,840,665	1,367,207,452
TOTAL	**15,983,265,178**	**16,241,488,975**	**16,499,655,347**	**16,757,623,941**	**17,016,666,957**

Table 3 ACT Need (Incident fevers with likely malaria infection, among malaria-at-risk populations), by geographical region, 2017 – 2021

Region	2017	2018	2019	2020	2021
Africa	707,197,111	724,901,109	742,763,830	760,923,382	779,613,889
Americas	7,058,158	7,116,938	7,174,033	7,230,071	7,310,829
Eastern Mediterranean	28,392,651	28,989,772	29,579,241	30,164,383	30,759,175
Europe	25,550	25,627	25,701	25,771	327
South-East Asia	234,486,844	236,470,447	238,441,780	240,361,647	242,440,518
Western Pacific	21,979,531	22,259,867	22,534,447	22,805,931	23,071,577
TOTAL	**999,139,845**	**1,019,763,759**	**1,040,519,031**	**1,061,511,185**	**1,083,196,315**

Table 4 ACT Demand by Channel, by Region, 2017 – 2021 (Baseline)

Channel	Region	2017	2018	2019	2020	2021
Public	Africa	275,586,886	300,590,704	324,772,797	349,835,235	374,813,333
	Americas	498,199	748,256	1,002,835	1,261,842	1,525,196
	Eastern Mediterranean	31,767,345	34,329,855	36,981,134	39,720,684	42,566,188
	Europe	50,617	54,096	57,620	61,205	64,769
	South-East Asia	27,141,228	29,652,148	32,205,101	34,792,600	37,437,949
	Western Pacific	1,785,043	1,986,795	2,192,166	2,400,666	2,612,208
	Public Total	336,829,318	367,361,854	397,211,653	428,072,232	459,019,643
Private Formal	Africa	51,642,641	56,633,051	62,116,477	67,810,929	74,114,548
	Americas	120,202	171,142	223,063	275,946	329,778
	Eastern Mediterranean	11,984,153	13,938,847	15,962,240	18,052,854	20,212,191
	Europe	16,180	17,883	19,621	21,399	23,191
	South-East Asia	46,418,249	54,199,197	62,127,313	70,187,790	78,420,057
	Western Pacific	790,761	917,353	1,046,232	1,177,103	1,309,907
	Private Formal Total	110,972,186	125,877,473	141,494,946	157,526,021	174,409,672
Private Informal	Africa	99,730,187	107,304,941	117,554,493	128,226,899	140,567,821
	Americas	145,300	208,921	273,800	339,901	407,170
	Eastern Mediterranean	12,558,102	14,135,539	15,774,192	17,473,664	19,237,058
	Europe	16,660	18,638	20,663	22,734	24,841
	South-East Asia	14,730,912	17,327,947	19,976,402	22,674,646	25,421,542
	Western Pacific	797,751	921,077	1,047,090	1,175,592	1,306,562
	Private Informal Total	127,978,912	139,917,063	154,646,640	169,913,436	186,964,994
Total (across channels)	Africa	426,959,714	464,528,696	504,443,767	545,873,063	589,495,703
	Americas	763,701	1,128,319	1,499,698	1,877,689	2,262,143
	Eastern Mediterranean	56,309,600	62,404,241	68,717,566	75,247,202	82,015,438
	Europe	83,456	90,617	97,904	105,338	112,802
	South-East Asia	88,290,390	101,179,292	114,308,815	127,655,036	141,279,549
	Western Pacific	3,373,556	3,825,224	4,285,488	4,753,361	5,228,677
Grand Total		**575,780,417**	**633,156,389**	**693,353,238**	**755,511,689**	**820,394,312**

Table 5 QAACT demand by channel, by region, by ACT type, 2017 - 2021 (Baseline - Lower bound)

Channel	Region	ACT Type	2017	2018	2019	2020	2021
Public	**Africa**	AL	198,892,669	216,924,481	234,135,650	251,943,608	269,374,396
		ASAQ	76,178,186	83,094,872	90,014,378	97,215,518	104,712,116
		ASSP	512,567	567,515	618,588	671,570	721,942
		DHA-PPQ	-	-	-	-	-
		ASMQ	3,464	3,835	4,181	4,539	4,879
		Africa	**275,586,886**	**300,590,703**	**324,772,797**	**349,835,235**	**374,813,333**
	Americas	AL	107,682	160,575	214,074	268,168	322,800
		ASAQ	114	172	230	289	349
		ASSP	45,466	68,769	92,622	117,012	141,938
		DHA-PPQ	-	-	-	-	-
		ASMQ	344,937	518,739	695,909	876,372	1,060,110
		Americas	**498,199**	**748,255**	**1,002,835**	**1,261,841**	**1,525,197**
	Eastern Mediterranean	AL	21,341,174	22,910,877	24,538,690	26,221,106	27,964,969
		ASAQ	4,471,122	4,789,160	5,113,379	5,448,429	5,802,690
		ASSP	5,954,983	6,629,747	7,328,988	8,051,065	8,798,439
		DHA-PPQ	-	-	-	-	-
		ASMQ	65	71	78	84	91
		Eastern Mediterranean	**31,767,344**	**34,329,855**	**36,981,135**	**39,720,684**	**42,566,189**
	Europe	AL	41,804	44,444	47,117	49,840	52,534
		ASAQ	-	-	-	-	-
		ASSP	8,812	9,652	10,503	11,365	12,235
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Europe	**50,616**	**54,096**	**57,620**	**61,205**	**64,769**
	South-East Asia	AL	24,887,227	27,116,491	29,385,269	31,684,619	34,041,870
		ASAQ	2,029,345	2,256,346	2,485,902	2,719,477	2,953,232
		ASSP	1,577	1,877	2,182	2,493	2,809
		DHA-PPQ	-	-	-	-	-
		ASMQ	223,079	277,434	331,747	386,010	440,038
		South-East Asia	**27,141,228**	**29,652,148**	**32,205,100**	**34,792,599**	**37,437,949**
	Western Pacific	AL	1,117,094	1,246,882	1,379,653	1,514,956	1,653,070
		ASAQ	343,992	372,423	400,840	429,206	457,337
		ASSP	3,637	4,035	4,442	4,855	5,277
		DHA-PPQ	-	-	-	-	-
		ASMQ	55,112	69,495	84,185	99,214	114,521
		Western Pacific	**1,519,835**	**1,692,835**	**1,869,120**	**2,048,231**	**2,230,205**
	Public Total *(all regions)*	AL	246,387,650	268,403,750	289,700,453	311,682,297	333,409,639
		ASAQ	83,022,759	90,512,973	98,014,729	105,812,919	113,925,724
		ASSP	6,527,042	7,281,595	8,057,325	8,858,360	9,682,640
		DHA-PPQ	-	-	-	-	-
		ASMQ	626,657	869,574	1,116,100	1,366,219	1,619,639
	Public Total		**336,564,108**	**367,067,892**	**396,888,607**	**427,719,795**	**458,637,642**
Private	**Africa**	AL	59,065,940	54,533,500	55,297,267	56,459,064	61,461,702
		ASAQ	9,313,673	8,990,720	9,655,447	10,385,839	11,454,537
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Africa	**68,379,613**	**63,524,220**	**64,952,714**	**66,844,903**	**72,916,239**
	Americas	AL	60,884	87,250	114,071	141,507	169,336
		ASAQ	1,000	1,421	1,851	2,291	2,740
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Americas	**61,884**	**88,671**	**115,922**	**143,798**	**172,076**
	Eastern Mediterranean	AL	3,727,059	4,142,001	4,569,957	5,017,954	5,478,851
		ASAQ	609,542	668,634	728,906	792,124	857,857
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-

		Eastern Mediterranean	**4,336,601**	**4,810,635**	**5,298,863**	**5,810,078**	**6,336,708**
	Europe	AL	7,617	8,476	9,347	10,246	11,149
		ASAQ	37	44	52	59	67
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Europe	**7,654**	**8,520**	**9,399**	**10,305**	**11,216**
	South-East Asia	AL	18,589,512	21,713,381	24,896,798	28,135,330	31,440,151
		ASAQ	1,429	1,904	2,377	2,852	3,325
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	2,435	2,841	3,254	3,675	4,104
		South-East Asia	**18,593,376**	**21,718,126**	**24,902,429**	**28,141,857**	**31,447,580**
	Western Pacific	AL	323,685	379,362	436,107	494,427	553,709
		ASAQ	4,942	5,638	6,341	7,059	7,782
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Western Pacific	**328,627**	**385,000**	**442,448**	**501,486**	**561,491**
	Private Total *(all regions)*	AL	81,774,697	80,863,970	85,323,547	90,258,528	99,114,898
		ASAQ	9,930,623	9,668,361	10,394,974	11,190,224	12,326,308
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	2,435	2,841	3,254	3,675	4,104
	Private Total		**91,707,755**	**90,535,172**	**95,721,775**	**101,452,427**	**111,445,310**
TOTAL (across channels)	**Africa**	AL	257,958,609	271,457,981	289,432,917	308,402,672	330,836,098
		ASAQ	85,491,859	92,085,592	99,669,825	107,601,357	116,166,653
		ASSP	512,567	567,515	618,588	671,570	721,942
		DHA-PPQ	-	-	-	-	-
		ASMQ	3,464	3,835	4,181	4,539	4,879
		Africa	**343,966,499**	**364,114,923**	**389,725,511**	**416,680,138**	**447,729,572**
	Americas	AL	168,566	247,825	328,145	409,675	492,136
		ASAQ	1,114	1,593	2,081	2,580	3,089
		ASSP	45,466	68,769	92,622	117,012	141,938
		DHA-PPQ	-	-	-	-	-
		ASMQ	344,937	518,739	695,909	876,372	1,060,110
		Americas	**560,083**	**836,926**	**1,118,757**	**1,405,639**	**1,697,273**
	Eastern Mediterranean	AL	25,068,233	27,052,878	29,108,647	31,239,060	33,443,820
		ASAQ	5,080,664	5,457,794	5,842,285	6,240,553	6,660,547
		ASSP	5,954,983	6,629,747	7,328,988	8,051,065	8,798,439
		DHA-PPQ	-	-	-	-	-
		ASMQ	65	71	78	84	91
		Eastern Mediterranean	**36,103,946**	**39,140,491**	**42,279,997**	**45,530,763**	**48,902,897**
	Europe	AL	49,421	52,920	56,464	60,086	63,683
		ASAQ	37	44	52	59	67
		ASSP	8,812	9,652	10,503	11,365	12,235
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Europe	**58,270**	**62,616**	**67,019**	**71,510**	**75,985**
	South-East Asia	AL	43,476,739	48,829,872	54,282,067	59,819,949	65,482,021
		ASAQ	2,030,774	2,258,250	2,488,279	2,722,329	2,956,557
		ASSP	1,577	1,877	2,182	2,493	2,809
		DHA-PPQ	-	-	-	-	-
		ASMQ	225,514	280,275	335,001	389,685	444,142
		South-East Asia	**45,734,604**	**51,370,274**	**57,107,529**	**62,934,456**	**68,885,529**
	Western Pacific	AL	1,440,779	1,626,244	1,815,760	2,009,383	2,206,779
		ASAQ	348,934	378,061	407,181	436,265	465,119
		ASSP	3,637	4,035	4,442	4,855	5,277
		DHA-PPQ	-	-	-	-	-
		ASMQ	55,112	69,495	84,185	99,214	114,521
		Western Pacific	**1,848,462**	**2,077,835**	**2,311,568**	**2,549,717**	**2,791,696**
	Total	AL	328,162,347	349,267,720	375,024,000	401,940,825	432,524,537

	(all regions)	ASAQ	92,953,382	100,181,334	108,409,703	117,003,143	126,252,032
		ASSP	6,527,042	7,281,595	8,057,325	8,858,360	9,682,640
		DHA-PPQ*	-	-	-	-	-
		ASMQ	629,092	872,415	1,119,354	1,369,894	1,623,743
GRAND TOTAL (excluding DHA-PPQ)			**428,271,863**	**457,603,064**	**492,610,382**	**529,172,222**	**570,082,952**
GRAND TOTAL (including DHA-PPQ)			**430,802,934**	**460,294,955**	**495,302,274**	**531,864,114**	**572,774,843**

**DHA-PPQ split by region NA.*

Table 6 QAACT demand by channel, by region, by ACT type, 2017 - 2021 (Baseline - Upper bound)

Channel	Region	ACT Type	2017	2018	2019	2020	2021
Public	**Africa**	AL	198,892,669	216,924,481	234,135,650	251,943,608	269,374,396
		ASAQ	76,178,186	83,094,872	90,014,378	97,215,518	104,712,116
		ASSP	512,567	567,515	618,588	671,570	721,942
		DHA-PPQ	-	-	-	-	-
		ASMQ	3,464	3,835	4,181	4,539	4,879
		Africa	***275,586,886***	***300,590,703***	***324,772,797***	***349,835,235***	**374,813,333**
	Americas	AL	107,682	160,575	214,074	268,168	322,800
		ASAQ	114	172	230	289	349
		ASSP	45,466	68,769	92,622	117,012	141,938
		DHA-PPQ	-	-	-	-	-
		ASMQ	344,937	518,739	695,909	876,372	1,060,110
		Americas	***498,199***	***748,255***	***1,002,835***	***1,261,841***	**1,525,197**
	Eastern Mediterranean	AL	21,341,174	22,910,877	24,538,690	26,221,106	27,964,969
		ASAQ	4,471,122	4,789,160	5,113,379	5,448,429	5,802,690
		ASSP	5,954,983	6,629,747	7,328,988	8,051,065	8,798,439
		DHA-PPQ	-	-	-	-	-
		ASMQ	65	71	78	84	91
		Eastern Mediterranean	***31,767,344***	***34,329,855***	***36,981,135***	***39,720,684***	**42,566,189**
	Europe	AL	41,804	44,444	47,117	49,840	52,534
		ASAQ	-	-	-	-	-
		ASSP	8,812	9,652	10,503	11,365	12,235
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Europe	***50,616***	***54,096***	***57,620***	***61,205***	**64,769**
	South-East Asia	AL	24,887,227	27,116,491	29,385,269	31,684,619	34,041,870
		ASAQ	2,029,345	2,256,346	2,485,902	2,719,477	2,953,232
		ASSP	1,577	1,877	2,182	2,493	2,809
		DHA-PPQ	-	-	-	-	-
		ASMQ	223,079	277,434	331,747	386,010	440,038
		South-East Asia	***27,141,228***	***29,652,148***	***32,205,100***	***34,792,599***	**37,437,949**
	Western Pacific	AL	1,117,094	1,246,882	1,379,653	1,514,956	1,653,070
		ASAQ	343,992	372,423	400,840	429,206	457,337
		ASSP	3,637	4,035	4,442	4,855	5,277
		DHA-PPQ	-	-	-	-	-
		ASMQ	55,112	69,495	84,185	99,214	114,521
		Western Pacific	***1,519,835***	***1,692,835***	***1,869,120***	***2,048,231***	**2,230,205**
	Public Total *(all regions)*	AL	***246,387,650***	***268,403,750***	***289,700,453***	***311,682,297***	333,409,639
		ASAQ	***83,022,759***	***90,512,973***	***98,014,729***	***105,812,919***	113,925,724
		ASSP	***6,527,042***	***7,281,595***	***8,057,325***	***8,858,360***	9,682,640
		DHA-PPQ	***-***	***-***	***-***	***-***	-
		ASMQ	***626,657***	***869,574***	***1,116,100***	***1,366,219***	1,619,639
	Public Total		***336,564,108***	***367,067,892***	***396,888,607***	***427,719,795***	**458,637,642**
Private	**Africa**	AL	72,796,960	69,147,681	70,995,410	73,288,371	79,715,667
		ASAQ	13,191,302	13,331,590	14,519,749	15,797,295	17,460,916
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-

		ASMQ	-	-	-	-	-
		Africa	***85,988,262***	***82,479,271***	***85,515,159***	***89,085,666***	**97,176,583**
	Americas	AL	123,703	176,735	230,756	285,858	341,851
		ASAQ	2,097	2,968	3,858	4,768	5,694
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Americas	***125,800***	***179,703***	***234,614***	***290,626***	**347,545**
	Eastern Mediterranean	AL	10,625,647	12,291,207	14,013,909	15,797,216	17,635,510
		ASAQ	1,082,335	1,187,120	1,294,479	1,406,318	1,523,107
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Eastern Mediterranean	***11,707,982***	***13,478,327***	***15,308,388***	***17,203,534***	**19,158,617**
	Europe	AL	16,190	17,952	19,744	21,583	23,433
		ASAQ	68	81	95	108	122
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Europe	***16,258***	***18,033***	***19,839***	***21,691***	**23,555**
	South-East Asia	AL	39,862,195	46,567,988	53,401,126	60,350,225	67,444,662
		ASAQ	2,524	3,351	4,177	5,005	5,830
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	5,171	6,029	6,904	7,794	8,703
		South-East Asia	***39,869,890***	***46,577,368***	***53,412,207***	***60,363,024***	**67,459,195**
	Western Pacific	AL	628,830	723,398	820,010	918,868	1,019,554
		ASAQ	98,965	122,431	145,996	169,625	193,239
		ASSP	-	-	-	-	-
		DHA-PPQ	-	-	-	-	-
		ASMQ	56,513	68,494	80,654	92,982	105,445
		Western Pacific	***784,308***	***914,323***	***1,046,660***	***1,181,475***	**1,318,238**
	Private Total *(all regions)*	AL	***124,053,525***	***128,924,961***	***139,480,955***	***150,662,121***	166,180,677
		ASAQ	***14,377,291***	***14,647,541***	***15,968,354***	***17,383,119***	19,188,908
		ASSP	***-***	***-***	***-***	***-***	-
		DHA-PPQ	***-***	***-***	***-***	***-***	-
		ASMQ	***61,684***	***74,523***	***87,558***	***100,776***	114,148
	Private Total		***138,492,500***	***143,647,025***	***155,536,867***	***168,146,016***	**185,483,733**
TOTAL (across channels)	**Africa**	AL	271,689,629	286,072,162	305,131,060	325,231,979	349,090,063
		ASAQ	89,369,488	96,426,462	104,534,127	113,012,813	122,173,032
		ASSP	512,567	567,515	618,588	671,570	721,942
		DHA-PPQ	-	-	-	-	-
		ASMQ	3,464	3,835	4,181	4,539	4,879
		Africa	***361,575,148***	***383,069,974***	***410,287,956***	***438,920,901***	**471,989,916**
	Americas	AL	231,385	337,310	444,830	554,026	664,651
		ASAQ	2,211	3,140	4,088	5,057	6,043
		ASSP	45,466	68,769	92,622	117,012	141,938
		DHA-PPQ	-	-	-	-	-
		ASMQ	344,937	518,739	695,909	876,372	1,060,110
		Americas	***623,999***	***927,958***	***1,237,449***	***1,552,467***	**1,872,742**
	Eastern Mediterranean	AL	31,966,821	35,202,084	38,552,599	42,018,322	45,600,479
		ASAQ	5,553,457	5,976,280	6,407,858	6,854,747	7,325,797
		ASSP	5,954,983	6,629,747	7,328,988	8,051,065	8,798,439
		DHA-PPQ	-	-	-	-	-
		ASMQ	65	71	78	84	91
		Eastern Mediterranean	***43,475,326***	***47,808,182***	***52,289,523***	***56,924,218***	**61,724,806**
	Europe	AL	57,994	62,396	66,861	71,423	75,967
		ASAQ	68	81	95	108	122
		ASSP	8,812	9,652	10,503	11,365	12,235
		DHA-PPQ	-	-	-	-	-
		ASMQ	-	-	-	-	-
		Europe	***66,874***	***72,129***	***77,459***	***82,896***	**88,324**
	South-East	AL	64,749,422	73,684,479	82,786,395	92,034,844	101,486,532

	Asia						
		ASAQ	2,031,869	2,259,697	2,490,079	2,724,482	2,959,062
		ASSP	1,577	1,877	2,182	2,493	2,809
		DHA-PPQ	-	-	-	-	-
		ASMQ	228,250	283,463	338,651	393,804	448,741
		South-East Asia	***67,011,118***	***76,229,516***	***85,617,307***	***95,155,623***	**104,897,144**
	Western Pacific	AL	1,745,924	1,970,280	2,199,663	2,433,824	2,672,624
		ASAQ	442,957	494,854	546,836	598,831	650,576
		ASSP	3,637	4,035	4,442	4,855	5,277
		DHA-PPQ	-	-	-	-	-
		ASMQ	111,625	137,989	164,839	192,195	219,966
		Western Pacific	***2,304,143***	***2,607,158***	***2,915,780***	***3,229,706***	**3,548,443**
	Total	AL	***370,441,175***	***397,328,711***	***429,181,408***	***462,344,418***	499,590,316
	(all regions)	ASAQ	***97,400,050***	***105,160,514***	***113,983,083***	***123,196,038***	133,114,632
		ASSP	***6,527,042***	***7,281,595***	***8,057,325***	***8,858,360***	9,682,640
		DHA-PPQ*	**-**	**-**	**-**	**-**	-
		ASMQ	***688,341***	***944,097***	***1,203,658***	***1,466,995***	1,733,787
GRAND TOTAL (excluding DHA-PPQ)			***475,056,608***	***510,714,917***	***552,425,474***	***595,865,811***	***644,121,375***
GRAND TOTAL (including DHA-PPQ)			**477,587,679**	**513,406,808**	**555,117,366**	**598,557,703**	**646,813,268**

**DHA-PPQ split by region NA.*

Table 7 QAACT procurement by channel, by region, by ACT type, 2017 - 2021 (Baseline - Lower bound)

Channel	Region	ACT Type	2017	2018	2019	2020	
Public	**Africa**	AL	115,007,100	126,239,900	113,658,200	116,148,500	117,200,500
		ASAQ	53,380,900	58,952,500	59,509,700	58,188,400	58,257,000
		ASSP	500	600	600	600	600
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Public Total		***168,388,500***	***185,193,100***	***173,168,500***	***174,337,500***	***175,458,200***
	Americas	AL	5,900	6,400	6,400	6,400	6,400
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Americas Public Total		***5,900***	***6,400***	***6,400***	***6,400***	***6,400***
	Eastern	AL	1,148,900	1,310,400	1,309,900	1,309,900	1,309,900
	Mediterranean	ASAQ	4,059,700	3,390,500	2,911,700	3,055,700	3,082,900
		ASSP	1,548,400	1,404,500	1,442,400	1,442,400	1,442,400
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Eastern Med. Public Total		***6,756,900***	***6,105,400***	***5,664,000***	***5,808,000***	***5,835,300***
	Europe	AL	100	-	-	-	-
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-

		ASMQ	-	-	-	-	-
	Europe Public Total		***100***	***-***	***-***	***-***	***-***
	South-East Asia	AL	591,200	419,800	386,100	387,500	387,400
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	South-East Asia Public Total		***591,200***	***419,800***	***386,100***	***387,500***	***387,400***
	Western Pacific	AL	241,700	110,900	61,900	56,700	59,200
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	127,700	81,400	71,000	71,000	71,000
		ASMQ	20,100	21,800	19,000	19,000	19,000
	Western Pacific Public Total		***389,600***	***214,000***	***152,000***	***146,700***	***149,200***
	Public Total	AL	*116,994,900*	*128,087,500*	*115,422,400*	*117,909,000*	*118,963,500*
	(all regions)	ASAQ	*57,440,500*	*62,343,100*	*62,421,500*	*61,244,100*	*61,339,900*
		ASSP	*1,548,800*	*1,405,100*	*1,443,000*	*1,443,000*	*1,443,000*
		DP	*127,700*	*81,400*	*71,000*	*71,000*	*71,000*
		ASMQ	*20,100*	*21,800*	*19,000*	*19,000*	*19,000*
	PUBLIC TOTAL		***176,132,100***	***191,938,900***	***179,377,000***	***180,686,100***	***181,836,500***
Private Subsidized	**Africa**	AL	57,820,100	31,147,000	25,591,500	19,910,900	19,696,200
		ASAQ	4,413,100	2,963,300	2,900,200	2,836,100	2,834,500
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Pvt. Sub. Total		***62,233,200***	***34,110,300***	***28,491,700***	***22,747,000***	***22,530,700***
	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*	*31,147,000*	*25,591,500*	*19,910,900*	*19,696,200*
		ASAQ	*4,413,100*	*2,963,300*	*2,900,200*	*2,836,100*	*2,834,500*
		ASSP					
		DP					
		ASMQ					
	PRIVATE SUBSIDIZED TOTAL		***62,233,200***	***34,110,300***	***28,491,700***	***22,747,000***	***22,530,700***
Premium Private	**Africa**	AL	19,358,300	21,241,300	23,201,000	25,252,300	27,391,600
		ASAQ	4,642,700	5,273,100	5,929,700	6,622,700	7,346,100
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Pre. Pvt. Total		***24,001,000***	***26,514,400***	***29,130,700***	***31,874,900***	***34,737,700***
	Americas	AL	60,900	87,200	114,100	141,500	169,300
		ASAQ	1,000	1,400	1,900	2,300	2,700
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Americas Pre. Pvt. Total		***61,900***	***88,700***	***115,900***	***143,800***	***172,100***
	Eastern	AL	3,727,100	4,142,000	4,570,000	5,018,000	5,478,900
	Mediterranean	ASAQ	609,500	668,600	728,900	792,100	857,900
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Eastern Med. Pre. Pvt. Total		***4,336,600***	***4,810,600***	***5,298,900***	***5,810,100***	***6,336,700***
	Europe	AL	7,600	8,500	9,300	10,200	11,100
		ASAQ	-	-	100	100	100
		ASSP	-	-	-	-	-

		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Europe Pre. Pvt. Total		***7,700***	***8,500***	***9,400***	***10,300***	***11,200***
	South-East Asia	AL	18,589,500	21,713,400	24,896,800	28,135,300	31,440,100
		ASAQ	1,400	1,900	2,400	2,900	3,300
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	2,600	3,200	3,700	4,300	4,100
	South-East Asia Pre. Pvt. Total		***18,593,400***	***21,718,100***	***24,902,400***	***28,141,800***	***31,447,600***
	Western Pacific	AL	323,700	379,400	436,100	494,400	553,700
		ASAQ	4,900	5,600	6,300	7,100	7,800
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Western Pacific Pre. Pvt. Total		***328,600***	***385,000***	***442,500***	***501,500***	***561,500***
	Premium Private Total (all regions)	AL	*42,067,100*	*47,571,800*	*53,227,300*	*59,051,700*	*65,044,800*
		ASAQ	*5,259,600*	*5,950,700*	*6,669,200*	*7,427,100*	*8,217,800*
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	*2,600*	*3,200*	*3,700*	*4,300*	*4,100*
	PREMIUM PRIVATE TOTAL		***47,329,200***	***53,525,300***	***59,899,800***	***66,482,400***	***73,266,800***
TOTAL (across channels)	**Africa**	AL	192,185,500	178,628,200	162,450,700	161,311,700	164,288,300
		ASAQ	62,436,700	67,188,900	68,339,600	67,647,200	68,437,600
		ASSP	500	600	600	600	600
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Total		***254,622,700***	***245,817,800***	***230,790,900***	***228,959,400***	***232,726,600***
	Americas	AL	66,800	93,600	120,500	147,900	175,700
		ASAQ	1,000	1,400	1,900	2,300	2,700
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Americas Total		***67,800***	***95,100***	***122,300***	***150,200***	***178,500***
	Eastern Mediterranean	AL	4,876,000	5,452,400	5,879,900	6,327,900	6,788,800
		ASAQ	4,669,200	4,059,100	3,640,600	3,847,800	3,940,800
		ASSP	1,548,400	1,404,500	1,442,400	1,442,400	1,442,400
		DP	-	-	-	-	-

		ASMQ	-	-	-	-	-
	Eastern Mediterranean Total		***11,093,500***	***10,916,000***	***10,962,900***	***11,618,100***	***12,172,000***
	Europe	AL	7,700	8,500	9,300	10,200	11,100
		ASAQ	-	-	100	100	100
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Europe Total		***7,800***	***8,500***	***9,400***	***10,300***	***11,200***
	South-East Asia	AL	19,180,700	22,133,200	25,282,900	28,522,800	31,827,500
		ASAQ	1,400	1,900	2,400	2,900	3,300
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	2,600	3,200	3,700	4,300	4,100
	South-East Asia Total		***19,184,600***	***22,137,900***	***25,288,500***	***28,529,300***	***31,835,000***
	Western Pacific	AL	565,400	490,300	498,000	551,100	612,900
		ASAQ	4,900	5,600	6,300	7,100	7,800
		ASSP	-	-	-	-	-
		DP	127,700	81,400	71,000	71,000	71,000
		ASMQ	20,100	21,800	19,000	19,000	19,000
	Western Pacific Total		***718,200***	***599,000***	***594,500***	***648,200***	***710,700***
	Total	AL	*216,882,100*	*206,806,200*	*194,241,300*	*196,871,600*	*203,704,300*
	(all regions)	ASAQ	*67,113,200*	*71,256,900*	*71,990,900*	*71,507,400*	*72,392,300*
		ASSP	*1,548,900*	*1,405,100*	*1,443,000*	*1,443,000*	*1,443,000*
		DP	*127,700*	*81,400*	*71,000*	*71,000*	*71,000*
		ASMQ	*22,700*	*25,000*	*22,700*	*23,300*	*23,100*
GRAND TOTAL			***285,694,400***	***279,574,500***	***267,768,500***	***269,915,600***	***277,634,000***

Table 8 QAACT procurement by channel, by region, by ACT type, 2017 - 2021 (Baseline - Upper bound)

Channel	Region	ACT Type	2017	2018	2019	2020	
Public	**Africa**	AL	115,007,100	126,239,900	113,658,200	116,148,500	117,200,500
		ASAQ	53,380,900	58,952,500	59,509,700	58,188,400	58,257,000
		ASSP	500	600	600	600	600
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Public Total		***168,388,500***	***185,193,100***	***173,168,500***	***174,337,500***	***175,458,200***
	Americas	AL	5,900	6,400	6,400	6,400	6,400
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Americas Public Total		***5,900***	***6,400***	***6,400***	***6,400***	***6,400***
	Eastern Mediterranean	AL	1,148,900	1,310,400	1,309,900	1,309,900	1,309,900
		ASAQ	4,059,700	3,390,500	2,911,700	3,055,700	3,082,900
		ASSP	1,548,400	1,404,500	1,442,400	1,442,400	1,442,400
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Eastern Med. Public Total		***6,756,900***	***6,105,400***	***5,664,000***	***5,808,000***	***5,835,300***
	Europe	AL	100	-	-	-	-
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Europe Public Total		***100***	***-***	***-***	***-***	***-***
	South-East Asia	AL	591,200	419,800	386,100	387,500	387,400
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	South-East Asia Public Total		***591,200***	***419,800***	***386,100***	***387,500***	***387,400***
	Western Pacific	AL	241,700	110,900	61,900	56,700	59,200
		ASAQ	-	-	-	-	-
		ASSP	-	-	-	-	-
		DP	127,700	81,400	71,000	71,000	71,000
		ASMQ	20,100	21,800	19,000	19,000	19,000
	Western Pacific Public Total		***389,600***	***214,000***	***152,000***	***146,700***	***149,200***
	Public Total (all regions)	AL	*116,994,900*	*128,087,500*	*115,422,400*	*117,909,000*	*118,963,500*
		ASAQ	*57,440,500*	*62,343,100*	*62,421,500*	*61,244,100*	*61,339,900*

		ASSP	*1,548,800*	*1,405,100*	*1,443,000*	*1,443,000*	*1,443,000*
		DP	*127,700*	*81,400*	*71,000*	*71,000*	*71,000*
		ASMQ	*20,100*	*21,800*	*19,000*	*19,000*	*19,000*
	PUBLIC TOTAL		***176,132,100***	***191,938,900***	***179,377,000***	***180,686,100***	***181,836,500***
Private Subsidized	**Africa**	AL	57,820,100	63,996,521	62,801,721	60,945,426	60,677,942
		ASAQ	4,413,100	6,088,576	7,117,111	8,681,040	8,732,224
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Pvt. Sub. Total		***62,233,200***	***34,110,300***	***28,491,700***	***22,747,000***	***22,530,700***
	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*	*31,147,000*	*25,591,500*	*19,910,900*	*19,696,200*
		ASAQ	*4,413,100*	*2,963,300*	*2,900,200*	*2,836,100*	*2,834,500*
		ASSP					
		DP					
		ASMQ					
	PRIVATE SUBSIDIZED TOTAL						***22,530,700***

			62,233,200	***34,110,300***	***28,491,700***	***22,747,000***	
Premium Private	**Africa**	AL	30,627,500	33,592,000	36,678,700	39,903,000	43,268,900
		ASAQ	8,226,100	9,350,600	10,525,800	11,760,700	13,053,900
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Pre. Pvt. Total		***38,853,600***	***42,942,600***	***47,204,500***	***51,663,700***	***56,322,800***
	Americas	AL	123,700	176,700	230,700	285,800	341,800
		ASAQ	2,100	3,000	3,900	4,800	5,700
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Americas Pre. Pvt. Total		***125,800***	***179,700***	***234,600***	***290,600***	***347,500***
	Eastern	AL	10,625,600	12,291,200	14,013,900	15,797,200	17,635,500
	Mediterranean	ASAQ	1,082,300	1,187,100	1,294,500	1,406,300	1,523,100
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Eastern Med. Pre. Pvt. Total		***11,708,000***	***13,478,300***	***15,308,400***	***17,203,500***	***19,158,600***
	Europe	AL	16,200	18,000	19,700	21,600	23,400
		ASAQ	100	100	100	100	100
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Europe Pre. Pvt. Total		***16,300***	***18,000***	***19,800***	***21,700***	***23,600***
	South-East Asia	AL	39,862,200	46,568,000	53,401,100	60,350,200	67,444,600
		ASAQ	2,500	3,400	4,200	5,000	5,800
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	5,500	6,700	7,900	9,200	8,700
	South-East Asia Pre. Pvt. Total		***39,869,900***	***46,577,400***	***53,412,200***	***60,363,000***	***67,459,200***
	Western Pacific	AL	628,800	723,400	820,000	918,900	1,019,600
		ASAQ	99,000	122,400	146,000	169,600	193,200
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	61,300	78,200	95,300	112,700	105,400
	Western Pacific Pre. Pvt. Total		***784,300***	***914,300***	***1,046,700***	***1,181,500***	***1,318,300***
	Premium	AL	*81,884,100*	*93,369,300*	*105,164,200*		

	Private Total (all regions)					*117,276,800*	*129,733,900*
		ASAQ	*9,412,100*	*10,666,600*	*11,974,400*	*13,346,500*	*14,781,900*
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	*66,800*	*84,900*	*103,200*	*121,900*	*114,100*
	PREMIUM PRIVATE TOTAL		***91,357,900***	***104,110,400***	***117,226,200***	***130,724,000***	***144,630,000***
TOTAL (across channels)	**Africa**	AL	203,454,700	223,828,421	213,138,621	216,996,926	221,147,342
		ASAQ	66,020,100	74,391,676	77,152,611	78,630,140	80,043,124
		ASSP	500	600	600	600	600
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Africa Total		***269,475,300***	***298,220,697***	***290,291,832***	***295,627,666***	***301,191,066***
	Americas	AL	129,600	183,100	237,100	292,200	348,200
		ASAQ	2,100	3,000	3,900	4,800	5,700
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Americas Total		***131,700***	***186,100***	***241,000***	***297,000***	***353,900***
	Eastern Mediterranean	AL	11,774,500	13,601,600	15,323,800	17,107,100	18,945,400
		ASAQ	5,142,000	4,577,600	4,206,200	4,462,000	4,606,000
		ASSP	1,548,400	1,404,500	1,442,400	1,442,400	1,442,400
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Eastern Mediterranean Total		***18,464,900***	***19,583,700***	***20,972,400***	***23,011,500***	***24,993,900***
	Europe	AL	16,300	18,000	19,700	21,600	23,400
		ASAQ	100	100	100	100	100
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	-	-	-	-	-
	Europe Total		***16,400***	***18,000***	***19,800***	***21,700***	***23,600***
	South-East Asia	AL	40,453,400	46,987,800	53,787,200	60,737,700	67,832,000
		ASAQ	2,500	3,400	4,200	5,000	5,800
		ASSP	-	-	-	-	-
		DP	-	-	-	-	-
		ASMQ	5,500	6,700	7,900	9,200	8,700
	South-East Asia Total		***40,461,100***	***46,997,200***	***53,798,300***	***60,750,500***	***67,846,600***
	Western	AL	870,500	834,300	881,900		

	Pacific					975,600	1,078,800
		ASAQ	99,000	122,400	146,000	169,600	193,200
		ASSP	-	-	-	-	-
		DP	127,700	81,400	71,000	71,000	71,000
		ASMQ	81,400	100,000	114,300	131,700	124,400
	Western Pacific Total		***1,173,900***	***1,128,300***	***1,198,700***	***1,328,200***	***1,467,500***
	Total	AL	*256,699,000*	*285,453,221*	*283,388,321*	*296,131,126*	*309,375,142*
	(all regions)	ASAQ	*71,265,800*	*79,098,176*	*81,513,011*	*83,271,640*	*84,853,924*
		ASSP	*1,548,900*	*1,405,100*	*1,443,000*	*1,443,000*	*1,443,000*
		DP	*127,700*	*81,400*	*71,000*	*71,000*	*71,000*
		ASMQ	*86,900*	*106,700*	*122,200*	*140,900*	*133,100*
GRAND TOTAL			***329,723,100***	***366,134,297***	***366,522,032***	***381,036,666***	***395,876,666***

Table 9 Oral artemisinin monotherapy demand by region and channel, 2017 – 2021

Channel	Region	2017	2018	2019	2020	2021
Public	Africa	-	-	-	-	
	Americas	-	-	-	-	
	Eastern Mediterranean	-	-	-	-	
	Europe	-	-	-	-	
	South-East Asia	-	-	-	-	
	Western Pacific	-	-	-	-	
	Public Total	**-**	**-**	**-**	**-**	
Private Formal	Africa	141,535	99,575	79,450	54,477	42,273
	Americas	452	356	278	138	82
	Eastern Mediterranean	29,448	18,377	12,455	5,959	3,280
	Europe	61	37	24	11	6
	South-East Asia	4,271	3,580	3,404	3,206	1,820
	Western Pacific	6,479	6,563	7,034	7,461	8,225
	Private Formal Total	**182,246**	**128,488**	**102,645**	**71,252**	**55,686**
Private Informal	Africa	291,633	209,703	173,474	128,899	106,595
	Americas	547	435	342	170	102
	Eastern Mediterranean	41,156	25,269	16,768	7,525	4,109
	Europe	63	39	26	11	6
	South-East Asia	3,906	3,382	3,195	2,914	1,656
	Western Pacific	6,097	5,947	6,226	6,451	7,055
	Private Formal Total	**343,402**	**244,775**	**200,031**	**145,970**	**119,523**
Total	Africa	433,168	309,278	252,924	183,376	148,868
(across channels)	Americas	999	791	620	308	184
	Eastern Mediterranean	70,604	43,646	29,223	13,484	7,389
	Europe	124	76	50	22	12
	South-East Asia	8,177	6,962	6,599	6,120	3,476
	Western Pacific	12,576	12,510	13,260	13,912	15,280
Grand Total		**525,648**	**373,263**	**302,676**	**217,222**	**175,209**

Table 10 Private sector Injectable artemisinin demand, by region, 2017 – 2021 (Standard Units: Artemether 80 mg., Artemotil 150 mg., AS 60 mg.)

Region	Product Type	2017	2018	2019	2020	2021
Africa	Artemotil	11,988	12,108	12,229	12,351	12,474
	AS	5,078,593	5,197,565	5,318,408	5,441,149	5,565,812
	Artemether	15,186,098	15,107,807	15,026,432	14,941,919	14,854,213
	Africa	***20,276,679***	***20,317,480***	***20,357,069***	***20,395,419***	***20,432,499***
Americas	Artemotil	31	32	32	32	33
	AS	13,710	13,847	13,985	14,125	14,267
	Artemether	-	-	-	-	-
	Americas	***13,741***	***13,879***	***14,017***	***14,157***	***14,299***
Eastern Mediterranean	Artemotil	3,406	3,440	3,474	3,509	3,544
	AS	1,902,830	2,001,713	2,102,384	2,204,868	2,309,191
	Artemether	2,760,085	2,518,147	2,271,094	2,018,848	1,761,329
	Eastern Mediterranean	***4,666,321***	***4,523,300***	***4,376,952***	***4,227,225***	***4,074,064***
Europe	Artemotil	6	6	6	6	6
	AS	2,615	2,641	2,667	2,694	2,721
	Artemether	-	-	-	-	-
	Europe	***2,621***	***2,647***	***2,673***	***2,700***	***2,727***
South-East Asia	Artemotil	8,133,871	8,215,210	8,297,362	8,380,335	8,464,139
	AS	432,284	436,606	440,972	445,382	449,836
	Artemether	863,106	871,737	880,455	889,259	898,152
	South-East Asia	***9,429,261***	***9,523,553***	***9,618,789***	***9,714,976***	***9,812,127***
Western Pacific	Artemotil	221	223	225	228	230
	AS	130,510	131,815	133,133	134,465	135,809
	Artemether	37,767	38,145	38,526	38,912	39,301
	Western Pacific	***168,498***	***170,183***	***171,884***	***173,605***	***175,340***
Private Total (all regions)	**Artemotil**	**8,149,523**	**8,231,019**	**8,313,328**	**8,396,461**	**8,480,426**
	AS	**7,560,542**	**7,784,187**	**8,011,549**	**8,242,683**	**8,477,636**
	Artemether	**18,847,056**	**18,535,836**	**18,216,507**	**17,888,938**	**17,552,995**

Table 11 Private sector Rectal artemisinin demand, by region, by formulation, 2017 – 2021

Region	Formulation	2017	2018	2019	2020	2021
Africa	80 mg. artemether	1,654,651	1,655,701	1,656,606	1,569,715	1,657,972
	100 mg. artesunate	2,186,063	2,223,420	2,261,305	2,146,604	2,338,690
Americas	80 mg. artemether	1,938	1,957	1,976	1,967	2,016
	100 mg. artesunate	2,357	2,380	2,404	2,392	2,452
Eastern Mediterranean	80 mg. artemether	210,661	212,768	214,895	196,200	219,215
	100 mg. artesunate	256,227	258,789	261,377	238,637	266,630
Europe	80 mg. artemether	370	373	377	301	385
	100 mg. artesunate	449	454	459	366	468
South-East Asia	80 mg. artemether	9,554	9,650	9,746	8,960	9,942
	100 mg. artesunate	11,621	11,737	11,854	10,898	12,093
Western Pacific	80 mg. artemether	13,671	13,808	13,946	12,916	14,226
	100 mg. artesunate	16,628	16,794	16,962	15,710	17,303
Private Total	***80 mg. artemether***	**1,890,845**	**1,894,257**	**1,897,546**	**1,790,059**	**1,903,756**
	100 mg. artesunate	**2,473,345**	**2,513,574**	**2,554,361**	**2,414,607**	**2,637,636**

Table 12 Injectable artesunate public sector procurement by region, 2017 – 2021 (60 mg. vials)

Region	2017	2018	2019	2020	2021
Africa	26,665,500	26,489,300	24,920,400	24,589,000	25,747,600
Americas	-	-	-	-	-
Eastern Mediterranean	936,700	943,400	887,300	906,600	1,144,700
Europe	200	100	100	100	100
South-East Asia	46,300	40,700	22,100	22,200	22,200
Western Pacific	38,600	22,900	18,100	18,100	18,100
TOTAL	**27,687,300**	**27,496,400**	**25,848,000**	**25,536,100**	**26,928,900**

Table 13 RDT demand by channel, by region, 2017 – 2021

Channel	Region	2017	2018	2019	2020	2021
Public	Africa	466,599,394	521,301,261	557,588,308	587,936,653	616,002,952
	Americas	484,835	489,905	494,899	499,812	504,684
	Eastern Mediterranean	57,993,764	61,027,804	63,853,880	65,855,072	67,424,213
	Europe	-	-	-	-	-
	South-East Asia	14,276,273	14,424,645	14,571,542	14,715,553	14,861,252
	Western Pacific	3,770,280	3,827,316	3,883,515	3,938,300	3,991,907
	Public Total	**543,124,546**	**601,070,931**	**640,392,144**	**672,945,390**	**702,785,007**
Private Formal	Africa	96,020,272	102,086,540	108,581,452	113,828,592	119,547,220
	Americas	75,721	76,540	77,348	78,142	78,925
	Eastern Mediterranean	19,669,787	20,367,360	21,067,394	21,626,480	22,109,887
	Europe	-	-	-	-	-
	South-East Asia	30,135,506	30,462,191	30,785,979	31,103,374	31,423,855
	Western Pacific	2,260,258	2,294,646	2,328,559	2,361,622	2,393,937
	Private Formal Total	**148,161,544**	**155,287,277**	**162,840,732**	**168,998,210**	**175,553,824**
Private Informal	Africa	53,076,829	55,965,150	58,833,560	61,071,536	63,599,767
	Americas	26,082	26,369	26,651	26,929	27,197
	Eastern Mediterranean	6,119,204	6,410,760	6,687,944	6,892,238	7,057,474
	Europe	-	-	-	-	-
	South-East Asia	2,708,897	2,739,867	2,770,503	2,800,740	2,830,340
	Western Pacific	907,956	922,012	935,921	949,645	963,115
	Private Informal Total	**62,838,968**	**66,064,158**	**69,254,579**	**71,741,088**	**74,477,894**
Total *(across channels)*	Africa	615,696,495	679,352,951	725,003,320	762,836,781	799,149,938
	Americas	586,638	592,814	598,898	604,883	610,807
	Eastern Mediterranean	83,782,755	87,805,924	91,609,218	94,373,790	96,591,574
	Europe	-	-	-	-	-
	South-East Asia	47,120,676	47,626,703	48,128,024	48,619,667	49,115,446
	Western Pacific	6,938,494	7,043,974	7,147,995	7,249,567	7,348,959
GRAND TOTAL		**754,125,058**	**822,422,366**	**872,487,455**	**913,684,688**	**952,816,725**

Table 14 RDT public sector procurement, by region, 2017 – 2021

Region	2017	2018	2019	2020	2021
Africa	252,105,400	241,866,600	225,111,300	227,097,000	229,621,900
Americas	1,057,600	1,070,700	824,800	835,200	907,900
Eastern Mediterranean	6,016,600	5,728,200	5,658,800	5,749,800	6,669,700
Europe	43,200	20,300	20,300	20,300	19,200
South-East Asia	5,064,200	4,056,000	3,801,700	3,807,900	3,944,400
Western Pacific	7,368,300	6,017,500	4,252,200	4,621,300	5,103,300
TOTAL	**271,655,400**	**258,759,300**	**239,669,100**	**242,131,600**	**246,266,400**

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