



Prevention of malaria in pregnancy in sub-Saharan Africa: a synthesis and ecological analysis of national survey data

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Background

- The use of insecticide treated nets (ITNs) and intermittent treatment with at least two doses of sulfadoxine-pyrimethamine (IPTp) have been shown to reduce the burden of malaria in pregnancy and improve maternal health and birth outcomes

Objective

- To assess recent progress in coverage of these interventions in sub-Saharan Africa
- To explore factors associated with observed coverage
- Evaluation of equity

Methods

- Evaluation of correlates associated with coverage
 - Time between policy and survey
 - National malaria exposed births for 2010
 - Population density
 - Use of ANC (at least 1 or 2 visits, median month of start ANC, start ANC before 6 months)
 - Tetanus
 - Country with assistance from the President's Malaria Initiative for >1 year before survey
 - Disbursement from external funds
- Evaluation of distribution by:
 - socio-economic status
 - education status
 - location of residence

National surveys sub-Saharan Africa



Information about ITN, IPTp and ANC use at national level

United Nations Population Division 2010 revised database*



Estimated number of live births/country for 2010

Gething 2010*: % of population malaria exposed
Dellicour 2010*: Live and still births



Estimated number of malaria exposed births (live and stillbirths) per country



Coverage (% and number) for ITN and IPTp per country and overall

*References: Gething et al 2010, PLoS Computational Biology 6(4): e1000724
Dellicour et al 2010, PLoS Medicine 7(1): e1000221.
UNDP: <http://www.un.org/esa/population/>



United Nations Population Division 2010 revised database*



Population density



Population size



Gething 2010*: % of population malaria exposed



Estimated number of malaria exposed population per country



Organisation for Economic Co-operation and Development*



Disbursement of money for malaria control by external organizations per year



Disbursement per capita malaria exposed persons per year per country

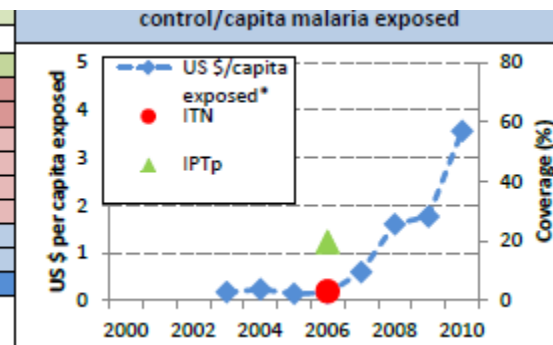
*References: Gething et al 2010, PLoS Computational Biology 6(4): e1000724
UNDP: <http://www.un.org/esa/population/>
OECD: <http://www.oecd.org>



Information available in malaria in pregnancy country profiles

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
ITN (%)							19.6					DHS
IPTp2 (%)							3.0					DHS
Any SP (any source, %)							4.9					DHS
Any am prevention (%)		82.2					81.9					
ANC (≥1 visit, %)		87.3					88.0					
Tetanus (%) †		50.1					58.9					
Iron(%)		84.1					86.1					
Disbursement (millions)				1.24	1.73	1.09	1.15	4.76	13.39	15.14	31.49	
Population exposed (1000)	6518	6721	6938	7165	7398	7634	7872	8113	8356	8602	8850	
Disbursement/capita				0.17	0.23	0.14	0.15	0.59	1.60	1.76	3.56	

Abbreviations: AM: antimalarial; ITN: insecticide treated net, IPTp: intermittent preventive treatment; SP sulfadoxine-pyrimethamine
 †Tetanus: 2001: 2 or more, 2006: "Protected"



Targets for malaria control among pregnant women over the last decennium in sub-Saharan Africa

By **2005**:

60% of pregnant women at risk of malaria

-benefit from ITNs
-have access to chemoprophylaxis or IPTp

Source: Abuja Declaration 2000

By **2010**:

80% of people at risk preventive measures

Pregnant women:

-**80%** ITNs
-**80%** IPTp in areas of stable malaria

Source: Roll Back Malaria 2008 Global Malaria Action Plan

By **2015**:

100% of people at risk preventive measures

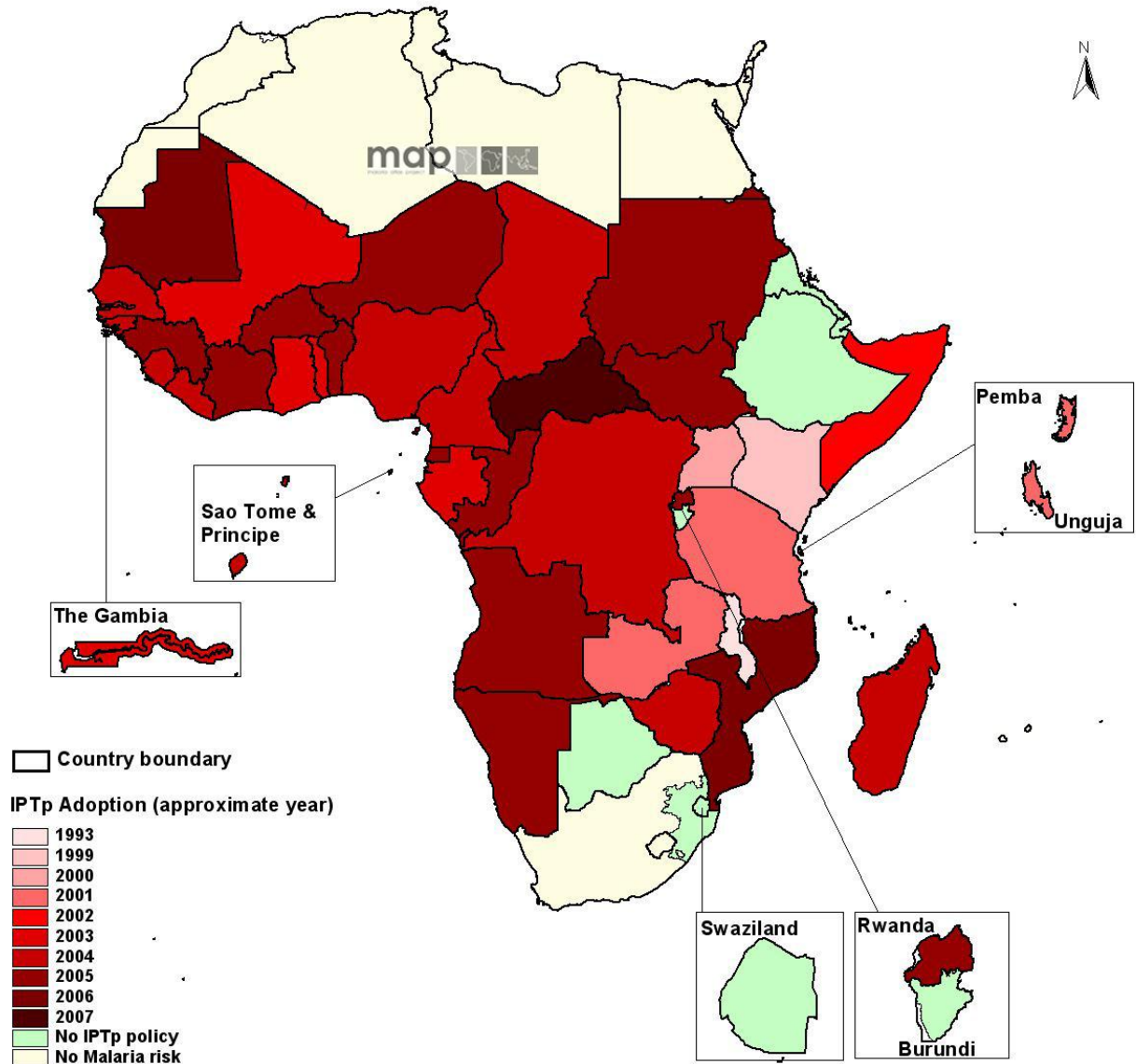
Pregnant women:

-**100%** ITNs
-**100%** IPTp

Source: Roll Back Malaria 2011 Updated Global Malaria Action Plan

Policies

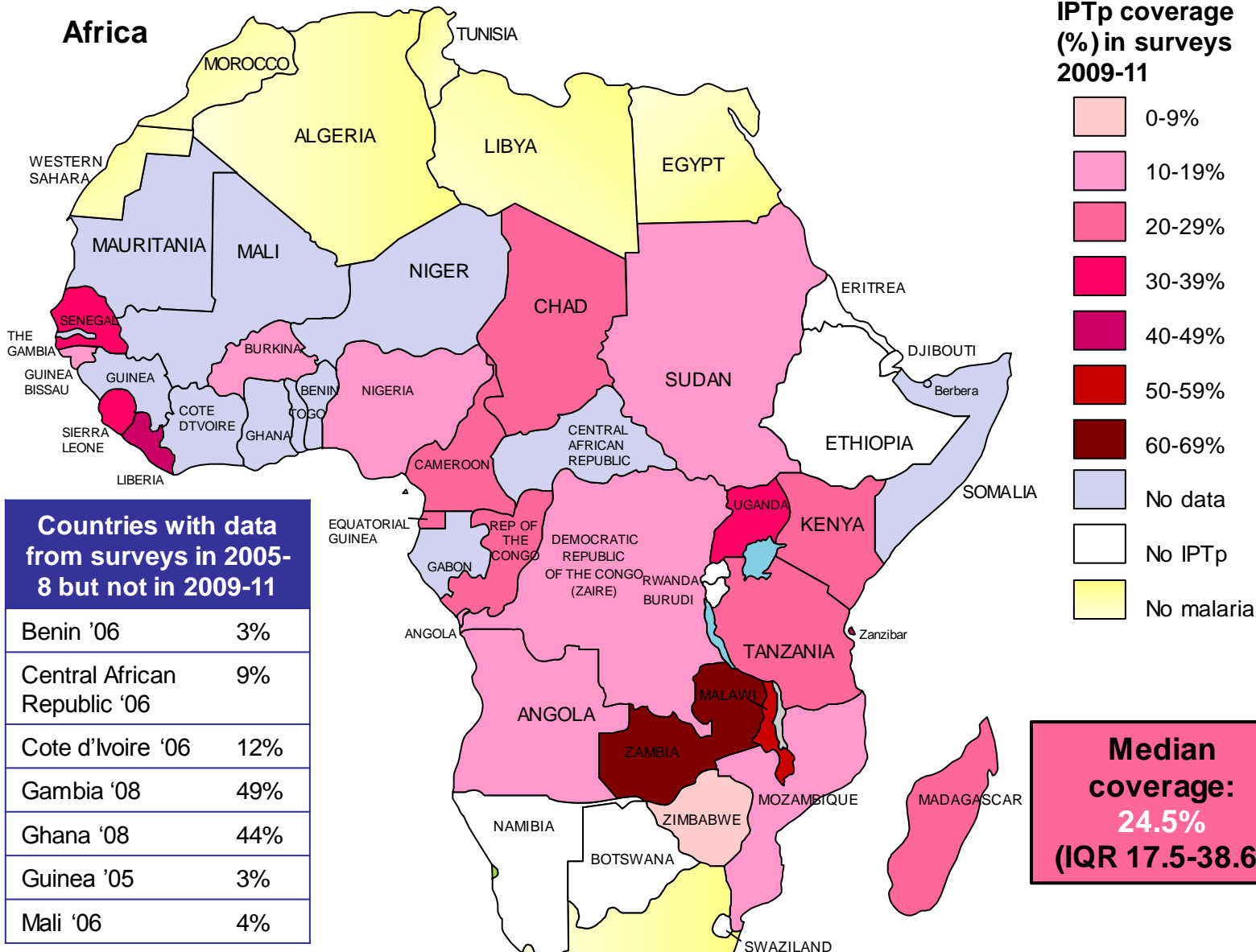
- 45 countries evaluated
 - 45 ITN policy
 - 38 IPT policy



Spread of IPTp policy across Africa

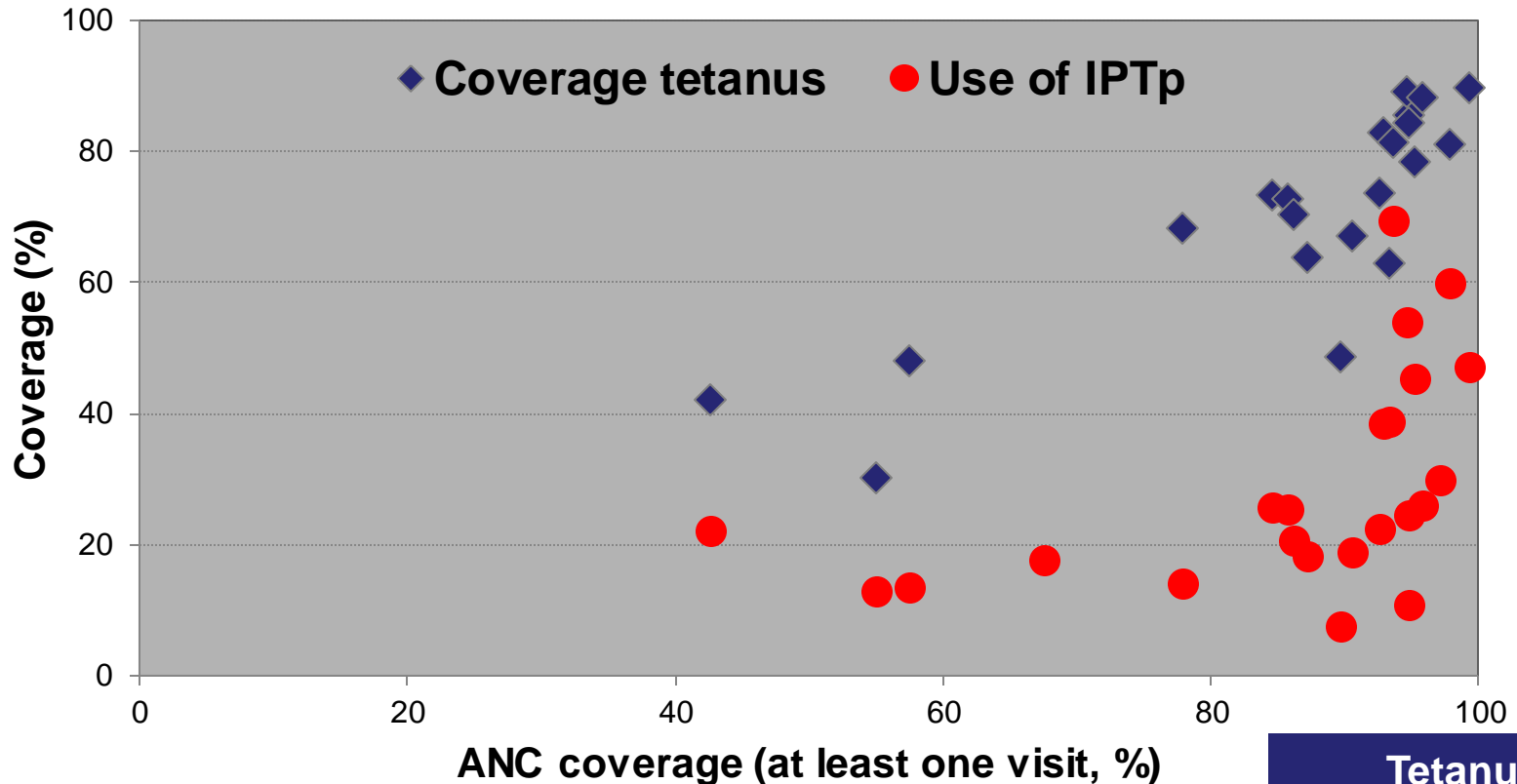


Africa



IPTp current situation 2009-2011, 23 countries

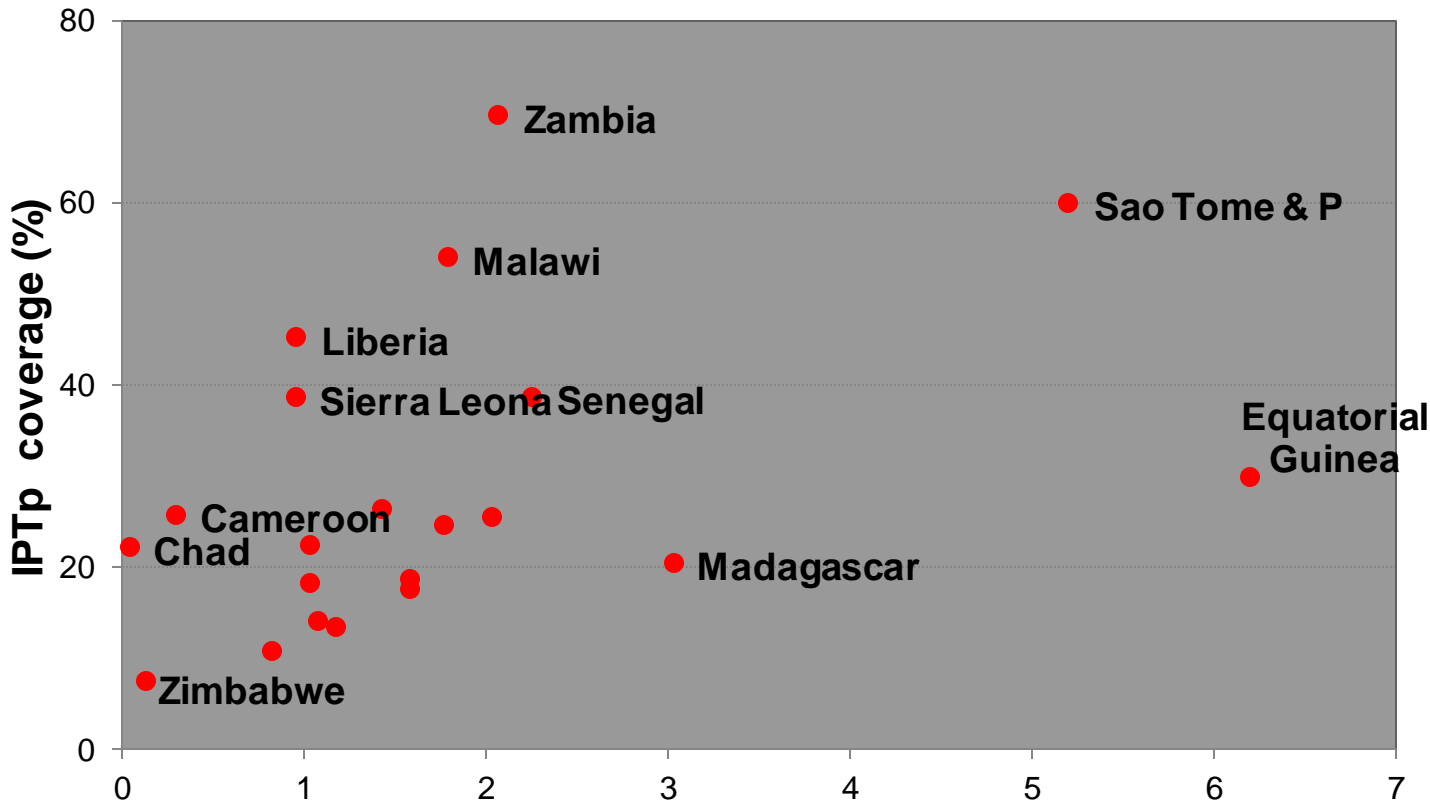
Coverage of IPTp and tetanus by ANC USE (at least one visit)



Spearman test ANC and IPTp: $\rho = 0.638$, $p=0.001$;
Tetanus and IPTp: $\rho = 0.596$, $p=0.004$

Tetanus
median coverage:
73.3%
(IQR 63.3-83.6%)
(21 countries)

Disbursements for malaria control by external organizations vs. IPTp coverage in 21 sub-Saharan countries, 2009-2011



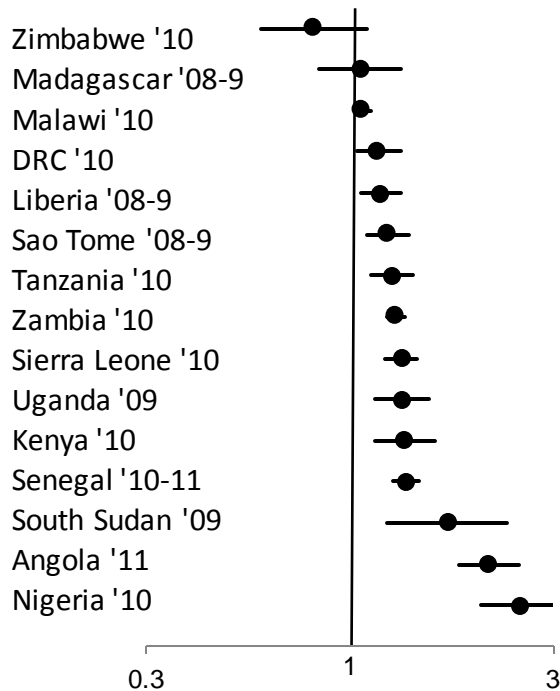
Average amount of disbursement for malaria control by external organizations per year per capita malaria exposed in the 2 years before the survey in US\$

Median disbursement
US\$ 1.44
Range 0.02-6.21
21 countries

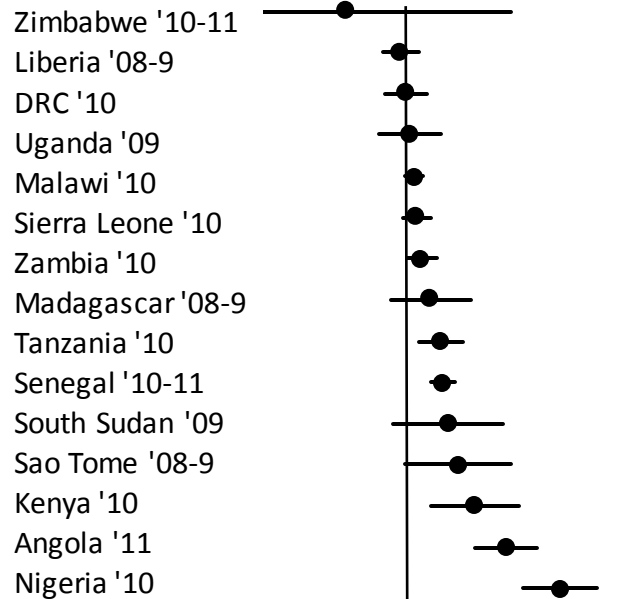
Spearman test: $\rho = 0.412$, $p = 0.062$

IPTp coverage by socio-economic status, educational status and place of residence in sub-Saharan countries, 2009-2011

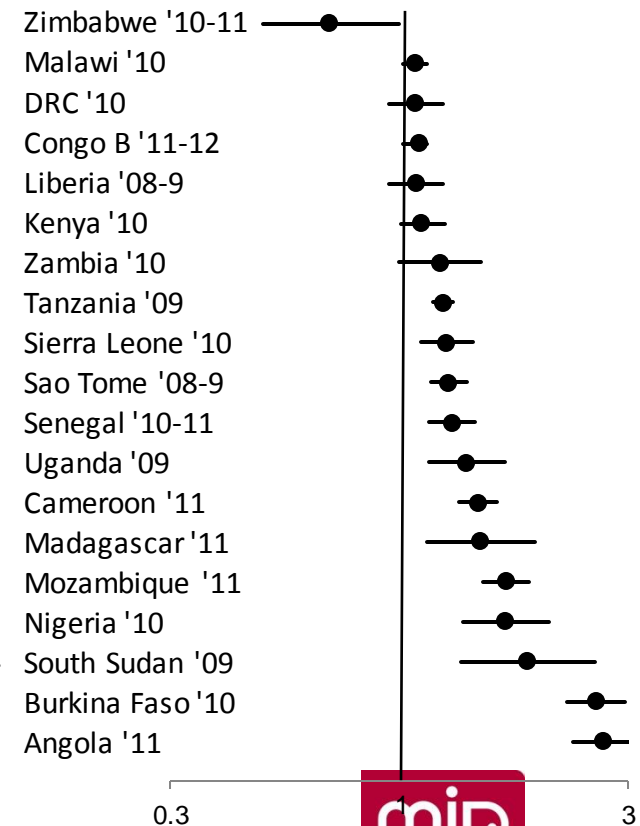
Socio-economic status
Risk ratio 2 highest vs. 3 lowest wealth quintiles, 95% CI



Education status
Risk ratio any education vs. none, 95% CI

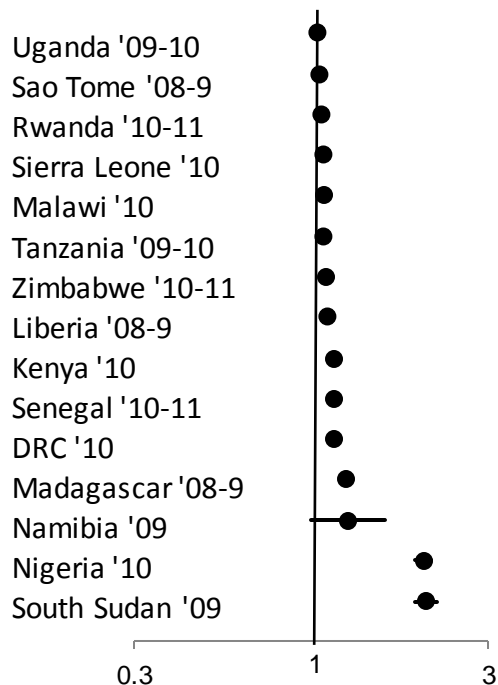


Place of residence
Risk ratio urban vs. rural location, 95% CI

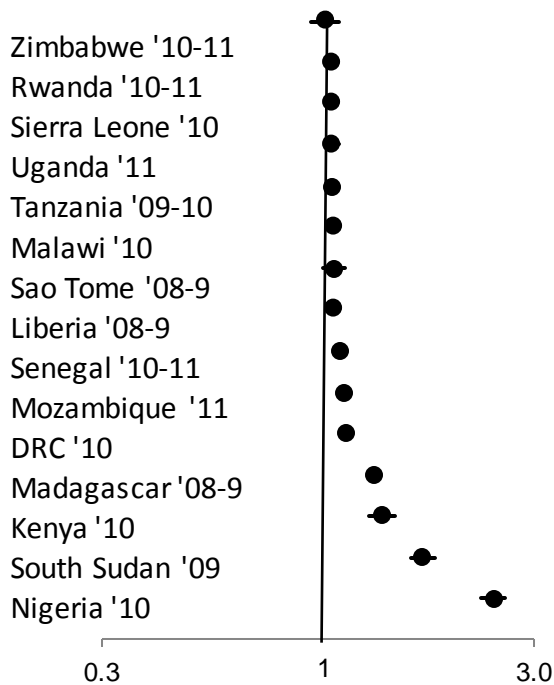


ANC coverage (at least one visit) by socio-economic status, educational status and place of residence in sub-Saharan countries, 2009-2011

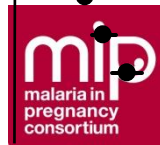
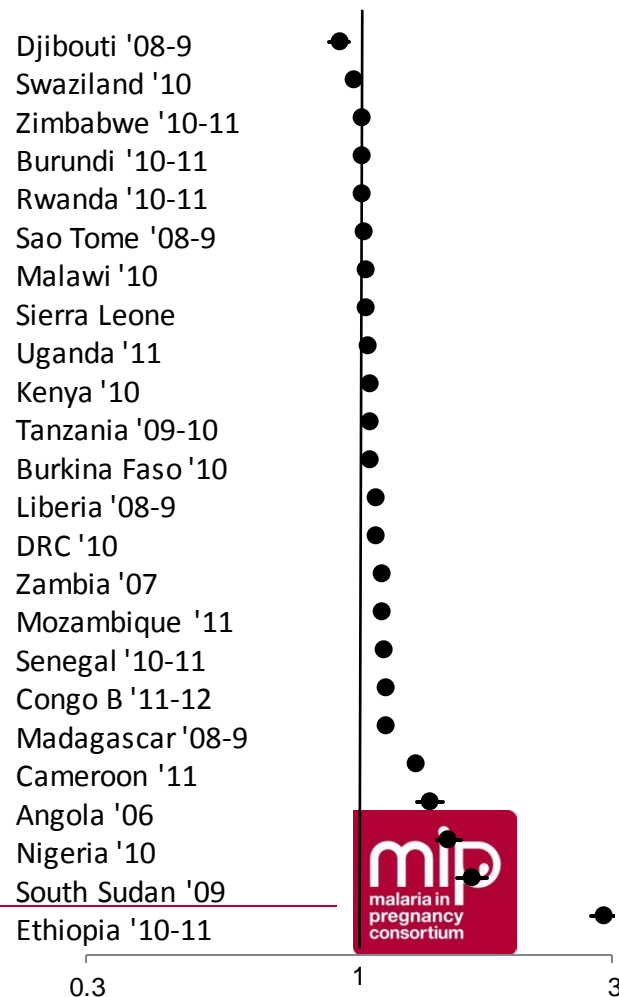
Socio-economic status
Risk ratio 2 highest vs. 3 lowest wealth quintiles, 95% CI



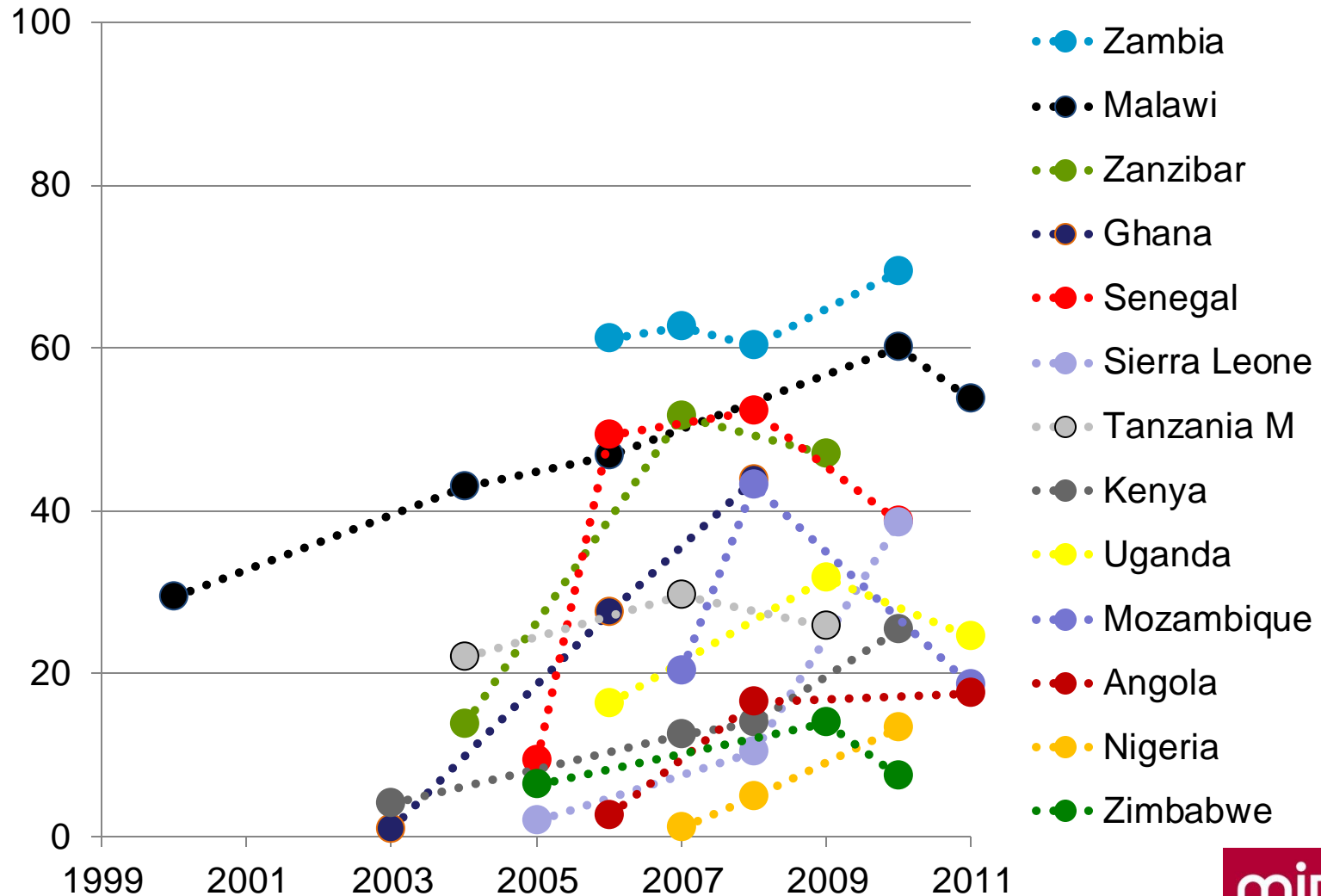
Education status
Risk ratio any education vs. none, 95% CI



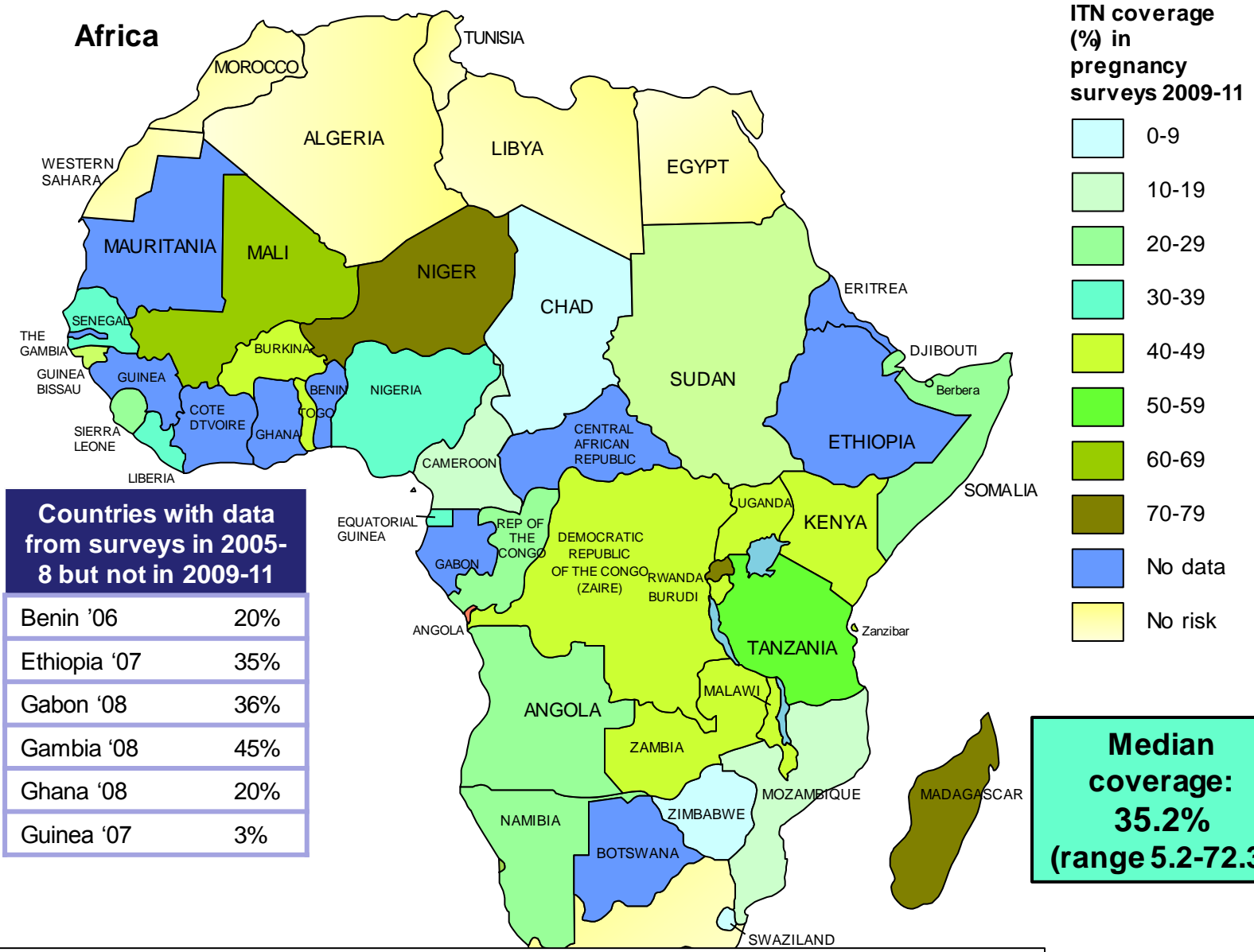
Place of residence
Risk ratio urban vs. rural location, 95% CI



13 Countries with information on IPTp coverage from three or more surveys



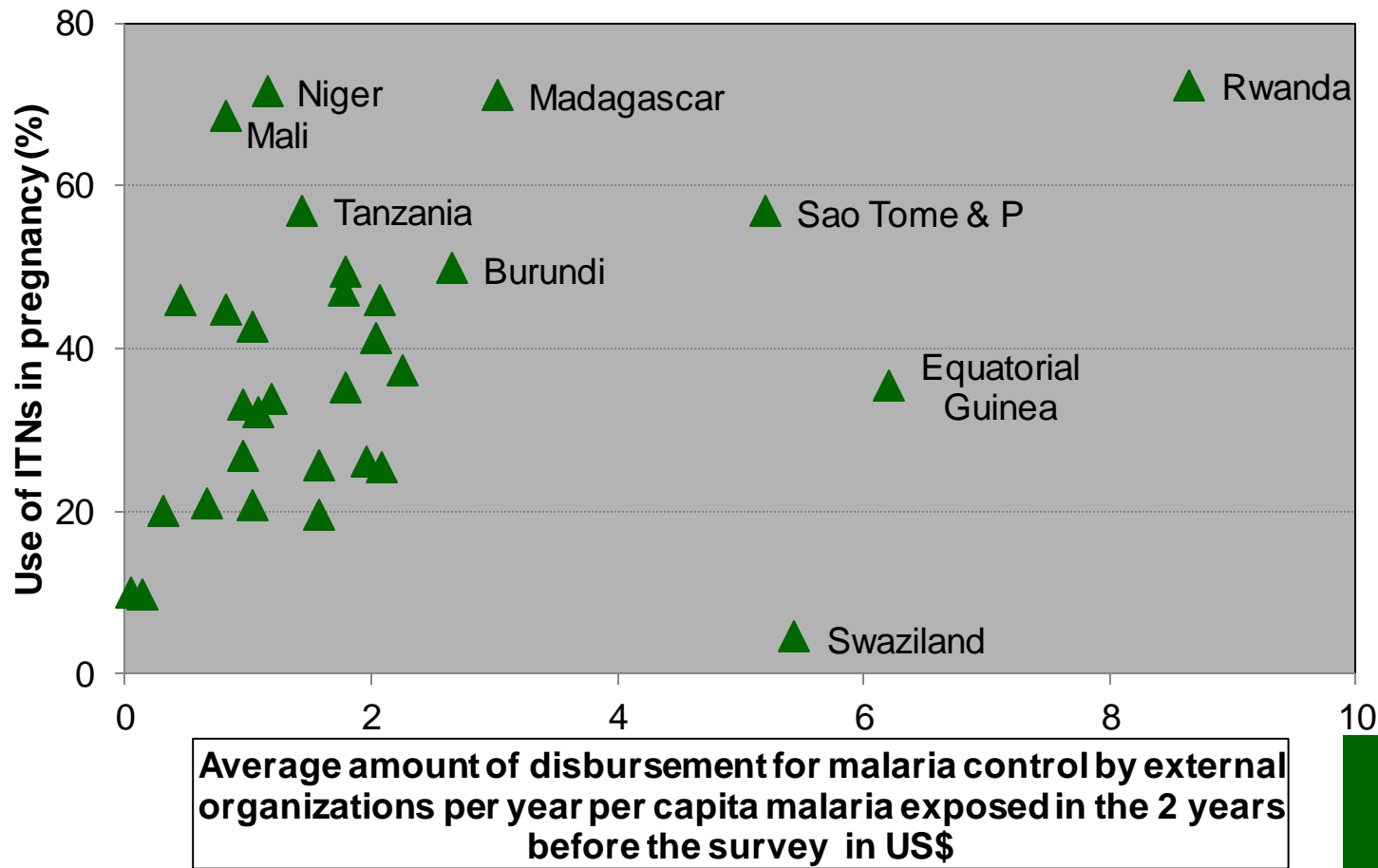
Africa



ITN coverage in pregnancy 2009-11



Disbursements for malaria control by external organizations vs. ITN coverage in 31 sub-Saharan countries, 2009-2011

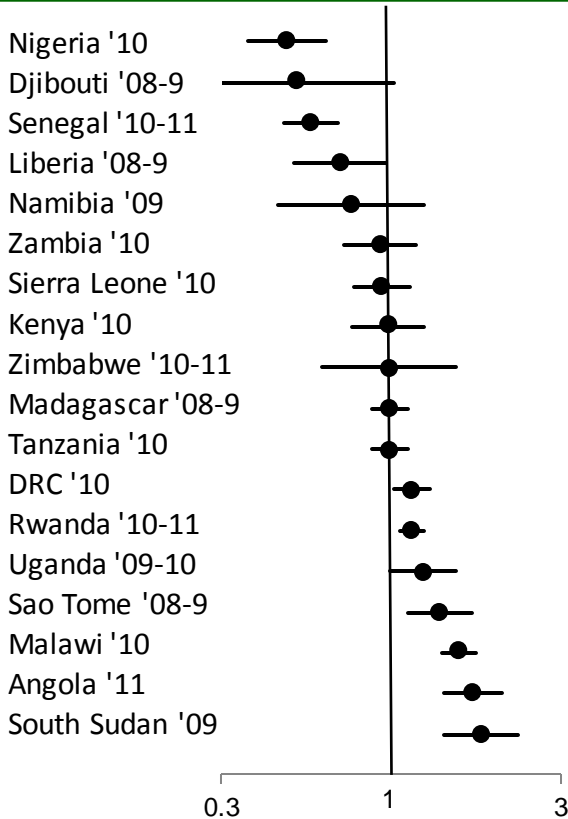


Spearman test: $\rho = 0.345$, $p = 0.062$

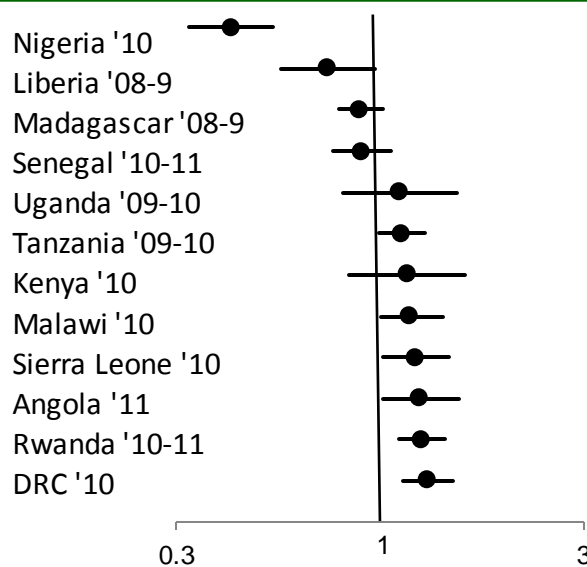
Median
disbursement
US\$ 1.52
Range 0.05-8.65
30 countries

ITN use by socio-economic status, educational status and place of residence in sub-Saharan countries, 2009-2011

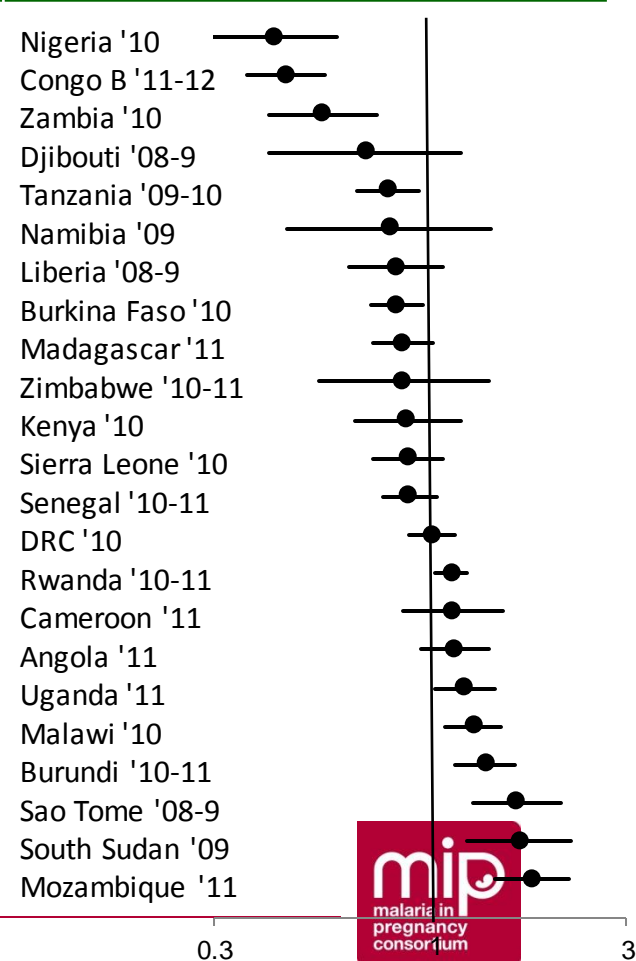
Socio-economic status
Risk ratio 2 highest vs. 3 lowest wealth quintiles, 95% CI



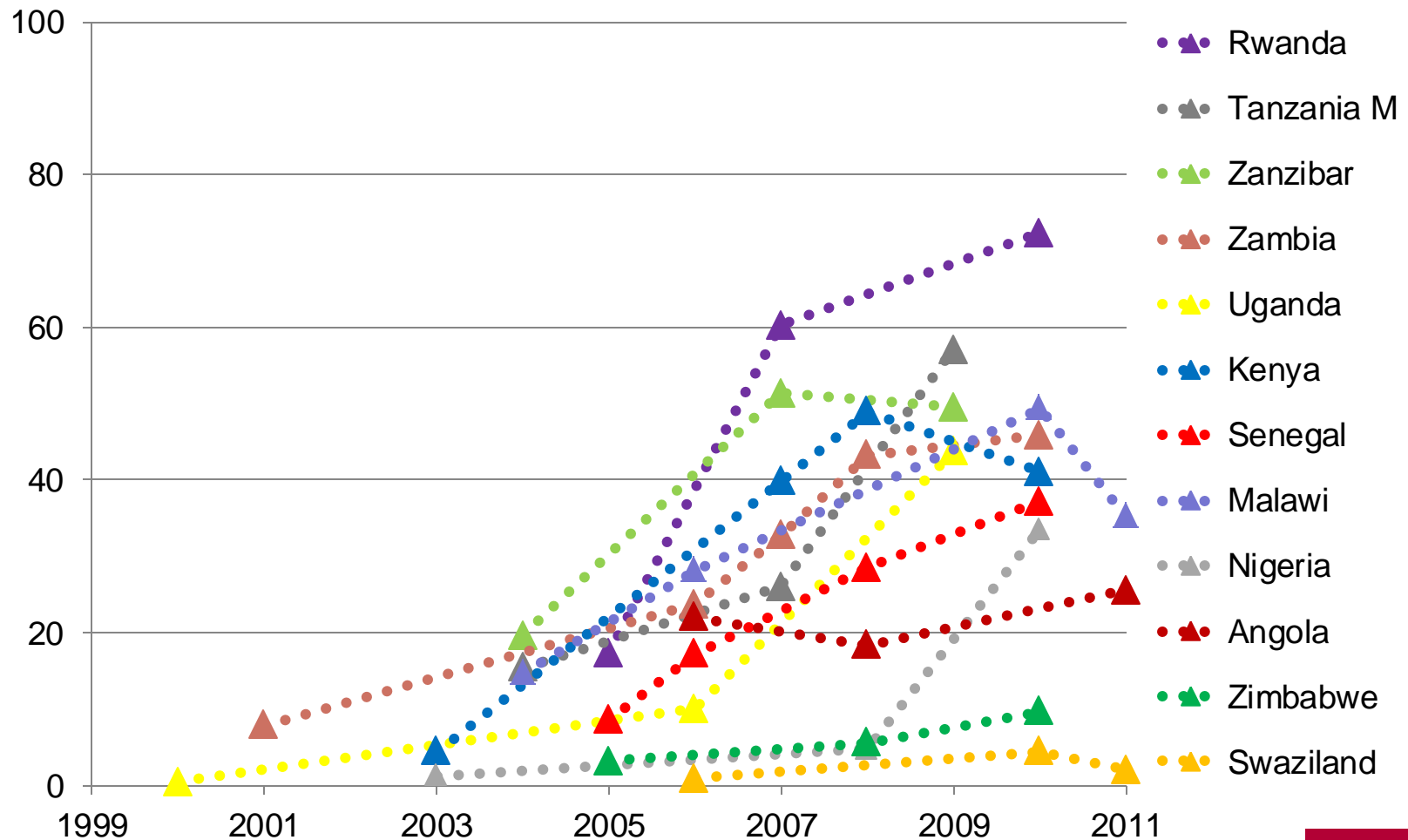
Education status
Risk ratio any education vs. none, 95% CI



Place of residence
Risk ratio urban vs. rural location, 95% CI



12 Countries with three or more surveys with information on ITN use in pregnancy



Correlates with coverage

	IPTp rho*, p	ITN rho*, p
Time between policy adoption and survey	0.257, p=0.2	0.024, p=0.9
National number of malaria exposed births	-0.308, p=0.2	0.206, p=0.3
Population density	0.270, p=0.2	0.343, p=0.05
ANC coverage (at least 1 visit)	0.638, p<0.01†	0.364, p=0.04
Support Presidential Malaria Initiative†	p=0.1‡	P=0.02‡
Disbursement for malaria control §	0.412, p=0.06	0.345, p=0.06

*: Spearman's rho for correlation (non-parametric test)

† Also significant for at least two ANC visits, and ANC started before 6 months of gestation

‡ Mann-Whitney U test (non-parametric test)

§ Average amount of disbursement for malaria control by external organizations per year per capita malaria exposed in the 2 years before the survey in US\$

Extrapolation of survey data to absolute numbers of births

2007

Surveys 2004-2009

IPTp 2 doses

- Data from 19 countries
- 13.6% covered
 - 2.7 million births



2010

Surveys 2009-2011

IPTp 2 doses

- Data from 23 countries
- 21.6% covered
 - 4.4 million births

ITN

- Data from 32 countries
- 17% covered
 - 4.7 million births



ITN

- Data from 33 countries
- 38.5% covered
 - 9.3 million births

Some limitations

- Reliance on public availability of national reports
 - MICS IV reports 2010-11 not available : West African countries more affected
 - All countries received Global Fund money, no guarantee for public reports
 - no (recent) public reports on coverage for ITNs: Eritrea, Cote d'Ivoire, Central African Republic, Mauritania
 - No reports on IPTp for Mauritania, Gabon
- Tetanus not ideal for comparison at ANC level
- Estimates risk ratios for equity not adjusted for survey design
- Analysis not by first administrative units
 - National coverage misleading in countries which are only partly malaria endemic

For the meeting participants

Take away headlines & surprising findings

- Slow increase overall, but large discrepancies between countries
- External funding and assistance important, but not the most important factor
- Number of births or population density not an important factor
- ANC correlated with ITN use
- Discrepancies in equity by country for IPTp & ITN
 - E.g. Nigeria: ITNs among poor, uneducated, rural women; IPTp among richer, educated, urban women

Of importance for malaria programs

- Determination important
- For countries with inequity: malaria mainly rural, so rural women priority!
- An ITN against malaria for everybody, but pregnant women and children **FIRST!**

Conclusion



Considerable success in some countries

More work needs to be done in others

IPTp may be harder to deliver than ITN

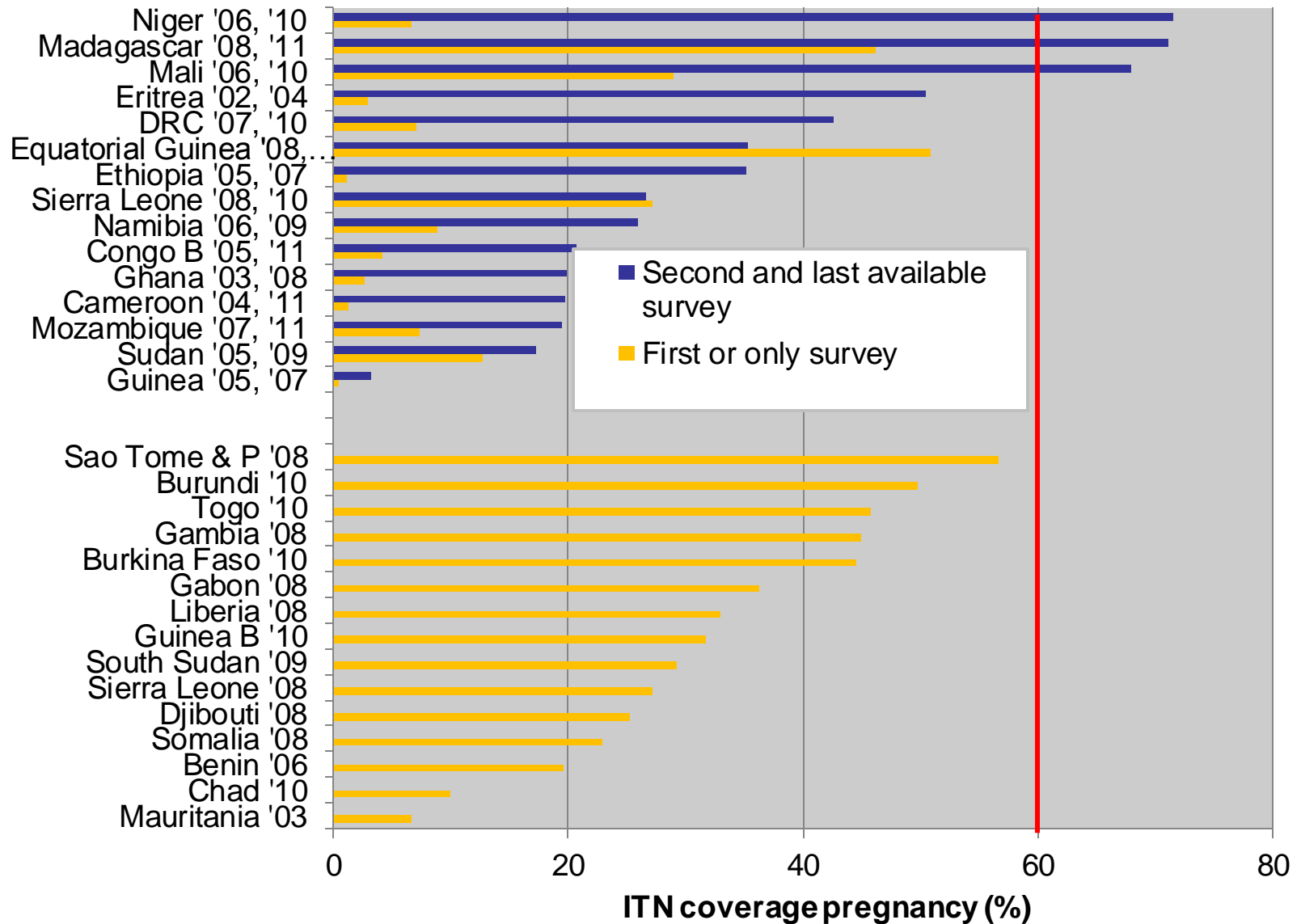


Thank you

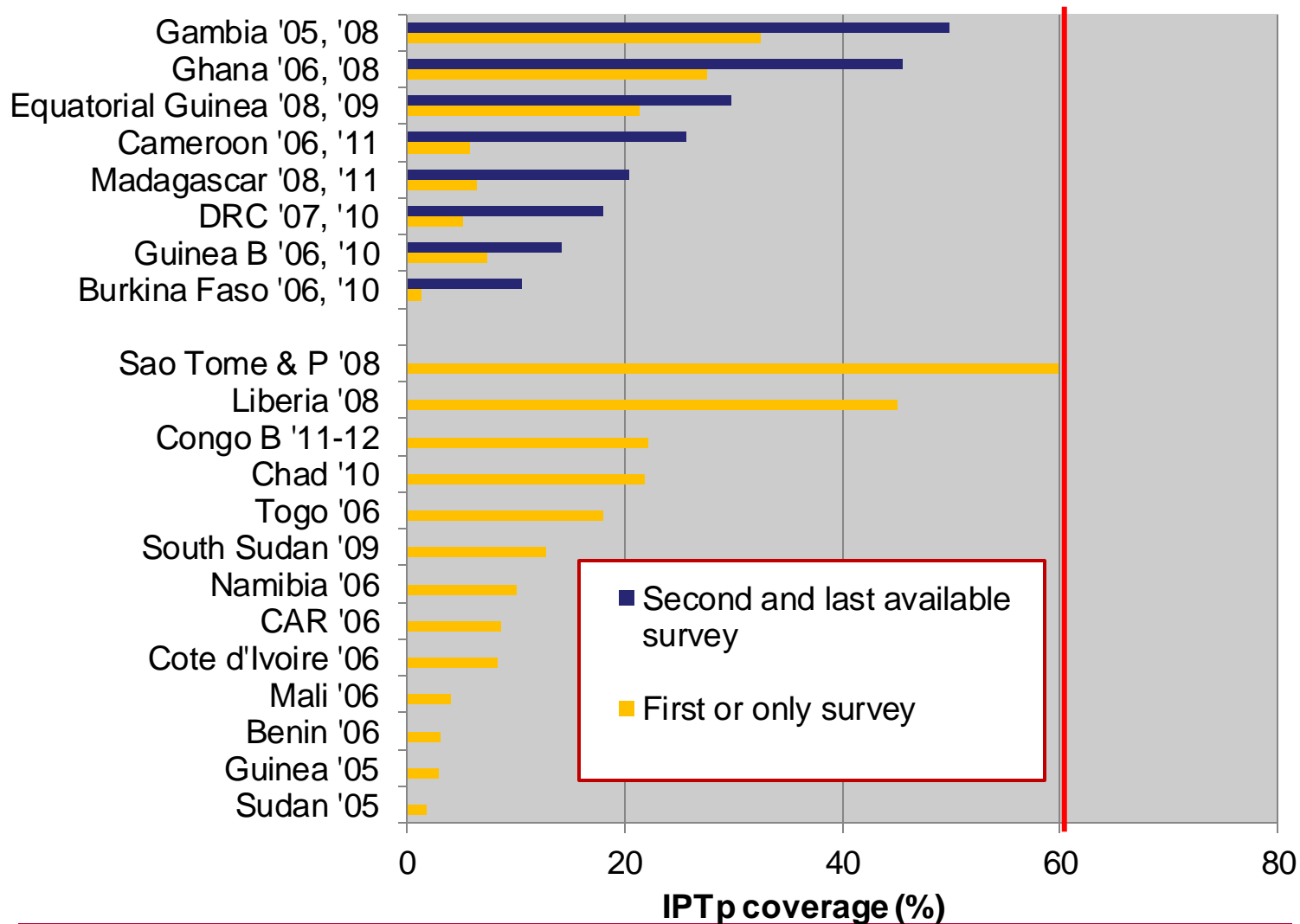


Margaret Nagasa, Family-tenderly together, 2003

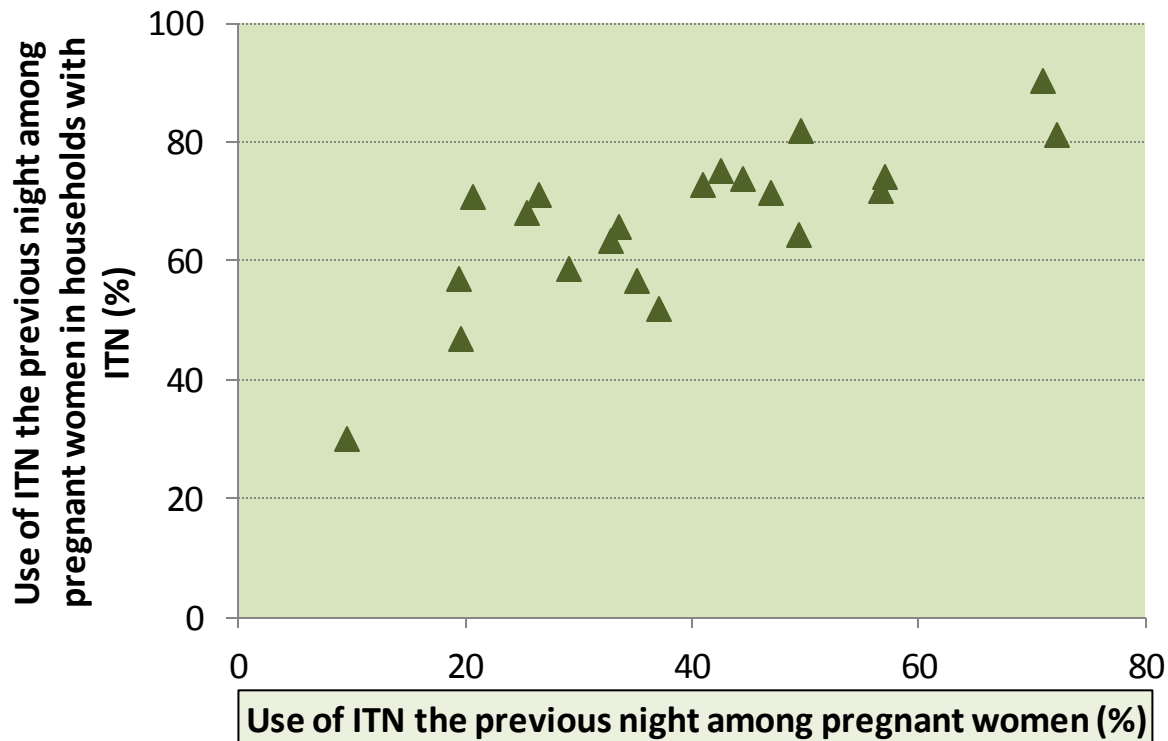
30 countries with information on ITN use limited to one or two surveys



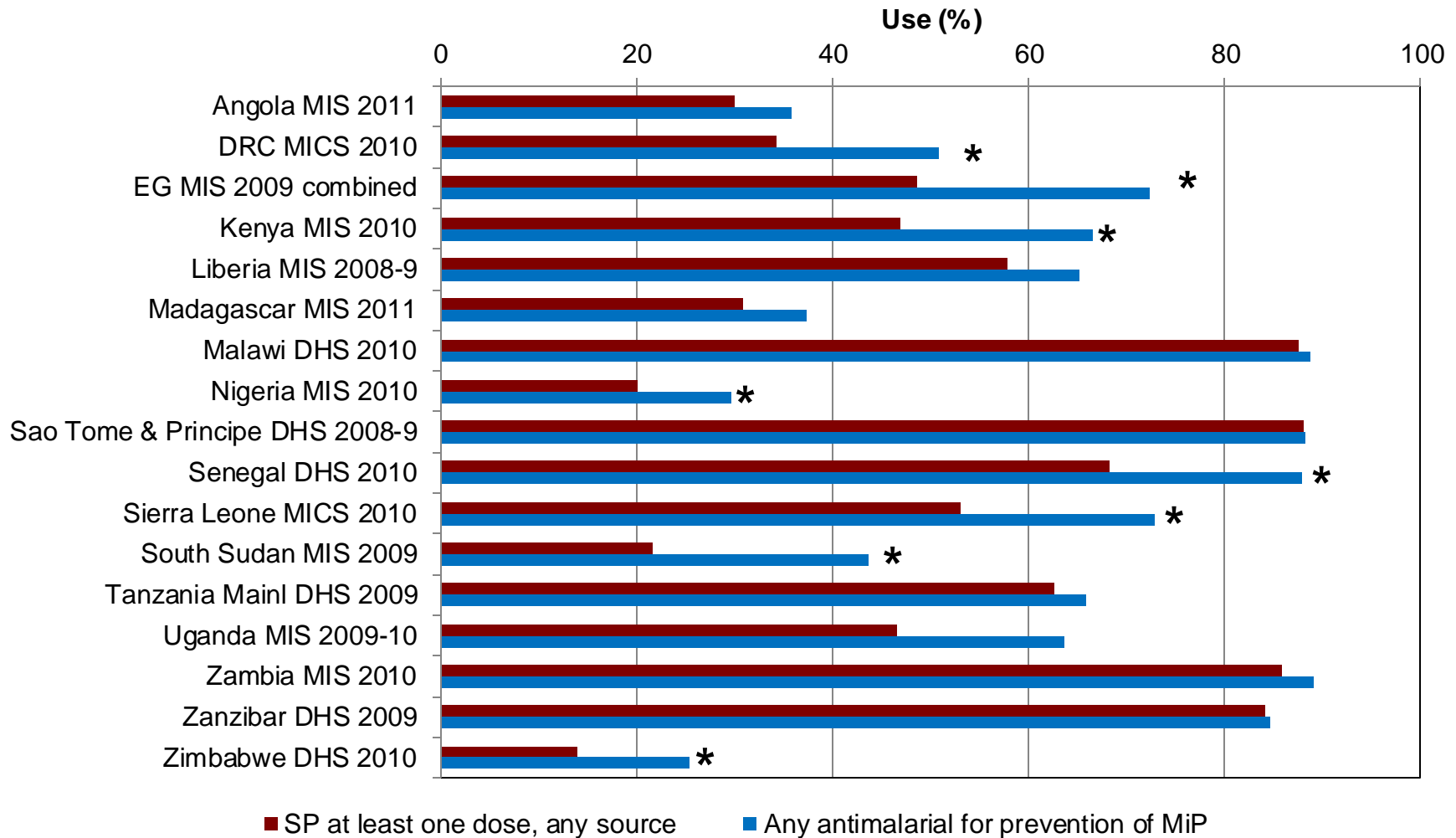
21 countries with information on IPTp coverage limited to one or two surveys



Scatter plot of the use of ITNs the previous night among pregnant women vs. the use of ITNs the previous night among pregnant women in a household with an ITN, 21 sub-Saharan countries, 2009-2011



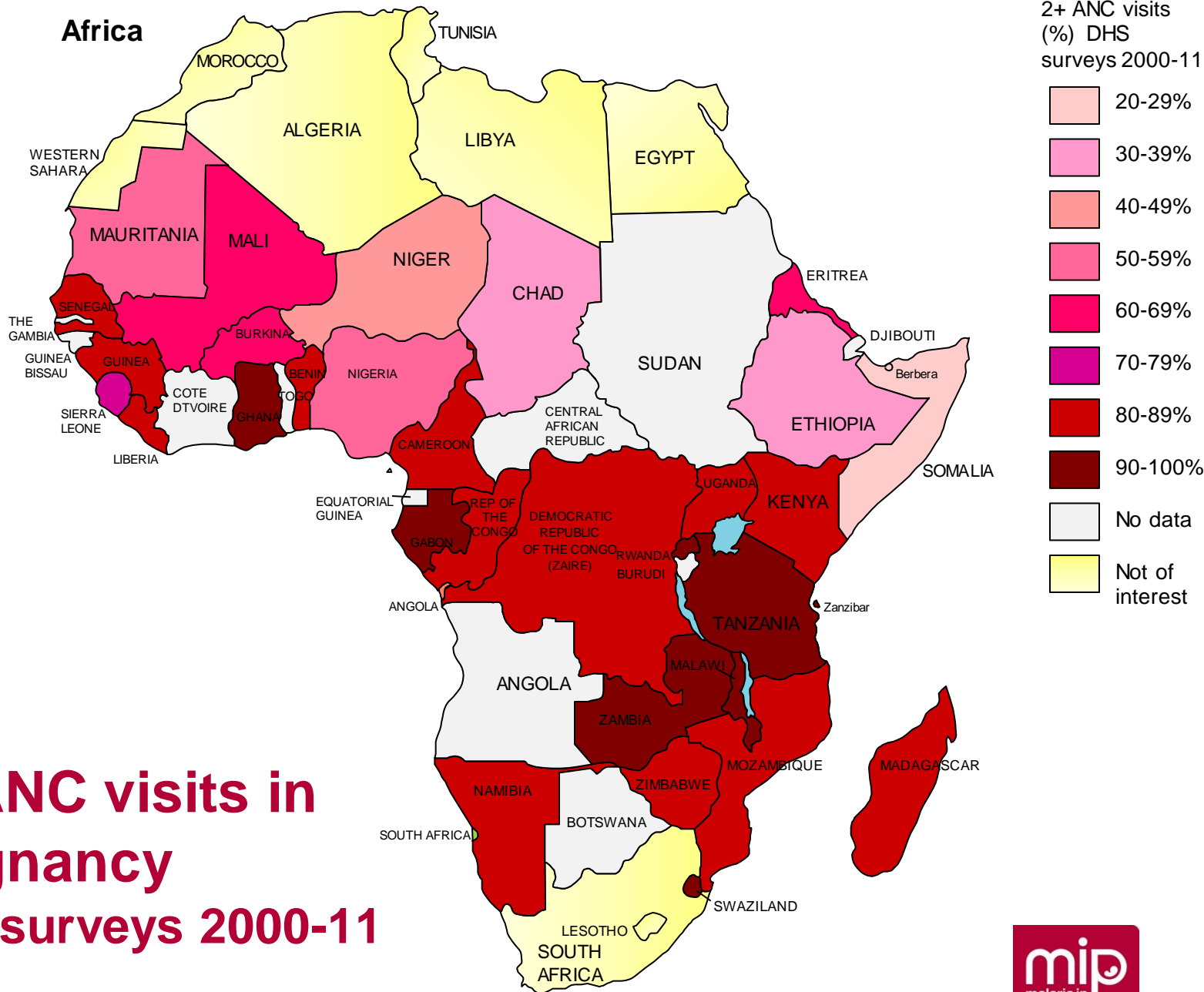
Comparison use of SP and use of any antimalarial for prevention of MiP in 17 countries with information



*Countries with a difference > 9% indicative of use of considerable use of antimalarials other than SP for MiP prevention. These include: DRC, Equatorial Guinea, Kenya, Nigeria, Senegal, Sierra Leone, South Sudan and Zimbabwe. Type of other antimalarial used not reported in these national surveys.

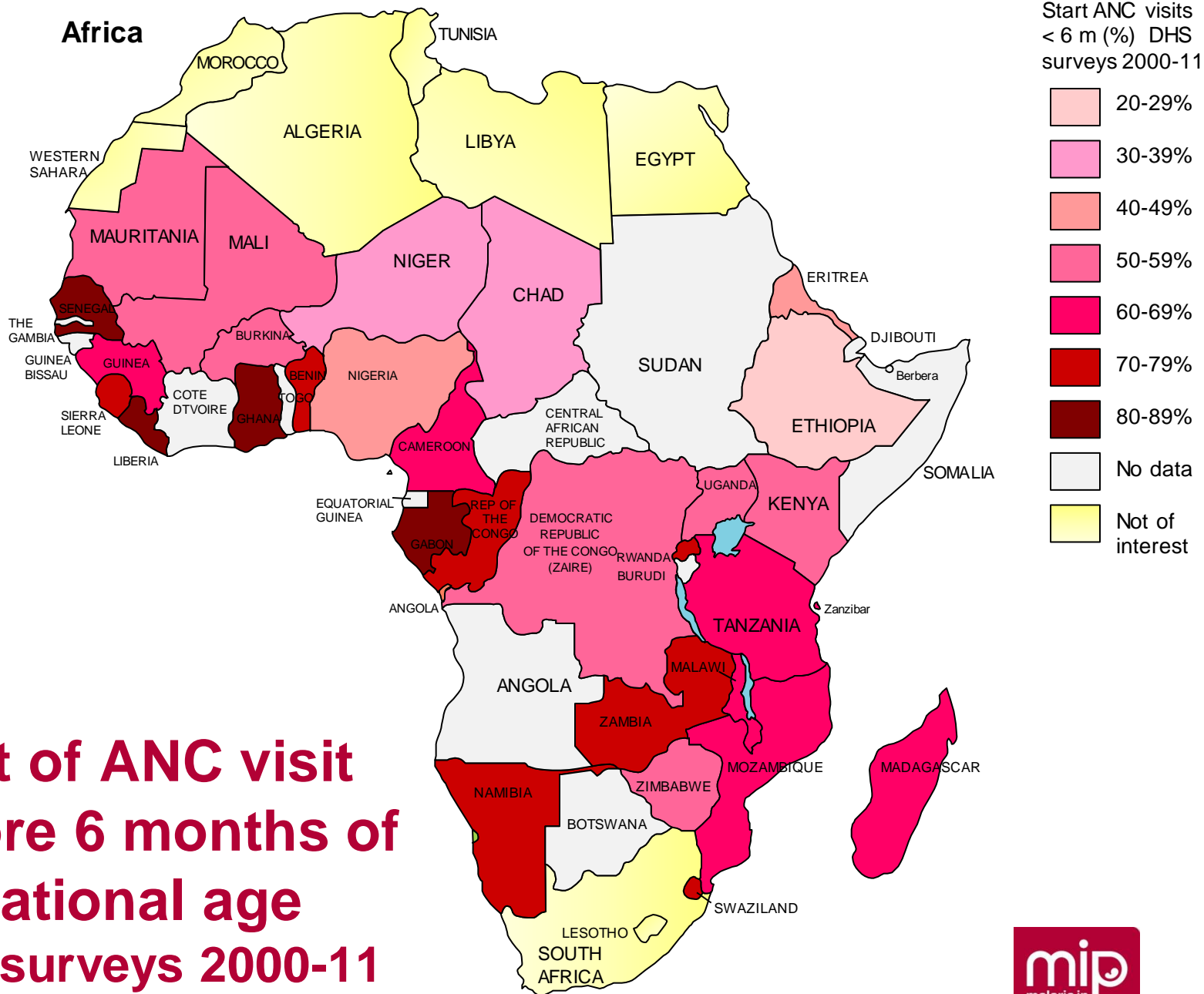


Africa



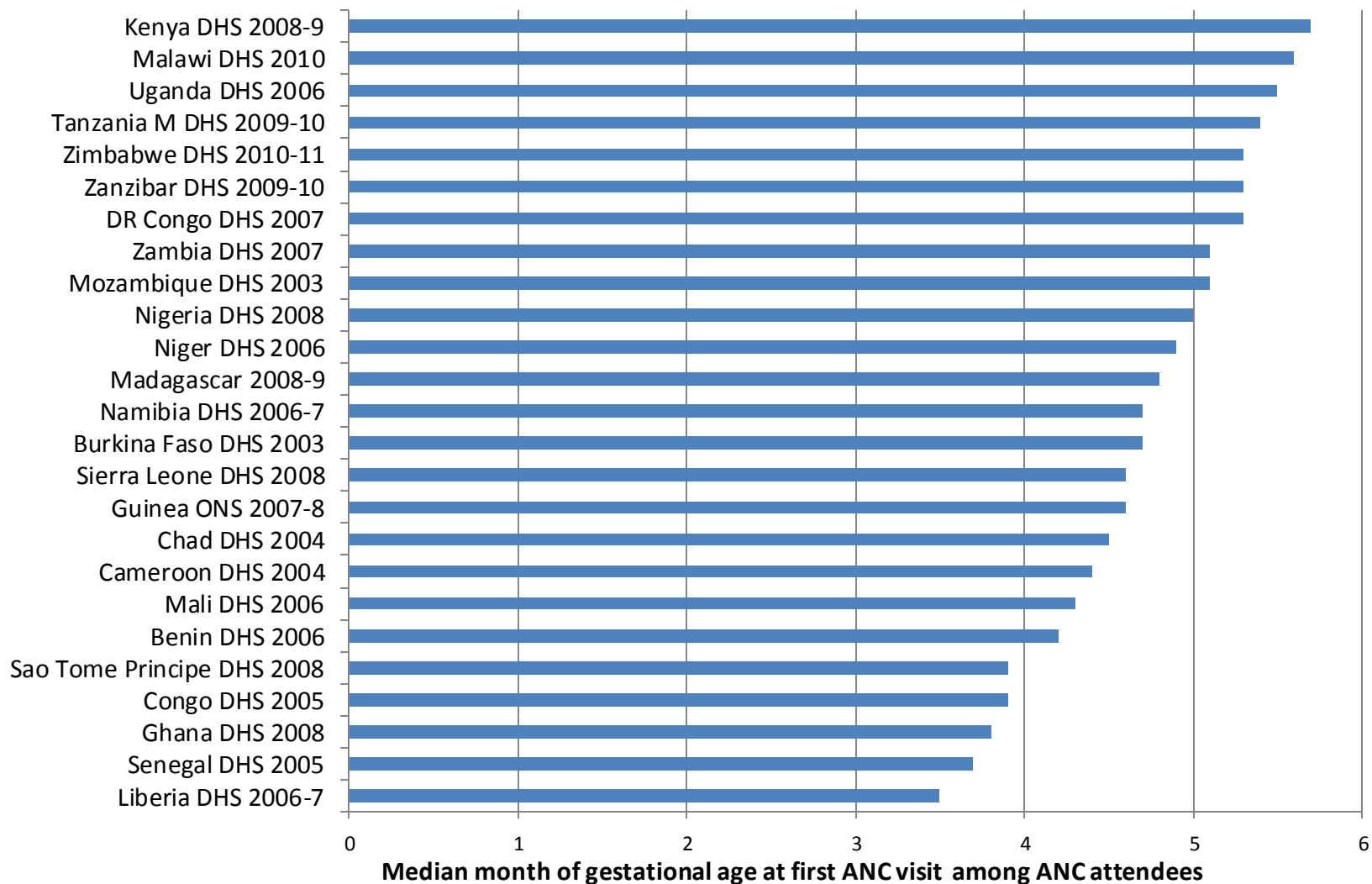
2+ ANC visits in pregnancy DHS surveys 2000-11

Africa

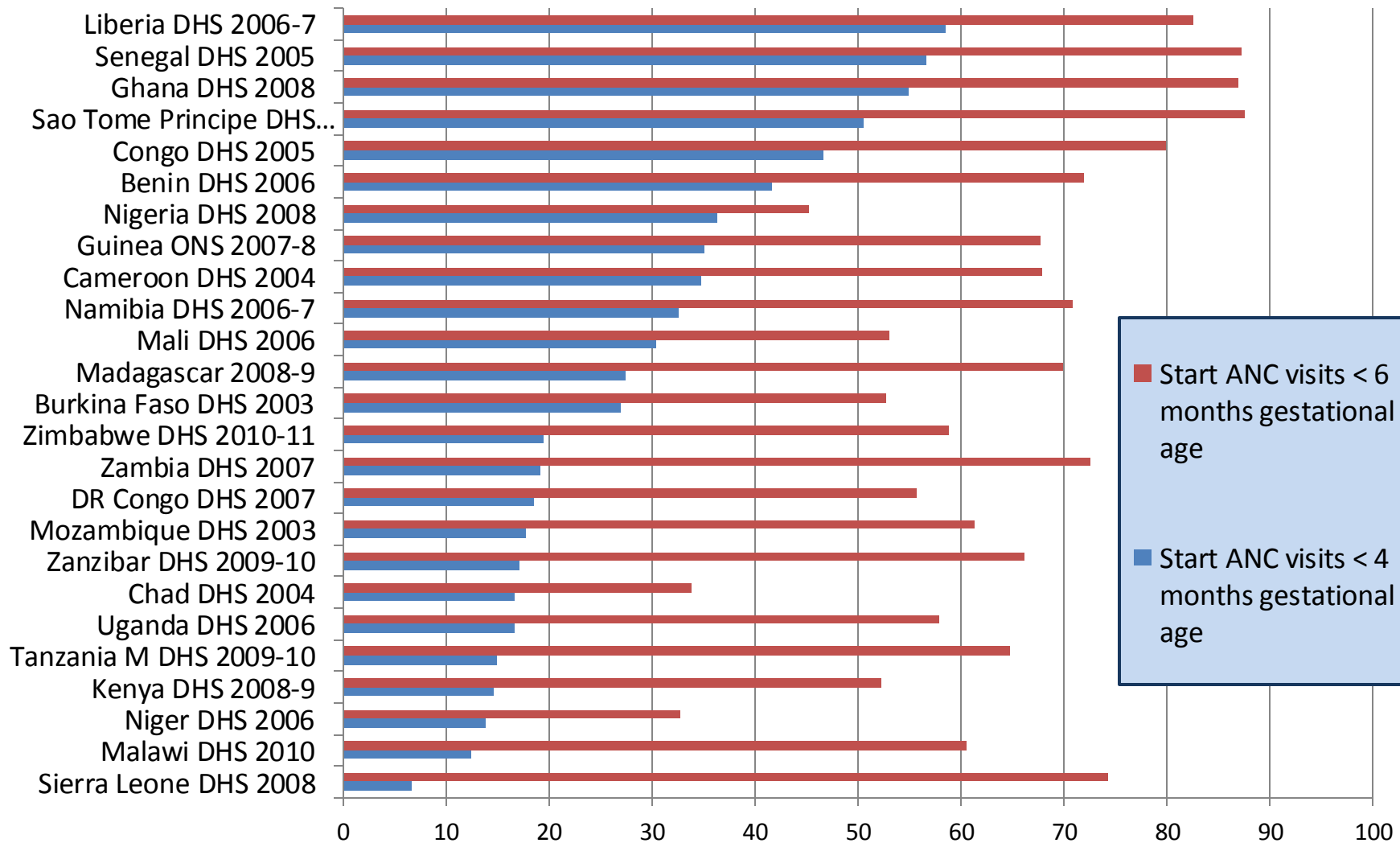


**Start of ANC visit
before 6 months of
gestational age
DHS surveys 2000-11**

Median month of gestational age at first ANC visit among ANC attendees in 25 countries with IPTp policy and DHS between 2004-2011



Gestational age at first ANC visit (%) among survey participants with last live birth in previous 5 years in 25 countries with IPTp policy and DHS between 2004-2011



Four or more ANC visits among survey participants with last live birth in previous 5 years in 26 countries with IPTp policy and national survey between 2004-2011

