Malaria, iron deficiency, and anaemia control

An update

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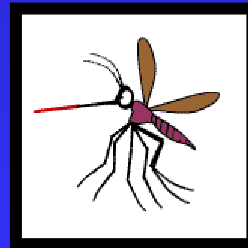
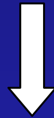


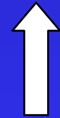
HIV/AIDS

Iron deficiency



Malaria

Hookworm

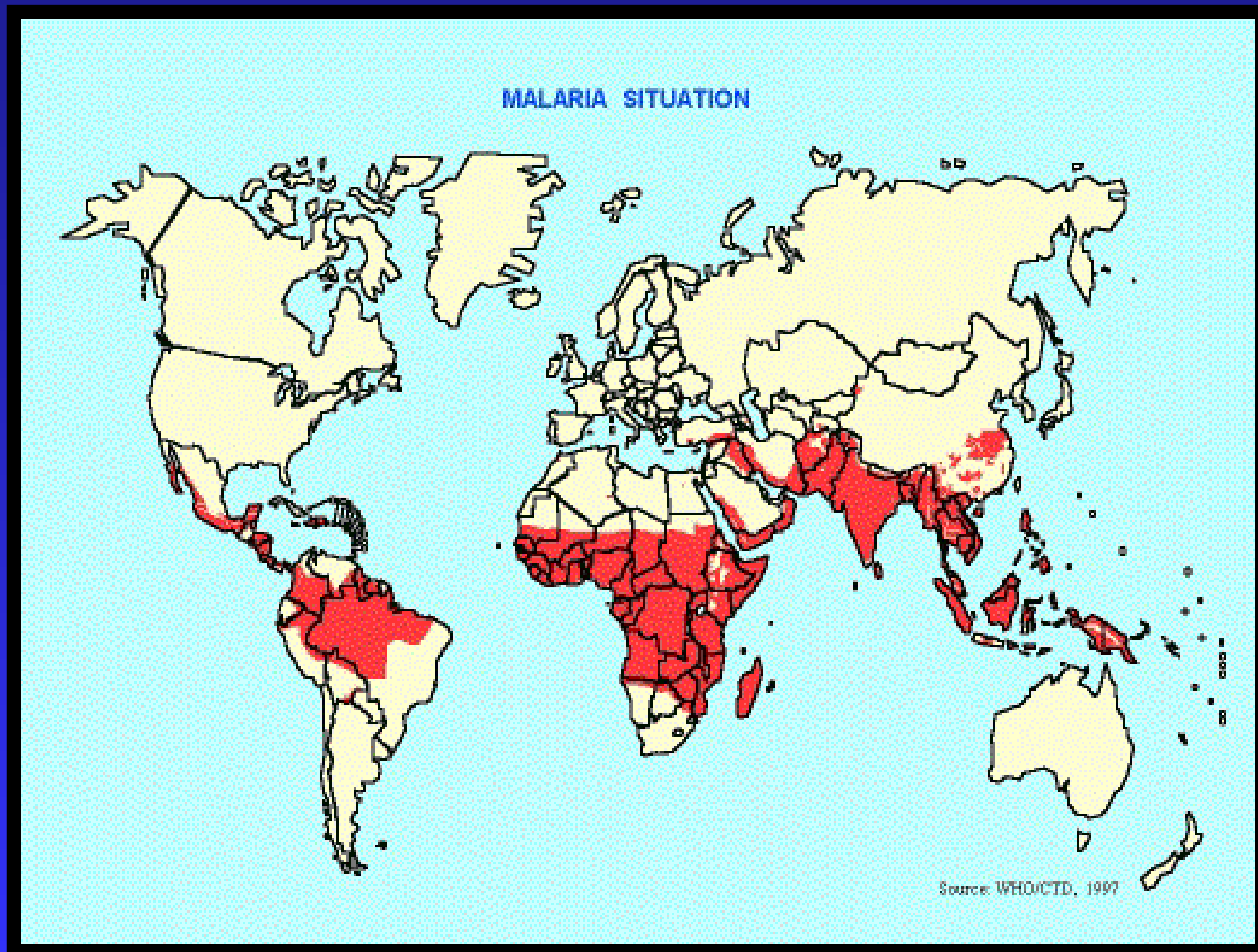


Haemoglobinopathies

Overview

- Malaria and malarial anaemia
- Preventive strategies
- Targeting infants and pregnant women
- Combined delivery of antimalarial interventions and micronutrients

40% of the world's population are at risk from malaria



The world's most deadly parasitic disease

- **300-500 million clinical cases / year**
- **>1 million deaths**
  - African children <5yrs
  - *P. falciparum*
- **Severe malarial anaemia a major cause of mortality**

Spectrum of clinical disease

	Transmission pattern	
	Stable	**Unstable**
Severe disease	Infants / young children	Adults
Malaria in pregnancy	Asymptomatic infections Severe anaemia Placental parasitaemia : low birth weight	Severe malaria Risk of abortion, premature delivery, stillbirth

Clinical features of falciparum malaria (stable transmission)

Uncomplicated malaria

Fever

Headache

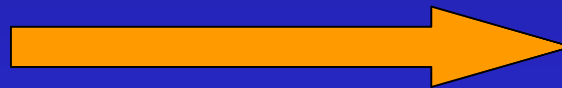
Vomiting

Diarrhoea

'Flu symptoms

Mild anaemia

No treatment



Delayed treatment

Severe malaria

Severe anaemia

Respiratory distress

Prostration

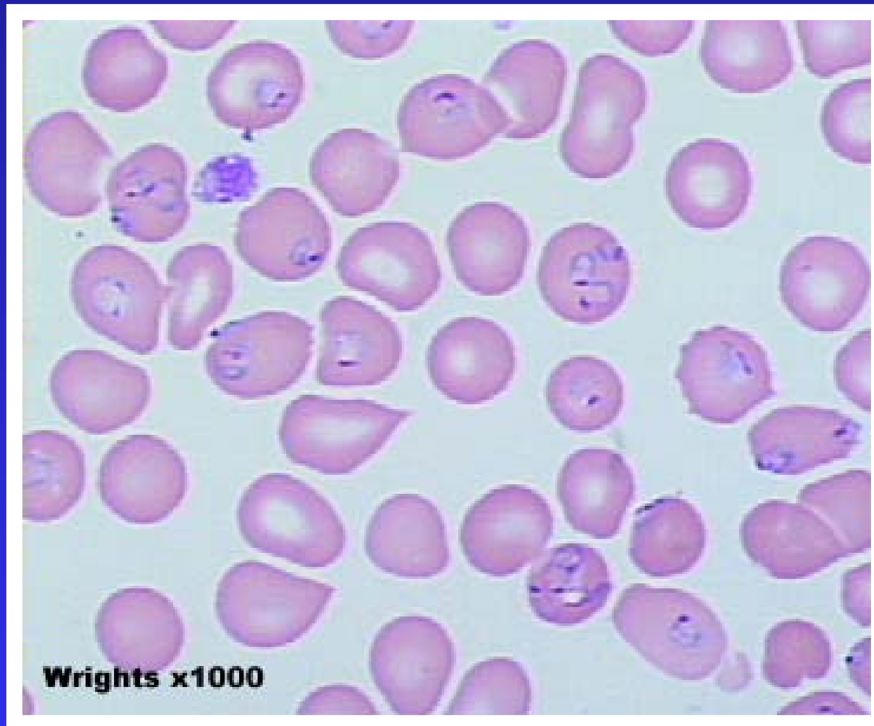
Coma, convulsions

Hypoglycaemia

Infants

Young children

Pathogenesis of malarial anaemia



- Haemolysis of infected RBCs
- Increased splenic clearance of uninfected RBC
- Decreased erythropoeisis

Pathogenesis of severe malarial anaemia

Baseline	Recurrent malaria	Life-threatening anaemia
Nutritional deficiencies	Reinfection	Lactic acidosis
Hookworm	Recrudescence	Hypovolaemia
		Respiratory distress
Hb 8g/dl	Hb 6 g/dl	Hb 4 g/dl

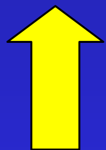
DEATH

Preventive strategies

Baseline

Nutritional deficiencies

Hookworm



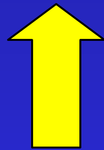
Micronutrient supplementation

Deworming

Recurrent malaria

Reinfection

Recrudescence



ITNs

IPT

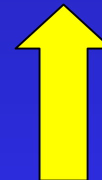
Prompt, effective treatment

Life-threatening anaemia

Lactic acidosis

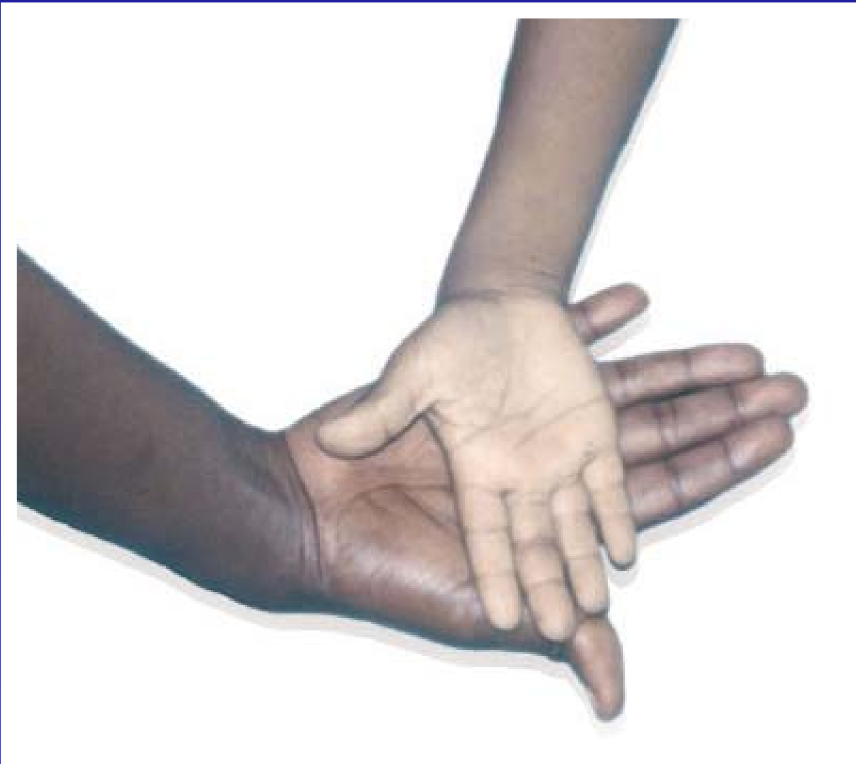
Hypovolaemia

Respiratory distress



Emergency blood transfusion

Underlying principles



- Focus on prevention of mild to moderate anaemia
- Target high risk groups
  - young children
  - pregnant women

Insecticide treated nets (ITNs)

ITNs in children <5yrs

Mortality

- 17% reduction all-cause mortality (Cochrane review)
- Approximately 0.5 million deaths per year in Africa could be prevented with ITNs

Anaemia

- 63% reduction in Hb <8g/dl (Abdulla et al 2001)
- Odds of anaemia increased with distance from netted village (ter Kuile et al in press)

ITNs in pregnant women

During pregnancy

- 38% reduction peripheral parasitaemia
- 21% reduction Hb< 11g/dl
- 47% reduction Hb< 7g/dl

At delivery

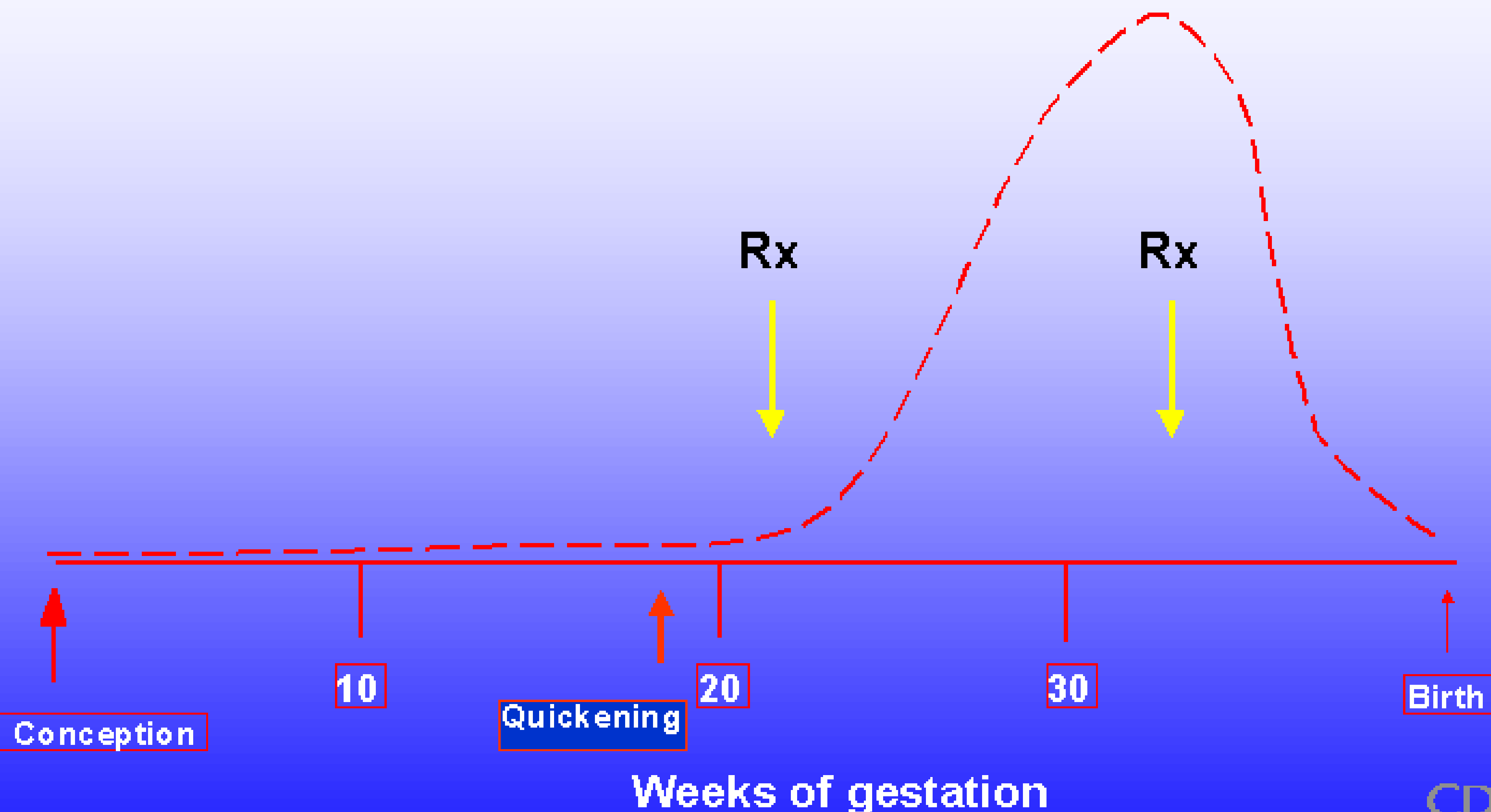
- 23% reduction placental malaria
- 28% reduction low birth weight
- 25% reduction any adverse birth outcome

(ter Kuile et al in press)

Intermittent preventive treatment in pregnancy (IPT)

- The administration of a curative treatment dose of an effective antimalarial drug at predefined intervals during pregnancy

Intermittent Preventive Therapy



Strengthening of partnerships for accelerated maternal mortality reduction : a regional consultation

IPT in pregnancy

- Sulphadoxine-pyrimethamine (SP) given twice in 2nd/3rd trimesters
  - 39% reduction in maternal Hb<8g/dl at 34 weeks (Shulman et al 1999)
  - 56% reduction in placental malaria (Parise etal 1998)
  - 43% reduction in low birth weight (Parise et al 1998)
- Safe, well-tolerated, single dose regimen

Intermittent preventive treatment in infants (IPTi)

IPTi: initial findings

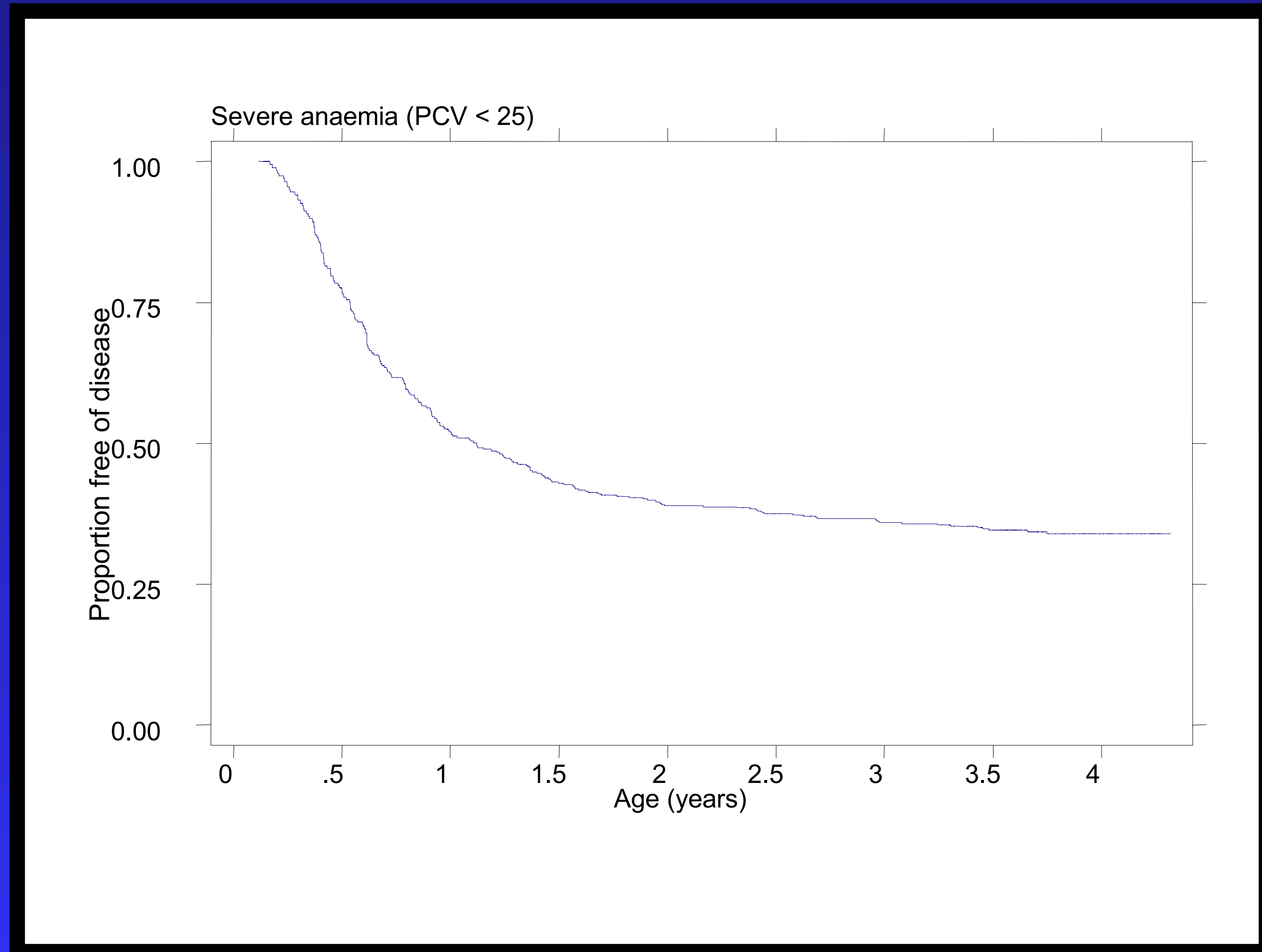
- Single dose of sulphadoxine-pyrimethamine (SP)
  - 2, 3, and 9 months, at EPI vaccination
  - 60% reduction in clinical malaria
  - 50% reduction in anaemia, during the first year of life

(Schellenberg et al, Lancet 2001)

IPTi: remaining questions

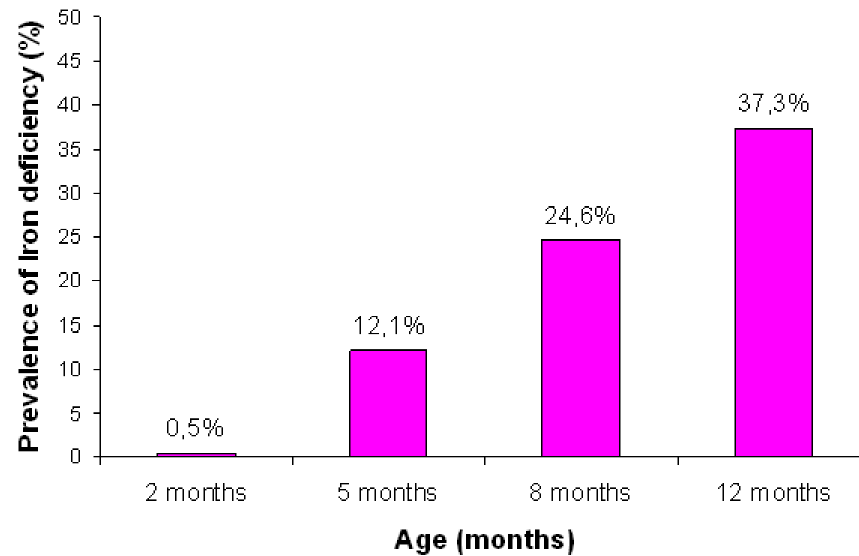
- **Will it work in other epidemiological settings?**
- **Is it safe?**
  - Impact on seroconversion to EPI vaccines?
  - Impact on development of malarial immunity?
  - Development of drug resistance?
  - Adverse drug reactions?
- **Will it reduce mortality?**
- **Is it operationally feasible?**
- **Is it cost-effective?**

Prevalence of anaemia in Tanzanian infants



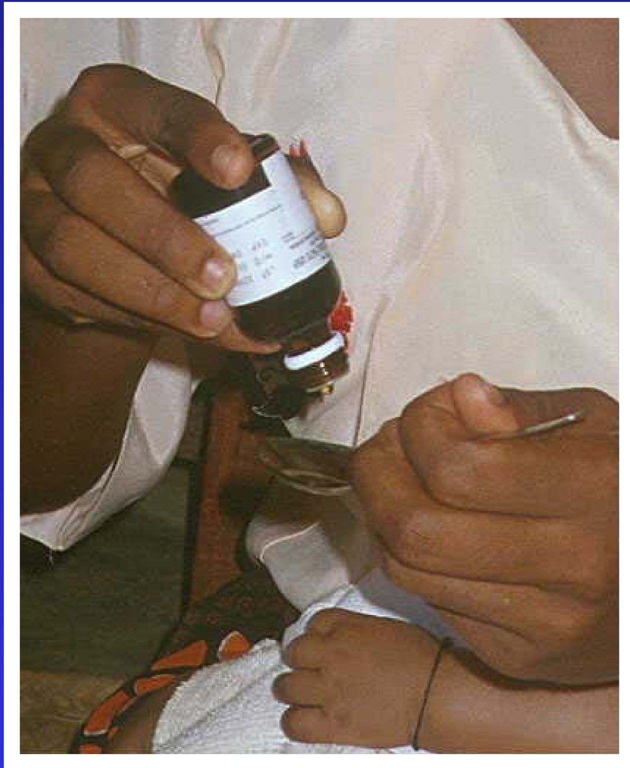
Menendez et al

Iron deficiency in Tanzanian infants



ID in Tanzanian infants. Menendez unpublished

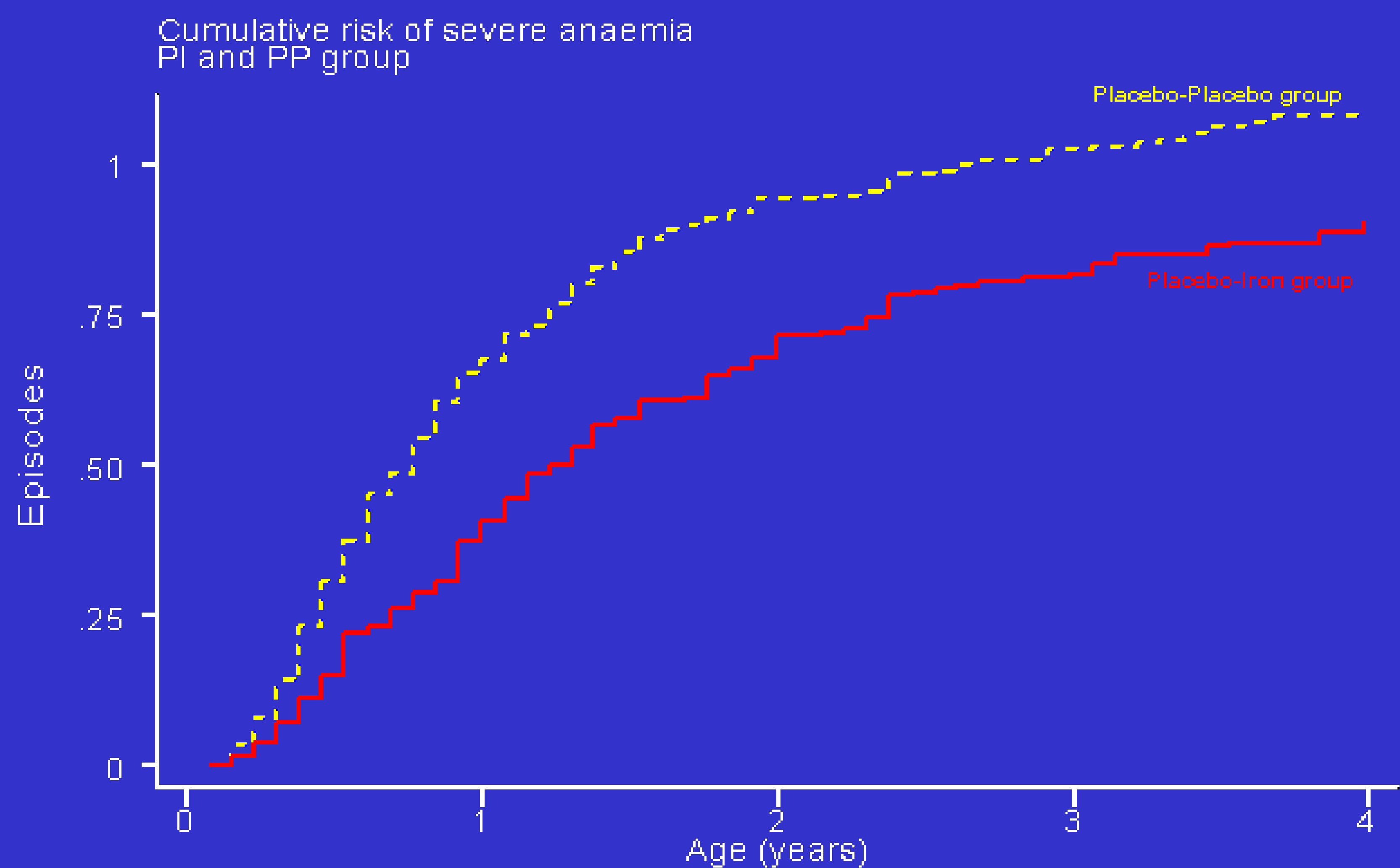
Iron supplementation in infancy



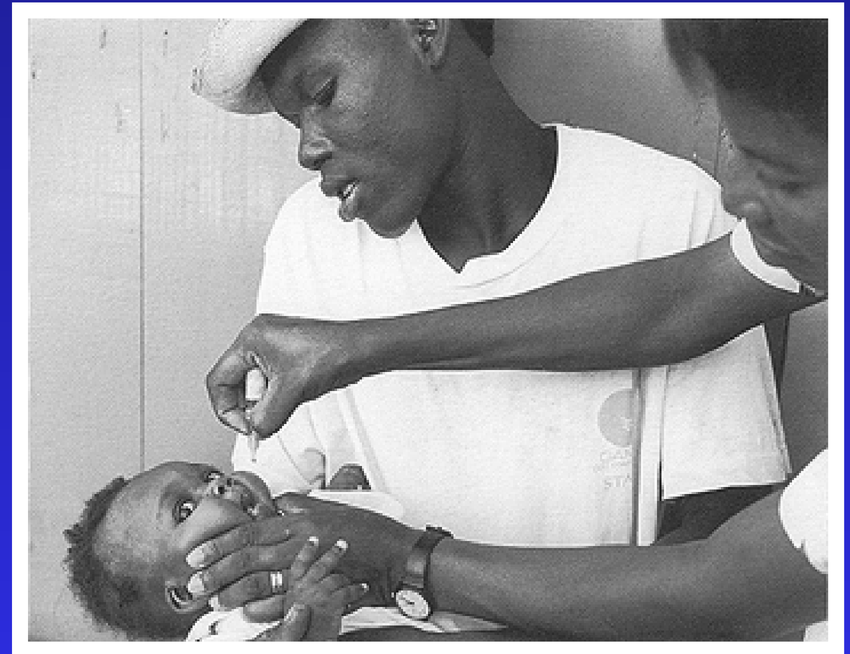
- Iron 2mg/kg/day daily between 2 and 6 months
- 30ml bottles at 2 months (EPI) and 4 months (weighing visit)
- 32% reduction in PCV <25%
- 75% received two-thirds of the intended dose

Menendez et al 1997

Cumulative incidence of severe anaemia by iron-placebo groups after four years follow-up



Sustainable systems for the combined delivery of interventions



Antenatal Clinics

Expanded Programme on Immunization

What can be delivered?

Antenatal Clinics

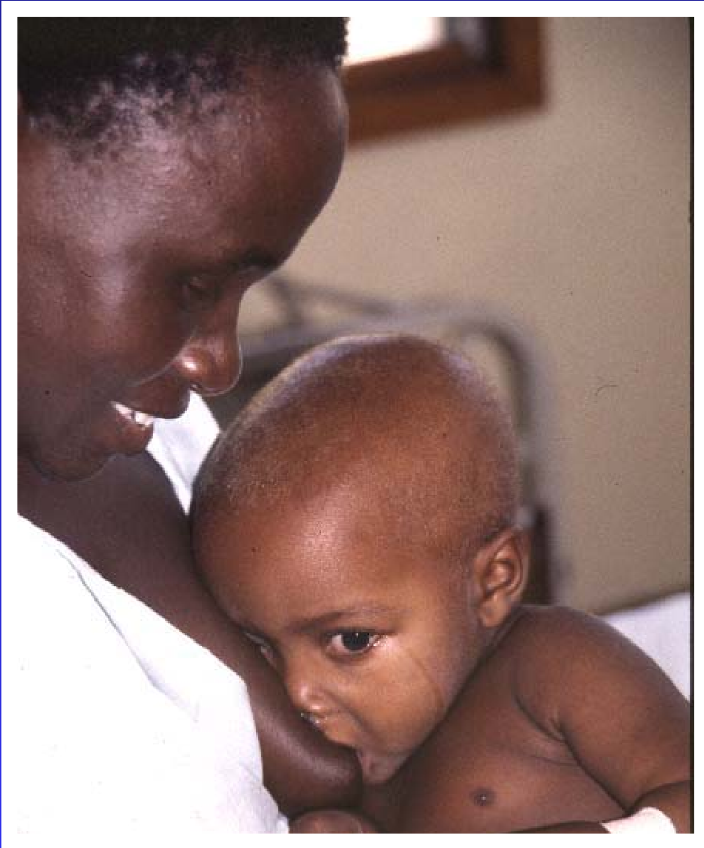
- IPT
- ITNs
- Iron, folate
- Other micronutrients?
- Dietary advice

EPI

- IPTi in the future?
- ITNs
- Pre-packaged antimalarial drugs
- Iron
- Vitamin A
- Other micronutrients?
- Advice on complementary feeding

Opportunities for targeted screening?

Summary



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Thankyou