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Subject Category - 1st Choice:

Surveillance/Public Health

Subject Category - 2nd Choice:

Hand Hygiene

Title:

Water, Sanitation and Hygiene Interventions to Reduce Healthcare-Associated Infections among Mothers and Neonates in Low- and Middle-Income Countries

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Abstract:

Background

Despite global improvements in water, sanitation and hygiene (WASH), many healthcare facilities in low- and middle-income countries still lack access to basic WASH services. The lack of access to WASH threatens patient safety by reducing the capacity to effectively conduct infection prevention and control (IPC) leading to the spread of healthcare-associated infections (HAIs). Pregnant women and neonates are especially vulnerable to these infections. Though the percentage of institutional births has been increasing in LMICs, gaps remain in understanding the impact and cost-effectiveness of WASH interventions on HAI morbidity and mortality among mothers and neonates in LMICs.

Methods

We developed a representative model of the Indian healthcare system, and estimated the impact,

cost, and cost-effectiveness of improving WASH in healthcare facilities. We analyzed five scenarios: (1) increased access to water in facilities below standard; (2) improved sanitation in facilities below standard; (3) increased IPC due to increased water; (4) increased IPC through non-water-based efforts; and (5) limited increase in hand-hygiene IPC only. Effectiveness was measured as the change in HAI cases and deaths as a result of interventions. HAIs in the analysis were restricted to bacterial infections not directly caused by unclean water. A survey of Indian healthcare facilities was used to estimate costs. Cost-effectiveness was measured as the cost per death averted over a 5-year-period.

Results

An estimated 6,000 deaths in pregnant mothers and nearly 50,000 neonatal deaths due to HAIs occur in India annually. Investments in improving only water access and sanitation (scenarios 1 & 2) had a limited impact on HAI mortality (Figure 1). Increases in water-based IPC significantly reduced HAI deaths across all facilities and settings, especially in rural areas, where water is currently less available and IPC compliance is typically lower. Non-water-based IPC was also effective in reducing the impact of HAIs, however, it was generally less cost-effective (Figure 2).

Conclusions

Improvements in water quality and accessibility can reduce mortality caused by HAIs. However, the effectiveness and cost-effectiveness of these improvements to reduce HAIs are limited unless paired with improvements in IPC. While non-water based IPC activities were effective at reducing HAIs, improving access to clean water would have additional impacts through reductions in direct infections making them likely to be far more cost-effective. As LMICs continue to grow economically, prioritizing these types of health system infrastructure projects can have large benefits both directly through reductions in diarrheal disease and indirectly through reductions in HAIs.

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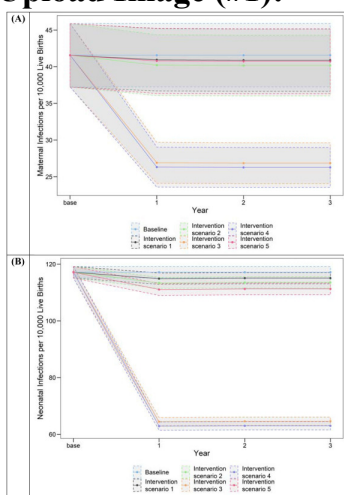


Figure 1. Incidence of maternal/neonatal infections per 10,000 live births. Estimates of the impact of improving access to clean water had only a limited impact on HAIs (scenarios 1 & 2), however interventions that improved IPC significantly (scenarios 3 & 4) reduced the number of maternal HAIs per 10,000 live births from more than 40 to around 26.

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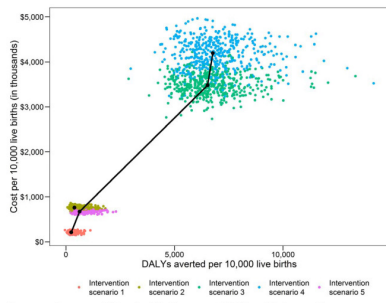


Figure 2: Incremental cost-effectiveness of different interventions
 The plot shows variation in the incremental costs given variability in the costs of the intervention. Each point is the outcome of a model simulation. The further to the right on the graph the more DALYs are averted, and the higher up the graph the more an intervention costs. The black dots are the median result. The line connecting the median results is the efficiency frontier. An intervention that on average is more costly and averts fewer DALYs than another intervention is considered to be dominated, and because Scenario 5 dominates Scenario 2, Scenario 2 is not connected.

Disclosure

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