

# Estimating Benchmarks of Success in the Affordable Medicines Facility—malaria (AMFm) Phase 1

**January 14, 2011**

Submitted to: The Global Fund to Fight AIDS, Tuberculosis and Malaria

Submitted by: The Evidence-to-Policy initiative (E2Pi)  
The Global Health Group (GHG)  
University of California, San Francisco  
50 Beale Street, Suite 1200, Box 1224  
San Francisco, CA 94105  
[www.e2pi.org](http://www.e2pi.org)

**Authors**

Marco Schäferhoff, Gavin Yamey (E2Pi)

**Project Consultant**

Dominic Montagu, Health Systems Initiative, GHG

**E2Pi** | **EVIDENCE TO  
POLICY INITIATIVE**

# Table of Contents

<b>Abbreviations</b> .....	5
<b>Definitions</b> .....	5
<b>Context</b> .....	6
<b>Executive Summary</b> .....	7
<b>1. Introduction</b> .....	12
1.1 Our Approach to Estimating Success.....	13
1.2 Limitations of Our Approach.....	13
<b>2. ACT Subsidy Pilots and Programs</b> .....	14
2.1 Subnational Pilot Studies of Subsidized ACT.....	14
2.2 National ACT Subsidy Programs.....	14
2.3 Data on ACT Availability in Subsidized ACT Pilots and Programs.....	16
2.4 Data on ACT Price in Subsidized ACT Pilots and Programs.....	18
2.5 Data on Market Share in Subsidized ACT Pilots and Programs.....	20
2.6 Data on ACT Use in Subsidized ACT Pilots and Programs.....	22
2.7 Implications of the ACT Subsidy Pilots and Programs for AMFm Phase 1.....	22
<b>3. National ACT Scale-up Initiatives</b> .....	24
3.1 Evidence on ACT Availability in National ACT Scale-Up Initiatives.....	24
3.2 Evidence on ACT Price in National ACT Scale-Up Initiatives.....	26
3.3 Evidence on ACT Market Share in National ACT Scale-Up Initiatives.....	26
3.4 Evidence on ACT Use in National ACT Scale-Up Initiatives.....	27
3.5 Implications of the Data from National ACT Scale-Up Initiatives for AMFm Phase 1.....	30
<b>4. Commodity Social Marketing Programs</b> .....	31
4.1 Classifying SM Programs.....	31
4.2 Studies on Availability (NGO Model).....	31
4.3 Studies on Market Share (NGO Model).....	32
4.4 Studies on Use (NGO Model).....	32
4.5 Studies on Price (NGO Model).....	34
4.6 Manufacturer’s Model of Commodity SM.....	34
4.7 Evaluating the Impact of the Manufacturer’s Model.....	35
<b>5. National Oral Rehydration Scale-up Programs</b> .....	37
5.1 National Scale-Up of ORT.....	37
<b>6. Drug Company Expectations For the Uptake of a New Drug Into Emerging Markets and Developing Countries</b> .....	38
<b>7. Recommendations for AMFm Success Benchmarks</b> .....	39
7.1 How We Derived Our Recommendations.....	39
7.2 Our Recommendations on Success Benchmarks for Availability.....	41
7.3 Our Recommendations on Success Benchmarks for Market Share.....	42

7.4 Our Recommendations on Success Benchmarks for Price .....	42
7.5 Our Recommendations on Success Benchmarks for Use.....	44
7.6 Key Factors Influencing the Success of AMFm Pilots.....	45
<b>8. Judging Success of AMFm Phase 1 Across Multiple Parameters.....</b>	<b>46</b>
8.1 The BSC Approach .....	46
8.2 Weighting Success Measures in AMFm Phase 1 .....	47
8.3 Aggregating the Results of the National Programs to Assess the Overall Performance of ..... the AMFm	47
<b>Appendix A:</b> Key Informants Interviewed.....	48
<b>Appendix B:</b> Key Results from Global Fund Five-Year Evaluation .....	49
<b>Appendix C:</b> ACT Prices in ACTwatch Countries.....	50
<b>Appendix D:</b> UNICEF Data on Proportion of Children Under Age 5 Receiving Any ..... Antimalarial and Proportion Receiving ACT	51
<b>Appendix E:</b> The CHAI Zinc Uptake Model.....	53
<b>Appendix F:</b> Two Alternative Approaches: (1) Weighted Mean Approach and (2) Aggregate..... Weighting Modeling Approach Using Monte Carlo Simulations	54
<b>Appendix G:</b> Judging the Success of AMFm Phase 1 Across Multiple Parameters Using ..... a Global Fund-Type Approach	59
<b>Appendix H:</b> Introducing Weighting Factors in Assessing Success in AMFm Phase 1.....	61
<b>Appendix I:</b> Aggregating the Results of the National Programs to Assess the Overall ..... Performance of the AMFm	62
<b>Endnotes</b> .....	63

## Tables and Figures

Table 1. Guidelines for success benchmarks at 1 and 2 years after effective start date of the ..... AMFm Phase 1 at the country level	9
Table 2. Estimates derived from a weighted mean approach.....	10
Table 3. Estimates derived from a weighted modeling approach using Monte Carlo simulations .....	10
Table 4. ACT subsidy pilots and programs .....	15
Table 5. Availability of ACTs at 1 year in ACT subsidy pilots and programs.....	16
Table 6. Data on price at 1 to 4 years in ACT subsidy pilots and programs.....	19
Table 7. Market share of ACTs and other antimalarials in ACT subsidy pilots and programs before ..... and after introduction of subsidized ACTs	21
Table 8. Annual PSI sales volumes of subsidized ACT by brand in six countries.....	21
Table 9. Availability of antimalarials in countries tracked by ACTwatch .....	25
Table 10. Availability of antimalarials in government and mission health facilities in Zambia after ..... ACT was adopted as first-line therapy	26
Table 11. Relative volumes of adult antimalarials sold or distributed in seven ACTwatch countries.....	27
Table 12. Antimalarial use in countries tracked by ACTwatch .....	28

Table 13. Changes in antimalarial drug use following national policy changes in five African countries..	29
Table 14. Usage data in studies of condom SM programs in low-income settings.....	33
Table 15. Data on zinc usage in the SUZY Project.....	33
Table 16. Summary of the four case studies of the manufacturer's model.....	35
Table 17. Changes in sales volume and market share in Morocco's OC social marketing program ..... using the manufacturer's model	36
Table 18. Changes in sales volume and market share in the Dominican Republic's OC social ..... marketing program using the manufacturer's model	36
Table 19. Guidelines for success benchmarks at 1 and 2 years after the effective start date of the ..... AMFm Phase 1 at the country level	40
Table 20. Estimates derived from a weighted mean approach.....	41
Table 21. Estimates derived from a weighting modeling approach using Monte Carlo simulations.....	41
Table 22. Factors that can influence the success of the AMFm Phase 1 .....	45
Table 23. Median prices of a full course of an adult treatment of the most common antimalarial, ..... and of the price of ACT relative to the most common antimalarial	50
Table 24. Proportion of children under age 5 receiving any antimalarial and proportion receiving ACT..	51
Table 25. Data used for model and means and standard deviations for the weights given for the..... different studies	56
Table 26. Estimates derived from a weighted mean approach.....	58
Table 27. Results of the modeling approach: Estimates for the different quantities Qi and 95% ..... confidence intervals	58
Table 28. A Global Fund-type approach to scoring success at 1 year in the AMFm.....	59
Table 29. A Global Fund-type approach to scoring success at 2 year in the AMFm.....	60
Table 30. Example of quantitative indicator ratings for the AMFm pilots.....	60
Table 31. An aggregate score for the overall performance of AMFm Phase 1 .....	62
Table 32. Judging the overall score of AMFm Phase 1 using four separate indicators.....	62
Figure 1. A modified BSC for the AMFm at 1 year .....	11
Figure 2. A modified BSC for the AMFm at 2 years.....	11
Figure 3. The AMFm Impact Model.....	12
Figure 4. Annual PSI sales volumes of subsidized ACT by brand in four countries.....	21
Figure 5. Global ORT usage rates from 1986 to 2003.....	37
Figure 6. The components of the Balanced Scorecard.....	46
Figure 7. Proportion of surveyed health facilities stocking ACT and other antimalarial drugs in ..... national programs funded by the Global Fund	49
Figure 8. Forecasts for zinc uptake in the CHAI model .....	53

## Abbreviations

<b>ACT</b>	artemisinin-based combination therapy
<b>AHC</b>	Ad Hoc Committee of the AMFm
<b>AL</b>	artemether-lumefantrine
<b>AM</b>	antimalarial
<b>AMFm</b>	Affordable Medicines Facility—malaria
<b>AMT</b>	artemisinin monotherapy
<b>AQ</b>	amodiaquine
<b>ARM</b>	artemether
<b>AS-AQ</b>	artesunate-amodiaquine
<b>ATS</b>	artesunate
<b>CHAI</b>	Clinton Health Access Initiative
<b>CQ</b>	chloroquine
<b>DHA</b>	dihydroartemisinin
<b>DRC</b>	Democratic Republic of the Congo
<b>HF</b>	halofantrine
<b>MMV</b>	Medicines for Malaria Venture
<b>NGO</b>	non-governmental organization
<b>Non-QAACT</b>	non-quality-assured artemisinin-based combination therapy (this abbreviation refers to any antimalarial drug other than a QAACT, e.g., CQ, SP, and artemisinin monotherapy)
<b>OC; OCP</b>	oral contraceptive; oral contraceptive pill
<b>ORT</b>	oral rehydration therapy
<b>QAACT</b>	quality-assured artemisinin-based combination therapy
<b>QN</b>	quinine
<b>RDT</b>	rapid diagnostic test
<b>RRP</b>	recommended retail price
<b>SES</b>	socioeconomic status
<b>SI</b>	supportive interventions
<b>SM</b>	social marketing
<b>SMP</b>	sulfamethoxyprazine-pyrimethamine
<b>SP</b>	sulfadoxine-pyrimethamine
<b>SUZU Project</b>	The Scaling Up of Zinc for Young Children Project (a national-scale project in Bangladesh)
<b>USAID</b>	U.S. Agency for International Development

## Definitions

*Key definitions related to antimalarials are as follows:*

**Artemisinin-based combination therapy (ACT):** A combination of artemisinin or one of its derivatives with a partner drug. The partner drug is an antimalarial of a different class. A quality-assured ACT (QAACT) is one that has met the Global Fund's quality assurance policy.

**Oral artemisinin monotherapy:** Artemisinin or one of its derivatives in a dosage form with an oral route of administration (i.e., tablets, suspensions, and syrups, but not suppositories or injections).

**Antimalarial combination therapy:** The simultaneous use of two or more drugs with different modes of action to treat malaria.

**First-line ACT:** The specific ACT that was recommended when a country initially adopted the treatment into its national malaria treatment policy.

*Four key terms related to QAACTs are used throughout this report. In defining these terms, we have used definitions that are consistent with those used by the Independent Evaluation of the AMFm Phase 1:*

**Availability:** The proportion of all facilities, private and public (including informal outlets), stocking QAACTs, among outlets with any antimalarials in stock at the time of the survey;

**Market share:** Total volume of QAACTs sold or distributed as a proportion of the total volume of all antimalarials sold or distributed in the last week (seven days) via outlets that will be included in the Independent Evaluation's outlet surveys;

**Use:** The proportion of children under age 5 with fever who received a QAACT on the day that the fever started or on the following day (in the future, with the scale-up of RDTs, this definition is likely to be replaced by "the proportion of children under age 5 with parasitologically confirmed malaria who received a QAACT on the day that the fever started or on the following day");

**Price:** Cost to patients of a full adult or child course of a QAACT (the Independent Evaluation replaces the term "full adult course" with the term "adult equivalent treatment dose," the quantity of drugs required to treat a 60-kg adult; similarly, it uses the term "child equivalent treatment dose").<sup>1</sup>

*Our definition of outlets is aligned with the definition used by the Independent Evaluation, which includes all types of outlets with the potential to sell or provide antimalarials. Outlets can be classified into two categories:*

**Public health facilities** (e.g., tertiary care facilities, district/provincial-level facilities, health centers, and dispensaries) and Part One pharmacies (registered pharmaceutical outlets with a qualified pharmacist that are allowed to sell prescription medicines); and

**Other drug sellers**, such as grocers, private clinics, drug shops, informal outlets, and community health workers.

## Context

The Global Fund Board made the following decision in November 2009 (Decision Point GF/B20/DP24):

“The Board refers to its earlier decisions regarding the Affordable Medicine Facility—malaria (“AMFm”) and clarifies its intent that the Global Fund will only expand from Phase 1 (the pilot phase) of AMFm to a global scale-up on the basis of evidence gathered during the pilot phase that the initiative is likely to achieve its four stated objectives: (i) increased ACT affordability, (ii) increased ACT availability, (iii) increased ACT use, including among vulnerable groups, and (iv) “crowding out” oral artemisinin monotherapies, chloroquine, and sulfadoxine-pyrimethamine by gaining market share. The Board further clarifies that it will consider evidence that the AMFm will achieve these four objectives more cost-effectively than other financing models that aim to achieve similar objectives solely or principally through the expansion of public sector services (i.e., public health facilities and community health workers only).”

This report on success benchmarks addresses the first part of the Board Decision Point only. The Global Fund is addressing separately the second part of the Decision Point (comparative effectiveness and cost-effectiveness).

The Global Fund Board’s decision of December 2010 (Decision Point GF/B22/DP13) includes the following provision:

“The Board refers to its earlier decision regarding the evaluation of Phase 1 of the Affordable Medicines Facility—malaria (AMFm) (GF/B20/DP24), and notes that the AMFm Phase 1 is currently funded as a 24-month program.

The Board recognizes the shift in the start of the implementation of AMFm Phase 1 and the need to ensure an evaluation that can inform a decision on the future of the AMFm as a business line. Accordingly, the Board decides to extend the implementation period of AMFm Phase 1 by six months and requests the AMFm Ad Hoc Committee to present a recommendation to the Board at its second meeting in 2012 on whether to expand, accelerate, modify, terminate or suspend the AMFm business line.

The Board grants the Secretariat the authority to work with relevant countries and Principal Recipients to extend the relevant grants and to make any other consequential amendments to those grants as a result of the extension of AMFm Phase 1. The Board further decides that there are no additional funds earmarked for financing AMFm Phase 1 Supporting Interventions, and countries and Principal Recipients should plan accordingly.”

E2Pi understands that, in this revised timeline, (i) end-point data collection for the independent evaluation needs to be completed by November 2011 to ensure that a final report will be ready in time for the Board’s second meeting in 2012, and (ii) three of the AMFm Phase 1 countries will have had co-paid ACTs for at least 12 months, but others will have had co-paid ACTs for various periods of less than 12 months.

# Executive Summary

The AMFm involves a price subsidy at the “factory gate” combined with supportive interventions (SIs), such as public awareness campaigns and training for ACT providers. It has four objectives: increasing the availability of ACTs in public and private outlets; reducing the price of ACTs to one comparable to that of other antimalarials; increasing the market share of ACTs among antimalarials; and increasing use of ACTs, including among vulnerable groups. All four objectives refer to QA-ACTs. The AMFm is being rolled out in a phased manner—a pilot phase (Phase 1) was launched in 2010.

The AMFm Ad Hoc Committee (AHC) commissioned the Evidence-to-Policy initiative (E2Pi) to initially spend 15 days reviewing relevant literature and conducting key informant interviews in order to:

- estimate what might be realistically expected in the first and second years of the AMFm Phase 1 implementation; and
- lay out different ways of balancing and judging performance on different outputs.

A draft paper was discussed at an AHC meeting in London on June 22–23, 2010. During this meeting, the AHC gave its feedback on the draft and suggested additional literature to review and additional key informants to interview. A revised paper, incorporating the AHC’s comments and the additional literature review/key informant interviews, was submitted to the AHC on July 19, 2010, and sent to nine external peer reviewers. The paper was revised to address the reviewers’ concerns, and was then presented at the October 18–20, 2010, AHC meeting in Geneva. Feedback from this meeting, and from an AHC subcommittee devoted to AMFm benchmarks, was then incorporated into the final version.

Our approach was to summarize experience from: subnational pilots of subsidized ACT; national programs of subsidized ACT; other national ACT scale-up initiatives (e.g., those supported by the Global Fund); commodity social marketing programs; national scale-up programs for oral rehydration therapy; and drug company efforts to launch a new product into an emerging market or a developing country. We interviewed 33 key informants (see Appendix A). Based on the literature review and information from the interviews, we then estimated what we believe to be achievable benchmarks of success in the AMFm Phase 1.

**Availability:** Pilots in Uganda, Tanzania, and Angola found that the proportion of private outlets stocking ACTs rapidly increased from zero to around 69% to 81% (the range of outcomes at 1 year in the three pilots), though the Uganda pilot experienced stock-outs. Few of the national ACT subsidy programs have published data on ACT availability; we found data for Senegal, Cambodia, and Rwanda. Senegal and Cambodia achieved levels of ACT availability at 1 year that were much lower than those found in the pilot studies. In Senegal, 44.8% of public and private outlets stocked adult ACT, while in Cambodia, only 22% stocked adult ACT and 6% child ACT. Through Rwanda’s subsidy program, 80% to 90% of pharmacies carried ACT at 18 months after launch. Other antimalarials (e.g., CQ, SP, artemisinin monotherapy) are still widely available in Senegal and Cambodia. Rwanda successfully banned these from the market.

**Market share:** At 1 year after the launch of the Tanzania, Uganda, and Angola pilots, ACT had a market share of 38% to 51% (38% in Angola; 44.2% in Tanzania [compared with 1% at baseline], 51% in Uganda [compared with 0% at baseline]). Poorer people were less likely to purchase ACT and more likely to purchase other antimalarials than those living on a higher income. There are only limited market share data for national ACT subsidy programs. Results for Cambodia’s subsidized ACT program suggest that 6 years after PSI scaled up the program, ACT had only 28% of the market share in the private sector. Examination of PSI data shows that sales volumes remained at very low levels in the first 2 years and that it took PSI at least 2 years before substantial sale volumes were reached.

**Price:** Adherence to the recommended retail price was strong (i.e., the mean observed price was close to the recommended retail price) in all four of the pilots. The pilots in Uganda, Tanzania, and Angola found that the mean observed retail prices of ACTs were comparable to, or below, the prices of suboptimal antimalarials (e.g., SP, CQ) at 1 year (Tanzania, Angola) or 20 months (Uganda). In the Kenya pilot (a cluster randomized controlled trial), 95% of caregivers in the intervention arm said they bought the subsidized ACT at the recommended retail price of \$0.25 (for child treatment). We found only limited data on price in national ACT subsidy programs. In Senegal’s subsidized ACT program, price adherence was strong in both the public and private sectors, and the consumer price for ACTs was found to be below the price of SP. There are only limited data from Cameroon’s national subsidy program—these suggest that price adherence was only strong in the Yaoundé Centre province. In Cambodia, 4 years after the national ACT subsidy program was initiated, ACT was sold at a much higher price than CQ.

**Use:** In the ACT subsidy pilots and programs, we only found data on ACT use (i.e., ACT given to a child within 24 and 48 hours of fever onset) for the Uganda and Kenya pilots. One year after the Uganda pilot launched, the proportion of children accessing

## 1

### Data from Subnational Pilots and National Programs of Subsidized ACT

Four small (subnational) pilot studies of subsidized ACT and the available results from ongoing national ACT subsidy programs provide the most direct evidence of what success might look like for the four objectives in the AMFm. Nevertheless, many key informants cautioned strongly against extrapolating directly from the subsidized ACT pilots.

ACTs within 24 and 48 hours of fever onset was 15% and 20%, respectively (compared with 3% and 4%, respectively, at baseline). In the Kenya pilot, which assessed outcomes at 1 year, use increased from baseline by 40.2 percentage points in the intervention arm and by 14.6 percentage points in the control arm.

## 2 Evidence on National ACT Scale-Up

We examined data on national initiatives to scale up the availability and use of ACT (e.g., ACT scale-up programs supported by the Global Fund). The outcomes from these efforts can help to guide expectations for success of the AMFm, particularly with respect to the public sector. We summarized data from multiple sources, including: UNICEF household surveys; ACTwatch (a project of PSI in collaboration with the London School of Hygiene and Tropical Medicine); the Global Fund Five-Year Evaluation; and studies of the impact of changes in national malaria drug policy upon use of different antimalarials.

At 3 to 9 years after countries changed their national policies to ACT, availability of ACTs remains very low in the seven countries tracked by ACTwatch, ranging from 6.6% in Benin to 28% in Uganda (these data refer to availability of first-line ACTs, i.e., the ACT that was recommended when the country adopted the drug in its national malaria treatment policy). In six out of seven countries, availability of first-line ACT across all outlets is below 20%, and providers are much more likely to stock non-artemisinin-based therapies than ACTs. ACTs are more likely to be available in public facilities than in private outlets. In public facilities, mean availability is 61.7%, but in private drug stores mean ACT availability is only 13.8%. Private drug stores are a major provider of antimalarials in most countries, and low ACT availability in these stores means that average availability at the national level is low. Thus, if the AMFm is to succeed in increasing national availability of ACTs, there will need to be a substantial rise in availability in the private sector.

ACTwatch data also show that national ACT market share is very low. Of the seven countries tracked by ACTwatch, only two had market share levels higher than 10%.

ACT use remains limited in most countries. In two ACTwatch countries (Benin and Madagascar), the proportion of febrile children under age 5 that receive a first-line ACT within 48 hours is below 5%. The proportion is below 20% in Uganda and Zambia. Other national surveys (done from 2005 to 2009) reinforce this finding, showing that in most countries less than 10% of children with fever received an ACT within 48 hours.

## 3 Commodity Social Marketing (SM) and Other Scale-Up Programs

We examined data on the impact of commodity SM on availability, price, use, and market share of the socially marketed commodity. We examined two models: (a) the NGO model used in low income countries, which tends to focus on population groups that cannot afford to pay commercially viable

prices, uses a donor subsidy to keep prices low, and uses additional supply chains set up by the NGO; and (b) the manufacturer's model, which aims to be self-sustaining without donor support, and which uses a commercial company's existing distribution channels.

Studies of socially marketed products using the NGO model (e.g., to market condoms, water purification products, oral contraceptives, zinc, and vitamin A) suggest that a 2-year timescale may not be sufficient for a new product to achieve high uptake rates. We argue that the national zinc scale-up project in Bangladesh (the SUZY Project) offers a very valuable model for the AMFm Phase 1, because it has many parallels with AMFm Phase 1. For example, as with the AMFm, the SUZY Project is a national subsidized commodity SM program that promotes a product used for the treatment of a life-threatening childhood illness and that aims to "crowd out" other medications (e.g., antidiarrheal drugs, antibiotics). The SUZY Project only achieved usage rates of 12% (rural areas) to 25% (non-slum urban areas) by year 2.

There are very few data on the manufacturer's model of commodity SM that can help guide expectations for AMFm Phase 1. The only study that included data on the impact of the model on the market share and price of a socially marketed brand was a study of a socially marketed oral contraceptive in Morocco. In this study, there was a rise in market share of just 3 percentage points over baseline at 2 years and 12 percentage points over baseline at 10 years.

Many SM programs are local in scale, whereas the AMFm aims for national scale up. Therefore we briefly summarize outcomes of national scale up programs for oral rehydration therapy (ORT). We believe these data provide a reality check for expectations of what can be achieved at just 1 and 2 years of any national scale-up program. For example, despite a 17-year, worldwide effort to promote effective diarrhea case management, mean ORT use in 40 low- and middle-income countries increased very slowly, from about 35% of diarrhea cases in 1986 to about 41% in 2003.

## 4 Expectations for the Uptake of a New Drug into an Emerging Market

Several of our key informants were executives from drug companies, including multinational drug companies (e.g., Novartis) and generic drug manufacturers (e.g., Cipla). We also interviewed a local drug importer and distributor from Uganda. These industry representatives shared with us their expectations for the uptake of a drug after its introduction into developing countries and emerging economy markets—answering the question, what is realistic in terms of market penetration for a new health commodity? The executives suggested that for the introduction of new pharmaceutical products into developing and emerging market countries, market share levels of 5% to 10% and 20% are envisaged after 1 and 2 years, respectively. Key informants pointed out that uptake of a new

drug will be affected by a range of factors, such as whether there is pent-up demand for the new product or longstanding loyalty towards the existing products.

## 5 Our Estimates for Success at Years 1 and 2 in the AMFm Phase 1

To derive our estimates of realistic outcomes for availability, market share, price, and use at years 1 and 2, we used a pragmatic “mixed methods” approach (i.e., drawing upon the empirical studies mentioned above plus key informant opinions):

- First, the **range of results** in the studies that we reviewed—for availability, market share, price, and use—was used as a starting point for the range of results that we believe are possible in the AMFm at years 1 and 2.
- Next, we considered **which of these data are most relevant to the AMFm**. We felt that the two closest models for what the AMFm is likely to achieve are: (i) national ACT subsidy programs run by governments in Cameroon and Senegal using existing distribution channels; and (ii) national programs to socially market a subsidized health commodity (e.g., the SUZY Project). The scale of operations in these programs is analogous to that of the AMFm. Similarly, we felt that the success to date of the national ACT scale-up programs supported by the Global Fund should be used as a benchmark for what can be achieved in a short time scale (1–2 years).
- Based on the above approach, we **estimated an initial set of “benchmarks of success” for the AMFm Phase 1**.
- We then **discussed these benchmarks with key informants** and asked whether they believed the benchmarks were realistic. These informants included several representatives of drug companies, including generic drug companies, who have expertise in how markets respond to new products and to price reductions in the developing world.
- We **presented our suggested benchmarks to the AHC at its June 2010 meeting**, and these were discussed and debated over the course of 2 days. Feedback from the AHC was incorporated into a revised set of benchmarks.
- After our paper was peer reviewed, we **made additional adjustments to the benchmarks of success**. We presented these revised benchmarks at the October 2010 AHC meeting. We incorporated feedback from the AHC, including from a subcommittee devoted to AMFm benchmarks. The **final benchmarks are summarized in Table 1**. These benchmarks are intended as a tool for tailoring expectations of what can be achieved in the time frame; none of them are minimum thresholds or cutoff points for “pass” or “fail.” All of them will have to be interpreted in light of relevant contextual factors.

**Table 1.** Guidelines for success benchmarks at 1 and 2 years after effective start date of the AMFm Phase 1 at the country level

	Year 1	Year 2
<b>Availability</b> (The proportion of all facilities, private and public [including informal outlets], stocking QAACTs, among outlets with any antimalarials in stock at the time of the survey)	Increase of <b>20 percentage points</b> from baseline	Increase of <b>40 percentage points</b> from baseline
<b>Market share</b> (Total volume of QAACTs sold or distributed as a proportion of the total volume of all antimalarials sold or distributed in the last week [7 days] via outlets that will be included in the Independent Evaluation’s outlet surveys)	Increase in ACT market share of <b>10 to 15 percentage points</b> from baseline <i>and</i> Decrease in market share of artemisinin monotherapy (AMT) from baseline	Increase in ACT market share of <b>15 to 20 percentage points</b> from baseline <i>and</i> Decrease in market share of AMT from baseline
<b>Use*</b> (Proportion of children under age 5 with fever who received a QAACT on the day that the fever started or on the following day)	Increase of <b>5 to 10 percentage points</b> from baseline	Increase of <b>10 to 15 percentage points</b> from baseline
<b>Price</b> (Adult equivalent treatment dose)	<b>QAACT price &lt;300%</b> of the price of the dominant non-QAACT (in most countries this is CQ or SP)** <i>and</i> Price of AMFm co-paid QAACT < price of AMT (this is useful but not sufficient to determine success)	<b>QAACT price &lt;150%</b> price of the price of the dominant non-QAACT (in most countries this is CQ or SP) <i>and</i> Price of AMFm co-paid QAACT < price of AMT (this is useful but not sufficient to determine success)

\*The denominator for ACT use is “fever episodes in children under age 5” (not “parasitologically confirmed malaria cases”). The Independent Evaluation relies on national surveys (e.g., Demographic and Health Surveys; Multiple Indicator Cluster Surveys; Malaria Indicator Surveys; ACTwatch surveys), which use the denominator “fever episodes in children under age 5” due to a lack of proper malaria diagnosis in many countries.

\*\* Price change was the indicator with the weakest empirical basis for setting a 1-year expectation. This figure is presented to facilitate Ad Hoc Committee discussions that will take account of country context. Price trends during the implementation period will be of particular use to the Ad Hoc Committee.

During the peer review process, a number of peer reviewers suggested that if we had adopted a different methodology for deriving our estimates, we may have estimated different benchmarks. We have therefore included in this report our estimates derived from two other approaches: (1) estimating a weighted mean of the outcomes of the studies included in our literature review; and (2) an aggregate weighting modeling approach using Monte Carlo simulations (modeled with the assistance of the Institute for Health Metrics and Evaluation [IHME]). For these two approaches, the four quantities of interest (availability, price, market share, use) for year 1 and year 2 were estimated in the following way. First, we weighted the data available from the different studies that we reviewed according to (a) our judgment of how closely the conditions of the study resembled those of the AMFm, and (b) the study's methodological rigor. Second, for those studies in which outcomes were not measured at 1 year and 2 years (e.g., in the subnational pilot of subsidized ACT in Tanzania, availability was only measured at 1 year, not 2 years), we used extrapolations to estimate the results at 1 and 2 years (for these extrapolations, we assumed that scale-up would be linear). Finally, we calculated the weighted mean of the data at years 1 and 2 (Table 2), and, with the assistance of the IHME, we also conducted a Monte Carlo multivariate sensitivity analysis to estimate availability, price, market share, and use through 1,000 Monte Carlo simulations (Table 3). In both cases, the estimates for availability, market share, and use show change from baseline, whereas the estimates for price are absolute figures. The results of these two approaches were very similar, which was expected given that they used the same data and similar methodologies. With the exception of price, the estimates derived from these two approaches were very similar to those derived from our pragmatic "mixed methods" approach, which gave us additional confidence that the estimates presented in Table 1 are realistic.

**Table 2.** Estimates derived from a weighted mean approach (detailed methods are in Appendix F)

Indicator	Year 1	Year 2
Availability (%)	22.2	36.6
Price (US\$)	3.00	3.84
Market share (%)	11.8	21.9
Use (%)	11.8	22.2

**Table 3.** Estimates derived from a weighting modeling approach using Monte Carlo simulations (detailed methods are in Appendix F)

Indicator	Year 1 (95% confidence interval)	Year 2 (95% confidence interval)
Availability (%)	22.3 (20.7–23.8)	36.5 (34.3–38.9)
Price (US\$)	3.00 (2.79–3.22)	3.79 (3.30–4.26)
Market share (%)	11.8 (10.3–13.5)	21.9 (19.6–24.7)
Use (%)	11.8 (10.0–13.4)	22.1 (18.5–25.4)

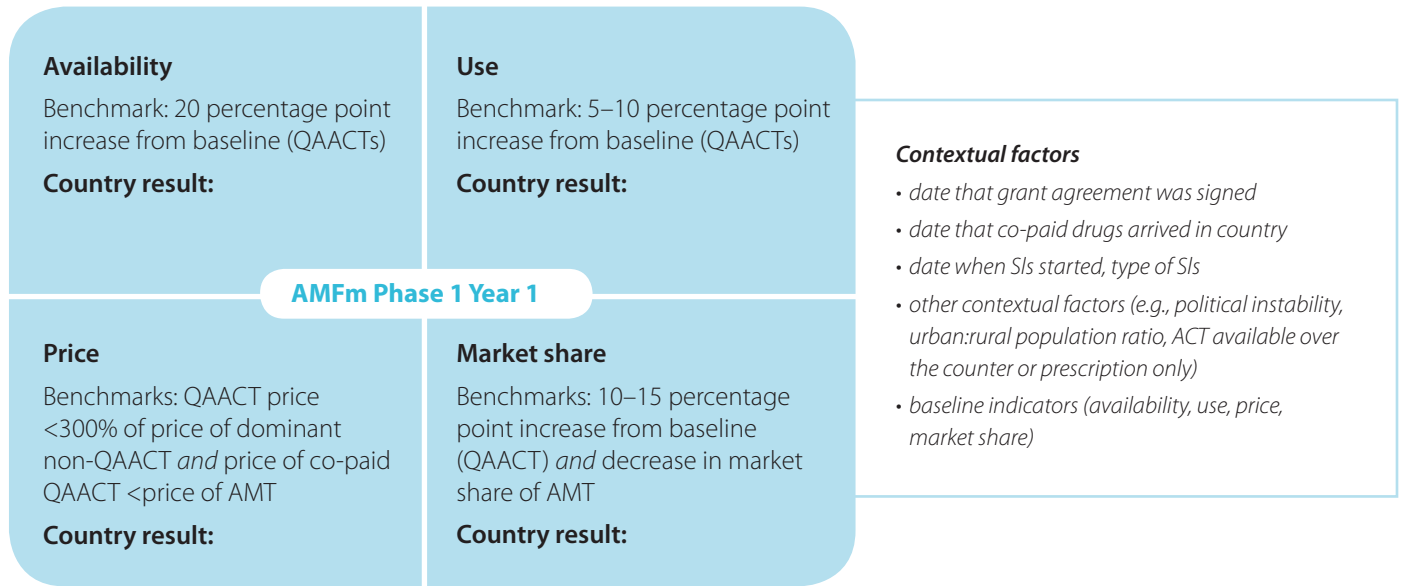
## Approaches to Balancing the Four Different Objectives of the AMFm Phase 1

6

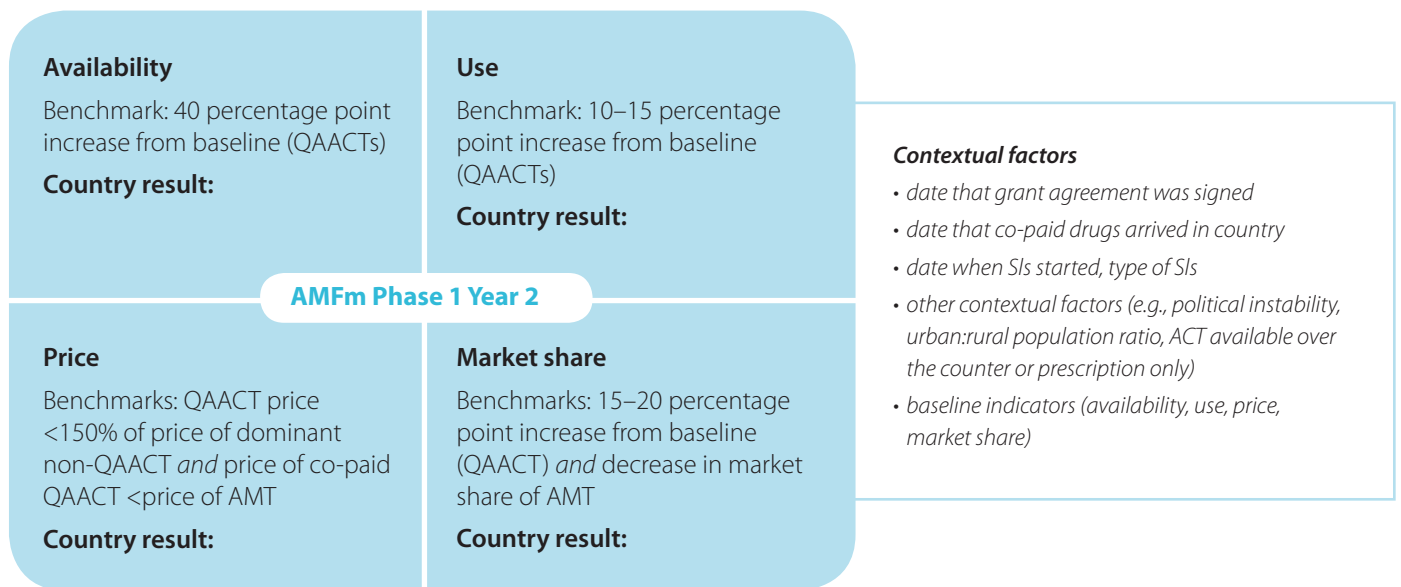
Finally, we review examples of approaches that balance different program objectives against each other—the Balanced Scorecard (BSC), the Global Fund grant-rating system, and weighting systems. We apply them to the success metrics that we have previously proposed, concluding with several different examples: a Balanced Scorecard for the AMFm Phase 1; a Global Fund-type approach with no weighting; and different options for a weighted Global Fund-type approach. There was no agreement among the key informants, or among members of the AHC at the June 2010 meeting, about whether or not weighting should be used or which objective should be weighted more heavily. Among those who argued that weighting should be used, two common arguments were: (1) market share should be weighted more heavily (since a key aim of the AMFm Phase 1 is to “crowd out” other antimalarial drugs and artemisinin monotherapy); and (2) availability and price should be weighted more heavily (because an increase in market share and use will only occur when ACTs are available at an affordable price). We provide examples of both types of weighting. Some key informants argued that outcomes should be measured separately in urban and rural areas (as a way to incentivize efforts to scale up ACT in remote rural regions).

We end our paper by displaying our final recommendations using a Balanced Scorecard approach, shown in Figures 1 and 2 on the following page. The scorecard can also be used to note the relevant contextual factors for each specific AMFm pilot country (e.g., date of grant agreement, date that subsidized drugs arrived, and the type of supportive interventions that are in place).

**Figure 1.** A modified BSC for the AMFm at 1 year\*



**Figure 2.** A modified BSC for the AMFm at 2 years\*



\*These benchmarks are intended as a tool for tailoring expectations of what can be achieved in the time frame; none of them are minimum thresholds or cutoff points for “pass” or “fail.” All of them will have to be interpreted in light of relevant contextual factors.

# 1. Introduction

The Affordable Medicines Facility—malaria (AMFm) is a financing mechanism designed to make artemisinin-based combination therapies (ACTs) more accessible in places where malaria is endemic and there are high levels of resistance to older antimalarial drugs. ACT use remains very limited in these countries due to a variety of factors, including ACT stock-outs in the public sector and high prices in the private sector. In the AMFm, donors make a co-payment toward the cost of ACTs purchased by eligible first-line buyers. Subsidized ACTs will then be distributed through providers across the public, private, and not-for-profit sectors. By reducing the cost of ACTs available across all providers, the AMFm aims to serve as a platform for scaling up access to ACTs and curtailing emerging resistance to artemisinin.<sup>2</sup>

The AMFm has four objectives (all refer to QAACTs; see earlier definitions of these objectives):

- Increasing the **availability** of ACTs in public and private outlets;
- Reducing the **price** of ACTs to be comparable with other antimalarials (e.g., CQ, SP, artemisinin monotherapy);
- Increasing the **market share** of ACTs among antimalarials;
- Increasing the **use** of ACTs, including among vulnerable groups such as poor people, rural communities, and children.<sup>3</sup>

These four indicators are likely to be strongly interrelated (Figure 1). If the AMFm is a success—i.e., if the supportive interventions are effective and the subsidy at the “factory gate” is passed on to consumers, there should be a fall in the **price** of QAACTs compared to current prices. Since more patients could now afford QAACTs, more outlets should be willing to stock QAACTs, which in turn is likely to create a fall in non-QAACT stocks. This rise in **availability** of QAACTs and fall in availability of non-QAACTs would represent a rise in the **market share** of QAACTs, which in turn is likely to be linked with increased use of QAACTs. It is then hoped that the increase in **use** of QAACTs for fever episodes in young children will be associated with a fall in the burden of malaria.

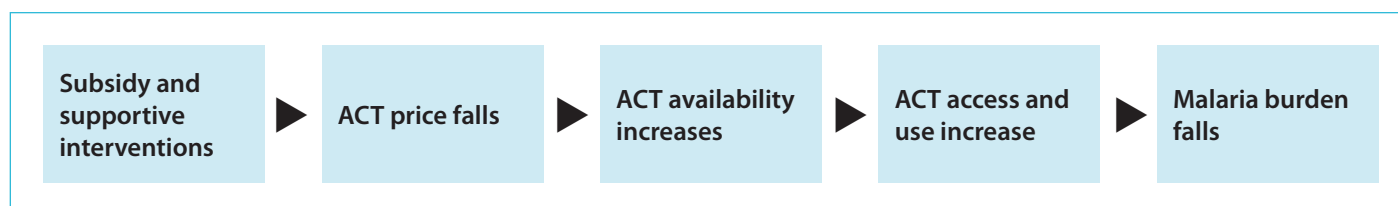
Use will not just be a function of the cost of QAACTs, but is likely to be influenced by other sociocultural factors (e.g., the willingness to pay for QAACTs, consumers’ knowledge about the superior efficacy of QAACTs over monotherapies, and consumers’ longstanding preference for older treatments).

The AMFm is being introduced in a phased manner. A first pilot phase (AMFm Phase 1) is being undertaken in Cambodia, Ghana, Kenya, Madagascar, Niger, Nigeria, Tanzania (mainland and Zanzibar), and Uganda. The current plan is for Phase 1 to last 2 years and for the Global Fund Board to decide whether to continue, expand, suspend, or terminate the program at its second meeting in 2012. The Board decision will depend on (1) the outcome of the Independent Evaluation, which has been commissioned to determine whether the pilots have been successful in achieving the AMFm’s four objectives,<sup>1</sup> and (2) the advice of the AMFm Ad Hoc Committee (AHC). End-point data collection for the independent evaluation needs to be completed by November 2011. By that time, only three AMFm countries will have had co-paid ACTs for at least 12 months.

In August 2010, AMFm-subsidized ACTs arrived in the two countries where pilot implementation was fastest (Ghana and Kenya). By mid-September 2010, Madagascar, Niger, and Tanzania had placed their first orders for subsidized ACTs, which were expected to arrive in these three countries within weeks after the orders were placed. At the time of writing this, subsidized ACTs had not arrived in the remaining pilot countries.

The AHC has identified the need to (1) define success against the four objectives outlined above, within the timescale of Phase 1, and (2) identify how success can be judged across different parameters (the AMFm Phase 1 may perform better on some parameters, and in some countries, than others). The AHC commissioned E2Pi, the Evidence to Policy initiative,<sup>4</sup> to (1) estimate what might be realistically expected at 1 and 2 years into the AMFm Phase 1 and (2) lay out a variety of ways of balancing and judging performance on different outputs. E2Pi was initially commissioned to spend 15 days conducting a literature review and key informant interviews, and produce a draft paper for discussion at an AHC meeting in London on June 22–23, 2010. During this meeting, the AHC gave its feedback on the draft paper and suggested additional literature to review and additional key informants to interview. A revised paper incorporating the AHC’s comments and the additional literature review and key informant interviews was submitted to the AHC on July 19, 2010, and sent to nine external peer reviewers. The paper was revised to address the reviewers’ concerns, and was then presented at the October 18–20, 2010, AHC meeting in Geneva. Feedback from this meeting, and from an AHC subcommittee devoted to AMFm benchmarks, was then incorporated into the final version.

**Figure 3.** The AMFm Impact Model



Appendix A shows the 33 key informants that we interviewed. We used a snowball technique to reach informants with relevant experience and expertise. We conducted interviews with AHC members, the Global Fund secretariat, malaria and social marketing experts (academics and practitioners), supply chain experts, and representatives from pharmaceutical companies (including generic drug companies).

## 1.1 Our Approach to Estimating Success

In order to provide estimates for success in terms of availability, affordability, market share, and use in the AMFm Phase 1, we have taken the following approach:

First, in Section 2, we summarize the results of four very small, subnational **subsidized ACT pilot studies** and the available results from **ongoing national ACT subsidy programs**. These provide the most direct evidence of what success might look like for these four objectives in the AMFm Phase 1—though there are important differences between the AMFm and the ACT subsidy pilots/national programs. For example, most of the national ACT subsidy programs have been run by the social marketing organization PSI (<http://www.psi.org/>) using additional ACT distribution channels (these programs, therefore, do not mimic the AMFm, which will use only existing distribution channels). Additional supply channels that provided ACTs to private outlets were also introduced in the Uganda and Angola pilots. The only national ACT subsidy programs that are government-run are those in Senegal and Cameroon (we argue that these provide a better model for what success might look like in the AMFm Phase 1).

Then, in Section 3, we summarize data on **efforts to make ACTs available at national levels through public and private sector health facilities (e.g., through programs funded by the Global Fund)**. The outcomes from these efforts can help to guide expectations for success of the AMFm, particularly with respect to the public sector (national scale-up initiatives have largely been aimed at scaling up ACT in the public sector).

Given that the AMFm uses social marketing (SM) to promote a subsidized health commodity, in Section 4 we review data on availability, use, market share, and price in **SM programs of other subsidized health commodities** (e.g., condoms, zinc, vitamin A, water purification products). We examine both

the **non-governmental organization (NGO) model** and the **manufacturer's model** of commodity SM.

Many SM programs are local in scale, whereas the AMFm aims for national scale-up. Therefore, in Section 5, we briefly summarize outcomes of **national scale-up programs for oral rehydration therapy**. We believe these data provide a reality check for expectations of what can be achieved just 1 and 2 years into a national scale-up program.

Next, in Section 6, we summarize our interviews with drug company executives who shared with us their **expectations for the uptake of a new drug** after its introduction into an emerging market or developing country. Again, this information has guided us in suggesting what is realistic in terms of market penetration for a new health commodity.

Based on our findings in Sections 2–5, we provide in Section 7 our **estimates for what could be considered a success in years 1 and 2 in the AMFm Phase 1**, and we explain the methods that we used to reach these estimates.

Finally, in Section 8, we review examples of **approaches that balance different program objectives against each other** (e.g., the Balanced Scorecard (BSC), the Global Fund grant-rating system), and we apply them to the success metrics proposed in Section 6.

## Limitations of Our Approach

This report has **several limitations**, including: (1) there are few available data from pilots and ongoing programs of subsidized ACT, and to date only one of the four pilots has been published; (2) there are major weaknesses in the peer-reviewed research literature on socially marketed health commodities; (3) the time frame for writing this report limited our ability to collect more in-depth data; (4) there are inherent uncertainties in estimating benchmarks of success in any scale-up program; and (5) among the 33 key informants that we interviewed, there were strong differences of opinion. Given the short timescale for this project, it was not possible to conduct a formal systematic review (e.g., a Cochrane review), but we aimed to be as systematic as possible in searching the published and gray literature, using relevant search terms for each section of this paper.

## 1.2

## 2. ACT Subsidy Pilots and Programs

### 2.1 Subnational Pilot Studies of Subsidized ACT

Four small, subnational pilot studies of introducing subsidized ACTs into the private sector have been or are being conducted (Table 4). Three of these studies included a control group and one was uncontrolled. The results of a fifth pilot, in Tanzania, are unavailable.<sup>5</sup>

- The Tanzanian Ministry of Health and Social Welfare and the Clinton Health Access Initiative (CHAI) initiated a pilot study in two rural Tanzanian districts in October 2007. A third district served as a control. The study was quasi-randomized. ACTs were sold at a 90% subsidy. The pilot ended in November 2008 and the results were published in September 2009.<sup>6</sup>
- The Medicines for Malaria Venture (MMV) and Uganda's Ministry of Health jointly initiated a pilot study in September 2008, the Consortium for ACTs in the Private Sector Subsidy (CAPSS) Study. This pilot study is ongoing. Subsidized ACTs, carrying a leaf logo on the packet, were made available in four rural districts in Uganda (cumulative population, 1.4 million); one district served as a control. The trial was non-randomized. The ACTs were sold at a 95% subsidy. Preliminary results of this study were presented at a meeting in Kampala, Uganda, on June 2, 2010; MMV has kindly shared these initial data with us.<sup>7</sup> MMV informed us that new public sector interventions were launched in the control district after MMV's pilot was initiated. The interventions in the control district targeted ACT distribution through the public sector and community health workers (i.e., not through private outlets). MMV's intervention was solely focused on private drug shops (it did not include the public sector or community health workers). As discussed below, ACT usage turned out to be higher in the control arm of the trial.
- The Kenyan Ministry of Public Health and Sanitation, the London School of Hygiene & Tropical Medicine, and the KEMRI-Wellcome Trust conducted a small-cluster randomized trial (18 clusters) involving retail outlets in three districts of western Kenya over 1 year. The study ended in May 2010. The primary outcome was ACT use. In each district, there were three intervention sublocations and three control sublocations (the average population per selected sublocation was 4,620). Subsidized ACT (AL, Tibamal) was sold at a recommended retail price of \$0.25 (a 96% subsidy). The study has not yet been published, but the lead author, Beth Kangwana (KEMRI-Wellcome Trust), has kindly shared a preliminary draft of the paper with us.<sup>8</sup>

- The MENTOR Initiative is assisting the Angolan government in piloting the distribution of subsidized ACTs through private sector outlets in two municipalities, with a combined estimated population of 700,000. Funded by USAID/PMI, the distribution of ACTs to private outlets was launched in July 2009. To date, MENTOR provides ACTs (Coartem) for children under age 5 at a highly subsidized price to 95 pharmacies in the two intervention municipalities. The suggested retail price for Coartem is \$1.00, a price comparable to AQ and CQ. The study has no control group. It has not yet been published, but MENTOR has kindly shared the pilot results with us.<sup>9</sup>

### National ACT Subsidy Programs

To the best of our knowledge, programs providing subsidized ACTs through private and/or public sector outlets are underway, or have been completed, in at least 13 countries (Table 4).

- In two countries—Senegal and Cameroon—the government is in charge of the distribution. With funding from the Global Fund, Senegal's government launched the distribution of subsidized ACTs through private pharmacies in 2006 to supplement treatment provided by public sector facilities. In Cameroon, the government began in 2007 to subsidize antimalarials in public and not-for-profit NGO health facilities and in private pharmacies.
- In eight countries, PSI distributes subsidized ACTs to drug stores and outlets: Rwanda, Madagascar, Nigeria, the Democratic Republic of the Congo (DRC), Sudan, Tanzania, Cambodia, and Myanmar.<sup>10</sup> The largest PSI programs are in Cambodia, Nigeria, Rwanda, and Madagascar (PSI, personal communication). Through the support of international donors, countrywide PSI projects to distribute ACTs for children under age 5 are ongoing in Madagascar and Rwanda, building on PSI's capacity to promote and deliver ACTs to private wholesalers and retailers. In Cambodia, where PSI purchases ACTs from an international ACT manufacturer, a subsidized ACT program began as a two-district pilot in 2002, and has since scaled up to reach 17 of 20 malaria-endemic provinces. In Nigeria, PSI's local affiliate, the Society for Family Health, started to distribute subsidized ACTs through the private sector in 2006.

### 2.2

**Table 4.** ACT subsidy pilots and programs

Country	Lead organization	Pilot or Program	Launch year	Age group	Outlet	Coverage
Angola	MENTOR Initiative, govt.	Pilot	2009	Children under 5	Pharmacies	2 municipalities
Kenya	PSI, govt., LSHTM, KEMRI	Pilot	2009	Children under 5	Retail outlets	3 districts
Tanzania	PMI, MSH.	Pilot	2007	All age groups	Accredited drug dispensing outlets	2 regions
Tanzania	CHAI, govt.	Pilot	2007	All age groups	Drug shops	2 districts
Uganda	MMV, govt.	Pilot	2008	All age groups	Drug shops, clinics	4 districts
Cameroon	Govt.	Program	2007	All age groups	Public and private health facilities	Countrywide
Cambodia	PSI	Program	2002	All age groups	Pharmacies, drug shops	17 of 20 malaria- endemic provinces
Democratic Republic of the Congo	PSI	Program	2006	Children under 5	Pharmacies	Limited to some districts
Kenya	SHEF	Program	2006	Children under 5	Franchised clinics	3 districts
Madagascar	PSI	Program	2003	Children under 5	Pharmacies, private providers, community agents	Countrywide
Myanmar	PSI	Program	2003	Children under 5 (adults recently)	Franchised clinics	Limited to urban centers
Nigeria	SFH/PSI	Program	2006	Children under 5	Pharmacies, drug shops, PPMV	18 districts
Rwanda	PSI	Program	2007	Children under 5	Pharmacies	Countrywide
Senegal	Govt.	Program	2006	All age groups	Pharmacies	Countrywide
Sudan	PSI	Program	2008	Children under 5	Pharmacies	Southern Sudan
Tanzania	PSI	Program	2009	Children under 5	Private pharmacies	Countrywide

**Abbreviations:** Govt., government; KEMRI, Kenya Medical Research Institute; LSHTM, London School of Hygiene & Tropical Medicine; MMV, Medicines for Malaria Venture; CHAI, Clinton Health Access Initiative; PSI, Population Services International; SFH, Society for Family Health (PSI operates in Nigeria through its affiliate, SFH); SHEF, Sustainable Health Enterprise Foundation; MSH, Management Sciences for Health; PPMV, Proprietary Patient Medicine Vendors.

## 2.3 Data on ACT Availability in Subsidized ACT Pilots and Programs

### Summary points

- Pilots in Uganda and Tanzania found that the proportion of private outlets stocking ACTs rapidly increased from 0% to between 72% and 75% at 1 year, though the Uganda pilot experienced stock-outs. In the Angola pilot, the availability of ACT in private pharmacies increased from 0% to between 69% and 81% at 1 year, depending on the dosage (Table 5). There are no data on availability from the Kenya pilot.
- The latest figures on ACT availability in national subsidy programs present a mixed picture. Cambodia achieved levels of availability at 1 year that were much lower than those found in the three pilot studies (22% for adults, 6% for children). There are only limited data for Cameroon, and these suggest that ACT availability is low, especially in the private sector. In Senegal, subsidized ACTs were widely available in public and NGO outlets (>80%) at 1 year, but availability was much lower in the private sector, with only 57% of urban outlets and 31% of rural outlets carrying ACTs. Only 7% of private outlets had all three ACT dosages (adult, child, and infant) available. In Rwanda's program, 80% to 90% of private pharmacies carried ACT at 18 months after launch.
- With respect to the availability of other common antimalarials (e.g., CQ, SP), the data suggest that these are still widely available in all countries except Rwanda.

**Table 5.** Availability of ACTs at 1 year in ACT subsidy pilots and programs

	Uganda pilot	Tanzania pilot	Angola pilot	Cambodia program	Rwanda program	Senegal program	Cameroon program
<b>Time frame</b>	20 months	1 year	1 year	1 year	18 months	1 year	1 year
<b>ACT availability</b>	75% child ACT	72.2% (mean of all age groups) 0% at baseline	69% Coartem B6 (smallest packet by weight)  81% Coartem B12 (next largest packet size) 0% at baseline	22% adult ACT, 6% child ACT  0% at baseline	80%–90% child ACT  10% at baseline	44.8% adult ACT 58.2% child ACT 46.3% infant ACT	Low availability (no quantitative data)
<b>ACT availability: urban versus rural areas</b>	Less ACTs in stock in rural areas	Availability higher in urban areas	No data	No data	No data	70% in urban and 68% rural areas (at least one ACT in stock)	No data
<b>ACT stock-outs</b>	Private sector stock-outs following public sector stock-outs	No stock-outs	No stock-outs	Stock-outs in 70% of private outlets (in 2009, 6 years after launch of subsidy)	No data	No data	Private outlets more likely to experience stock-outs
<b>Availability of other common anti-malarials</b>	No data	Generic SP and SMP still widely available	CQ fell from 52% to 35%, HF from 38% to 11%, AQ from 72% to 47%	Non-artemisinin-based therapies and monotherapies were available at 15.9% and 15.2%, respectively, of private drug stores (6 years after launch of subsidy)	Govt effectively banned other antimalarials from the market	Private sector (no data for public sector): SP: 96% (urban), 100% (rural) AQ: 92% (urban), 96% (rural) CQ: 54% (urban), 86% (rural)	Non-QAAs widely available

### Subnational pilots

In the **Tanzania pilot study**, the proportion of shops stocking ACTs in the intervention districts increased from 0% in August 2007 to 72.2% in August 2008 ( $p < 0.001$ ).<sup>6</sup> In the control district, the percentage of outlets stocking ACTs decreased from 1% to 0% over the same period. The Tanzania pilot found a substantial difference in availability between urban and rural areas. ACTs were stocked more often in shops located closer to district towns and major roads. Compared with drug shops that stocked ACTs, shops that never stocked ACTs were located significantly farther from roads, the district town, and other public and private facilities, and had substantially lower total antimalarial sales (all  $p < 0.01$ ).<sup>11</sup> The pilot also shows that other common antimalarials were still widely available. The proportion of shops stocking generic SP as the most common antimalarial fell very little, from 79.7% in August 2007 to 76.8% in August 2008. Similarly, in the same time frame, there was no substantial fall in the proportion of shops stocking the two most commonly sold antimalarial drug brands. The proportion of shops stocking Orodar, a generic SP, fell from 61.6% to 54.3%, while the proportion of shops stocking Malafin, a generic SMP, increased from 21.7% to 34.4%.

In the **Uganda pilot study**, subsidized ACTs were available in 75% of all licensed private sector outlets in the intervention districts at the time of the retail audit in May 2010, 20 months after the launch of the pilot.<sup>7</sup> This figure has been fairly consistent over the 20 month period of the pilot. While the quantities purchased by outlets have increased dramatically over time, there have nevertheless been stock-outs in the private sector due to unanticipated demand for ACT following protracted public sector stock-outs. Surveys of ACT stocks at public sector and NGO health facilities in May 2010 found that 36% of outlets in the intervention districts had no ACTs and an additional 10% had only one age-specific dosage in stock. Stock-outs are thus considered the number one challenge in the pilot. Pilot findings also suggest that outlets in the remote and less populous areas receive less regular deliveries. Data on the availability of ACTs in the control district were unavailable at the time of writing this report.

In the **Angola pilot**, ACTs were largely unavailable in private pharmacies in the two intervention municipalities when the pilot was launched in July 2009.<sup>9</sup> In June 2010, Coartem B6, the smallest package by weight of subsidized ACT, was stocked in 69% of the project pharmacies, while 81% of them stocked Coartem B12, the next largest package size. In the same time frame, CQ availability fell from 52% to 35%, HF availability fell from 38% to 11%, and AQ availability fell from 72% to 47%. One factor that is likely to contribute to the persistent availability of other antimalarials is that there is no subsidy for adult ACTs (only for child ACTs), so adult ACTs remain unaffordable for many consumers.

### National ACT subsidy programs

Compared to the sub-national pilots of subsidized ACT, **Senegal's national ACT subsidy program** achieved a lower ACT availability at year 1. Financed by the Global Fund, the National Medical Store procured a first consignment of ACT (AS-AQ) in April 2006 for distribution through public outlets. To complement the public sector distribution, Senegal's government began distributing subsidized ACTs through private pharmacies in September 2006. In September 2007, the Institute for Research and Development conducted a study on ACT price and availability in 26 public and NGO facilities, and in 41 private outlets.<sup>12</sup> Across all outlet types, 44.8% stocked adult ACT, 58.2% stocked child ACT, and 46.3% stocked ACT for infants. In **urban areas**, 70% of all outlet types stocked at least one of the three ACT dosages, with 83% of public and NGO outlets, and 57% of private outlets, having at least one age-specific dosage available. Availability was high in public and NGO facilities, with 90% of facilities stocking adult ACTs, 82% child ACTs, and 82% infant ACTs. ACT availability was much lower in the private sector, with 11% of private outlets stocking adult ACTs, 43% child ACTs, and 29% infant ACTs. Only 7% of private outlets stocked all three ACT doses. In **rural areas**, 68% of all outlet types had at least one age-specific ACT dosage available. Over 80% of public/NGO outlets had at least one age-specific ACT dosage available, but only 31% of private outlets stocked ACT. Other common antimalarials were widely available in the private sector (the study did not assess availability of other antimalarials in the public sector): 96% of private shops in urban areas stocked SP, 100% stocked QN, 92% stocked AQ, and 54% stocked CQ. In rural areas, SP was found in 100% of private outlets, AQ in 96%, and CQ in 86%.

### Data on Cameroon's national ACT subsidy program also suggest limited availability of subsidized ACTs.

In 2007, Cameroon saw the first massive deployment of ACTs. Funding from the Global Fund (round 5) was used to subsidize ACTs in both the private and public sectors. According to recent articles by one of the leading malaria experts in Cameroon, many public and private health facilities have run short of subsidized ACT stocks.<sup>13</sup> ACT stocks have expired in the National Supply Center for Drugs and Essential Commodities and provincial pharmaceutical supply centers. Dispensaries in particular have encountered difficulties ensuring the supply of subsidized ACTs.<sup>13</sup> Experts who we interviewed told us that mono-therapies are still widely present and are being sold in many health facilities, especially those that are private and denominational (Wilfred Mbacham, Pierre Ongolo-Zogo, personal communications).

In **Rwanda's national ACT subsidy program**, ACT availability at 1 year was similar to the availability in the ACT pilot studies discussed above. According to Rwanda's AMFm proposal, only 1 in 10 private pharmacies stocked ACT child doses in 2007; by July 2009, 18 months after the 2008 launch of PSI's ACT subsidy program, 80% to 90% of pharmacies carried the drug.<sup>14</sup> Key informants (e.g., those at MMV and PSI) emphasized that

Rwanda's malaria control program has many unique features and the results of its program would not be easy to replicate in the AMFm pilot countries. Rwanda's government has shown great commitment to malaria control in recent years, and it effectively banned monotherapies immediately after ACTs became the recommended first-line treatment in 2006. Only ACTs and QN as a second-line drug are now available on the market to treat children with malaria (Corine Karema, personal communication). The government's engagement helped PSI to make ACTs rapidly and widely available in the private sector.

**Cambodia's national ACT subsidy program**, however, did not achieve such high levels of ACT availability at 1 year. In 2004, twelve months after PSI scaled up the distribution of subsidized ACTs, the Cambodia National Malaria Baseline Survey 2004 showed that only 22% of private drug stores sold adult ACT doses, while only 6% sold child doses.<sup>15</sup> In 2007, an outlet survey found that ACT (Malarine) was available in only 40% of private outlets.<sup>16</sup> A more recent 2009 survey by ACTwatch found that 29% of pharmacies and 25% of drug stores stocked the recommended first-line ACT.<sup>17</sup> Non-artemisinin-based therapies and monotherapies were available at 16.4% and 17.1% of pharmacies, respectively, and at 15.9% and 15.2% of drug stores. About 70% of all private outlets experienced a stock-out in the 3 months before the survey.<sup>17</sup> Lack of funding for the subsidy might explain the poor ACT availability in Cambodia's program.

## 2.4

### Data on ACT Price in Subsidized ACT Pilots and Programs

#### Summary points

- Adherence to the recommended retail price (RRP) was strong in the four subnational pilots. The pilots in Uganda, Tanzania, and Angola also found that the observed retail prices of ACTs were comparable with, or below, the price of suboptimal antimalarials (e.g., SP, CQ) at 1 year (Tanzania, Angola) or 20 months (Uganda).
- In our examination of the national subsidized ACT program in Senegal, we found that price adherence was strong in the public and the private sectors, and that the ACT price was below the price of SP. There is only limited evidence available on Cameroon's national subsidy program; this evidence suggests that price adherence was only strong in the Yaoundé Centre province.
- In Cambodia, 4 years after the national ACT subsidy program was initiated, ACT was sold at a much higher price than CQ (Table 6).

#### Subnational pilots

In the **Tanzania pilot study**, the RRP for the subsidized ACT was set at 300, 600, 900, and 1,200 Tanzanian shillings (\$0.25, \$0.50, \$0.75, and \$1.00) for the four weight-specific packs. On average, the mean observed consumer price for ACTs was \$0.58, close to the mean RRP of \$0.50. ACTs for children un-

der age 5 were less expensive than those for adults (a mean price of \$0.35 and \$0.70, respectively). The average price paid for ACTs for adults did not differ significantly from the price for SP (\$0.67), but was considerably higher than for AQ (\$0.48). The mean price paid for ACTs for children under age 5 was significantly less than SP (\$0.51) or AQ (\$0.86). About 86% of all purchases were within \$0.08 of the RRP. ACT consumer prices were not substantially higher at more remote shops facing less competition. To test whether putting the RRP on the ACT packaging affected the price paid, ACTs distributed to one intervention district (Kongwa) were marked with the RRP to inform consumers of the maximum amount they should pay. No RRP was included on the ACT packaging in the second intervention district (Maswa). The pilot found that prices were higher in Kongwa. The study therefore suggests that caution should be used in placing the RRP on the packaging, based on a detailed understanding of pricing practices and only in cases where unreasonable profit margins are being charged.<sup>6</sup>

In the **Uganda pilot study**, the maximum recommended retail price for the subsidized ACT ranged from 200 Ugandan shillings (UGX) to UGX 800 (\$0.10 to \$0.40), depending on the target age/doses. Based on exit interviews conducted at drug shops in May 2010, 95% of people purchasing "ACT-leaf" paid the correct price. Despite occasional profiteering, the mean price paid was within 10% of the recommended price (mean price paid for lowest weight band: UGX 228, [\$0.11; range of UGX 200–800]; mean price paid for highest weight band: UGX 851, [\$0.43; range of UGX 800–2500]).<sup>7</sup>

In the **Kenya pilot**, 95% of caregivers in the intervention arm said they bought the subsidized ACT (AL, Tibamal) at the recommended retail price of \$0.25 (out of the eight caregivers who did not pay this price, three paid less than \$0.25 and five paid between \$0.31 and \$1.23).<sup>8</sup>

In the **Angola pilot**, mystery shoppers found that pharmacies in the intervention municipalities were keeping to the proposed price of 75 kwanzas (\$1.00) for a dosage of child ACTs.<sup>9</sup> In August 2009, two pharmacies were found to be violating the proposed price, selling the medicine at 100 and 300 kwanzas. The subsidized ACTs were sold at a price comparable to other common antimalarials. On average, pharmacies sold CQ for 80 kwanzas and AQ for 74 kwanzas in January 2010.

#### National ACT subsidy programs

In **Senegal's national ACT subsidy program**, price adherence was high in the public and private sectors. Adult doses were to be sold at CFA 600 (\$1.29), and child and infant doses at CFA 300 (\$0.65) in public clinics, NGO facilities, and private pharmacies. According to a study by WHO and Health Action International (HAI), the price of a full course of SP in Senegal is about \$2.00, indicating that Senegal's ACT subsidy works.<sup>18</sup> Public sector and NGO clinics purchased adult ACTs from the National Medical Store at CFA 575 (\$ 1.24), while private pharmacies purchased them at CFA 460 (\$0.99), yielding a gross margin

**Table 6.** Data on price at 1 to 4 years in ACT subsidy pilots and programs (price refers to a full adult or child course of ACT)

	Uganda pilot	Tanzania pilot	Angola pilot	Senegal program	Cameroon program	Cambodia program
<b>Time frame between subsidy launch and survey</b>	20 months	1 year	1 year	1 year	1 year	4 years
<b>ACT recommended retail price (RRP)</b>	\$0.10–\$0.40 Mean price for all ACTs: \$0.50	\$1.00	\$1.00	\$1.31	Public sector: \$0.28 (infant) \$1.12 (adult)  Private sector: \$0.47 (infant) \$1.88 (adult)	\$0.63
<b>ACT observed retail price</b>	\$0.11–\$0.43	Mean: \$0.58 (adult \$0.70, child: \$0.35)	\$1.0 in most private pharmacies	\$1.34	Better price adherence in Yaoundé Center province than in remote provinces	\$ 1.07
<b>% of observed price in relation to RRP</b>	+14% to +6%	Mean: +16%	No data	+2%	No data	+70%
<b>Price of alternative antimalarials</b>	CQ: \$0.15	Mean: Adult SP: \$0.67 Child SP: \$0.51 Adult AQ: \$0.48 Child AQ: \$0.86	No data	SP: \$2.00	No data	CQ: \$0.20
<b>% of ACT price above/below price of alternative antimalarial</b>	ACT: -24% (for lowest-weight pack compared with CQ)	Adult ACT vs. adult SP: +4% Adult ACT vs. adult AQ: +46% Child ACT vs. child SP: -31% Child ACT vs. child AQ: -59%	No data	Not currently available	No data	ACT:+535%

of 29% on the product. Using the HAI methodology, the survey by the Institut de Recherche pour le Développement, conducted 1 year after the launch of the private subsidy, found that the observed mean price for adult doses of ACT at private outlets was CFA 621 (\$1.34) [range: CFA 600–650], which was similar to the RRP. The mean observed public sector price was even closer to the RRP, at CFA 604 (\$1.31) [range: CFA 600–625]. For child doses, the public sector price was CFA 304 (\$0.69) [range: CFA 300–325] and the private sector price was CFA 322 (\$0.66) [range: CFA 300–350].<sup>12</sup> Prices in rural areas followed these trends. Mystery shopping, which was conducted in addition to the HAI methodology, confirmed the results. However, only 18 public and 31 private outlets were included in the survey, making it very difficult to draw inferences about national price levels from these results.

In **Cameroon’s national ACT subsidy program**, price adherence was stronger in Yaoundé Centre province than in more remote provinces, and was also stronger in the public sector

than in the private sector. With Global Fund support, Cameroon purchased four million ACT doses in 2007. The recommended price to patients for the infant dose of AS-AQ in public facilities was CFA 140 (\$0.28) and CFA 235 (\$0.47) in the private sector. For the adult dose, it was CFA 560 (\$1.12) and CFA 940 (\$1.88) in the public and private sectors, respectively. In 2008, a cross-sectional survey in three of the ten provinces of Cameroon was conducted to examine if the subsidy was passed on through the distribution channels. The survey was conducted in Yaoundé Centre province, and in the northwest and southwest provinces. Data collection was based on structured questionnaires and interviews, and a mystery shopper survey. Among the health outlets surveyed, 32 were rural, 23 were in a small city, and 42 were in urban towns. While we did not receive a full report of the survey, Professor Wilfred Mbacham from the University of Yaoundé shared with us the executive summary, which suggests that the survey had one main outcome. It found that Yaoundé Centre province always had the

lowest ACT prices, concluding that the “subsidy benefits seem to work only in Yaoundé with the lowest cost per tablet... in all three provinces surveyed.” The higher prices in the northwestern and southwestern provinces are explained through the large distance of many outlets to the provincial centers.

In **Cambodia’s national ACT subsidy program**, in 2007—four years after PSI began to subsidize ACTs in 17 of 20 malaria-endemic provinces—the mean consumer price for ACTs was \$1.07 (range: \$0.63–\$3.75) for adult doses of Malarine and \$0.95 for child doses (range: \$0.63–\$2.50).<sup>15</sup> The RRP for ACTs in the subsidy program was \$0.63—thus, the mean consumer price for adult ACTs was 70% higher than the RRP. A 2009 ACTwatch survey found that the median price of ACT treatment in Cambodia was \$1.18, much higher the RRP. On average, the price for ACTs in the Cambodia program was ten times higher than for CQ, the second most popular antimalarial. Prices were also highest in village stores (on average, \$1.50).<sup>16</sup> Irregular supply and frequent stock-outs are likely to contribute to the high prices of ACTs, as intermittent availability at retail outlets gives providers an incentive to hoard and sell later at higher prices when supply drops.<sup>19</sup> Lack of funding for the subsidy, as discussed previously, might explain the high ACT prices in Cambodia’s program.

## 2.5

### Data on Market Share in Subsidized ACT Pilots and Programs

#### Summary points

- At 1 year after the launch of the Tanzania pilot, ACT had a market share of 44.2% (compared with 1% at baseline), and in the Uganda pilot market share at 1 year was 51% (compared with 0% at baseline).<sup>6, 7</sup> In the Uganda pilot, market share was 69% at 18 months (Table 7). Poorer people were less likely to purchase ACT and more likely to purchase other antimalarials than those living on a higher income. In the Angola pilot, the market share for ACT was 38% after 1 year.<sup>9</sup>
- There are only limited market share data for ACT subsidy programs. Results for Cambodia suggest that 6 years after PSI scaled up the distribution of subsidized ACT to private outlets in Cambodia, ACT had only 28% of the market share in the private sector.<sup>16, 20</sup>
- Examination of PSI’s national sales volumes show that in many countries it took PSI at least 2 years before high sale volumes were reached.

#### Subnational pilots

In the Tanzania pilot, exit interviews found that the proportion of antimalarial consumers who purchased ACTs rose significantly in the intervention districts from 1% at baseline to 44.2% at 1 year. Over the same period, the proportion who purchased SP fell significantly from 58.2% to 35.8% and the proportion who purchased AQ fell significantly from 36.6% to 16.5%. Purchases by mystery shoppers followed a similar trend, with the proportion of shoppers offered ACTs in intervention districts

rising from 4.5% to 56.9% and those offered SP falling from 62.4% to 26% over 1 year.<sup>6</sup>

In the Uganda pilot, the market share of subsidized ACTs for children under age 5 increased over 1 year, while the market share of suboptimal antimalarials (e.g., CQ) fell (the National Drug Authority has banned CQ imports, which is likely to have contributed to the fall in CQ market share). In licensed outlets, the proportion of ACTs increased from 0% at baseline to 51% at 1 year after the launch of the pilot (September 2008). At 20 months (May 2010), the market share of subsidized ACTs was 69% in the intervention districts, while it remained low (5%) in the control district. In the same time frame, the share of subsidized ACTs also increased in unlicensed drug stores, from 0% in to 14%. These outlets do not receive official supplies from the pilot, but purchase “ACT-leaf” from licensed drug shops. While subsidized ACTs were purchased by all socioeconomic status (SES) groups in the four Ugandan intervention districts (in licensed and unlicensed outlets), the poorest SES quintile was less likely to purchase ACTs (24%) compared to the other four SES quintiles (33%–39%). Other antimalarials were displaced in the intervention districts. Market share of CQ fell from 19% in October 2008 to 11% at 1 year, and to 5% at 18 months. Market share of QN decreased from 50% to 28% (at 1 year), and to 24% at 18 months. In the control district, 80% of consumers purchased QN in May 2010.<sup>7</sup>

In the Angola pilot, the market share of ACTs increased from 0% in July 2009 to 38% in April 2010. Mono-therapies accounted for 47% of all antimalarial sales. While no baseline data are available, most children received monotherapies before subsidized ACTs were introduced.<sup>9</sup>

#### National ACT subsidy programs

In Cambodia’s national subsidy program, in 2009, (seven years after PSI started to distribute subsidized ACTs to private outlets, and six years after PSI scaled up the ACT program to 17 of 20 malaria-endemic provinces) the National Malaria Center reports that the nationally recommended ACT (AS+MQ) comprised only 28% of the reported sales in the private sector. Monotherapies were still widely available, accounting for 50% of all sales in the commercial private sector.<sup>16, 19</sup>

Typical methods to estimate the market share of a product are customer interviews and outlet surveys. But data from these types of studies were not available to us for most of the countries in which subsidized ACTs are distributed nationally. Key informants suggested that we should examine sales volumes as an alternative proxy to estimate the uptake of subsidized ACTs over time. PSI’s Annual Health Impact Reports include the annual total volume of ACTs sold in PSI programs. We were unable to calculate the market share of these subsidized brands (i.e., the proportion of subsidized ACTs in relation to the total volume of all antimalarials sold) because we were unable to obtain data on the total volume of all antimalarials sold in a country. Nevertheless, our examination of PSI’s national sales volumes show that in many countries it took PSI at least 2 years before substantial sale volumes were reached (Table 8; Figure 4).

**Table 7.** Market share of ACTs and other antimalarials in ACT subsidy pilots and programs before and after introduction of subsidized ACTs

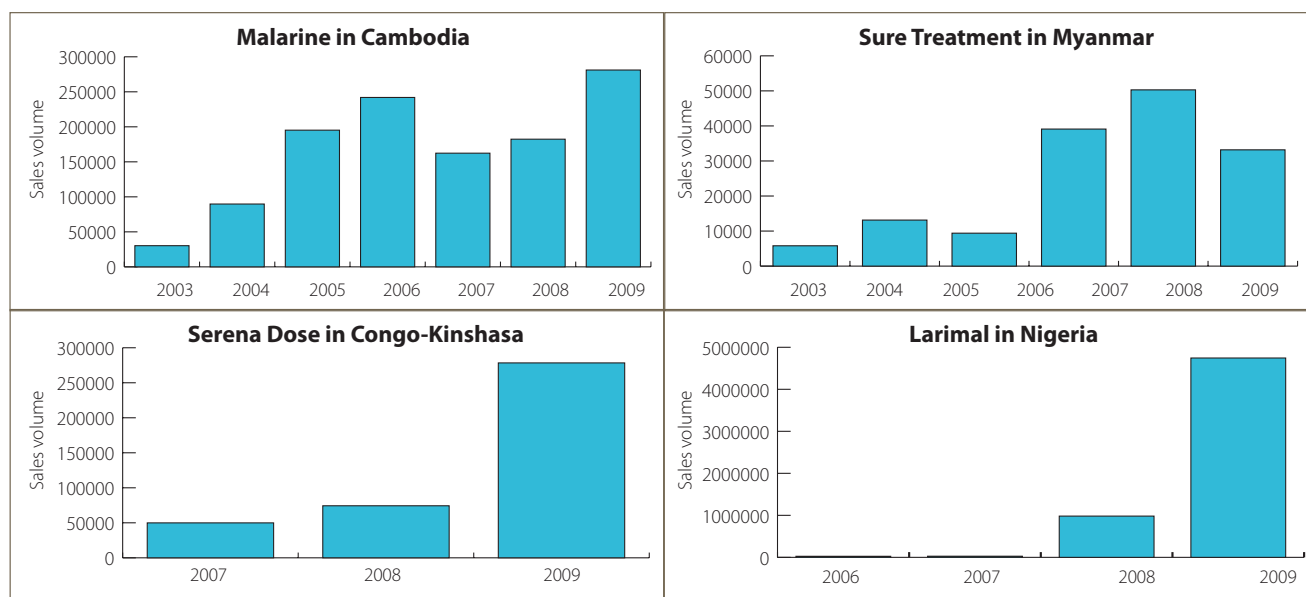
	Market share of ACT at baseline	Market share of ACT at 1 yr	Market share of ACT at 15–20 months*	Market share of other antimalarials at baseline	Market share of other antimalarials at 1 yr*
<b>Tanzania pilot</b>	1%	44.2%	39.7% (15 months)	SP: 58.2% CQ: 36.6%	SP: 35.8% CQ: 16.5
<b>Uganda pilot</b>	0%	51.0%	69.0% (20 months)	Quinine: 50% CQ: 19%	Quinine: 28% CQ: 5%
<b>Angola pilot</b>	0%	38%	No data	No data	Monotherapies: 47%
<b>Cambodia program</b>	No data	No data	28% (after 6 years)	No data	Monotherapies: 50% (after 6 years)

\*For Cambodia, only 6-year data are available.

**Table 8.** Annual PSI sales volumes of subsidized ACT by brand in six countries

	2003	2004	2005	2006	2007	2008	2009	Launch Date
<b>Congo-Kinshasa (Serena Dose)</b>					49,896	74,328	278,354	9/06
<b>Nigeria (Arsuamoo)</b>					47,500	1,048,076	618,830	8/07
<b>Nigeria (Laridox)</b>						19,200	593,852	5/08
<b>Nigeria (Larimal)</b>				25,216	27,204	981,978	4,745,050	1/06
<b>Rwanda (PRIMO PPT)</b>						1,043,812	1,087,932	1/08
<b>Madagascar (ACTI PAL)</b>						288,921	519,338	1/08
<b>Myanmar (Sure Treatment)</b>	5,801	13,134	9,396	39,103	50,288	33,178		7/03
<b>Cambodia (Malarine)</b>	30,242	89,740	195,216	241,936	162,364	182,333	281,116	2/03

**Figure 4.** Annual PSI sales volumes of subsidized ACT by brand in four countries



The data in Figure 4 suggest that it usually takes more than 2 years before a large increase in sales is seen. PSI managers who we interviewed supported this finding, arguing that it often takes many years before a new product obtains a substantial market share. Countries such as Uganda and Rwanda, in which undesirable antimalarials were removed from the market through the effective enforcement of government drug policies, are an exception rather than the rule (PSI, personal communication). The interviewees unanimously emphasized that it requires considerably more time and effort to increase market share levels in rural and less populous areas. Ability to reach the rural population depends on the quality of a country's distribution system, on the time for products to move down the supply chain to the periphery, and on the turnover in the periphery.

Expectations for what kind of market share can be achieved after 1 or 2 years also depend on the total market size. The antimalarial market in Nigeria is much larger than in Rwanda, for example, and as a consequence it will take longer for a newly introduced health commodity to achieve a high market share in Nigeria.

## 2.6 Data on ACT Use in Subsidized ACT Pilots and Programs

### Summary points

- We only found data on ACT use (i.e., ACT given to a child within 24 and 48 hours of fever onset) in two pilot studies—those conducted in Uganda and Kenya.<sup>7,8</sup>
- One year after the launch of the Uganda pilot, usage was 15% within 24 hours and 20% within 48 hours (compared with 3% and 4%, respectively, at baseline).<sup>7</sup> However, increase in usage from baseline was higher in the control arm of the trial following the launch of an ACT project targeting the public sector in the control district.
- In the Kenya pilot, which assessed outcomes at 1 year, use increased by 40.2 percentage points in the intervention arm and by 14.6 percentage points in the control arm.<sup>8</sup>

### Subnational pilots

In the Uganda pilot, there was a five-fold increase in ACT usage within 1 year in the intervention arm. The proportion of children accessing ACTs within 24 and 48 hours of fever onset was 15% and 20%, respectively, at 1 year compared with 3% and 4%, respectively, at baseline. Most children who received an ACT within 24 and 48 hours used a subsidized ACT. However, preliminary data indicate that outcomes were even better in the control district than in the intervention districts. In the control district, the proportion of febrile children accessing ACTs within 24 and 48 hours increased from 1% and 2%, respectively, at baseline to 17% and 23%, respectively, at 1 year. According to MMV, this increase in the control district can be

explained by the fact that new interventions were also initiated in the control district, targeting the community level distribution of ACTs through the public sector. Both community medicine dispensers (CMDs) and the public sector are now highly functional in the control areas (Ambrose Talisuna, personal communication). In contrast, the private sector in the intervention districts compensates for the lack of ACT availability in the public sector (including the lack of functioning CMDs). This difference between the intervention and control districts is also reflected in where people obtain their ACT stocks. Public health facilities and CMDs are the key sources of ACTs in the control district, whereas in the intervention areas CMDs are nonfunctional and the public sector stocks are highly variable.

In the Kenya pilot, the primary outcome was “the proportion of children age 3 [months] to 59 months reporting fever in the past 2 weeks who started treatment with AL on the same day or following day of fever onset.”<sup>8</sup> At 1 year, the percentage of children receiving AL on the same day or following day of fever onset had risen by 14.6 percentage points in the control arm and by 40.2 percentage points in the intervention arm. Thus, there was a difference between the two arms of the trial of 25.6%. The percentage of children receiving antimalarial monotherapy (mainly AQ, SP, and QN) fell by 7.0 percentage points in the control arm and 26.6 percentage points in the intervention arm.

## 2.7 Implications of the ACT Subsidy Pilots and Programs for the AMFm Phase 1

The data above served as our starting point for estimating the metrics of success laid out in Section 7. However, our literature review and key informant interviews both cautioned us against expecting that the data from the subnational pilots or national programs could simply be replicated in AMFm Phase 1.

While three of the four ACT pilots were controlled trials (Kenya, Tanzania, and Uganda), in the Uganda trial the intervention and control districts were purposively selected (there was no randomization), while the Tanzania trial was at best quasi-randomized (there are very few details about the randomization process). Given the small number of intervention districts in these two nonrandomized or only quasi-randomized trials, it is likely that important confounders were not balanced between the intervention and control arms. And for the Uganda trial, it is clear that the control group received additional interventions (ACT distribution through public sector and community-based channels)—and thus the results are very hard to interpret.

There are several unique features of the subnational pilots and the national programs that make it difficult to extrapolate the results to the AMFm pilot countries:

- The subnational trials were conducted in a small number of intervention districts (two in Tanzania and Angola, three in Kenya, and four in Uganda).<sup>6-9</sup> In contrast, the AMFm Phase 1 pilots will be rolled out nationally.

- The AMFm Phase 1 countries will usually use the existing distribution systems of countries, distributing ACTs through existing national public and private wholesalers, whereas the pilots in Uganda and Angola extended the supply chain by adding a direct distribution mechanism. It is unlikely that an AMFm Phase 1 country could replicate the successes of the Uganda and Angola pilots without the creation of this type of additional supply chain, particularly given the time needed for drugs to reach the shelves of remote rural communities.
- In Angola, the MENTOR Initiative monitors ACT price and informs pharmacies in cases of detected price violations, making clear that such violations are intolerable. It is unlikely that such tight monitoring will occur nationally in all AMFm Phase 1 pilot countries.
- The Tanzanian pilot included only one type of retail outlet (private drug shops) and one wholesaler, whereas the national rollouts will include multiple types of outlets and distribution mechanisms.
- Interviews with key informants laid out additional caveats in trying to draw direct lessons from either the subsidized ACT pilots or national programs:
- Socioeconomic factors, the regulatory framework (e.g., whether or not a prescription is needed to purchase ACT), the structure of private supply chains, and malaria treatment-seeking behavior all vary considerably between and within countries.
- The success of the AMFm Phase 1 will partly depend on the quality of the supportive interventions. All four subnational pilots included extensive communication campaigns and training sessions. While the AMFm Phase 1 countries must implement a set of supportive interventions to increase ACT access in the public and private sectors, the quality of these interventions is unlikely to mimic the quality achieved under trial conditions.
- There is great variation in the quality of the data on outcomes in the national ACT subsidy programs, and these data need to be interpreted with caution. For example, in many cases the surveys that were conducted to monitor success

used very small sample sizes, or they used purposive rather than random sampling.

- Following AMFm Phase 1 initiation, the co-paid ACTs will arrive at different times in the different pilot countries. The fastest-moving countries may have considerably more time to implement the subsidy than slower-moving countries.

Given that the AMFm Phase 1 countries are unlikely to be able to replicate the conditions of a research trial, we do not expect these countries to show the same levels of success as those in the subnational trials. ACT subsidy programs run by the government (i.e., those in Senegal and Cameroon) are probably a closer model for what might be achievable in AMFm Phase 1. However, data on Cameroon are scarce and the Senegal study is based on a small number of outlets.

The data that we have reviewed suggest that the significant market penetration required to reach high levels of availability and market share takes more than 2 years. It will be difficult for AMFm Phase 1 countries to scale up more quickly than this, given the time needed to set up ACT distribution mechanisms and establish scaled up supportive interventions (e.g., campaigns to raise awareness).

Based on the ACT pilots and programs, we believe that better early outcomes are likely to be seen in heavily populated urban areas than in remote rural areas.

Finally, the ACT pilots and programs do not provide information about two potential harms of ACT subsidy initiatives. The first is inappropriate sales of ACT to febrile children who do not have malaria. This potential harm could arise from the fact that many children with fever in malaria-endemic countries do not have malaria. For example, recent studies suggest that only 10% to 40% of febrile children under age 5 in rural Tanzania are parasitaemic.<sup>21</sup> The risk of this potential harm could be reduced with the use of rapid diagnostic tests (RDTs) to confirm diagnosis prior to selling ACT (RDT subsidies are not included in the AMFm). The second is the risk of delay by very sick patients in seeking medical care.

### 3. National ACT Scale-Up Initiatives

In this section, we summarize data on recent efforts to make ACTs available in malaria-endemic countries. The outcomes from these efforts can help to guide expectations for success of the AMFm, particularly with respect to the public sector. As public ACT-subsidy schemes only exist in Cameroon and Senegal, our analysis in Section 2 was strongly focused on the private-sector side of the AMFm. However, the AMFm's objective is to make ACTs widely available and increase their penetration into both the public and the private sectors. Public sector availability of ACTs—in addition to the proportion of ACTs among all antimalarials distributed by the public sector—has grown in many countries. Analyzing these public sector changes can provide useful insights for estimating AMFm success metrics, and complements the data on the existing AMFm subsidies. For example, is there any evidence that the adoption of ACT as first-line treatment for uncomplicated malaria led to “crowding out” of monotherapies (e.g., CQ, SP)?

As with the data in Section 2, we have organized the results in Section 3 into four domains: availability, price, market share, and use. Where possible, we have included available data on equity, such as between rich and poor people or between rural and urban areas. At the June 2010 AHC meeting, the committee suggested that we also examine the impact of a change in national policy upon the availability and use of different antimalarials, and so we have added this analysis to the paper.

In examining data from ACTwatch surveys, and from the Global Fund Five-Year Evaluation, we were faced with the question of which year we should consider as the baseline for national ACT scale-up. We have presented in our paper two possibilities. The first is the year in which a country adopted ACT as first-line treatment in its national policy. Given that some countries took several years to begin national rollout after policy adoption, we also give information on the year in which such rollout began in earnest. In order to determine when national rollouts occurred, we searched relevant documents published online by the Global Fund, ACTwatch, and the President's Malaria Initiative, as well as the peer-reviewed literature. We acknowledge that there is some uncertainty about the exact date on which such rollouts occurred.

#### 3.1 Evidence on ACT Availability in National ACT Scale-Up Initiatives

In this section, we examine data from three sources: (1) ACTwatch ([www.actwatch.info](http://www.actwatch.info)); (2) the Global Fund Five-Year Evaluation; and (3) a cross-sectional survey in Zambia.

Evidence from ACTwatch outlet surveys: In the seven countries tracked by ACTwatch, availability of first-line ACTs is low, ranging from 6.6% in Benin to 28% in Uganda (Table 9). In all countries except for Uganda, availability of first-line ACT across all outlets is below 20%. All countries except Madagascar

changed their malaria treatment policy to ACTs in 2005 or earlier, while most of the surveys were conducted in late 2008, i.e., the time frame between national drug policy change and the national surveys was at least 3 years. On average, first-line ACT is available in 13.4% of public and private facilities in the seven countries. In all countries, providers are much more likely to stock non-artemisinin-based therapies than ACTs. In Nigeria and the DRC, oral artemisinin-based monotherapies are still widely available. Stock-outs of first-line ACTs are common.<sup>22</sup> ACTs are much more likely to be available in public facilities than in private outlets. In public facilities, availability in these seven countries ranges from 20% to 85.6% (mean 61.7%; median 65.8%). The mean for Part One pharmacies (pharmacies licensed by the national drug authorities), which exist in all countries except Cambodia, is 60.1% (range: 25.8%–79.6% [if Cambodia is included, where some of the pharmacies and clinics are licensed and others not, the mean falls to 55.6%]). On average, ACTs are only available in 13.8% of private drug stores (range: 4.3%–25%). Although availability in public facilities is high, the overall national availability is still very low, because private outlets are the primary providers of antimalarials and they often do not have ACTs on their shelves (see Section 3.3 for the proportion of antimalarials sold/distributed through the private sector).

In three countries, ACTwatch conducted the surveys 1 year after the national rollout. ACT availability ranged from 6.6% to 18.5% 1 year after the national rollout (6.6% in Benin; 9.6% in Madagascar; 18.5% in the DRC). In Uganda, the survey was conducted 2 years after national rollout and availability reached 28%. In the three remaining countries, the surveys were conducted 3–6 years after the national ACT rollout (availability was 6.5% in Cambodia at 6 years; 8.1% in Zambia at 3 years; 16.7% in Nigeria at 3 years).

#### Evidence from the Global Fund Five-Year Evaluation

The recent external evaluation of the Global Fund (the Five-Year Evaluation) includes data on the availability of ACTs.<sup>23</sup> The methodological rigor of the surveys included in the Five-Year Evaluation is lower than that adopted by ACTwatch in its surveys. In the Global Fund Five-Year Evaluation, in three countries (Ethiopia, Malawi, and Peru) the surveyed facilities were not randomly selected. Compared to ACTwatch surveys, the samples of the seven countries surveyed for the Five-Year Evaluation were also smaller (range of facilities surveyed (N) = 49 to 535). ACT was available in 79%–94% of facilities that offer malaria treatment in Ethiopia, Malawi, and Zambia, but ACT availability was much lower in Burkina Faso (36%), Cambodia (24%), Peru (1%), and Haiti (1%) (see Appendix B). Except in Zambia and Malawi, other antimalarials were still widely available even though six of the countries had adopted national policies making an ACT the first-line treatment (as long ago as 2000 for Cambodia and as recently as 2007 for Malawi).<sup>23</sup>

**Table 9.** Availability of antimalarials in countries tracked by ACTwatch

Country (survey date)	Year that ACT was adopted as national policy	Year of national ACT rollout	Availability of antimalarials in all outlets	Availability of first-line ACTs in all outlets	Availability of first-line ACTs by outlet type	Availability of other antimalarials	Outlets with no stock-outs in first-line ACTs three months before survey
<b>Benin (11/08)</b>	2005	2008	68.6%	6.6%	Public facility: 65.8% Part One pharmacy: 77.1% Private outlets: < 10%	Non-artemisinin-based therapy: 66.3% Artemisinin-monotherapy: 3.7%	52.5%
<b>Cambodia (06/09–07/09)</b>	2000	2003	11.6%	6.5%	Public facility: 64.3% Pharmacy/clinic: 28.9% Drug store: 25% Other private outlets: 0.5%–8.9%	Non-artemisinin-based therapy: 5.4% Artemisinin-monotherapy: 4.5%	64.3%
<b>Congo (DRC) (09/08–11/08)</b>	2005	2008	71.5%	18.5%	Public facility: 20.2% Part One pharmacy: 25.8% Drug store: 20% Other private outlets: 8.6%	Non-artemisinin-based therapy: 66.4% Artemisinin-monotherapy: 47.8%	60.3%
<b>Madagascar (12/08)</b>	2006	2007	37.3%	9.6%	Public facility: 85.6% Part One pharmacy: 47.5% Drug store: 20% Other private outlets: 0.1%–16.5%	Non-artemisinin-based therapy: 34.4% Artemisinin-monotherapy: 0.5%	85.8%
<b>Nigeria (12/08)</b>	2005	2005	94.9%	16.7%	Public facility: 30.0% Part One pharmacy: 73.7% Drug store: 7.5% Other private outlets: 15.6%	Non-artemisinin-based therapy: 92.5% Artemisinin-monotherapy: 47%	47.2%
<b>Uganda (09/08–10/08)</b>	2004	2006	51.2%	28%	Public facility: 82.8% Part One pharmacy: 56.9% Drug store: 4.3% Other private outlets: 0%–17.1%	Non-artemisinin-based therapy: 50.4% Artemisinin-monotherapy: 8.7%	2.9%
<b>Zambia (10/08–01/09)</b>	2002	2005	17.0%	8.1%	Public facility: 83.0% Part One pharmacy: 79.6% Drug store: 6.2% Other private outlets: 0%–56.8%	Non-artemisinin-based therapy: 86.2% Artemisinin-monotherapy: close to 0%	69.9%

**Table 10.** Availability of antimalarials in government and mission health facilities in Zambia after ACT was adopted as first-line therapy

Antimalarial drug	Availability in 2004	Availability in 2006
AL	51.1%	59.6%
SP	100%	92.3%
QN (injections)	72.3%	75.0%
QN (tablets)	78.7%	86.5%
CQ	75.5%	0%

### Evidence from a study in Zambia examining ACT availability in response to a national policy change

Zambia was the first African country to change national antimalarial treatment policy to ACT (AL); it adopted ACT as its first-line therapy in December 2002. AL was introduced in a phased manner, starting in February 2003 (in seven districts) and expanding to 28 of 72 districts by the end of 2003. Zurovac and colleagues surveyed government and mission health facilities (i.e., no private outlets) in four of these 28 districts between January and March 2004 and conducted a follow-up study of the same four districts in 2006.<sup>24</sup> The four districts were purposively (not randomly) sampled. Table 10 summarizes the results on availability, showing that ACT availability increased from 51.1% to 59.6% between 2004 and 2006. Other common antimalarials except CQ were still widely available.

## 3.2

### Evidence on ACT Price in National ACT Scale-Up Initiatives

For the AMFm to be able to increase ACT usage, the price subsidy at the “factory gate” will need to be passed on to the consumer. The available data on ACT price in current national ACT scale-up programs do not allow us to draw any conclusions about ACT price markups in the AMFm Phase 1 countries. However, such data are a useful reminder of the existing ACT prices and the price differences between ACTs and other common antimalarials. Appendix C shows that ACTs are distributed for free in public outlets in four of seven ACTwatch countries (Cambodia, Madagascar, Uganda, and Zambia). It is important to note, however, that patients typically have to pay as much as \$0.30–\$0.50 for a consultation at a public facility, particularly in Anglophone countries. So, even if the drugs themselves are free, patients still bear a treatment cost. In the three countries where ACTs are not distributed for free in the public sector, the median price ranges from \$1.17 in Benin to \$2.75 in the DRC. The median price for ACTs in private outlets ranges from \$1.17 in Cambodia to \$7.51 in Zambia. In six countries, the median price for other common antimalarials (e.g., CQ, SP) ranges from \$0.16 to \$0.54. The only outlier is the DRC, where the median price for QN is \$3.12. In all seven ACTwatch countries, the retail prices of other common antimalarials are well below those of ACTs. Prices for ACTs are up to 40 times higher than less effective monotherapies.

These figures show that pricing levels differ substantially between countries, and that ACT prices in the private sector will need to be lowered dramatically in order to make them affordable to patients—particularly the poorest patients.

### Evidence on ACT Market Share in National ACT Scale-Up Initiatives

## 3.3

ACTwatch provides data on the relative volumes of full-course adult treatments sold or distributed. Table 11 shows the share of first-line ACTs, non-artemisinin-based monotherapies and artemisinin monotherapies from surveys conducted in seven countries (these assess the volumes of antimalarials sold in the week before the survey). The data show that ACT market share is very low in all seven countries; the highest market share is in Cambodia and Zambia, the two countries that were early adopters of ACT as national policy (in 2000 and 2002, respectively). Even in these two countries, first-line ACTs account for only 24.5% (Cambodia) and 15.5% (Zambia) of all antimalarials sold or distributed. Non-artemisinin-based monotherapies account for the largest share in all countries except Cambodia. Artemisinin monotherapies still account for larger relative volumes than first-line ACT in Cambodia, Nigeria, and the DRC.

One year after the national rollout, ACT market share ranged from 0.9% to 7.5% (0.9% in Madagascar; 2.8% in the DRC; 7.5% in Benin). In Uganda, the ACT market share was 4.3% after the national rollout. In the three remaining countries, the ACT market share ranged from 2.1% to 24.5% (2.1% in Nigeria; 15.5% in Zambia; 24.5% in Cambodia) 3–6 years after the national rollout.

In five countries (Benin, Cambodia, Madagascar, Uganda, and Zambia), most first-line ACTs were distributed through the public sector. Other antimalarials (e.g., CQ, SP) still accounted for a substantial proportion of antimalarials sold or distributed in public facilities. In addition, 83% to 94% of patients rely on private providers in five of the seven ACTwatch countries (Benin, Cambodia, DRC, Madagascar, and Nigeria). In Uganda, the private sector provided 71% of all sold or distributed ACTs, while in Zambia 51% of ACTs are provided by private channels. These findings underline the relative importance of the private sector for the provision and increased use of ACTs, and that scaling up ACT availability and market share in the private sector will be crucial for the success of the AMFm.

**Table 11.** Relative volumes of adult antimalarials sold or distributed in seven ACTwatch countries

Country (survey date)	Year that ACT was adopted as national policy	Year of national ACT rollout	Relative share of first-line ACT and all ACTs (of all adult treatments sold or distributed)	Relative share of non-artemisinin-based monotherapies and oral artemisinin monotherapies (of all adult treatments sold or distributed)
<b>Benin (11/08)</b>	2005	2008	First-line ACT: 7.5% ACTs: 12.1%	Non-artemisinin-based monotherapies: 87.3% Artemisinin monotherapies: 0%
<b>Cambodia (06/09–07/09)</b>	2000	2003	First-line ACT: 24.5% ACTs: 56.8%	Non-artemisinin-based monotherapies: 8.2% Artemisinin monotherapies: 35.1%
<b>DRC (09/08–11/08)</b>	2005	2008	First-line ACT: 2.8% ACTs: 11.8%	Non-artemisinin-based monotherapies: 66.0% Artemisinin monotherapies: 22.3%
<b>Madagascar (12/08)</b>	2006	2007	First-line ACT: 0.9% ACTs: 5.6%	Non-artemisinin-based monotherapies: 94.2% Artemisinin monotherapies: 0.3%
<b>Nigeria (12/08)</b>	2005	2005	First-line ACT: 2.1% ACTs: 6.4%	Non-artemisinin-based monotherapies: 84.4% Artemisinin monotherapies: 9.2%
<b>Uganda (09/08–10/08)</b>	2004	2006	First-line ACT: 4.3% ACTs: 4.8%	Non-artemisinin-based monotherapies: 94.8% Artemisinin monotherapies: 0.4%
<b>Zambia (10/08–01/09)</b>	2002	2005	First-line ACT: 15.5% ACTs: 20%	Non-artemisinin-based monotherapies: 79% Artemisinin monotherapies: 1%

### 3.4 Evidence on ACT Use in National ACT Scale-Up Initiatives

In this section, we provide data on ACT use in national programs from: (1) national health surveys; (2) ACTwatch surveys; (3) the Global Fund Five-Year Evaluation; and (4) results from country-specific case studies in Nigeria, Kenya, Tanzania, Senegal, and Zambia.

#### Evidence from national household surveys

UNICEF publishes data from multiple countries, recently updated in November 2009, on the proportion of children under age 5 with fever who receive ACTs.<sup>25</sup> The data are based on the most recent national-level survey data from Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), and Malaria Indicator Surveys (MIS). These data refer to cases of fever, and not to cases of confirmed malaria (a large proportion of children under age 5 with fever do not have malaria). In Appendix D, we summarize the most recent national-level survey data on the proportion of children who received any antimalarial and the proportion who received ACTs. In 24 out of 41 countries, less than a third of children with fever receive an antimalarial; only in 10 countries did more than half of febrile children receive an antimalarial. In most surveys conducted since 2005, less than 10% of children with fever received an ACT at the time of the survey.

#### Evidence from ACTwatch

ACTwatch has conducted household surveys in four countries to assess the use of ACTs; these are summarized in Table 12. Only 2.4% to 19.3% of children under age 5 with fever received first-line ACT within 48 hours (1–4 years after national rollout).

#### Evidence from the Global Fund Five-Year Evaluation

The Five-Year Evaluation by the **Global Fund** found little or no evidence of an increase in usage of ACTs in response to Global Fund support, even though there was evidence showing countries had purchased large amounts of ACTs.<sup>23</sup> Zambia was a notable exception: the 2008 Zambia National Malaria Indicator Survey reported that 12.7% of children under age 5 with fever were treated with ACT (20.6% were treated with SP). None of the other countries surveyed for the evaluation showed ACT use above 5%.

#### Evidence on antimalarial use by vulnerable groups

Several studies show that there are substantial differences in the use of antimalarials based on socioeconomic status. A literature review by Worrall and colleagues suggests that wealthier population quintiles are usually more likely to receive treatment than poorer groups.<sup>26</sup> Based on an analysis of DHS data, Barat and colleagues find that there were major disparities between the poorest and least-poor quintiles in the percent-

age not receiving any type of antimalarial treatment in eastern and southern Africa (41% versus 21%) and also in western and central Africa (64% versus 23%).<sup>27</sup> This finding is confirmed by Schellenberg and colleagues, who reported that febrile children were twice as likely to receive appropriate treatment when their family was in the least-poor quintile compared to the poorest quintile (62% versus 31%).<sup>28</sup>

### Evidence on changes in antimalarial drug use following national policy change

We summarize data on changes in antimalarial use in Zambia, Kenya, Tanzania, Senegal, and Nigeria in Table 13 on the next page.

**Table 12.** Antimalarial use in countries tracked by ACTwatch

Country (date of survey)	Year that ACT was adopted as national policy	Year of national ACT roll-out	% of children under 5 receiving antimalarials	% of children under 5 receiving antimalarials on the same or next day	% of children under 5 receiving first-line ACT	% of children under 5 receiving first-line ACT on the same/next day
Benin (04/09–05/09)	2005	2008	41.1%	33.4%	7.4%	4.5%
Madagascar (12/08–01/09)	2006	2007	47.2%	44.6%	2.6%	2.4%
Uganda (03/09–04/09)	2004	2006	51.5%	44.1%	20.8%	17.6%
Zambia (04/09–07/09)	2002	2005	39.0%	36.0%	21.1%	19.3%

**Source:** ACTwatch outlet surveys, available at <http://www.actwatch.info/results/overview.asp> (accessed July 12, 2010)

**Table 13.** Changes in antimalarial drug use following national policy changes in five African countries

Reference	Country	National policy change	Outcome
Zurovac, D., et al. 2005: Treatment of paediatric malaria during a period of drug transition to artemether-lumefantrine in Zambia: cross sectional study. <i>BMJ</i> 331:734.  Zurovac, D., et al. 2007: Paediatric malaria case-management with artemether-lumefantrine in Zambia: a repeat cross-sectional study. <i>Malaria Journal</i> 6:31.	Zambia	Adopted ACT as first-line therapy in 2002  In 2004, during the early implementation of the treatment policy in Zambia, AL was not recommended for children under 10 kg; they were supposed to be treated with SP. In October 2005, the policy was changed to also recommend AL for children weighing 5 to 9 kg.	Prescriptions for children with uncomplicated malaria treated in govt. and mission health facilities:  <b>Children 5–9 kg</b> <b>2004: AL: 1.1%; SP: 80.1%;</b> QN: 2.7%; CQ: 0.2%; no antimalarial prescribed: 15.9% <b>2006: AL: 27%; SP: 38.8%;</b> QN: 4.7%; CQ: 0%; no antimalarial prescribed: 29.5%  <b>Children &gt;10kg</b> <b>2004: AL: 10.7%; SP: 67.5%;</b> QN: 4.8%; CQ: 0%; no antimalarial prescribed: 17% <b>2006: AL: 42.2%; SP: 27.6%;</b> QN: 7.0%; CQ 0%; no antimalarial prescribed: 23.2%
Sabot, O.J., et al. 2009: Distribution of artemisinin-based combination therapies through private sector channels: Lessons from four country case studies. <i>Resources for the Future</i> , January 2009.  <a href="http://www.rff.org/RFF/Documents/RFF-DP-08-43_FINAL.pdf">http://www.rff.org/RFF/Documents/RFF-DP-08-43_FINAL.pdf</a>	Kenya	Adopted ACT as first-line therapy in 2004, but new policy only became operational during the third quarter of 2006.	Proportion of patients receiving ACT:  <b>Dec 2006: AL: 15%</b> <b>Mar 2008: AL: 42%</b>
Gitonga, C.W., et al. 2008: The use of artemether-lumefantrine by febrile children following national implementation of a revised drug policy in Kenya. <i>Trop Med Int Health</i> 13:4, 487–494.	Kenya	See above	Use of ACT among rural febrile children:  <b>Aug 2006</b> (“pre-policy implementation” baseline period): <b>First-line ACT</b> accounted for <b>0.8%</b> of treatments (1 out of 118 fevers); <b>SP</b> accounted for <b>8.5%</b> (10 out of 118 fevers).  <b>Jan–June 2007</b> (“post-policy implementation” period): <b>First-line ACT</b> accounted for <b>8.7%</b> (23 out of 264 fevers) after the policy. <b>SP</b> accounted for <b>4.2%</b> (11 out of 264 fevers).
Simba, D.O., et al. 2010: Who gets prompt access to artemisinin-based combination therapy? A prospective community-based study in children from rural Kilosa, Tanzania. <i>PLoS ONE</i> 5(8): e12104.	Tanzania	Adopted ACT as first-line therapy in October 2006	Use of ACT among 607 febrile children under 5  <b>2008 study:</b> 37.6% received ACT
Mokuolu, O.A., et al. 2007: Effect of artemisinin-based treatment policy on consumption pattern of antimalarials. <i>Am J Trop Med Hyg</i> 76:7–11.	Nigeria	Adopted ACT as first-line therapy in Jan 2005	Antimalarial prescriptions at a single urban teaching hospital (University of Ilorin):  <b>2004: Artemisinin-containing medications: 18.5%;</b> CQ: 72.9%; SP: 7.1%  <b>2005: Artemisinin-containing medications: 50%;</b> CQ: 27.3%; SP: 22.7% (Rise in SP may have been related to the 2005 adoption of SP for intermittent preventive therapy against malaria in pregnancy.)
Oreagba, I.A., et al. 2008: The use of artemisinin-based combination therapies (ACTs) in public secondary health facilities in Lagos, Nigeria. <i>Niger Postgrad Med J</i> 15:2, 94–100.	Nigeria	See above	Antimalarial prescriptions at all 10 general hospitals in Lagos over a 1-year period (Mar 2005–Mar 2006):  <b>ACT: 5.9%;</b> artemisinin monotherapy: 18.2%; CQ: 48.8% (no baseline data available)
Munier, A., et al. 2009: Antimalarial prescriptions in three health care facilities after the emergence of chloroquine resistance in Niakhar, Senegal (1992–2004). <i>Malaria Journal</i> 8:83.	Senegal	Switched from CQ to AQ/SP in June 2003	Study examined changes in antimalarial prescriptions in three health care facilities in the Niakhar region between 1992 and 2004, and found an association between the 2003 policy and a fall in CQ prescriptions.

## Implications of the Data from National ACT Scale-Up Initiatives for the AMFm Phase 1

**The evidence from national ACT scale up programs suggests that only small increases in ACT availability, market share, and use can be expected after just one year and two years in the AMFm pilot countries.**

At 3–9 years after countries changed their national policies to ACT, **availability of first-line ACTs** remains low in the seven countries tracked by ACTwatch, ranging from 6.6% in Benin to 28% in Uganda. In six out of seven countries, availability of first-line ACT across all outlets is below 20%, and providers are much more likely to stock non-artemisinin based therapies than ACTs. ACTs are more likely to be available in public facilities than in private outlets. In public facilities, mean availability is 61.7% (range 20%–85.6%), but in private drug stores mean ACT availability is only 13.8% (range 4.3%–25%). Private drug stores are a major provider of antimalarials in most countries, and low ACT availability in these stores means that average availability at the national level is low. Thus if the AMFm is to succeed in increasing national availability of ACTs, there will need to be a substantial rise in availability in the private sector.

ACTwatch data also show that national **ACT market share** is very low. Of the seven countries tracked by ACTwatch, only two had market share levels higher than 10% (24.5% in Cambodia, and 15.5% in Zambia).

**ACT use** remains limited in most countries. In two ACTwatch countries (Benin and Madagascar), the proportion of febrile children under 5 years that receive a first-line ACT within 48 hours is below 5%. The proportion is below 20% in Uganda and Zambia. Other national surveys (done in 2005–2009) reinforce this finding, showing that in most countries less than 10% of children with fever received an ACT within 48 hours. Higher levels of ACT usage have been found in some (but not all) studies of the impact of changing national drug policy (e.g. Zurovac and colleagues found that in Zambia, 4 years after national policy change to ACT, first-line ACT usage was 27–42.2%, depending on childhood weight group; see Table 13).

One peer reviewer noted that the uptake of ACT in the 41 countries included in Appendix D (i.e. the UNICEF data) is “remarkably poor.” This reviewer suggested that “a major investment in social marketing, in addition to the price subsidy, will be crucial to success” in the AMFm Phase 1.

Finally, as with many other health commodities and services, the evidence suggests that wealthier population quintiles have better access to malaria treatment than poorer groups.

## 4. Commodity Social Marketing Programs

In many developing countries, social marketing (SM) programs have been used to improve the availability, affordability, market share, and use of health commodities. These programs could offer lessons for what could be considered success in the AMFm Phase 1.

### 4.1 Classifying SM Programs

Two commonly used classifications are defined by the following questions:

- **What is being marketed?** The first classification is based on whether the SM program aims to (i) promote behavior change (behavior change SM, e.g., promoting partner reduction to reduce HIV transmission risk), or (ii) promote sales of a health commodity (commodity SM, e.g., promoting condom sales).
- **In commodity SM programs, is there a subsidy?** Commodity SM programs are often classified as using either the non-governmental organization (NGO) model or the manufacturer's model.<sup>29</sup> The NGO model is used primarily in low income countries, and usually involves heavily subsidizing the product and intervening in the supply chain (e.g., establishing a new, parallel supply-chain system). In contrast, the manufacturer's model is largely used in middle income countries with a well developed commercial infrastructure, and this model uses existing supply chains. Meekers and Rahaim argue that the manufacturer's model "typically use[s] experts to provide temporary technical assistance to existing private sector companies, which eventually are expected to continue the program without subsidies."<sup>29</sup>

In our summary of the literature on commodity SM programs, **we begin by examining the NGO model.** While a small number of studies of the NGO model report on outcomes at 1 year and 2 years, many report outcomes once the program is considered mature (e.g., at 3 to 6 years).

We summarize relevant studies of five socially marketed products that were marketed using the NGO model: condoms, water purification products, oral contraceptives (OC), zinc, and vitamin A. If the researchers examined equity, we have noted this in our review. These studies used "before and after" designs, often with no control group, which means that causality cannot be inferred. There have been very few randomized controlled trials (RCTs) of commodity SM programs. A recent literature review, as yet unpublished, by Dominic Montagu and Adam Visconti, identified only two RCTs of such programs, one on bed nets and the other on sexual health promotion (Dominic Montagu, personal communication).

After discussing the NGO model, **we then summarize data from four studies of the manufacturer's model,** all involving condoms or oral contraceptives.

Social marketing experts that we interviewed cautioned against expecting rapid market penetration within 2 years.

They also pointed out that there are likely to be important differences between the AMFm Phase 1 and other types of commodity SM programs. For example, one key informant stated that "there are lots of reasons why condoms aren't a good model for the AMFm—for example, with condoms, in some countries there wasn't much competition and [we] got very high market coverage." There are also limitations in comparing a preventive intervention (e.g., condoms, water purification tablets) with a curative one (e.g., antimalarials). For example, demand for a curative treatment might be higher because it is being used to provide immediate relief for an acute illness and the benefits are immediately apparent (unlike those of a preventive intervention). It is also unclear whether brand loyalty to older antimalarial drugs (e.g., CQ, SP), which the AMFm will need to tackle if it is to succeed in "crowding out" these drugs, is equivalent to brand loyalty to condoms or oral contraceptives.

Key informants also stressed that success depends very much on how much pent-up consumer demand there is for a product (e.g. if there is high pent-up demand for a cheap OC, then sales volume of a new, socially marketed, low-cost OC is likely to reach a high level in a short time period). And, as mentioned, success also depends on whether consumers have a sense of loyalty or preference for a particular product (e.g., in some settings, brand loyalty towards CQ or SP might be a very strong challenge to the AMFm).

### Studies on Availability (NGO Model) Socially marketed condoms

4.2

"Little documentation exists on the measurement of condom availability and its trends over time," said Piot and colleagues in a 2010 PSI study.<sup>30</sup> Nevertheless, a small number of studies do report on such trends, summarized below:

- Four years after Tanzania's socially marketed condom program was launched, 25% of outlets were selling the socially marketed brand.<sup>31</sup> At 5 years, the percentage increased to 32% but it stabilized at 6 years. The study did not examine the socioeconomic status of consumers but it did find an increase in availability in nontraditional outlets (e.g., kiosks). The researchers concluded that "increasing condom availability in nontraditional outlets tends to benefit poor people because they are more likely to shop at such outlets."
- Six years after the introduction of socially marketed, donor-subsidized condoms into Zambia's commercial sector, 39% of outlets in urban areas stocked the socially marketed brand *Maximum*.<sup>32</sup> In contrast, only 2% of outlets carried commercial brands and only 3% carried the unbranded condom donated to the Government of Zambia by international donors. Poorer men had better access to condoms (defined by estimated walking time to a condom source), probably because of their proximity to groceries and kiosks supplying socially marketed condoms.
- Four years after the launch of India's highly targeted SM condom program, aimed at increasing condom availability

## Studies on Market Share (NGO Model)

### Socially marketed contraceptives

We found two relevant national studies:

- Within 3 years of the launch of an SM condom program in Indonesia, the socially marketed brand Fiesta had gained 10% of market share.<sup>36</sup>
- Three years after the launch of an SM oral contraceptive program in Honduras, the socially marketed contraceptive had gained a 15% share of the overall oral contraceptive market.<sup>37</sup>

### Implications of these studies on market share for the AMFm Phase 1

The small subnational pilots of subsidized ACT achieved very impressive figures for market share within 2 years. However, these two national studies on socially marketed condoms and OCs found that market share at 3 years was only 10% to 15%. As with the studies on availability discussed above, these studies on market share suggest we should be cautious in setting expectations too high for national ACT market share in the AMFm phase 1.

## Studies on Use (NGO Model)

### Socially marketed condoms

A 2003 UK Department for International Development (DFID) review of the evidence base for social marketing concluded that “the effectiveness of social marketing for increasing the use of products and services is well established in the areas of HIV/AIDS, maternal and child health, and family planning and reproductive health.”<sup>38</sup> The review summarized data from 16 studies, and found evidence to suggest that SM programs can increase the use of a variety of health commodities, including condoms, oral contraceptives, bed nets, and oral rehydration therapy (ORT). Table 14 on the next page summarizes the usage data in 6 studies on condoms in low-income countries included in the DFID review (some of these studies also examined use of other types of contraception).

### Socially marketed zinc

Two years after the launch of a national SM zinc program, the proportion of children with diarrhea who received zinc was 19% in urban slum areas, 25% in urban non-slum areas, 17% in municipal areas, and 12% in rural areas.<sup>39</sup> The Scaling Up of Zinc for Young Children (SUZY) Project was an SM program promoting a subsidized dispersible zinc tablet, *Baby Zinc*, priced at about \$0.25 for a 10-tablet blister pack. Formative studies found that over 90% of parents sought help for their child’s diarrhea from private sector providers (in over 70% of cases, the provider was an unregulated drug vendor or village doctor). Usage data at 1 and 2 years are shown in Table 15 on the next page.

in sex-worker hot spots, coverage had reached 79.1% (coverage was defined as the proportion of hot spots where condoms were available according to the researchers’ pre-defined minimum standards).<sup>30</sup>

### Socially marketed water purification products

Below we briefly summarize availability data in three SM programs distributing water purification products:

- In Tanzania’s program, led by PSI, 13% of rural outlets surveyed stocked *WaterGuard* tablets within 1 year of their launch, while 6% of outlets stocked *WaterGuard* liquid 4 years after launch.<sup>33</sup>
- In Benin’s program, led by PSI, about 1 year after the introduction of *Aquatab*, national coverage (the proportion of locations in which a product was available) was only 7.5%, but by the end of 2 years coverage reached 35.5%.<sup>34</sup>
- In Uganda’s program, led by PSI (which transformed into an organization called PACE [Programme for Accessible Health, Communication and Education] in April 2009), 20% of rural outlets and 20.6% of urban outlets stocked *PUR* powder at 4.5 years after launch; 25.7% of rural and 27% of urban outlets stocked *WaterGuard* solution at just under 4 years after launch; and 26.0% of rural outlets and 32.8% of urban outlets stocked *WaterGuard* tablets at 2.5 years after launch.<sup>35</sup>

### Implications of studies on availability (NGO model) for the AMFm Phase 1

Availability of socially marketed water purification products was very low at 1 year in the Tanzania, Benin, and Uganda programs. Even after 6 years of heavily subsidized SM condom programs, availability of socially marketed condoms was only 32% in Tanzania and 39% in Zambia. These data suggest that we should be cautious in our expectations for ACT availability in the AMFm phase 1, particularly at year 1.

Both the Tanzania and Zambia studies suggest that nontraditional outlets may play an important role in improving equity, and the Zambia study suggests that poor men had greater access to condoms because of their proximity to such outlets. Based on the ACT subsidy pilots and programs, increasing the availability of ACT in remote rural areas will clearly be a challenge; the Tanzania and Zambia condom SM studies suggest that using nontraditional outlets may be one way to address this challenge. Finally, PSI’s India initiative suggests that a highly targeted program (which targets hot spots) can achieve high coverage rates.

**Table 14.** Usage data in studies of condom SM programs in low-income settings<sup>38</sup>

Reference	Data on use
Agha, S. 2002. A quasi-experimental study to assess the impact of four adolescent sexual health interventions in Sub-Saharan Africa. <i>International Family Planning Perspectives</i> 28:67–70, 113–8.	In Cameroon, “ever use” of condoms, use of condoms for pregnancy prevention, and use of abstinence for pregnancy prevention increased significantly. In Botswana, use of contraception increased. In Guinea, condom use at last sex and “ever use” of the pill increased significantly.
Agha, S. 2002. Declines in casual sex in Lusaka, Zambia: 1996–1999. <i>AIDS</i> 16(2): 291–3.	In 1992, PSI, in collaboration with the Pharmaceutical Society of Zambia, began condom social marketing activities.  Women reported 17% condom use in 1996 and 21% in 1999, but the increase was not statistically significant. Men reported 24% condom use in 1996 and 28% in 1999, but the increase, again, was not statistically significant.
Meekers, D. 2001. The role of social marketing in sexually transmitted diseases/HIV protection in 4600 sexual contacts in urban Zimbabwe. <i>AIDS</i> 15(2): 285–7.	Three years after the launch of an SM condom ( <i>Protector Plus</i> ), 34.6% of all sexual contacts were protected by <i>Protector Plus</i> . In the study, sexually active male factory and blue-collar workers in Harare and Bulawayo were prospectively surveyed over 6 weeks. Overall, 48.8% of all sexual contacts were protected: 34.6% by <i>Protector Plus</i> , 4.6% by commercial brands, and 9.6% by free condoms.
Meekers, D. 2000. The effectiveness of targeted social marketing to promote adolescent reproductive health: The case of Soweto, South Africa. <i>Journal of HIV/AIDS Prevention &amp; Education for Adolescents and Children</i> 3:4, 73–92.	Significant increase at 1 year in men ever using a condom from 57.4% to 73.4%; use at last sex increased from 38.0% to 54%. “Two-year intervention also saw large increases in condom use in control area rendering intervention increases insignificant.” <sup>37</sup>
Van Rossem, R., and Meekers, D. 2000. An evaluation of the effectiveness of targeted social marketing to promote adolescent and young adult reproductive health in Cameroon. <i>AIDS Education and Prevention</i> 12:5, 383–404.	After 2 years, increase of 19% in women reporting ever using a condom (57% to 76%).
Schopper D. et al. 1995. Village-based AIDS prevention in a rural district in Uganda. <i>Health Policy and Planning</i> 10:2, 171–80.	After 18 months, significant increase in ever using a condom in casual partnerships from 23% to 46% overall (6.5% to 33% in women and 27% to 48% in men).

**Table 15.** Data on zinc usage in the SUZY Project

% children receiving zinc	Baseline	11–14 months	19–23 months
City slum	4%	16%	19%
City non-slum	15%	26%	25%
Municipal	7%	18%	17%
Rural	4%	11%	12%

The Center for Strategic Health Operations Research at CHAI is currently developing a model that forecasts future zinc uptake in the 15 countries that accounted for 75% of all deaths from diarrhea among children under age 5 in 2007. The model is unpublished, but CHAI has kindly shared it with us (Appendix E); the model reinforces the likelihood that uptake will be slow.

### **Socially marketed vitamin A**

One year after the launch of a pilot SM project of red palm oil as a vitamin A supplement in north-central Burkina Faso, one-third of respondents in a survey had consumed RPO in the previous week.<sup>40</sup>

### **Socially marketed water purification products**

SM experts who we interviewed informed us that SM campaigns never get more than 13% consistent usage at 3 years (the figure is often closer to 7%). A major reason for low usage is that demand for the commodity is low (Françoise Armand, personal communication).

### **Implications of these studies on use for AMFm Phase 1**

The studies that we reviewed suggest that 1 to 2 years is a very short time period to see high levels of usage of a socially marketed commodity. Higher levels of usage can be achieved in more mature SM programs. Of the studies on commodity usage summarized above, we believe that the zinc program (the SUZY Project) has very strong parallels with the AMFm Phase 1. The SUZY Project was a national subsidized commodity SM program, with a major national marketing and advertising campaign (the data at 1 and 2 years have been reported in a peer-reviewed journal).<sup>39</sup> As with ACTs in AMFm Phase 1, zinc is being promoted in the SUZY Project for the treatment of a life-threatening childhood illness. In one of our key informant interviews, the interviewee noted that SM programs aimed at scaling up zinc (or oral rehydration therapy) have another parallel with the AMFm Phase 1: one of their aims is to “crowd out” other commercial products for diarrhea, such as antidiarrheal drugs or ineffective antibiotics. Indeed, recent work on scaling up zinc in Pakistan suggests that many people prefer to buy antidiarrheal drugs and antibiotics rather than zinc, and major work will be needed to change consumer demand for zinc (Françoise Armand, personal communication). Finally, as with parents seeking antimalarials in the private sector for their febrile children, most parents also seek help for childhood diarrhea in the private sector. For all of these reasons, we believe that the SUZY Project usage data can help inform estimates of success in AMFm Phase 1. In the SUZY Project, there was a 7 to 12 percentage point increase from baseline at 1 year, and an 8 to 15 percentage point increase from baseline at 2 years.

## **4.5**

### **Studies on Price (NGO Model)**

We were unable to find peer-reviewed studies examining the effect of SM commodity programs using the NGO model in low-income settings in achieving a specific target price. We did, however, find studies suggesting that price increases are

a major barrier to condom uptake. For example, **in the 12 months following an increase in price (by an average of 60%) of five brands of contraceptives in an SM program in Bangladesh, condom sales fell by 46% from the average during the preceding 12 months.**<sup>41</sup>

### **Implications of these studies on price for the AMFm Phase 1**

These studies highlight the relationship between price and sales in commodity SM programs. As discussed, in the AMFm Phase 1, the four indicators of success are likely to be highly correlated (e.g., an increase in price of ACT is likely to be associated with lower usage rates).

### **Manufacturer’s Model of Commodity SM**

The NGO model of commodity SM is used in low-income countries, and tends to focus on population groups that cannot afford to pay commercially viable prices. In the NGO model, a donor subsidy is used to keep prices low—thus the model assumes long-term “donor dependency.”<sup>42</sup> An alternative model is the manufacturer’s model, which aims to be self-sustaining without donor support.

In the manufacturer’s model, the SM organization partners with a manufacturer or distributor who is willing to market the commodity at a price that (1) is lower than the competitor products on the market, and (2) is high enough for the commercial partner to still make a profit. The commercial partner uses its existing distribution mechanism to distribute the commodity; it agrees to a low price in exchange for the SM organization embarking on a marketing campaign for a limited period of time. The SM organization then withdraws its support (the withdrawal of support is called “graduation”), after which it is hoped that the commodity remains available and commercially viable. The role of donors in the manufacturer’s model is to support education, media messaging, and marketing—donors do not subsidize the commodity itself (they work with the government to invest in health education to support sales of the commodity).

The manufacturer’s model began to be used in the 1990s and is generally used in middle-income countries. The first project to use the manufacturer’s model was the Social Marketing for Change (SOMARC) Project, funded by USAID, which developed partnerships with contraceptive manufacturers in several countries (e.g., Turkey).<sup>42</sup> The model has been tried in Africa, without success (Françoise Armand, personal communication). For example, PSP (the Private Sector Program, funded by USAID) has attempted to use the model to market a non-subsidized OC in Nigeria, in the hope of breaking the country’s dependency on donor-subsidized OCs. An Indian generic company manufactured the OC at low cost (\$1.20), and a Nigerian organization did the social marketing for the low-cost OC. But the product is not selling well because there is a heavily subsidized OC that costs just \$0.30 (Françoise Armand, personal communication).

## **4.6**

## 4.7 Evaluating the Impact of the Manufacturer’s Model

It is extremely difficult to assess the impact of the manufacturer’s model on the availability, market share, price, and use of the socially marketed commodity. Agha and colleagues argue that “there is a near absence of studies on the impact of projects implemented under the manufacturer’s model.”<sup>43</sup>

In our review of the formal and gray literature, we found only four country-specific case studies of the manufacturer’s model, all of which examined contraceptives (condoms or OCs).<sup>43</sup> Unfortunately, these studies rarely report on changes in sales volume, market share, and price of the specific socially marketed brand of condom or OC. Instead, they report changes in the commercial sector’s share of the total market for a product (the “total market” comprises commercial, public, and NGO sectors—the primary outcome in these studies was a change in the commercial sector’s share). For example, they report whether the commercial sector’s share of all condom sales changes during and after the SM campaign (the commercial sector’s share will include sales of the socially marketed condom). In the manufacturer’s model, a marker of success is a rise in the commercial sector’s share of the overall condom or OC market (a rise suggests that the model “contributed towards increasing the sustainability of product supply by encouraging the use of commercial sector contraceptive sources”).<sup>43</sup>

Below we briefly summarize data from four country-specific case studies of the manufacturer’s model.<sup>43,44</sup> Data are available examining (1) the commercial sector’s market share, and (2) sales volume, market share, and price for the socially marketed brand. Table 16 summarizes the four country-specific case studies. In all cases, the manufacturer agreed to lower the price of the commodity in exchange for the SM organization marketing the commodity).

### Data on the commercial sector’s market share

In Turkey, the commercial sector’s OC market share (as a proportion of the total OC market) was increasing prior to the launch of the SM program; the increase was concentrated among upper-income women. The introduction of the SM program was associated with a rise in the commercial market share among lower- and middle-income women, which continued after graduation. In the Dominican Republic, there are no available data on trends in market share prior to the SM campaign. There was a large increase in the commercial share of OCs from 1986 to 1991, from 30% to 75%, mostly due to public sector OC users switching to the commercial sector. After graduation, from 1991 to 1996, the commercial share fell from 75% to 64%, but then increased again after 1997 to 76% (these fluctuations may have been related to the United Nation Population Fund’s changes in provision of OCs to the public sector). During SM activities, the commercial sector’s share of OCs increased among lower- and middle-income women. In Peru, the commercial sector’s condom market share was increasing prior to the launch of the SM program, and the increase was concentrated among upper-income women. The trend continued from 1994 to 1996, but the commercial sector share of condoms declined after graduation in all different wealth quintiles (the decline may have been related to the government mandating the provision of free family planning). In Turkey’s condom SM program, data are only available for 1993 and 1998. The commercial sector share did not change during this period (it remained at about 66%).

### Data on the socially marketed brand: sales volume, market share, and price

*Sales volume and market share:* Data are only available for **Morocco** and the **Dominican Republic**. For Morocco, there are no baseline data available for 1992, the date when SM activities began. If 1994 is taken as the starting point (which is when major promo-

**Table 16.** Summary of the four case studies of the manufacturer’s model

Country	Socially marketed commodity	Launch date	Date of graduation
Morocco	OC	SOMARC Project began activities in 1992, but major promotional activities began in 1994	1996 (marketing activities ended)
Dominican Republic	OC	1986	1990
Peru	Condom	1994	1996
Turkey	Condom	1991	1993

tional activities began), there was **a rise in market share of the SM brand of just 3 percentage points over baseline at 2 years and 12 percentage points over baseline at 10 years** (Table 17).

For the Dominican Republic, the only available data are from after graduation (there are no baseline data from prior to the SM campaign and no data from the years of the SM campaign). The post-graduation data are shown in Table 18.

*Price:* In **Morocco**, between 1994 and 2004, the average retail price of the SM brand of OC remained at just over \$0.50 per unit. The average price of other commercial brands was about \$1.25 until 2002, and increased to \$1.50 in 2004. Hence the SM brand was less than 50% of the price of other commercial brands, and the manufacturer did not raise prices after graduation. In Turkey, the price of the SM condom increased many times from 1991 to 1993, but it remained midway between the least and most expensive condom brands by graduation.

### Implications for the AMFm Phase 1

There are very few data on the manufacturer’s model that can help guide expectations for AMFm Phase 1. The only study that included data on the impact of the model on the market share

and price of a socially marketed brand was the OC study in Morocco. In this study, there was a rise in market share of just 3 percentage points over baseline at 2 years and 12 percentage points over baseline at 10 years (if baseline is defined as the year in which the major SM activities began). This study reaffirms that changes in the market share of a socially marketed commodity are slow; thus it is unrealistic to expect to see a large change in market share in just 1 or 2 years (the time frame of the AMFm Phase 1).

In the Morocco study, the price of the socially marketed commodity (an OC) remained at 40% to 50% of the price of other commercial brands even after graduation. This suggests that in **the manufacturer’s model, companies do not increase the commodity price after the SM campaign ends.** The studies done in the Dominican Republic, Peru, and Turkey suggest that the manufacturer’s model can contribute to a higher commercial-sector share of contraceptives among lower- and middle-income women. Finally, we did not find any examples of the successful use of the manufacturer’s model in Africa.

**Table 17.** Changes in sales volume and market share in Morocco’s OC social marketing program using the manufacturer’s model

Year	Sales volume of SM brand	Market share of SM brand
1992 (SM activities began)	Not available	Not available
1994 (major marketing activities began)	1.3 million cycles	25%
1996 (last year of marketing)	1.7 million cycles	28%
2004	3.2 million cycles	37%

**Table 18.** Changes in sales volume and market share in the Dominican Republic’s OC social marketing program using the manufacturer’s model

Year	Sales volume of SM brand	Market share of SM brand
1994 (4 years after graduation)	0.51 million cycles	73%
2002 (12 years after graduation)	0.64 million cycles	Not available
2004 (14 years after graduation)	0.22 million cycles	49%

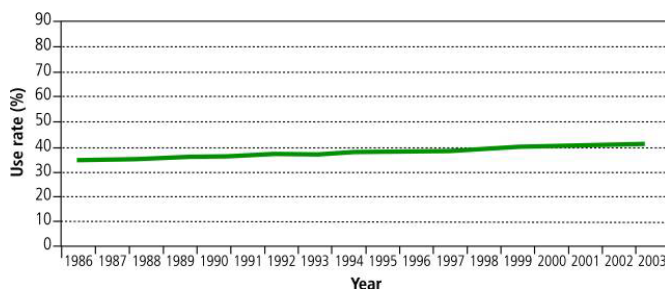
## 5. National Oral Rehydration Scale-up Programs

Many of the commodity SM programs reviewed above were local in scope. Given that the AMFm Phase 1 is aimed at the national scale-up of ACT, we believe there may be important lessons from examples of other national scale-up programs. Thus we briefly summarize results of national programs to scale up oral rehydration therapy (ORT).

### 5.1 National Scale-Up of ORT

In 1980, the WHO initiated a special program for control of diarrheal diseases (CDD) in children, promoting ORT as the primary intervention to reduce illness and deaths from diarrhea.<sup>45</sup> Most national programs for control of diarrheal diseases were established between 1980 and 1990, and by 1988 over 100 countries had national ORT scale-up programs in place.<sup>46</sup> A recent analysis based on data from 107 DHS surveys in 40 low- and middle-income countries found that **mean use of ORT to treat childhood diarrhea cases in these countries increased from about 35% in 1986 to about 41% in 2003** (Figure 5).<sup>47</sup> Thus global progress over 17 years was very modest, with an annual increase of just 0.39% ( $p=0.089$ ). There have been national differences in the success of scale-up, but there is little high-quality evidence to allow us to explain these differences. Differences in usage rates between countries may, for example, be explained by different national CDD strategies.

**Figure 5.** Global ORT usage rates from 1986 to 2003



The figure, used by permission of the WHO, is based on national scale-up in 40 low- and middle-income countries.

### Implications of the results of national ORT scale-up for the AMFm Phase 1

Despite concerted national and global attention to ORT scale-up since 1980, usage reached only 41% by 2003, and there is worrisome evidence that this proportion has fallen to about 33% in recent times (Zulfiqar Bhutta, personal communication). Our interviews with key informants who have worked on ORT scale up have highlighted the following issues:

- It is crucial to maintain marketing beyond the initial phase. If ORT marketing efforts tail off, vendors often end up selling alternative products for diarrhea (e.g., antidiarrheals, antibiotics).
- For any new commodity introduced to the market, it is important to understand the competing products and customers' preferences for, and loyalty to, these products (this is true for both ORT and ACT). Subsidizing the costs of the new commodity alone is unlikely to be enough for it to gain market share.
- Evidence of the benefit of ORT was often not enough to persuade health providers to recommend ORT for diarrhea treatment. (As one key informant said, "We need to pay more attention to the community through which we work, i.e., the providers—with ORT, they were harder to influence than we thought.")
- Unlike ACT, in general there have not been major financial constraints preventing ORT use. Yet even without financial barriers, coverage only reached 41% by 2003 (from 35% in 1986). Key informants suggested that the experience with ORT should caution us not to expect rapid, sustained ACT uptake in the AMFm Phase 1.

## 6. Drug Company Expectations For the Uptake of a New Drug Into Emerging Markets and Developing Countries

We interviewed drug company executives at multinational drug companies (GSK, Novartis), a generic drug company (Cipla), and at a Ugandan drug company based in Kampala (Surgipharm Ltd). We also interviewed a supply-chain expert with experience in forecasting the demand and uptake of new drugs and pharmaceutical products (MIT-Zaragoza). These key informants shared with us their **expectations for the uptake of a new drug** after its introduction into an emerging market or developing country. We have used this information to understand what is realistic and feasible in terms of market penetration for a new health commodity in a developing country setting.

- One expert suggested that for the introduction of new pharmaceutical products into emerging market countries, such as China, India, and Brazil, market share levels of 10% and 20% are envisaged after year 1 and year 2, respectively. This estimate refers to a situation where a high-quality health product enters into a market where another high-quality product is already available. This situation differs from the AMFm scenario, in which a superior product is introduced into the market for a price that is intended to be comparable to other, less effective products.
- A second expert, talking about the same group of countries, argued that a market share of 45% could be reached after 1 year in urban areas, while the market share in rural areas would be considerably lower, at around 15%. At the national level, this second expert suggested that a result of 20% to 30% could be expected after 1 year, depending on the level of urbanization.

- A third expert suggested that in the fastest moving AMFm pilot countries, market share levels of 35% could be achieved after 12 months.
- A representative from a generic pharmaceutical company (Cipla) reported that the expected market share for a branded generic product introduced into a developing country market would be 4% to 5% after 1 year, and 10% after 2 years. Cipla is also one of the manufacturers that supplies ACTs under the AMFm. For the AMFm, this representative believed that market share levels of 10% at 1 year and 25% after 2 years are to be expected. Thus his expectations are higher for AMFm-subsidized ACTs compared to the introduction of other drugs. His greater expectations for the AMFm were based on the fact that the antimalarial market is characterized by a smaller number of competitors due to WHO's prequalification process for ACTs.

All experts agreed that the level of both market share and availability will vary greatly between urban and rural settings after 1 and 2 years.

Finally, the interviewed experts stressed that high levels of availability and market share in the AMFm would only be possible within 2 years in small countries with effective government regulations and good distribution systems, such as Rwanda.

## 7. Recommendations For AMFm Success Benchmarks

### 7.1 How We Derived Our Recommendations

The Terms of Reference for this work were to estimate “what might be realistically expected in the first and second years of AMFm implementation.” There have been no large scale randomized controlled trials, at a national level, of the AMFm model. In the absence of such definitive evidence, our estimates had to be based upon five other types of evidence: (1) very small-scale, subnational trials of subsidized ACT; (2) uncontrolled before-and-after national programs of subsidized ACT; (3) national data on the outcomes of other types of ACT scale-up approaches (e.g., scale-up via the public sector with Global Fund support); (4) outcomes from public health programs that are analogous to the AMFm, i.e., that used social marketing to increase sales of a subsidized health commodity; and (5) the views of key informants with relevant expertise.

To derive our estimates of realistic outcomes for availability, market share, price, and use (defined on page 5) at years 1 and 2, shown in Table 19, we used a pragmatic “mixed methods” approach (i.e., drawing upon data from empirical studies plus key informant opinions):

- First, the **range of results** for the studies that we reviewed—for availability, market share, price, and use—was used as a starting point for the range of results that we believe are possible in the AMFm at years 1 and 2. We also considered the range initially suggested by key informants in the first set of interviews that we conducted.
- Next, we considered **which of these data are most relevant to the AMFm**. We felt that the two closest models for what the AMFm is likely to achieve are: (i) national ACT subsidy programs run by governments in Cameroon and Senegal using existing distribution channels; and (ii) national programs to socially market a subsidized health commodity (e.g., the SUZY Project). The scale of operations in these programs is analogous to that of the AMFm. Similarly, we felt that the success to date of the national ACT scale-up programs supported by the Global Fund should be used as a benchmark for what can be achieved in a short time scale (1 to 2 years).
- Based on the above approach, we **estimated an initial set of success benchmarks**.
- We then discussed these benchmarks with key informants and asked for their opinion on whether they believed they were realistic. These informants included several representatives of drug companies, including generic drug companies, who have expertise in how markets respond to new products and to price reductions in the developing world.
- We **presented our suggested benchmarks to the AHC at its June 2010 meeting**, and these were discussed and debated over the course of 2 days. Feedback from the AHC was incorporated into a revised set of thresholds.

- After our paper was peer-reviewed, **we made additional adjustments to the benchmarks of success**. We presented these revised benchmarks at the October 2010 AHC meeting. We incorporated feedback from the AHC, including from a subcommittee devoted to AMFm benchmarks. **The final benchmarks are summarized in Table 19.** (The same table appears in the Executive Summary, as Table 1.)

We acknowledge that our approach involved drawing upon expert opinion, and it also involved using our personal judgment in weighting those studies we believed to be most relevant to the AMFm. But the Terms of Reference asked us to take expert opinion into account, and to examine the literature for studies that might help to inform expectations for success. We believe that our approach led to a set of pragmatic benchmarks that are in line with what has been seen in other national scale-up programs at just 1 and 2 years into the program. The literature on national commodity scale-up (e.g., for zinc, for ORT, or for ACT in Global Fund-supported programs) suggests that 1 to 2 years is a very short time frame to achieve large changes in use, availability, price, and market share.

The proposed success benchmarks are country-specific (i.e., they do not represent an aggregate score for the overall success of the AMFm). In all cases: (1) “ACT” refers to QAActs, and (2) the estimates are for expected changes across all facilities (the Independent Evaluation of the AMFm will assess all facilities, both public and private; it is not powered to distinguish changes in one sector alone).

We did not find strong evidence in our literature review, nor in our key informant interviews, to suggest that outcomes could increase in a linear fashion (e.g., see Appendix E). We think that outcomes will initially rise slowly, then more rapidly, and then tail off with time i.e., the uptake curve is likely to be sigmoidal. Thus we believe that expectations for the first year of the AMFm Phase 1 should be modest. A sigmoidal curve also means that if a country is starting from a higher level of initial coverage, it will be more difficult for that country to increase coverage. Thus baseline outcomes in each pilot country should be considered as one of the important contextual factors when judging the success of the AMFm Phase 1 in a pilot country (see below).

Some key informants noted that the rollout of rapid diagnostic tests for malaria in some countries and not others could make it difficult to compare AMFm success across different countries. We acknowledge this concern, and our recommendations should be taken as an initial and broad approach to judging success.

**Table 19.** Guidelines for success benchmarks at 1 and 2 years after the effective start date of the AMFm Phase 1 at the country level

These benchmarks are intended as a tool for tailoring expectations of what can be achieved in the time frame; none of them are minimum thresholds or cutoff points for “pass” or “fail.” All of them will have to be interpreted in light of relevant contextual factors

	Year 1	Year 2
<b>Availability</b> (The proportion of all facilities, private and public [including informal outlets], stocking QAACTs, among outlets with any antimalarials in stock at the time of the survey)	Increase of <b>20 percentage points</b> from baseline	Increase of <b>40 percentage points</b> from baseline
<b>Market share</b> (Total volume of QAACTs sold or distributed as a proportion of the total volume of all antimalarials sold or distributed in the last week [7 days] via outlets that will be included in the Independent Evaluation’s outlet surveys)	Increase in ACT market share of <b>10 to 15 percentage points</b> from baseline <i>and</i> Decrease in market share of artemisinin monotherapy (AMT) from baseline	Increase in ACT market share of <b>15 to 20 percentage points</b> from baseline <i>and</i> Decrease in market share of AMT from baseline
<b>Use*</b> (Proportion of children under age 5 with fever who received a QAACT on the day that the fever started or on the following day)	Increase of <b>5 to 10 percentage points</b> from baseline	Increase of <b>10 to 15 percentage points</b> from baseline
<b>Price</b> (Adult equivalent treatment dose)	<b>QAACT price &lt;300%</b> of the price of the dominant non-QAACT (in most countries this is CQ or SP)** <i>and</i> Price of AMFm co-paid QAACT < price of AMT (this is useful but not sufficient to determine success)	<b>QAACT price &lt;150%</b> price of the price of the dominant non-QAACT (in most countries this is CQ or SP) <i>and</i> Price of AMFm co-paid QAACT < price of AMT (this is useful but not sufficient to determine success)

\*The denominator for ACT use is “fever episodes in children under age 5” (not “parasitologically confirmed malaria cases”). The Independent Evaluation relies on national surveys (e.g., Demographic and Health Surveys; Multiple Indicator Cluster Surveys; Malaria Indicator Surveys; ACTwatch surveys), which use the denominator “fever episodes in children under age 5” due to a lack of proper malaria diagnosis in many countries.

\*\* Price change was the indicator with the weakest empirical basis for setting a 1-year expectation. This figure is presented to facilitate Ad Hoc Committee discussions that will take account of country context. Price trends during the implementation period will be of particular use to the Ad Hoc Committee.

During the peer-review process, a number of peer reviewers suggested that if we had adopted a different methodology for deriving our estimates, we may have estimated different benchmarks. We have therefore included in this report our estimates derived from two other approaches: (1) estimating a weighted mean of the outcomes of the studies included in our literature review; and (2) an aggregate weighting modeling approach using Monte Carlo simulations (modeled with the assistance of the Institute for Health Metrics and Evaluation [IHME]). Below is an explanation of how we estimated the four quantities of interest (availability, price, market share, use) for years 1 and 2 using each approach (described in greater detail in Appendix F).

First, we weighted the data available from the different studies that we reviewed according to (1) our judgment of how closely the conditions of the study resembled those of the AMFm, and (2) the study’s methodological rigor. Second, for those studies in which outcomes were not measured at 1 and

2 years (e.g., in the subnational pilot of subsidized ACT in Tanzania, availability was only measured at 1 year, not 2 years), we used extrapolations to estimate the results at 1 and 2 years (for these extrapolations, we assumed that scale-up would be linear). Finally, we calculated the weighted mean of the data at 1 and 2 years (Table 20) and, with the assistance of the IHME, we also conducted a Monte Carlo multivariate sensitivity analysis to estimate availability, price, market share, and use through 1,000 Monte Carlo simulations (Table 21). In both cases, the estimates for availability, market share, and use show a change from baseline, whereas the estimates for price are absolute figures. The results of these two approaches were very similar, which was expected given that they used the same data and similar methodologies. With the exception of price, the estimates derived from these two approaches were very similar to those derived from our pragmatic “mixed methods” approach, which gave us additional confidence that the estimates presented in Table 19 are realistic.

**Table 20.** Estimates derived from a weighted mean approach (see detailed methods in Appendix F)

Indicator	Year 1	Year 2
Availability (%)	22.2	36.6
Price (US\$)	3.00	3.84
Market share (%)	11.8	21.9
Use (%)	11.8	22.2

**Table 21.** Estimates derived from a weighting modeling approach using Monte Carlo simulations (see detailed methods in Appendix F)

Indicator	Year 1 (95% confidence interval)	Year 2 (95% confidence interval)
Availability (%)	22.3 (20.7–23.8)	36.5 (34.3–38.9)
Price (US\$)	3.00 (2.79–3.22)	3.79 (3.30–4.26)
Market share (%)	11.8 (10.3–13.5)	21.9 (19.6–24.7)
Use (%)	11.8 (10.0–13.4)	22.1 (18.5–25.4)

## 7.2

### Our Recommendations on Success Benchmarks for Availability

**For the AMFm Phase 1, we suggest the following as benchmarks of success for availability:** an increase in availability of QAACTs of 20 percentage points from baseline at year 1 and an increase of 40 percentage points from baseline at year 2.

**Rationale:** The very small, subnational pilot studies of subsidized ACT in Angola, Tanzania, and Uganda found very high ACT availability (69%–81%) at 1 year, suggesting that under trial conditions (including major external funding, additional distribution channels, and a huge amount of supportive interventions) it is possible to achieve very good results for availability. However, it is extremely unlikely that these successes could be replicated in a large, national scale-up program. Key informants urged us not to extrapolate directly from these pilots, given that the “on the ground” situation in the AMFm Phase 1 pilot countries will differ from trial conditions.

We believe that the national ACT subsidy programs run by governments (in Cameroon and Senegal), and Cambodia’s national scale-up experience, are a closer model for what the AMFm is likely to achieve. There are only limited data for Cameroon—these suggest that ACT availability is low, especially in the private sector. In Senegal, across all outlet types, 44.8% stocked adult ACT, 58.2% stocked child ACT, and 46.3%

stocked ACT for infants. Subsidized ACTs were widely available in public and NGO outlets (>80%) at 1 year, but availability was much lower in the private sector, with only 57% of urban outlets and 31% of rural outlets carrying ACTs. Only 7% of private outlets had all three ACT dosages available. The results for the PSI-led national program in Cambodia (22% availability in adult ACT; 6% in child ACT at 1 year) should also lower expectations for the AMFm. The interviewed experts argued that Rwanda represents an exceptional case, and that the very positive results in Rwanda’s ACT subsidy program (80%–90% availability at 1 year) should not be expected in many AMFm Phase 1 countries. With the exception of Rwanda, in the subnational ACT subsidy pilots and the national ACT subsidy programs, we found that non-QAACTs are usually still very widely available at 1 or 2 years (e.g., in the Tanzania pilot, the proportion of shops stocking generic SP fell by only 3 percentage points at 1 year). We do not think it is feasible to expect very large reductions in the availability of non-QAACTs within the very short time frame of the AMFm Phase 1.

The national ACT scale-up initiatives that we reviewed (e.g., those funded by the Global Fund) have in many countries led to high ACT availability in public sector facilities. For example, in the seven countries monitored by ACTwatch, surveys found a mean ACT availability in the public sector of 61.7%. However, these were conducted between 3 and 9 years after countries adopted ACT as national policy; the data suggest that it takes at least 3 years to get high ACT availability in the public sector. In private drug stores mean ACT availability in the seven ACTwatch countries overall is only 13.8%. Private drug stores are a major provider of antimalarials in most countries, and low ACT availability in these stores means that average availability at the national level is low. Thus if the AMFm is to succeed in increasing national availability of ACTs, there will need to be a substantial rise in availability in the private sector. In order for retailers to take the risk of purchasing large volumes of ACT, the AMFm will need to quickly increase the demand for ACTs. Increasing ACT availability in remote private outlets will be a particular challenge.

Our recommendations on ACT availability have also been informed by results of commodity social marketing programs, e.g., water purification products achieved just 7.5% to 13% availability at year 1, and took 2 to 4.5 years to reach availability levels of over 20%. Socially marketed, non-targeted condom programs have taken 6 years to reach availability levels of 32% to 39% (higher availability can be achieved with highly targeted programs, e.g., those targeting sex-worker hot spots).

Finally, as shown in Appendix F, the estimates for change in availability from baseline at years 1 and 2 derived from our pragmatic “mixed methods” approach were very similar to those derived from two other approaches—a weighted mean approach, and a weighting modeling approach using Monte Carlo simulations. The first approach led to an estimate of

22.2% increase in availability from baseline at year 1 and 36.6% increase in availability at year 2. The second approach led to an estimate of 22.3% change in availability from baseline at year 1 (95% confidence interval [C.I.]: 20.7%–23.8%) and 36.5% change in availability at year 2 (95% C.I.: 34.3%–38.9%).

## 7.3

### Our Recommendations on Success Benchmarks for Market Share

**For AMFm Phase 1, we suggest the following as benchmarks of success:** an increase in ACT market share of 10 to 15 percentage points from baseline at year 1, and an increase of 15 to 20 percentage points from baseline at year 2. There should also be a decrease in the market share of artemisinin monotherapy from baseline at years 1 and 2.

**Rationale:** Based on our key informant interviews and literature review, we feel strongly that the very impressive market share data achieved in the three small, subnational ACT subsidy pilots in Angola, Tanzania, and Uganda (38%–51% at 1 year) are not replicable in AMFm Phase 1. Our analysis of annual data on PSI's sale volumes indicates that it usually requires more than 2 years until a large increase in sales can be observed. Key informants supported this finding, and argued that a longer time frame is needed to increase market share levels in rural and less populous areas. In addition, the question of what kind of market share levels can be achieved after 1 to 2 years depends strongly on the total market size, i.e., it will take longer to achieve high market share levels in larger markets.

Our recommendations were also informed by (1) the market share results from contraceptive SM programs (typically a market share of 10% to 15% by year 3), (2) the market share results for the manufacturer's model used to market an oral contraceptive in Morocco (an increase of just 3 percentage points from baseline at year 2), (3) the expectations that drug companies have for market penetration of a new drug in an emerging market (e.g., market share of 10% and 20% at years 1 and 2, respectively), and (4) the data on market share from ACTwatch surveys (2.1%–7.5% market share for first-line ACTs at 3 years after adoption of ACT as first-line therapy; of the seven countries tracked by ACTwatch, only two currently have ACT market share levels higher than 10%.)

At the October 2010 AHC meeting, the AHC noted that one of the objectives of the AMFm is to displace the use of artemisinin monotherapy in order to “buy time” (i.e., to delay the emergence of resistance to artemisinin compounds for as long as possible). Thus the AHC suggested, and we agree, that the market share benchmark should also include a fall in the market share of AMT from baseline at years 1 and 2.

Finally, as shown in Appendix F, the estimates for change in market share from baseline at years 1 and 2 derived from our pragmatic “mixed methods” approach were very similar

to those derived from two other approaches—a weighted mean approach, and a weighting modeling approach using Monte Carlo simulations. Both approaches led to an estimate of 11.8% change in market share from baseline at year 1 (95% C.I.: 10.3%–13.5% for the result of the modeling approach) and 21.9% change in market share from baseline at year 2 (95% C.I.: 19.6%–24.7% for the result of the modeling approach).

### Our Recommendations on Success Benchmarks for Price

**For AMFm Phase 1, we suggest the following as benchmarks of success for price** (price refers to adult equivalent treatment dose, as outlined in the Independent Evaluation's Inception Report1): at 1 year, QAACT price under 300% of the price of the dominant non-QAACT (in most countries this is CQ or SP); at 2 years, QAACT price under 150% of the price of the dominant non-QAACT. In addition, at both 1 and 2 years, the price of AMFm-co-paid QAACT should be under the price of artemisinin monotherapy (this is a useful but not sufficient benchmark to determine success).

**Rationale:** In estimating success benchmarks for price, both the literature review and the key informant interviews led us to believe that the benchmark should be relative to the dominant non-QAACT, which in most countries is CQ or SP. The AMFm technical design specifically discussed ACT target price as one that is relative to the price of CQ and SP; the design states: “AMFm has the potential, and will be measured against its ability, to reduce consumer prices of a treatment course of an effective coformulated antimalarial from the current level of USD 6–10 to a far lower level of USD 0.20–0.50 (which is competitive with current retail prices of CQ and SP) for the majority of patients.”<sup>48</sup> Similarly, the Independent Evaluation is addressing the following question related to ACT affordability: “Has the cost of quality-assured ACTs to patients been reduced at public, private for-profit and not-for-profit outlets in rural/urban areas to a price comparable to the price of most popular antimalarials?”<sup>1</sup>

The AMFm technical design states that the intent for the AMFm is that ACTs become “cost competitive with the lowest-cost monotherapies.”<sup>48</sup> Many of the key informants we spoke with said that the success of the AMFm will be measured against whether it can bring ACT prices down to the current retail prices of the most popular antimalarials (e.g., CQ, SP). As mentioned above, the original intent of the AMFm was to bring the price of ACT in the private sector down to \$0.20 to \$0.50, the price range of CQ and SP in four countries surveyed in 2007 (Kenya, Uganda, Cameroon, Burkina Faso).<sup>48</sup> In the most recent ACTwatch surveys, we found that CQ or SP was the dominant antimalarial in six countries (in the DRC it was quinine); the price of CQ or SP ranged from \$0.16 to \$0.54, which is very similar to the ACT price range quoted in the AMFm technical design. Our suggested benchmarks, which are relative to the price of the dominant non-QAACT (usually CQ or SP), will in-

## 7.4

dicating whether the AMFm is succeeding in reaching this price range. We believe that unless ACT prices fall to prices that are competitive with the dominant alternatives (e.g., CQ, SP), it is hard to envisage how ACT usage will increase.

We acknowledge, however, that there are few empirical data to guide expectations for how quickly ACT prices will fall in the AMFm pilot countries. Indeed, price change was the indicator with the weakest empirical basis for setting expectations at 1 and 2 years. Based on the existing data, together with expert input from the key informant interviews, we believe that it is feasible that AMFm pilot countries could reach an ACT price of under 300% of the price of the dominant non-QA ACT (usually CQ or SP) by year 1, and under 150% by year 2. Beyond year 2, prices should be expected to continue to fall and reach parity with CQ/SP as per the original intent of the AMFm.<sup>48</sup>

To give an example, in Nigeria, the dominant antimalarial is SP (the 2009 Nigeria ACTwatch survey found that SP makes up 52.3% of the total volume of all antimalarials sold or distributed). The 2009 median price for a full course of adult SP treatment was \$0.54. ACTs cost about \$6.00 to \$8.00 (first-line ACT [AL] cost \$6.12; WHO-approved ACT was \$7.65; nationally registered ACT was \$5.74). If we assume that SP remains at \$0.54 over the first 2 years of AMFm Phase 1, we are thus proposing that a benchmark of success is that ACT prices have fallen to under \$1.62 by year 1 and under \$0.81 by year 2. We would expect ACT prices to continue to fall beyond 2 years, to eventually reach parity with the price of SP, as originally intended in the AMFm technical design. As discussed below, there are data (though these are limited) to suggest that such a price decline is feasible and achievable at national scale.

The available data that can help inform the question of how quickly ACT prices will reach CQ/SP prices are (1) data from the subnational pilots of subsidized ACT, and (2) data from the national programs of subsidized ACT.

In the four subnational studies of subsidized ACT, there were very large, very rapid ACT price reductions (i.e., within 1 year). Thus there is solid evidence that the subsidy worked when tested at small scale. However, many key informants told us that they do not think the price reduction under the AMFm will be as fast as was seen in the four subnational pilots. Thus the thresholds we have suggested take into account the likelihood of this slower rate, and they allow for the likelihood that mark-ups will initially be higher than the 150% markup modeled in the technical design.

We know of only two national ACT subsidy programs (Senegal and Cambodia) that have specific data on price (the final price data from the national Cameroon program are not yet available). These two programs do not give a clear, coherent picture of the speed at which ACT prices fall in national subsidy programs. Nevertheless, there is evidence from both these pro-

grams that the subsidy can bring ACT prices down, in one case very quickly (Senegal).

- In Senegal, 1 year after launch of the subsidy, observed mean price for adult doses of ACT at private outlets was \$1.34, similar to the RRP and below the price of SP (\$2.00). Private outlets purchased the subsidized ACTs at \$0.99 (i.e., the subsidy was largely passed on to consumers).
- In Cambodia, data are only available at 4 years after PSI began to subsidize ACTs in 17 of 20 malaria-endemic provinces, when the mean consumer price for adult ACTs was \$1.07. Subsidized ACTs were sold to private outlets at a price of \$0.42 for adults ACTs.

Several key informants with expertise in malaria drug pricing, including key informants who are involved in rolling out the AMFm Phase 1, suggested that prices are likely to fall with time—i.e., they expect higher ACT prices at year 1 than at year 2. These informants suggested that ACT prices should fall once there are more outlets selling subsidized ACTs (i.e., increased competition should bring the price down). ACT price at 1 and 2 years will also be influenced by the supply-side and demand-side supportive interventions that a pilot country rolls out (e.g., educational efforts targeted at both sellers and patients). Unlike with CQ or SP, there is not yet a “mature market” in the private sector for ACT. And availability levels of subsidized ACTs are likely to be low in the first few months of the AMFm, as it takes time for outlets to sell previously ordered antimalarials and to order new stocks. For all these reasons, retail prices for co-paid ACTs may initially be high, but should then be expected to fall. In Kenya, for example, there are early reports of high initial retail prices for co-paid ACTs under the AMFm. On August 17, 2010, Kenya’s national newspaper, *The Daily Nation*, reported that pharmacists were selling subsidized ACT at the old price of 225 Kenyan shillings, about \$2.78.<sup>49</sup> A follow-up news story on November 9, 2010, reported that “a cross section of pharmacies, sampled by *Nation*, from Nairobi, Mombasa, Naivasha and Meru are found to be selling the medicines at inflated prices of anywhere between Sh50 and Sh240 instead of the recommended price of Sh40 for an adult dosage.”<sup>50</sup>

Patouillard and colleagues recently reviewed studies examining the retail-sector drug distribution chain in developing countries, including for malaria drugs.<sup>51</sup> Their review is helpful in setting expectations about price markups along the chain. In their review, the authors define three types of suppliers: **terminal** suppliers who sell directly to retailers and buy from upstream suppliers. These upstream suppliers are called **primary** suppliers if they provide the point of entry into the distribution chain or **intermediate** suppliers if they themselves obtain drugs from primary suppliers. For drugs in general, price mark-ups ranged from 27% to 99% at the primary level, 8% at the intermediate level, and 2% to 67% at the terminal level. For antimalarial drugs specifically, mark-ups ranged from 3% to 566% in pharmacies, 29% to 669% in drug shops, and 100% to

233% in general shops; markups were higher in rural outlets than in urban ones. One peer reviewer suggested that a drug such as CQ probably enters the chain at a price of about \$0.05, and then gets marked up to around \$0.30–0.40 by the time it reaches the consumer end of the price chain. This reviewer suggested that we should expect similar markups for co-paid ACTs.

Finally, there are very few available data on price in studies of ACT or other subsidized, socially marketed commodities. Hence we had very few data points available for the weighted mean approach and aggregate weighting modeling approach using Monte Carlo simulations shown in Appendix F. In addition, while we were able to model changes from baseline at years 1 and 2 for availability, market share, and use, we were unable to do so for price (we did not have data on price changes from baseline). Thus, the models shown in Appendix F show absolute prices at years 1 and 2. Given these many limitations, we do not believe that the results of these two approaches for price are realistic expectations for the AMFm Phase 1.

## 7.5 Our Recommendations on Success Benchmarks for Use

**For the AMFm Phase 1, we suggest the following as benchmarks of success for use:** an increase of 5 to 10 percentage points in use from baseline at year 1 and an increase of 10 to 15 percentage points in use from baseline at year 2.

**Rationale:** There are very few available data on ACT usage in the subnational subsidized ACT pilots or the national subsidy programs. In the Uganda pilot, at 20 months after launch, 15% of children were treated with ACT within 24 hours of fever and 20% within 48 hours of fever (from a baseline of 3% and 4%, respectively). In the Kenya pilot, there was a 40.2 percentage point increase in usage from baseline in the intervention group, and a 14.6 percentage point increase in the control group, a difference of 25.6 percentage points. Thus, under subnational trial conditions, it is possible to achieve major increases in ACT usage within 1 year.

However, key informants repeatedly expressed doubt that the AMFm could achieve major increases in usage within just 1 to 2 years, and many suggested that there would be no increase at all in usage at 1 year. At the June 2010 AHC meeting, some members of the AHC felt that usage should not be measured at 1 year, because 1 year is too soon to expect any change in usage. Data from national ACT scale-up initiatives show that usage rates remain extremely low in countries that have attempted to scale up ACT use. For example, in the seven countries monitored by ACTwatch, only 2.4% to 19.3% of children under age 5 with fever receive first-line ACT (in all seven countries, ACT has been adopted as first-line therapy for at least 3 years).

We believe that the national zinc scale-up project in Bangladesh, the SUZY Project, has many parallels with AMFm Phase 1; in the SUZY Project, zinc usage was only 12% to 25% by year 2. Usage data in studies of condom SM programs suggest that it can take 2 to 3 years before about one-third of people use condoms consistently. In studies of water purification SM programs, usage rates have not exceeded 13% at 3 years. Global scale-up of ORT usage, which has been extremely slow, and the models created by CHAI for projecting future uptake in zinc usage (Appendix E) suggest we should be very cautious about expecting rapid rises in ACT usage within the time frame of AMFm Phase 1.

One AHC member suggested that usage levels will lag behind market share levels (our proposal is in line with this suggestion). The AHC member gave the following example. Let us say there are 100,000 cases of children with fever. Of these fevers, 40% (40,000 children) receive antimalarial drug treatment. Let us also say that at 1 year after the launch of the AMFm, the ACT market share has increased from 10% to 20% (i.e., an increase in 10 percentage points from baseline). This increase in market share means that the number of children receiving ACT increases from 4,000 to 8,000. Thus, usage of ACT has increased from 4% at baseline (4,000 out of 100,000 children with fever) to 8% at 1 year (8,000 out of 100,000 children with fever). Usage has risen by 4 percentage points from baseline (compared with a rise in market share of 10 percentage points from baseline).

Our definition of use refers to children with fever—rather than to children who have parasitologically confirmed malaria. We acknowledge that our definition is likely to become an outdated indicator. The introduction of RDTs will enable parasitological confirmation of malaria infection, after which a more appropriate use indicator will be the proportion of children with confirmed malaria who receive ACTs.

Finally, as shown in Appendix F, the estimates for change in ACT use from baseline at years 1 and 2 derived from our pragmatic “mixed methods” approach were very similar to those derived from two other approaches—a weighted mean approach, and a weighting modeling approach using Monte Carlo simulations. The first approach led to an estimate of 11.8% change in use from baseline at year 1 and 22.2% change in use at year 2. The second approach also led to an estimate of 11.8% change in use from baseline at year 1 (95% C.I.: 10.0%–13.4%) and 22.1% change in use at year 2 (95% C.I.: 18.5%–25.4%).

## 7.6 Key Factors Influencing the Success of AMFm Pilots

As we have mentioned in Section 2.7, country context matters. Many different factors could influence the success of the AMFm Phase 1. Some of these factors are within the control of a subsidy mechanism (e.g. quality of supportive interventions), while others are outside its control (e.g. political unrest, floods).

It is therefore crucial to take these contextual factors into consideration when the success of the individual AMFm pilots, or the overall success of the AMFm model, are judged. The AMFm pilot countries will be using existing supply chains, and thus the AMFm will inherit the existing strengths and weaknesses of these chains. Table 22 outlines some of the main factors that can influence outcomes in the AMFm Phase 1.

**Table 22.** Factors that can influence the success of the AMFm Phase 1

Factors under the control of a subsidy delivery program	Country-specific parameters
Time when subsidized ACTs arrive in the country Scope and quality of supportive interventions Quality of country proposals Number of first-line buyers	Size of country and of antimalarial market Baseline levels of ACT price, availability, market share, and use Population density (e.g., urban-to-rural population ratio) Structure of public and private supply chains Political stability, catastrophic environmental events (e.g., floods), and socioeconomic conditions Government leadership and drug regulatory framework Health system factors, including provider awareness, training, and supervision Malaria treatment-seeking behavior Support of local private manufacturers and NGOs

## 8. Judging Success of AMFm Phase 1 Across Multiple Parameters

Having proposed ranges for success across the four key indicators, we now turn to the question of how we might balance them. For example, should all four measures be given equal weight in the final score that a country receives at years 1 and 2 after the launch of the AMFm, or should one or more of the four indicators be weighted more heavily? Should urban and rural settings be weighted differently?

In the first version of this paper, which was discussed at an AHC meeting in London on June 22–23, 2010, we proposed two main approaches to the question of judging the AMFm’s success across the four different parameters—the Balanced Scorecard (BSC) approach and an approach that mimicked the Global Fund approach to judging the performance of its existing grants. The AHC felt that the BSC approach was more appropriate, and we therefore now focus on the BSC. For the record, our suggestion for a Global Fund-type approach to balancing the four parameters is shown in Appendix G.

### 8.1 The BSC Approach

Kaplan and Norton’s original definition of a Balanced Scorecard (BSC) is: “A multi-dimensional framework for describing, implementing, and managing strategy at all levels of an enterprise by linking objectives, initiatives, and measures to an organization’s strategy.”<sup>52</sup>

The scorecard was originally developed for the commercial sector as a tool to measure a company’s performance through a balance of four perspectives (see Figure 6). The company sets goals for all four perspectives, and then measures performance against these four goals.

The BSC was not intended to be used just a measurement tool or “data dashboard,” but as a tool to help organizations develop strategies. The key innovation of the BSC was that it allowed organizations to focus not just on the financial bottom line, but on four different parameters—which could be easily visualized at once.

**Figure 6.** The components of the Balanced Scorecard

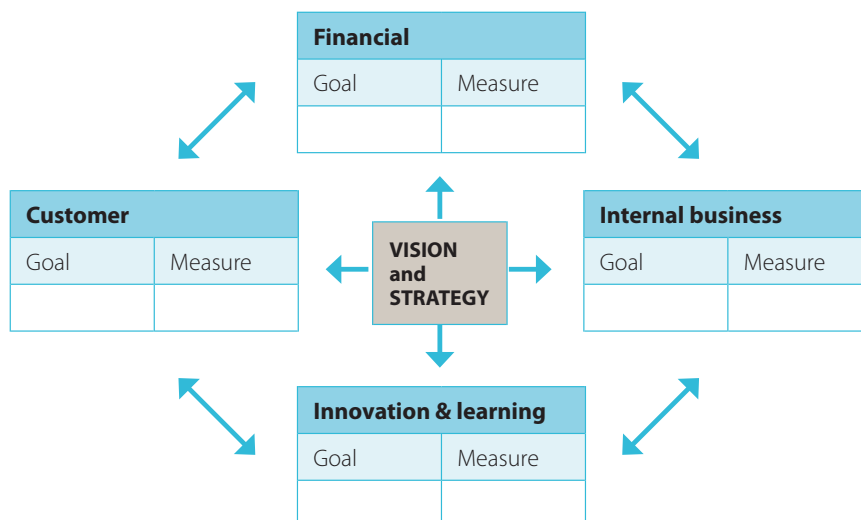


Figure 6 is based on an illustration available under a Creative Commons license: <http://www.flickr.com/photos/phploveme/2997473310>

### Modifications of the BSC for public health

Many public health agencies have created modifications of the BSC, in which the original four perspectives have been modified so as to be more relevant to public health. The BSC has also been modified for use in improving public health in very low-income settings. The Ministry of Public Health in Afghanistan, for example, has developed a BSC to regularly monitor the progress of its strategy to deliver a basic package of health services across different regions of the country.<sup>53</sup> The modified BSC used in Afghanistan has 6 domains and 29 indicators; targets (benchmarks) are set for each indicator. No weighting was used (given the large number of indicators, weighting had no effect on the final score). A single score (red, yellow, or green) can be calculated based on the proportion of indicators where the benchmarks were met. For this modified BSC to be useful, the government, funding agencies, and NGOs all needed to buy into it (David Peters, personal communication). While the BSC has been used in Afghanistan to award bonuses and contracts, its primary purpose is as a tool to assist with overall strategic direction.

Caution is needed in using the BSC purely for performance measurement, particularly if it is imposed from outside without widespread buy-in from implementers and beneficiaries. If a BSC scorecard becomes too complex—with a large number of domains and indicators, and a complex weighting system—it can threaten widespread buy-in (David Peters, personal communication).

### Modifying the BSC for AMFm Phase 1

We suggest that the AMFm Phase 1 could use a BSC approach to assess the success of the AMFm model country by country. The modified BSC would use the four quadrants of availability, affordability, market share, and use. For each quadrant, the goal would be the benchmark of success that we suggested in Section 7. Figures 1 and 2 (on page 11) show a modified BSC for the AMFm Phase 1—a simple graphic that allows visualization of all four success benchmarks simultaneously.

The scorecard can also be used to note the relevant contextual factors for each specific AMFm pilot country (e.g., date of grant agreement, date that subsidized drugs arrived, type of supportive interventions in place).

Overall, we believe that the scorecard could serve as a good basis to assess and learn how the AMFm model unfolds in a variety of country contexts in order to draw lessons for the future. As discussed above, the BSC is not intended to be imposed from outside—ideally there should be buy-in for the benchmarks from the pilot countries themselves.

## 8.2 Weighting Success Measures in AMFm Phase 1

An important question for the AMFm Phase 1 is whether to weight one or more success measures more heavily than the others (the Global Fund uses such weighting). In our key informant interviews, and at the June 2010 AHC meeting, there was **a wide range of views on whether there should be a weighting system or not**. And among those who argued for weighting, there was no agreement on which indicators should be weighted more heavily. In the end, the AHC decided that weighting should not be used. For the record, we lay out below the different weighting options we presented to the AHC.

**Option 1: Assigning equal weight to the four main AMFm objectives.** Some interviewees, and some AHC members, argued that the four key AMFm outputs—price, availability, market share, and use—should be treated with equal importance. They justified their position by arguing that all four indicators are inter-related (e.g., a fall in price, or an increase in availability is likely to be associated with a rise in market share).

**Option 2: Weighting one or more objectives.** Among those who argued for weighting, two different viewpoints were common:

- One argument is that if the primary aim of the AMFm Phase 1 is to “crowd out” older antimalarials and artesunate monotherapy, market share should be weighted more heavily.
- A second line of argument is that price and availability are

of much greater importance than the other indicators. According to this view, an increase in market share and use will follow when ACTs are available at an affordable price.

Appendix H gives two worked examples of weighting for market share, and weighting for price/availability, based on the Global Fund-type approach that we present in Appendix G.

None of the key informants argued that use should be weighted more heavily. Indeed many experts believed that there would be little, if any, increase in use in the short time frame of AMFm Phase 1.

### **Option 3: Weighting factors for urban and rural areas.**

Rather than assigning greater importance to one or more of the main AMFm indicators, a third option would be treating them with equal importance but differentiating between urban and rural areas in the weighting. Our literature review on scale-up of commodities in low-income settings suggested that scale-up is much harder to achieve in remote, rural settings. Thus, some key informants suggested that performance should be measured separately for rural and urban areas, and that rural areas should be given a higher weighting. Such weighting might also help to incentivize more aggressive use of supportive interventions in more remote areas.

## Aggregating the Results of the National Programs to Assess the Overall Performance of the AMFm

Finally our Global Fund-type approach laid out in Appendix H could also be used to assess the overall performance of AMFm Phase 1 at years 1 and 2. We presented the idea of an aggregated result to the AHC at the June 2010 meeting, but the committee did not feel that such a result would be valuable. For the record, our initial suggestion for an aggregate score is shown in Appendix I.

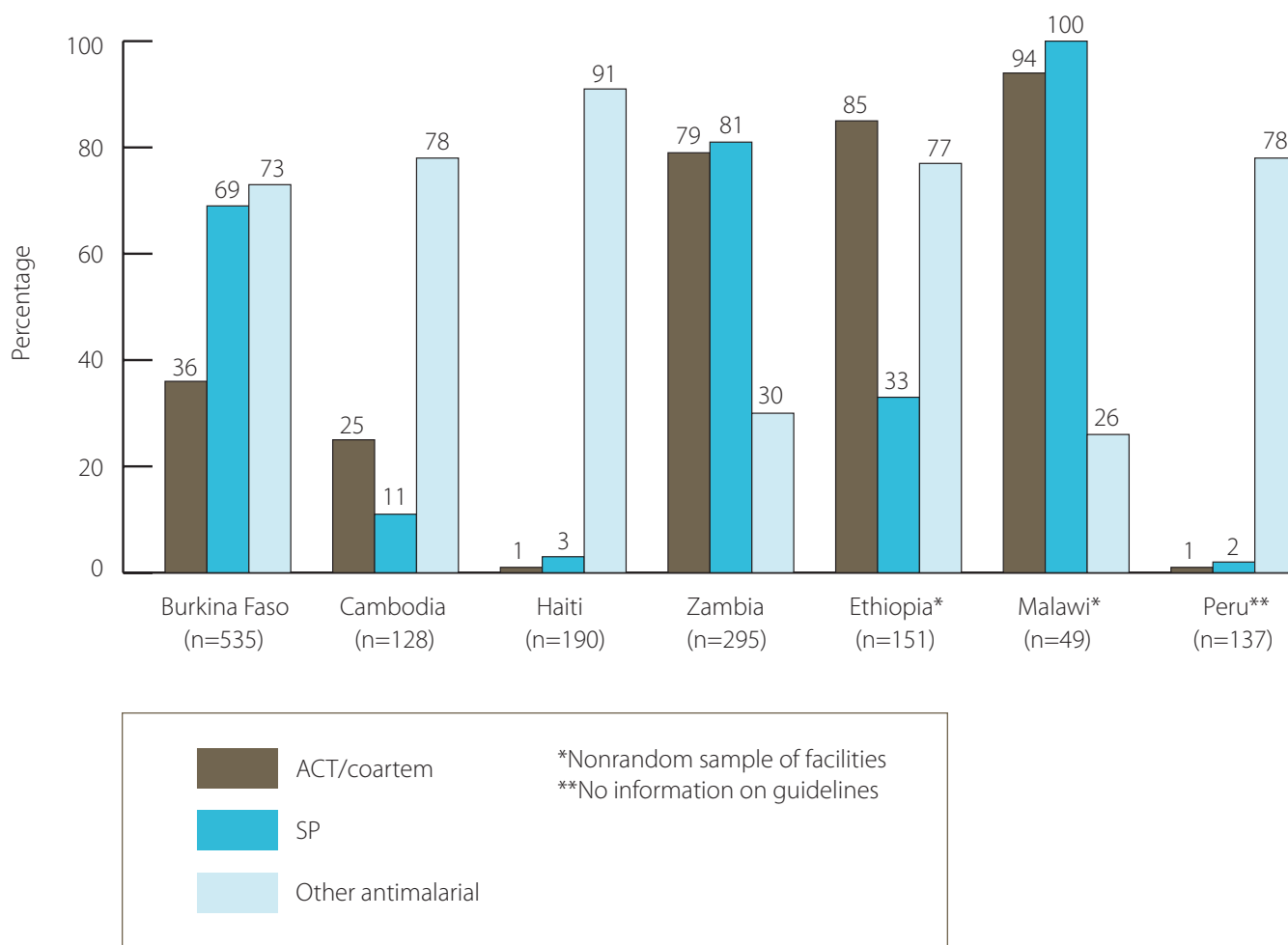
8.3

## Appendix A: Key Informants Interviewed

1. **Soren Andreasen**, Partner, Commons Consultants
2. **Françoise Armand**, AED (previously at Abt Associates Inc.)
3. **Martin Auton**, HAI
4. **Steven Chapman**, Chief Technical Officer, PSI
5. **Desmond Chavasse**, Vice President (Malaria Control and Child Survival), PSI
6. **Jessica Chervin**, Clinton Health Access Initiative
7. **Renia Coghlan**, Associate Director, Global Access, MMV
8. **Penny Grewal Daumerie**, Director, Global Access, MMV
9. **Martine Donogue**, HLSP
10. **W. Douglas Evans**, Professor, Department of Prevention and Community Health; Department of Global Health, George Washington University, Washington, D.C., USA
11. **Birger C. Forsberg**, Division of International Health (IHCAR), Department of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden
12. **Megumi Gordon**, Clinton Health Access Initiative
13. **Dana Hovig**, Chief Executive, Marie Stopes International
14. **Gaurav Kapoor**, Clinton Health Access Initiative
15. **Corine Karema**, National Malaria Program Manager, Rwanda
16. **Karna George Kone**, Public Health Consultant
17. **Llyod Matowe**, Senior Technical Officer, Market Dynamics and Cost-Effectiveness, Affordable Medicines Facility—malaria (AMFm Unit), Global Fund to Fight AIDS, Tuberculosis and Malaria
18. **Wilfried Mbacham**, Public Health Biotechnologist, University of Yaoundé, Cameroon
19. **Joana Martinho do Rosário**, Private Sector Programme Manager, MENTOR Initiative, Angola
20. **Kinny Nayer**, Managing Director, Surgipharm Ltd
21. **Pierre Ongolo-Zogo**, Senior Lecturer, Department of Medical Imaging, University of Yaoundé
22. **Edith Patouillard**, London School of Hygiene & Tropical Medicine
23. **David Peters**, Associate Professor and Director, Health Systems Programs, Johns Hopkins Bloomberg School of Public Health
24. **Hans Rietveld**, Director, Global Marketing and Access, Novartis
25. **Oliver Sabot**, Clinton Health Access Initiative
26. **Tanya Shewchuk**, ACTwatch
27. **Raman Singh**, Vice President, Commercial Operations, Emerging Markets and APAC/Japan, GSK
28. **Angus Spiers**, Malaria Team, PSI
29. **Ambrose Talisuna**, Team Lead, Uganda pilot, MMV
30. **Prashant Yadav**, Professor of Supply Chain Management, MIT-Zaragoza
31. **Shunmay Yeung**, London School of Hygiene & Tropical Medicine
32. **Rahul Lande**, Export Executive, Cipla
33. **Rahul Kapadia**, Manager, Ipca Laboratories

## Appendix B: Key Results from Global Fund Five-Year Evaluation

**Figure 7.** Proportion of surveyed health facilities stocking ACT and other antimalarial drugs in national programs funded by the Global Fund



**Source:** DCA Facility Census of DCA Facility Survey 2008

**Note:** ACT was adopted as national policy in Cambodia in 2000, Peru in 2001, Zambia in 2002, Ethiopia in 2004, Burkina Faso in 2005, and Malawi in 2007 (Haiti has not adopted ACT as national policy).

## Appendix C: ACT Prices in ACTwatch Countries

**Table 23.** Median prices of a full course of an adult treatment of the most common antimalarial, and of ACT, and the price of ACT relative to the most common antimalarial (in US\$)

Country	Median price of most common AM (US\$)	Median price of ACT in public health facilities (US\$)	Median price of ACT in private health facilities (US\$)	Median price of ACT in all facilities selling ACTs (US\$)	Median price of ACT relative to the price of the most common AM in outlets selling ACT (ratio)
<b>Benin (11/08)</b>	CQ: 0.29	1.17	6.25	5.68	19.6
<b>Cambodia (06/09–07/09)</b>	CQ: 0.16	0.00	1.18	1.18	4.9–9.8
<b>Congo (DRC) (09/08–11/08)</b>	Quinine: 3.12	2.75	2.29–4.58	3.89	1.6
<b>Madagascar (12/08)</b>	SP: 0.38	0.00	4.04	4.04	11.3
<b>Nigeria(12/08)</b>	SP: 0.54	2.18	5.36–6.72	6.12	11.2–12.6
<b>Uganda (09/08–10/08)</b>	SP: 0.18	0.00	5.26–7.30	5.26–7.30	22.1
<b>Zambia (10/08–01/09)</b>	SP: 0.32	0.00	7.51	7.51	1.2

**Source:** ACTwatch outlet surveys, available at <http://www.actwatch.info/results/overview.asp> (accessed July 12, 2010).

## Appendix D: UNICEF Data on Proportion of Children Under Age 5 Receiving Any Antimalarial and Proportion Receiving ACT

**Table 24.** Proportion of children under age 5 receiving any antimalarial and proportion receiving ACT

Country	Source	% children of under 5 receiving any antimalarial	% of children under 5 receiving ACT
Angola	MIS 2006–2007	29	2
Benin	DHS 2006	54	0
Burkina Faso	MICS 2006	48	No data
Burundi	MICS 2005	30	3
Cameroon	MICS 2006	58	2
Central African Republic	MICS 2006	57	3
Congo (DRC)	DHS 2005	48	No data
Congo (DRC)	DHS 2007	30	1
Cote d'Ivoire	MICS 2006	36	3
Djibouti	MICS 2006	10	No data
Ethiopia	MIS 2007	10	No data
Gambia	MICS 2006	63	0
Ghana	DHS 2008	43	22
Guinea	DHS 2005	44	No data
Guinea-Bissau	MICS 2006	46	No data
Indonesia	DHS 2007	1	No data
Lao PDR	MICS 2006	8	0
Liberia	DHS 2007	59	No data
Malawi	MICS 2006	25	0
Mali	DHS 2006	32	No data
Mauritania	MICS 2007	21	1
Mozambique	MIS 2007	23	23
Namibia	DHS 2006–2007	10	2
Niger	DHS 2006	33	No data
Pakistan	DHS 2006–2007	3	No data
Rwanda	DHS 2005	12	No data
Rwanda	DHS 2007–2008	6	0

<b>São Tomé and Príncipe</b>	MICS 2006	25	6
<b>Senegal</b>	MIS 2006	22	No data
<b>Senegal</b>	MIS 2008–2009	9	4
<b>Sierra Leone</b>	MICS 2005	52	1
<b>Somalia</b>	MICS 2006	8	1
<b>Sudan</b>	ONS 2006	54	4
<b>Tajikistan</b>	MICS 2005	2	0
<b>Tanzania</b>	THMIS 2007–2008	57	21
<b>Togo</b>	MICS 2006	48	1
<b>Uganda</b>	DHS 2006	61	3
<b>Vietnam</b>	MICS 2006	3	0
<b>Zambia</b>	MIS 2006	58	10
<b>Zambia</b>	MIS 2008	43	13
<b>Zimbabwe</b>	DHS 2005–2006	5	No data

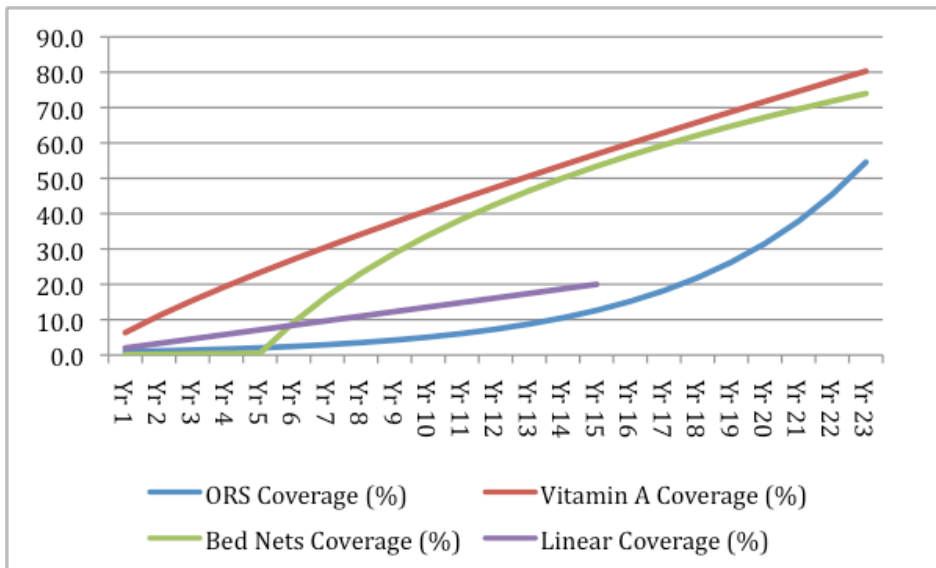
**Source:** [http://www.childinfo.org/malaria\\_tables1.php](http://www.childinfo.org/malaria_tables1.php) (accessed 3 January 2011)

# Appendix E: The CHAI Zinc Uptake Model

The Center for Strategic Health Operations Research at CHAI is currently developing a model that forecasts zinc uptake in the 15 countries that together had 75% of the deaths from diarrhea among children under age 5 in 2007. The model is unpublished, but CHAI has kindly shared it with us (see figure below). The model predicts zinc uptake in these 15 countries from 2001 to 2015. As with all mathematical models, there are uncertainties and assumptions inherent in CHAI's zinc uptake model, and the predicted uptake curves are a "best fit" based on available data (Gaurav Kapoor, CHAI, personal communication). The model gives four possible uptake curves (the y axis in the figure shows coverage, and the x axis gives the year). The blue line predicts what zinc uptake would look like if it were similar to what has been documented for oral rehydration solution (ORS) uptake (an "ORS model" for zinc uptake).

The red line predicts what zinc uptake would look like if it were similar to documented trends in vitamin A uptake (a "vitamin A model" for zinc uptake). The green line predicts what zinc uptake would look like if it were similar to documented trends in bed net uptake (a "bed net model" for zinc uptake). Finally, the purple line models zinc uptake if it were linear. Zinc uptake is likely to be closest to the ORS model, rather than the vitamin A or bed net model—since distribution of vitamin A and bed nets require highly organized delivery mechanisms, which do not exist for zinc (Gaurav Kapoor, personal communication). The model may have lessons for the AMFm Phase 1—the ORS model of zinc uptake shows that rapid uptake of a subsidized children's health intervention is difficult to achieve and is likely to be nonlinear.

**Figure 8.** Forecasts for zinc uptake in the CHAI model



# Appendix F: Two Alternative Approaches: (1) Weighted Mean Approach and (2) Aggregate Weighting Modeling Approach Using Monte Carlo Simulations

During the peer review process, several peer reviewers suggested that if we had adopted a different methodology for deriving our estimates, we may have estimated different benchmarks. To respond to this concern, we present two alternative approaches to estimating changes in availability, market share, use, and price from baseline: (1) a simple weighted mean approach; and (2) an aggregate weighting modeling approach using Monte Carlo simulations. The modeling was kindly conducted by Stéphane Verguet, Postgraduate Fellow, Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA (verguet@uw.edu).

## Weighting

The studies included in these two approaches are shown in Table A below. We weighted the data from these studies in a two step process. First, we assigned each study a weight of 1 to 4 points according to (1) how closely the study conditions resembled those of the AMFm, and (2) the methodological rigor of the study. We used the following criteria: 1 point if the study was national rather than local; 1 point if the study was of a treatment rather than a preventive intervention; 1 point if there was a price subsidy in place; and 1 point for methodological rigor (for trials, we defined rigor as being randomized or quasi-randomized; for observational studies, we defined rigor as using randomized selection). Second, we converted the final scores into percentages. For each weight, we estimated a standard deviation according to our level of confidence in the weighting we had assigned.

## Extrapolation

For some studies, outcomes were not measured at 1 year and 2 years (e.g., in the subnational pilot of subsidized ACT in Tanzania, availability was only measured at 1 year, not 2 years). For the purposes of these two approaches, for all studies we used extrapolations to estimate the results at 1 and 2 years. We assumed a linear scale-up model (we acknowledge that scale-up of commodities is more likely to follow a sigmoid pattern, rather than a linear one, but we did not have enough data points to model sigmoidal scale-up).

## ACTwatch surveys and the Global Fund 5-Year Evaluation

In order to extrapolate outcomes at 1 and 2 years from these studies, we decided to use as a baseline the year in which a country rolled out its national ACT policy. For example, we found good evidence to suggest that Nigeria's national roll-out started in earnest in 2005—we therefore considered ACTwatch's Nigeria survey (conducted in 2008) to have taken place at 3 years after baseline. In order to determine when national rollouts occurred, we searched relevant documents published online by the Global Fund, ACTwatch, and the President's Malaria Initiative, as well as the peer-reviewed literature. We acknowledge that there is some uncertainty about the exact date on which such rollouts occurred.

## Assumptions about baseline data

Some studies (e.g., the subnational pilots of subsidized ACT in Tanzania, Angola, and Uganda; the national subsidized ACT program in Rwanda; the SUZY Project) did report baseline data, so we were able to calculate changes in outcomes (e.g., changes in availability) from baseline. For the other studies that we included in the model, we made the assumption that use, availability, and market share were all 0% at baseline. This allowed us to input changes from baseline into our model for these three outcomes. For price, however, we were unable to model the change from baseline—instead, we kept in our model the absolute prices at years 1 and 2 (there were very few price data available for the model).

We did not include data on condom use, because we did not think it was likely that usage rates of “any” condom was 0% at baseline (almost all of the studies looked at usage of any condom, not usage of the specific socially marketed, subsidized condom). In contrast, we did include data on condom availability and market share, because these studies specifically examined availability/market share of the newly introduced, subsidized, socially marketed brand of condom (in this case, we do believe that at baseline, availability and market share of this specific brand were 0% at baseline).

## Estimates of benchmarks from a simple weighted mean approach

In this approach, we simply added the weighted values shown in Table 25 and calculated the weighted mean for the four AMFm indicators. The results of this approach are shown in Table 26.

## Estimates of benchmarks from an aggregate weighting modeling approach

Stéphane Verguet provides the following modeling explanation:

The different quantities of interest  $Q_i = \{\text{availability, price, market share, use}\}$  for year 1 and year 2 were estimated by weighting the pieces of data available (see above for how the weighting was done) from the different studies  $D_j = \{\text{subnational pilot of subsidized ACT in Tanzania, SUZY Project, etc.}\}$  according to different weights  $w_{ij} \in [0,1]$ :

$$Q_i = \sum_{j=1}^N w_{ij} D_j / \sum_{j=1}^N w_{ij}$$

where the  $w_{ij}$  are normally distributed with mean  $\mu_{ij}$  and variance  $\sigma_{ij}^2$ :

$$w_{ij} \sim \text{Norm}(\mu_{ij}, \sigma_{ij}^2).$$

The expected value, or mean  $\mu_{ij}$ , captures the magnitude of the belief in that particular data point (i,j), which is de-

rived from the point assignment, and the variance  $\sigma_{ij}^2$  is a first attempt to capture the uncertainty around it as described in the Weighting section above. Table 25 lists the different weights (means and standard deviations) given for the data.

A Monte Carlo multivariate sensitivity analysis was conducted to estimate the aggregate uncertainty from the model weight inputs (R software, <http://www.r-project.org>). All weight inputs were varied simultaneously in a

1,000-trial. The input weight parameters (see Table 25) were specified values using symmetrical normal distributions  $N(\mu, \sigma^2)$  (see Table 25 on the following pages) in which the mean  $\mu$  was the weight associated with the data point and the standard variance  $\sigma^2$  captured uncertainty around the weight input parameters. This allowed the determination of 95% prediction intervals. Table 27 collects the values inferred for the different quantities  $Q_i$  obtained through 1,000 Monte Carlo simulations.

**Table 25.** Data used for model and means and standard deviations for the weights given for the different studies  
The extrapolated data are in the boxes with the darkest shading.

### Availability

Study	Year 1 result	Year 2 result	Year 3 result	Year 4 result	Year 5 result	Year 6 result	Year 7 result	Weight (mean $\mu$ )	Weight (SD $\sigma$ )
Pilot: Uganda	75%	75%						0.025	0.003125
Pilot: Angola	75%	100%						0.025	0.003125
Pilot: Tanzania	72.2%	100%						0.025	0.00625
Program: Cambodia	14%	22.67%	31.33%	40%				0.037	0.00925
Program: Rwanda	75%	100%						0.037	0.004625
Program: Senegal	48.8%	97.6%						0.037	0.004625
ACTwatch: Benin	6.6%	13.2%						0.037	0.004625
ACTwatch: Cambodia	1.1%	2.17%	3.25%	4.33%	5.41%	6.5%		0.049	0.01225
ACTwatch: DRC	18.5%	37%						0.037	0.004625
ACTwatch: Madagascar	9.6%	19.2%						0.037	0.004625
ACTwatch: Nigeria	5.57%	11.13%	16.7%					0.049	0.01225
ACTwatch: Uganda	14%	28%						0.037	0.004625
ACTwatch: Zambia	2.7%	5.4%	8.1%					0.037	0.004625
GFATM: Burkina Faso	36%	72%						0.037	0.004625
GFATM: Cambodia	5%	10%	15%	20%	25%			0.049	0.01225
GFATM: Zambia	39.5%	79%						0.037	0.004625
GFATM: Ethiopia	28.33%	56.67%	85%					0.025	0.003125
GFATM: Malawi	94%	100%						0.025	0.003125
GFATM: Peru	0.14%	0.29%	0.43%	0.57%	0.71%	0.86%	1%	0.025	0.003125
Survey (Zurovac 2007): Zambia	59.6%	100%						0.012	0.0015
<b>Condoms</b>									
Survey (Agha 2004): Tanzania	6.25%	12.5%	18.75%	25%	32%	32%		0.037	0.004625
Survey (Agha 2003): Zambia	6.5%	13%	19.5%	26%	32.5%	39%		0.037	0.004625
Survey (Piot 2010): India	19.78%	39.55%	59.33%	79.1%				0.025	0.003125
<b>Water purification</b>									
PSI survey (tablets): Tanzania	13%	26%						0.037	0.00925
PSI survey (liquid): Tanzania	1.5%	3%	4.5%	6%				0.037	0.00925
PSI survey (tablets): Benin	7.5%	35.5%						0.037	0.00925
PSI survey (powder): Uganda	4.1%	8.2%	12.18%	16.24%	20.3%			0.037	0.00925
PSI survey (solution): Uganda	6.59%	13.18%	19.76%	26.35%				0.037	0.00925
PSI survey (tablets): Uganda	9.8%	19.6%	29.4%					0.037	0.00925

## Use

Study	Year 1 result	Year 2 result	Year 3 result	Year 4 result	Year 5 result	Weight (mean $\mu$ )	Weight (SD $\sigma$ )
Pilot: Uganda	16%	32%				0.069	0.00865
Pilot: Kenya	40.2%	80.4%				0.103	0.01285
Pilot: Benin	4.5%	9.0%				0.103	0.01285
ACTwatch: Madagascar	1.2%	2.4%				0.103	0.012875
ACTwatch: Uganda	3.52%	7.04%	10.56%	14.08%	17.6%	0.103	0.012875
ACTwatch: Zambia	4.83%	9.65%	14.48%	19.3%		0.103	0.012875
Survey (Simba 2010): Tanzania	18.8%	37.6%				0.069	0.008625
<b>Zinc</b>							
SUZY Project: Bangladesh	10.3%	10.8%				0.138	0.0345
<b>Vitamin A</b>							
Survey (Zagr� 2002): Burkina Faso	33.3%	66.6%				0.069	0.0345
<b>ORT</b>							
Survey of 40 countries (Forsberg 2007)	0.39%	0.78%				0.138	0.01725

## Market share

Study	Year 1 result	Year 2 result	Year 3 result	Year 4 result	Year 5 result	Year 6 result	Weight (mean $\mu$ )	Weight (SD $\sigma$ )
Pilot: Uganda	51%	69%					0.051	0.01275
Pilot: Angola	38%	76%					0.051	0.006375
Pilot: Tanzania	43.2%	86.4%					0.051	0.006375
Program: Cambodia	4.67%	9.33%	14%	18.67%	23.33%	28%	0.077	0.01925
ACTwatch: Benin	12.1%	24.2%					0.077	0.009625
ACTwatch: Cambodia	9.47%	18.93%	28.4%	37.87%	47.33%	56.8%	0.103	0.02575
ACTwatch: DRC	11.8%	23.6%					0.077	0.009625
ACTwatch: Madagascar	5.6%	11.2%					0.077	0.009625
ACTwatch: Nigeria	21.33%	42.67%	6.4%				0.103	0.02575
ACTwatch: Uganda	2.4%	4.8%					0.077	0.009625
ACTwatch: Zambia	6.67%	13.33%	20%				0.077	0.009625
<b>Condoms</b>								
Survey (Purdy 2006): Indonesia	3.33%	6.67%	10%				0.051	0.051
Survey (Janowitz 1992): Honduras	5%	10%	15%				0.051	0.01275
Survey (Armand 2008): Morocco	1.5%	3%					0.077	0.009625

## Price (US\$)

Study	Year 1 result	Year 2 result	Weight (mean $\mu$ )	Weight (SD $\sigma$ )
Pilot: Uganda	No data	\$0.11–0.43	0.095	0.011875
Pilot: Angola	\$1.00	No data	0.095	0.011875
Pilot: Tanzania	\$0.58	No data	0.095	0.02375
Program: Senegal	\$1.34	No data	0.143	0.017875
ACTwatch: Benin	\$5.68	No data	0.143	0.017875
ACTwatch: DRC	\$3.89	No data	0.143	0.017875
ACTwatch: Madagascar	\$4.04	No data	0.143	0.017875
ACTWatch: Uganda	No data	\$6.12	0.143	0.017875

**Table 26.** Estimates\* derived from a weighted mean approach

Indicator	Year 1	Year 2
Availability (%)	22.2	36.6
Price (US\$)	3.00	3.84
Market share (%)	11.8	21.9
Use (%)	11.8	22.2

\*The estimates for availability, market share, and use show change from baseline. The estimates for price are absolute figures.

**Table 27.** Results of the modeling approach: Estimates\* for the different quantities  $Q_i$  and 95% confidence intervals (C.I.)

Indicator	Year 1 (95% C.I.)	Year 2 (95% C.I.)
Availability (%)	22.3 (20.7–23.8)	36.5 (34.3–38.9)
Price (US\$)	3.00 (2.79–3.22)	3.79 (3.30–4.26)
Market share (%)	11.8 (10.3–13.5)	21.9 (19.6–24.7)
Use (%)	11.8 (10.0–13.4)	22.1 (18.5–25.4)

\*The estimates for availability, market share, and use show change from baseline. The estimates for price are absolute figures.

## Appendix G: Judging the Success of AMFm Phase 1 Across Multiple Parameters Using a Global Fund-Type Approach

Global Fund financing is based on a demand driven and performance-based approach. Country proposals are designed without involvement of the Global Fund. Indicators are selected and targets are set based on the activities proposed by the countries in a performance framework that is a part of the grant agreement. To receive installments on an ongoing basis, recipients of Global Fund grants have to submit progress updates to the Global Fund secretariat. The secretariat monitors grant performance and makes explicit performance decisions and periodic ratings for each progress period (e.g., each semester).

In evaluating grant performance, the Global Fund gives countries ratings from A1 to C (A1 means performance exceeds expectations; A2, expected; B1, adequate; B2 inadequate but potential demonstrated; and C unacceptable).<sup>54</sup> Performance ratings are based on an assessment of results against the targets set by recipient countries, and are also informed by a review of program management and external contextual factors.

In the first step, the quantitative indicator rating is calculated. Quantitative indicator ratings are based on whether a recipient country has reached the targets for the proposed performance indicators (e.g., number of condoms distributed, number of people with advanced HIV receiving antiretroviral therapy). Ten of these indicators are considered as being the most important (the “top 10 indicators”), and are given greater weight in calculating the final quantitative indicator rating.<sup>54</sup> The ratings are based on the mean percentage of target reached for a set of indicators of grant performance, as described below (A1 means the mean percentage was >100%, A2 is 100% to 90%, B1 is 60% to 89%, B2 is 30 to 59%, and C is <30%).

In order to assign these ratings, the Global Fund does the following: (1) it calculates the percentage of target reached for the full list of target performance indicators (e.g., if the target

was to train 590 doctors and nurses in HIV treatment services, and 280 were trained, the percentage of target reached is 47%); and (2) it then calculates a mean achievement percentage for all indicators and also for the top 10 indicators; finally, (3) based on these two means, it generates two indicator ratings, one based on the mean percentage of the top 10 indicators (the “top 10-indicator rating”), and the other based on the mean percentage of all indicators (the “all-indicator rating”). The top 10-indicator rating provides the initial score, which is then adjusted if the all indicator rating differs by two or more rating points. For example, if the mean percentage of the top 10 indicators (i.e., the top 10-indicator rating) is 59%, the initial score is B2. But if the all-indicator rating (the mean percentage of all indicators) is 90%, giving a score of A2, the final score is adjusted upwards to B1.

The quantitative indicator rating is only a starting point for evaluating grant performance. As a second step, the Global Fund reviews the program management and financial performance, and the quantitative indicator rating might be downgraded in cases of negative management issues. In addition, the Global Fund also recognizes external contextual factors when it assigns evaluation scores. Outbreaks of civil war, a sudden government crisis, or a natural disaster could all be taken into account by the Global Fund when ratings are given.

### A Global Fund-Type Approach to Measuring Success in the AMFm Phase 1

An approach similar to the Global Fund’s grant performance rating methodology could be adopted for balancing the different objectives of the AMFm against each other. For AMFm Phase 1, an alternative to a simple BSC approach is to score countries according to how close they came to the goals in the four different quadrants. An example of this kind of scoring system is shown in the tables below.

**Table 28.** A. Global Fund-type approach to scoring success at 1 year in the AMFm (% refers to an increase in percentage points from baseline)

	1 point	2 points	3 points	4 points
<b>Price</b>	QAACT price <400% of the price of the dominant non-QAACT	QAACT price <350% of the price of the dominant non-QAACT	QAACT price <300% of the price of the dominant non-QAACT	QAACT price <250% of the price of the dominant non-QAACT
<b>Availability (increase from baseline)</b>	0%–6%	7%–13%	14%–20%	>20%
<b>Market share (increase from baseline)</b>	0%–5%	5%–10%	10%–15%	>15%
<b>Use (increase from baseline)</b>	0%–3%	3%–5%	5%–10%	>10%

**Table 29.** A Global Fund-type approach to scoring success at 2 year in the AMFm (% refers to an increase in percentage points from baseline)

	1 point	2 points	3 points	4 points
<b>Price</b>	QAACT price <250% of the price of the dominant non-QAACT	QAACT price <200% of the price of the dominant non-QAACT	QAACT price <150% of the price of the dominant non-QAACT	QAACT price <100% of the price of the dominant non-QAACT
<b>Availability (increase from baseline)</b>	10%–20%	20%–30%	30%–40%	>40%
<b>Market share (increase from baseline)</b>	0%–7%	8%–15%	15%–20%	>20%
<b>Use (increase from baseline)</b>	0%–5%	5%–10%	10%–15%	>15%

**Table 30.** Example of quantitative indicator ratings for the AMFm pilots

Score	Number of points
A	14–16
B	11–13
C	8–10
D	4–7

For each year, the maximum number of points that a country could reach is 16. Based on a Global Fund-type approach, countries could then be assigned a final quantitative indicator rating of A to D as shown in Table 30. Similar to the Global Fund methodology, the number of points reached by a country could be the initial starting point for the rating. Contextual factors, such as severe and unexpected changes or the general socioeconomic, political, and environmental context could be considered as a critical element in the rating process. We suggest that taking country contexts into account may be even more critical for the AMFm than for other Global Fund grants, given that AMFm performance benchmarks are not set by countries themselves. For example, given that the distribution of ACTs to remote areas will be particularly challenging in large countries, it would make sense to consider this contextual factor during the rating process.

## Appendix H: Introducing Weighting Factors in Assessing Success in AMFm Phase 1

### Weighting for Market Share

There is a strong argument for giving market share double the weight of the other indicators, given that one key aim of the AMFm is to “crowd out” older antimalarials and artesunate monotherapy. Thus, the four indicators could be weighted as follows: market share, 40%; availability, 20%; price, 20%; and use, 20%.

The weightings are then applied to the initial score that a country receives on the four indicators.

For example, assume that a country receives the following score at year 1: price, 1 point; availability, 1 point; market share, 4 points; use, 1 point. Without any weighting, the total is 7 points, which is a D rating. We could now weight for market share as follows:

$[(1 \text{ point for price} \times 20\%) + (1 \text{ point for availability} \times 20\%) + (4 \text{ points for market share} \times 40\%) + (1 \text{ point for use} \times 20\%)] \times 4$

$$(0.2 + 0.2 + 1.6 + 0.2) \times 4 = 8.8$$

Thus, with weighting for market share, the country’s rating is upgraded to a C rating.

### Weighting for Availability and Price

An alternative argument put forward by some key informants is that price and availability are the two most important indicators of success, and should be weighted more heavily. One way to do that is to weight the four indicators as follows—market share: 10%, availability: 40%, price: 40%, and use: 10%.

The weightings are then applied to the initial score that a country receives on the four indicators.

Assume that a country receives the following score at year 1: price, 3 points; availability, 2 points; market share, 1 point; use, 1 point. Without any weighting, the total is 7 points, which is a D rating. We could now weight for price and availability as follows:

$[(3 \text{ points for price} \times 40\%) + (2 \text{ points for availability} \times 40\%) + (1 \text{ point for market share} \times 10\%) + (1 \text{ point for use} \times 10\%)] \times 4$

$$(1.2 + 0.8 + 0.1 + 0.1) \times 4 = 8.8$$

Thus, with weighting for price and availability, the country is upgraded to a C rating.

## Appendix I: Aggregating the Results of the National Programs to Assess the Overall Performance of the AMFm

Our Global Fund-type approach laid out in Appendix F could also be used to assess the overall performance of the AMFm Phase 1 at years 1 and 2.

Given that Zanzibar and mainland Tanzania submitted separate applications, we could look at the overall aggregated performance of the nine applicants at year 1 and year 2. The maximum possible aggregate score each year would be (16 x 9) points, i.e., 144 points each year. This aggregate score could be used to assist in determining the overall performance of the AMFm Phase 1. An example is shown in the table below.

**Table 31.** An aggregate score for the overall performance of AMFm Phase 1

Score	Number of points
A	118–144
B	91–117
C	64–90
D	36–63

The overall success of AMFm Phase 1 could also be judged by rating the four indicators separately; a suggested way of doing this is shown in the table below. For example, the overall performance of AMFm Phase 1 at 2 years could be a B for market share, a B for price, an A for availability, and a C for use.

**Table 32.** Judging the overall score of AMFm Phase 1 using four separate indicators

Availability		Price		Use		Market share	
Score	Points	Score	Points	Score	Points	Score	Points
A	31–36	A	31–36	A	31–36	A	31–36
B	23–30	B	23–30	B	23–30	B	23–30
C	17–23	C	17–23	C	17–23	C	17–23
D	9–16	D	9–16	D	9–16	D	9–16

# Endnotes

- <sup>1</sup> ICF Macro, London School of Hygiene & Tropical Medicine, 2010: Independent Evaluation of the Affordable Medicines Facility—malaria (AMFm) Phase 1. Inception Report.
- <sup>2</sup> Moon S., et al. 2009: Focusing on Quality Patient Care in the New Global Subsidy for Malaria Medicines. *PLoS Med* 6(7): e1000106.
- <sup>3</sup> Global Fund to Fight AIDS, Tuberculosis and Malaria: Affordable Medicines Facility—malaria: Monitoring and Evaluation Technical Framework (Phase 1), Geneva, July 31, 2009.
- <sup>4</sup> The Evidence-to-Policy initiative (E2Pi) conducts independent analysis and synthesis of evidence to help address critical policy/strategic questions in global health, <http://e2pi.org>, (accessed January 13, 2011).
- <sup>5</sup> A fifth small pilot, financed by PMI, has been conducted in Tanzania but data on this pilot are not available.
- <sup>6</sup> Sabot, O.J., et al. 2009: Piloting the Global Subsidy: The Impact of Subsidized Artemisinin-Based Combination Therapies Distributed through Private Drug Shops in Rural Tanzania. *PLoS ONE* 4(9): e6857.
- <sup>7</sup> Medicines for Malaria Venture, 2010: The impact of subsidized ACTs in Uganda's private sector. CAPSS1 MoH-MMV Pilot, preliminary findings, presentation, Kampala, June 2, 2010. MMV shared additional unpublished data with us.
- <sup>8</sup> Kangwana, B., et al. The Impact of Retail Sector Delivery of Artemether-Lumefantrine on Malaria Treatment of Children under Five in Kenya—a Cluster Randomized Controlled Trial. Unpublished paper, which Beth Kangwana shared with E2Pi in 2010.
- <sup>9</sup> MENTOR Initiative: Preliminary 3rd Quarter Report, April 2010–June 2010. Pilot study: Private Sector Distribution of Artemisinin-Based Combination Therapy (ACT) in Angola, July 2010.
- <sup>10</sup> <http://www.psi.org/our-work/healthy-lives/malaria/about> (accessed November 15, 2010).
- <sup>11</sup> Cohen, J., et al. 2010: A pharmacy too far? Equity and spatial distribution of outcomes in the delivery of subsidized artemisinin-based combination therapies through private drug shops. *BMC Health Services Research* 10: (Suppl. 1): S6 doi:10.1186/1472-6963-10-S1-S6. Three variables were independent predictors of whether a shop ever stocked ACTs (all  $p < 0.01$ ): the number of surveys in which the drug shop participated; the distance from the shop to the next town; and the average distance to the three nearest neighboring shops.
- <sup>12</sup> Kone, K.G., et al. 2007: Subsidized ACTs available for sale in private drugstores: experience in Senegal. Institut de Recherche pour le Développement, Paris.
- <sup>13</sup> Ongolo-Zogo, P., Bonono R.C., 2010: Policy brief on improving access to artemisinin-based combination therapies for malaria in Cameroon. *International Journal of Technology Assessment in Health Care* 26:2, 237–241; Ongolo-Zogo, P., 2009: Access to ACT, challenges for public health decision-makers, in: Cameroon Coalition against Malaria: About Malaria, Newsletter, October 2009. Available at [http://www.cameroon-coalition-malaria.org/sites/cm-en/data/files/ccam\\_newsletter3.pdf](http://www.cameroon-coalition-malaria.org/sites/cm-en/data/files/ccam_newsletter3.pdf) (accessed June 29, 2010).
- <sup>14</sup> Global Fund to Fight AIDS, Tuberculosis and Malaria: Rwanda Application Form, Affordable Medicines Facility—malaria. Available at <http://www.theglobalfund.org/programs/search/index.aspx?search=2&lang=en&doctype=AMFm> (accessed May 27, 2010).
- <sup>15</sup> Sabot, O.J., et al. 2009: Distribution of artemisinin-based combination therapies through private sector channels: Lessons from four country case studies. Available at [http://www.rff.org/RFF/Documents/RFF-DP-08-43\\_FINAL.pdf](http://www.rff.org/RFF/Documents/RFF-DP-08-43_FINAL.pdf) (accessed May 27, 2010).
- <sup>16</sup> Population Services International, 2008: Cambodia. MAP Study Evaluating the Coverage and Quality of Coverage of Malaria Prevention and Treatment Products in Endemic Areas, January 2008, Phnom Penh.
- <sup>17</sup> ACTwatch: Outlet Survey Report (Baseline) Kingdom of Cambodia June 2009–July 2009; ACTwatch: Got ACTs? Informing the Evidence Gap in Cambodia. Presentation by Sochea Phok. Available at [http://www.actwatch.info/countries/country\\_results.asp?00=&01=29](http://www.actwatch.info/countries/country_results.asp?00=&01=29) (accessed June 8, 2010).
- <sup>18</sup> World Health Organization and Health Action International 2007: Medicine Prices in Africa. Analysis of findings from 11 countries in the WHO African region. Available at [http://www.haiweb.org/medicineprices/pdf/Africa-synthesis-report-FINAL\\_10-September-2007.pdf](http://www.haiweb.org/medicineprices/pdf/Africa-synthesis-report-FINAL_10-September-2007.pdf) (accessed November 15, 2010).
- <sup>19</sup> Allen, H, 2010: Accessible drugs, responsible providers, informed customers. Covering the last mile for malaria treatment. Presentation by PSI Cambodia, Zaragoza, March 2010.
- <sup>20</sup> Private Sector Malaria Case Management: Experience from 7 years of implementation in Cambodia. Presented by Sochea Phok at the RBM Working Group on Case Management, July 8–9, 2009, Geneva.
- <sup>21</sup> D'Acromont, V., et al. 2009: Time To Move from Presumptive Malaria Treatment to Laboratory-Confirmed Diagnosis and Treatment in African Children with Fever. *PLoS Med* 6(1): e252.
- <sup>22</sup> Stock-outs have also been documented recently in Kenya. In a national survey conducted 2 years after ACT (AL) was introduced, Kangwana and colleagues found that a quarter of surveyed facilities had none of the four AL weight-specific treatment packs in stock. Kangwana, B., et al. 2009: Malaria drug shortages in Kenya: a major failure to provide access to effective treatment. *Am J Trop Med Hyg.* 80: 5, 737–8.
- <sup>23</sup> The Global Fund: The Five-Year Evaluation of the Global Fund. Study area 3: Impact on HIV, TB, and malaria. Available at <http://www.theglobalfund.org/en/terg/evaluations/5year/> (accessed May 27, 2010).

- <sup>24</sup> Zurovac, D., et al. 2005: Treatment of paediatric malaria during a period of drug transition to artemether-lumefantrine in Zambia: cross-sectional study. *BMJ* 331:734; Zurovac, D., et al. 2007: Paediatric malaria case-management with artemether-lumefantrine in Zambia: a repeat cross-sectional study. *Malaria Journal* 6:31.
- <sup>25</sup> [http://www.childinfo.org/malaria\\_tables1.php](http://www.childinfo.org/malaria_tables1.php) (accessed November 15, 2010).
- <sup>26</sup> Worrall, E., et al. 2005: Is malaria a disease of poverty? A review of the literature. *Trop Med & Int Health* 10:10, 1047–1059.
- <sup>27</sup> Barat, L. M., et al. 2004: Do malaria control interventions reach the poor? A view through the equity lens. *Am. J. Trop. Med. Hyg.* 71: 2s, 174–178.
- <sup>28</sup> Schellenberg, J.A., et al. 2003: Inequities among the very poor: Health care for children in rural southern Tanzania. *Lancet* 361: 561–566.
- <sup>29</sup> Meekers, D., Rahaim, S., 2005: The importance of socio-economic context for social marketing models for improving reproductive health: Evidence from 555 years of program experience. *BMC Public Health* 5:10.
- <sup>30</sup> Piot, B., et al. 2010: Lot quality assurance sampling for monitoring coverage and quality of a targeted condom social marketing programme in traditional and non-traditional outlets in India. *Sex Transm Infect* 86(Suppl 1):i56–61.
- <sup>31</sup> Agha, S., Meekers, D. 2004: The availability of socially marketed condoms in urban Tanzania 1997–1999. *J Biosoc Sci* 36:127–140.
- <sup>32</sup> Agha, S., Kusanthan, T., 2003: Equity in access to condoms in urban Zambia. *Health Policy and Planning* 18:3, 299–305.
- <sup>33</sup> [http://www.psi.org/sites/default/files/publication\\_files/672-tanzania\\_map\\_h2o\\_smrs.pdf](http://www.psi.org/sites/default/files/publication_files/672-tanzania_map_h2o_smrs.pdf) (accessed November 15, 2010).
- <sup>34</sup> [http://www.psi.org/sites/default/files/publication\\_files/2009-benin\\_map\\_h20\\_ors\\_msr.pdf](http://www.psi.org/sites/default/files/publication_files/2009-benin_map_h20_ors_msr.pdf) (accessed November 15, 2010).
- <sup>35</sup> [http://www.psi.org/sites/default/files/publication\\_files/2009-uganda\\_map\\_sws.pdf](http://www.psi.org/sites/default/files/publication_files/2009-uganda_map_sws.pdf) (accessed November 15, 2010).
- <sup>36</sup> Purdy, C., 2006. Fruity, fun and safe: creating a youth condom brand in Indonesia. *Reproductive Health Matters* 14:127–134.
- <sup>37</sup> Janowitz, B., et al. 1992: Impact of social marketing on contraceptive prevalence and cost in Honduras. *Stud Fam Plann.* 23: 2,110–7.
- <sup>38</sup> [http://www.dfidhealthrc.org/publications/srh/SM\\_Annex5.pdf](http://www.dfidhealthrc.org/publications/srh/SM_Annex5.pdf) (accessed November 15, 2010).
- <sup>39</sup> Larson, C.P., et al. 2009: Impact monitoring of the national scale up of zinc treatment for childhood diarrhea in Bangladesh: repeat ecologic surveys. *PLoS Med* 6(11): e1000175.
- <sup>40</sup> Zagré, N.M., et al. 2002: Changes in vitamin A intake following the social marketing of red palm oil among children and women in Burkina Faso. *Sante* 12(1): 38–44.
- <sup>41</sup> Ciszewski, R., Harvey, P., 1994: The effect of price increases on contraceptive sales in Bangladesh. *J Biosoc Sci* 26:25–35.
- <sup>42</sup> Armand, F., 2003: Social marketing models for product-based reproductive health programs: a comparative analysis. Washington, D.C., USAID/Commercial Market Strategies project.
- <sup>43</sup> Agha, S., et al. 2005: When Donor Support Ends: The Fate of Social Marketing Products and the Markets They Help Create. Bethesda, Maryland: Abt Associates Inc.
- <sup>44</sup> Armand, F., 2008: The Manufacturer's Model: History, Lessons Learned and Beyond. At <http://www.psp-one.com/content/resource/detail/5029/> (accessed November 15, 2010).
- <sup>45</sup> Snyder J.D., Merson M., 1982: The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data. *Bull World Health Organ* 60:605–13.
- <sup>46</sup> World Health Organization, 1989: Programme for Control of Diarrhoeal Diseases. Seventh Programme Report. 1988–1989, Geneva, WHO document WHO/CDD/90.34.
- <sup>47</sup> Forsberg, B.C., et al. 2007: Diarrhea case management in low- and middle-income countries—an unfinished agenda. *Bull World Health Organ* 85:42–48.
- <sup>48</sup> <http://www.rbm.who.int/partnership/tf/globalsubsidy/AMFmTechProposal.pdf> (accessed November 15, 2010).
- <sup>49</sup> <http://www.nation.co.ke/News/regional/War%20on%20malaria%20gets%20boost/-/1070/980090/-/15alweo/-/index.html> (accessed September 26, 2010).
- <sup>50</sup> <http://www.nation.co.ke/News/Overpriced%20medicines%20%20sabotage%20malaria%20war%20%20/-/1056/1050364/-/ueb5w7z/-/index.html> (accessed November 15, 2010).
- <sup>51</sup> Patouillard, E., et al. 2010: Retail sector distribution chains for malaria treatment in the developing world: a review of the literature. *Malaria Journal* 9:50.
- <sup>52</sup> Kaplan R.S., Norton D.P. 1996: *The Balanced Scorecard: Translating Strategy into Action* Boston: Harvard Business School Press.
- <sup>53</sup> Hansen P.M. et al. 2008: Measuring and managing progress in the establishment of basic health services: the Afghanistan health sector balanced scorecard. *Int J Health Plann Manage.* 23:107–17.
- <sup>54</sup> <http://www.theglobalfund.org/en/performancebasedfunding/methodology/?lang=en> (accessed 27 May, 2010)
- <sup>55</sup> [http://www.theglobalfund.org/documents/me/TopTenIndicatorsCard\\_en.pdf](http://www.theglobalfund.org/documents/me/TopTenIndicatorsCard_en.pdf) (accessed 27 May, 2010)