Women and Community Measures Associated with Maternal Morbidity
04/07/2024, Kath Fillman

Introduction. This analysis used data from a study in Uttar Pradesh, India on the effectiveness of the World Health Organization's (WHO) Safe Childbirth Checklist, which was developed with hopes of reducing meraternal, fetal, and newborn harm. This analysis aimed to determine which variables pertaining to womens' and community health are associated with maternal morbidity.

Dataset. The dataset BetterBirth-DataSet.csv was provided by the instructor. It contained 120 sites with 43 variables. The data was subset to include only variables of interest and removed sites with missing values for any of these predictors. Variables of interest included the proportion of women in the district who are literate, patients above 35 years and below 25 years, patients in scheduled caste or other backward caste, patients with any of 14 complications, patients with anemia or hemoglobin issues, average number of pregnancies for women at the site, if they were high income, and their location in relation to the central study hub. This subsetted data included 114 sites with the 11 variables of interest.

Exploratory Data Analysis. The mean morbidity for mothers was 11% with a standard deviation of 0.05 (table 1). Maternal morbidity is right skewed and does not have peaks near 0.00 nor after 0.25 (fig 1). The mean literacy rate for women in all districts was 59% with a standard deviation of 0.05. 2% of the women were above age 35 with a standard deviation of 0.02 and 38% of women were under 25 with a standard deviation of 0.08. 31% of women were in a schedule caste and 47% were in a other backwards caste; these values had standard deviations of 0.09 and 0.10 respectively. Women had had an average of 2.36 pregnancies across all sites with a standard deviation of 0.24. 3% of patients had prior complications (sd 0.03) and 2% had anemia (sd 0.07). 33. $3\overline{3}$% of the sites were in districts that had an income higher than the national average. 31.58% of the sites were within the central hub (table 1).

Methods. A forward model selection process was chosen to ascertain the variables to be used within the final model. Forward selection was chosen as when building models, the product should be generalizable. By choosing the method that naturally includes fewer predictors, this goal is achieved. This also makes it most reasonable to use an AIC criterion-based approach as there is no need to penalize models with more predictors. P values less than 0.05 were considered significant. All analyses were performed in R-studio version 4.1.3, build 402.

Results. The final model included the predictors district literacy, average number of pregnancies at site, and whether or not the site was within the central hub. The model had an AIC of -450.33. The model is written as $maternal\ morbidity = 0.1757 + \beta_{literacy} \cdot -0.2827 + \beta_{avg.\ pregnancies} \cdot 0.0376 + \beta_{central\ hub} \cdot 0.0529$ (table 2).

Conclusions. Using forward model selection, a model that describes which women and community measures are associated with maternal morbidity includes district literacy, average number of pregnancies at site, and whether or not the site was within the central hub.

Analysis

Table 1: Summary Statistics for Subsetted Data

Variable	**Mean**	**Standard Deviation**
Morbidity	0.11	0.05
Literacy	0.59	0.05
Age 35+	0.02	0.02
Age Under 25	0.38	0.08
Scheduled Caste	0.31	0.09
Other Backwards Caste	0.47	0.10
Avg. Number of Pregnancies at Site	2.36	0.24
Prior Complications	0.03	0.03
Anemia	0.02	0.07
	Yes	**No**
High Income	34	80
Rather or Not Patient is in Central Hub	36	78

Table 2: Model Outcomes

	Estimate	Standard Error	P-Value
Intercept	0.1757	0.0582	0.00315
Literacy	-0.2827	0.0632	3.66×10^{-12}
Avg. Number of Pregnancies at Site	0.0376	0.0138	1.90×10^{-5}
Rather or Not Patient is in Central Hub	0.0529	0.0068	0.0074

Figure 1: Histogram of Severe Maternal Morbidity