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Summary of health research published by IHI



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Foreword

This Research Digest represents one of the new initiatives by IHI. Other publications include policy briefs and forum discussion papers. Our aim is to ensure that our research findings reach as wide an audience as possible so that new evidence informs policies and strategies. It is our sincere hope that this booklet will be of interest to planners, policy makers, health workers, the donor community and other researchers.

Readers who wish to refer to the full text version of any of these papers can find them in IHI's new digital library, accessible through our website, www.ihl.or.tz.

We intend to publish a Research Digest every year, providing summaries of IHI's research published in that year. We shall be grateful of any advice and suggestions that will help us to improve the quality and utility of future issues of the IHI Research Digest.

Dr. Hassan Mshinda
Director
IHI
Dar Es Salaam
June 2008

Acknowledgements

This Research Digest presents the summaries (abstracts) of IHI's research that has been published in peer review journals in 2007. This includes 27 articles that were authored or co-authored by IHI staff as well as those conducted at our research facilities. We take this opportunity to thank all of those researchers and collaborators whose work is presented here. A full list of authors is presented for each paper. These researches would not have been possible without the support of diverse sources of research funding. We take this opportunity to express our gratitude to all of them.

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Dar Es Salaam.**

Editors:

Paul Smithson

Mbarwa Kivuyo

Maria Msellemu

Innocent Shango

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For more details, contact: Director, IHI

info@ihl.or.tz

Patterns of age-specific mortality in children in endemic areas of sub-Saharan Africa.

Authors: Abdullah S, Adazu K, Masanja H, Diallo D, Hodgson A, Ilboudo-Sanogo E, Nhacolo A, Owusu-Agyei S, Thompson R, Smith T, Binka FN.

Understanding of the age- and season- dependence of malaria mortality is an important prerequisite for epidemiologic models of malaria immunity. However, most studies of malaria mortality have aggregated their results into broad age groups and across seasons, making it hard to predict the likely impact of interventions targeted at specific age groups of children. We present age-specific mortality rates for children aged < 15 years for the period of 2001-2005 in 7 demographic surveillance sites in areas of sub-Saharan Africa with stable endemic *Plasmodium falciparum* malaria. We use verbal autopsies (VAs) to estimate the proportion of deaths by age group due to malaria, and thus calculate malaria-specific mortality rates for each site, age-group, and month of the year. In all sites a substantial proportion of deaths (ranging from 20.1% in a Mozambican site to 46.2% in a site in Burkina Faso) were attributed to malaria.

CONCLUSIONS: The overall age patterns of malaria mortality were similar in the different sites. Deaths in the youngest children (< 3 months old) were only rarely attributed to malaria, but in children over 1 year of age the proportion of deaths attributed to malaria was only weakly age-dependent. In most of the sites all-cause mortality rates peaked during the rainy season, but the strong seasonality in malaria transmission in these sites was not reflected in strong seasonality in the proportion of deaths attributed to malaria, except in the two sites in Burkina Faso. Improvement in the specificity of malaria verbal autopsies would make it easier to interpret the age and season patterns in such data.

Am J Trop Med Hyg. 2007 Dec;77(6 Suppl):99-105. Review. PMID: 18165480 [PubMed - indexed for MEDLINE]

Preventing childhood malaria in Africa by protecting adults from mosquitoes with insecticide-treated nets.

Authors: Killeen GF, Smith TA, Ferguson HM, Mshinda H, Abdulla S, Lengeler C, Kachur SP.

Malaria prevention in Africa merits particular attention as the world strives toward a better life for the poorest. Insecticide-treated nets (ITNs) represent a practical means to prevent malaria in Africa, so scaling up coverage to at least 80% of young children and pregnant women by 2010 is integral to the Millennium Development Goals (MDG). Targeting individual protection to vulnerable groups is an accepted priority, but community-level impacts of broader population coverage are largely ignored even though they may be just as important. We therefore estimated coverage thresholds for entire populations at which individual- and community-level protection are equivalent, representing rational targets for ITN coverage beyond vulnerable groups. **METHODS AND FINDINGS:** Using field-parameterized malaria transmission models, we show that high (80% use) but exclusively targeted coverage of young children and pregnant women (representing <20% of the population) will deliver limited protection and equity for these vulnerable groups. In contrast, relatively modest coverage (35%-65% use, with this threshold depending on ecological scenario and net quality) of all adults and children, rather than just vulnerable groups, can achieve equitable community-wide benefits equivalent to or greater than personal protection.

CONCLUSIONS: Coverage of entire populations will be required to accomplish large reductions of the malaria burden in Africa. While coverage of vulnerable groups should still be prioritized, the equitable and communal benefits of wide-scale ITN use by older children and adults should be explicitly promoted and evaluated by national malaria control programmes. ITN use by the majority of entire populations could protect all children in such communities, even those not actually covered by achieving existing personal protection targets of the MDG, Roll Back Malaria Partnership, or the US President's Malaria Initiative.

PLoS Med. 2007 Jul;4(7):e229. PMID: 17608562 [PubMed - indexed for MEDLINE]

Age interactions in the development of naturally acquired immunity to *Plasmodium falciparum* and its clinical presentation.

Authors: *Aponte JJ, Menendez C, Schellenberg D, Kahigwa E, Mshinda H, Vountasou P, Tanner M, Alonso PL.*

Naturally acquired malaria immunity has many determinants and, in the absence of immunological markers of protection, studies assessing malaria incidence through clinical endpoints remain an approach to defining immunity acquisition. We investigated the role of age in disease incidence and the effects of chemoprophylaxis on clinical immunity development to *Plasmodium falciparum* during a randomised controlled trial. **METHODS AND FINDINGS:** A total of 415 Tanzanian infants were randomly assigned to receive weekly malaria prophylaxis with Deltaprim (3.125 mg of pyrimethamine plus 25 mg of dapson) or placebo between the ages of 2 and 12 mo. Children were followed up until 4 y of age. Uncomplicated febrile malaria, severe malaria, and anaemia morbidity were assessed through hospital-based passive surveillance. Compared with the group of control participants, there was a marked reduction in the incidence of clinical malaria, severe malaria, and anaemia in the group of children who had received chemoprophylaxis during the first year of life. After discontinuing the intervention, there was a significant increase in the incidence of clinical malaria for 2 y. The cumulative rates of clinical malaria, by age 4 y, were slightly higher in the group of children who had previously received chemoprophylaxis: 3.22 episodes versus 3.02 episodes in the group of control participants; rate difference 0.20 (95% confidence interval [CI]: -0.21 to 0.59). By age 4 y, the cumulative rates of severe malaria, however, were slightly lower in chemo-suppressed children (0.47 versus 0.59) (rate difference -0.12 [95% CI: -0.27 to 0.03]). The number of episodes of anaemia was also slightly lower in chemo-suppressed children by age 4 y: 0.93 episodes (95% CI: 0.79 to 0.97) versus 1.12 episodes in the group of control participants (95% CI: 0.97 to 1.28) (rate difference -0.19 [95% CI: -0.40 to 0.01]), respectively.

CONCLUSIONS: Reducing exposure to *P. falciparum* antigens through chemoprophylaxis early in life can delay immunity acquisition. Infants appear to acquire immunity faster than older children, but have a higher risk of developing severe forms of malaria and anaemia. These findings provide insight on the interplay between immunity and exposure-reduction interventions.

PLoS Med. 2007 Jul 31;4(7):e242. Erratum in: *PLoS Med.* 2007 Dec;4(12):e359. PMID: 17676985 [PubMed - indexed for MEDLINE]

Modelling the impact of intermittent preventive treatment for malaria on selection pressure for drug resistance.

Authors: *Alexander N, Sutherland C, Roper C, Cissé B, Schellenberg D.*

Intermittent preventive treatment (IPT) is a promising intervention for malaria control, although there are concerns about its impact on drug resistance. **METHODS:** The key model inputs are age-specific values for a) baseline anti-malarial dosing rate, b) parasite prevalence, and c) proportion of those treated with anti-malarials (outside IPT) who are infected. These are used to estimate the immediate effect of IPT on the genetic coefficient of selection (s). The scenarios modelled were year round IPT to infants in rural southern Tanzania, and three doses at monthly intervals of seasonal IPT in Senegal. **RESULTS:** In the simulated Tanzanian setting, the model suggests a high selection pressure for drug resistance, but that IPTi would only increase this by a small amount (4.4%). The percent change in s is larger if parasites are more concentrated in infants, or if baseline drug dosing is less common or less specific. If children aged up to five years are included in the Tanzanian scenario then the predicted increase in s rises to 31%. The Senegalese seasonal IPT scenario, in children up to five years, results in a predicted increase in s of 16%.

CONCLUSION: There is a risk that the useful life of drugs will be shortened if IPT is implemented over a wide childhood age range. On the other hand, IPT delivered only to infants is unlikely to appreciably shorten the useful life of the drug used.

Malar J. 2007 Jan 22;6:9. PMID: 17241476 [PubMed - indexed for MEDLINE]

Impact of artemisinin-based combination therapy and insecticide-treated nets on malaria burden in Zanzibar.

Authors: *Bhattarai A, Ali AS, Kachur SP, Mårtensson A, Abbas AK, Khatib R, Al-Mafazy AW, Ramsan M, Rotllant G, Gerstenmaier JF, Molteni F, Abdulla S, Montgomery SM, Kaneko A, Björkman A.*

The Roll Back Malaria strategy recommends a combination of interventions for malaria control. Zanzibar implemented artemisinin-based combination therapy (ACT) for uncomplicated malaria in late 2003 and long-lasting insecticidal nets (LLINs) from early 2006. ACT is provided free of charge to all malaria patients, while LLINs are distributed free to children under age 5 y ("under five") and pregnant women. We investigated temporal trends in *Plasmodium falciparum* prevalence and malaria-related health parameters following the implementation of these two malaria control interventions in Zanzibar. **METHODS AND FINDINGS:** Cross-sectional clinical and parasitological surveys in children under the age of 14 y were conducted in North A District in May 2003, 2005, and 2006. Survey data were analyzed in a logistic regression model and adjusted for complex sampling design and potential confounders. Records from all 13 public health facilities in North A District were analyzed for malaria-related outpatient visits and admissions. Mortality and demographic data were obtained from District Commissioner's Office. *P. falciparum* prevalence decreased in children under five between 2003 and 2006; using 2003 as the reference year, odds ratios (ORs) and 95% confidence intervals (CIs) were, for 2005, 0.55 (0.28-1.08), and for 2006, 0.03 (0.00-0.27); *p* for trend < 0.001. Between 2002 and 2005 crude under-five, infant (under age 1 y), and child (aged 1-4 y) mortality decreased by 52%, 33%, and 71%, respectively. Similarly, malaria-related admissions, blood transfusions, and malaria-attributed mortality decreased significantly by 77%, 67% and 75%, respectively, between 2002 and 2005 in children under five. Climatic conditions favorable for malaria transmission persisted throughout the observational period.

CONCLUSIONS: Following deployment of ACT in Zanzibar 2003, malaria-associated morbidity and mortality decreased dramatically within two years. Additional distribution of LLINs in early 2006 resulted in a 10-fold reduction of malaria parasite prevalence. The results indicate that the Millennium Development Goals of reducing mortality in children under five and alleviating the burden of malaria are achievable in tropical Africa with high coverage of combined malaria control interventions.

PLoS Med. 2007 Nov 6;4(11):e309. PMID: 17988171 [PubMed - indexed for MEDLINE]

Asexual blood-stage malaria vaccine development: facing the challenges.

Authors: *Genton B, Reed ZH.*

The aim of this article is to highlight the challenges that researchers face in the development of asexual blood-stage vaccines, and the progress made recently towards achieving the goal of a successful candidate to reduce morbidity. **RECENT FINDINGS:** There is good rationale to support the development of blood-stage malaria vaccines, the most promising being the demonstration that non-immune volunteers repeatedly challenged and cured with blood-stage parasites developed immunity to subsequent challenge as well as the demonstration of the efficacy of the first asexual blood-stage vaccine tested in a malaria endemic area (combination B) to reduce parasite density in children. The selective pressure induced by this vaccine and the accumulating evidence of extensive antigenic diversity of blood-stage proteins pose a difficult challenge to vaccine researchers. Numerous clinical trials, both in nonendemic and endemic areas, are being conducted with different antigens, different allelic types and different protein fragments.

SUMMARY: Considerable efforts and funding are available to shift from laboratory experiments to field trials. Field trials remain the definitive method to assess the real impact of different vaccines in the target populations. More rigorous side-by-side comparisons are needed between the different vaccines using standardized in-vitro and in-vivo testing, so that the most promising candidates will be selected for further development.

Curr Opin Infect Dis. 2007 Oct;20(5):467-75. Review. PMID: 17762779 [PubMed - indexed for MEDLINE]

Randomized controlled safety and efficacy trial of 2 vitamin A supplementation schedules in Tanzanian infants.

Authors: Idindili B, Masanja H, Urassa H, Bunini W, van Jaarsveld P, Aponte JJ, Kahigwa E, Mshinda H, Ross D, Schellenberg DM.

Vitamin A supplementation reduces morbidity and mortality in children living in areas endemic for vitamin A deficiency. Routine vitamin A supplementation usually starts only at age 9 mo, but high rates of illness and mortality are seen in the first months of life. **OBJECTIVE:** The objective of the study was to evaluate the safety and efficacy of vitamin A supplementation at the same time as routine vaccination in infants aged 1-3 mo. **DESIGN:** We recruited 780 newborn infants and their mothers to a randomized double-blind controlled trial in Ifakara in southern Tanzania. In one group, mothers received 60,000 microg vitamin A palmitate shortly after delivery, and their infants received 7500 microg at the same time as vaccinations given at approximately 1, 2, and 3 mo of age. In the other group, mothers received a second 60,000-microg dose when their infant was aged 1 mo, and their infants received 15,000 microg at the same time as the routine vaccinations. VAD was defined as a modified relative dose-response test result of ≥ 0.060 . **RESULTS:** High-dose vitamin A supplementation was well tolerated. The relative risk of VAD at 6 mo in the high-dose group compared with the lower dose group was 0.91 (95% CI: 0.76, 1.09; $P=0.32$). Serum retinol and incidence of illness did not differ significantly between the 2 groups. Some vitamin A capsules degraded toward the end of the study.

CONCLUSIONS: Doubling the doses of vitamin A to mothers and their young infants is safe but unlikely to reduce short-term morbidity or to substantially enhance the biochemical vitamin A status of infants at age 6 mo. The stability of vitamin A capsules merits further investigation.

Am J Clin Nutr. 2007 May;85(5):1312-9. PMID: 17490968 [PubMed - indexed for MEDLINE]

Efficacy and safety of artemisinin-based antimalarial in the treatment of uncomplicated malaria in children in southern Tanzania.

Authors: Kabanywany AM, Mwita A, Sumari D, Mandike R, Mugittu K, Abdulla S.

Tanzania switched the antimalarial first line to sulphadoxine-pyrimethamine (SP) in 2001 from ineffective chloroquine (CQ). By 2003 higher levels of SP resistance were recorded, prompting an urgent need for replacing the first line drug with ACT, as currently recommended by the World Health Organization. Despite this recommendation country-specific evidence-based data to support efficacy and safety profile of ACT is still limited. A study on the efficacy and safety of artesunate plus amodiaquine (AS+AQ) and artemether plus lumefantrine (AL)(Coartem) was carried out in 2004 with the view of supporting the National Malaria Control Programme in the review of the policy in mainland Tanzania. **METHODS:** An in vivo efficacy study was conducted at Ipinda and Mlimba health facilities between May and November 2004. The study recruited children aged 6-59 months presenting with symptoms of uncomplicated malaria, history of fever or an axillary temperature ≥ 37.5 degrees C; mono infection with *Plasmodium falciparum* (2,000-200,000 parasites/microl). Patients were randomized to received either SP or amodiaquine monotherapy or treated with standard doses of AS+AQ in Mlimba and Coartem in Kyela and followed-up for 28 days to assess treatment responses. This study reports results of the combination therapies. **RESULTS:** A total of 157 children (76 in Mlimba and 99 in Kyela) who were enrolled in to the study and treated with either AL or AS+AQ were successfully followed-up. Both combinations were tolerated and effected rapid fever and parasite clearance. The crude ACPRs were 80 (87%) and 41 (63%) for AL and AS+AQ respectively. However, after PCR adjustments the corresponding figures raised to 100% ($n = 86$) and 93.8% ($n = 45$) in AL and AS+AQ groups, respectively. The mean haemoglobin improved moderately from day 0 to day 28 by 1 g/dl in AL and 0.4 g/dl in AS+AQ treatment group and was statistically significant ($p < 0.001$ both).

CONCLUSION: These findings provide substantial evidence that AL is highly efficacious in areas of high resistance of SP and supported the country's decision to switch from SP monotherapy to AL.

Malar J. 2007 Nov 11;6:146. PMID: 17996121 [PubMed - indexed for MEDLINE]

Efficacy of pyrethroid-treated nets against malaria vectors and nuisance-biting mosquitoes in Tanzania in areas with long-term insecticide-treated net use.

Authors: Kulkarni MA, Malima R, Mosha FW, Msangi S, Mrema E, Kabula B, Lawrence B, Kinung'hi S, Swilla J, Kisinza W, Rau ME, Miller JE, Schellenberg JA, Maxwell C, Rowland M, Magesa S, Drakeley C.

To measure pyrethroid susceptibility in populations of malaria vectors and nuisance-biting mosquitoes in Tanzania and to test the biological efficacy of current insecticide formulations used for net treatment. **METHODS:** *Anopheles gambiae* Giles s.l., *An. funestus* Giles s.l. and *Culex quinquefasciatus* Say were collected during three national surveys and two insecticide-treated net (ITN) studies in Tanzania. Knockdown effect and mortality were measured in standard WHO susceptibility tests and ball-frame bio-efficacy tests. Test results from 1999 to 2004 were compared to determine trends in resistance development. **RESULTS:** *Anopheles gambiae* s.l. and *An. funestus* s.l. were highly susceptible to permethrin (range 87-100%) and deltamethrin (consistently 100%) in WHO tests in 1999 and 2004, while *Culex quinquefasciatus* susceptibility to these pyrethroids was much lower (range 7-100% and 0-84% respectively). Efficacy of pyrethroid-treated nets was similarly high against *An. gambiae* s.l. and *An. funestus* s.l. (range 82-100%) while efficacy against *Cx. quinquefasciatus* was considerably lower (range 2-100%). There was no indication of development of resistance in populations of *An. gambiae* s.l. or *An. funestus* s.l. where ITNs have been extensively used; however, susceptibility of nuisance-biting *Cx. quinquefasciatus* mosquitoes declined in some areas between 1999 and 2004.

CONCLUSION: The sustained pyrethroid susceptibility of malaria vectors in Tanzania is encouraging for successful malaria control with ITNs. Continued monitoring is essential to ensure early resistance detection, particularly in areas with heavy agricultural or public health use of insecticides where resistance is likely to develop. Widespread low susceptibility of nuisance-biting *Culex* mosquitoes to ITNs raises concern for user acceptance of nets.

Trop Med Int Health. 2007 Sep;12(9):1061-73. PMID: 17875017 [PubMed - indexed for MEDLINE]

Varying efficacy of intermittent preventive treatment for malaria in infants in two similar trials: public health implications.

Authors: Menendez C, Schellenberg D, Macete E, Aide P, Kahigwa E, Sanz S, Aponte JJ, Sacarlal J, Mshinda H, Tanner M, Alonso PL.

Intermittent preventive treatment (IPTi) with sulphadoxine-pyrimethamine (SP) in infants resulted in different estimates of clinical malaria protection in two trials that used the same protocol in Ifakara, Tanzania, and Manhica, Mozambique. Understanding the reasons for the discrepant results will help to elucidate the action mechanism of this intervention, which is essential for rational policy formulation. **METHODS:** A comparative analysis of two IPTi trials that used the same study design, follow-up, intervention, procedures and assessment of outcomes, in Tanzania and Mozambique was undertaken. Children were randomised to receive either SP or placebo administered 3 times alongside routine vaccinations delivered through the Expanded Program on Immunisation (EPI). Characteristics of the two areas and efficacy on clinical malaria after each dose were compared. **RESULTS:** The most relevant difference was in ITN's use ; 68% in Ifakara and zero in Manhica. In Ifakara, IPTi was associated with a 53% (95% CI 14.0; 74.1) reduction in the risk of clinical malaria between the second and the third dose; during the same period there was no significant effect in Manhica. Similarly, protection against malaria episodes was maintained in Ifakara during 6 months after dose 3, but no effect of IPTi was observed in Manhica.

CONCLUSION: The high ITN coverage in Ifakara is the most likely explanation for the difference in IPTi efficacy on clinical malaria. Combination of IPTi and ITNs may be the most cost-effective tool for malaria control currently available, and needs to be explored in current and future studies. **TRIAL REGISTRATION:** Manhica study Reg.N^o: NCT00209795. Ifakara study Reg. N^o.: NCT88523834.

Malar J. 2007 Sep 26;6:132. PMID: 17897454 [PubMed - indexed for MEDLINE]

Rapid microarray-based method for monitoring of all currently known single-nucleotide polymorphisms associated with parasite resistance to antimalaria drugs.

Authors: Cramer A, Marfurt J, Mugittu K, Maire N, Regös A, Coppee JY, Sismeiro O, Burki R, Huber E, Laubscher D, Puijalón O, Genton B, Felger I, Beck HP.

Parasite drug resistance is partly conferred by single-nucleotide polymorphisms (SNPs), and monitoring them has been proposed as an alternative to monitoring drug resistance. Therefore, techniques are required to facilitate analyses of multiple SNPs on an epidemiological scale. We report a rapid and affordable microarray technique for application in epidemiological studies of malaria drug resistance. We have designed a multiwell microarray that is used in conjunction with PCR-amplified target genes implicated in the drug resistance of malaria with subsequent one-tube minisequencing using two fluorochromes. The drug-resistance-associated genes *pfdhfr*, *pfdhps*, *pfcr1*, *pfmdr1*, and *pfATPase* were amplified and analyzed for cultured *Plasmodium falciparum* strains and from field samples. We obtained a specificity of 94%, and comparison of field sample results to those of restriction fragment length polymorphism (RFLP) typing resulted in an overall consistency of >90%, except for *pfdhfr51*, for which most discrepancies were due to false determinations by RFLP of mixed infections.

CONCLUSION: The system is sufficiently sensitive to assay parasites in clinical malaria cases and in most asymptomatic cases, and it allows high throughput with minimal hands-on time. The cost for the assay has been calculated as 0.27 euros/SNP (US \$0.33), which is below the cost incurred with other systems. Due to the simplicity of the approach, newly identified SNPs can be incorporated rapidly. Such a monitoring system also makes it possible to identify the reemergence of drug-susceptible parasites once a drug has been withdrawn.

J Clin Microbiol. 2007 Nov;45(11):3685-91. Epub 2007 Sep 5. PMID: 17804664 [PubMed - indexed for MEDLINE]

Participatory mapping of target areas to enable operational larval source management to suppress malaria vector mosquitoes in Dar es Salaam, Tanzania.

Authors: Dongus S, Nyika D, Kannady K, Mtasiwa D, Mshinda H, Fillinger U, Drescher AW, Tanner M, Castro MC, Killeen GF.

Half of the population of Africa will soon live in towns and cities where it can be protected from malaria by controlling aquatic stages of mosquitoes. Rigorous but affordable and scaleable methods for mapping and managing mosquito habitats are required to enable effective larval control in urban Africa. **METHODS:** A simple community-based mapping procedure that requires no electronic devices in the field was developed to facilitate routine larval surveillance in Dar es Salaam, Tanzania. The mapping procedure included (1) community-based development of sketch maps and (2) verification of sketch maps through technical teams using laminated aerial photographs in the field which were later digitized and analysed using Geographical Information Systems (GIS). **RESULTS:** Three urban wards of Dar es Salaam were comprehensively mapped, covering an area of 16.8 km². Over thirty percent of this area was not included in preliminary community-based sketch mapping, mostly because they were areas that do not appear on local government residential lists. The use of aerial photographs and basic GIS allowed rapid identification and inclusion of these key areas, as well as more equal distribution of the workload of malaria control field staff.

CONCLUSION: The procedure developed enables complete coverage of targeted areas with larval control through comprehensive spatial coverage with community-derived sketch maps. The procedure is practical, affordable, and requires minimal technical skills. This approach can be readily integrated into malaria vector control programmes, scaled up to towns and cities all over Tanzania and adapted to urban settings elsewhere in Africa.

Int J Health Geogr. 2007 Sep 4;6:37. PMID: 17784963 [PubMed - indexed for MEDLINE]

Interdependence of domestic malaria prevention measures and mosquito-human interactions in urban Dar es Salaam, Tanzania.

Authors: Geissbühler Y, Chaki P, Emidi B, Govella NJ, Shirima R, Mayagaya V, Mtasiwa D, Mshinda H, Fillinger U, Lindsay SW, Kannady K, de Castro MC, Tanner M, Killeen GF.

Successful malaria vector control depends on understanding behavioural interactions between mosquitoes and humans, which are highly setting-specific and may have characteristic features in urban environments. Here mosquito biting patterns in Dar es Salaam, Tanzania are examined and the protection against exposure to malaria transmission that is afforded to residents by using an insecticide-treated net (ITN) is estimated. **METHODS:** Mosquito biting activity over the course of the night was estimated by human landing catch in 216 houses and 1,064 residents were interviewed to determine usage of protection measures and the proportion of each hour of the night spent sleeping indoors, awake indoors, and outdoors. **RESULTS:** Hourly variations in biting activity by members of the *Anopheles gambiae* complex were consistent with classical reports but the proportion of these vectors caught outdoors in Dar es Salaam was almost double that of rural Tanzania. Overall, ITNs confer less protection against exophagic vectors in Dar es Salaam than in rural southern Tanzania (59% versus 70%). More alarmingly, a biting activity maximum that precedes 10 pm and much lower levels of ITN protection against exposure (38%) were observed for *Anopheles arabiensis*, a vector of modest importance locally, but which predominates transmission in large parts of Africa.

CONCLUSION: In a situation of changing mosquito and human behaviour, ITNs may confer lower, but still useful, levels of personal protection which can be complemented by communal transmission suppression at high coverage. Mosquito-proofing houses appeared to be the intervention of choice amongst residents and further options for preventing outdoor transmission include larviciding and environmental management.

Malar J. 2007 Sep 19;6:126. PMID: 17880679 [PubMed - indexed for MEDLINE]

Nature beats nurture: a case study of the physiological fitness of free-living and laboratory-reared male *Anopheles gambiae* s.l.

Authors: Huho BJ, Ng'habi KR, Killeen GF, Nkwengulila G, Knols BG, Ferguson HM.

Laboratory experimentation forms the basis for most of our knowledge of the biology of many organisms, in particular insects. However, the accuracy with which laboratory-derived estimates of insect life history and behaviour can predict their fitness and population dynamics in the wild is rarely validated. Such comparison is especially important in cases where laboratory-derived information is used to formulate and implement strategies for the genetic control of insects in nature. We have conducted a comparative study of the reproductive potential and life history of male *Anopheles gambiae* Gilies sensu lato mosquitoes from both standardized laboratory conditions and from natural field settings. We measured three indirect indicators of male mosquito fitness: energetic reserves, body size and survival, in a bid to determine whether the demographics and energetic limitations of wild males can be correctly predicted from their laboratory counterparts. Crucially, the body size and lipid reserves of wild males were substantially greater than those reared under standard laboratory conditions.

CONCLUSION: We caution that the energetic limitations of insects as identified in the laboratory may underestimate their resilience in the wild, and discuss the implications of this phenomenon with respect to vector-borne disease control programmes based on genetic control of mosquitoes.

J Exp Biol. 2007 Aug;210(Pt 16):2939-47. PMID: 17690243 [PubMed - indexed for MEDLINE]

Exploring the contributions of bed nets, cattle, insecticides and excitorepellency to malaria control: a deterministic model of mosquito host-seeking behaviour and mortality.

Authors: Killeen GF, Smith TA.

Domestic and personal protection measures against malaria exposure either divert host-seeking vectors to other hosts or kill those attempting to feed. Here, we explicitly model mosquito host-seeking processes in the context of local host availability and elucidate the impacts and mechanisms of pyrethroid-treated bed nets in Africa. It has been suggested that excitorepellent insecticides could increase exposure of unprotected humans by concentrating mosquito biting activity on this vulnerable group. This worst-case scenario is confirmed as a possibility where vector populations lack alternative hosts, but an approximate 'break-even' scenario, with users experiencing little overall change in exposure, is more likely because of increased mosquito mortality while foraging for resources. Insecticidal nets are predicted to have epidemiologically significant impacts on transmission experienced by users and non-users at levels of coverage that can be achieved by sustainable net distribution systems, regardless of excitorepellency or the ecological setting.

CONCLUSIONS: The results are consistent with the outcome of several randomised controlled trials, predicting enormous reductions in transmission at individual and community levels. As financial support, technology and distribution systems for insecticide-treated nets improve, massive reductions in malaria transmission could be realized.

Trans R Soc Trop Med Hyg. 2007 Sep;101(9):867-80. Epub 2007 Jul 13. PMID: 17631372 [PubMed - indexed for MEDLINE]

Adaptation of the ultrasensitive HIV-1 p24 antigen assay to dried blood spot testing. Implementation of molecular tests for the assessment of pediatric HIV-1 infection in resource-limited countries is difficult because of technical complexity and costs.

Authors: Knuchel MC, Jullu B, Shah C, Tomasik Z, Stoeckle MP, Speck RF, Nadal D, Mshinda H, Böni J, Tanner M, Schüpbach J.

Alternatives like the ultrasensitive HIV-1 p24 antigen enzyme-linked immunosorbent assay have therefore been proposed. We have now adapted this test to dried blood spot (DBS) plasma p24 antigen (p24). High background activity was recognized as originating from endogenous peroxidase and eliminated by H₂O₂ quenching. The assay was evaluated with 72 pediatric specimens from Tanzania and with 210 pediatric or adult specimens from Switzerland. A real-time polymerase chain reaction assay for DBS DNA and/or plasma RNA identified HIV-1 infection in 38 Tanzanian children. HIV-1 subtypes included 18 C, 9 A1, 8 D, 1 AC, 1 J-like, and 1 unidentified. The detection rates for the different assays were as follows: DBS-p24, 32 (84%) of 38 samples; DBS DNA, 30 (79%) of 38 samples; plasma-p24, 23 (85%) of 27 samples; and plasma RNA, 30 (100%) of 30 samples. False-negative DBS-p24 was associated with subtype D ($P < 0.01$). DBS-p24 detection for non-D subtypes was 93% (95% confidence interval: 81% to 99%), and for subtype C, it was 94% (95% confidence interval: 76% to 99%). Specificity among 193 HIV-negative DBS samples was 100%. Correlation of DBS-p24 and plasma-p24 concentrations was excellent ($R = 0.83$, $P < 0.0001$).

CONCLUSION: DBS-p24 is thus a promising alternative to molecular tests for HIV-1 in subtype C regions. It should now be evaluated in large studies of children for accurate assessment of diagnostic sensitivity.

J Acquir Immune Defic Syndr. 2007 Mar 1;44(3):247-53. PMID: 17146373 [PubMed - indexed for MEDLINE]

Molecular genotyping in a malaria treatment trial in Uganda - unexpected high rate of new infections within 2 weeks after treatment.

Authors: Mugittu K, Priotto G, Guthmann JP, Kiguli J, Adjuik M, Snounou G, Beck HP, Mshinda H, Olliaro PL, Taylor WR.

Polymerase chain reaction (PCR) genotyping of malaria parasites in drug efficacy trials helps differentiate reinfections from recrudescences. A combination therapy trial of one (n = 115) or three (n = 117) days artesunate (1AS, 3AS 4 mg/kg/day) plus sulphadoxine-pyrimethamine (SP) vs. SP alone (n = 153) was conducted in Mbarara, a mesoendemic area of western Uganda. All paired recurrent *Plasmodium falciparum* parasitaemias on days 7, 14, 21 and 28 post-treatment were genotyped by PCR amplification and analysis of glutamate-rich protein (glurp) and merozoite surface proteins (msp) 1 and 2 genes to distinguish recrudescence from new infections. A total of 156 (1AS = 61, 3AS = 35, SP alone = 60) of 199 paired recurrent samples were successfully analysed and were resolved as 79 recrudescences (1AS = 32, 3AS = 8, SP = 39) and 77 as new infections (1AS = 29, 3AS = 27, SP = 21). The ratios of proportions of new to recrudescence infections were 0.2, 0.9, 1.4 and 1.9 on days 7, 14, 21 and 28, respectively (P < 0.001, chi(2) test for linear trend).

CONCLUSION: Unexpected high new infection rates were observed early in follow-up on days 7 [5/26 (19.2%)] and 14 [24/51 (47.1%)]. These results impact significantly on resistance monitoring and point to the value of genotyping all recurrent infections in antimalarial trials.

Trop Med Int Health. 2007 Feb;12(2):219-23. PMID: 17300628 [PubMed - indexed for MEDLINE]

A new robust diagnostic polymerase chain reaction for determining the mating status of female *Anopheles gambiae* mosquitoes.

Authors: Ng'habi KR, Horton A, Knols BG, Lanzaro GC.

The principal malaria vector in Africa, *Anopheles gambiae*, contains two pairs of autosomes and one pair of sex chromosomes. The Y chromosome is only associated with males and other Y chromosome-specific DNA sequences, which are transferred to women during mating. A reliable tool to determine the mating status of dried wild *An. gambiae* females is currently lacking. DNA was extracted from dried virgin and mated females and used to test whether Y chromosome-specific polymerase chain reaction (PCR) markers can be successfully amplified and used as a predictor of mating. Here we report a new PCR-based method to determine the mating status among successfully inseminated and virgin wild *An. gambiae* females, using three male-specific primers.

CONCLUSION: This dissection-free method has the potential to facilitate studies of both population demographics and gene flow from dried mosquito samples routinely collected in epidemiologic monitoring and aid existing and new malaria-vector control approaches.

Am J Trop Med Hyg. 2007 Sep;77(3):485-7. PMID: 17827364 [PubMed - indexed for MEDLINE]

World Antimalarial Resistance Network (WARN) III: molecular markers for drug resistant malaria.

Authors: *Plowe CV, Roper C, Barnwell JW, Happi CT, Joshi HH, Mbacham W, Meshnick SR, Mugittu K, Naidoo I, Price RN, Shafer RW, Sibley CH, Sutherland CJ, Zimmerman PA, Rosenthal PJ.*

Molecular markers for drug resistant malaria represent public health tools of great but mostly unrealized potential value. A key reason for the failure of molecular resistance markers to live up to their potential is that data on their prevalence is scattered in disparate databases with no linkage to the clinical, in vitro and pharmacokinetic data that are needed to relate the genetic data to relevant phenotypes. The ongoing replacement of older monotherapies for malaria by new, more effective combination therapies presents an opportunity to create an open access database that brings together standardized data on molecular markers of drug resistant malaria from around the world. This paper presents a rationale for creating a global database of molecular markers for drug resistant malaria and for linking it to similar databases containing results from clinical trials of drug efficacy, in vitro studies of drug susceptibility, and pharmacokinetic studies of antimalarial drugs, in a World Antimalarial Resistance Network (WARN).

CONCLUSIONS: This database will be a global resource, guiding the selection of first line drugs for treating uncomplicated malaria, for preventing malaria in travelers and for intermittent preventive treatment of malaria in pregnant women, infants and other vulnerable groups. Perhaps most important, a global database for molecular markers of drug resistant malaria will accelerate the identification and validation of markers for resistance to artemisinin-based combination therapies and, thereby, potentially prolong the useful therapeutic lives of these important new drugs.

Malar J. 2007 Sep 6;6:121. PMID: 17822535 [PubMed - indexed for MEDLINE]

Improving health and social care relationships for harm reduction.

Authors: *Allman D, Myers T, Schellenberg J, Strike C, Cockerill R, Cavalieri W.*

This paper explores elements of the relationships that develop between people who use illicit drugs and people who provide services to them. It focuses on expectations people who use drugs and service providers have of health and social care relationships for harm reduction, as well as facilitators and barriers to effective and ineffective interactions, and to what governments might better do to help strengthen interactions. Prior to Canada's inaugural national harm reduction conference, informal discussion groups were organized to source local views regarding policy reform for harm reduction. One component of these discussion groups focused upon improving health and social care relationships for harm reduction. Community-based organizations providing services for harm minimization were consulted to help develop themes and questions. Discussion groups conducted in French or English were held in 10 cities across Canada. Groups were audio-recorded, transcribed and thematically analysed. Disjuncture between understandings of the nature of health and social care relationships for harm reduction were found. Interpersonal and structural factors functioned both for and against the development of effective interactions. Differences in expectation sets held by illicit drug users and service providers may reflect the fluid experience of boundaries as a population on society's margins moves between harm-causing and harm-reducing behaviours and identities.

CONCLUSION: The research described in this paper targeted those most directly involved in receiving, developing and delivering harm reduction programmes across a very diverse nation. It did so by including representatives of those most directly involved in utilizing and providing services within the research process itself. By incorporating a process that was community-based, user-driven, and which strived to be non-judgmental, the research was able to explore suggestions for improving health and social care relationships for harm reduction proffered by professionals actively providing services, as well as a variety of users, including some isolated or structurally excluded from service access by geography, illiteracy and/or street-involvement.

Int J Drug Policy. 2007 May;18(3):194-203. Epub 2006 Sep 7. PMID: 17689366 [PubMed - indexed for MEDLINE]

Drug shop regulation and malaria treatment in Tanzania--why do shops break the rules, and does it matter?

Authors: Goodman C, Kachur SP, Abdulla S, Bloland P, Mills A.

Regulatory infringements are extremely common in low-income countries, especially with respect to retail pharmaceutical sales. There have been few practical suggestions on public policy responses other than stricter regulatory enforcement, which governments are often unable, or unwilling, to do. This paper explores the challenges of regulating retail drug sellers, and potential solutions, through a case study of malaria treatment in rural Tanzania where small drug shops are a common source of medicine. Infringement of health-related regulation was extremely common. Most stores lacked valid permits, and illegal stocking of prescription-only medicines and unpackaged tablets was the norm. Most stocked unregistered drugs, and no serving staff met the qualification requirements. Infringements are likely to have reflected infrequent regulatory inspections, a failure of regulatory authorities to implement sanctions, successful concealment of regulatory violations, and the tacit permission of local regulatory staff.

CONCLUSION: Eliminating regulatory infringements is unlikely to be feasible, and could be undesirable if access to essential medicines is reduced. Alternatives include bringing official drug regulation closer into line with locally legitimate practices; greater use of positive incentives for providers; and consumer involvement. Such a change in approach has the potential to provide a firmer platform for public-private collaboration to improve shop-based treatment.

Health Policy Plan. 2007 Nov;22(6):393-403. Epub 2007 Oct 4. PMID: 17921151 [PubMed - indexed for MEDLINE]

Understanding and improving access to prompt and effective malaria treatment and care in rural Tanzania: the ACCESS Programme.

Authors: Hetzel MW, Iteba N, Makemba A, Mshana C, Lengeler C, Obrist B, Schulze A, Nathan R, Dillip A, Alba S, Mayumana I, Khatib RA, Njau JD, Mshinda H.

Prompt access to effective treatment is central in the fight against malaria. However, a variety of interlinked factors at household and health system level influence access to timely and appropriate treatment and care. Furthermore, access may be influenced by global and national health policies. As a consequence, many malaria episodes in highly endemic countries are not treated appropriately. PROJECT: The ACCESS Programme aims at understanding and improving access to prompt and effective malaria treatment and care in a rural Tanzanian setting. The programme's strategy is based on a set of integrated interventions, including social marketing for improved care seeking at community level as well as strengthening of quality of care at health facilities. This is complemented by a project that aims to improve the performance of drug stores. The interventions are accompanied by a comprehensive set of monitoring and evaluation activities measuring the programme's performance and (health) impact. Baseline data demonstrated heterogeneity in the availability of malaria treatment, unavailability of medicines and treatment providers in certain areas as well as quality problems with regard to drugs and services.

CONCLUSION: The ACCESS Programme is a combination of multiple complementary interventions with a strong evaluation component. With this approach, ACCESS aims to contribute to the development of a more comprehensive access framework and to inform and support public health professionals and policy-makers in the delivery of improved health services.

Malar J. 2007 Jun 29;6:83. PMID: 17603898 [PubMed - indexed for MEDLINE]

Economic burden of malaria in rural Tanzania: Variations by socioeconomic status and season

Authors: *Somi MF, Butler JR, Vahid F, Njau JD, Kachur SP, Abdulla S.*

To determine the economic burden of malaria in a rural Tanzanian setting and identify any differences by socioeconomic status and season. **METHODS:** Interviews of 557 households in south eastern Tanzania between May and December 2004, on consumption and malaria-related costs. **RESULTS:** Malaria-related expenses were significantly higher in the dry, non-malarious season than in the rainy season. Households sought treatment more frequently and from more expensive service providers in the dry season, when they have more money. Malaria expenses did not vary significantly across socioeconomic status quintiles, but poorer households spent a higher proportion of their consumption in both seasons.

CONCLUSION: Poorer households bear a greater economic burden from malaria relative to their consumption than better-off households. Households are particularly vulnerable to malaria in the rainy season, when malaria prevalence is highest but liquidity is lower. Alternative strategies to assist households to cope with seasonal liquidity issues, including insurance, should be investigated.

Tropical Medicine and International Health Journal, Vol. 12 (10), 1139-1147

Factors affecting home delivery in rural Tanzania

Authors: *Mrisho M, Schellenberg JA, Mushi AK, Obrist B, Mshinda H, Tanner M, Schellenberg D.*

Studies of factors affecting place of delivery have rarely considered the influence of gender roles and relations within the household. This study combines an understanding of gender issues relating to health and help-seeking behaviour with epidemiological knowledge concerning place of delivery. **METHODS:** In-depth interviews, focus group discussions and participant observation were used to explore determinants of home delivery in southern Tanzania. Quantitative data were collected in a cross-sectional survey of 21,600 randomly chosen households. **RESULTS:** Issues of risk and vulnerability, such as lack of money, lack of transport, sudden onset of labour, short labour, staff attitudes, lack of privacy, tradition and cultures and the pattern of decision-making power within the household were perceived as key determinants of the place of delivery. More than 9000 women were interviewed about their most recent delivery in the quantitative survey. There were substantial variations between ethnic groups with respect to place of delivery ($P < 0.0001$). Women who lived in male-headed households were less likely to deliver in a health facility than women in female-headed households (RR 0.86, 95% CI 0.80-0.91). Mothers with primary and higher education were more likely to deliver at a health facility (RR 1.30, 95% CI 1.23-1.38). Younger mothers and the least poor women were also more likely to deliver in a health facility compared with the older and the poorest women, respectively.

CONCLUSIONS: To address neonatal mortality, special attention should be paid to neonatal health in both maternal and child health programmes. The findings emphasize the need for a systematic approach to overcome health-system constraints, community based programmes and scale-up effective low-cost interventions which are already available.

Trop Med Int Health. 2007 Jul;12(7):862-72. PMID: 17596254 [PubMed - indexed for MEDLINE]

Cost-sharing strategies combining targeted public subsidies with private-sector delivery achieve high bednet coverage and reduced malaria transmission in Kilombero Valley, southern Tanzania.

Authors: Killeen GF, Tami A, Kihonda J, Okumu FO, Kotas ME, Grundmann H, Kasigudi N, Ngonyani H, Mayagaya V, Nathan R, Abdulla S, Charlwood JD, Smith TA, Lengeler C.

Cost-sharing schemes incorporating modest targeted subsidies have promoted insecticide-treated nets (ITNs) for malaria prevention in the Kilombero Valley, southern Tanzania, since 1996. Here we evaluate resulting changes in bednet coverage and malaria transmission. **METHODS:** Bednets were sold through local agents at fixed prices representing a 34% subsidy relative to full delivery cost. A further targeted subsidy of 15% was provided to vulnerable groups through discount vouchers delivered through antenatal clinics and regular immunizations. Continuous entomological surveys (2,376 trap nights) were conducted from October 2001 to September 2003 in 25 randomly-selected population clusters of a demographic surveillance system which monitored net coverage. **RESULTS:** Mean net usage of 75% (11,982/16,086) across all age groups was achieved but now-obsolete technologies available at the time resulted in low insecticide treatment rates. Malaria transmission remained intense but was substantially reduced: Compared with an exceptionally high historical mean EIR of 1481, even non-users of nets were protected (EIR [fold reduction] = 349 infectious bites per person per year [x4]), while the average resident (244 [x6]), users of typical nets (210 [x7]) and users of insecticidal nets (105 [x14]) enjoyed increasing benefits.

CONCLUSION: Despite low net treatment levels, community-level protection was equivalent to the personal protection of an ITN. Greater gains for net users and non-users are predicted if more expensive long-lasting ITN technologies can be similarly promoted with correspondingly augmented subsidies. Cost sharing strategies represent an important option for national programmes lacking adequate financing to fully subsidize comprehensive ITN coverage.

BMC Infect Dis. 2007 Oct 25;7:121. PMID: 17961211 [PubMed - indexed for MEDLINE]

Distribution of free untreated bednets bundled with insecticide via an integrated child health campaign in Lindi Region, Tanzania: lessons for future campaigns.

Authors: Skarbinski J, Massaga JJ, Rowe AK, Kachur SP.

Use of insecticide-treated bednets (ITNs) to prevent malaria remains low, and effective distribution strategies are needed. An integrated child health campaign with free distribution of 162,254 untreated bednets bundled with insecticide, measles vaccination, vitamin A, and mebendazole for children < 5 years old ("under-5s") was conducted in Lindi Region, Tanzania. We conducted a representative household survey 3 months after the campaign. Altogether, 574 households with 354 under-5s were visited. In households with an under-5, possession of bednets and ITNs increased from 60.9% to 90.7% ($P < 0.001$) and from 16.5% to 37.3% ($P < 0.001$), respectively. Increases occurred in all wealth quintiles and equity improved. Reported bednet and ITN use the previous night among under-5s was 46.3% and 21.5%, respectively.

CONCLUSION: Integrated campaigns rapidly and equitably increase bednet possession and use meriting continued large-scale implementation. However, our study found that bednets were rarely treated; thus, future campaigns should provide factory-treated long-lasting ITNs. Low ITN use underscores the need for further efforts to increase use after campaigns.

Am J Trop Med Hyg. 2007 Jun;76(6):1100-6. PMID: 17556618 [PubMed - indexed for MEDLINE]

Access to health care in contexts of livelihood insecurity: a framework for analysis and action.

Authors: Obrist B, Iteba N, Lengeler C, Makemba A, Mshana C, Nathan R, Alba S, Dillip A, Hetzel MW, Mayumana I, Schulze A, Mshinda H.

Access to health care is a major health and development issue. Most governments declare that their citizens should enjoy universal and equitable access to good quality care. However, even within the developed world, this goal is difficult to achieve, and there are no internationally recognized standards on how to define and measure "equitable access" [1]. Evidently, big disparities exist between the poor and the better off with respect to access to health care services and health status [2–4]. Gaps in child mortality between rich and poor countries are wide, as well as between the wealthy and the poor within most countries. Poor children are not only more likely than their better off peers to be exposed to health risks and have less resistance to disease, they also have less access to preventive and curative interventions. Even public subsidies for health frequently benefit rich people more than poor people. Clearly, more of the same is not enough [3]:

CONCLUSIONS: To improve equitable access, innovative and community-based approaches are needed to better align health care services with poor people's needs, expectations, and resources. This article presents a framework for analysis and action to explore and improve access to health care in resource-poor countries, especially in Africa. The framework links social science and public health research with broader development approaches to poverty alleviation. It was developed in the frame of the ACCESS Programme, which focuses on understanding and improving access to prompt and effective malaria treatment and care in rural Tanzania as an empirical case study [5,6]. The article first provides a brief outline of three approaches to investigating health care access, focusing either on health seeking, health services, or livelihoods. It then presents a framework that combines the three approaches, exemplified with research findings and interventions of the ACCESS Programme.

PLoS Med. 2007 Oct;4(10):1584-8. Review. No abstract available. PMID: 17958467 [PubMed - indexed for MEDLINE]

The use of personal digital assistants for data entry at the point of collection in a large household survey in southern Tanzania.

Authors: Shirima K, Mukasa O, Schellenberg JA, Manzi F, John D, Mushi A, Mrisho M, Tanner M, Mshinda H, Schellenberg D.

Survey data are traditionally collected using pen-and-paper, with double data entry, comparison of entries and reconciliation of discrepancies before data cleaning can commence. We used Personal Digital Assistants (PDAs) for data entry at the point of collection, to save time and enhance the quality of data in a survey of over 21,000 scattered rural households in southern Tanzania. **METHODS:** Pendragon Forms 4.0 software was used to develop a modular questionnaire designed to record information on household residents, birth histories, child health and health-seeking behaviour. The questionnaire was loaded onto Palm m130 PDAs with 8 Mb RAM. One hundred and twenty interviewers, the vast majority with no more than four years of secondary education and very few with any prior computer experience, were trained to interview using the PDAs. The 13 survey teams, each with a supervisor, laptop and a four-wheel drive vehicle, were supported by two back-up vehicles during the two months of field activities. PDAs and laptop computers were charged using solar and in-car chargers. Logical checks were performed and skip patterns taken care of at the time of data entry. Data records could not be edited after leaving each household, to ensure the integrity of the data from each interview. Data were downloaded to the laptop computers and daily summary reports produced to evaluate the completeness of data collection. Data were backed up at three levels: (i) at the end of every module, data were backed up onto storage cards in the PDA; (ii) at the end of every day, data were downloaded to laptop computers; and (iii) a compact disc (CD) was made of each team's data each day. A small group of interviewees from the community, as well as supervisors and interviewers, were asked about their attitudes to the use of PDAs. **RESULTS:** Following two weeks of training and piloting, data were collected from 21,600 households (83,346 individuals) over a seven-week period in July–August 2004. No PDA-related problems or data loss were encountered. Fieldwork ended on 26 August 2004, the full dataset was available on a CD within 24 hours and the results of initial analyses were presented to district authorities on 28 August. Data completeness was over 99%. The PDAs were well accepted by both interviewees and interviewers.

CONCLUSION: The use of PDAs eliminated the usual time-consuming and error-prone process of data entry and validation. PDAs are a promising tool for field research in Africa.

Emerg Themes Epidemiol. 2007 Jun 1;4:5. PMID: 17543099 [PubMed]

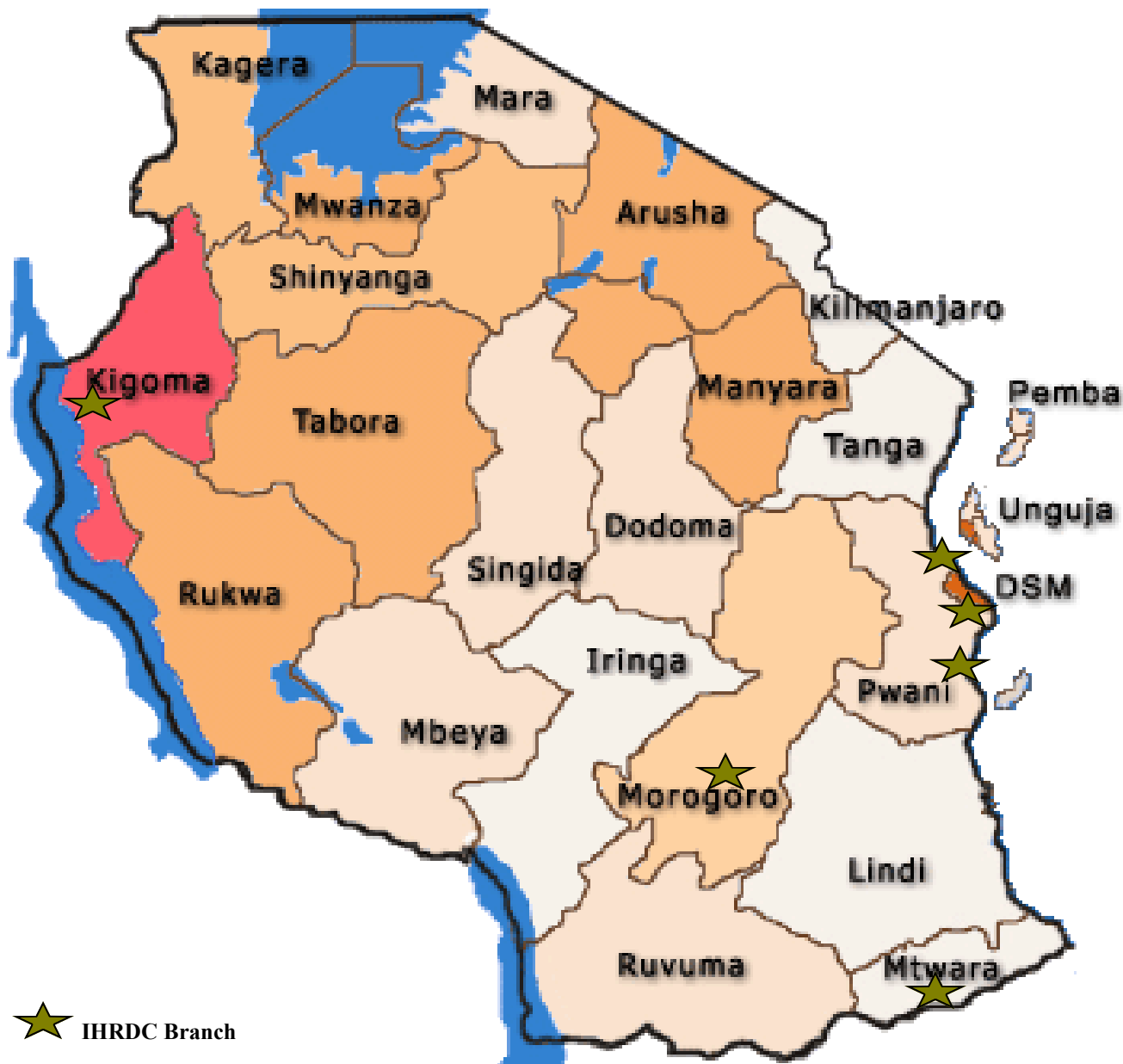
Is There Evidence for Dual Causation Between Malaria and Socioeconomic Status? Findings From Rural Tanzania

Authors: *Masha F. Somi, James R. G. Butler, Farshid Vahid, Joseph Njau, S. Patrick Kachur, and Salim Abdulla*

Malaria's relationship with socioeconomic status at the macroeconomic level has been established. This is the first study to explore this relationship at the microeconomic (household) level and estimate the direction of association. Malaria prevalence was measured by parasitemia, and household socioeconomic status was measured using an asset based index. Results from an instrumental variable probit model suggest that socioeconomic status is negatively associated with malaria parasitemia. Other variables that are significantly associated with parasitemia include age of the individual, use of a mosquito net on the night before interview, the number of people living in the household, whether the household was residing at their farm home at the time of interview, household wall construction, and the region of residence.

CONCLUSION: Matching estimators indicate that malaria parasitemia is associated with reduced household socioeconomic.

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★ IHRDC Branch

IFAKARA OFFICE:

P.O. Box: 53
Ifakara

Tel.: +255 232 625 164

Fax: +255 232 625 312
Email: ifakara@ihi.or.tz

DAR ES SALAAM OFFICE:

P.O. Box 78373
Dar Es Salaam

Tel.: +255 222 774 714

Fax: +255 222 771714
Email: info@ihi.or.tz

Website: www.ihi.or.tz

MTWARA OFFICE:

P.O. Box: 1048
Mtwara

Tel.: +255 232 333 487

Fax: +255 232 333 487

Email: mtwara@ihi.or.tz

BAGAMOYO OFFICE:

P.O. Box: 74
Bagamoyo

Tel.: +255 232 440 065

Fax: +255 232 440 064

Email: brtu@ihi.or.tz

RUFIJI OFFICE:

P.O. Box: 40
Ikwiriri

Tel.: +255 232 010 007

Fax: +255 232 010742
Email: rdss@ihi.or.tz

KIGOMA OFFICE:

P.O. Box: 1077
Kigoma

Tel.: +255 282 803 655

Email: kigoma@ihi.or.tz