An assessment of the impact of women empowerment on childhood vaccination coverage in Nigeria: a spatio-temporal analysis

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VACCINE IMPACT
MODELLING CONSORTIUM

Introduction

- Vaccination for children has contributed in attaining child health indicators through reduction of illness, disability and mortality from preventable diseases

- Vaccine-preventable diseases however still a major cause of morbidity and mortality in many low- and middle-income countries (LMIC)

- It is very challenging to get the last 20% of children in LMIC settings to receive the basic vaccinations

- SDG3 underscores the importance of achieving universal health coverage including access to affordable vaccines and medicines

Introduction

- In many LMICs, gender disparity and women disempowerment are major barriers to healthcare utilization including uptake of immunization services

- Women often play a central role as primary caregivers, yet content with structural barriers in accessing vaccine services as a result of the many constraints they face.

- Their level of health literacy, decision-making prowess, and access to resources can influence their ability to ensure immunization for themselves and their children.

Introduction

- Nigeria is predominantly a patriarchal society where gender segregation and stratification that limit the role of women are common

- Men are often the decision-makers while women are mostly confine to domestic cores, ultimately affecting them later in life causing lose of self-esteem in their adult life

- Understanding and addressing inequality in women empowerment can help improve vaccination coverage, equity, and health outcomes for all individuals, contributing to more effective public health interventions.

- We model the spatially-varying effects of women's empowerment on different childhood vaccination coverage in Nigeria in a spatio-temporal framework.

Measurement of women's empowerment

- There are irregularity in the definition/measurement of women's empowerment
  - Operationally guided by the principle of civil and social rights, **relating to enhancing capabilities**
  - Equal access to resources and opportunities, and having the agency to use these to make choices and decisions

- Several proxy variables are collected from household surveys

- Transformative approaches have been considered to combine the variables
  - Multivariate cluster analysis to identify empowerment patterns
  - Proportion of positive outcomes from different domains of women's empowerment (FEMI)
  - Factor analysis/principal component analysis

Data

- Nigeria DHS: 2003, 2008, 2013, 2018
  - Children aged 12-23 months
- Empowerment indicators
  - Participation in decision-making
    - Measured based on the variables that determine the person who decides on:
    - Respondent's healthcare
    - Large household purchases
    - Visits to family or relatives
    - What to do with money husband earns
  - Empowerment regarding healthcare utilization
    - Hurdles faced by women in an attempt to access healthcare for themselves.
    - Getting permission to go
    - Getting money needed for treatment
    - Not wanting to go alone
    - Distance to health facility
- Factor analysis to combine the indicators

Modeling approach
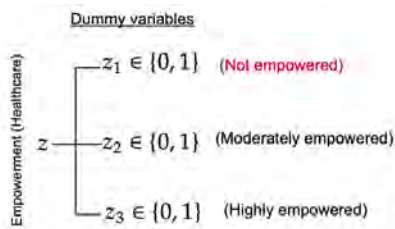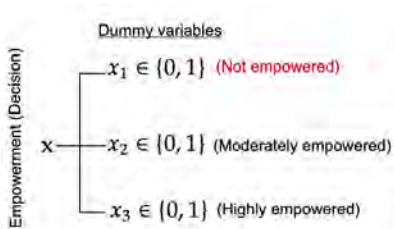
Vaccinations considered:

- **Zero dose**: No DPT-containing vaccine
- **MCV**: Received measles vaccine
- **DPT-complete**: Received 3 doses of DPT-containing vaccine
- **BCG**: One dose of BCG vaccine
- **All basic vaccines**: A dose of BCG, 3 doses of DPT, 3 doses of oral polio vaccine (excluding the one at birth), a dose of MCV

Modeling approach

Let $y_i \in \{0, 1\}$ $i = 1, 2, 3, ..., 774$ be an indicator variable representing one of "zero dose", "mcv", "dtp", "bcg", or "all basic dose". Then we model

$$y_i \mid \alpha, \boldsymbol{\gamma}, \phi \sim Bernoulli(\pi_i)$$
$$logit(\pi_i) = \alpha + x_{2i}\gamma_{1i} + x_{3i}\gamma_{2i} + z_{2i}\phi_{1i} + z_{3i}\phi_{2i}$$
$$\boldsymbol{\gamma}_1 \sim ICAR(\tau_{\gamma 1}),$$
$$\boldsymbol{\gamma}_2 \sim ICAR(\tau_{\gamma 2}),$$
$$\boldsymbol{\phi}_1 \sim ICAR(\tau_{\phi 1})$$
$$\boldsymbol{\phi}_2 \sim ICAR(\tau_{\phi 2}),$$
$$\sum \gamma_{1i} = \sum \gamma_{1i} = \sum \phi_{2i} = \sum \phi_{2i} = 0.$$
$$\mathbf{a} \sim ICAR(\tau_a) \implies a_i \mid a_{-i} \sim N\Big(\frac{\sum_{j \in \mathcal{N}_i} a_j}{\#\mathcal{N}_i}, \frac{1}{\tau_a \#\mathcal{N}_i}\Big),$$
$$\mathcal{N}_i \text{ is a set of neighbors of LGA } i.$$

Table

Table: Percentage distribution of children in study and for the mothers based on their class of empowerment

Variable	Number of children/women	Percentage
Year		
2003	1,012	5.66
2008	5,006	27.98
2013	5,790	32.36
2018	6,084	34.00
Decision-making		
Not empowered	8,170	45.66
Moderately empowered	4,562	25.50
Highly empoewered	5,160	28.84
Healthcare utilization		
Not empowered	5,533	30.92
Moderately empowered	5,059	28.28
Highly empoewered	7,300	40.80
Total	17,892	100

Results: Zero dose
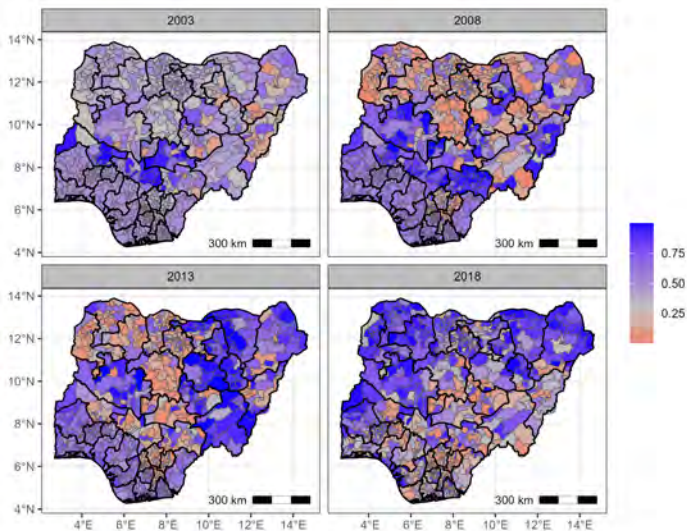
Figure: Predicted prevalence of zero dose
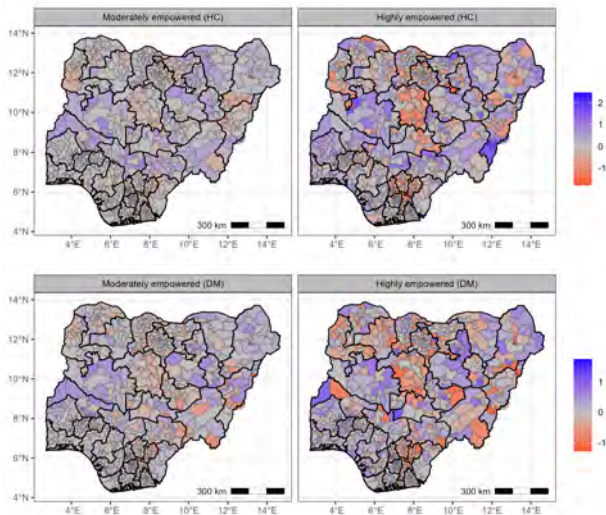
Figure: Estimated effects women's empowerment indicators on zero-dose coverage
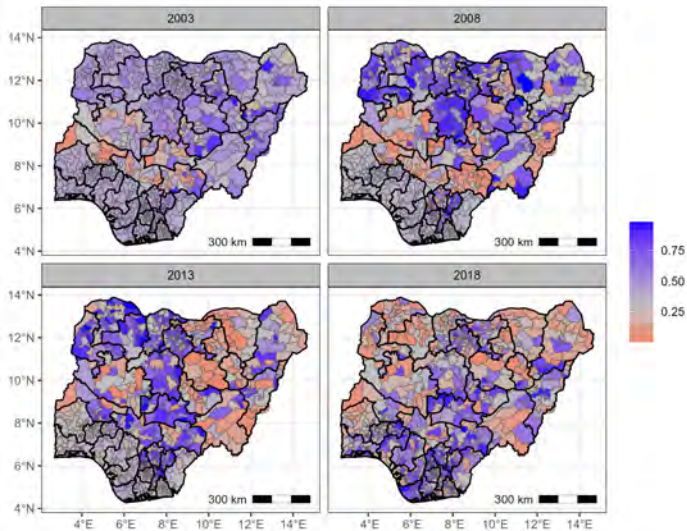
Figure: Predicted prevalence of MCV

Results: MCV

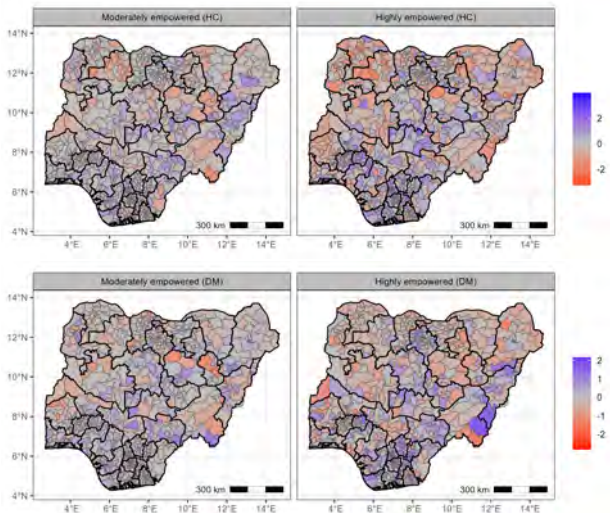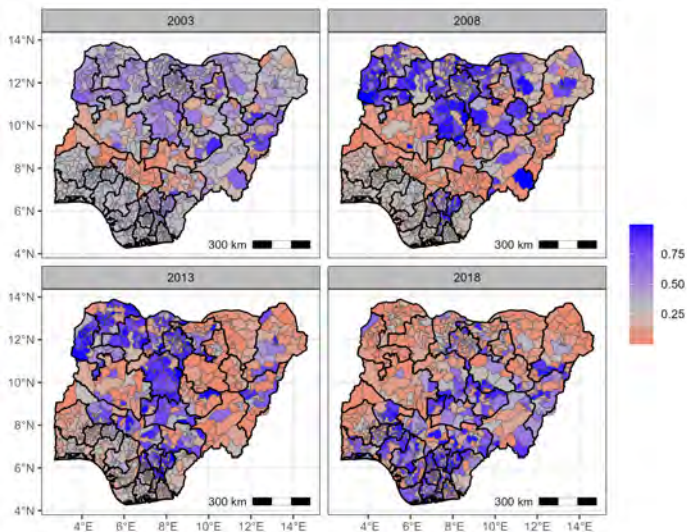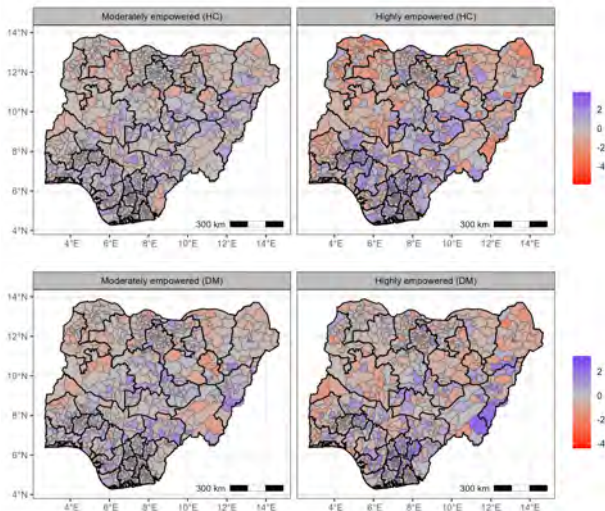Figure: Estimated effects women's empowerment indicators on MCV coverage

Figure: Predicted prevalence of DTP-complete

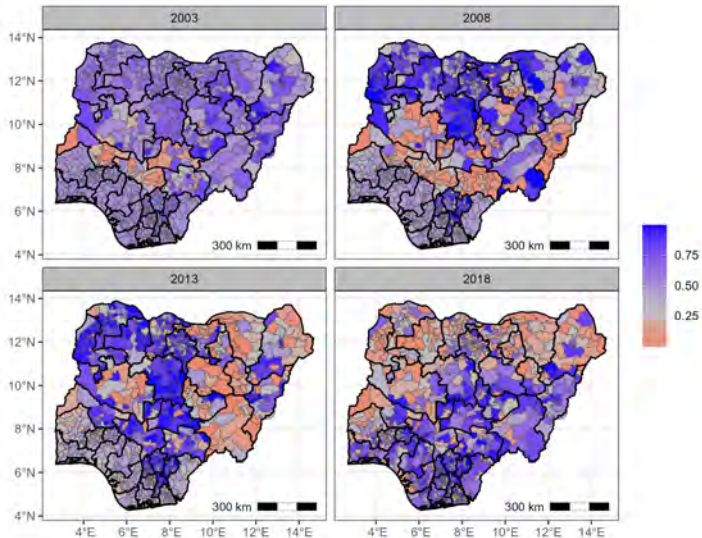Figure: Estimated effects women's empowerment indicators on DPT-complete coverage
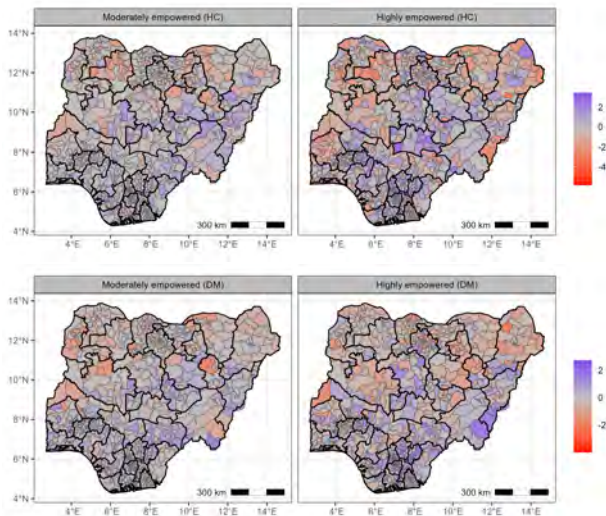
Figure: Predicted prevalence of BCG

Figure: Estimated effects women's empowerment indicators on BCG coverage
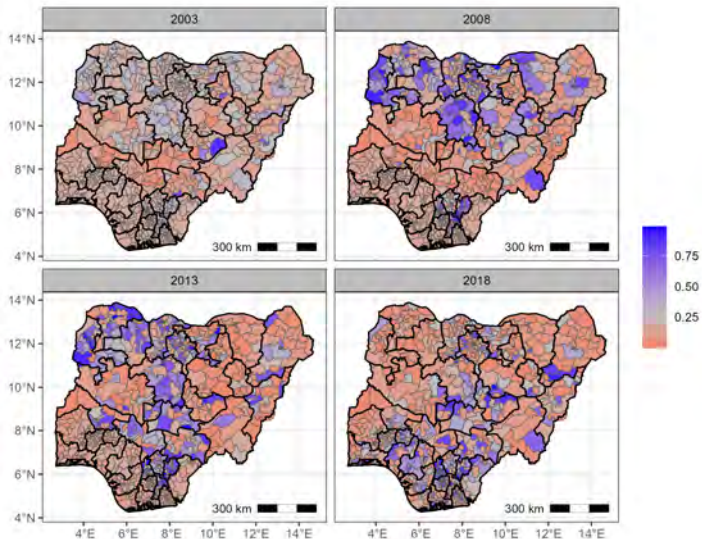
Figure: Predicted prevalence of all basic vaccines
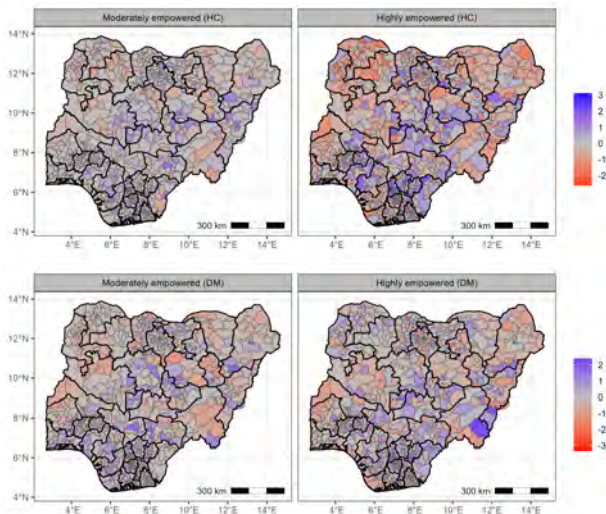
Results: All basic vaccines

Figure: Estimated effects women's empowerment indicators on all basic vaccines coverage

Conclusion

- Evidence of space-time variations for all the vaccination types during the survey periods.
    - Apparent north - south divide for all the vaccines
    - Coverage for all basic vaccinations particularly low everywhere

- There are more variations among the highly empowered but relatively uniform for the moderately empowered.
    - More apparent for decision-making in the case of zero-dose
    - Relatively uniform pattern for moderately empowered especially in the south west
    - There are lower chances of vaccine uptake among the highly empowered in most northern locations

Thank you