Health Risk Perceptions Are Associated with Domestic Use of Basic Water and Sanitation Services. Evidence from Rural Ethiopia

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Background

• Evaluations of WaSH interventions facilitate improvement of global health policy making and implementation practice by identification of factors determining provision

• Technical, engineering, sociological and cultural aspects of WaSH
  – ‘Rural WaSH do not only incorporate engineering (functionality, water system breakdowns, access to services and sustainability), but also sociology’ (Mara 2003)
  – Need for consideration of ‘software’: health risk perceptions, (mis)beliefs related to WaSH, WaSH-related behaviours and the cultural context of WaSH

• Health-related knowledge and risk perceptions are motivators for the adoption of health-promoting WaSH behaviour, but often neglected in project evaluations
WaSH context in rural Ethiopia

- 30% with basic drinking water, 4% with basic sanitation service (WHO / UNICEF 2015)
- Increasing water scarcity and environmental degradation may compound inadequate WaSH services, while also increasing food insecurity and malnutrition even further

Objectives of this study
(i) Identification of WaSH-related factors and practices, socioeconomic aspects, as well as risk perceptions and health beliefs associated with the domestic use of basic drinking water and sanitation service levels
(ii) Exploration of differences between the WaSH intervention and control group two years after the completion of an integrated nutrition and WaSH programme
Intervention and methodology
Integrating WASH and nutrition in Ethiopia

Goal

Maximize health impact of community-based nutrition (CBN) programs in rural Ethiopia, responding to combined risks of chronic malnutrition and inadequate access to basic WASH services for 1.4 million people.
Intervention and evaluation

- Rural water supply (CWS) through 1,800 water supply systems
- Water schemes with focus on multiple use services (MUS)
- Community-led total sanitation and hygiene promotion (CH&S)
- Community-based nutrition programme

Intervention (CBN+WaSH)
30 woredas; 576 kebeles

- 230 CBN & CWS kebeles
  - 16 CBN & CWS kebeles
    - 33-50 households

- 319 CBN & CLTSH kebeles
  - 22 CBN & CH&S kebeles
    - 40-44 households

- 27 CBN & MUS kebeles
  - 2 CBN & MUS kebeles
    - 36-39 households

Control (CBN only)
92 woredas; 2,158 kebeles

- 40 control kebeles
  - 38-42 households

4 Regions (Amhara, Oromia, SNNPR, Tigray)
Results
Main drinking water source, distance, time and volume

Use of basic water service (JMP)
Type of and sharing of sanitation facility

| Sanitation Facility: Hygiene and Structure | CBN Only | CBN + WaSH |
|------------------------------------------|----------|------------|
| Only cleaned when needed                 | 526      | 748        |
|                                         | 65.83 %  | 70.77 %    |
| Empty at least once                      | 920      | 1050       |
|                                         | 72.27 %  | 70.71 %    |
| Never emptied before                     | 353      | 435        |
|                                         | 27.73 %  | 29.29 %    |
| Currently observed to be clean           | 162      | 187        |
|                                         | 20.56 %  | 17.54 %    |
| Structure observed to be in good condition | 664     | 918        |
|                                         | 84.26 %  | 86.12 %    |

→ Use of basic water service (JMP)
## Risk perceptions

| Health beliefs and behaviours                        | CBN only | CBN + WaSH |   |   |
|------------------------------------------------------|----------|------------|---|---|
|                                                      | N   |   | N  |   |
| **Opinion of main benefits of latrine**              |   |   |   |   |
| Clean compound                                       | 1029 | 85.11   | 1236 | 88.16 |
| Better health                                        | 991  | 81.97   | 1191 | 84.95 |
| Easier / safer at night                              | 292  | 24.15   | 395  | 28.17 |
| Better privacy                                       | 489  | 40.45   | 602  | 42.94 |
| Better social position                               | 240  | 19.85   | 327  | 23.32 |
| **Opinion of main disadvantage of latrine**          |   |   |   |   |
| Construction costs                                   | 394  | 32.59   | 391  | 27.89 |
| Maintenance costs                                    | 227  | 18.78   | 215  | 15.34 |
| Cleaning work                                        | 48   | 3.97    | 68   | 4.85 |
| Dark                                                 | 24   | 1.99    | 48   | 3.42 |
| Small space                                          | 108  | 8.93    | 124  | 8.84 |
| Bad smell, dirt                                     | 230  | 19.02   | 257  | 18.33 |
| Reason for diarrhoea                                 | 82   | 6.78    | 120  | 8.56 |
| **Perceived reasons for diarrhoea**                  |   |   |   |   |
| Human faeces                                         | 1079 | 92.06   | 1278 | 93.56 |
| Presence of animal faeces in compound                | 790  | 67.41   | 965  | 70.64 |
| Flies in contact with faeces via food                | 1108 | 94.54   | 1325 | 97   |
| Mosquitos                                            | 607  | 51.79   | 698  | 51.1 |
| **Perceived measures that prevent diarrhoea**         |   |   |   |   |
| Washing hands with water only                        | 334  | 28.5    | 366  | 26.79 |
| Washing hands with ash                               | 733  | 62.54   | 906  | 66.33 |
| Washing hands with soap                              | 1047 | 89.33   | 1241 | 90.85 |
| Washing hands once a day is enough                    | 193  | 16.47   | 174  | 12.74 |
| **Activities at the household to prevent diseases, especially diarrhea** |
| Drink safe water                                     | 649  | 55.38   | 793  | 58.05 |
| Water treatment                                      | 155  | 13.23   | 194  | 14.2 |
| Use of the latrine                                   | 277  | 23.63   | 334  | 24.45 |
| Good hygiene practices                               | 846  | 72.18   | 1039 | 76.06 |
| Wash hands after using latrine                       | 633  | 54.01   | 795  | 58.2 |
| Wash hands before eating                             | 799  | 68.17   | 1011 | 74.01 |
| Covering the food                                    | 660  | 56.31   | 855  | 62.59 |
| Household cleanliness                                | 727  | 62.03   | 946  | 69.25 |

High awareness on risk factors related to WaSH and diarrhoea in the programme area.
Results of regression analysis: use of basic services

| Outcome: use of basic water service | OR  | CI 95% | p-value |
|------------------------------------|-----|--------|---------|
| **Explanatory variable**           |     |        |         |
| Intervention (CBN+WaSH) vs control (CBN only) | 1.00 | 0.83  | 1.21 | 0.968 |
| Oromia vs Amhara                   | 1.27 | 0.92  | 1.75 | 0.152 |
| SNNPR vs Amhara                    | 1.11 | 0.87  | 1.41 | 0.417 |
| Tigray vs Amhara                   | 1.03 | 0.75  | 1.40 | 0.861 |
| Household has electricity* vs none  | 2.45 | 1.90  | 3.15 | <0.001 |
| Household head's highest level of formal education | 1.01 | 0.97  | 1.07 | 0.385 |
| MUS of water point vs no           | 0.63 | 0.48  | 0.84 | 0.001 |
| Water quality is good vs not good  | 3.94 | 3.06  | 5.08 | <0.001 |
| Household paid for water in the rainy season vs no | 1.11 | 0.88  | 1.40 | 0.385 |
| Main cause of diarrhoea: drinking unsafe water | 1.48 | 1.20  | 1.81 | <0.001 |

| Outcome: use of basic sanitation service | OR  | CI 95% | p-value |
|------------------------------------------|-----|--------|---------|
| **Explanatory variable**                 |     |        |         |
| Intervention (WaSH = CBN) vs control (CBN only) | 1.41 | 1.18  | 1.69 | <0.001 |
| Oromia vs Amhara                         | 0.86 | 0.63  | 1.16 | 0.313 |
| SNNPR vs Amhara                          | 1.58 | 1.26  | 1.99 | <0.001 |
| Tigray vs Amhara                         | 1.05 | 0.80  | 1.38 | 0.729 |
| Household has electricity* vs none       | 1.19 | 0.95  | 1.47 | 0.123 |
| Latrine has been emptied at least once vs no | 6.00 | 4.86  | 7.40 | <0.001 |
| Household has received training before vs no | 1.55 | 1.22  | 1.97 | <0.001 |
| Opinion of main reason for diarrhoea: dirty space vs no | 1.81 | 1.50  | 2.19 | <0.001 |
| Benefit of latrine: better privacy vs no | 2.00 | 1.67  | 2.40 | <0.001 |
| Disadvantage of latrine: maintenance costs vs no | 0.49 | 0.38  | 0.63 | <0.001 |

*Electricity was used as a proxy variable to wealth in this study. **Significant factors are marked in bold. The significance level was set at p-value ≤ 0.05.
Discussion
The role of risk perceptions for basic services

High awareness on risk factors related to WaSH and diarrhoea:

Diarrhoea linked to faeces, the presence of flies, poor food hygiene, ‘dirty spaces’ and unsafe drinking water

Risk perceptions reflect the WaSH-related risks as described in the framework on faecal-oral disease transmission

Wagner & Lanoix (1958)
The role of risk perceptions for basic services

• Believing that unsafe drinking water or unhygienic environments caused diarrhoea, and perceiving drinking water quality as good motivated the use of basic drinking water and sanitation services

• Risk perceptions matter: closely linked to and motivating positive WaSH-related and health-protective behaviour: the use of basic services

Major motivator for behaviour change
Well-designed communication strategies and health messaging could speak to a highly effective form to engage households to accept and use basic services
The value of risk perception studies

- Key information from grassroots levels and data-scarce settings to understand health risks and health-related behaviours

- Need to integrate community risk perceptions in risk communication strategies and health messaging to constitute a highly effective form to engage households to accept and the use of basic drinking water and sanitation services

- With their potential to motivate households to ‘climb up’ the WaSH service ladders, thus, ultimately, health beliefs relevant for the achievement of the SDG 6 (United Nations 2018)
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Akpabio, E.M., 2012. Water meanings, sanitation practices and hygiene behaviours in the cultural mirror: a perspective from Nigeria. J Water, San Hyg Dev (3), 168-181.

Anthonj, C., Diekrueger, B., Borgemeister, C., Kistemann, T., 2018. Health risk perceptions and local knowledge of water-related disease exposure among Kenyan wetland communities. Int J Hyg Env Health.

Anthonj, C., Fleming, L., Ambelu, A., Cronk, R., Godfrey, S., Sozzi, E., Bevan, J., Bartram, J., 2018. Water point functionality and areas for improvement of monitoring in rural Ethiopia.

Bisung, E., Elliott, S.J., Abudho, B., Schuster-Wallace, C.J., Karanja, D.M., 2015. Dreaming of toilets: using photovoice to explore knowledge, attitudes and practices around water-health linkages in rural Kenya. Health & Place 31, 208–215.

Curtis, V.A., Danquah, L.O., Aunger, R.V., 2009. Planned, motivated and habitual hygiene behaviour: an eleven country review. Health Edu Res 24 (4), 655–673.

Halvorson, S.J., Williams, A.L., Ba, S., Dunkel, F.V., 2011. Water quality and waterborne disease in the Niger River Inland Delta, Mali: A study of local knowledge and response. Geogr Care 17 (2), 449–457.

Munguti, K.J., 1998. Community perceptions and treatment seeking for malaria in Baringo district, Kenya: implications for disease control. East African Med J 75 (12), 687–691.

Pidgeon, N., 1998. Risk assessment, risk values and the social science programme: Why we do need risk perception research. Rel Eng Sys Saf 59 (1), 5–15.

Rohrmann, B., Renn, O., 2000. Risk Perception Research. An Introduction, in: Renn, O., Rohrmann, B. (Eds.), Cross-Cultural Risk Perception. A Survey of Empirical Studies. Springer Verlag, pp. 11–53.

Trent, M., Dreibelbis, R., Bir, A., Tripathi, S.N., Labhasetwar, P., Nagarnaik, P., Loo, A., Bain, R., Jeuland, M., Browin, J., 2018. Access to Household Water Quality Information Leads to Safer Water: A Cluster Randomized Trial in India. Env Sci Tech.

Watson, J.A., Ensink, J.H.J., Ramos, et al., 2017. Does targeting children with hygiene promotion messages work? The effect of handwashing promotion target at children, on diarrhea, soil-transmitted helminth infections and behaviour change, in low- and middle-income countries. Trop Med Int Health, 22 (5), 526-538.
Limitations

- Cross-sectional study design could not represent the factor time or uncover cause-effect relationships, e.g. in terms of seasonal differences (inaccessibility of services during to flooding or reduced or intermittent water supply during droughts).

- Mainly male-headed households did not allow for gender-disaggregation of results, which may have allowed interesting insights and perceptions.

- Health risk perceptions, health beliefs and WaSH-related choices could have been influenced by cultural practices and social factors, which were not captured with this study.

- Future studies may consider the integration of qualitative data for triangulation.