

Cleaning Up Laundry:

An Analysis of the Environmental Impacts of Student Laundry Use
and Recommendations for Smith College

Rowan Van Ness
Smith College
Northampton, MA
May 2008

ABSTRACT

Concerns about climate change are widespread, and Smith College, like many other institutions, is working to reduce its impact. Laundry is a frequently overlooked, yet water- and energy-intensive process happening extensively, all over campus, with an estimate of students washing 60,000 loads annually. Through surveying students, interviewing the woman who oversees Smith's laundry contract with Mac-Gray Corporation, and reviewing articles on the environmental impacts of laundry use and the programs happening on other campuses, a deeper understanding of the current state of laundry at Smith is developed. Smith currently has high-efficiency washing machines, charges more for paying with quarters than with a OneCard, and most students air dry some of their clothes each time they wash them. Improvements could be made by providing more drying racks for students to air dry clothing, increasing education about the environmental impacts of laundry use, and supplying an environmentally-friendly detergent for student use in the laundry rooms.

INTRODUCTION

Concerns about climate change have swelled beyond the realm of scientists and environmentalists and have penetrated the general public. While using washing machines and dryers is an effective and time-saving way of cleaning our clothes, it is also an energy, water, and chemical intensive process that expands our ecological footprint with every load of wash. Conserving energy and water also reduces smog, acid rain, water and air pollution, and helps safeguard limited local water resources (Consumer Reports, 2007).

Students wash their clothes to remove stains and to prevent them from smelling. Some students wash their clothes after wearing them once, whereas others wash them more infrequently. Though frequently overlooked, every load of laundry washed and dried contributes to our environmental impact at Smith College with high usage of water, energy, and chemicals. This project is an exploration of current patterns of student laundry use, identifies the environmental implications of these habits, and provides suggestions for how Smith students can decrease their environmental impact while keeping their clothes clean.

Methodology

In order to learn about student laundry use on campus, I split the project into three distinct sections, utilizing different methods to analyze each section. To find out about patterns of student laundry use, I surveyed students and discussed their laundry habits with them. I learned more about the washing machines and dryers we have at Smith, and

thus their environmental impacts, by speaking with Moore, 2008, Director of Telecommunications and researching the website of the company with whom we have our laundry contract, Mac-Gray Corporation. I also researched online the chemicals found in laundry detergents that seem to have the largest environmental impacts. Lastly, I examined sustainability websites and press releases from various other colleges to gain a more thorough understanding of how student laundry works on other campuses.

Student Surveys

I conducted a convenience sample of 47 surveys to get a general idea of students' current laundry practices. I used three different versions of the survey, adding new questions to each version as my curiosity was sparked, without removing previous questions. The final version of the survey can be found in Appendix A. Ten students received the original version of the survey, nine received the second, and twenty-eight received the third. I distributed the surveys to a number of members of the crew team and to classmates in four of my classes to try and get a varied sample of students across campus.

I asked students questions about the frequency with which students do laundry and how many loads they typically do to get an understanding of the quantity of laundry being done, and thus the energy and water levels being used. Questions about whether students use hot or cold water in their wash help paint a general picture about how much energy is used. I inquired about what kinds and how much detergents and bleaches students use and how willing they are to change. In the last two versions, of the survey, I asked students how they thought Smith could best improve. I gathered some general

information about students as well, including if they participate in athletics or another activity that biases the amount of laundry they do.

Smith Machines and Environmental Impacts

To assess the environmental impacts of student laundry use, I familiarized myself with Smith's contract with Mac-Gray Corporation for the use and maintenance of our washers and dryers and read articles about the environmental impacts of both the machines and laundry detergents. I e-mailed questions about the contract to Moore, 2008, Director of Telecommunications at Smith College, who oversees the contract. I asked about how many machines we have on campus, who owns them, and how old they are to get an idea of when Smith anticipates replacing the machines. I asked about who collects the coins from the machines and cleans the laundry room vents and how often these services are provided, as well as how the laundry prices are set. I also inquired whether the drying time could be altered from the pre-programmed cycle and whether Smith had ever considered either providing detergent in bulk or implementing Mac-Gray's "Precision-Wash" system, where detergent is automatically measured and dispensed. Mac-Gray Corporation has a website about their "Clean and Green Vision" which was also extremely helpful in understanding the how the machines and systems they use compare to many standard laundry practices.

In order to gain a better understanding of the environmental impacts of detergent use, I read a variety of articles online from the Environmental Protection Agency, Environmental Groups, and blogs. I contacted Shizuka Hseih of the Chemistry

Department for further recommendations on information about detergents, and read a handful of articles she passed on from *Chemical and Engineering News*.

The Greening of Laundry

I examined sustainability websites and press releases from various other colleges to gain a more thorough understanding of how student laundry works on other campuses, where we excel at Smith, and where we have room for improvement. A number of environmental websites and blogs provided additional suggestions on reducing environmental impacts of laundry use.

RESULTS: Current State of Laundry at Smith College

Student Surveys

The 47 surveys completed included residents of 22 of the 36 different houses on campus. Most of the students surveyed participate in some activity that increases their laundry use, with 40% participating in a varsity sport, 34% participating in some other activity such as field work, dishwashing, or working out, and 26% participating in neither (Figure 1, A2). The Smith students surveyed reported doing on average two loads of laundry every two-and-a-half weeks.

With about 2500 students on campus, about 30 weeks in the academic year, and using the numbers above indicating the average quantity of laundry students wash, I

estimate that Smith students do about *60,000 loads* of laundry each year, at an average of 24 loads per person annually (Smith College).

Washers and Dryers at Smith

There are 98 washers and 104 dryers currently at Smith, which when the Mac-Gray contract started in 2002 (Moore, 2008). The machines at Smith include Maytag Commercial Neptune washers and Maytag Commercial dryers. The washers are Energy Star rated, water-efficient, front-load machines.

Payment Methods

The prices of using the laundry machines are set jointly by Smith College and Mac-Gray Corporation (Moore, 2008). To wash or dry one load of laundry at Smith costs students \$1.35 with a OneCard or \$1.50 in quarters. As seen in Figure 2, 89% of students pay for their laundry predominately with their OneCard (Figure 2, A2). Mac-Gray Corporation collects the coins about once a month or as needed (Moore, 2008).

Washing Clothes

From the surveys, I gathered that 79% of loads are large, with the remainder being medium (Figure 3, A2). Six fabric settings on the washers affect the temperature and speed of the wash cycles. About 18% of loads are “whites” using hot water, 49% are “colors” using warm water, 28% are “bright colors” using cold water, and 5% are other modes (Figure 4, A2). Only two students reported ever paying the extra 25 cents for a “supercycle,” inducing an additional rinse cycle.

Drying Clothes

Three fabric settings on the dryers affect the temperature and speed of the dry cycles. The dryers at Smith currently only have one time setting, which is for 60 minutes. The majority of the loads students dry at 82% are “whites and colors” (Figure 5, A2). Nearly two-thirds of the students surveyed (64%) air dry at least a few pieces of clothing every time they do laundry (Figure 6, A2). Most reported air drying clothes to prevent damage and shrinking.

Detergents and Bleach

Almost half (49%) of Smith students surveyed use brands of detergents manufactured by Proctor & Gamble. Another 23% use Unilever detergents, and the remainder of students either did not know what kind of detergent they use or use a brand manufactured by another company (Figure 7, A2). Only 4% of respondents use bleach regularly and an additional 4% seldom use it (Figure 8, A2). Only 20% of students use the two tablespoons of detergent recommended on washing machines, while another 30% follow the instructions on the bottle, and the remaining 50% just pour the detergent into the machine, unscientifically (Figure 8, A2). The highest responses for why students use a particular brand of detergent were price (40%), scent or the lack of one (28%), and convenience (21%), (Figure 10, A2).

If Smith provided a detergent...

All of the students surveyed would consider using a Smith-provided detergent, with 81% saying 'yes,' and 19% saying 'maybe' (Figure 11, A2). Upon asking students how willing they would be to pay per semester for a Smith-provided, environmentally-friendly detergent, 30% indicated a willingness to pay of \$10 or more, 28% were willing to pay \$5-9, and 15% responded to each of the following categories: willingness to pay \$0-4, willingness to pay what they currently pay, and uncertain what they were willing to pay (Figure 12, A2).

DISCUSSION: A Look at the Environmental Impacts

Student Surveys

The students surveyed geographically represent almost two-thirds of the campus, suggesting that a relatively varied group of students may be represented in this study, assuming that the houses represent different kinds of students. My sample includes a high proportion of students who participate in some form of activity that increases their laundry use, which I believe may be higher than the campus averages. If this is the case, this study may slightly overestimate the amount of laundry students wash. In any case, Smith students do a lot of laundry and the environmental impacts add up. The significance of student use of laundry on campus is huge with so much happening.

Washers and Dryers at Smith

According to their website, Mac-Gray Corporation has been concerned with the environmental impacts of their machines for decades (Mac-Gray Corporation, 2008). The front-load washers use less than half of the water compared with conventional top-load machines and 60% less energy for heating the water as a result. They also claim to achieve superior cleaning results and reduce the time necessary for drying clothes by superior water extraction during the spin cycle (Mac-Gray Corporation, 2008). Using efficient machines definitely reduces the potential impacts of student laundry, though they are still large. When Smith's contract with Mac-Gray is renewed in 2012, it is likely that Smith will update its machines at that time (Moore, 2008).

Payment Methods

It is surprising to compare to the environmental impacts of laundry payment methods. Every \$2000 worth of coins decreases the gas mileage of the collector's vehicle by 2% due to the added weight of the coins. Reductions in gas mileage lead collectors to fill up their tanks more regularly, increasing resource depletion and carbon dioxide emissions (Mac-Gray Corporation, 2008).

Setting price differences between payment methods, as already implemented at Smith, creates economic incentives for paying with a OneCard, which explains at least part of why so many students choose to do so. The differences in prices also reflects the additional labor and environmental impacts associated with coin collection. Furthermore, high numbers of students paying with their OneCards reduces the number of service calls related to machine's coin slides, resulting in further reductions in labor and emissions (Columbia University Facilities).

Washing Clothes

Because there is no way of adjusting the load size on the machines, the same amount of water enters the machine regardless of how many clothes are inside. This means that filling the machines up with larger loads is a more efficient use of water, energy, and detergent. Smith students currently seem to mostly do large loads and no one reported doing small loads. From people's additional comments on the surveys, I would venture that this is a result of the costs of doing laundry as well as the time and energy it takes to wash one's clothes. Similarly, if students are price sensitive, that would also explain why few are willing to pay for a "supercycle."

Very little information is provided to students about the fabric settings on the washing machines, leading students to guess which mode best suits their laundry. Heating up the wash water requires additional energy use, which in Massachusetts comes predominately (89%) from fossil fuels. This increases environmental impacts, from the drilling of oil to the risks of oil spills and the emissions expelled while burning fuel (Massachusetts Technology Collaborative). Especially with the recent developments of detergents that work in cold water, this is an area where Smith students could work on decreasing their environmental impacts.

Drying Clothes

After examining MayTag's website, Mac-Gray Corporation's website, and attempting to call Mac-Gray, I was unable to find information defining the preprogrammed modes. This makes it difficult to assess the environmental impacts of the

various cycles. It is clear though, that air drying laundry does not use electricity and seems to preserve the lifespan of clothing. The more clothing is air dried, the fewer pieces go into the dryers, thus decreasing the drying time necessary in the machines. Furthermore, drying similar materials of clothing together can also help, as lightweight synthetic clothes, for example, take less time to dry than other materials (Bond, 1999). Because there is currently only one time setting on the dryers, it is up to the user to take the initiative to take their clothes out early to prevent clothing damage from over-drying and to reduce environmental impacts of running the dryers longer than necessary. If Smith students air dried more clothing, they may need to dry fewer loads than they wash. This is another area upon which Smith students could improve.

Detergents and Bleach

When researching the most harmful chemicals associated with laundry detergents, I came across Nonylphenol ethoxylates (NPEs), Linear alkylate sulfonate (LAS), phosphates, and sodium hypochlorite. NPEs are part of a class of chemicals that work as surfactants, making surfaces more susceptible to water, thus allowing cleaners to easily penetrate stains and wash them away. NPEs are endocrine inhibitors that mimic estrogen. Once they break down into nonylphenol, they become more toxic and do not easily biodegrade in water or soil, according to the EPA, and the level of nonylphenol in U.S. surface waters is rising (Hogue, 2006, p. 14). Because they are difficult to remove from the water at sewage treatment plants, they enter the environment (Fisk, 2007). They have been shown to affect male fishes, harming their ability to reproduce (National Geographic Society, 2007). Because there are easy, cost-effective substitutes for NPEs, it

would not be difficult for manufacturers currently using NPEs to switch away to another product (Hogue, 2007, pp. 33-35).

Linear alkylate sulfonate, like NPES, is another common surfactant. It is often used either as a substitute for or in conjunction with NPEs. LAS is considered an “anionic surfactant” and can cause health problems, such as respiratory irritation, nausea, vomiting, and diarrhea. In the environment, it deprives the water of oxygen, killing aquatic life. Heat causes LAS to break down and produce toxic and corrosive fumes such as sulfur oxides (National Geographic Society, 2007).

Phosphates used to be widely used in detergents as builders, elements that allow the cleaning agents in detergents to do their task. The widespread usage of phosphates in detergents accounted for about half of the phosphates entering water systems. This nutrient enrichment caused excessive algae growth, depriving waters of the oxygen necessary for aquatic life in a process called eutrophication. By the 1960s, many state and local governments banned or strictly limited their use (Knud-Hansen, 1994).

Sodium hypochlorite, more commonly known as chlorine bleach, can also be an irritant and can be fatal when swallowed. When sodium hypochlorite combines with carbon molecules, organochlorines such as dioxin form and affect aquatic life (National Geographic Society, 2007).

Fortunately, most of these chemicals are not really a problem for Smith students. Most students use detergents manufactured by either Proctor & Gamble or Unilever, and both companies phased out NPEs decades ago (Hogue, 2006). As previously mentioned, phosphates have been widely banned and removed from products. Very few students use

bleach as an additional additive, so sodium hypochlorite is only harmful to the degree that students use detergents with it as an ingredient.

One of the major problems with understanding the impacts of the detergents Smith students do use is the limited availability of product information. No laws require a listing of the ingredients found in detergents to preserve their secret recipes, so the ingredients that are listed are very general (Laundry Alternative, 2005). They do, to some extent, state what is *not* included though. Both Tide and All, for example, claim to contain biodegradable surfactants and to be free of phosphates.

Because laundry detergents contain chemicals that have adverse environmental effects, it is important to not use more detergent than is necessary. Not only does this limit the amount of chemicals entering the environment, but also limits the amount of packaging needed associated with detergents and saves consumers' money. High-efficiency machines use less water than standard machines, and thus need a smaller amount of detergent to create the same concentration of suds in the water (Mac-Gray Corporation, 2008). Using too much detergent can cause soap residue to remain on clothes and in the machines, which can cause mildew and prevent clothes from becoming clean (ConsumerSearch, Inc., 2008).

Less than a quarter of students reported using the two tablespoons of detergent recommended on the machines. Many had not even noticed the recommendation. A larger percentage follows the directions given on their detergent bottles, but this is only beneficial if they are using a high-efficiency detergent that suggests a proper amount, as the regular amount of a normal detergent would be too much (Mac-Gray Corporation, 2008). The highest amount of students just pour the detergent into the machine, which

more likely results in too much detergent being used than too little, as many students expressed beliefs that a little more detergent would make their clothes a little cleaner. This is another area that leaves room for improvement.

A variety of kinds of detergents are available on the market. Three kinds of products worth highlighting include super-concentrated detergents, high-efficiency, and cold-water detergents. Regular detergents are mostly water. Super-concentrated detergents reduce the amount of water in the detergents, decreasing the amount of packaging necessary to wash the same number of loads, thus reducing transportation costs and emissions as more bottles can fit in a single truck (McCoy, 2008, pp. 15-23).

High-efficiency detergents create fewer suds, making them more beneficial for use with high-efficiency machines. The sudsy residue left on clothing and in machines can lead to mildew (ConsumerSearch, Inc., 2008). These detergents also give directions to be used with high-efficiency machines, decreasing the likelihood of user-error.

New developments in detergents have taken place in the last few years, thus enabling cleaning enzymes to activate in cold water (McCoy, 2006, pp. 13-19). Tide claims that consumers washing laundry in cold water can save up to \$63 per year, and TerraPass.com claims that we could prevent 30 million tons of carbon dioxide from entering the atmosphere if all washers in the U.S. used only cold water (ConsumerSearch, Inc., 2008).

Students stated a wide variety of reasons for why they use a particular kind of detergent, though two of the top reasons were because of the price and the convenience of a particular detergent. This leads me to believe that if environmentally-friendly detergents were convenient and reasonably priced, students would be willing to use them.

If Smith provided a detergent...

If Smith provided an environmentally-friendly detergent in the laundry rooms, most students would use it. Students seem to be willing to pay at least as much as they currently pay for laundry detergent to have access to such a service, as laundry detergents tend to run between \$4-8 per 32-load bottle, and students tend to do about 24 loads per year. This is worth looking into, especially since buying detergent in bulk would decrease the number of bottles bought, reducing packaging waste, and would encourage students to use environmentally-friendly detergents.

Student Laundry on Other Campuses

Taking a look at other campus's laundry programs helps put Smith's program in perspective. Many of the other schools in the region also have contracts switched to high-efficiency machines, including Columbia, Harvard, and Yale, amongst others (Columbia University Facilities, Harbus, 2008, Student Financial and Administrative Services). As a result, they have access to the same kinds of machines that we have on campus at Smith. Even so, some of the schools have differentiated themselves in their additional sustainability efforts with regards to laundry. Columbia has gone coin-less (Columbia University Facilities). Cornell sells "eco-conscious" laundry detergents around campus (Campus Life Green Team, 2006). Harvard's Graduate Green Living Program posted signs in laundry rooms and created a laundry quiz (Harbus, 2008).

Yale recently installed a "PrecisionWash" system which automatically dispenses detergent directly into machines through their contract with Mac-Gray Corporation

(Student Financial and Administrative Services). This system eliminates detergent packaging waste, keeps the laundry rooms cleaner by eliminating spillage, and prevents people from using too much detergent, eliminating the likelihood of soap residue remaining on clothing and reducing the amount of detergent entering the environment (Mac-Gray Corporation, 2008). Students pay an extra 30 cents per load when they pay for their laundry to cover the added costs of the detergent. Yale has elected to have the eco-friendly detergent, Dropps, as the automatically distributed product (Student Financial and Administrative Services).

Other Ways of Greening Laundry

Besides the ways already mentioned, there are a number of other ways one can “green” the laundry process. For example, removing clothes promptly reduces need for ironing, saving time and energy (Bond, 1999). Cleaning the dryer filter after each use optimizes air flow and dryer performance (Bond, 1999). Lint traps the humid air inside the dryer, hindering the drying process. Removing the lint can save up to 30% of the energy associated with drying, prevents fires, and helps lengthen the life of the dryer (Harbus, 2008).

RECOMMENDATIONS

Based on my findings, I have a number of recommendations of how Smith could improve the student laundry use on campus. Because of the extensive use of laundry

conducted by Smith students, the impacts are large, though Smith's current sustainability efforts have reduced the impacts from what they could be.

Equipment

When Smith's contract goes up for renewal in 2012, it will be really important for Smith to get the most energy- and water-efficient machines available through the Mac-Gray contract. It is not currently possible to have time-selective drying cycles, but this innovation would allow for improvements in energy usage from drying cycles. What Smith could do right now would be to provide drying racks and spaces for students to air dry their clothing, allowing students to both save energy as well as money. Because this would also lengthen the life of students' clothing, they may purchase less clothing, further reducing impacts.

Education

It sounds like one of the main problems with laundry as it stands is the lack of education about the environmental impacts of doing laundry. Students do not naturally connect doing laundry with the amount of resources necessary to make their clothes clean. This is especially true when considering detergents and the number of students who haphazardly pour detergent into the machines. By creating posters and discussions about laundry on campus, students may become more aware of their impacts.

Detergents

Because the chemicals in detergents have adverse effects, students using environmentally-friendly detergents could reduce these effects. Students seem to be most interested in having cheap, convenient laundry detergent available to them. Installing the PrecisionWash system might be a good solution at Smith. Minimally, having bulk-supplied, eco-friendly laundry detergent would decrease the effects of packaging and could ensure that harmful chemicals are not entering the waterways from Smith. From my surveys, it seems like students may be receptive to such changes.

APPENDIX 1

Student Laundry Use at Smith College

Survey for EVS 300

Please return to Rowan Van Ness, Box 8766

Laundry Frequency

- How often do you typically do laundry? _____
- How many loads do you typically do? _____
- What mode(s) do you typically use for washing? (indicate distribution of loads per laundry day, i.e. 1 load of whites, 2 of colors, etc) ___whites ___colors
___bright colors ___permanent press ___woolens ___delicates and knits
- What mode do you typically use for drying? (indicate distribution of loads per laundry day, i.e. 1 load of whites, 2 of colors, etc)
___whites and colors ___permanent press ___delicates
- How full are your loads typically? (mark with an x) ___small ___medium ___large
- Do you ever air dry your clothes? _____ How many pieces? _____
How frequently? _____
Why? _____
- Do you ever wash your laundry off-campus? _____
How often? _____ Where? _____
Why? _____
- How do you typically pay for your laundry? ___OneCard ___Quarters
- How frequently do you pay for a supercycle? ___times per semester
- Any additional comments?

Soaps and Detergents:

- What kind(s) of detergent do you use? _____
- Why do you use that detergent? (Price? Scent? Brand? Convenience? Other?)

- How much detergent do you use? ___the amount recommended on the bottle
___the 2 Tbsp. recommended on the machine ___just pour it in/nothing scientific
- If Smith provided an environmentally friendly detergent...
Would you use it if it were free?_____
How much would you be willing to pay (per semester) to have unlimited access to it?_____
- Do you ever use bleach in your wash? If yes, how frequently?_____
- Any additional comments?

Background Information:

- House:_____
- Number of machines available in house: ___Washers ___Dryers
- Do you participate in an activity that increases your laundry use? (i.e. sports, dance classes, field work, etc.)_____
If yes, what is it? _____
- Any additional comments?

How do you think Smith College can best reduce environmental impacts from laundry use?

APPENDIX 2

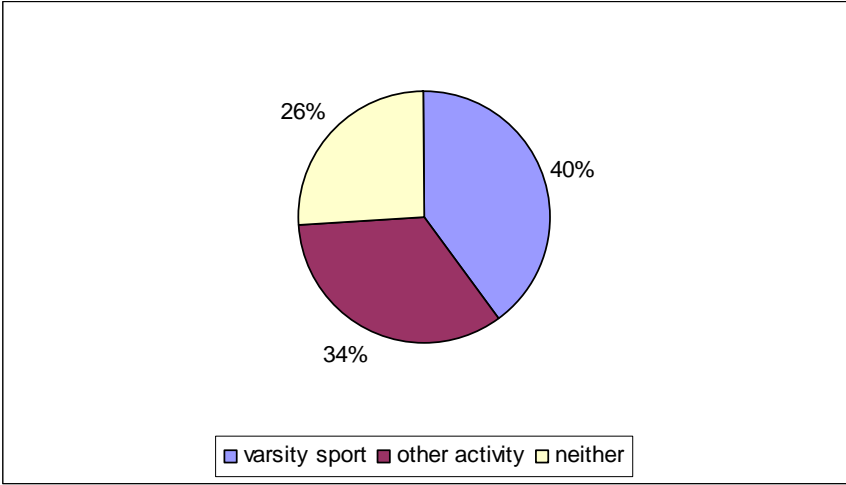


Figure 1: Participation in Activities Influencing Laundry Use

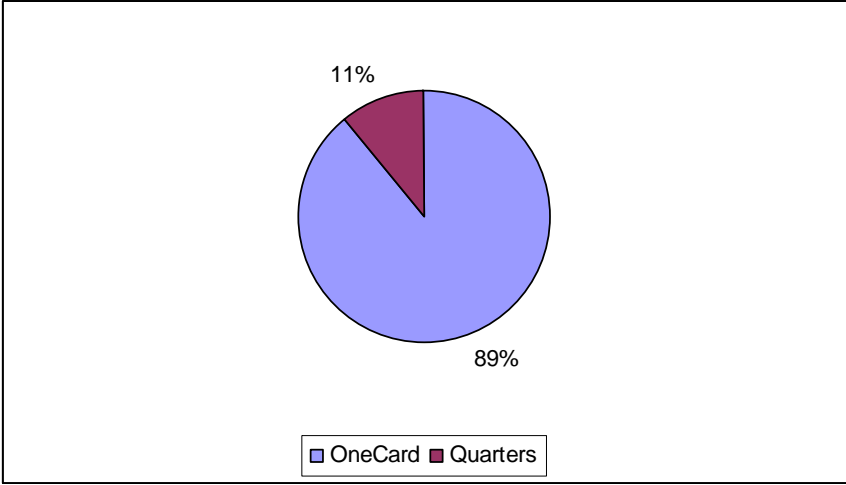


Figure 2: Typical payment methods.

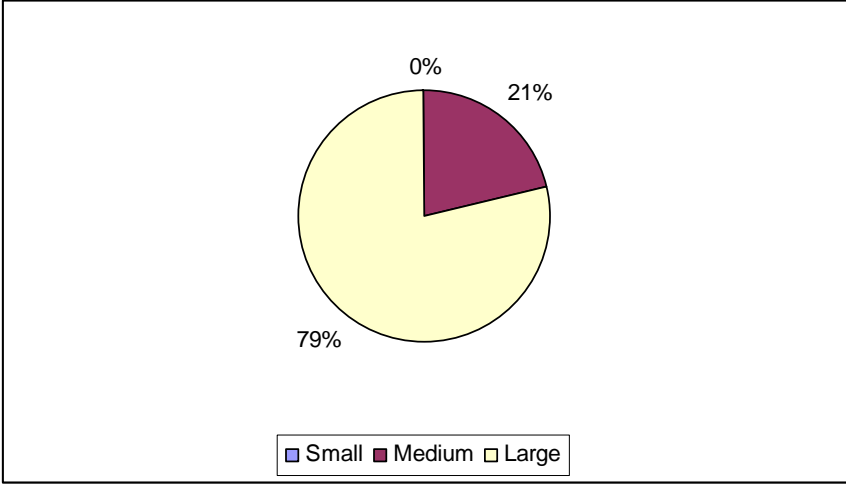


Figure 3: Load size.

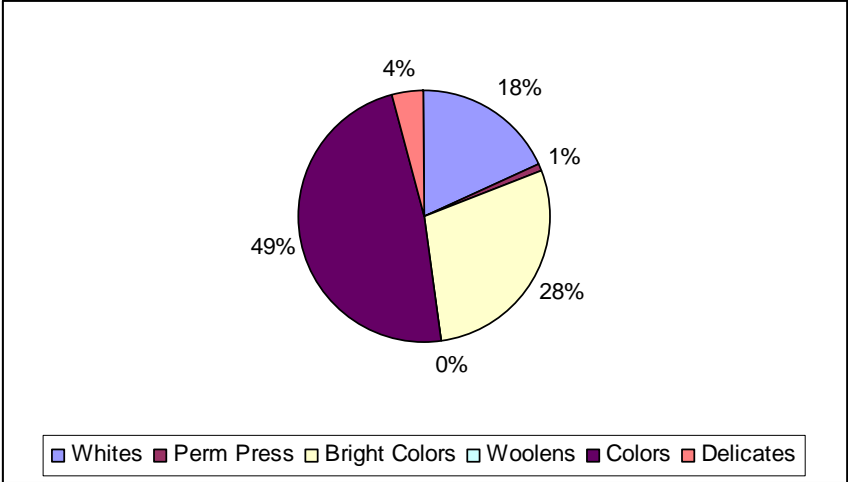


Figure 4: What modes students use on the washing machines.

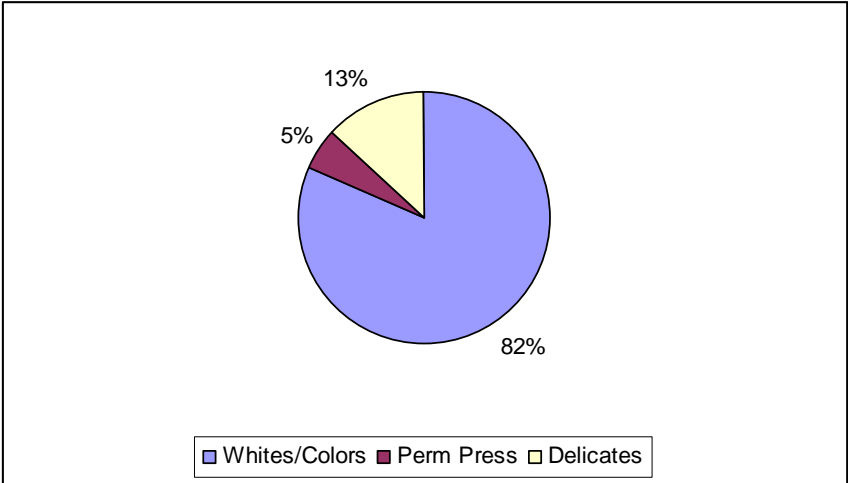


Figure 5: What modes students use on the dryers.

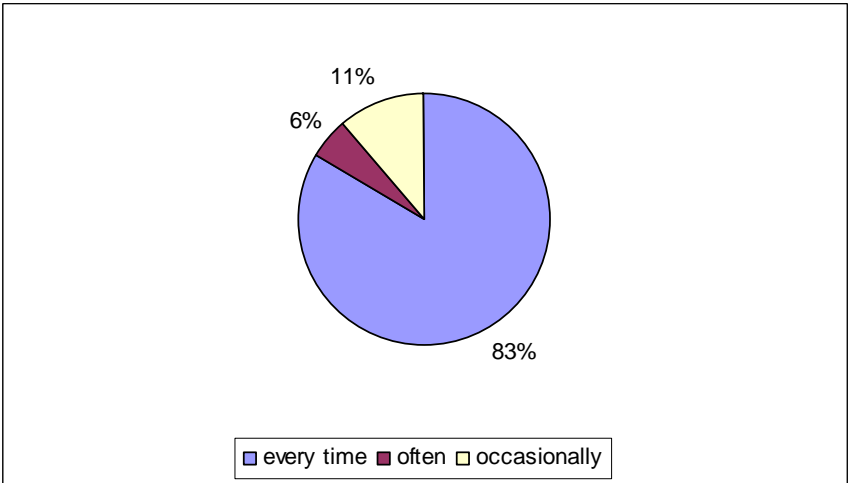


Figure 6: Frequency of air-drying at least some articles of clothing.

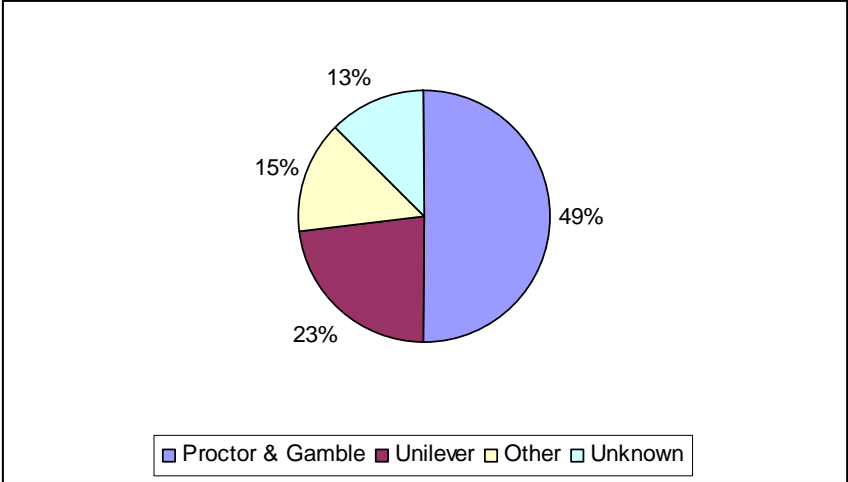


Figure 7: Distribution by manufacturer of detergents Smith students use.

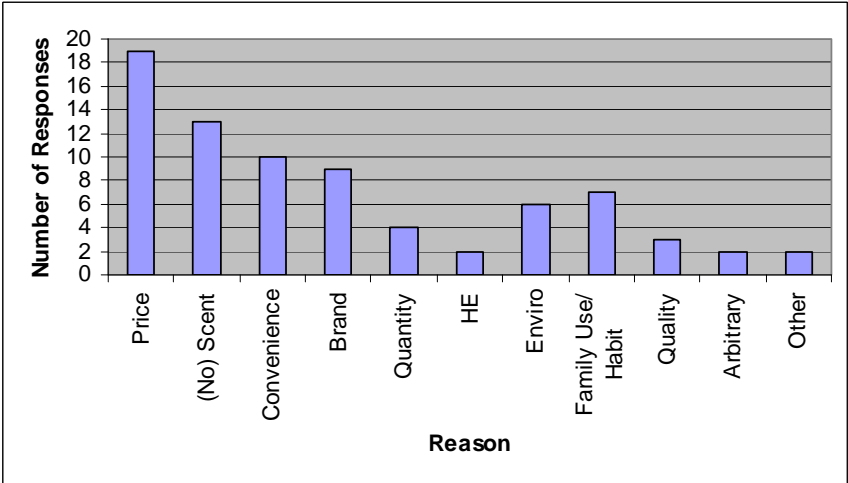


Figure 8: Why People Use Their Particular Kind of Detergent

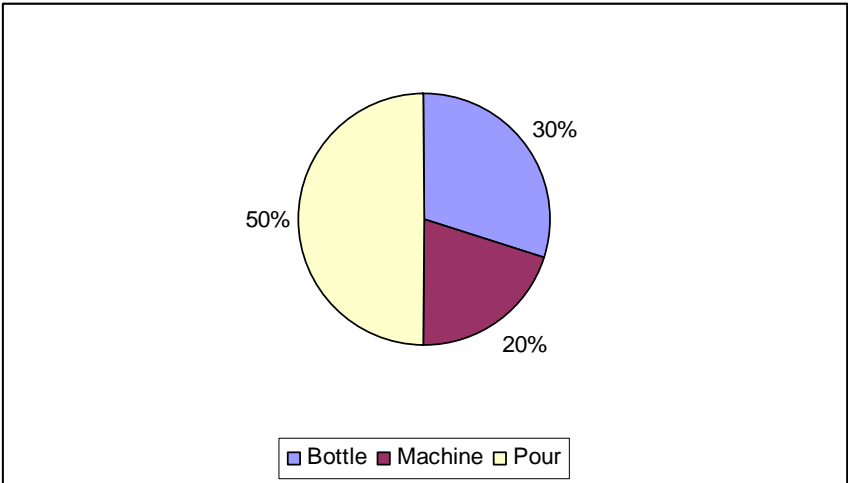


Figure 9: How students determine how much detergent to use.

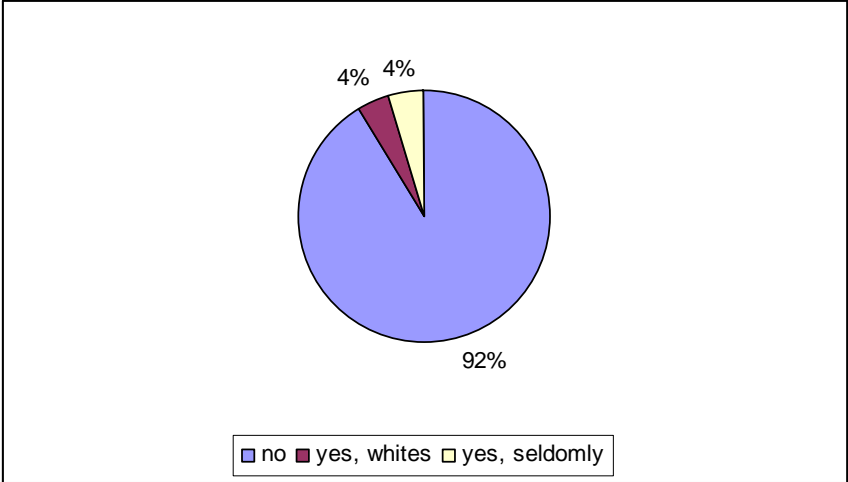


Figure 10: Do students use bleach in their laundry.

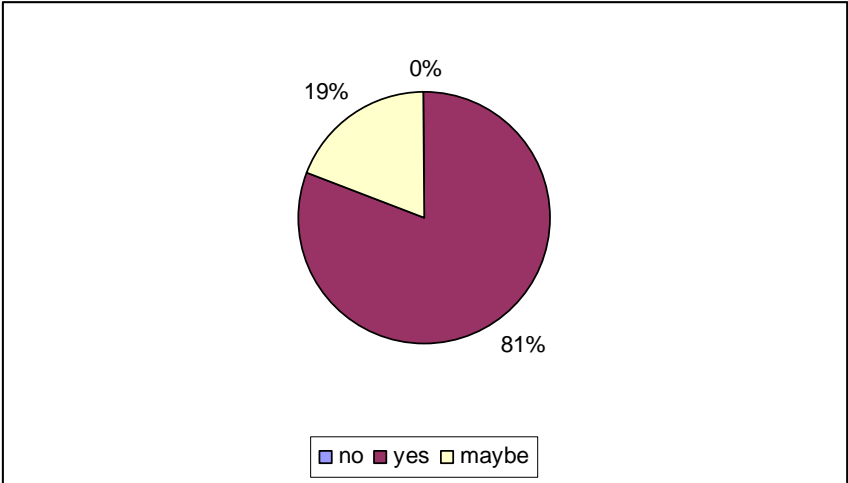


Figure 11: Would students use a detergent provided by Smith.

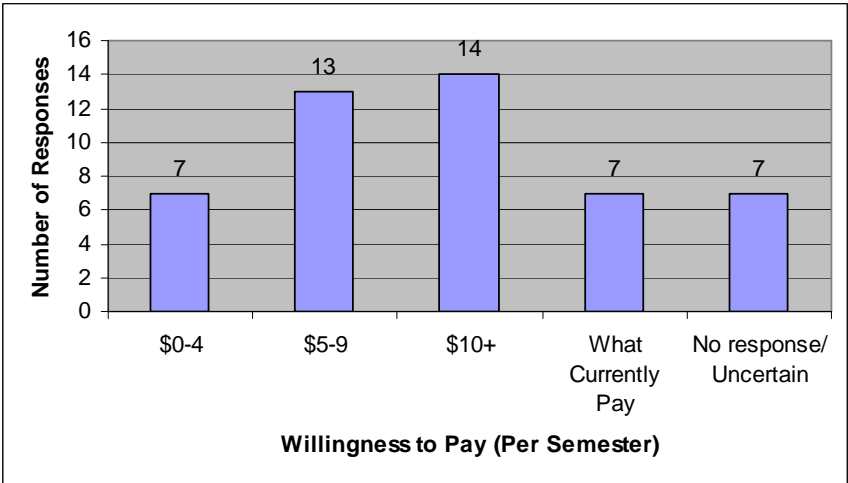


Figure 12: Willingness to Pay for a Smith-Provided, Environmentally-Friendly Detergent

LITERATURE CITED

- Bond, A. (1999). 12 Laundry Tips for Maximum Energy Savings. *Care2.com*. Retrieved May 8, 2008, from <http://www.care2.com/greenliving/12-energy-saving-laundry-tips.html>
- Campus Life Green Team (2006). Report on Activities – Calendar Year 2006. *Cornell University*. Retrieved from <http://www.sustainablecampus.cornell.edu/getinvolved/Staff%20orgs/Docs/GreenTeam06Report.final.doc>
- Columbia University Facilities. Turning Your Laundry Green. *Columbia University*. Retrieved May 8, 2008, from <http://cuf.columbia.edu/news/laundry.html>
- Consumer Reports (2007). Washers/Dryers: Green Buying Guide 2/08. *GreenerChoices.org*. Retrieved from May 8, 2008, from <http://www.greenerchoices.org/printProduct.cfm?product=washer>
- ConsumerSearch, Inc. (2008). Laundry Detergent. *The New York Times Company*. Retrieved May 8, 2008, from http://www.consumersearch.com/www/house_and_home/laundry-detergent/review.html
- Fisk, Umbra (2007). Fit to be Tide: On Green Laundry Detergents. *Grist*. Retrieved May 8, 2008, from <http://www.grist.org/advice/ask/2007/09/24/>
- Harbus. (2008). Show Love for the Environment When Doing Your Laundry. *Harvard Business School*. Retrieved May 8, 2008, from <http://media.www.harbus.org/media/storage/paper343/news/2008/02/11/GreenLiving/Show-Love.For.The.Environment.When.Doing.Your.Laundry-3199569.shtml>
- Hogue, C. (2006). Greener Cleaners: EPA initiative urging phaseout of NPE surfactants receives mixed reviews. *Chemical and Engineering News*, 84:25, 14.
- Hogue, C. (2007). Surfactant Scrutiny: EPA considers requiring texts on nonlyphenol ethoxylates for long-term effects on aquatic life. *Chemical and Engineering News*, 85:42, 33-35.
- Knud-Hansen, C. (1994). Historical Perspective of the Phosphate Detergent Conflict. *Conflict Resolution Consortium, University of Colorado*. Retrieved May 8, 2008, from http://www.colorado.edu/conflict/full_text_search/AllCRCDOcs/94-54.htm/
- Laundry Alternative (2005). Are Leading Brand Laundry Detergents Environmentally Friendly? *The Laundry Alternative Inc*. Retrieved May 8, 2008, from <http://www.laundry-alternative.com/detergentsinfo.htm>

- Mac-Gray Corporation (2008). Academic Institutions: PrecisionWash Laundry. *Mac-Gray Corporation*. Retrieved May 8, 2008, from http://www.macgray.com/ac2_prec.html
- Mac-Gray Corporation (2008). Washing Instructions. *Mac-Gray Corporation*. Retrieved May 8, 2008, from http://www.macgray.com/wd_washer.html
- Mac-Gray Corporation (2008). Clean and Green. *Clean and Green Vision*. Retrieved April 14, 2008, from http://www.cleanandgreenvision.com/clean_and_green.html
- Mac-Gray Corporation (2008). Environmental Responsibility: A Memo to Mac-Gray Employees. *Clean and Green Vision*. Retrieved April 14, 2008, from <http://www.cleanandgreenvision.com/communications.html>
- Massachusetts Technology Collaborative. Sources of Electricity. *Renewable Energy Trust*. Retrieved May 8, 2008, from <http://www.mtpc.org/cleanenergy/massenvironment/sources.htm>
- McCoy, M. (2006). Specialty chemical makers seek business both with cleaning product innovators and the companies that follow them. *Chemical and Engineering News*, 84:5, 13-19.
- McCoy, M. (2008). Greener Cleaners: Consumer demand for environmentally friendly cleaning products has changed the game for chemical suppliers. *Chemical and Engineering News*, 86:3, 15-23.
- Moore, S. (2008). E-mail from Director of Telecommunications. Received April 21, 2008.
- National Geographic Society (2007). Laundry Supplies. *Green Guide*. Retrieved May 8, 2008, from <http://thegreenguide.com/reports/product.mhtml?id=78&sec=2>
- Smith College. For First-Year Students: FAQ. *Smith College*. Retrieved May 8, 2008, from http://www.smith.edu/admission/firstyear_faq.php
- Student Financial and Administrative Services. ASA Laundry Agency. ASA Laundry Agency. *Yale University*. Retrieved May 8, 2008, from <http://www.yale.edu/sfas/agencies/laundry.html>