

# The Real Costs of Institutional “Green” Cleaning

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## Executive Summary

**The purpose of this study was to get more objective information on the relative costs of environmentally preferable (“green”) cleaning products relative to conventional cleaning products. Existing literature on the subject showed institutional-grade green cleaning products as cost competitive or slightly more expensive than their conventional counterparts. The literature shows that green cleaning practices offer opportunities for cost savings, for example, through reduced use of water and chemicals use, safer work environments, and reduced need to lift heavy buckets. In 2009, we surveyed the prices of 373 cleaning products from 26 manufacturer across 8 product categories. The prices of green products were not significantly different from those of equivalent conventional products, with the exception of floor strippers, where conventional products were more expensive. In general, green products averaged somewhat cheaper than conventional, with the exception of glass cleaners. As expected, products sold as aerosols or as ready-to-use (RTU) products were significantly more expensive than the equivalent concentrates; RTU products averaged 15 times more expensive and aerosols averaged 27 times more expensive. Because most third-party certified green products are sold as institutional-grade concentrates, businesses currently using consumer-grade products should consider switching to green institutional products to both save money and improve their environmental profile.**

## Introduction

“Green cleaning” generally refers to the use of products and services that have a “lesser or reduced impact on human health and the environment when compared with competing products or services that serve the same purpose” [1]. While proponents point to the beneficial qualities of green cleaning programs, skeptics sometimes cite product performance and cost-effectiveness as obstacles. This report aims to investigate the notion that switching to institutional-grade green cleaning programs can be cost-neutral by providing a broad comparison and analysis of both the direct and the intangible costs associated with green cleaning products.

President Clinton introduced the concept of green cleaning to the mainstream in the form of a 1993 executive order – later reauthorized in 1998 – for environmentally preferable purchasing (EPP) by federal agencies [2]. States, counties, cities, and school districts have begun to follow suit. In 2006, New York State became the first state to mandate green cleaning programs in public schools, followed by Illinois in

2007. So far in 2009, four states – California, Minnesota, Oregon, and Vermont – have introduced legislation that would require green cleaning programs in schools. Furthermore, Illinois and Washington State are considering legislative bills that would require all state agencies to implement green cleaning programs [3].

The new generation of green cleaning products are characterized by their reduced use of potentially harmful chemicals. Chemicals of concern include volatile organic compounds (VOCs), quaternary ammonium compounds, phthalates (a group of endocrine disruptors), alkylphenol ethoxylates, 2-butoxyethanol, phosphates, and synthetic fragrances and dyes, among others [4]. Some of these chemicals are known carcinogens, neurotoxins, mutagens, reproductive toxins, asthmagens, and can contribute to downstream aquatic toxicity and indoor air pollution. Along with more benign ingredients, green products are often designed to emphasize recycled or recyclable packaging, reduce transportation energy use through the use of concentrates, and reduce exposure to the product, for example, using improved automatic dilution systems.

A primary driving force behind the adoption of green cleaning programs is the precautionary principle, which states that the absence of scientific certainty should not be a justification for postponing cost-effective measures to protect the environment and public health from adverse effects [5]. In 2005, the City & County of San Francisco passed a Precautionary Purchasing ordinance [6] that requires the City to consider the environmental and health costs of its annual purchases, and requires City departments to restrict their purchases to an “approved” alternative product list [7]. Likewise, the European Union also adheres to the precautionary principle as part of its REACH program [8].

Verification of a product’s environmentally preferable status rests on the manufacturer. In some cases, manufacturers choose to use their own, proprietary green label, without outside verification. More frequently, verification takes place through third-party certifiers such as Green Seal or Ecologo. Additionally, the US Environmental Protection Agency runs the Design for the Environment (DfE) program, which until recently has functioned as a technical assistance program for product formulation, but not as a certification. Some institutional purchasers – particularly in earlier days – created their own specifications for green cleaning products. The City of San Francisco, for example, advanced its own specification in 2004 [9], which is quite similar to the present-day GreenSeal GS-37 standard.

The primary goal of this report is to compare and discuss the direct financial costs of green and conventional cleaning products in eight product categories based on their cost per ready-to-use (RTU) gallon at the medium dilution ratio. Since all green, but few conventional, cleaning products are sold as concentrates in order to cut down on packaging and transportation costs, comparing the different products at their cost per RTU gallon ensures an accurate financial comparison. Another goal of this report is to address and quantify the intangible environmental and social costs that can be avoided by transitioning to green cleaning programs.

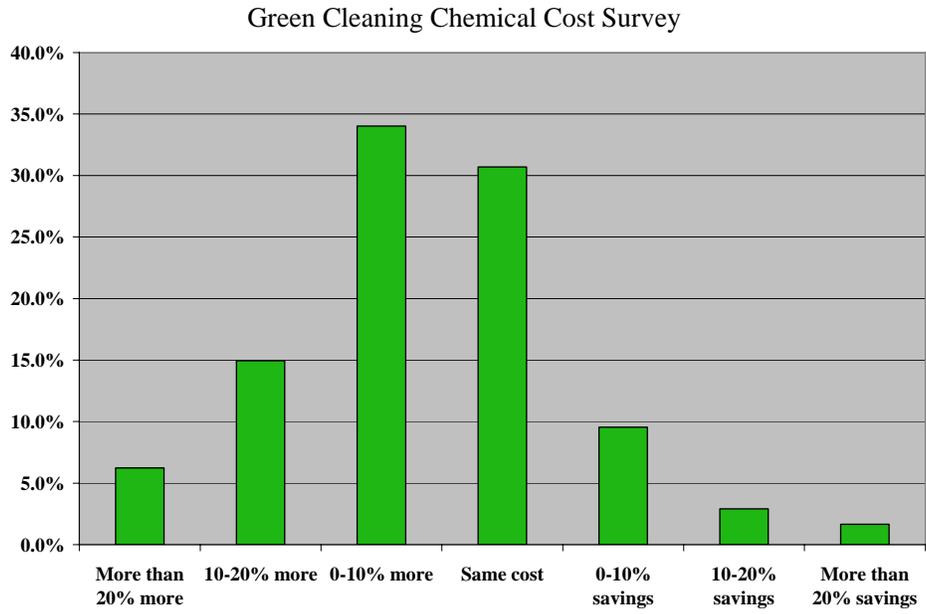
This paper is in two parts. Part I reviews a selected body of literature on the costs and considerations of green cleaning programs. Part II compares price, dilution ratio, and cost per RTU gallon data for a representative range of institutional-grade cleaning products, both green and conventional.

## **Part I.**

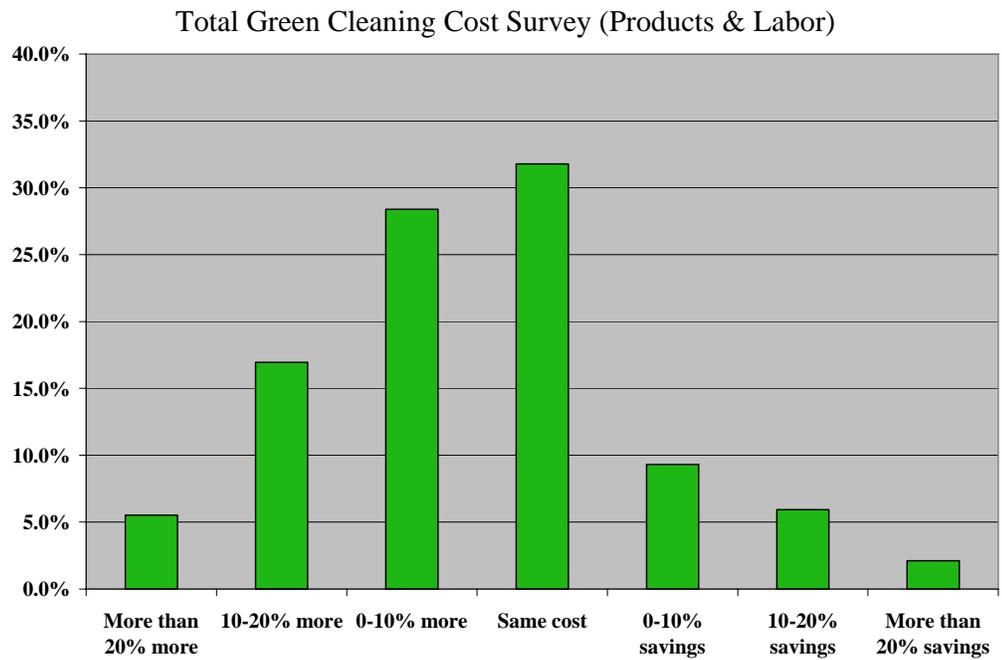
### **A Review of the Literature**

At the forefront of concerns about institutional green cleaning products is performance and cost-effectiveness. As with many green products and services, the direct costs of green cleaning products are generally perceived by the public to be slightly higher than those of conventional cleaners. According to a 2008 survey by the Ashkin Group, the total overall costs of green cleaning products, including all products and labor, and the total spent on chemicals was reported in the range of about the same price to 10 percent higher than conventional cleaners [10].

**Figure 1.** Results from the Ashkin Group’s Green Cleaning Chemical Cost Survey. (Source: The Business of Green Cleaning [11].)



**Figure 2.** Results from the Ashkin Group’s Total Green Cleaning Cost Survey (Products & Labor). (Source: The Business of Green Cleaning [12].)



However, in order to evaluate the true cost-effectiveness of a green cleaning program, one must account for the following factors: product application methods, concentrate volumes and dilution methods, the appropriate use of disinfectants, differing labor requirements, and health and environmental benefits. Each of these factors can lead to price discrepancies when determining the direct costs of green cleaning products.

### ***Product Application Methods: Microfiber***

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The type of applicator used is among the most important factors to consider when determining the true cost of green cleaning products. New technologies, such as microfiber mops and towels, can significantly change the amount of cleaning chemicals, water, and labor needed to clean surfaces. Many of the reports on microfiber performance have come from hospital case studies documenting the use of microfiber mops on hard floor surfaces.

In 1999, the University of California Davis Medical Center (UCDMC) conducted a microfiber mop pilot program. The data recorded throughout the program yielded several beneficial findings, including: a 60 percent lifetime cost savings for microfiber mops, a 95 percent reduction in chemical and water costs associated with mopping, and a 20 percent labor savings per day [13]. Furthermore, the program found that the microfiber mops were just as effective, and in some instances outperformed their conventional counterparts. Within one year, the medical center completely replaced conventional cloth mops with the microfiber version in all patient-care areas.

Due to a decrease in water use, the lighter microfiber mops make custodial job duties less strenuous because they are much lighter, do not require mop wringing, and greatly reduce the need to change mop bucket water. Since microfiber mops are easier and faster to use, the UCDMC saved 638 hours per year for each worker, or about \$7,665 in wages [14]. The lighter mops also decrease the potential for occupational injuries, which translates into potential savings through reduced worker's compensation claims filed and associated administrative time spent dealing with such claims.

As for performance, a report published in the American Journal of Infection Control reported that microfiber mops outperformed conventional cotton mops in microbial removal, 95% and 65% respectively [15]. This superior performance, combined with the 95 percent decrease in water and cleaning chemical usage seen by the UCDMC, makes a strong case for the adoption of microfiber mops for hard floor cleaning in business, government, and school buildings, as well as in hospitals.

**Table 1.** Microfiber and Conventional Wet Loop Mop Cost Comparison at the UC Davis Medical Center. (Source: US Environmental Protection Agency [16].)

	Microfiber Mop	Conventional Wet Loop Mop
<b>Mop Costs</b>		
Costs:	\$17.40 each	\$5.00 each
Washing Lifetime:	500 to 1000	55 to 200
Rooms Cleaned Per Washing:	1	22
<b>Cost Total:</b>	<b>\$1.74 to \$3.48 per 100 rooms</b>	<b>\$0.11 to \$0.41 per 100 rooms</b>
<b>Labor Costs</b>		
Rooms Cleaned Per Day:	22 per eight hour shift	20 per eight hour shift
Labor Cost:	\$12 per hour	\$12 per hour
<b>Cost Total:</b>	<b>\$436 per 100 rooms</b>	<b>\$480 per 100 rooms</b>
<b>Chemical Costs</b>		
Quantity of Chemical:	0.5 ounce per day	10.5 ounces per day
Cost of Chemical:	\$0.22 per ounce	\$0.22 per ounce
Rooms Cleaned Per Day:	22	20
<b>Cost Total:</b>	<b>\$0.50 per 100 rooms</b>	<b>\$11.55 per 100 rooms</b>
<b>Water Use</b>		
Quantity:	1 gallon	21 gallons
Rooms Cleaned:	22	20
<b>Cost Total:</b>	<b>5 gallons per 100 rooms</b>	<b>105 gallons per 100 rooms</b>
<b>Electricity Usage (Washing)</b>		
Cost:	\$0.30 per mop	\$1.00 per mop
Cleaning Frequency:	once per room	once per day
<b>Cost Total:</b>	<b>\$30 per 100 rooms</b>	<b>\$5 per 100 rooms</b>
	<b>&gt;&gt; Total Costs &lt;&lt;</b>	
	<b>\$468 to \$470 per 100 rooms per day</b>	<b>\$497 per 100 rooms per day</b>
	<b>&gt;&gt; Microfiber mops use 95% less water and chemicals &lt;&lt;</b>	

The upfront costs of microfiber mops are about twice the amount of conventional mops, according to a 2003 report by the University of Massachusetts Lowell, and three times the amount, according to the UCDCM report [17]. However, microfiber mops have a comparatively lower long-term cost due to the reduced use of cleaning product, water, labor, and the fact that microfiber mop heads have a lifetime ten times longer than that of a conventional mop [18].

With so many potential benefits, one of the main questions is why more custodians are not using microfiber. The two most prominent factors are: the higher upfront costs of microfiber applicators and the special cleaning requirements for soiled microfiber mops and cloths. According to Tom Barron, EPA pollution prevention consultant, institutions using microfiber must have a dedicated washing machine for the applicators because sharing a machine with lint generating items will quickly decrease the effectiveness of the material. Thus, having a separate washing machine for microfiber is an additional

expense and space consideration for green cleaning programs, which is not always feasible for small and medium-sized institutions.

### ***Concentrate Volumes and Automatic Dilution Equipment***

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When comparing the prices of green versus conventional cleaning products, one must consider the role of product concentrates. For most product categories, concentrates are required for GreenSeal or Ecologo certification, whereas ready-to-use (RTU) and aerosol products are still common among conventional products.

The use of concentrates reduces the amount of water within the products that needs to be shipped when purchase orders are fulfilled by manufacturers and distributors. Thus, the decrease in large quantities of water being shipped reduces the amount of energy used in the transportation of these products. The environmental advantage is obvious when considering that a concentrated product with a 1:128 (1 ounce product mixed with 128 ounces water) dilution ratio produces 128 times the volume of one ready-to-use (RTU) gallon. The resulting difference in shipping weight is 16 pounds (green product) vs. 2,048 pounds (RTU product). This will be an increasingly important consideration as energy prices rise.

According to a 2004 report for the City of Seattle by Tom Barron, the upfront cost savings associated with the shipping of concentrates instead of RTU product comes to about \$4.88 per custodian per year [19]. It's apparent that conventional cleaning products will continue to move towards concentrates, if possible, because of the potential for savings.

In addition to upfront cost savings, dilution systems allow custodial staff to more accurately control the concentrate to water dilution ratio, thereby offering cost savings by reducing product waste through improper dilution. The Olmsted Medical Center (OMC) in Minnesota found that it would save \$1,900 annually by using concentrated cleaners in reusable bottles [20]. Finally, well-designed automatic dilution systems reduce the risk of worker exposure to chemical concentrates. While cost data on this issue is not available, the latest GreenSeal GS-37 standard recognizes this advantage by including specifications for the dilution systems as well as the products themselves.

### ***Cooperative Procurement Contracts and Future Demand***

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Cost-effectiveness is often cited as one of the main barriers to purchasing green cleaning products because they are perceived to be more expensive than conventional products. However, substantial cost savings can be obtained through leveraged purchasing power. The potential of this power in purchasing green cleaning products has been seen in region-wide contracts through associations such as the Western States Contracting Alliance. In 2007, the states of Oregon, Washington, Colorado, Nevada, and Utah secured a 45-50% savings on a wide variety of institutional-grade cleaning products across different product categories through a cooperative contract with WAXIE Sanitary Supply [21]. These high-volume contracts carry substantial potential for savings when government purchasers act together.

Furthermore, with federal, state, and municipal governments across the country switching to environmentally preferable institutional-grade cleaning products, the scale of the demand shift will change the landscape for future prices. Green products will naturally become increasingly cost competitive due to an increase in production and competition on the supply side in response to the increased demand. This creates medium-term cost considerations of green cleaning programs.

### ***Disinfectant Use: How Clean is Clean?***

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Disinfectants are among the most potent and hazardous of all common cleaning products, but they serve a vital purpose. Surface hygiene and pathogen control are important considerations, especially in hospitals. Certified green cleaning products are not established as having antimicrobial or antibacterial properties. The US EPA categorizes disinfectants as pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), therefore disinfectants are unable to be certified as green [22]. As a result, disinfectants are not included in the product cost comparison section of this report. However, there is still

a potential for cost savings by reducing the amount of disinfectants used unnecessarily in institutional cleaning programs.

The Olmsted Medical Center (OMC) in Minnesota conducted a pollution prevention project in 2007 and found that by reviewing which surfaces need to be disinfected compared to those that were actually being disinfected, the OMC was able to reduce their surfaces to be disinfected by 63%. This resulted in a cost savings of \$10,000 annually [23]. Through the reduction of unnecessary chemicals, switching to green cleaning products, and improved processes related to disinfecting procedures, the OMC expects to see annual cost savings to be greater than \$20,000 [24].

There is concern not only about the adverse effects of disinfectant use on human health and the environment, but also long-term public health consequences of over-disinfecting, such as antibiotic resistance. As the OMC case study demonstrated, by reviewing which surfaces must be regularly disinfected and which surfaces are actually being disinfected, there is a cost saving potential through a transition from RTU disinfectants to green cleaning concentrates.

### ***Labor Considerations***

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One of the most important and often cited concerns of green cleaning products is that of performance. When products are less effective they require more time and effort to complete their tasks, which results in higher labor costs. There is currently a lack of data in the published literature to support an analysis of the differing labor costs between green and conventional cleaners.

According to Michael Hanson, San Francisco City Hall Custodial Services Manager, in the early days of green cleaning the products were initially more expensive and less effective than traditional cleaners. This has changed over time and the evolution of green cleaning products has made them comparable to conventional products in performance and price. Although green cleaners are now more effective than they used to be, the general consensus is that they still require a little more effort than their conventional counterparts. Higher labor costs translate into a slightly higher overall cost for green cleaning programs.

While green cleaning products may require a little more effort to get the job done, many conventional cleaning products contain chemicals that put custodians at risk of occupational injuries from chemical exposure and building occupants – adults and children – at risk of respiratory problems such as asthma. Data from Washington State show that 289 custodians suffered from cleaning chemical exposure injuries in 1997 [25]. According to Tom Barron's 2004 report for the City of Seattle, the total cost per injury was \$1,359, including medical and lost time costs [26]. The cleaning industry employs approximately 2.8 million potentially exposed workers, according to the US EPA [27]. This suggests that there is significant room for a reduction in costs due to occupational injuries related to toxic chemical exposure from conventional cleaning products.

Roughly five percent of the total US workforce that works indoor – 4.7 of 89 million workers – has asthma [28]. The estimated health care costs from the effects of work exposure attributed to indoor workers totals \$2.7 billion annually [29]. Additionally, the costs from absences due to illness and other performances losses due to work exposure amount to another \$340 million annually [30]. As for asthma and children, there is a cost associated with student absenteeism, as it is tied to school funding. According to Air Quality Sciences, asthma is the leading cause of school absenteeism for children under the age of 15, which accounts for 14 million lost school days [31]. Of course, not all cases of asthma are tied to cleaning chemicals, but this demonstrates the magnitude of potential savings from decreasing or removing toxic chemical use and asthmagens from our indoor work and school environments.

### ***Health and Environmental Benefits***

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Green cleaning programs offer a multitude of intangible health and environmental benefits, such as reduced use and release of toxic chemicals, decreased transportation energy costs and greenhouse gas emissions through the exclusive use of concentrates, hazardous material disposal avoidance, improved

indoor air quality resulting in decreased absenteeism and increased productivity, decreased downstream aquatic toxicity, and the reduction of occupational injuries and worker's compensation claims filed.

### ***Conclusion***

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In summary, institutional green cleaning products are generally seen as cost competitive or slightly more expensive than their conventional counterparts. However, improved cleaning and purchasing practices offer opportunities for cost savings. Microfiber mop case studies have shown that the technology outperforms conventional mops, is cost effective over time, and offers various beneficial qualities, including up to 95% water and chemical savings and less strenuous work conditions for custodial staff. The use of concentrated products and automatic dilution equipment can offer financial savings and health benefits for custodial staff as well. Certified green products are all sold as concentrates, which directly reduces transportation and packaging costs, thereby lowering RTU product prices – an important consideration when comparing green and conventional product prices. When the costs of occupational injuries from chemical exposure are factored in, the benefits of automatic dilution equipment can offer savings through reductions in worker's compensation claims filed. Cooperative procurement contracts must also be considered as a means for lowering the costs of green cleaning products. Discounts vary, but the Western States Contracting Alliance (WSCA) was able to secure 45-50% off of retail list prices in a 2007 contract for five western states. More prudent use of disinfectants may offer both cost savings and safer work environments. By reassessing disinfectant needs versus application habits, a medical center in Minnesota was about to reduce disinfectant use by 63%, saving over \$20,000 annually. Finally, there are important, but hard to quantify, benefits for building occupants, such as reduced illnesses, better job performance, and decreased absenteeism.

## Part II.

### Product Cost Survey

The number and variety of cleaning products marketed as environmentally preferable or “green” have expanded rapidly over the past decade [32]. Expanded institutional green purchasing programs, such as those required by federal and various state procurement programs [33], have helped in this market transformation. Prices have fallen as competition has increased, yet green cleaning products are still commonly considered more expensive than their conventional equivalents [34]. In times of shrinking budgets, the perceived cost premiums required for green products becomes an obstacle to adoption of green cleaning programs, and has also been used effectively as an argument against state legislation requiring green cleaning practices in public schools [35].

In an effort to better quantify the cost premiums commanded by green cleaning products, the San Francisco Department of the Environment conducted a survey of institutional cleaning product vendors in the Summer and Fall of 2009. In keeping with reports from City purchasers and from cleaning professionals nationwide, we expected to find that green products still cost somewhat more, with high variability between product categories.

### Methodology

#### *Product categories and definitions*

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The following categories of cleaning products are included in the survey: General purpose cleaners, glass cleaners, cleaner/degreasers, restroom cleaners (non-disinfectant), neutral floor cleaners, hard floor strippers, hard floor finish, and carpet cleaners.

For the purposes of this survey, products were considered “green” if they were third-party certified under one of the following standards:

- Green Seal GS-37 (institutional cleaners) – any version
- Green Seal GS-40 (hard floor care)
- Ecologo CCD-146 (hard surface cleaners)
- Ecologo CCD-147 (hard floor care)
- Ecologo CCD-148 (carpet cleaners)

In addition, products recognized by the US EPA’s Design for Environment (DfE) program, or products that are on the SF Approved Product List – 2009 [36], were also counted as green products. In contrast, “conventional” is defined as: not certified or recognized as “green” by any of the aforementioned third-party certification companies or government programs

#### *Data collection*

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The price and dilution data included in this report are from 26 manufacturers. The majority of data was collected from the online catalog of Grainger Industrial Supply, Staples, and Champion Chemical Co., with additional data from the catalogs of Waxie Sanitary Supply, Starline Supply Co. – a local distributor in Oakland, CA, and Neutron Industries, a division of State Industrial Products of Ohio. To avoid sample bias, *all* available green and conventional products that clearly fit into one of the eight cleaning product categories were included in the study. All prices are retail list prices. Negotiated contract prices were not accepted for this analysis. A total of 373 products were included in the survey.

## ***Data analysis***

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Institutional cleaning products are usually sold as concentrates, with different dilution ratios recommended for different surfaces or levels of soil. Some products, such as floor finishes, are only sold as ready-to-use (RTU), which requires no dilution. Some product categories can be found in both RTU and concentrate forms.

For a standardized comparison of concentrates, this cost analysis uses the price per RTU gallon at medium-soil dilution as the primary measure for evaluation. This measure is calculated using a product's cost per gallon and its medium-soil dilution ratio (oz. product/oz. water):

$$\frac{\text{Cost per gallon of cleaning product}}{\text{Number of product ounces for 1 RTU gallon}}$$

The cost per gallon component is necessary because of the variety of quantities and container sizes available. Unit as sold quantities range from 1-12 containers per order and container sizes range from 1 quart to 55 gallons. Thus, calculating the cost per gallon for each product allows for a uniform baseline cost measure. The medium-soil dilution component is defined as the manufacturer's recommended dilution ratio for medium soil applications. If only high- and low-soil dilution ratios are provided, the average of the two is calculated.

Data was tabulated in spreadsheets, and average prices were compared between green and conventional products for each product category. Since RTU products are generally more expensive, they were analyzed separately. Two-tailed t-scores were calculated using GraphPad software [37] for each product category to identify statistically significant differences (at  $p < 0.05$ ).

## **Results and Discussion**

### ***Concentrated products***

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The results are summarized in Table 2 and in Figure 3. In general, the prices for green product concentrates were equivalent or even lower than prices for conventional products. The only statistically significant difference was for floor strippers, where the green products (average price=\$1.86/gal RTU) were significantly less expensive than the conventional products (average price=\$4.59/gal RTU) at  $p=0.02$ . This may be related to ingredient costs, since green floor strippers have lower levels of glycol ethers and other expensive solvents. Green products averaged less expensive in five of seven product categories, and were more expensive only for glass cleaners. Taken altogether, with 212 total products considered, the green products averaged \$1.64/gal RTU compared to \$2.39/gal RTU for conventional products, although this difference was not significant. No RTU or aerosol products were included in these averages.

The figure of greatest interest is sometimes the lowest price available, not the average price. Green products had the lowest price in four out of the seven product categories surveyed (Table 2, "Low" columns), again suggesting that green product costs are overall similar to conventional products.

These price differences were opposite the expected result. Analyses were re-examined for sample error or other confounding factors, but none were found.

### ***Ready-to-use products***

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The prices of ready-to-use green products were comparable to those of conventional products (Figure 4), although the sample size was somewhat small (122 conventional products vs. 18 green products). Green carpet and general purpose cleaners averaged slightly cheaper than their conventional counterparts, while green restroom and glass cleaners were slightly more expensive. None of the differences were statistically significant.

There were relatively fewer green RTU products because concentrated products are generally considered more environmentally friendly. Concentrates can be 1/64 or even 1/128 as heavy as RTU products, resulting in substantial energy savings in transportation. The GS-37 and CCD-146 standards require concentrates for certifications; the few RTU general purpose, degreaser, and general purpose cleaner products all fell under the Design for Environment program. Floor finishes are the exception, since they commonly are shipped ready to use.

As expected, RTU products were significantly more expensive than concentrates for both green and conventional products ( $p < 0.0001$ ). The average RTU price was \$30.10/gal — almost 15 times greater than the concentrate price of \$2.16/gal.

### ***Aerosol products***

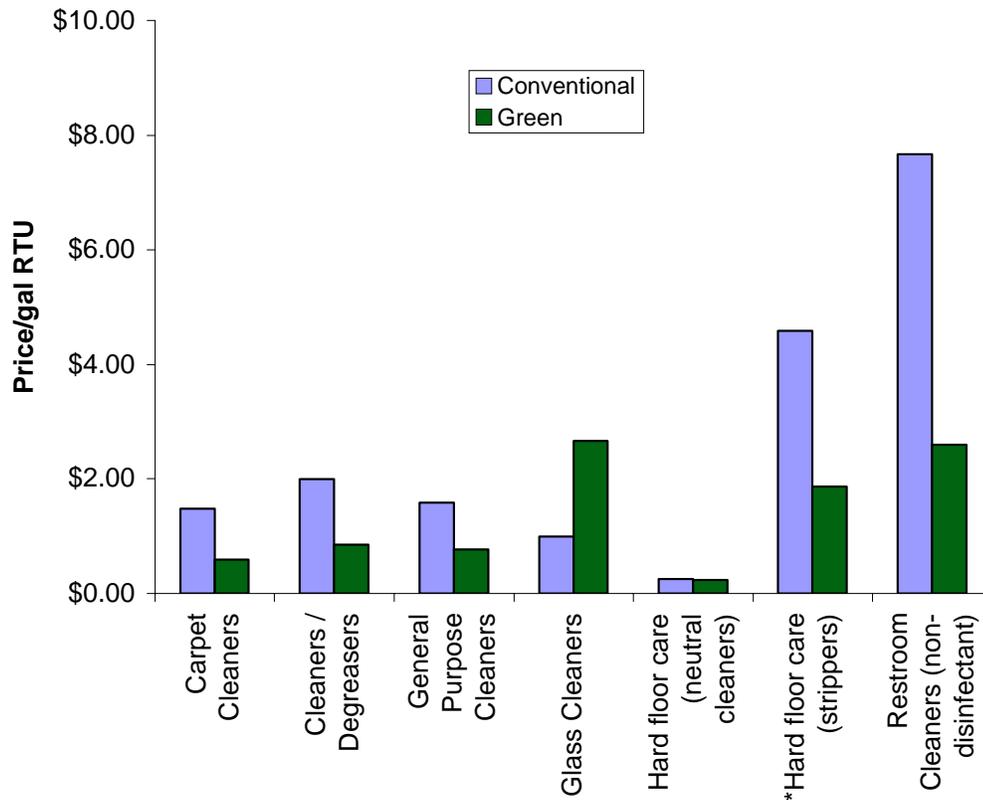
The environmental impacts of aerosol cans include increased packaging waste, increased transportation costs, and petroleum-based propellants that are greenhouse gasses. Aerosol cans pose a worker hazard in the waste management industry, due to their potential to explode in compacting equipment. The use of aerosol products also poses greater respiratory risks due to the fact that tiny droplets drift farther and can penetrate more deeply into the lungs. For these reasons, none of the aerosol products included in this survey fell under Green Seal, Ecologo, or Design for Environment; hence, comparing green and conventional aerosol products was not possible.

Within the set of conventional products, the price differential for aerosols vs. non-aerosols was even steeper than that of simple ready-to-use products. Aerosols averaged \$57.60/gal, or 27 times greater than concentrate prices. ( $p < 0.0001$ ).

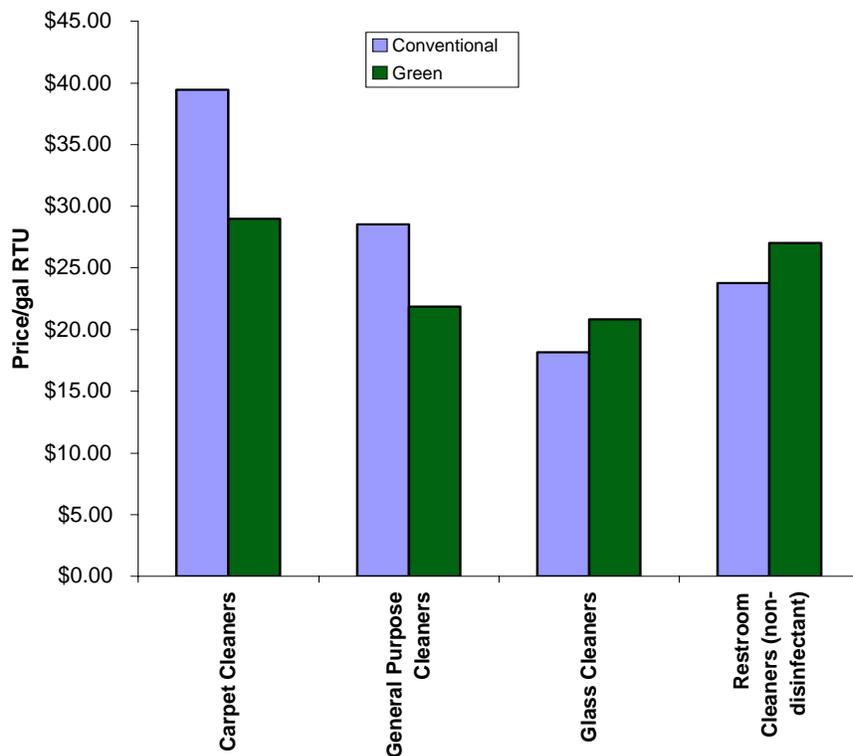
**Table 2.** Price comparison of green and conventional cleaning products sold as concentrates. Ready-to-use (RTU) products not included. Prices shown are dollars/gal RTU at medium soil dilution.

Product category	<b>Conventional</b>			
	Low	Average	High	N
Carpet Cleaners	0.11	1.48	8.23	28
Cleaner/Degreasers	0.06	2.00	20.30	45
General Purpose Cleaners	0.19	1.59	7.79	15
Glass Cleaners	0.21	0.99	3.00	9
Neutral Cleaners	0.06	0.25	0.84	17
Strippers	1.01	4.59	9.74	21
Restroom Cleaners	0.80	7.67	24.50	11
Product category	<b>Green</b>			
	Low	Average	High	N
Carpet Cleaners	0.09	0.59	1.44	6
Cleaner/Degreasers	0.20	0.85	1.87	5
General Purpose Cleaners	0.24	0.76	1.27	10
Glass Cleaners	0.18	2.66	22.71	16
Neutral Cleaners	0.08	0.24	0.41	13
Strippers	0.03	1.86	6.13	8
Restroom Cleaners	0.24	2.59	10.41	7

**Figure 3.** Price comparisons of green and conventional cleaning products sold as concentrates. Ready-to-use (RTU) products not included. No differences are statistically significant except floor strippers.



**Figure 4.** Price comparisons of green and conventional RTU cleaning products. Products sold as concentrates not included. No differences are statistically significant.



## Conclusions

### ***Green products do not necessarily cost more***

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Considering the popular impression that “it takes green to go green,” we were surprised by the relative affordability of green cleaning products. Even without considering potential cost savings from other elements of a green cleaning program, such as automatic dilution systems or microfiber mops, the prices of green and conventional products were substantially the same. This finding should prove useful for green cleaning advocates seeking buy-in from skeptical managers.

Some factors were not considered, of course, chief among them the issue of product performance. It is conceivable that some custodians will find themselves using more green product to perform similar work, particularly if they have not been adequately trained. Green products sometimes require behavior changes among custodial staff, for example, allowing products to soak in to surfaces for a longer period of time in order to achieve expected levels of cleaning, or longer scrubbing times. This is to be expected when strong acids, bases, and solvents are substituted out of ingredient lists. Other performance issues of note include the durability of non-zinc floor finishes and – especially – the effectiveness of graffiti removers (not a product considered here).

There are many factors that enter into product prices, including costs of ingredients, production costs (including economies of scale), unit size, proximity to manufacturer and resulting shipping costs, inventory/shelf life considerations, introduction of improved product lines, and sales strategies. One would therefore expect that the prices will vary greatly by location and from season to season.

### ***Reducing aerosol use saves money***

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The quality and variety of trigger spray dispensers has increased, and with it the need to use pressurized aerosol cans has declined. Environmental and human health considerations notwithstanding, the fact that aerosols cost 27 times more than concentrate formulations is a convincing argument.

### ***Switching to concentrated institutional cleaners is an easy win***

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Switching to concentrated institutional cleaning products is clearly a simple cost-saving measure that can also bring major environmental benefits. While concentrates pose higher worker health hazards due to their higher acute toxicity, this risk can be mitigated by requiring the use of automatic dilution systems. In addition, ecolabel programs are much better established in institutional products; it is difficult to even find third-party certified ecolabels on consumer-grade products. Small business owners – who might otherwise be tempted to purchase ready-to-use consumer products at a big-box store – might particularly benefit from this lesson.

### ***Better data is needed on the benefits of green products***

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Research is needed to generate more comprehensive cost/benefit analyses of green cleaning strategies. Once quantified, legislators, insurers, and decisionmakers can more easily craft policies that promote the greater public good. Some lingering questions are: How much can product use be reduced by using automatic dilution equipment or microfiber mops? What are the associated cost savings and health benefits? How much more labor – if any – is required when using green products? What is the cost impact? What impacts do green cleaning programs have on workers compensation claims, absenteeism, and worker productivity? What are the downstream aquatic toxicity hazards and costs associated with cleaning chemicals?

## Notes

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