

2015 Global Health Case Competition

Connecting students from diverse fields to address a global health challenge

Stunting in Children in the Northern India: Addressing the Roles of Open Defecation and Sanitation

February 2nd-7th, 2015

Sponsored by:

**UAB SPARKMAN CENTER
FOR GLOBAL HEALTH**

Knowledge that will change your world

Opening Scenario

You have recently been hired as the Team Regional Director for a child health non-governmental organization (NGO) in Northern India. You are extremely excited to start working to help improve the health of northern Indian children. You learn that stunting among children in Uttar Pradesh is a widespread problem, regardless of socioeconomic status. Akshay Malik, a tiny one-year-old living in a rural village of Uttar Pradesh is malnourished. His parents seem to be doing all the right things. He was breast-fed; the family has six goats, access to buffalo milk, and a good amount of wheat and potatoes. Although his mother has always fed him as much as he would eat, the doctors diagnosed him as malnourished and Akshay is on his way to stunted growth if something is not changed.

You take a trip up to the rural village in Uttar Pradesh to visit Akshay and to determine what may be causing the problem. You arrive at the parents' house and are graciously welcomed. You start to interview the parents on their lives, eating habits, and overall health status in order to get a bigger picture of what the problem may be for young Akshay. You ask to use the restroom, and the family looks at you funny. They inform you that nobody has an indoor toilet. The government built latrines in the village four years ago, but no one really uses them. They prefer, and have for generations practiced open defecation. You suspect that this may be a problem, and find that an emerging body of scientific studies suggests that Akshay and many of the 162 million other children under the age of five in the world who are malnourished are suffering less from a lack of food than from poor sanitation. You decide that your first project will address this issue.

Introduction

UNICEF estimates that one in three (195 million) children worldwide under the age of five are stunted¹. Eighty percent of the global burden of stunting is localized in just twenty-four countries, most of which are in Asia and Africa (40% and 30% respectively), with three out of ten stunted children living in India².

Stunting has been a crucial problem in India for a number of years. UNICEF estimates 43% of the children under the age of five in India suffer from stunted growth. Factors such as rural environment, low birth weight from undernourished mothers, and low maternal education have been associated with high rates of stunting in India. According to UNICEF India, only half of children are exclusively breast-fed for the first six months and then transitioned to age appropriate foods, an important element of stunting prevention. One study in Uttar Pradesh estimated that exclusive breastfeeding and appropriate transition foods could decrease the prevalence of stunting by up to 30%, demonstrating that a focus on nutrition alone will not be sufficient to decrease stunting³.

Team Assignment

While there have been attempts by the government to build latrines in the northern part of India, they often go unused for various reasons⁴⁻⁶. There seem to be cultural, practical, and economic considerations that will need to be addressed for combating stunting in these children. You and your local child health NGO have decided to submit a proposal to develop and implement a toolkit of effective, culturally appropriate, and feasible sanitation programs incorporating educational, policy, environmental, social, and/or other strategies that involve important stakeholders from local government, the community, NGOs, and other partners.

The time frame for the proposal to develop an effective sanitation intervention is over a period of three years. The maximum amount you are permitted to request is \$2,000,000 for the entire duration of the project. To receive funding, your team will have to present the proposal to a panel of local and global experts on February 7, 2015. You will need to justify your decisions concerning the development of your final strategies and be prepared to explain the details of your plans.

Important Considerations

- Who is your target population? Will you focus on adults, youth, women and children or the entire population?
- How and where (urban and/or rural) will you test the strategies?
- Who will you develop partnerships with (other NGOs, local government, etc.) to leverage resources and expertise?
- How will you monitor and evaluate your project?
- Are the proposed strategies feasible, effective and culturally appropriate?
- What measures did you propose to improve the health of these children?
- For your intervention program, what are the:
 - Objectives?
 - Strategies?
 - Settings?
 - Budget?
 - Timeline?
- What impact will this implementation have at the individual, family, community, and national level?
- Are there any long term or short term financial returns?
- Can a socio-ecologic framework be used in assessing this problem and how will this be accomplished?

Case Background

Located in northern India on the border with Nepal, Uttar Pradesh covers 93,933 square miles and equates to almost 7% of the total area of India making it the fourth largest province by area⁷. According to the latest population estimates, there are 200 million people living in Uttar Pradesh making it the most populous state in India. Hindi is the official language and Hindu is the majority religion (81%) versus Islam (18.4%). Agriculture and service industries compose the largest part of the Uttar Pradesh economy, and it ranks fourth in economic power in India⁷.

The state of Uttar Pradesh has amongst the highest fertility and maternal mortality rates in the country. In 2011 UNICEF estimated the percentage stunting for children under the age of five in India to be 24.4% for moderate stunting and 32.4% for severe stunting. Malnutrition, especially in terms of iron deficiencies, is a major issue. Diarrhea is the leading cause of child death. In addition, Uttar Pradesh is one of five districts in India that account for 30% of all open defecation

worldwide; the high population density of Uttar Pradesh contributes significantly to the hazard of open defecation.

Global Burden of Stunting

One in three (195 million) children worldwide under the age of five are stunted¹. Eighty percent of the global burden of stunting is localized in just twenty-four countries, most of which are in Asia and Africa (40% and 30% respectively), with three out of ten stunted children living in India².

Stunting is defined as low-height-for-age less than 2 standard deviations from the median WHO Growth Standard. Stunting is used as a measurement for chronic under-nutrition², and is often attributed to both malnutrition and poor health conditions resulting from low socioeconomic and inadequate sanitation⁸. Unlike wasting, children who have adequate calorie intake may still be stunted⁴. More than half of the world's malnourished children under the age of five, 162 million children are stunted due to poor sanitation rather than lack of food⁹. Short-term consequences of stunting include morbidity and mortality, while the long-term consequences of stunting include reduced intellectual ability and reproductive performance as well as increased risk for metabolic and cardiovascular disease².

Stunting in India

Stunting has been a crucial problem in India for a number of years. UNICEF estimates 43% of the children under the age of five in India suffer from stunted growth. Factors such as rural environment, low birth weight from undernourished mothers, and low maternal education have been associated with high rates of stunting in India. According to UNICEF India, only half of children are exclusively breast-fed for the first six months and then transitioned to age appropriate foods, an important element of stunting prevention. One study in Uttar Pradesh estimated that exclusive breastfeeding and appropriate transition foods could decrease in the prevalence of stunting by up to 30%, demonstrating that a focus on nutrition alone will not be sufficient to decrease stunting³. Lack of sanitation is an important component that increases exposure to and incidence of early childhood infectious diseases. Lack of sanitation diverts nutrients away from childhood growth. A review of demographic data from 1986 to 2007 demonstrated that access to high quality sanitation may decrease the odds of child diarrhea by 13% and stunting by 27%¹⁰.

While availability of and access to nutritious food are important factors in the prevention of malnutrition, adequate absorption, sufficient antibodies, elimination of pathogens following ingestion are equally necessary¹¹. In areas of India where feeding programs have been implemented, the problem of stunting remains high and the lack of sanitation has been identified as a major contributor, especially the common practice of open defecation. India has the highest prevalence of open defecation in the world accounting for 60% of the rate worldwide¹². Without adequate waste disposal practices, humans are often exposed to fecal bacteria. Subsequently, ingestion of fecal bacteria prevents the absorption of nutrients by destroying the villi of the small intestine¹¹. Often malnutrition due to fecal bacteria goes undiagnosed, as obvious symptoms are not manifested. Consequently, research has demonstrated that proximity to open defecation explains 99.5% of variation in height among children¹³.

Although this exposure is detrimental to the public's health, even in cases when latrines are available, open defecation is a preferred practice in much of India. Seventy percent of rural Indians practice open defecation⁵.

Open Defecation

Over 1 billion people across the globe practice open defecation (OD) on a regular basis with 638 million of these people living in India¹⁴, over half of India's total population. OD rates are disproportionately high in rural areas where two-thirds of homes do not have toilets⁶, and according to recent research 72% of villagers openly defecate⁴. Seventeen of the 20 countries with the highest OD rates have stunting rates over 35%¹¹, and in areas with high OD rates, children and adults are frequently exposed to human feces⁴. Villagers defecate in open fields, behind bushes, along roadsides⁶ often contaminating soil and water sources⁹. Children are, thus, exposed to human feces while participating in daily activities including playing outdoors, traveling to and from school, swimming in local ponds, washing clothes, etc. Ingestion of fecal bacteria, particularly gastrointestinal diseases such as enteropathy, causes a chronic illness that prevents the body from absorbing nutrients, and encephalitis, inflammation of the brain associated with enteroviruses and childhood infections⁴. OD is one of the main causes of diarrhea, and according to the WHO, OD through this interaction and contamination mechanism can also cause intestinal parasite infestation, cholera, typhoid, hepatitis, and polio. This association between OD and these adverse health conditions explains why Indian children, on average, are more stunted than African children who have a lower calorie intake⁴. Additionally,

poor sanitation is linked to non-health adverse outcomes, e.g. lower level of school achievements, economic productivity, and violence towards young girls and women¹⁵.

OD has a cultural component. According to Hindu texts (specifically the 2000-year-old ancient text, "Laws of Manu") and practices, humans should not defecate in enclosed spaces or in close proximity to where they live and eat⁴⁻⁵ as doing so is viewed as unclean and impure. On the other hand, OD is viewed as pleasant, healthy, wholesome, and social⁵. Many Indians believe, especially those in rural areas, that only the lowest caste members (dalits) defecate in enclosed spaces¹⁶⁻¹⁷. Dalits also often clean feces from latrines in the cities, leading to an even more negative social and cultural stigma⁴. Toilets placed by government programs often go unused in villages⁵. Interestingly, Muslim Indians, though usually of lower socioeconomic status in general compared to Hindus, practice less open defecation. A 2005 government survey found that 67% of all Hindu households compared to 42% of Muslim households practiced OD⁴.

Sanitation in India & Uttar Pradesh

Recognizing global implications and impact of proper sanitation and water access, the WHO and UNICEF established the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. Although the 2015 goal of 88% of the population worldwide having access to improved water sources has already been surpassed, vast regional and residential disparities prevail. In India, increased access to improved water sources, ranging from a public tap, hand pump, protected dug well, or protected spring, was accomplished for 534 million people between 1990 and 2012. However, an estimated 92 million people still lack access to appropriate water sources. Poor water source access is often associated with poor sanitation. Between 1990 and 2012, 291 million people gained access to improved sanitation facilities in India¹⁵. However, according to the latest comprehensive report, it is estimated that 43% of Indians will still have inadequate sanitation in 2015.

Looking specifically at Uttar Pradesh, regarding access to clean water, 96.8% of households overall had access to improved sources of drinking water in 2008-2009; 98.4% in urban areas and 96.4% in rural areas¹⁵. Yet, rural areas in Uttar Pradesh have among the worst indicators for improved sanitation measures. In 2008-2009, only 31.9% of total households had access to improved sanitation. While 79.3% of households in urban areas had access to improved sanitation, only 18.5% of households in rural areas had access to improved sanitation.

Current Sanitation Strategies

Much effort has been channeled to reduce OD in India and to address its effects. Present interventions include pit latrines, septic toilet tanks, and development of underground sewage systems. Rural initiatives include toilet construction and compost chambers around some agricultural areas. Various toilet models have been constructed at public locations, such as elementary schools, using locally available materials. Indeed, much effort to reduce OD has catered to urbanized areas. As a result, between 2001 and 2010, household latrine coverage has almost tripled from 22% to 68%¹⁸.

OD has been reduced significantly in urban areas, but still remains a huge problem in rural areas, which largely lack safe sanitation practices. As a country, India has shown strong commitment to improving sanitation practices in rural areas through their flagship program Total Sanitation Campaign (TSC). TSC aims to reduce OD practice by changing social norms and behaviors and providing technical support and financial subsidies. TSC has adopted a five-pronged approach consisting of raising awareness, transparency, participation, accountability, and vigilance. Examples of TSC efforts include provision of a small subsidy to low-income rural households that construct and utilize toilets. Despite these efforts, the cultural customs of OD have deterred many Indians, largely of older generations, from moving away from OD. In response to poor sanitation statistics, Indian government launched the Patil et al. (2014)¹⁹ study that conducted a randomized clinical trial exploring the effect of TSC on defecation behaviors and its impact on child health in 80 rural villages of Madhya Pradesh state. This study showed that significant numbers of households constructed latrines but continued the practice of OD.

Summary of Team Assignment

Children are stunted due to a variety of factors, most notably lack of adequate sanitation. Open defecation in India is extremely common, preferred, and supported by cultural and religious norms. Your local child health-focused NGO has the opportunity to address the issue of stunting in northern India through an intervention of your choice. You have a budget of up to \$2,000,000 USD to be used over a time-frame of three years. You are able to work with other partners (NGOs, universities, local governments, etc.). Your team must present its proposed strategies to combat pediatric stunting in northern India in a presentation format on February 7, 2015.

To receive the funding, your team will have to present the proposal to a panel of local and global experts selected by the global sanitation initiative. You will need to be able to justify the decisions you make towards the development of your final strategies and be prepared to explain details of your choices.

Important Considerations

- Choice of Target Population: Who is the target population and why did the team choose to target them?
- Social Benefit/Social Return on Investment: Impact on health outcomes, economic improvement, and productivity at the personal, family, and community levels
- Feasibility: How well do the proposed strategies utilize and/or improve capacity of current health systems, training/education required to implement plan, what provisions for education, product, or service delivery?
- Economic Impact: Direct costs associated with proposed strategies; transportation and/or opportunity costs to stakeholders
- Cultural Acceptability: Cultural perceptions of the proposed strategies and the extent to which they have taken in local cultural context and technologies
- Legal and Ethical Issues: Strategies for how these will be addressed, if applicable
- Scalability: Application of recommendation to other communities or more extensive coverage beyond the Northern India, provided there is evidence of success
- Sustainability: Plans for how the program will proceed once funding ends
- Monitoring and Evaluation: Comparison of baseline data, to data collected during and after proposed intervention(s) and how this information will be used to inform program improvements and demonstrate impact
- Risk Identification & Mitigation Strategies: Potential challenges/risks associated with recommendation(s) and how those will be addressed
- Innovation: Are there aspects of the proposal which could be considered particularly innovative or creative; novel application of existing technologies or new products/services proposed?
- What are your specific plans to address:
 1. Stunting
 2. Cultural practice of OD
 3. Issues of OD contamination of roads and sources of water
 4. Lack of sanitation infrastructure
 5. Disposal of sewage into the gutters, water bodies, or open fields

References

1. UNICEF. 2009. Tracking Progress on Child and Maternal Nutrition: A survival and development priority. Retrieved November 13, 2014 from: http://www.unicef.org/publications/files/Tracking_Progress_on_Child_and_Maternal_Nutrition_EN_110309.pdf
2. Badham J, Sweet L. 2010. Stunting: an Overview. Sight and Life. Retrieved on November 13, 2014 from: http://www.sightandlife.org/fileadmin/data/Publications/Stunting/Stunting_An_Overview.pdf
3. Brennan L, McDonald J, Shlomowitz R. 2004. Infant feeding practices and chronic child malnutrition in the Indian states of Karnataka and Uttar Pradesh. *Econ Hum Biol*, 2(1), 139-158.
4. Economist. 2014. The Final Frontier. *The Economist Asia*. Retrieved November 13, 2014 from: <http://www.economist.com/news/asia/21607837-fixing-dreadful-sanitation-india-requires-not-just-building-lavatories-also-changing>
5. Coffey D, Gupta A, Hathi P, Khurana N, Spears D, Srivastav N, Vyas S. 2014. Revealed preference for open defecation: Evidence from a new survey in rural north India. SQUAT Working Paper No. 1-26.
6. Biswas S. 2012. Is India's lack of toilets a cultural problem? BBC News India. Retrieved November 13, 2014 from: <http://www.bbc.com/news/world-asia-india-17377895>
7. Ministry of Statistics and Programme Implementation (Government of India). Millennium Development Goals India Country Report 2011. Retrieved Sep 29, 2014 from: http://www.undp.org/content/dam/undp/library/MDG/english/MDG%20Country%20Reports/India/MDG_India_2011.pdf
8. WHO. 2014. Global Database on Child Growth and Malnutrition. Retrieved November 13, 2014 from: <http://www.who.int/nutgrowthdb/about/introduction/en/index2.html>
9. Harris, G. 2014. Poor Sanitation in India May Afflict Well-Fed Children with Malnutrition. *The New York Times*. Retrieved November 13, 2014 from: <http://www.nytimes.com/2014/07/15/world/asia/poor-sanitation-in-india-may-afflict-well-fed-children-with-malnutrition.html>
10. Fink G, Günter I, Hill K. 2011. The effect of water and sanitation on child health: evidence from the demographic and health surveys 1986-2007. *International Journal of Epidemiology*. 40, 1196-1204.
11. Chambers R, Von Medeazza R. 2013: Sanitation and Stunting in India: Undernutrition's Blind Spot. *Economic & Political Weekly*. 48(25), 15-17.
12. Spears D. 2013. How Much International Variation in Child Height Can Sanitation Explain? Working Paper – Research Programs in Development Studies from Princeton University. Retrieved November http://www.princeton.edu/rpds/papers/Spears_Height_and_Sanitation.pdf.pdf
13. Spears D, Ghost A, Cumming O. 2013. Open Defecation and Childhood Stunting in India: An Ecological Analysis of New Data from 112 Districts. *PLOS one*. 8(9) e73784.

14. United Nations Department of Economics and Social Affairs (UNDESA). 2014. Access to Sanitation. Retrieved November 13, 2014 from: <http://www.un.org/waterforlifedecade/sanitation.shtml>
15. WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. Progress on Drinking Water and Sanitation: 2014 Update. Retrieved Sep 30, 2014 from: http://www.wssinfo.org/fileadmin/user_upload/resources/JMP_report_2014_webEng.pdf
16. Kumar GP. 2014. Total Sanitation: Why toilets alone cannot stop open defecation. First Post India. Retrieved November 13, 2014 from: <http://www.firstpost.com/india/total-sanitation-why-toilets-alone-cannot-stop-open-defecation-1650563.html>
17. Mehrotra K. 2014. India's Toilet Race Failing as Villages don't Use Them. Bloomberg. Retrieved November 13, 2014 from: <http://www.bloomberg.com/news/2014-08-03/india-s-toilet-race-failing-as-villages-don-t-use-them.html>
18. Purohit P. 2012. Sanitation in India. Mahatma Gandhi Centre for Sanitation. Retrieved November 13, 2014: <http://www.slideshare.net/purohit1323/sanitation-in-india-12066973>
19. Patil SR, Arnold BF, Salvatore AL, Briceno B, Ganguly S, Colford Jr JM, Gertler PJ. 2014. The Effect of India's Total Sanitation Campaign on Defecation Behaviors and Child Health in Rural Madhya Pradesh: A Cluster Randomized Controlled Trial. PLOS Medicine. DOI: 10.1371/journal.pmed.1001709

Appendices

Esrey SA. 1996. Water, Waste, and Well-Being: A Multicountry Study. *American Journal of Epidemiology*. 143(6): 608-23.

Government of Uttar Pradesh. 2011. Statistics of Uttar Pradesh. Retrieved November 13, 2014: <http://up.gov.in/upstateglance.aspx>

Kerala Gov In. Total Sanitation Campaign. Retrieved November 13, 2014 from: http://www.sanitation.kerala.gov.in/index.php?option=com_content&view=article&id=65&Itemid=75

UN. 2014. Open Defecation. Retrieved November 13, 2014 from: <http://opendefecation.org/#slide1>

UNICEF & WHO. Progress on Sanitation and Drinking-Water: 2010 Update. Retrieved November 13, 2014 from: <http://www.unicef.org/media/files/JMP-2010Final.pdf>

UNICEF India. Nutrition. Retrieved November 13, 2014 from <http://www.unicef.org/india/nutrition.html>

UNICEF India. The Situation of Children in India. Retrieved November 13, 2014 from: http://www.unicef.org/india/The_Situation_of_Children_in_India_-_A_profile_20110630.pdf

UNICEF India. Uttar Pradesh. Retrieved November 13, 2014 from: http://www.unicef.org/india/overview_4299.htm

WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation. India: estimates on the use of water sources and sanitation facilities (1980 - 2012). Retrieved Sep 30, 2014 from: [http://www.wssinfo.org/documents/?tx_displaycontroller\[region\]=&tx_displaycontroller\[search_word\]=india&tx_displaycontroller\[type\]=country_files](http://www.wssinfo.org/documents/?tx_displaycontroller[region]=&tx_displaycontroller[search_word]=india&tx_displaycontroller[type]=country_files)