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Integrated and sustainable vector control in sub-Saharan Africa

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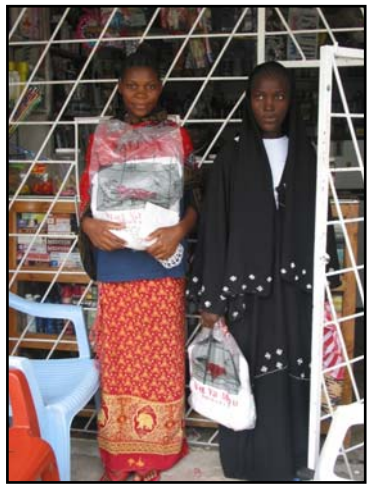


Vector control has proven effective for centuries

- **Primary prevention of malaria on a large scale has so far essentially been achieved through vector control. Intermittent Preventive Treatment (IPT) was added recently.**
- **Larval control and environmental management were successful in different areas during the 18th-19th century, for example in Europe. In sub-Saharan Africa (SSA) larval control is thought to be only applicable in specific situations (e.g. urban malaria, dry areas, commercial settings, areas with cold winters)**
- **Since the availability of DDT after WWII, many areas have been made malaria-free in Europe, Asia and the Americas with indoor residual spraying (IRS)**
- **In the 1980s the development of insecticide-treated nets has made effective vector control possible even in remote areas without much health infrastructure**

Historical evidence for impact of IRS in Africa

- Early small-scale IRS trials in the 1950s consistently documented substantial impact on transmission (but only rarely its interruption) in 10 countries in SSA (**Bruce-Chwatt 1984, Kouznetsov 1977**).

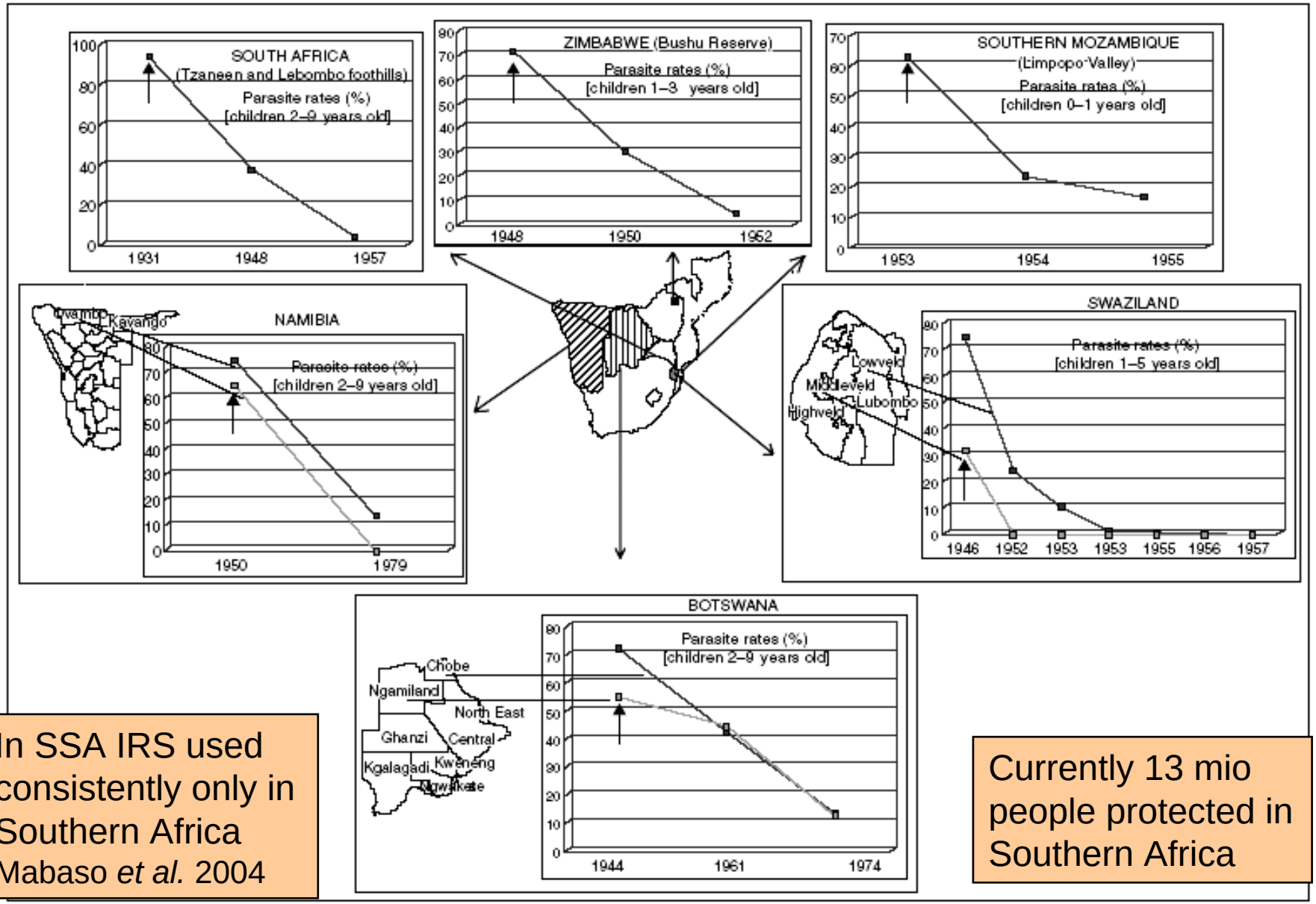
- **Pare-Taveta, Tanzania** (dieldrin): EIR from 10-50 to less than 1, decrease in the crude mortality rate from 24 per 1000 in 1955 to 16 per 1000 in 1958, and in the infant mortality rate from 165 to 132 per 1000 (**Pringle 1969, Bradley 1991**).

- **Kisumu, Kenya** (fenitrothion): transmission reduced by 96% in 2 years. Crude death rate reduced by 43% and the infant mortality rate by 41 %, with no change observed in an adjacent control area (**Payne 1976**).

- **In northern Nigeria** (propoxur): substantially decreased transmission and improved infant and child mortality. (**Molineaux 1985**).

- Good evidence of impact on malaria morbidity in Burundi

- Conversely, **cessation of IRS** has had dramatic consequences in Ethiopia, Madagascar, Sao Tome, South America.



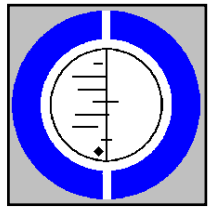
In SSA IRS used consistently only in Southern Africa
Mabaso *et al.* 2004

Currently 13 mio people protected in Southern Africa

Figure 1 Parasite rates before and after the inception of malaria control by indoor residual spraying (IRS) (arrows show the start of IRS) in Swaziland, Botswana, Namibia, South Africa, Zimbabwe and southern Mozambique (for references on country data see main text).

Summary of impact of ITNs

Source: Cochrane review, Lengeler 2004



- **ITNs have a substantial impact on child mortality (1-59 months) in Africa: overall, there is a reduction of 18% in child mortality in 5 large-scale trials.**

- **This is equivalent to 5.5 deaths averted per year and per 1000 protected children**

With 80 mio. children under 5 at risk in Africa
480,000 deaths could be saved every year

•ITNs have a substantial impact on mild disease episodes:

- In Africa: 50% reduction against *P. falciparum*
- In Asia and LA: 62% reduction against *P. falciparum*
- In Asia and LA: 52% reduction against *P. vivax*

Implementation under programme conditions works as well (effectiveness ~ efficacy) and there is no delayed mortality effect!

Comparing IRS with ITNs – is one better?

	PE IRS	PE ITN	IRS: cost p.p. protected	ITN: cost p.p. protected	Reference
Tanzania 12 villages Randomized	64%	55%	4.6	1.3	Curtis *et al.* 1998
India 126 villages Randomized	30%	54%			Misra *et al.* 1999
South Africa 14 blocks Randomized	PE ITNs vs IRS: 33%		2.3 (one round)	3.7	Mnzava *et al.* 2001 Goodman *et al*. 2001
Pakistan P.v. Non-random. P.f.	44% 49%	42% 61%			Rowland *et al*. 1999
Kenya Non-random.	75%	63%	0.88 (one round)	2.3	Guyatt *et al.* 2002

PE= protective efficacy = (1-RR) x 100

NO!!! Choosing between IRS and ITN is largely a matter of operational feasibility and availability of resources.

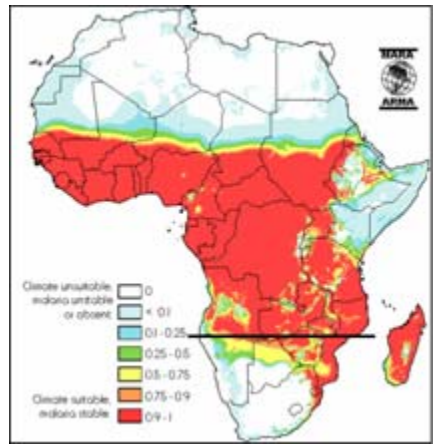
How can vector control be implemented:

- On a large scale
- Sustainably (financially, operationally)
- With a maximum level of health service integration

?????

IRS Implementation - 2006

- There is no known example in which community members had to pay for IRS or participate beyond clearing out their houses… Hence programme implementation is entirely dependant on resources from either the government or commercial companies. IRS programmes are the "model" vertical programme but they are well integrated into the health system!



- Currently mainly implementation in countries with
  - Low populations at risk (13 mio in southern Africa vs >500 mio in the rest of sub-Saharan Africa)
  - Relatively high GDP (6.8 times higher in southern African countries compared to their direct neighbours – USD 2819 vs 413)

In these settings both integration and sustainability is achieved.

New IRS initiatives

- Mainly through the recent Presidential malaria Initiative (PMI). Started in summer 2005 with 3 countries, at least 7 more to follow in 2006
- IRS an important component in all plans submitted to countries – unfortunately more for ideological than for evidence-based reasons
- Implementation is proceeding (e.g Angola, Uganda, Zambia, Zanzibar)
- Implemented by American organizations, with link to health system unclear. Very low level of integration at present. Financing entirely dependent on PMI.

ITNs: Current main implementation models

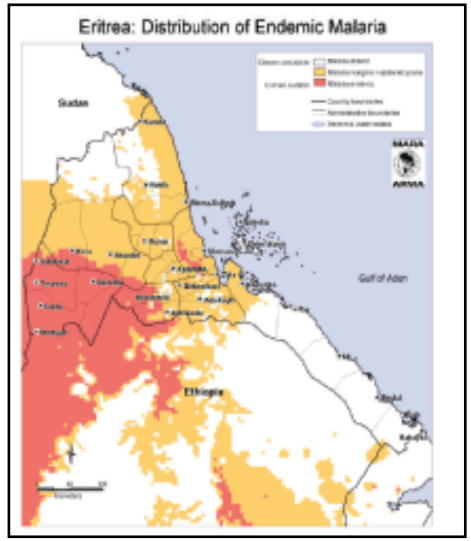
Public sector

1. Free distribution of ITNs through health facilities (Eritrea)
2. Free distribution of ITNs in the frame of vaccination campaigns (Togo, Zambia, Niger, Mozambique)
3. Free insecticide treatment (China, Vietnam)

Commercial / mixed

4. A comprehensive market approach (NETMARK project in Senegal, Mali, Ghana Nigeria, Mozambique, Uganda, Zambia, Ethiopia) – with and without subsidies.
5. Social marketing (Malawi, Kenya) – with and without subsidies, with and without product distribution.
6. Integrated approaches (NATNETS Tanzania).

(1) Free nets through health services



<u>Example</u>: Eritrea

Population 4 mio (700,000 under five)

Also Vietnam, India, South America in limited areas

- **More than 1 million nets distributed during the last 4 years. Few operational details available**
- **Reduction of 85% in number of cases since 1999 (180,000 to 28,000)**
- **But also drought and other interventions (larval control, environmental management)**

- ➢ **Very well integrated but requires a well functioning health system and strongly motivated MoH**
- ➢ **Sustainable as long government commitment remains**

(2) Free distribution of ITNs in frame of vaccination campaigns

<u>Example</u>: Togo in 2004

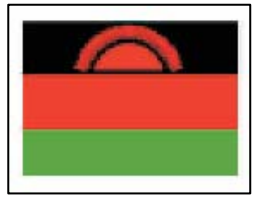
Population 5 mio (800,000 under five)

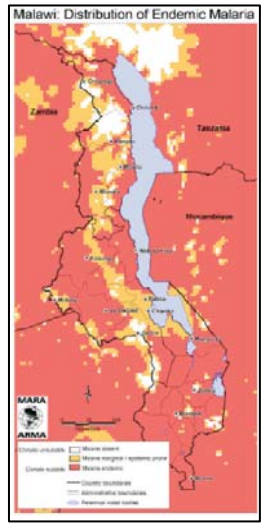
Also in 10 other countries in 2006

- **Roughly 700,000 ITNs given together with measles and polio vaccine within few days**
- **At the end, 67% HH ownership of ITNs (no socio-economic disparity!), 63% regular use in children.**

- **Requires major national mobilization, but this can be shared with other interventions (measles/polio vaccination, Vit A, deworming)**
- **Integration limited and potentially over-burdening of health system; best use of resources in country with high immunization rates???**
- **Biggest problem is that is does not offer an ITN to children born after the campaign!!**

(5) Social marketing programmes
(Population Services International model)





<u>Example</u>: Malawi

Population 12 mio (1,800,000 under five)

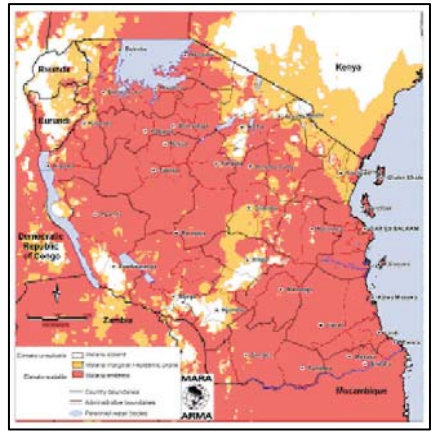
Also Kenya, Rwanda and other smaller programmes

- **More than one million nets distributed each year**
- **Market segmentation:**
  - **More expensive blue conical ITNs through commercial outlets for $5–6 (8% of all nets)**
  - **Unbranded green rectangular ITNs delivered via community-based groups at the subsidised price of $1.2 (16% of all nets)**
  - **Green rectangular ITNs made available to pregnant women and children <5 for $0.6 through public health facilities (76% of all nets)**
- **ITNs are branded and heavily promoted through a range of mass media and interpersonal communications channels**

➢ **Integrated to some extent but distinct distribution system**

➢ **Sustainability depending on outside funding**

(6) Integrated approaches



Example: Tanzania
Population 35 mio (5,300,000 under five)

- **In 1999, regular ITN use was only 10%; a national ITN stakeholder partnership was created**
- **A National strategic plan was produced and approved in 2000. The national ITN initiative (NATNETS) was hence created. It consists of three main components:**
  1. **An ITN coordination cell within the NMCP (SDC / STI)**
  2. **A national strategic social marketing programme to support the commercial sector to develop the ITN market - SMARTNET (DfID/RNE, implemented by PSI); nets for sale in the commercial sector for $ 3-6**
  3. **A national subsidy scheme targeting pregnant women with vouchers (GFATM) – price reduciton of $ 2.5**
- **Around 3 million nets distributed each year**

Tanzania National Voucher Scheme (TNVS)

MoH contractor (MEDA – Mennonite Economic development Agency)

Medical Stores Dept.

Net producer

Net wholesaler

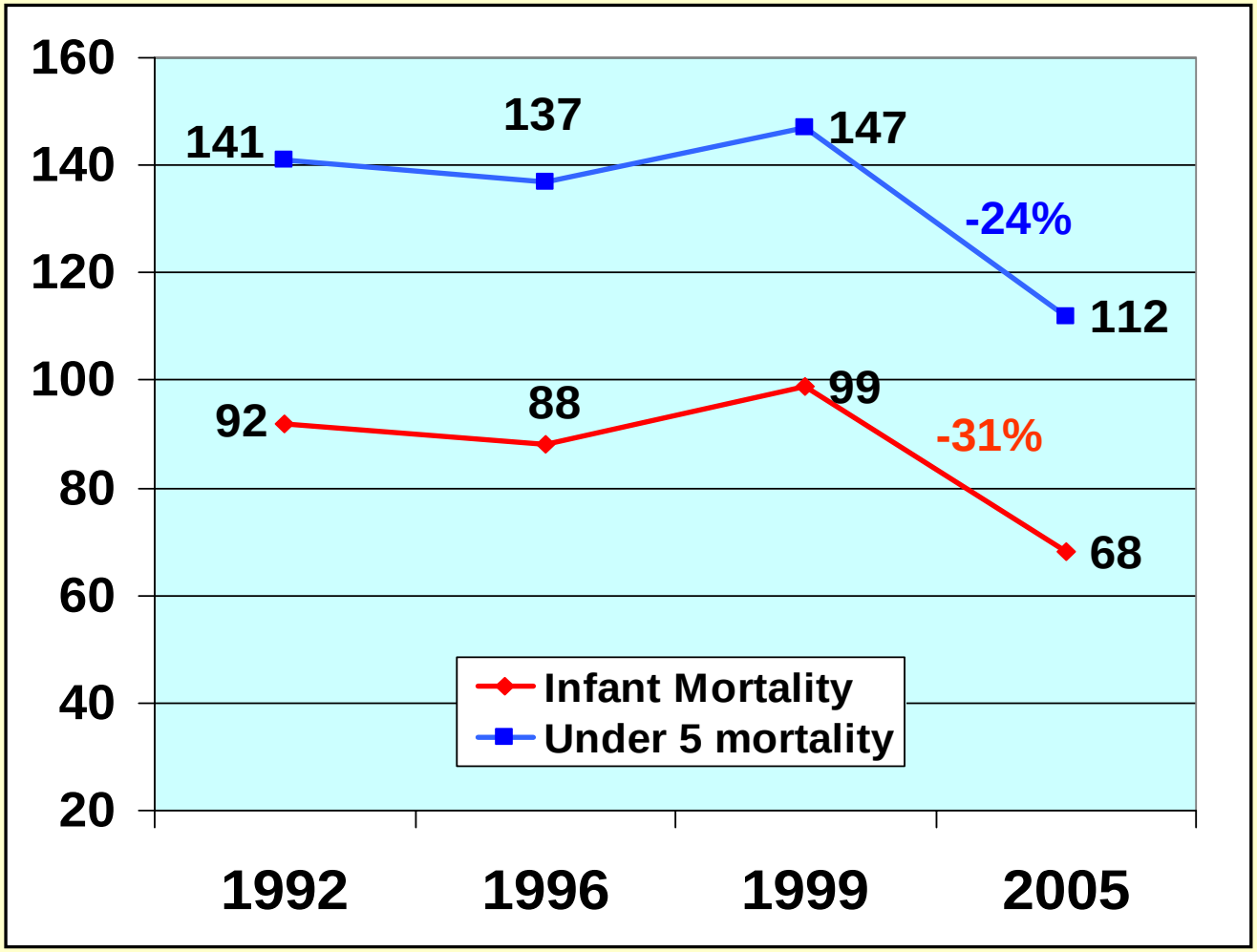
Districts, then MCH clinics

Net retailer

Pregnant woman attending ANC

Training Promotion
MoH contractors (Care & World Vision)

Improving child survival…



Source:
Tanzania
DHS surveys
Macro Int.

An improvement of 24% in under 5 mortality represents
39,200 deaths less each year

Conclusions

- **Both IRS and ITNs work, in the short- and long-term**
- **IRS and ITNs are necessary interventions to reach international health targets in large parts of the world, including the millenium development goals**
- **IRS is currently widely used in southern Africa, where it is sustainable and well integrated**
- **In most other SSA countries the resources to carry out IRS are not available but new programmes are being implemented in the frame of the US PMI**
- **Robust strategies exist to upscale ITNs in all endemic countries, with substantial external funding being available.**
- **Impact on child mortality starts to show!**

Age pattern of mortality rates