



Air pollution and Tuberculosis

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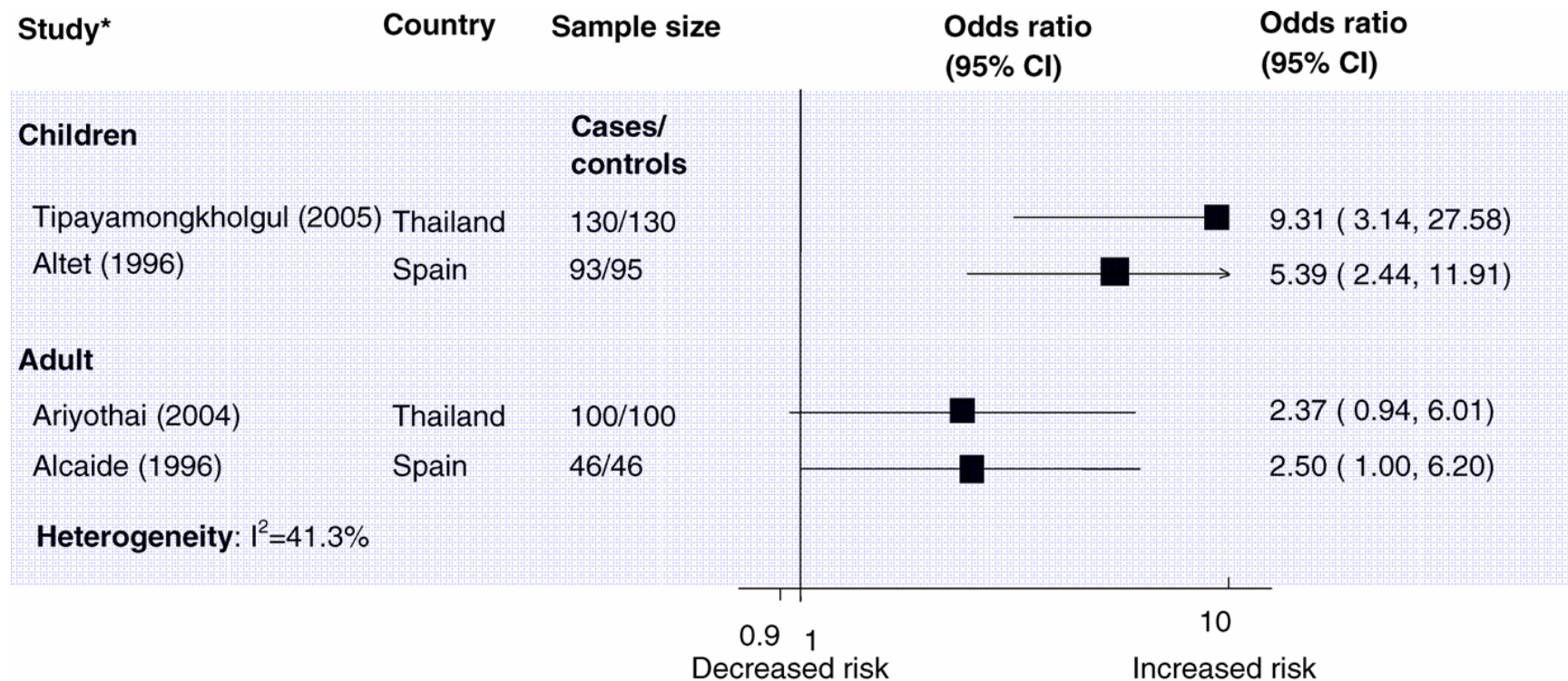
Rationale

Many studies have found an association between tobacco smoking and Tb

Air pollution

- Tobacco smoking
- Passive smoking
- Indoor Air pollution
- Ambient Air pollution

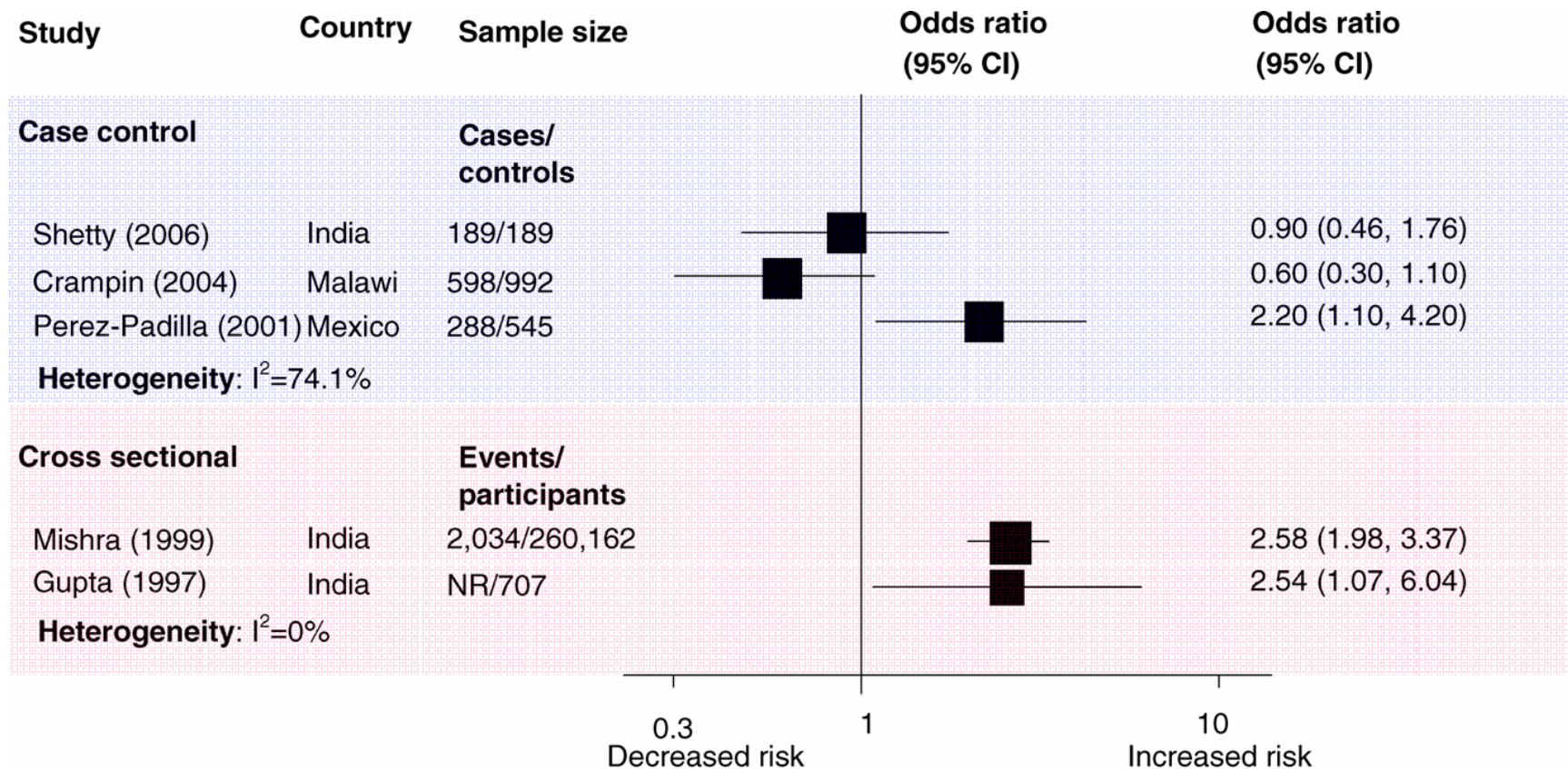
State of knowledge: Passive smoking



Note: The horizontal axis is on log scale

*All studies are case control studies

State of knowledge: Indoor air pollution



Note: The horizontal axis is on log scale

Lin HH et al., PLoS Medicine, 2007

State of knowledge: Ambient Air pollution

Author, Date	Population	Geographical location	Exposure	Results
?, 2008		Russia (Amur)	Ambient air pollution, mercury-containing pesticides, emission of metallic mercury at gold mining	No association found
Reid A, 2008	2552 women, residents of blue asbestos mining and milling townships, , not involved in mining or milling	Wittenomm, Western Australia		SMR = 5.38 (0.14-30.0)

Evidence of causal relationship

- Dose-response relationship
- Biological plausibility

Mechanisms

1st level of host defense

- Impairment of the normal clearance of secretions on the tracheobronchial mucosal surface

Mechanisms

2nd level of host defense

- Reduced activity of
 - Alveolar macrophages
 - Dendritic cells
 - Natural killer cells

Mechanisms

Pulmonary Alveolar Macrophages (1)

- Reduced adherence to surfaces
- Reduced phagocytic ability
- Lower level of secreted proinflammatory cytokines

Mechanisms

Pulmonary Alveolar Macrophages (2)

- Elevated iron content
 - Iron overload impairs defense against intracellular microorganisms through reduced production of TNF and NO

Mechanisms

Pulmonary Alveolar Macrophages (3)

- Action on nicotinic acetylcholine receptors
 - Decreased TNF- α
 - Impairment of intracellular killing of *M. tuberculosis*

Intervention studies

- Effect of smoking cessation of household members on TB treatment outcomes?

A modelling study

- Complete cessation of smoking and solid-fuel use by 2033 would reduce the projected annual tuberculosis incidence in 2033 by
 - 14-52% if 80% DOTS coverage is sustained
 - 27-62% if 50% coverage is sustained
 - 33-71% if 20% coverage is sustained

Conclusions

- Exposure to respirable pollutants (tobacco and biomass fuels) increases the risk of both TB infection and TB disease

➤ **Policy implications**