

Maji Safi Group

2018 Health Screening Report

Executive Summary

Maji Safi Group (MSG) provides comprehensive water, sanitation, and hygiene (WASH) education and programming to rural, underserved individuals and families in Shirati, Tanzania. MSG's model for promoting community-driven water, sanitation and hygiene (WASH) education and disease prevention focuses on behavioral change; however, measuring such changes in the community is a challenge. In 2018, Maji Safi Group conducted its fourth annual health screening campaign to test and treat MSG's current and potential program participants for schistosomiasis, amoebiasis, intestinal worms, and malaria. The purpose of the health screening campaign is to alleviate the burden of the diseases, while also gathering data to establish a longitudinal study on disease prevalence rates in the Rorya District. Since 2015, MSG has been able to provide this health screening service to 18,202 community members in the Rorya District.

This year, MSG tested 6,911 community members – some had received no MSG education, others were current or past program participants. This was MSG's largest health screening initiative to date. For the fourth year in a row, disease rates showed that MSG program participants, who have been exposed to MSG's education, have lower disease rates for schistosomiasis, amoebiasis, and intestinal worms than non-program participants with no exposure to MSG programs.

Background Information on WASH Diseases

Waterborne and water-related diseases can be transmitted through four different transmission routes (Choffnes & Mack, 2009). These four transmission routes are classified as waterborne, water-washed, water-based, and water-related insect vectors (Choffnes & Mack, 2009). Waterborne disease transmission occurs through ingestion of water that contains disease pathogens (Choffnes & Mack, 2009). The water-washed transmission route is through improper hygiene that results in oral contact with feces on hands or body (Choffnes & Mack, 2009). Skin contact with unsanitary water that contains aquatic hosts carrying pathogens is a water-based transmission path. Lastly, transmission through water-related insect vectors involves being bitten by an insect that breeds and lives near water (Choffnes & Mack, 2009, p. 16). The diseases that were tested during the health screening were schistosomiasis, amoebiasis, intestinal worms, and malaria.

Schistosomiasis

Schistosomiasis is a water-based parasitic disease that is transmitted through skin contact with freshwater snails that hold the eggs of the *Schistosoma* worm (Madinga, Linsuke, Mpabanzi, Meurs, Kanobana, Speybroeck, Lutumba, & Polman, 2015). This Neglected Topical Disease (NTD) is common in tropical and sub-tropical regions that have a high predominance of unsanitary conditions and unsafe water sources (Madinga et al., 2015). These unsanitary conditions are typically caused by the open defecation and urination of infected individuals into water sources in the region (Madinga et al., 2015). While there are five types of schistosomiasis (CDC, 2012), the two that are most common are *S. mansoni* and *S. haematobium* (Madinga et al., 2015). *S. mansoni* eggs are excreted and diagnosed by examining fecal samples, while *S. haematobium* eggs are excreted and diagnosed through urine samples (CDC, 2012). Individuals infected with schistosomiasis can experience acute symptoms such as rashes, blood in urine or stool, headaches, and diarrhea (CDC, 2012). Without treatment, schistosomiasis can also result in anemia (Friedman J.F., Kanzaria, H.K., &

McGarvey, S.T., 2005), cognitive delays (Jukes, Nokes, Alcock, Lambo, Kihamia, Ngorosho, Mbise, Lorri, Yona, Mwanri, Baddeley, Hall, Bundy & Partnership for Child Development, 2002), and stunting (Stephenson, Latham, & Ottesen, 2000).

Amoebiasis

Amoebiasis is classified as a water-washed disease caused by the parasite *Entamoeba histolytica* (Stanley, 2003). Amoebiasis is common in underdeveloped countries located in the tropics that have poor sanitation and hygiene practices (“Amoebiasis”, 2015). The disease is spread by ingesting fecal matter in food or water or from person-to-person (“Amoebiasis”, 2015). Many individuals with amoebiasis do not experience any symptoms of the disease, and their bodies are able to resolve the illness (Stanley, 2003). However, 10%-20% of infected individuals (“General Information”, 2015) develop symptoms, including watery or bloody diarrhea or tenderness and pain in their abdomen (Stanley, 2003). More severe cases of amoebiasis may cause an amoebic liver abscess, which can rupture through the diaphragm causing respiratory distress as well as urinary tract problems, genital diseases, and even amoebic brain abscesses (Stanley, 2003).

Intestinal Worms

Intestinal worms or parasites, like amoebas, are common water-washed parasitic infections found in “hot and humid environments” among poor communities with low access to sanitation facilities, clean water, and adequate housing (Oliveira, Ferreira, Atouguia, Fortes, Guerra, & Centeno-Lima, 2015). Once again, many infected people are asymptomatic; however, of those that are not, the clinical symptoms are wide-ranging (Rice, Skull, Pearce, Mulholland, Davie & Carapetis, 2003). Symptoms range from mild gastrointestinal discomfort and weakness (Rice et al., 2003) to iron deficiency anemia, stunting, or death (Oliveira et al., 2015).

Malaria

Malaria is a water-related disease spread through insect vectors and is responsible for an “estimated 216 million cases and 655,000 deaths” globally per year (21. White, Pukrittayakamee, Hien, Faiz, Mokuolu, & Dondorp, 2014, pp. 723). Although severe malaria mortality has been reduced by 22% on the continent of Africa, 90% of malaria-related deaths in children under five are in sub-Saharan Africa (White et al., 2014). The species of mosquitos that transmit malaria are resilient and known to live in “high densities in tropical climates, breed readily, and preferentially bite humans” (White et al., 2014). Typical symptoms of malaria include, but are not limited to, fever, sweating, weakness, and enlargement of the liver or spleen (“Disease”, 2015). Severe symptoms may include severe anemia, impairment of consciousness, seizures, and abnormal blood coagulation, which, if left untreated, all contribute to high rates of mortality (“Disease”, 2015). The development of Malaria Rapid Strip Tests has been a more cost-effective tool in diagnosing infected individuals than standard methods (White et al., 2014).

Background Information on Partners

Maji Safi Group: Health Screening Program

Maji Safi Group Facts	
Country	Tanzania
Region	Mara
Approximate population of the Mara Region	1,700,000 Residents
Districts MSG works in and their approximate populations	Rorya District = 265,000 Residents Musoma Rural = 208,000 Residents Musoma Town = 135,000 Residents

Year established	2012
Organization type	Nonprofit LLC
“Maji Safi” is Swahili for	“Clean Water”
MSG Mission Statement	To promote health and disease prevention in underserved and impoverished areas through holistic community empowerment and by working predominantly with local women and youth.
Number of programs	14 Programs
Approximate number of residents reached through MSG programs (2012-2017)	635,000 Mara Region Residents

Maji Safi Group (MSG) is dedicated to sustainable community development through water, sanitation, and hygiene (WASH) education and health promotion in the Mara Region, Tanzania. MSG hires local Tanzanians to be Community Health Educators (CHEs), who implement MSG’s 14 programs in culturally relevant and creative ways. Since May 2012, CHEs have taught more than 635,000 Mara Region residents WASH lessons (including repeat participants) and the importance of improving personal and community WASH behaviors. In addition, MSG has helped local authorities fight cholera outbreaks. MSG’s model promotes behavioral change; however, measuring changes in the community is a challenge. Thus, MSG developed a health screening program in 2015 that tests and treats Rorya District community members – some with, some without exposure to MSG education. Comparing the two groups’ disease rates affords a way to evaluate the longitudinal impact of our programs.

During health screening campaigns in 2015, 2016 and 2017, MSG partnered with the Rorya District Government through the District Medical Office (DMO), District Health Office (DHO) and District Education Office (DEO) to plan and conduct the screenings according to Tanzanian government policies and laws. Each year, MSG hired government nurses, clinical officers, and lab technicians to screen, diagnose, and prescribe medicine, while the MSG staff organized and ran the program. Health screenings were conducted through blood, urine and stool samples to determine if the participants had one or more of the following WASH diseases: schistosomiasis, amoebiasis, intestinal worms, and malaria. If the participant tested positive for one or more diseases, medicine was distributed free of charge, and every participant received disease prevention education.

While our Health Screening Program does provide valuable statistics longitudinally, it is important to note that this program is not a “perfect research model”, but over time, our results do indicate a common trend among program participants vs. non-program participants. Although we do not follow the same schools, program participants and non-program participants each year, we do aim to reach the same type of program participants and non-program participants by visiting schools that have partnered with MSG in similar time frames and communities living in similar conditions. However, there will be a degree of error in our results due to the change in program participants from year to year, which causes sampling bias. This is specifically evident when looking at the different schools we have screened over the years; some years have focused on primary schools, other years on secondary schools.

MSG's 6-Year Overall Programmatic Impact (2012-2018)

Program/Activity	Number Reached Aug. 2012 – Aug. 2013	Number Reached Sept. 2013 – Dec.2014	Number Reached Jan.2015 – Dec. 2015	Number Reached Jan. 2016 – Dec. 2016	Number Reached Jan. 2017 – Dec. 2017	Total Number Reached Per Program
Home Visit	1,699 Family Members	1,025 Family Members	2,464 Family Members	1,207 Family Members	2,755 Family Members	9,150 Family Members
After School	3,808 Students	1,243 Students	931 Students	1,588 Students	2,575 Students	10,145 Students
Disease Prevention Center (DPC)	791 Visitors to DPC	802 Visitors to DPC	1,210 Visitors to DPC	1,032 Visitors to DPC	1,445 Visitors to DPC	5,280 Visitors to DPC
Singing and Dance Group (including performances)	756 Community Members	1,048 Community Members	1,746 Community Members	3,250 Community Members	7,858 Community Members	14,658 Community Members
Maji Safi Cup	2,032 Participants	1,697 Participants	4,170 Participants	6,936 Participants	8,054 Participants	22,889 Participants
Outreach - events, market, stores, salons, restaurants	1,907 Community Members	6,521 Community Members	8,827 Community Members	7,699 Community Members	7,278 Community Members	32,232 Community Members
Female Hygiene	-	1,282 Participants	7,890 Participants	2,342 Participants	2,502 Participants	14,016 Participants
Hotline*	-	1,326 Participants	4,603 Participants	1,467 Participants	1,830 Participants	9,226 Participants
Radio Show Listeners	-	31,500 Listeners	49,000 Listeners	98,000 Listeners	231,000 Listeners	409,500 Listeners
Radio Show Callers	-	-	-	206 Direct Callers	254 Direct Callers	460 Direct Callers
Health Screenings	-	-	3,060 Screened	5,160 Screened	3,071 Screened	11,491 Screened
Cholera Outreach	-	-	53,237 Participants	41,593 Participants	-	94,830 Participants
Male Hygiene	-	-	-	348 Participants	772 Participants	1,120 Participants
Arborloo Toilet	-	-	-	-	175 Users	175 Users
Total reached each year (excluding Radio Show, but including callers)	10,993 Community Members	14,944 Community Members	88,138 Community Members	72,828 Community Members	38,569 Community Members	225,672 Community Members
Total reached each year (including Radio Show)	10,993 Community Members	46,444 Community Members	137,138 Community Members	170,828 Community Members	269,569 Community Members	635,172 Community Members

Notes: *Hotline numbers indicate number of SMS messages sent/received and number of incoming and outgoing calls made.

**Radio Show started in October 2014 and is estimated to reach approximately 3,500 per show. This number may indicate repeat listeners as well.

In 2018, MSG collaborated with the Rorya District Government offices, working directly with the District Development Office (DDO), District Education Office (DEO), District Medical Office (DMO) and the Malaria Focal Person. The DDO provided MSG with a letter of support to continue health screenings. The DEO provided letters of support to continue health screenings in government schools. The DMO provided a letter of support and the following medicines for those who were diagnosed with WASH-related diseases: 2,100 treatments of Artemether/lumefantrine for children to treat malaria, 3,200 treatments of Artemether/lumefantrine for adults to treat malaria, 7300 malaria rapid tests, 8,400 doses of Praziquantel to treat schistosomiasis, 6,500 doses of Albendazole for worms, nine boxes of gloves and 12 safety boxes. The DMO also approved MSG to work with government lab technicians, nurses and clinicians.

2015, 2016, and 2017 Health Screening Results

2015 Health Screenings Summary

The first health screening campaign, conducted in 2015, was a means of detecting and treating WASH-related diseases in the different stages of MSG’s WASH-education intervention. During the pilot year, we found that many students and health screening participants were sick – 55% of those screened tested positive for one or more water-related diseases (schistosomiasis, amoebiasis, intestinal worms, malaria). MSG tested and educated 3,060 community members (including approximately 900 program participants) and treated 5,604 cases of water-related diseases. The screenings provided the health screening participants with an understanding of their WASH health situation, needed treatment, and education to prevent future WASH-related diseases. Additionally, following the World Health Organization and Tanzanian Ministry of Health’s guidelines, all health screening participants received treatment for intestinal worms regardless of whether they tested positive or not. This mass treatment was conducted because the Rorya District is endemic for intestinal worms. Figure 1 indicates the disease rates for each water-related disease we tested for in 2015.

Figure 1: 2015 Health Screening Disease Rates

2015 Health Screening Rates	Amoebiasis	Intestinal Worms	Schistosomiasis in Stool	Schistosomiasis in Urine
Overall percentage of health screening participants who tested positive	20%	18%	2%	31%
New MSG program participants who tested positive	28%	12%	17%	4%
MSG program participants	18%	16%	4%	14%
Non-program participants	22%	30%	3%	16%

2016 Health Screening Summary

In 2016, Maji Safi Group (MSG) conducted its second annual health screening campaign, testing 5,060 people. The participant sample included MSG program participants, their guardians, local non-program participants, students, and fishermen as a means of evaluating the effectiveness of our programs and the overall health situation in the Rorya District. Overall, disease rates showed that MSG program participants who had been exposed to MSG education typically had a lower WASH-related disease prevalence rate than non-program participants with no exposure to MSG programs.

Data also suggested that MSG should add malaria lessons to its education. Figure 2 indicates the disease rates for each water-related disease we tested for in 2016.

Figure 2: 2016 Health Screening Disease Rates

2016 Health Screening Rates	Amoebiasis	Intestinal Worms	Schistosomiasis in Stool	Schistosomiasis in Urine	Malaria
Overall percentage of health screening participants who tested positive	14%	24%	7%	13%	22%
Percentage of current program participants who tested positive	10%	9%	5%	8%	23%
Percentage of past program participants who tested positive	9%	9%	5%	6%	16%
Percentage of family members of program participants who tested positive	11%	14%	3%	7%	21%
Percentage of staff members who tested positive	12%	6%	0%	3%	11%
Percentage of non-program participants who tested positive	18%	41%	10%	21%	23%

2017 Health Screening Summary

In 2017, MSG screened and treated 3,071 program and non-program participants. However, five forms were missing from the final count, so analysis was only conducted for 3,066 participants. The screenings took place over 11 days between July 29, 2017 and November 11, 2017. On average, MSG screened and treated 279 people per day with a range of 187 to 379 participants per day. Of those tested, 49% were female, and 51% were male.

The participant sample included MSG program participants, their guardians, non-program participants, and secondary school students. Primary school students were not screened this year due to a concurrent mass treatment campaign implemented by the Tanzanian government at all primary schools. MSG chose not to screen and treat primary school students in order to avoid double treatment. It was found that 51% of the 2017 health screening participants tested positive for one or more water-related diseases. Compared to the 2015 and 2016 health screening results, this is a 4% and 5% decrease, respectively. When looking at program participants' disease rates in comparison to non-program participants, the results continued to indicate that those exposed to MSG's education typically had lower disease prevalence rates than those not yet exposed to MSG's education. Data also suggested that MSG should add malaria lessons to its education. Figure 3 indicates the disease rates for each water-related disease we tested for in 2017.

Figure 3: 2017 Health Screening Disease Rates

2017 Health Screening Rates	Amoebiasis	Intestinal Worms	Schistosomiasis in Stool	Schistosomiasis in Urine	Malaria*
Overall percentage of health screening participants who tested positive	14%	38%	23%	12%	6%
Percentage of current program participants who tested positive	11%	12%	8%	6%	4%
Percentage of past program participants who tested positive	7%	12%	7%	8%	4%
Percentage of family members of program participants who tested positive	7%	5%	8%	4%	2%
Percentage of staff members who tested positive	13%	0%	4%	0%	7%
Percentage of non-program participants who tested positive	20%	74%	44%	20%	6%

*Note: Only selected community members and Singing and Dance participants and their family members were tested for malaria. Only 400 malaria tests were given.

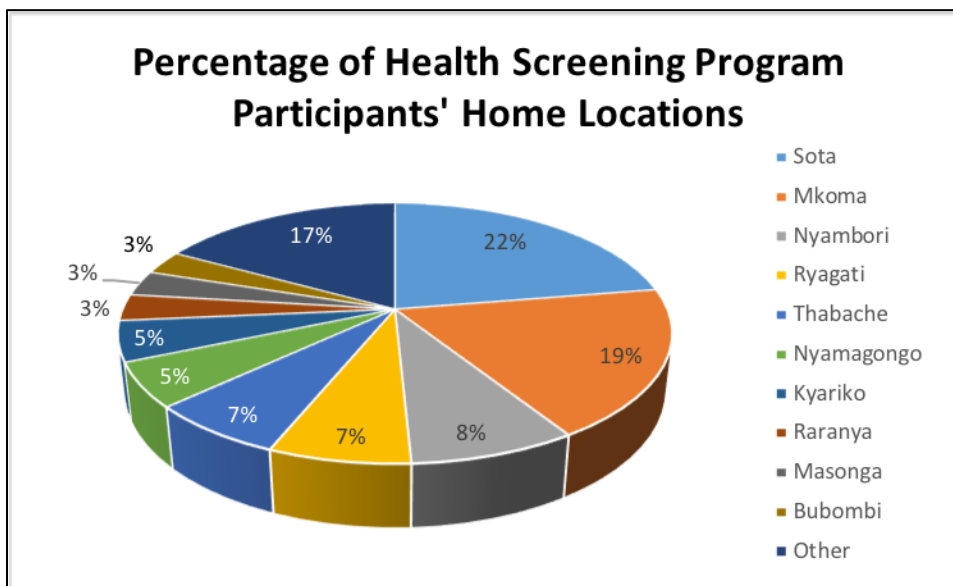
2018 Health Screening Results

2018 Demographics

In 2018, the MSG Health Screening Program was once again very well received among participants and community members. Overall, MSG screened and treated 6,911 program and non-program participants. The screenings took place over 19 days between March 16, 2018 and April 27, 2018. On average, MSG screened and treated 364 people per day with a range of 144 to 559 participants per day.

Of those tested, 49% were male, and 51% were female. The youngest person tested was two months old, and the oldest person tested was 96 years old. The screenings took place in several different locations: the MSG office, Tina's Pre and Primary School, Sota Primary School, Majengo Primary School, Katuru Secondary School, Raranya Secondary School, Tai Secondary School, Bukura Secondary School, Sarungi Secondary School, and the Ryagati, Nyambori, and Thabache communities. The majority of those screened came from the village of Sota (22%), Mkoma (19%), followed by Other (17%) which consists of various locations in the Mara region, then Ryagati (7%) and Thabache (7%), Nyamagongo (5%) and Kyariko (5%), and Raranya (3%), Masonga (3%) and Bubombi (3%), as indicated in Figure 4.

Figure 4: Percentage Breakdown of Health Screening Program Participants' Home Locations



Overall 2018 Results

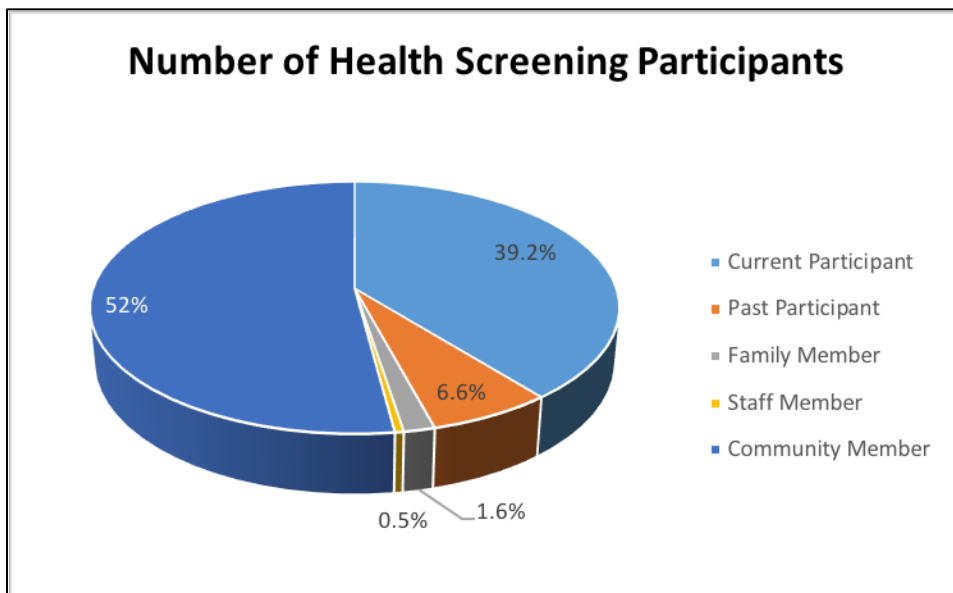
For the 2018 health screening campaign, MSG used the same health screening questionnaire that was used in 2016 and 2017 to ensure rates could be compared longitudinally. It was found that 54% of the 2018 health screening participants tested positive for one or more water-related diseases (amoebiasis, intestinal worms, schistosomiasis in stool, schistosomiasis in urine, and malaria). Compared to the 2015 health screening results, this is a 1% decrease in overall disease rates, but an increase in overall disease rates between 2017 and 2018. This is to be expected, as MSG expanded the Health Screening Campaign into new communities and schools that had not yet received any MSG education or intervention (i.e. participants in these new areas had not received MSG's WASH lessons prior to being screened).

When looking at program participants' disease rates in comparison to those of non-program participants, the results continually indicate that those exposed to MSG's education typically had a lower disease prevalence rate. Participant status was categorized in five ways: current program participant (involved in an MSG program within the year), past program participant (involved in an MSG program a year or longer ago), family member (a current or past program participant's family member), staff (an MSG staff member), and non-program participant (= community member in pie chart). The breakdown of the health screenings participants' status is indicated in Figure 5 and Figure 6.

Figure 5: Health Screening Participant Status

Participant Status	Current Participant	Past Participant	Family Member	Staff Member	Non-program participant	Overall Total
Number of Health Screening Participants	2,710	456	114	32	3,599	6,911

Figure 6: Percentage Breakdown of Type of Health Screening Participants



As indicated in Figure 7, there is a significant difference between disease rates among MSG program participants (current and past) and non-program participants. The gap between program participants and non-program participants is larger than in any of our previous years. These percentages indicate that community members with no exposure to MSG programs or education have a higher percentage of amoebiasis (9% higher), intestinal worms (62%-63% higher), schistosomiasis in stool (37%-39% higher), schistosomiasis in urine (18%-20% higher), and malaria (28% higher) than current and past MSG program participants.

These results lead us to believe that those who participate in Maji Safi Group’s programs (currently or in the past) have a better understanding of WASH knowledge and can better prevent WASH-related diseases, such as amoebiasis, intestinal worms, schistosomiasis, and malaria, than community members who have not had access to MSG education via programs.

The disease rate trends of those who have been exposed to MSG programs compared to those of non-program participants also hold for family members of MSG program participants and staff members. There are higher amoebiasis, intestinal worm, schistosomiasis, and malaria rates among non-program participants than among family members of program participants and MSG staff. We conclude that staff and family members have lower WASH-disease rates because they are exposed to MSG education. As Figure 7 indicates, exposure to MSG education has a significant impact on disease rates.

Figure 7: 2018 Health Screening Disease Rates

2018 Health Screening Rates	Amoebiasis	Intestinal Worms	Schistosomiasis in Stool	Schistosomiasis in Urine	Malaria
Overall percentage of health screening participants who tested positive	9%	41%	26%	17%	28%
Percentage of current program participants who tested positive	4%	9%	7%	6%	14%

Percentage of past program participants who tested positive	4%	10%	5%	8%	14%
Percentage of family members of program participants who tested positive	8%	15%	13%	6%	14%
Percentage of staff members who tested positive	5%	14%	14%	6%	6%
Percentage of non-program participants who tested positive	13%	72%	44%	26%	42%

We also wanted to know if the frequency of MSG lessons had an impact on disease rates. Therefore, we asked health screening participants how many times they had participated in an MSG WASH lesson. Categories to choose from included: never (they have never had a direct WASH lesson from a CHE), 1-3 times (they have had 1-3 WASH lessons from a CHE), four times (they have had four WASH lessons from a CHE) and 5+ (they have had five or more WASH lessons from a CHE). We chose these frequencies because we always aim to give at least four lessons in several of our programs (Home Visit, Female Hygiene, Male Hygiene, Singing and Dance, Maji Safi Cup, and After School). Figure 8 and Figure 9 show the breakdown and percentages of the health screening participants who had received MSG’s education. Figure 10 indicates that never having had an MSG lesson from a CHE contributes to the highest disease rates. This figure also shows that it is best to have four, five, or more lessons from a CHE, as rates indicate that having at least four lessons lowers WASH disease rates among program participants.

Figure 8: 2018 Number of MSG Lessons Received by Health Screening Participants

Number of Lessons Received	No Lessons	1-3 Lessons	4 Lessons	5+ Lessons	Total
Number of Health Screening Participants	3,727	995	212	1,977	6,911

Figure 9: 2018 Percentage of MSG Lessons Received by Health Screening Participants

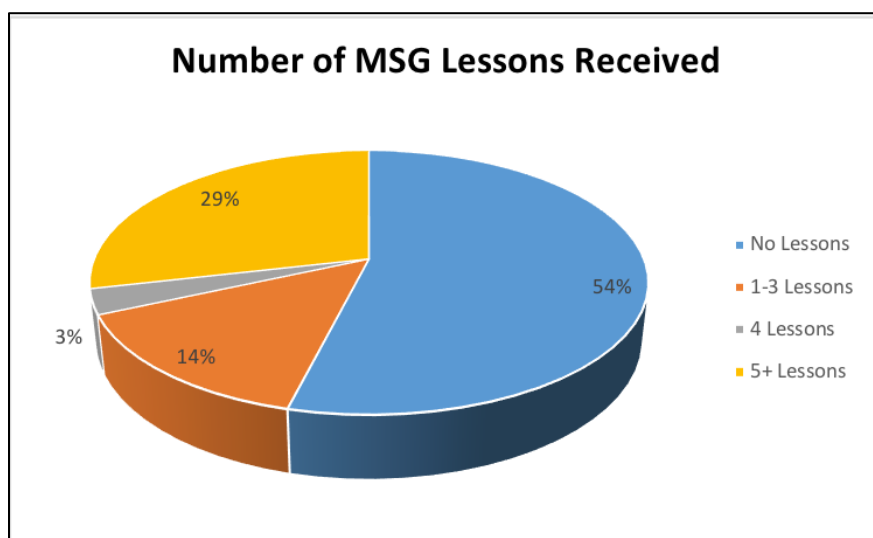


Figure 10: 2018 Health Screening Disease Rates as They Relate to Level of MSG Participation

2018 Health Screening Rates	Amoebiasis	Intestinal Worms	Schistosomiasis in Stool	Schistosomiasis in Urine	Malaria
Overall percentage of health screening participants who tested positive	9%	41%	26%	17%	28%
Percentage of health screening participants who have received no MSG lessons and tested positive	12%	70%	43%	26%	41%
Percentage of health screening participants who have received 1-3 MSG lessons and tested positive	8%	14%	10%	11%	17%
Percentage of health screening participants who have received 4 MSG lessons and tested positive	2%	10%	8%	5%	13%
Percentage of health screening participants who have received 5+ MSG lessons and tested positive	3%	6%	5%	4%	13%

Maji Safi Group Program Disease Rates

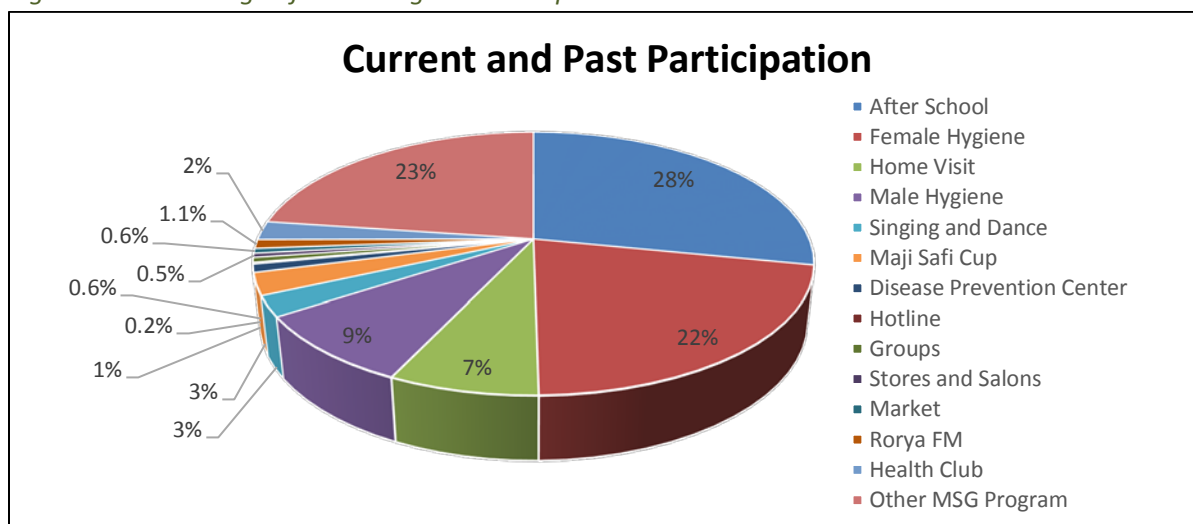
MSG tested 3,489 current and past program participants, which made up 50% of all those tested in 2018. MSG programs in which participants engaged included After School, Female Hygiene, Male Hygiene, Singing and Dance, Home Visit, Maji Safi Cup, Disease Prevention Center, Hotline, Outreach with groups, Outreach with stores and salons, Market outreach, Radio show, School Health Clubs, and Other, such as Emergency Outreach or Health Screenings. It is important to note that 285 health screening participants partake (or partook) in more than one MSG program. This number indicates that they are currently in more than one MSG program or have participated in a program in the past and are currently participating in another program. As indicated in Figure 11 and Figure 12, the majority of program participants (past and current) came from After School (28.2%), Outreach Programs, including Groups, Stores and Salons, Market, Rorya FM and Other MSG Programs (25.5%), then Female Hygiene (21.6%), followed by Male Hygiene (8.7%), Home Visit (7.3%), Maji Safi Cup (2.7%), Singing and Dance (2.5%), Disease Prevention Center (1.0%) and Hotline (0.2%).

Figure 11: Number of Current and Past MSG Program Participants

Program	Number of Current and Past Participation	Percentage
Home Visit	253	7.3%
Female Hygiene	753	21.6%
After School	985	28.2%

Male Hygiene	305	8.7%
Singing and Dance	86	2.5%
Maji Safi Cup	95	2.7%
Health Club	81	2.3%
Disease Prevention Center	35	1.0%
Hotline	7	0.2%
Groups	21	0.6%
Stores and Salons	16	0.5%
Market	20	0.6%
Rorya FM	38	1.1%
Other MSG Program	794	22.8%
Total	3,489	100%

Figure 12: Percentage of MSG Program Participation



According to Figure 13, nearly all MSG program participants had lower WASH disease prevalence rates than community members who had not had any exposure to MSG programs: amoebiasis (1%-13% lower – aside from Hotline and Rorya FM which were 1%-8% higher), intestinal worms (51%-72% lower), schistosomiasis in stool (21%-44% lower), schistosomiasis in urine (18%-26% lower – aside from Hotline which was 3% higher), and malaria (13%-42% lower). Disease rates among the program participants also varied. Amoebiasis rates ranged from 0% positive in Groups and Stores and Saloons to 21% positive in Rorya FM. Intestinal worm rates ranged from 0% positive in the Hotline and Market programs to 35% positive in Disease Prevention Center. Schistosomiasis in stool rates ranged from 0% positive in Hotline and Market to 23% in Disease Prevention Center. Schistosomiasis in urine rates ranged from 0% in the Singing and Dance, Disease Prevention Center, Groups, and Stores and Salons to 29% in Hotline. Malaria rates ranged from 0% positive in Groups, Stores and Saloons, and Market to 29% positive in Hotline. It should be noted that while the first column of Figure 13 indicates the number of non-program participants and individuals from each program that participated in the 2018 Health Screening, not all of these individuals were able to produce a urine, stool, or blood sample during the screening. Thus, the percentages in Figure 13 only include individuals who were able to produce the required sample for the test.

Figure 13: Disease Rates among MSG Program Participants

Health Screening Rates	Number screened	Amoebiasis	Intestinal Worms	Schistosomiasis in Stool	Schistosomiasis in Urine	Malaria
Overall percentage of health screening participants who tested positive	6,911	9%	41%	26%	17%	28%
Home Visit	253	5%	7%	5%	5%	13%
Female Hygiene	753	4%	7%	4%	6%	11%
After School	985	4%	9%	7%	5%	15%
Male Hygiene	305	3%	10%	7%	6%	10%
Singing and Dance	86	4%	4%	8%	0%	4%
Maji Safi Cup	95	6%	3%	6%	2%	7%
Disease Prevention Center	35	12%	35%	23%	0%	26%
Hotline	7	14%	0%	0%	29%	29%
Groups	21	0%	11%	6%	0%	0%
Stores and Salons	16	0%	8%	8%	0%	0%
Market	20	12%	0%	0%	5%	0%
Rorya FM	38	21%	21%	12%	8%	5%
Health Club	81	1%	4%	5%	1%	9%
Other MSG Programs (health screenings, emergency outreach)	794	5%	8%	6%	7%	15%
Non-Program Participants	3,599	13%	72%	44%	26%	42%

School Results

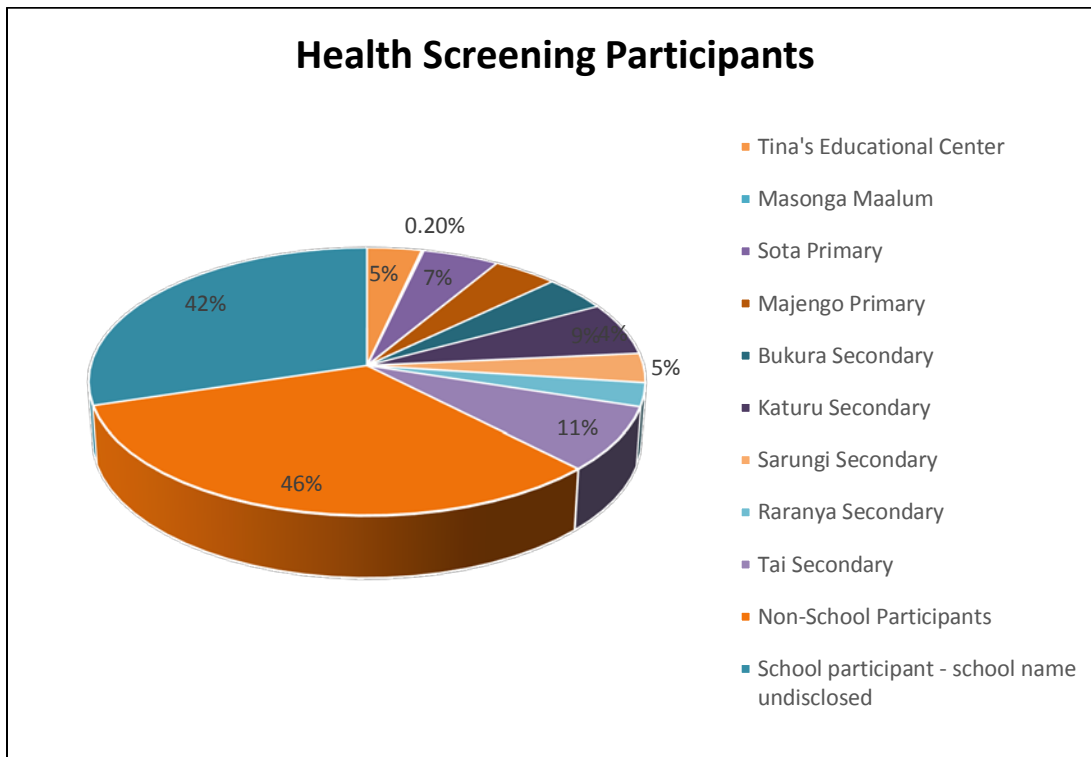
MSG was able to collaborate with nine schools during the 2018 Health Screening Program. Figure 14 - Figure 16 indicate the number and percentage of students screened this year and the class breakdown. Screening and treatment took place at five secondary schools and four primary schools. Some of these schools had previously participated in our

Health Screening campaign, but this was the first year for MSG to screen and treat at Masonga Special Needs School, Majengo Primary School, Bukura Secondary School, and Raranya Secondary School.

Figure 14: Health Screening Participation at Schools

School Name	Number of Health Screening Participants	Percentage of School Participation in Overall Health Screening Campaign
Tina’s Educational Center	301	3.8%
Masonga Special Needs School	14	0.2%
Sota Primary	463	7%
Majengo Primary	398	6%
Bukura Secondary	409	6%
Katuru Secondary	573	8%
Sarungi Secondary	333	5%
Raranya Secondary	263	4%
Tai Secondary	738	11%
School participant – school name undisclosed	491	7%
Non-School participants	2,928	42%
Total	6,911	100%

Figure 15: Pie Chart of Health Screening Participation at Schools



Data from 82 school students was not included in Figure 16 as they did not disclose which class they were in.

Figure 16: Chart of School and Class Breakdown

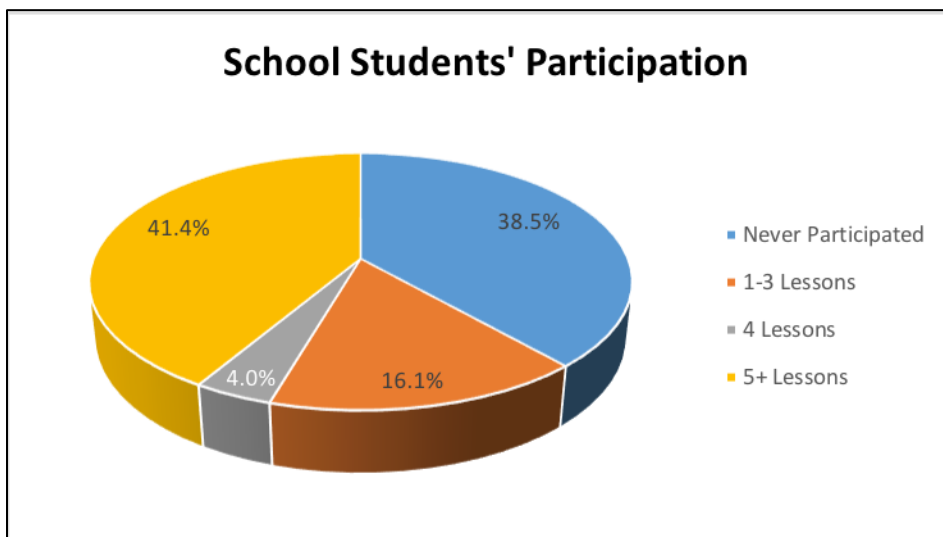
School Name	Pre-K	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Form 1	Form 2	Form 3	Form 4	Teacher	Parent	Overall number screened
Tina's Educational Center	40	23	27	30	35	49	40	33	0	0	0	0	1	0	278
Masonga Special Needs School	0	0	6	5	0	0	0	3	0	0	0	0	0	0	14
Sota Primary	5	28	66	43	61	93	73	74	0	0	0	0	0	2	445
Majengo Primary	6	67	46	61	42	54	47	59	0	0	0	0	0	3	385
Bukura Secondary	0	0	0	0	0	0	0	0	188	113	62	40	0	0	403
Katuru Secondary	0	0	0	0	0	0	0	0	181	198	129	52	0	0	560
Sarungi Secondary	0	0	0	0	0	0	0	0	139	94	56	42	1	0	332
Raranya Secondary	0	0	0	0	0	0	0	0	85	80	73	21	0	0	259
Tai Secondary	0	0	0	0	0	0	0	0	245	245	138	106	0	0	733
Total	51	118	145	139	138	196	160	169	838	730	458	261	2	5	3,410

When looking at the data from the MSG program participants, we also looked at MSG participation levels, broken up into four levels: non-program participants, have completed 1-3 lessons with MSG, have completed 4 lessons with MSG, and have completed 5 or more lessons with MSG. MSG is assigned class grades to teach during the After School, Male Hygiene and Female Hygiene Programs; therefore, there are some class levels that have not received MSG education yet. Of those who were screened at a school, 62% (2,148 participants) participated in an MSG Program either as a past or current participant, and 38% (1,343 participants) have yet to receive MSG WASH education. Figure 17 and Figure 18 show a breakdown of the different schools, classes and overall MSG participation level.

Figure 17: MSG Participant Status per School

School Name	# Never participated	# Participated in 1-3 lessons	# Participated in 4 lessons	# Participated in 5+ lessons
Tina's Educational Center	119	58	8	116
Masonga Special Needs School	0	0	0	14
Sota Primary	157	98	6	202
Majengo Primary	216	81	51	50
Bukura Secondary	375	3	0	31
Katuru Secondary	74	114	27	358
Sarungi Secondary	148	56	17	112
Raranya Secondary	93	46	6	118
Tai Secondary	161	105	25	447
Total	1,343	561	140	1,448

Figure 18: Percentage of MSG Participant Status in Participating Secondary Schools



School Demographics

The 2018 Health Screening Program also looked at the age and gender demographics of the school students MSG works with. The results in Figure 19 show that despite having a higher percentage of females than males in primary school, the majority of secondary schools that were screened had a higher percentage of males than females. These rates represent the gender differences found in rural schools in Tanzania.

Figure 19: School Participants' Average Age and Gender

School Name	Average Age	Percentage of Males	Percentage of Females
Tina's Educational Center	11	48%	52%
Masonga Special Needs School	13	36%	64%
Sota Primary	13	49%	51%
Majengo Primary	11	48%	52%
Bukura Secondary	17	58%	42%
Katuru Secondary	16	48%	52%
Sarungi Secondary	18	57%	43%
Raranya Secondary	16	55%	45%
Tai Secondary	17	54%	46%

School Disease Rate Analysis

During this health screening, the program participants were screened and tested for amoebiasis, intestinal worms, schistosomiasis in stool, schistosomiasis in urine, and malaria. Figure 20 shows an analysis of the program participants' water-related disease rates.

Figure 20: Disease Rates per School

School Name	Number of Students Screened	Percentage tested positive for Amoebiasis	Percentage tested positive for Intestinal Worms	Percentage tested positive for Schistosomiasis in Stool	Percentage tested positive for Schistosomiasis in Urine	Percentage tested positive for Malaria
All Health Screening Participants	6,911	9%	41%	26%	17%	28%
Tina's Educational Center	278	7%	35%	26%	16%	25%
Masonga Special Needs School	14	0%	20%	0%	8%	36%
Sota Primary	445	6%	25%	15%	9%	29%
Majengo Primary	385	13%	40%	35%	12%	18%
Bukura Secondary	403	4%	51%	29%	33%	41%
Katuru Secondary School	560	5%	24%	12%	16%	14%
Sarungi Secondary School	332	4%	44%	24%	21%	43%
Raranya Secondary School	259	2%	37%	24%	22%	29%
Tai Secondary School	734	5%	17%	13%	9%	21%

**Note: Please note that all percentages were based on only those who produced a stool and/or urine sample.*

Figure 20 illustrates disease prevalence rates within each school. We found that Majengo Primary students have the highest amoebiasis rates (13%) and schistosomiasis in stool rates (35%). Bukura Secondary students have the highest intestinal worm rates (51%) and schistosomiasis in urine rates (33%). Sarungi Secondary students have the highest malaria rates (43%). Overall, these statistics indicate that participants are generally healthier if they are being or have been exposed to Maji Safi Group's WASH education. Schools that have partnered with MSG in our school programs the longest, and thus have received our WASH education, tend to have healthier students (Tina's Educational Center, Sota Primary, Katuru Secondary). This can be attributed to the continued increase in knowledge provided by MSG regarding

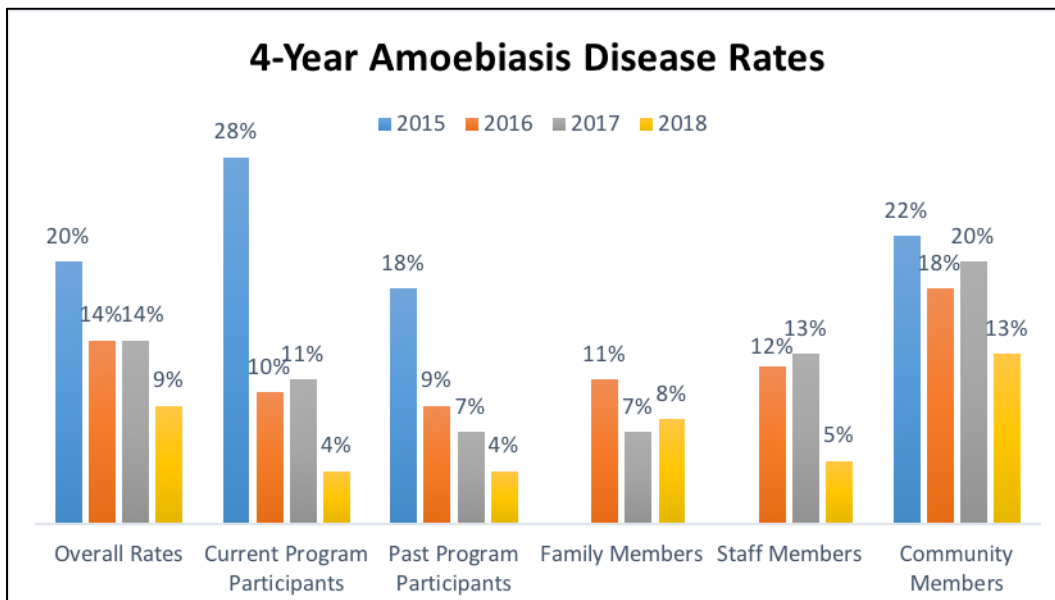
disease prevention of water-related infections. Likewise, schools that have not yet partnered with MSG in our school programs have some of the highest disease rates, such as Bukura Secondary School. After the 2018 Health Screening Program was implemented, Bukura Secondary School partnered with MSG in our school program through the establishment of an MSG School Health Club. This club will continue teaching WASH and female and male hygiene lessons throughout the next school year. We anticipate lower disease prevalence rates in the 2019 Health Screening Program, as students will have had a full year to be educated on WASH disease prevention.

Discussion

During the 2018 Health Screening Program, Maji Safi Group (MSG) collected extensive information about disease rates in the Rorya District. These rates represent the fourth year in our longitudinal study and are important to assessing the overall impact MSG’s lessons are having on WASH behaviors in the community.

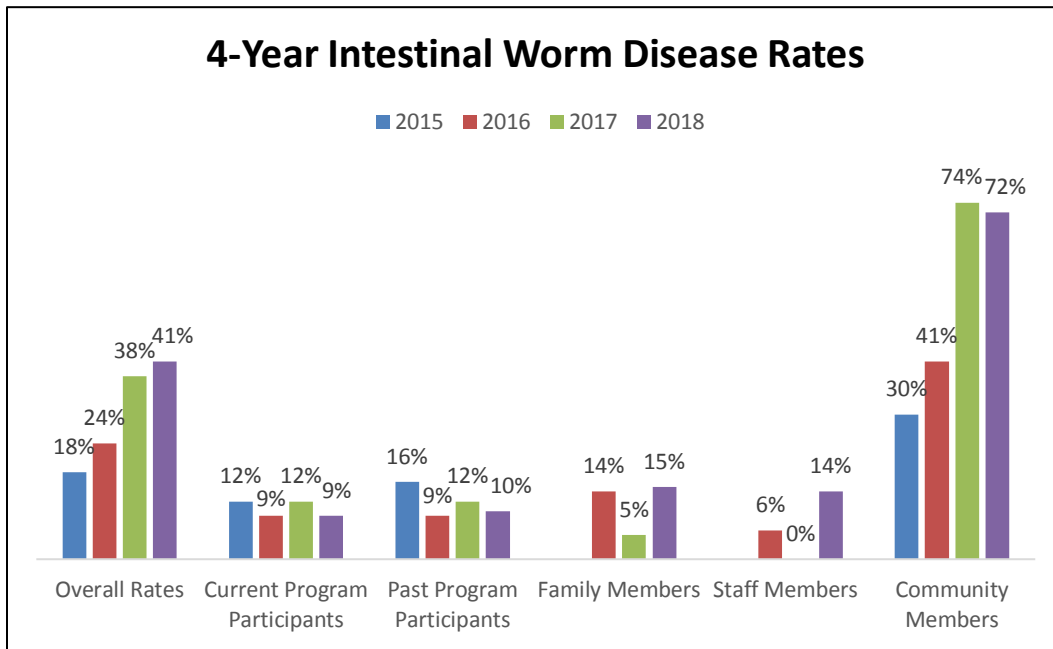
Over four years, our results have remained consistent: People who have been exposed to MSG’s WASH education are healthier than those who have not received such education. Prevention is proving to save MSG program participants from continuously contracting WASH-related diseases. Our Health Screening results continue to indicate that those related to and/or interacting with program participants, whether through a family member or an entire school, benefit from the health education their connection is learning. Both family members and students from schools that have partnered with MSG for a long time had lower WASH disease rates than community members who had not yet received WASH education from MSG. Figures 21-25 demonstrate how disease rates have varied over the years. The common trend we are seeing is that each consecutive year, current and past program participants have lower disease rates than non-program participants (with the exception of amoebiasis in 2015 and schistosomiasis in stool in 2015). Additionally, current and past program participants have generally continued to have lower disease prevalence rates since 2015. This data maintains that MSG’s WASH-related disease prevention education is effective in positively impacting and affecting the trajectory of people’s health status.

Figure 21: 4-Year Amoebiasis Disease Rates



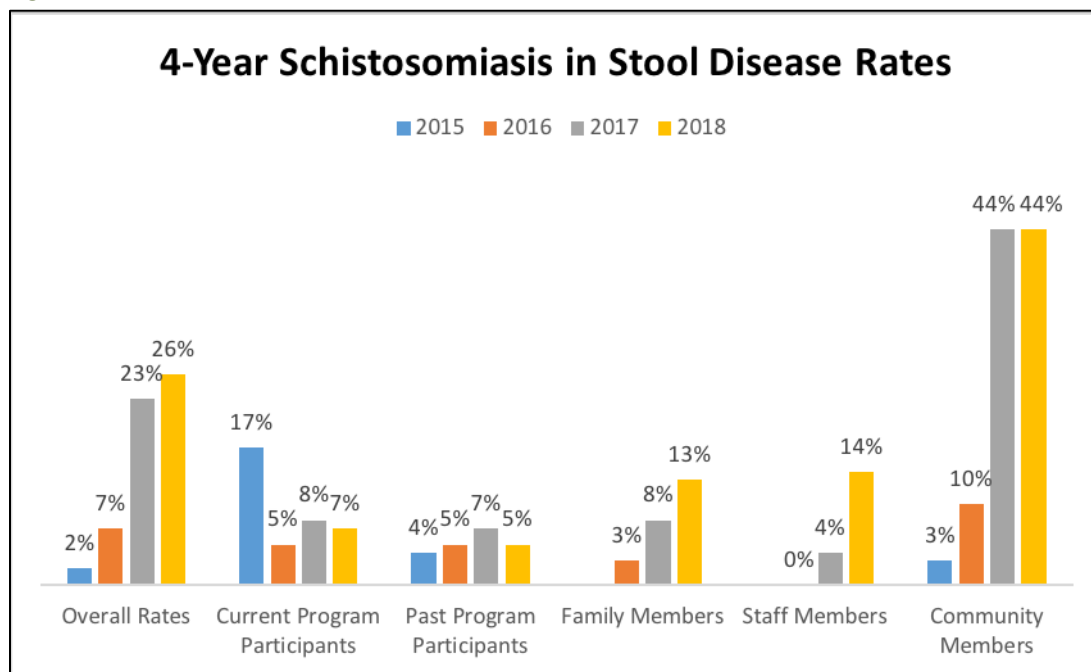
**Note: Family members and staff members were not tested in 2015. (Community Members = Non-program participants).*

Figure 22: 4-Year Intestinal Worm Disease Rates



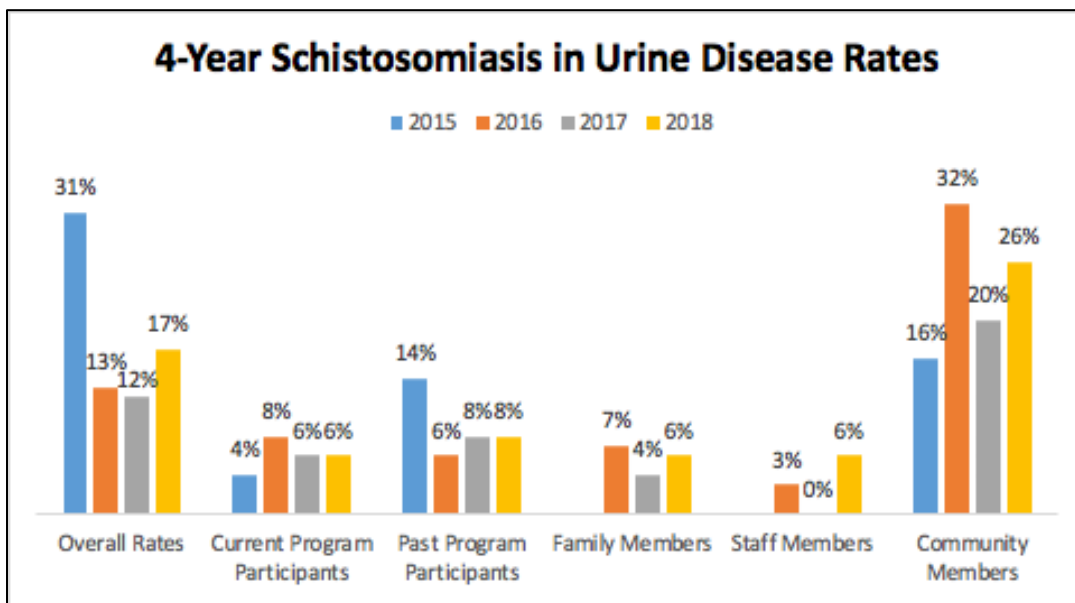
*Note: Family members and staff members were not tested in 2015. (Community Members = Non-program participants).

Figure 23: 4-Year Schistosomiasis in Stool Disease Rates



*Note: Family members and staff members were not tested in 2015. (Community Members = Non-program participants).

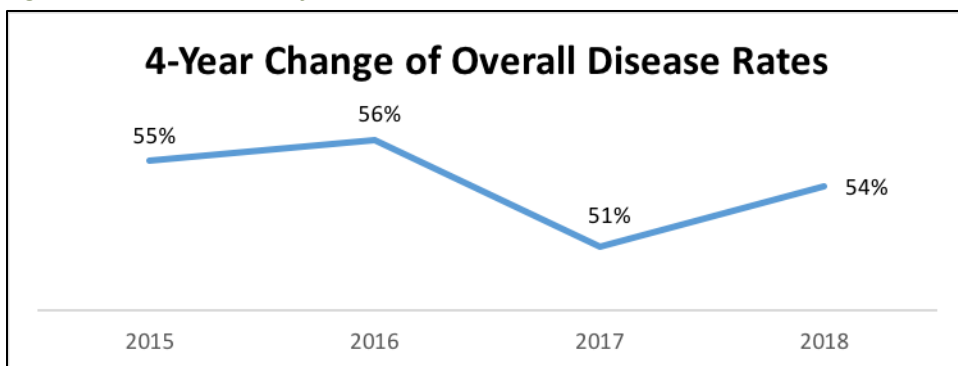
Figure 24: 4-Year Schistosomiasis in Urine Disease Rates



*Note: Family members and staff members were not tested in 2015. (Community Members = Non-program participants).

When looking at the four-year change in overall disease rates (i.e. calculating the percentage of those screened who have one or more diseases), there is a slight increase in overall disease rates between 2017 and 2018. This is to be expected as MSG expanded the Health Screening Program into new communities and schools that had not received any MSG education or intervention in the past (i.e. participants in these new areas had not received MSGs WASH lessons prior to being screened). This overall increase in disease rates is indicated in Figure 25.

Figure 25: 4-Year Trend of Overall Disease Rates



Recommendations for the Future

The 2018 Health Screening Campaign was very successful, but there is always room for improvement. MSG recommends the following for the 2019 Health Screening Campaign:

- Update health screening questionnaire.
- Continue to collaborate with the local and district government regarding health screening dates and support to implement the program.
- Re-screen the communities and schools that were screened for the first time in 2018 in order to compare participants' disease prevalence rates before and after receiving MSG WASH-related disease prevention education.

Conclusion

Health screening results measure WASH-disease prevalence rates of people who have received MSG WASH education and participated in programs and compare them to disease prevalence rates of new MSG program participants and potential program participants who have never participated in MSG programs. The results continuously prove that there is a lower prevalence of disease rates among program participants who have completed MSG's WASH lessons. In 2018, in collaboration with the local and district governments, MSG was able to screen 6,911 community members. Results indicated that MSG significantly improves the lives of program participants and community members who are exposed to MSG education. It is our hope to continue our collaboration with the local and district governments in 2019 to further evaluate MSG programs and improve the lives of community members. Together, we can provide a clean bill of health coupled with community-driven education, which is a sustainable intervention model for decreasing WASH-related diseases in rural areas of Tanzania.