

Scaling Up Rural Sanitation

Investing in the Next Generation: Growing Tall and Smart with Toilets

Stopping Open Defecation Improves Children's Height in Cambodia

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INTRODUCTION

Open defecation within a community harms the physical and cognitive development of children, even children living in households that use toilets themselves. Frequently digesting feces due to poor sanitation can cause diarrhea, malnutrition, and stunted growth—and thus impact negatively on a child's cognitive development (Box 1). Experiencing these health hazards at young ages can ultimately limit one's earning potential later in life.

In addition to the use of health services, mother and child nutrition practices and care, the immediate disease environment shapes early life health and ultimately a child's achievement later in life. Thus, elimination of open defecation makes a sensible priority for policy makers that are concerned with the next productive generation.

Key Messages

- The period between 2005 and 2010 witnessed a significant reduction in the number of households openly defecating and an increase in average child height. **The improvement in sanitation access likely played a substantial role in increasing average child height over these five years.**
- Good toilets make good neighbors. The research in Cambodia found that open defecation not only affects one's own health, but it also affects the health of one's neighbors. **The extent of open defecation in a community is more important for a child's development than whether the child's household itself openly defecates.**
- Given the importance of the extent of open defecation in a community, **sanitation policies would best prioritize collective community-wide behavior change to stop open defecation**; incentives, policies, and targets that encourage collective behavior change are needed.
- **Poor households with severe cash constraints are best supported through programs that focus on collective outcomes, complemented by targeted household support.** Examples of pro-poor support could include household financing and/or targeted output-based subsidies aligned with community-wide sanitation outcomes.

BOX 1. OPEN DEFECTION AND STUNTING

There is a growing body of evidence that links open defecation to poor child health through at least two mechanisms. The first and most commonly recognized mechanism is diarrhea from digesting feces. The second, which is only recently becoming understood, is a disorder of the intestine caused by continued fecal exposure. This condition called chronic **environmental enteropathy** prevents absorption of nutrients, even without the child getting diarrhea and appearing ill. (Checkley et al. 2008¹ and Humphrey 2009²)

As this brief shows, the level of open defecation in a community is associated with shorter children in Cambodia. Moreover, the level of open defecation in a community is more important for a child's development than whether the child's household itself openly defecates. By looking at the change in defecation levels and average child height between 2005 and 2010 within Cambodian provinces, the study is able to show that improvements in sanitation access played a substantial role in increasing average child height over the same five years.

PROBLEM STATEMENT

Open defecation in Cambodia is among the highest in the world. In 2010, 57 percent of Cambodian households still defecated openly, and in rural Cambodia this reached 66 percent. At the same time, malnutrition indicators—such as stunting of under-five year old children—remain high at 40 percent in 2010.³ Moreover, poor households are three times less likely to have access to improved sanitation facilities as compared to the average household.⁴

From 2005 to 2010—the period under study in this research brief—much of the improvement in sanitation reflects new latrines that were largely invested by households themselves, complemented by subsidized provision through several development projects.⁵

Recognizing that many other factors impact on stunting, the key question this research aimed to answer is “How does the sanitation environment affect the evolution of a child's height over the initial years of his or her life?” The research presented in this brief seeks to explore whether child height and open defecation are related. From these research findings and considering the government's strategy (Box 2), some directions for policy makers are recommended to accelerate progress in rural sanitation.



¹ Checkley, William, Gillian Buckley, Robert H Gilman, Ana MO Assis, Richard L Guerrant, Saul S Morris, Kare Molbak, Palle Valentiner-Branth, Claudio F Lanata, Robert E Black, and The Childhood Malnutrition and Infection Network. 2008. “Multi-country analysis of the effects of diarrhoea on childhood stunting.” *International Journal of Epidemiology* 37: 816-830.

² Humphrey, Jean H. 2009. “Child undernutrition, tropical enteropathy, toilets, and hand-washing.” *The Lancet* 374: 1032-35.

³ National Institute of Statistics, Directorate General for Health, and ICF Macro. 2011. *Cambodia Demographic and Health Survey 2010*. Phnom Penh, Cambodia and Calverton, Maryland, USA: National Institute of Statistics, Directorate General for Health, and ICF Macro. <http://www.measuredhs.com/publications/publication-FR249-DHS-Final-Reports.cfm>

⁴ Water and Sanitation Program. Forthcoming. “Where Have All the Poor Gone?”: *Cambodia Poverty Assessment 2013*. Washington, DC: Water and Sanitation Program/World Bank Group.

⁵ Rosenboom, Jan Willem, Cordell Jacks, Phyrum Kov, Michael Roberts, and Tamara Baker. 2011. “Sanitation Marketing in Cambodia.” *Waterlines* 30: 21-40.



BOX 2. RURAL SANITATION ACCESS IN CAMBODIA: WHAT DOES IT TAKE?

The Royal Government of Cambodia—with support from development partners and NGOs—has recently adopted an ambitious target to achieve universal sanitation coverage by 2025. The National Rural Water Supply, Sanitation and Hygiene Strategy 2011–2025 articulates the need for a harmonized program that i) generates demand for better sanitation and stopping open defecation, ii) fosters a dynamic local private sector to deliver sanitation products and services to rural households, and iii) builds a strong enabling environment through policy guidance, monitoring systems, local capacities, and establishing incentives and financing arrangements for the sector, including for the poor.

METHODOLOGY

A child's height is an important statistic for policy makers to consider because it is a good indicator of overall health throughout a child's life and future achievement. Long-term research studies following individuals in the US and the UK, for instance, have shown that taller children are more likely to become taller adults, and taller adults are more likely to earn more.⁶ Additionally, in places like India, taller children are much more likely to be able to read and do math.⁷ Therefore, any linkage between sanitation and child height reveals that exposure to open defecation can be a serious barrier for children growing into tall, smart, and productive adults.

⁶ Case, Anne and Christina Paxson. 2008. "Stature and Status: Height, Ability, and Labor Market Outcomes." *Journal of Political Economy* 116: 499-532.

⁷ Spears, Dean. 2012. "Height and Cognitive Achievement among Indian Children." *Economics & Human Biology* 10: 210-219. doi:10.1016/j.ehb.2011.08.005

The data for this brief come from Cambodia's Demographic and Health Survey in 2005 and 2010. As a measure for stunted growth, the so-called height-for-age z-scores reported in the DHS are calculated by standardizing the height of an individual child using a well-nourished and healthy reference population for the same age and sex. A z-score of -2 means that a child is 2 standard deviations below the mean height of children of the same age and sex in the reference population. According to international standards, children with z-scores below -2 are considered stunted (see also www.measuredhs.com).

The methodology for this analysis is described in "Growing taller among toilets: Evidence from changes in sanitation

and child height in Cambodia, 2005-2010." by Kov, Smets, Spears, and Vyas. The draft of this paper is available online at www.riceinstitute.org.⁸

The research first examines how levels of open defecation are related to stunting for different age groups, secondly it explores how the level of open defecation relates to children's height in households with and without toilets, and finally it establishes if—when controlling for fixed effects and other socio-economic, demographic and health variables—the relationship between levels of open defecation and children height is strong and statistically significant.



⁸ RICE Institute is a non-profit organization dedicated to understanding the lives of impoverished people, especially young children, and to promoting their well-being. RICE uses and conducts research to advance knowledge about policy problems and potential solutions for the least well off, and shares this knowledge with government officials and other researchers.

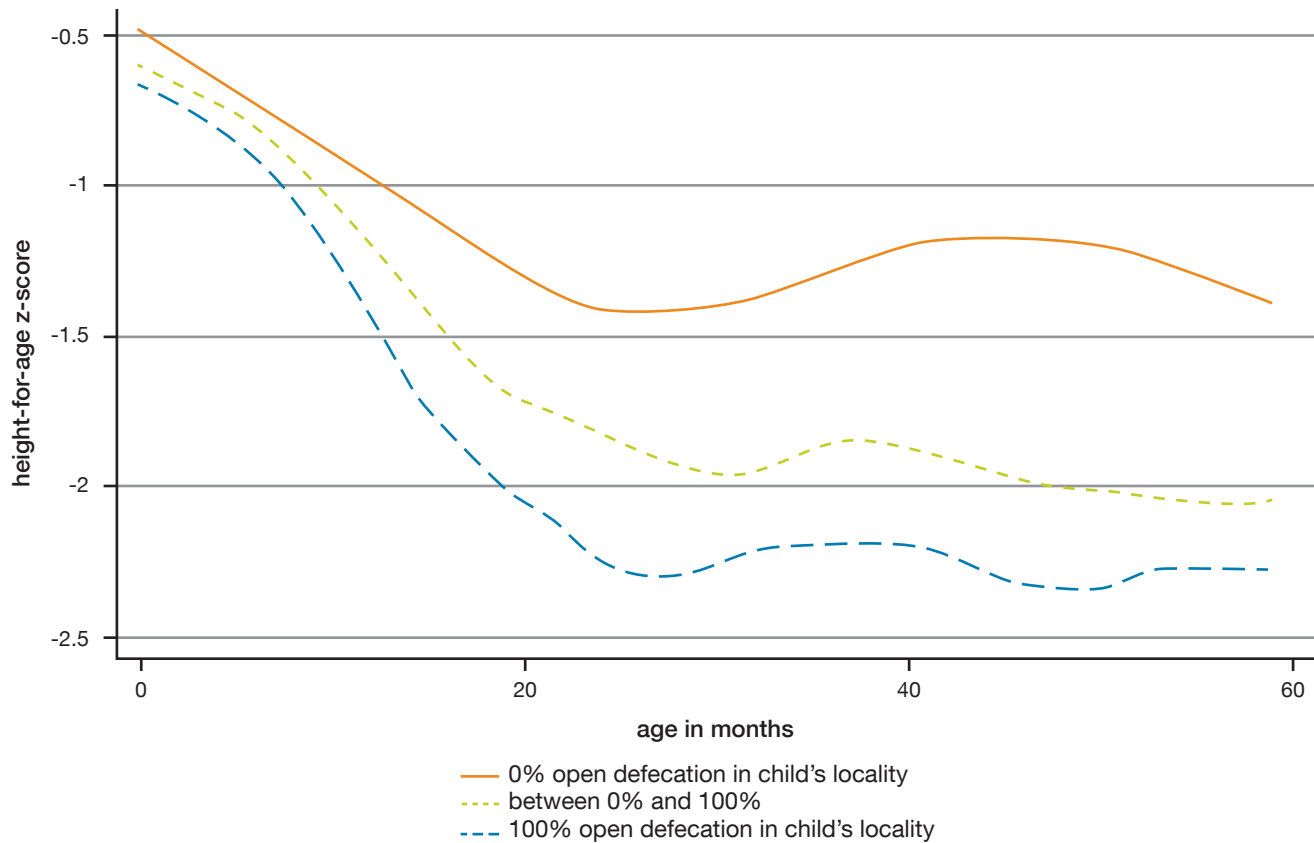
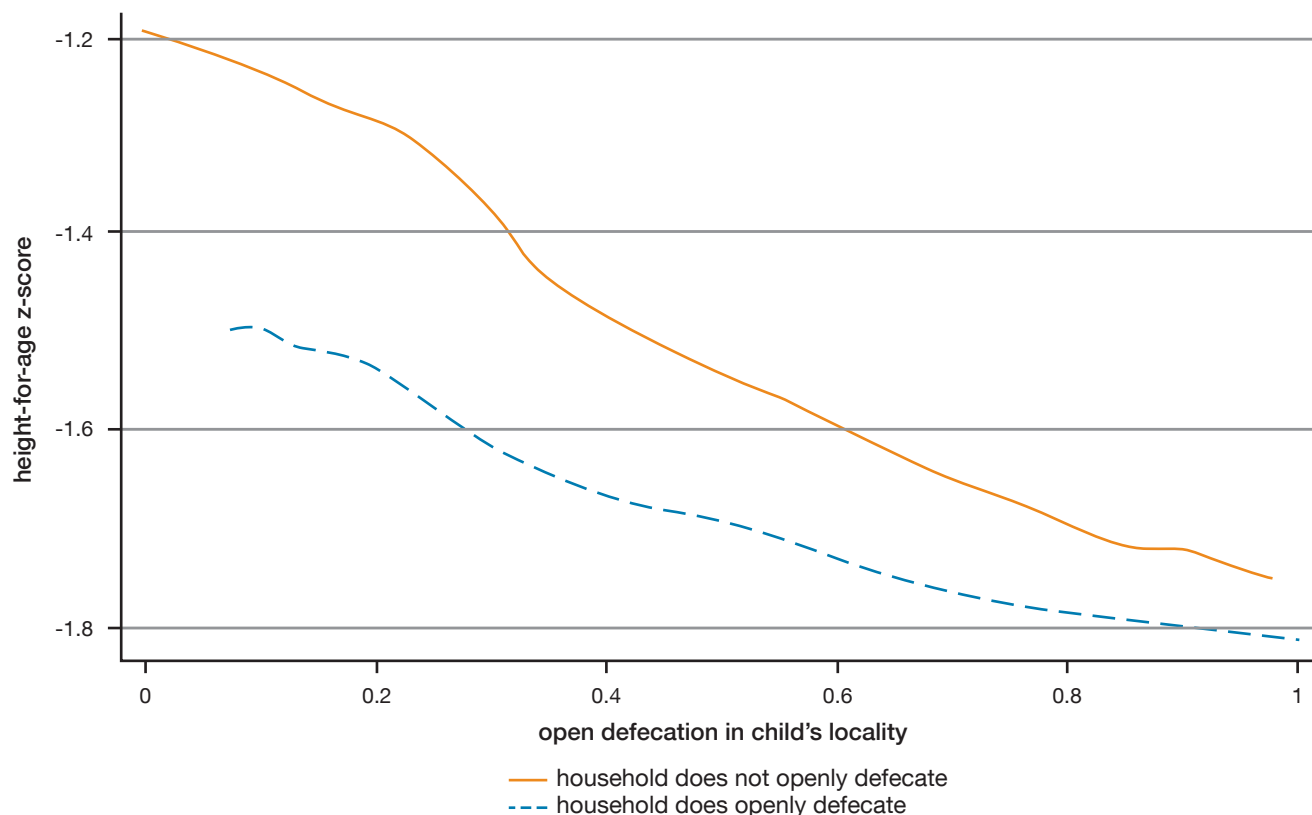
Figure 1. Growth faltering (age for height z-score) of under five year children for different ages**KEY LESSONS****1. Open defecation is associated with greater stunting at every age**

Figure 1 shows that children at every age are shorter in places where a greater fraction of households are openly defecating. The figure also shows that the effect appears to be most important early in a child's life; by the time a child reaches the age of two, the damage of the disease environment has mostly taken its toll and is irreversible. Once a child's growth is stunted at a young age, he or she remains short compared to other children of the same age and sex for the rest of his or her life.

2. Open defecation is associated with greater stunting even when the household itself does not openly defecate

Figure 2 shows that in communities where open defecation is practiced, children in households with toilets are on average taller than children in households that defecate in the open. However, on average, when almost an entire community is defecating in the open, children in households that use a toilet are almost as short as children in households that do not use a toilet. In other words: the more open defecation around a household, the smaller the positive effect of using a toilet on the height of the children in that household.

Figure 2. Growth faltering (height for age z-score) for households with and without a toilet for different levels of open defecation



In fact, a more in-depth analysis shows that the magnitude of the effect of open defecation levels in a child's community on child height is larger than the magnitude of the effect of the household's own defecation practices. Altogether, although household-level access to sanitation is important, this suggests that open defecation affects not only one's own health, but also the health of one's neighbors.

The in-depth analysis also found that the effect of open defecation in a community on a child's height is much more pronounced in urban areas as compared to rural areas.

This finding is not surprising because urban areas are more densely populated than rural areas and children are more likely to be exposed to other people's feces.

3. Changes in open defecation predict changes in child height in Cambodian provinces

The previous two figures suggest a relationship between the sanitation environment and child stunting. However, good conditions are often found together, and problems are often found in places with other problems. The relationship that was found between open defecation and shorter children could



therefore be due to other differences. This problem was tackled in two ways: first by considering persistent geographic differences and secondly by controlling for other factors that might influence open defecation and child height.

The research looked at how the reduction in open defecation from 2005 to 2010 in urban and rural parts of Cambodian provinces relates to the improvement in child height. This was done by controlling for persistent geographic differences, so-called fixed effects such as climate for example, that may lead to the belief that there is a relationship between open defecation and height when there actually isn't. Even when controlling for such persistent differences, there is still a strong and statistically significant relationship between open defecation and child height.

However, there may still be other factors that are changing over time within urban and rural parts of provinces that may be falsely leading to the belief that there is a relationship between rates of open defecation and child height. For instance, changes in overall infrastructure, mother's health and literacy, breastfeeding practice, wealth, family size, consumption, and population density over time may be related to changes both in rates of open defecation and child height.⁹ However, when controlling for such characteristics and recognizing that due to data limitations it was not possible to control for complementary feeding practices and duration of breast feeding, the analysis shows that sanitation still plays a substantial role in explaining child height. In communities where all households defecate openly, children are on average between 0.44 and 0.77 standard deviations shorter than

⁹ Household socio-economic controls: electrification, ownership of durable consumer goods, floor materials, household size, literacy of mother, average consumption, population density; Demographic controls: birth order and birth month; Health and health care: child has a health and vaccination card, institutional delivery, breastfeeding immediately or on first day. The DHS does not have a consumption module and detailed information about food consumption is not available. Moreover, in the particular case of the 2005 to 2010 Cambodian DHS, infant and young child feeding indicators are not directly comparable across survey rounds. However, according to the official report for the 2010 Cambodian DHS there has not been much improvement in complementary feeding practices since 2005.

children living in communities where no one defecates openly; this is equivalent to an average five year old child being 2 to 3.6 cm shorter.

CONCLUSION

Sanitation matters for the health of Cambodia's children and their future economic potential. Children in households who do not practice open defecation are less stunted (or taller) than children in households that do. It is also shown that open defecation affects everyone who is exposed to it in the community, and not just those households who practice open defecation themselves. With almost three-quarters of the rural population openly defecating, investing in sanitation now will help to create a taller, smarter, and more productive workforce for the future.

The research findings are underscoring the target that the government has set itself to achieve universal sanitation coverage by 2025. Cambodia already has successfully demonstrated the ability to harness local private enterprises and market-based approaches to delivering sanitation to rural households.¹⁰ While the strategy recognizes the need for a programmatic approach that creates demand for sanitation and to stop open defecation, significant gaps in the enabling environment for service delivery remain, such as sanitation policy

guidelines, a monitoring system, local implementation capacities and appropriate incentives, and financing arrangements, especially for reaching the poor.¹¹

In line with the research findings, and informed by global best practices on effective sanitation finance,¹² Cambodia's sanitation policies would best prioritize collective community-wide behavior change interventions to stop open defecation and create demand for sanitation. Policy guidelines and incentives at different levels need to be aligned, rewarding the achievement of collective sanitation outcomes.

Poor households with severe cash constraints to invest in a toilet are best addressed through a program that aims for collective behavior change, complemented by targeted support to the poor. Examples of such pro-poor support could be low-interest household financing and/or targeted output-based subsidies aligned with community-wide sanitation outcomes.

Finally, due to the relationship between open defecation and stunting, integration of certain aspects of sanitation interventions as part of broader nutrition programs could offer important synergies to achieve nutritional outcomes for Cambodia.

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Scaling Up Rural Sanitation

Today, 2.5 billion people live without access to improved sanitation. Of these, 71 percent live in rural communities. To address this challenge, WSP is working with governments and local private sectors to build capacity and strengthen performance monitoring, policy, financing, and other components needed to develop and institutionalize large-scale, sustainable rural sanitation programs. With a focus on building a rigorous evidence base to support replication, WSP combines Community-Led Total Sanitation, behavior change communication, and sanitation marketing to generate sanitation demand and strengthen the supply of sanitation products and services, leading to improved health for people in rural areas.

For more information, please visit www.wsp.org/scalingupsanitation.

Contact Us

For more information please visit www.wsp.org or email wsp@worldbank.org.

¹⁰ Pedi, Danielle, Phyrum Kov, and Susanna Smets. 2012. "Sanitation Marketing Lessons from Cambodia: A Market-Based Approach to Delivering Sanitation." Field Note. Washington, DC: Water and Sanitation Program/World Bank Group. <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Sanitation-marketing-lessons-Cambodia-Market-based-delivering-Sanitation.pdf>

¹¹ Perez, Eduardo. 2012. "What Does It Take to Scale Up Rural Sanitation?" Washington, DC: Water and Sanitation Program/World Bank Group. <http://www.wsp.org/sites/wsp.org/files/publications/WSP-What-does-it-take-to-scale-up-rural-sanitation.pdf>

¹² Tremolet, Sophie, Pete Kolsky, and Eddy Perez. 2010. "Financing On-Site Sanitation for the Poor." Technical Paper. Washington, DC: Water and Sanitation Program/World Bank Group. http://www.wsp.org/sites/wsp.org/files/publications/financing_analysis.pdf

The Water and Sanitation Program (WSP) is a multi-donor partnership created in 1978 and administered by the World Bank to support poor people in obtaining affordable, safe, and sustainable access to water and sanitation services. WSP provides technical assistance, facilitates knowledge exchange, and promotes evidence-based advancements in sector dialogue. WSP is implementing water and sanitation programs in its 23 focus countries across Africa, East Asia and the Pacific, Latin America and the Caribbean, South Asia, and in Washington, DC. WSP's donors include Australia, Austria, Canada, Denmark, Finland, France, the Bill & Melinda Gates Foundation, Ireland, Luxembourg, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States, and the World Bank.

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