Malaria attributable mortality estimation. What contribution can INDEPTH network make to global estimates?

Presentation at INDEPTH 12 International Scientific Conference

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On behalf of the MBE working group

Outline of Presentation

- Background
- The key issues
- Why INDEPTH?
- What has been done? The MTIMBA story
- What can be done?
- Proposed activities
- Seek your support

Background

- Global Malaria Mortality Estimation is being looked at in order to address differences reported
- GMP/WHO constituted the Malaria Policy Advisory Committee (MPAC) to look at malaria burden estimation
- MPAC endorsed the creation of an Evidence Review Group (ERG) on malaria burden estimation.
- Owusu/Aponte/Peter/Salim members of ERG
- CHERG, IHME, MAP, Tom Smith invited to report at the meeting
- It became evident from the discussions that INDEPTH had empirical data that could contribute to reliable estimates.

The key issues

- Existing approaches
  - **WHO**
    - Uses VA-based relationship between endemicity and malaria mortality in children, and a model fitted to hospital data to estimate adult rates relative to those in children.
  - **IHME**
    - CodeM algorithm for estimating proportionate mortality in endemic areas based on a limited VA study

- Deficiencies identified
  - All methods are based on VA
  - IHME estimates far more adult malaria deaths.

Why INDEPTH

- Existence of relevant empirical data in a number of DSS sites
  - VA
  - Malaria incidence
  - Malaria prevalence
  - Transmission (EIR data)

Plausible to consider a multi-site prospective analysis of age-specific mortality in relation to prevalence/transmission in a no. of sites

- Capable of conducting prospective studies recommended by MBE group
  - Malaria incidence in adults
  - Case-control studies

What have we done as INDEPTH?

MTIMBA

Mortality rates determined by prospective demographic surveillance

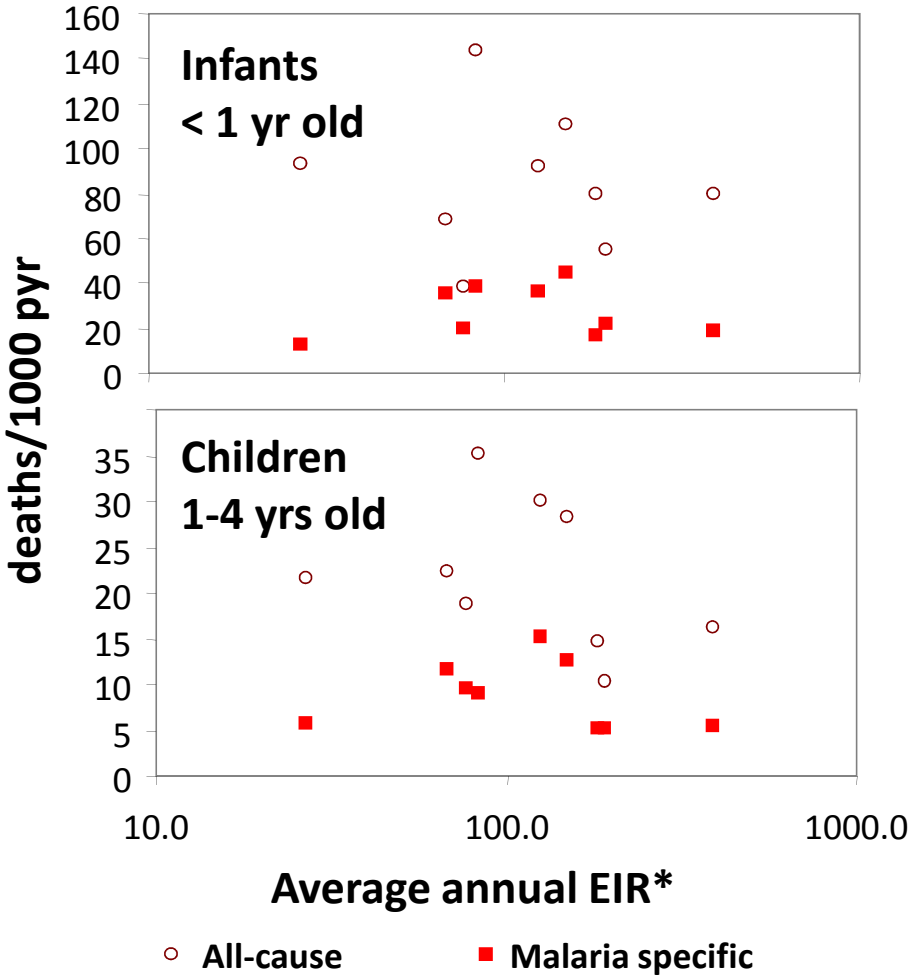
Site	Country	Period	Person-years at risk (children<5)	Deaths in children <5	
				No.	Rate/1000 person-years
Ifakara	Tanzania	2001-2004	35569	1030	29.0
Kisumu	Kenya	2001-2004	53158	2882	54.2
Kourweogo	Burkina Faso	2002-2003	24723	1118	45.2
Manhica	Mozambique	2001-2004	20045	736	36.7
Navrongo	Ghana	2001-2004	53231	1492	28.0
Niakhar	Sénégal	2002-2003	5482	179	32.7
Nouna	Burkina Faso	2002	13268	336	25.3
Oubritenga	Burkina Faso	2002-2003	76135	3246	42.6
Rufiji	Tanzania	2001-2004	42839	829	19.4

Entomological Inoculation Rates (EIR) determined by light trap collections and ELISA tests for sporozoites

Site	**Number of light trap collections**	***An. gambiae* caught**	***An. gambiae* sporozoite rate (%)**	***An. funestus* caught**	***An. funestus* sporozoite rate (%)**
Ifakara	2812	79481	1.02	18278	1.66
Kisumu	329	1390	2.16	60	0.00
Kourweogo	2864	14600	13.54	720	8.47
Manhica	6928	3689	1.27	21163	1.47
Navrongo	3302	50865	4.26	59854	3.95
Niakhar	704	1789	2.97	5	nd
Nouna	1592	16156	9.37	4603	3.00
Oubritenga	5756	41166	8.42	2204	4.92
Rufiji	5581	17885	3.51	16205	2.45

MTIMBA

Comparison between sites

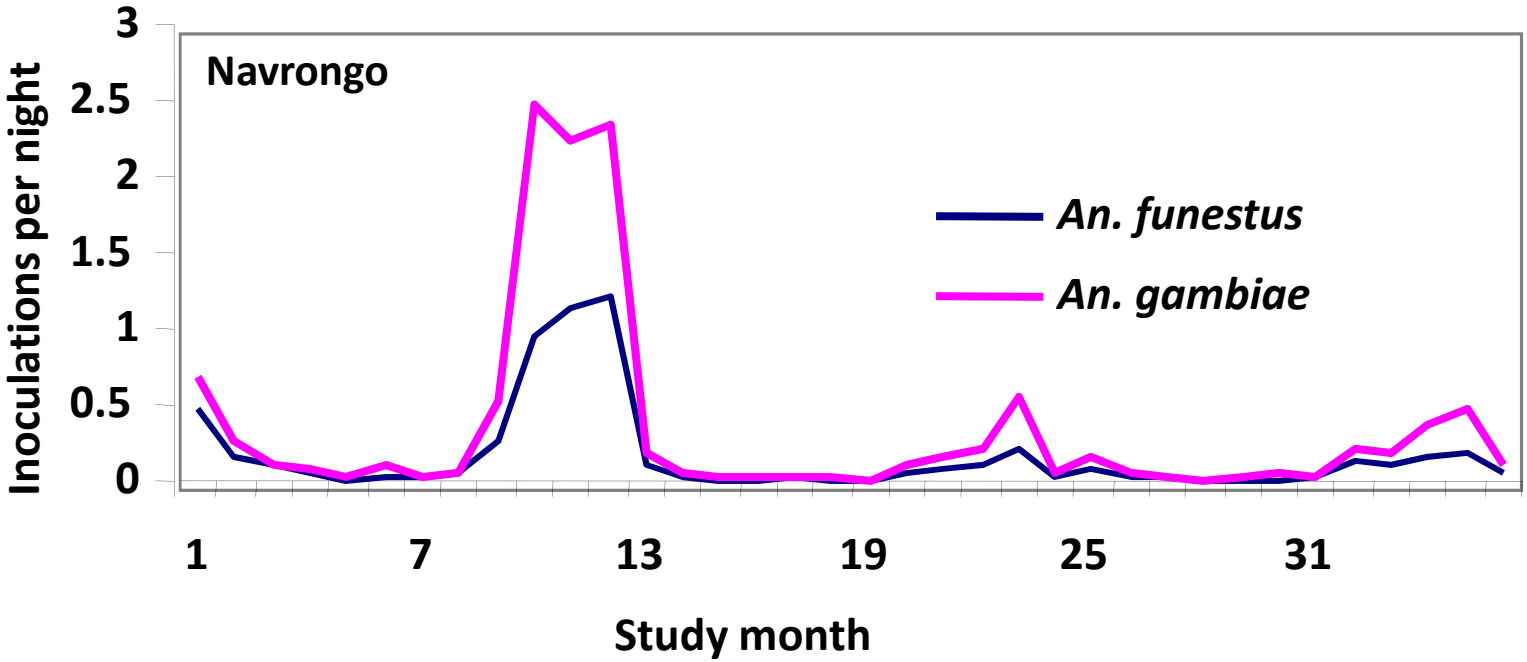


- No clear pattern emerged
- Unexplained variation between sites may reflect:
  - Different competing causes
  - Differences in health systems
  - Effects of bednets or socio-economic confounders
  - Variations in trapping efficiency of light traps

* using regional (W. and E. Africa) specific estimates of the trapping efficiencies of the light traps

Variation within sites

- Sampling period within sites was up to 3 years.
- Mosquito densities show strong seasonal and inter-annual variation



- Most sites sampled many locations
- Spatial smoothing of mosquito densities and sporozoite rates -> estimates of EIR across the whole map

What can we do as INDEPTH? Proposed activities

1. Workshop: Bring together all available individual level and geo-located **prevalence** data for INDEPTH sites, together with covariate data (in particular data on ITN coverage over time and on treatment rates), and mortality data.

2. Also **contributing any VA records** you have which contain a record of malaria testing (slide or RDT), with positive or negative result, and any cause of death.

3. Creation of virtual cohorts for prospective analysis of the relationship between rates of excess all-cause mortality and history of exposure as measured by prevalence.

4. Creation of virtual cohorts for prospective analysis of the relationship between rates of excess all-cause mortality and history of exposure as measured by EIR (This would represent a logical extension of the MTIMBA project).

5. Presentation of the results as rates of attributable age-specific mortality in relation both to current exposure and history of exposure.
   a. This would require the use of non-trivial statistical approaches, e.g. space-time Bayesian models to allow propagation of uncertainty into the exposure response estimates.
   b. sensitivity analyses to explore how the estimated relationships depend on uncertainties in the history of exposure.

Next steps

- Approved activity by the board
- Requests gone to all cenre leaders, seeking for information for defined periods on

  - VA/COD data,
  - malaria incidence
  - Malaria morbidity
  - Malaria prevalence
  - Malaria transmission
  - Geo-locations (malaria and mortality)
  - Contextual data
  - Opportunities for New studies (case-control, virtual cohorts)
  - Etc etc

We seek your support on this when requests come through

Next steps contd.

- A template has been sent by the ED to all member-centres
- The templates were to be completed and sent to me and ED by ISC2013
- Some centres have completed and sent completed templates to us
- Remaining are to follow suit
- The template will be discussed at the MBE working group meeting
- A workshop planned for data collation and analyses in Q1

Next steps contd.

At the workshop:

- Data sets at the individual and household levels wherever possible, to be prepared by each member-centre prior to the workshop
- Data dictionaries will be discussed at the working group meeting
- We need from each participation centre,
  - a focal malaria person at the workshop
  - A seasoned data manager/statistician
- Participation will be based on availability of data

In conclusion

- INDEPTH has had lots of good wills until now
- Our contribution to reliable estimates and making relevant information available is the survival path we have to chart
- This is a golden opportunity to demonstrate we have reliable empirical data
- Some of us are prepared to work towards one of these goals
- Your support is required to be able to bring this to fruition.
- Come in your numbers to the working group meeting and ensure we

Acknowledgement

- Some individuals helping to drive this:
  - Tom Smith, STPHI
- GMP/WHO and MPAC/ ERG
- INDEPTH Board
- All member-Centres setting this as a priority agenda

Thank you