AREC 345: Global Poverty & Economic Development

Lecture 12:

Geography Revisited: Health during Childhood

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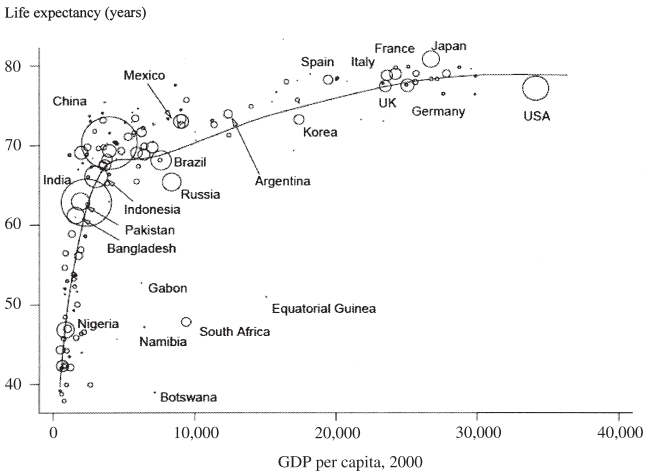
Health: Early Childhood Interventions

Wealthier is Healthier?



The **Preston curve**

Wealthier is Healthier?

High incomes may lead to higher levels of healthcare, improving outcomes; but improved health may make earning an income easier

- Direction of causality is not clear
- Education, for example, might drive the association
- Is it more effective to intervene to improve health, or focus on increasing income and let wealthier households invest in health?

Health related poverty traps?

- **Poverty trap**:
- Possible examples:
  - Under-nourishment in adults $\Rightarrow$ decreased wages from physical labor
  - Under-nourishment in kids $\Rightarrow$ reduced learning, test performance

Deworming: Research Questions

1. Does mass deworming make children healthier, on average?
   - Worm infections
   - Overall health
2. Does mass deworming improve educational outcomes?
   - School attendance/participation
   - Academic performance

$\Rightarrow$ Educational outcomes, long-term health might indicate a poverty trap

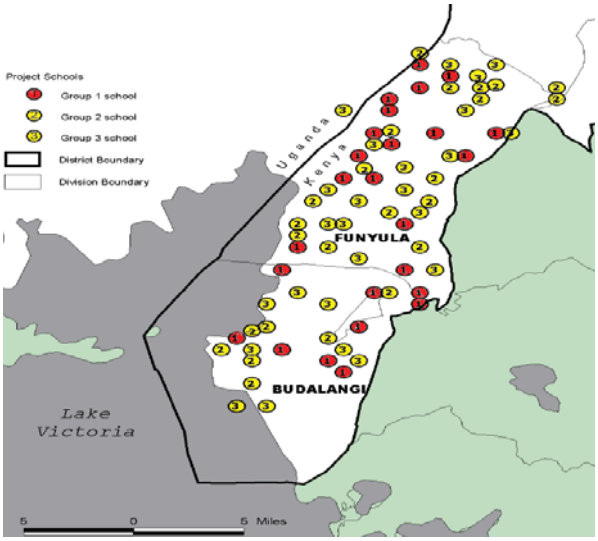
Primary School Deworming Project

Cluster randomized trial in 75 schools in western Kenya

- **Mass deworming**: deworming medication administered to all students present in school on designated treatment day
- NGO lacked funds to launch in all schools simultaneously
- Schools randomly assigned to one of three treatment groups
  - Students in Group 1 received free deworming drugs from 1998 on
  - Group 2 schools received free deworming drugs from 1999 on
  - Group 3 schools received free deworming drugs from 2001

Strategy: compare outcomes in G1 in 1999 to outcomes in G2, G3

Primary School Deworming Project



Primary School Deworming Project: Timeline

	1998	1999	2000	2001
G1 treatment:	G1 phased in			
G2 treatment:		G2 phased in		
G3 treatment:				G3 phased in
Data collection:	Baseline	Main survey		

Evaluation design:

- Treatment group: G1 schools had received deworming by 1999
- Comparison group: G2 schools had not received deworming by 1999

Baseline Characteristics

	Group 1	Group 2
Male	0.53	0.51
Year of birth	1986.2	1986.5
Grade progression (=Grade−(Age−6))	-2.1	-.1.9
School attendance	0.973	0.963
Access to latrine at home	0.82	0.81
Malaria or fever in past week	0.37	0.38

$\Rightarrow$ Randomization worked: Group 1 and Group 2 look similar at baseline

Thought Experiment: No Random Assignment

Suppose we collect data on school attendance:

- $ATTEND_i$ is a dummy variable equal to 1 if student i is present on the day of an unannounced attendance check at his school
- T_i is a dummy variable equal to 1 if student i's parents buy deworming medication for him from the local pharmacy

What is the cross-sectional association between being given deworming treatment at home (T_i) and attendance ($ATTEND_i$)?

$$ATTEND_i = a + b \cdot T_i + e_i$$

Our estimated regression coefficient is then:

$$\hat{b} = E\left[ATTEND_i | T_i = 1\right] - E\left[ATTEND_i | T_i = 0\right]$$

where $E\left[ATTEND_i | T_i = 1\right]$ is average attendance among the treated

Selection Bias

$\hat{b}$ doesn't tell us the impact of deworming if receiving the medication is associated with other factors/variables that predict attendance

- Example: household wealth ($W_i = 0$ if poor, $W_i = 1$ if wealthy)

What if the true underlying relationship between school attendance, household wealth, while treatment with deworming drugs was given by:

$$ATTEND_i = a + b \cdot T_i + c \cdot W_i + e_i$$

$\Rightarrow$ Deworming drugs improve school attendance by $b > 0$, while household wealth increases school attendance by $c > 0$

$\Rightarrow$ **What happens if the wealthy are more likely to treat their children with deworming medications than the poor?**

Selection Bias

What if the true underlying relationship between school attendance, household wealth, while treatment with deworming drugs was given by:

$$ATTEND_i = a + b \cdot T_i + c \cdot W_i + e_i$$

Expected level of school attendance for treated vs. untreated:

$$E\left[ATTEND_i | T_i = 1\right] = a + b + c \cdot E\left[W_i | T_i = 1\right]$$

$$E\left[ATTEND_i | T_i = 0\right] = a + c \cdot E\left[W_i | T_i = 0\right]$$

$E\left[W_i | T_i = t\right]$ is proportion wealthy among children with $T_i = t$

Selection Bias

If we regress $ATTEND_i$ on T_i, we'd get:

$$\hat{b} = E\left[ATTEND_i | T_i = 1\right] - E\left[ATTEND_i | T_i = 0\right]$$

$$= \underbrace{a + b + c \cdot E\left[W_i | T_i = 1\right]}_{E[ATTEND_i | T_i=1]} - \underbrace{\left(a + c \cdot E\left[W_i | T_i = 0\right]\right)}_{E[ATTEND_i | T_i=0]}$$

$$= b + \underbrace{c\left(E\left[W_i | T_i = 1\right] - E\left[W_i | T_i = 0\right]\right)}_{\text{selection bias term}}$$

Randomization to the Rescue

What happens when we randomly assign treatment?

- Treatment, control groups random samples of population
- Characteristics should be similar to population, on average
- Treatment, control groups should therefore be similar

Creates a situation where T_i is not associated with W_i:

$$E\left[W_i | T_i = 1\right] = E\left[W_i | T_i = 0\right] = E\left[W_i\right]$$

Selection bias term disappears

- Difference in attendance rates between treated, untreated students tells us the average impact of school-based mass deworming

Results: Direct Health Impacts

	Group 1	Group 2	Difference
Any moderate to heavy infection	0.27	0.52	-0.25*** (0.06)
Height-for-age z-score	-1.13	-1.22	0.09* (0.05)
Anemic	0.02	0.02	-0.02** (0.01)
Sick in the past week	0.41	0.45	-0.04** (0.02)

Measuring Spillovers

Direct impacts of deworming large, statistically significant

- Results differ from previous within school studies — why?
- Possible explanation: **spillovers**

Strategy 1: some students absent on day of treatment

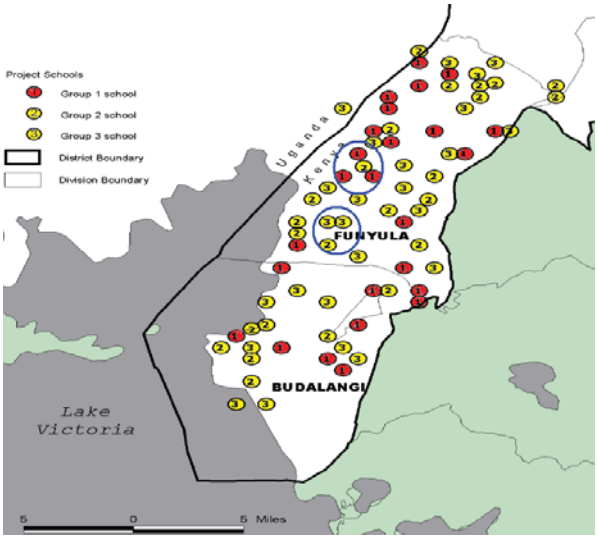
- Absence may be correlated w/ omitted variables (e.g. poverty)
- Can't compare outcomes for students who did, did not receive drugs

We can compare rates of worm infection in **untreated** population
in Group 1 to Group 2 students who eventually miss treatment

Results: Spillovers

	G1 Mean - Treated	G2 Mean Untreated
Any moderate to heavy infection	-0.27***	-0.21**
	(0.06)	(0.02)

Results: Spillovers Across Schools



Results: Impacts on School Attendance

School attendance data from random classroom visits

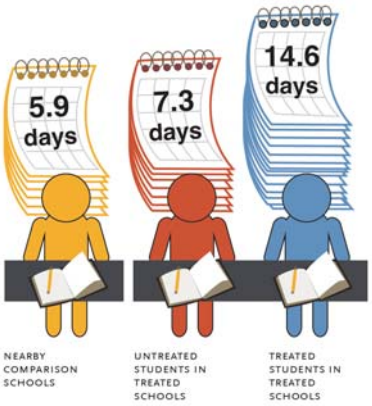
School Attendance

	Group 1	Group 2	Group 3
All students	0.84	0.73	0.77
Grade 2 and below	0.80	0.69	0.70

School-based mass deworming led to 7 percentage point increase in school attendance on base absence rate of approximately 25 percent

Results: Impacts on School Attendance

Treating one child for intestinal worms led to an increase in attendance of almost 28 days in that school year. Due to spillover effects, this impact was spread over the ● treated student, ● untreated students in treated schools, and ● students in comparison schools.

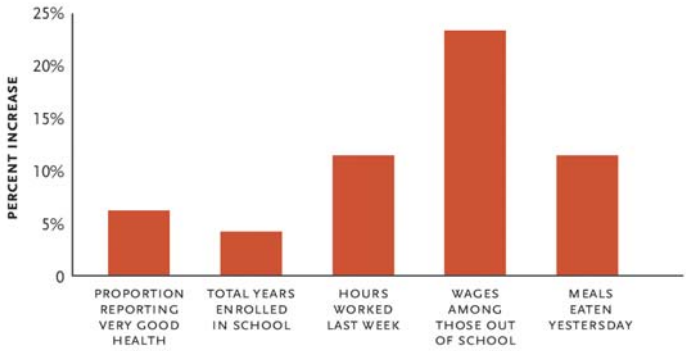


Results: Impacts on Test Scores

- Standardized tests in grades 3 through 8
- Why might deworming ↑ test scores
  - Increased focus, cognitive function
  - Attendance gains
- Why not?
  - Over-crowding
  - Poor school quality, low teacher effort
- Survey says:

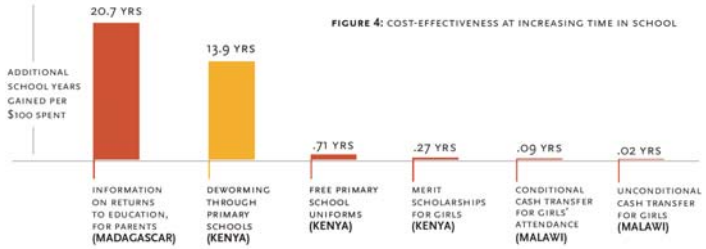
Epilogue: Long-Term Impacts

Impacts of the PSDP on (young) adult outcomes:



Epilogue: Long-Term Impacts

This makes school-based deworming one of the cheapest ways to boost educational attainment in areas where worms are endemic



With donor funding, Kenyan gov't now provides free deworming medication in all schools where worms infections are common

Epilogue: Long-Term Impacts

- Preston curve
- poverty trap
- neglected tropical diseases
- soil-transmitted helminths
- mass deworming
- spillovers