Sanitation externalities, disease, and children's anemia

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motivation & question

Research is accumulating that links open defecation with poor nutritional outcomes in children, particularly height (Spears, 2013). This paper proposes that open defecation could be an important cause of low hemoglobin levels, especially where open defecation rates and population density are high. This paper investigates this possibility using population-level data and econometric methods. Although tracing biological mechanisms is beyond the scope of this demographic paper, two possibilities are parasite infection and chronic absorption disorders of the intestine, caused by repeated exposure to fecal germs.

Hemoglobin levels are low among children in India and Nepal

This paper is partially motivated by the question of whether exposure to poor sanitation can account for some of the high anemia rates in South Asia – where malaria, one cause of anemia, is far less prevalent than in sub-Saharan Africa.

data: Demographic and Health Surveys

This paper uses publicly available Demographic and Health Surveys (DHS). Because open defecation is particularly high in India and Nepal, several analyses use the India 2005 or the Nepal 2006 and 2011 DHS. An international sample pools 81 DHS that measure hemoglobin levels of children.

cross-country comparisons

International variation in anemia rates is not well explained by differences in income; indeed, Alderman and Linnemayr (2009) suggest that economic growth alone is unlikely to reduce the high rates of anemia in developing countries.

Motivated by this observation, I compare data from 45 developing countries, using all DHS surveys that have collected data on children’s hemoglobin.

Open defecation is associated with international differences in hemoglobin

Along with the DHS, this paper also uses the Office of Population Research, Princeton University & r.i.c.e. and cross-country data in order to answer questions that have mainly been studied by nutritionists.

Further research could assess whether sanitation interventions can improve hemoglobin levels. A large-scale randomized controlled trial is currently underway in Zimbabwe.*

conclusions

Across a range of contexts and sources of identifying variation, I find a robust association between sanitation externalities and child hemoglobin. The approach of this paper is novel in that it applies econometric techniques to nationally representative cross-country data in order to answer questions that have mainly been studied by nutritionists.

Further regression results in the paper include detailed controls for household socioeconomic status, with similar results. A mechanism check finds a negative interaction between local open defecation and taking parasite medicine – consistent with the idea that re-infection reduces the effectiveness of anti-parasite medicine.

change within Nepal

To better isolate an effect of open defecation on hemoglobin – distinct from confounding omitted variables – I study change over time within regions of Nepal. In particular, I combine the 2006 and 2011 Nepali DHS, using region and year fixed effects.

Regional electrification is included as a placebo test. If changes in open defecation simply reflect overall improvements in infrastructure, we'd expect it to be correlated with changes in hemoglobin. It is not.

References


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