

# The effect of a comprehensive handwashing program on absenteeism in elementary schools

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Handwashing is one of the most important factors in controlling the spread of micro-organisms and in preventing the development of infections. The objective of this study was to determine the effectiveness of a comprehensive handwashing program on absenteeism in elementary grades. Two hundred ninety students from 5 independent schools were enrolled in the study. Each test classroom had a control classroom, and only the test classroom received the intervention (education program and hand sanitizer). Absenteeism data were collected for 3 months. The number of absences was 50.6% lower in the test group ( $P < .001$ ). The data strongly suggest that a hand hygiene program that combines education and use of a hand sanitizer in the classroom can lower absenteeism and be cost-effective. (*Am J Infect Control* 2002;30:217-20.)

Handwashing is one of the most important factors in controlling the spread of micro-organisms and in preventing the development of infections. Children are taught this basic principle very early in life and are given daily reinforcements by parents. However, when children are in school, reinforcement of handwashing by parents often decreases. Previous research documented that middle- and upper-school girls washed their hands after bathroom use 58% of the time and boys 48% of the time.<sup>1</sup> Soap usage was only 28% for girls and 8% for boys. Similar results were reported by Early and colleagues<sup>2</sup> who found a 58%-compliance rate for handwashing after bathroom use in a female elementary age-group. In 1999, an observational study conducted on handwashing after bathroom use in a single-sex (girl) high school in Oxford, United Kingdom, found that compliance to handwashing was higher (86%), but soap usage was only 10% and hand-drying only 25%.<sup>3</sup>

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0196-6553/2002/\$35.00 + 0 **17/46/120366**

doi:10.1067/mic.2002.120366

Further investigation revealed that low soap usage was due to the fact that soap dispensers were often not refilled and that lack of drying was due to the use of hot air dryers, which were too time-consuming.

Although our research has focused on lack of handwashing after bathroom use and did not address the effect on absenteeism, several articles have documented the effect of handwashing education on absenteeism. Master and colleagues<sup>4</sup> reported that mandatory handwashing programs reduced acute gastrointestinal illnesses in elementary school-age children. Classroom presentations and follow-up programs about handwashing resulted in a significant decrease in absenteeism due to illness during the 2 months after the presentations.<sup>5</sup> Hammond and colleagues<sup>6</sup> reported similar results in a population of more than 6000 elementary-age students representing 18 public schools in 4 states. Handwashing helped to reduce colds at a child-care center when education on handwashing was required in the curriculum.<sup>7</sup> Similar results in day care were reported by Butz and colleagues.<sup>8</sup> They found a significant reduction in symptoms of enteric disease when a hand hygiene intervention program was introduced.

However, to our knowledge there have been no studies evaluating the effect of a comprehensive program of education and placement of hand sanitizers in the classroom on absenteeism. Therefore, the

objective of this study was to determine the effectiveness of a comprehensive handwashing program, entitled "Buddies Handwashing Program," on absenteeism in elementary grades.

## METHODS

### Subjects

Five independent elementary schools in Pennsylvania were enrolled in the study. Written permission was obtained from the headmaster/headmistress at each school before student enrollment in the study. Each school was asked to provide 2 test and 2 control classrooms of the same grade. The median class size was 15 (range, 11-20 students). Three schools were coed, one was single sex (boys), and one was single sex (girls). Students in the test group received the intervention of education and hand sanitizer. Those in the control group did not receive any intervention.

### Education

The educational components of this program consisted of a 10-minute talk on the importance of handwashing, when to wash hands, and when to remind your buddy to wash his or her hands. This was followed by a video on micro-organisms and disease transmission. Students in kindergarten and first grade were shown a 2-minute video titled "The Sneeze," and children in grades 2 and 3 saw a 10-minute video titled "Haley's Germs" (GOJO Industries, Inc., Akron, Ohio).<sup>9</sup> After the video, each student received a "Buddies Handwashing Pamphlet" (Fig 1), on which kindergartners and first-graders completed the exercise of connecting dots that formed a hand and a bar of soap. Second- and third-graders completed a word search of common handwashing words, such as soap, water, and towel. The total time for conducting the education component was 1 hour. For this research, the presenter was the same individual, a junior high school student.

### Hand sanitizer

Each test classroom was equipped with a dispenser of Purell Instant Hand Sanitizer with Aloe (GOJO Industries). The active ingredient in Purell is ethyl alcohol at 62%. It is formulated with skin moisturizers such as glycerin and propylene glycol. Running water was not available in any classrooms. During the program, proper handwashing techniques with the hand sanitizer were demonstrated, and each student was asked to wash his or her hands. Students were asked to line up in small groups of 4 or 5. Each student was directed to the hand sanitizer. Under the directions of the program presenter, each was asked to wash his or

her hands. Directions were given if proper technique was not followed. After completing the handwashing, students were given cards identifying them as "Ambassadors of Hygiene" (GOJO Industries).<sup>9</sup>

### Data collection/analysis

Absenteeism was defined as the number of episodes of illness per child per month. A new episode of absenteeism that followed the initial one was considered unrelated if there was a lapse of 5 days. Illness was defined as an infectious process such as cold, flu, and gastroenteritis. Teachers were given a form to monitor each episode of illness. They were asked to determine either through parent or child the nature of absenteeism. Students were told during the education program that their teachers would be asking why they were absent and it was important for them to tell the teacher if the absenteeism was due to a personal situation, such as longer vacation, or injury, such as a broken arm. Absenteeism data were collected by the teachers for 3 months (March-May 2000) after initiation of the "Buddies Handwashing Program."

Four schools had 2 test classrooms, and 1 school had 1 test classroom, for a total of 9 test observations. Each school served as its own control. Data were collected for 3 months, resulting in 27 observations ( $n = 27$ ). Data were reviewed as a set of independent observations on grades by month and by school with use of a binomial distribution with parameters of  $n = 27$  and  $P = .05$ .

### Cost data/analysis

Cost data associated with absenteeism was defined as the following:

- Teacher time: One hour of teacher time per episode (for remedial work, take-home assignment) at an hourly rate of \$50. Time was determined by averaging the estimates reported by each school for preparing assignments and remedial work. The hourly rate was determined on the basis of the substitute teacher salary rate for the county in which the test schools are located.
- School nurse time: One hour per in-service and 1-hour preparation time per class at \$35. Although a school nurse was not part of this study, we factored in this cost since the school nurse would be responsible for the implementation of the program.
- Hand sanitizers: One fourth of the yearly cost for soap per child (\$2 per year or 50 cents per quarter)
- Activity booklet and ambassador card: 50 cents per child

**Table 1.** Episodes of absenteeism

School	Class size	Grade	March		April		May	
			Control	Test	Control	Test	Control	Test
1	17	1	5	9	5	4	0	3
	18	3	6	3	7	2	5	1
2	15	Kindergarten						
		A	7	2	14	1	23	3
	20	Kindergarten						
		C	14	5	7	8	19	10
3	13	Kindergarten	15	5	9	3	11	4
	11	2	10	2	7	2	5	4
4	18	3	8	3	6	4	7	3
5	16	Kindergarten	10	16	25	10	15	8
	17	2	8	6	16	10	13	9

Total episodes of absenteeism: control group = 277, test group = 140; % difference = 50.6% ( $P < .001$ ).

**Table 2.** Cost-effectiveness of a hand hygiene program (in dollars)

	Teacher time	School nurse time education	Hand sanitizer	Activity sheets	Total cost quarterly	Total cost projected yearly
Control	13,850 (277 h)	—	—	—	13,850	54,400
Test	7000 (140 h)	630 (18 h)	72.50	72.50	7775	31,100
Cost savings	6852	—	—	—	6075	24,300*

\*Yearly cost saving per student: 167.

## RESULTS

### Two hundred and ninety students (145 controls and 145 tests)

Table 1 shows the number of episodes of absenteeism by school and month. There was lower absenteeism in 23 of the 27 months the test groups ( $P < .001$ ) compared with the control groups. The test group had 50.6% fewer episodes of absenteeism than the control group (277 vs 140 episodes). Table 2 shows the cost-savings associated with a reduction in absenteeism. Teacher time in the test and control groups represents the hourly rate multiplied by the episodes of illness (1 hour of teacher work per episode). On the basis of these factors, the cost in the control group for absenteeism was \$13,850 per quarter. In the test group, the teacher time was \$7000 per quarter. However, for the test group, the costs of the school nurse's in-service time, hand sanitizer, and activity pamphlets were an additional \$775, for a total cost of \$7775, which is still a savings of \$6075 per quarter for the test group compared with the control group. On the basis of these estimations, the yearly projected savings would be \$24,300, or \$167 per student enrolled.

## DISCUSSION

Schools, like hospitals, have significant predisposing factors for the transmission of micro-organisms and cross-contamination, such as a close environment, inanimate objects serving as vehicles of transmission, and often inadequate supplies for handwashing. The number of lost school days annually among kindergarten through twelfth-grade students is 164 million, with an average of 4.5 days a year per student.<sup>10</sup> A report by the Carnegie Foundation<sup>11</sup> for education noted that 83% of teachers think that absenteeism is the main problem they face in school. In 1999, Cramer and colleagues<sup>12</sup> reported on a survey of parents' expectations of a school health program. They found that 96% of the 1200 respondents listed "preventing and controlling infections or contagious disease" as extremely important, ranking it No. 2 in a list of 24 health activities in a school health program.

Since hands are the primary vehicle of transmission of many infectious diseases, teaching children appropriate hand hygiene and providing accessible hand sanitizer in the classroom can be an effective

program for potentially decreasing absenteeism. Our data, like that of Hammond,<sup>6</sup> show a significant decrease in absenteeism when a hand sanitizer is placed in the classroom. However, the lower absenteeism seen in our study is much higher than that reported by Hammond and colleagues (50.6% vs 19.8%). This may be because the control classrooms in the Hammond study were given instruction on handwashing, whereas the students in our control group were not aware of the study. This awareness in the control group could account for increased handwashing compliance in the control group, resulting in a lower percent of absenteeism in the test group.

Implementing a program on hand hygiene must first gain administration support, and this support is often determined on the basis of cost rather than research data. This study has shown that a program of education and placement of a hand sanitizer in the classroom has the potential to save a school \$24,300 per year, or roughly \$167 per student enrolled.

The limitations of this study are 4-fold, including limited geographic location of the schools and a homogeneous student population (middle-class and upper-class private school students). Another limitation was that seasonal absenteeism was not determined. However, Hammond and colleagues<sup>6</sup> followed-up 6000 students for 1 year after a handwashing program with a hand sanitizer and documented that the lowest absenteeism occurred in September through January and that absenteeism in the largest school district peaked in March and continued through May (our study was February through May). The fourth limitation was that variables related to the home environment, such as smokers in house, hygiene, number of siblings, health status of siblings, and health provider visits, were not measured.

This research strongly suggests that a successful hand hygiene program for elementary schools should include the following components:

1. Administrative support
2. One-hour hand hygiene educational in-service by a school nurse for all students
3. Placement of hand sanitizer in classrooms and bathrooms

Research on the importance of hand hygiene in the school setting is only beginning to appear in the literature. It is clear that a program involving both education and the availability of innovative products will form the basis of a school program. Future areas of research need to address the effect such programs have on specific diseases such as gastroenteritis, flu, and common cold. Also, there is a need to look at the effect of such programs not only on the student but also on the teacher.

The authors wish to thank the headmasters and headmistresses of each school, teachers, and students who participated in the study. We also thank Richard Waterman, PhD, Adjunct Assistant Professor, Wharton School, University of Pennsylvania, for assistance with data analysis and Lois Porten in helping prepare the manuscript. In addition, the authors thank GOJO Industries for supplying the educational materials and hand sanitizer for the study.

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