

# **A conversation with Professor Paul Milligan and Diego Moroso, August 2, 2017**

## **Participants**

- Paul Milligan – Professor of Epidemiology and Medical Statistics, Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine
- Diego Moroso – Project Director, ACCESS-SMC, Malaria Consortium
- Natalie Crispin – Senior Research Analyst, GiveWell

**Note:** These notes were compiled by GiveWell and give an overview of the major points made by Professor Paul Milligan and Diego Moroso.

## **Summary**

GiveWell spoke with Professor Milligan of the London School of Hygiene and Tropical Medicine (LSHTM) and Mr. Moroso of the Malaria Consortium about the ACCESS-SMC coverage surveys that are conducted by research groups in each country, coordinated by LSHTM for the Malaria Consortium's seasonal malaria chemoprevention (SMC) program. Conversation topics included community effects of SMC treatment, the methodology of the coverage surveys, the possible sources of bias in coverage surveys, and how bias can be minimized.

## **Treatment campaigns**

### **Methodology**

SMC treatment is given in four cycles, once per month for four consecutive months during the malaria transmission season. Most SMC campaigns involve teams of health workers going door-to-door to distribute medicine. The teams explain to caregivers that they are coming to give children the SMC drugs to prevent malaria, and ask:

- the age of the child,
- if the child has ever been made unwell by a medicine,
- if the child has reacted badly to SMC drugs in the past,
- if the child has taken other medicines recently (specifically, either of the drugs used for SMC or a related antibiotic in the last month, or is currently taking any medication),
- if the child is well now, and if not,
- if the child has a fever.

If the child is unwell, they are referred to the nearest health facility or to a village-based community health worker. Those with a fever will be tested for malaria using a rapid diagnostic test (RDT). In this sense, SMC functions as a malaria screening program.

The RDT can be done either at a local health facility or by a community health worker (CHW) based in the village or a nearby village. If the child has malaria, they should be given artemisinin-based combination therapy (ACT); if not, they should receive other kinds of treatment as appropriate and may go on to get SMC.

If the child is not unwell and meets all the other treatment criteria, the team administers the first dose of SMC treatment and then gives the child's caregiver the blister pack so that they can administer the remaining doses of SMC medicine on each of the next two days. Each time the first dose of treatment is administered, health workers record the date of treatment on the child's SMC record card. The child's caregiver then keeps this card.

### *Mali*

In Mali, the procedure for SMC delivery is slightly different. Teams that deliver SMC also have RDTs, artemisinin drugs, antibiotics, oral rehydration solution, and other basic medicines so that they can treat children who are unwell. They are able to test and treat for malaria and provide other basic treatments on the spot without the need for referral. The disadvantage of this approach has been that the teams set up a fixed-site mini-clinic in the neighborhood, so people have to come to them. This resulted in lower and less equitable coverage of SMC than the door-to-door campaigns, but this is being addressed now by adopting a complementary door-to-door approach in hard-to-reach areas.

### **Additional screening**

Since SMC teams go door-to-door, this is a good opportunity to screen for other illnesses if this can be done simply. Researchers have piloted the use of a tuberculosis screening questionnaire alongside SMC in Ghana and Senegal, and nutritional screening has been piloted in Nigeria and Niger.

Professor Milligan would like teams to screen all household members for malaria during SMC rounds, rather than just children under five, especially slightly older children who have stopped receiving SMC and are therefore at a higher risk of contracting malaria than previously.

### **Community effects of SMC treatment**

A large cluster randomized trial in Senegal in 2009 and 2010 extended the age range for SMC treatments from under five years old to up to 10 years old. Researchers recorded malaria rates for all age groups, including adults, and saw that in areas where children were being treated, older age groups had lower malaria incidence. This indicates that treating older children had an effect on transmission.

In Mali, giving SMC to children up to 10 years old is being piloted, but Senegal is still the only country in which this is routine. Everywhere else, SMC is only given to children under five, which is not sufficient to have a noticeable effect on malaria transmission.

Malaria surveillance data can indicate where it would be most effective to extend the age range of SMC treatments, and if so, up to what age it should be extended. The SMC program in the past has been restricted by the supply of quality-assured drugs, but this situation has recently improved.

## **Coverage surveys**

### **Data collected**

LSHTM and its partners under ACCESS-SMC collect many types of data on SMC, including:

- Administrative data coming from field implementation (Malaria Consortium, CRS, government)
- Coverage survey data
- Data from surveys of CHW activity
- Data from health facilities on the impact of SMC on malaria cases
- Data on the efficacy of the SMC treatments

ACCESS-SMC evaluation program is designed such that all of these elements cross-check one another, ensuring the robustness of the results.

### **Methodology**

In the coverage surveys for the past two years, researchers have gone into the field after the fourth cycle of SMC to ask caregivers about how many SMC treatments their child received. This year the researchers will conduct surveys immediately after each SMC cycle, but the methodology of the survey will remain very similar otherwise.

The researchers ask caregivers:

- Do you know about the SMC program?
- Has your child had SMC?
- How many times did the health worker come?
- How many times did you get a blister pack for this child?
- Did you get a blister pack in the first month, the second month, the third month, and the most recent month?

Then they take the SMC record card and transcribe what is written on it. This year, researchers will photograph the card as well, to remove transcription error.

All coverage survey data are collected directly into tablet computers. The tablets used in the surveys should automatically record the GPS location where the data are being captured. This feature was not working reliably last year, but is expected to work this year.

### *Selection of participants*

The SMC coverage surveys use area sampling to select participants within villages. In area sampling, researchers make a map of the village and divide it into segments,

then the tablet automatically chooses a segment at random, and the interviewers include every household in that segment. This method, known as *compact segment sampling*, involves no subjectivity on the part of the researchers, an issue which can be an important source of bias in coverage surveys. GPS tracking of the tablets provides the location of each household, allowing supervisors to check exactly where the survey teams went.

In most countries, villages were selected using probability proportional to size sampling with approximately 50 clusters representing the entire area where ACCESS-SMC was operating. The exception is Niger, in which the researchers performed separate surveys in four representative regions, because the country is too large for them to conduct surveys everywhere.

### *2015 vs 2016*

GiveWell reviewed the methodology of the ACCESS-SMC coverage surveys in 2015 (<http://www.givewell.org/charities/malaria-consortium#Coveragesurveys>), and the methodology did not substantially change for the 2016 surveys.

The only change was the addition in 2016 of a separate mini-survey to assess the quality of treatment delivery by health workers. For this mini-survey, teams interviewed CHWs to find out if they were following the guidelines, and if they had encountered any challenges. They also interviewed caregivers to ask them about the quality of the service and exactly what the health workers did.

### **Data quality checks**

LSHTM sends monitors into the field during surveys to provide technical assistance to research teams. In addition, survey team supervisors are instructed to repeat some interviews to ensure that interviewers are administering the survey questionnaires properly.

### **Potential sources of bias in coverage surveys**

Major potential sources of bias in these surveys include a) exclusion of certain children or geographical areas from the sample and b) recall error in determining a child's SMC status, especially since in 2015 and 2016 surveys were only done at the end of the round. The first of these potential sources of bias is minimized in the SMC surveys by the use of area sampling. To determine a child's SMC status, questions are asked in various ways within the questionnaire, and the card, if available, is checked. Recall problems can be minimized by doing surveys at each cycle, and immediately after each SMC cycle: this is being done in 2017.

### **Exclusions**

#### *Health-related exclusions*

The SMC coverage surveys capture whether or not a child was treated, but do not capture whether the child was contacted by a health worker but then was excluded

for a legitimate reason. Because of this, the surveys likely underestimate the coverage of the program.

A more accurate way to determine coverage would be to ask caregivers if they were contacted by an SMC health worker who then followed the protocol – even if that meant that the child ultimately did not receive SMC drugs. It would also be necessary to capture these exclusions on the SMC record cards.

The main reason children are excluded is if they are unwell and require a treatment that conflicts with SMC. The proportion of children excluded due to illness is less than 5%. Children are excluded for allergic reactions only if they have experienced serious side effects from the drugs in the past, not if they have had mild reactions.

#### *Exclusions due to security concerns*

In Niger and Mali, security concerns prevented teams from conducting the survey in some regions. It is possible that this would lead to an overestimate of coverage, since it may be likely that insecure regions have lower coverage rates. However, in Niger, the four regions for which data were collected are believed to be broadly representative of the country, and the effect of omitting certain regions is likely quite small. An approximate estimate for the national figure for Niger was made by taking an average over the four regions, weighted by population.

There were also security issues in Nigeria, but in that case the teams did go to all of the regions they were asked to survey.

#### **Determining SMC status**

Researchers determine the number of SMC treatments a child has had by interviewing the child's caregiver and checking SMC record cards. This method relies on caregivers' memories, which makes it somewhat imprecise – a caregiver is likely to remember if their child had SMC at least once, but is less likely to remember the precise number of treatments their child received. This year, researchers will perform coverage surveys immediately after each treatment cycle to reduce recall error.

SMC record cards greatly improve accuracy. However, caregivers do not always retain the cards; in these cases caregiver recall is the only source of information. In addition, SMC record cards are not always fully completed by health workers, meaning that the cards are not necessarily reliable.

To mitigate the problem of unreliability, ACCESS-SMC researchers ask the caregiver to remember the number of treatments their child had without looking at the record card, then check the caregiver's answers against the card. Agreement has been generally good but where there is a discrepancy the interviewer tries to resolve this; if this cannot be done, the number of treatments indicated on the card is used unless the caregiver states a larger number, in which case the caregiver's report is used, as it is known that cards can be under-completed.

## Reports

LSHTM sends a report to each country with key indicators after each coverage survey has been completed. The purpose of monitoring is to improve the program so it is important this is followed by site visits to understand factors behind any problems revealed in the surveys and to take steps to address them. More detailed analyses of various coverage factors, such as equitability of coverage, will be available soon and will also be published. Some of these analyses are already available, while others are still in progress.

LSHTM aims to submit its analyses of the coverage survey data for publication to an academic journal by the end of the year. This will include an overview of the results, detailed results for each country, and a methodological paper on the design of the surveys. The methodological paper will include technical details and descriptions of the researchers' practical experiences in conducting the survey, so that people who want to do similar surveys in the future will be able to plan them effectively.

*All GiveWell conversations are available at <http://www.givewell.org/conversations>*