Pregnant women and children as sentinel populations

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Why pregnant women and children as sentinel populations?

- **Pregnant women and children under five visit health facilities frequently for routine care**
  - In most countries, a large proportion (>90%) of pregnant women visit antenatal care (ANC) at least once
    - Women attending ANC are thus representative of the general population of pregnant women
  - Children visit Expanded Programme on Immunization (EPI) clinics several times in the first year of life

Why pregnant women and children as sentinel populations?

- **Monthly attendance to routine care is relatively stable over time**

- **Majority of those attending ANC/ EPI clinics are healthy**

- **As compared to test positivity rates among febrile patients, which will fluctuate depending on the prevalent cause of fever, the proportion positive will more closely reflect population level prevalence**

Cross sectional surveys vs. Health facility Data

Cross sectional household survey

- Costly, requires substantial planning/ logistics

- Intermittent

- Generate spatial data at the level of selected clusters (though households can be individuals mapped)

Health Facility data collection

- Easier and less costly

- Continuous

- Generate spatial data at the level of the health facility catchment

Pregnant women and infants as sentinel populations to monitor prevalence of malaria: results of pilot study in Lake Zone of Tanzania

- **December 2012 to November 2013**

- **Kagera, Mwanza and Mara Regions in Lake Zone, Tanzania**

- **Non-probability sample of 54 health facilities**
  - 49 out of 131 eligible health centres (37.4 %)
  - 5 out of 42 eligible hospitals (11.9 %)

- **Pregnant women attending first ANC and infants 9-12 months old presenting for measles vaccination were screened for malaria infection using a malaria rapid diagnostic test (RDT), regardless of symptoms**

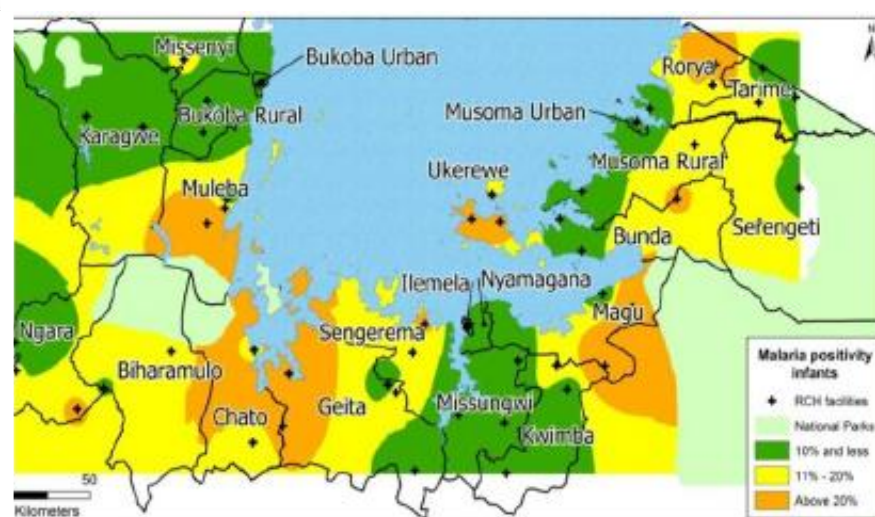# Prevalence of malaria among pregnant women and infants in Tanzania
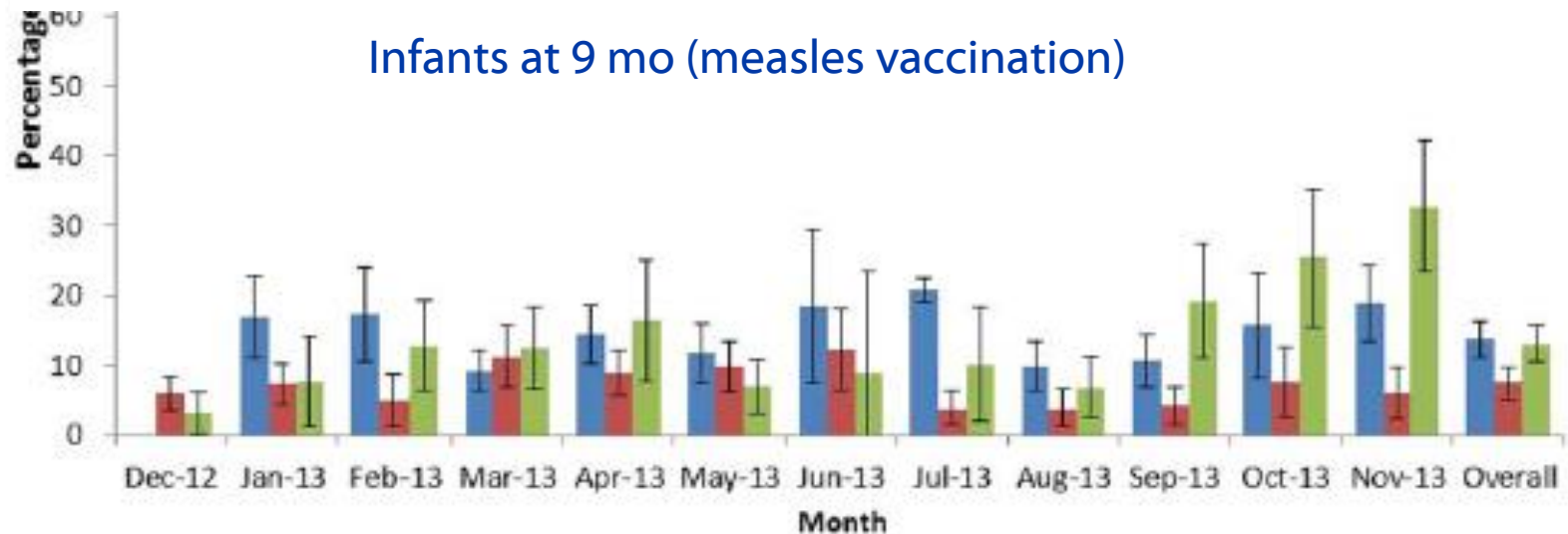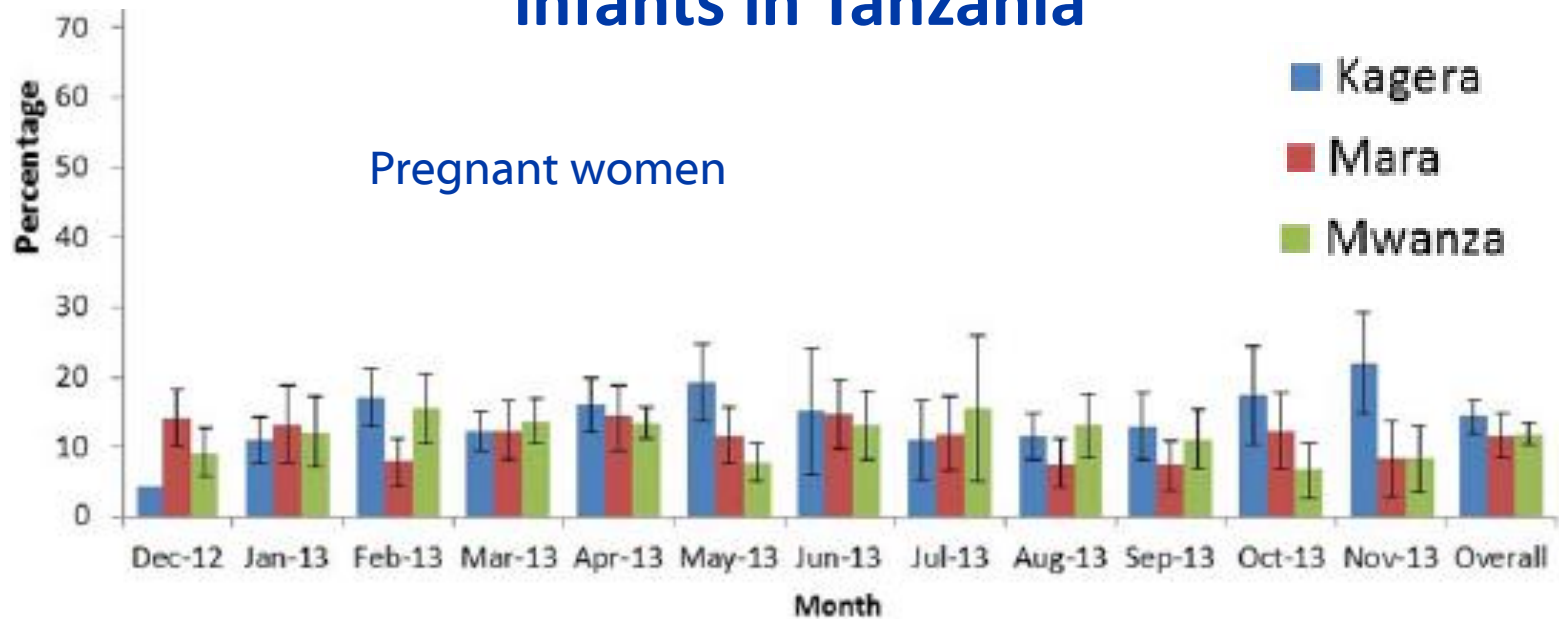
Geographical variation in proportion of pregnant women and infants positive for malaria

Pregnant women

Infants

- **Good spatial correlation between malaria prevalence in pregnant women and infants, especially in high transmission areas**

- **Spearman rho = 0.6; p < 0.001**

Willilio, et al. Malar J. 2016 Jul 29;15(1):392. doi: 10.1186/s12936-016-1441-0

How does the prevalence of parasitemia in pregnant women compare with that of children under five?

- **Meta-analysis by Van Eijk et al. assessed correlation between malaria prevalence in pregnant women and children 0–59 months**

- **Used 18 sources with 57 data points**
  - 17 surveys (1 health facility based and 16 community based)
  - 1 community based cohort study (Asembo Bay Cohort)

- **Strong linear relationship between the prevalence of malaria infection in pregnant women and children (r=0·87, p<0·0001)**

# How does the prevalence of parasitemia in pregnant women compare with that of children under five?

- **Prevalence was higher in children than pregnant women**
  - All gravidae (PPR= 1·44, 95% CI 1·29–1·62; I^2=80%, 57 studies)
  - Multigravidae (PPR= 1·94, 1·68–2·24; I^2=80%, 7 studies)
  - Primigravidae (PPR= 1·16, 1·05–1·29; I^2=48%, 8 studies) (marginal)

- **Pooled prevalence ratio (PPR) was higher in areas of higher transmission**

Prevalence of malaria in pregnant women vs. children under 5, sub-Saharan Africa, 1983 - 2012
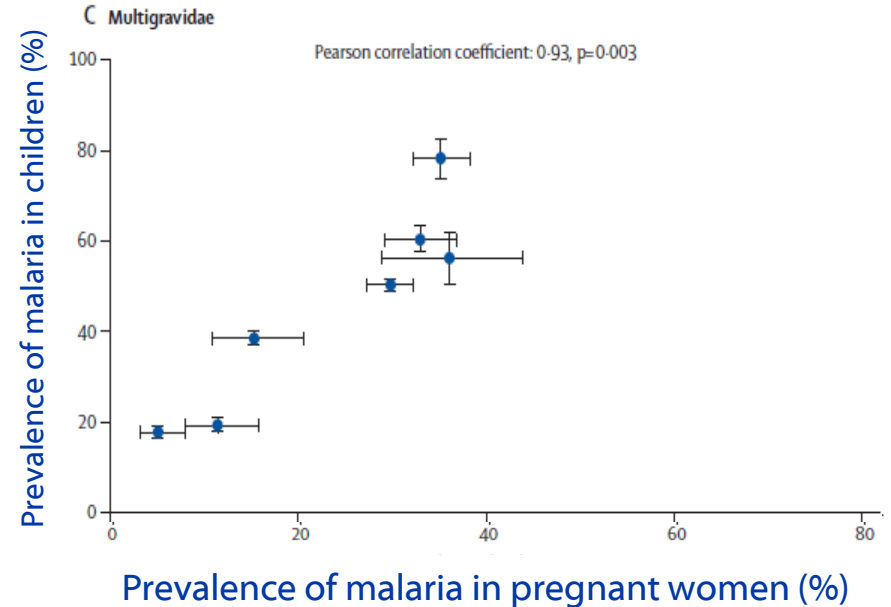

A All pregnant women

Pearson correlation coefficient: 0·87, p<0·0001

Prevalence of malaria in children (%)

Prevalence of malaria in pregnant women (%)
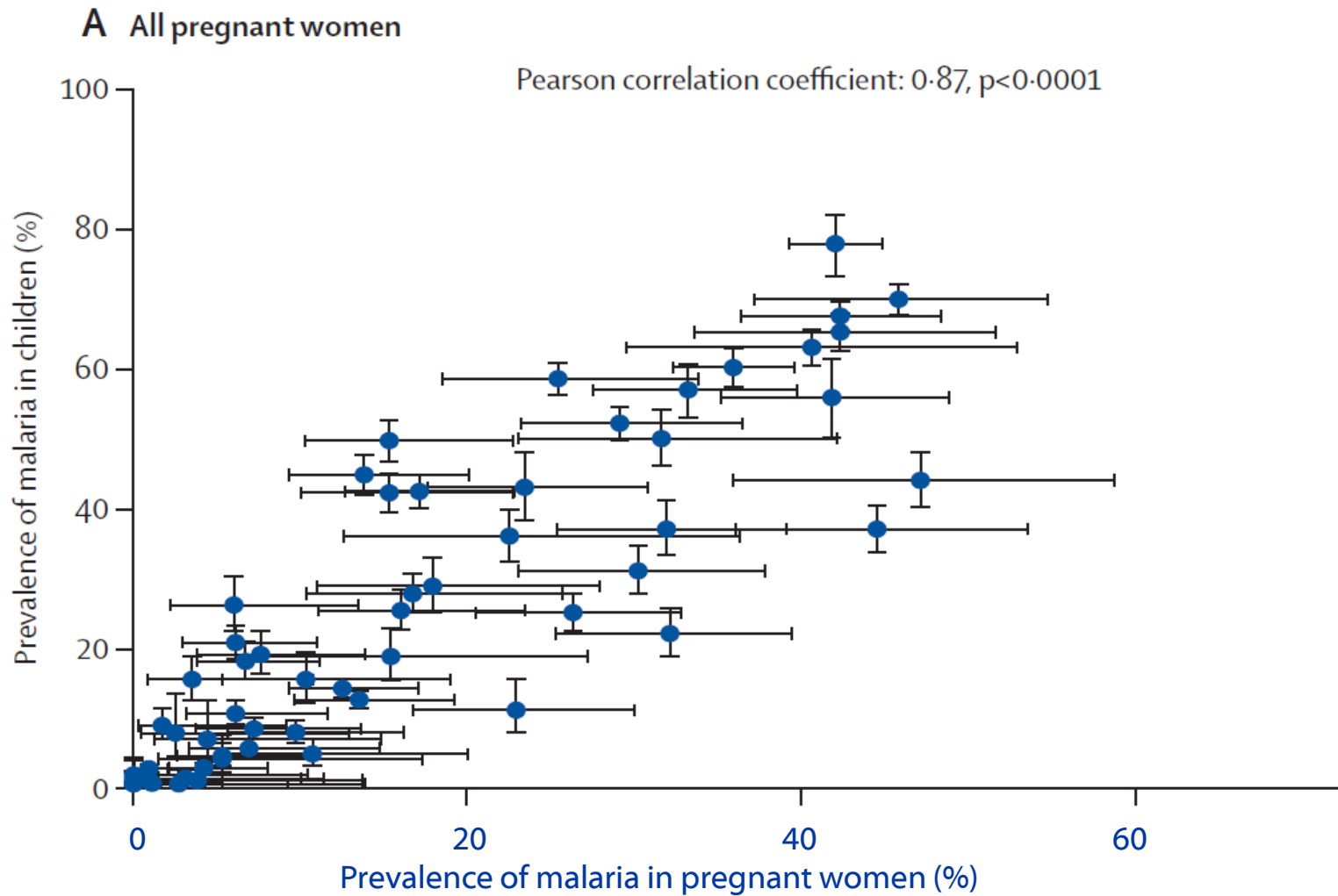
Prevalence of malaria in pregnant women vs. children under 5, sub-Saharan Africa, 1983 - 2012

Primigravidae
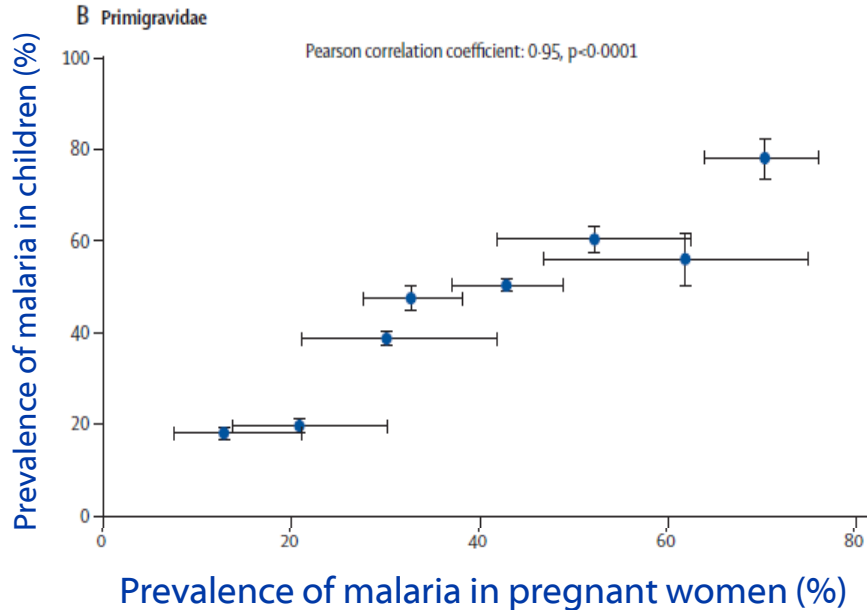

Multigravidae

$\rho = 0.95, p<0.0001$

$\rho = 0.93, p<0.003$

# Can we correlate malaria prevalence at ANC with community prevalence?

- **On-going study in Western Kenya comparing prevalence of malaria among women at 1st ANC and all-age prevalence in year-round community based malaria indicator surveys (cMIS), western Kenya**

- **ANC: Women are tested for malaria at 1st ANC, treated if positive. Location mapped to the health facilities**

- **cMIS: GPS mapped households randomly sampled Monday through Friday every week of the year, individuals are tested by RDT and treated if positive**

Correlation between malaria prevalence (RDT) at antenatal booking (ANC) and all-age prevalence in year-round community based malaria indicator surveys (cMIS), western Kenya

Slide provided by Aaron Samuels
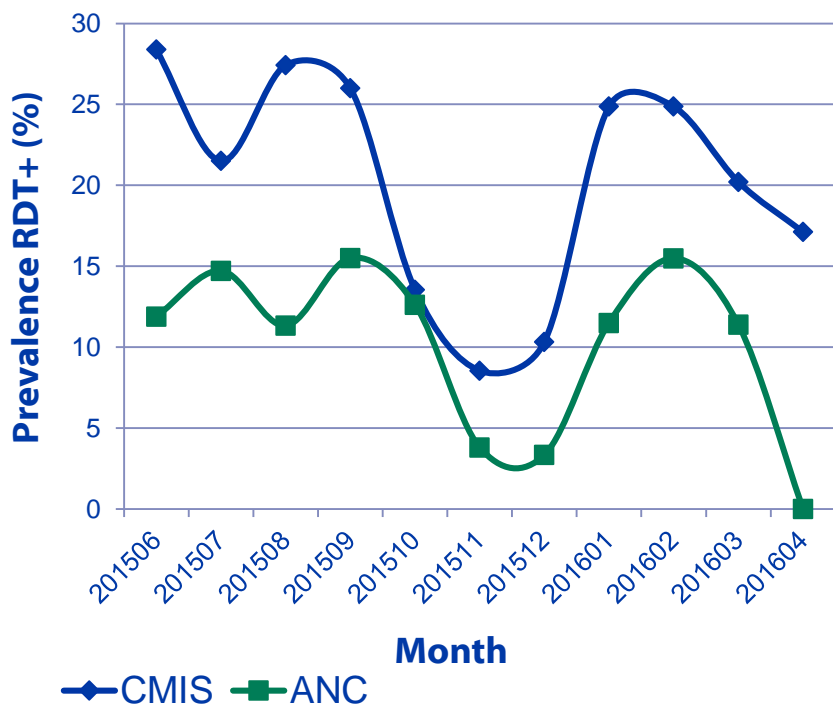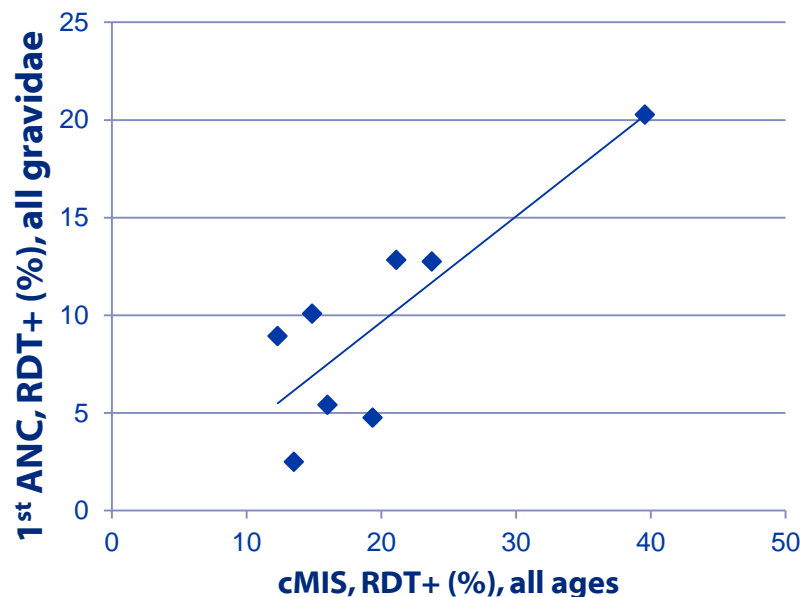
Practical issues related to facility based surveillance

- **Acceptability/ Feasibility**
  - Would asymptomatic individuals agree to testing? Would this policy affect attendance at ANC/ EPI clinics?
  - Effect on facility wait times- testing more people likely to increase wait times, which might also influence attendance rates

- **Data quality**
  - In general, health facility data are poor and reporting rates vary
  - RDT stock-outs would affect the quality and utility of data

- **Cost**
  - Cost of testing large numbers of largely asymptomatic individuals vs benefit to individual + utility of data

Conclusions

- **Populations accessible through health facilities may be used as a surrogate marker to monitor malaria prevalence continuously**

- **Pregnant women attending 1ˢᵗ antenatal care, particularly primigravidae, can serve as a useful indicator of malaria prevalence in the community**
  - Prevalence of malaria among primigravidae is similar to children under 5

- **Need to weigh the feasibility, acceptability, and cost of testing all patients versus the utility of this data**

For more information please contact Centers for Disease Control and Prevention

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