



# The contribution of HIV to pregnancy-related mortality

Clara Calvert, Basia Zaba and Carine Ronsmans  
London School of Hygiene and Tropical Medicine

Maternal Health and HIV: Examining Research through a Programmatic Lens  
Harvard School of Public Health  
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# Background

All deaths in  
pregnant and  
postpartum (42  
days) women

Direct obstetric

Indirect

Coincidental

Maternal  
deaths

Pregnancy-  
related  
deaths

All deaths in  
pregnant and  
postpartum (42  
days) women

HIV -

HIV +

Attributable  
to HIV/  
AIDS?

# HIV attribution: evidence from literature

**Empirical data:  
Cause of death  
studies (verbal  
autopsy)**

**Mathematical Model:  
Institute of Health  
Metrics and Evaluation  
(IHME)**

**Mathematical Model:  
Maternal mortality  
Estimation Inter-  
Agency Group (MMEIG)**

HIV -      HIV +

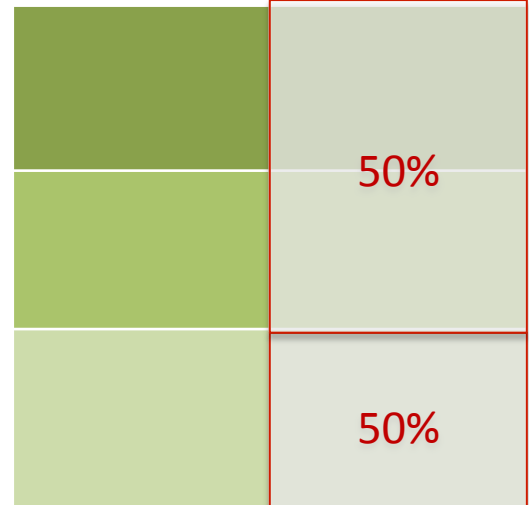
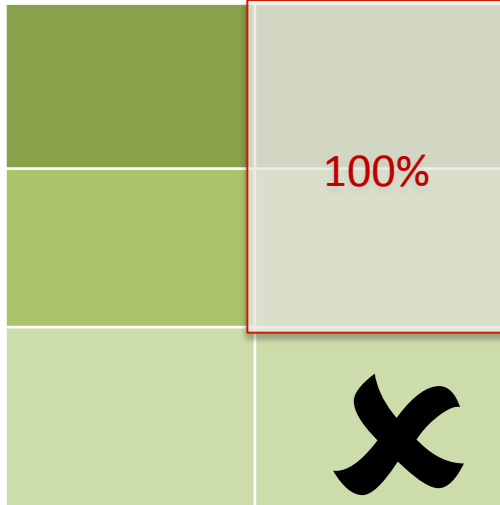
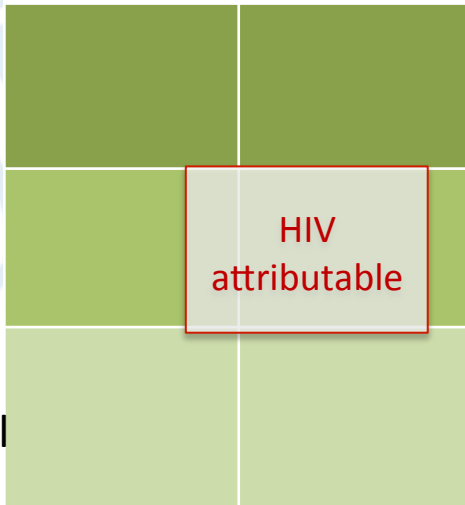
HIV -      HIV +

HIV -      HIV +

Direct  
obstetric

Indirect

Coincidental



HIV  
attributable

100%

50%

X

50%

# HIV attribution: evidence from literature



Cause of  
death review  
1997-2003

Africa

South Africa

IHME model

East Africa

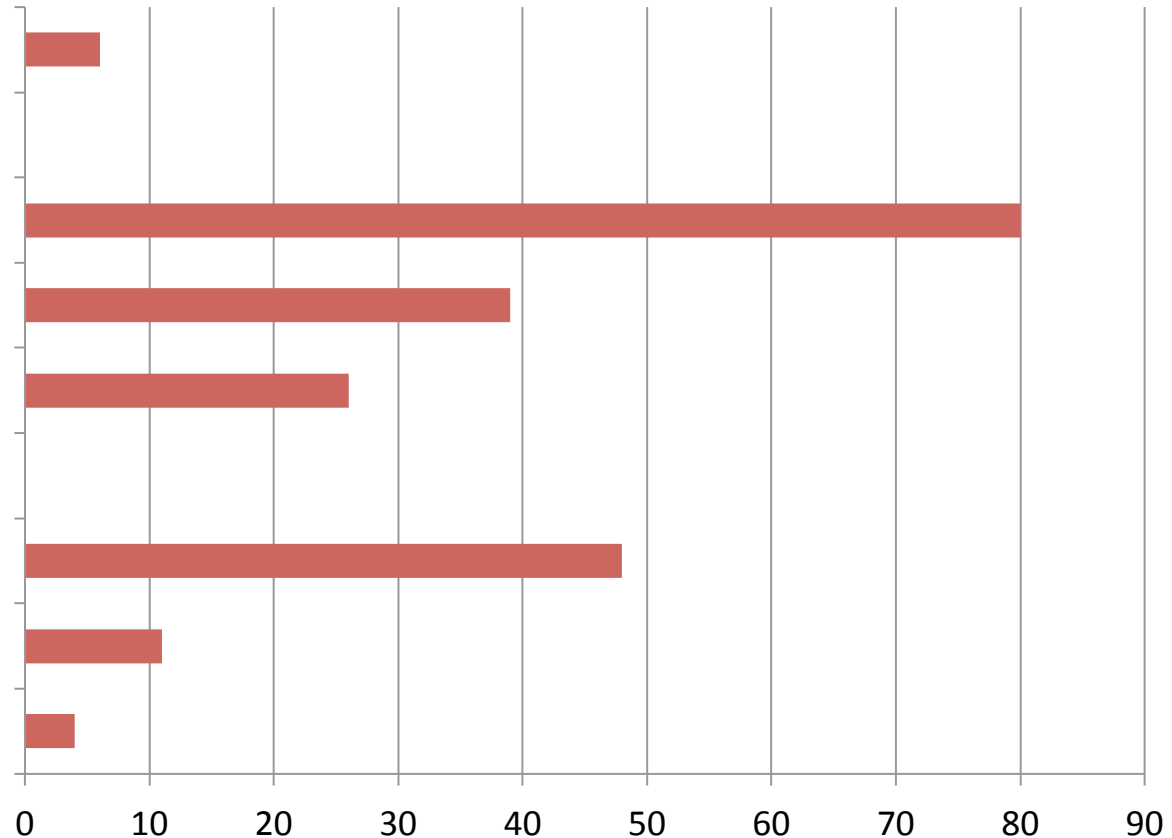
West Africa

MMEIG  
Model

South Africa

East Africa

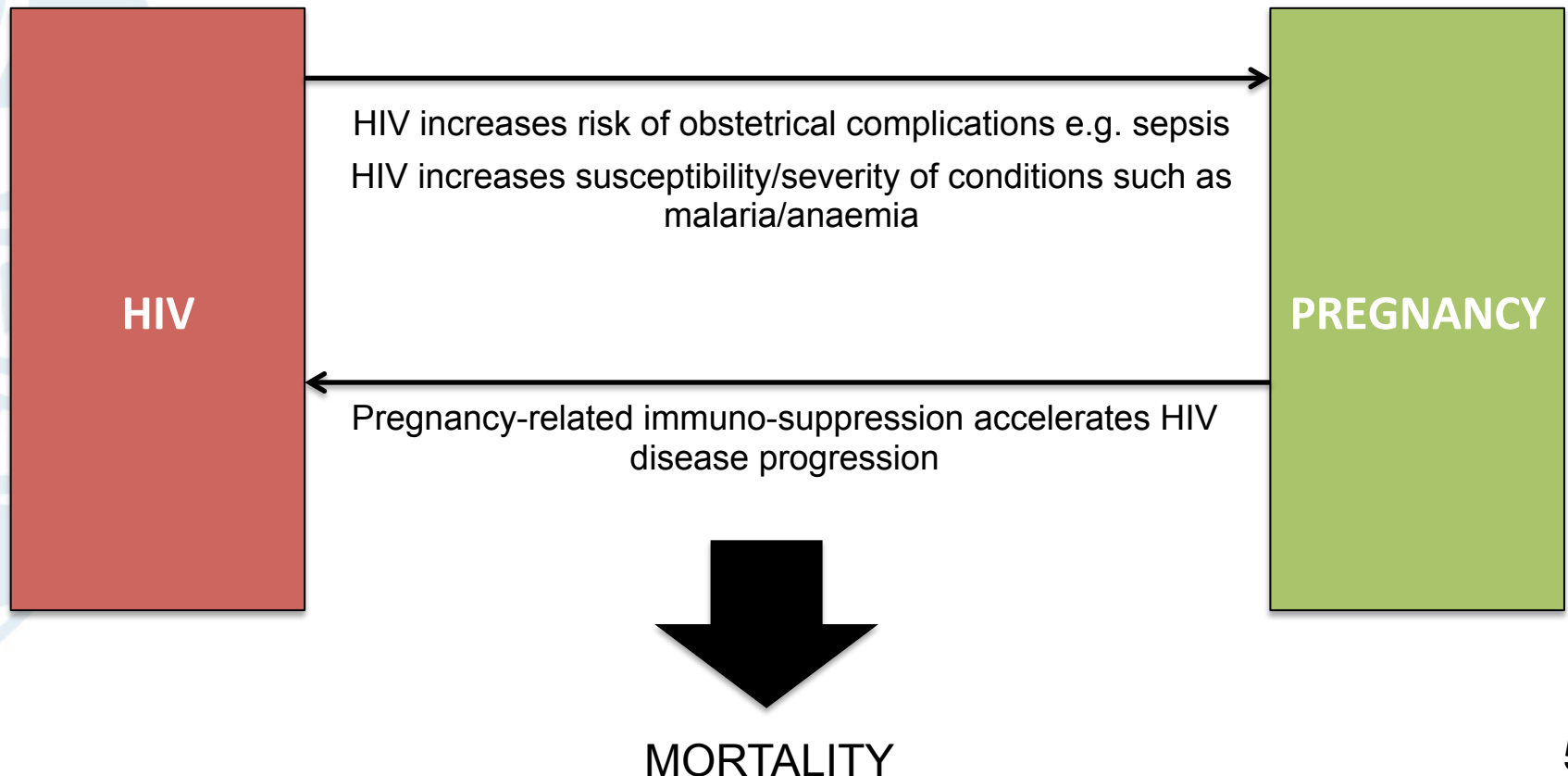
West Africa



Percentage of maternal deaths attributed to HIV/AIDS

# HIV attribution: evidence from literature

- Why might there be excess mortality attributable to HIV in pregnancy?



# Objectives

- **To calculate the excess mortality attributable to HIV in pregnancy**
  - Systematic review
  - ALPHA network data
- **To establish whether HIV increases the risk of obstetric complications**
  - Systematic review
  - ALPHA network data
- **To establish whether pregnancy increases the risk of HIV progression**
  - Systematic review

# Objectives

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# Methods

**HIV attribution: using relative risk and population attributable fraction comparing deaths rates in HIV+ and HIV- women**

**Relative Risk**

HIV -	HIV +

Death rate in HIV+ pregnant and postpartum women

Death rate in HIV- pregnant and postpartum women

**Population Attributable Fraction**

HIV -	HIV +	All

Death rate in all pregnant and postpartum women – death rate in HIV- pregnant and postpartum women

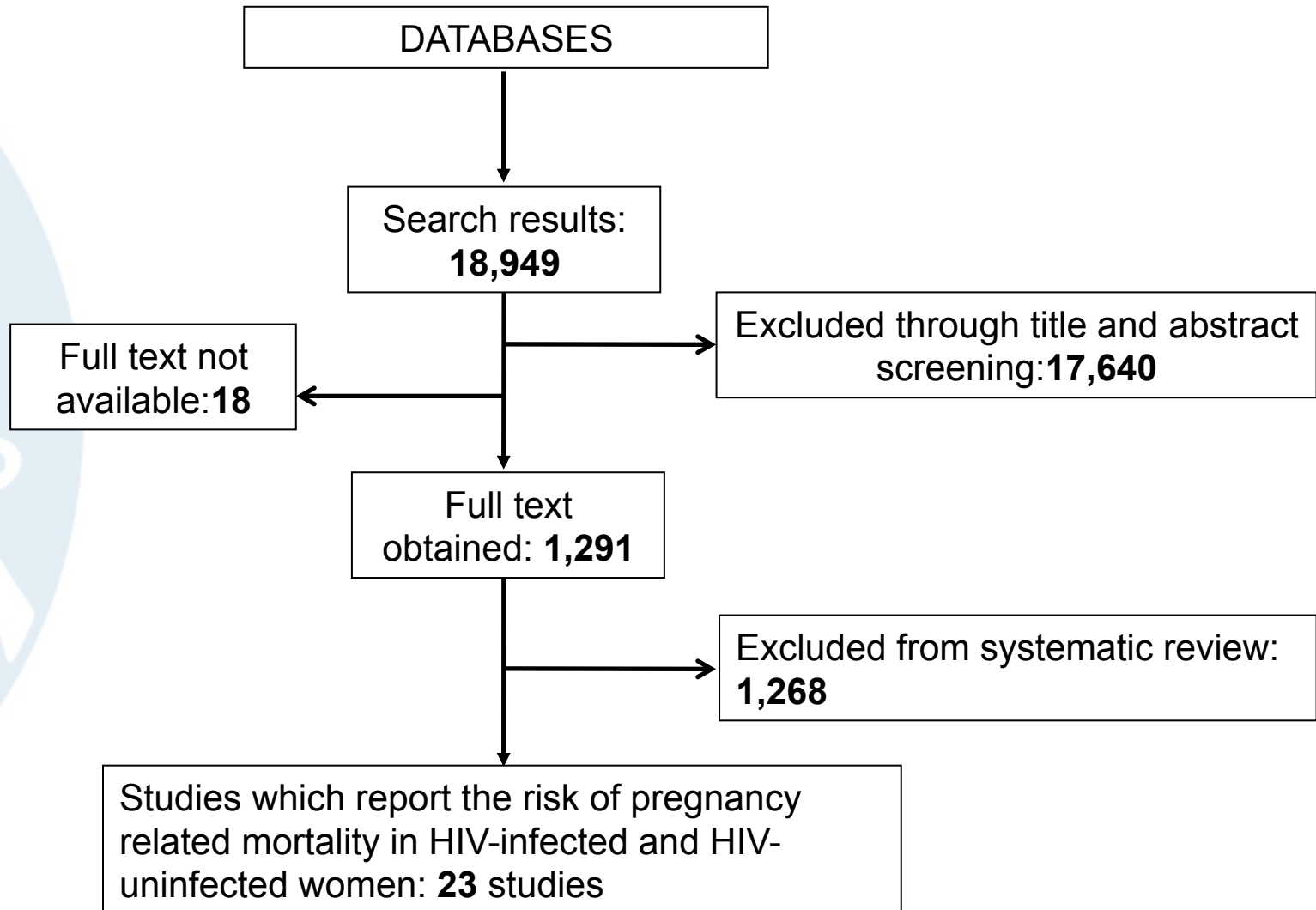
Death rate in all pregnant and postpartum women

**HIV-attributable death does not necessary mean an AIDS death**

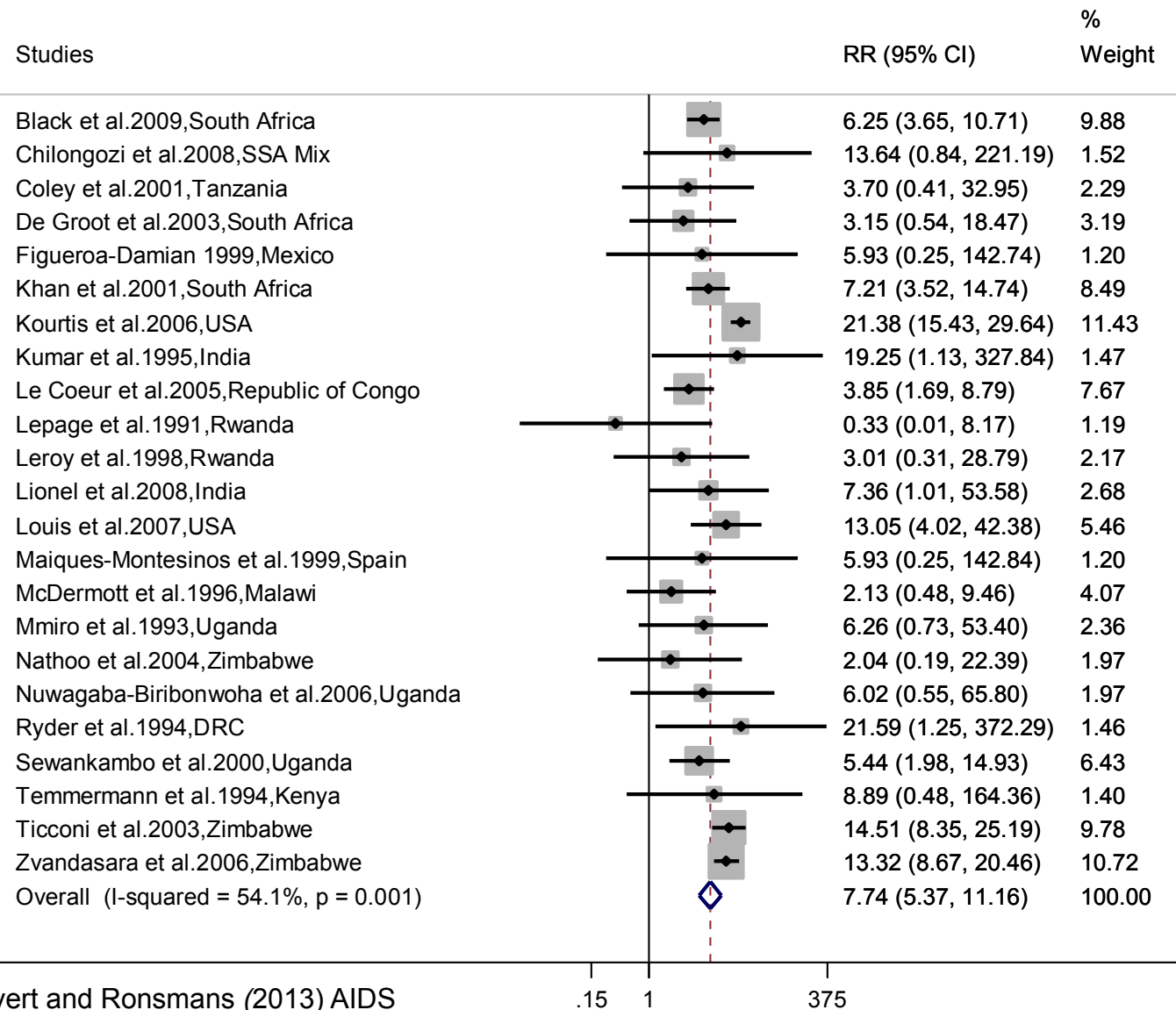


- **Search strategy**
  - PUBMED, EMBASE, POPLINE & AIM
  - Search terms: (maternal & HIV) & (mortality OR obstetric complication OR HIV progression)
- **Inclusion criteria**
  - At least 30 HIV-infected and HIV-uninfected women
  - HIV assigned using HIV testing
  - All countries and publication dates
  - Any language

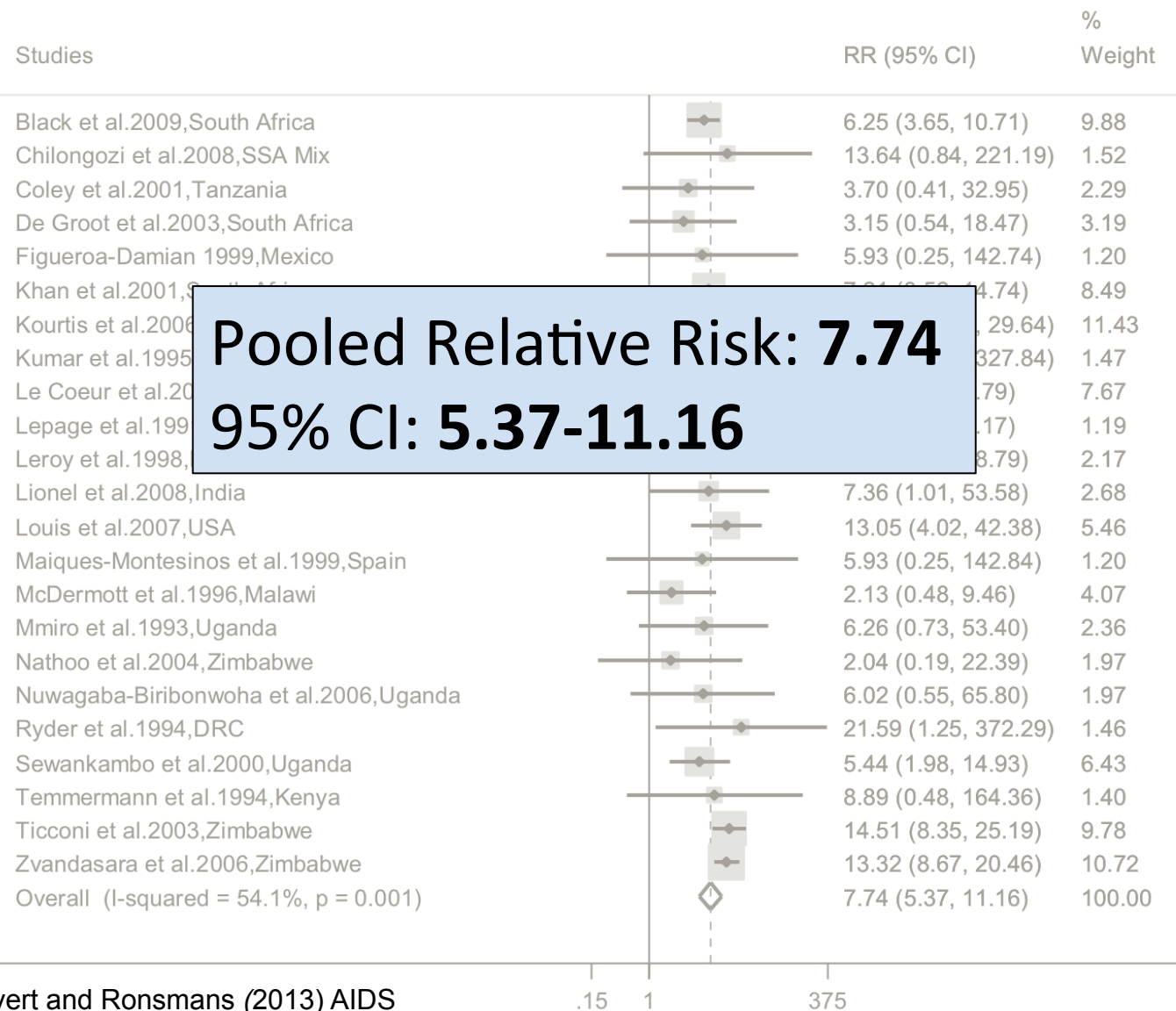
# Results: study flow chart



# Results: pooled relative risk

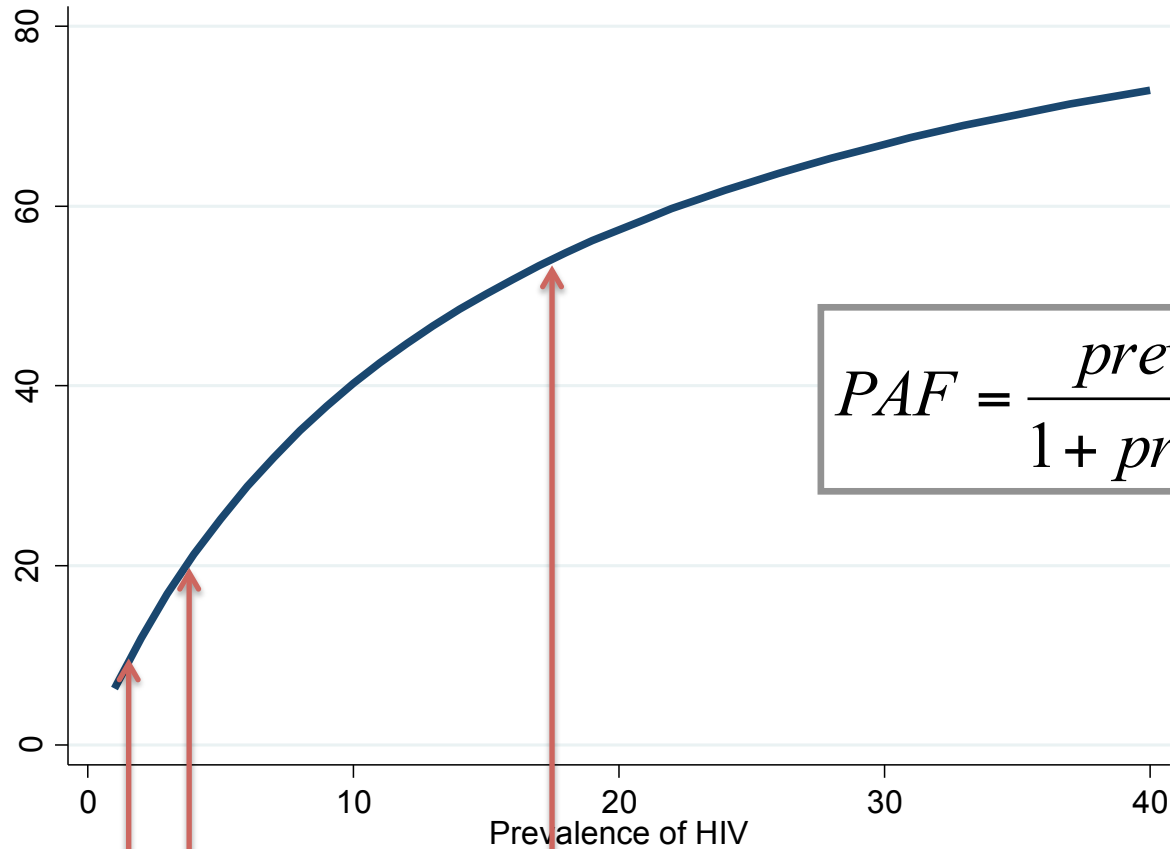


# Results: pooled relative risk



**Pooled Relative Risk: 7.74**  
**95% CI: 5.37-11.16**

# Results: Population attributable fraction



$$PAF = \frac{prev \cdot (RR - 1)}{1 + prev \cdot (RR - 1)}$$

**West Africa:**  
**6%**

**East Africa:**  
**17%**

**Southern Africa:**  
**53%**

# Objectives

- **To calculate the excess mortality attributable to HIV in pregnancy**
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  - ALPHA network data
- **To establish whether HIV increases the risk of obstetric complications**
  - Systematic review

## Effect of HIV infection on pregnancy-related mortality in sub-Saharan Africa: secondary analyses of pooled community-based data from the network for Analysing Longitudinal Population-based HIV/AIDS data on Africa (ALPHA)



*Basia Zaba, Clara Calvert, Milly Marston, Raphael Isingo, Jessica Nakiyingi-Miiro, Tom Lutalo, Amelia Crampin, Laura Robertson, Kobus Herbst, Marie-Louise Newell, Jim Todd, Peter Byass, Ties Boerma, Carine Ronsmans*

### Summary

**Background** Model-based estimates of the global proportions of maternal deaths that are in HIV-infected women range from 7% to 21%, and the effects of HIV on the risk of maternal death is highly uncertain. We used longitudinal data from the Analysing Longitudinal Population-based HIV/AIDS data on Africa (ALPHA) network to estimate the excess mortality associated with HIV during pregnancy and the post-partum period in sub-Saharan Africa.

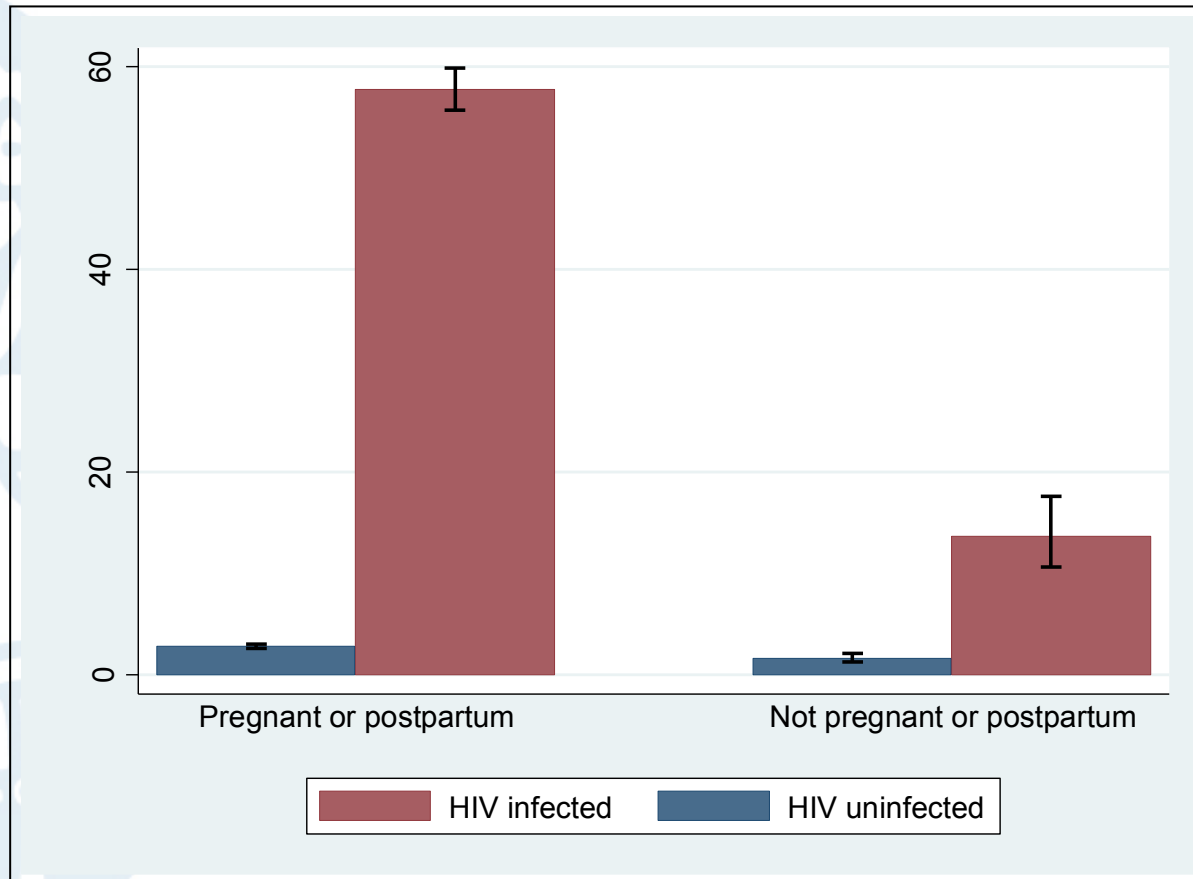
**Methods** The ALPHA network pooled data gathered between June, 1989 and April, 2012 in six community-based studies in eastern and southern Africa with HIV serological surveillance and verbal-autopsy reporting. Deaths occurring during pregnancy and up to 42 days post partum were defined as pregnancy related. Pregnant or post-partum person-years were calculated for HIV-infected and HIV-uninfected women, and HIV-infected to HIV-uninfected mortality rate ratios and HIV-attributable rates were compared between pregnant or post-partum women and women who were not pregnant or post partum.

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London School of Hygiene & Tropical Medicine, London, UK (Prof B Zaba MSc, C Calvert MSc, M Marston MSc, A Crampin MD, J Todd MSc, Prof C Ronsmans PhD); National Institute for Medical Research, Tanzania, Mwanza, Tanzania (R Isingo MSc); MRC/UVRI Uganda Research Unit on AIDS, Entebbe, Uganda (J Nakiyingi-Miiro PhD); Rakai

# Results: Mortality rates by HIV and pregnancy



## Relative risk:

Pregnant: 8.2  
(95 % CI: 5.7-11.8)

Not Pregnant: 20.5  
(95% CI: 18.9-22.4)

## Attributable rate:

Pregnant: 11.8  
per 1,000 women years

Not pregnant: 51.8  
per 1,000 women years

## Population attributable fraction:

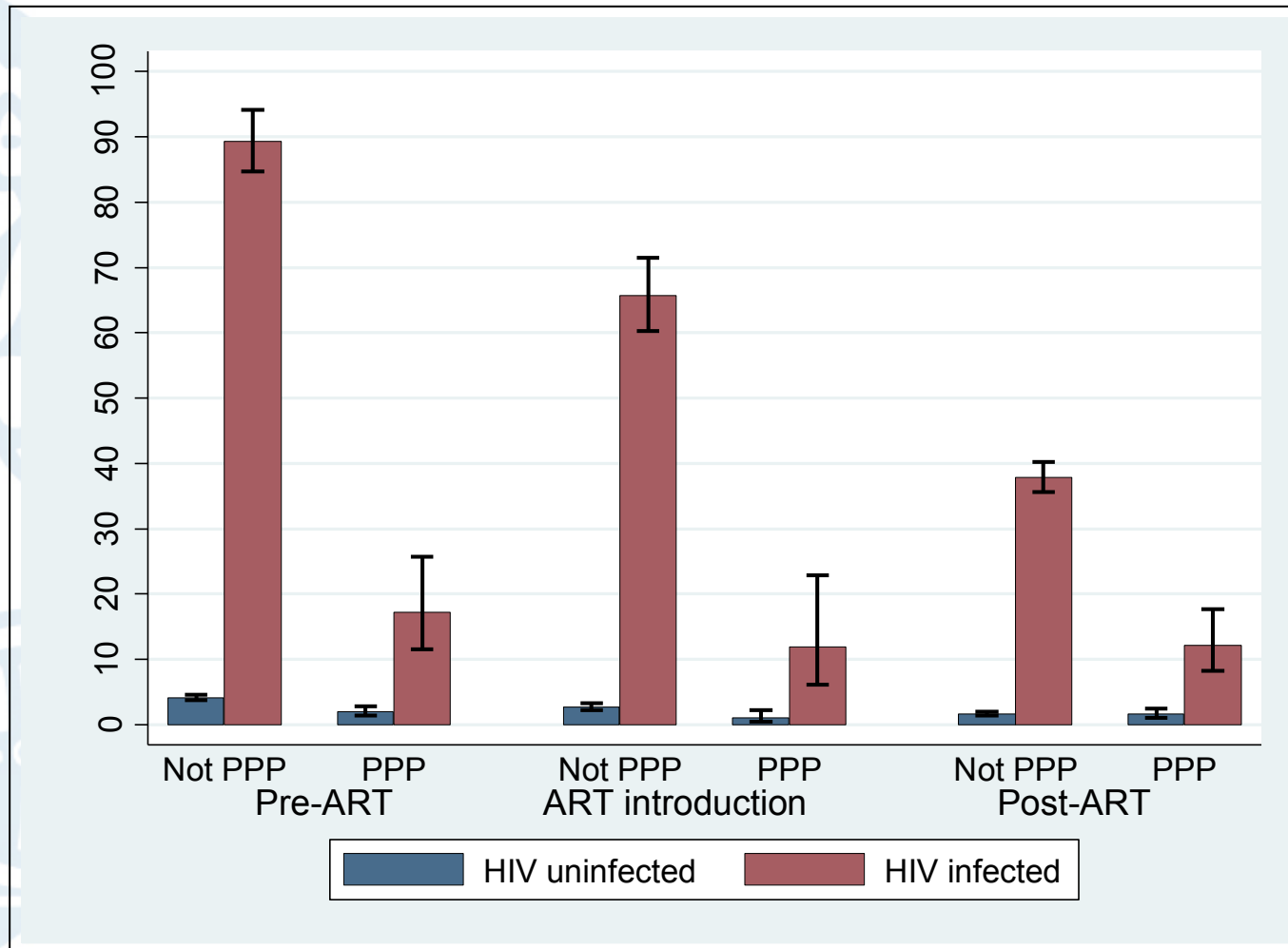
Pregnant: 44.6%

Not Pregnant: 77.6%

**Healthy pregnant woman effect?**



# Results: Mortality rates by HIV and pregnancy



# Objectives

- To calculate the excess mortality attributable to HIV in pregnancy
  - Systematic review
  - ALPHA network data
- **To establish whether HIV increases the risk of obstetric complications**
  - Systematic review

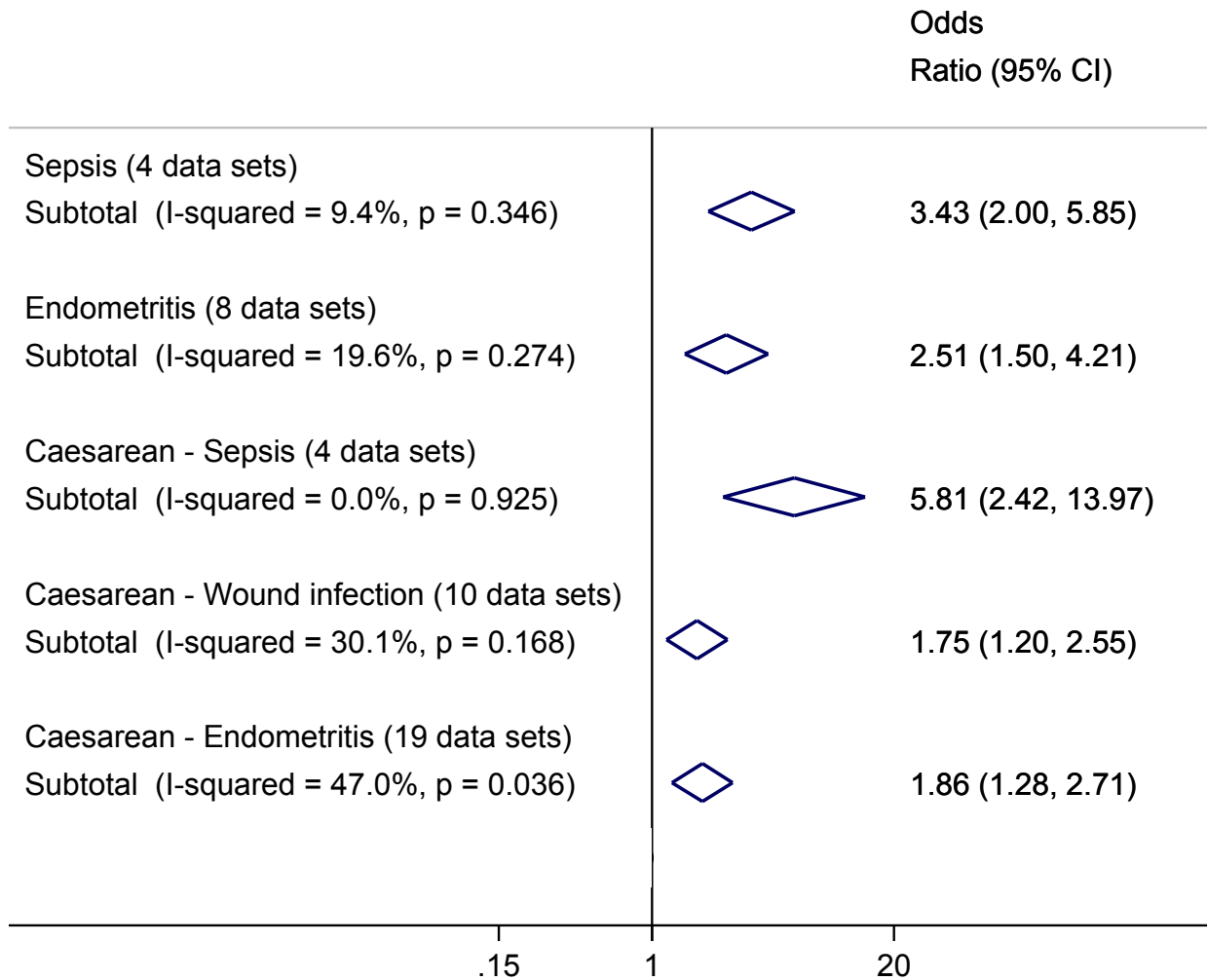
# Methods

- Included studies which looked at incidence of obstetric complications by HIV status
  - Maternal haemorrhage
  - Hypertensive disorders of pregnancy
  - Dystocia
  - Sepsis
- Studies identified using the systematic review described previously

# Results

- Included studies which looked at incidence of obstetric complications by HIV status: **44 studies**
  - Maternal haemorrhage: **17 data sets**
  - Hypertensive disorders of pregnancy: **19 data sets**
  - Dystocia: **5 data sets**
  - Sepsis: **25 data sets**
- Studies identified using the systematic review described previously

# Results: Sepsis



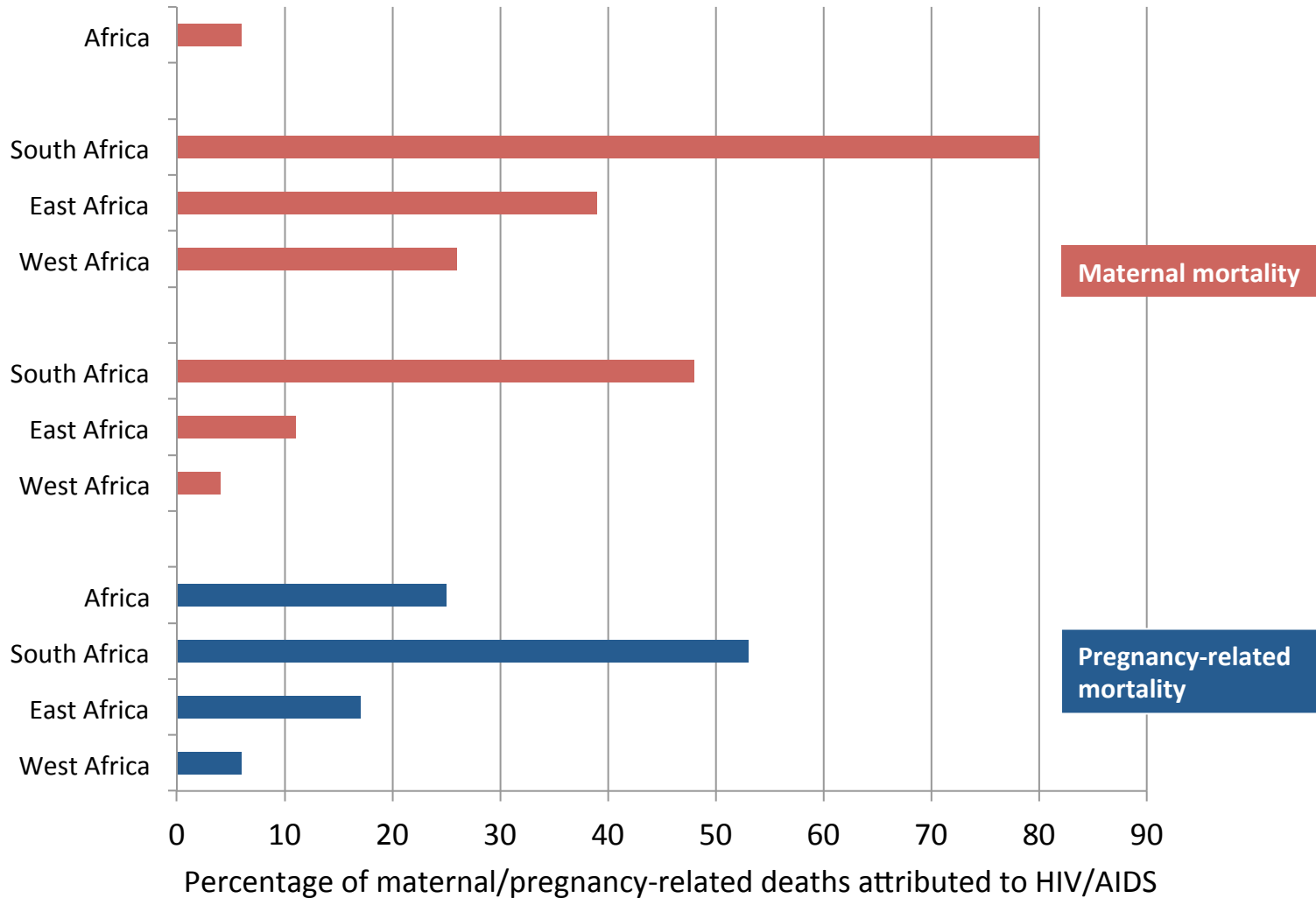
# Summary

Cause of  
death review  
1997-2003

IHME Model

MMEIG  
Model

Population  
attributable  
fraction



# Summary

- A very high percentage and number of deaths to pregnant and postpartum women were attributable to HIV, but the % is smaller in pregnant than non-pregnant women
- Increased risk of maternal sepsis and endometritis in HIV-infected women will contribute to this excess mortality, although direct obstetric causes only likely to explain a tiny fraction of the excess mortality
- ART appears to decrease mortality in non-pregnant women, but not in pregnant women

# Future plans

- Use the ALPHA network data to establish whether HIV increases the risk of obstetric complications
- Establish whether pregnancy increases the risk of HIV progression through a systematic review
- Investigate whether some types of ART and PMTCT programme are more successful in bringing down pregnancy-related mortality in HIV+ women





# Thanks for listening!

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