

Assessing innovations in malaria control service delivery: Impact evaluation under India's National Vector Borne Disease Control Program

A Summary Note

Overview and background

Malaria continues to represent a serious health threat to the Indian population. The World Bank, through preparation of the National Vector-Borne Disease Control Program (NVBDCP), is assisting the government of India to develop the new national response strategy. Among the Project Development Objectives of the NVBDCP are two critical goals in disease control efforts: (1) to increase the number of people benefiting from effective prevention, including the promotion of long-lasting insecticidal nets (LLINs), and (2) to provide timely diagnosis and treatment services for malaria control, most notably through the introduction of Artemisinin Combination Therapy (ACT) in endemic areas. The proposed impact evaluation studies described in this note will generate valuable evidence to assist in the realization of both goals. In addition, the impact evaluation studies will contribute to NVBDCP intentions to strengthen central and state capacities for evidence-based policy development and program management for effective malaria control.

A strong international evidence base supports the NVBDCPs efforts to promote LLINs. The insecticide treated bednet (ITN) is one of the most efficacious prophylactics against malaria and a leading public health intervention world-wide. Multiple studies have demonstrated the effectiveness of ITNs in reducing malarial incidence, particularly among pregnant women and children.¹ At the same time there is a substantial body of evidence documenting the extremely low rates of ITN use in many malarial areas. For instance, using data for a sample of African countries from 1998-2002, Monasch et al. (2004) noted that the median number of under-fives who slept under any net or ITNs were 15% and 2% respectively.

These results, along with the existence of externalities from vector and carrier reduction from the insecticide² has led some scholars to advocate free large-scale provision of ITNs and retreatment as the only feasible provision method (see Curtis et al. (2003) and Sachs (2005), for example). Others have argued that such universal public interventions are not sustainable in the long run and some measure of cost recovery will be necessary to achieve the desired levels of coverage.³ However, programs which shift the ITN cost to the consumer often report low take up rates (Cohen and Dupas, 2007). Recent reviews of national programs have also found the most widespread and equitable coverage attained through free mass distribution as opposed to commercial retail and heavily subsidized clinic distribution (Noor et al., 2007). Under the NVBDCP program, two LLINs per household will be distributed at no cost to highly endemic areas through government channels.

¹ See, Beach et al. (1993), Rowland et al. (2002), Stich et al. (1994), Premji et al. (1995), Nevill et al. (1996), Cham et al. (1997), Alonso et al. (1991), Muller et al. (2006), Maxwell et al. (2002), ter Kuile et al. (2003) and Dolan et al. (1993).

² See Sukin (2003) and all articles published in the same special Supplement of The American Journal of Tropical Medicine and Hygiene for evidence of comparable benefits in neighboring but untreated controls in a large ITN intervention in Western Kenya. Community effects are also documented in Howard et al. (2000), and Maxwell et al. (2002)

³ See, for instance, the report Roll Back Malaria (2002) (which concludes that "Large-scale and untargeted distribution of no-cost (or highly subsidized) nets is not sustainable and is likely to be counter-productive in the medium and long term." See also Webster et al. (2005) for work that is critical of free disbursement.

Besides cost, other commonly cited reasons for low ITN penetration concern the lack of sufficient information as well as lack of experience of net adoption and proper usage and hence lowered community acceptance of ITNs. Delivery mechanisms piloted in this IE work will consider distribution through alternative non-state channels and, consequently, will systematically vary the information and motivation through which households receive bed nets. This approach should assist policy makers better understand effective delivery approaches in the context of endemic regions in India.

In addition to prevention activities, the current quality of malaria case management in endemic areas leaves much scope for improvement – populations in many districts face inadequate access to curative services and delays occur at various stages in the process of malaria diagnosis and treatment. These delays may be due to shortages of medical personnel or medicines, difficult terrain, or financial reasons. In this challenging environment GOI now hopes to ensure rapid diagnosis and treatment through the enlistment of volunteer Village Health Workers (ASHA) into the case management guidelines and to provide ACTs at the village level in chloroquine-resistant areas. The goal is for all febrile cases presenting to a health worker to be tested and, if positive, treated within 24 hours of onset of symptoms.

The emerging evidence base for the efficacy of ACT is already substantial.⁴ The current challenge for the GoI is to achieve its goals for case management within the constraints of the existing rural health system. Case management alternatives regarding the degree of ASHA supervision and management will be evaluated as part of this IE work and should help in this endeavour.

Intervention summary description

Control:

Under the National Rural Health Mission, ASHA will serve as the local frontline treatment provider for malaria diagnosis and treatment in fever cases. Two LLINs at no cost to all households will be distributed by the public sector.

Treatment

Cluster A (Supply and demand side): Case management will be supplemented with intensified training, supervision, and support of ASHA by local NGOs based at the block level and each responsible for ASHAs of the study villages. Under this intervention arm, each ASHA will be visited at least once every month. The NGO will mobilize the community to avail care from the ASHA in case of fever. The supply chain of commodities will be tracked and managed by the NGO from the district malaria office till the ASHA. All households will receive free LLINs with distribution and community mobilization activities under the responsibility of local NGOs and assisted by SHGs. The same NGOs will also monitor initial use of LLINs.

Cluster B (Demand side): All households will receive free LLINs with distribution and community mobilization activities under the responsibility of local NGOs and assisted by SHGs. The same NGOs will also monitor initial use of LLINs.

Identification strategy

The interventions involving the contracting of local NGOs will be implemented in two districts purposively sampled from the 50 PF endemic districts selected in the first year of the NVBDCP. The selected districts will represent agro-climatic zones, epidemiologic patterns, and socio-economic conditions most suitable for scalable learning. Identification of the causal impact of each intervention will

⁴ See Yeka et al. (2005), Price et al. (1996), van den Broek et al. (2005), and Bukirwa (2006) for such evidence. The proper administration of ACTs is critical for the reduced likelihood of emergence of ACT resistance – see Laxminarayan et al. (2005).

occur through the within-district random assignment of locales to treatment or control status. The locale size will be chosen as the minimum possible geographic and administrative size that can assure effective implementation of the intervention while simultaneously minimizing potential spillovers in behaviors and outcomes across treatment and control areas.

The two selected districts are Sundargarh and Mayurbhanj in Orissa State. In each of the two districts, the intervention will be implemented in a random selection of villages from two administrative blocks each. Five to six of the villages in each study block will receive one of the two interventions and six observed control villages will receive the standard government program. This creates a study area of roughly 32 villages in the case management treatment arm, 32 in the prevention treatment arm, and 32 control villages in 6 endemic blocks in the three districts.

Size of study

Power analysis suggests this sample will be sufficient to detect moderate improvements in net usage and prompt fever treatment at standard levels of statistical significance. In each study village, 20 households will be interviewed and, after a village listing of all recent fever cases (fever within the last 2 weeks), up to 20 recent fever cases (from a second household sample) will also be interviewed. An additional, second, control group from blocks not involved in the study will also be interviewed in order to identify whether any local spill-overs or other externalities from treatment activities affect the outcomes of control villages in the same block as the intervention. This second control group will derive from randomly selected additional endemic blocks in the same districts but not participating in the study and will constitute another 48 villages in total.

These power calculations focus on two main outcomes of interest: the percentage of households correctly utilizing at least one LLIN – for the prevention intervention – and the percentage of fever cases tested for Pf malaria within 24 hours – for the treatment intervention.

Data Collection and Analysis

The survey data will be collected in two phases. Baseline data collection will occur during November – December 2008, the peak transmission season following the rainy period. Intervention activities will then commence in the March – May period of 2009. Follow-up surveys with the same households and villages will be fielded exactly 12 months after the baseline in November – December 2009. The follow-up survey will be partly based on the baseline survey instrument but will also record detailed information on the household responses to the experimental intervention in terms of adoption and behavior change.

The data will be collected using a professional survey team and will be entered in India with sufficient safeguards being taken to ensure accuracy and respondent privacy. As soon as preliminary results are validated they will be shared with the NVBDCP directorate to inform malaria policy going forward. Note that the randomized experimental design will allow causal inference from simple mean comparisons across treatment groups for the health and socio-economic outcomes of interest.

Along with the surveys, qualitative data will be collected through focus group discussions and key informant interviews.

Survey Instruments

The survey instruments consist of a household- and individual-level questionnaire administered to adult respondents, and an ASHA specific instruments questionnaire as well. Numerous malaria-specific survey instruments including the Malaria Monitoring and Evaluation Reference Group instruments will be

included where appropriate. The household-level questionnaire consists of a comprehensive survey of household demographic, socioeconomic and health characteristics and behaviors. As part of the survey, active fever cases will undergo blood testing for malaria with Rapid Diagnostic Tests.

In addition to the household questionnaire, there will be separate instruments at the community level and for the ASHA workers. The questionnaire for the ASHA workers will capture information on the case load, case management of malaria and other health activities to gauge their general performance and time spent on different health initiatives, with and without supervision. In addition to monitoring the activities of ASHA, the ASHA questionnaire will also help to gauge the performance, level of involvement and presence of MTS staff at the block level.

The survey based measures will be supplemented by administrative data, especially as it relates to malaria disease surveillance and hospital admitted cases of malaria as well as key information on contracted NGOs. Administrative data will also inform the additional costs of the interventions and enable an analysis of program cost-effectiveness. An additional benefit of the collected household data is that it will be used as one validation for the routine disease surveillance information and should help to improve strategies for overall surveillance in endemic regions.

References

1. Albarracín, D., McNatt, P. S., Findley-Klein, C., Ho, R., Mitchell, A., & Kumkale, G. T. (2003). Persuasive communications to change actions: An analysis of behavioral and cognitive impact in HIV prevention. *Health Psychology, 22*, 166–177.
2. Alonso, P.L., S.W. Lindsay, J.R. Armstrong, M. Conteh, A.G. Hill, P.H. David, G. Fegan, A. de Francisco, A. J. Hall, and F. C. Shenton. 1991. “The effect of insecticide-treated bed nets on mortality of Gambian children.” *Lancet*, 337(8756), 1499–502.
3. Beach, R.F., T.K. Ruebush, J.D. Sexton, P.L. Bright, A.W. Hightower, J.G. Breman, D.L. Mount, and A.J. Oloo. 1993. “Effectiveness of permethrin-impregnated bed nets and curtains for malaria control in a holoendemic area of western Kenya.” *The American Journal of Tropical Medicine and Hygiene*, 49(3), 290–300.
4. Bukirwa H, Yeka A, Kanya MR, Talisuna A, Banek K, et al. 2006. “Artemisinin Combination Therapies for Treatment of Uncomplicated Malaria in Uganda.” *PLoS Clinical Trials* 1(1): e7 doi:10.1371/journal.pctr.0010007
5. Cham, M.K., B. Olaleye, U. D’Alessandro, M. Aikins, B. Cham, N. Maine, L.A. Williams, A. Mills, and B.M. Greenwood. 1997. “The impact of charging for insecticide on the Gambian National Impregnated Bednet programme.” *Health Policy and Planning*, 12(3), 240–7.
6. Cohen J. and Dupas P., “Free Distribution or Cost-Sharing? Evidence from a randomized malaria prevention experiment”, mimeo, Dartmouth College, October 2007
7. http://www.dartmouth.edu/~pascaline/Free_Distribution_vs_Cost-Sharing_10.15.07.pdf
8. Van den Broek, Ingrid, Ribka Amsalu, Manica Balasegaram, Pamela Hepple, Engudaye Alemu, El Badri Hussein, Muhammed Al-Faith, Jacqui Montgomery and Francesco Checchi. 2005. “Efficacy of two artemisinin combination therapies for uncomplicated falciparum malaria in children under 5 years, Malakal, Upper Nile, Sudan” *Malaria Journal*, 4:14 doi:10.1186/1475-2875-4-14
9. Curtis, C., C. Maxwell, M. Lemnge, W. L. Kilama, R.W. Steketee, W. A. Hawley, Y. Bergevin, C. C. Campbell, J. Sachs, A. Teklehaimanot, S. Ochola, H. Guyatt, and R.W. Snow. 2003. “Scaling-up coverage with insecticide-treated nets against malaria in Africa: who should pay?” *The Lancet Infectious Diseases*, 3(5), 304–7.
10. Dolan, G., F.O. ter Kuile, V. Jacoutot, N.J. White, C. Luxemburger, L. Malankiri, T. Chongsuphajaisiddhi, and F. Nosten. 1993. “Bed nets for the prevention of malaria and anaemia in pregnancy.” *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 87(6), 620–6.
11. Howard, S., J. Omumbo, C. Nevill, E. Some, C. Donnelly, and R. Snow. 2000. “Evidence for a mass community effect of insecticide-treated bednets on the incidence of malaria on the Kenyan coast.” *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 94, 357–360.
12. Kuile, F.O., D.J. Terlouw, P.A. Phillips-Howard, W.A. Hawley, J.F. Friedman, M.S. Kolczak, S.K. Kariuki, Y.P. Shi, A.M. Kwena, J.M. Vulule, and B.L. Nahlen. 2003. “Impact of permethrin-treated bed nets on malaria and all-cause morbidity in young children in an area of intense perennial malaria transmission in western Kenya: cross-sectional survey.” *The American Journal of Tropical Medicine and Hygiene*, 68(4Suppl), 100–7.
13. Maxwell, C.A., E. Msuya, M. Sudi, K.J. Njunwa, I.A. Carneiro, and C.F. Curtis. 2002. “Effect of community-wide use of insecticide-treated nets for 3–4 years on malarial morbidity in Tanzania.” *Tropical Medicine & International Health*, 7(12), 1003–1008.
14. Muller, O., C. Traore, B. Kouyate, Y. Ye, C. Frey, B. Coulibaly, and H. Becher. 2006. “Effects of insecticide-treated bednets during early infancy in an African area of intense malaria transmission: a randomized controlled trial.” *Bulletin of the World Health Organization*, 84(2), 120–6.
15. Noor, A.M., Amin A.A., Akhwale W.S. and Snow R.W., “Increasing access and decreasing inequity to insecticide-treated net use among rural Kenyan children”, *PLoS Med* 4 (2007), p. e255