Malaria Eradication in the Americas
A Retrospective Analysis of Childhood Exposure

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Motivation

- ▶ Tropical Regions Tend to be Poor

- ▶ Is There Something Debilitating about the Tropics?

- ▶ One Story: Tropical Disease

- ▶ But Tropical Disease is a Consequence of Poverty as well

- ▶ Approach: Look at Large-Scale, Targeted Campaigns

- ▶ Historical Efforts to Combat Malaria
  - ▶ US, circa 1920, result of new public-health knowledge
  - ▶ LatAm, circa 1955, DDT-based worldwide campaign

Motivation, Part 2

- ▶ Why Childhood Exposure?
  - ▶ Childhood symptoms/infection worse
  - ▶ Childhood as base of investments/development

- ▶ Why These Campaigns?
  - ▶ Innovations to Knowledge and Spending on Public Health
  - ▶ Origins Were External to the Affected Regions
  - ▶ They Achieved Rapid and Dramatic Results

Example: Malaria in Colombia

1. Large Decline in Cases Following Onset of Spraying Campaign
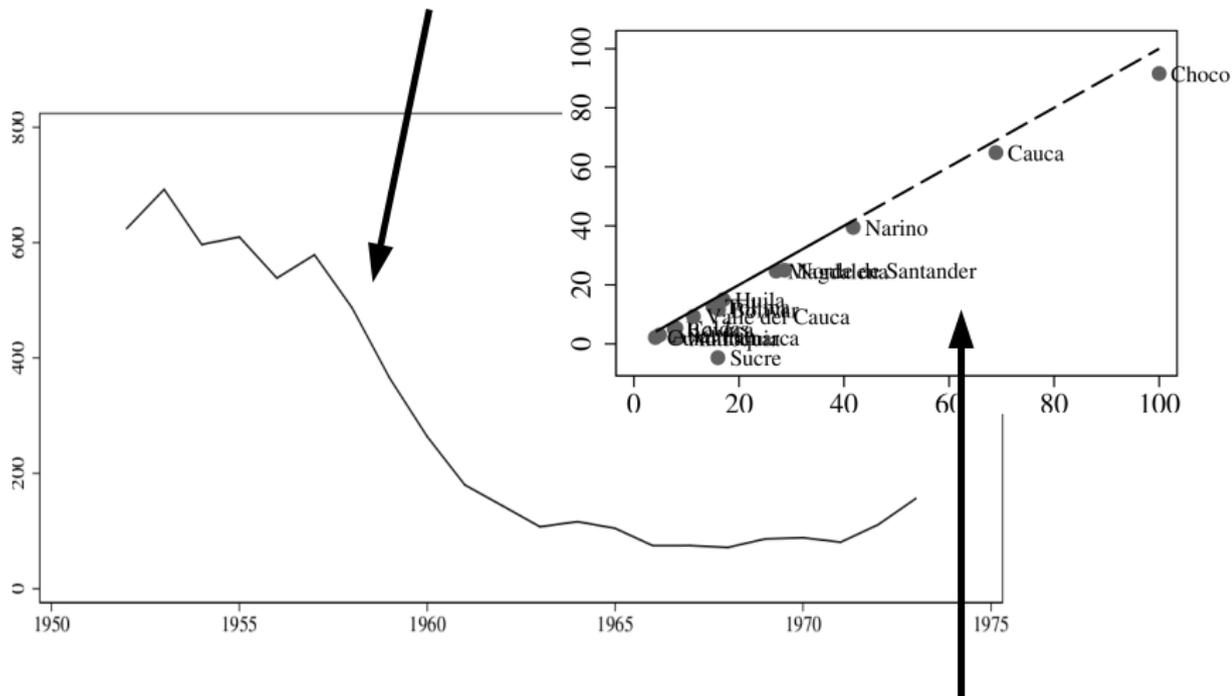
2. Largest Benefit in Areas that had More Malaria To Begin With

Looking for the 'Footprint' of the Campaigns

- Areas with Large Disease Burdens Saw Large Declines in Morbidity.

- Are Similar Patterns Evident for Other Outcomes?

- Does it Correspond to Childhood Exposure?

- Examine Retrospectively Using Census Data by Cohort
  - Areas with Higher Pre-Campaign Disease Saw Faster Cross-Cohort Growth in Income.
  - The Shift in Income Coincided with Childhood Exposure to the Campaign

Areas with Higher Pre-Campaign Disease Saw Faster Cross-Cohort Growth in Income.

Example: Brazil, by cohort and state of birth.
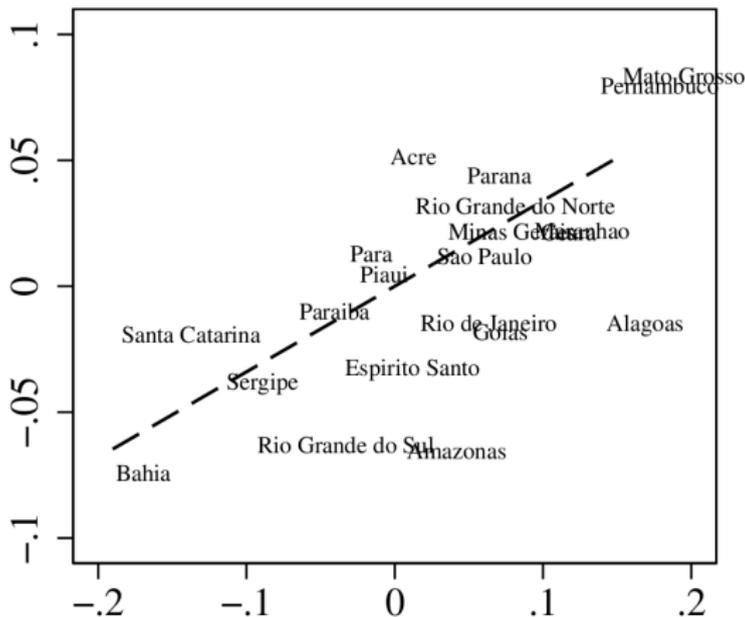
x axis: index of pre-campaign malaria.
y axis: index of income change, born circa 1935 to born circa 1960

The Shift in Income Coincides with Childhood Exposure to the Campaign

Cohort-Specific Relation between Income and Pre-Campaign Malaria in Area of Birth:

$$y_{it} = \alpha_t + \beta_t M_i + X_i \Gamma_t + \epsilon_{it}$$

where t is year of birth, i is area of birth, and M_i is pre-campaign malaria.

Plot the $\hat{\beta}$.

1. Do we observe a shift?
2. When does it happen?
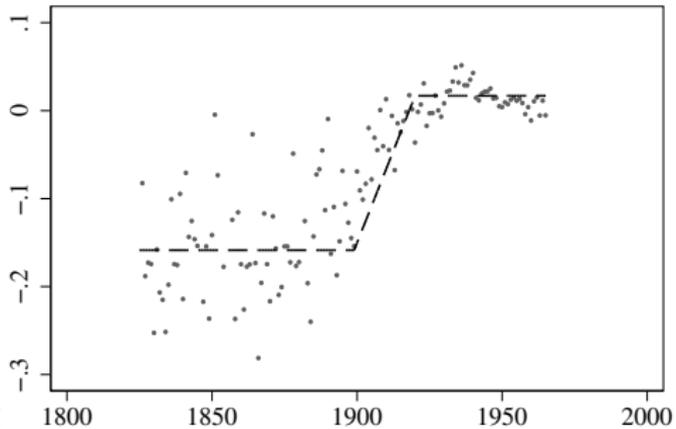3. Does it coincide with childhood exposure (the dashed line)?

Estimates:
- ▶ Following Page: United States
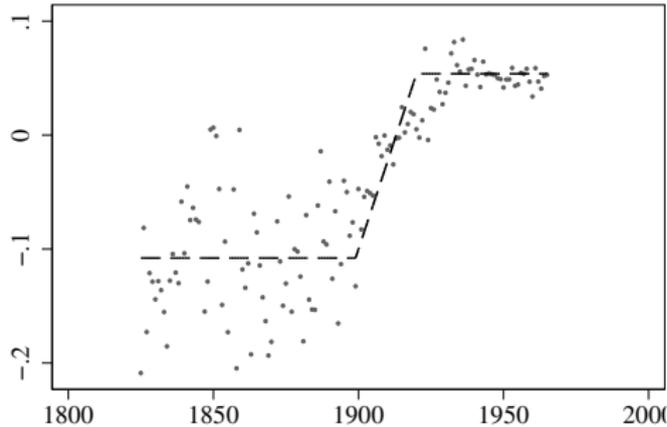- ▶ Page After That: Brazil, Colombia, Mexico

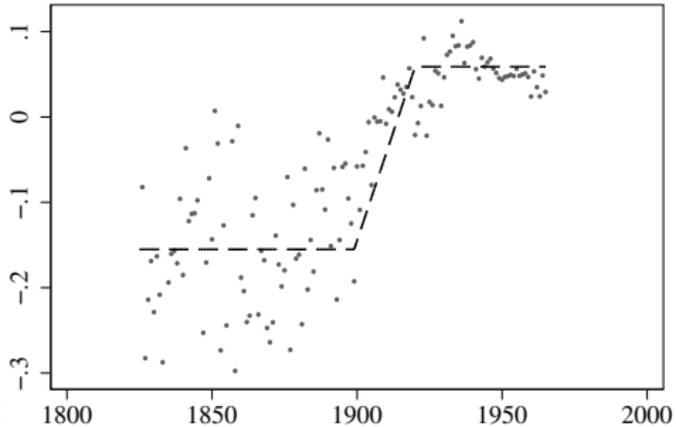Basic Specification, Occupational Income Score
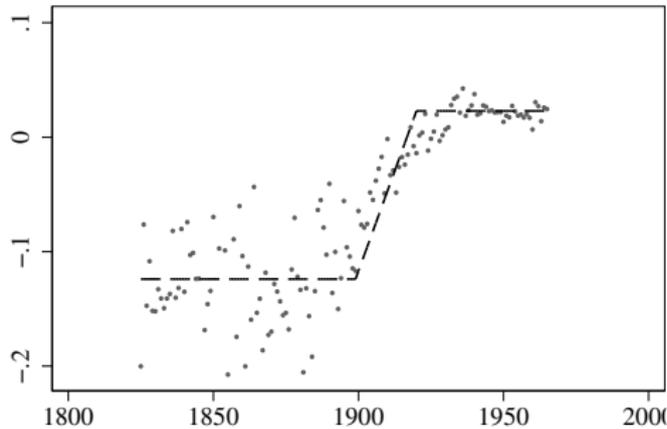
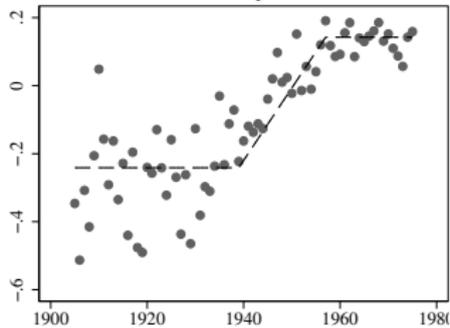Basic Specification, Duncan Score

Additional controls, Occupational Income Score

Additional controls, Duncan Score
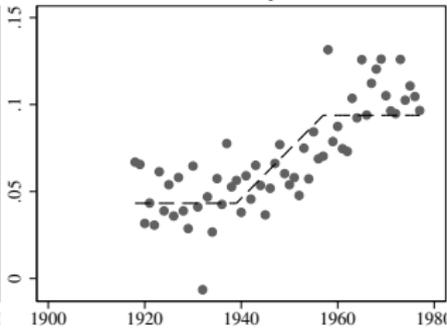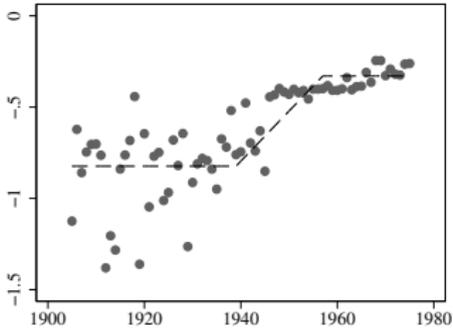
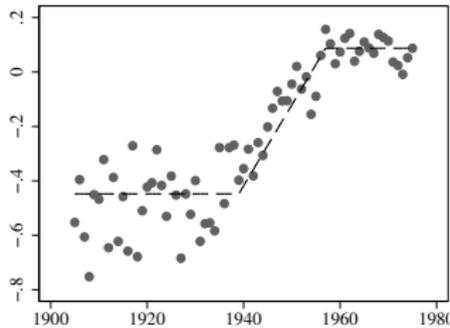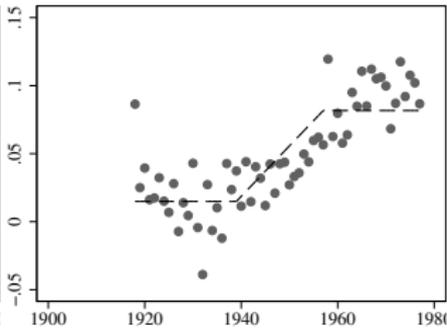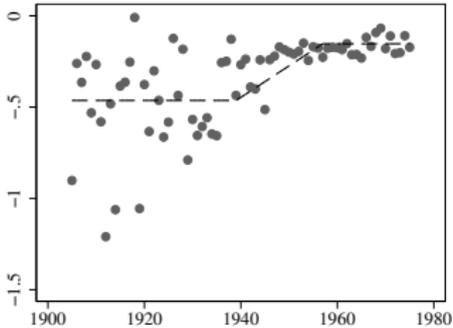|		
Brazil, Basic Specification	Colombia, Basic Specification	Mexico, Basic Specification
Brazil, Additional Controls	Colombia, Additional Controls	Mexico, Additional Controls

How Large Are these Effects?

- ► Consider Reducing Probability Childhood Infection: $1 \rightarrow 0$.

- ► Note that this is *Persistent* Infection in Childhood

- ► Estimated Increase in Adult Income: 40–60%

- ► Similar Numbers across All 4 Episodes Studied

- ► Accounts for $\approx 12\%$ of Income Gaps (US North vs South; US vs LatAm)

- ► About 25% of X-Country Estimates (Other channels? Reverse causality?)