

VectorWorks

End of Project Report

2014-2019



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U.S. President's Malaria Initiative

VECTOR)WORKS

Scaling Up Vector Control for Malaria Prevention

VectorWorks, 2019

Project Name: VectorWorks

Recipient/Contractor: Johns Hopkins Center for Communication Programs

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PMI VectorWorks

Malaria is a preventable, curable disease caused by bites from female Anopheles mosquitoes, or malaria vectors, infected with Plasmodium parasites. It caused 435,000 deaths among an estimated 219 million cases worldwide in 2017 (WHO, 2019). Insecticide-treated mosquito nets (ITNs), a key component of vector control, can successfully reduce or eliminate malaria transmission with sufficiently high coverage. This report highlights critical results and program successes of U.S. President's Malaria Initiative (PMI) VectorWorks, a five-year global project aiming to scale up vector control for malaria prevention through improved distribution of ITNs, optimal roll out of promising alternative vector control tools, and global policies that are informed by monitoring and evaluation data. Bringing together seven institutions, working in 16 malaria-endemic countries, the project developed and implemented better ways to distribute ITNs, conducted research to inform evidence-based decision making, and worked to refine policy at the global and country levels, improving vector control, preventing malaria, and changing lives. VectorWorks was made possible by support from U.S. President's Malaria Initiative from 2014 to 2019. The project was led by the Johns Hopkins Center for Communication Programs, with Tropical Health LLP, Swiss Tropical and Public Health Institute, Mennonite Economic Development Associates, Ifakara Health Institute, Tulane University Center for Applied Malaria Research and Evaluation, PSI, consultants, and a wide range of in-country collaborating partners.



Alex and his father open a mosquito bed net that he received at school in Buhigwe, Tanzania. Magali Rochat for PMI VectorWorks, Courtesy of Photoshare.

VECTORWORKS by the Numbers

Selected achievements 2014-2019

VectorWorks has worked in

15 countries

Angola, Benin, DRC, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Myanmar, Nigeria, Senegal, Tanzania, Uganda, Zimbabwe



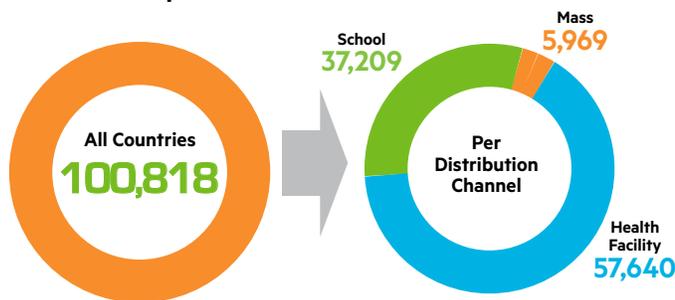
33

peer reviewed journal articles

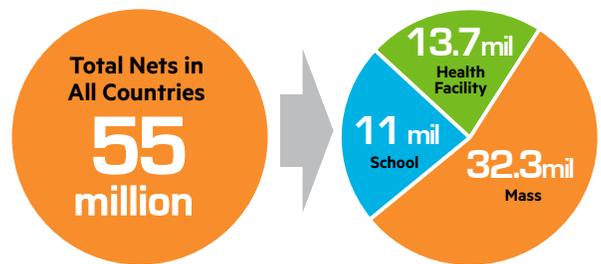


produced and disseminated by VectorWorks

People trained in ITN distribution



Number of ITNs distributed with VectorWorks support



11

studies conducted

for improving insecticide-treated net (ITN) access and use



8 countries since 2014

VectorWorks has conducted ITN durability monitoring



VectorWorks supports social behavior change communication activities for ITN use in 5 countries

Liberia
Ghana
Guinea
Tanzania
Zimbabwe

VectorWorks has created **33 TOOLS** to improve ITN access and use



Country Highlights



TANZANIA: 100% of facilities did not have any stock outs in Year 4 and 5.

GHANA: The proportion of pregnant women receiving nets during ANC increased from 33% to 75.3% from Year 1-5. The proportion of children receiving nets during CWC increased from 58% to 72.8% from Year 1-5.



Acknowledgements

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Abbreviations

AMP	Alliance for Malaria Prevention
AMREC	Adaptive Management Research Consultants in Kenya
ANC	antenatal care
DHS	Demographic and Health Surveys
DRC	Democratic Republic of Congo
EPI	Expanded Programme on Immunization
GES	Ghana Education Service
GHS	Ghana Health Service
Global Fund	The Global Fund to Fight AIDS, Tuberculosis and Malaria
GMP	Global Malaria Programme (WHO)
ID	institutional delivery
IVD	immunization and vaccine development
ITN	insecticide-treated net
M&E	monitoring and evaluation
MERG	Monitoring and Evaluation Reference Group
MIS	Malaria Indicator Surveys
MPAC	Malaria Policy Advisory Committee
NMCP	National Malaria Control Program
PAMCA	Pan African Mosquito Control Association
PMI	President's Malaria Initiative
PSI	[only use acronym]
RBM	Roll Back Malaria
SBC	social and behavior change communication
SHEP	School Health Education Program (Ghana)
SWAT	Standing with Africa to Terminate Malaria Team (U.S. Peace Corps Ghana)
Swiss TPH	Swiss Tropical and Public Health Institute
USAID	U.S. Agency for International Development
VCTEG	Malaria Vector Control Technical Expert Group
VCWG	Vector Control Working Group
WHO	World Health Organization
ZAMEP	Zanzibar Malaria Elimination Program

Introduction

This end of project report highlights the accomplishments of the U.S. President's Malaria Initiative (PMI) VectorWorks project from 2014 to 2019. First, the report briefly summarizes progress in malaria control in sub-Saharan Africa prior to VectorWorks in five key areas:

- **Knowledge** – specifically on insecticide-treated net (ITN) distribution strategies, including mass campaigns and routine and continuous distribution (CD) channels, on ITN durability monitoring, on ITN use versus access, and on the impact of gender roles and norms on ITN use and care behaviors
- **Know-how** – including available tools, examples, guides, and training on ITN distribution planning, implementation, and evaluation, and on net durability monitoring
- **Nets** – estimates of ITN ownership and use, particularly among biologically vulnerable populations of pregnant women and children, and of indoor residual spraying (IRS), in sub-Saharan Africa
- **Outcomes** – operational indicators like the efficiency and cost effectiveness of various ITN distribution strategies and outcome results, including malaria morbidity and mortality
- **Policies and guidance** – specifically how the growing body of knowledge on ITN distribution strategies, ITN access, use and care, and net durability monitoring are reflected in global, national, and local policies.

Then, the core of the report describes the impact of VectorWorks activities in each of these domains, resulting in more knowledge, know-how, nets, better outcomes, and promising directions for new policies. The report provides snapshots of specific work and outcomes in countries where VectorWorks was active using interspersed stories from the field. Finally, the next steps section proposes future actions to maintain and build upon the success of the VectorWorks project in improving ITN access and use and in better understanding the interaction of different malaria control strategies to reduce the burden of malaria infection in sub-Saharan Africa.

Before VectorWorks

To assess the impact of the VectorWorks project, it is important to understand malaria disease trends and malaria control progress in 2014, when the project began. Although great strides have been made in malaria control since 2000, resulting in significant reductions in both morbidity and mortality, **in 2013** there were still an estimated 584,000 people who died from malaria, with 198 million cases reported (WHO, 2014). VectorWorks aimed to reduce these numbers by targeting specific needs identified in five key areas of malaria vector control—knowledge, know-how, nets, outcomes, and policies and guidance.

Knowledge

- When VectorWorks began, it was **already known** that mass campaigns could quickly, substantially, and equitably increase ITN coverage. It was equally clear that even well-implemented campaigns could not achieve 100% coverage, and that net losses began in the first months after ITN delivery. The NetWorks project expanded knowledge of “keep-up” strategies designed to address these issues and maintain high levels of ITN coverage after mass campaigns, building on existing routine antenatal care (ANC) and immunization program (EPI) channels and **piloting** both school- and community-based **continuous ITN distribution**. NetWorks found that CD strategies could maintain ITN coverage, over time, following mass campaigns. More research was needed to inform the integration of CD channels into ITN distribution strategies, including how CD interacts with different contextual factors and other ITN delivery and malaria control activities.
- NetWorks had also contributed to the evidence base for **ITN durability monitoring** in 2014, identifying determinants of net condition following mass distribution campaigns in a **study** of three eco-geographical zones in Nigeria (Kilian et al., 2015). Results differed by region, underscoring the need to collect durability data across a wider range of contexts to better inform ITN distribution strategies, while the fact that net repair did not measurably improve net condition implicate the development and implementation of future net care social and behavioral change (SBC).
- In 2014, NetWorks published a **paper** on recalculating the **gap between ITN access and use**, using access to a net within the household rather than the traditional access metric of household ownership of at least one net. The paper showed that 80–90% of people with access to an ITN in their household were using one, a much smaller gap than previously calculated (Koenker et al., 2014). These findings indicated the need for more research on the programmatic utility of various ITN use-and-access indicators and prompted consideration of how malaria prevention resources are balanced between promoting net access and net use. NetWorks had also compiled all the available sub-national data on ITN use-and-access in 46 malaria endemic countries in a regularly updated ITN use and access report, providing clear assessments of local data for planning net distribution and SBC activities. A sustainable mechanism to ensure the continuity of these ITN use and access reports was needed.
- When VectorWorks began, **residual transmission** (all forms of persisting malaria transmission in areas with full universal coverage with effective ITNs or IRS programs) had been reported in many settings. While **alternative vector control strategies** had been proposed and tested, none had produced strong enough supporting evidence to warrant scale up (Killeen, 2014). Further research was needed both on residual transmission mechanisms and strategies to address them.

- Finally, with the roll out of the **USAID Gender Equality and Female Empowerment Policy** and **Operational Policy on Integrating Gender Equality and Female Empowerment** in USAID's Program Cycle just two years prior to VectorWorks' initiation, the project had a mandate to explore how **gender impacts** ITN distribution and use, and malaria risk, in general.

Know-how

- In 2014, NetWorks had already developed the first version of NetCALC, a **tool** in Excel used to plan **ITN distribution strategies**, and had conducted several **training** workshops on **ITN campaign planning**. NetWorks had also developed documents to walk country malaria control program teams step-by-step through identification of appropriate CD channels to include in their ITN strategies and they published a review of ANC and EPI channels. What was needed when VectorWorks began was a free, easily accessible one-stop-shop for all these materials.
- In 2014, a similar gap existed for **tools to monitor ITN durability**. While the World Health Organization (WHO) published guidance on monitoring net durability and estimating net longevity in 2011 and 2014—and NetWorks produced a set of PowerPoint slides, job aids, and instructions—more work was needed to ensure consistent data collection across countries. Detailed durability monitoring protocols and questionnaires needed to be developed, implemented, and evaluated, and a central clearinghouse for these materials needed to be created.
- Prior to 2014, Networks developed an **online toolkit for SBC on net care and repair** and implemented it in Uganda and Nigeria. These tools needed to be implemented and evaluated in a wider range of settings, allowing further refinement, and SBC messaging on other aspects of malaria vector control could also be developed and tested.

Nets

- In 2014, an estimated **56% of people** in sub-Saharan Africa had **access to an ITN in their household**, with an estimated **46% of the population** in these countries **sleeping under an ITN**. In 2015, **68% of children under-5** were estimated to be **sleeping under an ITN**, a huge improvement from less than 2% in 2000. Despite these gains, approximately **269 million** of the 834 million people at risk of malaria in sub-Saharan Africa in 2014 had **no access to any ITN or IRS** (WHO, 2015). Clearly, further efforts were needed to provide more nets to more people.
- NetWorks had carried out CD pilots in five countries as of 2014, with more than **4.3 million ITN distributed via school, community, and health facility channels**. The success of these interventions in rapidly providing large numbers of nets to people at risk of malaria infection warranted further scaling up of CD and its introduction in other malaria endemic countries.

Outcomes

- More could have been done in 2014 to decrease **ITN distribution costs**. The median cost of protecting one person for one year using ITNs was 2.20 U.S. Dollar (USD) (range 0.88–9.45 USD) in a 2011 review (White et al., 2011). The median cost per ITN delivered was 7.03 USD (2.97–19.20 USD range). In NetWorks pilots of continuous ITN distribution, cost per net delivered ranged from 5.50 USD to 20.00 USD. When multiplying these costs by millions of ITNs, budgets for malaria control interventions could easily become unsustainable.

- The **efficiency** of ITN distribution could also be improved in 2014. NetWorks found that CD could improve ITN coverage while avoiding oversupply in pilots of various channels, signaling opportunities for more research on how to streamline CD and other ITN distribution channels.
- By 2014, no published research had yet shown the impact of different ITN distribution strategies on **malaria incidence**.

Policies and guidance

Much of the new knowledge NetWorks had generated around ITN distribution and use had not yet been incorporated in global, national, and regional guidance in 2014.

- Advice on determining the **role of CD in a malaria control program** and, subsequently, planning and implementing various CD channels were not codified or collected into a centralized repository or document.
- Emerging data on **ITN use versus access**, and implications for planning and implementing ITN distribution, had yet to be disseminated in a standardized way.
- Better understanding of **universal coverage metrics** had not been included in guidance on key metrics, and information was scarce on how to use net durability monitoring results to inform the timing of ITN replacement and the development of effective SBC for net care.

What VectorWorks Changed



More Nets

- school distribution scaled up from **0.5 million** ITN in 2015 to **3.5 million** ITN in 2018 in Tanzania
- ITN distribution support in **9** sub-Saharan African countries
- increase from **51%** to **89%** of pregnant women receiving ITN at antenatal care in Ghana
- assisted with delivery of **47.3 million** nets



New Policy

- Roll Back Malaria Harmonization Working Group and Malaria Operational Plan Guidance on **use to access ratio**
- WHO recommendations for achieving and maintaining universal coverage noting **school distribution** could replace mass campaigns
- RBM **Repurposing ITNs** Consensus Statement
- WHO policy on universal access to malaria interventions including **population ITN access** as key indicator
- mass distribution in French and English



Better Outcomes

- school distribution costs reduced from **5.83** to **1.57 USD** in Tanzania
- very positive attitudes toward net care and repair among people citing 4-5 sources of SBC information, **18%** vs. **60%** of ITN serviceable with negative vs. very positive attitudes in Nigeria
- **local development and piloting of NetApp** mobile technology in Ghana replacing paper data collection for mass ITN distribution



More Know-How

- **28** tools developed to improve ITN distribution and use
- over **100,000** people trained on ITN distribution in sub-Saharan Africa
- training of **2,382** district and circuit officers and **54,288** teachers in Ghana on malaria prevention SBC
- **62** NMCP managers and ITN focal points from **19** sub-Saharan African countries trained on critical steps of ITN mass distribution in French and English



More Knowledge

- **38** presentations and webinars
- durability monitoring in **7** sub-Saharan African countries and Myanmar
- **33** peer reviewed articles
- **11** studies to improve ITN access and use

What VectorWorks Changed

More Knowledge

VectorWorks generated **more information on integrating CD into ITN distribution strategies** and its interaction with other vector control strategies by scaling up school- and community-based CD, conducting further pilots of these channels, and supporting routine ANC/EPI and mass distribution campaigns in several sub-Saharan African countries. Data were collected to assess the efficacy, cost effectiveness, and equity of different combinations of ITN delivery strategies and the impact of contextual factors, such as timing of the most recent mass ITN distribution campaign, net preferences, or seasonality on net distribution. The resulting knowledge has enabled successful integration of CD into ITN distribution strategies in several countries and has informed measures to streamline and improve all ITN delivery channels.

Collaborating closely with local partners, VectorWorks successfully expanded knowledge on ITN durability. The project **monitored ITN durability in DRC, Ghana, Kenya, Liberia, Mozambique, Myanmar, Nigeria, and Tanzania** and provided further insight into factors influencing the useful life of ITNs, including the impact of different SBC messages. This information allows for more accurate planning of ITN distribution timing and quantification of nets needed and enables both planners and ITN users to better focus their resources to maximize the utility of available nets.

VectorWorks provided **more information on ITN coverage and use**, assessing the programmatic utility of different ITN use-and-access indicators, and analyzing data from 33 malaria endemic countries to better understand why different metrics provide different coverage estimates and how to best use each indicator in planning ITN distribution strategies. VectorWorks conducted qualitative research on drivers and barriers to net use in several contexts, as well as on net preferences and their impact on net purchase and use, informing efforts to close the gap between use-and-access. The project also developed the itnuse.org website to host regularly updated national and sub-national data on ITN use and access, ensuring the availability of this important resource beyond the life of the VectorWorks project.

In parallel with its work on ITN distribution, durability, access, and use, VectorWorks **expanded the evidence base on outdoor and residual malaria transmission** and compiled regular updates on alternative vector control tools. VectorWorks conducted both qualitative and quantitative research on residual malaria transmission in several countries in sub-Saharan Africa, with nighttime outdoor activities emerging as an important risk factor. These studies also indicated that specific groups, such as men and seasonal workers, may be at higher risk and require targeted malaria prevention activities. The fact that VectorWorks did not find evidence to support scale up of any existing alternative vector control tools is a strong indication of the ongoing need to invest in developing and researching strategies to address residual malaria transmission.

VectorWorks **considered gender across all analyses**, finding that men tend to be outside more often at nighttime and women are prioritized for sleeping under ITN in households without enough nets. The project also provided further evidence of established gender norms, such as net care being women's work and net use signaling weakness among men. This knowledge contributes to the equity of ITN distribution, use and care, and informing careful consideration of gender in planning and implementing net delivery strategies and SBC messages that include both men and women.

The VectorWorks team disseminated the knowledge generated by the project through various channels, with **38 presentations** and **webinars** and **33 peer-reviewed articles** published to-date. Newsletters and various other data, guidance, news, and tools were shared directly with relevant stakeholders via email and websites, including

vector-works.org, ITNuse.org, continuousdistribution.org, and durabilitymonitoring.org. Sixteen additional articles are in process and VectorWorks partners continue to participate and present results at relevant VCWG/AMP, WHO, and Global Fund meetings and at congresses, including the ASTMH annual meeting and the RBM SBC Working Group meetings.

Evidence base for integrating CD in ITN distribution strategies

VectorWorks achieved several important goals in broadening the evidence base supporting appropriate, effective, and efficient integration of CD in ITN distribution strategies:

- Reinforced the fact that **routine ANC/EPI net delivery** is an essential, though not sufficient, “keep-up” strategy and identified challenges to its effective and efficient implementation.
- Provided further evidence of the feasibility of **school-based CD**, particularly at scale, and characterized contexts well adapted to this strategy.
- Showed that **community-based CD** can also be effective and equitable, in certain contexts, maintaining high ITN coverage on its own.
- Added to evidence that thorough household registration is essential for successful **mass distribution campaigns** and that rationing nets or capping prevents large families from receiving enough ITNs.
- Provided specific **cost and cost-effectiveness** data for different ITN distribution channels, showing similar cost effectiveness for CD and mass campaigns, low costs for malaria deaths averted by routine ANC/EPI ITN delivery, and opportunities to improve local government cost estimates.
- Published the first analysis of **seasonality of net use** controlling for access to ITNs, contributing to appropriate targeting of net use SBC and geospatial modeling of ITN use and malaria transmission.

Routine ANC/EPI ITN distribution

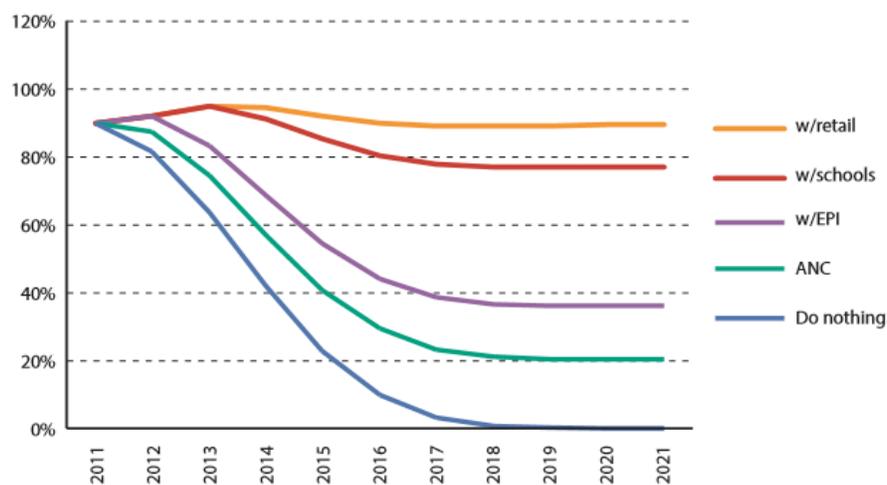


Figure 1. NetCALC simulation of ITN coverage rates over time with use of various combinations of distribution channels in Ghana from from 2011 (NetWorks, 2015)

Since 2011, WHO has recommended routine distribution of ITNs through ANC/EPI channels to prioritize access among biologically vulnerable populations of pregnant women and children under-5. This channel remains an essential pillar of ITN distribution strategy although it has been shown to not be enough to maintain high levels of coverage on its own, as pregnant women and infants represent but a fraction of the total population.

VectorWorks' support of routine ANC and EPI distribution in **Tanzania, Ghana, and Liberia** reinforced the role of this channel as a necessary, but not sufficient, component of ITN delivery strategies. In Ghana, ownership of at least one ITN per two people decreased significantly from 51.3% one year after a mass campaign to 40.2% after an additional year of routine ANC/EPI and continuous school-based distribution in two classes. The percentage of the population with access to an ITN in their household also decreased significantly, from 74.5% to 66.4% during the same period. In this study, VectorWorks also found low rates of ITN coverage among pregnant women and children eligible for nets, with 28.5% of households with a currently pregnant woman reporting owning an ITN from ANC and 20.2% of households with children eligible for a measles booster during pilot implementation reporting receiving an ITN from a child welfare clinic (CWC) (de Beyl et al., 2018).

Similarly, when VectorWorks analyzed reports for WHO on **routine ANC distribution** from 17 countries and routine EPI distribution from 16 countries, results showed that 55% of women attending ANC and 34–37% of children attending immunization services received ITNs on average, with wide variation by country. These low availability ratios suggest missed opportunities to provide ITNs to almost half of all women attending these services and more than 60% of infants (Theiss-Nyland et al., 2016).

VectorWorks reported on a **qualitative rapid assessment of routine ANC/EPI distribution** in four countries aimed at identifying drivers of low ITN coverage among pregnant women and children eligible for vaccinations—finding that stockout, or running out of nets, was the primary issue. This stemmed from centralization of key tasks, including ITN quantification, supply logistics, such as having enough secure, rodent-free space to store nets, and data collection (Theiss-Nyland et al., 2016). The project also conducted a **process evaluation** of routine ANC/EPI ITN distribution in Tanzania, including in-depth interviews of local government leaders, health facility workers, and district and national stakeholders, and observation of national- and health facility-level ITN storage facilities. This revealed similar needs for timely and accurate data, effective communication, coordination across all levels, and buy-in from health facility workers to reduce the risk of stockouts and allow more agile response when it occurs.

“You find that it is difficult to have accurate data about the consumption at the operational levels to be able to make proper quantification at national level. So we often have to estimate...”

-National Malaria Program, Mali

“The major challenge now is that there are many books to write in when we collect data and people sometimes get lazy to fill all the registers correctly”

- District Health Office, Malawi

“ITN...sometimes go out of stock... when they bring, sometimes they bring on time, sometimes it could have a delay of one month, two months we have to wait until it comes.”

-Facility Head, Kenya

Quotes from stakeholders in routine ANC/EPI ITN distribution programs in Rwanda, Mali, Malawi, and Kenya (Theiss-Nyland et al., 2016).

School-based continuous ITN distribution

School-based CD consists of annual net distribution to all pupils in targeted grades at participating schools; it helped maintain ITN coverage after mass campaigns in initial pilots. VectorWorks added to the evidence on how this CD channel functions by evaluating pilot results from **Nigeria** and conducting and **assessing** school-based CD pilots in **Guinea** and Mozambique, and national programs in Ghana and Tanzania.

In Mozambique, school-based CD contributed to maintaining ITN access in the intervention district. Population ITN access was 71% at baseline and 64% at endline ($p=0.26$), but would have been 40% without the contribution of the school nets. In the control area, population ITN access was 69% at baseline and 70% at endline. Households in the control area retained their campaign nets to a greater degree than in the intervention area, and obtained more ANC nets during the study period than households in the intervention area. This points to how different channels may perform differently depending on context.

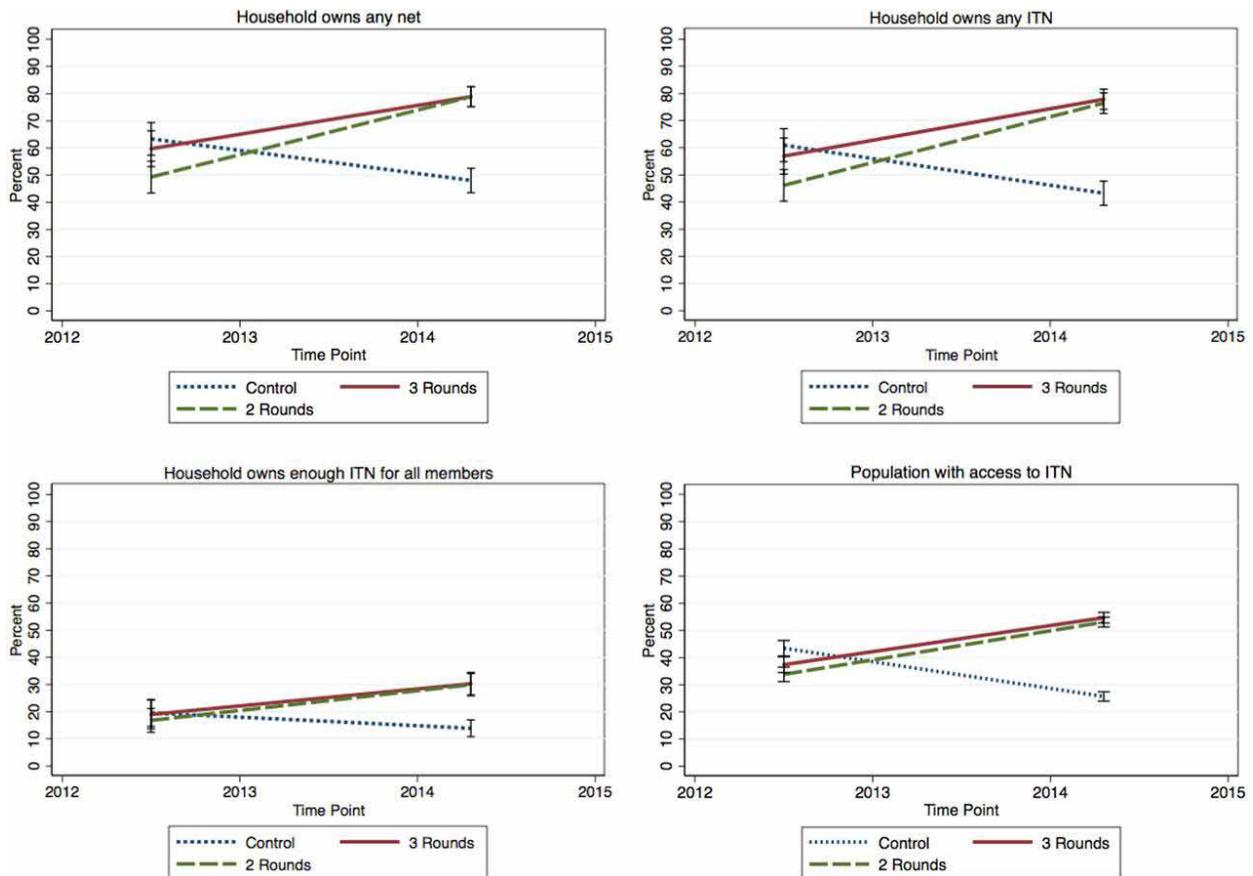


Figure 2. ITN access and use in regions with 2 or 3 rounds of school-based continuous ITN distribution or with none after 2011 mass campaign, Cross River State, Nigeria 2012–2014 (Acosta et al., 2018).

In Nigeria, school-based CD proved effective in maintaining high levels of coverage after mass campaigns compared to substantial drops in coverage in comparison areas without this channel. School-based CD was nearly as equitable in distributing ITNs as mass campaigns and used fewer nets to obtain similar coverage. No significant under- or over-supply was reported and very few households received nets from both school-based CD and simultaneous routine ANC/EPI ITN distribution, indicating that these strategies may be complementary rather than redundant (Acosta et al., 2018).

In Ghana, VectorWorks expanded **school-based CD** to all 10 regions, working with the NMCP and School Health Education Program (SHEP) to support training, implementation, monitoring, and supervision at all levels. The project helped to streamline and improve all aspects of school-based CD in every region, collecting data along the way to inform these improvements and school-based delivery in other settings. For instance, VectorWorks conducted a desk validation of school enrollment data in six regions, finding wide variations between enrollment data received and distribution data from the previous year. Enrollment data from the Basic Education Management Information System (BEMIS) was often more reliable, they are only available at the end of each school year and only capture the 85% of registered schools. To address these issues, VectorWorks met with the deputy director general of the Ghana Education System to encourage a move to on-line enrollment data that can be updated frequently and validated by collection and analysis of weekly school attendance data.



STORIES FROM THE FIELD

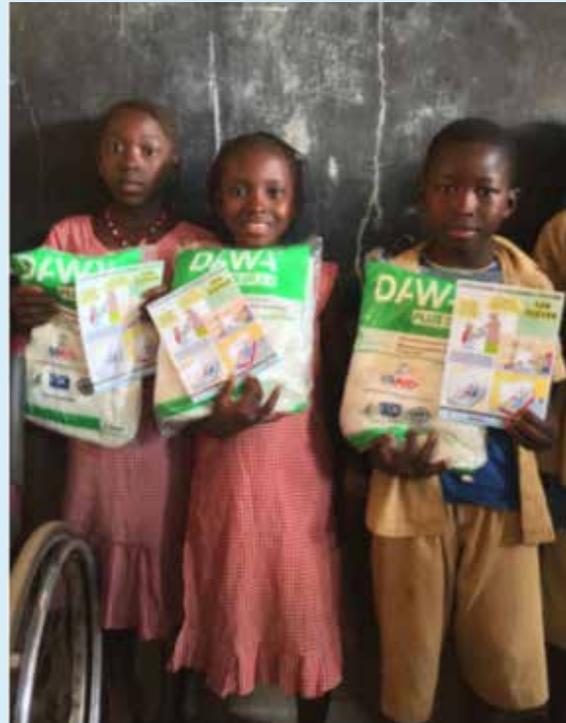
Guinea pilots school-based CD as part of its ITN distribution strategy

VectorWorks partnered with PMI and the Guinea NMCP to find an appropriate interim measure to boost ITN coverage between mass campaigns in 2016 and 2019. This involved:

1. **Conducting a national CD assessment**, interviewing more than 40 community, education, and health system stakeholders and evaluating existing routine ANC/EPI distribution to assess the feasibility of adding school- or community-based CD;
2. **Planning and implementing a school-based CD pilot** in 182 schools in the Boffa district, with VectorWorks facilitating the formation of two coordination committees made up of national, regional and prefect-level stakeholders, planning and coordinating net delivery, and supporting the development and implementation of a harmonized SBC strategy with messages in three languages; and
3. **Evaluating and disseminating pilot results**, comparing ITN access and use indicators between Boffa and the Dubreka district, where no school-based CD was carried out, and organizing two dissemination meetings to share results and discuss future implications.

The pilot was successful, with 100% coverage of eligible students and 21,617 nets delivered. Compared to the control district of Dubreka, the intervention district of Boffa reported higher:

- household (HH) ownership of at least 1 ITN (80% vs. 53%)
- HH ownership of at least 1 ITN for every two people (31% vs. 21%)
- population access to an ITN (58% vs. 38%)
- proportion of people sleeping under an ITN the previous night (47% vs. 24%)

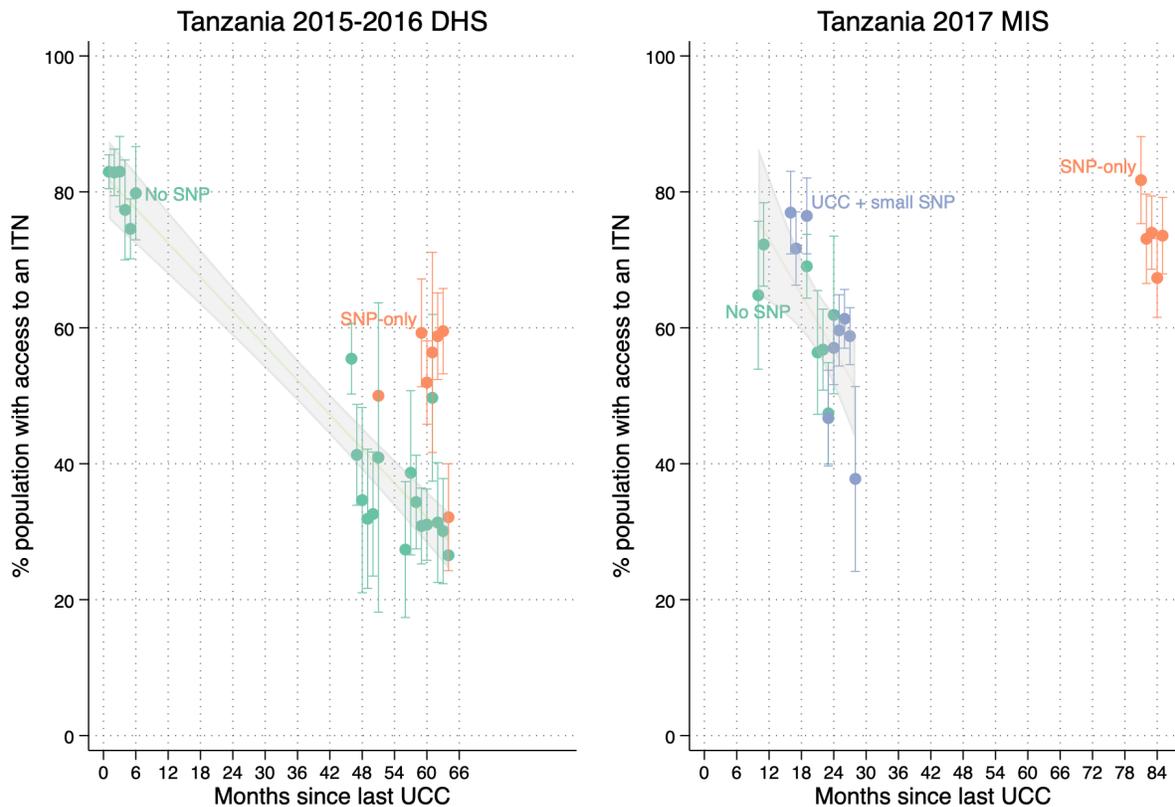


Students from Tatemba Primary School in the Koba subdistrict of Boffa, Guinea with their nets and malaria prevention SBC materials. Sara Berthe for PMI VectorWorks.

“Everyone did their job to ensure success for the entire district ... the team worked seriously with rigor and promptness.”

—Ousmane Yattara,
Boffa District Education Office focal point

VectorWorks also supported the NMCP to plan, implement, and evaluate four rounds of school-based CD in 14 target regions in Tanzania. The project facilitated planning and coordination meetings at national and sub-national levels; trained staff in all aspects of planning, implementation, and evaluation; and organized distribution logistics. The School Net Program (SNP) evolved over time, demonstrating the ability of this ITN distribution strategy to adapt and innovate in response to initial distribution results and changing contextual factors. VectorWorks also demonstrated the **effectiveness of school-based CD in Tanzania**, finding that ITN use and access indicators were maintained or improved across all four rounds of SNP (Stuck et al., 2019), and that ITN access was at very high levels in SNP areas a full seven years after the last mass campaign.



Koenker et al., 2019. Dots represent parts or combinations of regions based on time since campaign (household survey interview date - regional issuing dates).

Figure 3. Percentage of population with access to ITNs in Tanzania, by months, since last mass ITN distribution campaign for partial or multiple regions with no SNP (green), incomplete SNP implementation (blue), and full SNP implementation (orange) using data from the 2015–2016 DHS and 2017 MIS. (Koenker et al, 2019).

These results further strengthen the case for school-based CD to maintain ITN coverage where school attendance is consistently high, and they also show that productive relationships can be built between ministries of health and education to promote the successful implementation of this strategy.

Community-based continuous ITN distribution

Community-based CD provides another option for distributing ITNs that can address situations where health-facility infrastructure is less developed and school attendance rates are low, rendering routine ANC/EPI and school-based CD channels less effective. This strategy consists of community health workers using defined criteria for ITN eligibility to distribute vouchers or coupons that can be redeemed at a designated distribution point, usually a health facility.

In addition to analyzing the results of community-based CD pilots in [Nigeria](#), [Madagascar](#), and [South Sudan](#), VectorWorks expanded the knowledge base on this ITN distribution strategy by providing significant technical assistance to community-based CD in Zanzibar, building data reporting and tracking systems and implementing distribution, delivering both coupons and ITNs. The project also identified factors impacting the feasibility of community-based delivery channels, collaborating with NMCPs to conduct [CD assessments in Kenya and Guinea](#). Results indicated that community-based CD would be feasible in Kenya because of their strong community health worker (CHW) network and support from health facilities within five kilometers of each community. Community-based CD was not recommended in Guinea, where many communities did not have a CHW network, not all communities had easy access to a health facility, and the supply chain management system was in transition. In addition to identifying the most appropriate CD channels to include in national ITN distribution strategies, these assessments highlight challenges to address to make other CD channels feasible.

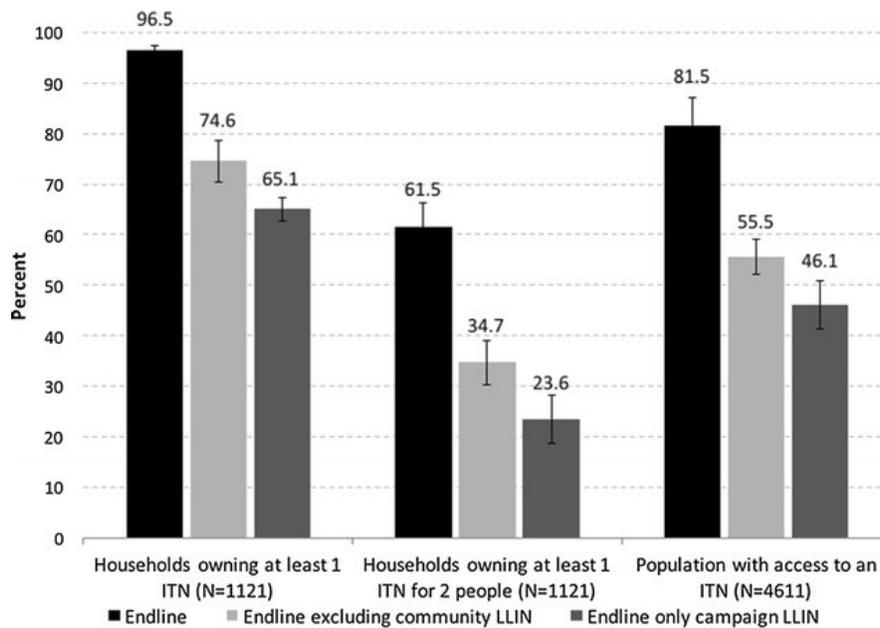


Figure 4. ITN access and use at endline, overall, and calculated, excluding ITNs received through community-based CD and considering only ITNs from campaign in Toamasina II District, [Madagascar 2013–2014](#) (de Beyl et al., 2017).

Results from standalone community-based CD pilots in [South Sudan](#) and [Madagascar](#) were very promising, with household ITN ownership and population ITN access improving significantly and [approaching](#) (Kilian et al., 2017) or even [exceeding](#) (de Beyl et al., 2017) universal coverage targets. VectorWorks found this strategy was equitable across wealth quintiles, and communities were pleased with its implementation.

VectorWorks found that integration of community-based CD with Community Drug Distributor networks in the Nasarawa district of [Nigeria](#) was not as successful, in part due to stockouts of both coupons and ITNs. While ITN access indicators did not improve in areas receiving the intervention, they did not significantly decline as they did in comparison areas lacking community-based CD (Killian & Obi, 2015).

In Zanzibar, VectorWorks designed and implemented a [community CD program](#) by building on a system first rolled out in 2013–2014 with technical assistance from NetWorks. This channel involved distribution of ITN coupons redeemable at health facilities to eligible community members by Shehas, who are local government leaders. After the first round of distribution, VectorWorks conducted a community channel review to identify and address challenges to successful implementation. This led to integration of ITN coupons into the existing health facility ordering and reporting logistics system, electronic logistics management system (eLMIS), and the existing Health Management Information System (HMIS). VectorWorks also developed a DHIS2 dashboard to ensure ITN coupon

validity, allowing scanning of coupons to capture data both at distribution of the coupon and its redemption for a net. To take advantage of this scanning feature and further improve security, VectorWorks also redesigned the coupons to include bar codes, holograms, and unique numbering. The project continued to monitor indicators, including time from coupon distribution to redemption, most frequently cited eligibility criteria, and percentages of coupons distributed and redeemed to ensure successful community-based CD implementation in Zanzibar and to inform planning of community ITN distribution channels in other settings.

Mass ITN distribution campaigns

Working closely with AMP to identify and discuss emerging issues in workstreams—including the Emerging Issues Working Group (EIWG), the Monitoring, Operational Research and Evaluation (MORE) Working Group, and the Establishing Minimum Data Requirements (EMDR) Work Stream—VectorWorks catalyzed research on key topics in ITN distribution via mass campaigns, which this partnership brought to the forefront.

VectorWorks contributed new insights into the [comparative efficacy of various strategies for mass ITN distribution campaigns](#), assessing survey data collected after 14 mass campaigns in Ghana, Nigeria, Senegal, South Sudan, and Uganda (Zegers de Beyl et al., 2016). In keeping with previous literature, VectorWorks saw a strong positive association between the proportion of households registered during mass campaigns and the proportion of households receiving at least one ITN. VectorWorks found that reasons households were not accounted for in mass campaign registration differed substantially by their registration completeness. In areas with low registration rates, the predominant reason for non-registration was that distribution teams did not come to the household, while in areas with high registration rates this was primarily because no one was present in the household when registration was attempted. These findings reiterate the need for strategies to access hard-to-reach households for registration and careful planning registration visit timing to improve the likelihood of finding a household member at home.

[VectorWorks analyzed net ownership and access indicators](#) from 59 national surveys conducted in sub-Saharan Africa in 2010–2016, shortly after mass campaigns, and found that household size had a significant impact on ITN access. While the proportion of households owning at least one net increased significantly as household size increased—indicating good campaign reach—large households were far less likely to own enough ITNs than smaller households. Population access to an ITN was more stable as household size increased. These results indicate the need to reconsider the common practice of capping the number of nets provided during mass campaigns, or rationing nets at distribution points to reduce the risk of stockouts, as this directly prevents larger households from receiving enough ITNs.

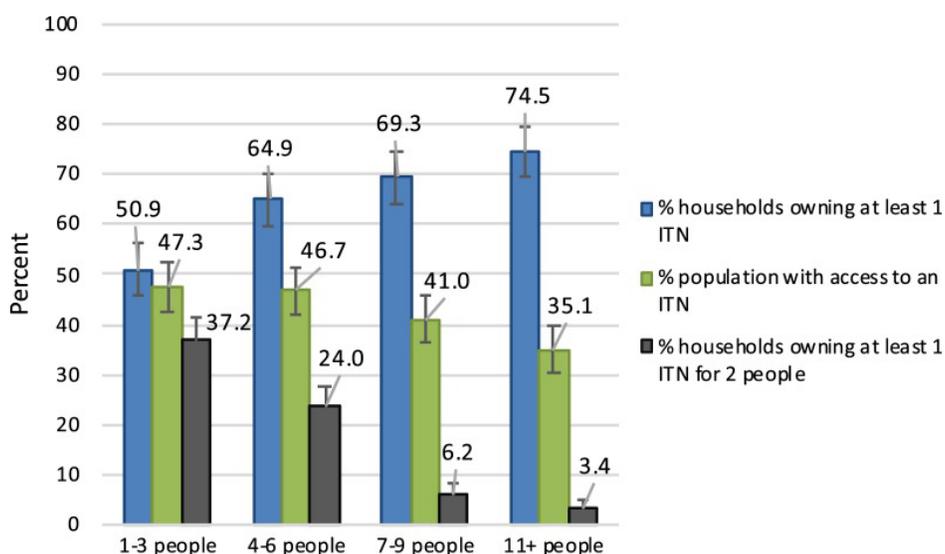


Figure 5. ITN access indicators for households of varying sizes across 59 household surveys in sub-Saharan Africa (2010–2016) (Koenker et al., 2018).



STORIES FROM THE FIELD

Senegal contributes to evidence on mass ITN distribution and social marketing distribution channel

VectorWorks supported two consultants providing technical support to the NMCP and IntraHealth in planning and implementing a mass ITN distribution campaign in Senegal in 2016. This involved collaborating to develop macro and microplanning tools and providing technical expertise throughout planning and implementation.

At the request of PMI and the NMCP, VectorWorks also collaborated with the Institut de Recherches et d'Investigations par Sondage (IRIS) to evaluate the impact of a 2014 social marketing campaign in Dakar on ITN coverage. This involved:

1. Development of a household survey to estimate program reach and ITN access and characterize buyers of socially marketed nets;
2. Training of 20 data collectors and field supervisors;
3. Supervision of the survey of 1,080 households in 2016; and Analysis of results and reporting on findings



“Are mosquitoes invading your nights? MILDA, (the brand name and acronym for LLIN) the net that kills mosquitoes.” Poster from Senegal social marketing campaign.

VectorWorks found that **28.1%** of households still recognized the social marketing logo and **6.2%** of households still owned nets from the program, even though it had ended two years prior to the survey, and that households exposed to program messages were significantly more likely to have purchased a socially marketed net.

ITN distribution cost and cost effectiveness

VectorWorks produced new data on ITN distribution strategy costs and cost effectiveness, updating previous general estimates and providing new specific information on mass campaigns, and CD channels, including routine (ANC/EPI), school, and community. The project published six country-specific **cost analysis reports** that provides data from pilots and full-scale implementation, conducted a **meta-analysis on ITN distribution channel costs and cost-effectiveness** using data up to 2017, and analyzed **cost data from various ITN distribution channels in three sub-Saharan African countries**.

The main conclusions from this work are that local context is an important consideration in determining which ITN distribution strategy is most cost effective, and that CD channels can be similarly or more cost effective than mass campaigns. Ultimately, the choice of ITN distribution strategy should be governed by expected cost effectiveness, feasibility, and affordability. VectorWorks studies also showed that net lifespan can interact with distribution strategy and play an important role in the appropriate strategic choice. These results are important given the fact that **ITN procurement constitutes 60% of malaria control commodities costs** worldwide (WHO, 2017), and prior to VectorWorks little was known about the costs and cost effectiveness of ITN delivery channels.

VectorWorks found that cost per ITN delivered did not significantly differ between mass campaigns and CD channels in a meta-analysis of **ITN distribution channel costs and cost-effectiveness**, as shown by the overlapping

violin plots in figure 6. VectorWorks did find differences between ITN distribution channels when considering more operational and epidemiological outcomes, with routine ANC/EPI distribution channels preventing more disability adjusted life-years (DALYs) and malaria cases and deaths for significantly lower costs than mass campaigns. Along with highlighting areas for improving cost effectiveness, these findings indicate that because channels do not have significantly different cost per net delivered, decisions about which channels to use should be based more on which options will work best for the context.

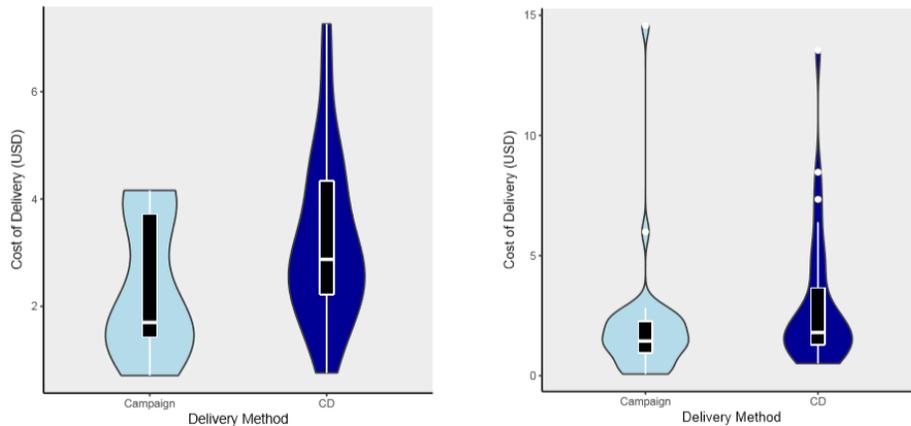


Figure 6. Financial (left) and economic (right) costs per ITN delivered for mass campaigns (light blue) and CD (dark blue).

Using simulation models of malaria incidence reflecting different assumptions about malaria host and vector dynamics and different ITN distribution strategies, VectorWorks found further evidence that ITN distribution channel choice impacts both health and cost outcomes in the short and long term. This analysis identified several important factors to consider when planning ITN distribution strategies, including historical malaria transmission intensity, previous malaria control activities, and anticipated net life-span (Scates et al., 2019). VectorWorks used these results to inform ITN planning and implementation tools, including the CD decision flow chart and NetCALC Lite described later in this report.

VectorWorks also showed that costs per net distributed usually do not vary substantially by delivery channel within a country for international donors (green in figure 7), while domestic contributions (orange in figure 7) may vary significantly. This led to large overall differences in costs per net delivered by mass campaigns and CD channels, but it may be attributed, at least in part, to the need to improve the precision of local government cost estimates.

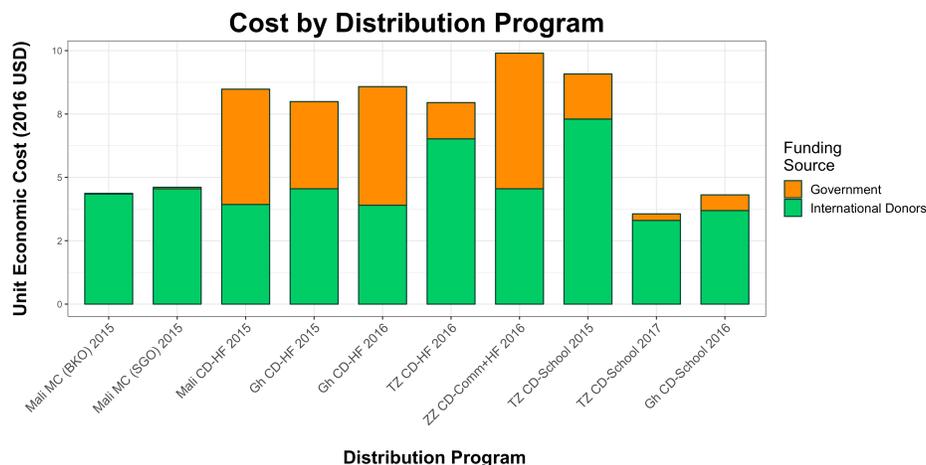


Figure 7. Economic cost of ITN distribution (including cost of net) per net delivered for local governments (orange) and international donors (green) by ITN distribution channel.



STORIES FROM THE FIELD

Kenya, Myanmar and Nigeria contribute to ITN durability evidence

base

VectorWorks monitored ITN durability in Kenya, Myanmar, and Nigeria. Although monitoring activities differed by country, in each setting VectorWorks organized trainings for data collections, implemented field work in collaboration with NMCPs and local research institutions, led data analysis workshops, produced reports, and discussed results with stakeholders to inform program planning.

In Myanmar, VectorWorks conducted ITN durability monitoring in Tamu Township following a 2015 mass campaign. The project led data collection on DawaPlus 2.0 and PermaNet 2.0 net brands at baseline, 12-, 24-, and 36-month follow-up and collected ITNs during the 24- and 36-month rounds of data collection for bioassays to assess insecticidal integrity.

Results showed sub-optimal insecticide effectiveness at 24 months, though chemical residue analysis suggested active ingredient was still present.

In Nigeria, VectorWorks collaborated with the National Malaria Elimination Program (NMEP) to conduct ITN durability monitoring in the Zamfara, Oyo, and Ebonyi states. The project assessed DawaPlus 2.0 brand nets at baseline and 12-, 24-, and 36-month follow up and investigated insecticidal integrity through bioassay of nets collected at 12-month follow-up. Analysis of resulting data indicated:

- median net survival of
 - 5.3 years in Zamfara state,
 - 3.2 years in Oyo state, and
 - 3.3 years in Ebonyi state.

These results reflect differing socio-ecologic environments across the three states, as well as excellent net attitudes and care in Zamfara.

In Kenya, VectorWorks collaborated with the Pan African Mosquito Control Association (PAMCA) to plan and initiate ITN durability monitoring. The project assessed DawaPlus 2.0 and DuraNet brands in socio-ecologically similar Busia and Kwale counties following a mass distribution campaign in 2017.

Baseline data collection was successful for two key reasons, according to the local coordinator:

- collecting data using tablets ensured accuracy and all owed real-time corrections or clarification with participating households, and
- pairing experienced durability monitoring data collectors with community health volunteers allowed the former to accurately and efficiently collect data with the former providing local insight and facilitating acceptance of the survey.

VectorWorks conducted baseline and 12-month data collection and worked to ensure a smooth transition of 24- and 36-month data collection and study analysis and reporting to other implementing partners at the end of the project. This involved both local capacity building and involvement of implementing partner Vectorlink from the start of activities.

Seasonality of ITN use

While seasonality of ITN use is well documented, VectorWorks was the first to quantify **seasonal variation in net use among people with access**. Seasonal ITN use trends were more pronounced in arid climates, with peak use occurring one–three months after peak rainfall. This indicates that net use is influenced by mosquito density and provides important input for targeting net use SBC, suggesting more return on investment for these activities during the dry season in arid climates (Koenker et al., 2019). Results will also contribute to geospatial models of ITN use and malaria transmission.

ITN durability evidence base

Information on how long particular ITN brands last in different settings is useful for identifying ITN products that last less than the expected three years, which is helpful to inform ITN distribution strategies. Accurate data on net durability and its drivers also help to more effectively develop and target SBC messaging on net care to prolong net life. These factors differ across geography; research has shown that **durability of the same net brand varies between regions in the same country**.

VectorWorks standardized a durability monitoring protocol for PMI and **implemented monitoring in 18 sites across eight countries**, providing useful sub-national data on how long ITNs last in particular contexts.

In addition to expanding the geographic reach of ITN durability monitoring, VectorWorks developed a series of detailed tools, described later in this report, to promote standardized collection and analysis of net durability data. This allowed VectorWorks to compare durability across regions and between countries, create and refine a **risk index predicting the likelihood of increased ITN damage**, and model predictors of net durability. The project also conducted qualitative and quantitative studies of ITN attrition, or the loss of nets that are still usable and effective, resulting in a better understanding of how often attrition takes place and what drives it.

VectorWorks used durability data up to 36 months after mass ITN distribution, from 12 sites in five countries, to refine a **risk index predicting the likelihood of increased ITN damage**, based on environmental, socioeconomic, household, and attitudinal factors. The project showed that this tool was reasonably accurate in predicting median ITN lifespan using data collected at baseline and during preliminary rounds of ITN distribution. With further optimization, it could be used to classify regions by risk of net damage early on in the net distribution process, allowing targeted net care SBC and more accurate projections of ITN distribution needs over time.

In a modeling exercise using pooled ITN durability data from the Centers for Disease and Prevention studies in 37 sites, across eight countries, VectorWorks found the largest reductions in malaria transmission were projected to be achieved by improving net use, rather than by improving retention, physical integrity, or insecticidal integrity of ITNs. Swiss TPH and VectorWorks presented these results to the RBM Vector Control Working Group (VCWG) LLIN Priorities Workstream in 2018 to facilitate discussion on implications for vector control strategy and implementation (Briet, 2018).

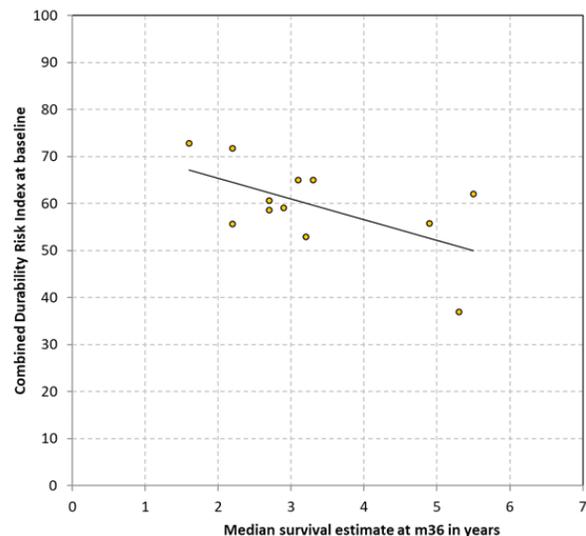


Figure 8. Linear regression of baseline combined ITN durability risk index on 36-month median survival estimate in years.

ITN Use versus Access

VectorWorks produced and analyzed data on ITN coverage and use to achieve several objectives to:

- better understand the programmatic utility of **ITN use and coverage indicators**
- provide centralized, regularly updated **reporting on ITN use and access data**
- identify **drivers of and barriers to net use**
- explore the impact of **net preferences** on purchase and use of nets

ITN use and access indicators

Use-and-access indicators are essential to understanding the impact of ITN distribution activities, because while high levels of net use are the ultimate goal of these interventions, they must be interpreted in the context of availability. The percentage of the population using an ITN the night before being surveyed is typically used to assess ITN use. ITN coverage, on the other hand, is usually quantified using three indicators, two at the household level and one at the population level. The proportion of households owning at least one ITN provides a sense of the spatial reach of ITN distribution, but not the extent to which individuals have access to a net they can use.

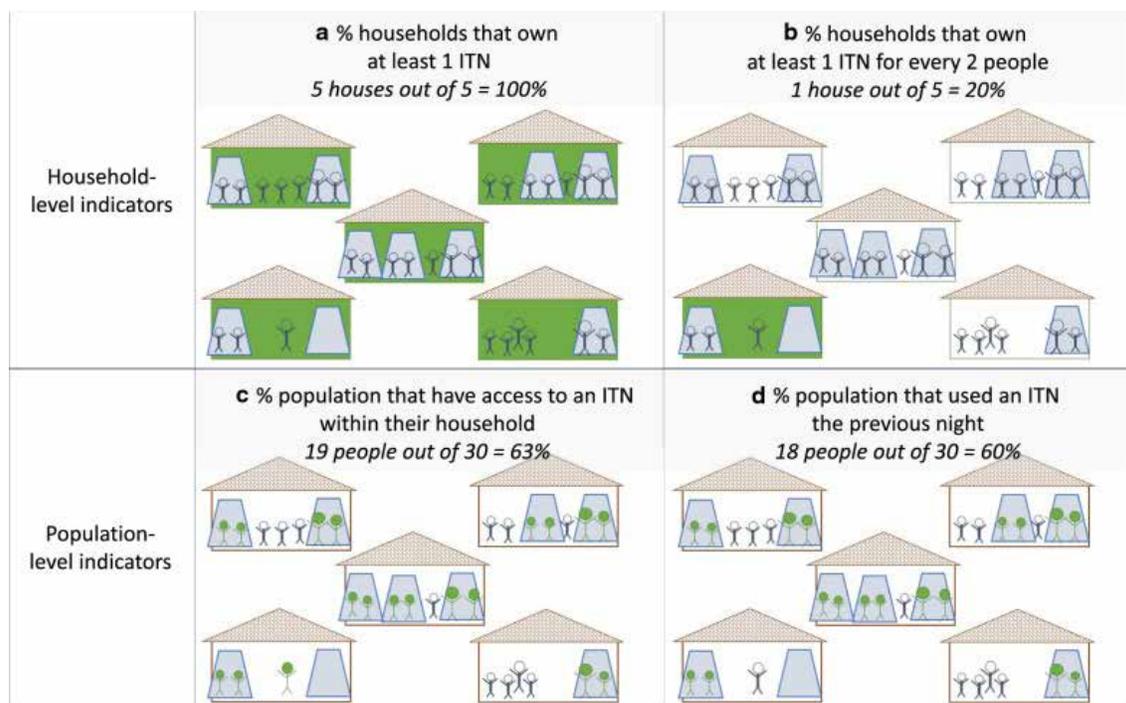


Figure 9. Graphic depiction of household- and population-level ITN indicators applied to 5 households, 30 individuals, and 10 ITNs with households and individuals meeting indicator criteria for net ownership in green (Koenker et al., 2018).

Household ownership of at least one ITN for every two people is often referred to as “universal coverage” and intuitively seems like a good choice of summary indicator, because it reflects the algorithm used to determine how many nets are needed in a mass distribution campaign. However, despite great efforts to scale up ITN distribution in the last decade, no country has achieved the target of at least 80% coverage using this indicator. Population ITN access, or the percentage of the population with access to a net within their household, precisely counts all individuals who could use an ITN, accounting for nets in all households rather than only those reaching a certain threshold.

VectorWorks analyzed data from 86 DHS and MIS surveys in 33 countries in sub-Saharan Africa to better

understand the **programmatic utility of each of these three ITN access indicators** and to explore why household ownership of at least one ITN for every two people, or household ownership of sufficient ITNs, consistently falls far below target levels (Koenker et al., 2018). Again, in this analysis, no national programs reached 80% of household ownership of enough ITNs (i.e., at least one per two household members), with only one region out of 122 achieving 81% coverage using this indicator.

Population ITN access and household ownership of sufficient ITNs were highly correlated, with the proportion of households with at least one net per two individuals estimated at around 60% when population access is 80%. This is because the percentage of households with sufficient ITNs underestimates coverage, completely omitting

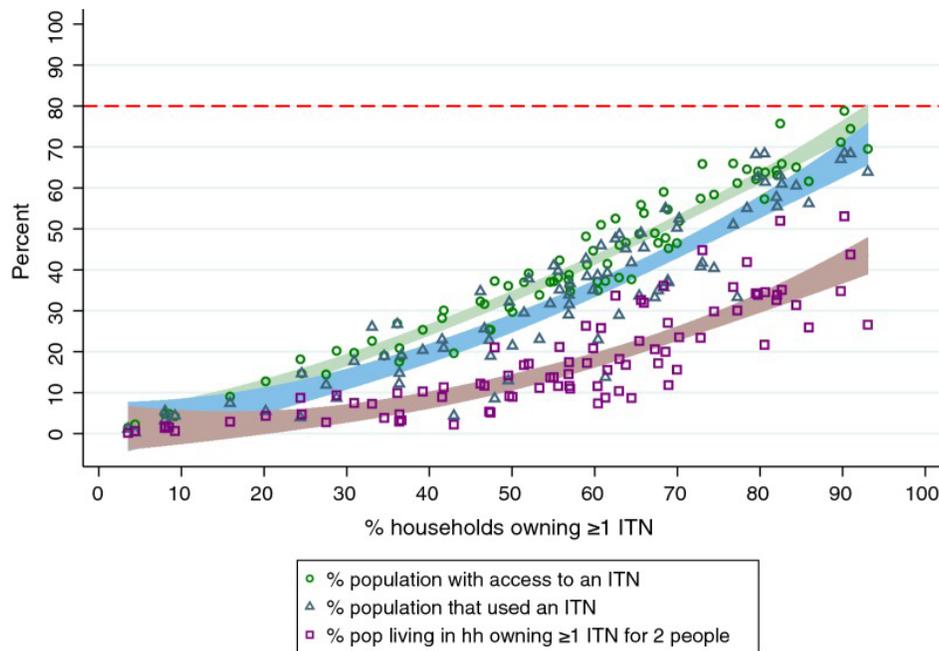


Figure 10. Proportion of people with access to ITN (green) and living in households with enough ITNs (red) as a function of household ownership of any ITN, with the population sleeping under ITN the previous night (blue) (Koenker et al., 2018).

households with enough nets to cover most, but not all, individuals. VectorWorks quantified this omission, finding that across 86 national surveys, 60% of people with access to an ITN are ignored when using the proportion of households with at least one net per two people as an indicator. These results indicate that population ITN access is a more programmatically appropriate indicator of “universal coverage,” with the advantage of being directly comparable to population use estimates.

“This [ITN use and access report] is the document I use the most out of anything in malaria control, it’s so incredibly useful!”

– Dr. Melanie Rensha, RBM Country and Regional Support Partner Committee co-Chair and former interim Director of RBM

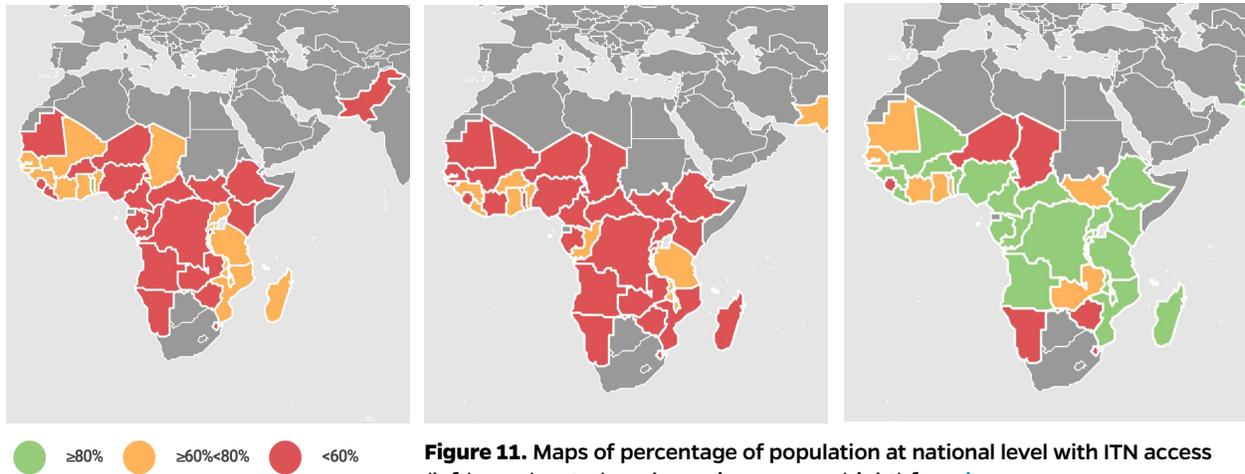
“When there is access to nets, they are being used. A culture of net use exists [in DRC].”

– Ferdinand Ntoya, PMI Malaria Program Specialist, DRC

Reporting ITN use and access data

In light of the importance of local data on ITN access and use, VectorWorks developed the itnuse.org website to join all the most recent national and regional data on use and access, presenting them in an intuitive and user-friendly manner. This enables comparison of net use and access metrics over time and across different contexts and consideration of factors relevant to net access and use, which vary between and within countries, such as rainfall patterns, urbanicity, and wealth distribution, providing NMCPs with important input for planning national and sub-national ITN distribution and malaria vector control strategies.

VectorWorks created maps using the most recent use and access ratio data available for all countries included on itnuse.org, allowing a visual assessment of geographic trends. Maps come with observations that include information on recent ITN distribution efforts and potential explanations for visualized trends, such as altitude, rainfall, and temperatures.



ITN use and misuse evidence base

While these data collected and presented by VectorWorks indicated a smaller gap between ITN access and use than previously calculated, there was still room to improve use of available nets in many contexts. VectorWorks addressed this need by contributing to [qualitative data](#) on drivers of the gap between net use and access, using durability monitoring data to explore causes of net attrition, assessing net use and repurposing in Uganda using DHS and MIS surveys, and conducting rapid assessment of ITN misuse for fishing in Tanzania and [Malawi](#).

A study in three epi-ecological zones in Ghana [presented at ASTMH 2018](#) indicated that people are not just “net users” or “non-users,” but individual net use habits vary across seasons, over time, and even during a single night. Heat, skin irritation, and lack of airflow were the biggest barriers to ITN use, while personal experience with malaria, including having loved ones fall ill, was the most powerful motivator for consistent use.

In Zanzibar, VectorWorks conducted [in-depth interviews with community members and local leaders](#) that revealed similar barriers to ITN use. These results indicate occasional net users as a target population for SBC, encouraging net use and heat and air circulation as key barriers to net use that must be addressed (Monroe et al., 2019).

“...I had a baby girl, but we were not sleeping in the mosquito net and she had malaria...we rushed her to the clinic and after observation, they said... we should take her to Apam (district capital). When we arrived there, she was dead, my baby girl was dead. So, since that time, we have slept in the mosquito net every day. Even when it is hot, we sleep in it.”

– 33-year-old female, under-five caretaker, Central Region, Ghana

“During the hot season everything is hot, even the net itself, if you are covered with a net you’ll be on fire.”

– Male household member, Donge Mchangani, Zanzibar

VectorWorks also published on the [impact of net care SBC in Nigeria and Uganda](#). Results showed substantially improved attitudes toward net care and increased net durability with SBC, but no improvements in ITN conditions linked to net repair activities (Helinski et al., 2015; Koenker et al., 2015). These findings reinforce the key role of net care, rather than net repair, in ITN durability and the need to focus SBC on improving attitudes and actions around net care but not net repair.

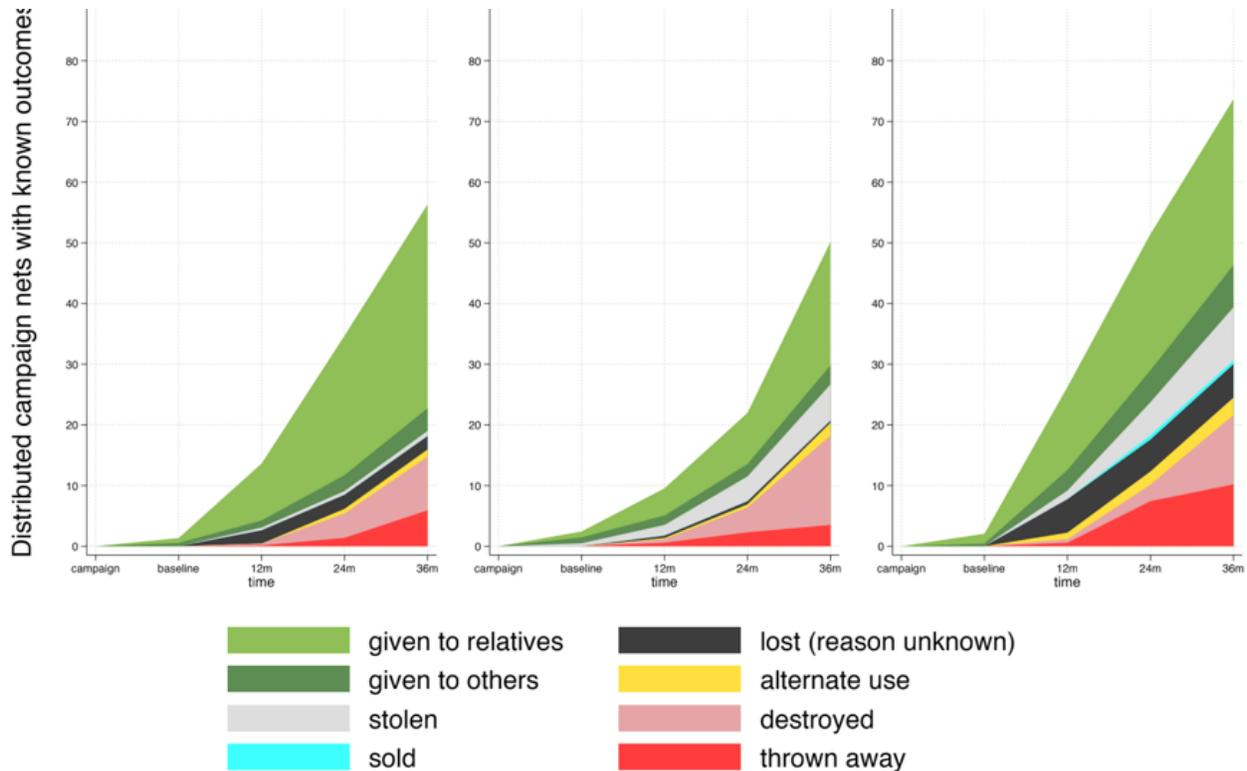


Figure 12. Percentage of campaign nets lost by [cause of net attrition](#) over time after ITN distribution in three districts in Mozambique.

VectorWorks provided new insights on [net attrition and its causes](#), including misuse, using data from durability monitoring in five countries. The fact that all-cause attrition was not strongly predictive of net survival outcomes indicates this metric should not be used for planning ITN distribution. While more nets were thrown away than repurposed, used otherwise or misused, the most common source of attrition was giving nets away to family members, affirming the assumptions of malaria control staff. Encouragingly, people in sub-Saharan Africa usually stopped using nets only when they felt they were no longer useful for malaria prevention because of large holes. With these data, VectorWorks indicated that ITN investments are being used appropriately and provided useful information for SBC focused on net care.



STORIES FROM THE FIELD

Uganda drafts memos on ITN use and misuse using MIS and DHS data and conducts mass ITN distribution campaign

VectorWorks used data from MIS and DHS surveys in Uganda and other countries to draft memos on ITN use and misuse. The net use memo reported a higher proportion of the population using ITN in Uganda than in Zimbabwe or Ghana, with rates similar to Tanzania. Common barriers to use included negative beliefs about ITNs, small sleeping spaces making hanging difficult, and nets being too old. Net repurposing was found to be rare.

VectorWorks also provided technical assistance for the 2016 mass ITN distribution campaign in Uganda, contracting three AMP consultants to create a package of tools and plans to facilitate planning and implementation of the mass campaign.



STORIES FROM THE FIELD

Malawi assesses net misuse for fishing and conducts mass ITN distribution campaign

Although fishing with an ITN is not a common occurrence in sub Saharan Africa, VectorWorks conducted a rapid assessment of five lake-side communities in Malawi to better understand drivers of this type of ITN misuse. The project found that increased pressures from poverty, climate change, and hunger may drive higher rates of ITN misuse for fishing in certain communities, emphasizing the need to address underlying issues of food security and economic stability. Nets were also used to dry fish, display goods at small roadside stands or stores, as doors, room dividers, or window screens in houses, or as protective fencing for young plants.

VectorWorks also supported two AMP consultants providing technical assistance for mass ITN distribution in 19 districts in Malawi. This included:

1. development of transportation logistic plans and tracking systems;
2. cascade trainings on mass distribution implementation; and
3. implementation of mass campaign at site level.

“They come and coax the people to sell so because of poverty people sell (ITNs) to buy salt, maize flour. Because of poverty you do sell 3 or 4 and they use those nets for fishing.”

– Community Leader’s focus group discussion, Mangochi



Using ITN for fishing in Malawi. Steven A. Harvey for PMI VectorWorks.

“When you receive three mosquito nets and you don’t have food at home, at the same time your husband is not working, you just sell it to fishermen at the price of k400 so that your children should not go to bed without eating. By doing that you are killing your future.”

– Women’s focus group discussion, Zomba, Malawi

Net preferences

VectorWorks also explored the impact of ITN costs and other characteristics on net purchase and use, conducting a [review of net preferences and their impact on use](#) and a [discrete choice experiment](#) on how net cost and attributes influence willingness to pay.

In the review, VectorWorks summarized existing literature on net preferences and performed a secondary analysis of any DHS or MIS datasets with information on net characteristics or net preferences. Results showed that people have preferences for ITN shapes and colors that vary nationally and sub-nationally, but these preferences do not impede net use at the population level. VectorWorks also found that even when more expensive conical nets are strongly preferred, increased net use related to this preference cannot make up for the losses in ITN coverage caused by spending a fixed budget on fewer conical nets (Koenker et al., 2017). Both PMI and the Global Fund no longer procure conical nets as a direct result of this article, as described later in this report.

VectorWorks found that when people were given money and presented with a series of ITN purchase choices in a discrete choice experiment, they were very willing to buy nets, even as the price increased, and would pay extra for desired attributes like larger net size or insecticide treatment if they could afford them. These findings are encouraging for NMCPs interested in including commercial sector net sales in their national ITN distribution strategies, and they indicate the potential for the private sector to increase sales or revenues by promoting preferred net characteristics (Gingrich et al., 2017).

Residual/Outdoor Transmission Evidence Base

Despite immense gains in ITN coverage during the past decades in malaria endemic countries, transmission still persists around the margins of high coverage with ITNs or indoor residual spraying (IRS). VectorWorks generated new knowledge about this outdoor and residual malaria transmission, reviewing the existing literature, conducting studies of human and mosquito behavior dynamics in Zanzibar, and developing new approaches to effectively integrate data on human and mosquito behavior. The project also engaged at the global level to share knowledge and best practices on residual malaria transmission and alternative vector control tools.

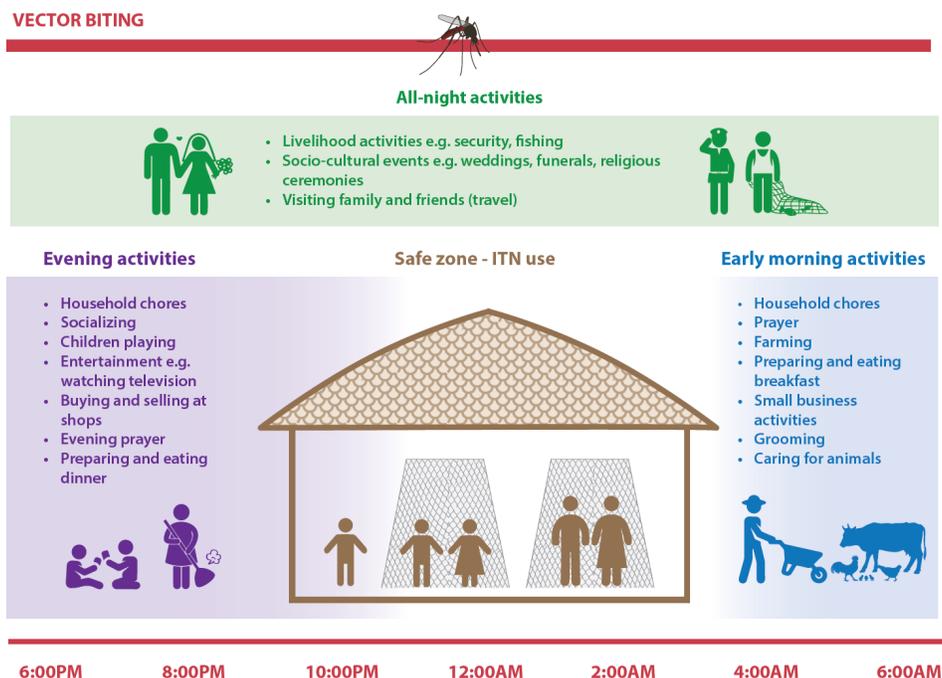


Figure 13. Depiction of night-time activities covered by ITN use and those not protected by appropriate use of ITN, Zanzibar

VectorWorks conducted a literature review focused on **when and where people are exposed to malaria mosquitoes** in sub-Saharan Africa (Monroe et al., 2019). Results suggest there are broad nighttime human activity categories that are similar across settings, including household chores, entertainment, livelihood activities, and large-scale community events. Human-vector interaction indicators, or measures of malaria vector exposure for human hosts in different scenarios, such as an unprotected individual indoors versus an ITN user indoors, were found to be under-utilized and inconsistently applied.

VectorWorks assessed residual transmission in Zanzibar in six wards, building on existing methods, lessons learned through primary research, and global engagement to apply a harmonized approach to assessing **entomology and human behavior**. The approach VectorWorks used provides essential data elements to be captured, methods for calculating relevant indicators, and suggestions for best practices in data collection and analysis.

These methodologies have the potential to improve understanding of residual transmission across different contexts and allow an assessment of changes in malaria exposure when new vector control tools are introduced. In Zanzibar, it was found that 76% of people had access to ITNs and 75–80% of those with a net used it. While consistency of net use among owners could be improved, the greatest gains in malaria control within Zanzibar would be made by addressing outdoor transmission, with more than two-thirds of **mosquitoes found outdoors** and 15–30% of people away from the home at some point during the night.

VectorWorks also conducted **in-depth interviews with community members and local leaders** in Zanzibar and found a wide range of outdoor night-time activities, from peri-domestic activities like chores, monitoring security, socializing, and childcare; to social events like weddings, funerals, or seeing family or friends.

Men and seasonal workers were more mobile than women and children, spending more time outdoors, away from home, traveling and working at night. These night time activities can impact exposure to malaria mosquitoes and the ability to use a net. Effectively targeting vector control tools and SBC interventions to groups at higher risk of malaria exposure, including men and seasonal workers, will be crucial in low-transmission settings like Zanzibar.

VectorWorks presented these results and contributed to global discussions on residual malaria transmission by participating in a workshop on residual malaria transmission, hosted by WHO and Ifakara Health Institute; by organizing and facilitating a symposium at the American Society of Tropical Medicine and Hygiene meeting; and by presenting at the Alliance for Malaria Prevention, the RBM Vector Control Working Group, the RBM Monitoring and Evaluation Reference Group, and the Multi-lateral Initiative on Malaria meetings.

“When you are outside you really can’t wear the bed nets, can you?”

– Female community member, Zanzibar



Woman washing clothes outside of home at night, Zanzibar. Courtesy of VectorWorks. April Monroe for PMI VectorWorks.

Gender differences in analyses

In a study on **age and gender stratified trends in ITN use** across 29 sub-Saharan African countries (Olapaju et al., 2018), VectorWorks found that ITN use was significantly higher among women than men when not enough nets were available in the household. After many years of prioritizing vulnerable groups like pregnant women and children as they are highly impacted by malaria it is important to emphasize the need to provide enough ITNs for all household members and for SBC urging consistent net use among both men and women. While people primarily use the nets they have, this is not the case in all settings or among all groups.

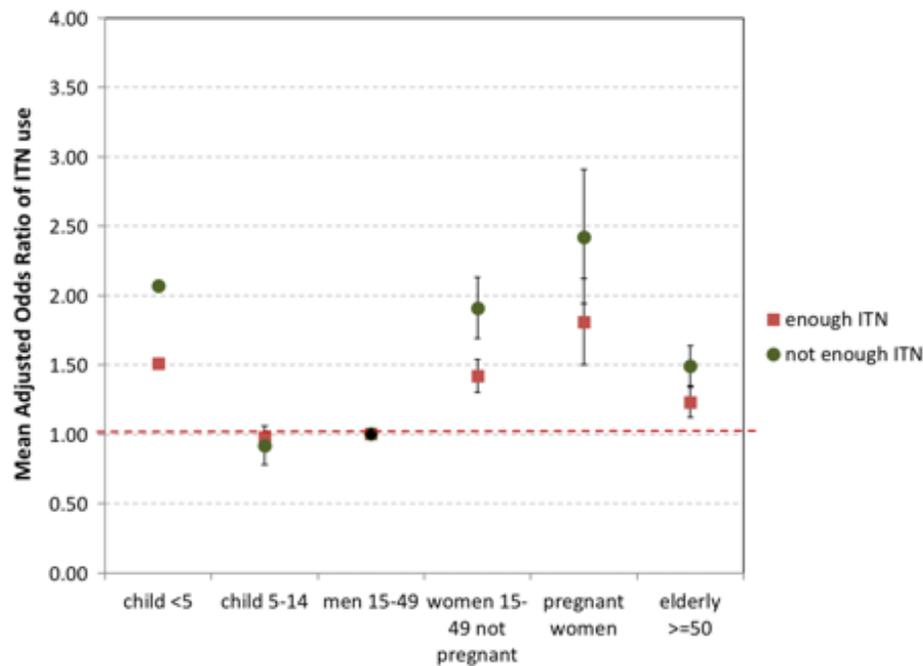


Figure 14. Mean adjusted odds ratios for ITN use among different age and gender groups (Olapeju et al., 2018).

VectorWorks also supported the Ifakara Health Institute in conducting [qualitative research](#) on [net care](#) in Tanzania, which indicated that both men and women perceive ITN care to be women’s responsibility.

In Ghana, VectorWorks carried out qualitative research to better understand the gap between use and access. The study provides some insight on potential drivers of lower use among men, as ITN use was perceived as a sign of weakness among some men, and men were reported to more commonly sleep outside or spend significant time away from home.

“They have this slogan, excuse me to say ‘dagban doo’ here, ‘dagban doo bi ninda’ (meaning dagomba man doesn’t do) so like they are proud. Like a dogomba man sleeping under a net, what is malaria? That is how it is, so he feels that he can take care of himself better than using a net because when he uses a net they will say you are just a weakling.”

– 27-year-old female, health worker, Northern Region, Ghana

More Know-How

VectorWorks increased practical knowledge on how to choose, plan, implement, monitor, and evaluate ITN delivery strategies, particularly routine and CD channels, developing **28 ITN distribution tools** and consolidating all materials related to continuous ITN distribution in an intuitive online toolkit available in several languages ([continuousdistribution.org](#)). The project also provided **ITN distribution training to over 100,000 people** at all levels of implementation, from consultants to government representatives at the national, regional, and local levels; administrators; health care workers; teachers; and volunteers.

VectorWorks expanded and refined the **tools needed to plan, conduct, analyze, and report on durability monitoring** following [PMI technical guidance](#) and created [durabilitymonitoring.org](#) as a one-stop-shop for these tools and durability monitoring datasets. The project ensured this know-how reached implementing teams by providing **baseline and refresher durability monitoring training** in eight countries. These activities were well aligned with PMI’s commitment to increase monitoring of net durability and helped ensure efficient collection of standardized data to be used to improve ITN distribution planning and development and implementation of net care SBC.

ITN distribution tools

With continuousdistribution.org, VectorWorks brought together decision-making tools like NetCALC, which helps users quantify how many nets are needed for ITN distribution and offers practical guides for specific activities like routine health facility LLIN distribution, templates of questionnaires, necessary documents, forms, spreadsheets, and presentations, including examples of country experiences with CD strategy development and implementation. These resources provide NMCP and other partners everything needed to plan, implement, monitor, and evaluate ITN CD campaigns in a one-stop-shop. The website is much more than a simple clearinghouse. It is organized in steps to walk planning teams through every aspect of ITN distribution—from deciding whether CD is right for their setting and choosing the most appropriate channels to implementing ITN distribution, collecting and analyzing resulting data, and interpreting results.

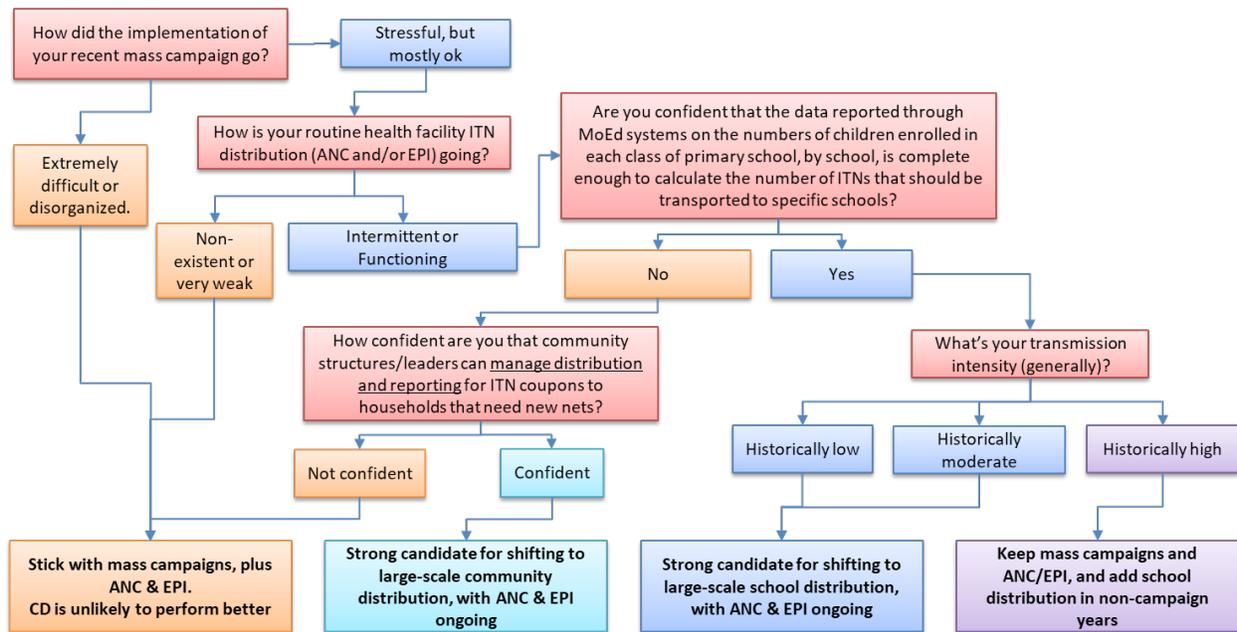


Figure 15. ITN distribution strategy flow chart, available on continuousdistribution.org

VectorWorks created the ITN distribution strategy flow chart above to highlight major points to consider when planning ITN distribution strategies and to guide users in identifying channels that may work in their context. The flow chart is available in both French and English on continuousdistribution.org and is integrated into the NetCALC Lite user interface.

After a potential ITN distribution channel is identified, continuousdistribution.org walks users through three steps to choose the CD channel or channels best suited to their local context, including 12 detailed steps for implementing each type of CD. VectorWorks included relevant resources at each of these steps, including web- or Microsoft Office-based tools that help synthesize information on local context and tailor CD implementation to the particular setting; and informative documents, guides, and question sets. The project provided many templates and real-life examples of necessary documents and presentations on the website, allowing planners to modify these tools to their context rather than developing them from scratch—saving time and resources while standardizing practices.

VectorWorks promoted this toolkit by sharing the web link via relevant mailing lists and social media channels and presenting it to ITN working groups during VectorWorks technical assistance visits and AMP consultant and NMCP trainings. The project also distributed materials from continuousdistribution.org on digital media platforms and mobile applications used by educators, health workers, and community leaders in malaria endemic countries and dedicated part of the [Net Distribution Webinar](#); they were attended by over 100 participants and is available online at continuousdistribution.org.



STORIES FROM THE FIELD

Angola continues mass distribution, improves routine ANC/EPI, and evaluates ITN delivery, use and care

VectorWorks collaborated with PMI, the NMCP, and the Global Fund to **scale-up and maintain universal ITN coverage** in Angola. Key activities included:

1. Technical **support for mass campaign** and process evaluation of first three phases to identify areas for improvement;
2. Qualitative and quantitative **assessment of ITN use and care**;
3. Support for **revision of national ITN strategy**; and
4. Field assessment of routine ANC/ EPI channels resulting in national **ANC/EPI ITN distribution guidelines**.

In the ANC/ EPI ITN distribution field assessment, VectorWorks found issues with stock-outs of both ITNs and registration supplies and identified underlying causes including inadequate storage facilities and inefficient systems for requesting or receiving supplies. This informed the routine ANC/ EPI ITN distribution guide for Angola, a country-specific tool to facilitate more efficient, sustainable, and standardized net delivery through this channel. VectorWorks involved key stakeholders at national and local levels in every step of this work to ensure the applicability and acceptability of the proposed procedures.

VectorWorks created country-specific guidance on ITN distribution in Angola, DRC, Ghana, Liberia, Malawi, Mozambique, Tanzania, Uganda, and Zimbabwe informed by both research and field experience in each country.

In **Tanzania**, VectorWorks created a generic SNP implementation guide, reference manual, and training slides, eliminating the need to create new materials for each wave of implementation. The project also developed standard operating procedures (SOPs) for school-based CD in **Ghana**, evaluating their implementation in a report to the NMCP and PMI. VectorWorks created country-specific gender training curricula for both countries, which included guidance on incorporating gender considerations in all aspects of ITN distribution planning, implementation, and assessment.

VectorWorks' support of school-based CD and routine ANC/EPI ITN distribution scale-up in **Zimbabwe** included developing implementation guidelines for both channels, informed by pilots in four districts. AMP consultants, supported by VectorWorks, created planning and implementation tools for mass distribution in **Uganda** and **Malawi**, including a communication implementation timeline for the 2016 Uganda campaign and logistics tracking systems in Malawi. In the **DRC**, VectorWorks provided technical assistance to UNICEF in developing tools for school-based CD planning and implementation, including participation in a workshop to develop SBC messages and materials. The project also collaborated with the **Mozambique** NMCP and the GSHC-PSM project to develop new school-based CD tools.

VectorWorks developed a health facility checklist and other standardized tools to guide planning, implementation, monitoring, and evaluation of routine ANC/ID ITN distribution in **Liberia**; this led to greater understanding and knowledge of ANC/ID procedures and improved documentation and reporting among health facility staff. The project also created a guideline for ITN distribution in institutions, including orphanages, army barracks, and private hospitals to support mass distribution campaigns in Liberia.

ITN Distribution Training

In addition to developing and distributing tools, VectorWorks provided in-person and web-based training on ITN distribution to various key stakeholders to expand the reach of this know-how and improve and standardize approaches to ITN distribution planning, implementation, evaluation, and reporting.

With VectorWorks' support, AMP held two regional trainings on the critical steps of ITN mass distribution and CD campaigns for 62 NMCP representatives and implementing partners from 18 African countries and Pakistan, all with mass campaigns planned in 2019 and 2020. These trainings—one in French and one in English—used a country scenario to simulate mass ITN distribution campaign planning. Sharing best practices between countries was encouraged, which participants found particularly useful.

Because NMCPs often rely on technical assistance from skilled AMP consultants when planning and implementing ITN distribution campaigns, VectorWorks also developed and conducted training on mass campaign implementation and CD for **AMP consultants**. The four-day training session, held in 2018, was the first time these AMP technical assistance providers had gathered in one room since 2012. Fifteen expert AMP consultants from 13 countries attended the training, which used self-guided, interactive activities to introduce school- and community-based CD channels and to refresh critical components of mass campaign planning, including logistics and communications, micro- and macro-planning, implementation, and evaluation.

VectorWorks also provided in-country ITN distribution training at the national, regional, and local levels.

- In **Tanzania**, VectorWorks trained more than 2,400 people on school-based CD and 8,900 people on routine ANC/EPI ITN distribution. The project facilitated regional review meetings in both Zanzibar and the Mainland where regional and council health monitoring teams reviewed routine ANC/EPI distribution performance and mentoring was provided to district teams on development and use of corrective strategies for under-performing health facilities.
- VectorWorks **Liberia** trained county health personnel on routine ANC/ID ITN distribution protocols and procedures; who, in turn, trained health facility staff on implementing these channels. The project also collaborated with the Liberia NMCP and Family Health Unit to conduct a one-day orientation for 20 implementing partners. They reviewed health facility implementation procedures and monitoring tools and strategies, and discussed lessons learned to improve ANC/ID distribution.
- In **Angola**, VectorWorks provided training on mass ITN distribution and supported two consultants who developed and conducted two workshops for government and implementing partner staff involved in these campaigns to share lessons learned.
- In **Mozambique**, VectorWorks planned and implemented training-of-trainers as part of technical support for a school-based CD pilot.



Terry Wanjiru from Kenya leading a demonstration on how to hang an ITN. *Courtesy of PMI VectorWorks.*

- VectorWorks and the Health Communication Capacity Collaborative (HC3) conducted a three-day workshop on data use and SBC messaging on ITN use and ownership for the NMCP and implementing partners in **Zimbabwe**; the project also held a NetCALC refresher training.
- VectorWorks supported two AMP consultants providing technical assistance to the **Malawi** NMCP in planning and carrying out a mass ITN distribution campaign who, among other tasks, completed cascade training at local sites.
- In **Uganda**, three AMP consultants, supported by VectorWorks, provided technical assistance for a mass campaign. This included training NMCP staff and others on planning and implementation.



STORIES FROM THE FIELD

Ghana increases capacity to develop, monitor, and implement vector control interventions

Ghana was VectorWorks' second largest country program. The project collaborated with the NMCP, School of Health Education Program (SHEP), U.S. Peace Corps Ghana and others to **sustain universal ITN coverage** through:

1. Planning, implementing, and assessing **school-based CD** in all ten regions;
2. Supportive supervision and improved logistics for routine **ANC/CWC ITN distribution**, which was expanded to ten regions;
3. Planning and implementing **mass distribution campaigns**; and
4. Planning and implementing **ITN durability monitoring** in two districts in the Northern Region.

This included school-based CD training for over 33,000 people and **cascade school-based SBC training** where VectorWorks trained 35 national and regional stakeholders who created master teams to train district and circuit level teams, resulting in SBC training for over 2,300 circuit supervisors, 8,200 head teachers and health coordinators, and 54,300 teachers. The project partnered with Peace Corps Ghana to train volunteers on sharing ITN use and care SBC messages in their communities, and incorporated SBC in **mass distribution implementation training**, where sub-district supervisors also learned how to validate community population data and implement campaigns. Following successful mass distribution, VectorWorks provided **baseline durability monitoring training** based on standard PMI guidelines, preparing local teams and

implementing partners to continue activities after the project ended. VectorWorks also trained 295 members of national, regional and district health monitoring teams on **supportive supervision of ANC/CWC distribution**, whose implementation resulted in coaching of over 41,000 health facility staff and higher rates of ITN distribution among eligible pregnant women and children under five. The project helped distribute routine ANC/CWC ITN delivery training materials to 85 colleges of health sciences, nursing, and midwifery in all ten regions.



On-the-job midwife training in Ghana on ITN distribution. Prince Owusu for PMI VectorWorks.

“[Before SBC training], teachers had little motivation to engage in the program. [After training], automatically, teachers wanted to be a part of it.”

– Stephen Dugbartey, Municipal SHEP Coordinator

Durability monitoring tools

VectorWorks responded to PMI's request to develop a standardized collection of ITN durability data by developing durability monitoring protocols and questionnaires and recommended data structures for submission to PMI and promoting their use through various dissemination and training activities. These tools improve the consistency of net durability data which in turn facilitates assessment of differences across regions and countries, more accurate procurement calculations, and identification of areas to target for net care SBC.

VectorWorks also addressed the need to create a single online repository for these standard protocols and questionnaires and other ITN durability tools and datasets with the development of durabilitymonitoring.org. The site operationalizes [PMI technical guidance](#) for routine durability monitoring and furthers PMI's efforts to scale up durability monitoring in all focus countries.

On the website, VectorWorks first provides a complete list of PMI sites with completed, current or upcoming durability monitoring activities. This list includes information on products assessed, specific areas involved, and the timeframe for monitoring along with links to peer-reviewed publications and reports on monitoring results. The second section is reserved for ITN durability monitoring data sets as they become available. Users can sign up for a durability monitoring newsletter and alerts when new data are available. These data allow assessment of net durability based on characteristics like ITN brand or geographic location to answer questions about how different factors impact net longevity and provide further support for results of previous research. For example, data from durabilitymonitoring.org indicate that the same net has a median lifespan of 5.3 years in the Zamfara region of Nigeria and 1.7 years in the DRC, supporting the results of modelling described earlier that indicate net care can impact durability more than net characteristics.



Figure 16. Visual aid for counting and classification of ITN holes, available on durabilitymonitoring.org

VectorWorks dedicated the third section of the website to durability monitoring tools, including the LLIN Durability Monitoring Package—in both English and French—and many materials in Portuguese, as well. The first part of this package provides guidance and tools on durability monitoring study design, implementation, and data collection and entry, such as:

- template standard protocols and questionnaires,
- tools for data collection,
- tools for budgeting, and
- tools for household selection and sampling.

VectorWorks also included extensive supporting materials, like complete training PowerPoints for fieldworkers, visual aids, tools, and lists of fieldwork supplies for fieldwork, as well as standard report templates and analysis “do-files.” These promote standardized durability monitoring to ensure data consistency across countries and over time.

In addition to tools and materials, durabilitymonitoring.org provides step-by-step guidance on whether to conduct durability monitoring, which factors to consider in determining the most appropriate study design for a given setting, and how to assess them to decide on the best strategy.

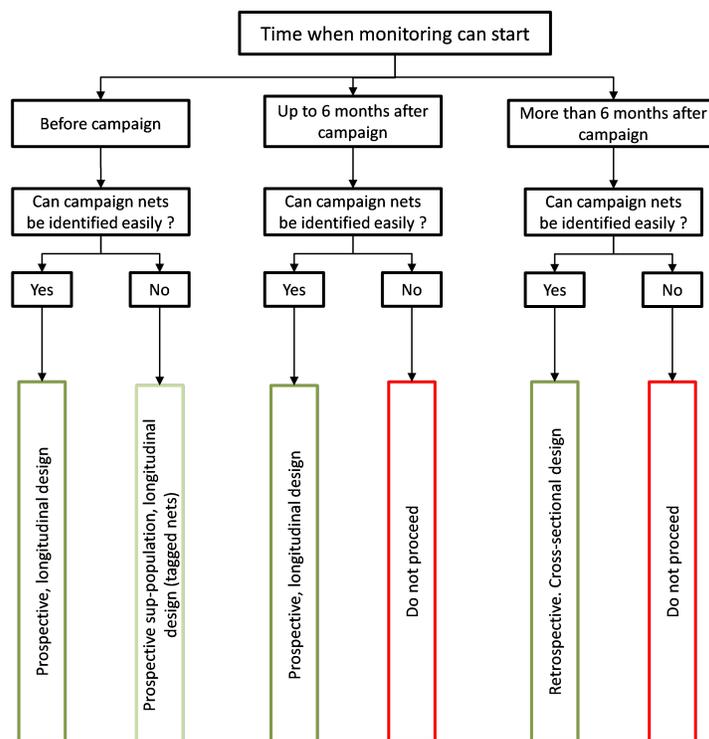


Figure 17. Durability monitoring decision making flow chart, available on durabilitymonitoring.org

The second section of the LLIN Durability Monitoring Package focuses on data cleaning, preparation, analysis, interpretation, and reporting. VectorWorks included useful tools like Stata do-files on data preparation, analysis, and presentation; and Excel files for producing report figures and report templates. The site provides a comprehensive guide on interpreting the results of both physical and bioassay ITN durability monitoring, and determining a plan of action; as well as guidance on how to transition to a new implementing partner, an important consideration given the 40-month timeframe needed to complete durability monitoring.

Durability monitoring training

VectorWorks, in partnership with national programs and local research institutions, provided in-person baseline and refresher training on durability monitoring in DRC, Ghana, Kenya, Liberia, Mozambique, Myanmar, Nigeria, and [Tanzania](#). This ensured the collection of high-quality, standardized data while building local capacity and ownership of the durability monitoring process—promoting sustainability long after the end of the project. At three ASTMH conferences, VectorWorks also organized annual meetings of durability monitoring researchers and PMI counterparts. These meetings contributed to harmonization of durability monitoring efforts, providing a useful forum for sharing best practices and lessons learned and discussing challenges, opportunities, and priorities.

In [Liberia](#), VectorWorks partnered with the NMCP and the University of Liberia Pacific Institute for Research and Evaluation to implement ITN durability monitoring. This included a four-day training on random selection of households, locating and storing GPS coordinates for households, using an Android-based application to count net holes, and administering a household net durability survey. Training was effective, with median participant knowledge test scores improving 35 percentage points from pre-training to post-training.

Effective baseline training was essential to the success of durability monitoring in the [DRC](#), where travel to and within the country was limited for project staff. Initial training, coordinated by VectorWorks, the Kinshasa School of Public Health, and the NMCP empowered local teams to assume leadership of subsequent rounds of refresher training with only virtual assistance from VectorWorks.

Net misuse for fishing toolkit

VectorWorks developed and disseminated a toolkit on [identifying and mitigating ITN misuse for fishing](#) to assist USAID missions, donors, or implementing partners after potential ITN misuse for fishing is identified. The document provides information on why, when, and how to conduct a rapid assessment of ITN misuse for fishing, as well as how to analyze results and develop appropriate programmatic responses. A visual flow chart summarizes the expected processes involved; templates are provided for structured observation forms and questionnaires for rapid assessments. VectorWorks shared specific examples of toolkit implementation in Malawi and Tanzania in this document, including sample protocols, budgets, and data analysis codebooks.

“On Monday, I thought what are we doing? Everything seemed big. On the second day, I started to enjoy the training. Now that we have completed the training—everything seems so simple”

— Leo Harris, University of Liberia student

“The training was very interesting and I’m proud to be a part of this team. At first I thought, ‘what are we doing counting holes,’ but it is very interesting and the activity will have significant programmatic impact for decision making. You can’t take data from other countries and use it here; you must contextualize it here.”

— Victor S. Koko, M&E officer at Liberia NMCP

“The [initial] training received in 2016 was very important and interesting as it was our first experience in assessing sustainability following the PMI protocol!”

— Dr. Paul Mansiangi, durability monitoring co-investigator, DRC

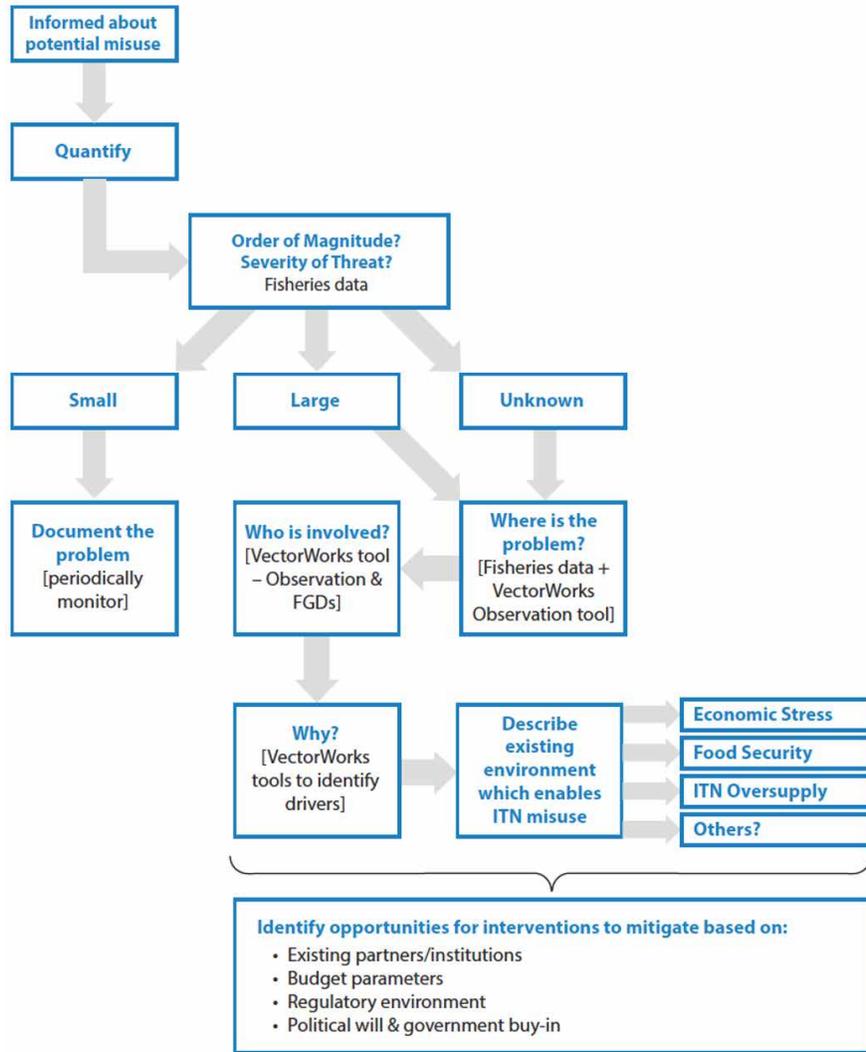


Figure 18. Flow chart depicting response to potential ITN misuse for fishing, from the [Identifying and Mitigating Misuse of ITN for Fishing Toolkit](#).

Gender training and strategy

To ensure gender was strategically integrated into activities and operations throughout the life of the project, VectorWorks carried out a gender analysis to identify opportunities to more intentionally consider gender in ITN distribution planning, implementation, and evaluation.



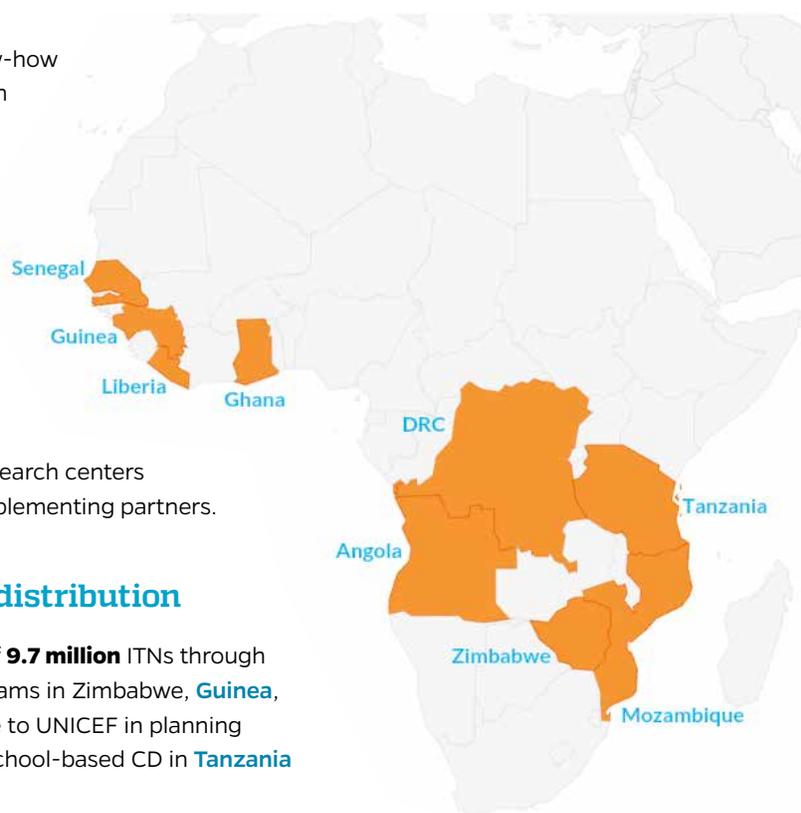
From left to right: VectorWorks [Ghana Gender Champions](#) Richard Kpabitey and Vivian Abiwu, [Danielle Piccinini for PMI VectorWorks](#) and VectorWorks [Tanzania Gender Champion](#) Kanuth Dimoso, [Eric Filemyr for PMI VectorWorks](#).

This informed a comprehensive **gender strategy** that included (1) publishing and presenting on gender research and emergent gender considerations, (2) collecting sex and age disaggregated indicators for operations research and monitoring and evaluation activities, (3) identifying barriers to engagement for females and males at each level of intervention, (4) promoting gender transformative SBC, and (5) developing a gender training for project field staff. VectorWorks conducted **one-day gender training** in both Tanzania and Ghana, leading to country-specific addendums to the project gender strategy and the identification of gender champions to facilitate local implementation of the gender strategy.

The VectorWorks gender team reviewed project materials, particularly logos and photos, to ensure gender equity and avoidance of gender stereotypes, and created a **gender checklist** to be employed at the beginning of all activities to identify opportunities to incorporate gender considerations.

More Nets

VectorWorks put knowledge and know-how into practice, assisting with distribution of **47.3 million** ITNs across nine sub-Saharan African countries via school- and community-based CD, routine ANC/EPI channels, and mass campaigns. To accomplish this, the project collaborated with a wide range of international partners, including PMI, AMP, PSI, and the Global Fund; and national stakeholders, such as NMCPs, various government ministries and offices, research centers and universities, other donors, and implementing partners.



School-based continuous distribution

VectorWorks assisted in distribution of **9.7 million** ITNs through school-based CD, including pilot programs in Zimbabwe, **Guinea**, and Mozambique; technical assistance to UNICEF in planning distribution in the DRC; and national school-based CD in **Tanzania** and **Ghana**.

Guinea is considering national school-based CD, based on positive results from their pilot, and VectorWorks supported Zimbabwe in preparing to scale-up CD implementation in targeted districts after successful pilots of both school- and community-based channels. Prior to the school-based CD pilot in Mozambique, VectorWorks provided input and provided technical assistance in planning to include this channel in the national ITN distribution strategy. In Benin, VectorWorks worked with the NMCP and other partners to review and synthesize information and facilitate discussion to inform an integrated vector control strategy. These activities laid the groundwork for future distribution of more nets, applying lessons learned from VectorWorks pilots and analyses to ensure effective, efficient, and equitable CD implementation.



STORIES FROM THE FIELD

Zimbabwe prepares to scale up continuous ITN distribution

VectorWorks collaborated with the NMCP, the Zimbabwe Assistance Program in Malaria (ZAPIM), PSI, and the Health Communication Collaborative (HC3) in Zimbabwe to help prepare for scale up of continuous ITN distribution. This involved:

- providing technical assistance to PSI in implementing pilots of school- and community-based CD in four districts;
- supporting planning and implementation of **end-line survey** for community-based pilot and completion of evaluation report of a school-based pilot;
- conducting and reporting on a **process evaluation** on CD pilots;
- developing school- and community-based **CD implementation guides** based on lessons learned from pilots;
- holding a three-day workshop on data use and malaria SBC resulting in an **ITN communication strategy**; and

- running a **NetCALC refresher training** and assisting in **secondary analysis of MIS data** to better understand ITN ownership and use, providing valuable know-how and knowledge for CD planning.



Demonstration of ITN use in outdoor sleeping space in Zimbabwe. Allison Divincenzo for PMI.



STORIES FROM THE FIELD

Benin collects data to inform integrated vector control strategy

VectorWorks generated data to inform the integrated vector control strategy in Benin through several activities:

1. **Reviewing available evidence** on malaria prevention strategies;
2. Holding a **two-day strategy workshop** with the NMCP to discuss findings and recommendations;
3. Creating a **memo assessing options for malaria vector** control that drew from the review and workshop;
4. Collaborating with the Ministry of Health and the Open Malaria project to use an **impact simulation model** to assess how different combinations of malaria interventions might effect malaria prevalence and incidence; and
5. Providing technical support for behavioral components of **study on outdoor sleeping and ITN use**.



STORIES FROM THE FIELD

Mozambique lays the groundwork to integrate CD into ITN distribution strategy

VectorWorks collaborated with the NMCP and the Instituto Nacional de Saude (INS) in Mozambique to scale up ITN coverage, generate net durability data, assess the feasibility of school-based CD, support and assess a pilot of this channel, and update the national ITN distribution strategy. Specifically, the project:

- provided technical assistance for logistics and communications planning for the 2016 mass campaign;
- conducted a process evaluation of first phase of mass ITN distribution campaign in Nampula;
- designed and implemented a prospective durability monitoring study in three sites, strengthening local capacity;
- facilitated a tour of Tanzania’s school-based CD program for representatives from the Mozambiquan NMCP and Ministry of Education and Human development;
- conducted a feasibility assessment of school-based CD implementation;
- supported the planning, implementation, and supervision of a school-based CD pilot led by Tropical Health; and
- conducted baseline and endline evaluations of school-based CD pilot.

In Tanzania, VectorWorks supported the government in implementing their school-based ITN distribution, locally referred to as SNP. The program grew from three regions in the first year to seven in the second, and 14 regions in the third—distributing 490,000 ITNs in SNP3, 1,152,715 in SNP4, 2,094,470 ITNs in SNP5, and 1,372,616 ITNs in SNP6.

School-based distribution is an important component of Ghana’s national CD strategy. VectorWorks collaborated with the Ghana NMCP, the GES SHEP, and the USAID Procurement and Supply Management Project to distribute **936,357** ITNs in Year Two, **1,369,206** in Year Three and **1.6 million** in Year Five of the project via this channel.

Routine health facility- and community-based continuous distribution

VectorWorks helped distribute **10.6 million** ITNs through health facility distribution channels, including routine channels, like antenatal care (ANC), Institutional Delivery (ID), child welfare clinics (CWC), Expanded Program on Immunization (EPI), and Immunization and Vaccine Development (IVD); and community-based CD, using vouchers redeemable at health centers. VectorWorks supported routine ANC/EPI ITN distribution in Tanzania, Ghana, and Liberia and implemented community-based CD in Zanzibar.



Aretha Agbeyome, the Saftongu District School Health Coordinator in Volta Region, distributes LLINs to class 2 students at the Covenant Private Primary School, Ghana. Sarah Hoibak for PMI VectorWorks, Courtesy of Photoshare.

VectorWorks expanded health facility-based CD in Tanzania via the Chandarua Kliniki program, where ITNs were distributed directly to pregnant women on their first ANC visit and to children during the first measles vaccination visit.

Launched in two southern regions, the program delivered **237,760** nets in Year Two of the project. Expanding to include nine regions, VectorWorks distributed **1,249,120** nets in Year Three. In Year Four, the project delivered **775,810** nets purchased by the U.S. Government and an additional **1,155,640** nets purchased by other partners, while in Year Five **176,440** and **1,307,360** nets were distributed after purchase by the U.S. Government and other partners, respectively.

VectorWorks distributed ITNs through Chandarua Kliniki in **Zanzibar** as well, with **58,665** nets delivered to 190 health facilities in the first six months via ANC, EPI, and community vouchers redeemable at health centers.

VectorWorks also provided technical support for routine ANC/EPI ITN distribution in Ghana throughout the project, resulting in steady increases in the percentage of pregnant women receiving an ITN at their first ANC visit: from 33% in 2014 to 81% in 2019. Coverage was somewhat higher for children vaccinated for measles, with 58% receiving an ITN at their measles booster vaccination in 2014. VectorWorks helped sustain and improve that coverage, with 79% of children receiving an ITN at their measles booster vaccination in 2019.

Mass distribution

VectorWorks provided technical support to aid in distributing **26.9 million nets** in Angola, Ghana, Malawi, Mozambique, Senegal, and Uganda, via mass distribution campaigns. Specific technical assistance was provided, upon request, from PMI countries from a revolving fund, facilitating timely deployment of consultants.

In Ghana, mass campaigns were conducted in Year One of VectorWorks, resulting in **2,818,842** ITNs distributed, Year Two resulting in **8,641,087** nets distributed, and Years Four and Five with **10,188,164** and **5,282,650** ITNs distributed, respectively. The 2018 mass campaign was carried out in Ashanti and Greater Accra, regions with large populations and dense urban centers. VectorWorks helped the NMCP design and implemented specific strategies for registration, distribution, and social mobilization in these settings; and was involved in developing a multi-media messaging campaign and a weekend and early morning registration and distribution schedule to accommodate normal working hours. These efforts contributed to the distribution of **2,261,986** nets in Ashanti and **3,020,664** in Greater Accra.

In Liberia, VectorWorks provided emergency support to the NMCP after the 2014 mass campaign, providing **100,000** ITNs to the Montserrado area, which the campaign had missed.



Mtwara regional commissioner Ms. Halima Dendego (left) gives ITNs to woman at launch of Chandarua Kliniki in Tanzania. Eric Filemyr for PMI VectorWorks.



Minister of Health Hamad Rashid (right) gives ITN to Johari Juma (left) at launch of Chandarua Kliniki in Zanzibar. Hannah Koenker for PMI VectorWorks.



STORIES FROM THE FIELD

Liberia improves routine ANC/ID ITN distribution, implements two mass distribution campaigns, and initiates ITN durability monitoring stud

VectorWorks collaborated with the NMCP and Ministry of Health in Liberia to achieve and maintain high levels of ITN coverage by **improving routine ANC/ID ITN distribution**. This involved:

- providing **implementation training** to the National Monitoring Team (NMT) to be cascaded to county health personnel;
- developing **standardized tools** to guide NMT implementation and reporting, including job aids and monitoring checklists;
- conducting orientation for **implementing partners** to disseminate tools and encourage proper reporting;
- **monitoring routine ANC/ ID ITN distribution** at 118 health facilities across all 15 counties; and
- conducting **county review meetings** to share best practices, identify areas for improvement and strategize on how to address them.

The project supported **mass distribution** as well in 2015 and 2018,

- developing guideline for distribution at special institutions like orphanages, army barracks, and private hospitals, and
- airing radio spots, participating in radio talk shows, and talking with health promotion focal points about mass campaign SBC messages.

VectorWorks also **planned and implemented baseline and 12m data collection for ITN durability monitoring** in Grand Gedeh and Lofa counties following the 2018 mass campaign.

In addition to facilitating the distribution of ITNs during the VectorWorks project, these activities improved processes and data available for planning and built local capacity, **facilitating more effective and efficient mass campaigns and routine ANC/ ID ITN delivery in the future**. Health facility staff:

- increased their knowledge of routine ITN distribution processes,
- improved documentation and reporting of this channel, and
- increased their accountability for net stocks.



The National Monitoring Team along with the VectorWorks Program Officer (Patricia Tengen) mentoring and coaching the Bomi County Monitoring and Evaluation Officer, and the ANC and Institutional Delivery Personnel's of Zordee Clinic in Klay District, Bomi County on May 21, 2019. Andrea Brown for PMI VectorWorks.

Better Outcomes

VectorWorks project activities resulted in better outcomes, including:

- **more efficient, cost-effective ITN distribution**
- **greater local capacity to plan and implement ITN distribution**
- **more effective and equitable malaria control**

The project evaluated various ITN distribution channels to identify areas for improvement in planning and implementation, leading to the development and testing of strategies to streamline delivery and maximize return on investment. VectorWorks also used ITN distribution process evaluation data to identify key targets and messages for SBC, resulting in improved net care attitudes and practices, and increasing the usable life of ITNs. VectorWorks worked with local partners to increase their knowledge and capacity, allowing planning, implementation, and assessment of ITN distribution strategies to continue after VectorWorks ended. This led to more effective and equitable malaria control that reaches entire populations and achieves important gains toward universal ITN coverage and malaria control targets.

More efficient and cost-effective ITN distribution

Through pilots and larger scale programs, VectorWorks established that continuous ITN distribution through school-based channels can maintain high coverage—approaching 80% universal coverage targets. VectorWorks found that school-based CD may also be more efficient than mass campaigns, maintaining high coverage with fewer ITNs distributed. Comparing the number of nets delivered over six years by a continuous school-based distribution program in Tanzania (SNP) to the number of nets that would have been distributed by two mass campaigns in the same area over the same six years, the project found that SNP delivered substantially fewer nets while maintaining high ITN access.

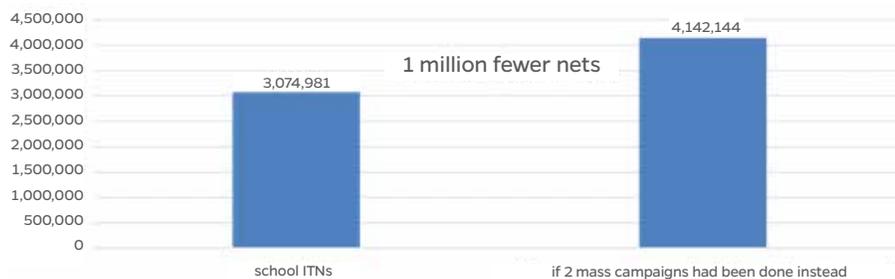


Figure 19. Number of ITNs delivered in Tanzania via SNP versus mass campaign, 2013-2018. VectorWorks legacy FAQ slideset.

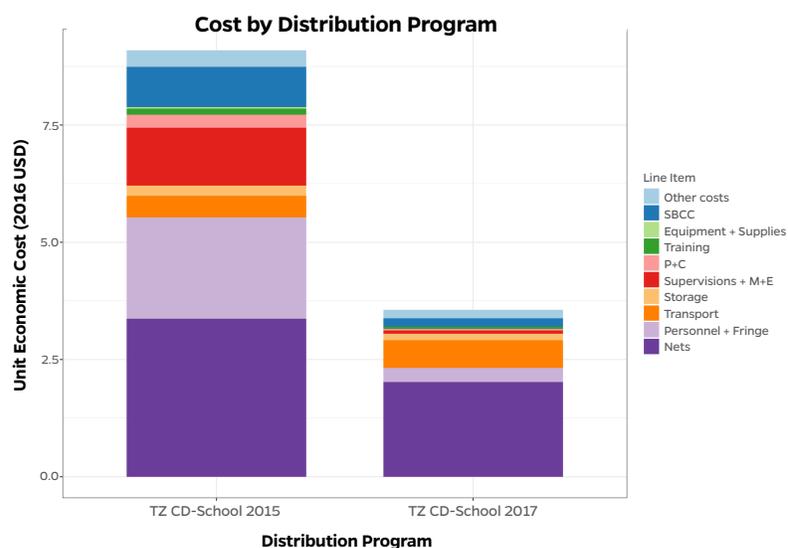


Figure 20. Economic costs of school-based ITN distribution in Tanzania in 2015 and 2017, broken down by cost category. Personal communication from S. Scates.

VectorWorks also demonstrated that **several measures of ITN distribution cost decreased substantially** over the course of the project, thanks to successful cost-cutting measures. After VectorWorks and PMI led the third round of SNP in Tanzania (SNP3) in 2015, estimated economic costs per net delivered (inflated to 2016 USD) were 5.71 USD, which excludes the cost of nets. For SNP4, PMI and VectorWorks worked closely with the central government and national-level representation to develop new data collection and reporting tools within the existing national data platforms, alleviating the burden on local government officials to quantify student enrollment and verify all distribution data. In SNP5, VectorWorks built local capacity to take full advantage of these tools, including training-of-trainers at the national, regional, and district levels, and high-level advocacy. The project conducted a second costing exercise after SNP5 that indicated these measures were successful at decreasing costs. Economic cost per ITN delivered dropped more than 70% to 1.54 USD, again excluding the cost of nets. This is consistent with the economic cost per ITN delivered of 1.16 USD in Ghana’s VectorWorks-supported school-based CD program, indicating cost-effective net distribution using this channel in both settings.

VectorWorks leveraged the existing data collection by the Ghana Education System (GES) to quantify school enrollment in Ghana and collaborated with government counterparts in Tanzania to integrate school-based ITN distribution into the existing Basic Education Management Information System (BEMIS). This eliminated the need to train over 1,500 ward-level education coordinators, across 14 regions, in collecting data on student enrollment. This increased implementation efficacy and significantly reduced costs.

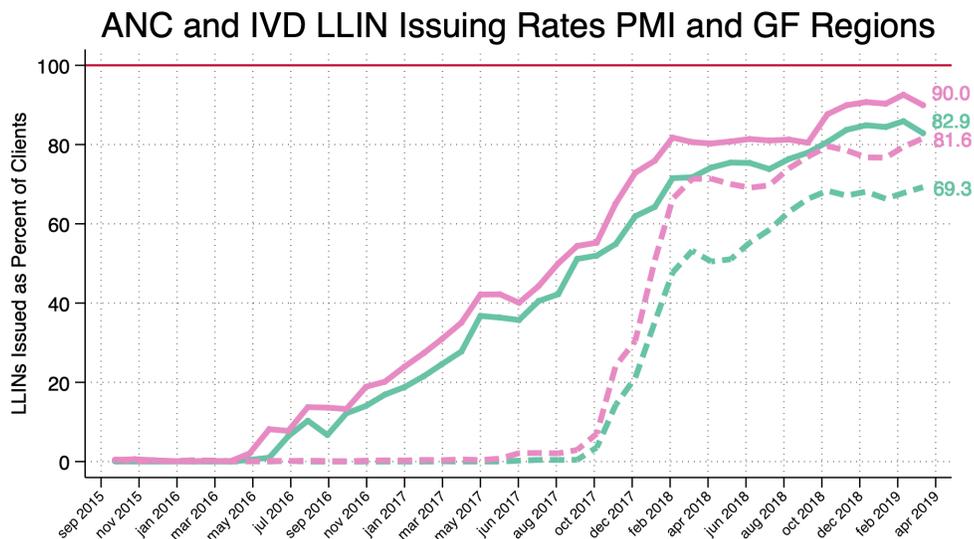


Figure 21. Issuing rates at ANC and IVD in PMI and GF Regions.

The project **used existing health facility data in Tanzania** to streamline implementation and monitoring and evaluation of routine ANC/EPI net distribution channels, as well. Partnering with regional and local divisions of the Office of the President (PORALG), VectorWorks developed the Chandarua Kliniki dashboard on the District Health Information System 2 (DHIS2) platform, already in use at health facilities. Health facilities can visualize numbers of children getting their first measles vaccination, or pregnant women at their first ANC visits, and compare them directly with numbers of ITNs distributed to each population. These data are summarized in monthly and quarterly district accountability reports. This allows more efficient tracking of progress toward ITN distribution targets and identification of centers in need of additional support, saving district supervisors time and money. When the system was rolled out nationwide, VectorWorks trained both PMI- and Global Fund-supported regions in its use.

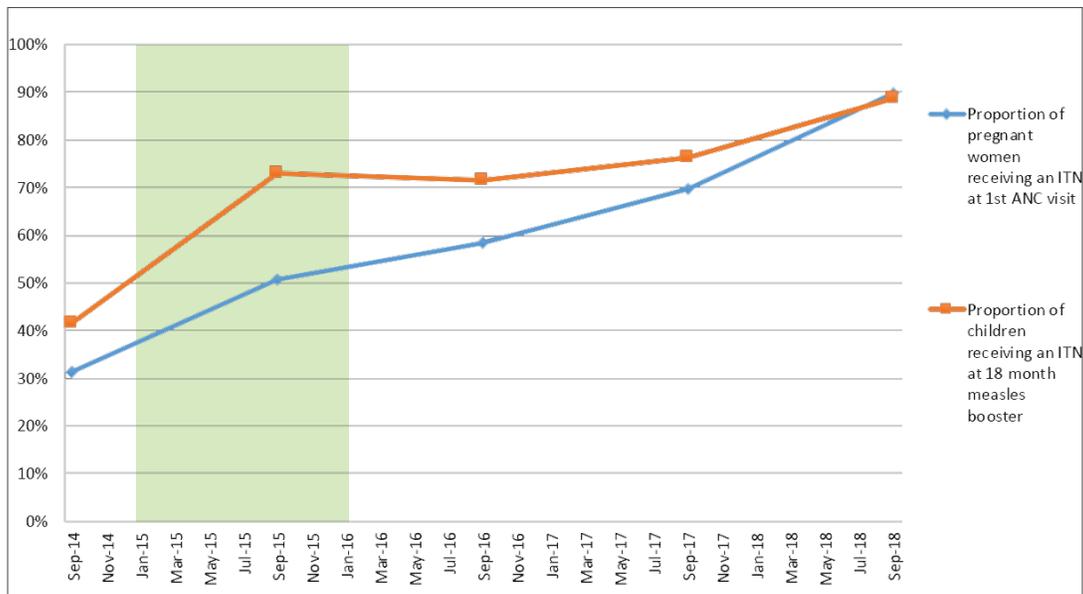


Figure 22. Trend in ANC (blue) and CWC (orange) ITN distribution rates in Ghana before and after VectorWorks implementation of **supportive supervision program** in 2015.

“Before we had the dashboard, you might go out on a site visit to a clinic and realize you’d spent two hours at a facility where ITN distribution was going quite well. Now with the Chandarua Kliniki dashboard, once information is in the system, it can be used to determine which health facilities have issues, and where district monitoring teams should visit to conduct monitoring...the system gives us a quick snapshot of what is going on, to allow us to focus our attention.”

– Noela Kisoka, VectorWorks Tanzania
Director of Field Implementation



Supervision team members in Mtwara, Tanzania review monitoring data at a clinic identified by the Chandarua Kliniki dashboard. Eric Filemyr for PMI VectorWorks.

VectorWorks developed and implemented a **health facility supportive supervision program** in Ghana to address inefficiencies in routine ANC/EPI ITN distribution and improve the timeliness and completeness of reporting for these channels. The program was implemented in 2015 in both ANC clinics and Child Welfare Clinics (CWC), where children are vaccinated. Results showed that supportive supervision improved health facility-based ITN distribution to pregnant women and children under-5, with evidence that timeliness and completeness of reporting improved, as well.

VectorWorks also reviewed the delivery and resupply schedule for health facility CD in Ghana, successfully reducing stockouts by decentralizing distribution, increasing local ITN stocks up front. In **Tanzania**,

“[Chandarua Kliniki report forms are] extremely helpful, as they help me identify facilities and districts which need attention, which is critical for management.”

– Dr. Gozbert Mutahyabarwa,
Ruvuma Regional Medical Officer, Tanzania

“...the Chandarua Kliniki dashboard’s ability to alert me to facilities having trouble stocking and managing nets allows me to ask the district medical officers in each district specific questions, and to focus on where the problems were.”

– Dr. James Kiologwe,
Dodoma Regional Medical Officer, Tanzania

VectorWorks improved school-based CD logistics by eliminating re-bundling until ITNs were offloaded at schools, saving 7–10 days of processing time and drastically cutting distribution costs. VectorWorks also devised and implemented a just-in-time delivery approach, where ITNs are picked up directly at the port in large trucks and shipped to regions where they are immediately moved to smaller trucks for delivery to individual schools. This eliminates the need for fixed storage at the regional level and speeds delivery.

Greater local capacity for ITN distribution planning and implementation

In keeping with the **USAID Journey to Self-Reliance framework**, VectorWorks successfully transferred capacity for ITN distribution planning, implementation, and evaluation, including ITN durability monitoring to local partners. This resulted in country staff taking a leading role in many instances and developing and implementing their own initiatives within the project, improving ITN distribution practices while building local buy-in, ownership, and capacity.

One example is **NetApp**, a mobile application developed by the Ghana NMCP and GHS to collect data during ITN distribution mass campaigns. The vision of Dr. Keziah Malm, Program Manager of the Ghana NMCP, NetApp was piloted in four districts before being successfully rolled out during national mass distribution campaigns in 2018. VectorWorks helped troubleshoot and debug the app and assisted with the pilot, with the Ghana Ministry of Health leading development, logistics, data management, and implementation. Use of the NetApp resulted in greatly improved ITN registration and distribution efficiency and easier data access, which allowed faster identification of low performing areas in need of intervention. Users provided very positive feedback, and other countries were interested in adapting it for use in their own mass campaigns after NetApp was presented at the 2018 VCWG meeting in Geneva. Another example of improving local capacity in net distribution logistics is Tanzania, where VectorWorks contracted a local logistics company, Simba Logistics and Equipment Supply, to scale up school-based continuous ITN distribution. Using their **proprietary mobile phone and web-based system** to keep track of ITN distribution greatly improved accuracy and speed of ITN accountability calculations. Simba remains available as a distribution provider after the project ends as a local Tanzanian private company .

VectorWorks **shifted school-based CD program management to district level teams** in Tanzania, starting in 2017, by including members from both the health and education departments in streamlined district SNP

“[Without] NetApp, I would have been struggling with data compilation and manually analyzing LLINs received and distributed. With the app, I am cool.”

– Roland Glover, GHS Regional Malaria Focal Person, Volta Region, Ghana

“The distribution [of ITNs using NetApp] is quicker, faster, and time efficient. It doesn’t waste much time”

– Stella, Registered Community Health Nurse, Ghana

“...my busy schedule makes it impossible for me to be in the field all the time, but with NetApp, I am virtually in the field always no matter where I am.”

– Dr. Keziah Malm, Ghana NMCP Programme Manager

“[NetApp] significantly improved the quality of data for LLIN distribution. The program [has] real time ability for tracking the entire process”

– Sylvester Segbaya, Chief of Party VectorWorks Ghana



Stella (center), Registered Community Health Nurse, using **NetApp** in Ghana. Courtesy of PMI VectorWorks.

management teams. In addition to the cost savings mentioned earlier, building district capacity increased ownership of the SNP program at a more local level, helping ensure program sustainability.

From the beginning, VectorWorks began **transferring ITN durability monitoring capacity** to local partners. In addition to planning for transfer of durability monitoring study activities to other implementing partners in Kenya, Ghana, and Liberia at the end of the project, VectorWorks structured all activities in the eight countries where durability monitoring studies were conducted to encourage greater local participation, ownership, and autonomy, over time.

In Zanzibar, ZAMEP had a significant leadership role in durability monitoring from the beginning, facilitating local capacity building. They were successful in leading this activity because ZAMEP staff have strong technical expertise, entomology capacity, and are government employees. This led to almost 100% data collection staff retention, ensuring acceptance from communities where they work.



Head teacher Sosthenes Charles Zakayo using the **Simba Logistics ITN distribution app** at Kamunyonge Primary School in Mara Region, Tanzania. Riccardo Gangale for PMI Vectorworks.



STORIES FROM THE FIELD

The DRC builds local capacity for ITN durability monitoring

VectorWorks partner Tropical Health collaborated with the Kinshasa School of Public Health in the DRC to design and implement a three-year prospective ITN durability monitoring study in the provinces of Sud Ubangi and Mongala. Due to travel restrictions to and within the country, all VectorWorks support was remote after in-person training for baseline data collection. After three rounds of durability monitoring the local team was able to conduct all aspects of the study on their own. This included data analysis; Dr. Albert Kilian of Tropical Health assessed baseline and 12-month data, sharing his work with local teams to allow them to analyze 24-month data independently for comparison with a parallel VectorWorks analysis and conduct 36-month data completely on their own.

“I believe that the capacity building we do in DM is very good. As we move to the 12 and 24 months data collections I can see during the trainings that people are proud that they are making progress in better understanding the concept, interpreting the data, or being told that the data they collect is of excellent quality.”

– Dr. Albert Kilian, Tropical Health

More effective malaria control

A longitudinal analysis of data from 18 sentinel health registries in Madagascar found that malaria incidence decreased by 14% in areas with community-based CD, while areas with no community-based CD saw a 12% increase in malaria incidence. While the percentage of alert-free sentinel sites was 98.2% in the first year following a mass campaign, it dropped to 56.7% during second year, and 31.5% during third year. The only exception was

the Toamasina district, where no alerts were reported during community-based CD following the mass campaign. The authors of the study, who were not affiliated with VectorWorks, concluded that the duration of ITN coverage from a mass campaigns is limited to a single transmission season if not reinforced with CD. These findings suggest that VectorWorks' substantial efforts to implement and support ITN distribution in sub-Saharan Africa through all channels, but particularly CD, had an important impact on malaria control.

VectorWorks' study on [cost and cost-effectiveness analysis of various ITN distribution channels](#) described earlier in this report indicated impacts of ITN distribution, particularly routine channels, on malaria-related mortality as well.

Routine ANC/EPI ITN delivery resulted in the greatest reduction in malaria deaths at the lowest cost, compared with other distribution channels.

New Policies

VectorWorks actively engaged with various policymakers throughout the life of the project, contributing to discussions of emerging policy issues, presenting relevant findings from operational and monitoring and evaluation research, and making recommendations based on the experience, knowledge, and know-how acquired over the course of the project. The results of this work can be seen in recent revisions to three key policy documents, described below.

Revised WHO GMP recommendations for achieving universal coverage

VectorWorks informed most of the 2017 updates to [WHO GMP recommendations for achieving universal coverage](#) with LLINs, including:

- definition of universal coverage, which was modified to include both ITN access and ITN use
- objective of ITN distribution strategies, which was changed to focus on both achieving and maintaining universal coverage
- guidance on combining ITN distribution channels, where it was specified that routine ANC/EPI ITN distribution should continue during mass distribution, while school-based CD should not
- procurement ratio of one LLIN for every 1.8 persons, which was made more flexible, allowing adjustments as dictated by local data
- recommendations on when to employ net use SBC, which were changed to suggest SBC only when evidence exists that LLINs are not being used properly
- addition of recommendations to ignore preferences for more expensive nets, as any increases in use are unlikely to outweigh additional costs, unless nationally representative data clearly show that purchase of more costly nets will significantly increase use among at-risk populations
- addition of point on tracking LLIN coverage at the district level to enable identification of sub-national trends in coverage and trigger subsequent sub-national responses
- suggestion to promote LLINs where untreated nets are widely available reinforced with more definitive language
- statement that top up campaigns are not recommended, which was modified so that it no longer includes potential exceptions.

Updated PMI technical guidance and malaria operational plan templates

New knowledge produced by VectorWorks also informed almost every section on ITN distribution of PMI's technical guidance and operational plan guidance, echoing many of the changes to the WHO GMP recommendations described above.

- PMI's current goal is to help countries reach and maintain universal coverage with ITNs.
- PMI does not prioritize support for hang-up activities.
- PMI will not support repair activities, but will support SBC on comprehensive ITN care.
- PMI does not allow PMI resources to support “keep-up” campaigns at the present time.

Key or new updates highlighted at the start of the document include changes to the durability monitoring and use-to-access ratio sections to include links to durabilitymonitoring.org and itnuse.org. VectorWorks comparative analyses of CD channel costs were cited, describing relative costs and benefits of various combinations of routine ANC/EPI, school-based CD, and mass campaign channels.

Global Fund guidance note on completing malaria funding requests

VectorWorks contributions to the body of knowledge on ITN distribution and malaria vector control were considered in recent revisions to the Global Fund guidance note on completing malaria funding requests. The importance of both achieving and maintaining universal coverage are stressed, with applicants advised that mass campaigns should be complemented by routine health facility ITN distribution, while other approaches—such as school-based CD—may be considered appropriate. The guidance also clearly states that differential usage, but not net preferences, may warrant distribution of non-standard ITNs, and that durability monitoring should be conducted according to standard methodology. Flexibility has been introduced to the one net per 1.8 persons procurement ratio, allowing deviations based on local data, and in [capping net numbers differentially](#) by region, based on variations in household size.

RBM Consensus Statement on Repurposing ITNs: Applications for BCC Messaging and Actions at the Country Level

In addition to contributing to key guidance on malaria vector control and ITN distribution, VectorWorks collaborated with RBM to create a [consensus statement on prevention of ITN misuse and safe repurposing of old ITNs](#). The statement reflects VectorWorks' definition of three net repurposing categories—beneficial and neutral repurposing and misuse, providing guides for decision making around when and how to repurpose an older ITN.

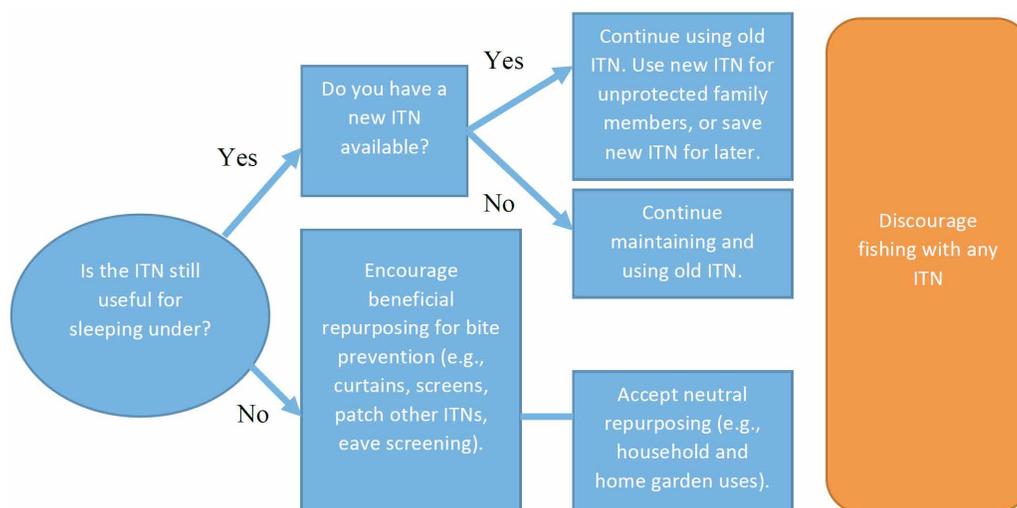


Figure 23. Flowchart of recommendations for ITN use and repurposing.

Next steps

During five years, VectorWorks provided more knowledge and know-how on ITN distribution planning, implementation, and evaluation; supported the distribution of more nets; produced better outcomes; and informed new policy in the area of malaria vector control. It emerged that context is important in determining the success of a given ITN distribution strategy. Streamlined, transparent logistics is crucial to preventing and addressing stockouts in health facility-based CD distribution; high rates of school enrollment is crucial to the success of school-based distribution; and thorough, accurate household registration is required for mass campaigns to approach universal ITN coverage. VectorWorks developed and disseminated many tools to help planners and implementers assess their context and adopt appropriate ITN distribution strategies, providing local teams with training and support to transfer capacity. Despite these accomplishments, important gaps remain in the malaria vector control evidence base and obstacles remain to reducing the burden of malaria. More research is needed on next-generation nets to better understand where to most (cost) effectively deploy them, what data are required to guide programs in prioritizing within a finite funding envelope, how they fit into a country's overall integrated vector control and resistance management plans, and how long new active ingredients are lasting. More studies are needed to understand host and vector behaviors that impact residual transmission, particularly outside the peri-domestic setting. Alternative tools and strategies to complement ITNs and address this source of transmission are still lacking. Some conclusions from VectorWorks' research have not been validated outside sub-Saharan Africa and may not necessarily reflect the situation in other areas where malaria is endemic. With donor and government budgets for malaria vector control flat or decreasing and increasing emphasis on local autonomy, more work is needed to build sustainable local capacity and improve the efficiency and cost effectiveness of ITN distribution and malaria control measures. Considering this context, next steps for research and implementation would include:

More Knowledge

1. Determine whether SBC can substantially improve net use or efforts should focus on expanding net access instead.
2. Measure the impact on malaria incidence of fluctuating access provided by mass campaigns versus sustained high ITN access from full-scale CD implementation.
3. Identify which entomological indicators should be used to evaluate new vector control tools.
4. Determine the operational costs of new vector control tools.
5. Understand how long next generation net active ingredients last.

More Know-How

1. Simplify quantification of nets for CD channels, as NetCALC Lite is still quite complex.
2. Develop effective alternative vector control strategies and determine how they should be deployed in different contexts.

More Nets

1. Continue to focus on maintaining universal coverage after mass campaign distribution by reinforcing routine ANC/EPI distribution and CD channels, as appropriate.
2. Refine ITN distribution strategies to account for local context using local data to identify and address gaps in coverage and any issues with distribution.

Better Outcomes

1. Promote wide-spread adoption of measures proven to improve efficacy and cost effectiveness of various ITN distribution channels, creating greater return on investment.
2. Promote targeted next-generation net distribution to manage insecticide resistance.

New Policies

1. Develop policies to guide accurate identification of areas of insecticide resistance and effective, efficient delivery of enough next-generation nets to protect these populations.
2. Create policies that deprioritize malaria vector control spending away from high-wealth households in urban areas who are able to easily purchase nets or window screens and live in low transmission neighborhoods. This could involve defining closed or improved housing as malaria vector control.

References

- Acosta, A., Obi, E., Ato Selby, R., Ugot, I., Lynch, M., Maire, M., ... Kilian, A. (2018). Design, Implementation, and Evaluation of a School Insecticide-Treated Net Distribution Program in Cross River State, Nigeria. *Glob Health Sci Pract*, 6(2), 272-287. doi:10.9745/GHSP-D-17-00350
- Briet, O. (2018). Pooled analysis of LLIN durability monitoring studies. In. Presentation to RBM Vector Control Working Group LLIN Priorities Workstream, 7 February 2018.
- de Beyl, C. Z., Acosta, A., Monroe, A., Nyanor-Fosu, F., Ofori, J. K., Asamoah, O., ... Koenker, H. (2018). Impact of a 15-month multi-channel continuous distribution pilot on ITN ownership and access in Eastern Region, Ghana. *Malar J*, 17(1), 124. doi:10.1186/s12936-018-2275-8
- de Beyl, C. Z., Kilian, A., Brown, A., Sy-Ar, M., Selby, R. A., Randriamanantenasa, F., ... Koenker, H. (2017). Evaluation of community-based continuous distribution of long-lasting insecticide-treated nets in Toamasina II District, Madagascar. *Malar J*, 16(1), 327. doi:10.1186/s12936-017-1985-7
- Gingrich, C. D., Ricotta, E., Kahwa, A., Kahabuka, C., & Koenker, H. (2017). Demand and willingness-to-pay for bed nets in Tanzania: results from a choice experiment. *Malar J*, 16(1), 285. doi:10.1186/s12936-017-1929-2
- Helinski, M. H., Namara, G., Koenker, H., Kilian, A., Hunter, G., Acosta, A., ... Lynch, M. (2015). Impact of a behaviour change communication programme on net durability in eastern Uganda. *Malar J*, 14, 366. doi:10.1186/s12936-015-0899-5
- Kilian, A., Koenker, H., Obi, E., Selby, R. A., Fotheringham, M., & Lynch, M. (2015). Field durability of the same type of long-lasting insecticidal net varies between regions in Nigeria due to differences in household behaviour and living conditions. *Malar J*, 14, 123. doi:10.1186/s12936-015-0640-4
- Kilian, A., Woods Schnurr, L., Matova, T., Selby, R. A., Lokko, K., Blaufuss, S., ... Lynch, M. (2017). Evaluation of a continuous community-based ITN distribution pilot in Lainya County, South Sudan 2012-2013. *Malar J*, 16(1), 363. doi:10.1186/s12936-017-2020-8
- Kilian, A., & Obi, E. (2015). Community-Based, Continuous Distribution of LLIN in Nasarawa State, Nigeria. In: VectorWorks Project, Johns Hopkins Center for Communication Programs.
- Killeen, G. F. (2014). Characterizing, controlling and eliminating residual malaria transmission. *Malar J*, 13, 330. doi:10.1186/1475-2875-13-330
- Koenker, H., Arnold, F., Ba, F., Cisse, M., Diouf, L., Eckert, E., ... Kilian, A. (2018). Assessing whether universal coverage with insecticide-treated nets has been achieved: is the right indicator being used? *Malar J*, 17(1), 355. doi:10.1186/s12936-018-2505-0
- Koenker, H., & Kilian, A. (2014). Recalculating the net use gap: a multi-country comparison of ITN use versus ITN access. *PLoS One*, 9(5), e97496. doi:10.1371/journal.pone.0097496
- Koenker, H., Kilian, A., Hunter, G., Acosta, A., Scandurra, L., Fagbemi, B., ... Lynch, M. (2015). Impact of a behaviour change intervention on long-lasting insecticidal net care and repair behaviour and net condition in Nasarawa State, Nigeria. *Malar J*, 14, 18. doi:10.1186/s12936-014-0538-6
- Koenker, H., Taylor, C., Burgert, C., Thwing, J., Fish, T., & Kilian, A. (2019). Quantifying Seasonal Variation in Insecticide-Treated Net Use among Those with Access. *Am J Trop Med Hyg*. doi:10.4269/ajtmh.19-0249
- Koenker, H., & Yukich, J. O. (2017). Effect of user preferences on ITN use: a review of literature and data. *Malar J*, 16(1), 233. doi:10.1186/s12936-017-1879-8
- Monroe, A., Mihayo, K., Okumu, F., Finda, M., Moore, S., Koenker, H., ... Harvey, S. (2019). Human behaviour and residual malaria transmission in Zanzibar: findings from in-depth interviews and direct observation of community events. *Malar J*, 18(1), 220. doi:10.1186/s12936-019-2855-2

- Monroe, A., Moore, S., Koenker, H., Lynch, M., & Ricotta, E. (2019). Measuring and characterizing night time human behaviour as it relates to residual malaria transmission in sub-Saharan Africa: a review of the published literature. *Malar J*, 18(1), 6. doi:10.1186/s12936-019-2638-9
- NetWorks. (2015). Continuous Distribution: Filling Gaps to Sustain Gains. Retrieved from https://www.continuousdistribution.org/wp-content/uploads/2017/02/Health-Facility-based-LLIN-Distributions_Guide.pdf
- Olapeju, B., Choiriyah, I., Lynch, M., Acosta, A., Blaufuss, S., Filemyr, E., . . . Koenker, H. (2018). Age and gender trends in insecticide-treated net use in sub-Saharan Africa: a multi-country analysis. *Malar J*, 17(1), 423. doi:10.1186/s12936-018-2575-z
- Scates, S., Acosta, A., Koenker, H., Briet, O., & Yukich, J. (2019). Cost-effectiveness of continuous distribution: a simulation study. Manuscript in preparation.
- Stuck, L., Kramer, K., Scates, S., Wisniewski, J., Akim, I., Lengeler, C., . . . Daddi, D. (2019). The School Net Programme in Tanzania: experience, planning and outcomes after a decade of planning and implementation. Manuscript in preparation.
- Theiss-Nyland, K., Ejersa, W., Karema, C., Koné, D., Koenker, H., Cyaka, Y., . . . Lines, J. (2016). Operational challenges to continuous LLIN distribution: a qualitative rapid assessment in four countries. *Malar J*, 15, 131. doi:10.1186/s12936-016-1184-y
- Theiss-Nyland, K., Lynch, M., & Lines, J. (2016). Assessing the availability of LLINs for continuous distribution through routine antenatal care and the Expanded Programme on Immunizations in sub-Saharan Africa. *Malar J*, 15(1), 255. doi:10.1186/s12936-016-1309-3
- White, M. T., Conteh, L., Cibulskis, R., & Ghani, A. C. (2011). Costs and cost-effectiveness of malaria control interventions--a systematic review. *Malar J*, 10, 337. doi:10.1186/1475-2875-10-337
- WHO. (2019). Malaria Fact Sheet. Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/malaria>.
- WHO. (2014). World Malaria Report. Retrieved from https://www.who.int/malaria/media/world_malaria_report_2014/en/
- WHO. (2015). World Malaria Report. Retrieved from <https://www.who.int/malaria/publications/world-malaria-report-2015/report/en/>
- WHO. (2017). Achieving and maintaining universal coverage with long-lasting insecticidal nets for malaria control. Retrieved from https://www.who.int/malaria/publications/atoz/who_recommendation_coverage_llin/en/
- Zegers de Beyl, C., Koenker, H., Acosta, A., Onyefunafua, E. O., Adegbe, E., McCartney-Melstad, A., . . . Kilian, A. (2016). Multi-country comparison of delivery strategies for mass campaigns to achieve universal coverage with insecticide-treated nets: what works best? *Malar J*, 15, 58. doi:10.1186/s12936-016-1108-x

Annexes



VectorWorks Peer-Reviewed Publications

1. Koenker H, Taylor C, Burgert-Brucker CR, Thwing J, Fish T, Kilian A. Quantifying Seasonal Variation in Insecticide-Treated Net Use among Those with Access. *Am J Trop Med Hyg.* 2019;101(2):371-382. doi:10.4269/ajtmh.19-0249.
2. Monroe A, Mihayo K, Okumu F, Finda M, Moore S, Koenker H, Lynch M, Haji K, Abbas F, Ali A, Greer G, Harvey S. Human behaviour and residual malaria transmission in Zanzibar: findings from in-depth interviews and direct observation of community events. *Malaria Journal.* June 2019:1-13. doi:10.1186/s12936-019-2855-2.
3. Monroe A, Moore S, Koenker H, Lynch M, Ricotta E. Measuring and characterizing night time human behaviour as it relates to residual malaria transmission in sub-Saharan Africa: a review of the published literature. *Malaria Journal.* 2019;18(1):1-12. doi:10.1186/s12936-019-2638-9.
4. Dillip A, Mboma ZM, Greer G, Lorenz LM. "To be honest, women do everything": understanding roles of men and women in net care and repair in Southern Tanzania. *Malaria Journal.* December 2018:1-8. doi:10.1186/s12936-018-2608-7.
5. Olapeju B, Choiriyyah I, Lynch M, Acosta A, Blaufuss S, Filemyr E, Harig H, Monroe A, Selby RA, Kilian A, Koenker H. Age and gender trends in insecticide-treated net use in sub-Saharan Africa: a multi-country analysis. *Malaria Journal.* November 2018:1-12. doi:10.1186/s12936-018-2575-z.
6. Mboma ZM, Dillip A, Kramer K, Koenker H, Greer G, Lorenz LM. "For the poor, sleep is leisure": understanding perceptions, barriers and motivators to mosquito net care and repair in southern Tanzania. *Malaria Journal.* October 2018:1-13. doi:10.1186/s12936-018-2528-6.
7. Koenker H, Arnold F, Ba F, Cisse M, Diouf L, Eckert E, Erskine M, Florey L, Fotheringham M, Gerberg L, Lengeler C, Lynch M, Mnzava A, Nasr S, Ndiop M, Poyer S, Renshaw M, Shargie E, Taylor C, Thwing J, Van Hulle S, Ye Y, Yukich J, Kilian A. Assessing whether universal coverage with insecticide-treated nets has been achieved: is the right indicator being used? *Malaria Journal.* October 2018:1-11. doi:10.1186/s12936-018-2505-0.
8. Acosta A, Obi E, Selby RA, Ugot I, Lynch M, Maire M, Belay K, Okechukwu A, Inyang U, Kafuko J, Greer G, Gerberg L, Fotheringham M, Koenker H, Kilian A. Design, Implementation, and Evaluation of a School Insecticide-Treated Net Distribution Program in Cross River State, Nigeria. *Global Health: Science and Practice.* 2018;6(2):GHSP-D-17-00350-287. doi:10.9745/GHSP-D-17-00350.
9. de Beyl CZ, Acosta A, Monroe A, Nyanor-Fosu F, Ofori JK, Asamoah O, Owusu P, Hornston S, Gerberg L, Fotheringham M, Kilian A, Koenker H. Impact of a 15-month multi-channel continuous distribution pilot on ITN ownership and access in Eastern Region, Ghana. *Malaria Journal.* March 2018:1-10. doi:10.1186/s12936-018-2275-8.
10. Kilian A, Schnurr LW, Matova T, Selby RA, Lokko K, Blaufuss S, Gbanya MZ, Allan R, Koenker H, Swaka M, Greer G, Fotheringham M, Gerberg L, Lynch M. Evaluation of a continuous community-based ITN distribution pilot in Lainya County, South Sudan 2012-2013. *Malaria Journal.* September 2017:1-13. doi:10.1186/s12936-017-2020-8.
11. Beyl CZ, Kilian A, Brown A, Sy-Ar M, Selby RA, Randriamanantenasa F, Ranaivosoa J, Zigirumugabe S, Gerberg L, Fotheringham M, Lynch M, Koenker H. Evaluation of community-based continuous distribution of long-lasting insecticide-treated nets in Toamasina II District, Madagascar. *Malaria Journal.* August 2017:1-14. doi:10.1186/s12936-017-1985-7.
12. Gingrich CD, Ricotta E, Kahwa A, Kahabuka C, Koenker H. Demand and willingness-to-pay for bed nets in Tanzania: results from a choice experiment. *Malaria Journal.* July 2017:1-15. doi:10.1186/s12936-017-1929-2.
13. Koenker H, Yukich JO. Effect of user preferences on ITN use: a review of literature and data. *Malaria Journal.* May 2017:1-18. doi:10.1186/s12936-017-1879-8.

14. Theiss-Nyland K, Ejersa W, Karema C, Koné D, Koenker H, Cyaka Y, Lynch M, Webster J, Lines J. Operational challenges to continuous LLIN distribution: a qualitative rapid assessment in four countries. *Malaria Journal*. 2016;15(1):131. doi:10.1186/s12936-016-1184-y.
15. de Beyl CZ, Koenker H, Acosta A, Onyefunafoa EO, Adegbe E, McCartney-Melstad A, Selby RA, Kilian A. Multi-country comparison of delivery strategies for mass campaigns to achieve universal coverage with insecticide-treated nets: what works best? *Malaria Journal*. February 2016:1-14. doi:10.1186/s12936-016-1108-x.
16. Helinski MH, Namara G, Koenker H, Kilian A, Hunter G, Acosta A, Scandurra L, Selby RA, Mulondo K, Fotheringham M, Lynch M. Impact of a behaviour change communication programme on net durability in eastern Uganda. *Malaria Journal*. 2015;14(1):366. doi:10.1186/s12936-015-0899-5.
17. Koenker H, Kilian A, Hunter G, Acosta A, Scandurra L, Fagbemi B, Onyefunafoa EO, Fotheringham M, Lynch M. Impact of a behaviour change intervention on long-lasting insecticidal net care and repair behaviour and net condition in Nasarawa State, Nigeria. *Malaria Journal*. 2015;14(1):18. doi:10.1186/s12936-014-0538-6.
18. Ricotta EE, Boulay M, Ainslie R, Babalola S, Fotheringham M, Koenker H, Lynch M. The use of mediation analysis to assess the effects of a behaviour change communication strategy on bed net ideation and household universal coverage in Tanzania. *Malaria Journal*. 2015;14(1):15. doi:10.1186/s12936-014-0531-0.
19. Kilian A, Balayo C, Feldman M, Koenker H, Lokko K, Ashton RA, Bruce J, Lynch M, Boulay M. The Effect of Single or Repeated Home Visits on the Hanging and Use of Insecticide-Treated Mosquito Nets following a Mass Distribution Campaign - A Cluster Randomized, Controlled Trial. *PLOS ONE*. 2015;10(3):e0119078. doi:10.1371/journal.pone.0119078.
20. Kilian A, Koenker H, Obi E, Selby RA, Fotheringham M, Lynch M. Field durability of the same type of long-lasting insecticidal net varies between regions in Nigeria due to differences in household behaviour and living conditions. *Malaria Journal*. 2015;14(1):253. doi:10.1186/s12936-015-0640-4.
21. Monroe A, Asamoah O, Lam Y, Koenker H, Psychas P, Lynch M, Ricotta E, Hornston S, Berman A, Harvey SA. Outdoor-sleeping and other night-time activities in northern Ghana: implications for residual transmission and malaria prevention. *Malaria Journal*. 2015;14(1):35. doi:10.1186/s12936-015-0543-4.

VectorWorks Ghana

End of Project Report

2014-2019



Aretha Agbeyome, South Tongu District School Health Coordinator in the Volta Region, distributes LLINs to class 2 students at the Covenant Private Primary School, Ghana. Sarah Hoibak for PMI VectorWorks, courtesy of Photoshare

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Executive summary

VectorWorks' second largest country program was in Ghana, where the entire population of over 28 million people is at risk of malaria infection. After the National Malaria Control Program (NMCP) of the Ghana Health Service (GHS) successfully achieved universal insecticide-treated net (ITN) coverage with a mass distribution campaign from 2010–2012, a strategy was sought to sustain these gains. ITNs have been distributed free of charge in Ghana since 2004 via antenatal care (ANC) and immunization service channels, but these strategies alone cannot sustain universal coverage. Furthermore, data from the GHS's district health information management system (DHIMS), from October 2013 to September 2014, indicated only 33% of pregnant women received an ITN on their first ANC visit and 58% coverage of children on their first child welfare clinic (CWC) visit.

From 2015–2019 VectorWorks Ghana, funded by the U.S. President's Malaria Initiative (PMI) through USAID, assisted the NMCP to address these challenges and sustain universal coverage of ITNs, focusing on policy, capacity building, monitoring and evaluation, and implementation support. With the goal of **increasing country capacity to develop, monitor, and implement vector management interventions**, the project successfully:

- Supported **school-based continuous distribution** (CD), orienting and training key stakeholders, validating class enrollment data, and collaborating with the NMCP and the School Health Education program (SHEP) on implementation, monitoring, and supervision at all levels.
- Provided supportive supervision of **routine health facility-based ITN distribution** and training on implementation and monitoring of these activities.
- Gave technical assistance to plan and implement **national point mass distribution** (PMD) campaigns, training supervisors on validation of ITN quantification data.
- Planned **ITN durability monitoring** following PMD, undertaking baseline data collection, and ensuring successful transition of future data collection rounds to implementing partners.
- Provided training for circuit supervisors, head teachers, and school health coordinators in all regions on **malaria prevention social and behavior change** (SBC), including net use and care.
- **Considered gender in all project activities**, developing and implementing the VectorWorks Ghana Gender Strategy, with support from two gender champions.
- Conducted qualitative **research on barriers and facilitators to net use**.
- **Engaged with national and international partners**, providing critical inputs into ITN distribution and ITN use and care strategies, sharing and learning about ideas and best practices with other countries, and collaborating to promote malaria prevention in schools and communities.

As a result, 35,921,091 ITNs were delivered between 2014 and 2019, with 35,921,091 distributed through school-based CD, 5,381,559 via ANC/CWC channels, and 5,381,559 ITNs delivered through PMD. The percentage of pregnant women receiving an ITN during their first ANC visit increased consistently from 33% in 2014 when the project began to 81% in 2019, with the percentage of children who received an ITN during their last measles vaccination visit increasing from 58% to 79% over the same period. The numbers of schools implementing CD and pupils receiving ITNs through this channel consistently exceeded program targets. Over 80,000 people were trained in ITN distribution and over 27,000 SBC activities were implemented to promote ITN use and care over the lifetime of the project. These accomplishments accompanied a 50% reduction in in-patient malaria cases and 60% reduction in malaria deaths in Ghana over the past ten years.

VectorWorks Ghana worked throughout the project to build capacity, provide continuous information and feedback, and prepare all national partners and others involved in malaria control activities for a seamless transition of project activities, ensuring that the gains made by VectorWorks Ghana in ITN coverage, use, and care and in malaria prevention are sustained.

Introduction

Background

After years of net distribution through routine health facility-based channels, Ghana's successful door-to-door insecticide-treated mosquito net (ITN) distribution and hang-up campaign in 2010–2012 signaled a shift in priorities from targeted delivery of nets to biologically vulnerable populations toward universal ITN coverage. To sustain and build on the important gains in universal coverage made during the mass campaign, the National Malaria Control Program (NMCP) collaborated with the NetWorks project, VectorWorks' predecessor, between 2012 and 2014. A continuous distribution (CD) strategy was drafted, refined, and implemented, which involved the piloting of routine ITN distribution through antenatal care (ANC) and child welfare clinics (CWCs), school-based CD, and private sector channels, including social and behavior change communication (SBC) on appropriate net use and care, and national scale up of school-based CD and health facility-based ITN distribution. These efforts demonstrated the feasibility of routine and CD channels in Ghana, including national scale up, and highlighted the value of using a mix of channels to achieve equitable universal ITN coverage.

Goals and objectives

VectorWorks Ghana was initiated in March 2015 as part of the global VectorWorks project to build on these previous ITN distribution activities and assist Ghana's NMCP in achieving sustained universal ITN coverage through a combination of point mass distribution (PMD) and CD campaigns. The long-term goal of VectorWorks Ghana was to **increase country capacity to develop, implement, and monitor vector control interventions**. Three main objectives guided all project activities to fulfill this goal:

Objective 1: Increase the effectiveness of routine and CD channels, which include:

- **antenatal clinics** (ANCs): distribution of ITNs to pregnant women at their first ANC visit
- **Child Welfare Clinics** (CWCs): delivery of ITNs to children receiving their measles 2 and rubella vaccination through the Expanded Programme on Immunization (EPI)
- **primary schools:** allocation of ITNs to pupils in primary classes 2 and 6 every year (excluding mass campaign years).

Objective 2: Provide technical support to improve the effectiveness of mass ITN distribution campaigns.

Objective 3: Collaborate with other programs and organizations to promote sustained ownership and appropriate use and care of ITNs through effective mobilization and SBC.

Project activities

VectorWorks Ghana supported further scale up of school-based CD and routine health facility-based ITN distribution and provided technical assistance for another national PMD campaign, providing training in essential program elements, including net use and care SBC and validation of ITN quantification data. The project also planned and supported monitoring of ITN durability and conducted research on barriers to and facilitators of net use. The project engaged with key stakeholders at the local, national, and international level to promote the sharing of ideas, best practices, and results, and contribute to ongoing improvements to Ghana's malaria control strategy. New knowledge and know-how emerging from this work were effectively disseminated through peer-reviewed scientific articles; existing online platforms, including VectorWorks and governmental websites, the Ghana Education System (GES) online training system, existing WhatsApp groups used by healthcare workers and students, presentations and posters at relevant meetings and congresses, and multi-media content, including webinars, videos, and photo stories.

This report summarizes VectorWorks Ghana’s activities from 2015–2019, highlighting the key achievements of the project.

Key achievements

VectorWorks Ghana partnered with key stakeholders, including the Ghana Health Service (GHS), through the NMCP, the School Health Education Program (SHEP), the Malaria Vector Control Oversight Committee (MaVCOC), the Health Promotion department of the GHS, the Ghana Coalition of NGOs in Malaria; USAID projects, including USAID | DELIVER PROJECT, IMPACT Malaria, Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM), Systems for Health, Communicate for Health, the Noguchi Memorial Institute for Medical Research (NMIMR), and Peace Corps Ghana in planning, implementing, and monitoring project activities. This resulted in more than 33 million ITNs distributed between 2014 and 2019, contributing to a 50% reduction in in-patient malaria cases and 60% reduction in malaria deaths in Ghana during the past 10 years. A [VectorWorks Ghana end of project video](#) was made to celebrate these and other accomplishments detailed below and shared during the VectorWorks Ghana end of project event in July 2019.

School-based continuous distribution

School-based CD was expanded to all 10 regions of Ghana, with VectorWorks Ghana facilitating supervision and monitoring of various training and orientation activities. Working together with the NMCP and SHEP, VectorWorks Ghana supported the implementation, monitoring, and supervision of all school ITN distribution activities at all levels.

VectorWorks Ghana conducted interviews with in-country personnel to understand and document the validation processes used for school distribution, resulting in a [report](#) that highlights issues with ITN quantification data, best practices for ensuring data quality, and sample training and quality assurance tools. A VectorWorks Ghana desk validation in six regions showed wide variations between enrollment data received and distribution data from the previous year—50% of 6,900 schools participating in field validation of enrollment data revealed a variance of 5% or more. Often Basic Education Management Information System (BEMIS) data showed less variation with the actual class register than enrollment data submitted by schools, reviving a discussion on the need for improved EMIS data, or an alternative approach to quantifying ITNs. Though EMIS data are often more reliable, they are available only at the end of each school year and do not capture non-registered schools, which make up 15% of schools participating in school-based CD. VectorWorks Ghana met with the deputy director general of the GES to raise these issues, resulting in assurances of improvement to enrollment data collection and tasking of the GES data manager to address identified gaps. The ultimate goal is to have on-line enrollment data that can be updated frequently and validated by collection and analysis of weekly school attendance data.

VectorWorks Ghana provided orientation sessions and training for district education directorate officers and SHEP coordinators involved in school-based CD implementation, who then passed on this knowledge and know-how to circuit supervisors and private-school coordinators in their districts. The project also developed standard



Mercy and her siblings walk to their home after Mercy received an LLIN in her class 6 at Don Bosco Private School, as part of the 2016 Ghana primary school-based distribution. Sarah Hoibak for PMI VectorWorks, courtesy of Photoshare.

operating procedures (SOPs) for school-based CD implementation, with best practices and lessons learned from SOP use captured in a report to PMI and the NMCP. In total, over 33,951 people were trained on school-based CD by VectorWorks Ghana from 2014-2019.

Overall, VectorWorks Ghana distributed 3,608,789 million ITNs through school-based CD from 2014-2019.

Following the final round of school-based CD carried out by VectorWorks Ghana, the project developed and implemented an SOP on how to evaluate this channel. Key outcome measures included:

- reach of school-based CD (percentage of households that received an ITN through the channel)
- efficacy of school-based CD (percentage of households with a child in class 2 or class 6 that received an ITN through the channel).

The results of this school-based CD assessment will be invaluable to Ghana as they look to determine the most effective combination of ITN distribution channels to employ moving forward.

Routine health facility-based ITN distribution

In 2015, VectorWorks Ghana expanded routine health facility-based ITN distribution from four regions to include both ANC and CWC distribution at all 10 regions by 2018. The project enacted several measures to improve the efficiency of this strategy.

- In response to VectorWorks research indicating that net stock-outs frequently reduced the effectiveness of routine health facility-based ITN distribution, a years' worth of ITN stock was delivered to health facilities in all ten regions, decentralizing distribution and resulting in fewer stock-outs;

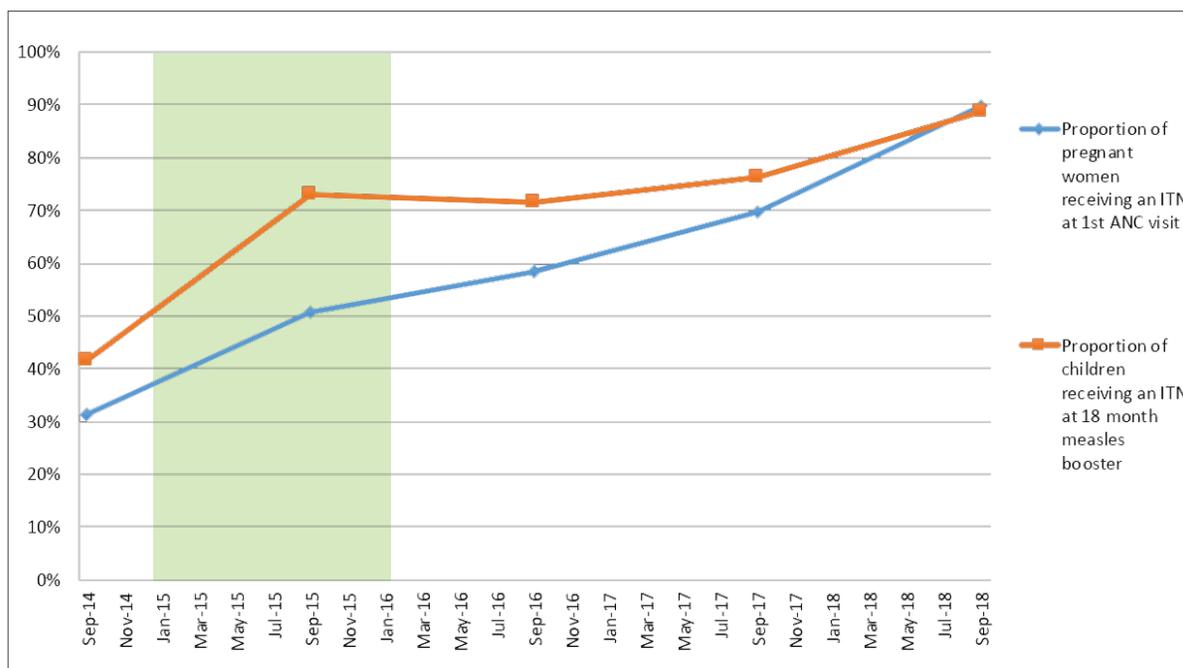


Figure 1. Trend in ANC and CWC ITN distribution rates in Ghana before and after VectorWorks implementation of supportive supervision program in 2015.

- National, Regional and District Health Monitoring Teams were set up by VectorWorks Ghana in all ten regions, with training provided to 295 members of these teams to subsequently conduct on-the-job training and **supportive supervision** in eight regions, visiting 12,746 health facilities using a checklist to assess logistics and supply chain management and coaching 41,187 staff. VectorWorks Ghana also held regional review meetings in all eight regions to review performance and promote sharing of experiences and lessons learned within each district, clustering districts for sub-regional meetings to reduce the number of meeting participants, increase participation, and reduce travel costs. These activities successfully increased ITN coverage provided by ANC and CWC channels and improved the timeliness and completeness of reporting.
- Engaging with the Maternal and Child Survival Project (MCSP) and the Nurses and Midwives Council to advocate for inclusion of information on routine health facility ITN distribution in nursing and midwifery training curricula resulted in piloting of training materials distributed by VectorWorks Ghana in 85 nursing, midwifery, and health sciences colleges across all 10 districts.
- Converting training materials on routine health facility channels into easily accessible digital formats, including PDF versions of guidelines, made available on relevant websites and WhatsApp platforms used by health workers and students. A mobile application presenting these guidelines, introduced by district malaria focal persons to health workers, who, in turn, used a workshop to support installation and presentation of introductory briefs on app use.

VectorWorks Ghana collected cost and cost-effectiveness data to assess routine health facility-based ITN distribution, in combination with other strategies, contributing to a **cost analysis series report on both routine health facility- and school-based CD in Ghana** and the first publication to break down the **costs and cost-efficacy of various ITN distribution channels**.

As a result of VectorWorks Ghana's efforts, over 5.38 million nets were distributed via routine health facility channels between 2014–2019. The percentage of pregnant women receiving an ITN during their first ANC visit increased consistently from 33% in 2014 when the project began to 81% in 2019, with the percentage of children who received an ITN during their last measles vaccination visit increasing from 58% to 79% over the same period.

Point mass distribution campaigns

Early in the project, VectorWorks Ghana trained sub-district supervisors on validation of community population data for quantification of ITNs, revised mass ITN distribution guidelines, and led a point mass distribution (PMD) campaign in the Upper East region.

Prior to phased mass distribution in 2018–2019, VectorWorks Ghana facilitated a two-day PMD planning workshop in September 2017 to develop a comprehensive campaign plan, timelines, and implementation progress tracker. The project and the NMCP were responsible for coordinating and facilitating the steering committee and four subcommittees—planning and coordination, social mobilization, logistics, and monitoring and evaluation—charged with providing critical oversight of key campaign components and developing materials and tools for PMD pilot and subsequent scale up. Participants included representatives from PMI, NMCP, GHSC-PSM, the Eastern and Volta Regional Health Directorates, and the four districts to be involved in the PMD pilot.



Mercy and her son Daniel lay together under ITN, Central region, Ghana. Sarah Hoibak for PMI VectorWorks, courtesy of Photoshare.

Because of a shift from paper-based household registration to the use of NetApp—a mobile application developed by the Ghana NMCP and GHS to collect data during ITN distribution mass campaigns—the NMCP piloted PMD in two districts each in the Volta region and the Eastern region from September 2017 to January 2018. VectorWorks Ghana provided technical assistance in planning and implementing the pilot, including a functionality assessment of NetApp by VectorWorks partner, Tropical Health.

Following these pilots, VectorWorks Ghana supported training and implementation for PMD scale up in nine regions in 2018, successfully implementing specific strategies for registration, distribution, and social mobilization in the highly urban Ashanti and Greater Accra regions. Various media channels were used, including radio and community networking through organized groups to disseminate information about household registration, distribution dates and venues, adopting mobile distribution strategies, in some cases; and timing of registration and distribution to suit urban schedules, visiting households either early in the morning or on weekends. These efforts resulted in delivery of 26.9 million ITNs via PMD from 2014-2019.

ITN durability monitoring

VectorWorks Ghana began preparing for durability monitoring of mass campaign ITNs in parallel with PMD scale up in 2018. VectorWorks led the training for baseline durability monitoring, following standard PMI guidelines in November 2018 at two neighboring districts in the Northern region; the NMIMR-led data collection team started fieldwork immediately after. Three hundred households were successfully enrolled to be followed through 2021, collecting data on the Olyset and DawaPlus 2.0 ITN brands. Because the 12-, 24-, and 36-month rounds of data collection fell outside the life of the VectorWorks project, VectorWorks Ghana transferred all relevant study documents and tools, as well as local IRB, to the new principal investigator affiliated and the PMI VectorLink project. The partners who would continue the durability monitoring study were invited to participate in all durability monitoring activities in Year Five of the project. This ensured continuity and built in-country capacity to undertake ITN durability monitoring, providing valuable information on the performance and useful life of ITNs distributed during the final PMD campaign, implemented with technical assistance from VectorWorks Ghana.

Social and behavior change communication

At a national training-of-trainers in Ada, Greater Accra region in January 2017, VectorWorks Ghana successfully trained 35 national SHEP officers, regional SHEP coordinators, regional malaria focal persons, national and regional health promotion officers, regional GES cultural officers and NMCP vector control and SBC officers on how to create master trainers' teams responsible for training district- and circuit-level training teams. The project trained 2,804 circuit and district supervisors who cascaded training to 8,289 head teachers and school-based health coordinators and 52,372 teachers at schools in their districts on malaria prevention SBC for primary schools. 22,603 schools from 216 districts were involved, with training content including:

- information on causes, transmission, symptoms, impact, prevention, and benefits of prevention of malaria
- description of key elements of school SBC, including audience, messages, and required materials
- malaria education activities for use at school assembly sessions, in the classroom, at PTA meetings, and at community outreach events
- information on the structure and function of school health teams
- information on school health activity planning

This resulted in the formation of school health teams and clubs charged with developing an action plan for health education, including malaria prevention messaging and emphasizing appropriate use and care of ITNs. Following training, In March 2019, VectorWorks Ghana monitored 2,982 schools, in seven regions, finding that school health

teams or clubs were in place at 84% of schools and that 83% of these teams were functional—that means they met at least twice a year to plan activities and review progress in implementing action plans for health education.

VectorWorks Ghana created and disseminated user-friendly and easily accessible digital versions of school SBC training materials via existing digital media platforms appropriate for e-learning, such as those used by GES. The school-based CD training described above incorporated information on these electronic materials; routine supervision was updated to include monitoring their use. These materials can support the formation and activity of new school health teams and clubs beyond the lifetime of VectorWorks.

In early 2017, VectorWorks Ghana organized a workshop to develop SBC messages and materials for health facilities, inviting 41 participants from the NMCP SBC subcommittee, the Health Promotion Unit of the GHS, regional malaria focal persons, and health promotion focal persons from all 10 regions; and USAID projects Systems for Health, Communicate for Health, and GHSC-PSM. The following materials were developed and distributed to health facilities across the country, promoting ITN use and care both in health facilities and in the community:

- **key messages** on malaria prevention, ITN use and care, and managing ITNs with consideration for protecting the environment targeting district storekeepers, officers at various health facilities, midwives and community health nurses, pregnant women, child caregivers, and family members
- a **reference guide** for health workers at ANC and child welfare clinics to serve as a job aid
- a **poster** to promote the safety and security of ITNs in storage at district- and health facility-stores and while being transported from one location to another
- a **chart** with six key facts about using and managing ITNs for use in informal education of clients and health facility staff.

VectorWorks Ghana partnered with Peace Corps Ghana to include information on malaria epidemiology in Ghana, the country malaria control strategy, including key interventions employed; roles of implementing partners; and ITN use and care SBC in school and community settings in training for all new Agriculture and Health-focused Peace Corps Ghana Volunteers. This was meant to facilitate their promotion of ITN use and care in their communities. It resulted in the piloting and scale up of stencil-tracing activities aimed at educating students and the community about malaria prevention and ITN use and care in an interactive way. Starting in 2018, Peace Corps Ghana Volunteers taught all teachers participating in school SBC training how to use local materials to create stencils and wall paintings. In Year Four, stencils were used in 25 communities in seven regions, engaging 5,200 school children and creating excitement and discussions leading to acceptance of malaria prevention SBC.

All of these activities led to over 25.1 million people exposed to malaria control SBC messages disseminated by VectorWorks Ghana from 2014-2019.

Incorporation of gender considerations in all project activities

The global VectorWorks project developed a **gender training** curriculum for field staff in Ghana, implemented in Accra in July 2016. This training resulted in VectorWorks Ghana developing a country-specific addendum to the project gender strategy and identifying two gender champions—Vivian Abiwu, VectorWorks Ghana Program Officer and Richard Kpabitey, VectorWorks Ghana Monitoring and Evaluation Manager—to lead the gender initiative. As ITN-related behaviors tend to be perceived as only being for women in Ghana, male involvement was encouraged. Both



*left: VectorWorks Ghana Gender Champion Vivian Abiwu. Danielle Piccinini for PMI VectorWorks.
right: VectorWorks Ghana Gender Champion Richard Kpabitey. Danielle Piccinini for PMI VectorWorks.*



male and female students were assigned roles in classroom dramas showing how to hang and care for ITNs and nominated as champions of ITN use and care during primary school SBC activities; equal participation by mothers and fathers was stressed at Parent-Teacher Association malaria prevention meetings.

Results of qualitative research on barriers to and facilitators of ITN use also pointed to gendered differences and the need to ensure net care and use SBC messaging that resonates with both males and females.

Research on barriers to and facilitators of ITN use

VectorWorks Ghana and NMIMR conducted a qualitative study on barriers and motivators to ITN use in three sites, in three regions, across three ecological zones, to better understand and address the gap between net access and use. Eighteen focus group discussions and seven case studies were conducted. The results indicated that ITN use is not binary (user versus nonuser), but can vary throughout a single night, across seasons, and over time. Three key factors were found to contribute to low ITN use in Ghana:

- **ITN characteristics and perceptions:** itching or burning sensations and strong chemical scent
- **sleeping space characteristics:** heat from restricted airflow and congestion, perception that net use is not possible in certain contexts, such as outdoor or cramped sleeping spaces
- **perceptions of futility of net use:** no point in sleeping under a net because of exposure to mosquitoes prior to bedtime, different understandings of malaria transmission.

Facilitators to ITN use, on the other hand, included having a traumatic personal experience with malaria infection of oneself or a loved one, growing up using an ITN, or developing the habit of using one.

In addition to presenting these findings to PMI and the NMCP, VectorWorks Ghana developed a memo outlining key SBC activities to sub-target ITN use among those with access, to share with both parties. In collaboration with the NMCP SBC Task Force, the project outlined a short-, medium- and long-term implementation roadmap for these recommendations and structural approaches to enhance the usability of ITNs in challenging contexts. Results were presented at the [2018 meeting of the American Society of Tropical Medicine and Hygiene](#) and published peer-reviewed article. These results and recommendations will inform malaria control SBC policy and strategy in Ghana and will influence SBC implementation strategies in other PMI-funded projects, as well.

Key stakeholder engagement

On the national level, VectorWorks Ghana coordinated with the NMCP to inform Ghana's ITN strategy in several ways:

- Meetings to discuss the future landscape of ITN distribution in Ghana and evaluation of Ghana's mixed school and mass distributions, with implications for coverage and value for money culminating in a detailed **presentation of analyses of Ghana's ITN strategies since 2002 and distribution options to consider moving forward**. This was presented to the NMCP and PMI, with the intent to share this information with a larger audience of stakeholders.
- VectorWorks Ghana and other partners involved in ITN distribution participated in **quarterly ITN subcommittee meetings held by the NMCP**, which were replaced by meetings focused on PMD in the year leading up to implementation. This regular platform for sharing challenges, successes, and opportunities for various ITN distribution channels helped improve the efficiency of net distribution in Ghana and generated new policy recommendations to improve ITN use and care. This included reviewing Ghana's policy on ITN distribution channels at a stakeholder meeting in October 2016, attended by GHSC-PSM, Systems for Health, Nets for Life/ADDRO, all regional malaria focal persons, regional SHEP coordinators, SHEP National, and

PMI. It resulted in key recommendations on mass campaigns (shorten duration to no more than one year, include specific strategies for urban settings, enable greater regional and district level responsibility, improve registration, data validation, and community mobilization), routine health facility-based ITN distribution (improve efficiency of supply chain and stock management, improve documentation and accountability of ITNs received and distributed at all levels, strengthen commitment of district teams), and school-based CD (conduct district level systematic data validation, collect enrollment data in the second school term, address differences between enrollment data and actual enrollment to ensure all children in targeted classes receive an ITN).

- The project participated in regular meetings of the NMCP malaria SBC committee as well, applying lessons learned and best practices to influence SBC policy, particularly related to ITN distribution, use, and care.
- VectorWorks Ghana played an active role in quarterly MaVCOC meetings, providing critical input on ITN distribution, use, and care strategies. This informed the general vector control policy recommendations made by this public/private forum to the NMCP.
- VectorWorks Ghana participated in review meetings to update Ghana's Integrated Vector Management Policy in July and August of 2019.

In addition to generating recommendations for new national policies to improve ITN distribution and malaria vector control, the creation of partnerships with and between local stakeholders promoted the sustainability of successful VectorWorks Ghana activities and seamless transition after project completion.

VectorWorks Ghana also engaged international stakeholders, attending Roll Back Malaria (RBM) Alliance for Malaria Prevention (AMP), and Vector Control Working Group (VCWG) meetings and the American Society of Tropical Medicine and Health conference to share experiences, ideas, and priorities in ITN distribution and malaria vector control, across countries. The VectorWorks Ghana team, including the NMCP monitoring and evaluation officer and the co-chairman of MaVCOC, presented on the, "Usefulness of DHIMS2 for tracking ITNs" at the 2017 VCWG meeting; the Ghana NMCP manager, Dr. Keziah Malm, presented on "Opportunities and challenges with domestic resource mobilization: Experiences from Ghana" at the [2019 AMP meeting](#).

Way forward

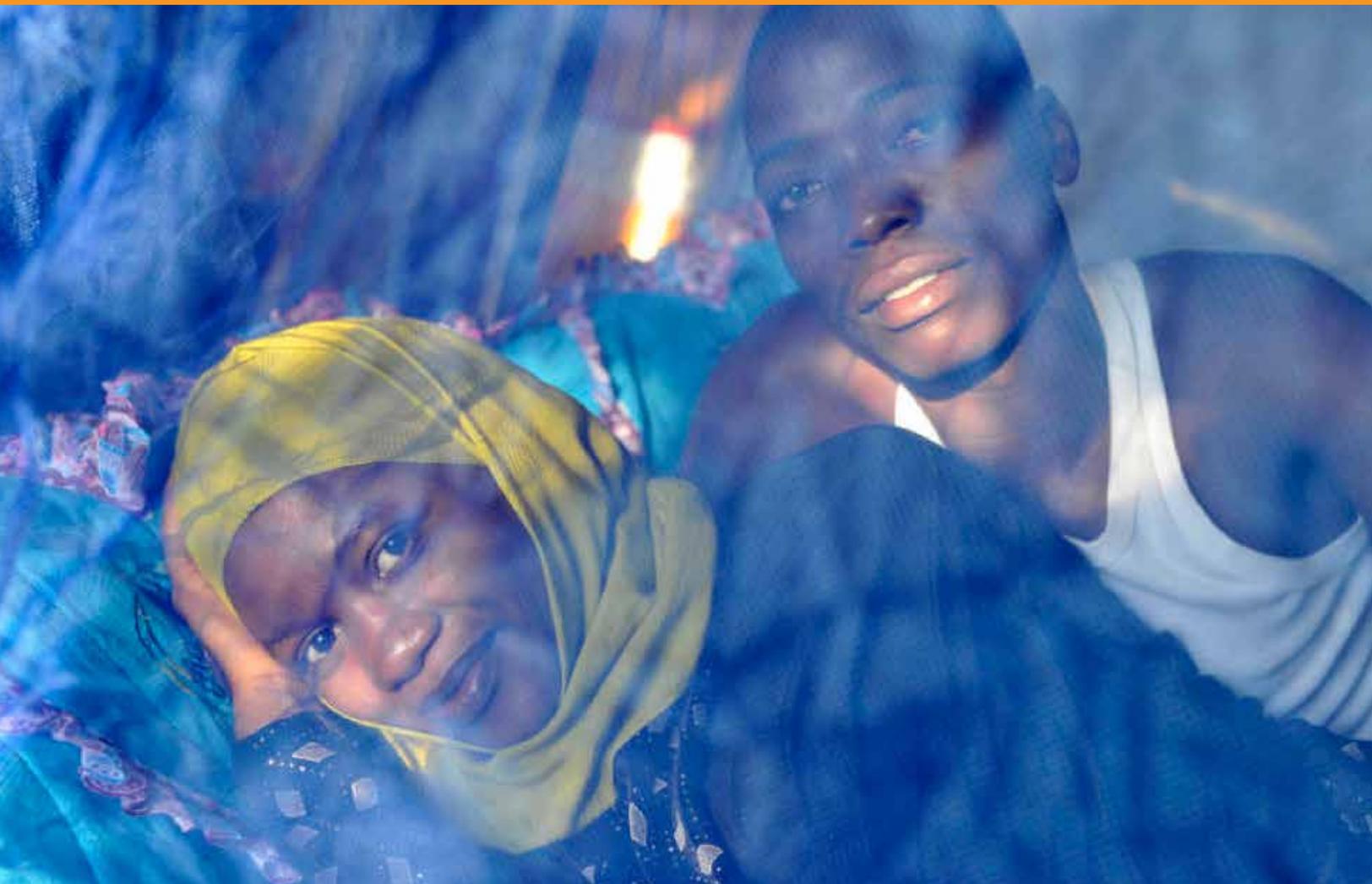
Future activities that could help maintain and build upon the accomplishments of VectorWorks Ghana, bringing the country closer to reaching universal ITN coverage and malaria control goals, include:

- Continue to refine and use tools developed by VectorWorks Ghana to aid CD and PMD campaign planning, implementation and monitoring, net use and care SBC in various settings, ITN durability monitoring, and incorporation of gender considerations in all project activities.
- Engage with the GES to resolve issues with the collection of school enrollment data to be used in quantifying ITNs in school-based CD.
- Advocate for permanent inclusion of routine health facility-based ITN distribution training in health care worker curriculum.
- Develop and implement new strategies to further involve boys and men in ITN use and care activities.
- Execute the implementation roadmap outlining key SBC activities to sub-target ITN use among those with access.
- Continue to engage national and international stakeholders to promote evidence-based updates to malaria control and ITN distribution policy and practice, based on VectorWorks Ghana outputs.

VectorWorks Tanzania

End of Project Report

2014-2019



Fatuma Dadi Make and her husband Ally Issa Mume sleep under a bed net in her house in Mtwara, Tanzania. Fatuma is 6 months pregnant with her first child. Riccardo Gangale for PMI VectorWorks, Courtesy of Photoshare.

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VectorWorks Tanzania would like to thank Megan Fotheringham, Lilia Gerberg, George Greer, and Naomi Serbantez for their ongoing support and encouragement of the project.

Executive summary

More than 57.3 million people living in Tanzania, where VectorWorks ran its largest country program, are at risk of malaria infection. After two mass campaigns achieved universal coverage with insecticide-treated nets (ITNs) in 2011, the National Malaria Control Program (NMCP) explored “**keep-up**” options for maintaining universal ITN coverage in Tanzania. An in-depth assessment suggested that adding school-based continuous distribution (CD) to the **Tanzania National Voucher Scheme (TNVS)**, which has provided ITN vouchers to pregnant women and infants since 2004, could likely sustain universal coverage at or below the costs of mass distribution campaigns. **School-based CD pilots** from 2013–2015 were promising, with ~95% of eligible children receiving an ITN and 49% of households, with one net per two people in pilot regions compared to 23% in control regions. More information was needed, however, to determine if universal coverage could be maintained using these two “keep-up” strategies, and how to ensure long-term sustainability in the changing circumstances.

VectorWorks Tanzania, funded by the U.S. President’s Malaria Initiative (PMI) through USAID, worked with the NMCP from 2014–2019 to answer these critical questions and achieve the goal of **sustaining high ITN coverage with appropriate, effective, and reliable CD**. The project successfully:

- Supported the NMCP in developing a **national, comprehensive ITN distribution strategy**, creating or modifying the existing **data management systems** to track and report ITNs ordered and received, and implementing targeted and national **SBC** that promotes school-based CD and routine health facility-based ITN distribution, and proper ITN use and care.
- Supported **school-based CD**, incorporating this channel into the national ITN distribution strategy and scaling-up implementation to include 14 target regions.
- Supported **routine health facility-based ITN distribution**, launching the *Chandarua Kliniki* program and providing technical assistance to the Medical Stores Department (MSD) in the Mainland and the Central Medical Store (CMS) in Zanzibar in managing ITN storage and distribution.
- Reintroduced **community-based CD** in Zanzibar using an updated coupon system.
- Worked to revive **private sector ITN distribution** throughout Tanzania.
- Guided the Zanzibar Malaria Elimination Program (ZAMEP) in implementing ITN durability monitoring in two districts.
- **Considered gender in all project activities**, developing and implementing the VectorWorks Tanzania Gender Strategy, with support from two gender champions.
- Conducted **qualitative and quantitative research** on ITN ownership under CD, and residual malaria transmission.
- **Engaged with national and international partners**, providing critical inputs into ITN distribution, use, and care strategies, sharing and learning about ideas and best practices within Tanzania and with other countries, and collaborating to ensure coordinated implementation of ITN distribution.

As a result, VectorWorks Tanzania delivered over 15.7 million ITNs between 2014 and 2019, 7.6 million through school-based CD and 8.2 million through routine health facility ITN distribution and community-based CD. The percentage of pregnant women receiving an ITN during their first ANC visit increased consistently from 24.4% in Year Two of the project to 88.7% in Year Five, with the percentage of children receiving an ITN during their last measles vaccination visit increasing from 14.0% to 82.3% during the same period. Per net delivery costs for school-based CD decreased more than 70% from 2015 to 2017.

VectorWorks Tanzania worked throughout the project to build capacity, provide continuous information and feedback, and prepare all national partners and others involved in malaria control activities for a seamless transition of project activities, ensuring that the gains made by VectorWorks Tanzania in ITN coverage, use, and care—and in malaria prevention—are sustained.

Introduction

Background

Following several years of targeted distribution of insecticide-treated nets (ITNs) to pregnant women and infants under the **Tanzania National Voucher Scheme (TNVS)**, the percentage of households with at least one net per two people increased from 23% when the program began in 2004 to 39% in 2007, with the percentage of children under-5 in the Mainland using an ITN increasing from 16% to 26% in the same period. A national under-5 catch-up campaign from 2008–2010, universal coverage campaigns from 2010–2012, and complementary net use promotion “hang-up” campaigns from 2009–2011 indicated a shift towards a universal coverage strategy and produced notable gains in ITN access and use, with 91% of Mainland households and 74% of households in Zanzibar owning at least one net by 2011. Also, the percentage of pregnant women and children under-5 sleeping under an ITN the previous night reaching 75% and 72% on the Mainland and 36% and 51% in Zanzibar, respectively. Although redemption rates for TNVS vouchers remained steady, even during universal coverage campaigns, it became clear that this routine distribution channel could provide only about half of the ITNs needed each year to cover all newborns.

An in-depth assessment of **“keep-up” options for maintaining universal ITN coverage in Tanzania**, funded in 2011 by the Swiss Development Cooperation, found that the existing reproductive and child health (RCH) voucher program—with school-based continuous distribution (CD)—was most likely to be able to maintain universal ITN coverage after mass campaigns. In response, the National Malaria Control Program (NMCP) worked with the NetWorks project, VectorWorks’ predecessor, to implement pilots of school-based CD from 2013–2014. Pilot results indicated the feasibility of implementing school-based CD in Tanzania to rapidly and equitably distribute a large number of ITNs, but more information was needed to determine whether the proposed strategy could maintain universal ITN coverage, and at comparable costs to mass campaigns.

Goals and objectives

In 2014, VectorWorks Tanzania began as part of the global VectorWorks project with the goal of **sustaining high ITN coverage with appropriate, effective, and reliable CD**. Two specific objectives were to:

Objective 1: Support continuous and equitable access to ITNs.

Objective 2: Support PMI and the Tanzania NMCP in developing vector control interventions for the specific challenges faced by Tanzania.

Project activities

To address whether combined routine RCH ITN distribution and school-based CD could maintain universal ITN coverage, VectorWorks Tanzania supported the NMCP in developing a comprehensive national distribution strategy aimed at sustaining high ITN coverage through CD channels and including generation, collection, and assessment of the data needed to properly evaluate this strategy. The project promoted successful CD implementation, creating new information systems and leveraging those already existing to inform planning, implementation, and evaluation,

and promoting program engagement and proper ITN use and care via community outreach and SBC. VectorWorks Tanzania streamlined and scaled up school-based CD, introduced new routine RCH ITN distribution after TNVS funding ended abruptly in 2014, and, in Zanzibar, implemented community and RCH ITN distribution and monitored ITN durability. The project conducted research to address the remaining questions around malaria vector control and engaged key stakeholders at every step of the project, with a structured approach applied to consider gender in all activities. Knowledge and know-how produced by VectorWorks Tanzania were shared through peer-reviewed articles, presentations, documents, videos, trainings and webinars online, and personal contact at meetings.

This report summarizes VectorWorks Tanzania's activities from 2014 to 2019, highlighting the key achievements of the project.



A truck containing 760 bales of 40 nets each is unloaded into smaller trucks which are going to deliver the nets to the 131 schools in Chato District, Tanzania. Riccardo Gangale for PMI VectorWorks, Courtesy of Photoshare.

Key achievements

VectorWorks Tanzania partnered with key stakeholders, including the Ministry of Health, Community Development, Gender, Elderly, and Children (MoHCDGEC) through the NMCP, the President's Office - Regional Administration and Local Government (PO-RALG), the Zanzibar Malaria Elimination Program (ZAMEP), the Medical Stores Department (MSD), the Central Medical Store (CMS), the Ifakara Health Institute (IHI), the Malaria Safe partnership, and the NETCELL project, including private logistics and transportation companies Simba Logistics and Equipment Supply and Mohamed Enterprises Limited.

This resulted in the successful development and implementation of a comprehensive national ITN distribution strategy emphasizing CD channels, with VectorWorks Tanzania delivering more than 15.7 million ITNs between 2014 and 2019. A [VectorWorks Tanzania video](#) was made celebrating these and other accomplishments detailed below, centering on several different champions in the fight against malaria in Tanzania and highlighted in Washington, D.C., on World Malaria Day in 2018.

National ITN distribution strategy

Early in the project, VectorWorks Tanzania drafted a comprehensive national ITN distribution strategy proposing mass campaigns followed by a shift in 14 regions to fully continuous ITN distribution via routine RCH distribution and school-based CD. Tanzania was the first country to propose such a shift from universal coverage to CD strategies in their national policy.

VectorWorks Tanzania and the NMCP regularly updated this strategy with the most recent data from the School Net Program (SNP), Tanzania's school-based CD program, and revised it based on input from key stakeholders in both public and private sectors. The national ITN distribution strategy informed the Global Fund funding requests and other grant applications, while VectorWorks Tanzania worked to build consensus and finalize the strategy.

Data management systems

Good quality data on school enrollment, RCH service utilization, and numbers of community members are essential to quantifying the number of ITNs needed for various distribution strategies, avoiding both stockouts and over-supply. Accurate, real-time data on ITN orders and deliveries are also needed to monitor ITN distribution implementation of all types, identifying and addressing any issues as quickly as possible and ensuring accountability at all points in the distribution chain.

VectorWorks Tanzania addressed these needs by developing or adapting several data management systems. The project contracted **Simba Logistics** to handle school-based CD and routine RCH distribution logistics, using their **proprietary web-based platform** to track ITN deliveries. Accessed from web and mobile devices to provide real-time ITN supply data, improving accountability and allowing immediate identification of any supply-chain issues. Additionally, PO-RALG, the NMCP, and VectorWorks Tanzania partnered to develop a dashboard to collect and visualize SNP implementation data, including ITN issuing data, building on Tanzania's existing **Basic Education Management Information System (BEMIS)**. VectorWorks Tanzania obtained yearly enrollment figures directly from BEMIS, eliminating a prior existing need to train and send staff to collect school enrollment data in-person, significantly cutting costs.

The project developed the **Chandarua Kliniki dashboard** to increase visibility of data on clients seen and ITNs issued through RCH centers, releasing different versions adapted to the independent health systems of the Mainland and Zanzibar. The dashboard was built on the **existing District Health Information Management System 2 (DHIS2)** and modified throughout the project to improve practicality, ease, and frequency of use and to integrate as many aspects of health facility-based CD planning, implementation, and monitoring as possible. VectorWorks Tanzania also developed an online tool to replace paper forms used during supportive supervision visits to health facilities. The cloud-based *Chandarua Kliniki* system both stored data and provided password-protected access to various users, at difference access levels, using any device connected to the internet. VectorWorks Tanzania provided training to the PO-RALG team and Regional (RHMT) and Council Health Management Teams (CHMT) on how to use the dashboard to view trends in ITN issuing performance and create monthly accountability reports. The project also extended training and use of the dashboard beyond the 14 PMI focus regions to all 26 regions in Tanzania, so that a single program could be used across the country, regardless of who distributed the ITNs.

In both the Mainland and Zanzibar, VectorWorks Tanzania used the existing **electronic Logistics Management Information System (eLMIS)** to order health facility ITNs, ensuring timely placement of orders and avoiding stockouts. VectorWorks Tanzania successfully integrated ITN reporting and requisition into the Integrated Logistics System (ILS) in the Mainland and the Zanzibar Integrated Logistic System (ZILS) in Zanzibar.

VectorWorks Tanzania also created a **dashboard to visualize data on ITN coupons** issued and redeemed as part of community-based CD. This dashboard sits on the DHIS2 platform and provides summary reports on coupon stock on hand and numbers of coupons distributed and redeemed at national and district levels. This helps maintain coupon and ITN stock levels at CMS.



Head teacher Sosthenes Charles Zakayo receives a text message from Simba Logistics with information on the delivery of mosquito nets to be delivered at Kamunyonge primary school, Tanzania. Riccardo Gangale for PMI VectorWorks, Courtesy of Photoshare.

Social and behavior change communication

VectorWorks Tanzania collaborated with the SBC Communication Technical Working Group of the NMCP to plan and implement SBC on ITN distribution, use, and care throughout the project, contracting with a service provider to conduct social mobilization and SBC activities around the new *Chandarua Kliniki* program. In addition to promoting health facility-, community- (for Zanzibar), and school-based CD strategies and ITN use and care—including proper washing of nets—SBC addressed common concerns expressed by communities, such as why some school classes are chosen for ITN distribution in a district while others are not. SBC messages also stressed sharing of excess nets, as this practice helps redistribute any oversupply of ITNs.



A road show event in Ruvuma Region. Ashley Mwamaka for PMI VectorWorks.

VectorWorks Tanzania SBC activities included:

- **experiential media** including public announcements and 878 road shows reaching 645,888 people in 49 Mainland districts, and 290 additional road shows reaching 127,053 people in 11 districts in Zanzibar
- **radio campaigns**, one in 2018 with 5,756 radio spots, including commercials, talk shows, interviews, presenter mentions, and pre-recorded messages over four months; and one in 2019 for three months, airing 3,328 spots.

VectorWorks Tanzania presented an abstract on the use of radio to create and promote routine health facility-based ITN distribution at the 2019 RBM SBC Working Group meeting.

School-based continuous distribution

VectorWorks Tanzania supported the NMCP to plan, implement, and evaluate their school-based CD strategy in 14 PMI target regions. This involved facilitating planning and coordination meetings at national and subnational levels; training staff at all levels in planning, implementation, and evaluation; and organizing distribution logistics. In total, VectorWorks Tanzania trained 2,449 people on school-based CD from 2014–2019. Tanzania's SNP evolved with each round, demonstrating agility in adapting to initial feedback and results and variable contextual factors, such as time, because of the most recent universal campaign or school enrollment estimates. In addition to the data management systems and SBC activities described previously, VectorWorks Tanzania implemented the following innovations to SNP, **increasing efficiencies in school-based CD** over the five years of the project:

- **Eliminated Ward Education Coordinator (WEC) training**, as WECs no longer need to manually collect enrollment data after the move to existing online systems for obtaining these data.
- **Created a generic SNP implementation guideline** and associated reference manual and training slides adapted from SNP1 and SNP2 standard operating procedures, substituting refresher training and reducing required training to baseline only, and standardizing implementation throughout the country.
- **Developed a just-in-time delivery approach**, where ITNs are picked up directly at the port in large trucks and shipped to regions where they are immediately moved to smaller trucks and moved to individual schools as soon as possible, eliminating the the extra step and expense of fixed storage at the regional level; and

- Eliminated re-bundling.** During SNP1–3, centralized re-bundling involved spending several days at the port opening ITN bales to allocate exact numbers needed to each district, remaking bundles of the correct size, and then repeating this re-bundling procedure at district warehouses to create ITN bundles of the correct size for each school. This resulted in delays of 7–10 days. VectorWorks shifted to re-bundling ITNs only as they were off-loaded at schools during SNP4 and SNP5. This saved time and effort and eliminated the need for storage space at the district level, substantially reducing distribution costs.

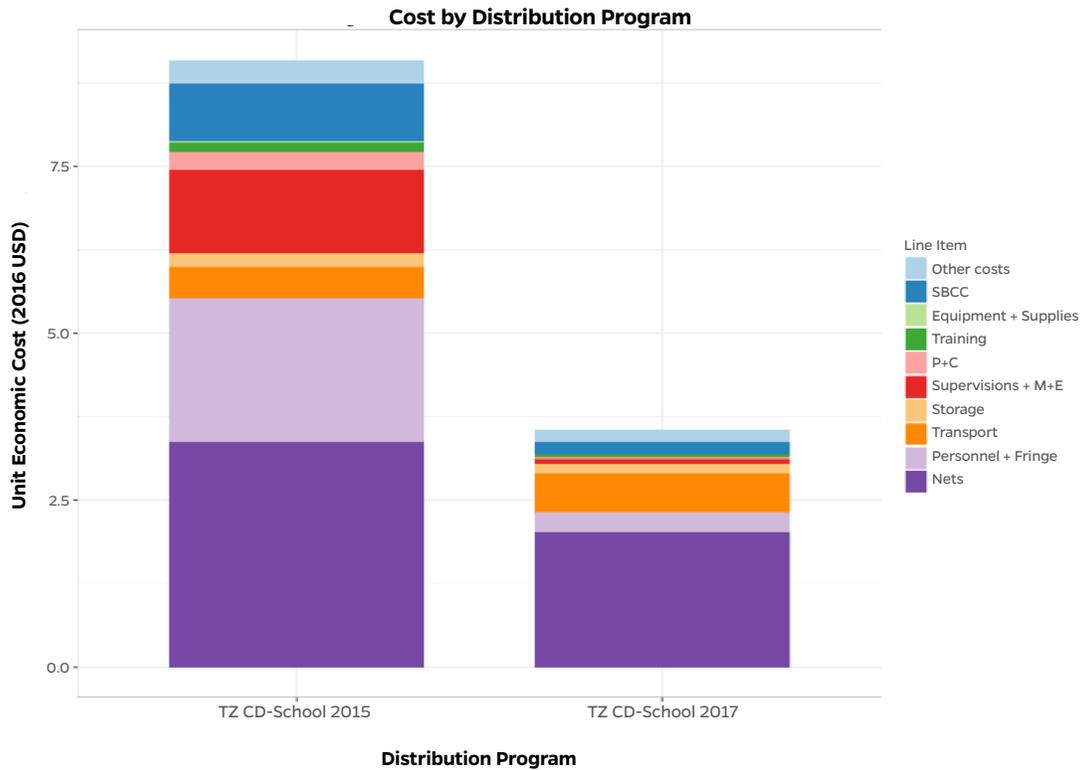


Figure 1. Economic costs of school-based ITN distribution in Tanzania in 2015 and 2017, broken down by cost category. Personal communication from S. Scates.

VectorWorks Tanzania collected cost and cost-effectiveness data to assess the impacts of ITN distribution efforts, contributing to cost analysis series reports on [SNP3](#) and [SNP5](#), as well as the first publication to break down [costs and cost-efficacy of various ITN distribution channels](#). Gains were seen in cost effectiveness of Tanzania’s SNP, as per net delivery costs for school-based CD decreased more than 70% from 2015 to 2017.

VectorWorks also assessed ITN access versus time since the last mass campaign in Tanzania using data from the 2015–2016 Demographic Health Survey (DHS) and 2017 Malaria Indicator Survey (MIS). In figure 2, dots represent partial regions or multiple regions in the surveys, green represents regions with only mass campaigns, blue represents those with only partial SNP coverage or participation after mass campaigns, and orange represents those fully participating in SNP after mass campaigns. Similar to other countries, regions of Tanzania with no SNP implementation following mass ITN distribution demonstrate linear declines in population ITN access, dropping about 12 percentage points per year, while **sites with incomplete SNP implementation show slightly higher access, and sites with full SNP implementation maintain very high population ITN access a full seven years after the previous mass campaign.** These results clearly show the effectiveness of school-based CD in maintaining ITN access in the absence of mass campaigns.

VectorWorks Tanzania's activities resulted in **delivery of more than 7.6 million ITN through school-based CD** from 2014–2019.

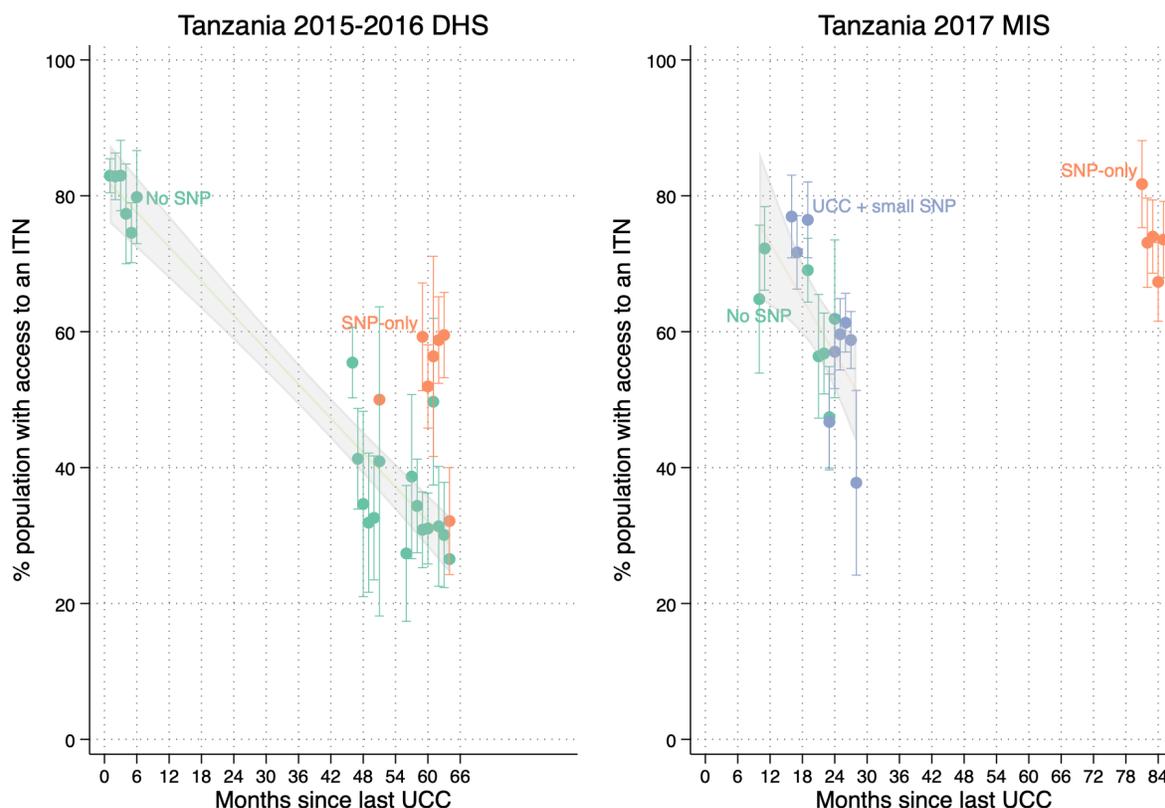


Figure 2. Percent of population with access to ITNs in Tanzania by months since last mass ITN distribution campaign for partial or multiple regions with no SNP (green), incomplete SNP implementation (blue), and full SNP implementation (orange) using data from the 2015-2016 DHS and 2017 MIS. (Koenker et al, 2019).

Routine health facility-based ITN distribution

VectorWorks Tanzania expanded routine health facility-based ITN distribution via their *Chandarua Kliniki* program, from nine regions when the program was first rolled out in 2016 to all 14 PMI focus regions by 2019. ITNs were distributed directly to pregnant women at their first antenatal care (ANC) visit and to children on the first measles vaccination visit. In addition to collaborating to develop or adapt data management systems and disseminate SBC messaging through various channels as described previously, VectorWorks Tanzania:

- **trained 10,768 people** on routine health facility-based ITN distribution
- **held regional review meetings** in five Mainland regions and in Zanzibar involving RHMTs, CHMTs, and selected health facilities staff to share routine health facility-based ITN distribution successes and challenges and develop corrective actions to improve performance
- provided **technical assistance** to the MSD in the Mainland and CMS in Zanzibar in managing ITN storage and distribution
- implemented initial **smart push ITN distribution in 26 regions**, providing six months of ITN stock to health facilities in one delivery and continuing with quarterly resupply in 14 regions.

VectorWorks Tanzania provided technical assistance to CMS in Zanzibar and supported MSD in the Mainland to improve ITN storage and delivery to health facilities through a variety of activities, including:

- **assessed ITN storage capacity** in all 10 MSD zones, resulting in rental of private warehouse space in Makambako district and in Mwanza, Kagera, Lindi, and Dar es Salaam regions to address inadequate MSD storage capacity and eventual transition to MSD warehouses with appropriate conditions
- **contracted Simba Logistics** to handle routine health facility-based ITN distribution in the Mainland while assisting MSD in **building capacity** to take over this distribution, including acquisition of MSD fleet vehicles with Global Fund support; this resulted in the Mwanza zone having the capacity to handle routine health facility-based ITN distribution in the Shinyanga region and two districts in the Mwanza region;
- performed **quarterly performance assessments of ITN storage and distribution** to promote improvement and capacity building
- conducted **quarterly review meetings** with MSD zone managers and other relevant stakeholders to share achievements and challenges in ITN storage and distribution activities.

As it did for the SNP, VectorWorks Tanzania collected cost and cost-effectiveness data on the *Chandarua Kliniki* program in the Mainland in the first year of operation, resulting in a **cost series analysis report** and contributing to the analysis comparing **costs and cost-efficacy of various ITN distribution channels**. Results indicated that the lowest costs per malaria case averted are associated with routine health facility-based distribution programs like *Chandarua Kliniki*, and the program provides significant return on investment, with each person-year protected resulting in an economic cost of only 1.32 in 2016 USD.

Because of VectorWorks Tanzania's efforts, over 8.2 million nets were distributed via health facilities in both the Mainland and Zanzibar between 2014–2019. The percentage of pregnant women receiving an ITN during their first ANC visit increased consistently from 24.4% in 2015 to 88.7% in 2019, with the percentage of children receiving an ITN during their last measles vaccination visit increasing from 14.0% to 82.3% over the same period. Per net delivery costs for school-based CD decreased more than 70% from 2015 to 2017.



Nurse Consolata Nsubui hands over a bed net to Mamy Amis and her daughter Mursat Ramadhan, who has been vaccinated for measles at Nyamaganga hospital in Mwanza, Tanzania. Riccardo Gangale for PMI VectorWorks, Courtesy of Photoshare.

Community-based continuous distribution

VectorWorks Tanzania designed and implemented an updated community-based CD channel in Zanzibar, where coupons with new security features were provided to community members meeting the following criteria:

- have an ITN too torn to be repaired
- sleep in uncovered sleeping spaces
- live in a household identified during active malaria case detection
- ITNs lost in emergency situations.

These coupons were distributed by trained, government-appointed local community leaders, or Shehas, and could be redeemed for an ITN at health facilities. Between June 2014 and December 2015, **132,991 ITNs** were distributed through community-based CD in Zanzibar. By the end of the project, an additional 396,681 ITNs were delivered to health facilities for community and RCH distribution.

Private sector ITN distribution

VectorWorks Tanzania also worked with the NMCP throughout the project to revitalize and enable the private ITN market, which has been robust in Tanzania since the early 1990s. In the private sector, it is important to create an enabling environment for affordable and attractive treated nets as untreated have been more commonly available. The project conducted a market dynamics landscape assessment in response to manufacturers' requests for additional information prior to investing, organizing a stakeholder's workshop to identify barriers to market entry and develop solutions, and drafting a commercial channel implementation guideline, and soliciting review and endorsement from the NMCP and other stakeholders. The guideline addresses concerns about fair competition, clearly stipulating how the private sector will operate in the context of marketing elements and how other non-marketing issues will be solved. It will be important to address all market entry barriers noted by key stakeholders and continue to champion the implementation of Tanzania's private sector CD channel to revive this important component of the ITN distribution strategy.

ITN durability monitoring

VectorWorks Tanzania guided ZAMEP in implementing durability monitoring of two ITN brands in two districts in Zanzibar. As per PMI guidelines, 15 clusters of 10 households each were monitored at each site, for a total of 300 households. The project led baseline and refresher training for each of the four rounds of data collection, as well as assistance with field work at baseline and 12-, 24-, and 36-month follow-up. In addition, VectorWorks Tanzania held a data management and analysis workshop for ZAMEP members to further build local capacity to take over ITN durability monitoring data collection, analysis, and interpretation. All rounds of durability monitoring follow up were successfully completed, producing important data on the performance and "useful life" of ITNs distributed during the 2016 mass distribution campaign supported by the Global Fund. **After three years of follow-up** among similar, rural populations in the Zanzibar islands of Unguja and Pemba, the 150 denier polyethylene LLIN Olyset showed significant lower physical survival compared to the 100 denier polyester LLIN PermaNet 2.0; even though, at the end, the estimated median survival was 2.7 years for the Olyset and 2.9 years for the PermaNet.

Incorporating gender considerations in all project activities

The global VectorWorks project developed a **gender training** curriculum for field staff in Tanzania, implemented in Dar es Salam in January 2016. This training resulted in VectorWorks Tanzania developing a country-specific addendum to the project gender strategy and identifying two gender champions, Cecelia Makafu, PSI Tanzania Head of Malaria and Child Health, and Kanuth Dimoso, VectorWorks Tanzania Program Monitoring Manager, to lead the gender initiative. As ITN-related behaviors tend to be perceived as only being for women in Tanzania, male involvement was promoted, with both male and female figures represented in project logos and images.

In March 2017, Baltimore-based VectorWorks staff met with VectorWorks Tanzania's monitoring and evaluation officer to plan tracking of gender-related outcomes, which included reporting



VectorWorks Tanzania Gender Champion Kanuth Dimoso. Eric Filemyr for PMI VectorWorks. Eric Filemyr for PMI VectorWorks

of training participant and ITN recipient numbers broken down by gender. A review of SBC materials found that they successfully promoted gender equity and avoided harmful gender stereotypes.

VectorWorks Tanzania also supported [IHI research](#) on [net care](#), which indicated, as expected, that both men and women perceive ITN care to be women's responsibility.

Qualitative and quantitative research

VectorWorks Tanzania developed and implemented a research plan, including qualitative and quantitative studies of malaria vector control. One compared the Lot Quality Assessment (LQAS) method to the Malaria Indicator Survey (MIS) as measures of ITN ownership in three regions in Tanzania participating in CD. The LQAS involves defining "lots," in this case each region involved in the study, selecting clusters within each lot and then a random household from each cluster for assessment. Understanding whether the LQAS provides estimates of ITN ownership coverage at the regional level that are accurate enough to be used for ITN distribution decision making is important because the tool could provide a low-cost alternative to the MIS.

VectorWorks Tanzania built on existing methods, lessons learned through primary research, and global engagement, collaborating with IHI and ZAMEP on a study of residual malaria transmission in six wards in Zanzibar. The study applied a harmonized approach to assessing [entomology and human behavior](#), which provides standard data elements to be captured, methods for calculating relevant indicators, and suggestions for best practices in data collection and analysis. This approach, if applied consistently, can improve understanding of residual transmission across different contexts and allows comparisons over time and geography. To promote application of these methods, VectorWorks Tanzania held a data analysis workshop, including hands-on data analysis sessions. Study results indicated high ITN access and use, but 15–30% of people were away from home at some point each night, outside where more than two-thirds of mosquitoes were found.

This indicated the greatest gains in malaria control may come from addressing outdoor transmission. [Qualitative interviews](#) provided insight on the range of outdoor nighttime activities and indicated that men and seasonal workers may be at higher risk of malaria infection, helping to identify targets for intervention.

These results and recommendations will inform malaria control policy and implementation in Tanzania and influence strategies in other PMI-funded projects as well.



Woman washing clothes outside of home at night, Zanzibar. April Monroe for PMI VectorWorks.

Key stakeholder engagement

On the national level, VectorWorks Tanzania engaged with coordination and technical working groups to share experiences; network with other implementing partners, donors, and the government; and ensure its alignment with the malaria control stakeholder agenda in Tanzania. These meetings included:

- general NMCP meetings to discuss project progress
- regional engagement meetings for seven regions each for SNP and RCH led by VectorWorks Tanzania, the NMCP, and PO-RALG resulting in a noticeable increase in regional involvement and ownership of school-based CD and routine health facility-based ITN distribution
- workshop with the PO-RALG ICT Directorate to discuss amending BEMIS to consider sex and gender aspects and include SNP data (ITN quantifications, issue, and delivery)
- meetings with the NMCP and MSD to coordinate health facility CD scale-up where VectorWorks Tanzania contributed quantification estimates to aid discussion of handling logistics of rapid expansion and to prepare MSD to take over health facility CD logistics after project completion
- long-lasting insecticide-treated nets Task Force meetings where the project team presented SNP progress, routine health facility ITN distribution, and private sector activities
- stakeholder's workshop to discuss the new supplementary malaria strategic plan (2018–2020) and commercial sector implementation guide draft, where VectorWorks Tanzania facilitated and led discussion on amending the Tanzania ITN Plan (2018–2020) to synchronize it with the strategic plan
- Tanzania Vector Control Expert Consultation Workshop to address whether the focus on ITNs should be reconsidered, resulting in the government's definitive endorsement of the ITN strategy
- malaria operations plan meetings, where VectorWorks Tanzania supported the NMCP and presented the *Chandarua Kliniki* dashboard
- World Malaria Day commemoration coordination meetings to plan presentation of dashboard
- NMCP SBC Communication Technical Working Group meetings to discuss SBC activities and avoid duplication of efforts
- senior management briefing on malaria control activities organized with PO-RALG and the NMCP;
- mass replacement macroplanning meeting for the 2020 mass campaign where VectorWorks Tanzania presented AMP guidance for mass campaign planning and implementation
- meetings with PO-RALG to discuss coordination of malaria partners.

In addition to facilitating the sharing of knowledge and know-how and providing input to improve ITN distribution policies, creation of partnerships with and between local stakeholders promoted the sustainability of school-based CD and routine health facility ITN distribution strategies by increasing the Tanzanian government's ownership.

VectorWorks Tanzania also engaged international stakeholders, attending Roll Back Malaria (RBM) Alliance for Malaria Prevention (AMP) and Vector Control Working Group (VCWG) meetings and the American Society of Tropical Medicine and Health (ASTMH) conference to share experiences, ideas, and priorities in ITN distribution and malaria vector control across countries. The project team organized a symposium accepted at the 2018 ASTMH conference entitled, "[Why is Malaria Transmission Persisting in Some Contexts Despite High Coverage of Vector Control Tools, such as LLINs and IRS? Results from Recent Studies Across Three WHO Regions.](#)"

Way forward

Future activities that could help to maintain and build upon the accomplishments of VectorWorks Tanzania, bringing the country closer to reaching universal ITN coverage and malaria control goals, include:

- continue to refine and use tools and systems developed or adapted by VectorWorks Tanzania to plan, implement, and monitor school- and community-based CD and routine health facility ITN distribution
- develop strategies to reach non-targeted populations, such as families without school children, seasonal workers, or displaced persons within the national ITN distribution strategy
- endorse and implement the commercial channel ITN distribution implementation guideline
- continue to articulate Tanzania's transition from a universal coverage strategy to a continuous ITN distribution strategy to relevant audiences, sharing lessons learned that can be applied by other countries as they review and revise their own national ITN distribution strategies.

