Zero malaria starts with UHC

William R Brieger on eliminating malaria and how this goes hand in hand with Universal Health Coverage

April hosts several important global health days or observances. On World Health Day 2019 WHO stressed that, 'Universal health coverage (UHC) is WHO's number one goal. Key to achieving it is ensuring that everyone can obtain the care they need, when they need it, right in the heart of the community.'[1] For World Malaria Day WHO took cognisance of the concern that, 'After more than a decade of steady advances in fighting malaria, progress has levelled off. According to WHO's latest World malaria report, no significant gains were made in reducing malaria cases in the period 2015 to 2017.

The estimated number of malaria deaths in 2017, at 435,000, remained virtually unchanged over the previous year, and set a theme of 'Zero malaria starts with me,' to ensure that everyone remained committed to eliminating the disease.[2] This is why WHO stated that malaria elimination and universal health coverage go hand in hand at a special event during the 72nd World Health Assembly.[3]

The coinciding of these two events points to clear action. To achieve zero malaria, the goal of involving everyone from the policy-maker to the community member must have a focus on achieving universal coverage of all malaria interventions ranging from insecticide treated bednets (ITNs) to appropriate provision of malaria diagnostics and medicines. Many of the studies to date have focused on ITNs, which include long-lasting insecticide treated nets (LLINs), but nationwide monitoring through the Demographic and Health Surveys (DHS), the Malaria Indicator Surveys (MIS) and the Multi-Indicator Cluster Surveys (MICS) also document the status of other interventions, especially appropriate treatment and intermittent preventive treatment in pregnant women (IPTp).

Insecticide treated nets and UHC

UNICEF's website provides a data repository that includes the most recent DHS, MIS and MICS survey data per country between 2014 and 2017. For the indicator of one ITN per to people in a household, shows Angola at only 13%, most countries for which recent data are available reached between 40-50%. Only two achieved above 60% on a point-in-time survey, Uganda at 62% and Sao Tome and Principe at 95%.[4] The website shows information that where there were multiple surveys in a country during the period, there were variations, sometimes quite wide, over the years. Aside from the fact that the surveys may have had slightly different procedures, the problem remains of achieving and sustaining UHC for ITNs.

Another factor that affects maintaining UHC for ITNs, assuming the target can be met is the durability of nets. The physical integrity as well as the insecticide efficacy can decline over time. Intact nets may lose their insecticide through improper washing and drying, yet still prevent mosquito bites to the individual sleeping under them. Nets with holes may still maintain a minimal level of effective insecticide and may not fully prevent bites but ultimately kill the mosquito that flies through. Researchers in Senegal have been grappling with these challenges.[5]

Program managers must themselves grapple with whether such compromised nets count toward universal coverage as well as how often to conduct net replacement campaigns. A report from community surveys in Uganda during 2017 found that, 'Long-lasting insecticidal net ownership and coverage have reduced markedly in Uganda since the last net distribution campaign in 2013/14.'[6] UHC for ITNs is always a moving target.

A frequently unaddressed issue in seeking to improve ITN coverage is whether it makes a difference in malaria disease. A study in Malawi reported that although ITNs per household increased from 1.1 in 2012 to 1.4 in 2014, the prevalence of malaria in children increased over the period from 28% to 32%.[7] The authors surmised that factors such as insecticide resistance, irregular ITN use and inadequate coordinated use of other malaria control interventions may have influenced the results. This shows that UHC for ITNs cannot be viewed in isolation.

This brings up the issue of the role of the many different vector control measures available. Researchers in Côte d'Ivoire examined the use of eave nets and window screening.[8] At present eave nets are mainly deployed in research contexts but use of window and door screening and netting are commercially available interventions that households employ on their own. One wonders then whether UHC should focus on how the household and the people therein are protected by any malaria vector intervention.

Here the discussion should focus on the question raised by colleagues in the USAID/PMI Vectorworks Project.[9] WHO declared a goal of universal ITN coverage in 2009 using the target of one ITN/LLIN for every two household members. Vectorworks found that a decade on only one instance of a country briefly achieving 80% of this UHC net target, whereas no others reached above 60%. In fact, the bigger the household, the less chance there was of meeting the two people for one ITN target.

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Just because people live in a household that has the requisite number of nets, does not guarantee the actual target for sleeping under a net can be achieved because of practical or cultural realities in a household. Neither the minimal indicator of having at least one net in a household, or the ideal or 'perfect' indicator of UHC are satisfactory for judging population protection.

The Vectorworks team suggests that, 'Population ITN access indicator is a far better indicator of 'universal coverage' because it is based on individual people,' and can be compared to, 'The proportion of the population that used an ITN the previous night, which enables detailed analysis of specific behavioral gaps nationally as well as among population subgroups.' Population access to ITNs therefore, provides a batter basis for more realistic policies and strategies.

Preventive and curative treatments

Definitions of indicators also have evolved for other malaria interventions. When Intermittent Preventive Treatment for pregnant women (IPTp) began in the early 2000s, the recommended dosing was twice during pregnancy after the first trimester one month apart in high and/or stable transmission areas. Due to lessening efficacy of sulfadoxine-pyrimethamine (SP), the dosage recommendation has changed to at least three times, still a month apart from the beginning of the second trimester.[10]

This updated policy was broadcast widely between 2012 and 2013, but it took countries some time to build capacity and scale up for the expanded coverage goals. UNICEF Data[4] again show that between 2014 and 2017 coverage was far below either 80% of pregnant women, let alone reaching them universally. Most countries achieved 30% or less coverage. Zambia at 50% was the highest. Low coverage leaves both pregnant women and the unborn child at risk for anaemia and death in the former and low birth weight, still birth or miscarriage for the latter. The *World Malaria Report* of 2018 estimates that three doses of IPTp were received by only 22% of pregnant women in the target countries in 2017.[11]

The concept of IPT was investigated for infants and children by a consortium of researchers in several African Countries. It was found that IPTi with SP could have a positive effect on preventing malaria.[12] To operationalise this concept, the World Health Organization developed what is known as Seasonal Malaria Chemoprevention (SMC) that would be delivered in the Sahel region of West Africa[13] where malaria transmission itself is seasonal and where there are some countries with very low transmission with implications for malaria elimination.

The SMC delivery process was not linked to immunisation but provided by community health workers and volunteers. SP and Amodiaquine (SP-AQ) were used in combination and provided monthly, three or four times during the rainy/high transmission season. Coverage was targeted at children below school age. It is only recently that SMC has been scaled up to reach all eligible countries or states and regions within designated countries.

WHO states that SMC focuses on, 'children aged 3–59 months (and) reduces the incidence of clinical attacks and severe malaria by about 75%.' In some countries the coverage is extended to primary school aged children, making comparisons and calculations of coverage (universal or otherwise) challenging.

The *World Malaria Report* of 2018 notes that, 'In 2017, 15.7 million children in 12 countries in Africa's Sahel subregion were protected through seasonal malaria chemoprevention (SMC) programs. However, about 13.6 million children who could have benefited from this intervention were not covered, mainly due to a lack of funding.'[11] This implies that 54% of eligible children were reached. Coverage of SMC can refer to receiving any of the doses or as having received all the monthly doses offered by a nation's malaria control program. Specifically, the *World Malaria Report* drew on surveys in seven countries that provided four monthly doses to determine that 53% of children received all doses.

Determining coverage for malaria treatment for sick people is not as straightforward as finding out the numbers who slept under an ITN or swallowed IPTp doses, and even those are not simple. As defined, correct treatment first consists of parasitological diagnosis, which at the primary care level could be by microscopy or rapid diagnostic test (RDT). The next issue is treating only those with positive tests. Finally, the treatment must consist of age- or weight-specific doses of an approved artemisinin-based combination therapy (ACT) drug. Very few clinic records or surveys document whether the treatment given is 'correct' by these standards.

WHO addresses the need for achieving universal access to malaria diagnostic testing and notes this will not be easy.[14] They provide a successful example of Senegal, where following the introduction of malaria RDTs in 2007, malaria diagnostic testing rates rose rapidly from 4% to 86% (by 2009). Logistics, funding, training and supportive supervision complicate implementation.

UNICEF Data[4] report that performance of malaria diagnostics in febrile children in surveys between 2014 and 17 was approximately 30% on average for countries with national surveys within that time frame (Figure 3). Only four countries achieved 50% or better. Most surveys then go on to report the number of febrile children who received ACTs, but do not necessary indicate how many who were correctly diagnosed were given ACTs vs those who received ACT but did not receive a test or tested negative.

The Nigeria 2015 Malaria Indicator Survey Illustrates this dilemma.[15] Among 2,600 children who reported having a fever in the two weeks preceding the survey, 66.1% sought advice (or care). Overall, 12.6% of febrile children received a diagnostic test as defined in the question as to whether the child was stuck on the finger or heel to obtain blood. Among the febrile children 37.6% reportedly were given some type of antimalarial drug. Overall 15.5% of febrile children were given an ACT. Even if ACTs were given only to tested children, not all tests would have been positive. The overall implication is that more children receive any, let alone the correct drugs that there is evidence for actual presence of disease. We have a long way to go to measure malaria treatment coverage correctly, not to mention achieving universal coverage with appropriate treatment.

Other interventions

Other interventions are coming on board, and whether these will be used of a large scale or targeted to certain epidemiological contexts remains to be seen. In each case, one will need to examine whether one can measure whether the intervention is universally accessible to and used by the intended population or subgroup.

After 30 years of research and testing, a malaria vaccine is ready to go through implementation testing in Malawi, Ghana and Kenya.[16] This pilot of the vaccine, known as RTS,S, will be made available to children up to 2 years of age with the Malawi launching first during the week of World Malaria Day.

WHO explains that, 'The malaria vaccine pilot aims to reach about 360,000 children per year across the three countries. Ministries of health will determine where the vaccine will be given; they will focus on areas with moderate-to-high malaria transmission, where the vaccine can have the greatest impact.' There will be a strong monitoring component to identify coverage levels as well as any implementation challenges and adverse effects that may only become visible in a larger scale intervention that the typical efficacy trials. Implementation is occurring in areas with a relatively strong existing malaria control effort, with an intent to learn how a vaccine can complement a total control package.

Mass Drug Administration (MDA) has been a successful strategy for controlling and eliminating neglected tropical diseases with special reference to onchocerciasis, lymphatic filariasis, trachoma, soil transmitted helminths and schistosomiasis. Use in malaria has been limited due to a number of financial and logistical challenges, not the least of which is the need to achieve high coverage over several periods of distribution. This is why WHO recommends, 'Use of MDA for the elimination of P. falciparum malaria can be considered in areas approaching interruption of transmission where there is good access to treatment, effective implementation of vector control and surveillance, and a minimal risk of re-introduction of infection.'[17]

Another link with MDA for a different disease, onchocerciasis, has pointed to a potential new malaria intervention. Around ten years ago it was observed that after ivermectin treatment for onchocerciasis in Senegal survivorship of malaria vectors was reduced.[18] Subsequently the potential effect of ivermectin has been intentionally researched with the outcome that, 'Frequently repeated mass administrations of ivermectin during the malaria transmission season can reduce malaria episodes among children without significantly increasing harms in the populace.'[19] Mathematical models for onchocerciasis control have predicted the need to achieve annual coverage targets below what could be called universal levels. Using ivermectin for mosquito control would require more frequent dosing and higher coverage.

In conclusion, we have seen that defining as well as achieving universal coverage of malaria interventions is a challenging prospect. For example, do we base our monitoring on households or populations? Do we have the funds and technical capacity to implement and sustain the level of coverage required to have an impact on malaria transmission? Are we able to introduce new, complementary and appropriate interventions as a country moves closer to elimination?

A useful perspective would be determination if households and individuals even benefit from any part of the malaria package, even if everyone does not have access and utilise all components? This may be why zero malaria has to start with each person living in endemic areas.

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