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TRANSFORMATION TOWARDS SUSTAINABLE
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Effectiveness of integrating sanitation and nutrition (SanNut) programmes: evidence from an RCT in Kitui, Kenya

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Child stunting is a persistent problem in many of Kenya's rural counties. Kitui County has one of the highest stunting rate in the nation, with 45% of the population exhibiting elements of stunting against the national prevalence of 26%. Factors related to poor sanitation and hygiene practices among caregivers of children exposed to fecal contamination through their environs, and poor nutrition practices put children at risk for stunting. Despite their shared objectives, sanitation and nutrition programs are often implemented separately. The SanNut study explored whether an integrated sanitation and nutrition program piloted in Kitui County would lead to better sanitation and nutrition behaviours and practices among caregivers of young children compared to a standard sanitation program. Findings show that the program had modest but statistically significant improvements on key hygiene and nutrition-related childcare practices.

Introduction

Undernutrition is estimated to directly cause 45 percent of all child deaths (Black et al. 2013). While undernutrition is directly caused by inadequate dietary intake and disease, there are a multitude of underlying determinants of these causes such as inadequate childcare practices, low maternal education, poor access to health services, lack of access to clean water and sanitation, and poor hygiene practices (Chase et al. 2016). Consequently, tackling undernutrition requires a multi-sectoral response.

Undernutrition is an indicator of non-income poverty, and one of the primary channels through which WASH can affect health outcomes is through nutrition (Chase et al. 2016). There is strong evidence that faecal contamination of the household environment, soil contaminated with human and animal faeces, and unsafe disposal of child faeces contribute significantly to the diarrhoeal disease burden (Curtis et al. 2000; Marquis et al. 1990; Mara et al. 2010). Similarly, environmental enteropathy, a condition that results in changes to intestinal lining of children, is also caused by faecal contamination (Korpe et al. 2012). Collectively, by losing nutrients through vomiting, diarrhoea and loss of appetite, and causing malabsorption of nutrients among affected children, diarrhoeal diseases and environmental enteropathy are the primary channels through which poor sanitation leads to undernutrition and stunting in children. Fortunately, water and sanitation interventions are associated with a lower risk of diarrhoea and better nutrition outcomes, specifically undernutrition and stunting. In particular, Community Led Total Sanitation (CLTS) programs have proven to be an effective channel for cultivating community-led improvements in sanitation (Esrey et al. 1992; Checkley et al. 2004; Fink et al. 2011) through increasing private latrine construction and decreasing incidence of diarrhoea and open defecation (Alzua et al. 2015; Clasen et al. 2014; Patil et al. 2014).

Equally, there is interest among nutrition practitioners about the effectiveness of interventions that seek to change nutrition behaviour to address undernutrition. For instance, there is interest in the effectiveness of breastfeeding promotion interventions on exclusive breastfeeding rates in early infancy. Given the recognized benefits of breastfeeding for the health of the mother and infants, the World Health Organization (WHO) recommends exclusive breastfeeding (EBF) for the first six months of life. However, the prevalence of EBF is low globally in many of the developing and developed countries around the world (Imdad et al. 2011). Evidence shows that community-led breastfeeding promoting strategies can significantly increase exclusive breastfeeding rates with developing country communities (Bhandari et al. 2003, Haider et al. 2000; Morrow et al. 1999; Aidam et al. 2005). Further attention has been paid to a suite of cost-effective interventions that prevent micronutrient deficiencies, a further contributor to child malnutrition and cognitive impairment (Bhutta et al. 2013). These interventions, which include Vitamin A, Folic Acid, Iodine, and Zinc supplementation, are provided to mothers and young infants at most rural health facilities, but require knowledge and the practice of frequent health facility visitation on the part of caregivers.

Our study sought to understand if it is possible to effectively integrate these two sets of behaviours – sanitation and early infant nutrition – into one program in order to leverage complementarities between poor sanitation and undernutrition. The study measured the impact of this combined approach on influencing key sanitation and nutrition behaviours that affect early childhood malnutrition and development. The results of the study will influence whether to scale-up integrated sanitation & nutrition programs in Kenya and whether program modifications are necessary for potential scale-up.

Evaluation methodology

Description of the intervention

From June 2016 to March 2017, Kitui County Government implemented a county-wide Community Led Total Sanitation (CLTS) program in 2,100 villages called PATUMAIP[1]. CLTS programs focus on achieving Open Defecation Free (ODF) communities which requires that: all households construct (or share) and use latrines; there should be no faeces in the homestead or within the community, and households should have a handwashing station with both water and soap. UNICEF provided implementation and technical support for the PATUMAIP program. A combined sanitation and nutrition – SanNut - intervention was designed to integrate nutrition messaging into this CLTS program. SanNut was a modified form of the Kenya National Protocol for CLTS and targeted caregivers of children under 5 years and pregnant women.

The program design sought to emphasize the link between open defecation, poor feeding practices and health seeking behaviours, which ultimately result in stunting. It was also meant to address recognized gaps in CLTS, namely a limited focus on toddler hygiene and sanitation of the toddler environment. Additionally, the program included nutrition messages to address the key behavioural causes of malnutrition. SanNut was overlaid onto a traditional CLTS program through addition of the following supplemental activities:

- Addition of two caregiver meetings following the CLTS community trigger session to sensitize mothers and other caregivers of children under 5 (with a specific focus on children under 2) on the importance of toddler hygiene and good nutrition for the health of their children.
- Household follow-up visits by community health volunteers (CHVs) that includes, in addition to standard CLTS messaging, the supplemental messages covered in the two caregiver meetings.

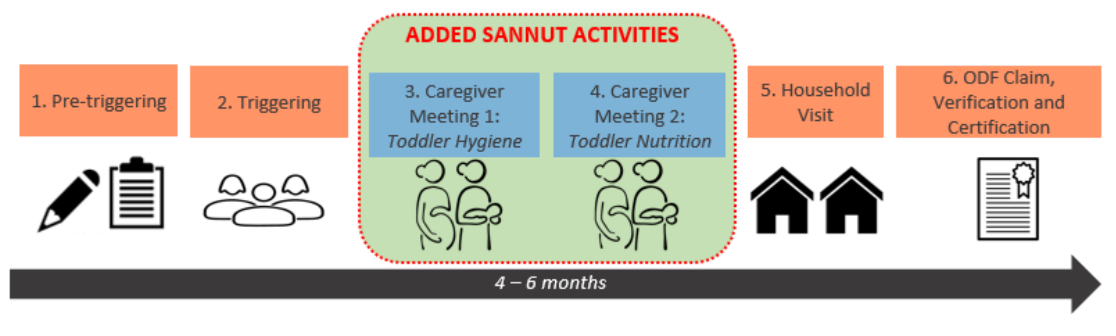

Figure 1. Overview of SanNut activities within CLTS implementation

Study design

IDinsight designed a clustered randomized control trial to measure the effects of the SanNut program on caregiver practices and sanitation and nutrition outcomes. The study was conducted in 5 out of the 8 sub counties in Kitui representing the rural areas of the larger Kitui County.

The sampling frame consisted of villages that were part of the larger CLTS roll-out in Kitui and excluded those that were already ODF, or had other ongoing nutrition interventions similar to SanNut. Out of the 724 villages that met the above criteria, 604 villages were randomly selected to take part in the study. 305 villages were randomly assigned to receive the SanNut program (the treatment group) and the remaining 295 villages received the standalone CLTS program (the control group). Assignment was stratified for treatment and control at the ward level to ensure 1) geographic balance between treatment and control groups and 2) that wards, which are the administrative unit responsible for overseeing the PATUMAIP CLTS rollout, had the same percentage of villages being set aside for the SanNut intervention.

In order to have sufficient statistical power to measure meaningful effects, 8 households were randomly sampled per village from the list of all households with children under 5 years. An additional 4 replacements households were added using the same sampling procedure to allow for substitution in case any of the 8 households was found to be ineligible during surveying.

The final sample consisted of 2,279 households in 305 villages in the treatment group and 2,157 households in 295 villages in the control group[2]. The SanNut evaluation and pre-analysis plan were registered prior to the evaluation roll-out on the American Economic Association's registry for RCTs[3].

Research questions and objectives

IDinsight designed a household questionnaire to capture changes in caregiver practices on key sanitation and nutrition behaviours and outcomes. Since the SanNut activities were layered onto existing CLTS programming, data was also collected on CLTS indicators to evaluate whether the additional activities detracted from CLTS objectives. In summary, data on the following indicators were collected:

Table 1. Summary of outcome indicators

Sector	CLTS or SanNut	Indicator	Source of data
Sanitation	Standard CLTS (as per Kenya national CLTS protocol)	Sanitation knowledge	Caregiver quiz
		Latrine use	Caregiver survey
		Latrine structure maintenance	Checklist observation
		Handwashing infrastructure	Observation
	SanNut	Disposal of child faeces	Caregiver survey
		Child diarrhoea	Caregiver survey
		Handwashing practice	Caregiver survey
		Courtyard cleanliness	Checklist observation
Nutrition		Nutrition knowledge	Caregiver quiz
		Proper feeding practice	Caregiver survey
		Health facility visit	Caregiver survey, MCH booklet observation

Data collection

Household surveys were conducted from April to July of 2017, 6-9 months after CLTS and 3-4 months after SanNut using a team of IDinsight trained enumerators. The enumerators identified sampled households within the evaluation villages (which included the name of the head of the household for easy identification). Once the correct household was identified, the enumerators identified the primary caregiver as per the survey sample list and in cases where the individual listed was not the primary caregiver, they substituted the correct primary caregiver within the same household (this occurred in only 5% of the households surveyed). The survey was then administered to the primary caregiver electronically using SurveyCTO.

Findings

There were modest improvements in knowledge and practices related to handling child faeces and handwashing, as well as an increase in the presence of handwashing station. Households in the treatment group showed a decrease in self-reported incidence of child diarrhoea. There were improvements in nutrition knowledge though no evidence of changes in nutrition practices.

Sanitation knowledge

Sannut improved knowledge in some sanitation indicators but not all. Specifically:

- SanNut increased knowledge of some practices to prevent faecal contamination of food. Firstly, relative to caregivers in the control group, caregivers in the treatment group were 4.0 percentage points[4] more likely to report building or using latrines for defecation (p[5] < 0.01). Additionally, SanNut increased knowledge on; correctly disposing animal faeces by 4.4 pp relative to the control group ($p < 0.01$) and using clean utensils by 2 pp relative to the control group ($p = 0.04$). Interestingly, caregivers in the treatment group were 4.2 pp less likely to demonstrate knowledge of safe food storage practices, suggesting that SanNut messaging may have substituted for some standard CLTS messaging. There was no evidence of SanNut's impact on 3 other sanitation practices on ways to prevent faecal contamination of food.
- SanNut increased knowledge about how handling child faeces causes diarrhoea (+3.4 pp, $p = 0.03$), but did not impact knowledge of other sanitary practices that can cause diarrhoea.
- SanNut increased knowledge about washing hands after handling child faeces (5.4 pp, $p < 0.01$), but did not impact knowledge of other critical times for washing hands.
- There was no evidence of impact on knowledge of practices that could prevent getting diarrhoea from water nor on the safest ways to dispose of a child's stool.

Handwashing station ownership

SanNut increased handwashing station ownership by 5.8 pp relative to the control group ($p < 0.01$). When functionality (stocked with soap/ash and water) of the handwashing station was considered, SanNut increased ownership of (functional) handwashing stations by 1.99 pp relative to the comparison group ($p < 0.01$).

Self-reported proper disposal of child faeces

SanNut increased proportion of households reporting that they correctly dispose (in the latrine or a hole in the ground) the faeces of the youngest child aged between 6 months and 2 years by 5.04 pp relative to the comparison group ($p = 0.024$). There was no evidence of impact of SanNut on proper disposal of faeces or on latrine use of the oldest child aged between 2 and 5 years.

Child diarrhoea

SanNut reduced incidence of caregiver-reported diarrhoea within the past two weeks of data collection for all children aged between 6 months and 5 years by 2.9 pp relative to the control group ($p = 0.02$). Caregivers in the treatment group were also less likely to report diarrhoea when identifying their child's stool on a Bristol Stool Chart, though the result was not statistically significant (-1.5 pp, $p = 0.19$).

Caregiver handwashing practice

SanNut increased the number of correct times that caregivers stated they washed their hands (out of twelve possible handwashing instances) by 0.16 times relative to the control group ($p < 0.01$). When looking at individual instances of handwashing, SanNut increased proportion of respondents stating they washed their hands in the following instances: after cleaning a child who has defecated (5.4 pp, $p < 0.01$), after handling child faeces (2.9 pp, $p < 0.01$) and before food preparation (5.2 pp, $p < 0.01$). We did not find evidence of SanNut's impact on washing hands after the following instances: after touching animals, after handling animal faeces, when hands are dirty, when returning from outside work and before and after eating. Additionally, there was no evidence of SanNut's impact on how the hands of the youngest child aged between 6 months and 2 years are washed.

There was no evidence of impact of SanNut on other sanitation practices, namely latrine use, courtyard cleanliness or latrine structure maintenance.

Additionally, SanNut did not have a deleterious effect on the CLTS indicators of latrine use and latrine structure maintenance as well as handwashing station ownership (in fact, SanNut improved handwashing station ownership).

Nutrition knowledge

SanNut improved knowledge in some nutrition indicators but not all. SanNut increased the proportion of women correctly indicating how long after birth a child should be put to breast by 6.6 pp relative to the control group ($p < 0.01$), but did not impact knowledge on benefits of breastmilk, how long one should exclusively breastfeed or when to start complementary feeding.

There was no evidence of SanNut's impact on the following nutrition practices: proper feeding of the child based on age; health facility visits for Vitamin A supplementation or deworming treatment.

Discussion

The SanNut intervention had a positive impact on knowledge of some sanitation practices, especially handwashing after handling child/animal faeces. Knowledge gains translated into positive impact on some sanitation practices, including handwashing and disposal of child faeces. These were key behaviours targeted by the program to complement CLTS, which mainly addresses adult sanitation practices without a clear focus on toddler hygiene and a clean toddler environment. SanNut led to a moderate decrease in diarrhoeal incidence for the children under 5 years in the household, though the magnitude and strength of the evidence varied by the source of data. The differences in the caregiver-reported point estimates could reflect both a lower incidence of diarrhoea in treatment households and a lower willingness to report diarrhoea, perhaps due to social desirability effects from the SanNut program. SanNut thus presents an opportunity to improve sanitation and nutrition outcomes in communities where CLTS is being implemented.

At the same time, there is no evidence that SanNut crowded out improvements in sanitation outcomes targeted by CLTS programming. As such, while it is encouraging that the SanNut intervention does not have any deleterious effects on CLTS, SanNut does not replace the need for a strong focus within CLTS on sustained behaviour change of sanitation practices.

SanNut improved knowledge about breastfeeding, notably early initiation, though this did not translate to self-reported improved practice (exclusive breastfeeding or complementary feeding). Since SanNut incorporates only a limited set of nutrition messages, it should work in complement with other nutrition interventions that address a wider set of nutrition outcomes for the overall health of the community.

Overall, the SanNut program demonstrated a successful approach to integrating nutrition messaging with existing sanitation programming. Future research and programming should explore whether short-term increases in sanitation and nutrition knowledge and practices translate into sustained improvements in key nutrition outcomes.

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Notes

[1] Pamoja Tujikinge Magonjwa Integrated Program (a county-wide program in Kitui focusing on community action for health with an emphasis on preventive and promotive health initiatives).

[2] Treatment assignment was not fully adhered to during implementation in 8 (~3%) of control villages that were treated accidentally. We adjust for this non-compliance by instrumenting actual treatment with assigned treatment.

[3] SanNut study ID: AEARCTR-0002019 (link).

[4] All point-estimates come from an IV regression that instruments actual treatment with assigned treatment status (see Note 2) and includes stratification dummies and household demographics as controls.

[5] P-values are calculated from cluster-robust standard errors.

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