

# **Introduction to Epidemiology**

**DMID/ICSSC**

**Dar es Salaam, Tanzania**

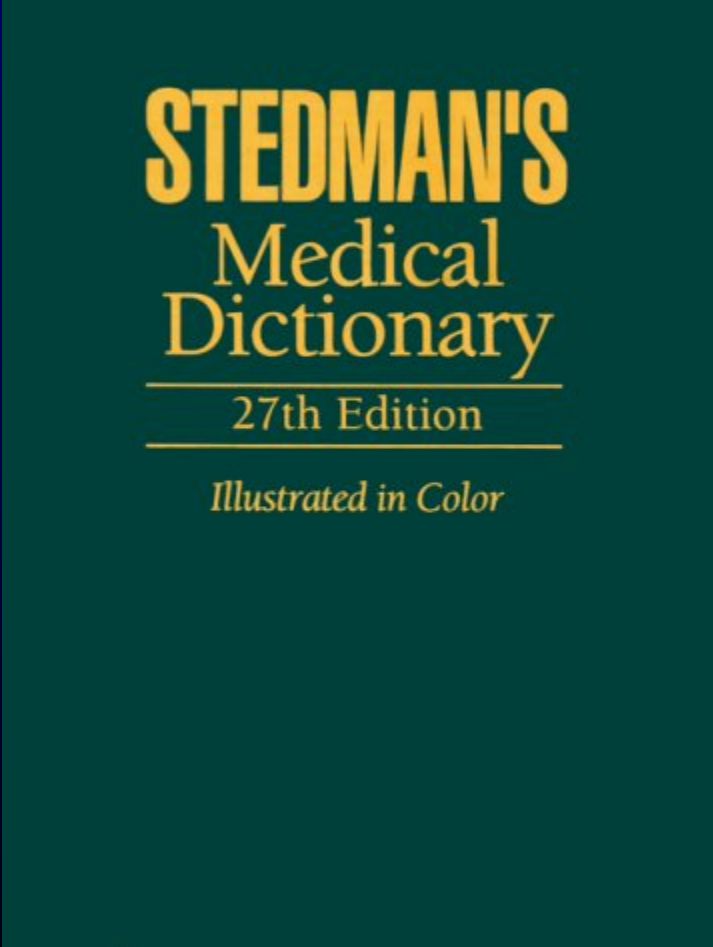
**January 17-22, 2010**

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# A LEXICON OF EPIDEMIOLOGY

The study of  
epidemics and  
epidemic  
diseases.

Stedman's  
Medical Dictionary



**STEDMAN'S**  
Medical  
Dictionary  

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27th Edition

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*Illustrated in Color*

# The science of making the obvious obscure



Physician

The worst-taught  
course in all four  
years of medical  
school



Anonymous  
medical student

# The study of skin diseases

## Neighbor



# Epidemiology

- ❖ **More than statistics; biostatistics; medical science - a specific research methodology**
- ❖ **“Methods” conjures up what images?**
- ❖ **Has a bad rap - really fun and exhilarating**
- ❖ **Part of the interest is that sometimes it runs counter to intuition**

# Epidemiology of AIDS Before HIV

- ❖ Risk groups identified
  - ◆ MSM
  - ◆ Blood recipients
  - ◆ IVDU
- ❖  $\geq 100$  partners/year  
(implying that 99 are safe...)
- ❖ Anal receptive intercourse/fist
- ❖ Not using condoms



Nash Herndon/FHI

# AIDS Prevention Before HIV

- ❖ **Exclusion of risk groups from blood donation**
- ❖ **Education/recommendations on the risk factors**

# AIDS Prevention Before HIV: Effects

- ❖ **Transfusion associated, transmission dropped**
- ❖ **In certain areas, risk factor transmission dropped, witness the 90% reduction in syphilis in San Francisco**
  - ◆ **Supported by subsequent HIV analysis of banked blood**

# Bacterial Vaginosis and Prematurity in Indonesia\*

- ❖ Association between bacterial vaginosis diagnosed at 16 to 20 weeks and preterm delivery (gestational age <37 weeks)
  - ◆ OR = 2.0; 95% CI 1.0 - 3.9
  - ◆ Above OR adjusted for mother's age, education, smoking and Trichomonas

\*Joesoef et al. Am J Obstet Gynecol 1993;169:175-8.

# **Bacterial Vaginosis and Prematurity in Indonesia\* (cont.)**

- ❖ **“Only bacterial vaginosis diagnosed early in the second trimester of pregnancy plays a major role as a risk factor for preterm delivery”**
- ❖ **Clindamycin vaginal cream - an effective treatment**

**\*Joesoef et al. Am J Obstet Gynecol 1993;169:175-8.**

# Begin Program in Indonesia?

- ❖ PPE
- ❖ Conduct an RCT
  - ◆ Corollary to PPE: SE

# Intravaginal Clindamycin for BV: Effects on Preterm Delivery and LBW\*

| Outcome       | Clindamycin | Placebo | OR (95% CI)     |
|---------------|-------------|---------|-----------------|
| Preterm (<37) | 15.0%       | 13.5%   | 1.1 (0.7 - 1.7) |
| Preterm (<32) | 4.7%        | 2.6%    | 1.8 (0.8 - 4.2) |
| LBW (<2500gm) | 9.0%        | 6.8%    | 1.3 (0.8 - 2.4) |

\*Joesoef et al. Am J Obstet Gynecol 1995; 173:1527-31.

# Oral Clindamycin for BV: Effects on Preterm Delivery or Late Miscarriage

| Outcome   | Oral Clindamycin | Placebo | RR (95% CI)<br>p-value         |
|---|------------------|---------|--------------------------------|
| Preterm (>24 but <37) or late miscarriage (pregnancy loss >13 but < 24) | 5.3%             | 15.8%   | 0.34 (0.18-0.62)<br>p = 0.0002 |

Ugwumadu A, Manyonda I, Reid F, Hay P. Effect of oral clindamycin on late miscarriage and preterm delivery in asymptomatic women with abnormal vaginal flora and bacterial vaginosis: a randomised controlled trial. *Lancet* 2003; 361: 983-88.

# Study Design is Critical

## ❖ Reading the literature

- ◆ No study is perfect – the limitations MUST be understood

## ❖ Conducting research

- ◆ Serious mistakes in the study design stage cannot be corrected in subsequent stages

# Types of Epidemiologic Studies

complexity



## Observational: “natural experience”

### Descriptive:

- like newspaper reporting
- has no control or comparison group

### Analytic:

- has a control or comparison group

## Experimental: investigator controls

- has an exposed or experimental group plus a control or comparison group determined by investigator

# Descriptive Studies

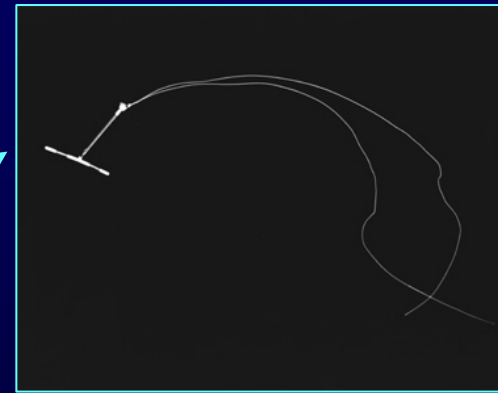
- ❖ **Estimate frequency**
- ❖ **Time trend**
- ❖ **Generate more specific etiologic hypotheses**

# Descriptive Study of Women with PID

**Outcome (PID)**



**Exposure (STI, IUD)**



IUD → PID?

**SES (Age, Marital Status, Etc.)**

# Observational Analytic Studies

**Cohort**

**Exposure**

Exposed  $\Longrightarrow$  Outcome?

Not Exposed  $\Longrightarrow$  Outcome?

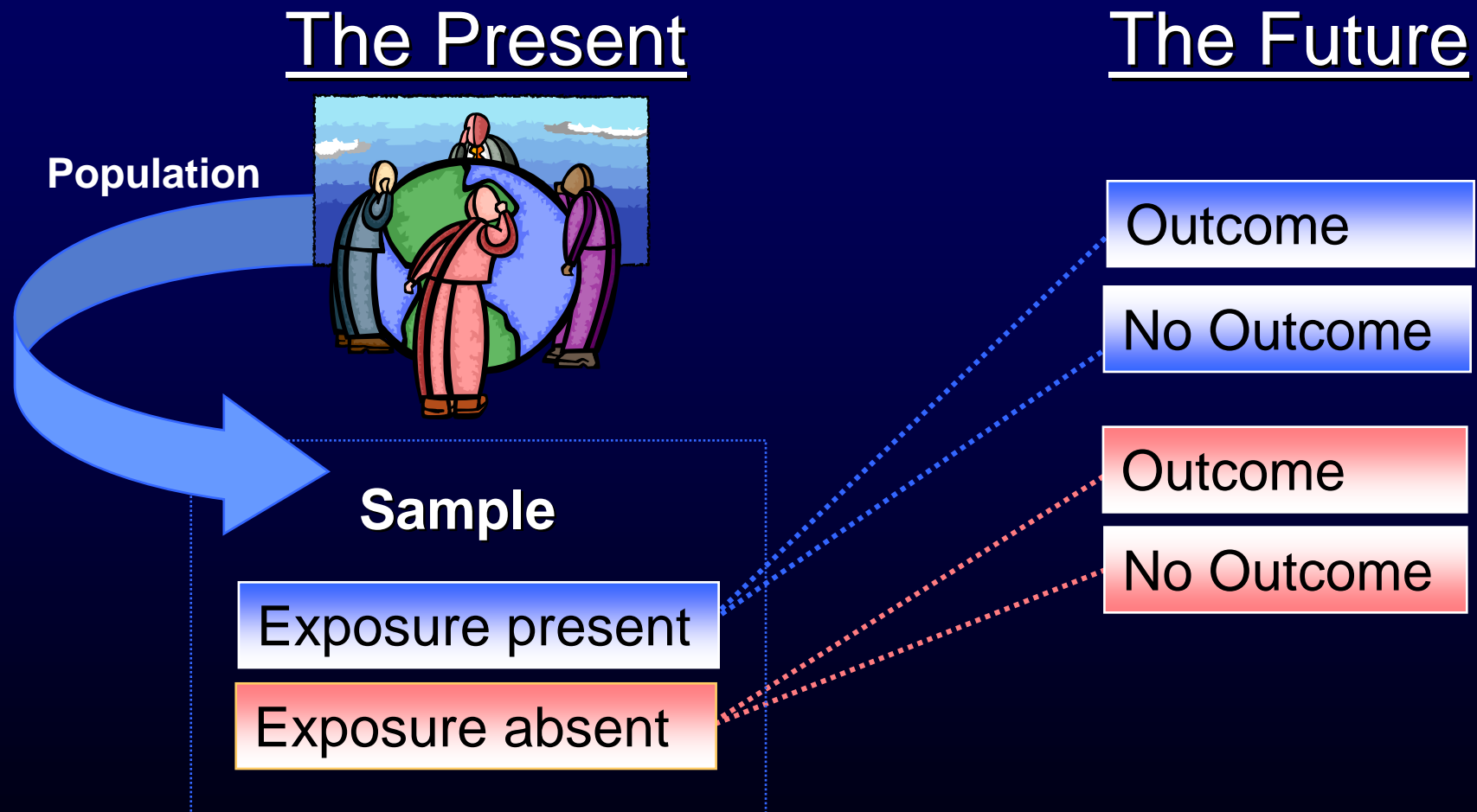
**Case-Control**

**Outcome**

Exposed?  $\longleftarrow$  Outcome

Exposed?  $\longleftarrow$  Control

# Prospective Cohort Design



# Example of a Prospective Cohort Design: Treatment of Severe Malaria in Children

## The Present

Population



Sample

PTX present

PTX absent

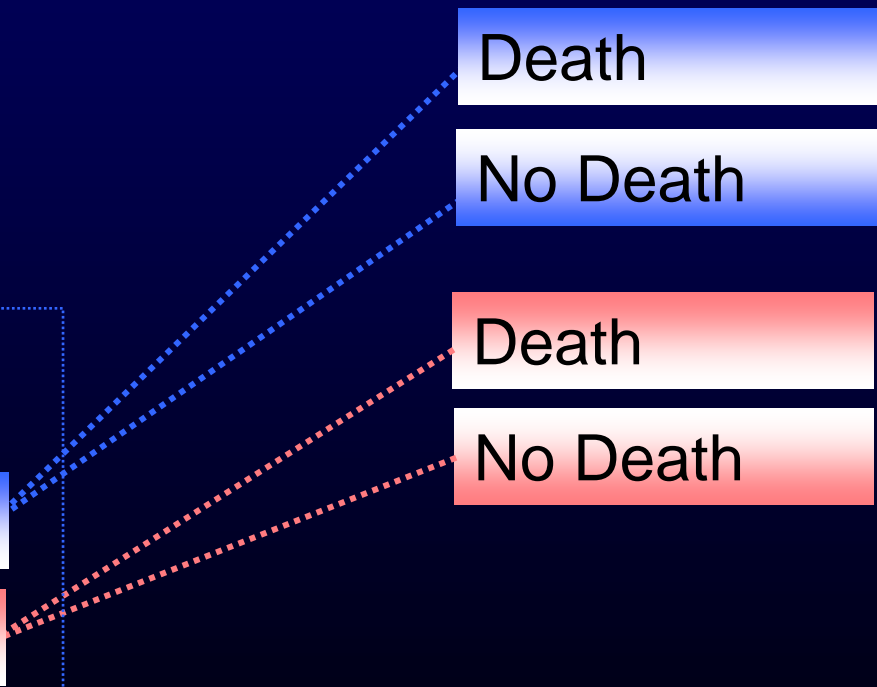
## The Future

Death

No Death

Death

No Death



# Case-Control Design

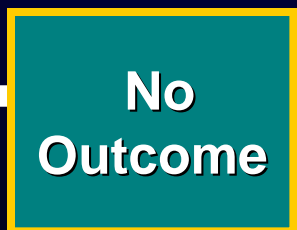
The Past or Present

The Present



Sample of cases

Population with disease (cases)



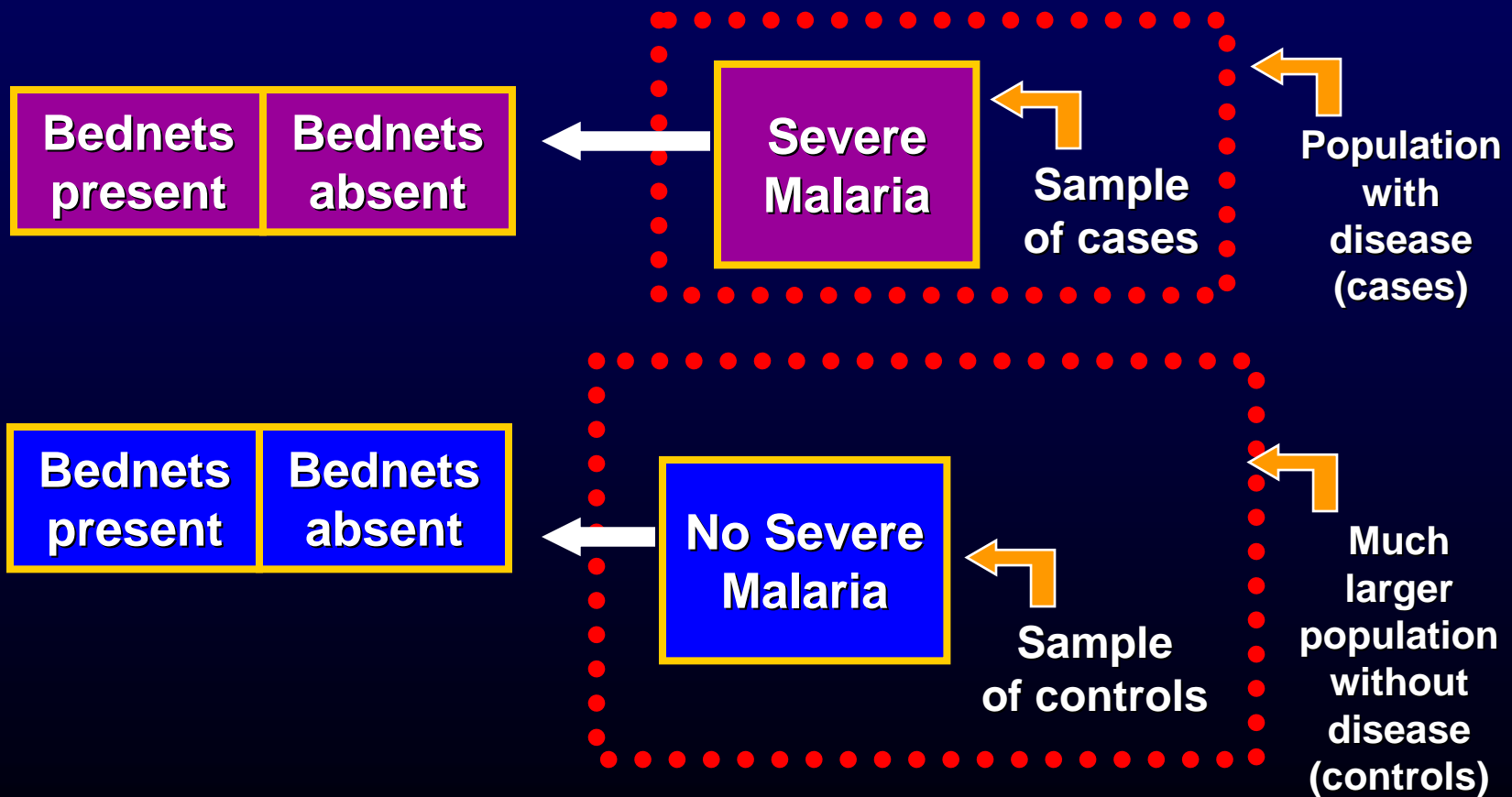
Sample of controls

Much larger population without disease (controls)

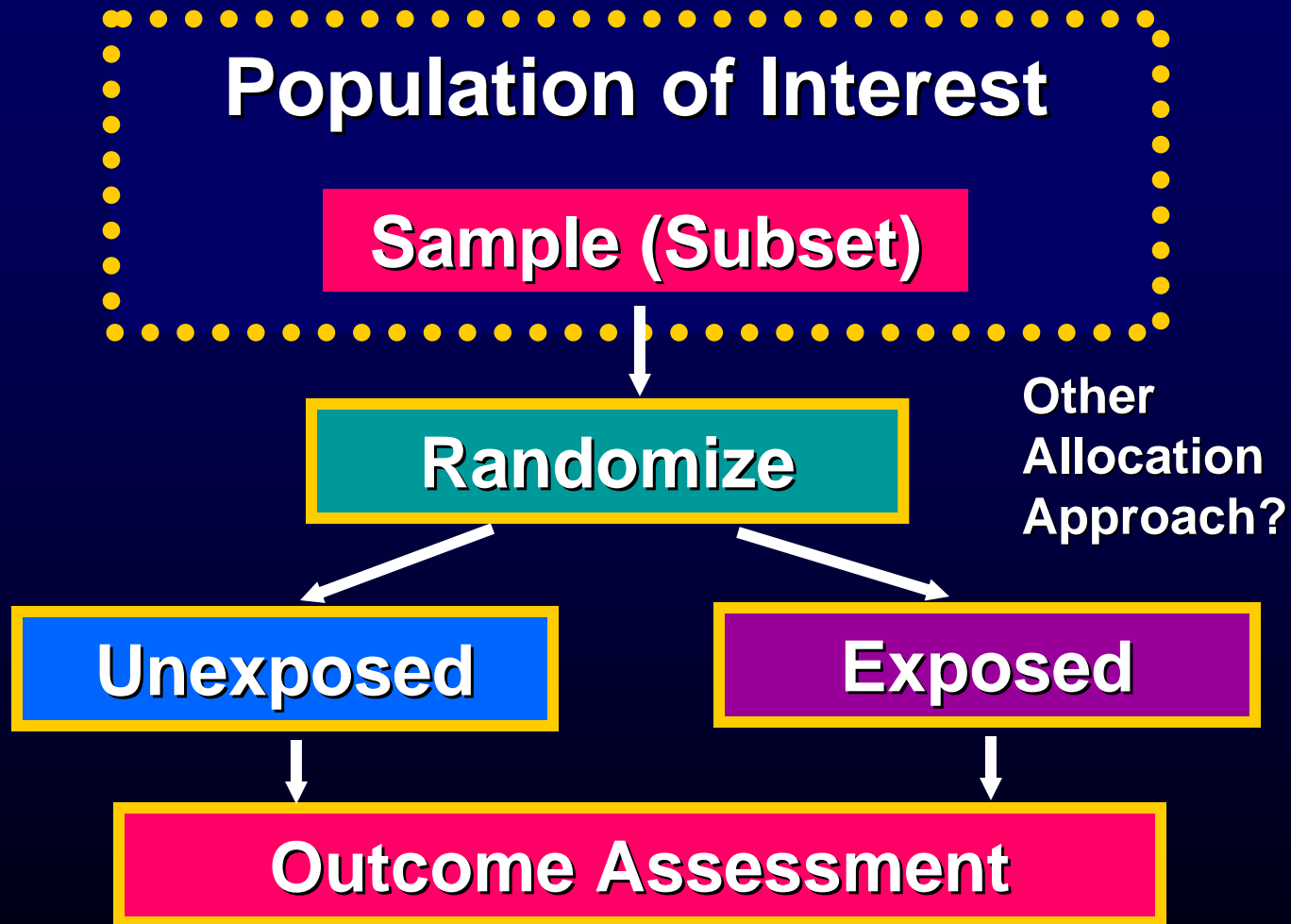
# Example of Case-Control Design: Use of Bednets and Severe Malaria in Children

The Past or Present

The Present



# RCT PARADIGM



# RCT PARADIGM

Population of Interest

Child  $\leq 5$  year presenting at hospital with severe malaria

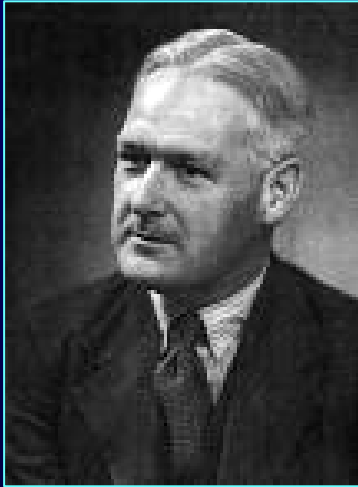
Randomize

PTX

Placebo

Outcome Assessment  
Death within 7 days

# During the Emergence of Modern Epidemiology (around 1950)



**Sir Austin Bradford Hill, Sir Richard Doll and colleagues conducted:**

- ◆ A case-control study of lung cancer
- ◆ A cohort study of smoking and lung cancer
- ◆ The first RCT in medicine, streptomycin for treatment of TB



*END*