SPLASH School Outcome Study

THE EFFECT OF WASH IN SCHOOLS ON EDUCATIONAL OUTCOMES: ABSENTEEISM AND TEACHER-PUPIL CONTACT TIME

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USAID FROM THE AMERICAN PEOPLE

Ministry of General Education

SPLASH Schools Promoting Learning Achievement through Sanitation and Hygiene

About SPLASH:

SPLASH (Schools Promoting Learning Achievement through Sanitation and Hygiene) is a comprehensive school-based water supply, sanitation, and hygiene (WASH) project funded by USAID/Zambia through field support. SPLASH is implemented through the WASHplus project, which supports healthy households and communities by creating and delivering interventions that lead to improvements in WASH and household air pollution (HAP). This multi-year project (2010-2016), funded through USAID's Bureau for Global Health (AID-OAA-A-10-00040) and led by FHI 360 in partnership with CARE and Winrock International, uses at-scale programming approaches to reduce diarrheal diseases and acute respiratory infections, the two top killers of children under age 5 globally.

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EXECUTIVE SUMMARY

The SPLASH School Outcome Study investigated the effect of a full WASH in Schools program on absenteeism and teacher-pupil contact time in the context of the USAID-funded Schools Promoting Learning Achievement through Sanitation and Hygiene (SPLASH) project in Zambia. The study was conducted in three intervention and three control districts. SPLASH implemented a comprehensive WASH in Schools program in the intervention districts (Mambwe, Chipata, and Lundazi), located in the Eastern Province. The control districts (Luangwa, Chongwe, and Rufunsa) were adjacent to the intervention districts but located in Lusaka Province. The intervention/control districts in the study were matched for cultural, economic, and ecological characteristics. No specific WASH in Schools program was implemented in the control districts while the study was underway.

The study was based on a quasi-experimental longitudinal design with data points collected during three school terms over a period of 10 months in 124 schools equally distributed into intervention and control study groups. A sampling framework was constructed in each province. Inclusion in the framework relied on the presence or absence of 11 criteria associated with a full school WASH package incorporating both infrastructure and hygiene education elements. Schools were randomly selected from each one of the regional sampling frameworks. Intervention schools met all 11 criteria, and control schools met only some or none at all. In selected schools, field enumerators visited odd grades (1, 3, 5, 7 and 9) and conducted roll call to determine pupil absenteeism and establish whether the teacher was present. In addition to roll call, enumerators also collected data on pupil absences during the two weeks prior to the school visit, identifying pupils who had been absent at least one day in those two previous weeks. They interviewed the parents of children so identified to understand the reason(s) for the child's absence. To collect data, the researchers developed three instruments using ODK software and uploaded them onto six Samsung tablets running the Android operating system. Data were analyzed by month, school term, and season. The monthly analysis was descriptive. However, for school and season comparison researchers used repeated measures of analysis of variance. A gender analysis was conducted to determine differences between boys and girls. A confounder analysis was conducted using linear regression.

The study clearly establishes that improved WASH conditions and education in a school had a positive effect on pupil and teacher absenteeism and teacher-pupil contact time. Effects in the expected direction are clear during the measures taken in the 2015 school year but not in the last few months of the 2014 school year. The difference between intervention and control schools is evident when looking at the measure we termed *de jure* (past two weeks) absenteeism. In this case, the absenteeism differences detected may be at least threefold higher (or 300 percent) in control schools when the time dimension is seasons, but fivefold (or 500 percent) when the time dimension is school term. The differences when we look at *de facto* (day of data collection) absenteeism hover around 34 or 35 percent when we look at the data by seasons and may be as high as 100 percent when we look at the data by school terms. These differences occur in two of three seasons or terms examined. Further, pupil absenteeism findings remain even in the presence of three other potential confounders: the presence of a school feeding program, the presence of school improvement projects other than WASH, and the type of school. The WASH program seems to affect boys and girls equally. WASH in Schools programs positively impact school attendance for teachers and pupils but appear to have less of an impact on contact time.

The fact that we found results in the opposite direction than expected when we started collecting data, mainly at the end of the 2014 school year, suggests that the effects of a school WASH program may take some time to kick in. It may also suggest that the end of the school year is a special period and absenteeism may be affected by many factors that a WASH in Schools program would not influence. In either case, in light of these findings we must argue in favor of conducting future studies of absenteeism using a longitudinal approach as absenteeism may have seasonal variations influenced by multiple factors.

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ACRONYMS

GRZ	Government of the Republic of Zambia
MDG	Millennium Development Goals
MGE	Ministry of General Education
NRWSSP	National Rural Water Supply and Sanitation Programme
O&M	Operations and Maintenance
PETS	Public Expenditure Tracking Survey
SHN	School Health and Nutrition
SPLASH	School Promoting Learning Achievement through Sanitation and Hygiene
USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene

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INTRODUCTION

The School Outcome Study presented in this report was conducted in the context of the SPLASH project, a four-year USAID-funded WASH in Schools project. The project was implemented by FHI 360 and CARE through the global USAID WASHplus Project in four districts of Zambia's Eastern Province, namely Chipata, Lundazi, Mambwe, and Chadiza. SPLASH was designed to contribute to USAID/Zambia's education portfolio that aims to improve learning achievements, primarily in reading. Building on past efforts by USAID and other education sector stakeholders to address inequities in the education system, SPLASH worked with the Ministry of General Education and other line ministries (such as the Ministry of Local Government and Housing and Ministry of Health) to provide disadvantaged and vulnerable groups the same opportunities to participate and excel through access to quality education. As part of its implementation strategy, SPLASH carried out formative studies to shape its approach and draw lessons for the improvement of WASH in Schools. This school outcome study was a quantitative effort to link the provision of school WASH improvements to learning achievements.

Purpose of the Study

WASH in schools interventions have a positive effect on pupil health and other outcomes. A common assumption is that healthier pupils miss less school, attendance will increase pupil-teacher contact time and this leads to positive influence on learning outcomes. The present study was based on certain premises. The literature suggests that pupil academic performance depends on many factors, including pupil-teacher contact time. We assumed that the latter is influenced by attendance on the part of both teachers and pupils. Further, we also assume that the existence of a safe, clean and hygienic environment, including access to adequate safe drinking water and clean, accessible child-friendly toilets influences attendance.

The present study is an attempt to help build the evidence base concerning the effects of such WASH programs. In this attempt, we systematically explore differences in attendance in pupils and teachers over time in WASH and non-WASH schools, thus emulating the prospective nature of other research designs. Further, we estimate the impact on pupil-teacher contact time in order to inform the educational sector in Zambia, in addition to the USAID/Zambia education strategy. Contact time is considered one of the essential components of school performance influencing learning outcomes. We also explore reasons behind pupil absenteeism, and compare enrollment between intervention and control schools to expand the exploration of school outcomes for the benefit of the education sector. This study does not explore reasons for teacher absenteeism.

Study Goal

The goal of the study was to identify the effect of a comprehensive school WASH program on school attendance and teacher-pupil contact time. A comprehensive school WASH program includes the following hardware, "software," and governance components:

- The hardware component includes access to a safe drinking water source on school premises, access to safe drinking water in classrooms, sanitation facilities that comply with national standards, and functional handwashing facilities with water and soap available all the time.
- The software component includes hygiene education through classroom activities, the presence of a WASH club involved in supporting hygiene on school grounds and conveying hygiene messages to surrounding households.
- The governance component includes strengthening institutions responsible for school WASH at district, zone, and school levels; creating fully functional operations and maintenance (O&M) systems; and involving community participation and contributions of upfront and in-kind materials for construction of sanitation facilities.

Objectives

To explore if the presence of WASH in school increases attendance among pupils and teachers.

Pupil absenteeism was defined two ways. One, as the total number of days of absence per roll call in grades 1, 3, 5, and 7 over the total number of pupil days tracked. And two, the number of students in class in those same grades during the day of a school visit that declared being absent during the two prior weeks. The study considered any pupil absent who was not present during our roll call and who was not temporarily out of the classroom. Teacher absenteeism was defined as the total number of days of absence of teachers of first, third, fifth, and seventh grades over the total number of teacher days tracked. The enumerators confirmed with the school administrators that absent teachers had not reported for work during the day of the school visit.

To explore if increased school attendance improves teacher-pupil contact time.

Contact time was limited to the time devoted to learning and excluded time spent in extracurricular activities (e.g., recess, cleaning the classroom, fetching water, etc.).

To explore the reasons for pupil absenteeism

This information was collected through interviews with parents of absent pupils from schools participating in the study.

To explore the influence on enrollment and dropout rates

This information was collected through interviews with head teachers and official records. The analysis focuses on a segment of the pupil population since the study collected information only from odd grades in the intervention and control areas.

BACKGROUND

The goal of the water and sanitation sector in Zambia (GRZ) is "to achieve 75 percent accessibility to reliable safe water and 60 percent adequate sanitation by 2015 in order to enhance economic growth and improve the quality of life."[1] GRZ, through line ministries and in collaboration with the donor and civil society communities, developed a number of policies and regulations that provide the basis for increasing and improving access to water supply and sanitation to achieve the Millennium Development Goals (MDGs) and Education for All goals. These include among others: the Public Health Act (drainage and sanitation/hygiene regulation); the National Rural Water Supply and Sanitation Program (NRWSSP); the Ministry of General Education (MGE) infrastructure operational development plan of 2010; and the School Health and Nutrition (SHN) Program policies and implementing guidelines. National standards require schools to have one toilet compartment or latrine drop hole per 40 boys and one toilet compartment or latrine drop hole per 25 girls. Official education statistics generated in 2011 indicate that out of 8,754 primary schools in the country, 50 percent met the pupil/toilet ratio requirements for boys and girls.[2] The same statistics generated for 2012 revealed that the percentage had increased to 58 percent coverage. Neither the 2011 nor the 2012 official statistics provide any information about handwashing facilities and practices.

Water, Sanitation, and Hygiene in Schools

Studies[3] have shown that schools with improved physical conditions are conducive to learning and will stimulate academic performance in foundational subjects such as reading and mathematics. Healthier pupils and teachers will spend more time in class and on task.[4] Adolescent girls are more likely to go to and stay in schools with adequate sanitation facilities.[5] All of the above should lead to learning achievement in the target academic subjects. In their systematic literature review, Jasper et al.[6] argued that inadequate water and sanitation facilities in schools may be a major hindrance to the achievement of MDG 2.A: "Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling." They suggest that schools in developing and developed countries that lack adequate water and sanitation services are associated with potential detrimental effects on health and, as a result, school attendance. This systematic review, which included 47 studies, came to the following major conclusions:

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[1] Ministry of Finance. 2011. Sixth National Development Plan. Republic of Zambia.

[2] Ministry of General Education. 2011. Education Statistical Bulletin. Republic of Zambia

[3] Duran-Narucki V. 2008. School Building Conditions, School Attendance and Academic Achievement in New York City Schools: A Meditational Model. *Journal of Environmental Psychology*. 28: 278–286.

[4] Taalat M. et. al. 2011. Effects of Hand Hygiene Campaigns on Incidence of Laboratory-Confirmed Influenza and Absenteeism in Schoolchildren, Cairo, Egypt. *Emerging Infectious Diseases*. April 17 (4):619–25.

[5] Sommer M. 2010. Where the Education System and Women's Bodies Collide: The Social and Health Impact of Girls' Experiences of Menstruation and Schooling in Tanzania. *Journal of Adolescence.* 33: 521–529.

[6] Jasper T, T. Lee, and J. Bartram. 2012. Water and Sanitation in Schools: A Systematic Review of the Health and Educational Outcomes. *International Journal of Environmental Research and Public Health.* August 9 (8):2772–2787.

- Inadequate drinking water contributes to inadequate hydration, which may be associated with decreased physical activity and cognitive capacity, weight gain, and urinary tract infections.
- Post-pubescent school girls and female teachers face challenges to school attendance during menses, due to unavailability and affordability of sanitary materials and the lack of adequate school facilities (e.g., lack of gender segregated toilets, no running water, broken toilet doors).
- School conditions, including sanitation infrastructure, have been correlated to school attendance and pupils' academic success on standardized mathematics and English tests.
- Provision of water for handwashing and soap is associated with handwashing knowledge, decreased absenteeism, and reported illnesses.
- Combined WASH interventions have been related to a reduction of helminthic infections.

An important determinant of academic performance is the time pupils spend learning while at school. The definition of time-on-task used in this document is the amount of time pupils spend attending to school-related tasks. However, an important distinction needs to be made between *allocated* time (time that pupils are required to be in class) and *engaged* time (time that pupils participate in learning activities while in school). Engaged time may be a predictor of learning outcomes, especially if these are gains in achievement and not absolute achievement levels.[7] As Farbman has suggested, "Adding time can have a meaningfully positive impact on pupil proficiency and…upon a child's educational experience."[8] In the context of this study, WASH improvements were considered as contextual variables that create conditions allowing for increased attendance and teacher-pupil contact time, thus raising the possibility of more time spent on learning tasks. The variables were an expression of a time dimension associated with learning: more days spent in school and more time when attending school devoted to learning activities.

Description of the Study Area

The study was conducted in three SPLASH intervention districts (Mambwe, Chipata, and Lundazi) in Eastern Province and three control districts (Chongwe, Rufunsa, and Luangwa) in Lusaka Province. The aim was to measure the effect of WASH in the more than 370 Eastern Province schools, which served an estimated population of more than 170,000 children, where SPLASH provided WASH support. The study was carried out in both government- and nongovernment-supported schools (community and grant-aided). A government school is one fully funded by the government; a community school is one constructed by the community where the government may assign teachers; and a grant-aided school is one that receives a government subsidy to operate. Often grant-aided schools are faith based. According to a baseline 2012 SPLASH school facility assessment of the entire universe of schools in Eastern Province, 81 percent of the schools had between seven and nine grades. Most of the schools with nine grades were in Chipata. Sixty-five percent of schools had two shifts, 20 percent had three shifts,

[7] Frederich W and H. Walberg. 1980. Learning as Function of Time. *The Journal of Education Research*. 73 (4): 185–194.

[8] Farbman D. 2012. The Case for Improving and Expanding Time in School: A Review of Key Research and Practice. Boston: National Center on Time and Learning.

and 15 percent had only one shift. The bulk of the schools with three shifts were also in Chipata. All grades were taught during each shift in only 34 percent of the schools. It was thus more common for different grades to be taught during different shifts. In one-third of the schools, multi-grade teaching took place. This characteristic was more common in Lundazi than in the other districts.

Brief Description of the Intervention Project

The four-year (2011-2015) SPLASH project was designed and implemented in line with the USAID education policy and the goals of the water and sanitation sector in Zambia. SPLASH operated within the SHN Program framework of the Ministry of General Education, which articulated a relationship between health, nutrition, and education. SPLASH supported the SHN WASH component, which is a critical but under-represented aspect of SHN. SPLASH helped to overcome limitations of inadequate human and financial resources and offered a model school WASH program by implementing these five strategies:

1. Install and rehabilitate improved drinking water, sanitation, and hygiene infrastructure in schools
2. Improve the hygiene behaviors and health of learners, teachers, and subsequently their communities
3. Strengthen local governance and coordination of WASH in schools
4. Engage those who set policies at the national, provincial, and district levels to support WASH in schools
5. Strengthen the capacity of small-scale service providers and the private sector to deliver WASH goods and services to both schools and communities on a sustainable basis

By the end of its four years of implementation, SPLASH achieved the following outputs:

Table 1: SPLASH Outputs

RESULTS	SCHOOLS	FACILITIES	BENEFICIARIES		
			PUPILS	TEACHERS	OTHER
New improved water sources constructed/rehabilitated	373	423	172,377	1,885	
Improved sanitation facilities constructed	273	3,059	142,189	1,527	
Handwashing facilities constructed	499	662			
Teachers who completed in-service WASH training				1,320	
Administrators and officials successfully trained					214
Schools with access to teacher and pupil WASH educational packages	370				

Source: SPLASH database, October 2015

Table 1 shows that 423 improved water sources were constructed in 373 schools in Eastern Province benefitting about 172,377 pupils and 1,885 teachers. In some schools, the program may have both constructed a new water point and rehabilitated an existing one. Furthermore, the program provided 3,059 sanitation facilities in 273 schools benefitting 142,189 pupils and 1,527 teachers. During the same four years of implementation, the SPLASH program provided 662 handwashing facilities in 499 schools and in-service WASH training benefitting 1,320 teachers and 214 administrators and other officials. By the end of the program, SPLASH had provided educational materials for teachers and pupils in 370 schools.

LITERATURE REVIEW

The rate of pupil absenteeism in Zambia, especially at the basic education level (Grades 1 to 9), has been a source of great concern over the years, compounded by the absence of regular and systematic information at all levels. Although officially all classes in Zambia are expected to maintain up-to-date class attendance registers, the reality is that either the responsible person rarely updates the register or the schools lack registers altogether. During the course of the study, we observed that the school attendance registers kept by teachers did not always match kept by the school. We assumed that drop outs and new enrolments were more accurately reflected in teacher records than in official records kept by the school administrator. The disparity described made us change our data collection strategy. That is, during the period of data collection for this study, part of the data on attendance was supposed to be obtained from the registers. However, the reality on the ground just described dictated that the initial approach be abandoned to rely exclusively on students lists kept by teachers to do roll call. Moreover, information on pupil attendance is supposed to be submitted in monthly returns from every school. However, evidence suggests that this information is not collected, quality assured, synthesized, or evaluated at higher levels.

Nonetheless, some specific studies provide information on the rates of absenteeism and on the magnitude of this challenge. The bulk of this data can be obtained from the Examinations Council of Zambia, dedicated studies on absenteeism, expenditure service delivery surveys, and the Southern and Eastern African Consortium for Monitoring of Education Quality program.

The Examinations Council of Zambia has three main sources of information on absenteeism: the first is obtained from the examination attendance registers. This rate is superficial because of the high stake nature of examinations—most pupils will present themselves on the day of the examinations due to the consequences of not attending.

Pupil Absenteeism

Working with UNICEF, the Examinations Council of Zambia undertook a detailed analysis of the impact of the rate of absenteeism, taking into account the net economic losses and the resultant general impact on education delivery. This study focused on the rate of absenteeism in examinations, and as result should not be considered as a comprehensive study on absenteeism in general under conditions when no testing is occurring However, this rate of absenteeism, although relatively high, takes place during the period when every enrolled pupil is universally expected to present himself or herself for examinations, regardless of rain or thunder.

Generally in the National Assessment Surveys, average absenteeism rates have been around 19 percent and in a number of instances actually exceed this rate. All National Assessment Surveys[9] exclude pupils absent on the first day of visit because of the high rate of absenteeism. The absent pupils are excluded in order to avoid wastage of assessment materials, some of which

[9] Examination Council of Zambia. 1999, 2001, 2003, 2006, 2008, 2012. National Assessment Surveys. Government of Zambia.

are printed abroad at very high cost. Although the National Assessment Surveys collect information on the rate of absenteeism on the first day of the data collection visit, it remains unanalyzed for the most recent surveys. In the earlier surveys where the rate of absenteeism information was analyzed, the average was 19 percent (2003 and 2001 reports). This rate was calculated in a similar manner as the roll call absenteeism in the SPLASH Outcome Study—the proportion of enrolled learners absent on the date of the school assessment.

According to the Public Expenditure Tracking Survey (PETS),[10] a large share of pupils are absent for at least one school day a week. In the survey, 35 percent of Grade 5 pupils reported being absent at least one school day during the week prior to the survey, and 22 percent of Grade 9 pupils indicated being absent. On average, Grade 5 pupils missed 15 percent of school days, and Grade 9 pupils missed 8 percent. Among the reasons stated were family reasons such as funerals or weddings (61 percent) and others such as work, family holidays, and dirty clothes (9 percent).

Teacher Absenteeism

The PETS-QSDS 2014 study indicated that the official records (available at primary and secondary schools) show attendance rates of 83 percent for both primary and secondary schools (in February and June of 2013). It was further pointed out that 16 percent of primary school teachers and 12 percent of secondary school teachers were absent for more than 50 percent of school days in June and were a major factor in bringing down the teacher attendance rate.

The PETS-QSDS surveys also indicated that: teacher management is inefficient; teacher absenteeism remains almost the same over the past decade; teacher attrition is high and a high percentage of teachers want to and do transfer schools; and teacher subject knowledge is insufficient, especially at Grade 9. On a given day, 18 percent of teachers do not attend school. Approximately 50 percent of teachers want to transfer, especially teachers in rural schools, but the 53 percent of transfers that happen at Grade 5 and 44 percent of transfers at Grade 9 are from urban schools to rural schools. In terms of teacher subject knowledge, 50 percent of Grade 5 teachers score below 90 percent in Grade 5 subject materials and the same percentage of Grade 9 teachers score below 70 percent in Grade 9 subject materials.

Pupil-Teacher Contact Time

Walberg[11] states that instructional quantity and subject achievement are significantly correlated. Berliner[12] suggests that these findings speak in favor of school productivity and pupil achievement. Separate research suggests that the quantity of time allocated to a particular curricular area may yield large performance effects for pupils within educational systems.[13] Further research suggests that the difference depends on the amount of time dedicated.

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[10] Public Expenditure Tracking Surveys (*PETS*) and. Quantitative Service Delivery Survey (*QSDS*). 2014. Government of Zambia.

[11] Walberg H. 1986. "Syntheses of Research on Teaching." In M.C. Wittrock (Ed), *Handbook of Research on Teaching* (3rd edition, pp. 214-30). New York: Macmilan.

[12] Berlinger D. 1990. "What's All the Fuss About Instructional Time?" In *The Nature of Time in Schools: Theoretical Concepts, Practitioners Perceptions*. New York and London: Teachers College Press, Columbia University.

[13] Purvis A and D Levine. (Eds.) 1975. *Educational Policy And International Assessment: Implications of the IEA Theory of Achievement*. Berkeley, California: McCutchan.

Martinez and Brock[14] refer to this as time-on-task or engaged time. Others suggest that this is the actual time spent learning. Our evaluation of the SPLASH program could not directly observe what happens in each classroom and subject to establish how much of the school time is on-task, passively off-task, verbally off-task, and actively off-task, as suggested by Martinez and Brock. However, one option was to focus on allocated time, and assume that if allocated time increases, the chances for time-on-task will also increase. For the purposes of this study, allocated time is the extent to which the three hours of instruction that are officially expected to take place at each grade have actually occurred in schools where attendance of both pupils and teachers has increased as a result of a WASH in Schools intervention.

[14] Martinez E and S. Brock. 2009. Measuring On-Task Behavior. Time On-Task. www.education.com/reference/article/time-on-task/.

METHODOLOGY AND DESIGN

Study Design

The study was a quasi-experimental cluster design. It was conducted in two similar geographical areas (intervention matched with a control group) over a period of ten months. Schools in the Eastern Province that received a full WASH program[15] through SPLASH comprised the intervention group while schools without a full WASH package in Lusaka Province comprised the control. No external donor was implementing a WASH in Schools program in the control schools. Although control schools were selected outside Eastern Province to avoid contamination, only schools located in communities of similar cultural and economic characteristics to those in the Eastern Province were selected.

Study Sample

The study sampled 128 schools (64 intervention schools and 64 control schools). Schools in each study group were randomly selected from an existing sampling frame. A multistage procedure was used to select the study schools. In the first stage provinces were selected: the intervention province (Eastern) was matched with a control province (Lusaka) selected for similarity of social, cultural, and economic characteristics. In the second stage districts were selected in the two provinces. In the intervention group, Chipata, Lundazi, and Mambwe districts were chosen because they had implemented a full WASH program through the SPLASH project. In the control group, districts were selected using cultural and socio-economic matching criteria, including ecological zones. In the third stage schools were selected based on the same principles used to select districts but only from those provinces and districts already chosen. The fourth and last stage was at school level, where the grades to be studied were selected. At this stage a systematic sampling procedure was introduced to select only the odd grades. Thus, the first, third, fifth, seventh, and ninth grades were selected into the study sample, with higher grades added to explore the effect of a WASH program on older girls who may have started menstruating.

The full WASH program would be the theoretical treatment for schools that were classified as intervention or experimental while the control group of schools would have no treatment or would receive no WASH program intervention. The hypothetical construct was that a significant difference in rates of absenteeism would be observed between the control and the intervention schools on a single day visit and in the previous two weeks. Several analysis options were explored and tried: the analysis of variance, bivariate and multivariate correlational analysis, and comparisons of means including T-test analyses. In almost all cases, the assessment was meant to explain variations in the rate of absenteeism between the control and intervention schools.

[15] A full WASH program was defined by 11 different criteria requiring schools to have functional water, sanitation, washrooms for girls, and handwashing facilities as well as an operational WASH software package. The latter included trained instructors in hygiene promotion, a functional WASH club, and community outreach activities.

Study Instruments

The study was conducted using three instruments: an interview guide (for head teachers), roll call roster (for pupils), and questionnaire (for parents). These were used for interviewing teachers, conducting roll calls, and interviewing parents of pupils who were absent from school in the two weeks prior to the study visit. The three instruments were developed in ODK software and installed on six Samsung tablets using the Android operating system. The parent instrument had questions for eliciting data on factors that prevent children from going to school. The instrument contained pupil and school ID numbers to link responses to a particular school. It also identified the gender of both the interviewed parent and the pupil who was absent from school. No names were recorded on the instruments for privacy and confidentiality reasons. The head teacher instrument was administered to heads of selected schools to obtain data on the school WASH facilities and hygiene promotion programs targeting pupils and their families. It also obtained data on planned school programs that would disrupt learning. The instrument also collected data on pupil enrollment, teacher population, and dropout numbers for the school. The instrument for roll call tracked pupil absenteeism by gender, grade, and class. It obtained data on the characteristics of the grade and class being studied, the shift during which the class is held, whether it was multi-grade, whether there was a water corner or textbooks, the sex of the teacher, and whether the teacher was present. The three questionnaires were linkable using the school code and school name.

Data Collection and Management Procedures

The visit to conduct roll call on a class was done unannounced every other month. During the first visit, data were collected on school WASH facilities through an interview of the head teacher. Roll call was conducted in classes of the first, third, fifth, seventh and ninth grades. Absenteeism data collected on the day of the school visit was referred to as *de facto* absenteeism. Absenteeism data collected on the absence of any pupil present in the class for at least one day during the two weeks prior to the school visit was called *de jure* absenteeism. We also interviewed parents of de jure absent pupils to determine what prevented children from attending school. From the total of all the pupils that were absent two weeks prior to the study visit, a random sample of 5 percent was used to select those whose parents were visited for follow up interviews.

The enumerators visited the same schools again every other month during the remaining school year. In the next visits, however, they only conducted roll calls in classrooms and visited parents to identify reasons for absenteeism. In schools that had double shifts for the grades being studied, enumerators collected data from both shifts. This could require visiting the school for the same exercise in the morning and in the afternoon. Since the visit to conduct roll call on a class was done every other month, some classes were visited twice for roll call before the term ended. Some schools had to be visited the following term to visit the same class more than once. Data collection for absenteeism continued in the original grade and class even if new individuals had come into that class or other pupils had moved to a different grade or school. When the school abolished the grade or class at the school being studied, then the collection of data from that grade or class stalled. Recorded data was exported online from the schools to

ODK Aggregate, a saver where all the data were deposited. Then data imports were done at SPLASH main offices in Lusaka from Aggregate into CSV format and then into Excel. Linking of data variables was done in Microsoft Access before exporting the data file to SPSS for further analysis. Electronic files were created automatically as the data were entered into the tablets, and they were generally transmitted daily to the main server for the project database.

Data Analysis

The unit of analysis for this study was the school. Although data were obtained per pupil and teacher at the class level, aggregations were done at school and grade levels. Descriptive statistics reflecting rates of pupil absenteeism, teacher absenteeism, and pupil-teacher contact time were aggregated into three time dimensions: months, seasons, and school terms. Overall ten months, three seasons, and three terms were surveyed. The data collection period was extended for as along as possible given the remaining project life when the study was initiated. An important consideration was to capture the possible trends in absenteeism over time and avoid having a single snapshot during only one short moment to the school year. The seasons considered were hot, wet, and cold. The three schools terms included: the first term when data were collected (September to December 2014), the second term (February to April 2015), and the third term (May to July 2015). T-tests were used to explore differences between intervention and control schools. A linear regression was also calculated to determine whether differences in pupil absenteeism depended on the SPLASH intervention plus the following additional potential determining factors: presence of a school feeding program, presence of school improvement projects other than WASH, school location, size, and type. Data for absenteeism and pupil-contact time rates are presented as percentages. The numerator in all cases represents the observed occurrences and the denominator the expected occurrences of any of the indicators tracked. The result of this division was multiplied by 100 to generate a percentage. Enrollment and dropout data using official records available at the visited schools were also collected. Raw enrollment figures were aggregated by school and broken down by gender. Dropout rates were calculated and expressed as percentages reflecting the percent of enrolled pupils that left school permanently. Enrollment and dropout figures reflect all grades—odd and even grades.

Pupil absenteeism was measured in two ways:

- De facto absenteeism obtained through roll call on the day of visit to the school
- De jure absenteeism representing pupils that were absent at least once during a two-week period prior to the school visits

Teacher absenteeism was tracked by determining which teachers did not come to work their shift during the day of the school visit. Pupil-teacher contact time was initially estimated by class and aggregated at the school level. The estimate was developed by deducting from the expected three hours of instruction per day for both pupil and teacher absences. It was determined that the full three hours took place when pupils and teachers were both in a classroom the day of a school visit. No time of instruction was possible when the teacher was absent. Hours were discounted when some pupils were absent and the teacher was present.

Separate analyses using repeated measures analysis of variance were conducted. This required having absenteeism and contact time rates for all schools in the sample. Not all schools included in the sample were visited at all intended occasions. Absenteeism data may have been interrupted for different reasons (e.g., weather, road conditions, head teachers not available at time of visit, etc.). To fill the gaps when conducting statistical analysis across time, values were imputed for schools for which data were missing. These values are the mean score values of the indicators of interest per district. Value imputation occurred mainly for the first term of the school year 2015. The results of this analysis are not presented in this report but are available upon request.

This report contains the analysis by season and school terms for pupil absenteeism but for purposes of brevity and simplicity presents the results for teacher absenteeism and pupil-teacher contact time by school term only.

FINDINGS AND DISCUSSION

This section presents the findings and discussions of the study. The main findings are presented according to the study's key objectives:

- To explore if the presence of WASH in school increases attendance among pupils and teachers
- To explore if increased school attendance improves teacher-pupil contact time
- To explore the reasons for pupil absenteeism
- To explore differences in enrollment and drop-out rates between intervention and control schools

Pupil Absenteeism by Season

The findings of the analysis of pupil absenteeism by season are presented in Table 2 and are broken down by type of absenteeism tracked and by gender. Significant differences appear in bold when the probability of the difference is under .05 in the last column of the table. In alignment with our working hypothesis, the expectation is that absenteeism rates in intervention schools would be lower than in control schools. Statistically significant findings contrary to expectations are presented in red. The seasons are presented in the sequence that the data were collected. The data collection started in the dry hot season; it continued in the wet season and ended in the dry cold season.

Table 2: Seasonal Comparisons of Pupil Absenteeism Rate between Control and Intervention Groups by Type of Absenteeism Measure

TYPE OF ABSENTEEISM	SEASONS	GENDER OF PUPILS	INTERVENTION	CONTROL	T-TEST	P
De Facto	Dry Hot	Boys	**28.0**	**22.2**	**2.0**	**.04**
		Girls	**26.1**	**20.4**	**2.1**	**.03**
		All	**27.0**	**21.8**	**2.5**	**.01**
	Wet	Boys	14.6	19.2	1.8	.07
		Girls	14.7	19.2	1.0	.30
		All	14.7	17.5	1.9	.06
	Dry Cold	Boys	**16.9**	**22.8**	**2.2**	**.03**
		Girls	15.5	19.6	1.7	.08
		All	**16.1**	**21.3**	**2.1**	**.04**
De Jure	Dry Hot	Boys	**38.3**	**28.7**	2.4	**.02**
		Girls	**36.7**	**26.4**	2.7	**.01**
		All	**37.3**	**27.6**	2.5	.01
	Wet	Boys	**23.7**	**46.1**	5.2	**.00**
		Girls	**26.1**	**42.2**	4.0	**.00**
		All	**24.9**	**45.3**	4.7	**.00**
	Dry Cold	Boys	**12.9**	**46.7**	12.3	**.00**
		Girls	**12.8**	**44.1**	11.6	**.00**
		All	**12.8**	**45.5**	12.2	**.00**

Note: Results presented in this table reflect findings pertaining to the equality of variances between the two study groups. The equality of variance was examined using Levene's Test for Variance Equality. Only in the case of data for girls in the dry hot season did the Levene test indicate that the variances in question were heterogeneous. The t- test results presented in Table 2 reflect that finding.

According to Table 2, findings regarding pupil absenteeism indicate statistically significant differences in the expected direction between the intervention and the control groups in:

- The dry cold season when considering de facto absenteeism
- The wet and dry cold seasons when considering de jure absenteeism

For de facto absenteeism, the difference in the dry cold season is found both for boys and for all pupils when boys and girls are aggregated together. The absenteeism rate is 16.9 among boys in the intervention group and 22.8 in the control group, a difference of 5.9 points. For all pupils considered together, the de facto absenteeism rate is 16.1 in the intervention group and 21.3 in the control group, a difference of 5.2 points. In the first case, absenteeism is 35 percent higher in control than in intervention schools. In the second, that percent is 32 percent.

According to the data in Table 2, the differences in the wet season are in the right direction for de facto absenteeism but do not reach statistical significance. In the case of all pupils it reaches marginal significance because the p value is .06 and the cut off threshold is .05. This may be partially explained by the lower number of schools visited during the wet season than in other seasons considered in this study.

The data presented in Table 2 also indicate that when considering de jure absenteeism, the detected differences in the expected direction in the wet and in the dry cold seasons are relatively large. The largest differences are observed in the dry cold season where the de jure absenteeism rate is generally close to 13 in the intervention group and in the mid-40s in the control group. The differences in favor of the intervention group schools hover around 33 rate points. This means that pupil de jure absenteeism is at least three times higher in the control schools than in the intervention schools.

The data in Table 2 also tell us that absenteeism may have operated differently than expected in a statistically significant manner in the dry hot season. In this case, the absenteeism rate in intervention schools, presented in bold red numbers, tends to hover around a six point difference for de facto absenteeism and around ten points for de jure absenteeism.

Pupil Absenteeism by School Term

The findings of the analysis of pupil absenteeism by school term are presented in Table 3. As in the previous table, the findings in Table 3 are broken down by type of absenteeism tracked and by gender. Significant differences appear in bold when the probability of the difference is under .05 in the last column of the table. In alignment with our working hypothesis, the expectation is that absenteeism rates in intervention schools would be lower than in control schools. Statistically significant findings contrary to expectations are presented in red. The seasons are presented in the way that the data were collected. The data collection started in the dry hot season; it continued in the wet season and ended in the dry cold season.

Table 3: School Term Comparisons of Pupil Absenteeism Rate between Control and Intervention Groups by Type of Absenteeism Measure

TYPE OF ABSENTEEISM	TERMS	GENDER OF PUPILS	INTERVENTION	CONTROL	T-TEST	P
De Facto	First	Boys	27.3	23.3	1.9	.06
		Girls	**25.9**	20.4	2.0	**.04**
		All	**26.8**	21.7	2.2	**.03**
	Second	Boys	9.5	19.3	3.9	**.00**
		Girls	10.0	17.6	2.9	**.00**
		All	9.7	18.5	3.6	**.00**
	Third	Boys	16.4	22.7	2.3	**.02**
		Girls	15.3	19.3	1.7	.09
		All	16.3	21.3	2.0	**.04**
De Jure	First	Boys	**39.6**	29.6	2.7	**.01**
		Girls	**38.3**	26.4	3.1	**.00**

	All	**38.9**	27.6	2.9	**.00**
Second	Boys	8.4	46.4	12.6	**.00**
	Girls	9.3	44.4	11.4	**.00**
	All	8.8	45.5	12.4	**.00**
Third	Boys	14.7	45.9	8.9	**.00**
	Girls	14.1	42.3	8.4	**.00**
	All	14.4	44.2	8.8	**.00**

Note: Results presented in the table reflect findings pertaining to the equality of variances between the two study groups. The equality of variance was examined using Levene's Test for Variance Equality. Only in the case of data for girls in the dry hot season did the Levene test indicate that the variances in question were heterogeneous. The t-test results presented in Table 3 reflect that finding.

Findings presented in Table 3 indicate that most of the differences detected between the intervention and the control schools are statistically significant. As it was the case for the data presented in Table 2 of the analysis of findings by seasons, we find that when we analyze the data by school term the results:

- Are in the expected direction for what we have named the second and third terms (February to April 2015 and May to July 2015, respectively) and for both measures of pupil absenteeism
- Are not in the expected direction in general for what we have named the first term (September to December 2014)

Furthermore, when we consider the de facto absenteeism rate, the largest difference between intervention and control schools occurred for boys and for all pupils in the second school term. In this term, the absenteeism rate detected in control schools is practically twice that detected in intervention schools (9.5 vs. 19.3 and 9.7 vs. 18.5, respectively).

In the case of the de jure absenteeism rates, the largest differences between intervention and control schools also occur in the second term and among boys. In this case, the difference is between 8.4 in intervention schools and 46.4 in control schools. That is a fivefold difference.

During the first school term, differences detected are in the opposite direction than expected. That is, the control schools outperform the intervention schools. This is true for both measures of pupil absenteeism. The following section on monthly variations in absenteeism rates sheds light on where the inverted results may be occurring.

Monthly Analysis of Pupil Absenteeism

This section presents findings of absenteeism analyzed by month for the ten-month period of data collection. The analysis has some limitations because not all schools were visited every single month. In some months data from too few schools make it difficult to generalize, but the analysis can help provide a more in-depth understanding of what is happening in segments of the deeper dive into trends. Figure 1 compares de facto absenteeism rates on a monthly basis for intervention and control schools. No statistical analysis was done of these data as there are too few schools per study group in some of the months considered.

Figure 1: Rate of Pupil Absenteeism by Month

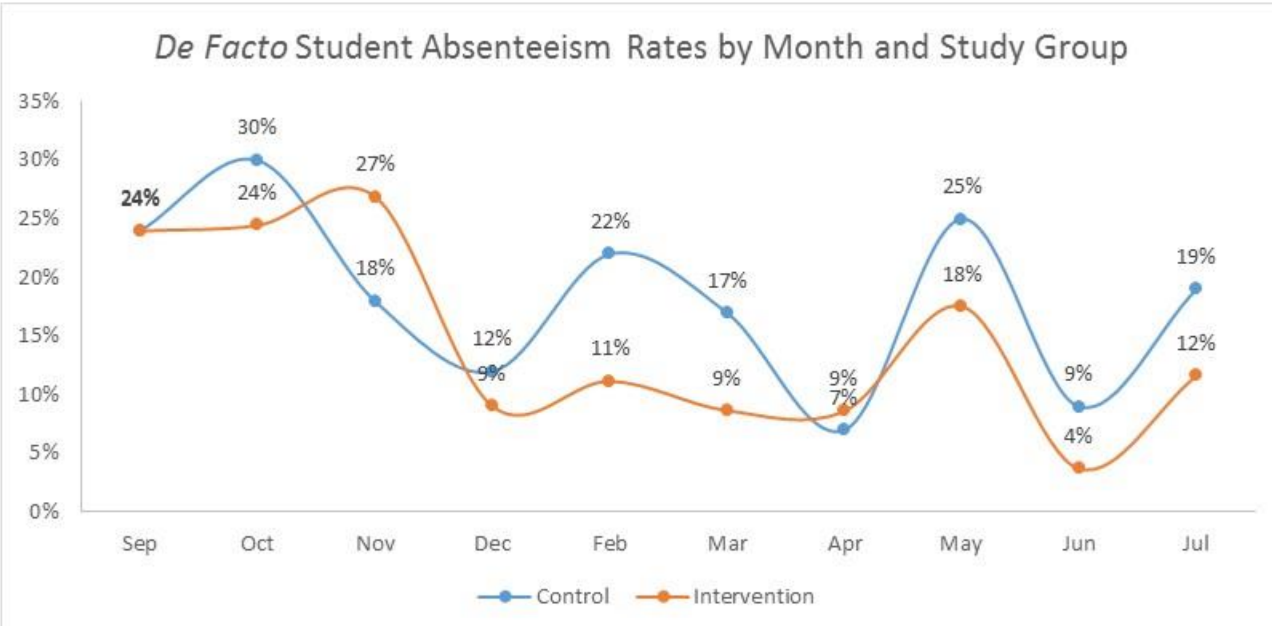


Figure 1 shows that the pupil absenteeism rate was higher in eight out the ten months in control schools compared to intervention schools. Only during two months (November and April) was absenteeism higher in intervention schools than control schools. The November absenteeism rate could be attributed to the five days of examinations occurring that month. During examinations, pupils not involved in testing are asked to stay home to avoid disruption of testing. On the other hand, the differences in the opposite expected direction in April may be due to the fact that the term was ending and parents may have decided to keep their children at home. In the U.S. context, for example, school districts are required to have a set number of schooling days. Yet, at year end fewer educational activities may take place. As a result, anecdotal data suggest that families may not feel compelled to have children attend school, generating a spike in absenteeism during the last school month. This may also be the case in Zambia.

Reasons for Pupil Absenteeism Reported by Parents

One area that this study tried to ascertain was the parents' perspective on major reasons contributing to absenteeism. Five percent of absent pupils had their parents targeted for questioning along these lines. Table 4 shows the major reasons given by parents for pupil absenteeism throughout the study.

Table 4: Parent-Stated Reasons for Absenteeism

REASONS	INTERVENTION	CONTROL	TOTAL	SIGNIFICANCE
Family Obligations	12.4	15.5	15.0	NS
Financial Limitations	16.5	9.1	11	0.01
Farming	19.8	7.8	11	0.01
Child Expresses No Interest in School	2.5	6.8	5.8	0.05
Menstruation	15.7	1.8	5	0.00

The most cited reason for absenteeism was family obligations (household chores, taking care of siblings, the elderly, and the sick), followed by financial limitations (no money for school fees, project contribution, shoes, uniforms, and books, among others). Just as frequently mentioned were economic reasons, which were predominantly farming or agricultural activities. Other reasons included: no interest in school (6 percent), menstruation (5 percent), visiting relatives/elsewhere on holiday (2 percent), and distance (2 percent). Listing the different reasons mentioned by the parents interviewed is important in the context of this study as it shows factors of absenteeism that may not be affected by a WASH in Schools program. At best, such a program can be expected to contribute to the reduction of pupil absenteeism but not eradicate it.

Effect and Significance of Confounders on De Facto Absenteeism

To validate the findings about pupil absenteeism, the analysis also explored the role of other factors that may operate as potential confounders when predicting de facto pupil absenteeism. The aim of this analysis was to measure the weight of the WASH intervention compared to other such factors and to determine if the effect of WASH would remain in place despite the presence of these other factors.

A linear regression model was created using data for Term 3 and confounders likely to enhance a school, including:

- Existence of a school feeding program
- Presence of school improvement projects other than WASH
- Presence of multi-grade teaching at the school
- School type (public vs. community)
- School size (small vs. large with the median as the breakdown point)
- Location (rural vs. urban)

As an initial step in the process, correlations between potential confounders were established to detect collinearity effects and eliminate variables from the model that showed significant correlation coefficients. This analysis showed that:

- School size was significantly correlated with the existence of a school feeding program ($r=.23$), location (.32), and multi-grade teaching ($r=-.34$).

- Multi-grade teaching is significantly correlated with school type (r=.22), reflecting that this is more common in community schools.

As a result, the variables school size, location, and multi-grade teaching were excluded from the linear regression model. That is, we eliminated variables that are related to each other and can make it difficult to establish the precise effect of each predictor due to their internal associations.

Results of the linear regression analysis show that R Square = .14 (this is the percentage of the response variable variation that is explained by the linear regression model). The analysis of variance for the model indicates that the F ratio is 2.6 with p =.04, suggesting the suitability of the model in explaining the relationship of the predictors and the desired outcome of roll call absenteeism.

Table 5 shows the unstandardized Beta weights for all the coefficients in the model, reflecting the influence of all predictors retained in the model on the dependent variable, pupil absenteeism.

Table 5: Influence of Confounders on the Dependent Variable

	UNSTANDARDIZED BETA WEIGHTS	T	P
SPLASH intervention	- 7.96	-2.5	.01
Presence of school feeding program	- 2.39	-.55	.58
Presence of school improvement projects other than WASH	1.31	.42	.67
Type of school	2.86	.59	.58

We interpret the findings presented in Table 5 as follows:

- The SPLASH intervention and the presence of a school feeding program are negatively related with absenteeism as they both reduce it; yet, the presence of other school improvement projects as well as the type of school increase it
- The increase of absenteeism by type of school reflects the fact that public schools were coded with a lower number and that community schools were coded with a higher number. Thus, absenteeism is higher in community schools than in public schools.
- The differences detected between intervention and control schools that we have discussed elsewhere in this report remain when the influence of the other three factors in the model remain constant.

- The influence of the WASH intervention is considerably beyond and higher than that of a school feeding program also implemented in SPLASH schools. In fact, the weight that the WASH intervention has is more than threefold that of the school feeding program.

Teacher Absenteeism

Table 6 presents findings regarding one of the three indicators tracked by the School Outcome Study: teacher absenteeism. These findings are presented by school term and compare intervention to control schools. The expectation was that lower teacher absenteeism would occur in intervention schools when compared to control schools.

Table 6: Teacher Absenteeism by School Term

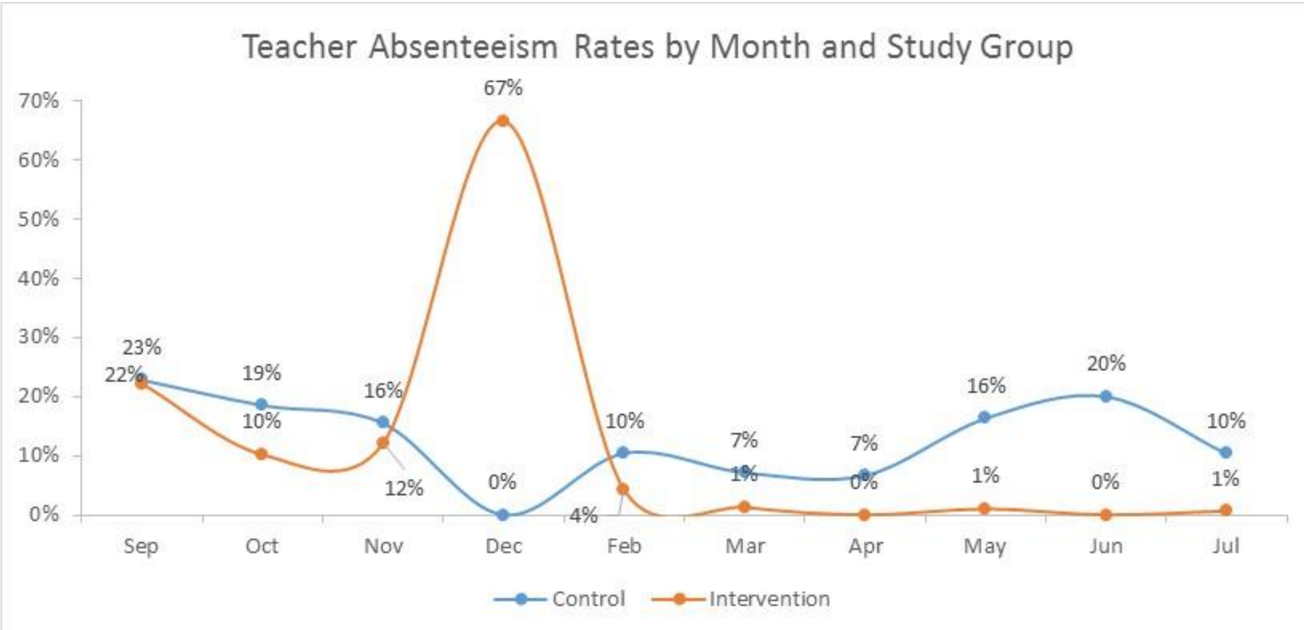
TERMS	INTERVENTION	CONTROL	T TEST	P
First Term	20.9	18.5	0.5	.61
Second Term	2.9	13.7	2.5	.01
Third Term	1.0	15.8	4.7	.00

Results of the analysis presented in Table 7 indicate that lower teacher absenteeism occurred in two of the three school terms examined: the second and the third school term. The rate of teacher absenteeism in control schools is almost five times greater than that detected in intervention schools in the second term and fifteen times greater in the third term.

As was the case with pupil absenteeism, no difference in teacher absenteeism was detected in the first term tracked. Again, this corresponds to the period between September and December 2014. The difference is not statistically significant yet in the opposite direction than expected.

To shed light on the issue, we explored monthly variations in teacher absenteeism as we did with pupil absenteeism. The following figure presents the result of that exploration, comparing teacher absenteeism in intervention and control schools. The chart shows higher teacher absenteeism in the month of December in intervention schools. The detection of this rate of teacher absenteeism in that month alone breaks the pattern of lower absenteeism for the first months of the tracking period reflected in the chart. That is, in the month of September teacher absenteeism is practically the same; in the months of October and November intervention schools record lower absenteeism. The spike in December certainly changes the picture for the entire term. It is difficult to explain why the difference detected occurred in intervention schools in December. Generally speaking when we see what happened monthly, teacher absenteeism is lower in intervention schools than in control schools.

Figure 2: Teacher Absenteeism Rates by Month and Study Group



Pupil-Teacher Contact Time

As explained earlier, our measure of contact time reflects allocated time as opposed to actual time-on-task. The rate of pupil-teacher (allocated) contact time assumed three hours of daily instruction across all grades, although in practice the higher grades spend more time in school. Three hours was used as the denominator while the numerator discounted both pupil and teacher absences, which subsequently were added together. This calculation was made for each class. The calculation assumed there were no substitute teachers when a regular teacher was absent. It was assumed that when a teacher in a given class was absent, pupils in that class were not mixed with pupils in other classes or even grades to compensate for the absence of the instructor.

Table 7: Pupil-Teacher Contact Time by School Term

TERMS	INTERVENTION	CONTROL	T TEST	P
First Term	73.2	78.3	2.2	.03
Second Term	90.2	81.5	3.6	.00
Third Term	82.2	78.7	1.3	.19

The data presented in Table 7 summarizes the major findings for this indicator. In this case, what we are expecting is higher contact time in intervention than in control schools. That is, if pupil and teacher absenteeism is being reduced, this would allow for more contact time between them, thus possibly creating more learning opportunities. Data in Table 7 tell us that:

- A statistical difference in the expected direction occurred in the second school term, where the contact time rate is about nine points higher in intervention schools than in control schools
- Even though the difference is in the expected direction in the third term, it does not reach statistical significance
- Contact time is statistically significant in the first term tracked, but in the opposite direction than expected

These findings are generally consistent with has been reported elsewhere. We tend to see more positive results in two terms of the school year. This is not true in one term, the term associated with the end of the school year. There may be events at the end of the school year that affect both pupil and teacher absenteeism, and a WASH in Schools program has no influence on those specific events. In the case of pupils it could be exams or school attendance becoming a lower priority, particularly in the last month of the school year; among teachers other factors may be at play. Teachers assigned to positions in rural areas may be eager to leave those positions at the end of the school year to reconnect with their families. This may occur whether or not school facilities have WASH infrastructure.

Enrollment Rates

During school visits, enumerators obtained enrollment figures per class according to the class register on the day of visit. They recorded enrollment figures for both boys and girls as well as for the class as a whole. Because several classes were visited per grade, the information thus collected was aggregated by grade. The information gathered is summarized in Table 8, showing enrollment figures for control and intervention schools per term and grades.

According to the table, intervention schools had more pupils in terms one, two, and three compared to those enrolled in control schools, and consequently they had more pupils enrolled the whole year. This conclusion is valid when considering all students as well as when the data are broken down by gender. This result may imply that intervention schools are likely to attract more pupils compared to control schools, although we do not know what the school age population in the catchment area is for intervention or control schools. However, this difference between intervention and control schools occurs in all instances, for all seasons and all grades considered. Thus, if our interpretation is correct we may argue that one of the reasons for this finding could be attributed to the fact that intervention schools have better learning environments due to the presence of the WASH program.

Anecdotally, SPLASH learned that at registration for school year 2015, intervention schools had to turn down applicants due to the fact that the schools' capacity had already been reached. We have no such information from control schools. However, future studies can and should keep track of enrollment applications and establish the extent to which WASH in Schools programs generate more demand for placements than schools without WASH programs.

Table 8: First Term Enrollment for Classes Studied by Intervention, Control, and Gender

TERMS	GRADES	GENDER	INTERVENTION	CONTROL	TOTAL
First	Grade 1	Boys	2,116	2,035	4,151
		Girls	2,241	2,015	4,256
		Total	4,357	4,050	8,407
	Grade 3	Boys	2,168	2,005	4,173
		Girls	2,280	1,912	4,192
		Total	4,448	3,917	8,365
	Grade 5	Boys	1,809	1,708	3,517
		Girls	1,773	1,674	3,447
		Total	3,582	3,382	6,964
	Grade 7	Boys	685	434	1,119
		Girls	582	400	982
		Total	1,267	834	2,101
	Grade 9	Boys	1,283	346	1,629
		Girls	1,208	221	1,429
		Total	2,491	567	3,058

Table 9: Second Term Enrollment for Classes Studied by Intervention, Control, and Gender

TERMS	GRADES	GENDER	INTERVENTION	CONTROL	TOTAL
Second	Grade 1	Boys	3,525	3,281	6,806
		Girls	3,626	3,332	6,958
		Total	7,151	6,613	13,764
	Grade 3	Boys	3,663	3,291	6,954
		Girls	3,886	3,068	6,954
		Total	7,549	6,359	13,908
	Grade 5	Boys	3,142	2,753	5,895
		Girls	3,238	2,633	5,871
		Total	6,380	5,386	11,766
	Grade 7	Boys	2,796	3,260	6,056
		Girls	2,692	3,037	5,729
		Total	5,758	6,297	12,055
	Grade 9	Boys	1,922	1,328	3,250
		Girls	1,690	1,142	2,832
		Total	3,612	2,470	6,082

Table 10: Third Term Enrollment for Classes Studied by Intervention, Control, and Gender

TERMS	GRADES	GENDER	INTERVENTION	CONTROL	TOTAL
Third	Grade 1	Boys	2,009	1,614	3,623
		Girls	2,061	1,694	3,755
		Total	4,070	3,308	7,378
	Grade 3	Boys	2,018	1,364	3,382
		Girls	2,096	1,306	3,402
		Total	4,114	2,670	6,784
	Grade 5	Boys	1,833	1,311	3,144
		Girls	1,962	1,274	3,236
		Total	3,795	2,585	6,380
	Grade 7	Boys	1,808	1,267	3,075
		Girls	1,646	1,115	2,761
		Total	3,456	2,382	5,838
	Grade 9	Boys	1,111	667	1,778
		Girls	998	585	1,583
		Total	2,109	1,253	3,362

Dropout Rates

Comparisons of dropout rates were conducted by gender and season. We explored whether variations in dropout rates occurred by season and gender. Table 11 presents the findings of this analysis while Table 12 shows results of the test of significance for dropout rate. As in previous similar tables, statistically significant differences detected appear in bold in the last column where the significance level is presented. By the same token, significant differences in the opposite direction than expected appear in bold and red. The expectation was that dropout rates would be lower in the intervention schools when compared to control schools.

Table 11: Mean Dropout Rates by Study Group, Sex, and Season

SEASONS	GENDER	INTERVENTION	CONTROL	T-TEST	P
Hot	Boys	1.84	1.3	1.49	.14
	Girls	**1.93**	.65	3.5	**.00**
Wet	Boys	1.1	.54	1.69	.09
	Girls	.81	.64	.53	.60
Cold	Boys	.18	.88	3.8	**.00**
	Girls	.20	.58	2.8	**.01**

Findings presented in Table 11 indicate that dropout rates are:

- Significantly higher in the expected direction for both boys and girls in the cold season
- Significantly higher in the opposite direction to what is expected for girls in the hot season

Further, no statistical differences were detected in the wet season for either gender. Thus, no clear pattern emerges across seasons, and it is difficult to ascertain whether a WASH intervention made a difference across the board as far as dropout rates are concerned.

CONCLUSIONS AND RECOMMENDATIONS

The study clearly establishes that a full WASH package, which includes the provision of water, sanitation, and hygiene education in schools, had an impact on pupil and teacher absenteeism and on teacher-pupil contact time. Effects in the expected direction are clear during the measures taken in the 2015 school year. The difference between intervention and control schools is evident when we look at the measure termed de jure absenteeism. In this case, the absenteeism differences detected were at least three times higher (or 300 percent) in control schools when the time dimension is seasons, but as much as five times higher (or 500 percent) when the time dimension is a school term. The differences when we look at de facto absenteeism may hover around 34 to 35 percent when the data is by seasons, and may even be as high as onefold (or 100 percent) when we look at the data by school terms.

The analysis indicated that the benefits of a WASH in Schools program contributed to reduced absenteeism equally for boys and girls. Our analysis also showed that pupil absenteeism findings remain even in the presence of three other potential confounders: the presence of a school feeding program, the presence of school improvement projects other than WASH, and the type of school.

The study identified the main reasons for pupil absenteeism from the perspective of a sample of parents, who pointed out the importance of family obligations, financial and health related issues. The linkage between the reasons for absenteeism from the parental perspectives and the dynamics of absenteeism within schools was difficult to establish as the study was not designed with that purpose in mind. The study was also not designed to explore the reasons for teacher absenteeism, an element that would have complemented the findings to help understand the peak of teacher absenteeism detected in the month of December 2014.

As far as pupil absenteeism is concerned, differences in the opposite direction than expected occurred in one of the periods considered, mainly during the end of the school year in 2014. This is true regardless of the time dimension considered: seasons or school terms. These unexpected results pose specific interpretation challenges and were observable both for pupil and teacher absenteeism, which in turn affect pupil-teacher contact time. Two main explanations are offered. One, that during the end of the school year schools may be administering standardized tests for fifth graders. When this occurs, pupils in other grades may be asked to stay home to reduce possible disruptions caused by other pupils in the school. And two, at the end of the year the concern for academic pursuits diminishes once all testing is done and pupils may be coming to school to socialize and say goodbye for the year. Under those conditions, parents may prefer that their children spend time doing something else besides attending school. On the other hand, a high peak of teacher absenteeism detected in intervention schools in the month of December 2014 may reflect the desire of teachers assigned to rural areas to leave their post and return home to their families.

RECOMMENDATIONS

Overall

- The positive contribution of WASH to educational performance is clear from this study. The Government of Zambia should consider expanding a WASH in Schools program to other parts of the country and continue to support the investments made to guarantee their operation, maintenance, and sustainability in the medium and long term.

Methodological Recommendations

- Given the seasonality of school absenteeism, future studies to explore this phenomenon should be longitudinal and continue to have the school as the unit of analysis to determine what happens in schools across seasons in one single year. When doing so, researchers should ensure that the definition of seasons used requires them to be mutually exclusive. Gender differences should continue to be tracked.

- Future studies tracking teacher absenteeism in tandem with student absenteeism should explore the reasons for absenteeism for both sub-populations.