Fundamental social causes in childhood vaccination: Madagascar

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Introduction

- Research has long focused on social inequalities in health in rich countries.
- *Fundamental Cause theory* posits that social inequalities in health arise in part social actors use resources to influence survival
  - Resources, including money, power, prestige, knowledge, and beneficial social connections, can influence knowledge about and access to life-saving preventions.
- Fundamental cause theory is equally applicable in situations where resources are generally unavailable, but are still unequally distributed.
- Vaccination is effective at reducing child mortality, but is unequally available in resource-poor settings.
- Barriers to access bias estimates of socioeconomic inequalities.

Objective

To robustly estimate the association between parental socioeconomic status and vaccination among children.

Results

Figure 1. There is substantial regional variability in vaccination rates: white areas show coverage below 25%

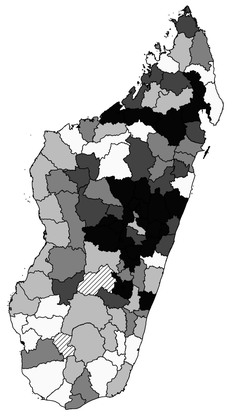

Figure 3. Multilevel logistic model assessing the influence of SES on vaccination while accounting for regional, geographic, and household variability in intercept, DHS 2008-9

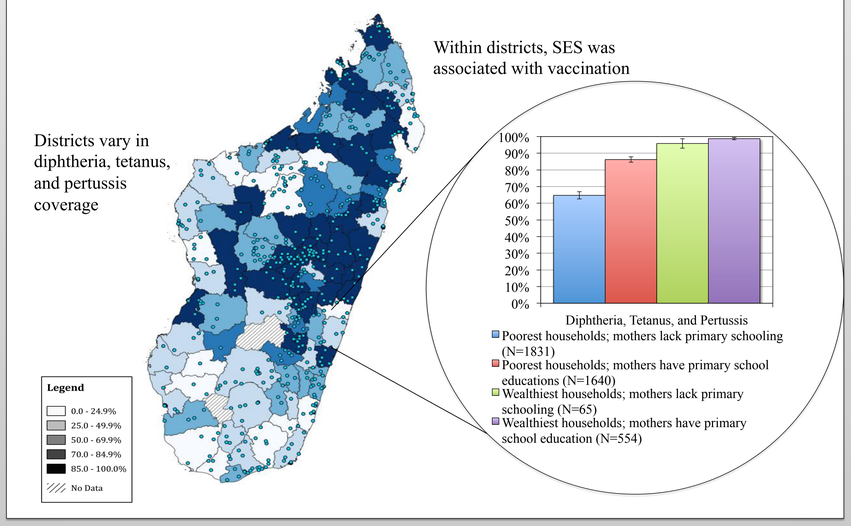

Figure 2. District variation in achievemnt of herd immunity for DPT, Polio and Measles: few areas show coverage approaching herd immunity

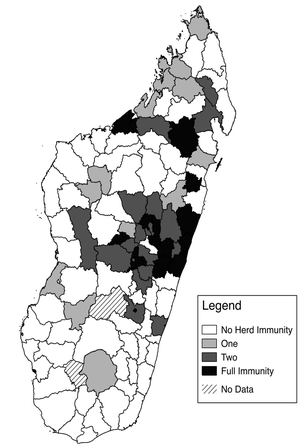

Table 1. Sample characteristics

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

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

	OR	95% CI	P
Mother's Primary School	3.34	2.21, 5.07	<0.001
Father's Primary School	2.11	1.38, 3.24	0.001
Median wealth	2.81	1.64, 4.84	<0.001
Pseudo-R^2	0.27		<0.001

Data (N≥4,557)

- Data come from the 2008-9 wave of the Demographic and Health Survey (DHS), Madagascar.
- Vaccination was measured amongst children aged 0-4.
  - Age-specific compliance for 5 Vaccines: DPT, Measles, Polio, Tuberculosis, and H. Influenza B
- 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, with random intercepts specified to account for shared-variability.
- Four-level model: individual, household, cluster, and district-level variation.
- 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 variability in vaccination uptake.

Summary

- Socioeconomic inequalities are not limited to rich countries
- Inequalities in vaccination occur even when most people are absolutely poor
- Results support FCT, suggesting 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 not been eliminated and has re-emerged in a number of war-torn and empoverished areas
- Herd immunity depends on consistent coverage

Conclusions

- FCT is generally applied to health in rich countries, but can be applied even when most people are poor
- Preventive medications can save lives, but doing so requires efficient and effective distribution
- Herd immunity may be compromised in small areas where poor people are concentrated