Children in the evolving TB epidemic

Ben Marais

THE UNIVERSITY OF SYDNEY

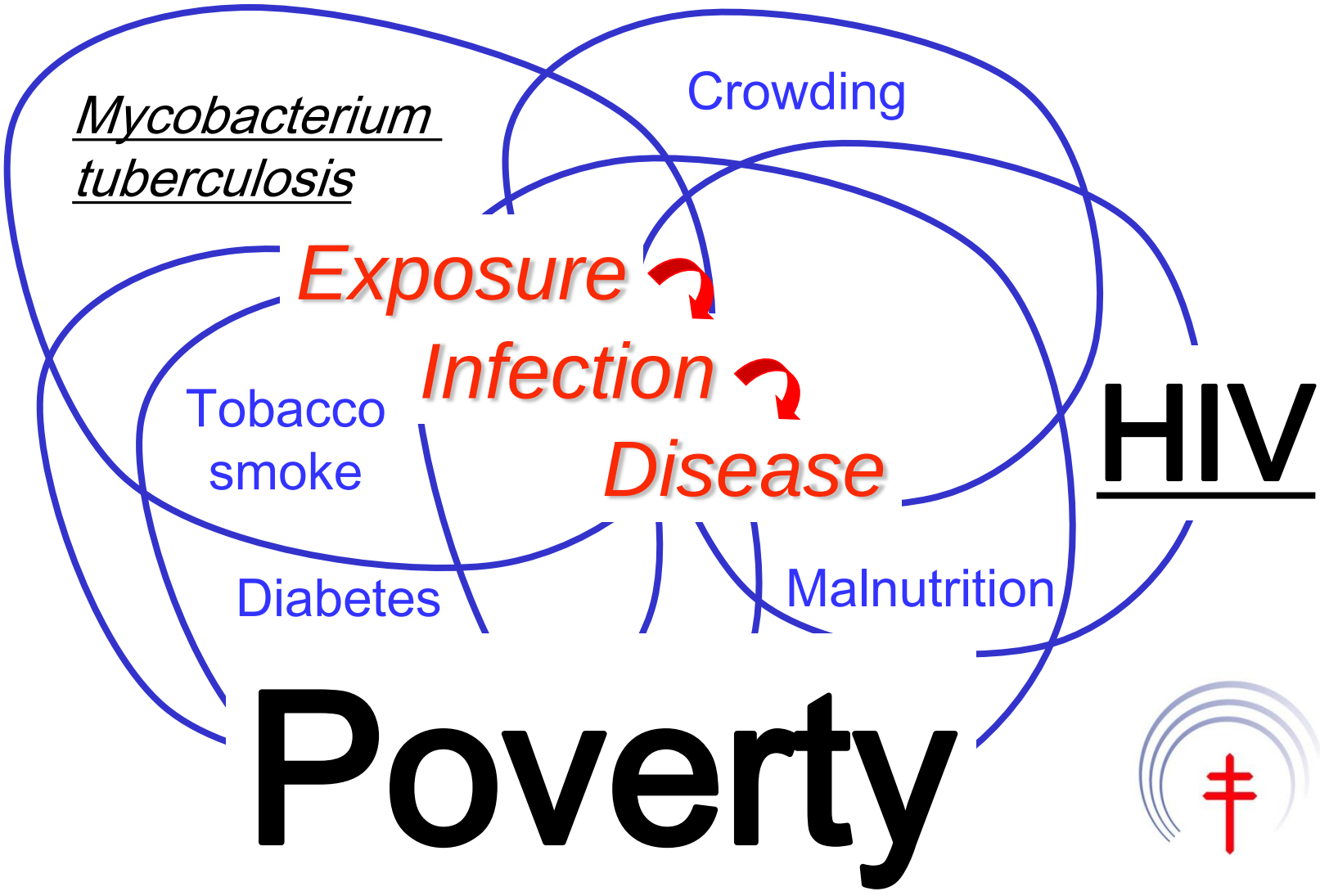
SEIB
Sydney Institute for Emerging Infectious Diseases & Biosecurity

www.sydney.edu.au/seib

Robert Koch 1843-1910 **Louis Pasteur 1822-1895**

“GERM THEORY” OF DISEASE

Web of causation



What is shaping the evolution of the global TB epidemic?

Host factors

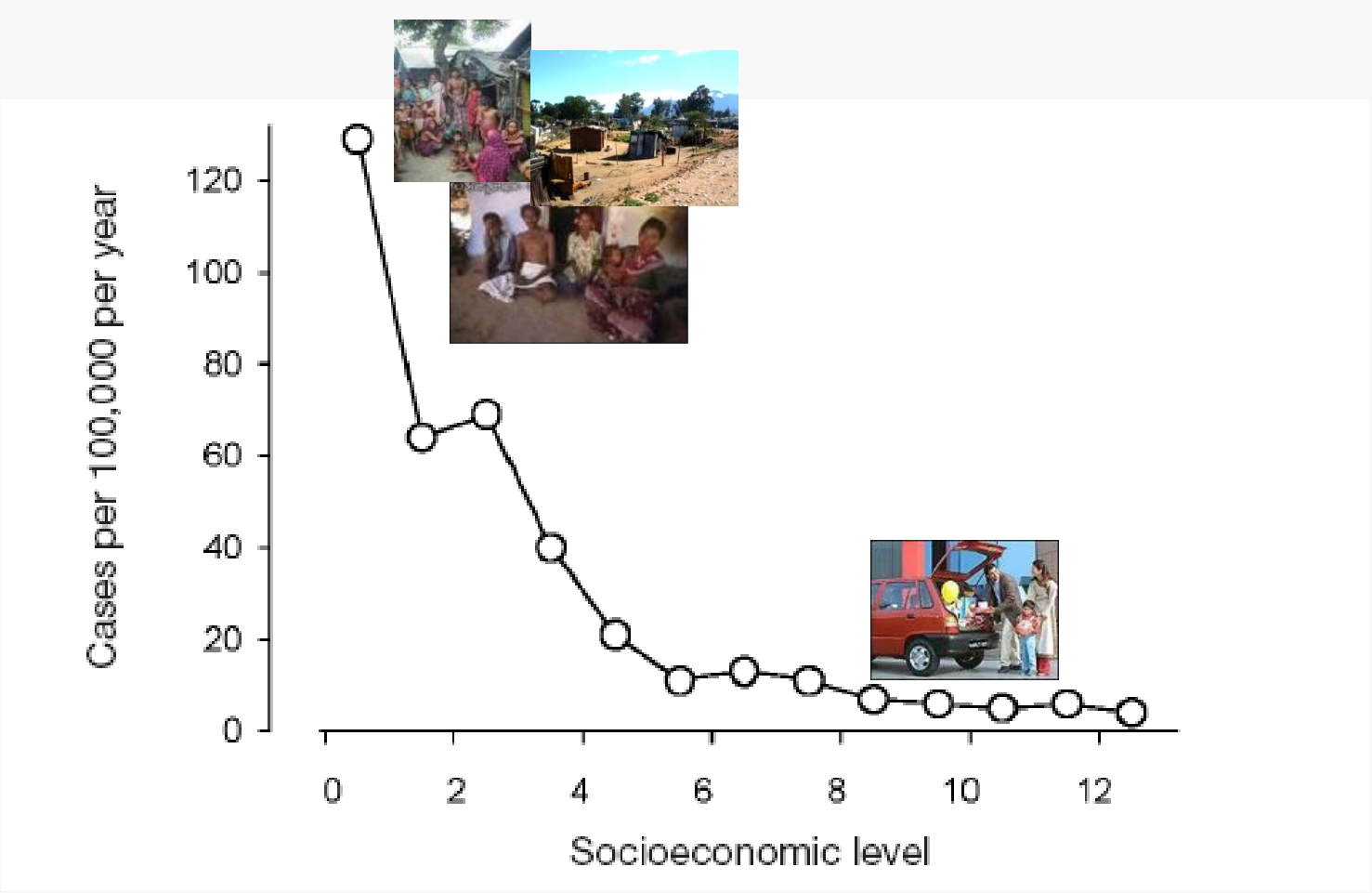
1) Demographic & disease shifts

- Increasing population density
- Increasing wealth/health disparity
- More vulnerable people
  - Old age
  - Immune therapy
  - HIV
  - NCDs (Diabetes mellitus, chronic lung disease)

The possibility of eradicating TB is essentially a function of a country's economic development level - Canetti, 1962

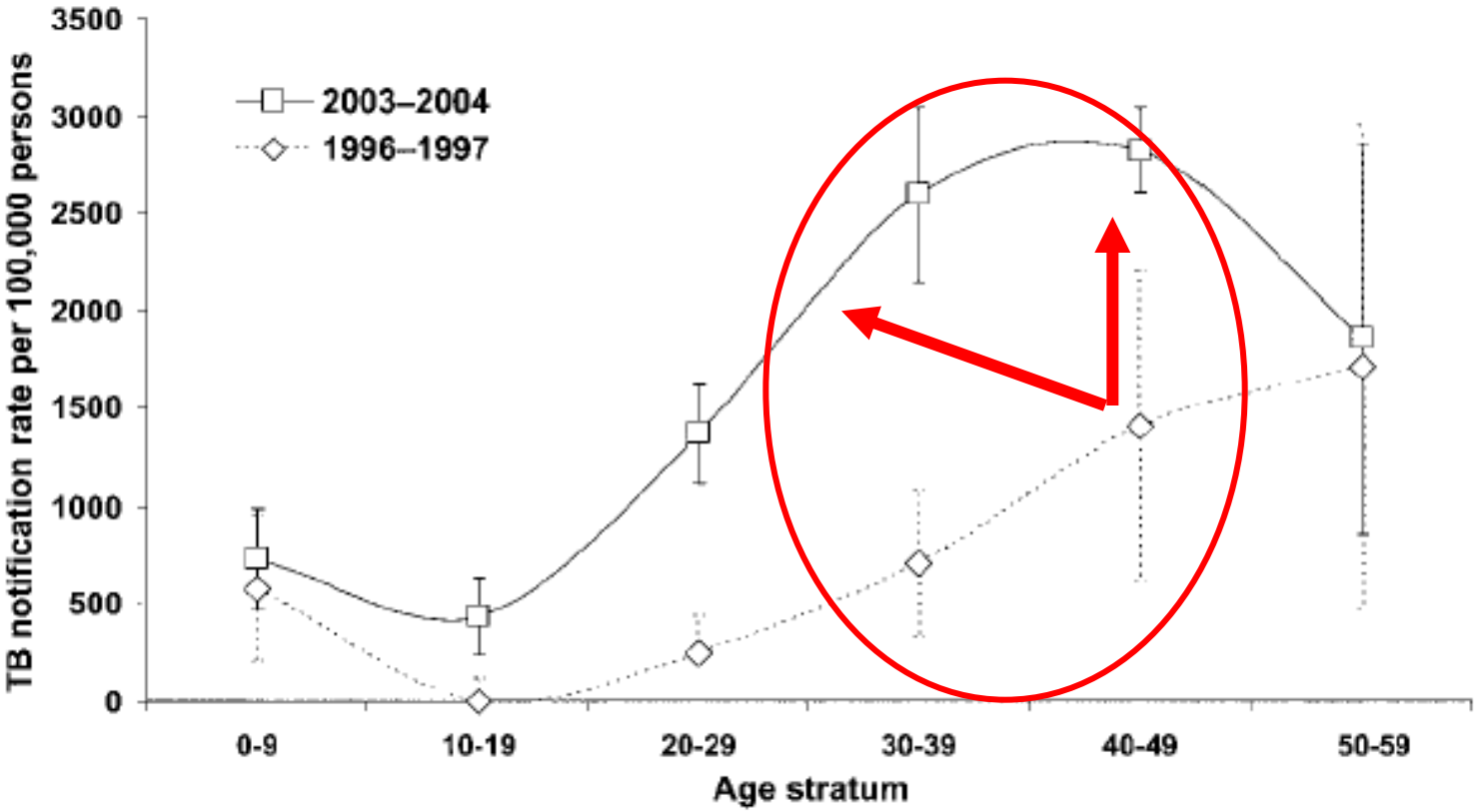
TB incidence rates & socio-economic level, New York, 1973

(SE level estimated on the basis of education, occupation and income)



Hinman AR et al, Am J Epidem 103:490, 1976

HIV induced age & gender shift



2003–2004	731	436	1369	2599	2824	1856
1996–1997	582	0	245	706	1405	1708

HIV prevalence among pregnant women **<10% in 1996** **>20% in 2004**

Lawn SD et al. CID 2006; 42: 1040-7

Active Case Finding Project - Cambodia

High Prevalence Target Community

TB suspects & HH Contacts

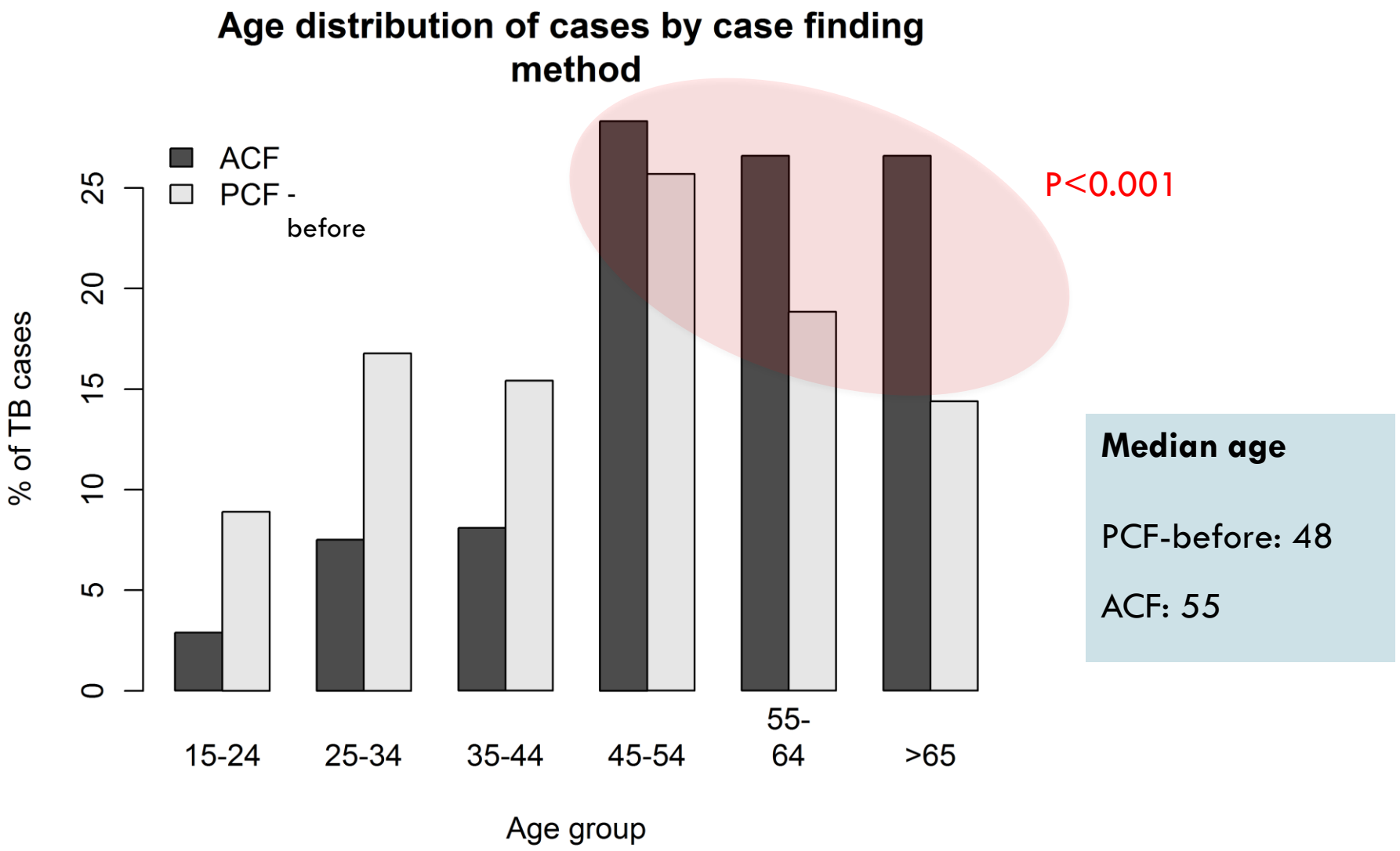
CXR

Microsc/ GeneXpert

House-to-house visit
Invite ADULT contacts and TB suspects to ACF sessions

Screen all TB suspects with mobile X-ray

ACF detects older patients

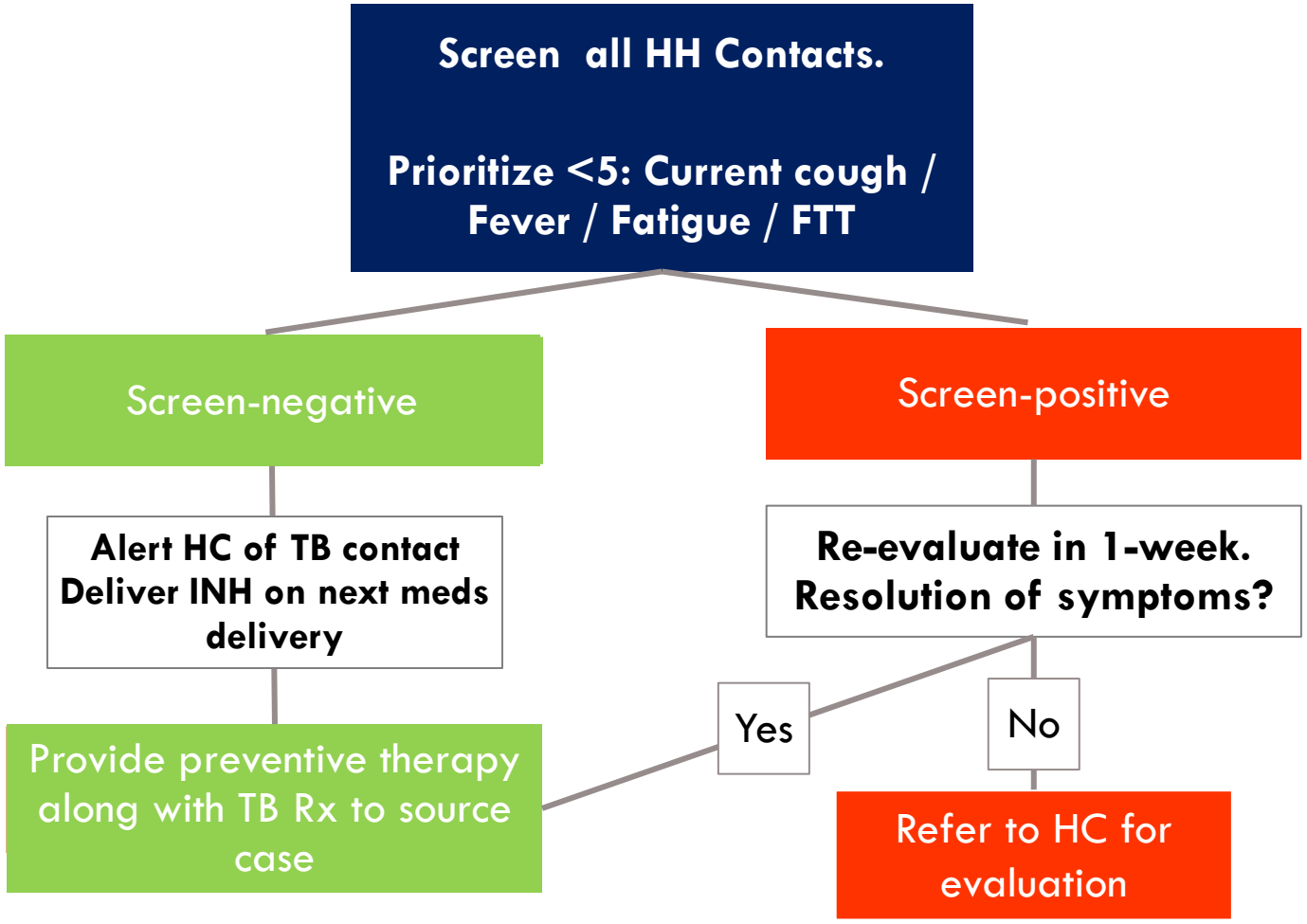


Median age

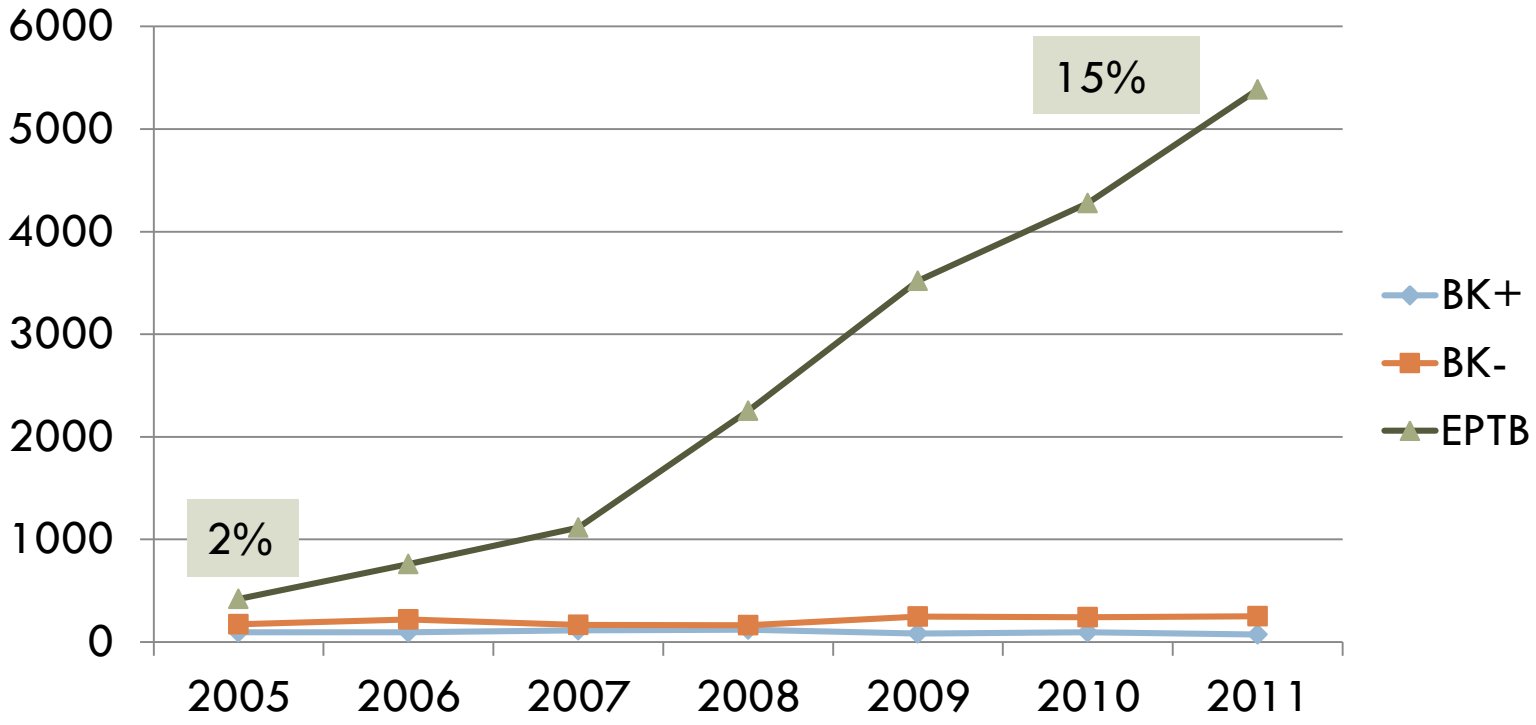
PCF-before: 48

ACF: 55

Linking in the Children

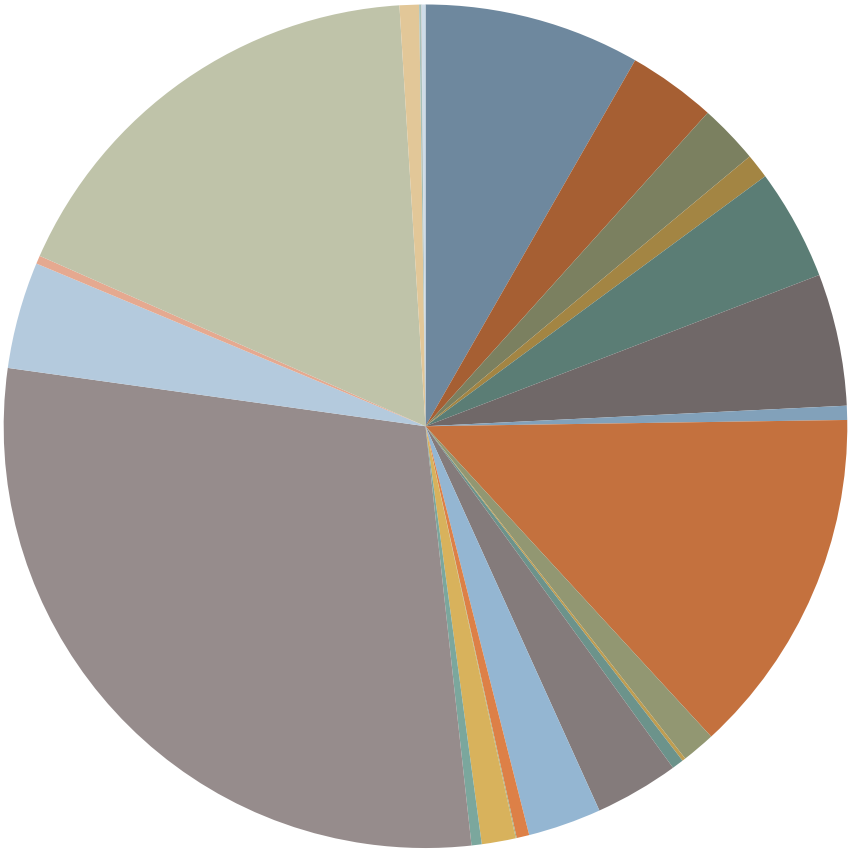


Child TB Notifications & Classification of Disease Since 2005



>75% cases clinically Dx cervical adenitis

Provincial Breakdown: EPTB in Children



N=5 375 (2011)

- 60% of cases diagnosed in 3 provinces
- Almost 30% in one province alone

SUMMARY

Poor access to Dx services

Limited CXR facilities

Sputum smear-based diagnosis

Pediatric investigations ONLY done at pediatric referral hospitals

HCWs only able to diagnose EPTB clinically

Presentation of disease at tertiary facilities:

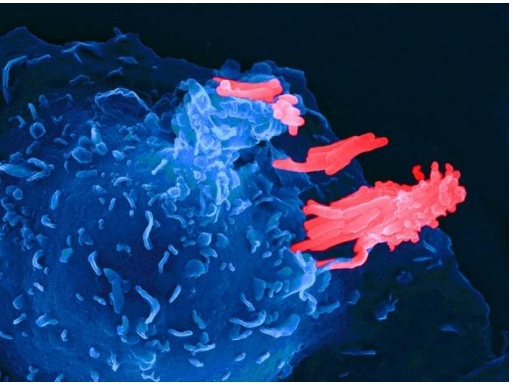
Severe, complicated, and chronic

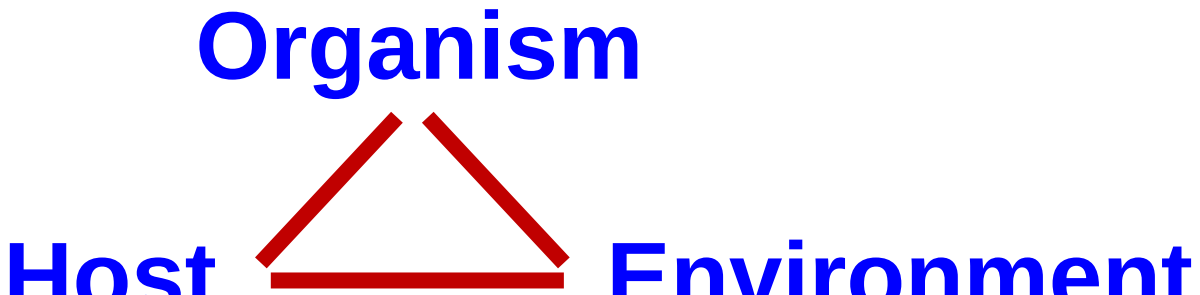
(Abd. TB, bone/joint TB, Potts, extensive lung disease)

Among children >5 years

Indicating acute illness in the most vulnerable (<5 years) may be missed

TB epidemic evolution





Environment

TB control efforts

Drug-resistant strains

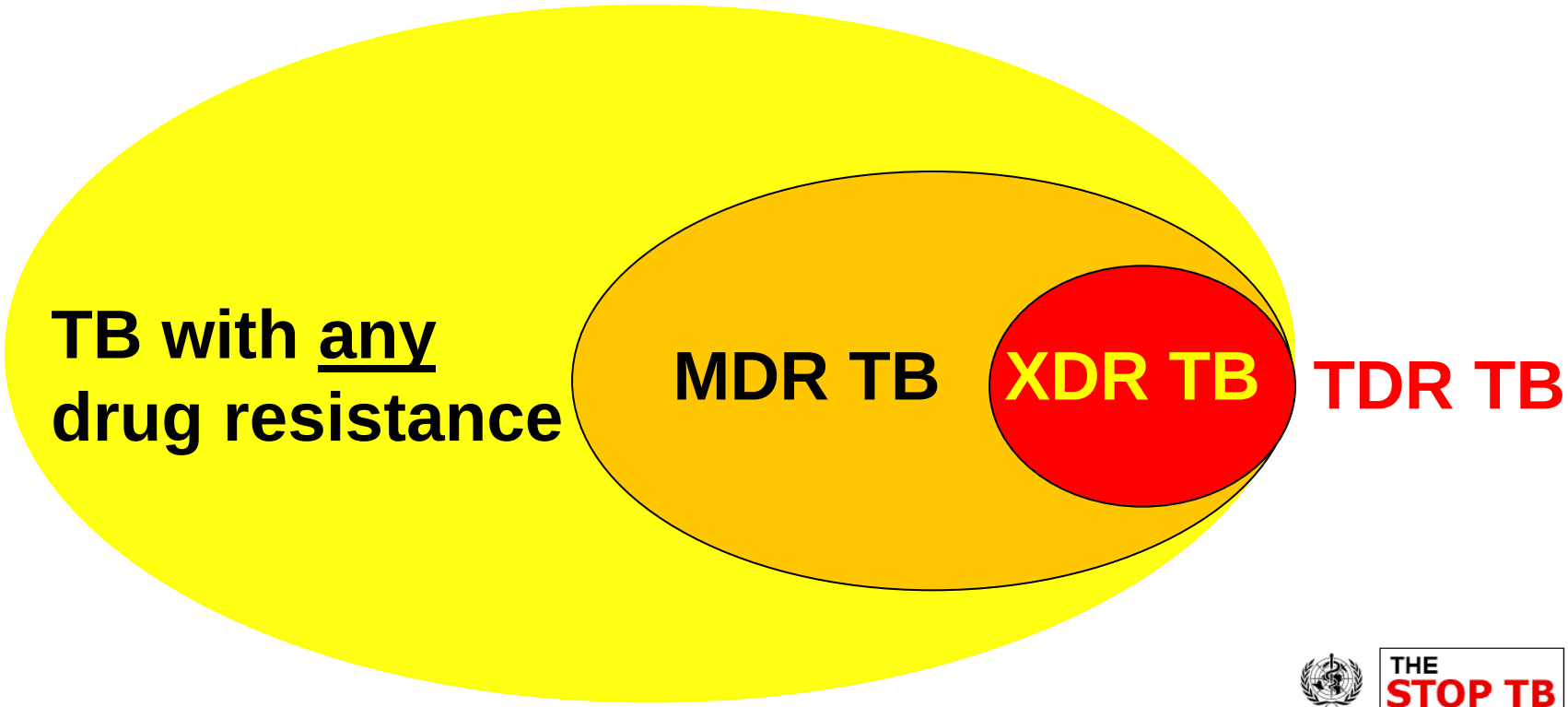
Sputum sm- disease

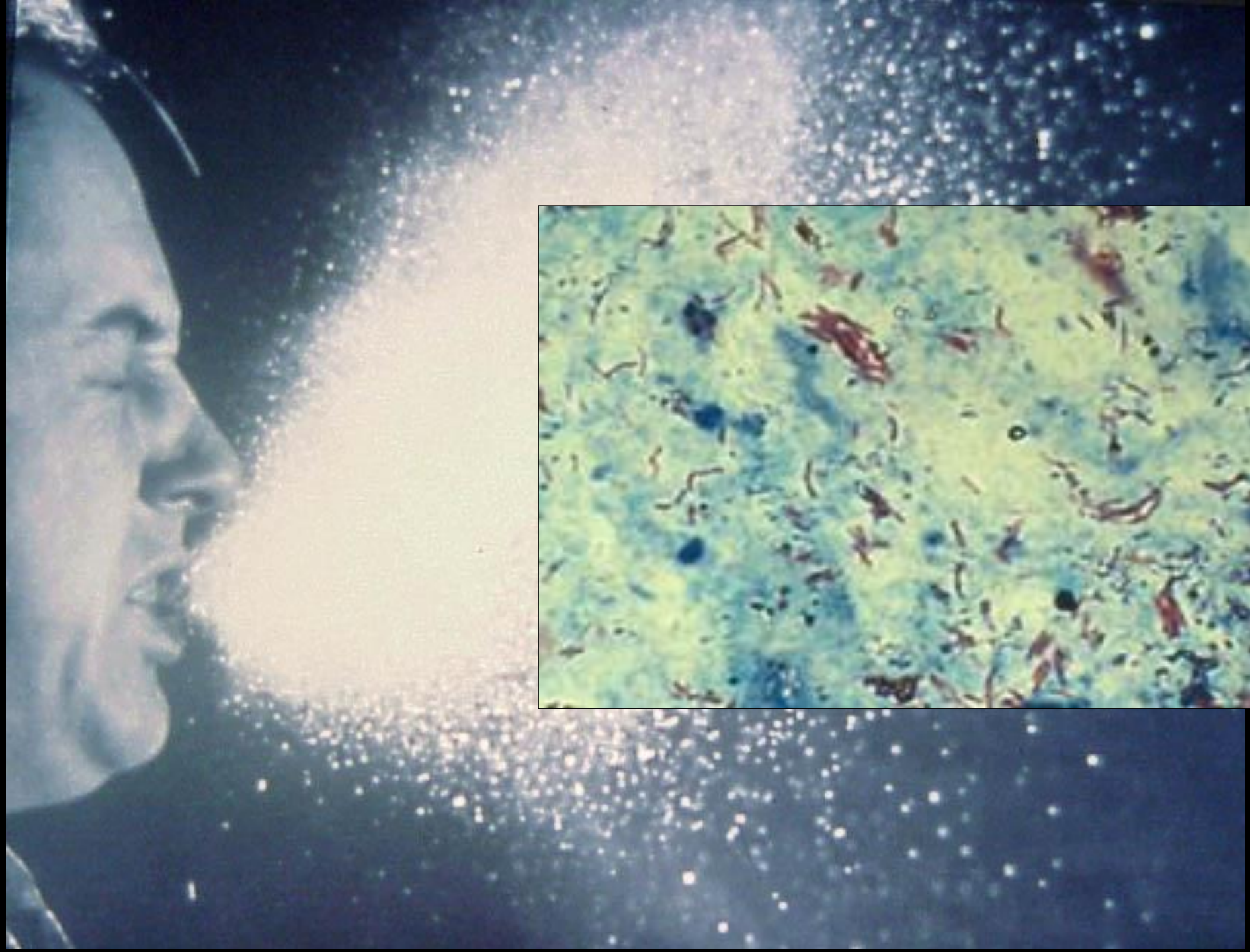
Vaccination

Circumvent BCG protection

Drug resistant TB

Children with drug-resistant TB reflect successful transmission of these strains





Epidemic spread of MDR-TB

Dogma: Drug resistant strains have reduced pathogenicity

Middlebrook G. Science 1953

Modelling: small sub-population of relatively fit MDR strains may eventually outcompete all other strains

Cohen T. Nature Med 2004

Work with clinical strains showed limited competitive cost associated with drug resistance

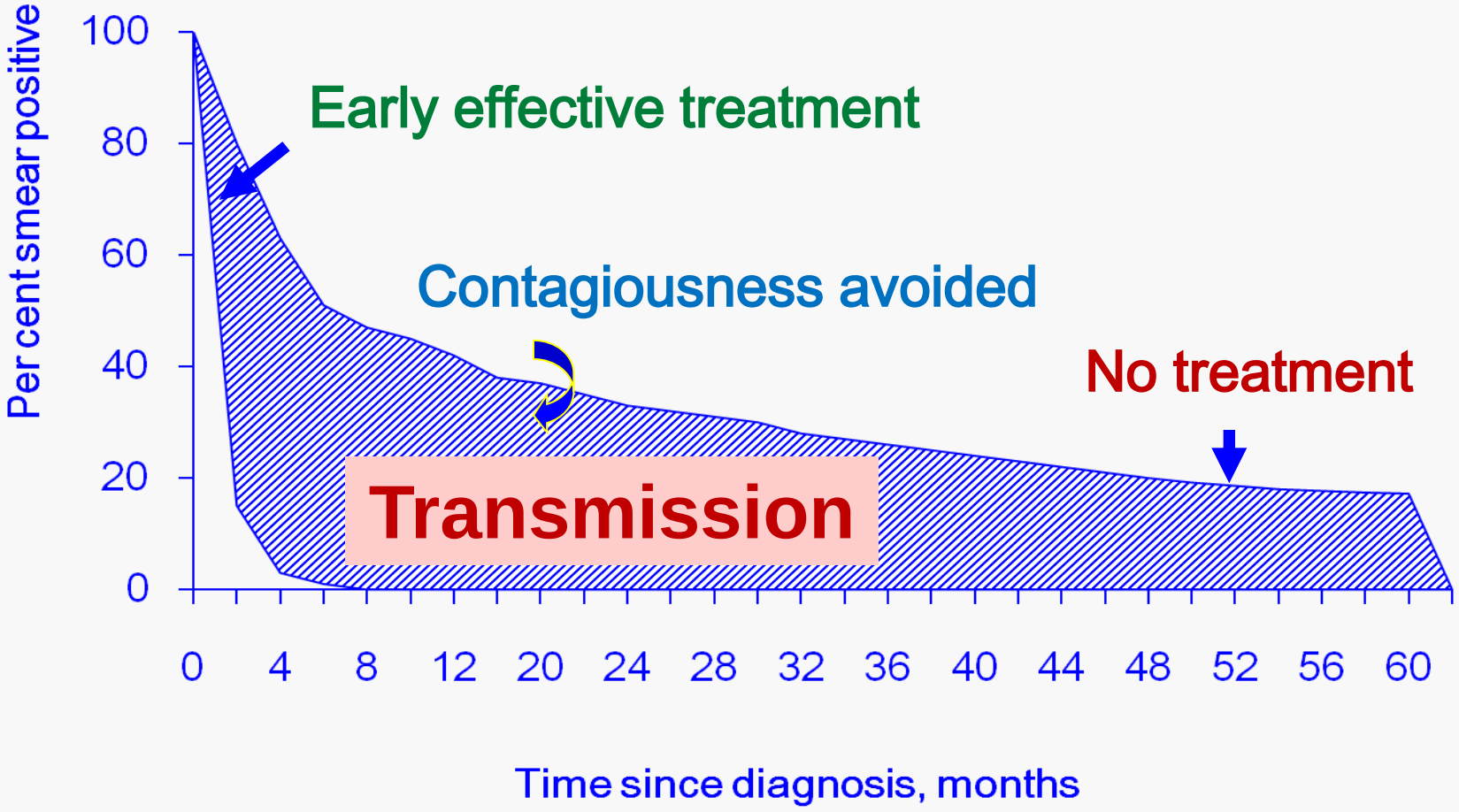
Gagneux S. Science 2006

Analysis of all MDR-TB specimens identified in Jhb, SA

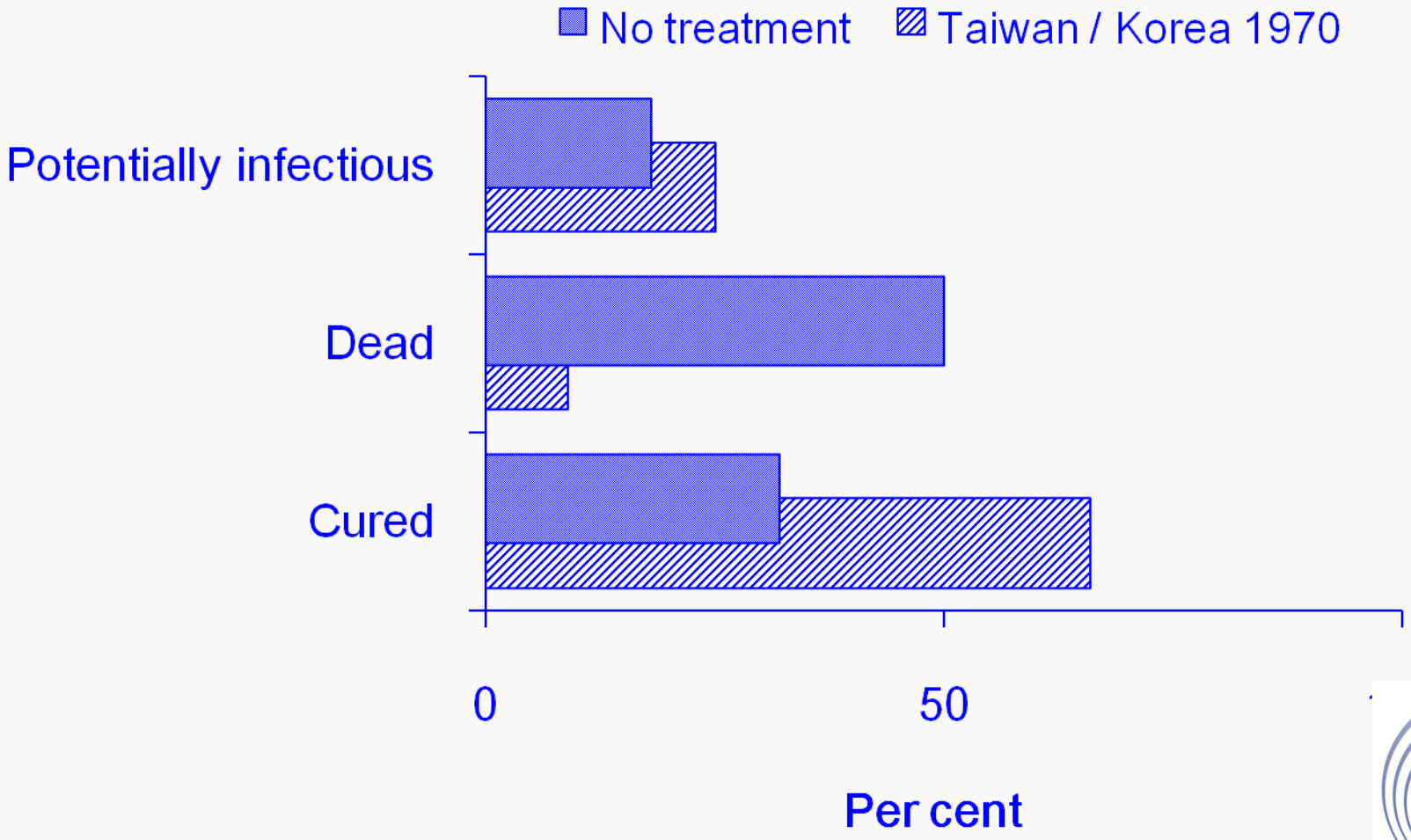
434 adult pts diagnosed from 2004-2007

- 238 (54.8%) of isolates were resistant to ALL 4 first line drugs (HRES)

What can we do to reduce transmission?



Risks of a poor TB control program



Bull Int Union Tuberc 1978; 53(2): 70-75

Ethical issues
Individual vs community

Individual Human Rights perspective	Community perspective
No personal harm Individual benefit Autonomy Justice	Community protection Common good Fairness Reciprocity

Millennium Development Goals

The evolving Global Health Agenda

Post MDG - Sustainable health targets

Medical ethics
The third dimension

One world – One health