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

Pregnant women

Infants at 9 mo (measles vaccination)

Geographical variation in proportion of pregnant women and infants positive for malaria

- Good spatial correlation between malaria prevalence in pregnant women and infants, especially in high transmission areas
- Spearman rho = 0.6; p < 0.001

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 ($r=0.87$, $p<0.0001$)

Van Eijk et al., Lancet Global Health, August 19, 2015 http://dx.doi.org/10.1016/S2214-109X(15)00049-2
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; I²=80%, 57 studies)
  - Multigravidae (PPR= 1.94, 1.68–2.24; I²=80%, 7 studies)
  - Primigravidae (PPR= 1.16, 1.05–1.29; I²=48%, 8 studies) (marginal)

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

Van Eijk et al., Lancet Global Health, August 19, 2015 http://dx.doi.org/10.1016/S2214-109X(15)00049-2
Prevalence of malaria in pregnant women vs. children under 5, sub-Saharan Africa, 1983 - 2012

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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

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

Time ($r= 0.69, p=0.025$)

Space ($r= 0.84, p=0.0098$)

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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