

NTDs – Targets of Opportunity

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*Working with Partners
To Improve Global Health*
*A Strategy for CDC
and ATSDR*



HEALTHY PEOPLE 2010: CHRONIC DISEASE PREVENTION • INFECTIOUS DISEASE PROTECTION • IMMUNIZATION • INJURY PREVENTION • PUBLIC HEALTH EDUCATION • EPIDEMIOLOGY • WORKPLACE HEALTH • IMMUNIZATION • WORKPLACE SAFETY • TRAINING • COMMUNITY PREVENTION RESEARCH • PRIVATE SECTOR PARTNERSHIPS • PUBLIC HEALTH WORKFORCE • WOMEN'S HEALTH • INFECTIOUS DISEASE PROTECTION • PUBLIC PARTNERSHIPS • HEALTHY PEOPLE 2010: PREVENTION AND CONTROL

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Outline of Presentation

- Organisms and diseases
- Global burden and geographical distribution
- Biological aspects of transmission and interventions
- Opportunities for elimination

Seven Tool-Ready NTDs

- Lymphatic filariasis
- Onchocerciasis
- Schistosomiasis
- STH
 - Ascariasis
 - Trichuriasis
 - Hookworm
- Trachoma

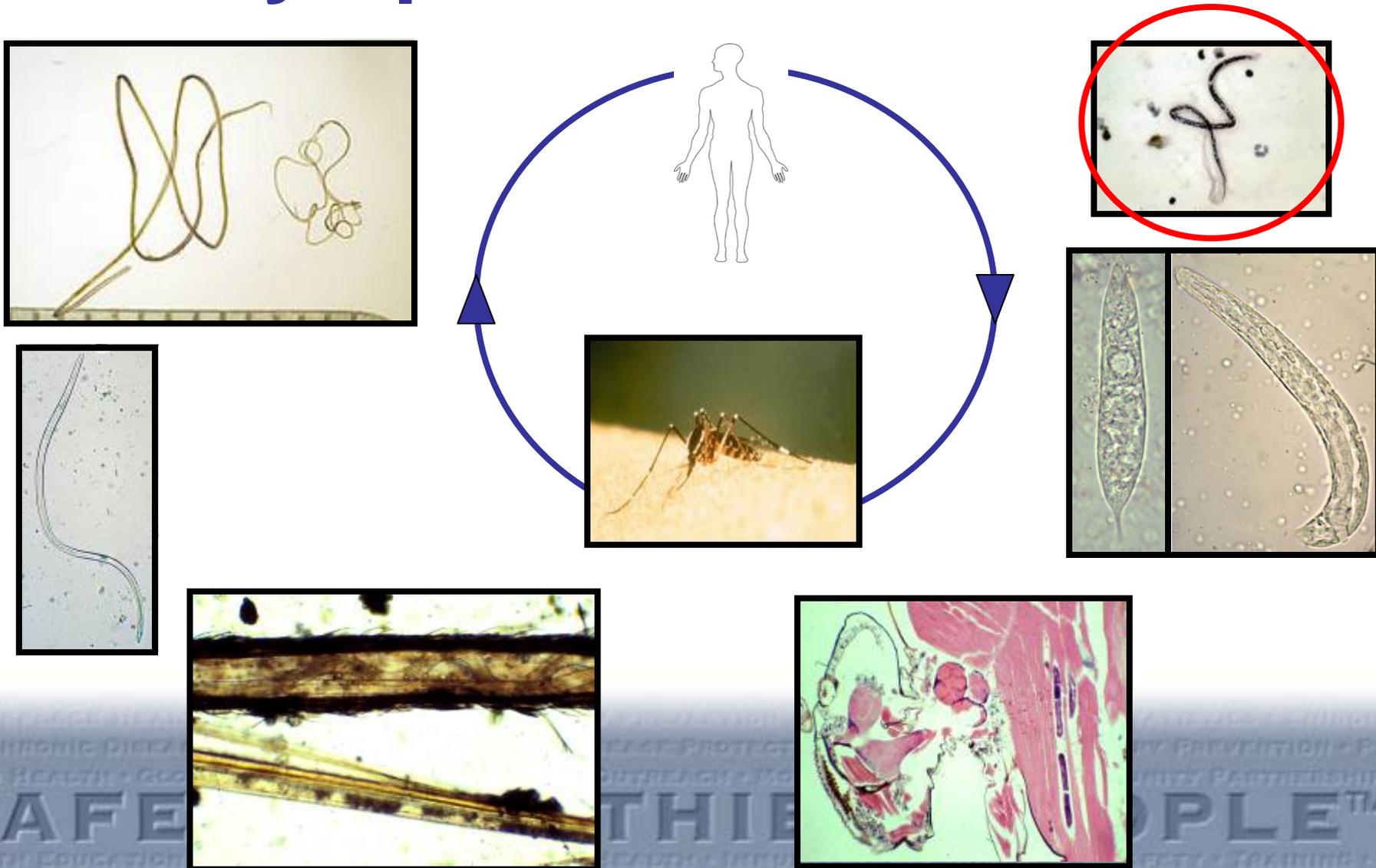


NTD Characteristics

- Affects 1/3 – 1/2 of global population
- High morbidity, low mortality; disfiguring
- Poor populations; remote rural, urban slums; no political voice; linked to poverty
- Aggregated, over dispersed; focal within country/district
- Social disparity; social stigmatization and discrimination
- Communicable diseases but don't travel well; not perceived as threat to developed countries
- Safe, effective, donated drugs permit mass treatment strategy – provides clinical benefit and reduces transmission
- Drug delivery can be packaged to reduce program costs

Parasites and Diseases

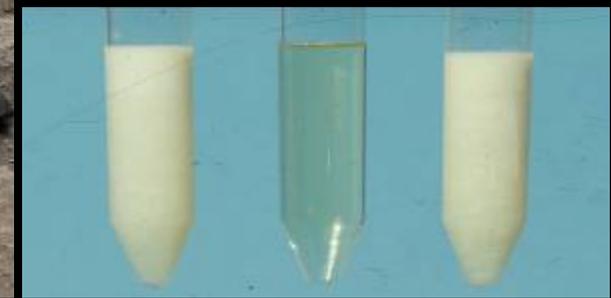
Lymphatic Filariasis



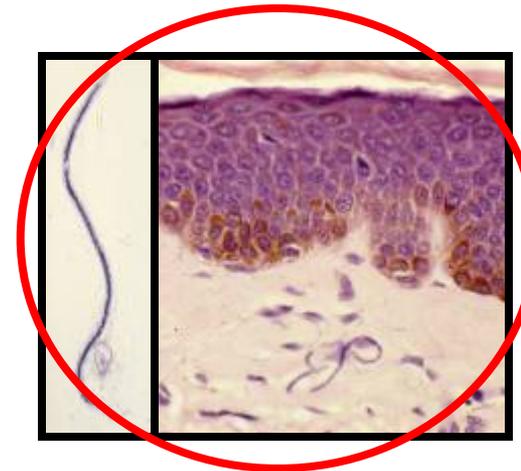
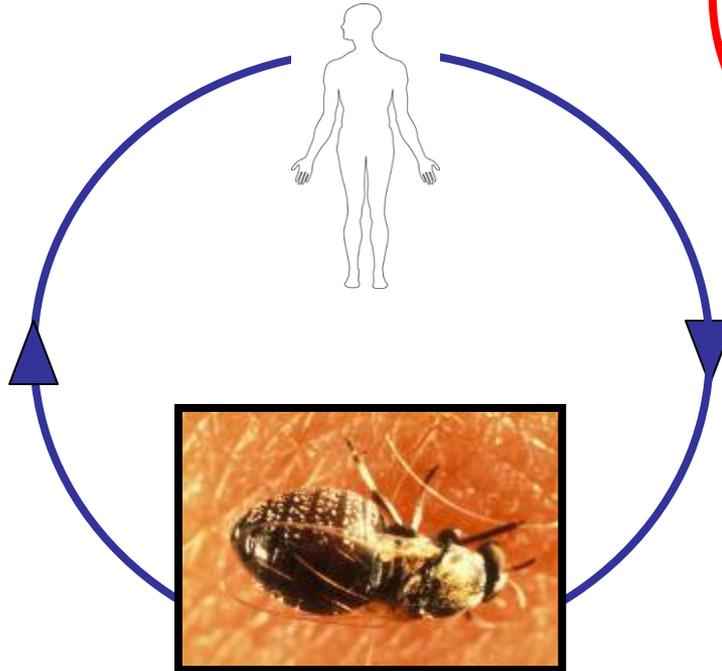
Lymphatic Filariasis

Disease

- Subclinical disease
- Acute adenolymphangitis
- Filarial fever
- Lymphedema
- Hydrocele
- Chyluria
- TPE



Onchocerciasis



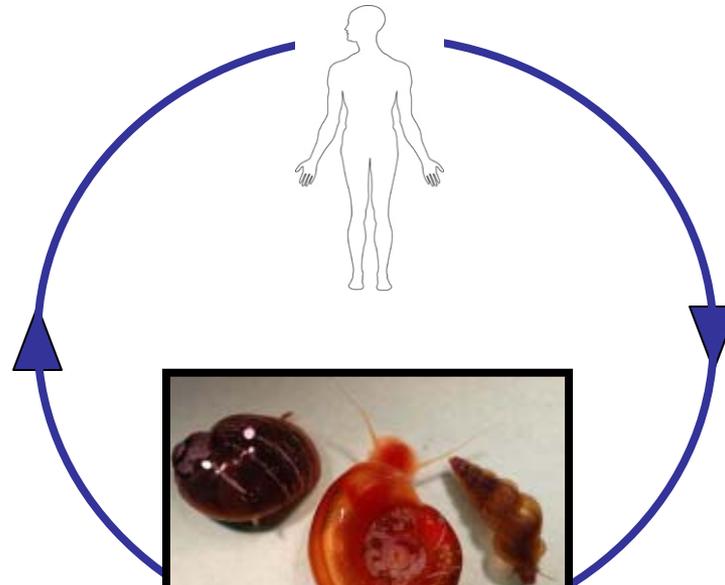
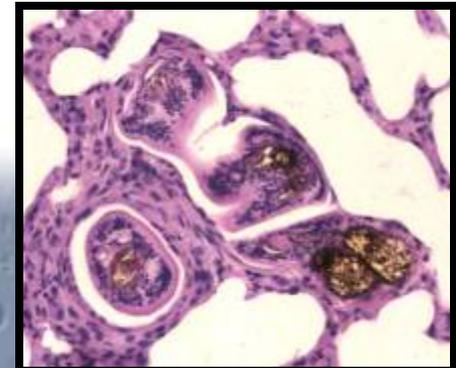
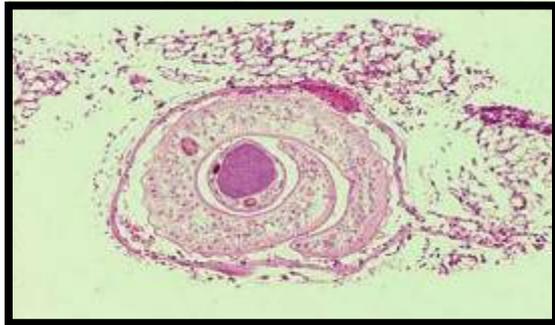
Onchocerciasis

Disease

- Subclinical disease
- Dermatitis
 - Acute & chronic
 - Lichenified
 - Atrophy
 - Depigmentation
- Subcutaneous nodules
- Lymphadenopathy
- Visual loss/blindness



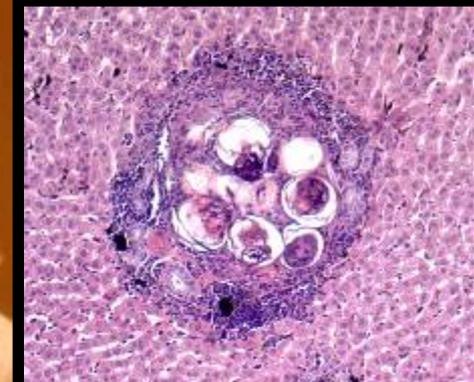
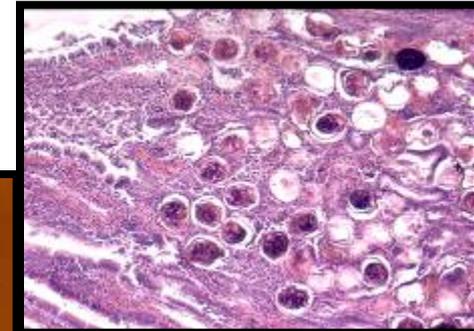
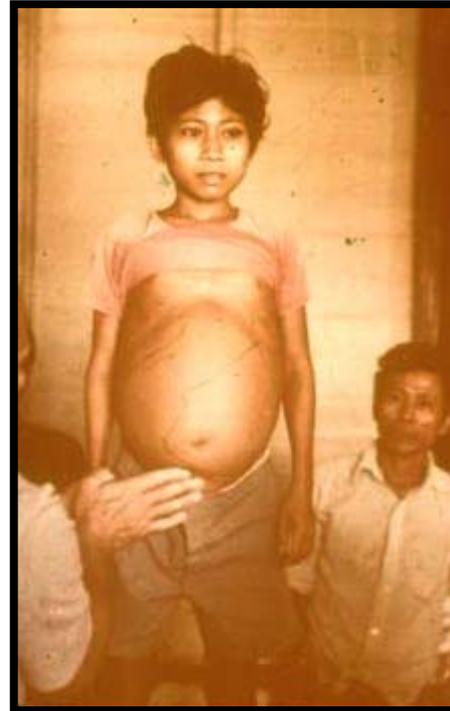
Schistosomiasis



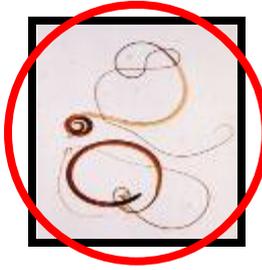
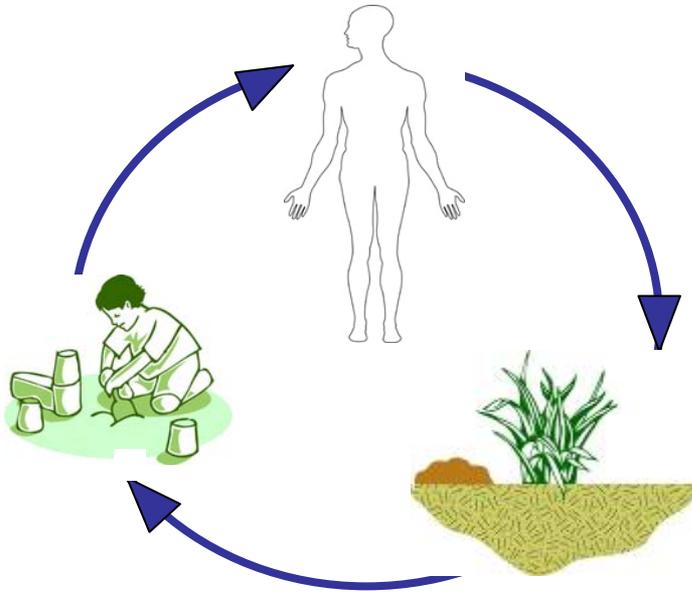
Schistosomiasis

Disease

- Subclinical disease
- Dermatitis
- Acute schistosomiasis
 - Katayama fever
- Chronic schistosomiasis
 - Fibrosis
 - Granulomatous inflammation
 - Portal vein hypertension
 - Hepatomegaly
 - Hematuria
 - Squamous cell bladder cancer



STH/Geohelminths



STH - Trichuriasis

Disease

- Subclinical disease
- Prolapsed rectum
- Nutrient competition leading to growth and cognitive retardation
- Finger clubbing



STH - Ascariasis

Disease

- Subclinical disease
- Pneumonitis
- Intestinal obstruction
- Nutrient competition leading to growth and cognitive retardation



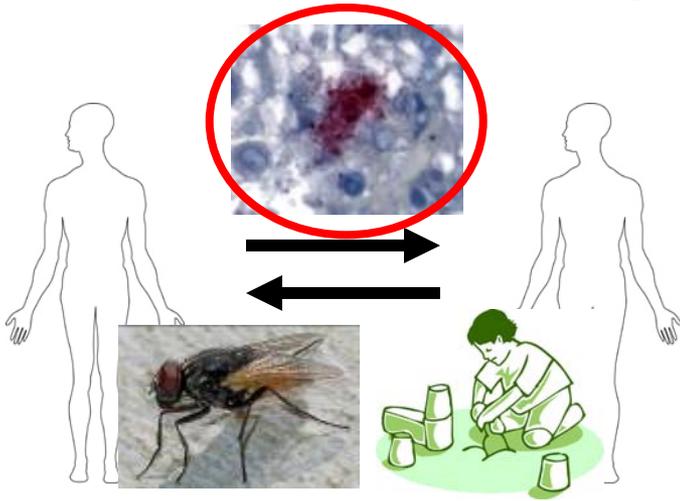
STH - Hookworm

Disease

- Subclinical disease
- Anemia
- Iron deficiency
- Nutrient competition leading to growth and cognitive retardation



Trachoma



Disease

- Diminished vision
- Blindness



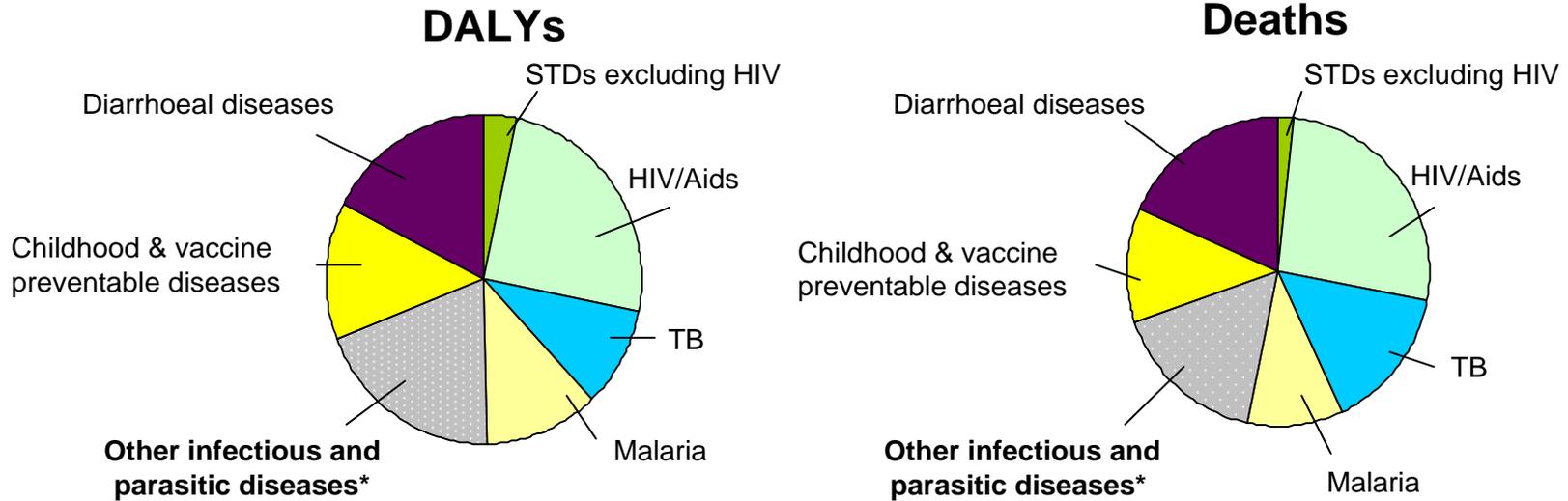
Burden of Disease and Geographical Distribution

Burden of NTDs

Condition	No. of cases*	Population at Risk*
Round worm	1B	4+B
Trichuriasis	800M	3+B
Hookworm	740M	3+B
Schistosomiasis	200M	700M
Lymphatic filariasis	120M	1+B
Trachoma	84M	590M
River blindness	37M	90M

** Approximate*

The Burden

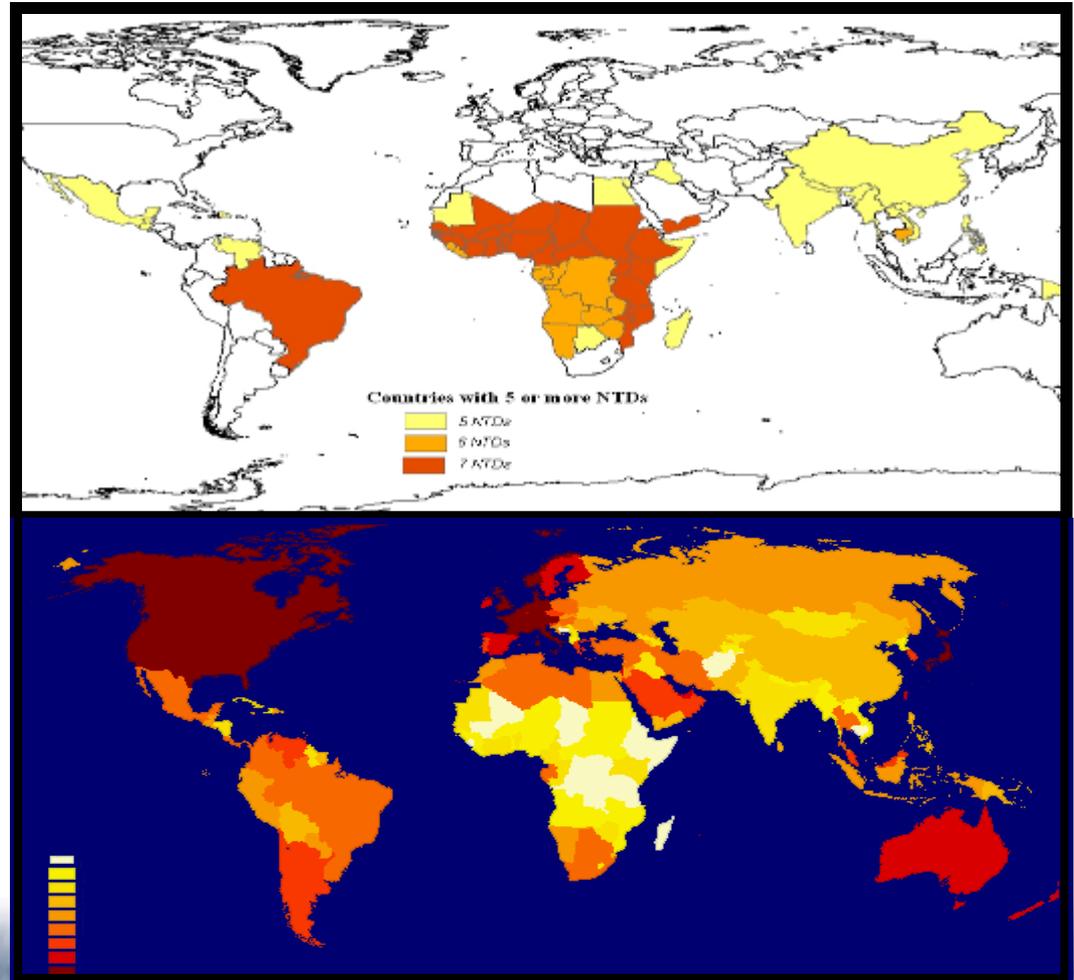


* Broader group of NTDs than the 7 USAID targets

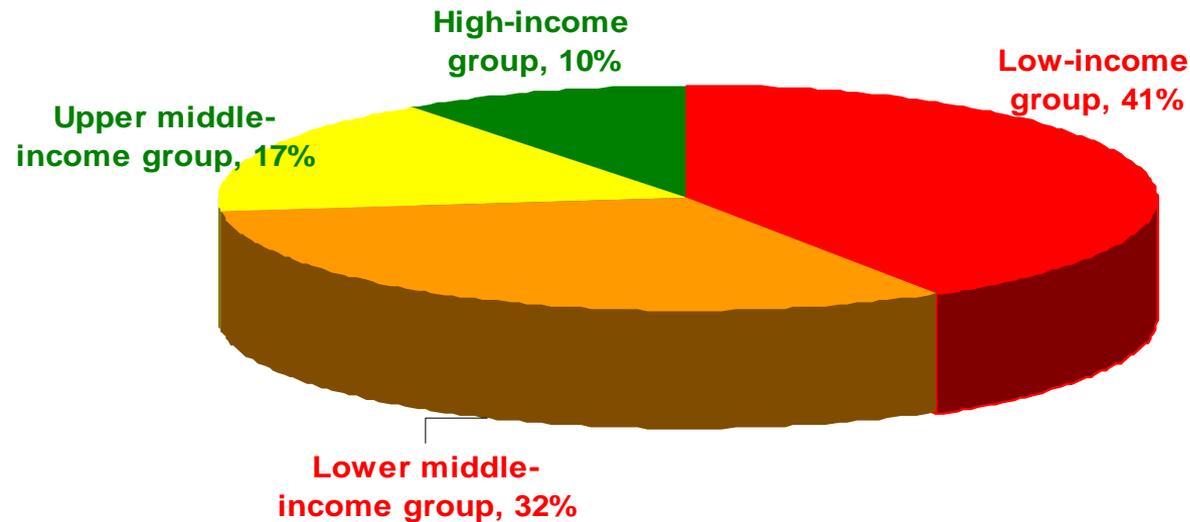
Source: World Health Report 2002

The NTD Burden

- NTDs are diseases of poverty
- NTDs exacerbate poverty

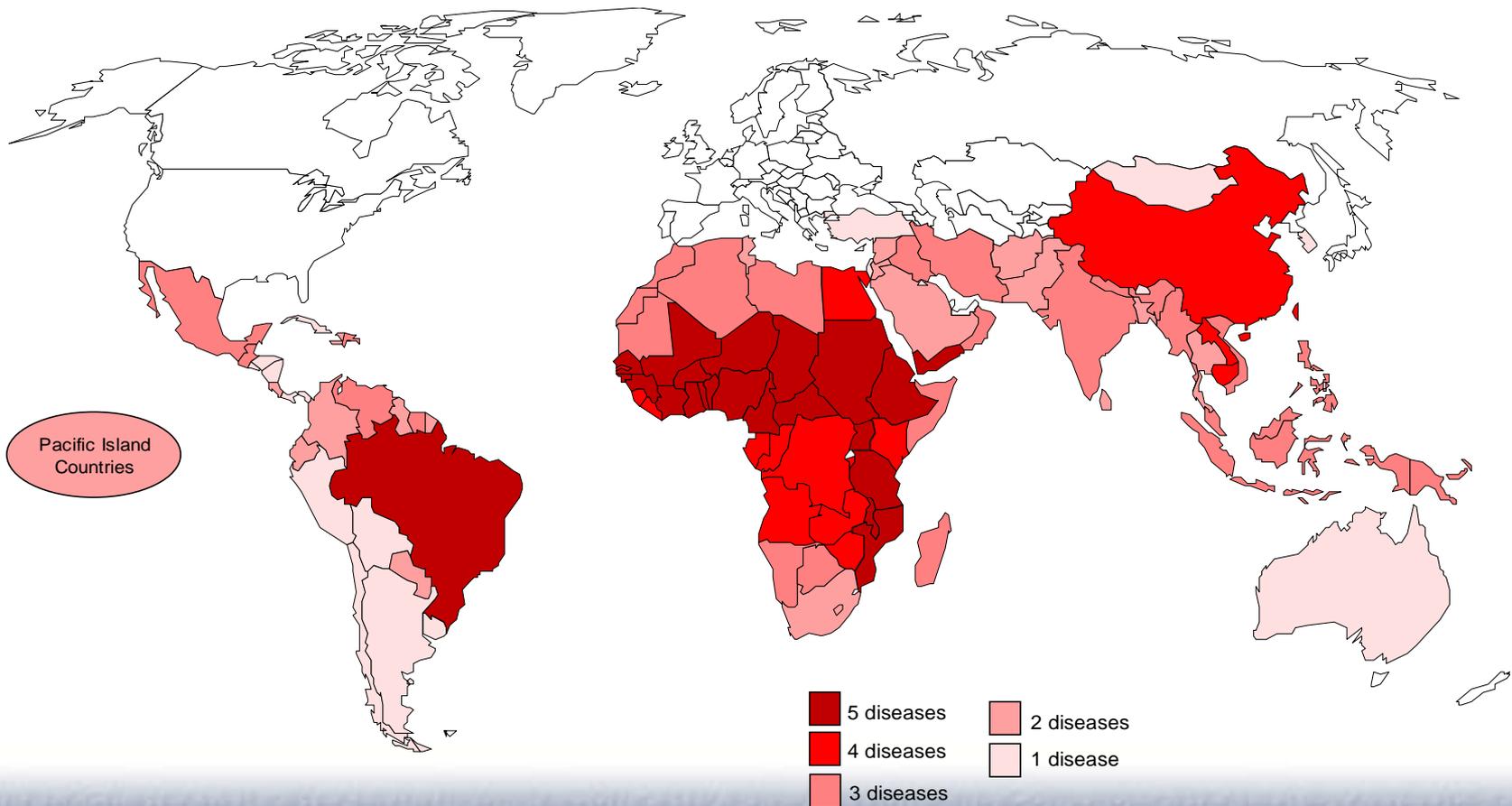


Countries affected by NTDs by income group



- More than 70% of countries and territories affected by neglected tropical diseases are low-income and low middle-income countries
- 100% of low-income countries are affected by at least 5 neglected tropical diseases

Global Overlap: 7 NTDs



Biological Aspects of Transmission and Interventions

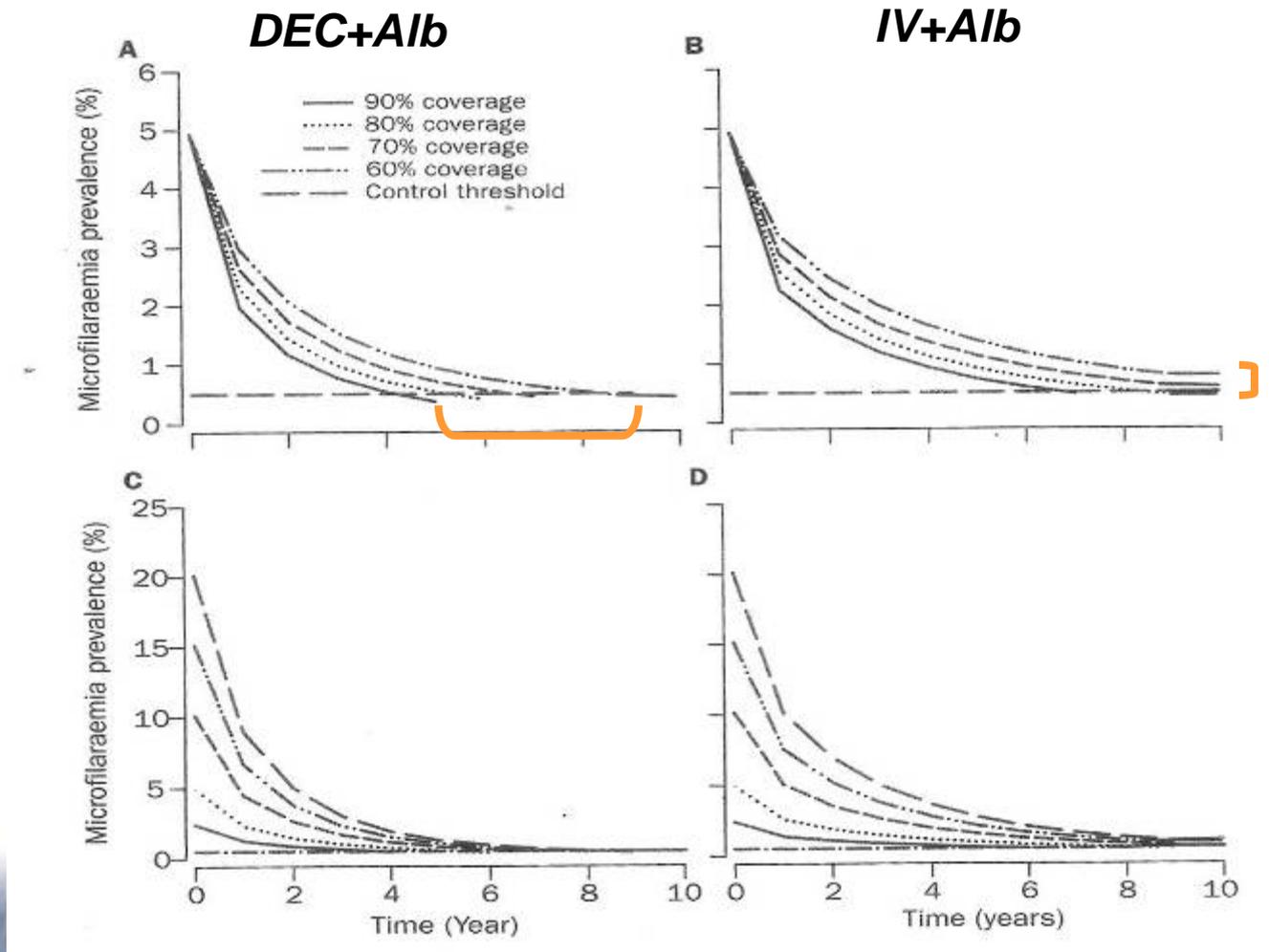
Factors that Influence Endemicity and Transmission

- Lifespan of parasite
- Prepatent period
- Host density
- Vector density
 - Competency
 - Human biting rates
- Parasite prevalence and intensity of infection
- Climate/weather
- Socioeconomic factors
- Human behavior
- Nutritional status
- Host immune responses
- Host genetic factors

Parasite life expectancies

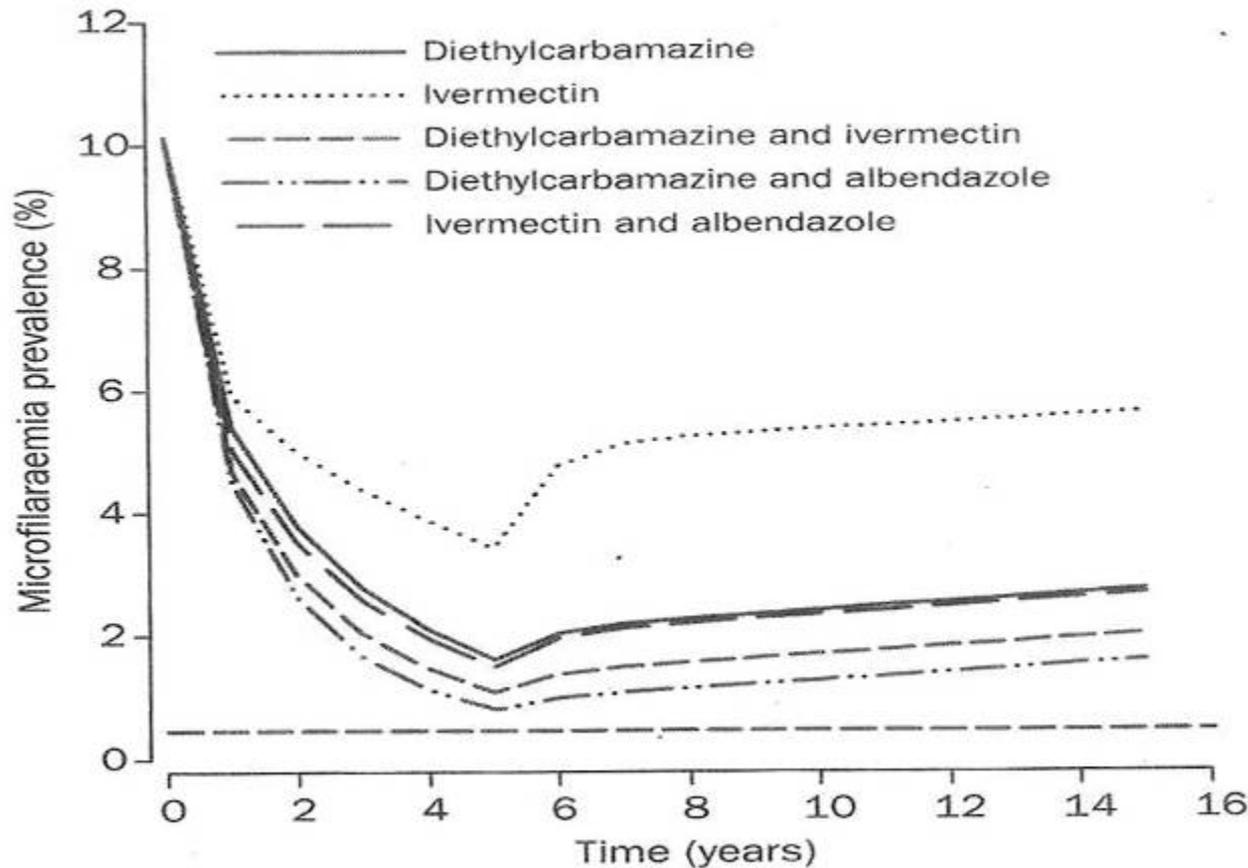
	Lifespan adults/yr	Rate of production/ day	Lifespan trans stage/ wk	Prepatent period days
Schisto	3-7	100-300	2-6*	25-30
Ascaris	1-2	200,000	4-52+	50-80
Trichuris	1-2	1,000	1-4	50-80
Hookworm	2-3	3,000 (N)- 20,000(A)	1-3	30-50
LF	5-10+	20,000-0	2-3*	210+
Oncho	5-10+	10,000-0	2-4*	270+

Coverage *REALLY* Matters



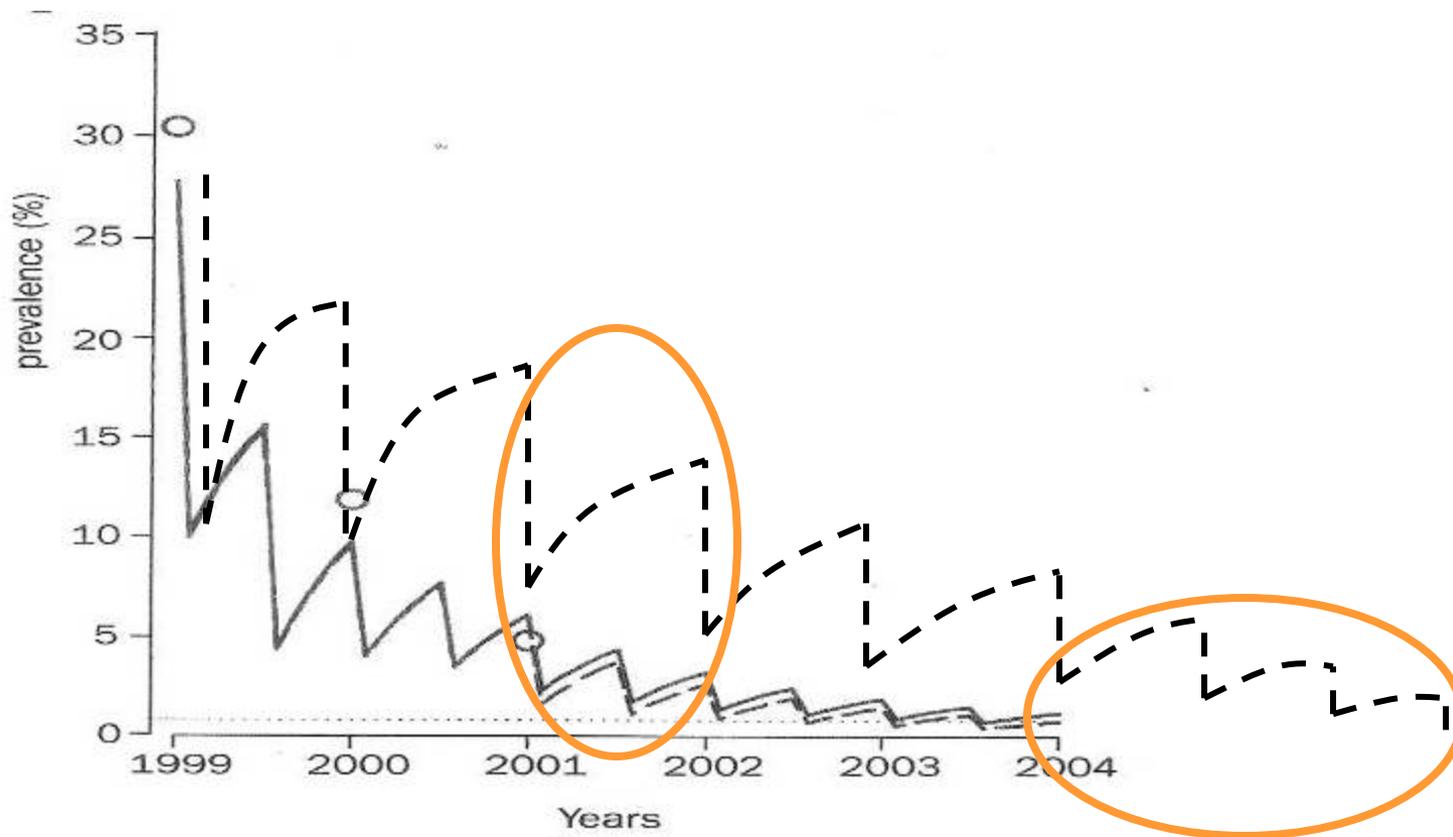
Michael et al, 2004

Benefit of Combination Therapy



Michael et al, 2004

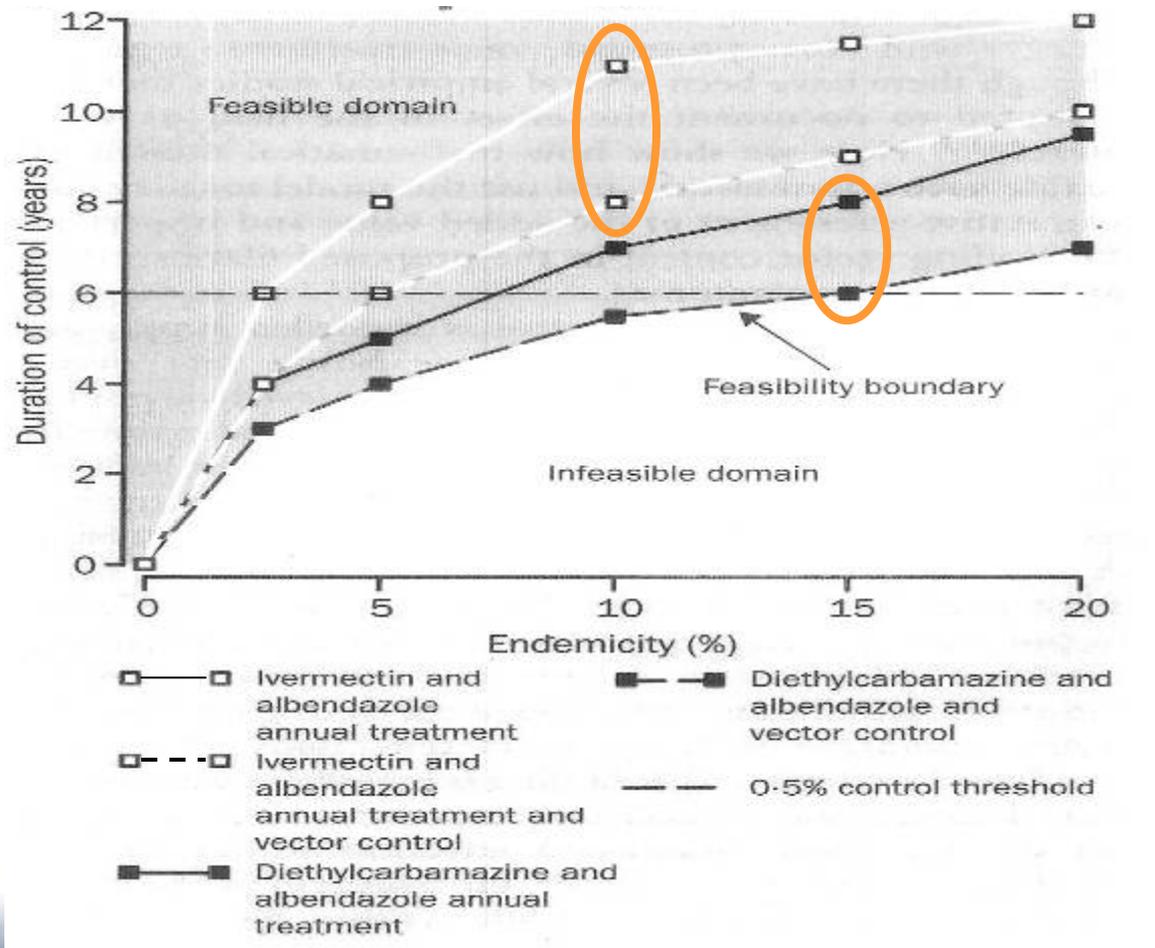
More Frequent Treatments: At what costs?



Modified from Michael et al, 2004

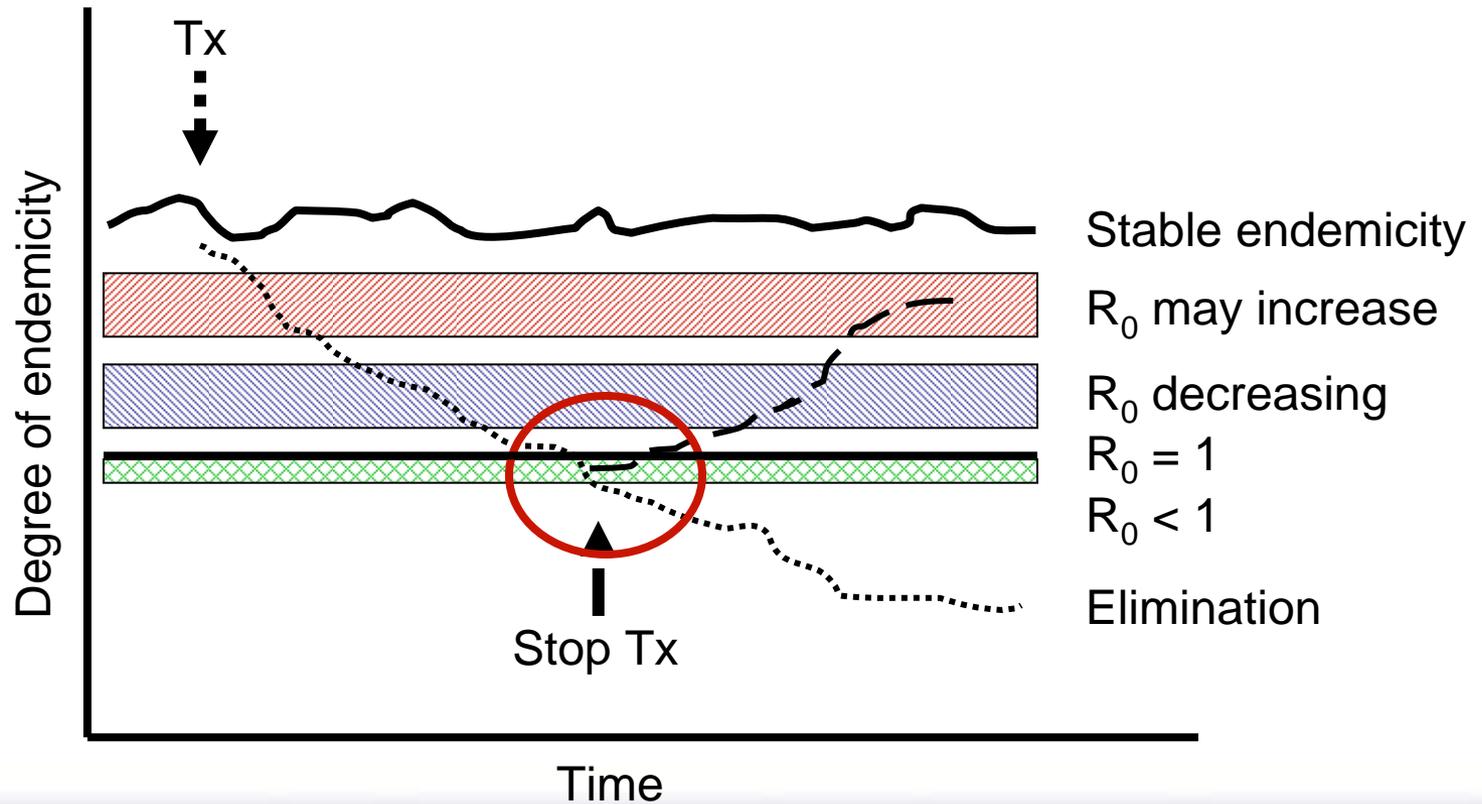
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Vector Control: At what cost?



Michael et al, 2004

Transmission Dynamics



Prospects for Elimination

Indicators of Eliminability

- **Biological plausibility**
 - No animal reservoir and opportunity to minimize human exposure
 - No multiplication in the environment
 - R_0 reduced to less than 1
- **Effective tools**
 - Effective intervention tools
 - Strategy to use tools
 - Diagnostics for mapping, monitoring
- **Proof of principle**
- **Adequate human and financial resources**

Lessons from Previous 'E' Programs

- ✓ Understand natural history of disease
- ✓ Consult widely before embarking
- Initiate surveillance early and use surveillance to guide program strategy
- Eradication/elimination requires vertical approach
- ✓ Remain open minded/flexible, expect unexpected
- ✓ Some countries will need more help than others
- Coordination of external donors essential
- Political commitment at all levels essential
- ✓ Inspire enthusiasm, don't declare success prematurely
- ✓ Set a specific target date for eradication/elimination

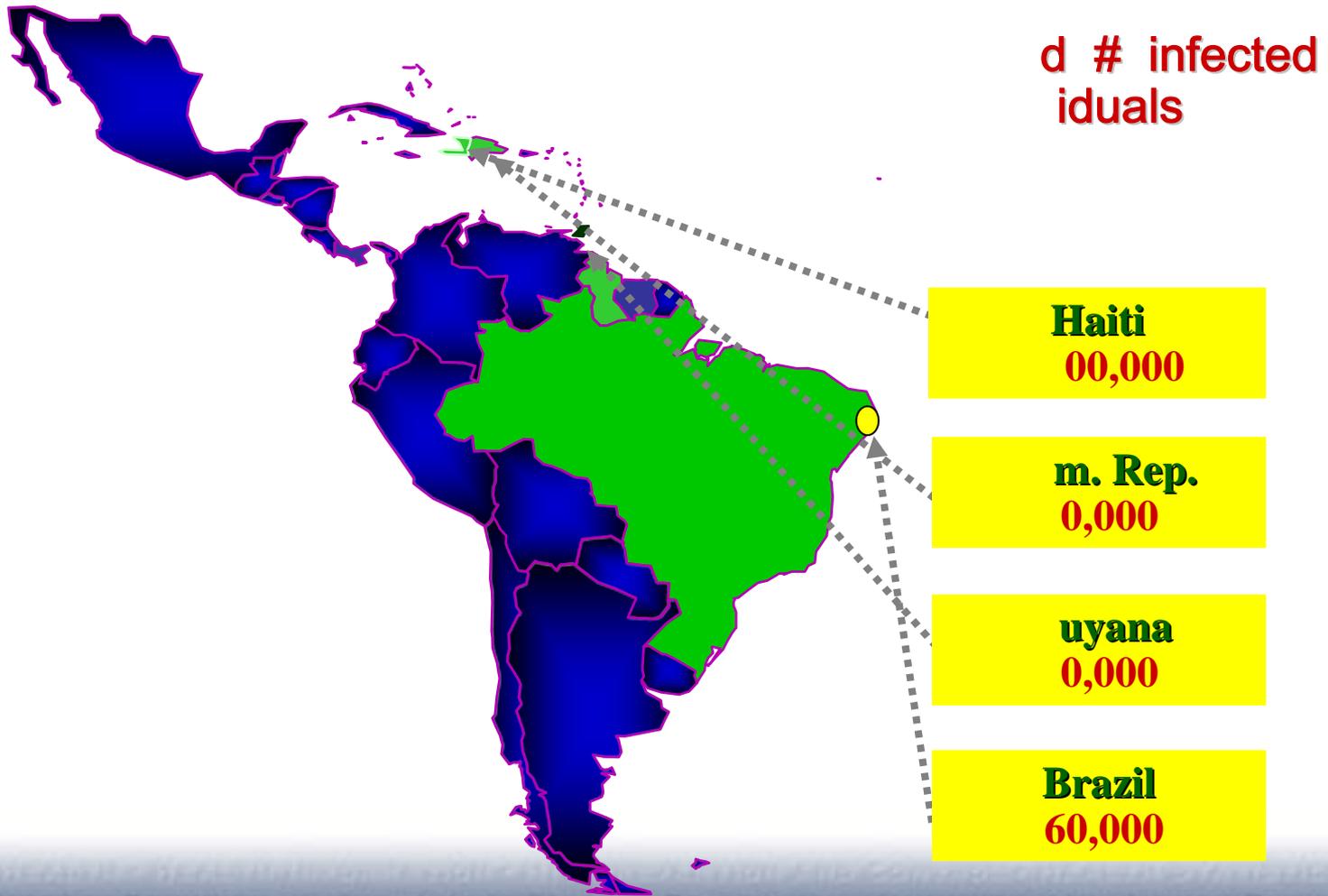
From: Dahlem Report, The Eradication of Infectious Diseases, 1998

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Why Geographic Considerations?

- Different vectors and vectorial capacity
 - *Simulium* in Africa vs *Simulium* in Americas
 - Within region differences: *S. ochraceum* vs *S. exiguum*
 - *Anopheles* versus *Culex* versus *Aedes*
- Differing levels of transmission intensity
- Different socio-economic/sanitation levels
- Different population behaviors, beliefs, etc.
- Different approaches to interventions
 - Ivermectin 2X versus 1X: OEPA versus APOC
 - Target insecticide on ITNs *Anopheles* vs *Culex*

LF in the Americas



d # infected
iduals

Haiti
100,000

m. Rep.
10,000

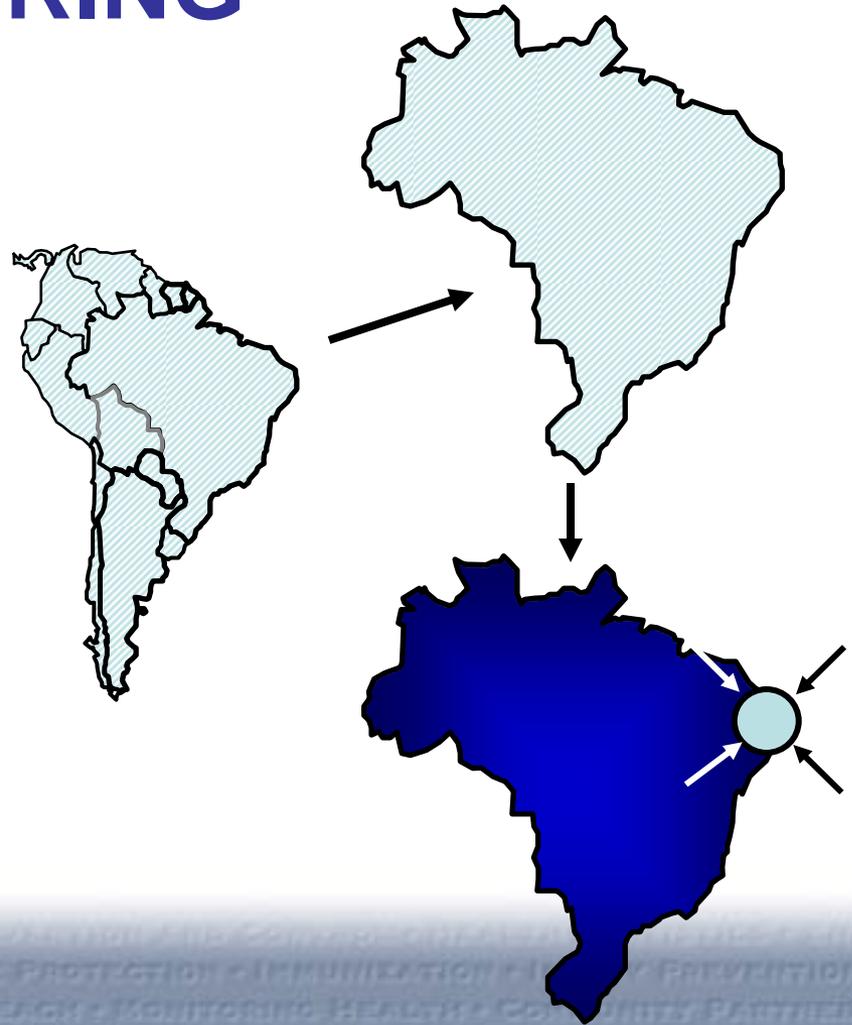
uyana
10,000

Brazil
60,000

Why Make a Case?

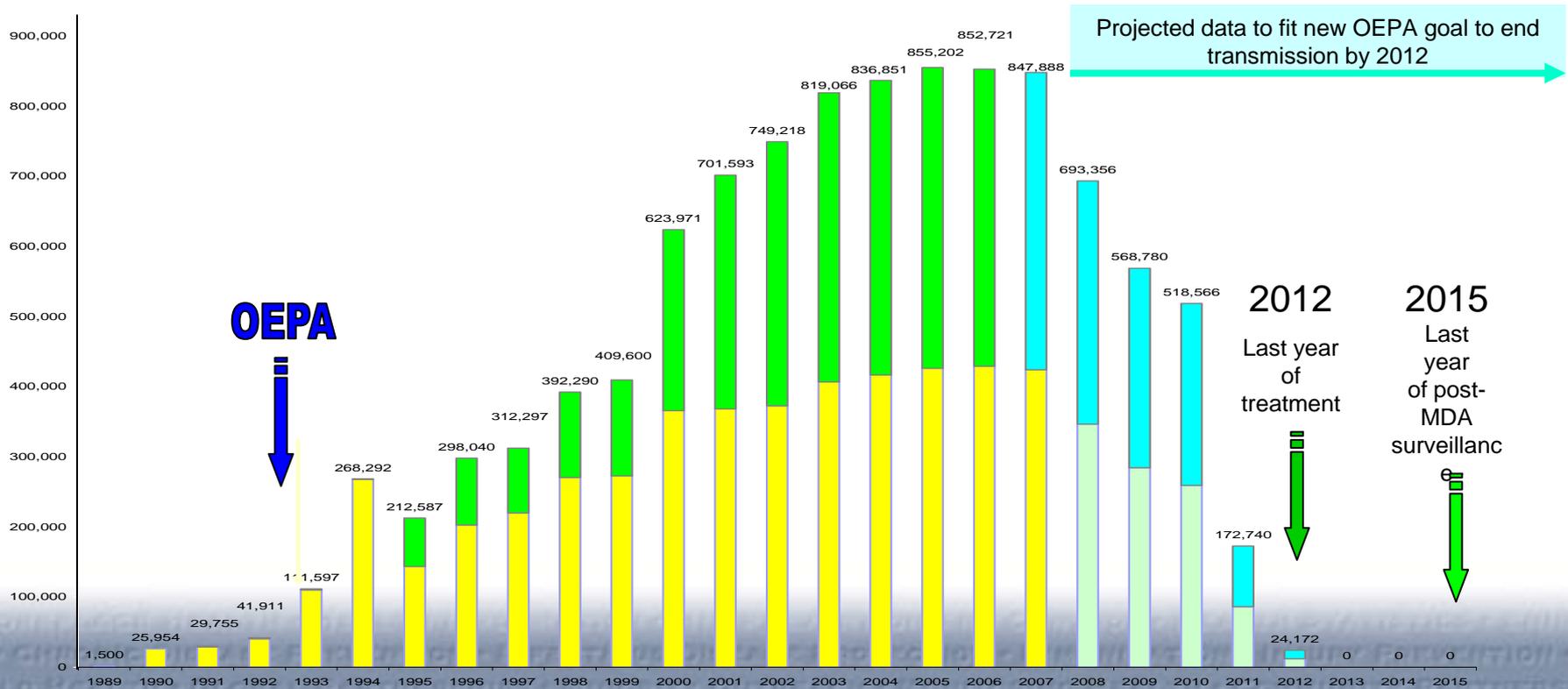
Think “RING”

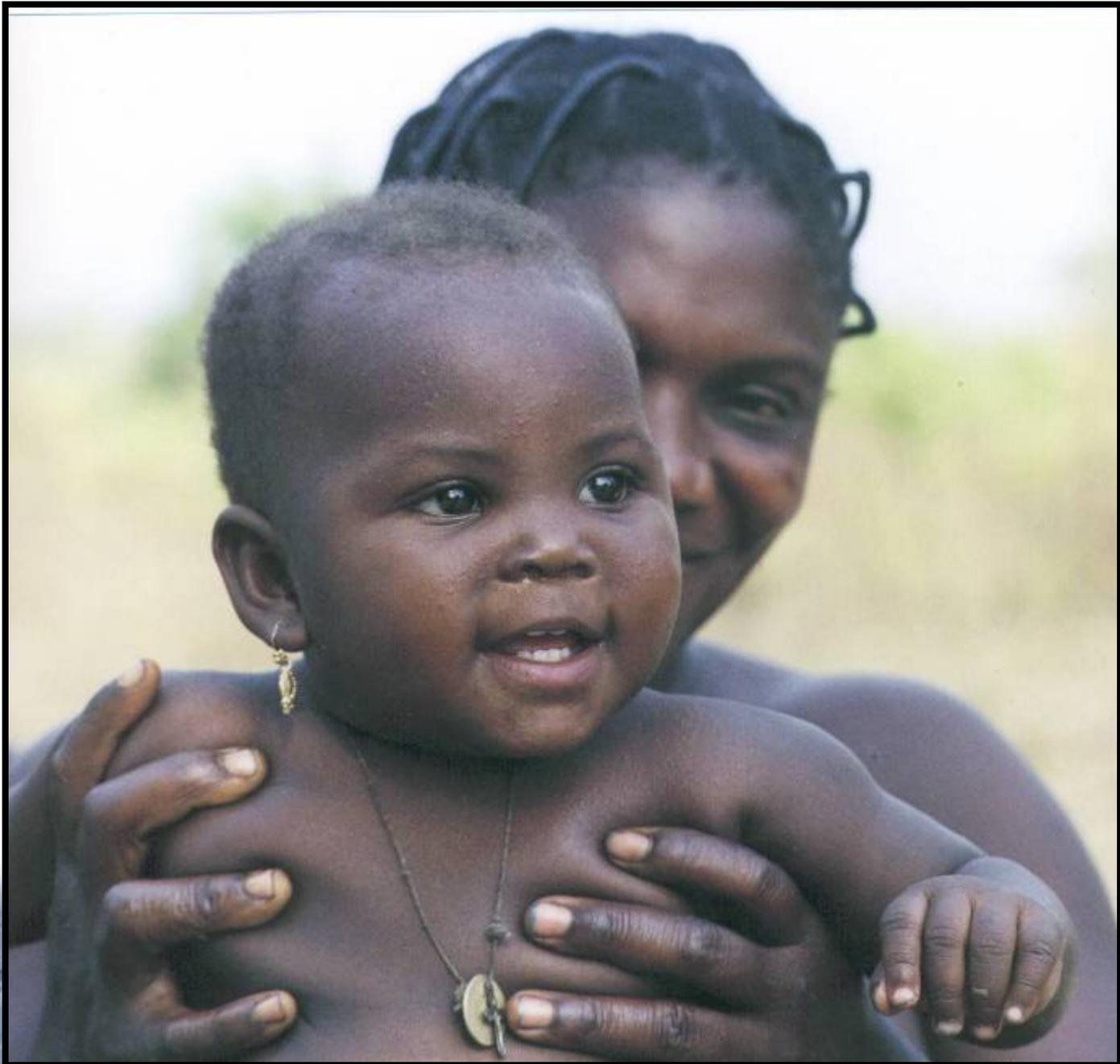
- **Some are islands, thus geographically isolated**
 - In/out migration contained
- **Diseases in almost all cases are foci = “islands”**
- **Can we get Africa to this point!**



THIS IS WHERE WE WANT TO GO

Treatments with Mectizan® in the Americas 1989-2012





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