



Madagascar

Improving Malaria Prevention, Diagnosis and Treatment by Investing in Supply Chains: Support under the USAID | DELIVER PROJECT



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The USAID | DELIVER PROJECT, Task Order 7, is funded by USAID, implemented by John Snow, Inc., and supports USAID's implementation of malaria prevention and treatment programs by procuring, managing, and delivering high-quality, safe, and effective malaria commodities; providing on-the-ground logistics capacity, technical assistance, and pharmaceutical management expertise; and offering technical leadership to strengthen the global supply, demand, and financing of malaria commodities.

No Product, No Program

The USAID | DELIVER PROJECT (the project) strengthened global, regional, and in-country supply chains to improve and expand the delivery of public health commodities to the people who need them. Under the Malaria Task Order, with funding from the President's Malaria Initiative (PMI), the project was responsible for procuring and distributing antimalarial commodities—long-lasting insecticide-treated bed nets (LLINs), rapid diagnostic tests (RDTs), artemisinin-based combination therapies (ACTs), and sulfadoxine pyrimethamine (SP)—to PMI-supported country programs. The project worked to improve the global supply and availability of antimalarial commodities and to bolster in-country supply systems.

The project's antimalarial commodities contributed to the reduction of morbidity and mortality due to malaria by preventing transmission, preventing cases among pregnant women, improving diagnosis, and providing treatment. The project worked across the logistics cycle (shown in figure 1) to ensure malaria products were available when and where needed.

The USAID | DELIVER PROJECT
has procured commodities
for Madagascar to¹:

Treat **2.9 MILLION**
malaria cases with ACTs

Test **10.2 MILLION**
suspected malaria cases with RDTs

Prevent malaria in pregnancy with
2.2 MILLION
SP Tablets

Protect against malaria with
15.9 MILLION
LLINs

Figure 1. The Logistics Cycle



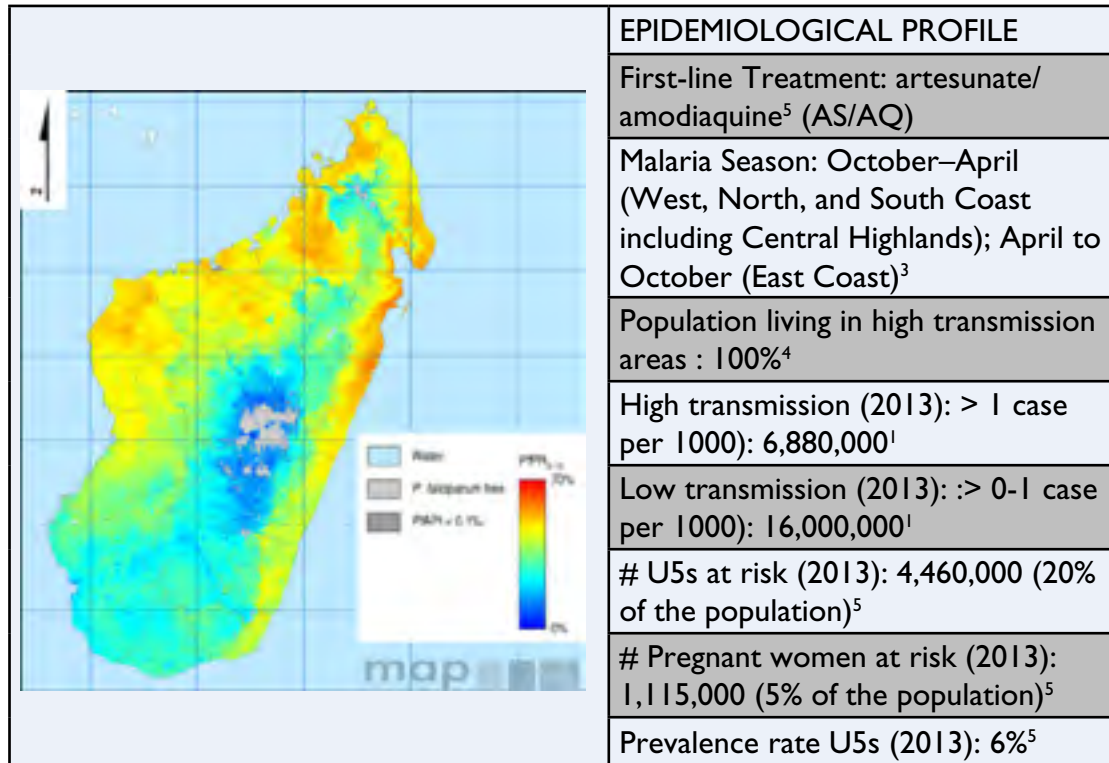
Malaria in Madagascar

Malaria is endemic in 90 percent of Madagascar, with transmission occurring year-round in the north. Elsewhere, stronger seasonal peaks occur between May and October. Between 2000 and 2014, malaria admissions and deaths declined overall (figure 2),¹ with deaths due to malaria in

hospitals decreasing from a high of 17 percent in 2003 to a low of 10 percent in 2011.² There was also a marked decline in reported malaria cases over the same period.²

While reported malaria deaths and cases have fallen nationally, morbidity from malaria among children remains high, with a national average of 6 percent and large geographical variations. In 2012, 5 percent of Malagasy's under-five children (U5s) admitted to a hospital were diagnosed with severe malaria. Severe malaria is among the four leading causes of reported deaths among children.³ Figure 3 shows the spatial distribution of plasmodium falciparum malaria endemicity in 2010.

Figure 3. Spatial Distribution of Plasmodium Falciparum Malaria Endemicity, Madagascar 2010⁴



¹ World Malaria Report, 2014. Accessible at: http://www.who.int/malaria/publications/world_malaria_report_2014/wmr-2014-profiles.pdf.

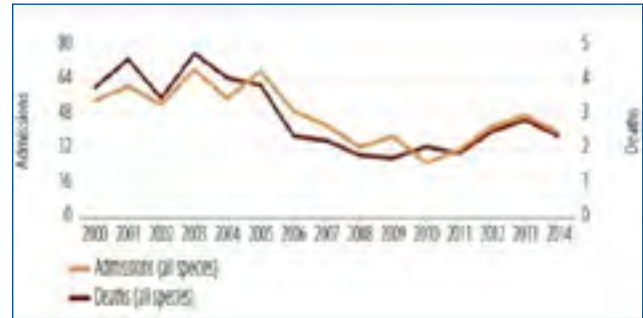
² National Health Management Information System, Madagascar, 2003-2011.

³ MIS 2013.

⁴ Malaria Atlas Project, 2010.

⁵ Enquête sur les Indicateurs du Paludisme (EIPM), 2013.

Figure 2. Malaria Admissions and Deaths Per 1,000 In Madagascar¹



The USAID | DELIVER PROJECT in Madagascar

Malaria programs rely on strong supply chains to provide adequate quantities of quality commodities. Toward this goal, the project worked to strengthen the supply chain as part of efforts to reduce malaria incidence and mortality.

The project began working in Madagascar in 2008; due to the 2009 political unrest, non-humanitarian assistance to the Malagasy government, including several PMI activities for fiscal year 2008, was suspended based on USG legislative and policy restrictions.⁶ PMI fiscal year 2009 funds were reprogrammed to activities, using international and local NGOs as implementing partners,⁷ so the project could continue to work toward achieving the Global Health Initiative objective of reducing malaria-related mortality by 70 percent by the end of 2015. With USAID and PMI support, the project procured and managed malaria commodities, making them available to the project's four faith-based NGO partners and community organizations. By 2014, and because of an internationally recognized free and fair December 2013 presidential election, restrictions on working directly with the government health system of Madagascar were lifted. The 2015 Malaria Operational Plan was the first to be developed with the perspective of re-engaging the Malagasy Ministry of Health (MOH) from the central level to the primary health facility level since 2009.

In 2009 and 2013, the project worked closely with the National Malaria Control Program (NMCP) and the National Coordination Committee to coordinate national LLIN campaigns. In addition, the project worked with PMI and Roll Back Malaria partners to coordinate supply chain activities and improve systems in-country. With the lifting of all restrictions on direct assistance to the Government of Madagascar, the project progressively transitioned the management of commodities from the NGO partners to the public sector supply chain, composed of SALAMA (central medical stores), district pharmacies, and health facility stores. Once the transition is complete, health facilities will be able to resupply the CHWs, and districts will be able to resupply the faith-based health facilities. In summary, the project provided technical assistance to support:

- Data visibility.
- Strengthening in-country systems, including:
 - Supply chain system analysis and design.
 - Establishing a logistics management unit (LMU).
- Distribution of LLINs and an LLIN recycling project.

⁶ Congressional Research Service, Madagascar's Political Crisis, June 2012. Accessed March 27, 2014. <http://fas.org/sgp/crs/row/R40448.pdf>.

⁷ UNICEF, Integrating Communication for Development within Malaria Programming to Control Malaria's Impact among Children and Pregnant Women, 2014.

Improving data visibility and strengthening in-country systems

After resuming bilateral cooperation with the government of Madagascar in 2014, the project provided support to MOH and NMCP in efforts aimed at improving product availability in-country through the procurement and delivery of high-quality malaria products and strengthening the systems that manage them.

In November and December 2014, the project conducted a quantitative assessment using the Logistics Indicator Assessment Tool to determine the availability of six key malaria tracer commodities at service delivery points and district warehouses.

As shown in figure 4, availability of AS/AQ formulations was generally high at the district level and basic health center (*centre de santé de base*, or CSB) level, and most facilities had all four formulations in stock on the day of visit. Compared to AS/AQ formulations, availability of SP and RDTs was relatively low across both levels. Among facilities that reported managing them, stockouts among malaria products were relatively low, ranging from 14–22 percent for AS/AQ presentations (table 1). An exception to this observation was RDTs, which were stocked out in 60 percent of districts and 29 percent of facilities that managing RDTs (table 1).

Figure 4. Management and Availability of Malaria Products by Level on Day of Visit, 2014

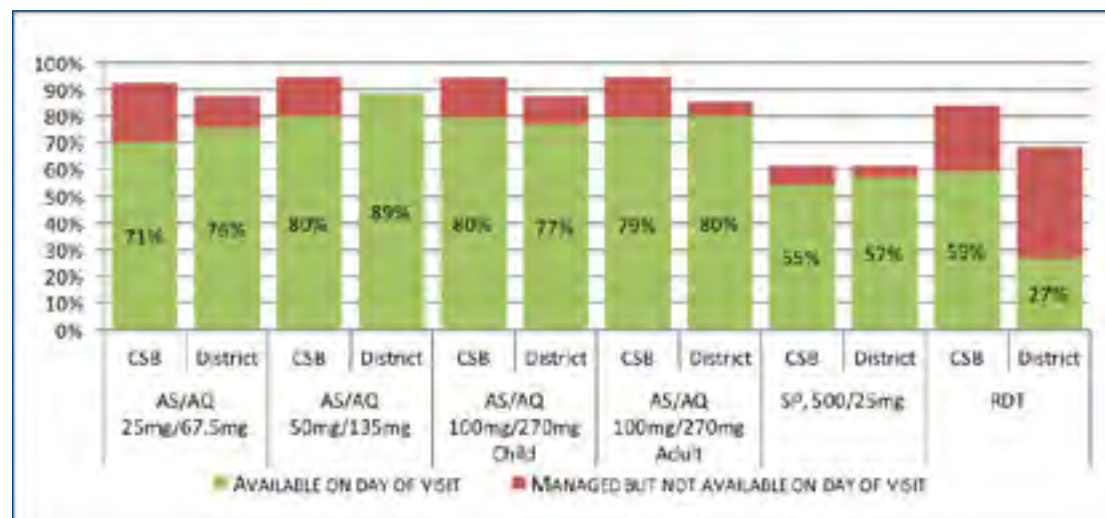


Table 1. Percentage of Facilities Stocked Out of Malaria Products on The Day of the Visit, 2014

	Total	CSB	District	Hospital	Central Store
AS/AQ 25mg/67.5mg	22	23	13	29	0
AS/AQ 50mg/135mg	14	15	0	22	100
AS/AQ 100mg/270mg Child	15	15	11	20	100
AS/AQ 100mg/270mg Adult	16	16	7	29	100
SP	13	11	7	42	100
RDT	34	29	60	41	0

Supporting LLIN recycling pilot project

Between 2004 and 2010, approximately 380 million LLINs were distributed in Africa to combat the spread of malaria (WHO 2010 report). LLINs have an estimated lifespan of three-to-five years (or twenty washes), and need to be replaced accordingly to ensure effective protection against malaria. The continued presence of LLINs in communities as they approach or surpass retirement has numerous implications for the environment, including effects on insecticide resistance (WHO 2010) and the uptake in usage of new nets.

In 2010, the project conducted an LLIN recycling pilot in six districts in Madagascar—the first of its kind—that examined the viability of recycling for LLINs that have been retired from use, with implications for countries throughout Africa. Madagascar and two other countries in Africa conducted the pilot study, which was funded by WHO and the United Nations Environment Program. Madagascar's pilot project was divided into three phases: Phase I – Feasibility and Pre-Collection; Phase II – LLIN Collection; and Phase III – Recycling and Final Analysis.

- Phase I took place in March 2010, with the objective of examining the feasibility of conducting a recycling pilot project in Madagascar.
- Phase II took place in November 2010, shortly after the net distribution campaign. More than 22,000 retired LLINs were collected, sorted, and shipped to Trex (a US-based manufacturer of wood-alternative decking products) for recycling.
- Phase III concluded in 2011 and comprised ongoing collection of LLINs from Madagascar and shipping them to the Trex facility in the U.S. for extensive testing and recycling some of the nets into a bio-composite plastic-wood board.
- Final analysis results concluded the following:
 - Polyethylene nets were able to be recycled, but polyester (PET) nets were not. PET nets are more difficult to process, because they are multi-fibrous, which causes dirt and other contaminants to lodge in the material.
 - Insecticide residue remaining in old LLINs (that are three years old) can be quite significant. A number of the nets retained a high enough degree of insecticide to protect against malaria carrying mosquitos past the original shelflife of the nets. Insecticide residue was also present in the densified form of the plastics from the LLINs, and may be found in the manufactured product (bio-composite plastic-wood board).
 - While recycling retired LLINs is technologically feasible, it is currently cost prohibitive. Options to lower the costs of recycling must be explored if such a project is to become commercially viable.
 - However, recycling old LLINs has a number of environmental benefits, including reductions in solid waste, the leaching of harmful chemicals into the soil, water, and air, and use of harmful chemicals to treat wood. NMCPs and donors need to determine whether the environmental benefits of recycling old LLINs outweigh the costs.

Key factors to consider, learned through this pilot project, could lead to the successful recycling of LLINs in other settings and include:

- Supply-side issues, such as a population's willingness to give back their retired LLINs. Affecting this household decision are factors such as whether a household has enough nets to give back, whether a new net had already been received and installed in the household, and whether the net was purchased by the user or given to the household by a donor.
- Ensuring that all LLINs will be collected from all potential collection sites (distance and poor access to roads can greatly affect this).
- Using a communication strategy (including what messages are disseminated and when, and who is involved).
- Carefully planning the distribution and collection campaigns for LLINs, including timing and availability of local infrastructure (e.g., warehouses, transportation, a compactor).

Project Staff And Volunteers Recycling LLINs



Photo: Ralph Rack, USAID | DELIVER PROJECT

Conducting network analysis and supply chain design for improving commodity flow

Effective public health supply chains must be responsive and adaptable to dynamic environments. Studies in similar settings have shown that supply chain design is a powerful and practical tool that can help improve a country's current supply chain performance and position supply chains for the future.⁸

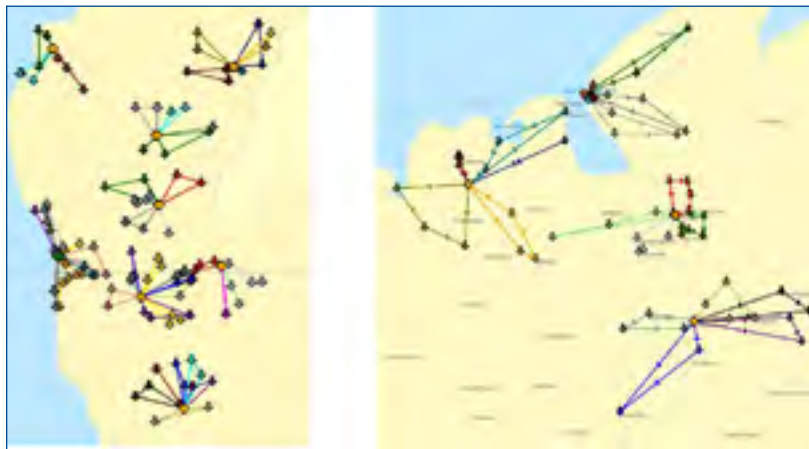
In Madagascar, between November 2014 and February 2015, the project assessed the national supply chain to identify recommendations to improve the flow of

⁸ USAID|DELIVER PROJECT June 2014: Optimizing Supply Chains for Improved Performance.

commodities from the central warehouse to health centers. This activity informed piloting in three geographic regions of Madagascar: Atsimo-Andrefana (southwest), Boeni (northwest), and Vatovavy-Fitovinany (southeast) (figure 6). Stakeholder engagement and collaboration contributed to completion of the national supply chain design activity, with key accomplishments including:

- Supply chain network analysis and optimization.
- Finalized cost analysis of the distribution network from the central warehouse to community health facilities.
- Recommendations for an integrated supply chain distribution system in three regions (figure 6 shows two of three pilot regions).
- Designed logistics management information and inventory control systems, which include resupply frequency, stock minimum/maximum levels, warehousing, and transportation requirements.

Figure 6. New Designed Integrated Distribution Routes in Two Pilot Regions of Atsimo Andrefana (Right) and Boeny (Left)



Note: Different color lines represent specific, independent distribution routes.

Establishing the logistics management unit as a key step in logistics system strengthening

To ensure a sustainable logistics system, it is important to recognize and invest in human resources and management structures required to oversee and operate these systems effectively. Developing a logistics management unit (LMU) is a means to achieving the goal of a sustainable system. To this end, the project established and strengthened the organizational capacity of the LMU, a management structure responsible for organizing, monitoring, and supporting all supply chain activities within the logistics system.

The design of the LMU took place during the final quarter of 2014. Key accomplishments and highlights from this activity included:

- Conducted a design workshop, where the roles and responsibilities of the LMU were agreed upon. Participants included project staff, the Directorate of Pharmacy, Laboratories and Traditional Medicine, and staff from all vertical health programs and partners working in supply chain
- Drafted an LMU mandate (strategic and operational), LMU function, job description of each position within the LMU, and an organizational chart.

Since its establishment, the LMU has conducted community health worker assessments, coordinated logistics committee meetings, and integrated select UNFPA workplan activities with the project's workplan activities. Strengthening organizational capacity of the LMU enabled the Directorate of Pharmacies, Laboratories and Traditional Medicine, a board of directors under the LMU that requires organizational and logistical support, to continue to make health products available to users in a timely manner.

Supporting the nationwide distribution of LLINs

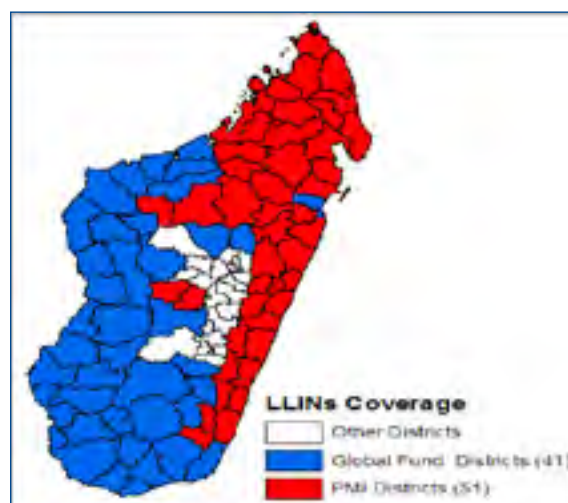
In anticipation of the nationwide distribution of LLINs in 2015, the project and the Coordinating National Committee for LLINs convened a strategic planning workshop. Discussions included possible approaches for the proper management of the distribution campaign, review of best practices, and lessons from previous campaigns. The workshop resulted in draft action plans for 2015 LLIN distribution that focused on five key domains:

- Household census.
- Training, logistics/distribution.
- Information, education and communication/behavior and communication change.
- Monitoring and evaluation.
- Coordination.

LLINs were distributed to 92 of 112 Madagascar's districts, for a coverage rate of 82 percent during 2015 (figure 7) (according to the Malaria National Policy, the 20 remaining districts were not considered for the LLIN distribution, as they are located in the highlands. Instead of LLINs, these districts received indoor residual spraying).

This was by far one of the largest activities of the NMCP and its partners in Madagascar.

Figure 7. 2015 LLINs Distribution Coverage



Supporting continuous monitoring of ACTs in the supply chain

From September 2014 on, The project supported the NMCP in monitoring ACT stock status, forecasting ACT needs, and developing and managing procurement plans using the PipeLine software. As part of this continuous monitoring of the national supply chain, Madagascar in 2015 also began submitting quarterly central-level data on ACTs, RDTs, and SP to the USAID Procurement Planning and Monitoring Reports for Malaria Products database.

In collaboration with the NMCP, the project worked to review and use these monitoring data in a timely way to improve stock availability and avert stockouts. For example, in December 2014, data indicated a possible stockout of ACTs at the national level pending procurement by Global Fund (GF NSA 2 funding). In response, the project urged PMI to make an emergency order of 408,700 ACTs, which was delivered in early February 2015.

“FIGHTING MALARIA IS LIKE SITTING ON A SPRING. YOU NEED TO KEEP UP THE PRESSURE TO KEEP FIGURES LOW”

Benjamin Ramarosandratana, director of the National Programme for the Fight Against Malaria⁹

Additionally, because tropical storms led to a malaria upsurge in Madagascar during February and March 2015, with reported stockouts at some health facilities, the project and the NMCP investigated district-level stock status to analyze the real needs of ACTs through the summer of 2015. Due to delays in a May Global Fund procurement, the project worked with the NCMP to place additional emergency orders to avert stockouts and provide treatments for each age group by July 2015.

Supporting improvements in key malaria indicators

Availability of key malaria products is critical to reducing malaria-related morbidity and mortality. When used properly as part of comprehensive interventions, these actions can prevent and treat malaria.

- Vector control: use of LLINs reduces all-cause mortality among U5s by approximately 55 percent in sub-Saharan Africa.¹⁰ In addition, LLINs have reduced malaria incidence in field trials by more than 50 percent in a variety of settings.¹¹

⁹ Fears of a malaria relapse in Madagascar. Accessed at: <http://www.irinnews.org/>.

¹⁰ Thwing J., Eisele T.P., Steketee R.W. Protective efficacy of malaria case management and intermittent preventive treatment for preventing malaria mortality

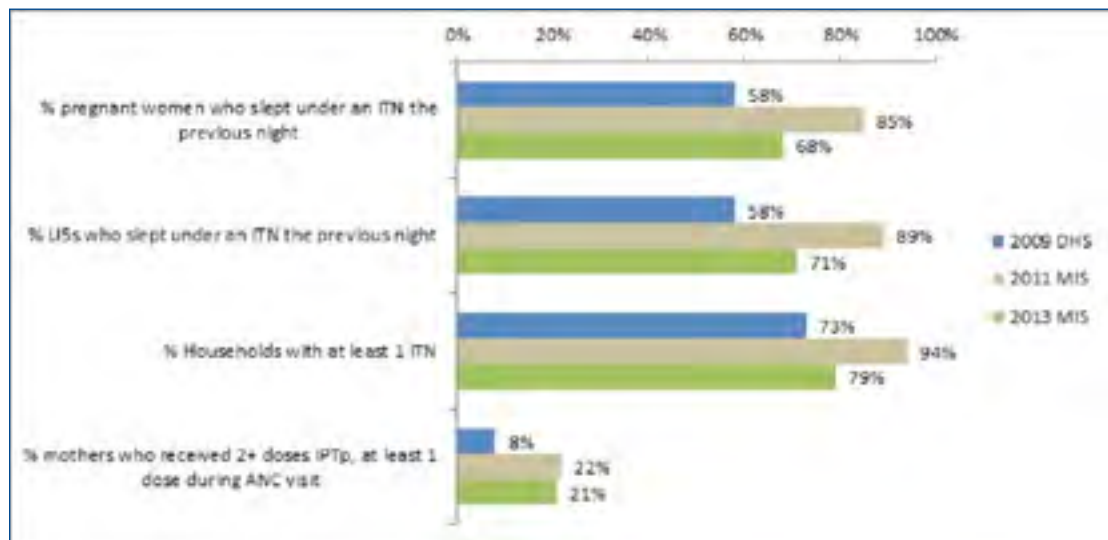
¹¹ Lengeler C. Insecticide-treated bed nets and curtains for preventing malaria. Cochrane Database Syst Rev. 2004;(2):CD000363.

- Intermittent preventive therapy in pregnancy (IPTp): administration of SP during antenatal clinic visits in the second and third trimesters of pregnancy has been shown to reduce severe maternal anaemia,¹² low birth weight,¹³ and perinatal mortality.¹⁴
- Ensure rational use of anti-malarial medicines through testing (microscopy, RDTs).
- Timely treatment with first-line drugs: ACTs have been estimated to reduce uncomplicated malaria mortality in children ages 1–23 months by 99 percent and in children ages 24–59 months by 97 percent.¹²

Survey data from the Madagascar Malaria Indicator Surveys (MIS) and Demographic Health Surveys (DHS) (figure 8) indicate that LLIN coverage improved overall since 2009:

- Nationwide, 79 percent of households owned at least one ITN in 2013 (MIS 2013), a 5 percent increase from 2009 (DHS 2009).
- In these same districts, 71 percent of U5s and 68 percent of pregnant women used an ITN the night before the survey.
- In 2013, 21 percent of pregnant women received at least two doses of sulfadoxine-pyrimethamine during antenatal care in these same districts also targeted by IPTp, compared with 8 percent in 2009 (DHS 2009).

Figure 8. Indicators from DHS Show Overall Increase in LLIN Ownership and Use of SP Since 2009



¹² Radeva-Petrova D., Kayentao K., ter Kuile F.O., Sinclair D., Garner P. Drugs for preventing malaria in pregnant women in endemic areas: any drug regimen versus placebo or no treatment. *Cochrane Database Syst Rev*, 2014 10:CD000169.

¹³ Kayentao K., Garner P., van Eijk A.M., Naidoo I., Roper C., Mulokozi A. et al. Intermittent preventive therapy for malaria during pregnancy using 2 vs 3 or more doses of sulfadoxine-pyrimethamine and risk of low birth weight in Africa: Systematic review and meta-analysis. *JAMA*, 2013 309(6):594–604.

¹⁴ Garner P., Gulmezoglu A.M. Drugs for preventing malaria-related illness in pregnant women and death in the newborn. *Cochrane Database Syst Rev*, 2003 (1):CD000169.

These results indicate a possible reduction in the malaria burden, and over this same time period, an increase in the number of children's lives saved:

- Under-five mortality fell from 72 per 1,000 live births in 2008 to 62 per 1,000 live births in 2012. Other determinants of child survival, such as morbidity and coverage of important health interventions, also improved significantly during this period.

Looking Forward:

Through implementing partners, and in partnership with the MOH and other organizations, the USAID | DELIVER PROJECT developed and strengthened reliable and sustainable public health supply chains to ensure that malaria commodities reach beneficiaries.

The USAID | DELIVER PROJECT was key in meeting Madagascar's needs for malaria prevention, diagnosis, and treatment. Improving access to malaria commodities by strengthening the supply chain is crucial to meeting these needs. Moving forward, it is recommended that work in collaboration with the Government of Madagascar focus on the following areas:

- Supporting the strengthening of the national supply chain systems for all public health medicines including:
 - Antimalarial drugs.
 - Diagnostics for malaria.
 - LLINs.
- Supporting the strengthening of SALAMA's storage and distribution processes.
- Strengthening the LMU.

¹ These commodity figures come from the project's MIS (up to September 2016) and may not completely align with the PMI annual report figures due to differing timeframes, definition of data, and other country specific reasons.



The authors' views expressed in this publication do not necessarily reflect the views of the U.S. Agency for International Development or the United States Government.

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