

About this sample Results section: This Results section comes from an empirical research paper published in the *International Quarterly of Community Health Education*:

Pasewaldt, S. E., Baller, S. L., Blackstone, S. R., & Bryan Malenke, L. (2019). Impact of a hand hygiene curriculum and group handwashing station at two primary schools in East Africa. *International Quarterly of Community Health Education* 39(3), 175-187. <https://doi.org/10.1177/0272684X18819968>

JMU alumna Stephanie Pasewaldt (class of 2018) conducted the research described in this Results section as part of her [Honors capstone project](#) in Health Sciences. After graduating, she revised and published her manuscript with the assistance of her project advisor and readers, whom she listed as co-authors. A Results section overview with writing strategies and other resources for writing empirical research papers are available at [this link](#).

Results

Pre- and Postsurveys

Quantitative Data

Descriptive statistics were run for each school sample individually and then descriptive statistics were run for the schools' combined sample using Version 25 of IBM Statistical Package for the Social Sciences software.

The pre- and postsurveys of subscales were analyzed and compared using paired *t*tests. Paired *t*tests were run for each school's sample separately and for the combined sample. Students' handwashing knowledge, attitudes, and practices improved after intervention implementation. After intervention implementation, students at both schools, and the overall sample, demonstrated statistically significant improvements between pre- and postsurveys on all subscales. Students' knowledge of the benefits of soap increased ($p < .001$), and students' knowledge of the critical handwashing times increased ($p < .001$).

Using headings and subheadings, the authors signal how they structured this section. Findings are broken down by instrument/method (e.g., surveys) and by data type (e.g., quantitative).

Notice how the authors lead with the answer to their primary research question: Did the intervention improve students' handwashing knowledge, attitudes, and practices?

The authors open with a description of their data analysis procedures. In some disciplines, this information would appear at the end of the Method section.

Here, the authors explain that there were statistically significant improvements in knowledge. However, the magnitude of those improvements remains unclear. It's good practice to share the effect size, as well as descriptive statistics (such as percentage increase or difference in average score) to help readers gauge the impact of an intervention.

These two sentences contain *callouts*—references within the text to a table or figure that appears in the paper.

Callouts should “tell readers what to look for in that table or figure,” according to the *APA Publication Manual* (p. 197). They should also avoid directional terms like “above” or “below,” as figure locations may shift.

Students’ attitudes and beliefs toward handwashing became more positive ($p < .001$). Prior to intervention implementation, students washed their hands an average of 3.34 times a day, but after implementation, students washed their hands an average of 4.51 times a day ($p < .001$). Table 4 summarizes the results of paired *t*tests run on subscales by school, including averages of scores and *p*values. Table 5 breaks down the results shown in Table 4 by listing each school’s grade’s average pre- and postscores.

This sentence provides statistical evidence for a “finding” presented earlier in the paragraph (i.e., that handwashing practices improved after the intervention). Notice how the numeric data in this sentence gives us sense of the scale of the improvement (something the previous two sentences neglect to do).

According to the *APA Publication Manual*, readers should be able to grasp the meaning of tables without reading the text of the paper. To facilitate understanding, tables should:

- employ an explanatory title,
- label all elements,
- use brief headings in columns and table spanners,
- use a sans serif font (e.g., Calibri)
- put items to be compared next to each other,
- align corresponding elements
- use notes to convey additional information necessary for understanding the table (e.g., abbreviations)

Table 4

Comparison of Paired Ttests by Subscale and School

Subscale	Both schools (n = 95)		Kenya (n = 38)		Uganda (n = 57)	
	Mean (x̄)	Sig (two-tailed)	Mean (x̄)	Sig (two-tailed)	Mean (x̄)	Sig (two-tailed)
Knowledge of the benefits of soap						
Pre	3.00	$p < .001^{**}$	2.79	$p < .001^{**}$	3.14	$p = .007^*$
Post	3.59	3.74	3.49			
Knowledge of the critical times for handwashing						
Pre	1.55	$p < .001^{**}$	1.71	$p < .001^{**}$	1.44	$p < .001^{**}$
Post	3.47	3.58	3.44			
Attitudes and beliefs toward handwashing						
Pre	3.51	$p < .001^{**}$	3.16	$p < .001^{**}$	3.74	$p = .013^*$
Post	3.95	3.95	3.95			
Daily handwashing quantity						
Pre	3.34	$p < .001^{**}$	3.13	$p < .001^{**}$	3.47	$p < .001^{**}$
Post	4.51	4.42	4.56			

* $p < .05$.
** $p < .01$.

Table 5

Comparison of Paired Ttests by Subscale, School, and Grade

School	Grade	n	Knowledge of the benefits of soap subscale		Knowledge of the critical times for handwashing subscale		Attitudes and beliefs toward handwashing subscale		Daily handwashing quantity	
			Pre x̄	Post x̄	Pre x̄	Post x̄	Pre x̄	Post x̄	Pre x̄	Post x̄
Uganda	4	15	3.33	3.60	1.40	3.33	3.53	3.87	3.33	4.40
	5	18	3.06	3.89	1.45	3.17	3.94	4.00	3.17	4.83
	6	10	2.70	3.50	1.30	3.50	3.60	3.90	2.90	3.90
	7	14	3.36	3.50	1.57	3.71	3.79	4.00	4.43	4.86
	Total	57	3.14	3.49	1.44	3.40	3.74	3.95	3.47	4.56
Kenya	3	2	3.00	3.50	1.00	3.00	3.50	4.00	2.00	5.00
	4	6	1.67	3.33	1.67	3.33	2.67	4.00	2.50	4.33
	5	6	2.83	4.00	3.33	3.33	3.33	4.00	3.67	5.00
	6	10	2.90	3.60	1.50	3.80	3.50	3.90	2.90	4.30
	7	3	3.67	4.33	1.67	4.00	3.33	4.00	3.00	4.00
	8	11	3.00	3.82	1.73	3.64	2.91	3.91	3.64	4.27
	Total	38	2.79	3.74	1.71	3.58	3.16	3.95	3.13	4.42

Data appears to be missing from this table (the postsurvey means from Uganda). A fresh set of eyes might help you catch oversights like this one—though mistakes like this sometimes evade notice, even in published articles.

Knowledge of the Critical Times for Handwashing

Additional descriptive statistics were run on the *Knowledge of the Critical Times for Handwashing* subscale, considering students at both schools, to analyze students' knowledge of the four critical times independently. The proportion of students who knew the critical times before intervention was compared to the portion of students that knew the critical times after intervention for each critical time individually. The proportion of students who mentioned the critical times increased for each individual critical time after interventions. The greatest of gains in knowledge were found for the critical times of after cleaning babies and before preparing/cooking food, and smaller gains in knowledge were found for the critical times of after using the toilet and before eating.

Before interventions, only a small proportion of students knew to wash their hands after cleaning babies (4.20%); however, this proportion increased significantly after implementation (85.30%). Before intervention, many students knew to wash their hands after using the toilet (83.20%), but, after implementation, almost all of the students knew to wash their hands after using the toilet (98.9%). Table 6 summarizes the proportion of students who mentioned the critical time before and after intervention.

This sentence probably isn't necessary, as the next sentence conveys the same information with greater specificity.

Notice how the authors present the central findings first, followed by more peripheral findings. This kind of emphatic organization is typical of Results sections.

In these sentences, the authors report their findings using the same figures that appear in Table 6. While it's not uncommon to share the same findings in the text and in a corresponding table, readers may gain more insight if text and figures present the data in complementary (rather than duplicate) ways. For example, the authors here might have reported changes between pre- and postsurveys this way: "Before interventions, only 4 of the 95 students (4.2%) knew to wash their hands after cleaning babies, but that number rose to 81 students (85.3%) after the intervention."

Table 6

Comparison of Student’s Knowledge of Each Critical Handwashing Time

Critical handwashing time	Both schools (n = 95)	
	Yes mentioned	Percent increase
After using the toilet		
Pre	83.20%	15.7%
Post	98.90%	
Before eating		
Pre	61.10%	20.0%
Post	81.10%	
Before preparing/cooking food		
Pre	6.30%	75.9%
Post	82.20%	
After cleaning babies		
Pre	4.20%	81.1%
Post	85.30%	

Descriptive statistics were run on the *Handwashing Communication* subscale to determine the proportion of students, considering both schools, who talked to their families or friends about handwashing. Before intervention implementation, 61.10% of students talked to their families about handwashing, but after implementation, this proportion of students increased to 97.9%.

Open-Ended Items

Responses from pre- and postsurveys were entered into Microsoft Excel 2012, coded by theme, and assessed for the most common responses.

Subscale: Knowledge of the Critical Times for Handwashing.

The most frequent response for important handwashing times, which was not listed as one of the four critical handwashing times, from both the pre- and postsurveys was *after eating*. On presurveys, more students said hands

This table displays a statistical error. Percentage increase is not calculated by subtracting the original percentage from the new percentage. Rather, it is calculated by taking the difference between two numbers, dividing the increase by the original number, and multiplying the result by 100. The actual increases for each of the critical handwashing times were: 18.9%, 32.8%, 1,200% and 1,925%.

As a result of this mistake, the effect of the intervention on was understated—in two cases, quite significantly.

Such errors can be avoided by having a statistician or someone experienced with quantitative research review results. Additionally, statistics tutors in JMU’s Science and Math Learning Center are well equipped to help student researchers review descriptive statistics in Results sections.

Novice researchers may be tempted to give reasons for intriguing findings like this one in the Results section. However, researchers should save speculations about why they got the results they did until the discussion section. The authors of this paper do just that.



should be washed after eating ($n = 60$), than students who said hands should be washed before eating ($n = 57$). However, on postsurveys, more students said hands should be washed before eating ($n = 77$), than students who said hands should be washed after eating ($n = 29$). Other responses that were cited as important handwashing times on postsurveys, but not on presurveys, were *before and after caring for a sick person, after touching animals, before writing in books, and after working*.

Subscale: Attitudes and Beliefs Toward Handwashing With

Soap. Students described how they felt after washing their hands. On presurveys, students most frequently stated they felt *good* ($n = 45$) or *well* ($n = 10$). On postsurveys, the most frequent response was again *good* ($n = 32$). However, on postsurveys, student responses included more descriptive adjectives including *confident* ($n = 5$), *smart* ($n = 4$), *healthy* ($n = 4$). Two students also reported that they were able to concentrate better in school with clean hands because their papers were not as dirty.

Subscale: Handwashing Communication. Students explained topics of conversations they had with their family or friends about handwashing. On presurveys, students most frequently stated they told others to wash their hands after using the toilet ($n = 15$) and relayed information about the importance of soap ($n = 8$). On postsurveys, students had most frequently talked with others about all four critical times to wash hands ($n = 21$). Many students also explained to others the most common areas germs are missed when washing hands, such as in-between fingers

Notice how each of these three subsections employs the same structure—beginning with a description of the subscale, reporting findings from the presurveys, and reporting findings from the postsurveys. The authors also organize results emphatically, beginning with the most prevalent themes and ending with the least prevalent ones.

Using parallel structure in paragraphs with similar content is a great way to help readers navigate, understand, and/or locate information.

and palms ($n = 15$). An additional nine students reported that they had witnessed someone not wash their hands after a critical time, so he or she explained the importance of handwashing to that person. Four specific quotes from students are found in [Figure 3](#). These quotes indicate students' handwashing behaviors improved in their homes and among their families.

Figure 3

Students' Postintervention Responses Regarding Discussion They Had With Family/Friends About Handwashing

- *"I watched my mom clean my new sister and forget to wash her hands after. I told her what I learned in school, and then she washed her hands."*
- *"My mom was making dinner without washing her hands. I told her to use soap and water before to make us safe and now our whole family washes hands at home"*
- *"My brother almost ate before washing his hands and I said, No! No! No!"*
- *"I told my family I was making a handwashing station out of old pipes and jerry cans, so we could wash our hands. It was easy!"*

Impact Evaluations

Kenya

The principal of the Kenya school stated that students still participated in group handwashing daily and teachers supervised the activity. He also said that the school participated in an activity for Global Handwashing Day as part of their on-going hygiene club, and one student had built two of his neighbors' handwashing stations. Finally, the principal said that the handwashing station had a positive impact on the school; however, there was one unforeseen obstacle. The handwashing station

It is common practice to provide quotations or excerpts as examples of qualitative observations. However, the conventions for presenting such examples varies across fields and journals. Here, the authors present quotations that exemplify their observations in a figure. Such examples may also be presented at the opening of the Results section or one of its subsections. Furthermore, concise examples can be incorporated in the text to illustrate key themes.

required the school to spend an additional 300 KES (3.00 USD) on water per week, which the school could not afford for three of the weeks during the 6-month follow-up period.

Uganda

The principal of the Uganda school stated that students still participated in group handwashing daily and teachers supervised the activity. He stated that students were no longer eating their food with dirty hands and sanitation conditions surrounding the school's toilets improved. One issue he noted was the soap bars, which were attached to the handwashing station, were frequently stolen and had to be repeatedly replaced.

Again, the authors do a good job of employing parallel structure in these subsections. Each offers a narrative summary of a conversation with a school principal—reporting long-term participation in handwashing, other sanitation-related activities and impacts, and unexpected challenges.