Economics 172

Issues in African Economic Development

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Lecture 7 – February 6, 2007

Estimating treatment effects

(1) $$Y_i = a + bT_i + cX_i + e_i$$

Y: educational outcome (e.g., school attendance)

T: indicator variable (=0 or 1) for taking deworming drugs

X: child characteristic (e.g., home socioeconomic status)

a, b, c: parameters / “coefficients” to be estimated

e: white noise “error/disturbance” term, $E(e) = 0$

i: denotes person “i” in the population, i from 1, …, N

Treatment effects and omitted variable bias

(1) $Y_i = a + bT_i + cX_i + e_i$

(2) $E(Y_i \mid T_i\!=\!1) - E(Y_i \mid T_i\!=\!0)$

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(2) $E(Y_i \mid T_i=1) - E(Y_i \mid T_i=0)$

$$= [a + b + cE(X_i \mid T_i=1) + E(e_i \mid T_i=1)] - [a + 0 + cE(X_i \mid T_i=0) + E(e_i \mid T_i=0)]$$

$$= b + c\,[E(X_i \mid T_i=1) - E(X_i \mid T_i=0)]$$

True effect — "Omitted variable/selection bias" term

Dealing with omitted variable bias

- When is omitted variable bias not a problem?

  1) Collect information on X

  Better data collection reduces OVB, fewer X's

  2) The omitted variable does not affect the outcome

  $c = 0$

  3) The omitted variables are not correlated with the explanatory variable of interest (here, T)

  "Experimental" variation in variables of interest

- If treatment with deworming drugs is assigned "randomly", and reduces worm infection, then the reduction in worms should be uncorrelated with X

Miguel (2005) / Miguel and Kremer (2004)

- Primary School Deworming Project (PSDP) in Kenya

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- Randomized evaluation design: Three steps
  (i) Schools divided by geographic zone, (ii) alphabetized, (iii) divided into three groups (1-2-3, 1-2-3, etc.)

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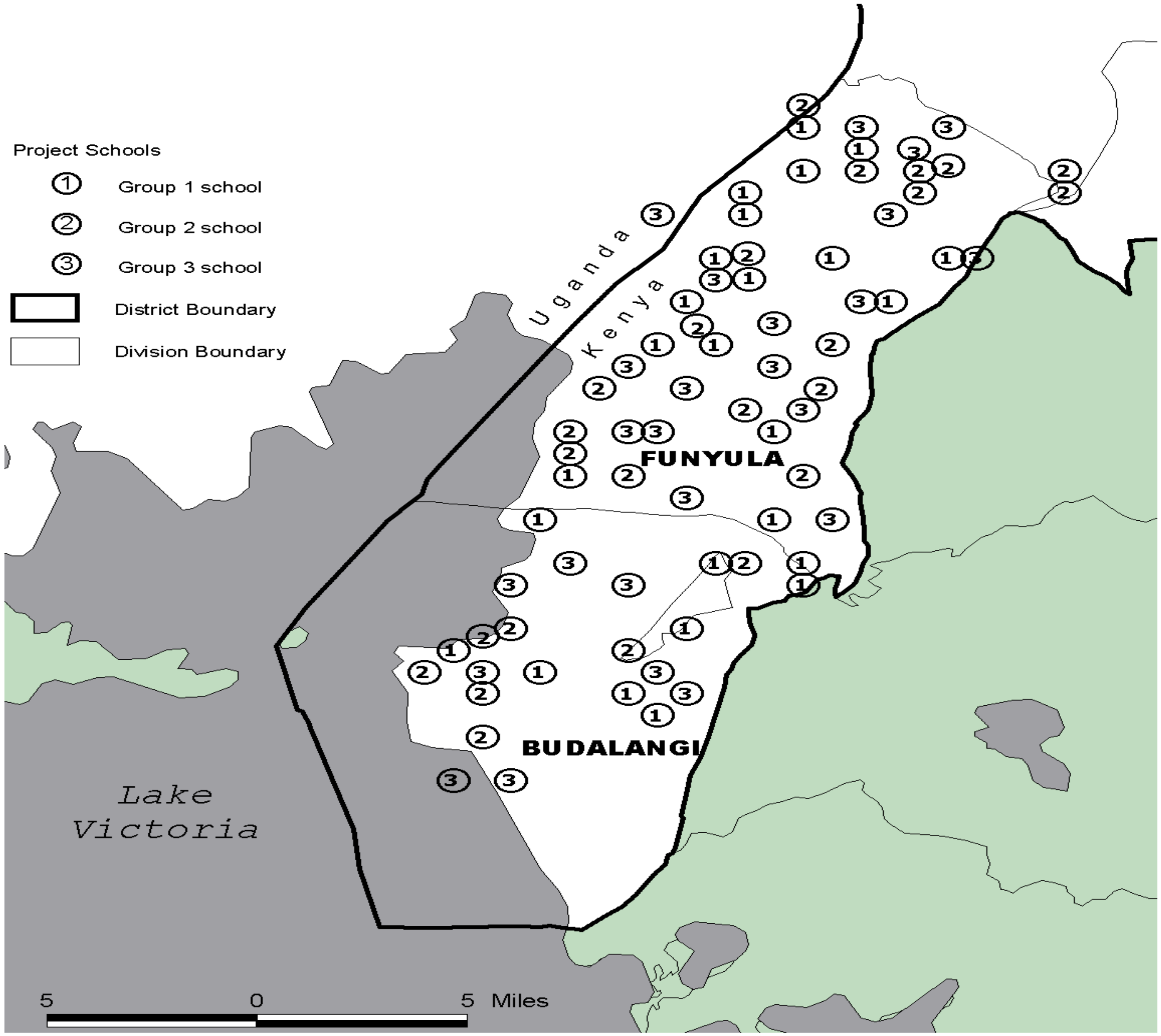
	1998	1999
Group 1 (25 schools)	Treatment	Treatment
Group 2 (25 schools)	Comparison	Treatment
Group 3 (25 schools)	Comparison	Comparison


Project Schools
Group 1 school
Group 2 school
Group 3 school
District Boundary
Division Boundary
Uganda
Kenya
FUNYULA
BUDALANGI
Lake Victoria
5
0
5 Miles

PSDP Baseline differences (1998)

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1996 exam score (normalized mean 0, s.d. 1)	-0.10	0.09	0.01

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Program impacts

- Three types of analysis:

  (1) Direct treatment effects: simple difference between treatment and comparison schools

  (2) Within-school externality impacts

  (3) Cross-school externality impacts

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Health, nutrition impacts (1999)

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Rate of moderate-heavy infection			
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Sick in past week	0.41	0.45	-0.04*
Height for age (Z-score)	-1.13	-1.22	0.09*
Hemoglobin (Hb)	124.8	123.2	1.6

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Within-school infection externalities (1999)

	Group 1 (Treated)	Group 1 (Untreated)	Group 2
Rate of moderate-heavy Infection, 1999	0.24	0.34	0.52

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	Group 1 (Treated)	Group 1 (Untreated)	Group 2
Rate of moderate-heavy Infection, 1999	0.24	0.34	0.52
Rate of moderate-heavy Infection, 1998	**0.39**	**0.41**	-

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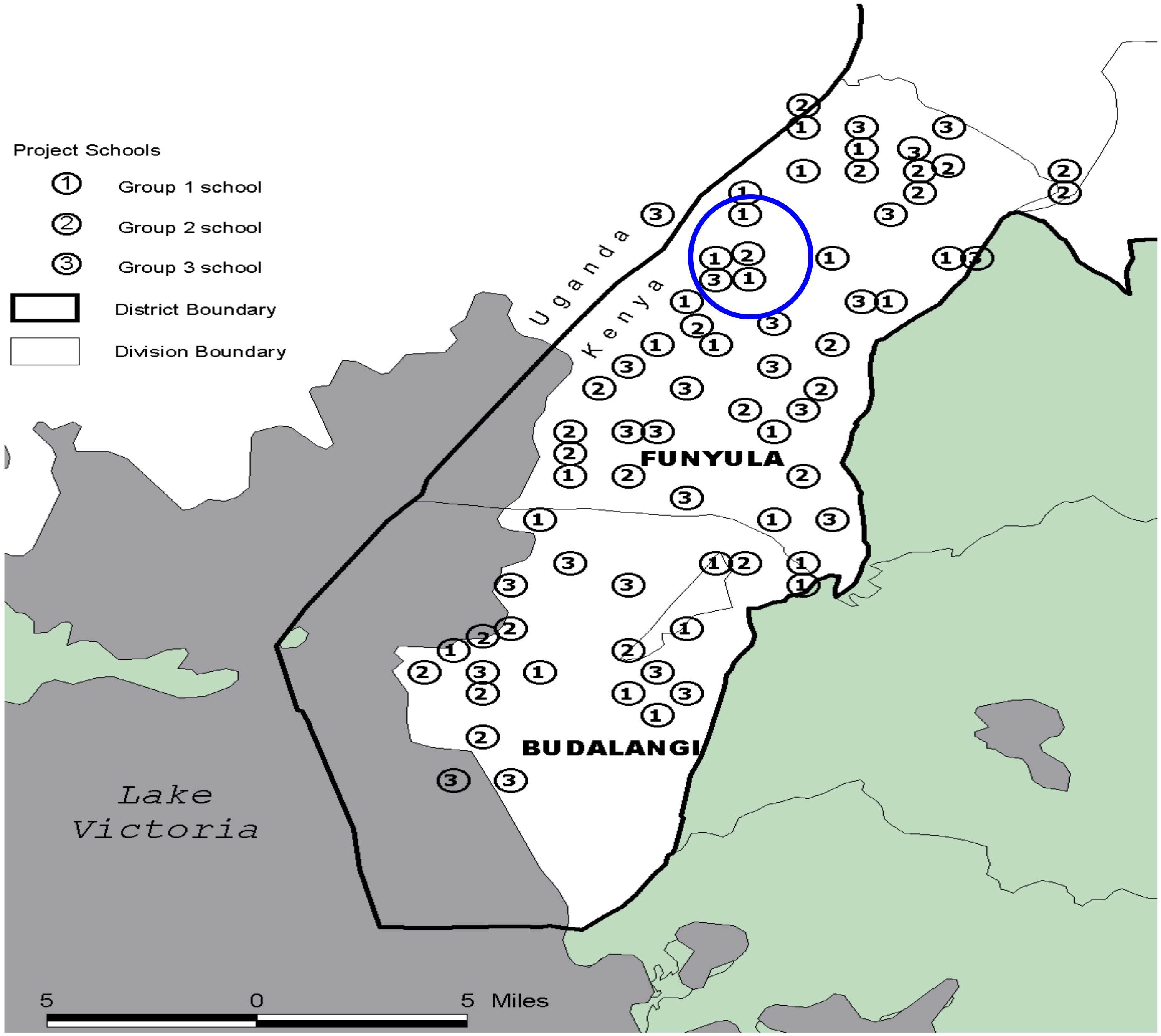
<u>Cross</u>-school infection externalities (1999)

- Large reductions in moderate-heavy infection levels within 3 km (2 miles) of treatment schools in 1999, smaller positive reductions up to 6 km



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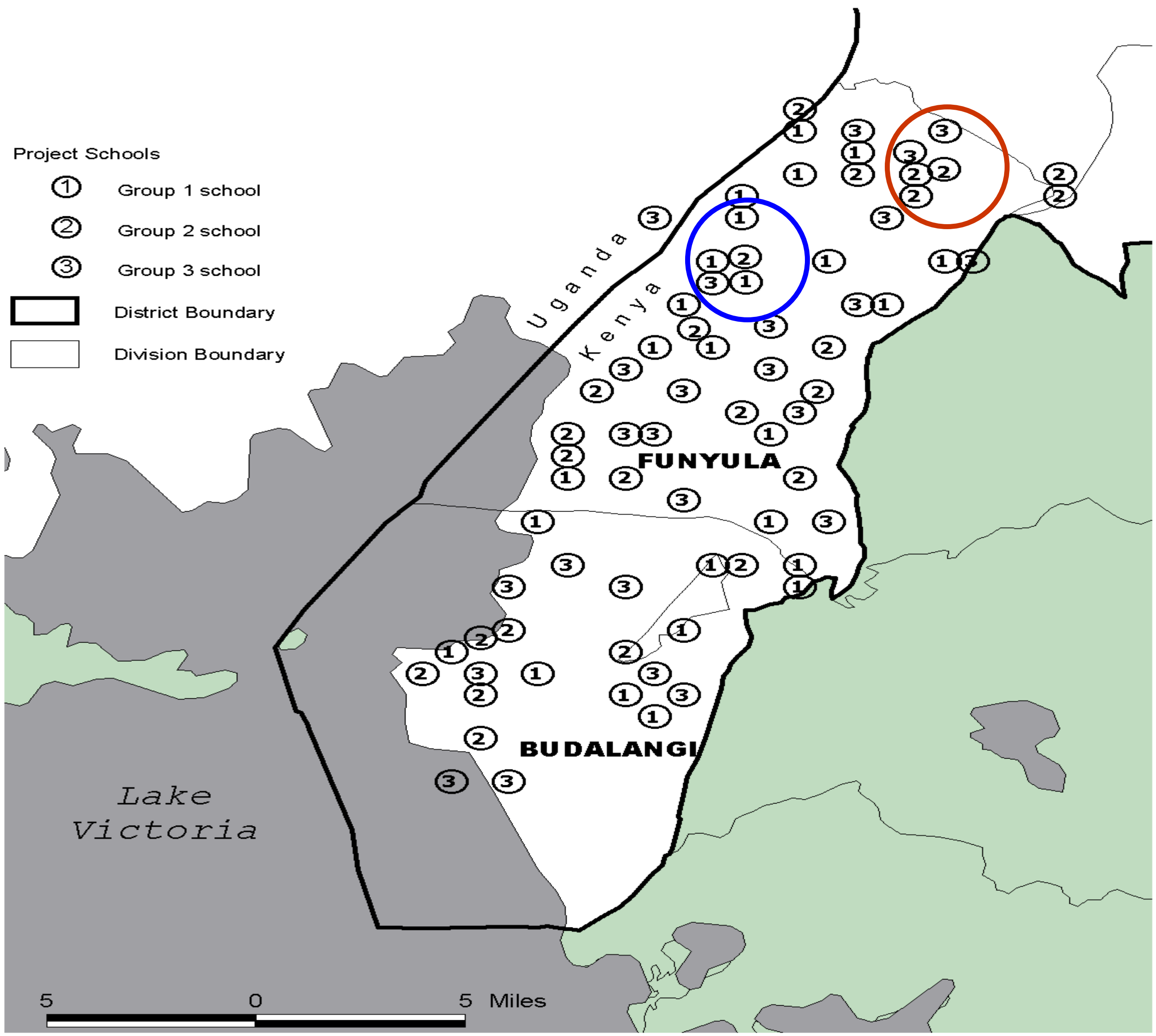

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- An average reduction in moderate-heavy infections of 23 percentage points in the study area can be attributed to cross-school externalities

Implications of treatment externalities

- Standard public finance theory: individual behaviors that generate positive externalities for other people are "under-provided", since people do not take into account the social benefits of their actions. Thus in the absence of a subsidy deworming is underprovided. There is a strong rationale for public deworming subsidies

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- Previous randomized studies that provided deworming within schools often showed positive but quite small impacts on child health, nutrition. Some concluded that "deworming isn't worth it". Why?

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This 10 percentage point "effect" is much smaller than the 25 percentage point effect we estimate when we compare treatment and comparison schools – and even that is an underestimate (due to cross-school externalities)

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	0.84	0.73	0.77

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Grades 6-8	0.93	0.86	0.89

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→ Treating worms reduces school absenteeism a lot!

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  - Congestion effects in the classroom
  - Time lags

Cost-benefit calculations

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- Previous study: each year of school → 7% higher wages
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→ Deworming benefits are at least three times (3x) as large as treatment costs (using the Tanzania costs)

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  -- Strong evidence people learned through their social network that the drugs were “not effective”

  (2) Socio-cultural explanations / resistance to new technologies (evidence from anthropology)

The Impact of Higher Drug Costs

- In 1998, 1999, 2000 deworming was given for free
- In 2001, parents in 25 randomly chosen Group 1 and Group 2 schools paid US$0.10-0.30 per child

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- 2001 deworming take-up:

  Free-treatment schools: 75%

  Cost-sharing schools: 18%

- For next time: Read Miguel (2005)

Whiteboard #1

Whiteboard #2

Whiteboard #3

Whiteboard #4

Whiteboard #5

Map of Africa

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