Modeling approach(es) for multivariate binary response

Steve and Jonathan

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Background

- Longitudinal (2003 - 2015) NUHDSS covering Korogocho and Viwandani

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  - Household size

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  - Household size
  - Wealth index

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  - Household expenditure

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- Response(s): Three WaSH variables were created as per WHO definition

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- Response(s): Three WaSH variables were created as per WHO definition
  - Drinking water source
  - Toilet facility type
  - Garbage disposal method

Problems

- How do we account for the repeated measurements within the households across the years?
  - Model the WaSH variables separately
  - Pick one of the WaSH indicator and treat the remaining two as fixed covariates
- The two approaches are not accounting for the unmeasured variations and correlation among the WaSH variables

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  - Simulation-based validation

Objective

- The aim is to investigate the contribution of demographic, social and economic factors to improved water, sanitation and hygiene (WaSH) among the urban poor.

Data exploration

- WaSH variables (services) are binary (`0 = unimproved` and `1 = improved`)
  - Each household was surveyed once per year
  - For some HH, the services have improved or unimproved for different years
- Aggregated by `year`, all HH have varying `wealth_index`

Simulations

Assumptions

- Each household has its own year effect on the intercepts (random-intercept)
  - These are correlated
- There is a single measured covariate (corresponding to wealth)

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- Observed values ($\{0, 1\}$) are drawn from binomial distribution with probability $\mathrm{plogis}(y_{hts})$

Results

- The results are here