

# Hand Hygiene Knowledge of College Students

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## ABSTRACT

An observational study was conducted to evaluate hygiene habits of students with fields of study, gender, and understanding of hygiene at a university in Alabama. One hundred students were randomly observed in ten restrooms on campus to determine whether or not students washed their hands. The study was divided into an observational stage, a quiz to ascertain student's knowledge of hygiene and the spread of pathogens, and a survey of self-reported illness rates. Females had a tendency to wash their hands more often than males while visiting the bathroom ( $p = 0.02$ ,  $X^2 = 11.6$ ). Science majors were more likely to wash their hands than non-science majors ( $p \leq 0.001$ ,  $X^2 = 5.2$ ). Females ( $p \leq 0.0001$ ,  $df = 98$ ,  $F = 21.5$ ) and science majors ( $p \leq 0.0001$ ,  $df = 98$ ,  $F = 81.4$ ) scored significantly higher on the survey than males and non-science majors, and that those observed not washing their hands reported being sick more often than those observed washing their hands ( $X^2 = 155.0$ ,  $df = 3$ ,  $p < 0.001$ , Fisher's exact  $p < 0.001$ ).

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## INTRODUCTION

Human populations are continually infected with common pathogens that cause respiratory and digestive discomfort.<sup>1-3</sup> The easiest and most effective way to prevent infection and transmission of these pathogens is by the simple act of regular hand washing.<sup>4-6</sup> People that do not, or are not regular hand washers have been shown to have an increased incidence of viral illness that can lead to inevitable bed rest.<sup>7,8</sup> Although it is known that hand washing is the primary way of preventing common communicable illnesses, hand washing is not as common as it should be in the general population. Hand washing after use of the restroom in most populations averages about 60% or less, even in health care settings.<sup>7,9-11</sup> Drankiewicz and Dundes<sup>7</sup> found that 63% of female college students washed their hands after using the bathroom, but only 38% used soap and water, while Anderson et al.<sup>12</sup> found that 58.3% of college students washed their hands or used a hand sanitizer after using the bathroom. Interestingly van de Mortel and Heyman<sup>13</sup> found that hand washing after contact with a patient varied with the job. One group was reported to have 90% of individuals washing their hands, however most of the study groups fell in the 40-70% range, with one group reporting only 20% of participants washing their hands.

In almost all populations females are more likely to wash their hands than males.<sup>11-15</sup> This trend had been noted in middle school (58% of females and 48% of males<sup>11</sup>) and college students after using the restroom (59% of females vs 32 % of males according to Anderson et al.,<sup>12</sup> and 69% vs 43% according to Thumma et al.<sup>16</sup>), health care workers after being in contact with intensive care patients (33% higher for female workers<sup>13</sup>), and the general population (90% vs 70%

after using the bathroom at a baseball game, and 39% vs 24% after sneezing<sup>15</sup>). It has also been shown that people presented with the benefits and consequences of handwashing are more likely to wash their hands.<sup>5,9,17</sup> Handwashing education often takes the form of posters and signage in restrooms and/or training sessions in the work place.<sup>3,6,18</sup> There is no literature discussing whether the education a person receives as part of a basic science curriculum can also influence handwashing. Science curriculums include at least two laboratory sciences that are often a freshman biology series. Many science majors will take up to 40 or 50 credit hours of biology. Although these science courses do not directly address hand hygiene, a basic understanding of bacteria, pathogens, and the immune system is taught and an increase in knowledge of the benefits may increase the incidence of handwashing.<sup>3</sup> Whether students apply this information and modify their daily hygiene habits is an interesting question and not known.

We sought to investigate whether expected societal hand washing norms (i.e. woman washing their hands more than men) existed within the student population and whether a science education would increase the incidence of hand washing and ameliorate the gender differences so often observed. We also wanted to know if societal gender handwashing norms applied to general hygiene knowledge and if a science education increased this knowledge. Lastly we were interested in knowing if the difference in hygiene habits translated to lower sickness rates.

This study involved an observational stage which consisted of recording the number of students that did or did not wash their hands in designated restrooms around campus; students were then asked to fill out a survey, take a short quiz to ascertain their knowledge of hygiene and the spread of pathogens and then asked to self report illness rates. We predict that female students will be more likely to wash their hands and be more aware of the benefits of handwashing than male students who are likely to not conceive the overall benefits of handwashing. A science background is predicted to increase students' knowledge of basic handwashing benefits and hygiene knowledge.

## MATERIALS AND METHODS

A total of 100 students were observed in 10 of the most widely used public restrooms on campus to determine whether or not they washed their hands. Each bathroom was observed for one hour between classes. This time was chosen because students rarely use the restroom during class. Although this is considered peak use, lines were never observed and sinks were always available. The students were recorded as whether or not they washed their hands. In order to be included in the sample, a student had to enter a stall and use the restroom. Hand washing included using water or soap and water. Students that were observed using the restroom were then asked to answer survey questions upon emerging from the bathroom. The surveys were coded as to whether the student washed their hands or not and consisted of a short questionnaire regarding major and gender. This data was used to categorize students into statistical groups. A science major as defined by the University includes nursing, biology, math, physical science, psychology, political science, and justice and public administration. Nonscience majors include business, education, and liberal arts. The first 50 male students (25 science and 25 non-science majors) and the first 50 female students (25 science and 25 non-science majors) were included in the study.

The survey was developed from the Queensland Health Hand Hygiene sheet.<sup>19</sup> The survey contained 10 true false questions on general hygiene knowledge. The survey was scored for the number of correct answers from 0 to 10. One additional question was included on the survey asking students to report how often they were ill from almost always to rarely. The data used for the analysis were collected without any identifiers to protect the respondent's confidentiality; no identifying data were recorded other than the major and gender of the respondent. This protocol was reviewed and approved by Institutional Review Board for Human Subjects (protocol #2008-05).

Categorical data (gender, washed hands or no, and major interactions) were analyzed by a logistic regression. Survey score was analyzed using an analysis of variance. Self reported illness rates were analyzed with a Chi Square to determine if the data varied from random, and then with a Fisher's exact test. (STAT-

view, STATview Institute, NC).

## RESULTS

One hundred students were chosen to participate in this study. Participants were divided by gender (50 male and 50 female) and college major (50 science and 50 non-science, divided equally by gender) (Table 1). Females had a tendency to wash their hands more often than males while visiting the bathroom ( $p = 0.02$ ,  $X^2 = 11.6$ ). Science majors were more likely to wash their hands than non-science majors ( $p \leq 0.001$ ,  $X^2 = 5.2$ ). However, there were no significant interactions between sex and major ( $p = 0.06$ ,  $X^2 = 3.5$ ,  $R^2 = 0.15$ ). Females ( $p \leq 0.0001$ ,  $df = 98$ ,  $F = 21.5$ ) and science majors ( $p \leq 0.0001$ ,  $df = 98$ ,  $F = 81.4$ ) scored significantly higher on the survey than males and non-science majors, and there is no sex/major interaction ( $p = 0.8$ ,  $df = 96$ ,  $F = 0.07$ ) (See Table 2 for questions and response rate). Self-reported illness rates indicate that non-hand washers are more likely to become ill than hand washers ( $X^2 = 155.0$ ,  $df = 3$ ,  $p < 0.001$ , Fisher's exact  $p < 0.001$ ). Sixty three percent of hand washer respondents reported becoming ill rarely, while 53% of non-hand washer respondents reported becoming ill once every 3 months (Table 3).

**Table 1.** Observed handwashing rates from 100 students, 50 male and 50 female, 25 from each major.

Gender	Major	Wash	Non-Wash
Females	Science	25	0
	Non-Science	15	10
	Science	18	7
Males	Non-Science	12	13

## DISCUSSION

Seventy percent of the study participants were observed washing their hands. Our study also indicates a significant difference between the hand washing rates of female and male students. Female students are significantly more likely to wash their hands than male students (80% vs 60%). Similar studies done at the University of Colorado by White et al.<sup>10</sup> (49% vs. 40%) and at private schools in Pennsylvania by Guinan et al.<sup>11</sup> (58% vs. 48%) have yielded similar results and revealed the existence of a difference between males and females

and hand-washing practices in schools. Anderson et al.<sup>12</sup> also found that females college students were more likely to wash their hands after leaving the restroom than males 59% vs. 32%), a pattern that also exists in health care settings.<sup>14</sup> It is unclear why females are more likely to wash their hands than males. There are some that theorize that there may be an early maternal effect.<sup>20</sup> However, there are others that cite the social pressures observed in female groups.<sup>7</sup> Females feel a greater need for acceptance within a group and are therefore more likely to wash their hands in the presence of peers. This may also play into an observational affect, with a greater need for social acceptance, when females are in the restroom with other occupants handwashing incidences has been reported to increase.<sup>7</sup> This may be an unfortunate side effect of observational studies that require the presence of an individual in a stall. This presence may artificially increase handwashing in females. It is also possible that the difference in hand washing behavior observed may be related to differing habits of males and females in the restroom. While females who enter a stall always sit to use the restroom and must wipe to clean themselves, males may not always sit and do not always need to use toilet paper. This may give men the idea that there is no need to wash their hands because their hands were not potentially in contact with fecal matter, although we have no data to support this, studies have shown that people are more likely to wash their hands after having a bowel movement than just urinating.<sup>16</sup> Future studies should differentiate between men that use the restroom solely to urinate and those that have bowel movements.

Our study also illustrates that there is a link between a general knowledge of science and hand washing; science majors were significantly more likely to wash their hands than non-science majors. This would indicate that the general information on bacteria, pathogens, and the immune system received in general biology courses is influencing a students' hygiene behavior outside of the class room. Other studies have found that an increase in the understanding of the benefits of hand hygiene increases the likelihood of hand washing<sup>21-23</sup> and it is interesting to speculate that students that are educated in the sciences have a general knowledge of bacteria and the immune system, and therefore the benefits of handwashing. This is somewhat supported

**Table 2.** Survey questions and percent correct respondents.

Question	% Correct
1. The common cold can be passed from one person to another.	78
2. Common infections caused by germs passed from one person to another include diarrhea, vomiting, and viruses?	61
3. More serious infections such as Hepatitis A and viral meningitis can be prevented by proper hand-washing?	60
4. Germs on door handles, toilet handles, bathroom tap-handles are harmless and cannot cause sickness.	64
5. Turning off the bathroom tap handles with a paper towel will help prevent the spread of germs to your hand.	65
6. It's okay to use the same piece of paper towel you used to turn off the tap handles to dry your hands.	62
7. You should particularly wash your palms and between your fingers since this is where most of the germs are.	67
8. Germs rarely get underneath the fingernails, and when they do, just running water on your hands gets rid of them.	59
9. You don't have to always wash your hands with soap, only after using the bathroom and before eating.	62
10. Using hand-sanitizer is a better and more effective way of washing your hands.	70

**Table 3.** Self reported illness rates from observed handwashers and non-handwashers.

How often are you sick?	Handwashers	Non-Handwashers
Almost Always	0	18%
Once or twice a month	0	0
Once every 3 months	0	53%
Once every 6 months	29%	29%
Rarely	66%	0
Skip (no answer)	4%	0

by survey data, indicating that science majors know more about hand hygiene than non-science majors. In class information may lead to a greater appreciation for the need to wash their hands during the day and a general understanding of the link between hand washing and illness. Although there are no other studies that look expressly at major and hand washing habits, Anderson et al. reported that students in academic buildings are more likely to wash their hands than those that used the rest room in the recreational center.<sup>12</sup> The major for these students is unknown, but it lends support to the hypothesis that a greater understanding of biology and/or science may lead to a greater incidence of handwashing.

Observed handwashers were also less likely to report illness than observed non-handwashers. Although in our study illness is undefined and the rates are self-reported, this is not an unexpected result. There are many studies that indicate that proper hand hygiene can decrease illness rates and that an increase in hand washing will not only decrease the incidence of illness within a person, but may be able to quell the spread of an infection throughout a population.<sup>7-8, 24</sup> White et al.<sup>10</sup>

found that as the incidence of hand washing increased in a residence hall, the incidence of upper respiratory infection decreased. Thumma et al.<sup>16</sup> found a similar result. Backman et al.<sup>25</sup> found that with handwashing intervention and an increase in handwashing practice, health care-associated infections decreased, similarly Cromer et al.<sup>18</sup> found that methicillin-resistant *Staphylococcus aureus* infections also decreased when monitoring and employee feedback increased the incidence of handwashing. Handwashing can also prevent the spread of viral infections (gastrointestinal and well as respiratory), in the home<sup>4</sup> as well as decreases exposure to toxic chemicals found in cleaning and pest control products often found on surfaces in the home.<sup>26</sup> Lastly, and possibly most importantly good hand hygiene can decrease the transmission of norovirus during a communal outbreak.<sup>24</sup> Heijne et al. report that with the introduction of proper hand washing techniques norovirus infection rate decreased by almost 85% during an outbreak at a boy scout camp. This is a huge decrease and represents a large number of potentially ill persons.

In the current environment of H1N1 influenza pandemic proper handwashing is potentially vital to preventing further spread of the virus. Grayson et al.<sup>27</sup> found that proper hand hygiene using either soap and water or alcohol based hand rub significantly reduced the population of virus on the hands. This would indicate that proper hand hygiene could potentially decrease the spread of this virus. Promoting hygiene is an important tool for keeping the population healthy. Our study suggests that an advertizing campaign

focused on increasing hand hygiene may be more beneficial if it focuses on men outside of the sciences.

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