

Introduction

- *Fundamental Cause Theory* (FCT) posits that social inequalities in health arise in part because social actors use resources to influence survival
- To date no one has applied FCT in global health research
- However, because resource-poor settings are characterized by 1) high levels of inequality, and 2) less universal access to known health interventions, FCT may be *more* applicable in such settings

Setting

- Madagascar is an island nation off eastern coast of Africa
- 40% live on less than \$1.25/day
- 4.1% of GDP (\$18/person/year) is spent on healthcare
- 60% of the population lives within 5km of a health center

Objective

To examine the association between parental socioeconomic status and vaccination among children in Madagascar while adjusting for shared unobserved variation from geographic and administrative clustering

Results

Figure 1. District variation in achievement of herd immunity for DPT, Polio and Measles: few areas show coverage approaching herd immunity

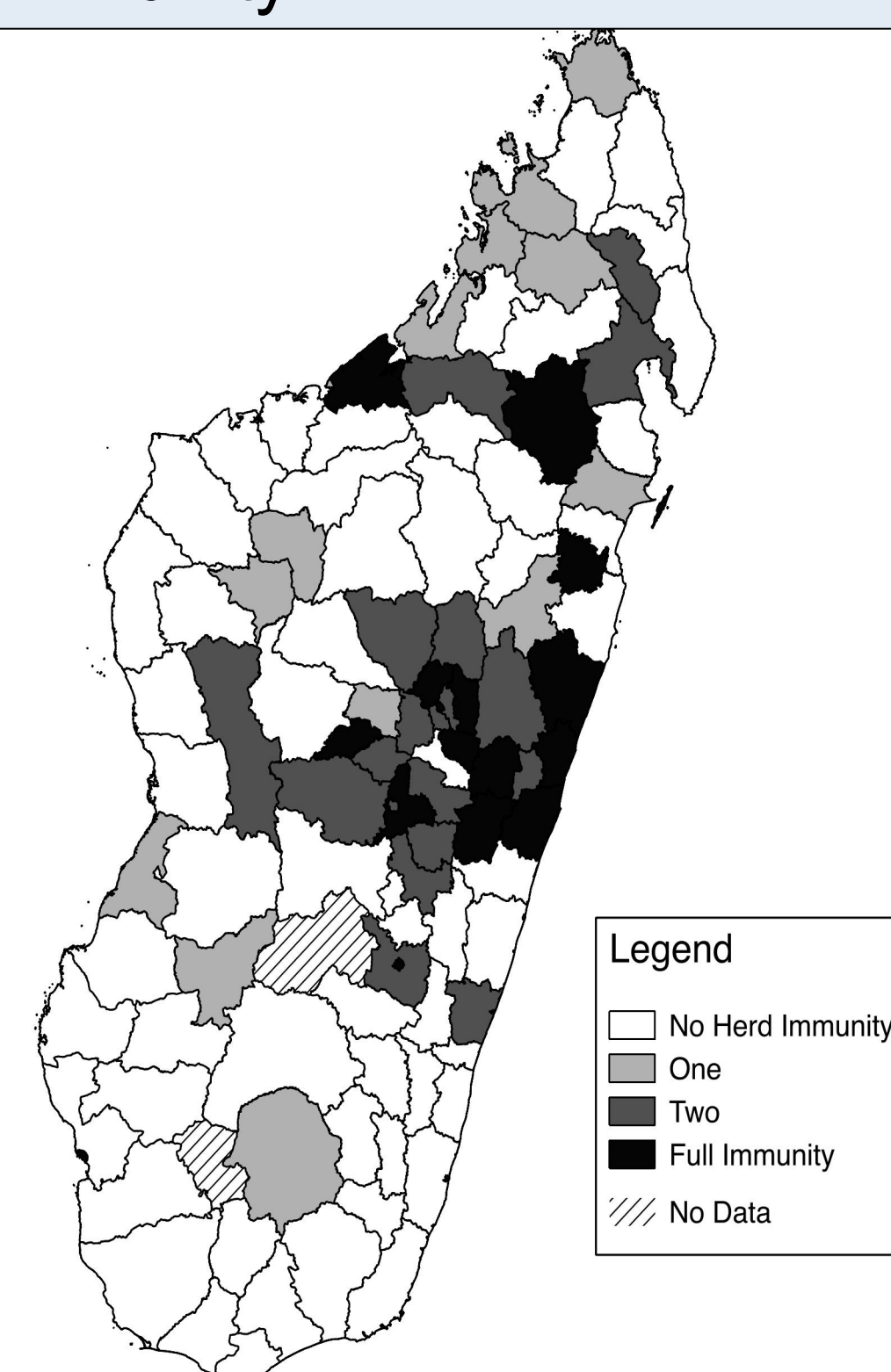


Figure 2. Multilevel logistic model assessing the influence of SES on DPT vaccination while accounting for regional, geographic, and household variability in intercept, DHS 2008-9

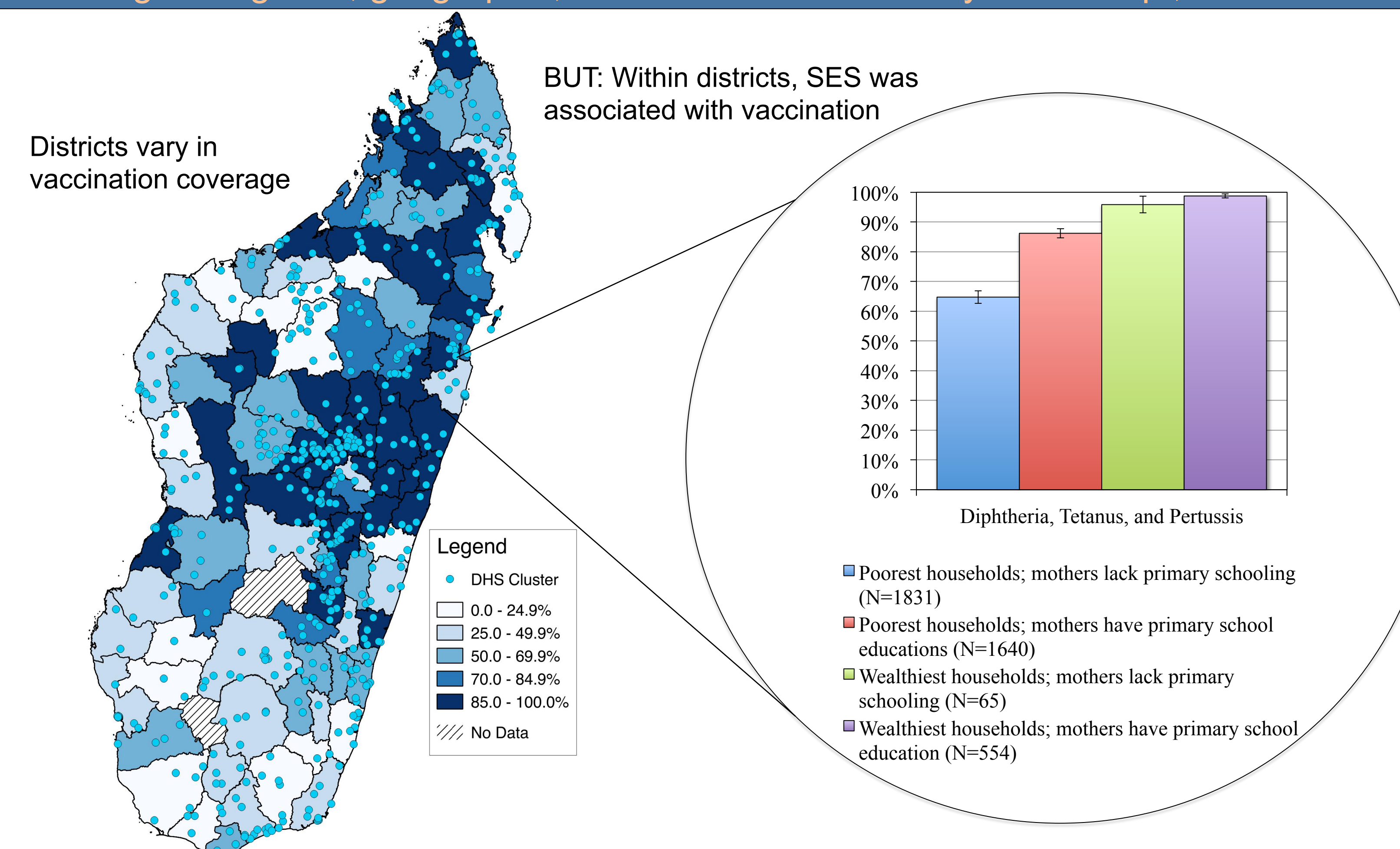


Table 1. Sample characteristics

Vaccination	Diphtheria, Tetanus, Pertussis	76.48%
	Tuberculosis	80.56%
	Measles	73.20%
	Poliomyelitis	68.82%
	H. Influenza B	48.01%
Mothers Education	No Primary	25.08%
Fathers Education	No Primary	22.16%
Household Wealth	Poorest	24.71%

Table 2. Odds ratios estimated using multilevel models, adjusting for administrative, geographic, and household variability

Mother: Primary School v no primary	3.34	2.21, 5.07	<0.001
Father: Primary School v no primary	2.11	1.38, 3.24	0.001
Median v Poorest quintile	2.81	1.64, 4.84	<0.001
Pseudo-R ²	0.27		<0.001

Data (N~4,557)

- Use the 2008-9 wave of the Demographic and Health Survey (DHS) from Madagascar
- Compliance for five vaccinations (DPT, Measles, Polio, Tuberculosis, and H. Influenza B) was observed amongst children aged 0-4
- Mother & Father's educational attainment was directly measured
- Household wealth was measured using Filmer & Pritchett quintiles
- GPS data were observed for geographic clusters, which are nested within districts

Methods

- Multilevel logistic regression was used
- Four-level model: individual, household, cluster, and district-levels
- Clusters capture geographic differences in proximity to or barriers to healthcare
- Households capture shared differences within households in parental preferences or experiences regarding vaccination
- Maps show geographic substantial variability in vaccination

Summary

- Socioeconomic inequalities are not limited to rich countries
- Inequalities in vaccination occur even when most people are absolutely poor
- Results suggest that a number of mechanisms link parental SES to vaccination outcomes
- Regional variability overcomes but can also exacerbate such inequalities
- In some districts, fewer than 25% of children report being vaccinated
- This is particularly concerning for Polio, which has reemerged in other areas of political instability

Main Finding

Social inequalities in vaccination among children aged 0-4 in Madagascar exist in addition to geographic variability and administrative differences that may represent barriers to access or limited supply

Conclusions

- FCT is generally applied to health in rich countries, but is viable even when most people are poor
- Focus on improving coverage within districts to achieve herd immunity
- Preventive medications can save lives, but doing so requires efficient and effective distribution
- Herd immunity may be compromised where poor people cluster