

Demand Forecast for Artemisinin-based Combination Therapies (ACTs) in 2012-2013

Q1-2012 Report

Prepared by the ACT Forecasting Consortium:



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This report was prepared by a consortium of forecasters including The Boston Consulting Group, the Clinton Health Access Initiative, and the Fundacion Zaragoza Logistics Center. The consortium is funded by UNITAID and operates under the leadership of the Affordable Medicines Facility – malaria (AMFM), the Global Fund to Fight AIDS, Tuberculosis and Malaria, the Medicines for Malaria Venture (MMV), the Roll Back Malaria Partnership, UNITAID and the World Health Organization. All reasonable precautions have been taken by the authors to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall UNITAID or the World Health Organization be liable for damages arising from its use.

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EXECUTIVE SUMMARY

Key Messages

- Public Sector ACT procurement is projected to increase substantially between 2011 and 2012, mainly due to transient international donor funding to individual endemic countries.
- While there is no indication that the “need” for ACTs will decrease, current donor funding commitments suggest a very sharp decrease in public sector procurement could occur in 2013.
- An additional risk to demand in 2013 is the decision regarding the future of the AMFm; the subsidized private sector currently represents about 30% of global demand for pre-qualified ACTs. If a decision is taken to terminate the AMFm after Phase 1 – which would further erode global ACT procurement levels – funding for a responsible transition will be critical to sustain the market.
- Additional funding across sectors, including the AMFm, international funding for public sector procurement, and domestic resources in endemic countries, will have a large impact on future demand.
- Communication of funding decisions in a timely manner is critical for accurate forecasting, and is important for those involved in producing ACTs and artemisinin (which has a relatively long lead time).

This study summarizes the latest demand forecasts for artemisinin-combination therapies (ACTs) and artemisinin in 2012 and 2013 produced by the ACT forecasting consortium. The consortium consists of The Boston Consulting Group, the Clinton Health Access Initiative, and Fundacion Zaragoza Logistics Center. Funded and coordinated by UNTAID, the project brings together forecasters originally working under the Roll Back Malaria (RBM) umbrella in an effort to produce a single ACT forecast for use by the malaria community. The consortium is overseen by a Steering Committee that includes representatives from the Affordable Medicines Facility – malaria (AMFM), the Global Fund to Fight AIDS, Tuberculosis and Malaria, the Medicines for Malaria Venture (MMV), the Roll Back Malaria partnership, UNTAID and the World Health Organization. This is the fourth in a periodic series of consortium forecasts that will be produced until mid-2013.

The consortium demand forecast uses multiple data sources and multiple models to generate a single, global, forecast of the quantity of pre-qualified ACTs and artemisinin that will be procured in 2012 and 2013. It projects ACT procurement across three market sectors – the public channel (including all sources of funding for public channel purchases), the premium (i.e., unsubsidized) private channel, and the subsidized private channel (in AMFm Phase 1 countries¹). The forecasts reported here project procurement at the manufacturer level, in the form of expected orders based on currently available and committed funding.

Projected WHO-pre-qualified ACT procurement in 2012 is 319M treatments. This marks a record year for ACTs, and reflects significant support from international funders who directly or indirectly pay for most of these treatments. The public channel is projected to be the largest channel for pre-qualified

1 Ghana, Kenya, Madagascar, Niger, Nigeria, Tanzania, Uganda. Cambodia was initially included in Phase 1 but had not yet placed any orders through the AMFm in 2011. Our forecast for 2012 and 2013 includes new orders from Cambodia under the AMFm.

ACTs with orders for 226M treatments in 2012. This figure is substantially higher than reported orders for 2010 and estimates for 2011 (182M and 176M, respectively) in the public channel, due to an increase in public funding available in several countries in 2012. Approved orders for private buyers in the subsidized private channel are forecasted to be 83M treatments in 2012, roughly comparable to our final estimates for 2011 for that channel. Premium private sector orders are projected to be 10M treatments.²

There is significant uncertainty around procurement levels for pre-qualified ACTs in 2013. As of the first quarter of 2012, committed international funding levels for 2013 are significantly lower than for 2012.³ In addition, it is unclear what form the AMFm will take in 2013 after the conclusion of the Phase 1 pilot. Later this year, a decision will be taken by the Global Fund Board to continue, modify, expand, or terminate the AMFm based on pilot results and donor interest. As a result, 2013 will be a transition year for the AMFm. Given that early results indicate the AMFm has increased ACT deliveries to countries, it is possible that the program will be continued or expanded in some form, but new funding will be needed to support such a continuation or expansion. If, however, the decision is made to terminate the AMFm after Phase 1 or scale down the program significantly, a potentially smaller level of funding for procurement in 2013 – based on available funding and country realities – would be deployed to enable an orderly adjustment in the market.

In light of this uncertainty two forecasts have been created for 2013. Scenario 1 assumes the AMFm continues in largely its current form in the 8 Phase 1 countries.⁴ This scenario would correspond to a decision by the Board to expand, continue, or slightly modify the AMFm after Phase 1. Scenario 2 assumes a decision is made to terminate or scale back the AMFm program, but that support equivalent to 6 months of funding is provided to enable an orderly transition in the private channel. Both scenarios project public channel procurement of ACTs based on currently committed funding. It should be noted that at this point, no donors have binding commitments to provide funding for the transition period.

In all scenarios, overall procurement levels are projected to decline significantly in 2013. Public channel procurement is expected to fall sharply, to 162M treatments in 2013. This projected drop is due to the decline in committed international funding available for 2013 and the end of transient funding that boosted order demand in 2012 in a number of countries. An emergence of new funding from international or domestic sources in 2013 could mitigate this decline, but our forecast projects orders based on what funding is committed as of Q1, 2012.⁵ Given that underlying consumer demand for

2 Due to changes in methodology and data sources, the premium private channel estimates for 2012 and 2013 are not directly comparable with those of earlier periods. Prior year estimates are believed to include some non-pre-qualified ACTs; as a result the figures for those earlier periods should be viewed as overstating demand for PQ ACTs in the premium private market.

3 It is worth noting that this decline in funding is independent of the recent decision by the Global Fund Board to terminate Round 11; given its timing, Round 11 would have impacted demand for ACTs only in the period after 2013.

4 It is also possible that a successful evaluation of the AMFm could lead to an expansion of the subsidy model to additional countries. However, given the timing of the AMFm evaluation and the work that would be needed to secure funding, design and implement such an expansion would mean that the incremental growth would likely occur after 2013.

5 Procurement of funds from bilateral and multilateral agencies with annual disbursement cycles may be under-represented through this approach.

effective antimalarial treatment is unlikely to drop materially in 2013, this situation creates a risk of unmet need for ACTs.

Under Scenario 1, which assumes that the AMFm continues in largely its current form in 2013, projected global orders for pre-qualified ACTs fall to 257M treatments. This represents a decline of 19% vs. our 2012 order forecast.

Scenario 2 assumes that a decision is taken to terminate or scale back the program but that additional funding is provided by donors to facilitate an orderly transition in the market.⁶ The potential size and structure of a transition program is still being determined; however, for modeling purposes we have assumed an amount equivalent to 6 months of current procurement levels is made available to enable such a transition in the private channel during 2013. Under this scenario, 2013 will have projected global orders for pre-qualified ACTs of 219M treatments. This represents a decline of nearly one-third from 2012 estimates. In this scenario, the decline in public channel orders from lower funding levels is combined with a year-on-year reduction of ~40M treatments in the subsidized private market.

Figure 1 summarizes our forecast of projected orders for ACTs across the channels.⁷

ACTs (millions of treatments)	Prior estimates			Scenario 1	Scenario 2
	2010	2011	2012	2013	2013
Public sector	182	176	226	162	162
Private-Subsidized sector	12	88	83	85	43
Private-Premium sector	20-25 (est.)	23	10	10	14
Total	214–219	287	319	257	219

Figure 1: Global Demand for Pre-qualified ACTs across Channels

We have also converted these forecasts of pre-qualified ACT demand into requirements for artemisinin. The current planting cycle in China will yield artemisinin that manufacturers will put into ACTs in 2013, so forecasts for 2013 ACTs are key inputs into planting decisions. The following table lays out the artemisinin required to meet the need under these scenarios, using a conversion ratio of 2.16 M ACT treatments per metric tonne of artemisinin.⁸ (Fig. 2)

⁶ Note: this is not a "worst-case scenario" as it does assume funding is made available for an orderly transition in the market. No donors yet have binding commitments to provide funding for a transition. A termination of the AMFm without transition support would cause procurement to decline even more sharply in 2013.

⁷ Due to changes in methodology and data sources between our final 2011 forecasts and our current forecast, the results for the private channel are not directly comparable across years. One of the data sources we used for the 2011 forecast was found to contain information about non-pre-qualified ACTs as well as PQ ACTs. We have distinguished PQ ACT data from this source in our new 2012 and 2013 forecasts. As a result, the private channel forecasts, both premium and subsidized, for 2011 should be viewed as slightly overstated.

⁸ For a discussion of the methods used to calculate artemisinin needs, see Methods section 3.6.

				Scenario 1	Scenario 2
	2010	2011	2012	2013	2013
ACTs (millions of treatments)	214–219	287	319	257	219
Artemisinin (metric tonnes)	~100	133	148	119	101

Figure 2: Global Demand for Pre-qualified ACTs and Artemisinin

It is worth noting that this demand is for pre-qualified ACTs only; additional artemisinin supply would be needed to produce non-pre-qualified ACTs, oral artemisinin monotherapies, IV artesunate for severe malaria, and to replenish manufacturer stocks that were depleted in 2011 and 2012. While these additional sources of demand for artemisinin are smaller than the demand for pre-qualified ACTs, they matter for farmers and extractors. Currently, work is underway by other groups to forecast the artemisinin demand from these other sources, and future reports will strive to incorporate this information.

Overall, we see a market for pre-qualified ACTs that remains quite large but highly volatile. After a record 2012, we project a market decline in 2013 – potentially to 2010 levels – due to reductions in committed donor funding. Given the cancellation of Global Fund Round 11, there are even greater uncertainties beyond 2013. This analysis calls into question whether the dramatic gains that have been achieved over the last few years in malaria control and burden reduction can be sustained. It also raises a question about whether additional new funding can and should be raised by international donors or domestic governments to support country procurement of pre-qualified ACTs in 2013. As additional information about funding commitments become clear, we will incorporate them into our future forecasts and reports.

There are several other implications of this report for policymakers and market participants. The decision about the AMFm's future will have a major impact on the market for ACTs. Ensuring clarity around the decision making process (including the decision timing and the criteria to be used to make the decision) is critical in allowing market participants to prepare effectively. In addition, the up-and-down patterns of funding and demand described here underscore the importance of effective policy and market coordination at the global and endemic country level; a rich understanding of market dynamics, patient need, and supply will become increasingly important to ensure these critical products are deployed most effectively, efficiently, and equitably. Longer-term commitments by donors could also help stabilize the market and allow market participants to prepare effectively.

Finally, we anticipate continued "tightness" in artemisinin supply as the supply market slowly "catches up" to meet continued these projected levels of demand for ACTs. Ongoing coordination of supply dynamics by the WHO and RBM "ACT Supply Task Force" may help alleviate these issues and ensure product is available to those most in need. Taken together, these trends portray a market that requires active decision making and close coordination by policymakers to ensure supplies are targeted at those most in need.

I. INTRODUCTION

This study originated from the work of the Affordable Medicines Facility – malaria (AMFm) Ad Hoc Committee. The Committee in 2009 requested that a working group be established to review the Artemisinin-based Combination Therapies (ACT) demand forecast under the AMFm, and to produce a refined forecast during the early stages of AMFm Phase 1 implementation in the context of global ACT demand. The work was to be done through joint leadership of the Roll Back Malaria (RBM) partnership, WHO, The Global Fund, and UNITAID. While the initial impetus for the demand forecast was to understand the impact of the AMFm, these forecasts strive to account for all funding sources and channels for ACTs.

In 2010, UNITAID announced plans to sponsor a global demand forecasting service for WHO-pre-qualified ACTs and artemisinin. The need for improved demand forecasting comes at a time when ACTs are increasingly relied on as standard of care for malaria case management and when there is growing uncertainty about future trends in the market, overall demand, and the level of supply required to meet it. In addition, the policy decision by the WHO to recommend confirmatory diagnosis before treatment for malaria could have significant future impact on demand for antimalarials. UNITAID selected The Boston Consulting Group (BCG) and its partners – the Clinton Health Access Initiative (CHAI) and Fundacion Zaragoza Logistics Center (MIT-Zaragoza) – to provide quarterly forecasts to inform policy makers and market participants. UNITAID finances and manages the contractual arrangements for the studies, which are overseen by a Steering Committee composed of representatives from the AMFm, the Global Fund to Fight AIDS, Tuberculosis and Malaria, MMV, RBM, UNITAID, and WHO.

This report is the fourth in a series of periodic updates by our consortium. Notably, it includes our first forecasts of demand for pre-qualified ACTs and artemisinin in 2013. It also comes at a time of increasing uncertainty in malaria and Global Health. As the global economic crisis continues, significant pressures have been placed on donor organizations and governments who directly or indirectly fund a large share of global demand for ACTs and artemisinin. Recently, the Global Fund announced that it would cancel its planned Round 11 of grants to developing countries; while that decision does not materially affect demand during the period forecasted here, it does underscore the challenges facing donors and the malaria community. In addition, a decision on the future of the AMFm, which has been a significant driver of global demand for ACTs, will be taken whether to continue, modify, expand or terminate the subsidy program.

This document details the findings of this revised forecast, and is divided into several sections:

- The Context section summarizes the background and objectives for the forecasting service.
- The Methodology section provides an account of the forecasting approach, including a brief account of the multiple inputs and iterative validation process we have used to maximize the robustness of the estimate.
- The Findings section breaks down the ACT demand forecast into the major public and private sector forecasts and translates these results into artemisinin demand.
- The final Implications section summarizes what we see as the main takeaways and implications from this forecast.

II. CONTEXT: ACTs, the AMFm, and the UNITAID demand forecasting service

Artemisinin-based Combination Therapies (ACTs), which utilize artemisinin derivatives along with a partner drug, such as amodiaquine, lumefantrine, mefloquine, or piperaquine, are now widely considered the most effective treatment for uncomplicated *Plasmodium falciparum* malaria. In 2004, the WHO revised its malaria treatment guidelines to recommend ACTs over all other therapies for acute *P. falciparum* cases, and they have been adopted as the standard of care in most endemic countries.

ACTs have quickly grown into one of the most widely used anti-malarial drug classes globally. Currently artemisinin is derived from agricultural sources, and has a >14-month production cycle from plant to ACT. As a result, producers cannot react rapidly to sudden changes in demand.⁹ The rapid growth in ACTs over the last decade has led to volatile artemisinin markets, including marked cycles of boom and bust in the volume of product cultivated. Unpredictability in supply and demand has influenced pricing in an erratic manner, complicated planning by market players, and placed at risk the ability to ensure broad availability of ACT treatments. These dynamics suggest a strong need for a well-developed ACT procurement and artemisinin demand forecasting service, one that is credible, transparent and robust, to inform decision making by policy makers and market participants.

The AMFm Ad Hoc Committee in 2009 requested that a working group be established to review the ACT demand forecast for AMFm and to produce a refined forecast during the early stages of AMFm Phase 1 implementation in the context of global ACT demand. Such forecasts have played a role in providing estimates of funding needs for ACTs. The work was to be done under the RBM umbrella - and co-convened by RBM, UNITAID and the Global Fund. UNITAID met this call by sponsoring a forecasting service tasked with quarterly updates through Phase 1 of the AMFm. The ACT Forecasting Service brings together three groups with experience forecasting the ACT market - the Boston Consulting Group (BCG), the Clinton Health Access Initiative (CHAI), and Fundacion Zaragoza Logistics Center. Specific outputs of this forecasting service are:

- to provide **global forecasts** for WHO-pre-qualified ACT procurement and artemisinin demand in 2011-2013 in light of the rollout of the AMFm, funding unpredictability, and new policies on the use of confirmatory diagnosis before treatment; this forecast will be updated periodically;
- to identify **implications** of the demand forecast and scenarios for production and supply chain decisions.

This forecast represents the collaborative efforts of the consortium members, with contributions and support of many others in the malaria community. We welcome reactions and feedback from market participants, policy makers and other stakeholders as it will allow us to refine our approach in coming forecast periods.

⁹ Later in 2012 Sanofi-Aventis is expected to launch a semi-synthetic form of artemisinin, which will have a much shorter lead-time and therefore should be more adaptable to changes in market demand. However, given capacity constraints, semi-synthetic artemisinin will be able to meet only a portion of market demand.

III. METHODOLOGY

Although BCG, CHAI and MIT-Zaragoza had previously created procurement and demand forecasts for ACTs, a new approach was required to create a single consortium forecast that incorporated new programs including the AMFm pilot. Our intent was not simply to agree upon country-level forecast outputs, but rather to build a composite model that incorporated the strengths of multiple approaches, data sources, and analytical practices. Specifically we sought to integrate several potentially relevant sources to estimate ACT procurement into a single forecast – including incidence of malaria-like fevers, treatment seeking behavior, treatment penetration in private and public sectors, and country-level procurement trends, among others.

The underlying premise of the consortium methodology is that *a combination of multiple forecasting models, run in parallel and drawing from different sources of information, is inherently more robust than a single model*. There are three key stages in implementing this methodology (Figure 3), including incorporation and vetting of data sources, parallel modeling, and analysis and reporting.

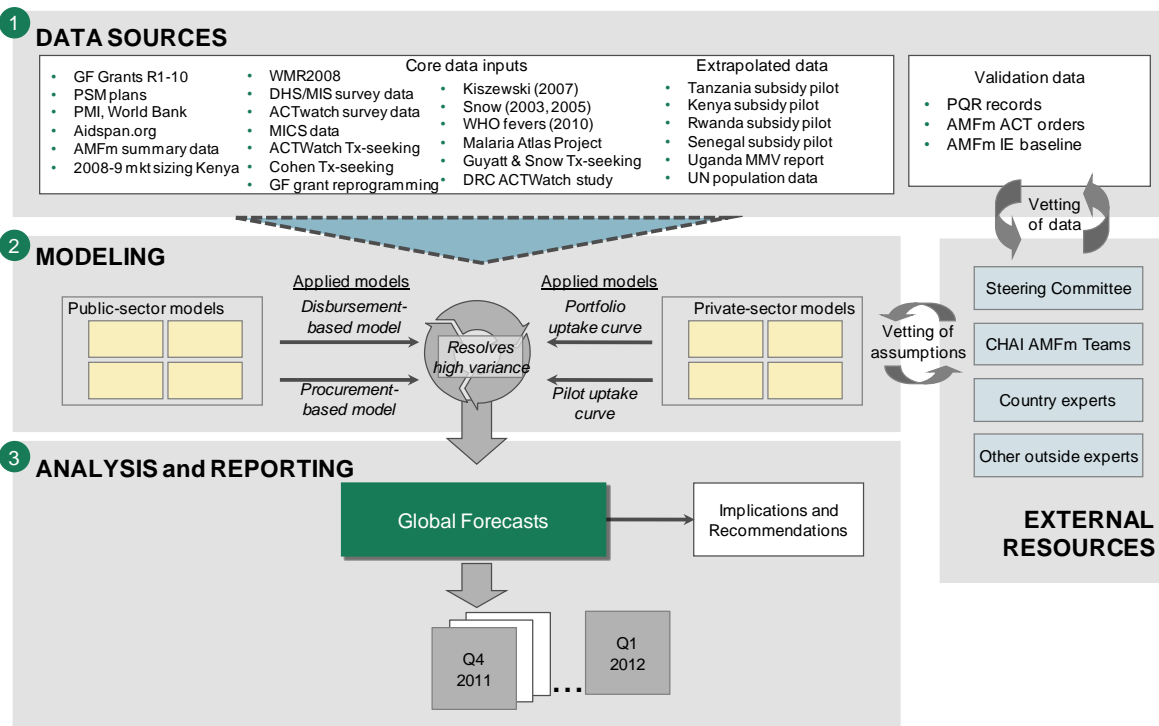


Figure 3: Three stages of the consortium forecasting approach

3.1 Data Sources: Incorporation and vetting of information

In the first stage the consortium gathered and validated inputs from available primary and secondary sources. This included a rigorous assessment of sources – validating interpretations, identifying gaps and accounting for inconsistencies in data collection and analytic techniques – followed by a selection of

most reliable and accurate sources to be used for each input where there was a clear winner, or allowing more than one source where a variety of inputs could enhance the forecast.

This step included pressure testing key assumptions around priority countries with country procurement officers and Global Fund, PMI, and World Bank program managers and/or adjusting model inputs based on assumptions communicated to us from program coordinators on the ground in the AMFm countries. We also conducted additional research and analysis as needed to compare our ACT procurement figures against other variables, such as AMFm orders by first-line buyers, and extrapolated data to other segments where information was absent.

3.2 Parallel Modeling: Creating a combined baseline global forecast from estimates in different segments

In the second stage, the consortium segmented the ACT market into sectors defined by channel (public sector, "subsidized private sector" for AMFm markets, and "premium private sector" for non-AMFm markets) and by country tier (AMFm, non-AMFm top tier, and non-AMFm lower tier). This segmentation enhanced the consortium's ability to model the unique dynamics of each segment. Independent models, each using different methodologies, were run to forecast ACT procurement in each channel. The outputs of these models were then compared and combined in an initial composite baseline forecast.

Multiple models were central to building the consortium's composite baseline ACT procurement forecast:

- In the public channel, a disbursement-based model, and a procurement plan-based model.
- In the private channel, a pilot uptake-curve model, and a portfolio uptake-curve model.

Each used a different methodology to forecast demand, and was run independently to generate country-level forecasts. Global results were disaggregated to reveal countries with high variances across the models, which were parsed out to the point of isolating discrepancies or errors in inputs (which were then corrected), or differences in assumptions and conclusions (which were preserved in the different models). This iteration process on inputs and assumptions results in increased accuracy and precision of the forecast.

3.2.1 Public sector models

In the public sector, the **disbursement-based model** projected ACT procurement based on the amount of public funding disbursed in a given year for ACT purchases. The methodology relies on the fact that funding for the great majority of ACTs is concentrated in a small group of donors, whose historical funding levels tend to be known for each individual country. This approach estimates the amount of money that will be made available to each country for ACT procurement in the future, using existing donor operational plans, analysis of trends, and adjusted for decreases or delays typically encountered during implementation.

The **procurement plan-based model** forecasted ACT procurement from country-level procurement plans, where available, and proposed procurement numbers in countries' public funding proposals. The projection included planned procurement funded by the Global Fund, PMI, World Bank, DFID, UNITAID,

country governments, and provisions from other donors. Planned procurement figures (in treatments) were discounted to account for delays in funding, delays in shipments, inventory stocking behaviors, and quantification error.

These models represent two largely complementary sides of the ACT equation in the public sector. The disbursement-based model provides an estimate of what resources will be available to procure ACTs, while the procurement-based model estimates the number of ACTs that countries hope to procure. Combining these two estimates allows a realistic global estimate that accounts both for national plans as well as for the reality dictated by availability of constrained financial resources.

3.2.2 Private-sector models

Two private sector models were employed. They both begin by using multiple fever incidence estimates and treatment-seeking behavior estimates to evaluate the fraction of acute fevers that will seek and obtain malaria treatment. Each model relies on different inputs (e.g. fever incidence estimates, private sector treatment seeking estimates, etc.) to arrive at a best estimate for the private sector antimalarial market. They both employ ACT uptake data from country pilots to infer ACT share in different countries.

In the **pilot uptake-curve model**, a patient-based approach was used to estimate country-specific ACT consumption. The model projected malaria-like fevers per year in each country, and – accounting for differential treatment seeking behavior and treatment rates based on malaria endemicity, age cohort and health sector – estimated the percentage of those with fever who receive an anti-malarial medicine. The forecast then estimated uptake of ACTs according to the presence or absence of subsidies in each country.

- In the **subsidized private sector**, the model applied assumptions on ACT uptake based on the findings of CHAI’s 2009 Tanzania Subsidized-ACT Pilot Study.
- In the **premium private sector**, for all countries not receiving subsidies from the AMFm, the share of WHO-pre-qualified ACTs in the private antimalarial market was estimated using ACTwatch retail outlet survey data and DHS/MIS estimates.

Portfolio uptake curve model: this model estimated global antimalarial demand by beginning with global malaria-like fevers. Fever estimates were then filtered by the percentage of fevers seeking treatment in the private sector by age cohort taken from publicly-available sources. The forecast then estimated the share of ACTs according to the presence or absence of subsidies in each country.

- In the **subsidized private sector**, *modeled uptake curves for ACT demand* relied on field data from the 2009 Tanzania sub-national subsidy pilot, accounting for children vs. adult ACT usage. The uptake curves also take into account data from recent national and local pilots in Uganda, Kenya, Rwanda, and Senegal. Private sector treatment seeking behavior is based on data from the AMFm Independent Evaluation baseline. For countries receiving their first shipment of AMFm funded ACTs, a one-time “channel-inventory filling” factor was also applied to the final forecasted numbers to account for inventory building.
- In the **premium private sector**, this approach applied data from recent studies of ACT market share in the private sector by country to derive total number of treatments. Country-specific pilot data was applied to countries such as Benin (7.2%), Cambodia (24.5%), DRC (8.7%),

Ethiopia (3%), and Zambia (13.7%) while a 3% market share was applied to other countries in the premium private sector.¹⁰

3.3 Analysis and Reporting: Combining model outputs into the forecast

The composite model combines outputs from the various component models to achieve a single averaged forecast, providing a more robust, less biased, and more accurate result. According to several peer-reviewed studies, in situations of high uncertainty, combining of forecasts is more accurate than applying the best-fitting model of any one forecast. Therefore, instead of trying to select the "best" method for forecasting ACT demand, the consortium assumes each method has some validity, and that no single method can provide a perfect forecast. Thus, we combine outputs from each of the public sector and private sector models, using each set of input assumptions. At present, outputs are given equal weighting in the final forecast, but as data on actual procurement becomes available against which to validate model components, we may weigh model components to optimize forecast results.

3.4 Definition of demand terms

Demand Definitions

Demand can be calculated at multiple levels in a market, and can therefore mean different things to different people. To avoid confusion, we use the following terms to define demand for ACTs at different levels.

- **Intermediary Orders:** The actual number of treatments that intermediaries (including national procurement agents or AMFm first-line buyers) order and that are approved for delivery in a given year. This definition matches most closely to "procurement" or "manufacturer sales" – and is the demand definition used by the consortium for the figures in this report.
- **First-Line Buyer Intentions:** The number of ACTs that national procurement officials or approved AMFm first-line buyers say they wish to purchase and have delivered in a particular year. Unlike intermediary orders, this definition does not account for potential limitations from manufacturers (due to capacity constraints) or funding organizations (due to funding constraints).
- **Potential Consumer Uptake:** The number of ACTs consumers would obtain from public or private channels, assuming product availability at current price points. This definition is built on models of treatment-seeking behavior for malaria-like fevers and consumer price sensitivity. However, given lack of confirmatory diagnosis in many cases today, it can also incorporate cases where non-malaria fevers are incorrectly treated with ACTs.

Demand in a marketplace can be measured at multiple levels. In our forecasts, we have examined demand for ACTs at three levels: demand by consumers, purchase intentions of first-line buyers, and orders approved by funders (such as AMFm). While demand across these levels should reach equilibrium in the longer term under stable market conditions, in the short term they can differ widely, especially given the changes in and uncertainty around global funding for ACTs through subsidy mechanisms. Understanding each component can be valuable for policy makers and market participants. (see Fig. 4).

¹⁰ Data are from ACT Watch and the Evidence to Policy Initiative paper "Estimating Benchmarks of Success"

The three levels of demand are defined below:

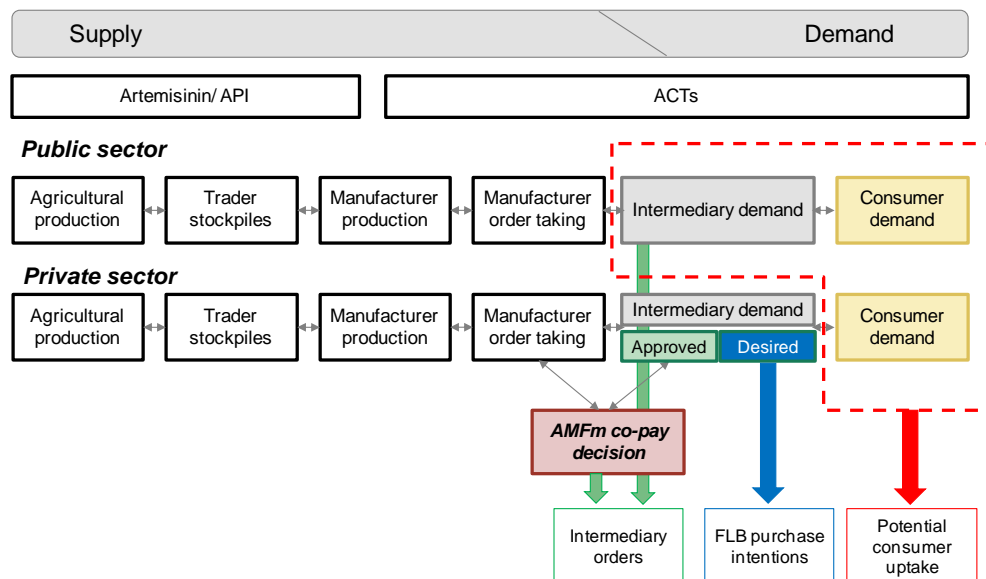


Figure 4: Artemisinin – ACT supply chain and demand elements

- Potential consumer uptake** seeks to estimate the number of ACTs consumers would obtain, given effective price points and product availability in the public or private channel. In this definition, potential consumer uptake is not the same as "need" since it takes into account the decision to seek care, beliefs (confirmed or not) that a fever is caused by malaria, and consumer sensitivity to prices. There is evidence that overall consumption of antimalarials today is higher than the number of underlying cases of malaria; efforts are underway to increase the usage of RDTs to improve the targeting of antimalarials.

In the public channel, where ACTs are often provided to patients for free, potential consumer uptake is assumed to equate to public channel procurement levels. The assumption here is that donors and country governments base their allocations and procurement decisions on estimates of underlying patient demand and care-seeking in the public sector, which may not be accurate in some cases. Since the product is free and the need for treatment generally exceeds supply, consumer uptake is modeled as what is available in that channel. In the private sector, where price influences product purchase decisions more directly, we have modeled consumer uptake on the basis of prior subsidy pilots which tracked product uptake based on relative pricing. Modeling of past experience provides a robust means of estimation of what would be taken up by consumers under the subsidy. For the private premium sector, we have modeled consumer uptake based on estimated PQ ACT market share and private sector treatment seeking behavior in the absence of a subsidy. These factors are inherently tied to a consumer’s willingness to pay, and not necessarily to “need”.

- First-line buyer purchase intentions** refers to the number of ACTs that approved AMFm FLBs would want to purchase and have delivered in a particular year. This can generally be expected to equal consumer demand if FLBs have a good awareness of how many ACTs will be purchased or consumed by the customers at the bottom of the supply chain, and assuming that FLBs a) seek to minimize

wastage of the ACTs they purchase, **b)** are not “leaking” the ACTs to other markets, and **c)** are not hoarding or otherwise misusing ACTs.

- **Intermediary orders** refer to the actual number of treatments that intermediaries (including national procurement agents or AMFm first-line buyers) order and that are approved for delivery. Under the AMFm, for example, an "order" requires two steps. First, manufacturers need to agree to sell their product to the FLB under the requested terms and conditions. Second, the AMFm must approve the order for the co-payment. As a result, the actual level of orders and deliveries under the AMFm may be lower than first-line buyer purchase intentions, and may also be different from consumer demand if funding constraints prevent subsidization.

The demand figures we are reporting in this forecast represent our projections of "intermediary orders." This focus seemed especially appropriate in light of the funding challenges facing the malaria field. We believe that understanding the projections of treatment orders in a constrained market place will be more helpful to policy makers and market players than estimates of what consumers or first line buyers might want if they were unconstrained by either funding or product supply. In the public channel, as noted above, orders are projected using the same methodology. In the subsidized private sector, the AMFm has put in place an order review process to ensure that requested orders meet several criteria including consistency with models of underlying consumer demand. As a result, "intermediary orders" and "potential consumer uptake" in the private subsidized channel have increasingly converged over time.

3.5 Price Assumptions

The different forecast models incorporate different assumptions around unit price.

- The procurement-based model is based on the number of ACT treatments that countries indicate they will purchase with a certain funding stream in a given year. Embedded in this procurement data are each country's price estimates for ACTs. Any funds that are reprogrammed or adjusted due to price changes are incorporated in each quarter's update. Pricing data for countries where this data is available can be found in the Appendix. Because of limitations in access to country-level procurement plans, not all pricing data are available.
- The disbursement-based model calculates the number of ACTs treatments procured by the public sector based on the available funds for that procurement and assumptions around current ACT prices and procurement patterns. The primary pricing assumption in the model is that global public sector ACT prices reflect, on average, the maximum price for hospital pack ACTs, established by the Global Fund for the AMFm. These maximum prices are published by RBM and the model's pricing assumptions for AL and ASAQ are based on the March, 2011 update to these pricing guidelines: (http://www.theglobalfund.org/documents/partners/rbm/RBM_ACTPricing_FactSheet_en/). In practice, actual prices paid by high-volume public buyers are often below this level due to competition among ACT manufacturers. Actual prices paid by first-line buyers under the AMFm are accessible on the AMFm web report: (http://portfolioreports.cloudapp.net/AMFm_Summary.asp). Price assumptions for other ACTs are based on historical pricing for these compounds. The secondary assumption is that the

distribution of ACT weight packs procured by the public sector reflects historical averages, as summarized in the following table:

Weight Pack	Artemether-based ACTs (AL)	Artesunate-based ACTs (ASAQ, ASSP, ASMQ)
6x1(AL) or 3+3 (ASAQ Co-b) or 25/67.5 (ASAQ FDC)	37%	26.1%
6x2(AL) or 3+3 (ASAQ Co-b) or 50/135 (ASAQ FDC)	23.5%	26.1%
6x3(AL) or 6+6 (ASAQ Co-b) or 100/270 (ASAQ FDC)	9.5%	18.5%
6x4(AL) or 12+12(ASAQ Co-b) or 100/270 (2) (ASAQ FDC)	30%	29.3%

- For the private sector, both the pilot uptake curve and portfolio uptake curve models are based on fever estimates and ACT market share data from field studies. The output from these models is the number of ACT treatments in the subsidized and unsubsidized private sector; no price estimates are built into these models.

It is important to note that changes in future price levels could have a significant impact on overall product volumes.

3.6 Procurement conversion to artemisinin supply need

To convert forecasted ACT procurement to artemisinin, we started with the milligrams of API needed to produce different dosages (e.g. by weight/ age) of various ACT formulations (e.g. AL, ASAQ). We then allowed for a 5% loss in the conversion of API to tablets. Next, we calculated the percentage of treatments represented by each product and dosage form in our 2012 forecast to derive a weighted average of "number of treatments that may be obtained per unit of artemisinin". This weighted average comes to approximately 2.16 million treatments per metric tonne of artemisinin in 2012. We applied this conversion factor to our ACT procurement forecast to estimate required artemisinin supply to meet demand.

It is worth noting that there are differences in both product and dose mix across channels and countries. For 2013, under the different funding scenarios, the market shares of different channels are very different, which alters the global product and dosing mix and changes the conversion factor used to estimate artemisinin supply need. In addition, it is unclear whether countries and funders may allocate limited funds in different ways in 2013 (e.g., emphasizing child doses) in light of funding pressures. Given these uncertainties and in order to simplify comparisons, we have applied the 2012 artemisinin conversion ratio to 2013 ACT procurement projections to estimate demand for artemisinin in that year. As more clarity around product and dose mix arises, we plan to update the artemisinin conversion ratio in future quarterly forecast updates.

IV. FINDINGS

Key Caveats to This Analysis

- This analysis represents a snapshot of future demand in a very dynamic and rapidly evolving environment – we rely on static sources complemented with forward-looking estimates where possible. Sudden changes in funding or procurement plans could alter the demand forecasts sharply.
- The forecast combines modeled results along with reported market information, both of which are only as good as the available underlying data. If new or better-quality data emerges, the forecasts reported here may be over- or understated.
- The focus of our forecasting work is very much at the global level. Given our methodology, we expect that our forecasts will be more accurate at higher levels of aggregation. Circumstances in specific local geographies may be quite different than the global story portrayed here.

4.1 International donor funding and AMFm drive ACTs to record 2012

Our current forecast projects that orders for pre-qualified ACTs will reach 319M treatments in 2012. This volume would represent a record year for pre-qualified ACT sales, and reflects growth of 11% over our final forecast of 2011 orders (287M treatments). The public channel is projected to be the largest channel for pre-qualified ACTs, with orders projected at 226M treatments in 2011. The subsidized private channel is forecast to have orders for 83M treatments, and the premium private market is projected to have 10M treatments.¹¹

Our estimate for 2012 has been revised upward since our last forecast in late Q3, 2011. At that time, we had forecasted orders of 295M ACT treatments in 2012. The increase of nearly 25M treatments in the forecast stems from two factors. The largest factor is an increase in planned procurement levels for 2012 in several countries. Specifically, we:

- updated figures for international funding by PMI, UNITAID, UNICEF and the World Bank in select countries;
- incorporated new Global Fund round grant information for select countries, and included reprogramming of funds for ACT purchases in large countries like Ghana and Tanzania;
- adjusted our disbursement methodology to better reflect the shifting dynamics of the Principal Recipient in Nigeria, and to adjust for other countries where detailed information on ACT procurement was unavailable in GFATM documents;
- added additional procurement in Myanmar to reflect DFID-BMGF plans to support ACT procurement.

¹¹ As noted above, changes in methodology in our modeling mean our final 2011 forecasts are not directly comparable with our current forecast in the private channel. One of the data sources we used for the 2011 forecast was found to contain information about non-pre-qualified ACTs as well as PQ ACTs. We have excluded this source in our new 2012 and 2013 forecasts. As a result, private channel forecasts for 2011 should be viewed as slightly overstated, and market growth in these channels essentially flat over the period.

The second factor is a set of methodological changes aimed at ensuring our models and assumptions integrate up-to-date information from new market research. In this case, we adjusted assumptions about the market share percentage to better reflect the share captured by pre-qualified ACTs (as opposed to all ACTs), and changed our assumptions about treatment-seeking behavior to match figures reported in the AMFm Independent Evaluation baseline report. The net effect of all these changes was an increase in nearly 25M treatment orders over the prior forecast.

4.2 Decline in committed international funding and uncertainty about AMFm produce challenging 2013

We are forecasting a significant decline in pre-qualified ACT procurement in 2013. At the present time, committed funding from international donors for ACTs, which is responsible for the vast majority of purchases in the public channel, is substantially lower for 2013 than for 2012. This decline translates into a forecast of 162M treatments procured in 2013 in the public channel, a decline of 28% in that channel vs. 2012 estimates. New sources of funding could mitigate this decline, but our order projections are based on the level of funding that is currently committed.

There is significant additional uncertainty about the ACT market in 2013 due to questions about what will happen to the AMFm after Phase 1. The Global Fund Board will decide later this year whether to continue, expand, modify or terminate the AMFm based on the results of the pilot and the interest of donors. While early results indicate the AMFm has resulted in increased deliveries to countries, the decision about the future of this novel financing mechanism remains to be made. As a result, 2013 will be a transition year for the AMFm.

In light of this uncertainty, two scenarios have been developed for pre-qualified ACT demand in 2013. Both scenarios assume public channel procurement based on currently committed international donor funding. Scenario 1 assumes the AMFm is continued in roughly its current form in 2013. This scenario equates to a Board decision to continue the AMFm in its current form or modify it slightly. It also yields the same results for 2013 as a Board decision to expand the AMFm to new geographies. Even if the Board decides to extend the AMFm to new countries, it will likely take more than a year (i.e., not until 2014) to organize and launch an ACT subsidy in other markets beyond the Phase 1 pilot countries.

Scenario 2 is based on the assumption that the AMFm program is retired in 2013 or reduced significantly in scope, with a transition period with roughly six months of funding support over the course of the year to allow a gradual market transition in the event of a negative Board decision. Efforts are currently ongoing to assess the appropriate size for a potential transition support program in the case of a Board decision to terminate the AMFm. At this point, it should be noted, no donors have made binding commitments to provide funding for a transition period.

In Scenario 1, orders in 2013 are projected to fall to 257M treatments. This would represent a roughly 19% year-on-year decline from the record 2012 order volume. The decline in demand in 2013 is driven by declines in committed international donor funding flows, which ebb after a peak in 2012.

In Scenario 2, we forecast demand for pre-qualified ACTs falling off to 219M treatments in 2013. In addition to the impact of lower international funding for public procurement 2013, this scenario also features an incremental decline of ~40M ACT orders in the subsidized private channel. The combined

drop of 100M treatments from 2012 marks a 31% year-on-year decline, and resets global demand for ACTs to roughly 2010 levels).¹²

The forecast break down across public and private sectors is shown in Fig. 5 below:¹³

ACTs (millions of treatments)	Prior estimates			Scenario 1	Scenario 2
	2010	2011	2012	2013	2013
Public sector	182	176	226	162	162
Private-Subsidized sector	12	88	83	85	43
Private-Premium sector	20-25 (est.)	23	10	10	14
Total	214-219	287	319	257	219

Figure 5: ACT demand forecast by sector, 2010-2013

This forecast period traces a pattern of rapid growth and then sharp decline, based largely on international funding flows and the impact of the AMFm. The rapid market growth observed between 2010 and 2012 estimates is driven by a sharp expansion of private sector pre-qualified ACT procurement under the AMFm and an expansion of international funding for ACTs. Under the AMFm, the private market for pre-qualified ACTs will have grown to nearly 30% of global demand. In addition, the number of treatments procured through the public channels will have reached an all-time high in 2012.

4.3 Growth and volatility are largest in AMFm Phase 1 countries

Looking at the market drivers, we see increased share of global PQ-ACT orders coming from AMFm Phase 1 countries. Our forecast predicts Phase 1 AMFm countries will account for about 64% of global pre-qualified ACT procurement in 2012, across all channels; in 2013 these countries will account for 61% of the global PQ-ACT market in Scenario 1, and will fall to just over 54% in Scenario 2.

Much of the growth in Phase 1 countries, not surprisingly, comes from the subsidized private sector, where the AMFm has had a particularly dramatic effect.¹⁴ The public channel in Phase 1 countries, which

12 If no funding for a transition of the AMFm is provided in 2013, global procurement would fall even more sharply; this "Worst Case" scenario would yield total global demand of only 180M treatments in 2013 (162M in the public channel and 18M in the premium private channel), a decline of 44% vs. 2012 forecasts.

13 The premium private market for ACTs is not well characterized, which complicates forecasting. In the consortium's prior forecasts, we learned that some of the sources used to estimate the size of this segment have included both pre-qualified and non-pre-qualified ACT products. In our new forecasts for 2012-2013, we have used sources that break out pre-qualified products distinctly. While this increases our confidence in the pre-qualified estimates for 2012-2013, it also means that one should not make direct comparisons of the market sizes in this segment between this and earlier forecast periods, as the demand totals in the premium-private sector in those earlier forecasts are likely overstated.

14 Private FLBs have placed the largest number of orders under the AMFM to date, but public FLBs are also significant participants in the program. According to the AMFm, private FLBs through late September 2011 have had ~107M treatments approved for co-payment (64% of total) while public FLBs had ~61M treatments approved (36%). Our analysis in this report focuses on private FLBs. However, it is worth noting that the distinction can be blurred as private FLBs may also supply public channels in certain markets.

includes funding from GFATM, PMI and other donors (and which includes some public purchases through the AMFm), is also forecasted to grow to roughly 120M treatments in 2012 (Fig. 6 and 7).

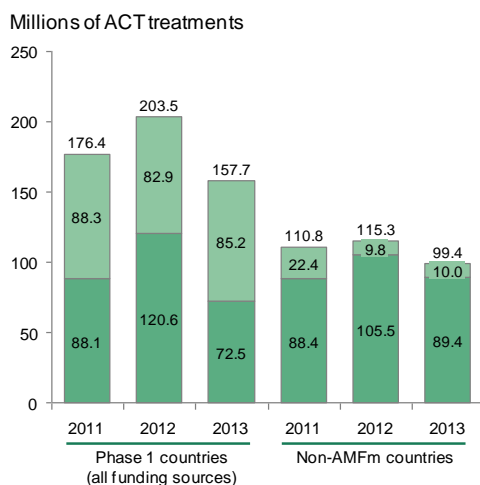


Figure 6: Global ACT demand in AMFm and non-AMFm countries (2011-12): Scenario 1

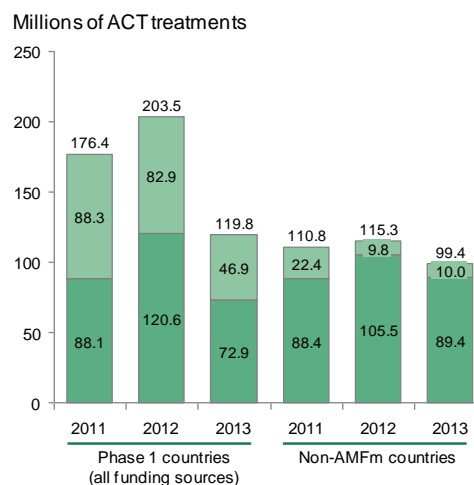


Figure 7: Global ACT demand in AMFm and non-AMFm countries (2011-12): Scenario 2

■ Private channel ACTs ■ Public channel ACTs

Termination of the AMFm after Phase 1 would have a dramatic impact on the pilot countries. Our forecasts in the Scenario 2 suggest total pre-qualified ACT orders in these countries will fall more than 40% in 2013. In Scenario 1, the impact is somewhat muted; in this case, projected orders fall 23% in 2013 in the AMFm Phase 1 countries, due solely to declines in international funding for public channel purchases. In the non-AMFm countries, demand for ACTs is also projected to fall by approximately 14% in 2013, also driven by declines in public sector funding and procurement.

4.4 Artemether-Lumefantrine and non-adult doses comprise the majority of products in 2012

Our forecasting models project the distribution of pre-qualified ACT treatments by product and dose size. In 2012, artemether-lumefantrine is expected to capture the largest share among products in this market, with roughly 70% of global treatments. Artesunate-amodiaquine is projected to make up 26% of treatments, while DHA-piperazine is forecasted to represent 4% of treatments. These figures are very close to our prior forecasts for 2011, which also estimated artemether-lumefantrine's share at 70% of the global market.

Pre-qualified ACTs also come in different dosages, appropriate for different age groups. Our forecast projects the adult dose (the largest dose size across products) to comprise 38% of treatments in the market in 2012. This level of treatment volume makes the adult dosage the largest single dose size in the market. However, the three non-adult dosages together make up 62% of the market. Among these three sizes, the smallest dose (infant size) is expected to comprise 29% of global treatments, followed by the next smallest size (toddler) with 21% of treatments. The third smallest dose size (adolescent) will have the smallest share in the market, with only 12% of treatments. This distribution is quite close to what we previously forecasted for 2011, which estimated adult doses as comprising 39% of the market.

Product and dosage mix vary widely across country and channel. The mix is also subject to change based on country procurement decisions and donor funding allocations, both of which may face closer scrutiny in a time of funding shortfalls. Given these factors and the uncertainties around the AMFm's status and the design of any transitional funding program, we have not in this report forecasted estimates of global product and dosage shares for 2013.

4.5 Artemisinin supply considerations

Estimates for procurement of pre-qualified ACTs can also be converted into demand for artemisinin. The forecast above translates into artemisinin demand in the range of 148 metric tonnes (using a weighted conversion rate of ~2.16 treatments per gram of Artemisinin, see methodology section 3.6) to meet 2012 PQ ACT demand. For 2013 pre-qualified ACT demand, applying the 2012 product and dose mix assumptions, approximately 119 and 101 metric tonnes of artemisinin would be needed under Scenarios 1 and 2, respectively. The demand for artemisinin here reflects only the supply needed to provide API for pre-qualified ACTs; additional supply would be needed to supply commercial non-pre-qualified ACTs, oral artemisinin monotherapies, IV artesunate, and to replenish company buffer stocks.

It is also worth noting that there is a roughly one-year time lag between the artemisinin and ACT procurement forecasts. Based on the artemisinin production cycle, artemisinin that will be converted into drugs for the 2013 malaria season will have been planted in late 2011 and early 2012. The agricultural production for drugs in 2012 in many cases has already been harvested at the time of this report's publication.

The supply situation for artemisinin and ACTs faces a number of challenges. In 2011, tightness in artemisinin and ACT supply was noted as a significant risk for the malaria drug market by global stakeholders, and resulted in significant spikes in the price of artemisinin on spot markets. Several factors contributed to this tightness including the rapid growth of the AMFm, a relatively small harvest in 2010-11, and a number of forecasting, sourcing and production challenges. In response, the WHO and RBM convened a "nerve center" function to monitor ACT supply and oversee a range of policy and market interventions to make needed supply available to those most in need. According to a recent report by this ACT Supply Task Force, stockouts of ACTs were identified or expected to occur in 27 countries between October 2011 and March 2012, including some of the largest markets for antimalarials.¹⁵ It is important to note that not all of these product shortages are attributable to artemisinin shortages, but challenges in obtaining supply could complicate efforts to improve product availability.

Additional agricultural supply of artemisinin from recent harvests should help alleviate some of the supply challenge in 2012. However, forecasts of growing demand suggest that the market may not be fully back into balance until year end. According to our forecasts, expected orders for pre-qualified ACTs in 2012 will require a total of 148 MT of artemisinin; estimates from Artepal suggest that farmers and extractors will provide between 150-165 MTs for this malaria drug production season – enough to meet demand but perhaps not enough to also meet the need required by IV artesunate, artemisinin monotherapies, non-pre-qualified ACTs, and replenishment of manufacturer stocks. (Fig. 8) Later in 2012, it is expected that Sanofi will launch its semisynthetic artemisinin for commercial use – which will provide up to another 20-40 MTs of supply. Until that point, we would anticipate that the "tightness" in the market may continue to be felt by many market participants.

¹⁵ "Inter-Agency ACT Supply Taskforce: overview of activities and main findings from September to December 2011"

The picture is quite different in 2013. According to our forecasts, under Scenario 2, demand for artemisinin from WHO pre-qualified ACTs will fall to 101 MTs; the projection under Scenario 1 is slightly higher at 119MTs (but still below 2011 and 2012 requirements). As noted above, these projections are based on currently committed funding for ACT procurement, and could rise if additional funding support is obtained from donors or endemic governments. While there is uncertainty about both funding and the planting and yield levels from this harvest, it is possible that there will be more supply from agricultural and semisynthetic supply in 2013 than demand. Such a surplus could allow manufacturers to replenish their production stocks.

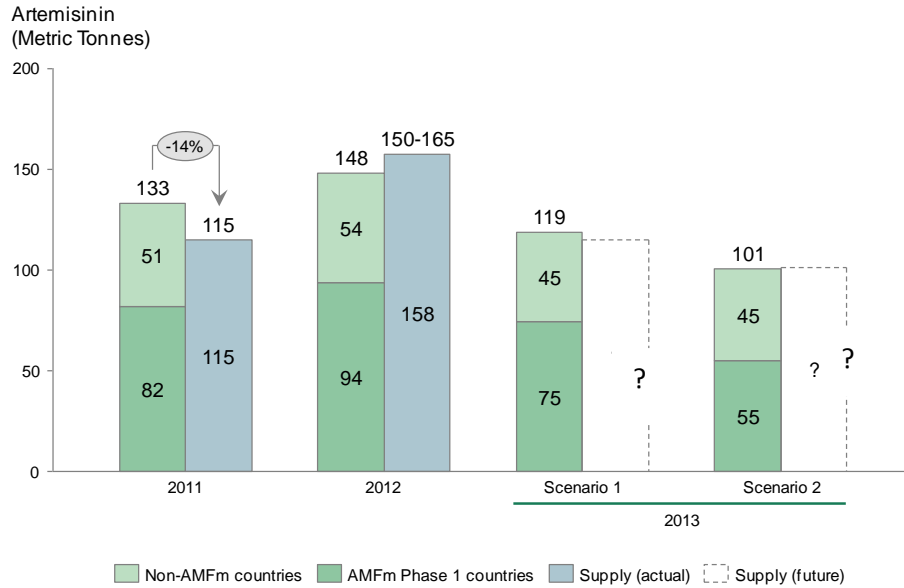


Figure 8: Global Artemisinin Demand from Pre-qualified ACTs, 2011-2013

Note: Weighted average of ~2.16 treatments/ gram of Artemisinin used. 2012 artemisinin supply figures shown do not include potential synthetic artemisinin production by Sanofi-Aventis. Estimates of 2011 and 2012 supply provided by A2S2. Supply represents volume of artemisinin available for ACT production in the year listed.

V. IMPLICATIONS

The goal of this demand forecasting process is to inform planning and policy making. Several of the findings and analyses outlined in this report have acute implications for manufacturers and policy makers in 2012 and 2103.

- (1) The market for WHO pre-qualified ACTs is estimated to grow to 319M treatments in 2012 – a record level for this product class – before dropping in 2013 as international donor funding declines from this peak funding year. Underlying consumer need and demand is not expected to decline materially during this period, creating a risk of significant unmet need.**
- (2) The projected decline in 2013 orders is based on lower levels of currently committed funding for ACT procurement; as 2013 approaches and the reduction in funding becomes more apparent, pressure from endemic countries and global stakeholders to boost funding is likely to intensify**
 - a decline in 2013 could be offset by increases in international funding, increased cost-sharing by domestic governments, or greater consumer spend for pre-qualified ACTs.
- (3) ACT orders in 2013 will depend heavily on important decisions regarding the future of the AMFm.**
 - If the AMFm is continued or expanded, orders for pre-qualified ACTs in 2013 could still fall from the record levels by almost 20% year on year (assuming no increase in international funding from currently committee levels).
 - If the AMFm is discontinued, global ACT orders would fall by almost 100M treatments, or more than 30% year on year; this would reset procurement back to 2010 levels.
- (4) Given the importance of the AMFm decision to global demand and the stakeholders involved, ensuring clarity around the decision making process (including the timing of the decision, and the criteria to be used in making the decision, and the nature of any transitional funding support in 2013) will be critical in allowing market participants to prepare effectively.**
- (5) The up-and-down patterns of funding and demand described here increase the importance of effective policy and market coordination at the global and endemic country level; a rich understanding of market dynamics, patient need, and supply will become increasingly important to ensure these critical products are deployed most effectively, efficiently and equitably.**
- (6) For 2012 we anticipate continued "tightness" in supply as the market slowly "catches up" on artemisinin supply shortages and strives to meet continued high levels of demand:**
 - Ongoing coordination of supply dynamics by the WHO and RBM "nerve center" may help alleviate these issues and ensure product is available to those most in need.
 - Similarly, continued close scrutiny of FLB order applications by the AMFm will help maintain a focus on meeting appropriate demand.
 - Overall "tightness" of supply may continue until the launch of semi-synthetic artemisinin later in 2012.

Taken together, these trends portray a market that requires active decision making and close coordination by policymakers to ensure supplies are targeted at those most in need.

VI. DEFINITION OF TERMS

- **AMFm orders:** ACT orders placed by first line buyers in the private sector and posted on Global Fund database.
- **Artemisinin combination therapy (ACT):** Antimalarials which utilize artemisinin derivatives along with synergistic drug, such as amodiaquine, lumefantrine, mefloquine, or piperazine. They are widely viewed as the most effective treatment for uncomplicated malaria and have become the standard of care in many malaria endemic countries.
- **Backlog:** The difference between total ACT requested deliveries and reported deliveries received by first line buyers in the private sector.
- **Deliveries/ reported deliveries:** Actual ACTs delivered to first line buyers in private sector for 2011 orders (as posted on the Global fund database).
- **First line buyers (FLBs):** Approved organizations eligible to purchase subsidized ACTs under the AMFm program.
- **First-Line Buyer Intentions:** The number of ACTs that national procurement officials or approved AMFm first-line buyers say they wish to purchase and have delivered in a particular year. Unlike intermediary orders, this definition does not account for potential limitations from manufacturers (due to capacity constraints) or funding organizations (due to funding constraints).
- **Intermediary Orders:** The actual number of treatments that intermediaries (including national procurement agents or AMFm first-line buyers) order and that are approved for delivery in a given year. This definition matches most closely to "procurement" or "manufacturer sales" – and is the demand definition used by the consortium for the figures in this report.
- **Potential Consumer Uptake:** The number of ACTs consumers would obtain from public or private channels, assuming product availability at current price points. This definition is built on models of treatment-seeking behavior for malaria-like fevers and consumer price sensitivity. However, given lack of confirmatory diagnosis in many cases today, it can also incorporate cases where non-malaria fevers are incorrectly treated with ACTs.
- **Q1 demand forecast:** Expected procurement levels for pre-qualified ACTs in 2012 and 2013, as projected by the ACT and artemisinin demand forecasting consortium. Members of the forecast consortium include The Boston Consulting Group (BCG), Clinton Health Access Initiative (CHAI) and Fundacion Zaragoza Logistics Center (MIT-Zaragoza).
- **Requested deliveries:** Monthly commitment to ACT deliveries from approved private sector first line buyers orders.

VII. ACKNOWLEDGEMENTS AND NEXT STEPS

Forecasting ACT demand is a process of continuous improvement, constantly requiring updates based on new information and research as it becomes available. The next forecast is planned for December of 2011. While we believe we have made significant improvements upon past forecast approaches, the consortium aims to improve upon the data sources, assumptions and methodology with each update. We are receptive to suggestions on how the information provided in this report and future forecasts can better serve this community.

We would like to thank the following people who contributed to this effort:

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APPENDIX 1

Pricing levels for ACTs used in procurement-based forecasting model

Country	Cost per unit (all costs are in USD unless specified)	Funding Source
Angola	\$1.00	PMI FY2011
Benin	\$1.65	PMI
C.A.R.	AL: 1.28euro/unit ASAQ: 1.15euro/unit	GF R8
DRC	\$0.90	PMI FY2011
Ethiopia	\$1.00	PMI FY2011
Kenya	\$1.05	PMI FY2011
Kenya	average: \$0.0461 AL 6x1: \$0.018 AL 6x2: \$0.036 AL 6x3: \$0.054 AL 6x4: \$0.072	GF R10
Liberia	\$1.05	PMI FY2011
Madagascar	ASAQ 50/153mg (child): \$0.684 per tablet	GF R7
Malawi	\$0.75	PMI FY2011
Mali	\$1.60	PMI FY2011
Mali	AL 6x1 (disp): \$0.35 AL 6x2 (FDC): \$0.69 AL 6x3 (FDC): \$1.04 AL 6x4 (FDC): \$1.39	GF R10
Mozambique	\$1.07	PMI FY2011
Nigeria	AL (6x1): \$0.37 AL (6x2): \$0.74 AL (6x3): \$1.11 AL (6x4): \$1.40	GF R8
Rwanda	\$1.82	PMI FY2011
Senegal	\$1.11	PMI FY2011
Sierra Leone	ASAQ 3x1 infant (co-b): \$0.25 ASAQ 3x1 child (co-b): \$0.33 ASAQ 3x1 adolescent (co-b): \$0.49 ASAQ 3x1 adult (co-b): \$0.84	GF R10
Tanzania	\$1.15	PMI FY2011
Tanzania	\$1.00	GF R9
Zambia	\$1.00	PMI FY2011