



PLANET WATER FOUNDATION

Building Healthy Communities through Clean Water and Hygiene Education Programs



AN IMPACT EVALUATION REPORT



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FOREWORD

Planet Water Foundation's interventions are having a substantial, positive impact on the health and well-being of children. In a longitudinal impact evaluation study conducted by researchers at the University of Nebraska Medical Center (College of Public Health) and BAIF Research Foundation (India), the following results were determined when assessing the impact of Planet Water's AquaTower and Hygiene Education program one year after implementation:

80%

Decrease in total number of diarrheal episodes among children from participating schools

Health Outcomes

School children benefiting from Planet Water's interventions experienced an 80% decrease in total number of diarrheal episodes versus a 27% increase (5.6 times more total episodes) among children in schools not participating in Planet Water's program.

Healthy Hygiene Knowledge and Practices

School children benefiting from Planet Water's interventions demonstrated a 17% higher average score in overall knowledge, practices, and attitudes regarding proper hygiene practices (i.e. hand washing) versus children in schools not participating in Planet Water's program.

Academic Achievement

With student math grades used as an indicator for academic performance, 58% of non-residential school students benefiting from Planet Water's interventions achieved a grade A during their second semester versus 37% for students not participating in Planet Water's program.



REPORT OVERVIEW

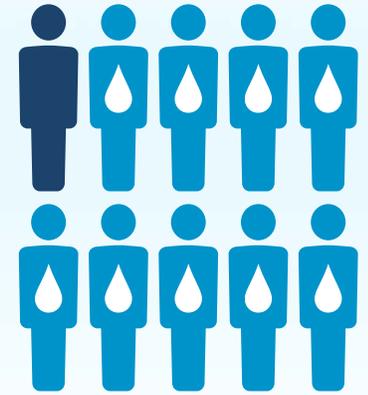
Planet Water Foundation commissioned an independent impact evaluation study in partnership with the University of Nebraska Medical Center (UNMC) in late 2013 through early 2014. This in-depth study evaluated knowledge, behavior, health, and educational outcomes associated with clean water access and hygiene education

among children from communities with Planet Water interventions as compared to those without. The goal of this study was to gain a better understanding of the impact of Planet Water's clean water access and hygiene education programs in the communities where the organization focuses its work.

BACKGROUND AND SIGNIFICANCE

748 Million

Without Access to Clean Water



Access to safe, clean drinking water remains a pressing issue globally with 748 million, or roughly one in ten people, lacking access to clean water.¹ In many areas of the world, including communities in the Asia Pacific region and Latin America where Planet Water focuses its work, the percentage of those lacking access to potable water is much greater.

By improving access to water, sanitation, and hygiene (WASH), the World Health Organization (WHO) estimates that it could prevent at least 9.1% of the global burden of disease and 6.3% of all deaths.² Prior studies, for example, show that appropriate soap supplies and repeated hand washing instructions helped to control a *Shigella* outbreak in children³ while other studies demonstrate that interventions using a combination of water treatment, hygiene practices, and education showed a decrease in the median percentage of students with acute respiratory illness.⁴

Meanwhile, approximately 75% of all school absences can be attributed to illness,^{5,6,7} having a negative impact on academic performance.^{8,9,10,11,12} WASH interventions have shown significant reductions in school absenteeism, while other findings indicate that school-based water and hygiene interventions may have a positive influence on educational outcomes.^{14,15,16,17}



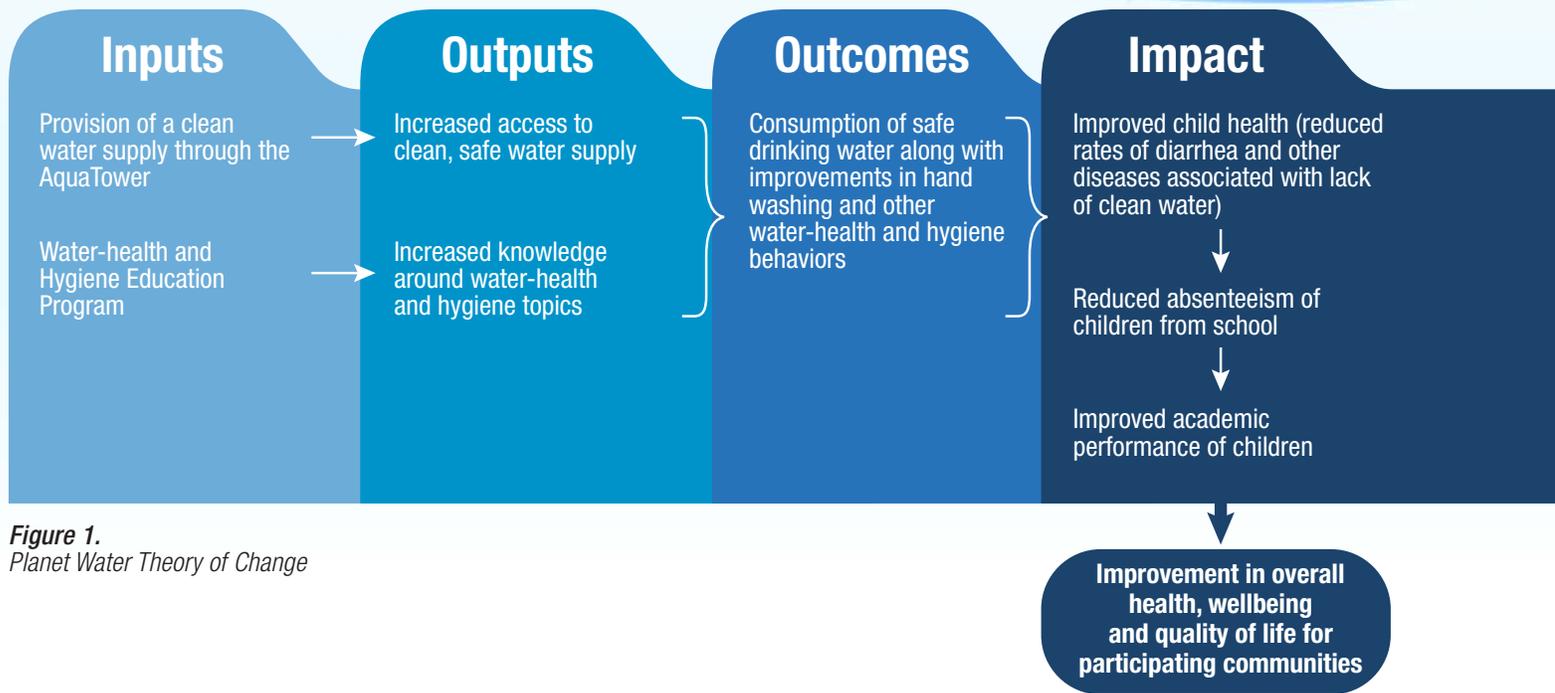


Figure 1.
Planet Water Theory of Change

PLANET WATER FOUNDATION APPROACH

To address the pressing global need for improved access to clean water and hygiene education, Planet Water implements a multifaceted program that aims to improve outcomes related to child health, education, and overall quality of life (Figure 1). As indicated above, there is strong evidence to suggest that change in access to safe water and hygiene behaviors can have a multidimensional impact on child development and community wellbeing.

Planet Water implements a school-based program aimed to improve health outcomes in children by providing access to safe drinking water, hand washing facilities, and water-health and hygiene education.

Safe water is provided through the Planet Water AquaTower, which utilizes ultra-filtration technology to remove bacteria, protozoa, viruses, pathogens and other contaminants producing clean drinking water for the community. The water is dispensed at nine faucets positioned around the AquaTower providing easy access points for drinking water and hand washing. Upon deployment of each project, Planet Water provides extensive training on maintenance procedures to school custodians as well as on-going sustainability support to ensure proper functioning of the system.

As an essential complement to providing clean water access, Planet Water's Water-Health & Hygiene education program teaches children the important aspects of hand washing and protecting against germs through a child-friendly, activity-based program incorporating games, drama, song, and dance. While the AquaTower is being deployed at a school, an additional Planet Water team goes into the classroom to implement a training session for teachers regarding the education program.

This training provides a comprehensive explanation and demonstration of the four program modules, their accompanying activities, and how to implement the program in the classroom. Each side of the AquaTower has a banner above the faucets depicting the same content from the education program materials, thus reinforcing the same key messages taught in the classroom at the point of use.



The program's education modules focus on:

- The importance of clean water
- How to your wash hands
- When to wash hands
- More ways to protect against germs

Planet Water has carefully designed its AquaTower and hygiene education program to intervene at multiple societal levels, including environmental, community, and individual focused activities, to ensure effective and sustainable change over time.

Environmental Level

Creating access to safe, clean water through the deployment of the AquaTower water filtration system

Community Level

Empowering communities and schools to play an active role in clean water and hygiene issues

Individual Level

Influencing awareness, knowledge, and behavior change through hygiene education programs

Figure 2. Planet Water Multilevel Intervention Model



STUDY OBJECTIVE

The objective of this study was to evaluate the impact of Planet Water Foundation's interventions focused on improving access to clean water and hygiene education, and the effect on decreasing diarrheal episodes and improving learning performance for children. The study aimed to assess the outcomes achieved related to changes in knowledge, attitudes, and practices, as well as the impact on health and educational achievement.

METHODOLOGY

The study followed a randomized control clinical trial design (Figure 3). The research team collected data from 12 schools in Pune and Thane Districts in the State of Maharashtra, India. Of these schools, six had been recipients of Planet Water's intervention and the other six, who were not part of the Planet Water program, were designated as control schools. This allowed for a comparison in outcomes between schools that received the intervention as compared to those that did not. The study also looked at residential versus non-residential schools to assess the degree of impact between these two subgroups. Because the schools where Planet Water works are predominantly non-residential, many of the results discussed in this report focus on this subgroup.

The researchers collected data from participating schools at the beginning of the academic year and followed these sites over the next four months. The Planet Water program had been deployed in the intervention schools an average of one year prior to initial data collection. Beginning the study at the start of the school year recreated the effect of introducing clean water to the school, since the children did not have access to the AquaTower during their summer break but did once the school year resumed. Meanwhile, change in knowledge, practices, and attitudes began upon the implementation of the intervention

and these outcomes are therefore analyzed in terms of the maintenance of change one year following project deployment by comparing children from schools that participated in Planet Water's program as compared to those that did not.

The researchers randomly selected schools and matched intervention and control sites based on various attributes. This technique ensures that the two groups are as similar as possible, with the exception of participating in the Planet Water program, so as to determine the outcomes that can be attributed to the intervention.



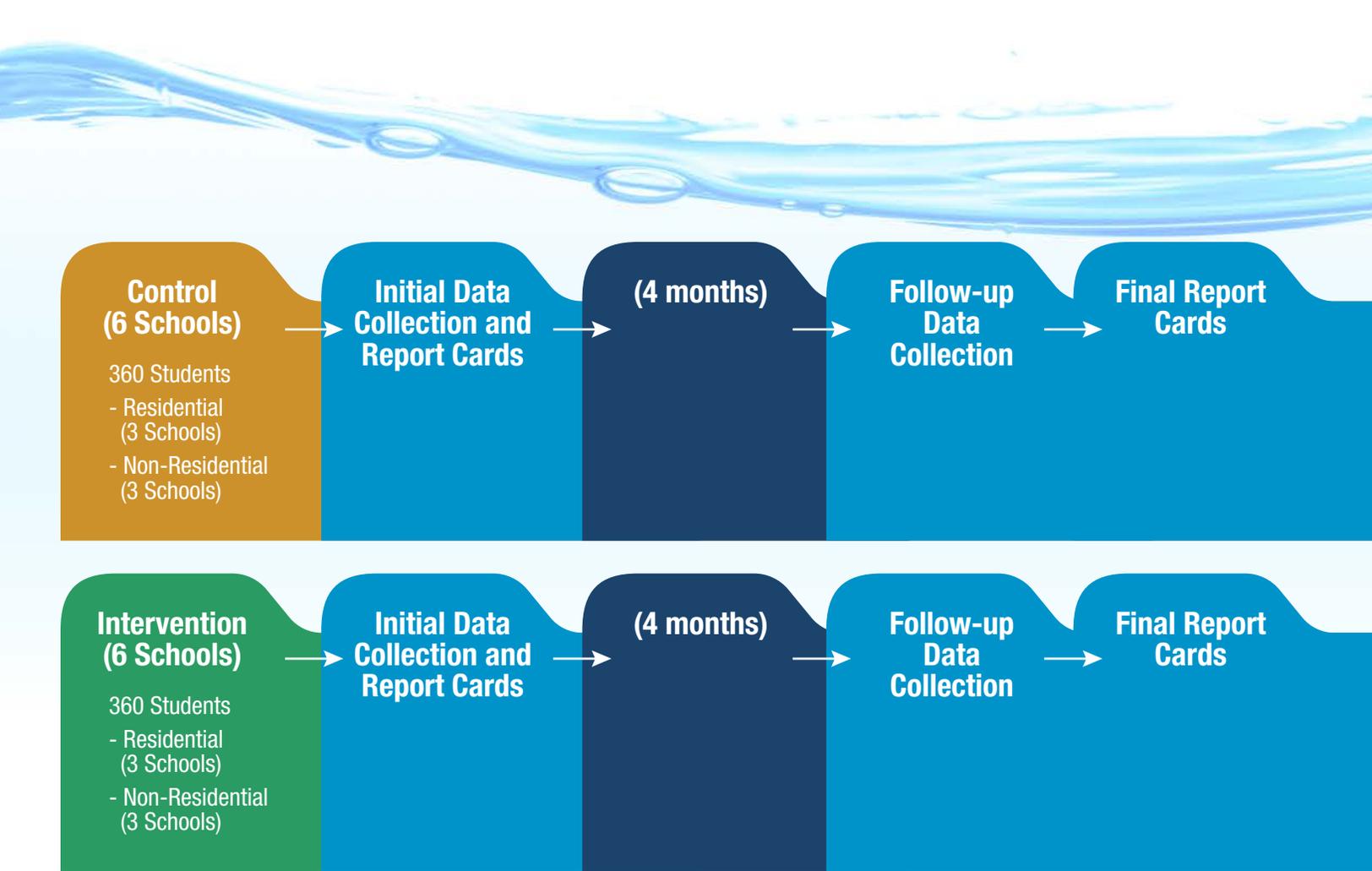


Figure 3. Study Design

The research team surveyed children regarding:

- Knowledge of water-health and hygiene topics
- Attitudes and practices of related behaviors
- Number of diarrheal episodes in the past two weeks, to assess impact on health outcomes
- Math grades, as a measure for academic performance, were collected from report cards at the end of the first and second semesters^a

^a **Statistical Methods:** Prior to testing the study hypotheses, descriptive statistics were computed for all variables to ensure data quality while data were examined for factors that could potentially confound or interact with the findings. All statistical testing was held at the alpha level 0.05, where the probability of a false positive test is 5%. The null hypothesis, that the intervention and control groups were the same, was rejected and the study hypotheses were said to be true, if the p-value was less than the alpha level. Therefore, statistically significant results were observed if a p-value was less than 5%, formally transcribed as $p < 0.05$. All analyses were conducted using SAS/STAT® software for Windows version 9.2 or higher.



PARTICIPANT DEMOGRAPHICS

The study includes data collected from 720 children between the ages of six and 12 years old, of which 360 benefited from Planet Water's interventions and 360 did not. Slightly more than half of participating children were males with an almost equal number of males and females in both the intervention and control groups. The majority of the children were nine years old with a similar amount of students in both groups enrolled in second, third, and

fourth grades. Among children from Planet Water intervention schools, 86% reported that they previously received water and hygiene education as compared with 61% of children from schools who did not participate in the program.^b

^b There was a significant difference between the control and intervention group ($p < 0.001$).

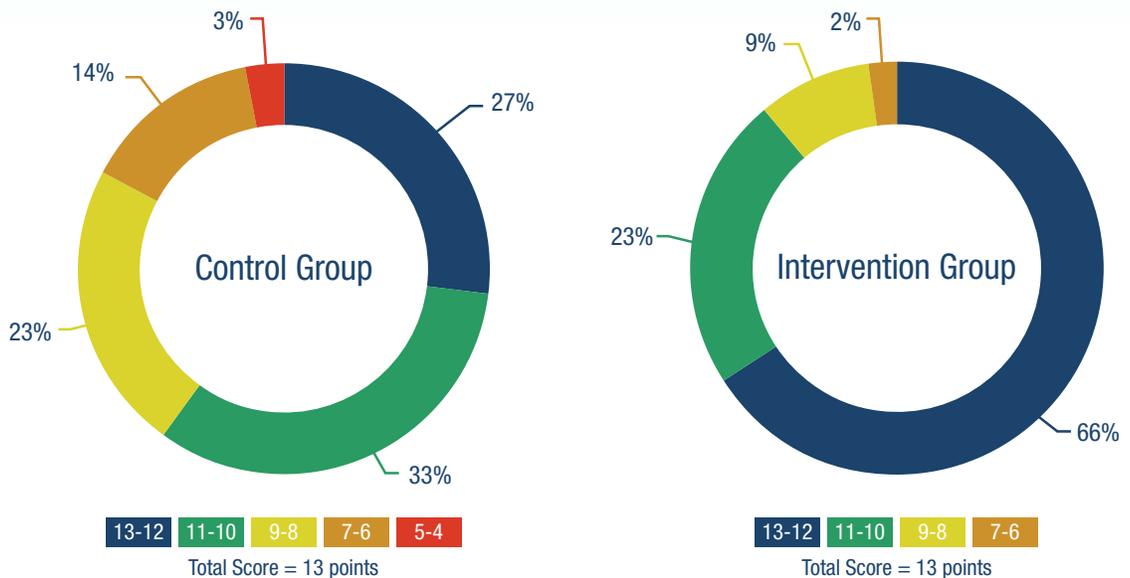
KEY OUTCOMES AND FINDINGS

1. Knowledge

Total Knowledge Score

School children benefiting from Planet Water’s interventions demonstrated a 17% higher average score in overall knowledge regarding water-health and hygiene topics versus children in schools who did not participate in Planet Water’s program.^c There were 2.4 times more children who scored 90% or better in overall knowledge among the children who participated in Planet Water’s program as compared with those from schools that did not receive the intervention (Figure 4).

Figure 4.
Knowledge Score
among the control and
intervention groups



A similar trend was observed when looking specifically at non-residential schools, with 1.9 times more children scoring above 90% in the group benefiting from the program as compared to those who did not participate.

^c The mean knowledge score was *significantly greater* among the intervention group ($p < 0.001$).

Individual Knowledge Items

Meanwhile, when looking at the individual questions asked related to knowledge, a higher percentage of children from the intervention schools responded correctly to all items directly addressed in the Planet Water education program (Table 1). For example, when asked whether one should wash their hands after using the toilet, 97% of children from schools that participated in Planet Water’s program responded correctly to this statement, 19% higher than children from schools who were not part of the intervention. Similarly, at least 25% more children from the intervention schools responded correctly when asked regarding hand washing after playing outside, handling trash, and coughing or sneezing.



Table 1. Percent Difference in Percent of Correct Knowledge between Intervention and Control

Children WASH Knowledge			
Knowledge Item	Control (%)	Intervention (%)	Difference (%)
One should was their hands:			
After toilet	78	97	19 *
Before meals	94	100	6 *
After playing outside	70	96	26 *
After handling trash	59	84	25 *
After coughing or sneezing	23	56	33 *
Eating with unwashed hands makes you sick	83	92	9 *
Drinking water that is untreated (i.e. not boiled or not filtered) can make you sick	64	81	17 *

Correct responses include “Yes”, and incorrect responses were “No” and “I don’t know.”

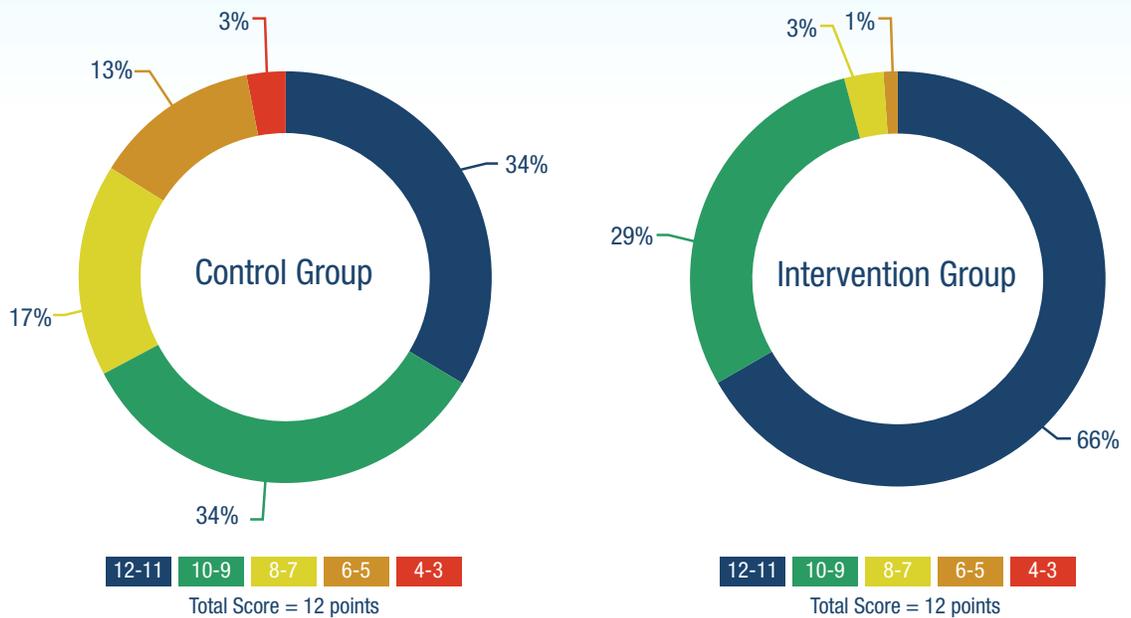
*Knowledge items found to be significantly greater among the intervention group ($p < 0.001$).

2. Practices and Attitudes

Total Practice and Attitude Score

School children benefiting from Planet Water’s interventions also demonstrated a 17% higher average score in overall practices and attitudes regarding water-health and hygiene versus children in schools not participating in Planet Water’s program. There were 2.0 times more children who scored 90% or better regarding overall practices and attitudes among the children from Planet Water intervention schools as compared with those from schools that did not participate (Figure 5).

Figure 5.
Practice and Attitude Score among the control and intervention groups



A similar trend was observed when looking specifically at non-residential schools, with 1.9 times more children scoring above 90% in the intervention as compared with children from schools that did not participate.



Individual Practice and Attitude Items

Schools participating in Planet Water's program also had a higher percentage of children who responded correctly to the individual practice and attitude questions, as compared to children from schools where the intervention was not implemented (Table 2). For example, 92% of children from intervention schools responded that they wash their hands with soap always or daily as compared with 77% in schools that did not participate in Planet Water's program, a difference of 15%. Meanwhile, 19% more children from intervention schools reported that washing their hands helps to prevent the spread of germs.

Similarly, children from schools that participated in the Planet Water program had significantly higher rates of proper hand washing practices across all the critical times for hand washing that are highlighted in the Planet Water education program. The percent of children who responded that they wash their hands before meals was high across both groups, suggesting that this may be a behavior that is already taught in the community. However, children from schools that did not receive the intervention had much lower proper hand washing practices for all other items, highlighting the need for WASH education, especially on these topics.

Table 2. *Percent Difference in Proportion of Correct Practices and Attitudes*

Children WASH Practices and Attitudes				
Practice Items	Control (%)	Intervention (%)	Difference (%)	
I use soap to wash my hands	77	92	15	*
I wash hands:				
Before meals	93	99	6	*
After going to the latrine/toilet	79	97	18	*
After touching/collecting trash	66	89	23	*
After urinating or defecating	78	91	13	*
After sneezing or touching my nose	19	50	31	*
After playing outdoors	74	91	17	*
Attitude Items				
Washing my hands helps to prevent the spread of germs	70	89	19	*
When washing my hands it is important to use soap	95	99	4	*
It is ok to wash my hands with dirty water as long as I use soap	87	88	1	

Proper practices response choice included “Always/Daily” and improper practices were “Sometimes” and “Not at all”.

*WASH Practice and Attitude items found to be significantly greater among the intervention group ($p < 0.001$).

3. Health Outcomes

Between the beginning of the school year and the four month follow-up, there was a 27% increase (from 84 to 107 episodes) in the total number of diarrheal episodes among children from schools who did not participate in the Planet Water program, as compared to an 80% decrease (from 97 to 19 episodes) in the children from schools that did receive the intervention. This difference was equivalent to 5.6 times more total episodes of diarrhea reported in the last two weeks among children from schools who did not participate in the Planet Water program, compared with children from schools that benefited from the Planet Water program.

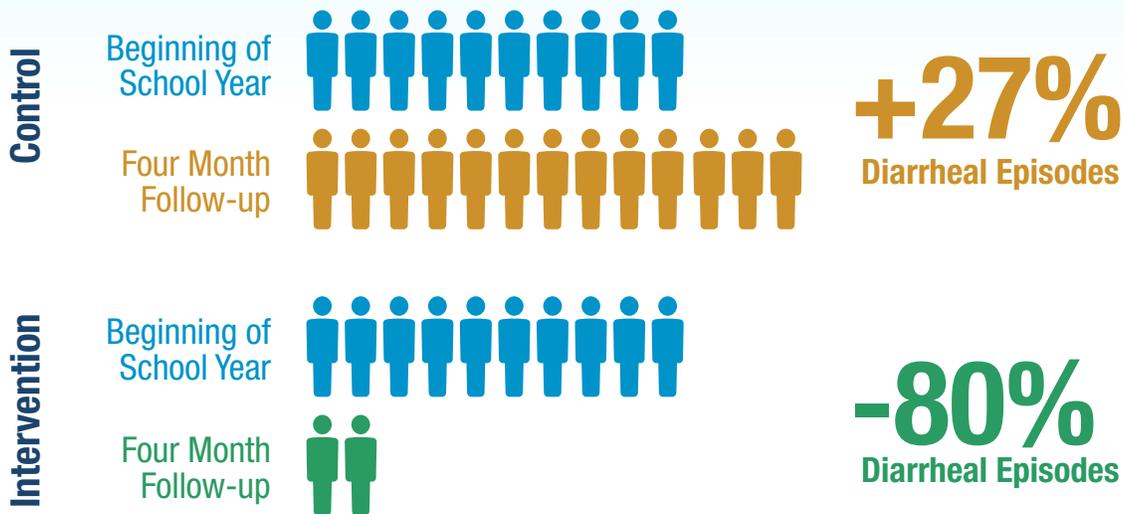


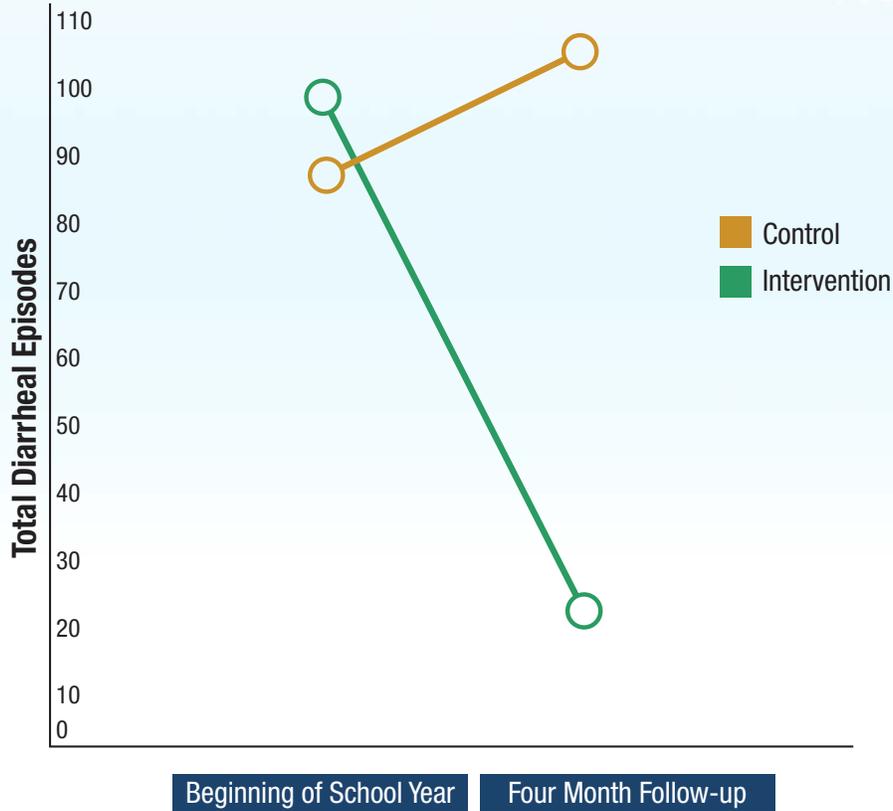
Figure 6.
Total number of diarrheal episodes at the Beginning of the School Year and Follow-up

Similarly, when surveyed at the beginning of the study, children from Planet Water intervention schools had a similar average number of diarrheal episodes in the past two weeks as compared with the children who did not participate in the program.^d However, when surveyed four months later, the children not exposed to the intervention had a significantly higher average of diarrheal episodes in the past two weeks, 0.32 (range of 0 to 8 episodes), as compared with children from intervention schools, who averaged 0.05 episodes (range of 0 to 3 episodes).^e

^d There was *not* a significant difference mean diarrheal episodes between the control and intervention groups ($p=0.576$)

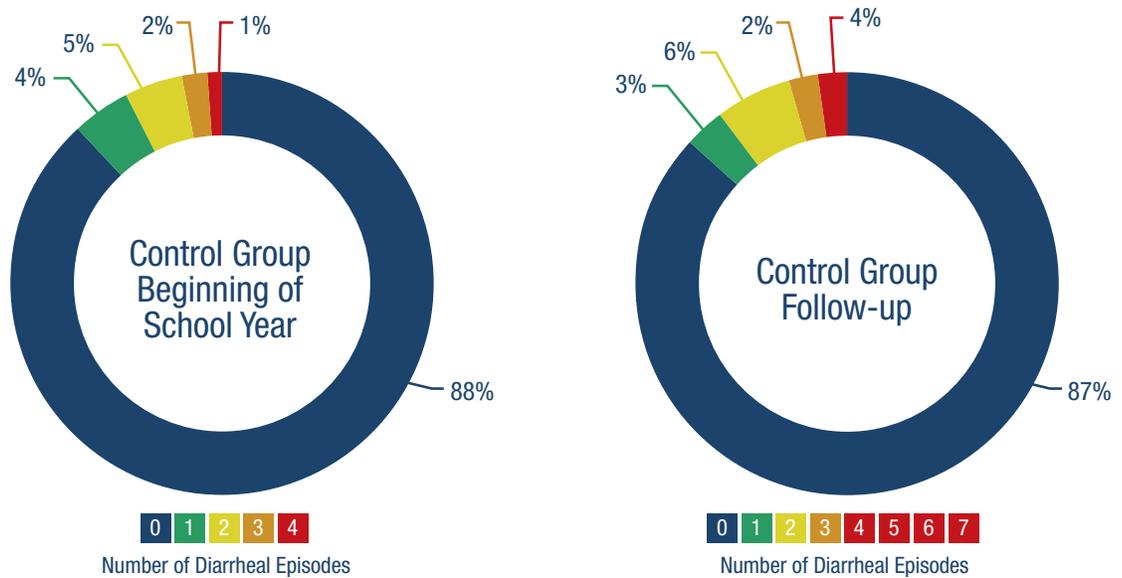
^e There was a *significant difference* mean diarrheal episodes between the control and intervention groups ($p<0.001$)

Figure 7.
 Percent Distribution of children reporting diarrheal episodes in the last two weeks between the control and intervention groups at the beginning of the school year and follow-up



It is also important to look at the percent of children who reported no episodes of diarrhea. Four months into the school year, 97.8% of children from intervention schools, as compared with 86.9% of children from schools that did not participate in the program reported that they had no cases of diarrhea over the previous two weeks. Similar trends were observed when looking at non-residential schools.

Figure 8.
 Percent Distribution of children reporting diarrheal episodes in the last two week in the control group at the beginning of school year and follow-up



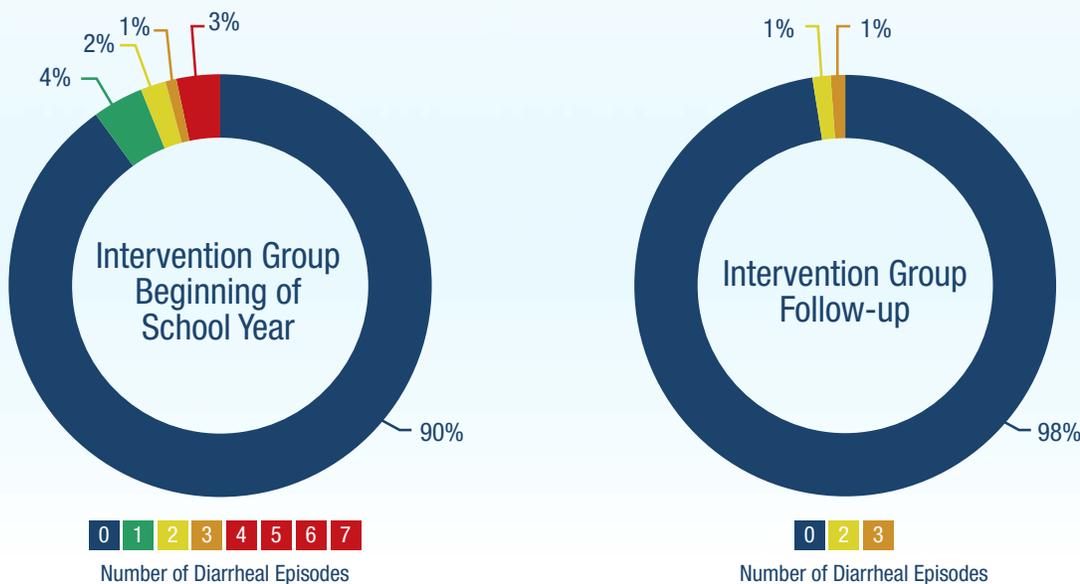


Figure 9. Percent Distribution of children reporting diarrheal episodes in the last two week in the intervention group at the beginning of school year and follow-up

4. Academic Performance

Mathematical problem solving skills provide a foundation on which more complex skills are built, and are crucial for academic and professional success.^{18,19,20,21,22} Incorporating measures of cognitive function can provide insight into better understanding how brain mechanisms that support efficient learning respond to interventions, such as the Planet Water program.²³ In this study, we use first and second semester math grades as outcomes for cognitive function and academic performance.

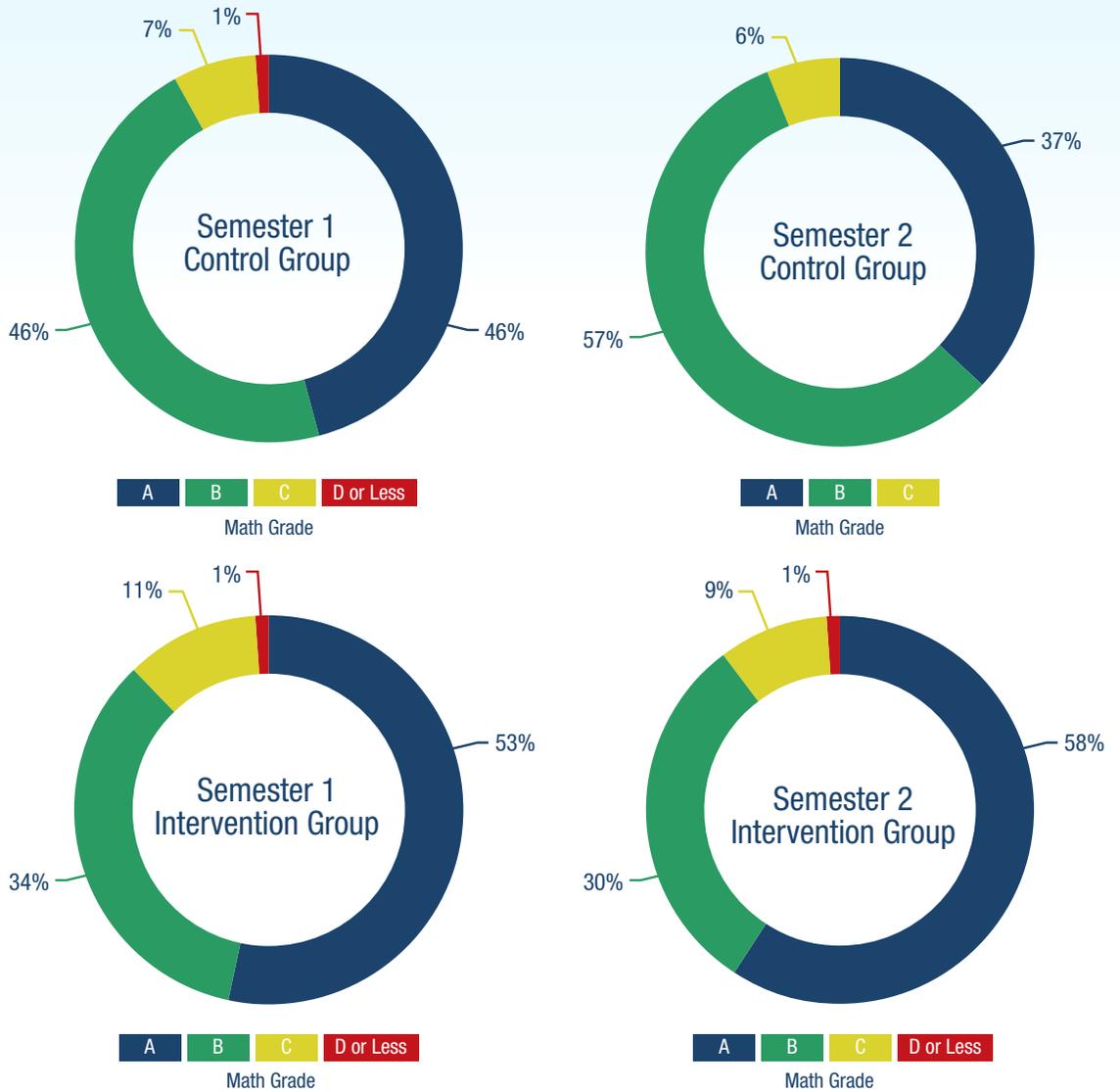
First semester math grades were significantly different between children from schools with the Planet Water intervention, as compared to those without, with the biggest differences found in B and C grades.^f While the percentage of A grades was similar, children from intervention schools had a higher percentage of B grades in math than the schools without the Planet Water program (60% vs. 47%). Meanwhile, children from schools who did not receive the intervention had a higher percentage of C grades than children from intervention schools (15% vs. 7%). Second semester grades had a similar distribution in both groups and no significant differences were observed.^g

f There was a *significant difference* in semester 1 grades among the intervention and control groups ($p < 0.001$).

g There was *not* a significant difference in semester 2 grades among the intervention and control groups ($p = 0.099$).

Looking specifically at non-residential schools indicated the greatest impacts on academic outcomes. While there were slight differences in first semester grades, 58% of non-residential school students benefiting from Planet Water’s interventions achieved an A grade during their second semester versus 37% of students from schools not participating in Planet Water’s program.

Figure 10.
Semester 1 and 2 Math Grades for Control and Intervention Groups among Non-Residential Schools



Strengths and Limitations of the Study

The timing of data collection in relation to the deployment of the Planet Water intervention is one limitation of the study, especially for capturing longitudinal change in knowledge, practices, and attitudes. Because the education program was first implemented an average of one year prior to data collection, initial change in knowledge, practices, and attitudes would have already occurred during the first months from deployment. The rigorous randomized control trial design allows for meaningful analysis of differences between intervention and control groups. As such, a unique strength of the study is that it captures the longer-term knowledge and behavior outcomes of Planet Water's interventions and the maintenance of this change at a year following implementation of the program.



Initiating the study at the beginning of the school year helped to counter this limitation for health outcomes. The study started following the school vacation period during which students were not able to access the AquaTower, recreating a comparison between the absence (summer vacation) and presence (start of school) of access to clean water from the AquaTower.

The evidence-based framework that was utilized in developing the study and the consideration of multiple factors that influence WASH related outcomes among children are additional strengths of the study. As is common in similar studies, data may be subject to over or underreporting and social desirability bias, where participants may answer questions in a way they perceive is favorable to others.²⁴ In anticipation of this possibility, the research team was given extensive training on data collection methods and strategies for ensuring data quality.

CONCLUSION

Planet Water Foundation conducted an impact evaluation study in partnership with the University of Nebraska Medical Center (UNMC) to evaluate knowledge, behavior, health, and educational outcomes associated with clean water access and hygiene education among children from communities with Planet Water interventions as compared to those without.

The results of this evaluation indicate that the Planet Water program is having a substantial, positive impact on improving WASH outcomes for children at participating schools. Children from Planet Water intervention schools had significantly higher total knowledge, practice, and attitude scores as well as a higher percentage of correct responses across almost all individual questions. The intervention group also experienced substantially improved health outcomes four

months into the school year, both in terms of the number of children affected by diarrhea as well as the intensity of cases. Meanwhile, non-residential schools that benefited from Planet Water's program demonstrated higher levels of academic achievement.

After stratifying by school residential status, several analyses suggest that the Planet Water program has a greater impact in non-residential schools as compared with residential schools. Although the majority of Planet Water projects are currently deployed in non-residential schools, this finding is informative to guide future programming and site selection to ensure that Planet Water continues to focus its work in areas where the interventions are proven to have the greatest impact.

While the results indicate an overall positive impact from the interventions, the study helps illuminate areas of existing need in the target communities as well as topics that could use additional reinforcement over time. These findings are useful for informing future trainings and designing additional interventions to further impact communities where Planet Water has a presence. This study is also useful in guiding the development of future evaluations. Further investigation is needed to assess in greater depth the impact of the interventions in non-residential schools and to evaluate the longitudinal changes that occur as a result of the Planet Water program, beginning with data collection at the time of project deployment with subsequent follow-up over time.



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