Childbirth in Bolivia: Exploring Geographic Barriers to Health Facilities

Background

Childbirth and pregnancy related complications are the leading cause of death among women in developing countries. The maternal mortality ratio (MMR) describes the number of maternal deaths per 100,000 live births. Bolivia has the highest maternal mortality ratio (MMMR) in Latin America; approximately 206 women per 100,000 live births in Bolivia are dying from complications of childbirth. In rural communities located in the highlands of Bolivia, MMR can reach up to 887 women per 100,000 live births. Countries in which higher percentages of births are attended by skilled health personnel have much lower MMRs. Unfortunately as of 2008, only 56% of women in Bolivia delivered in health facilities, 75.5% in urban areas and 30.1% in rural areas. Geographic barriers that prevent easy access to health facilities are one of the main reasons women in Bolivia do not deliver in health facilities. This project intends to investigate possible geographic barriers to health care and the effect they have on women’s place of childbirth delivery. The factors to be examined are: proximity to the nearest hospital, proximity to major roads, and elevation, using population density as a proxy for differentiating urban and rural areas.

Methods

Primary methods: Data for place of childbirth delivery were downloaded from DHS in the form of large numbers of survey responses and corresponding GPS cluster data. Once these files were filtered to include only hospitals (as smaller healthcare facilities often do not operate birthing rooms) and then compared to survey communities in which women delivered at home. A near analysis was conducted to determine the distance between communities in which women delivered at home and the closest hospital to them, as well as the distance between communities in which women delivered at a health care facility and the closest hospital to them. These data are represented in percentage histograms.

Case Studies: Two municipalities were chosen as case studies to represent municipalities with high (Puna) and low (Tarija) percentages of women delivering at home. These were chosen with the criteria that their borders contained at least one hospital and at least 20 respondent survey data points. These case study areas were then compared to elevation, population density, and proximity to roads. Data for Bolivian roads were downloaded from OpenStreetMap and filtered to only include major roads including highways and trunk roads. These larger roads

Results

Map A shows the percentage of women out of total survey respondents who delivered at home by municipal district. Comparison of the percentage histograms (Graphs A-B) show that proximity to a hospital greatly influences the likelihood a woman will deliver in a hospital. These data also show that proximity alone does not fully explain women’s decisions on location of childbirth. Examination of the two case studies can show more. Tarija (Maps B-E), a municipality in which 4% of women who deliver their children at home, is overall more populous (less rural), has a lower elevation, has more major roads, and the major roads are both close to the surveyed communities and lead directly to the municipal-level hospital. Puna (Maps F-H), a municipality in which 76% of women who deliver their children at home, is overall less populous (more rural), has a higher elevation, has fewer major roads, and the existing major roads are not near the surveyed communities nor do they lead directly to the municipal-level hospital. These maps and data are important as they paint a picture about why mothers are delivering at home instead of at hospitals, as well as hint at what can be done to address these reasons. Bolivian mothers who deliver at home are more likely to die from childbirth complications, making spatial analysis of geographic barriers to healthcare access for pregnant women critical in reducing the maternal mortality ratio in Bolivia.

Limitations

The DHS GPS clusters of data are displaced up to 2 km for urban clusters and up to 10 km for rural clusters. This displacement was completed at the state level, whereas this study compares at the municipality level. Displacement was random, but there could still be an effect on the near analysis.

Further Study

Other geographic factors not compared here include flooding patterns and public transportation routes and availability. Continued study of the data could include these factors or include a near analysis comparing respondent’s place of delivery with distance to the nearest road access point. A statistical regression could be performed to determine if distance to roads has a statistically significant effect on place of childbirth delivery. A more formal vulnerability assessment could be undertaken to determine which community clusters are most at risk of delivering at home and therefore of dying from childbirth complications.