Switching from Milk Cartons to Milk Dispensers at Bluestone Elementary School

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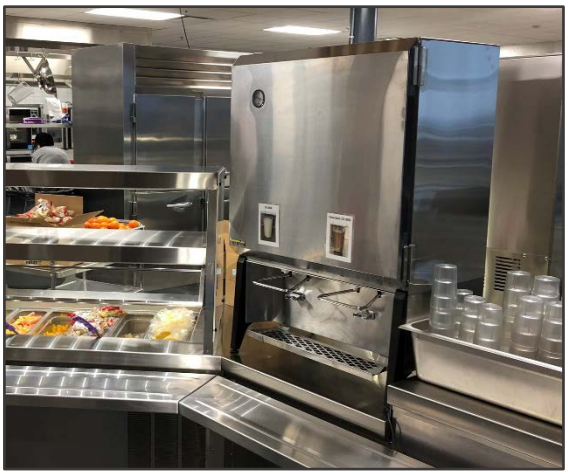
April 2019



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Abstract

In February 2019, Harrisonburg City Public Schools (HCPS) School Nutrition replaced traditional eight-ounce milk cartons with bulk milk dispensers at Bluestone Elementary School during school lunch with the goal of waste reduction as well as increased milk consumption. In addition to planning, engaging stakeholders, and purchasing of materials, HCPS School Nutrition completed a pre- and post-dispenser waste analysis. According to the analysis, after milk dispenser implementation, students took 41% more milk (2482.4 fluid ounces compared to 1758.4 fluid ounces), consumed 52% more milk (1905.2 fluid ounces compared to 1253.8 fluid ounces) and wasted 14% more milk (577.2 fluid ounces compared to 504.6 fluid ounces) daily. Although a larger volume of milk was wasted, overall milk waste of all milk taken daily decreased from 29% to 23%, and overall milk consumption increased from 71% to 77% of all milk taken daily. Additionally, the switch to milk dispensers amounted to an overall 91% reduction of milk packaging waste by compacted volume and an 89% reduction of milk packaging waste by weight. Cost per serving decreased from $0.22 to $0.20 after the switch however estimated biweekly purchasing costs increased from $125.16 to $139.56. The school nutrition director will continue to monitor purchasing costs, in addition to milk consumption, for several months after implementation to more accurately determine post-dispenser differences. The school staff response to the implementation was overwhelmingly positive, with staff recommending other schools implement dispensers based on their experience.

Introduction

Harrisonburg City Public Schools (HCPS) School Nutrition has implemented a new sustainable initiative in the school cafeteria of Bluestone Elementary School – milk dispensers. Instead of being offered a traditional eight-ounce carton of milk, students now use reusable cups to serve themselves from milk dispensers when moving through the lunch line.

Waste reduction is the major goal of the milk dispenser implementation. Milk cartons are not recyclable in the Harrisonburg area and are therefore being thrown away in the trash daily after use. Improved milk consumption and school lunch participation are secondary goals of the milk dispenser implementation. The following report details the implementation of the milk dispensers at Bluestone Elementary School including results of a pre and post implementation study detailing container and milk waste, changes in total milk consumption, and cost comparison.

Background

HCPS participates in the National School Lunch Program (NSLP), a federally assisted meal program providing nutritionally balanced, low-cost or no-cost lunches to nearly 31 million children every day (*The National School Lunch Program*, 2017). Schools participating in the NSLP receive reimbursement for meals served however these meals must meet federal nutrition standards based on the *Dietary Guidelines for Americans* and meal pattern requirements (*Nutrition Standards in the National School Lunch and School Breakfast Programs*, 2012). One requirement to meet standards is that eight ounces of either 1% or fat free milk be offered with each school lunch, as milk is recognized as a key contributor of nutrients in the diet such as calcium, phosphorus, vitamin A, potassium and protein (*2015-2020 Dietary Guidelines for Americans*, 2015).

HCPS has traditionally offered eight-ounce milk cartons of fat free white, low-fat (1%) white, and fat free chocolate flavored milk. However, in the fall of 2018, Andrea Early, MS, RD, Director of HCPS School Nutrition, was approached by Anne Lintner, Principal at Bluestone Elementary School, about installing milk dispensers to switch to bulk milk in the school cafeteria after students learned in the classroom about sustainability and the environmental impact of the

school's waste, including milk cartons served at lunch. HCPS School Nutrition agreed to support the school's sustainability efforts and milk dispensers were purchased. Implementation was overseen by School Nutrition Director Andrea Early and practicum student Jennifer Williams.

Other school districts across the country who have implemented milk dispensers report benefits of decreased container and packaging waste, as well as increased milk consumption related to students preferring the taste and chilled temperature of the milk from the dispensers (Larsen, 2014; Zipparo et al., 2016). One high school in Minnesota that switched to dispensers found that students would consume 659 more gallons (equivalent to 10,540 cartons) of milk over the course of one year and waste 10% versus 13% of milk taken (Jeffers Foundation, Silverking and Recycling Association of Minnesota, 2014). HCPS switched to a new milk vendor this current school year and students have vocalized a dislike of the taste of the milk in the cartons, which is possibly resulting in a decrease in consumption. By switching from milk cartons to milk dispensers, HCPS School Nutrition aims to support the sustainability efforts of Bluestone Elementary School as well as improve student nutrition through increased milk consumption.

Implementation

Site Location

As stated above, the milk dispensers were implemented at Bluestone Elementary School in Harrisonburg, Virginia. The school includes kindergarten through fifth grade with a total of 593 students. On average, 82% percent of students purchase school lunch, with an average of 488 school lunches served each day. 68% of the students qualify for free or reduced school lunch. Prior to milk dispenser use, Bluestone served fat free milk, low-fat milk (1%) and fat free chocolate milk at lunch from Marva Maid Dairy, located in Newport News, Virginia.

Material Purchasing

The following materials were purchased by HCPS School Nutrition prior to starting the milk dispenser implementation: milk dispensers, reusable cups, dishwasher racks for the cups, dishwasher rack dollies, and bulk milk. Two bulk milk dispensers were purchased from Silver King Refrigeration – one for each lunch line. Each dispenser has two spouts for dispensing milk and can accommodate three-, five- or six-gallon bags per spout. Based on student population numbers, a total of 600 9.5-ounce clear tumbler cups were purchased as this size cup allows for the NSLP-required eight ounce serving. Additionally, 17 dishwasher racks and two dishwasher rack dollies were purchased. The HCPS School Nutrition Director also confirmed, prior to purchase of other milk dispenser materials, that the school system's current milk provider Marva Maid could provide bulk milk. Marva Maid confirmed bulk milk could be provided in five-gallon bags of low-fat milk (1%) and low-fat chocolate milk (1%).

Figure 1. 9.5-ounce cup with 8 ounce serving of milk compared to half pint milk carton.

Installation

The milk dispensers were delivered to the school on January 29, 2019 and installed in the lunch line just before the point of service. Therefore, when going through the lunch line, children first receive a tray with selected entrée (protein and grain), choose vegetables and/or a fruit from the self-serve "garden patch", pick up a cup and pour milk, then go through the point of service. Prior to purchase of the milk dispensers, HCPS School Nutrition Director measured the area in the lunch line to ensure fit of the machines and confirmed that outlets were available with appropriate voltage.

Figure 2. Milk dispenser with signage on where to fill cup for appropriate portion to meet reimbursable requirements.

The milk dispensers were installed approximately one week before the first "test" milk bags were delivered and placed in the machines. Though not necessarily planned, this allowed adequate time to ensure proper

temperature control as well as allow the students to get used to seeing the milk dispensers in the lunch line, sparking excitement and curiosity.

Engaging Stakeholders

Building support and ownership of the milk dispensers among all stakeholders in the school was crucial to smoothly start operation. The following sections describe what took place to educate and train among the different stakeholders in the school before milk dispenser operation began.

Administration and Teaching Staff - The school nutrition director and practicum student met with the school principal the week before the milk dispensers were delivered and installed to discuss an implementation plan for the dispensers. The implementation plan included presenting at a faculty meeting about the milk dispensers, having training sessions for the students, and a timeline for when students would begin using the dispensers. Principal Lintner was tremendously supportive of the milk dispenser implementation by: adding a milk dispenser presentation to the agenda of the upcoming faculty meeting; helping coordinate dates and times with teachers for training sessions for students; and advocating for kitchen staff by emphasizing to teachers that extra assistance would be needed from teachers in the lunch line during the start of this new process.

During the faculty meeting held with all teaching staff, the practicum student presented on why the milk dispensers were being installed (waste reduction) and shared results of pre-dispenser waste data collection (this took place prior to milk dispenser use and will be detailed below). The practicum student also shared with teaching staff when students would be coming to the cafeteria for training sessions and when students would begin using the machines during lunch. During the meeting, staff voiced excitement about the possibility of waste reduction and the possibility for students to mix white and chocolate milk to reduce sugar intake.

Kitchen Staff - The kitchen manager and staff were made aware of the switch to milk dispensers' months before implementation. Once machines were installed, the school nutrition director and practicum student frequently communicated with the staff when the first milk would be delivered, when students would practice with the machines, and when students would start using the machines during lunch. The school nutrition director and practicum student educated

staff on how the machine worked, should be cleaned and how to change the milk bags. The practicum student worked with staff to establish processes for stocking cups before meals and storing clean cups after dishwashing. The school nutrition director and practicum student provided recommendations, but the kitchen manager was ultimately given the responsibility to regulate and assign new job tasks needed related to the milk dispensers.

Custodial Staff - One of the roles of the custodial staff at Bluestone is the collection of trays after lunch for the dishwashing room. At least one custodian is at a tray collection table in front of the dishwashing room window where students place unopened foods in a share bin, empty liquids into a container, empty remaining tray waste into a trash can, and leave tray and utensils to be washed. Custodial staff were made aware of the switch to milk dispensers prior to implementation as they would need to now have a place to collect reusable cups at the tray collection table. Custodians were given adequate time prior to milk dispenser implementation to accommodate this change.

Students - Students were introduced to the milk dispensers through training sessions before getting to use the dispensers at lunch. The school nutrition director, practicum student and kitchen manager, with school principal and assistant principal present, led training sessions over the course of two afternoons. Students came down to the cafeteria by grade and gathered around the dispensers. Students were educated on why the milk dispensers were being used, how they would go through the lunch line, how full they should fill their cups (emphasis was placed on not filling up all the way because of spills and pictures were placed on the machines) and how the milk dispenser worked. Students then practiced going through the lunch line and used the milk dispenser to pour a glass of milk. Students enjoyed sampling the milk and became excited to start using the dispensers at lunch.

Figure 3. Students using the milk dispensers at lunch.

Timeline

In summary of the above sections, the following outlines the full implementation timeline of the milk dispensers. Students began using the milk dispensers in two phases. Third, fourth and fifth grade classes began using the milk dispensers at lunch first, followed two weeks later by kindergarten, first and second grade. When third through fifth grade began using the milk dispensers, milk cartons were still available for younger grades during lunch. Once kindergarten through second grade were using the milk dispensers, milk cartons were phased out.

January 23-29, 2019:	Data collected for one week on pre-dispenser waste
January 24, 2019:	Meeting with school principal about milk dispenser implementation
January 29, 2019:	Milk dispensers delivered and installed
January 30, 2019:	Meeting with kitchen manager about milk dispenser implementation
February 4, 2019:	First milk bag delivered (chocolate milk) and placed in machine
February 5, 2019:	Faculty meeting presentation on milk dispensers
February 7, 2019:	Milk dispenser training with third, fourth and fifth grade
February 11, 2019:	Third, fourth and fifth grade started using milk dispensers during lunch
February 21, 2019:	Milk dispenser training with kindergarten, first and second grade
February 25, 2019:	Kindergarten, first and second grade started using milk dispensers during lunch (now all grades using milk dispensers)
March 18-22, 2019:	Data collected for one week on post-dispenser waste

Data Collection Methods

Data on milk consumption, milk waste, milk packaging waste, and milk and milk-service costs was collected and analyzed both pre- and post- milk dispenser implementation. Surveys and interviews were also completed to gather qualitative data on the milk dispenser implementation. Below describes data collection in further detail.

Milk Consumption and Waste

Milk consumption and milk waste at lunch was measured for a period of one week prior to any students using the milk dispensers at lunch and then for a period of one week after all grades were using the milk dispensers.

During the pre-milk dispenser data collection, the practicum student tracked number of milk cartons taken during lunch by counting the number of milk cartons at the beginning of lunch and the number of milk cartons remaining after lunch. The practicum student also added buckets for milk waste (one for fat free milk, one for 1% and one for fat free chocolate milk) in the tray collection area where students would pour unused milk at the end of lunch for measuring milk waste. Data collection took place for five days, starting on a Wednesday (due to school schedule) and concluding the following Tuesday, in order to include all five days of the school week in the data collection.

A limitation to pre-milk dispenser data collection was that on two of the data collection days, the count of fat free milk before and after lunch was inaccurate. Therefore, the fat free milk use was averaged over only three days, compared to the white (1%) and chocolate milk which were averaged over five days.

During the post-milk dispenser data collection, the practicum student estimated the amount of bulk milk in bags in dispensers prior to lunch, tracked the number of bulk milk bags added during lunch, and estimated the amount of bulk milk remaining in dispensers after lunch. The practicum student also added a bucket for milk waste in the tray collection area where students would pour unused milk at the end of lunch for measuring waste. One bucket was used for all milk waste during post-implementation because students were mixing milk when using the dispenser, making accurate data collection using separate buckets for 1% milk and 1%

chocolate milk difficult. Data collection took place for five days, starting on a Monday and concluding on a Friday, in order to include all five days of the school week in the data collection.

A limitation to post-milk dispenser data collection was that all kindergarten classes were on a field trip one day of the data collection and missed lunch. Therefore, only four or the five data collection days were used to calculate averages. Another limitation was that the actual amount of milk in the milk bags at the beginning and end of lunch service could not be accurately measured because usually a bag would still be in from the previous day or a partial bag would be left for the next day of service. Therefore, the practicum student had to visually estimate the fluid ounces of milk in each bag.

Milk Packaging Waste

Data on milk packaging waste was also collected for one week before and one week after the milk dispenser implementation. The volume and weight of pre-dispenser packaging (cartons) and post-dispenser packaging (bulk milk bags) was calculated and compared based on the milk consumption and waste data collected during the pre- and post-dispenser waste analyses.

Cost Analysis

Cost of milk service-related machinery and materials (such as milk coolers, milk dispensers, cups, etc.) was determined for both pre-dispenser milk service and post-dispenser milk service to compare set-up costs of milk carton service versus bulk milk service. Daily cost of milk for both pre- and post-milk dispenser implementation was estimated based on use data obtained during the pre- and post- waste studies. The school nutrition director will continue to monitor milk usage for several months after implementation to determine regular milk cost.

Staff Surveys and Interviews

An electronic survey about the milk dispensers was distributed to all school staff approximately three weeks after all students began using the milk dispensers at lunch. The cafeteria manager and head custodian were also interviewed to provide feedback on the milk dispenser implementation.

Results

Milk Consumption and Waste

Average daily milk usage prior to milk dispensers amounted to 1758.4 fluid ounces, or 219.8 cartons (equivalent of 2.75 five-gallon bags) (see Table 1 and Figure 4). After milk dispenser implementation, daily milk use was 2482.4 fluid ounces, or 3.88 bags (equivalent of 310.3 cartons) (see Table 1 and Figure 4). As can be seen in Table 1, after milk dispenser implementation, students took 41% more milk (2482.4 fluid ounces compared to 1758.4 fluid ounces; a difference of 724 fluid ounces), consumed 52% more milk (1905.2 fluid ounces compared to 1253.8 fluid ounces; a difference of 651.3 fluid ounces) and wasted 14% more milk (577.2 fluid ounces compared to 504.6 fluid ounces). Although a larger volume of milk was wasted, overall milk waste of all milk taken decreased from 29% to 23% and overall milk consumption increased from 71% to 77% of all milk taken (see Table 1 and Figure 5).

Table 1

Daily Milk Taken, Consumption and Waste

		Pre-Dispensers[1]	Post-Dispensers[2]	Difference	% Change
Milk Taken	**Fluid Ounces**	**1758.4**	**2482.4**	**724.0**	**41%**
	Cartons (8 fl oz)	219.8	Equivalent of 310.3		
	Bags (640 fl oz)	Equivalent of 2.75	3.88		
Milk Consumed	**Fluid Ounces**	**1253.8**	**1905.2**	**651.3**	**52%**
	Cartons	156.7	Equivalent of 238.1		
	Bags	Equivalent of 1.96	2.98		
Milk Waste	**Fluid Ounces**	**504.6**	**577.2**	**72.6**	**14%**
	Cartons	63.1	Equivalent of 72.2		
	Bags	Equivalent of 0.79	0.90		
Milk Consumed (%)		**71%**	**77%**		
Milk Wasted (%)		**29%**	**23%**		

Notes: [1]*averages from 5 days of data collection*
[2]*averages from 4 days of data collection*

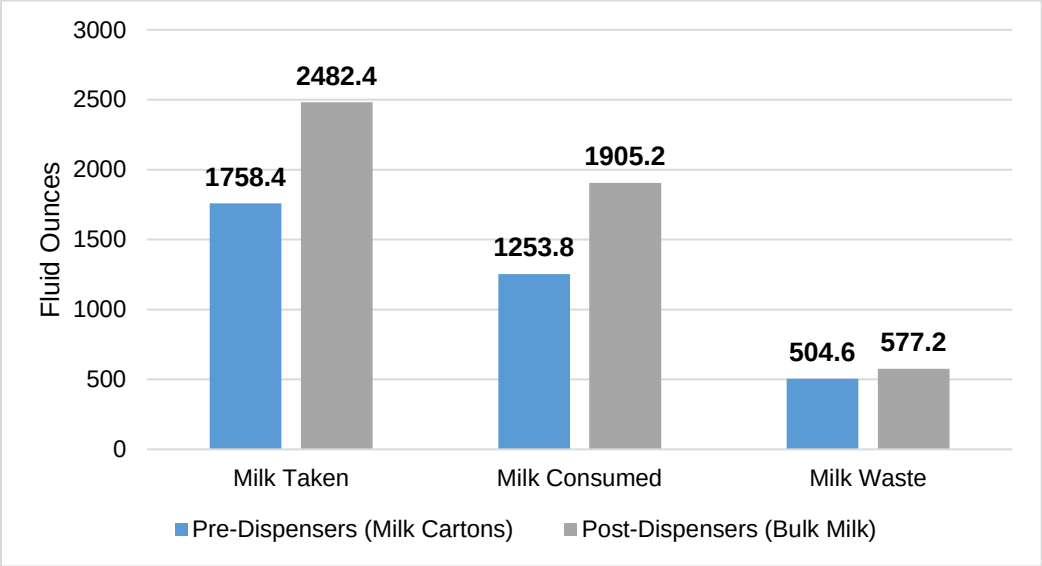

Figure 4. **Daily Milk Taken, Consumption and Waste**

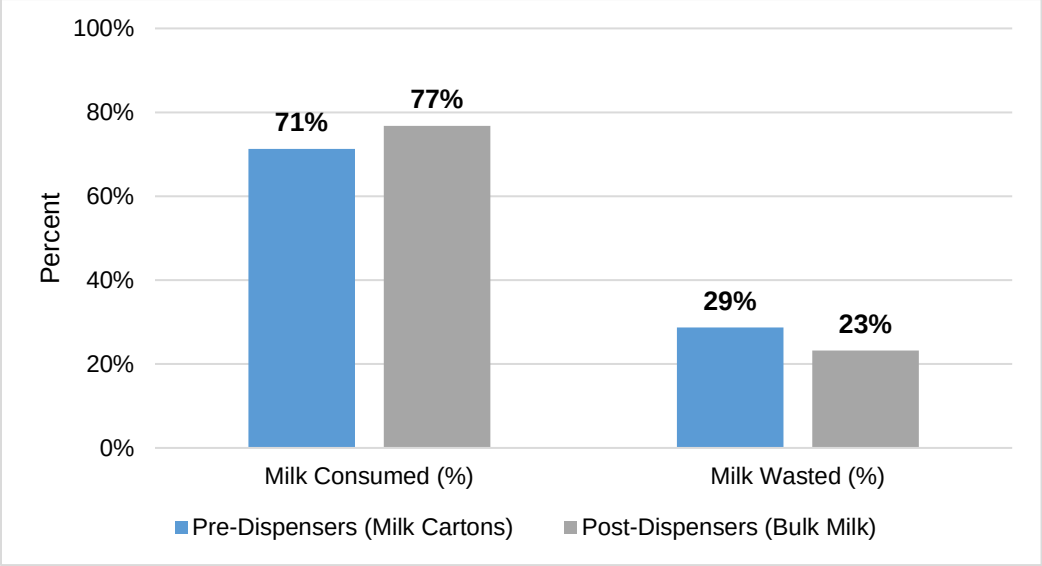

Figure 5. **Percent of Milk Consumed vs Wasted**

Table 2 below shows average daily milk taken by type of milk. Prior to milk dispenser implementation, 77% of milk taken was chocolate milk (1347.2 fluid ounces) and 23% of milk taken was white milk (411.2 fluid ounces). After milk dispenser implementation, 75% of milk taken was chocolate milk (1868.0 fluid ounces) and 25% of milk taken was white milk (614.0 fluid ounces).

Table 2

Daily Milk Taken by Type of Milk

Pre-Dispensers		
	Cartons	**Fluid Ounces**
White Milk (skim)	20.0	160.0
White Milk (1%)	31.4	251.2
Chocolate Milk (skim)	168.4	1347.2
Post-Dispensers		
	Bags	**Fluid Ounces**
White Milk (1%)	0.96	614.0
Chocolate Milk (1%)	2.92	1868.0

Note - daily averages based on pre and post waste studies over course of one week

Milk Packaging Waste

Daily milk packaging waste by volume was 360.7 in^3 before milk dispenser use and 31.3 in^3 after milk dispenser use, which projects to 36.9 ft^3 of milk packaging waste annually pre-dispensers and 3.2 ft^3 post-dispensers (see Table 3 and Figure 6). As can be seen in Table 4, after the switch from milk cartons to milk dispensers, the daily compacted volume of milk packaging waste decreased by 329.4 in^3, or 0.19 ft^3, which would amount to a projected annual volume decrease of 33.7 ft^3 - enough to fill about six bath tubs. The switch to milk dispensers amounted to an overall 91% reduction of milk packaging waste by compacted volume.

Table 3

Milk Packaging Waste by Volume

	Pre-Dispensers	**Post-Dispensers**
Daily Volume (in^3)	**360.7**	**31.3**
Projected Annual School Year Volume (ft^3)	**36.9**	**3.2**

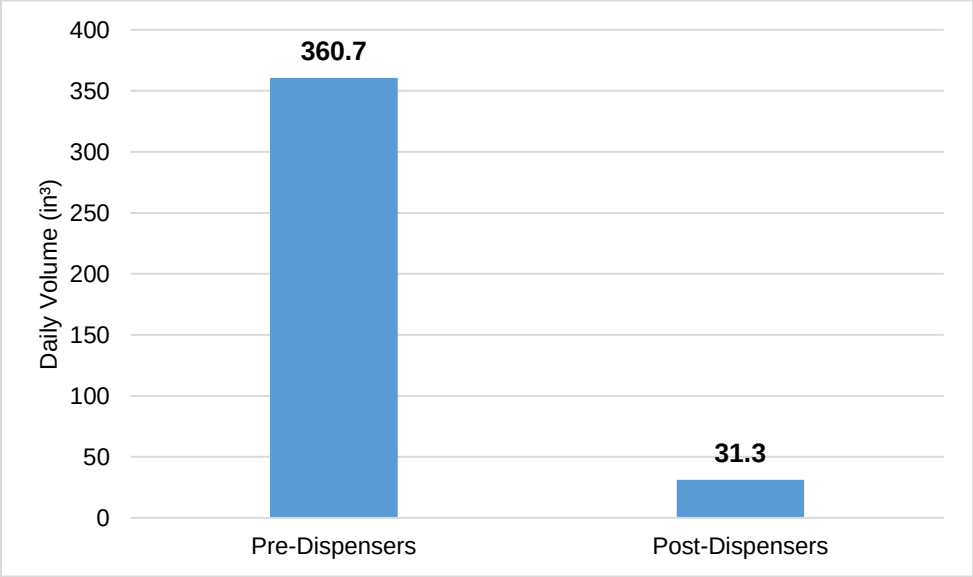

Figure 6. **Milk Packaging Waste by Volume**

Table 4

Waste Reduction by Volume Post-Dispensers

	Difference in Pre vs Post Waste
Daily Volume (in³)	**329.4**
Projected Annual School Year Volume (ft³)	**33.7**
Reduction in Waste by Volume (%)	**91%**

After the switch from milk cartons to milk dispensers, the daily weight of milk packaging waste decreased by 12.3 pounds, from 13.7 to 1.5 pounds daily (see Table 5 and Figure 7), amounting to a projected annual waste weight decrease of 2181.5 pounds, as seen in Table 6. The switch to milk dispensers amounted to an overall 89% reduction of milk packaging waste by weight.

Table 5

Milk Packaging Waste by Weight

	Pre-Dispensers	Post-Dispensers
	Flattened 8-Ounce Carton	***Flattened 5-Gallon Milk Bag***
Daily Weight (lb)	**13.7**	**1.5**
Projected Annual School Year Weight (lb)	**2431.5**	**257.5**

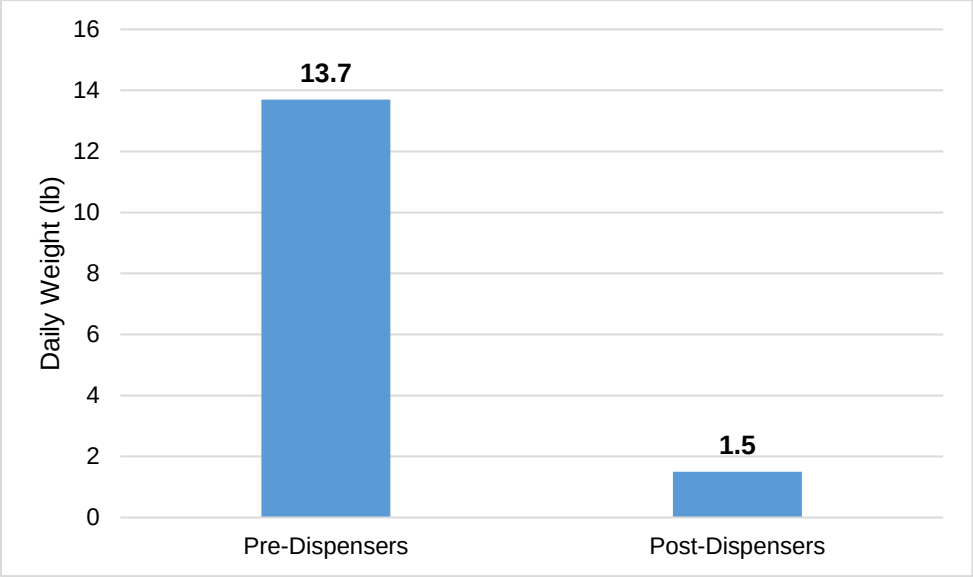

Figure 7. **Milk Packaging Waste by Weight**

Table 6

Waste Reduction by Weight Post-Dispensers

	Difference in Pre vs Post Waste
Daily Weight (lb)	**12.3**
Projected Annual School Year Weight (lb)	**2174.1**
Reduction in Waste by Weight (%)	**89%**

Cost Analysis

The average cost of milk cartons per eight-ounce serving is slightly higher than an eight-ounce serving of bulk milk from HCPS' current milk supplier ($0.22 versus $0.20) as can be seen below in Table 7. Based on the average number of milk servings taken during the two weeks of the pre- and post-dispenser waste analysis, total cost of milk taken per school day increased after milk dispenser implementation from $48.36 to $62.06. The estimated total cost of milk taken per school year, based on that daily cost, could increase from $8,559.01 to $10,984.56 with the switch to bulk milk.

Table 7

Cost Analysis - Daily Cost of Milk

	Pre-Dispensers	Post-Dispensers
Average Cost of Milk per 8-ounce serving	$0.22	$0.20
Total cost of milk taken per school day	**$48.36**	**$62.06**
Estimated total cost of milk taken per school year*	**$8,559.01**	**$10,984.56**

**Pre-dispensers calculated based on price of cartons, average number of cartons taken pre-dispensers and total number of school days per year. Post-dispenser calculated based on price of milk per ounce in milk bags, average number of cartons taken post-dispensers and total number of school days per year.*

Biweekly invoices for milk purchasing were averaged for two months prior to milk dispenser implementation as well as for one month after milk dispenser implementation, as seen below in Table 8. The average biweekly cost of milk cartons was $125.16, based on invoices from December and January. Milk dispenser implementation for all grades began in the middle of February (February 25), so February is not representative of a regular milk purchasing month, as the biweekly invoices reflect both milk carton purchases and an overordering of bulk milk due to milk dispenser trainings and not knowing what the weekly average use would be after implementation. As stated above, the school nutrition director will continue to monitor purchasing costs for several months after implementation to more accurately determine cost differences after bulk milk implementation.

Table 8

Cost Analysis - Biweekly Purchasing Costs

Month	Average Biweekly Cost	Pre-Dispenser Average	Post-Dispenser Average
December-18	$124.23		
January-19	$126.09	$125.16	
February-19	$176.14		
March-19	$102.98		$139.56

Initial setup costs for milk carton service at Bluestone Elementary School when the school opened was approximately $6,000 for two carton coolers, as seen below in Table 9. The initial set up cost for the milk dispenser implementation was a total of $4,888.23 which included two milk dispensers, 600 tumbler cups, 17 dishwasher racks and two dishwasher rack carts. Not included in this cost analysis are any installation or shipping costs.

Table 9

Cost Analysis - Initial Set-Up Costs

	Pre-Dispensers	Post-Dispensers
Carton Coolers (2)	$6,000.00	
Milk Dispensers (2)		$3,738.00
9.5 Ounce Tumbler Cups (600)		$443.75
Dishwasher racks (17)		$456.28
Dishwasher rack carts (2)		$250.20
Total cost of milk equipment	**$6,000.00**	**$4,888.23**

Staff Surveys and Interviews

An electronic survey was distributed to all school staff approximately three weeks after all students began using the milk dispensers at lunch, and 29 staff members responded. A detailed description of survey results can be found in Appendix A. Of those who responded to the survey, 76% were teachers, with the rest being administration, cafeteria staff, custodial staff, behavior specialist, home-school liaison, and instructional assistants. Overall, staff believed the milk dispenser implementation was ‘Good’ and ‘Strongly Agree’ they would recommend other schools use milk dispensers in their cafeterias. Staff were asked to rate how important waste

reduction and increased milk consumption is as a result of switching to milk dispensers. On average, staff rated waste reduction as 'Extremely Important' and increased milk consumption as 'Somewhat Important' when switching from milk cartons to dispensers. Some positive aspects of the milk dispensers reported by staff include waste reduction, children's excitement to drink milk from the dispensers, and increased milk consumption. Some negative aspects of the milk dispensers reported by staff include increased time in lunch line, spills, and kitchen staff having to replace empty milk bags while children are going through the lunch line.

The school nutrition manager at Bluestone was interviewed (see summary of interview in Appendix B) regarding changes in kitchen labor needs and duties, as well as positive and negative aspects of the milk dispenser implementation noted. Major new kitchen duties for staff included prepping milk bags to put in dispensers, putting milk bags in dispenser, and washing cups in the dish room. The most significant new duty for the kitchen manager with the milk dispensers is milk ordering and getting used to new milk usage.

The lead custodian responded to the electronic survey and was also interviewed informally on the milk dispenser implementation. Her overall response to the milk dispenser implementation was positive and supportive of both the material and milk waste reduction aspect, as she sees the amount of waste after lunch daily. As far as job duties related to the milk dispensers, the lead custodian now must collect the reusable cups from the students for the dish room at the tray table, however, reports this does not add significantly more work to her work load. The custodian regularly has student helpers eager to load reusable cups into dishwasher racks.

Discussion

After the switch from milk cartons to bulk milk dispensers at Bluestone Elementary School, students were found to take and consume more milk. Students also wasted less of the milk that was taken but did waste a larger volume of milk then before due to taking more milk than before. These findings are based off a one-week waste study completed three weeks after all students began using milk dispensers for lunch. Waste study results should be taken into consideration by those planning to implement milk dispensers, however these early results may be a skewed measurement of consumption and waste due to initial excitement about dispensers yet to diminish, more staff (teachers, kitchen staff, custodial staff, etc.) drinking and sampling milk initially, and milk spills leading to students coming back to get an additional serving. Completing another milk usage and waste study six to 12 months after milk dispenser implementation might provide more accurate usage data to compare to milk carton usage.

Milk-related material waste decreased significantly after the switch from milk cartons to bulk milk dispensers with a 91% reduction in waste by compacted volume and an 89% reduction in waste by weight. This is especially significant for areas like Harrisonburg where recycling for milk cartons is not available and the community is looking for solutions for waste reduction.

Cost analysis indicated that bulk milk usage could be more expensive than milk cartons based on daily usage and biweekly ordering. However, this cost analysis was just a preliminary look at milk cost and a fuller cost analysis should be completed in six to 12 months after milk dispenser implementation to fully assess costs.

The staff surveys and interviews suggested milk dispensers were overwhelmingly supported and viewed positively at Bluestone Elementary School. The findings suggest that bulk milk use can be implemented successfully in other schools, if staff share support for sustainability and waste reduction aspects of the switch. The findings also suggest that milk dispenser implementation can go well when the following is in place: the majority of administrative and teaching staff support the waste reduction aspect of the switch; students are allowed to mix milk to reduce sugar intake and staff and students are educated on this health promoting technique; and sufficient training and education is completed with staff and students on milk dispenser use prior to implementation.

Conclusion and Considerations for Those Looking to Switch to Bulk Milk Dispensers

The following summarizes what went well and what could have gone better when switching from milk cartons to bulk milk dispensers, as well as recommendations for milk dispenser use found during HCPS' initial implementation of milk dispensers at Bluestone Elementary School. See Appendix C for a simplified version of considerations and findings.

What Went Well when Switching from Milk Cartons to Bulk Milk Dispensers

Students consumed more milk and wasted less of milk that was taken after the switch to bulk milk dispensers. Less material waste was generated and going to the landfill, and there was increased excitement over the school nutrition program. With the use of cups with the milk dispensers, there were less spills than anticipated. The cups were also easier for younger kids to use than anticipated. Students also could mix white and chocolate milk with the dispensers, leading to teaching staff and school nurse encouraging students to mix milk to reduce sugar intake.

What Could Have Gone Better when Switching from Milk Cartons to Bulk Milk Dispensers

After milk dispenser implementation, the lunch line moves slower due to students pouring own milk and staff needing to refill milk dispenser while students are in line. There are also more spills in the cafeteria. Another aspect which could have gone better in implementation was that no milk dispenser machine demonstration from company representative happened until after students were using machines and a dispensing handle became loose, leading to machine needing to be closed. It would have also been beneficial to have purchased a milk dispenser with three spouts rather than two. This would lead to less replacing empty milk bags while students are going through the lunch line. As students take more flavored milk than white, we would put in two chocolate milk bags and one white milk bag if we had three spouts.

Recommendations for Others Looking to Implement Bulk Milk Dispensers

Before deciding to make the switch to milk dispensers, decision makers should consider the following regarding their capacity for implementation:

- Upfront cost of equipment needed for serving bulk milk
- Administration and teaching staff support for waste reduction
- Adequate kitchen staff (one to two people) capable of lifting for new bulk milk-related tasks
- Relationship with milk distributor who carries bulk milk that meets federal school nutrition regulations
- Space for milk dispensers and adequate electrical outlets before the point of service

When a decision has been made to use bulk milk dispensers, decision makers should consider the following in preparing for implementation:

- Milk Dispenser Set-Up
    - Place for machine before point of service
    - Number of spouts in milk dispenser
    - Adequate electric outlets
    - Place to store cups
- Kitchen Staff Training on Milk Service Procedures
    - Proper storage and rotation of milk bags regarding expiration dates
    - Proper cleaning and sanitizing of milk dispenser
    - Monitoring temperature of milk dispenser
    - Procedure for washing reusable cups
    - Have at least one to two people capable of lifting three to five-gallon milk bags
- Building Support from Teaching and Administrative Staff
    - Educate staff on switch to milk dispensers prior to implementation
    - Promote waste reduction, a better school lunch experience for the students, and the ability for students to mix white and chocolate milk when promoting milk dispensers

- Student Training and Education
    - Educate students on the milk dispensers prior to implementation
    - Allow students to use the milk dispensers and try milk prior to starting use in the lunch line
    - Put pictures on the milk dispensers and educate students on how full to fill cups in order to meet reimbursable requirements as well as reduce spills
- Tracking Milk Consumption and Waste
    - Consider completing a pre- and post-dispenser waste study like the one completed in this report, looking at milk consumption, milk waste, and material
    - Recommend a week long pre-dispenser study and a week long post-dispenser study, however, would do the post-dispenser study three to six or more months after implementation

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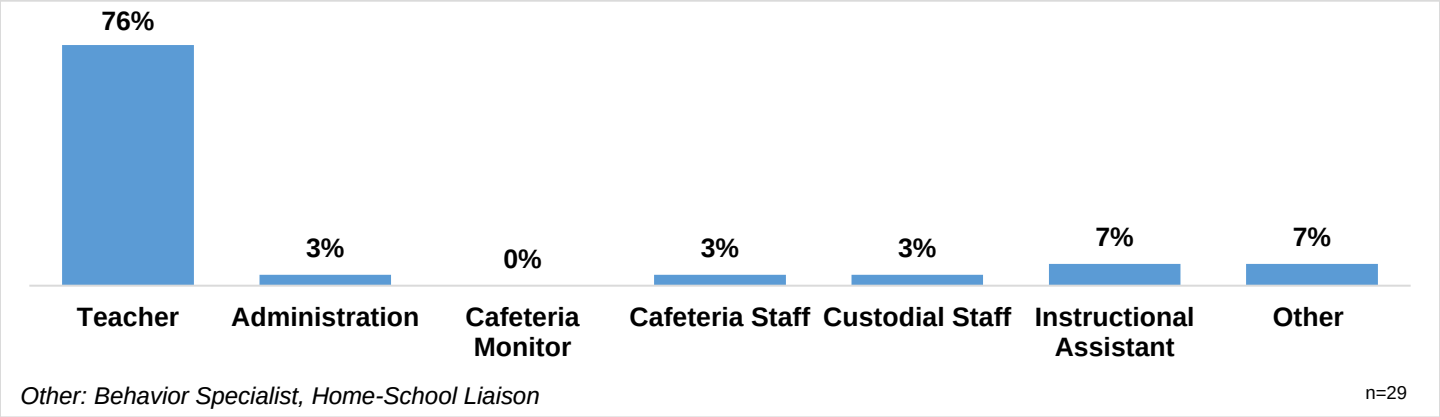
Appendix A. Staff Survey Results

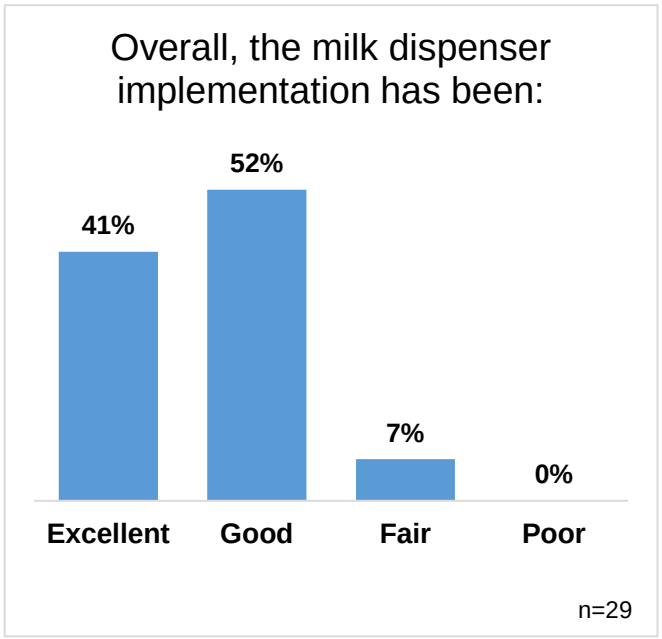
Milk Dispenser Implementation at Bluestone Elementary School

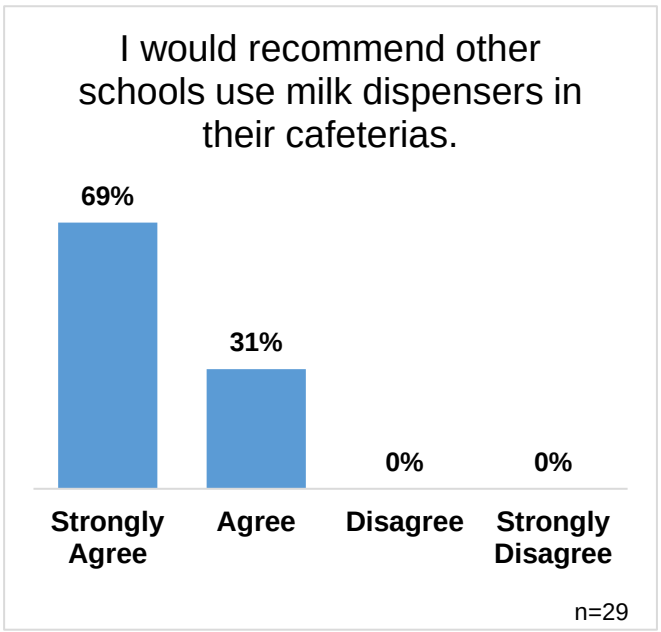
An evaluation survey was sent to all Bluestone Elementary School staff on March 18, 2019 to gather feedback on the switch from milk cartons to milk dispensers in the school. By close of survey on March 25th, 29 staff members had responded to the survey. This report serves as a summary of staff response to the milk dispenser implementation.

Who responded to the survey?



How did staff respond to the milk dispensers overall?





General Comments from Staff:

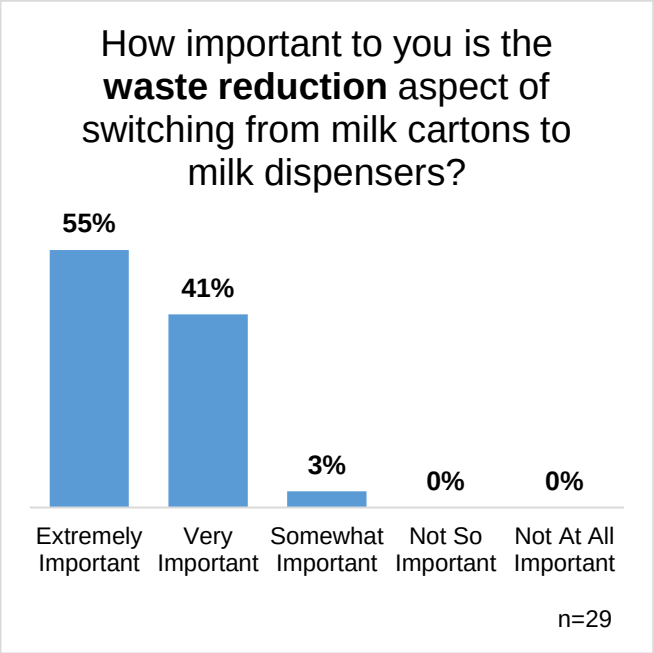
"I hope all the schools are willing to try this milk dispenser, the kids love it a lot."

"Thank you for trying something new that will ultimately have a positive impact on our students and our environment!"

"I liked the gradual implementation for younger grades. Our students got to observe the milk machines for a few weeks. By the time they got to use them they were so excited and took the responsibility of filling their milk cups seriously. They felt like it was a special privilege."

Importance of Waste Reduction and Milk Consumption

Staff were asked to rate how important waste reduction and increased milk consumption is as a result of switching to milk dispensers and provide a short explanation for their rating. On average, staff rated waste reduction as 'Extremely Important' and increased milk consumption as 'Somewhat Important' when switching from milk cartons to dispensers.



Waste Reduction Comments:

"I love the idea of not wasting so many milk cartons each day, especially since they have the special coating that is not recyclable. We need to do all we can to take care of our planet, and this is a great way to teach kids to do the same!"

"The milk cartons make excessive trash and students' waste part of the milk in the carton. With the dispenser, the children get only what they usually consume."

"Since our 3rd grade students studied pollution and global warming last year, the practice of reducing waste is very important for us to reflect in our own habits here at school."

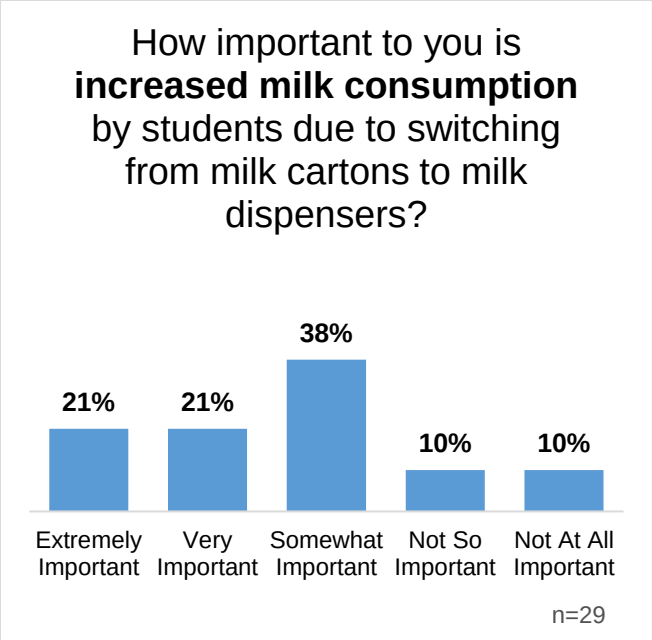
Increased Milk Consumption Comments:

"I saw 3 more of my own students drinking milk regularly who didn't buy milk previously."

"I dislike milk's sugar content, especially chocolate, but I like that students can mix milks in order to decrease the sugar content of straight chocolate milk."

"Children eat very little food, when they drink the milk they get at least calcium and protein."

"I think the most important thing is that the milk is not being wasted."



Positive and Negative Aspects of Milk Dispensers During Lunch Time According to Staff

Staff were asked the following questions to gather information on the impact of the milk dispensers during lunch time: “From your perspective, how have the milk dispensers positively impacted lunch time?” and “From your perspective, how have the milk dispensers negatively impacted lunch time?” Common themes were selected from responses and detailed below.

Positive Impacts

- **Waste reduction:** mentioned 12 times
  “Less waste is going in the trash.”
  “The students have seen that the school takes waste reduction seriously.”
  “It's encouraging to see kids so excited about health and responsible waste related practices.”
- **Children’s excitement to drink milk from the dispensers:** mentioned 11 times
  “More students are excited about getting milk for lunch. Many water drinkers have switched over to drinking milk.”
  “Students feel like they have more choice with the milk dispensers and feel more grown up.”
  “Students enjoy using the dispenser.”
- **Increased milk consumption:** mentioned 5 times
  “The milk dispensers have increased my class' milk consumption.”
  “Definitely super excited to see the kids drinking more milk!”
- **Milk tastes better from dispenser:** mentioned 4 times
  “[The students] frequently express how much better the milk tastes.”
- **Children able to choose how much milk to take:** mentioned 3 times
  “Students do not have to get a full cup, they can only pour what they want which limits waste.”
- **Mixing of regular and chocolate milk:** mentioned 1 time
  “They can also mix chocolate and regular milk, which would be a healthier choice than just chocolate.”

Negative Impacts

- **Increased time in lunch line:** mentioned 13 times
  “Students take longer to go through the line.”
  “Just slower pace getting through the lunch line.”
- **Spills:** mentioned 11 times
  “Increased spills.”
  “Spills. My little ones have a hard time caring their trays as it is. Adding the milk is a whole new ordeal.”
- **Having to replace empty milk bags while children going through line:** mentioned 4 times
  “Switching the milk dispensers when they are empty takes away a lot of our lunch time.”
  “The line takes longer, especially when the milk needs to be changed, but I think we're all fine with that.”
- **Teachers having a shortened lunch:** mentioned 2 times
  “It takes much longer to get through the lunch line, which leaves teachers with a shortened lunch (15, maybe 20 minutes to eat).”
  “Takes more time away from lunch to supervise students getting milk.”
- **Students playing with the cups:** mentioned 1 time
  “Students play with the cups (putting food in each other’s cups, etc)”

Evaluation Findings

- The staff response was overwhelmingly positive to the switch from milk cartons to milk dispensers
- Staff recommend other schools use milk dispensers based on their experience
- Waste reduction was more important to staff than increasing milk consumption
- Students prefer the taste of milk from the machines versus the cartons
- Since milk dispenser implementation, students take longer in the lunch line and there are more milk spills

Evaluation Recommendations

- Other schools should consider switching to milk dispensers
- Focus on waste reduction (both milk and trash) aspect of milk dispensers when gaining school staff support
- Introduce milk dispensers to older children first (3rd-5th grades) so younger grades can observe and see the process (K-2nd grades)
- Allow students to mix varieties of milk when using dispenser
- Have increased cafeteria staff support to help teachers assist children through lunch line

Appendix B. Summary of Interview with School Nutrition Manager

Summary of Interview with School Nutrition Manager at Bluestone Elementary School, Keyana Sonifrank

Changes in Kitchen Labor Needs and Duties	- Hasn't changed much but extra tasks have been added for staff
	  - Getting milk set up in bag holders in walk in refrigerator
	  - Getting milk set up in dispensers
	  - Using dish racks for cups in dish room

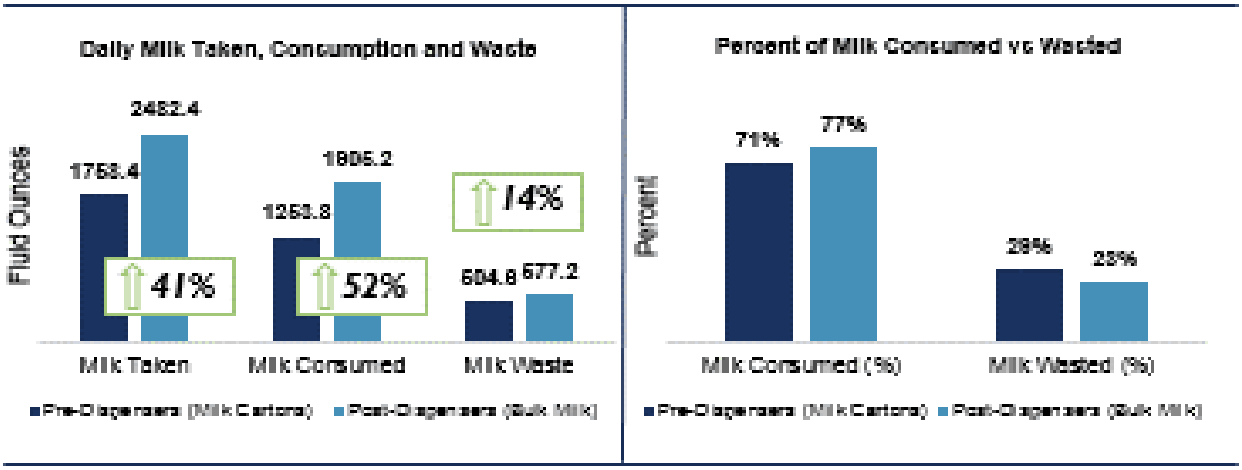
New Duties for Kitchen Manager	- Milk ordering – harder right now because getting used to number of bags being used; varies day by day still - Watching expiration dates
Changes in Lunch Line Flow Noticed by Manager	- Going a little slower
Positives of Milk Dispensers	- Helped with the waste - Noticed more kids that have enjoyed it than the cartons - Hasn't been taking longer to finish in dish room
Negatives of Milk Dispensers	- The changing of the milk bags in the dispensers during lunch is time consuming, especially when it runs out half way through the class – taking the time to pull the bags out, the kids get in the way and you get in the way of the kids.

Appendix C. Summary One Pager

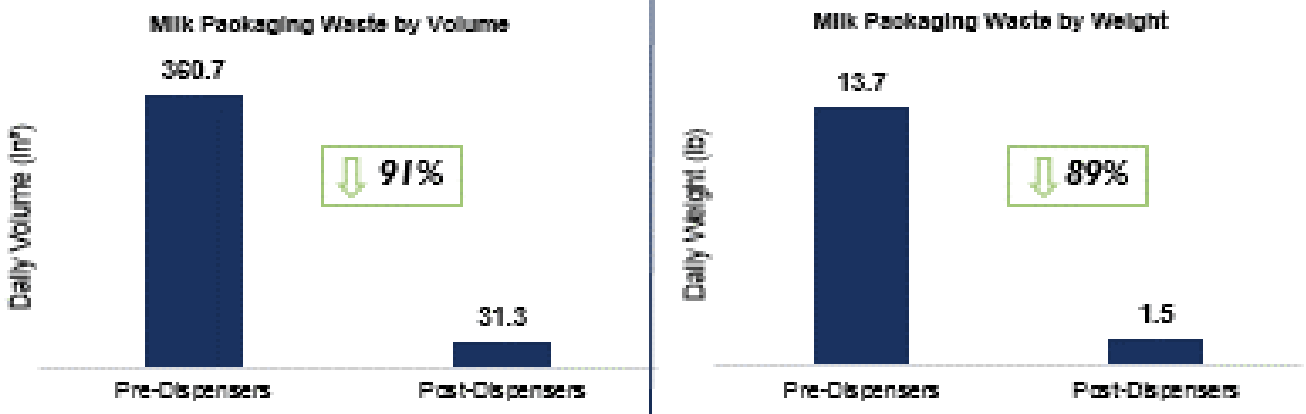
Switching from Milk Cartons to Milk Dispensers at Bluestone Elementary School

Harrisonburg City Public Schools (HCPS) School Nutrition has implemented a new sustainable initiative in the school cafeteria of Bluestone Elementary School – milk dispensers. Instead of being offered a traditional eight-ounce carton of milk, students now use reusable cups to serve themselves bulk milk from milk dispensers when moving through the lunch line.

Pre and Post Milk Dispenser Waste Study Results



Daily milk taken increased 41%, daily milk consumed increased 52% and daily milk waste increased 14%. Of all milk taken daily, the percent of milk consumed increased and the percent of milk wasted decreased.



The switch to milk dispensers amounted to a 91% reduction of milk packaging waste by compacted volume and an 89% reduction of milk packaging waste by weight.

Staff Response Overwhelmingly positive. Waste reduction aspect of the milk dispensers was most important to teaching and administrative staff. Staff recommends other schools implement dispensers based on their experience.

Recommendations for Others Looking to Implement Bulk Milk Dispensers

Before deciding to make the switch to bulk milk, decision makers should consider the following regarding their capacity for implementation:

- Upfront cost of equipment needed for serving bulk milk
- Administration and teaching staff support for waste reduction
- Adequate kitchen staff (one to two people) capable of lifting for new bulk-milk related tasks
- Relationship with milk distributor who carries bulk milk that meets federal school nutrition regulations
- Space for milk dispensers and adequate electrical outlets before the point of service

When a decision has been made to use bulk milk dispensers, decision makers should consider the following in preparing for implementation:

Milk Dispenser Set-Up

- Place for machine before point of service
- Number of spouts in milk dispenser
- Adequate electric outlets
- Place to store cups

Kitchen Staff Training on Milk Service Procedures

- Proper storage and rotation of milk bags regarding expiration dates
- Proper cleaning and sanitizing of milk dispenser
- Monitoring temperature of milk dispenser
- Procedure for washing reusable cups
- Have at least one to two people capable of lifting three to five-gallon milk bags

Building Support from Teaching and Administrative Staff

- Educate staff on switch to bulk milk prior to implementation
- Promote waste reduction, a better school lunch experience for the students, and the ability for students to mix white and chocolate milk

Student Training and Education

- Educate students on the milk dispensers prior to implementation
- Allow students to use the milk dispensers and try milk prior to starting use in the lunch line
- Put pictures on the milk dispensers and educate students on how full to fill cups in order to meet reimbursable requirements as well as reduce spills

Tracking Milk Consumption and Waste

- Consider completing a pre and post waste study like the one completed in this report, looking at milk consumption, milk waste, and material
- Recommend a week long pre study and a week-long post study, however, would do the post study three to six or more months after implementation

Harrisonburg City Public Schools School Nutrition. April 2019.