The Blantyre Integrated Malaria Initiative:

a model for effective malaria control

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The Blantyre Integrated Malaria Initiative (BIMI) is a district-wide malaria-control effort, supported jointly by the Government of Malawi and the United States Agency for International Development (USAID). BIMI was established in Blantyre District, Malawi in 1998 to promote sustainable and effective strategies to manage and prevent malaria-related morbidity and mortality. The goal of BIMI is to reduce malaria-related deaths among children under five-years of age by 30% by meeting the four main objectives listed in table 1. The key BIMI interventions and their expected beneficial outcomes are described in table 2.

Table 1: Objectives of the Blantyre Integrated Malaria Initiative

1. **Improve management** of pediatric fever and anaemia by health workers at the health facilities and by caretakers in the home.
2. **Improve access and demand for presumptive intermittent treatment** of pregnant women with antimalarial therapy.
3. Increase demand for, access to, and appropriate use of affordable **insecticide impregnated bed nets.**
4. Use human and material resources more effectively through improved **collection of data** and use of health management information systems.

Table 2: Key interventions and associated benefits of the Blantyre Integrated Malaria Initiative

Key interventions to reduce malaria-related mortality	Established benefits
Correct treatment of children under-5 in health facilities.	Decreased mortality (2) and and anaemia (3).
Early correct treatment of febrile children with an effective antimalarial drug at a health facility or in the community.	Decreased mortality (2,4).
Protective intermittent treatment of pregnant women with an effective antimalarial drug.	Decreased maternal anaemia and neonatal low-birth-weight (5,6,7).
Regular use of insecticide-impregnated bednets for children under 5 years of age and pregnant women.	Decreased mortality in children under-5 (8, 9, 10), and decreased maternal anaemia and neonatal low-birth-weight (11).

The origin

BIMI is part of a larger effort, the African Integrated Malaria Initiative (AIMI), launched in 1996 in four countries: Malawi, Kenya, Zambia and Benin. Programme evaluation is a key element to all AIMI programmes. Lessons learned, including the successes and challenges encountered while implementing key strategies and the financial and human resources needed for implementation, are shared with national malaria control programmes and with international health organizations to promote rational expansion of the AIMI interventions beyond the level of district demonstration projects. Malawi was selected as an AIMI programme site because of the long-standing national expertise and experience of using research findings to direct malaria control activities and policy (1).

The structure

BIMI is located within the Blantyre District Health Office, where the District Health Management Team (DHMT) has primary leadership responsibility for the design and implementation of BIMI, and where BIMI activities are included as an integral part of the annual District Health Plan. Guidance, review and oversight of the programme is provided by the BIMI steering committee, which is comprised of representatives from the Central and District Ministry of Health, the National Malaria Control Program, Lilongwe and Queen Elizabeth Central Hospitals Staff, the Blantyre City Assembly, USAID, and research and donor organizations (Wellcome Trust, The Malaria Project, Population Services International (PSI), and the United States Centers for Disease Control and Prevention (CDC)). National and international consultants provide technical assistance for research activities, programme development and programme evaluation.

The aims

Initial BIMI efforts focused on measurement of baseline data at health facilities and in the community. The information gathered was used to identify gaps in malaria control activities, to guide strategies for implementation of interventions, and to provide baseline measurements so the success of programme interventions could be monitored. A description of the baseline studies and initial interventions implemented are described on page 24 (Table 3).

Table 3: Blantyre Integrated Malaria Initiative baseline studies and interventions to date

Objective	Studies and surveillance	Interventions
Improved malaria treatment at the health facility	Health facility survey, Patient flow study Microscopy study, In vivo P. falciparum efficacy study comparing SP to cotrimoxazole.	IMCI training, supervision, and mentoring of clinicians, Reorganization of clinics to improve patient flow and distribution of workload, QAP problem solving workshops at the health facility level, Monthly microscopy supervision.
Improved identification and prompt treatment of fever as malaria	Ethnographic survey, Household survey, Active surveillance of severe cutaneous reactions to SP.	Information and education strategies are being developed to improve prompt care-seeking and treatment for febrile children.
Improved access to affordable insecticide treated bednets	Household survey Study of long-lasting insecticide efficacy during routine bednet use.	Subsidized bednet distribution in antenatal and under-5 clinics.
Improve access to and demand for protective intermittent treatment with SP during pregnancy	Drug supply evaluation and in-depth interviews with nurses in antenatal clinics.	To be determined when results of studies are available.
Use human and material resources more effectively through improved collection of data and use of health management information systems	Monitoring of all ongoing BIMI projects. Active surveillance for severe cutaneous reactions to SP.	Computers provided and DHMT HMIS in the process of being Computerized. Computer literacy instruction provided to the DHMT.

Preliminary survey

A survey conducted in 1999 to measure the level of care provided to sick children at all district government health facilities demonstrated that Blantyre District health workers followed national guidelines by providing protective antimalarial treatment to febrile children (78% of children with fever or a history of fever were appropriately treated with an antimalarial drug). However, health workers tended to focus on the child's chief complaint and thereby failed to diagnose secondary illnesses, (for example, malaria and pneumonia, anaemia or malnutrition). Also, less than half of the sickest children, those with signs of severe disease, were identified and managed according to national guidelines. Unfortunately, time constraints, whether self- or externally-imposed, made a complete evaluation of these sick children nearly impossible - total time spent taking a history and examining each child was usually less than 2 minutes.

IMCI training

The findings from this survey led to the training of Blantyre District clinical officers and nurses in the WHO/UNICEF guidelines for the Integrated Management of Childhood Illnesses (IMCI). The IMCI guidelines provide a means to use a limited number of signs and symptoms to identify and treat sick children presenting to outpatient health facilities. IMCI encourages health workers to always check for the presence of danger signs and four key signs or symptoms that may indicate the presence of a serious illness, regardless of the chief complaint. However, the high patient volume and low number of clinicians impeded regular use of IMCI at the health facilities. The DHMT responded in several ways:

1. By providing on-site mentor-supervision of IMCI-trained health workers for 3- 5 days at each health facility and by assisting with the division of IMCI tasks among existing health facility staff, including Health Surveillance Assistants.
2. By utilizing the expertise of the Quality Assurance Programme (QAP) to improve patient flow through the clinic, thereby decreasing client waiting time and improving the distribution of workload.
3. By working with the QAP to assist health facility staff to develop group problem-solving skills, focusing mostly on increasing patient contact time with clinical staff.

Malaria diagnosis

Another facility-based survey, conducted in June 2000, evaluated microscopy capacity and accuracy. Findings from this survey demonstrated that health facility microscopists received little supervisory support, but were reliable in their ability to detect malaria parasitemia (proportion of positive readings by district laboratory technicians that were true positives = 77% and proportion of negative readings by district laboratory technicians that were true negatives = 90%). However, clinicians frequently disregarded negative lab results (in 25% of cases) and treated based on the clinical presentation. Results of this survey were shared with clinicians and laboratory technicians and monthly supervision of laboratory technicians was initiated. Clinicians were encouraged to rely more on negative laboratory findings and seek other sources of fever in patients with a negative blood smear.

Malaria KAP

An ethnographic survey to understand perceptions of malaria illness and malaria treatment and a population-based household survey to measure care-giving behavior, protective intermittent treatment with sulfadoxine-pyrimethamine (SP) during pregnancy, and household bednet use, both conducted in early 2000, provided invaluable information for the programme. From these, we learned that caregivers identified malaria as a serious illness among children and pregnant women, but that SP was considered by some to be too strong for use by children. Consequently, antipyretics were given in the home as first-line therapy for childhood fever. This withholding of antimalarial therapy could be risky; blood samples from febrile children in the community showed that most recently febrile children (over 55%) had malaria parasitemia. Further complicating the matter, care-seeking at a health facility was usually delayed beyond the first 2 days of illness, thus most children did not receive prompt correct antimalarial treatment for febrile illness. The household survey results also revealed that although almost all pregnant women (99%) attended antenatal clinic (ANC), few received the recommended 2 doses of SP during their pregnancy (only 77% received at least one dose and only 1/3 received 2 doses). Additionally, very few children or pregnant women were sleeping under bednets one year ago.

Informing the public

To address these findings, the DHMT and BIMI staff are considering using radio spots to encourage caregivers to provide prompt correct treatment to febrile children with the correct dose of antimalarials if the child cannot be brought to a health facility during the first 1- 2 days of illness. Radio spots will also be used to remind families of the importance of protective intermittent treatment with SP during pregnancy. Plans are underway to conduct interviews with drug sellers, to learn more about prescribing practices. From these interviews, strategies will be formulated to improve prescribing practices, perhaps through pharmacist training courses or single dose packaging of antimalarial drugs by age to improve the administration of correct treatment dosages.

Collaborations

Recently, staff from Safe Motherhood, the District Reproductive Health Unit, and BIMI joined efforts and together, they are assessing SP drug supply at ANCs and conducting in-depth interviews with health workers to understand health worker's knowledge, beliefs and attitudes towards providing protective intermittent treatment doses of SP to pregnant women at the appropriate times during gestation. Using the results of this survey, strategies will be formulated to improve the administration of protective doses of SP during pregnancy.

As well as providing insecticide treated nets at full-product cost recovery through the commercial sector nationwide, PSI is working with BIMI to improve insecticide treated bednet coverage among the most vulnerable groups by making highly subsidized bednets available to pregnant women and children under 5 years of age at antenatal and under-5 clinics. This strategy has been highly successful - during the month of March alone over 7000 bednets were distributed using this avenue. After equitable distribution, a major obstacle to optimal bednets use is maintaining adequate levels of insecticide on the nets. Currently bednets require insecticide re-impregnation every six months, but bednet owners do not routinely follow this recommendation. To find alternative options to bi-annual re-impregnation, CDC is providing technical assistance to compare the persistence of insecticidal effect of long-lasting treated nets and traditionally treated nets during usual household bednet use.

Monitoring progress

Because BIMI is designed as a pilot programme from which the nation and the international community can learn how best to implement effective sustainable malaria control strategies, monitoring the success of intervention implementation is an essential component of the programme. Monitoring data are used to modify and update the BIMI work plan, and lessons learned are shared at quarterly Steering Committee meetings and at national and international meetings related to health. More comprehensive programme evaluations will be conducted at future dates to measure change in key BIMI indicators, and the outcome measures from those evaluations will be made available.

Research

In addition to supporting programme activities, and monitoring and evaluating those activities, the BIMI programme provides the opportunity to conduct operational research to address focused malaria-control questions that have arisen in Malawi. One example of such a question is whether the rate of SP-associated severe cutaneous reactions is increasing with the increased use of SP for treatment of febrile illnesses and for protective intermittent treatment during pregnancy. Through BIMI, a district-wide active surveillance system to measure the frequency of severe cutaneous reactions associated with SP has been established. Also through BIMI, the efficacy of cotrimoxazole compared to SP plus erythromycin for the treatment of children with malaria parasitemia and increased respiratory rate, consistent with IMCI classifications of malaria and pneumonia, is being studied. Additionally, BIMI staff are assisting the Central Ministry of Health to evaluate trends in malaria morbidity and mortality since SP replaced chloroquine as first-line therapy for simple malaria in 1993.

The way ahead

Future BIMI activities include exploring ways to fully implement IMCI at health facilities, including introducing job-aids and further dividing IMCI tasks among available personnel. There will be an evaluation of the district health-facility based referral system to identify obstacles to severely ill patients reaching referral-level health facilities. BIMI will evaluate potential roles for rapid diagnostic tools for malaria and anaemia within the rural health facilities. There will be further development and dissemination of education messages targeted towards caregivers, health workers, and drug vendors to improve early identification and treatment of febrile children. The interaction between malaria and HIV and the potential need for additional SP doses during pregnancy for HIV-infected women will be evaluated. An entomologic assessment of anopheline mosquito behavior patterns in the urban and peri-urban areas is planned. And, to further support the DHMT, computerization of the district health management information system and computer literacy training are underway.

Joining in RBM

Finally, the DHMT and BIMI staff and consultants are looking forward to improving partnerships to support the national Roll Back Malaria movement, which incorporates many of the strategies currently being implemented in Blantyre District. We hope the lessons learned in Blantyre District will serve as a resource for the national effort and that the expertise that now exists within Blantyre District will be useful for expansion of Roll Back Malaria activities. Additionally, we have found the integration of local expertise, as provided through the District Health Office, combined with expertise provided by external consultants and the administrative support provided by USAID, a rewarding and effective combination, in which local capacity is expanded and efforts are optimally implemented by those who know the citizens of Blantyre and are invested in the well-being of those citizens. We recommend this model to others interested in developing similar district-wide or national health efforts.

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STATISTICS CORNER

S White

Welcome to this new feature in the Journal! In this "Corner" we will look at a specific situation and the statistical methods that can be applied to the analysis of data.
Consider this scenario:

You want to know how well a simple test may diagnose something, and save the need for a more difficult, invasive or expensive test that would provide a definitive answer.
For example, ***in a patient with palpable lymph nodes, is the cause tuberculosis or not?***

To answer this with confidence you need an invasive procedure, preferably excision biopsy and histology (EBH). But such a procedure is not only invasive but also difficult, expensive and slow. You may therefore want to know how well a non-invasive, quick method would provide the answer.

One method (M_1) could be whether **simple examination** finds that the nodes are 'matted' or not, ie whether they seem to be stuck together in groups. Another method could be a **Mantoux (tuberculin) test (M_2)**. You want to evaluate each of these tests on its own for usefulness in diagnosing TB as the cause of the lymphadenopathy. You also want to know if one test is superior to the other.

You plan to conduct a study to evaluate and compare these two methods. The best design uses each method, M_1 and M_2, independently, as well as the invasive one, on all patients studied who have palpable lymph nodes. In all the calculations that follw, we will assume that **Excission Biopsy and History** (EBH) is 100% accurate - it will serve as our '*gold standard*' How should you plan to analyse your data?

You will need to select statistical tests to:

A Evaluate each method;

B Compare the two methods,

We will consider these questions in turn. To illustrate the statistical tests to be described suppose you have collected data on 100 patients. Some of the data are shown in Table 1 (this only shows 6 patients – the full table would list all 100 cases), which can be summarised in a three-way cross-tabulation (Table 2).

Table 1 Data listing according to diagnostic method (EBH = excision biopsy and histology, M1 = palpation, M2 = mantoux test)

Patient	EBH	M1	M2
1	TB	TB	TB
2	TB	Not TB	TB
3	Not TB	Not TB	TB
4	TB	TB	TB
5	Not TB	Not TB	not TB
(etc):	:	:	:
100	Not TB	TB	not TB