Problem Statement: Maternal, Neonatal & U5 Child Mortality in High-Burden Regions

Despite significant investments, maternal and neonatal mortality rates remain high in key regions such as

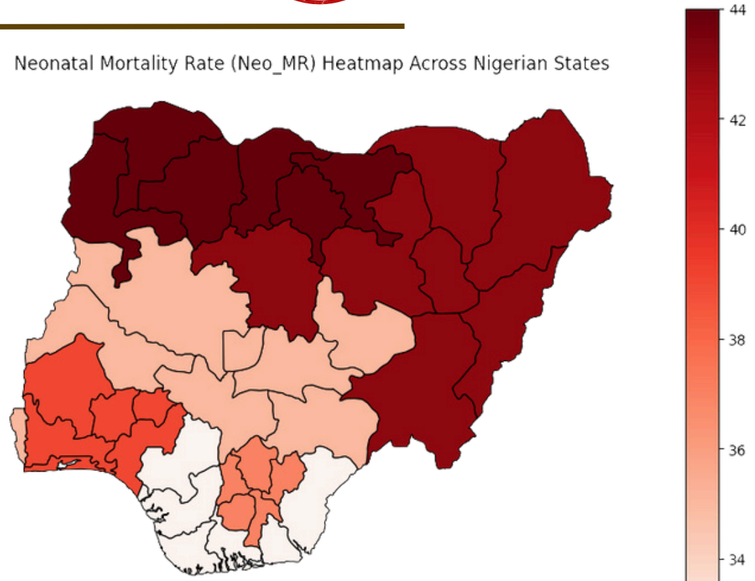
- Jigawa
- Kano
- Katsina
- Kebbi
- Sokoto.

Major contributing factors include:

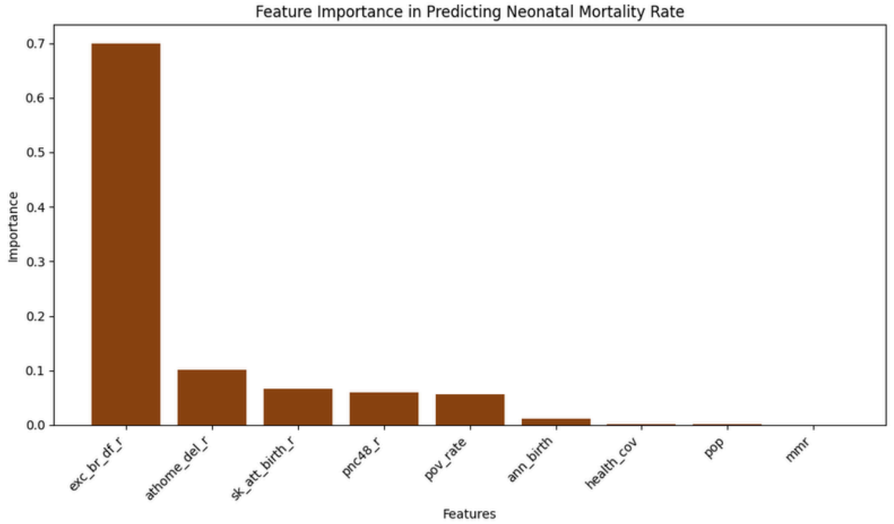
- Low exclusive breastfeeding rates.
- High rates of home deliveries without skilled birth attendants
- Limited postnatal care and early infection detection.
- Inadequate NICU access and emergency neonatal transport
- Gaps in healthcare coverage and maternal nutrition support

These Machine Learning Predictions are further supported by medical research, for example, systematic review published in *The Lancet*, confirm that exclusive breastfeeding for the first six months significantly reduces neonatal mortality rates. Also, According to *BMJ Global Health*, lack of postnatal follow-up contributes to preventable neonatal deaths

Our data analysis using machine learning models highlights that incremental improvements in maternal nutrition, healthcare access, infection control significantly reduce mortality risks.



Source: LexAnalytics Heatmap developed from *Nigeria State Data Profiles- An Accountability Tool for Maternal, Newborn and Child Health. in Nigeria- FMoH Nigeria*



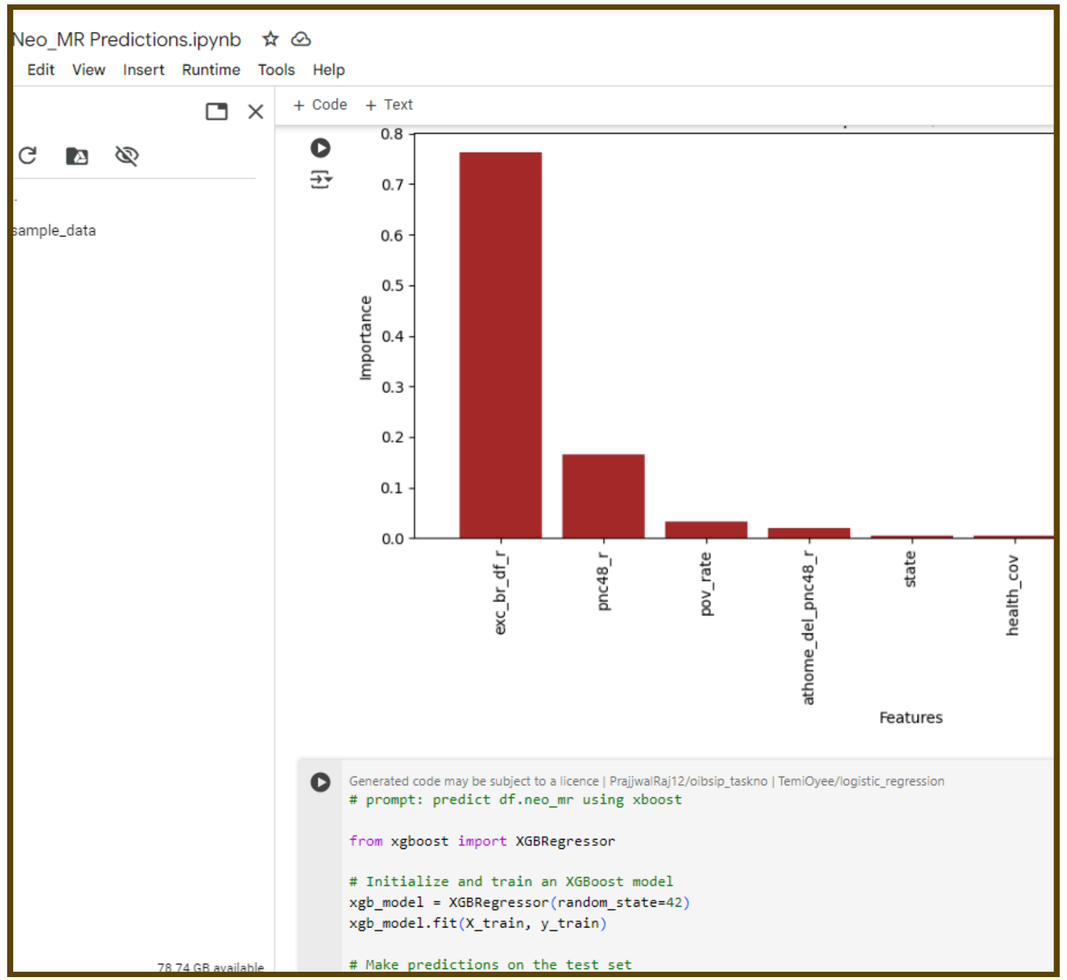
AI-Driven Policy Simulations & Insights

Key Findings from Predictive Analytics

LexMedical tested multiple AI models to predict Neonatal Mortality Rate (Neo_MR):

- **Gradient Boosting** (Most Precise, R^2 = 0.9993)
- **Random Forest** (Generalized Model, R^2 = 0.9288)
- **Hybrid Model** (Balanced, R^2 = 0.9417, MAE = 0.53)

Intervention	Predicted Neo_MR (%)
Baseline (No intervention)	44.0%
Aggressive Policy Scenario	36.7%
Practical Policy Scenario	36.62%
Maternal Nutrition & Healthcare Subsidies	36.62%
Neonatal Infection Treatment Focus	36.62%



~20% reduction in Neonatal Mortality Rates was achieved with these simulations in Jigawa, Kano and other High Burdened Northern States

AI-Driven Policy Simulations & Insights

Analysis of Factors and Limitations

Our dataset included key factors influencing neonatal mortality, such as **exclusive breastfeeding rates, home deliveries, postnatal care coverage, NICU access, maternal health risk, neonatal infections, and healthcare accessibility.** Despite targeted interventions, no significant reduction beyond 36.62% Neo_MR was achieved. The main limitations contributing to this include:

- Underlying socio-economic determinants that are not fully captured in the dataset (e.g., education levels, household sanitation, and maternal decision-making autonomy).
- Delays in emergency response times even with improved access to NICUs, due to gaps in transportation logistics.
- Untracked maternal morbidities (e.g. anemia, preeclampsia, gestational diabetes), which significantly impact neonatal survival.
- Potential inaccuracies in community-level reporting, leading to underestimation of risk factors.

Recommendations for Next Steps

To enhance model accuracy and achieve greater reductions in neonatal mortality, we recommend:

- Integrating additional socio-economic and behavioral datasets, including maternal education and nutrition indices.
- Enhancing real-time data collection through VillageDoc™ to capture household-level factors influencing neonatal health such as; Household Sanitation & Clean Water Access, Income & Financial Stability, Maternal Nutrition & Dietary Diversity, Birth Spacing & Family Planning, Health Seeking Behaviors etc...
- Incorporating maternal health risk assessment tools in CHW visits to better predict pregnancy complications.
- Collaborating with local government to refine intervention targets, using dynamic AI-driven models for continuous learning.