Implications of WASH Benefits trials for water and sanitation

Results of the WASH Benefits trials in Bangladesh and Kenya have been reported by Stephen Luby and colleagues[1] and by Clair Null and colleagues,[2] respectively. One group in each study assessed the effect on child height-for-age of "household sanitation upgrades from unimproved to improved latrines" in the child's compound. In both studies, adult latrine use was high at baseline: only about 5% of adults in each setting initially defecated in the open. The trials found that child height was not increased by upgrading sanitation facilities.

Global elimination of open defecation by 2030 is a Sustainable Development Goal (SDG). Although the results of the WASH Benefits trials are important for understanding sanitation intervention and similar programmes, we note that the results of these trials do not imply that child health would not be improved by a large transition from open defecation to latrine use, especially in a densely populated area, and that these results are consistent with existing observational data.

Based on data from four Demographic and Health Surveys (DHS), the table reports illustrative regressions of child height-for-age on sanitation practices in a child's local neighbourhood, among rural children in Bangladesh (2014), Kenya (2014), and India (2005 and 2015). All regressions include controls for the child's household's wealth quintile.

In Bangladesh and Kenya, where open defecation is uncommon, the independent variable is the fraction of households in a child's neighbourhood that use improved sanitation rather than unimproved sanitation or open defecation. This neighbourhood-level variable is intended to capture disease externalities. These observational results are consistent with the trial outcome: use of improved latrines is not significantly associated with child height. The coefficients on improved latrine use (reflecting a large linearised difference between 0% and 100% in neighbourhood-level improved latrine use) are less than 0·15 height-for-age SD, the minimal effect size that WASH Benefits was powered to detect.

The table also analyses data from two Indian DHS. Unlike in the settings of WASH Benefits, in rural India most people defecate in the open. In both Indian surveys, the fraction of households in a child's neighbourhood that defecate in the open is associated with a large difference in average child height-for-age. The fraction of households that use improved sanitation is not associated with height once open defecation is controlled. Further demographic evidence[3] suggests that the health consequences of open defecation are greater where population density is high; if so, children in rural India are at especially high risk.

	Bangladesh (2014)	Kenya (2014)	India (2005–06)	India (2015–16)
Linear regressions (dependent variable: child height-for-age)				
Local improved sanitation (fraction)	0·137 (SE 0·102)	0·105 (SE 0·0755)	−0·0880 (SE 0·113)	−0·0903 (SE 0·0547)
Local open defecation (fraction)	..	..	−0·394 (SE 0·0964)	−0·362 (SE 0·0498)
Controls for asset quintiles	Yes	Yes	Yes	Yes
Number of rural children younger than 5 years	4777	12 794	26 065	171 519
Summary statistics for all rural households or children				
Open defecation (household)	8·7%	16·6%	74·7%	54·9%
Unimproved sanitation (household)	35·6%	64·4%	76·8%	56·8%
Height-for-age (child younger than 5 years)	−1·617	−1·284	−1·968	−1·590

SE for regression coefficients clustered by survey primary sampling unit. Improved sanitation and open defecation fractions are the fraction of households in a child's survey primary sampling unit reporting a sanitation behaviour. Regression constant not reported owing to space.

Table: **Child height and rural sanitation in Demographic and Health Surveys**

We report grants from the Bill & Melinda Gates Foundation, outside of the submitted work.

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1 Luby SP, Rahman M, Arnold BF, et al. Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Bangladesh: a cluster randomised controlled trial. *Lancet Glob Health* 2018; **6:** e302–15.

2 Null C, Stewart CP, Pickering AJ, et al. Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Kenya: a cluster-randomised controlled trial. *Lancet Glob Health* 2018; **6:** e316–29.

3 Hathi P, Haque S, Pant L, Coffey D, Spears D. Place and child health: the interaction of population density and sanitation in developing countries. *Demography* 2017; **54:** 337–60.

Published **Online** April 26, 2018 http://dx.doi.org/10.1016/S2214-109X(18)30225-0