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HOW WATER, SANITATION AND AGRICULTURE CAN IMPROVE HEALTH AND NUTRITION

The COVID-19 crisis forces renewed attention to the critical role of hygiene, sanitation, and clean drinking water. In 2010, the United Nations General Assembly recognized access to safe water and sanitation infrastructure a matter of human right. This right strongly influenced the Millennium Development Goals, led to large international investments in water and sanitation infrastructure, and is still reflected today in Sustainable Development Goal 6. Progress towards targets 6.1 and 6.2 (universal access to safe and affordable drinking water and adequate sanitation by 2030) has been recorded and could be expected to spill over to other dimensions of human development, health and nutrition in particular. Yet, progress toward improved health and ending malnutrition is not commensurate with progress under Sustainable Development Goal 6. "Piping" clean water into villages and building toilets for households is necessary for rural health and nutrition, but often insufficient. Similarly, increased food production and income do not suffice to end malnutrition. In rural settings across the developing world, we hypothesize that part of the answer lies in improving our understanding of the complex linkages between agriculture, water and sanitation (Figure 1).

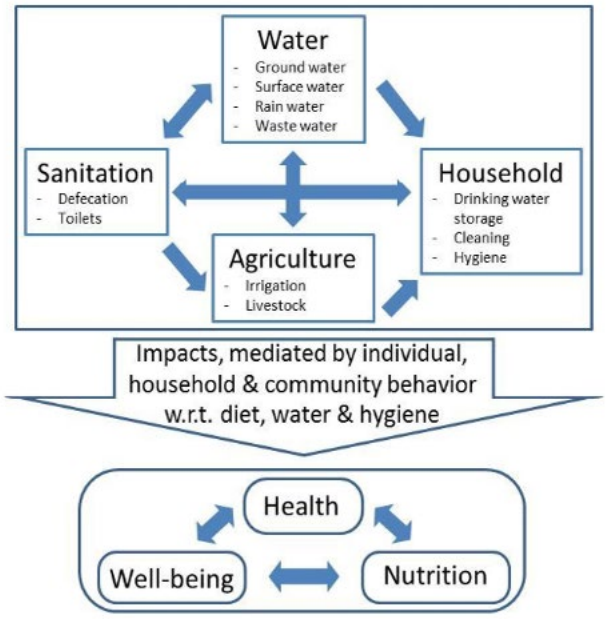

Figure 1: Interrelatedness of health, nutrition and well-being as influenced by the linkages between water, sanitation, agriculture and household behaviour

We researched the water, sanitation and agriculture linkages and their association with nutrition and health in various rural and peri-urban multi-purpose water systems in Bangladesh, Ethiopia, Ghana and India. We analyzed these linkages using nationally representative data on the availability of water and sanitation (WATSAN) infrastructure in rural areas of the four countries, as well as survey data capturing interactions between agriculture and WATSAN, describing various behavioral aspects of irrigation, water use and sanitation. The surveys were complemented by tests of the microbiological quality of the drinking water.

The role of water access and handling

Two aspects around water matter for health and nutrition: quantity and quality. High quality water safe for consumption is necessary for human health. This positive association is known to be mitigated by the quantity of safe water that is available and by the distance to the water source.

Across the four countries, we find a negative association between access to improved water sources and the height-for-age and weight-for-age of children below five years old. Our research at the study sites offers insights into this surprising result. First, we find that water from improved sources is frequently contaminated. In India and Bangladesh, 78% of our surveyed households use contaminated drinking water, although more than 90% have access to improved water sources. This contamination takes place between the point of source (where the water is collected) and the point of use, probably due to water handling (e.g. non-covered or unclean containers), lacking hygiene practices of those handling or transporting water (e.g. washing hands with soap after defecation) or due to water storage. In some settings, piped water distribution is associated with larger amounts of stored water in the households, possibly due to intermittent piped water flows. In general, the more drinking water is stored at home, or the larger the size of the water containers, the higher the likelihood of Escheria coli contamination (or E. coli, a bacteria related to human and animal feces). E. coli contamination of drinking water is associated with higher malnutrition rates in Bangladesh, Ethiopia and Ghana. Finally, we note that E. coli contamination of drinking water, and prevalence of child diarrhoea and malnutrition as potential consequences thereof, are often not confined to the poorest households but are rather an issue cutting across wealth groups.

Policy recommendation:

- When undertaking efforts to improve domestic water supply, equal attention should be given to the quality, quantity and proximity of the source to maximize health benefits. Monitoring quality from the source to the mouth can help to locate issues, whether in the infrastructure or in the behavior of users, and to severe this pathway to poor health and malnutrition.

The consequences of open defecation and the role of knowledge

A functioning sanitation system, which removes pathogens and bacteria present in human feces from the environment, helps to protect water resources from contamination. Access to sanitation is also a precondition for a clean, sanitary environment since people do not have to practice open defecation. We find that better sanitation infrastructure mostly decreases the prevalence of diarrhoea except for our low population density study areas in rural Ethiopia. There, open defecation might be better than unimproved or shared (communal) latrines. These are potential signs of behavioural problems around shared sanitation and the pathogenic concentration implied by community infrastructure. Across the four countries though, open defecation can happen despite the existence of sanitation infrastructure and is negatively associated with child nutrition outcomes.

Households in our study sites seem to consume contaminated water in part due to the lack of adequate information on water quality. Access to information is crucial for individuals to react and improve their behaviour. In Ghana, our research shows that people are less likely to use surface water and more likely to adopt safe water storage practices, after they could test water quality and participated in our information campaign. Our information interventions in Bangladesh incentivized people to wash their hands more often with soap, to clean water containers more frequently, and reduced water contamination and children's diarrhoea prevalence. To address the health and nutrition problem requires a variety of behavioural changes which are context specific and cannot be identified without specific data.

Policy recommendation:

- Besides providing access to improved water and sanitation facilities, education on health and hygiene behaviour as well as on safe handling and storage of water is necessary to ensure a positive health and nutrition effect.
- Such education provides better results in terms of changed behaviour and practices when it is associated with knowledge about, and experience with, the actual quality of the drinking water in the households (e.g. chemical coloration tests).

The role of agriculture, irrigation and food safety

Irrigation agriculture, its outputs and spillover effects, can have positive and negative effects on nutrition and health, for the farm households and the surrounding communities. Irrigation agriculture can allow higher and more stable yields, as well as a more diversified food production, whilst providing an additional source of water for domestic use. Yet, irrigation infrastructure can provide breeding grounds for parasites and diseases (e.g. malaria).

Our cross-country analysis demonstrates that irrigation, in particular using wastewater, can have a negative net association with health and nutrition. Across the four countries, households practicing polluted and wastewater irrigation have considerably lower height-for-age and weight-for-age among their children. In India our research shows that diarrhoea or parasitic prevalence among children are higher in households irrigating with wastewater. In Ethiopia, we find that irrigation water is detrimental to health and nutrition, if used for domestic purposes or as drinking water. In general, the analysis of our combined surveys across the four countries reveals that the linkages between agriculture and water and sanitation have a clear association with drinking water quality within households, with expected health and nutrition consequences.

Policy recommendation:

- Agricultural water practices should always be considered linked to domestic water supply.
- Adequate treatment and handling must be ensured when utilizing wastewater for irrigation.
- Disease risks should be considered when planning and implementing irrigation systems.

Fixing water, sanitation and hygiene issues separately from food production issues cannot sustainably address the underlying goals of improved nutrition and health. We advocate that adopting a system perspective to water use and management around the farm and the household is crucial. As the world struggles with the COVID-19 outbreak, we are reminded about the importance of basic hygiene behavior, such as washing hands with soap. Yet this cannot hide the necessity to consider water quality along the whole chain – from the source to the mouth. Such information, as part of water, sanitation and hygiene education and knowledge can help change problematic behavior. This might be even more critical than addressing infrastructural needs, as experiences with water or sanitation programs is not universally positive.

Sources

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