Cost-effectiveness of two maternal mortality interventions in rural India

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Introduction: In India, 83% of rural deliveries occur at home. Researchers estimate that 36% of the annual 540 maternal deaths per 100,000 live births in India are attributable to either postpartum hemorrhage (PPH) or anemia. These are both conditions that can be prevented in the home by evidence-based, low resource interventions that do not require institutional access. While PPH and anemia are suspected to have independent and interactive effects on maternal death rates, it has not yet been possible to quantify their effects on death rates empirically due to the large sample size that would be required.

This project focuses on two of the most promising interventions that could potentially prevent death from maternal hemorrhage for women who deliver outside the formal health system.

1. Skilled providers trained to administer misoprostol after delivery have been shown to lower mean blood loss and reduce PPH incidence for women who deliver outside the health system.
2. Iron supplementation in pregnancy has been shown to lower anemia prevalence.

Hypothesis: In a cohort of 10,000 hypothetical women, universal prenatal iron supplementation and use of 600ug oral misoprostol after delivery will significantly reduce maternal mortality.

Methods: The Stochastic Simulator of Hemorrhagic Shock (SSHS), a micro-simulation model designed to link changes in hemoglobin level and blood loss to estimates of lives lost, was applied to home birth settings to assess the cost-effectiveness of misoprostol and iron supplementation in terms of cost per life saved.

The simulation randomly assigned intrapartum blood loss and hemoglobin (Hb) values to 10,000 hypothetical women following population distributions. Each woman was then assigned corresponding mortality probabilities that correlated to blood loss and Hb values. Two intervention scenarios were then introduced to the simulation.

After the mortality results had been obtained, a cost-effectiveness analysis was performed to calculate cost per life saved for the two interventions.

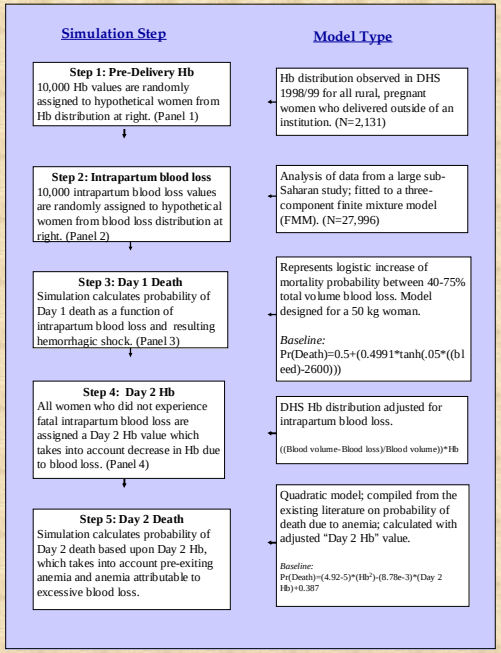
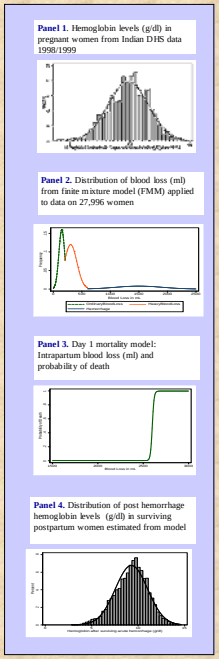


Fig.1: Conceptual Model: Simulation



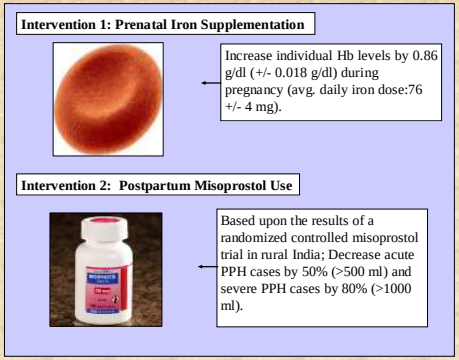


Fig. 2: Conceptual Model: Intervention Simulation

Results:

- **Misoprostol use after every delivery resulted in a 38% (95% CI: 5-73%) decrease in maternal deaths**
- **Median cost per life saved by misoprostol: $1,401 (IQR: $1,008-$1,848)**
- **Prenatal iron supplementation resulted in a 5% (95% CI: 0-47%) decrease in maternal deaths**
- **Median cost per life saved by prenatal iron supplementation: $2,241 (IQR: No lives saved-$3,882)**

Sensitivity Analysis:

- High and low estimates of misoprostol and iron incremental cost effectiveness ratios
- Iron was not a significantly effective or cost-effective maternal mortality intervention

Conclusions:

- **Misoprostol is a cost-effective maternal mortality intervention in low resource areas**
- **Iron supplementation has important health benefits but may not have an effect on maternal mortality**
- **With greater use, misoprostol could save tens of thousands of women each year**
- **Recommendations: training programs for local providers and specialized packaging for each indication of misoprostol use**

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Reference:

1. Sutherland T. Bishai DM. Cost-effectiveness of two maternal mortality interventions in home births in rural India. *International Journal of Gynecology and Obstetrics*: In Press.