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Community Improved Sanitation Coverage and Childhood Stunting (SAR23)

An Analysis Brief from The DHS Program

Why study community-level improved sanitation coverage?

Lack of access to improved sanitation facilities remains a global problem. In 2020, an estimated 1.1 billion people had no access to an improved sanitation facility. Poor sanitation has been linked to a variety of health issues, including malnutrition, diarrheal diseases, acute respiratory infections, and neglected tropical diseases. Although a person's access to improved household sanitation facilities can prevent exposure to fecal contamination in a person's household, there is growing awareness that the shared community environment can be contaminated when other households lack access to improved sanitation facilities.

National level estimates can conceal geographic variation that exists at more local levels. Understanding regional and local variation in health outcomes can improve targeting of health programs and make them more effective. This paper explores the effects of community-level sanitation coverage on stunting in children, one of the many health outcomes known to be affected by household-level sanitation coverage.



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Improved sanitation facilities: Flush/pour flush to piped sewer system, septic tank, pit latrine, or unknown; ventilated improved pit latrine; pit latrine with slab; composting toilet.

Stunting: Low height-for-age, a sign of chronic undernutrition that reflects failure to receive adequate nutrition over a long period of time.

Which countries were included in the study?

This analysis includes data from the 2018 DHS surveys for Nigeria and Zambia. Both countries have poor sanitation outcomes. Slightly more than half of the population has access to an improved sanitation facility (53% in Nigeria and 54% in Zambia). Additionally, both countries show geographic variation in access to improved sanitation. Access ranges from 17% in Ebonyi State to 93% in Abia State in Nigeria, and from 6% in the Western Province of Zambia to 80% in Lusaka Province. Stunting is also high in both countries: 37% of children under age 5 in Nigeria and 35% of children in Zambia are stunted.

What methods were used to conduct this analysis?

DHS Program surveys are conducted at the household level. Surveyed households are randomly chosen from clusters, small geographic areas within the population. For this analysis, clusters are used to represent

communities, which allows for the exploration of community-level improved sanitation using DHS data. A cluster's community-level improved sanitation coverage is calculated as the percent of the population in the cluster that has access to improved sanitation facilities. A geospatial modeling approach is used to create a map of the population with access to improved sanitation estimated down to 5 x 5 kilometer areas (Figures 1 and 3). These estimates are combined with population count data to calculate the population count without access to improved sanitation (Figures 2 and 4).

Multilevel logistic regression is also conducted to explore the relationship between community improved sanitation coverage and stunting among children. This analysis controls for background characteristics such as age and sex of the child, mother's height, household wealth, household crowding, urban/rural residence, and improved source of drinking water. The analysis also controls for geospatial covariates including region, nighttime light levels, and travel time to a high-density urban center. These last two covariates are from geospatial covariates datasets available on [The DHS Program's Spatial Data Repository](https://spatialdata.dhsprogram.com/covariates/) (<https://spatialdata.dhsprogram.com/covariates/>).

What are the key results?

Nigeria

- **The percent of the population using improved sanitation in Nigeria varies geographically**, with high levels of coverage in the east and south as seen in green in Figure 1. It appears that much of the north and west have low levels of coverage, as indicated in red. However, **the population at risk of being without access to improved sanitation in Nigeria is concentrated in small areas of the south, west, and north** when population count data is added to the model, as seen in red in Figure 2.
- **Improved sanitation at the community level is associated with reduced odds of childhood stunting in Nigeria overall.** For every 10% increase in community-level

improved sanitation coverage, the odds of stunting decrease by 3%. However, access to improved sanitation at the household level is not associated with reduced odds of childhood stunting in Nigeria.

- **Community-level improved sanitation coverage is associated with reduced odds of childhood stunting in North West and South West zones.** In the other four zones in Nigeria, community-level sanitation coverage is not significantly associated with reduced odds of childhood stunting.

Zambia

- **The percent of the population using improved sanitation in Zambia also varies geographically**, and is very low in southwest areas as seen in red in Figure 3. This does not mean that many people are at risk of being without access to improved sanitation in these areas as population counts are low as seen in green in Figure 4. The population at risk is concentrated in Lusaka, parts of Eastern province, and some provincial capitals, as seen in red.
- Neither community-level improved sanitation coverage nor household-level improved sanitation is associated with reduced odds of childhood stunting in Zambia at the national or provincial levels.

For both countries, factors that increase a child's odds of stunting are being male, having a mother who is short, being older (24-59 months), and living in the poorest households.

What does this mean?

While many studies consider *household* sanitation, fewer studies have explored the association between stunting and *community* sanitation. This study uses community-level sanitation data to create maps and models to show how sanitation habits of entire communities may affect people regardless of their household sanitation.

Geospatial modeling for both Nigeria and Zambia shows that in certain locations, the percent of

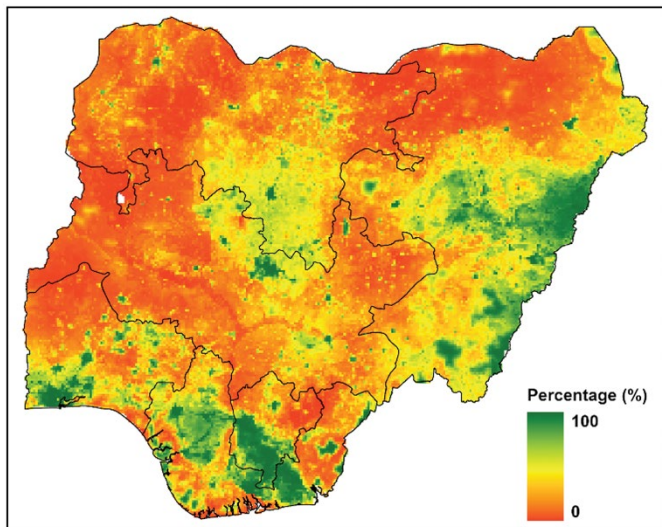


Figure 1. Modeled surface for the percent of the population using an improved sanitation facility in Nigeria (Figure 4a in full report).

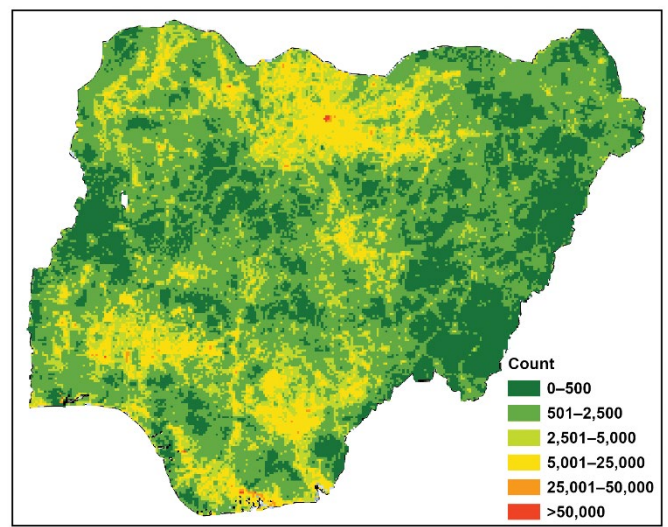


Figure 2. Modeled surface for the estimated population at risk of being without access to improved sanitation in Nigeria (Figure 4d in full report).

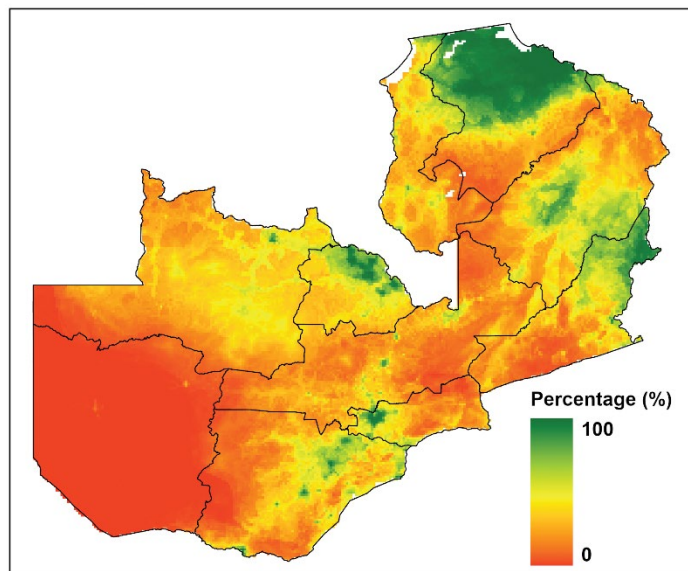


Figure 3. Modeled surface for the percent of the population using an improved sanitation facility in Zambia (Figure 5a in full report).

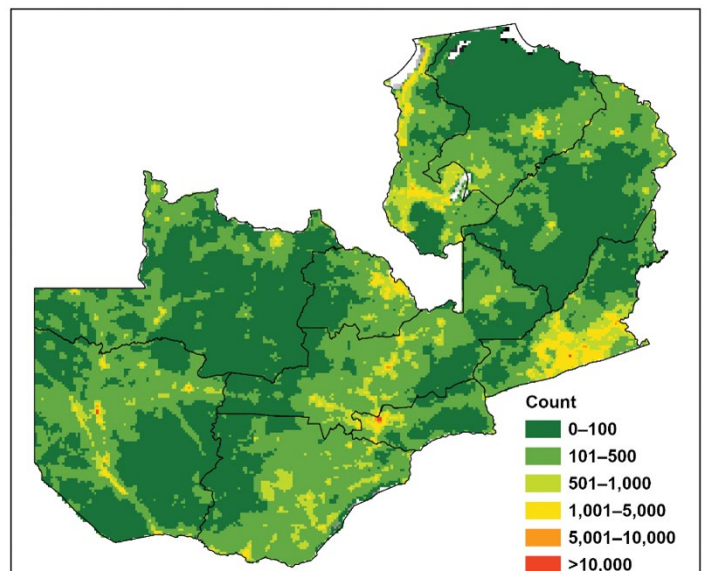


Figure 4. Modeled surface for the estimated population at risk of being without access to improved sanitation in Zambia (Figure 5d in full report).

the population with access to improved sanitation is high while the number of people at risk of being without access to improved sanitation is also high. This indicates that interventions may be needed in areas where a high proportion of the population is already using improved sanitation facilities. Therefore, both percent and population counts are important to consider when making programming and policy decisions.

The results of this analysis are mixed. In Nigeria, community-level improved sanitation coverage is a more important predictor of stunting than household access to improved sanitation. The lack of an association between community-level improved sanitation and stunting in Zambia is not particularly unusual, as the existing body of literature on this topic is mixed as well. Nonetheless, community-level improved sanitation coverage should be considered when evaluating sanitation-related health outcomes.

This brief summarizes The DHS Program's Spatial Analysis Reports 23, by Rose E. Donohue, Rachael Church, Shireen Assaf, and Benjamin K. Mayala with funding from The United States Agency for International Development through The DHS Program implemented by ICF. For the full report or more information about The DHS Program, please visit <https://dhsprogram.com/publications/publication-sar23-spatial-analysis-reports.cfm>.