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Helpdesk Report: Cost effectiveness of malaria interventions

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Query: Compare the cost effectiveness/ benefits of anti malarials and Rapid Diagnostic Testing against Insecticide Treated Nets, Indoor Residual Spraying and microscopy

Content

1. Introduction

There have been many academic studies and analyses of malaria interventions and their cost effectiveness. Unfortunately however, as the studies have varying methodologies and countries of focus, they are difficult to compare. The information summarised below outlines the highlights in terms of cost effectiveness data and conclusions.

2. Key Resources

Indoor Residual Spraying and Insecticide-Treated Nets in Reducing Malaria's Burden Evidence of Effectiveness for Decision Makers
Christian Lengeler and Brian Sharp, Global Health Council, 2003
http://www.geography.ryerson.ca/jmaurer/716art/716malaria.pdf#page=19

This report highlights a number of studies which compared the cost-effectiveness of insecticide treated nets (ITNs) Vs indoor residual spraying (IRS). It is pointed out however that a meta analysis of these studies is not possible due to variations in methodologies and outcomes. A comparison of the trials has led the authors to conclude that the difference in costs between ITNs and IRS is not usually large (although these studies all included the cost of the nets). Treating nets only was found to have a median cost of $1 per year vs. a median cost of $8 for a single round of IRS. Providing both nets and insecticide had a median cost of $7.2 per year (similar to a round of IRS). Choosing between these methods is therefore identified as a matter of feasibility and availability of local resources, rather than one of epidemiology or cost-effectiveness.

The impact of response to the results of diagnostic tests for malaria: cost-benefit analysis
By Yoel Lubell, Hugh Reyburn, Hilda Mbakilwa, Rose Mwangi, Semkini Chonya, Christopher J M Whitty, Anne Mills, British Medical Journal, 2008
http://www.bmj.com/cgi/reprint/bmj.39395.696065.47v1

This study compared the costs and benefits of rapid diagnostic testing (RDT) and microscopy at different levels of malaria transmission and among different age groups in Tanzania. The study found that in moderate to low levels of malaria transmission, RDT was more cost beneficial than microscopy and both were more beneficial than presumptive treatment but this was only where treatment was consistent with results. Where treatment is provided to those testing negatively, neither approach is cost beneficial. Where microscopy is more operationally sensitive, it becomes more cost beneficial than RDT.

Where prevalence is low (10%) and for a 15 year old, as the consistent response rate increases above 50%, the cost benefits of both forms of testing are improved compared to presumptive treatment (which costs around $5200 for 1000 patients). Above the consistent response rate of 50%, RDTs become marginally more cost beneficial and even though they are more sensitive than microscopy, they do not have much advantage in low prevalence settings.

Where prevalence is high (above 60%), presumptive treatment is more cost beneficial than either forms of testing among 15 year olds. As consistent response rates improve, RDTs become less costly whereas the costs of microscopy continues to increase as it is less sensitive.

The study assessed the cost benefits of testing under different scenarios of cost for year of life lost. Where the cost of a year of life lost is $25 and where prevalence is in the mid range, RDT is more cost beneficial whereas in low prevalence settings, microscopy is preferred. Where a figure of $150 per year of life lost is used, RDT is preferred up to a prevalence rate of about 70% when presumptive treatment is more efficient. At a value of $680, RDT was the most efficient except among the highest prevalence levels and lowest levels of consistent response rates.

Achieving the millennium development goals for health: Cost effectiveness analysis of strategies to combat malaria in developing countries
By Chantal M Morel, Jeremy A Lauer, David B Evans, BMJ, 2005
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1298848/pdf/bmj33101299.pdf

Looking at two groups of countries: i) mainly Southern and Eastern sub-Saharan Africa and ii) Western sub-Saharan Africa, this study assessed the cost effectiveness of a number of malaria prevention and treatment interventions. The study found that in the Western Africa group, the use of ACTs with 80% target coverage was most cost effective over all and the preferable intervention in resource poor settings. In the Southern and Eastern Africa region, coverage of 95% is required for this to be the most cost effective intervention. All interventions in both regions were found to be cost effective although cost effectiveness is more favourable in the Western region as there is a higher proportion of the population which is at risk.

The costs which are taken in to account in this study include the costs of the unit in addition to costs for: distribution, media, labour and then by patient, programme and training costs. With these costs taken in to account, ACT is deemed to be the most cost effective intervention as although it is more expensive, resistance is growing to other treatments so it may be more efficient under certain conditions.

This study estimates around 30 $int/ DALY for ITNs and IRS at 95% coverage in Western and around 40 $int/ DALY at 95% coverage in Southern and Eastern Africa. The study points to a previous study of sub-Saharan Africa with comparable results (Goodman et al, 1999) which found that the cost/ DALY averted of ITNs to be $19-85 (US$ 1995) compared with $16-29 for IRS. Where the studies differ however is that Morel et al assess the combination of interventions (i.e. ITN and IRS together) and found around 35 $itn/ DALY in Western and

around 48 $int/DALY in Eastern and Southern region. This figure is similar to the use of one intervention alone.

The study concludes that on purely cost effectiveness grounds, combination therapy is the most effective for most sub-Saharan African countries.

Operational response to malaria epidemics: are rapid diagnostic tests cost-effective?
By Estelle Rolland, Francesco Checchi, Loretxu Pinoges, Suna Balkan, Jean-Paul Guthmann and Philippe J Guerin, Tropical Medicine and International Health volume 11 no 4 pp 398–408, 2006
http://www.ncbi.nlm.nih.gov/pubmed/16553923

This study compared the cost effectiveness of Rapid Diagnostic Testing (RDT) with presumptive treatment. The main cost effectiveness measure was the incremental cost per false positive treatment averted by RDT and the only costs assessed were unit costs. Consistent with the findings of Lubell et al (2008), and as you would expect, it was found that as the level of malaria prevalence increases, RDT use becomes more expensive than presumptive treatment. The threshold was found to be 21% when using artesunate plus amodiaquine and 55% when using artemether-lumefantrine. It was found however that even where malaria prevalence is 90%, RDT use does not cost considerably more than presumptive treatment (29.9% more for artesunate plus amodiaquine and 19.4% for artemether-lumefantrine. The use of RDT is favoured however over presumptive treatment as it does not encourage drug resistance and it allows more accurate diagnosis (and therefore treatment) of non-malarial fever which could free up hospital funding.

Cost-effectiveness of malaria diagnostic methods in sub-Saharan Africa in an era of combination therapy
By Samuel Shillcutt, Chantal Morel, Catherine Goodman, Paul Coleman, David Bell, Christopher JM Whitty & A Mills, Bulletin of the World Health Oragnisation, 2008
http://msf.openrepository.com/msf/bitstream/10144/17723/1/Rolland%202006%20TMIH%20Cost-Effectiveness.pdf

This study looked at the relative cost-effectiveness of presumptive treatment, RDT and microscopy. A treatment was considered cost effective if it was dominant or had an incremental cost per DALY averted of under $150. The study found that decision makers can be 50% confident that RDT was cost effective up to 81% malaria prevalence and 95% confident up to 62% prevalence. Compared to microscopy, RDTs were found to be more than 85% likely to be cost effective at all prevalence levels. The cost effectiveness of RDT is attributed to improved treatment and health outcomes of non-malarial febrile illnesses and a reduced cost of antimalarial drugs. This however is base on the assumption that test results are used to inform treatment.

Cost-Effectiveness Study of Three Antimalarial Drug Combinations in Tanzania
By Virginia Wiseman, Michelle Kim, Theonest K. Mutabingwa, Christopher J. M. Whitty, PLoS Medicine, 2006
http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.0030373

Various combination therapies were compared to assess their cost effectiveness. The combinations were compared to amodiaquine (AQ), and were AQ with sulfadoxine-pyrimethamine (AQ+SP), AQ with artesunate (AQ+AS), and artemetherlumefantrine (AL) in a six-dose regimen. Effectiveness was assessed in terms of resource savings and number of cases of malaria averted based on parasitological failure rates at 14 and 28 days. Costs included those to providers, patients and their families. AL was found to be most cost effective day 14 and at day 28, there was only a negligible difference between AL and AQ+AS with both leading to a gross saving of around $1.70 and a net saving of around

$22.40 per case averted. The analysis varied the accuracy of diagnosis and the level of the subsistence rate used to calculate unpaid work and while this did vary the results, AL and AQ+QS were preferable over monotherapy. Although these combinations are more expensive, they do not have the problems of resistance and therefore require fewer courses of repeat treatments. Where recurrence is not as much of a problem and where accurate diagnosis low, AQ is more cost effective.

Operations, Costs and Cost-Effectiveness of Five Insecticide- Treated Net Programs (Eritrea, Malawi, Tanzania, Togo, Senegal) and Two Indoor Residual Spraying Programs (Kwa-Zulu-Natal, Mozambique)
By Joshua Yukich, Fabrizio Tediosi, Christian Lengeler, Swiss Tropical Institute, 2007
http://www.malariafreefuture.org/news/2007/20070713_OperationsCostcosteffectiveness.pdf

The study compared different distribution systems of large scale ITN use including: Free ITNs through services at community level (Eritrea); free ITNs through integrated vaccination campaigns (Togo); Socially marketed ITNs at a highly subsidised rate (Malawi); mainly commercial delivery (Senegal) and commercial delivery through social marketing and vouchers for the vulnerable (Tanzania) and two IRS programmes (one funded locally- South Africa and one donor/PPP initiative- Mozambique). Costs were taken as provider costs supplemented by user costs for ITN.

For conventional ITN use where the cost of re-treatment is not taken in to account, the cost per DALY averted ranged from $37 (Togo) to $89 (Senegal) and the cost of death averted as from $1174 (Togo) to $2926 (Senegal). When re-treatments were included, cost of DALY averted was $16 to $67 and from $521 to $2199 per death averted.

For LLINs with three year protection, the cost was higher than for conventional nets but much lower when re-treatment of nets is taken in to account. This led to lower costs for DALY averted: $16 (Eritrea) to $29 (Senegal) and lower cost of death averted from $539 to $960.

LLINs with five year protection had even lower cost per year when re-treatment is taken in to account leading to the cost of DALY averted ranging from $13 (Eritrea to $21 (Togo) and the cost of death averted from $431 to $692.

For IRS, the costs per person year of protection was higher than for three and 5 year LLINs as implementation costs are much higher and raise further when only children under 5 are targeted. This leads to the cost of DALY averted ranging from $119 to $132 and cost of life averted ranging from $3,933 to $4,357.