MALARIA IN PREGNANCY

Guidelines for measuring key monitoring and evaluation indicators

World Health Organization

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Acknowledgements

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Contents

Abbreviations used

HIV	human immunodeficiency virus
ITN	insecticide-treated net
IPT	intermittent preventive treatment
IPT1	first dose of intermittent preventive treatment
IPT2	second dose of intermittent preventive treatment
PREMA-EU	Pregnancy, Malaria, Anaemia-European Union-funded project
RBM	Roll Back Malaria
WHO	World Health Organization

Introduction

Malaria infection during pregnancy is an enormous public health problem, with substantial risks for the mother, her fetus and the neonate. In areas of low transmission of *Plasmodium falciparum*, where levels of acquired immunity are low, women are susceptible to episodes of severe malaria, which can result in stillbirths or spontaneous abortion or in the death of the mother (Luxemburger et al., 1997). In areas of high transmission of *P. falciparum*, where levels of acquired immunity tend to be high, women are susceptible to asymptomatic infection, which can result in maternal anaemia and placental parasitaemia, both of which can subsequently lead to low birth weight (Steketee, Wirima & Campbell, 1996). Although there are fewer data about the role of *P. vivax*, there is evidence that it can also cause anaemia and low birth weight (Nosten et al., 1999). Low birth weight is an important contributor to infant mortality (McCormick, 1985; McDermott et al., 1996). It has been estimated that malaria during pregnancy is responsible for 5–12% of all low birth weight and 35% of preventable low birth weight (Steketee, Wirima & Campbell, 1996) and contributes to 75 000 to 200 000 infant deaths each year (Steketee et al., 2001).The World Health Organization (WHO) currently recommends a package of interventions for controlling malaria during pregnancy in areas with stable (high) transmission of *P. falciparum* (WHO, 2004), which includes the use of insecticide-treated nets (ITNs), intermittent preventive treatment (IPT) and effective case management of malaria and anaemia (**Box 1**).

Effective implementation of the recommended strategy for malaria in pregnancy requires close collaboration between malaria control and reproductive health programmes at all levels, including policy development, planning, logistics, procurement, training and service delivery. Expanding programme coverage will require careful monitoring of implementation and evaluation of impact. Monitoring and evaluation of the interventions for malaria prevention and control during pregnancy require close collaboration between the two programmes.

To assess progress in and effectiveness of the delivery of interventions for the control of malaria during pregnancy, core indicators of process, outcome and impact have been identified (**Box 2**). The goal is to ensure that these indicators are collected, either routinely at health facilities and incorporated into national health information systems or through regular surveys and other Roll Back Malaria monitoring and evaluation mechanisms. Examples of the questionnaires used to elicit

BOX 1. Recommended interventions for malaria prevention and control during pregnancy

Policies for malaria prevention and control during pregnancy in areas of stable transmission should emphasize a package of intermittent preventive treatment and use of insecticide-treated nets and ensure effective case management of illness and anaemia. Insecticide-treated nets and prompt effective case management are recommended for all pregnant women living in malarious areas.

Intermittent preventive treatment

All pregnant women in areas of stable (high) malaria transmission should receive at least two doses of intermittent preventive treatment after quickening, the first noted movement of the fetus (WHO, 2004). WHO recommends a schedule of four antenatal clinic visits, with three visits after quickening. Intermittent preventive treatment at each scheduled visit after quickening will ensure that a high proportion of women receive at least two doses. Doses should not be given more frequently than monthly.

Currently, the recommended drug for intermittent preventive treatment is sulfadoxine–pyrimethamine, because it is safe for use during pregnancy, effective in women of reproductive age and can be delivered as a single dose under observation by a health worker.*

Insecticide-treated nets

Insecticide-treated nets should be provided as early in pregnancy as possible to all pregnant women living in malarious areas, including epidemic and disaster situations, according to the perceived need in the locality. Their use should be encouraged for women throughout pregnancy and postpartum. Nets can be provided in the antenatal clinic or through other sources in the private and public sectors.

Effective case management of malaria illness and anaemia

Effective case management of malaria illness for all pregnant women in malarious areas must be ensured. Iron supplementation for the prevention and treatment of anaemia should be given to pregnant women as part of routine antenatal care. Pregnant women should also be screened for anaemia, and those with anaemia should be managed according to national reproductive health guidelines.

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*Current scientific evidence suggests:

- At least two doses are required to achieve optimal benefit in most women.
- One study of intermittent preventive treatment in HIV-infected pregnant women showed that monthly dosing (most women receiving 3–4 doses) was necessary to achieve optimal benefit.
- In settings with an HIV prevalence among pregnant women greater than 10%, it is more cost-effective to treat all women with a 3-dose regimen than to screen for HIV and provide the regimen only to HIV-infected women.

There is no evidence that a third dose carries any additional risk, that more than 3 doses during pregnancy offers additional benefit or that receiving 3 or more doses of sulfadoxine–pyrimethamine increases the risk for adverse drug reactions. Research to assess the safety, efficacy and programme feasibility of other antimalarials in intermittent preventive treatment is under way.

information are provided in Annexes 1–5, and the household survey questionnaires are available on the internet (http://rbm.who.int/merg).

The indicators were chosen by an expert technical meeting organized by WHO (Headquarters and the Regional Office for Africa). Participants included academic institutions, development agencies, the Centers for Disease Control and Prevention in the United States, the Maternal and Neonatal Health Program of the Johns Hopkins Program for International Education in Gynecology and Obstetrics in the United States, the Malaria Consortium and the Pregnancy, Malaria, Anaemia-European Union-funded project. The indicators were selected on the basis of the following guiding principles:

- Monitoring of malaria during pregnancy should be part of National Malaria Control and Making Pregnancy Safer reproductive health programmes.
- Data collection, interpretation and corrective actions within routine health management information systems should primarily be conducted by reproductive health making pregnancy safer programmes, with support from malaria control programmes.
- Data collection at survey sentinel surveillance sites should primarily be conducted by malaria control programmes.
- Data should be easily collected.
- Data should be quickly summarized and analysed and feedback given to the persons at the health units that collected the data.
- Data should be locally useful.
- The creation of new or parallel systems of data collection should be avoided.

The indicators were subsequently pilot tested in three sub-Saharan African countries (Kenya, Nigeria and Uganda) to assess the feasibility of collecting data for these indicators through routine health management information systems. The protocol for this pilot study was prepared by WHO (Headquarters and the Regional Office for Africa) and various Roll Back Malaria (RBM) partners who are members of the Malaria in Pregnancy Working Group of the RBM Partnership and discussed with the three countries.

The current guidelines are based on experience gained from initial implementation and pilot testing in the three African countries. The objective is to provide guidance to malaria control and reproductive health care workers, particularly those in antenatal care clinics, for monitoring and evaluation of key indicators of malaria in pregnancy.

BOX 2. Recommended indicators for monitoring and evaluation of programmes to control malaria during pregnancy

Output indicators

- percentage of antenatal clinic staff trained: pre-service, in-service or during supervisory visits) in the control of malaria during pregnancy during the past 12 months (including intermittent preventive treatment, counseling on use of insecticide-treated nets and case management for pregnant women;
- percentage of health facilities reporting stock-out of the recommended drug for intermittent preventive treatment (currently sulfadoxine-pyrimethamine) in the past month or in the determined period (according to national guidelines).

Outcome indicators

- percentage of pregnant women receiving intermittent preventive treatment under direct observation (first dose, second dose, third dose, according to national guidelines);
- percentage of pregnant women who report having slept under an insecticide-treated net the previous night.

Impact indicators*

- percentage of low-birth-weight singleton live births (< 2500 g), by parity;
- percentage of screened pregnant women with severe anaemia (haemoglobin < 7g/dl) in third trimester, by gravidity.

* Influenced by other factors, such as nutrition, hookworm infection and pre-term birth

The target audience includes national malaria control programme managers, reproductive health programme managers, health workers at the health facility level and policy-makers.

The indicators are grouped into two categories, according to whether they could be measured through existing health management information systems or through routine or regular household surveys, such as a malaria indicator survey, multiple indicator cluster surveys, demographic and health surveys and other RBM monitoring and evaluation tools and mechanisms (e.g. demographic surveillance sites). For each indicator, the rationale for data collection and a precise definition are given, followed by a description of the source and method of measurement and the strengths and limitations of the indicator. Summary tables are provided on pages 24–28 of this document. A summary of the types of survey that can be used to derive information on indicators is shown in **Box 3.**

Framework for monitoring and evaluation

Monitoring and evaluation are needed to measure progress in and effectiveness of health programmes at all levels. Monitoring can help to verify that activities are being implemented as planned, ensure accountability and detect problems and constraints, to provide local feedback to the relevant authorities and to support them in better planning. Evaluation of outcomes and impact is needed to document periodically whether defined strategies and implemented activities are leading to expected results. Monitoring is continuous, while evaluation should be conducted intermittently.

A number of frameworks are used in selecting indicators for monitoring and evaluation. Indicators are used to measure what goes into a programme or project and what comes out of it. A widely accepted framework that has commonly been used is the "input–process–output–outcome–impact". For a programme or project to achieve its goals, inputs such as money and staff time must result in outputs, such as new or improved services, trained staff or persons reached with services. These outputs are the result of specific processes, such as training of staff, which should be included as key activities for achieving the outputs. If these outputs are well designed and reach the populations for which they were intended, the programme or project is likely to have positive short-term effects or outcomes, for example increased use of ITNs or adherence to IPT. These short-term outcomes should lead to changes in the longer-term impact of the programme, measured as fewer new cases of malaria and related burden of disease among those infected and affected, such as pregnant women and vulnerable children. In the case of malaria during pregnancy, a desired impact among infected women includes improved birth outcomes. The use of standard indicators provides national programmes with valuable measures of the same indicator in different populations, permitting analysis of trends. This helps to direct resources to regions or sub-populations with greater need and to identify areas for intensification or reduction of effort at the national level, ultimately improving the overall effectiveness of the national response. Over time, the use of standard indicators also ensures comparability of information across countries. When data from different sources are combined for analysis, such "triangulation" of data allows national, regional or local evaluation of programme efforts (WHO, 2006).

BOX 3. Surveys that provide information on malaria indicators

Three main types of surveys are relevant to monitoring and evaluation of interventions to prevent and control malaria in pregnancy in malaria control programmes.

Demographic and health surveys[1] and multiple indicator cluster surveys[2]

Nationally representative surveys of 4000–12 000 women aged 15–49 years, living in households that are sampled in a multiple-stage cluster design, are conducted in many developing countries at 5-year intervals. As the questionnaires are standardized and structured, the results are reasonably comparable between countries and over time. The indicators measured include mortality of children under 5 from all causes, possession and use of insecticide-treated nets by children under 5 and pregnant women, use of antimalarial treatment for children under 5 with fever, and use of intermittent preventive treatment by pregnant women. Recent demographic and health surveys also measured the prevalence of anaemia by measuring haemoglobin in children under 5 and women. The results are freely available on the internet.

Malaria indicator surveys

To supplement the standardized data collected from the demographic and health and multiple indicator cluster surveys, in 2004 the Roll Back Malaria programme and MACRO International developed a package that can be used at national or sub-national level. The sample size proposed for these surveys is smaller than that required for demographic and health and multiple indicator cluster surveys, because the malaria indicator survey is used mainly to monitor intervention coverage and not child mortality. Malaria indicator surveys are therefore less expensive than the other surveys and could be conducted at sub-national level. A malaria indicator survey could be used to design surveys in countries where no other surveys are being conducted or to fill gaps in the 5-year intervals between demographic and health or multiple indicator cluster surveys, for more rapid assessment of progress.

For operational reasons, both demographic and health and multiple indicator cluster surveys are conducted during the dry season, therefore outside the peak malaria transmission season. In contrast, malaria indicator surveys can be conducted at the time of peak transmission and combined with measurements of haemoglobin and parasite prevalence, in areas where these are considered relevant indicators of malaria burden or impact. The entire malaria indicator survey package (including questionnaire, training manual, guidance on sampling and sampling sizes with costing and analysis plans) is available for use by countries in hard copy, on CD ROM and on the internet (http://rbm.who.int/merg, section Survey and Indicator Guidance Task Force).

A scaled-down version of the malaria indicator survey is also available, called the 'lean malaria module', with standard questions on malaria intervention coverage that could be added to other planned household surveys.

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1 Demographic and health surveys are organized by MACRO International, Calverton, Maryland, USA, and are funded primarily by the United States Agency for International Development (USAID) (http://www.measuredhs.com).

2 Multiple indicator cluster surveys are organized and supported by UNICEF (http://www.childinfo.org).

Although countries rely on surveys, such as demographic and health surveys or multiple indicator cluster surveys (see Box 3), these produce data that are valuable for broader monitoring and evaluation but might not be easy to integrate into the usual sources of health information, such as national health information and surveillance systems. Building or strengthening national health management information systems is a prerequisite for proper monitoring of malaria in pregnancy control programmes and the necessary responses. An effective health management information system provides a solid basis for evaluating large-scale programmes, ultimately leading to improved planning and decision-making. On the basis of these findings, urgent decisions, such as how to allocate new resources to achieve the best overall results, will become easier to make (WHO, 2006).

For effective monitoring and evaluation of services being provided for malaria during pregnancy, disease control programmes should put in place systems for supervision at all levels of health care. This system must ensure that supervisors focus on the needs of the staff they oversee, to help them to conduct monitoring activities effectively, thus producing high-quality data. The approach should stress mentoring, joint problem-solving and dialogue. Supervisors must recognize lapses in skills and identify opportunities for training. It is the responsibility of the supervisor to manage workloads and to lobby for human and financial resources where necessary. Supervisors should themselves be good communicators, be knowledgeable about monitoring and evaluation and be conversant with the monitoring tools. Supervisors must be ready to review and discuss the tools with those they are supervising to ensure they are used properly. Supervisors must also analyse the data collected with the persons who collected them and encourage them to use the data for decision-making at their own level of operation. A supervisory schedule of 3–6 months is recommended.

Indicators to be measured at health facilities

Percentage of antenatal clinic staff trained in the control of malaria during pregnancy in the past 12 months

Rationale

Successful control of malaria during pregnancy requires delivery of the recommended interventions by skilled, well-informed health workers in the facility.

Definition

This is an indicator of the proportion of health workers who, among all health workers providing antenatal services, have received training in the prevention and control of malaria during pregnancy at the time of data collection, within the last calendar year.

Numerator: number of antenatal clinic staff trained in the control of malaria during pregnancy in the past 12 months

Denominator: total number of antenatal clinic staff during the same period

Measurement and data collection

Data for this indicator should be collected during supervisory visits and training activities and from annual reports. If a routine reproductive health supervisory form exists, it should be modified to include:

- the number of antenatal clinic staff and other health workers, and
- the number of staff trained in the control of malaria during pregnancy in the past 12 months.

If no supervisory form exists, it should be designed accordingly. Health workers who provide antenatal care are defined locally. The frequency of supervisory visits is often determined locally; however, it is recommended that at least one supervisory visit per facility per year is ensured.

Strengths and limitations

Strengths

- Data for this indicator can readily be collected at supervisory visits.
- In malarious areas where less than 100% of antenatal clinic staff are trained in malaria control, feedback can be given rapidly to the antenatal clinic supervisor or clinic manager to take corrective action.

Limitations

- The denominator might be difficult to determine, as some countries have limited information on the pool of human resources available in various facilities, and transfers of personnel between facilities are frequent. In this case, the numerator should be considered an adequate indicator on its own.
- The indicator does not provide any information about the quality of the training or the quality of services provided.

Comments

Training of clinic staff in the prevention and control of malaria in pregnant women should, at a minimum, include guidelines for IPT, effective case management, including referral when necessary, and counselling about the use of ITNs. The training should also include data collection, analysis, interpretation and use for local decision-making. To avoid duplication of efforts, the training should be integrated as much as possible into predefined or existing curricula (e.g. pre-service and in-service programmes) or other Making Pregnancy Safer training orientation courses. It should also be a part of malaria control training programmes for implementing new antimalarial drug policies.

Quality assurance methods and tools for improving the quality of malaria in pregnancy service delivery (Regional Centre for Quality of Health Care Institute of Public Health, 2006) should be used to strengthen supervision of health workers. Frequent supportive supervision might be needed to reinforce knowledge and skills acquired during training. The frequency of supervisory visits is often determined locally; however, it is recommended that at least one supervisory visit per facility per year be ensured. A system should be developed for training new staff in case of high staff turnover.

Percentage of health facilities reporting stock-out of the recommended drug for intermittent preventive treatment (currently sulfadoxine-pyrimethamine) in the past month

Rationale

Ensuring adequate supplies of the recommended antimalarial drug for IPT is key to the success of prevention and control of malaria during pregnancy in areas of stable (high) malaria transmission. This indicator assesses the frequency and adequacy of supply of the recommended drug for IPT in health facilities over a defined period.

Definition

This indicator provides information about the proportion of health facilities that were out-of-stock of the recommended drug for IPT during the past month.

Numerator: Number of health facilities reporting stock-out of the recommended drug for IPT (currently sulfadoxine-pyrimethamine) in antenatal clinics within the past calendar month

Denominator: Total number of health facilities offering antenatal services

Measurement and data collection

Data for this indicator should be obtained during periodic (monthly) supervisory visits. Stock-outs of sulfadoxine-pyrimethamine should be measured at the level of antenatal clinics, not pharmacies, because stocks in pharmacies do not necessarily reflect those in antenatal clinics.

To avoid multiple, overlapping data collection forms, relevant questions should be included in the routine reproductive health supervisory form.

The frequency of data collection should be monthly but could be determined locally to ensure that data collection is in tandem with other supervisory and data collection activities and schedules.

Strengths and limitations

Strengths

- Data for this indicator can readily be collected during supervisory visits.
- The collected data can be used locally for prompt corrective action.

Limitations

- Although the recommended frequency for collection of data for this indicator is monthly, supervision might not be regular enough for effective monitoring of the availability of drug supplies and stock-outs, which can then be reported and rectified. Regular, constant supervision and reporting of data might be needed to avoid disruption of the delivery of IPT in antenatal clinics. Such data could also be included in health management information system reports if sulfadoxine-pyrimethamine is listed as a tracer drug that is reported to districts monthly.

Percentage of pregnant women attending antenatal care who receive a first dose of intermittent preventive treatment (IPT1) under direct observation

Rationale

In areas of stable (high) malaria transmission, IPT with two to three doses of the recommended antimalarial medicine (currently sulfadoxine-pyrimethamine) during pregnancy has been shown to reduce the risk for severe maternal anaemia, placental parasitaemia and low birth weight significantly. Therefore, WHO recommends that all pregnant women in areas of stable malaria transmission receive at least two doses of IPT, during regularly scheduled antenatal visits under direct observation of a health worker.

Definition

This indicator assesses the proportion of women attending antenatal clinics who receive IPT1 as directly observed treatment by a health worker to maximize compliance.

Numerator: Number of pregnant women who receive IPT1 under observation

Denominator: Number of first antenatal clinic visits

Measurement and data collection

Data for this indicator should be collected at routine antenatal visits on an antenatal clinic register. To facilitate data collection and avoid

duplication of work, the existing register should be modified to include columns to record the doses of IPT (first, second or third) dispensed. Antenatal clinic cards should also be adapted to include a record of the doses received.

To facilitate data abstraction for reporting, it is advisable that records for each month be started on a new page. The frequency of data collection should be daily, with monthly summaries and monthly reporting within health management information systems, and should link to the data collection schedule for health management information systems .

The indicator can also be measured at the population level through household surveys, in which case the denominator would be the total number of pregnant women in the population surveyed.

Strengths and limitations

Strengths

- Data on IPT1 can readily be collected and analysed.
- The results might be comparable across countries.
- This indicator can be useful locally, as it can be linked to impact indicators such as low birth weight and severe anaemia to determine corrective action. A visual indication or presentation of the effectiveness of IPT in reducing the number of severe malaria and anaemia cases observed in an antenatal clinic can boost the morale of health workers.

Limitations

- Data on IPT coverage at national level can be misleading in countries with mixed transmission patterns, as malaria transmission is often localized and IPT might not be implemented in all areas of the country. Therefore, the indicator should be calculated only for areas in which the IPT strategy is implemented, and first antenatal visits in these areas should be used as the denominator.
- Antenatal clinic data might be incomplete and not reflect the true situation in settings where a substantial number of women have antenatal care at private clinics. Private clinics should be encouraged to provide IPT to pregnant women according to national guidelines and maintain appropriate records.
- Most women attend antenatal clinics for the first time during the second trimester and are therefore eligible for IPT1 at that time. A few women, however, make their first antenatal visit during the first

trimester, at which time they are not eligible for a first dose of treatment. The total number of first visits used as the denominator in this calculation is therefore an overestimate of the total number of women eligible for a first dose of treatment.

Comments

The column for IPT should not be marked if dosing is not observed directly. If no first dose is dispensed, the reasons should be marked in a column of the register designated for comments (e.g. stock-out, allergy, refusal, treatment for malaria illness, see Annex 1).

Treatment received for acute malaria illness episodes during pregnancy should not be recorded as IPT, which is administered for prevention. The antenatal clinic register should include a column for recording treatment of malaria illness episodes during pregnancy with the nationally recommended drug for pregnant women.

The denominator, i.e. first antenatal clinic visits (new attendances), is an approximation of the total number of pregnant women attending antenatal clinics during a specified period. To avoid difficulties in counting new attendance versus re-attendance, health workers should determine appropriate ways of identifying new attendees in the antenatal clinic register, such as adding a column labelled 'visit' for recording the visit number (e.g. visit 1, 2, 3, 4).

Receipt of IPT as recorded on antenatal clinic cards can also be reflected in maternity registers. A column could be included in the delivery register that indicates the number of doses of IPT received. Such data are easily linked to impact indicators and can be used to assess the effectiveness and impact of national programmes.

Percentage of pregnant women attending antenatal care who receive a second dose of intermittent preventive treatment (IPT2) under direct observation

Rationale

In areas of stable (high) malaria transmission, IPT with two to three doses of the recommended antimalarial medicine (currently sulfadoxine-pyrimethamine) during pregnancy has been shown to reduce the risk for severe maternal anaemia, placental parasitaemia and low birth weight

significantly. Therefore, WHO recommends that all pregnant women in areas of stable malaria transmission receive at least two doses of IPT, during regularly scheduled antenatal clinic visits under direct observation of a health worker.

Definition

This indicator assesses the proportion of women attending antenatal clinics who receive IPT2 under direct observation by a health worker.

Numerator: Number of pregnant women who receive IPT2 under observation

Denominator: Number of first antenatal clinic visits

Measurement and data collection

Data for this indicator should be collected at routine antenatal visits in the antenatal clinic register. To facilitate data collection and avoid duplication of work, the existing antenatal clinic register should be modified to include columns to record the doses of IPT dispensed (first, second, third). Antenatal clinic cards should also be adapted to include a record of IPT doses received.

IPT2 should be administered under direct observation by a health worker, to maximize compliance. To facilitate data abstraction for reporting, it is advisable that records for each month be started on a new page. The frequency of data collection should be daily, with monthly summaries and monthly reporting within the health management information systems, and should be linked to the data collection schedule for health management information systems.

The indicator can also be measured at the population level through household surveys, in which case the denominator would be the total number of pregnant women in the population surveyed.

Strengths and limitations

Strengths

- Data on IPT2 can readily be collected and analysed.
- The results are comparable across countries.
- This indicator can be useful locally, as it can be linked to impact indicators such as low birth weight and severe anaemia to determine corrective action. A visual indication or presentation of the effective-

ness of IPT in reducing the number of severe malaria and anaemia cases observed in an antenatal clinic can boost the morale of health workers.

Limitations

- The denominator, i.e. the number of first antenatal clinic visits, is an approximation of the total number of pregnant women attending antenatal clinics, and therefore the number of women who should receive IPT. Month-to-month variations in patient flow could, however, lead to short-term inaccuracies. For example, if the number of women returning for IPT2 exceeds the number of first antenatal clinic visits in a particular month, the percentage of women receiving the second dose could theoretically exceed 100%. Coverage estimates obtained over a long period tend, however, to be reliable and robust, and the short-term inaccuracies have little significant impact on periodic estimates. These data should therefore be collected monthly but analysed on an annual or half-yearly basis.
- The indicator might be misleading at national level in countries with mixed transmission patterns, as malaria transmission is usually localized. Therefore, the indicator should be calculated only for areas in which the IPT strategy is implemented, and first antenatal clinic visits in these areas should be used as the denominator.
- Antenatal clinic data can be incomplete and not reflect the true situation in settings where a substantial number of women access antenatal care at private clinics or do not access antenatal care at all.
- The indicator reflects the situation of women attending antenatal clinics and not use of IPT in the general population, except where antenatal care use is very high, as in most African countries.

Comments

The column for IPT2 should not be marked if dosing is not observed directly. If no second dose is dispensed, the reasons should be marked in a column of the register designated for comments (e.g. stock-out, allergy, refusal, treatment for malaria illness, see Annex 3).

Treatment received for acute malaria illness episodes occurring during pregnancy should not be recorded as IPT, which is administered for prevention. The antenatal clinic register should include a column for recording treatment of malaria illness episodes during pregnancy with the nationally recommended drug for pregnant women, according to national guidelines.

The denominator, i.e. first antenatal clinic visits (new attendances), is an approximation of the total number of pregnant women attending antenatal clinics. To avoid difficulties in counting new attendance versus re-attendance, health workers should determine appropriate ways of identifying new attendees in the antenatal clinic register, such as adding a column labelled 'visit' for recording the visit number (e.g. visit 1, 2, 3, 4).

Receipt of IPT2 as recorded on antenatal clinic cards can also be reflected in maternity registers. A column could be included in the delivery register that indicates the number of doses of IPT received. Such data are easily linked to impact indicators and can be used to assess the effectiveness and impact of national programmes.

Indicators to be measured in household surveys

Percentage of pregnant women who report having slept under an insecticide-treated net (ITN) the previous night

Rationale

In areas of stable endemic malaria, where most malaria infections in adults are asymptomatic, use of ITNs by pregnant women has been shown to reduce malaria-related maternal morbidity significantly and improve birth outcomes, including the incidence of low birth weight.

Definition

This indicator measures the level of use of ITNs by pregnant women at risk for malaria at the population level. An insecticide-treated mosquito net is: (i) a pre-treated net obtained in the past 12 months, (ii) a net that has been treated with insecticide in the past 12 months, or (iii) a permanent or long-lasting treated net that does not require re-treatment.

Numerator: Number of pregnant women at risk for malaria who reported having slept under an insecticide-treated net the night preceding the survey

Denominator: Total number of pregnant women at risk for malaria who reside within surveyed households

Measurement and data collection

Information on use of ITNs by pregnant women is best collected through household surveys, because data from health facilities are not representative of the population at large, including women who do not attend antenatal clinics. In highly endemic countries such as in most of sub-Saharan Africa, nationally representative household surveys are preferred. Data should be collected every 2–3 years. Nevertheless, ownership and use of ITNs can also be measured at antenatal clinics, especially if nets are provided by the clinic, and can be included on the antenatal clinic card and register. The benefit of including this information in antenatal clinic cards and registers is that the data can be included in routine monitoring systems to guide programme planning.

In countries where only part of the population is at endemic risk, ITNs are relevant only for households in high risk areas. Surveys should be conducted to take a representative sample of the area at risk, and the report should clearly describe the sampling design and definition of population-at-risk used. Alternatively, in such countries, areas without endemic malaria must be identified so that they can be excluded from this indicator during analysis of data collected through nationally representative household surveys.

Household surveys include malaria indicator surveys, multiple indicator cluster surveys, demographic and health surveys and other nationally representative surveys. Guidelines for conducting household surveys can be found in UNICEF (2004)

Strengths and limitations

Strengths

- The limited number of questions required to ascertain this indicator can readily be added to any nationally representative survey of households.
- The presence of a net can be verified at the time of interview.
- Various methods of assessment and questions allow the interviewer to assess whether the net has recently been treated with insecticide.
- The results are comparable across countries, if appropriate and consistent sampling procedures are followed and confounding factors are accounted for.

Limitations

- Including all pregnant women in a household survey is difficult because many women either do not know that they are pregnant or do not want to divulge the information.
- A large sample size is required to obtain precise estimates.
- There may be some bias if reluctance to discuss pregnancy is also associated with first birth, adolescence and other demographic factors.
- Reliable estimates of net re-treatment status might not be obtained because of poor date recall.
- The results might be biased by the seasonality of survey data collection, which is usually done during the dry season when net use is likely to be at its lowest.

- In countries in which only part of the population is at risk for malaria, national coverage might give an underestimate of effective coverage of populations at risk.

Percentage of low birth-weight singleton live births, by parity

Rationale

The burden of malaria-associated maternal anaemia and its effect on the fetus, resulting in low birth weight, has been increasingly recognized during the past decade. Measuring the incidence of low birth weight is necessary to show the impact of malaria control interventions in pregnancy. As the risk for low birth weight has been shown to be higher among primiparous than multiparous women, measurement of low birth weight must be differentiated by parity.

Definition

Low birth weight is defined as weight less than 2500 g obtained within 24 h of birth, regardless of gestational age. A low birth weight reflects both small-for-gestational age and prematurity. As it is difficult to assess gestational age in most settings, however, the two are often not differentiated.

The numerator and denominator are defined according to parity.

For primiparous women, the indicator is defined as follows:

Numerator: Number of low-birth-weight singleton live births to women with first birth

Denominator: Number of singleton live births to women with first birth

The indicator for multiparous women is defined as:

Numerator: Number of low-birth-weight singleton live births to women with two or more births

Denominator: Number of singleton live births to women with two or more births

Measurement and data collection

This indicator is best measured from nationally representative household surveys, such as malaria indicator surveys, multiple indicator

cluster surveys, demographic and health surveys and other nationally representative surveys. This is because facility-based data are not representative, as they are limited to the few women who deliver in facilities. Data from health facilities or delivery records are nevertheless the main source of data on birth weights obtained during household surveys (Blanc & Wardlaw, 2005). It is therefore critical to ensure that measurement of weight at birth in health facilities is strengthened and routinely recorded on maternity cards and registers.

These data are included in health management information systems in most countries. It is, however, important to ensure the quality of the data collected. Training of health workers in accurate data collection, analysis, interpretation and use of data at health facility and local levels is critical for programme decision-making. Data should be interpreted cautiously, as low birth weight has multiple causes.

The frequency of routine data collection in health facilities with regular national surveys is to be determined locally. As imprecise estimates are obtained from household surveys with inadequate sample sizes, sentinel sites can be used for assessing this indicator, with standardized methods and adequate sample sizes for comparison among sites and countries.

Strengths and limitations

Strengths

- Data collected in household surveys are nationally representative.
- The results are comparable across countries, if appropriate and consistent sampling procedures are followed and confounding factors are accounted for.
- This is a useful indicator at health facility level, allowing health workers and programme managers to observe the effects of maternal and newborn health interventions and to take corrective action where necessary.
- It is a useful global indicator for population health and development

Limitations

- A large sample size is required to obtain precise estimates.
- The women surveyed may not know or recall the birth weights of all their children, or they may report them incorrectly. Promoting childbirth in health facilities where infants are weighed at birth is likely to improve the quality of data on birth weight.

- Low birth weight has multiple causes, including malaria; therefore, trends in its prevalence should be interpreted with caution.

Percentage of screened pregnant women with severe anaemia (haemoglobin less than 7 g/dl) in third trimester, by gravidity

Rationale

The burden of malaria-associated anaemia among pregnant women in malarious areas has been increasingly recognized during the past decade. Measuring the prevalence of severe maternal anaemia in countries is important to show the impact of malaria in pregnancy and other maternal health interventions. As the risk for anaemia has been shown to be higher among primigravidae than multigravidae, measurement of anaemia must be differentiated by gravidity.

Definition

Severe anaemia is defined as a haemoglobin concentration less than 7 g/dl.

The numerator and denominator are defined according to gravidity

• *Among primigravidae, the indicator is defined as follows:*

Numerator: Number of women with severe anaemia (haemoglobin less than 7g/dl) during the third trimester of first pregnancy

Denominator: Number of pregnant women screened for anaemia during the third trimester of first pregnancy

• *For multigravidae, the indicator is defined as:*

Numerator: Number of pregnant women with two or more pregnancies with severe anaemia (haemoglobin less than 7 g/dl) during the third trimester

Denominator: Number of pregnant women with two or more pregnancies screened for anaemia during the third trimester

Measurement and data collection

Data on anaemia as an indicator of malaria control during pregnancy should be collected from nationally representative household surveys,

such as malaria indicator surveys, multiple indicator cluster surveys, demographic and health surveys and other nationally representative surveys.

Although anaemia is assessed for prevention and management during antenatal clinic visits starting from the first trimester, the data collected at health facilities might not be representative because:

- Haemoglobin screening is not available at all health facilities.
- Screening, if done, is usually clinical and performed during the first antenatal clinic visit.
- Screening is done with various methods and is therefore not standardized. Sentinel surveillance sites can be used to obtain consistent data obtained by standard methods for comparison among sites and countries.
- Screening is often offered for a fee and is therefore limited to pregnant women who can afford to pay for the test or who are ill.

The frequency of data collection is to be decided locally within planned national surveys. As imprecise estimates are obtained from household surveys with inadequate sample sizes, sentinel sites can be used for assessing this indicator.

Strengths and limitations

Strengths

- Data collected in household surveys are nationally representative.
- The results are comparable across countries, if appropriate and consistent sampling procedures and methods are used and confounding factors are accounted for.

Limitations

- A large sample size is required to obtain precise estimates.
- Anaemia has multiple causes, including malaria; therefore, trends in anaemia prevalence should be interpreted with caution. Seasonal influence is also an important factor in the measurement of anaemia. Malaria is less likely to contribute significantly to anaemia if haemoglobin is measured in the dry season, which is usually the case if data are collected as part of demographic and health surveys, than in the wet season, when malaria is more prevalent.

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    http://www.who.int/making_pregnancy_safer/en/

Summary: Guidelines for measuring indicators for monitoring and evaluation of malaria in pregnancy

Indicators to be measured in health management information systems				
Indicator	**Type**	**Definition**	**Data collection**	**Strengths and limitations**
Percentage of antenatal clinic staff (pre-service, in-service or at supervisory visits) trained in control of malaria during pregnancy in the past 12 months (including IPT, counselling on ITN use and case management for pregnant women)[1]	output	*Numerator:* Number of antenatal clinic staff trained in the control of malaria during pregnancy in the past 12 months *Denominator:* Total number of antenatal clinic staff during same period	Data should be collected during supervisory visits and training activities and from annual reports	**Strengths** • Data can readily be collected at supervisory visits. • Where less than 100% of antenatal clinic staff in malarious areas are trained in malaria control, feedback can be given rapidly to the antenatal clinic supervisor or clinic manager to take corrective actions. **Limitations** • The denominator might be difficult to determine, as some countries have limited information on the pool of human resources available in various facilities and transfers of personnel between facilities are frequent. In this case, the numerator should serve as an adequate indicator. • Frequent supportive supervision might be needed to reinforce knowledge and skills acquired during training. • The indicator does not provide any information about the quality of the training or the quality of services provided.
Percentage of health facilities reporting stock-out of the recommended drug for IPT (currently sulfadoxine-pyrimethamine) in the past month[2]	output	*Numerator:* Number of health facilities reporting stock-out of the recommended drug for IPT (currently sulfadoxine– pyrimethamine) in antenatal clinics within the past calendar month *Denominator:* Total number of health facilities offering antenatal services	Data should be collected during monthly supervisory visits	**Strengths** • Information can readily be collected during supervisory visits. • The information can be used locally for prompt corrective action. **Limitations** • Regular, constant supervisory visits and reporting of information might be needed to avoid disruption of delivery of IPT in antenatal clinics.

Summary: Guidelines for measuring indicators for monitoring and evaluation of malaria in pregnancy

Indicators to be measured in health management information systems				
Indicator	**Type**	**Definition**	**Data collection**	**Strengths and limitations**
Percentage of pregnant women attending antenatal care who receive IPT under direct observation (first dose, second dose, third dose)	output	*Numerator:* Number of pregnant women who receive a first, second or third dose of IPT under direct observation *Denominator:* Number of first antenatal clinic visits[3]	Data for this indicator should be collected at routine antenatal visits in an ANC register. Existing registers and ANC cards should be modified to include columns to record the doses of IPT (1st, 2nd or 3rd) received. The indicator can also be measured at the population level through household surveys, in which case the denominator would be the total number of pregnant women in the population surveyed.	**Strengths** • Data on first and second doses of IPT can readily be collected and analysed. • The results may be comparable across countries. • This indicator can be useful locally, as it can be linked to impact indicators such as low birth weight and severe anaemia to guide corrective action. A visual indication or presentation of the effectiveness of IPT in reducing the number of severe anaemia cases observed in antenatal care can boost the morale of health workers. **Limitations** • Data on coverage with IPT at national level might be misleading in countries with mixed transmission patterns, as malaria transmission is often localized and IPT may not be given in all areas of the country. • Antenatal clinic data might be incomplete and not reflect the true situation in settings where a substantial number of women access antenatal care in private clinics. Most women attend antenatal clinics for the first time during the second trimester and are therefore eligible for the first dose of IPT at that time. A few women however, make their first antenatal clinic visit during the first trimester, at which time they are not eligible for IPT1. The total number of first visits, used as the denominator in this calculation, is therefore an overestimate of the total number of women eligible for IPT1. • Month-to-month variations in patient flow could lead to short-term inaccuracies in estimates of coverage with a second dose of treatment. • The indicator reflects the situation only of women attending antenatal clinics and not use of IPT in the general population, except where antenatal clinic use is high, as in most African countries.

1. Training of clinic staff in prevention and treatment of malaria in pregnant women should, at a minimum, include guidelines for IPT, effective case management including referral when necessary, and counseling about the use of ITNs.

2. Time can be determined locally, e.g. 3 months

3 .The denominator for both IPT1 and IPT2, i.e. number of first antenatal clinic visits, is an approximation of the total number of pregnant women, the target population who should receive the treatment.

Summary: Guidelines for measuring indicators for monitoring and evaluation of malaria in pregnancy

Indicators to be measured in household surveys				
Indicator	**Type**	**Definition**	**Data collection**	**Strengths and limitations**
Percentage of pregnant women who report having slept under an ITN the previous night	Outcome	*Numerator:* Number of pregnant women at risk for malaria who reported having slept under an ITN the night preceding the survey [4] *Denominator:* Total number of pregnant women at risk for malaria who reside in surveyed households	Household surveys (such as demographic and health surveys, multiple indicator cluster surveys, malaria indicator survey and other nationally representative surveys) [5]	**Strengths** • The limited number of questions required to ascertain this indicator can readily be added to any nationally representative sample survey of households. • The presence of a net can be verified at the time of interview. • Various methods of assessment and questions allow the interviewer to assess whether the net has recently been treated with insecticide. • Results are comparable across countries, if appropriate and consistent sampling procedures are followed and confounding factors are accounted for. **Limitations** • Covering all pregnant women in a household survey is difficult because many women either do not know that they are pregnant or do not want to divulge the information. • A large sample size is required to obtain precise estimates. • There may be some bias if reluctance to discuss pregnancy is also associated with first birth, adolescence and other demographic factors. • The data might not provide reliable estimates of net re-treatment status because of poor recall of date of last treatment of the net. • The results might be biased by the seasonality of survey data collection, which is usually done during the dry season when net use is likely to be at its lowest.

4. An ITN is: (i) a pre-treated net obtained in the past 12 months, (ii) a net that has been treated with insecticide in the past 12 months or (iii) a permanent or long-lasting treated net that does not require re-treatment.
5. Although it is recommended that this indicator be measured in household surveys, ITN use should also be ascertained at antenatal clinic visits and recorded on antenatal clinic cards to promote its use among pregnant women.

Summary: Guidelines for measuring indicators for monitoring and evaluation of malaria in pregnancy

Indicators to be measured in household surveys				
Indicator	**Type**	**Definition**	**Data collection**	**Strengths and limitations**
Percentage of low-birth-weight singleton live births (< 2500 g), by parity	Impact	Among primiparous women, the indicator is defined as follows: *Numerator*: Number of low-birth-weight singleton live births to women with first birth *Denominator*: Number of singleton live births to women with first birth The indicator for multiparous women (two or more) is defined as follows: *Numerator*: Number of low-birth-weight singleton live births to women with two or more births *Denominator*: Number of singleton live births to women with two or more births	Household surveys (such as demographic and health surveys, multiple indicator cluster surveys, malaria indicator survey and other nationally representative surveys)	**Strengths** • Data collected in household surveys are nationally representative. • The results are comparable across countries, if appropriate and consistent sampling procedures are followed and confounding factors are accounted for. • This is a useful indicator at health facility level, allowing health workers and programme managers to observe the impact of maternal and newborn health interventions and to take corrective actions where necessary. • It is a useful global indicator for population health and development. **Limitations** • A large sample size is required to obtain precise estimates. • The women surveyed might not know or recall the birth weights of all their children, or they might report them incorrectly. Promoting childbirth in health facilities where infants are weighed at birth is likely to improve the quality of data on birth weight. • Low birth weight has multiple causes, including malaria; therefore, trends in its prevalence should be interpreted with caution.

Summary: Guidelines for measuring indicators for monitoring and evaluation of malaria in pregnancy

Indicators to be measured in household surveys				
Indicator	**Type**	**Definition**	**Data collection**	**Strengths and limitations**
Percentage of screened pregnant women with severe anaemia (haemoglobin < 7g/dl) in third trimester 7, by gravidity	Impact	Among primiparous women, the indicator is defined as follows: For primigravidae, the indicator is defined as follows: *Numerator*: Number of women with severe anaemia (haemoglobin < 7g/dl) during third trimester of first pregnancy *Denominator*: Number of pregnant women screened for anaemia during third trimester of first pregnancy For multigravidae, the indicator is defined as: *Numerator*: Number of pregnant women with two or more pregnancies with severe anaemia (haemoglobin < 7 g/dl) during third trimester *Denominator*: Number of pregnant women with two or more pregnancies screened for anaemia during third trimester	Household surveys (such as Household surveys (such as demographic and health surveys, multiple indicator cluster surveys, malaria indicator survey and other nationally representative surveys)	**Strengths** • Data collected in these household surveys are nationally representative. • The results are comparable across countries, if appropriate and consistent sampling procedures and methods are used and confounding factors are accounted for. **Limitations** • A large sample size is required to obtain precise estimates. • Anaemia has multiple causes, including malaria; therefore, trends in anaemia prevalence should be interpreted with caution.

6. Low birth weight is defined as < 2500 g within 24 h of birth, regardless of gestational age.
7. Third trimester is defined as 28–36 weeks of gestation.

ANNEX 1. Monthly data collection form for antenatal clinic units providing intermittent preventive treatment

District: .....

Health facility .....

Month ..... Year.....

FIRST ANTENATAL CLINIC VISIT	○ ○	Total
First dose of intermittent preventive treatment (IPT1)	○ ○	
Second dose of intermittent preventive treatment (IPT2)	○ ○	
Third dose of intermittent preventive treatment (IPT2)	○ ○	
Fourth dose of intermittent preventive treatment (IPT2)	○ ○	

ANNEX 2. Forms for data collection at antenatal clinics

✖ **Use of insecticide-treated nets** – Second antenatal clinic visit

Did you sleep under an insecticide-treated net last night?		Total
YES	○ ○	
NO	○ ○	

✖ **Anaemia (third trimester)**

Gravidity	**Severely anaemic (Hb < 7 g/dl)**	**Total**	**Not severely anaemic**	**Total**
FIRST PREGNANCY	○ ○		○ ○	
TWO OR MORE PREGNANCIES	○ ○		○ ○	

✖ **Low birth weight** (only singleton live births)

Parity	**Low birth weight (< 2500 g)**	**Total**	**Normal birth weight (≥ 2500 g)**	**Total**
FIRST BIRTH				
TWO OR MORE BIRTHS				

ANNEX 3. Boxes to be added to an existing form that already contains information on the number of first antenatal clinic visits, ages of patients and in which trimester they were at the time of the visit.

District: .....

Health facility .....

Month ..... Year.....

Total number of first antenatal clinic visits.....

Intermittent preventive treatment dose	Number
1.	
2.	
3.	
4.	
5.	

	Number		Total
Pregnant women who report having slept under an insecticide-treated net the previous night (second visit)	YES	NO	

	Number		Total
Severe anaemia (Hb < 7 g/dl) in women during first pregnancy (third trimester)	YES	NO	
Severe anaemia (Hb < 7 g/dl) in women with two or more pregnancies			

	Number		Total
Number of low-birth-weight singleton live births to women with first birth	YES	NO	
Number of low-birth-weight singleton live births to women with two or more births			

ANNEX 4. Example of form for collecting information from maternity register

District: .....

Health facility.....

Month ..... Year.....

Total number of first antenatal clinic visits.....

Date	Registry No.	Name	Delivery type	Outcome	Gestational age	Parity or gravidity	Birth weight	Low birth weight	Remarks

ANNEX 5. Supervisory visit form

Suggestions for questions that could be included, depending on the country. The responses should be integrated into the reproductive health supervisory form.

To be completed by the supervisor before a visit.

District .....

Health facility .....

Supervisor .....

Date of last supervision ..... Today's date.....

Data from routine collection .....

% first dose of intermittent preventive treatment .....

% second dose of intermittent preventive treatment .....

% screened for anaemia in third trimester .....

% of primigravid women with severe anaemia .....

% of multigravid women with severe anaemia .....

% who report sleeping under insecticide-treated nets .....

% low birth weight in primiparous women .....

% low birth weight in multiparous women .....

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