



Cambodia has seen a general decline in clinically diagnosed cases of malaria and case fatality over the past decade, coupled with a significant and steady decrease in overall malaria prevalence. A diverse range of interventions has been undertaken with the goal of achieving pre-elimination of malaria across Cambodia by 2015 and phased elimination of all forms of malaria in Cambodia by 2025. Resistance to artemisinins was identified and confirmed on the Cambodia–Thailand border in a series of studies conducted between 2001 and 2009. Delayed parasite clearance following treatment with ACTs has since been observed in some areas of Cambodia, Myanmar, Thailand and Vietnam, indicating the presence of artemisinin resistant malaria in the Greater Mekong Sub-Region.

Cambodia has recently designed and implemented policy and strategy changes to improve coverage of appropriate case management and address the threat of artemisinin drug resistance. The National Centre for Entomology, Parasitology and Malaria Control (CNM) has stratified the country into four zones: 1) Zone 1 - areas where artemisinin tolerance has been detected; 2) Zone 2 - areas with no evidence of drug tolerance but considered at risk (known as a 'buffer' area); 3) Zone 3 - malaria endemic provinces with relatively high malaria prevalence, but without evidence of resistance; and 4) 'No zone' – malaria endemic provinces with relatively low malaria prevalence. Significant policy changes include:

- A shift in the first-line therapy for *Plasmodium falciparum* (Pf) malaria from the artemisinin-based combination therapy (ACT) artesunate mefloquine (ASMQ) to ASMQ or dihydroartemisinin piperazine (DHA-PPQ) occurred in 2012 following targeted use of DHA-PPQ since 2009 in artemisinin resistance containment areas. Malaria case management using ASMQ or DHA-PPQ also includes treatment with primaquine (PQ). Atovaquone proguanil (Malarone) is authorized for use in Zone 1. The first-line therapy for *Plasmodium vivax* changed from chloroquine to DHA-PPQ plus PQ in 2012.
- Malaria rapid diagnostic tests (RDT) have been scaled-up to facilitate confirmatory testing before antimalarial treatment.
- The Village Malaria Worker (VMW) program has been scaled-up to improve access to appropriate fever case management; blood testing and treatment are provided free-of-charge through VMWs.
- The sale of oral artemisinin monotherapy was banned in 2009.
- Increased regulation of private sector sale of antimalarials and RDTs has been enforced.

The ACTwatch outlet surveys conducted in 2009, 2011, 2013, and planned for 2015 are designed to monitor key antimalarial market indicators at national level and across three research domains defined by the CNM stratification: Zone 1, Zone 2, and Zone 3 plus 'No zone.' The objective of the outlet survey is to monitor levels and trends in the availability, volumes, price and use of antimalarials, as well as outlet providers' perceptions and knowledge of antimalarial medicines.

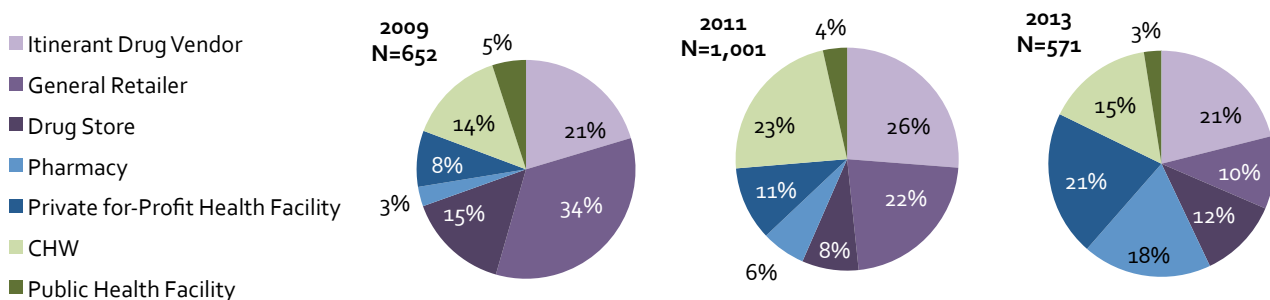
This documents aims to present the main findings of the 2013 outlet survey, as well as trends across time using data from the 2009, 2011 and 2013 surveys.

METHODS

A nationally-representative antimalarial outlet survey was conducted in Cambodia from September 2 to October 14, 2013. A representative sample of communes was selected from each of three research domains defined by CNM stratification: Zone 1, Zone 2, and Zone 3 plus 'No Zone'. Within selected communes, a census of all outlets with the potential to sell or distribute antimalarials and/or provide malaria blood testing was completed. The geographic area for the census was extended to the district level for public health facilities in order to obtain a sufficient sample size for indicator estimates within this outlet type. Outlets were screened to determine eligibility. Outlets eligible for the survey met at least one of three criteria: 1) one or more antimalarials were in stock on the day of the survey; 2) one or more antimalarials were in stock in the three months preceding the survey; and/or 3) malaria blood testing (microscopy or RDT) was available. Outlets that do not serve the general public (e.g. military facilities) were excluded from the study. A structured questionnaire was used to complete an audit of all antimalarials and RDTs as well as a provider interview. Double data entry was completed using Microsoft Access and Stata 12.1 (©StataCorp, College Station, TX) was used for all analyses. Data were weighted to account for variation in probability of outlet selection, and standard error calculation reflected clustering of outlets at commune and district levels. Standard indicators were constructed according to definitions applied across ACTwatch project countries.

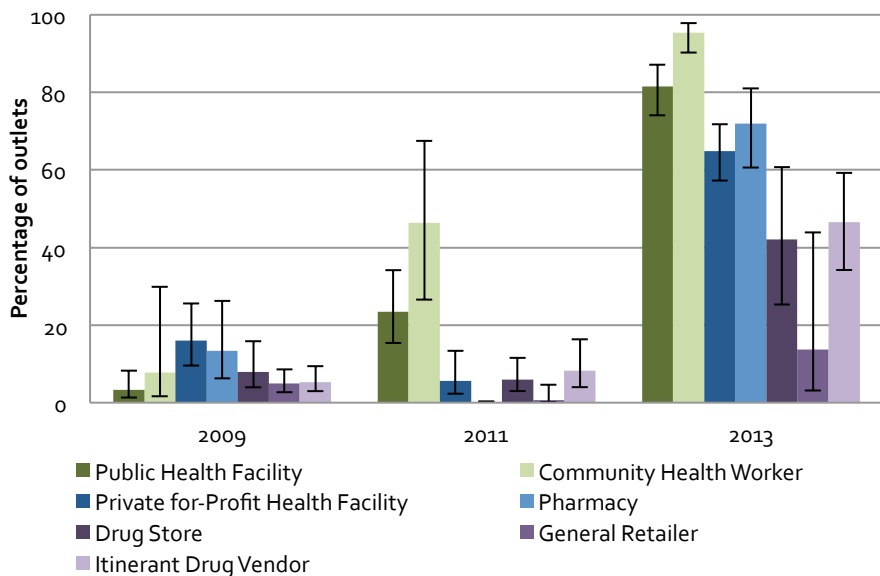
RESULTS

Figure 1. Market composition: outlet type distribution



The majority of antimalarial-stocking outlets were private sector outlets across survey rounds. Private sector market composition shifted over time towards increasing contribution from formal regulated private sector outlet types (private for-profit health facilities and pharmacies), and declining contribution from informal unregulated private outlet types (drug stores, general retailers, and itinerant drug vendors).

Figure 2. Percentage of antimalarial-stocking outlets with DHA-PPQ in stock on the day of the survey



The percentage of antimalarial-stocking outlets with the ACT DHA-PPQ in stock on the day of the survey increased across survey rounds. In 2013, most antimalarial-stocking public health facilities (85%), CHWs (95%), private health facilities (65%), and pharmacies (72%) had DHA-PPQ in stock. Availability was lower among drug stores (42%), general retailers (14%), and itinerant drug vendors (47%).

Figure 3. Percentage of antimalarial-stocking outlets with oral artemisinin monotherapy in stock on the day of the survey

The percentage of private sector antimalarial-stocking outlets with oral artemisinin monotherapy in stock on the day of the survey decreased over time. In 2013, availability was limited to 0.6% among private for-profit health facilities, and 5.2% among itinerant drug vendors.

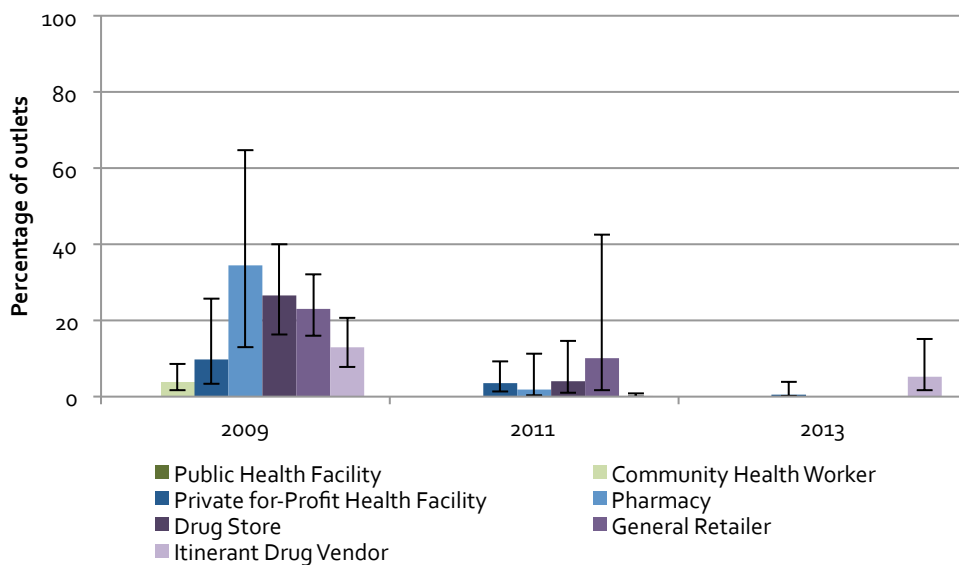
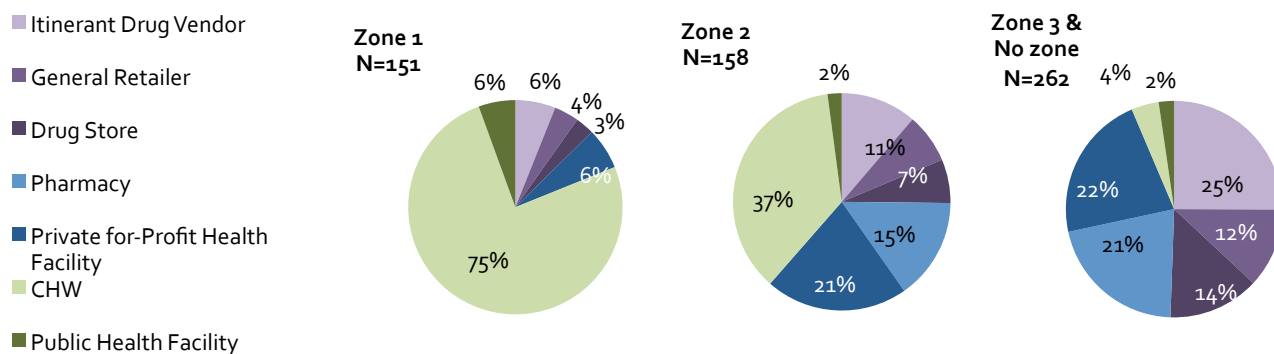
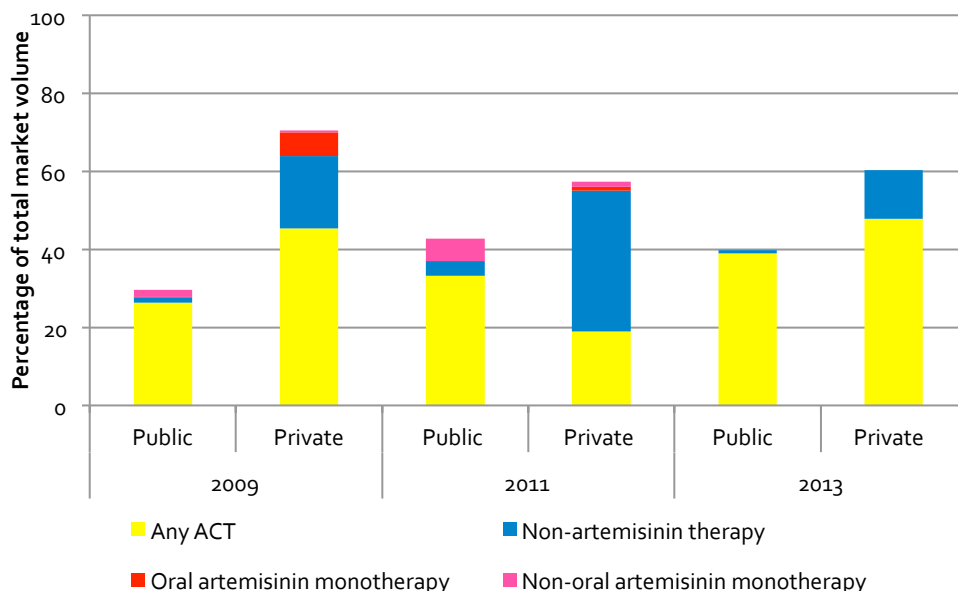


Figure 4. Market composition: outlet type distribution



Antimalarial market composition varied across research domains in 2013. Most antimalarial-stocking outlets in Zone 1 were CHWs (75%) and private sector outlets accounted for less than 20% of the market composition. In Zone 2, the private sector accounted for approximately 60% of antimalarial-stocking outlets, and CHWs for over one-third (37%) of the market composition. In the third research domain comprised of Zone 3 and 'No zone' areas, nearly all antimalarial-stocking outlets were private sector outlets.

Figure 5. Antimalarial market share: Relative market volume (sale/distribution) of antimalarial Adult Equivalent Treatment Doses (AETDs), by sector and antimalarial class, across survey rounds



At the national level, public sector antimalarial market share increased over time from 30% in 2009 to 40% in 2011. ACT relative market share decreased between 2009 (72%) and 2011 (52%), and increased to 87% in 2013. Oral artemisinin monotherapy accounted for 6% of total antimalarial market volume in 2009 and 1% in 2011, but was no longer reportedly sold/distributed in 2013.

Figure 6. Antimalarial market share, 2013: Relative market volume (sale/distribution) of antimalarial AETDs, by sector and antimalarial class, across research domains

Public sector market share differed across research domains, ranging from 93% in Zone 1 to 35% in Zone 3 & 'No zone.' The non-artemisinin therapy distributed in Zone 1 is atovaquone proguanil, while in Zone 3 & 'No zone,' non-artemisinin therapy distributed by the private sector was primarily chloroquine.

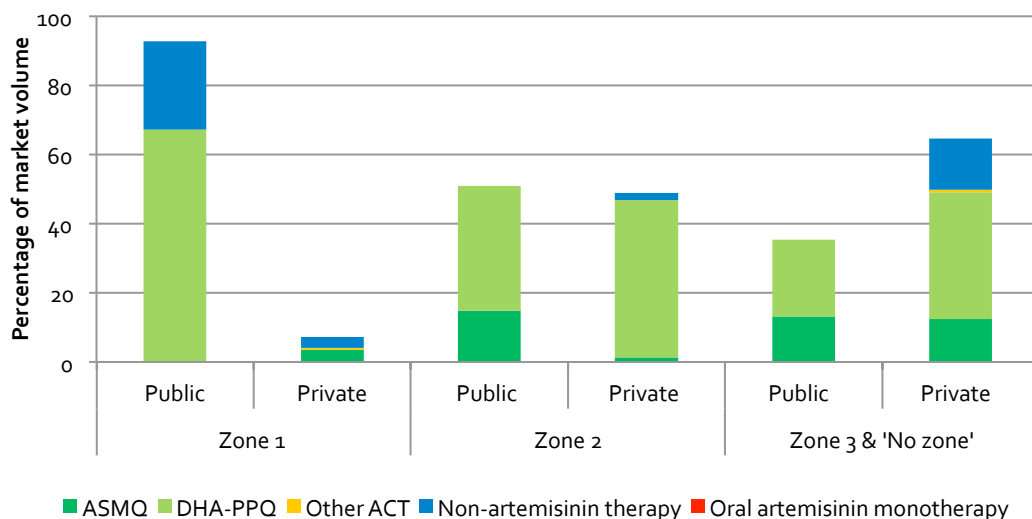
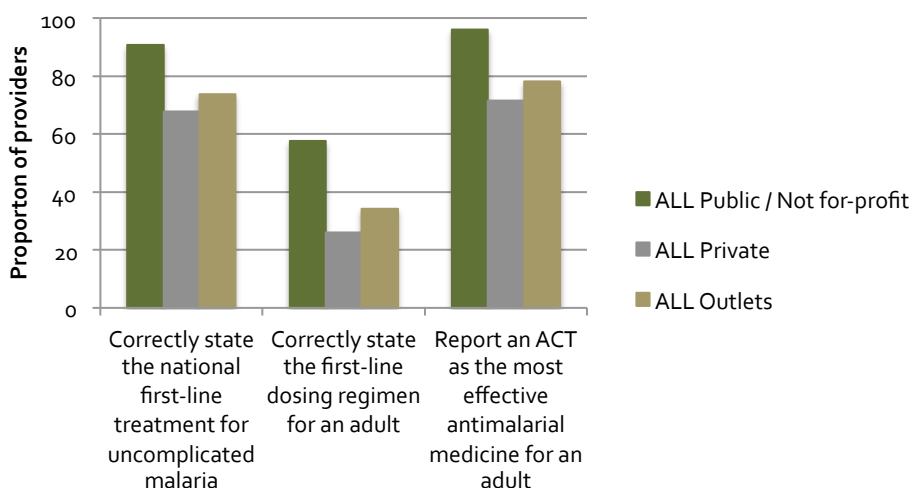


Figure 7. Provider antimalarial treatment knowledge and practices, by outlet type



Knowledge of the first-line treatment was slightly higher in the public sector, but remained high in the private sector. Less than 60% (57.7%) of providers in the public sector and just over a quarter of private sector providers knew the correct dosing regimen for an adult.

CONCLUSIONS

Overall, the results presented here show the successful implementation of recent shifts in policy, as well as the significant and positive impact of regulatory actions.

Indeed, figure 1 shows the shift in private sector market composition towards formal regulated outlet types: in 2009, unregulated private sector outlets (itinerant drug vendors, general retailers and drug stores) accounted for 70% of antimalarial-stocking outlets, a proportion that went down to 43% in 2013. In the same time, the proportion of formal private sector outlets (private for-profit health facilities and pharmacies) increased from 11% to 39%. Following the 2012 policy change, DHA-PQ is now available in most public and formal private sector antimalarial-stocking outlets (figure 2). Figures 3 and 5 show the success of the government-enforced ban on oral artemisinin monotherapy, as illustrated by the drastic decrease in the proportion of private sector outlets stocking monotherapy in figure 3 and the increasing relative market share of ACT compared to oral artemisinin monotherapy in figure 5.

These survey results also illustrate the successful implementation of tailored interventions between geographic zones under the artemisinin-resistance containment program. Village Malaria Workers have been successfully deployed in Zone 1, where they represent 75% of antimalarial-stocking outlets (figure 4). Moreover, the private sector now only represents 19% of antimalarial-stocking outlets in that area, compared to 51% on Zone 2 and 94% in Zone 3 & No-zone (figure 6).

The data also provides insight into the impact of widespread ACT stock-outs in 2011 that occurred especially in the private sector – whilst this did not seem to impact where patients sought treatment, it did impact the type of treatment accessed and explains the increase in non-artemisinin therapy (mainly chloroquine) observed in 2011 (figure 5). Finally, the results summarized here point to the continuing role of the private sector outside of Zone 1, particularly in Zone 3 and no-zone.

In summary, these results demonstrate the successful implementation of a number of significant policy changes in the recent years in Cambodia, as well as the feasibility of deploying specific interventions to targeted geographical areas. They also illustrate how ACTwatch evidence can be used to inform, monitor and assess impact of resistance containment policies and interventions in Cambodia and elsewhere in the region.

CONTACT

ACTwatch is a multi-country research project implemented by PSI (www.psi.org) designed to provide timely, relevant, and high quality antimalarial market evidence. Standardized tools and approaches are employed to provide comparable data across countries and over time, with the goal to inform and monitor national and global policy, strategy, and funding decisions for improving malaria case

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