Social inequalities in vaccination uptake among children aged 0-59 months living in Madagascar: An analysis of Demographic and Health Survey data from 2008-09

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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

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

Table 1. Sample characteristics

<table>
<thead>
<tr>
<th>Vaccination</th>
<th>Diphtheria, Tetanus, Pertussis</th>
<th>Diphtheria, Tetanus, Pertussis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measles</td>
<td>76.48%</td>
<td>80.56%</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>73.20%</td>
<td>68.62%</td>
</tr>
<tr>
<td>Poliomyelitis</td>
<td>66.52%</td>
<td>68.62%</td>
</tr>
<tr>
<td>H. Influenza B</td>
<td>48.01%</td>
<td>48.01%</td>
</tr>
</tbody>
</table>

| Mother's Education | No Primary | 25.08% | 25.08% |
| Father's Education | No Primary | 22.16% | 22.16% |
| Household Wealth   | Poorest    | 24.71% | 24.71% |

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

<table>
<thead>
<tr>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother: Primary School vs no primary</td>
<td>3.34, 1.38</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Father: Primary School vs no primary</td>
<td>2.11, 1.38</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Median vs Poorest quintile</td>
<td>2.81, 1.64</td>
<td>0.001</td>
</tr>
</tbody>
</table>

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

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