DECREASE IN DIARRHEAL ILLNESS CONSULTATIONS AFTER INTRODUCTION OF A PORTABLE WATER TREATMENT SYSTEM IN MAAT, SOUTH SUDAN: A RETROSPECTIVE ANALYSIS

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BACKGROUND AND OBJECTIVES

Maat is a payam located along the Nile and South Canal river, in Pigi county of Jonglei state in South Sudan (**Figure 1**); it has a varying **population of 6200 to 12850**, depending on environmental and socioeconomic factors. Access to clean water and sanitation in the region is very limited.
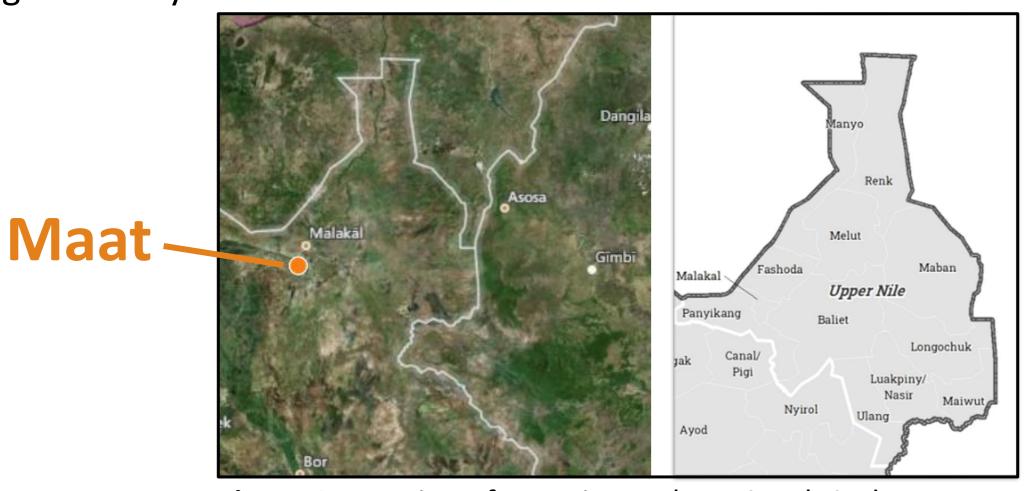

Figure 1: Location of Maat in northern South Sudan

The **goal was to potentially reduce cases of diarrhoea seen in MSF´s community-based clinic.** We aimed to determine if new cases of diarrhoeal illness decreased after the installation of the PAUL water filter, as compared to the period before.

The **Portable Aqua Unit for Lifesaving (PAUL) water filter** was installed by MSF in Maat town in November 2022, along with a solar-powered pumping system and small community water tap stands, to provide clean drinking water (see **Images 1** and **2**).
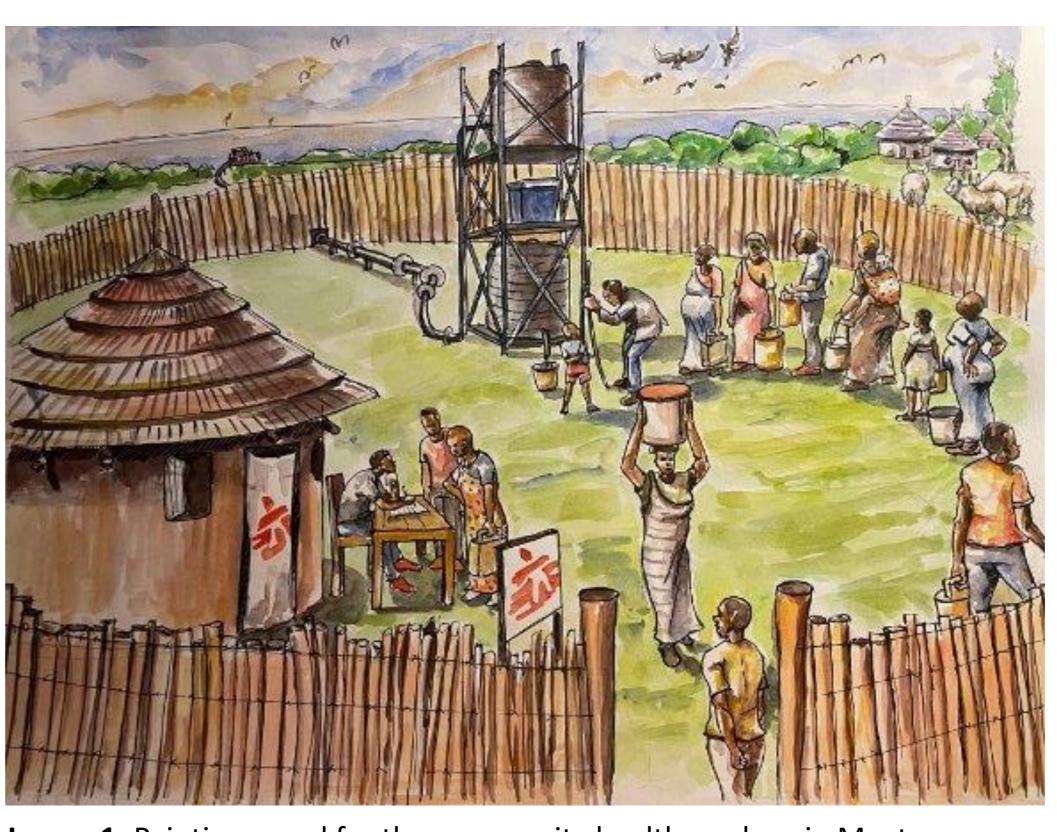

Image 1: Paintings used for the community health workers in Maat

Image 2: Solar and PAUL filter set-up in Maat

METHODS

A baseline survey was carried out by the Health Promotion team to assess water and sanitation access and quality in 97 households (**Image 3**). Routinely collected data on the number of consultations for bloody and non-bloody diarrhoea registered by MSF's Health Management Information System in the Maat clinic were retrospectively analysed by month. Data were compared from before (December 2021 to October 2022) and after (December 2022 to October 2023) installation of the filter. Population estimates from MSF's Water and Sanitation and Health Promotion teams for before and after filter installation were used to calculate disease-specific incidence and incidence rate ratios (IRR) for the periods before and after installation.

Baseline Survey Results (97 households (HH) visited)

Image 3: Health Promotion team conducting the survey

Water access & quality
- The river is the only source of water
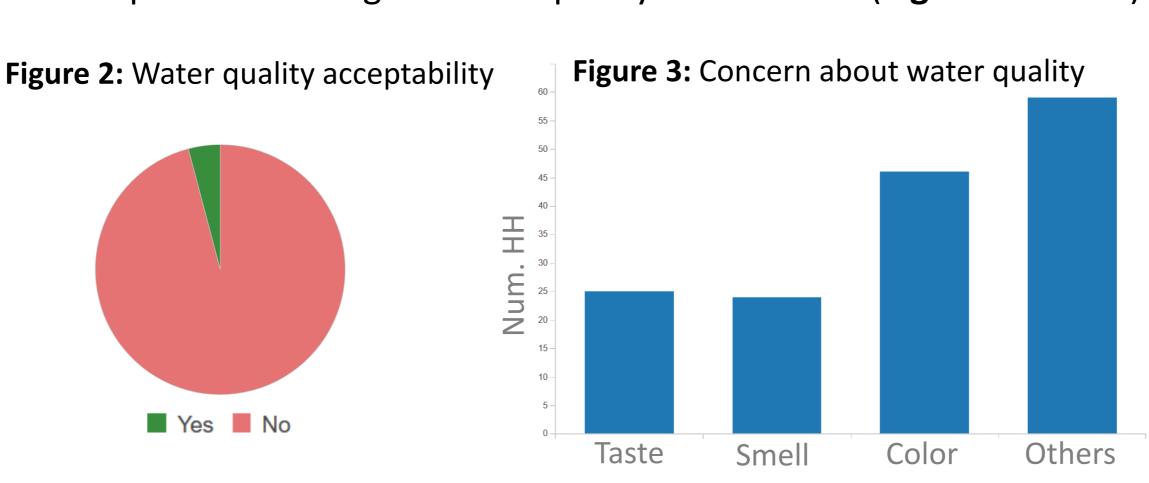- People acknowledge the low quality of the water (**Figures 2** and **3**)

Figure 2: Water quality acceptability

Figure 3: Concern about water quality

Figure 4: Soap available in the HH

Soap available in the household

Figure 5: Hygiene conditions of the water containers

Bad - Dirty with algae, no lid, partly broken
Very bad - Dirty with algae, open container, partly broken
Medium - Dirty but no algae, no lid, not broken
Good - No algae and clean, lid, not broken

Hygiene & Sanitation
- No soap available (**Figure 4**)
- Most containers are not clean (**Figure 5**)
- Only 9 % of the population have access to a latrine
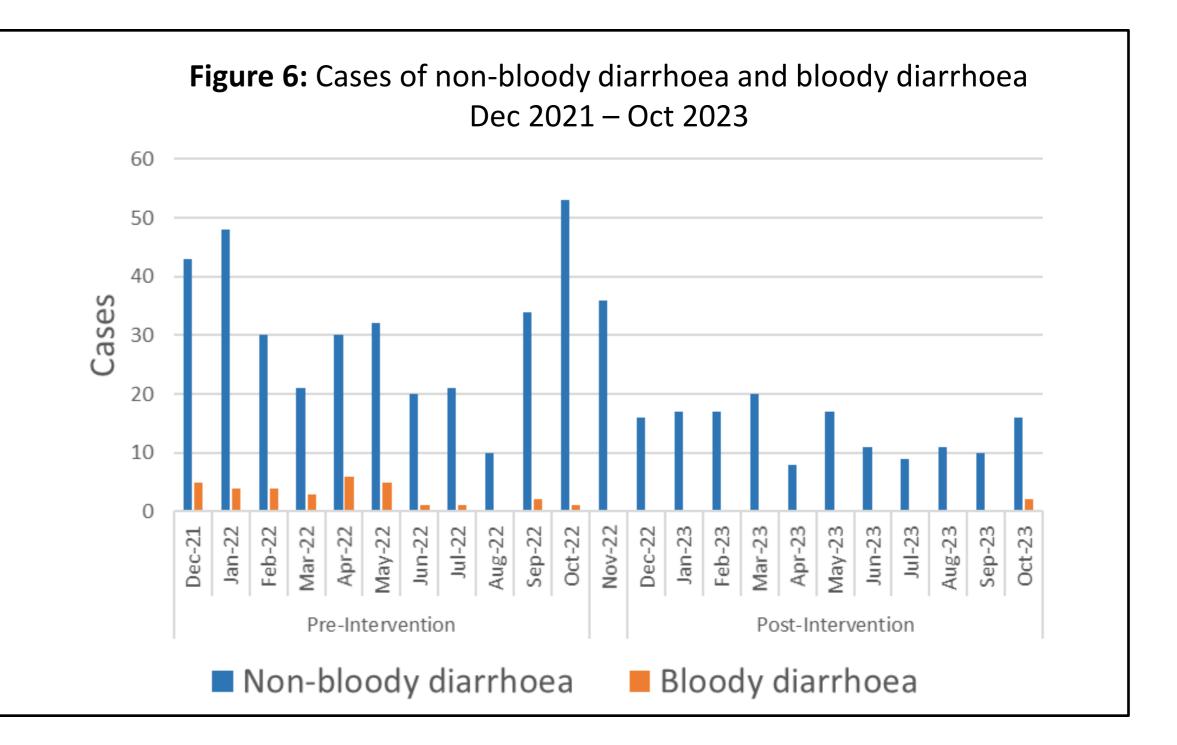
RESULTS

We found a great acceptance by the population of the filtered water, and a decrease in incidence of both bloody and non-bloody diarrhoea after filter installation. For all cases of diarrhoea, cases decreased from 374 to 154, an IRR of 0.85 (0.71-1.03 95% CI), or a decrease in incidence of all cases of diarrhoea of 15% (**Table 1** and **Figure 6**).

Table 1: Pre- vs post-intervention incidence of bloody and non-bloody diarrhoea

	Pre-intervention (Dec 2021 - Oct 2022) Population = 12850		Post-intervention (Dec 2022 - Oct 2023) Population = 6200		Incidence Rate Ratio with 95% CI
	Num cases	Incidence Rate	Num cases	Incidence Rate	
All cases of diarrhea	374	29.1/1000	154	24.8/1000	**0.85** (0.71 - 1.03)
Non-bloody diarrhoea	342	26.6/1000	152	24.5/1000	**0.92** (0.76 - 1.11)
Bloody diarrhea	32	2.5/1000	2	0.3/1000	**0.14** (0.02 - 0.46)

Non-bloody diarrhoea cases decreased from 342 to 152 after installation, IRR 0.92 (0.76-1.11 95% CI), decrease in incidence of 8.0%.

Bloody diarrhoea cases decreased from 32 cases before the filter to two cases after installation, IRR 0.14 (0.02-0.46 95% CI), decrease in incidence of 86%.

Figure 6: Cases of non-bloody diarrhoea and bloody diarrhoea Dec 2021 – Oct 2023

■ Non-bloody diarrhoea ■ Bloody diarrhoea

CONCLUSION

Our findings suggest that installation of the PAUL water distribution system may have impacted the incidence of diarrhoeal illnesses in Maat, particularly for cases of bloody diarrhoea.

LIMITATIONS

There are multiple limitations in the study.
- Maat is in a **remote area** presenting accessibility challenges for MSF teams.
- **Medical data records**, and maintenance of water systems relies on **community health workers**.
- **Lack of population census**, and unstable population (nomadism, conflict, and climate variability)
- **No follow-up survey** has yet been possible, thus difficult to relate the decrease in diarrhoeal illnesses to the clean water availability, changes in population composition, increased knowledge about prevention practices, uptake of positive hygiene practices, etc.

ACKNOWLEDGEMENTS

ETHICS STATEMENT

This study fulfils the exemption criteria set by the MSF ERB and was approved for submission by the OCBA Medical Director.