2009

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Abstract

Our experiment aimed to find whether there was a correlation between the distance necessary to travel in order to recycle and the actual frequency of recycling. As a result, we hypothesized that recycling rate would be dependent upon the convenience to the recycler and consequently that the farther the distance between the garbage and recycling receptacle, the lower the likeliness of recycling. Between two buildings, the Walsh Library and the McGinley Center, we found that the total amount of recycling varied only slightly between these two buildings with Walsh having a 71.6% rate of recycling of all items, while McGinley had a 71.9% rate of recycling of all items. When further broken down however, Walsh and McGinley had only properly recycled 55% and 48% of items respectfully. More clearly, only 55% and 48% of the items in each building were properly put into the recycling receptacles. As a result of this finding we had to reject our initial hypothesis and consequently fail to reject our null hypothesis. A secondary part of our study involved the distance of the entranceway's effect on the rate of recycling at connected recycling and garbage receptacles. In Freeman, 61.2% of the items were recycled properly while 89.8% of items were in total recycled. In Dealy, a mere 55.6% of items were recycled properly while only 71.6% of items were placed in the recycling bin in total. The final finding was that gender played no significant impact on recycling tendencies.

Introduction

The United States is considered to be the most wasteful country on the planet. Americans dispose of 210 million tons of municipal waste every year, weighing 12 billion tons annually (Cothran 2003). This ongoing issue became a problem in 1987, when a trash barge called the Mobro 4000 motored up and down the eastern seaboard looking for a landfill in which to dump 3,200 tons of New York State's garbage. After thousands of miles of searching for a sufficient landfill, the Mobro returned to its port fully loaded having no proper place to dump the garbage (Cothran 2003). This incident prompted the EPA to take a closer look at the municipal waste problem and find a solution. In 1988, the EPA issued its first recommendation that 25% of all municipal trash should be recycled. (Cothran 2003). In 2001, Americans recycled 30% of their municipal trash (Cothran 2003).

The act of recycling is the separation of a given material from waste, in order to process it, so that it can be used again in a form similar to its original use (Lund 1993). Recycling is defined today as a solid waste management strategy equally useful as land filling and incineration, but environmentally more desirable (Lund 1993). Aluminum, glass, and plastic are the easiest items to recycle and among the most common items recycled today. Aluminum cans are the most common product recovered through municipal and commercial recycling programs because they are easily identifiable by residents and employees (Lund 1993). Plastics, on the other hand, make up 8% by weight and 20% by volume of the 210 million tons of municipal waste produced annually (Lund 1993). In addition, Americans throw away 2.5 million plastic bottles every hour

(Cothran 2003). Similar to plastic and aluminum, glass is not biodegradable, but it is not harmful to the environment. When glass is weathered, it breaks down into small particles of silica and basic beach sand, which are common elements on earth (Lund 1993). The only glass being recycled in large quantities is container glass, which is the kind of glass used to make jars and bottles. Special care is involved in the process of recycling glass to make sure it is separated by color, in order to avoid color contamination. If color contamination occurs the glass contaminated cannot be recycled due to color dyes in the glass (Lund 1993).

Some items that we buy on the market today are a product of recycling, while others are not. Aluminum and glass are made of 30-40% recycled content, while plastic usually consists of non-recycled content (Cothran 2003). Even though some products are lacking the advantages of recycling, the act of recycling is a beneficial behavior for the environment. If five soft drink bottles are recycled, they will make enough fiberfill for a man's ski jacket, and if 1,050 milk jugs are recycled they can be made into a six-foot park bench (Cothran 2003). Recycling an aluminum can saves 95% of the energy that is used to make an aluminum can from virgin ore (Cothran 2003). Furthermore, some of the environmental benefits of recycling can occur both globally and locally. These benefits include preventing and reducing the pollution of water and air created by manufacturing new products or products made from virgin materials, saving energy in manufacturing, transporting, and disposing of products, decreasing greenhouse gas emissions, conserving natural resources such as timber, water, metals, and fossil fuels, reducing the need for land filling and incineration, and sustaining the environment for future generations (EPA 2006). The act of recycling promotes environmental

stewardship and recycling programs in public places promote recycling tendencies of individuals in their personal lives (EPA 2006). Thus, the process of recycling begins with the individual, and is not significantly determined by gender (Hansmann 2006).

In 2002, Fordham University under went an environmental audit of its campus. This audit showed a significant gap existing between groups and leadership taking an initiative to make Fordham's campus more environmentally friendly, and the general consciousness of the campus community as a whole to the environmental state of Fordham's campus and what could be done about it (VanBuren 2002). One finding by the environmental audit was that there was an inadequate amount of recycling receptacles in high traffic areas, especially near vending machines (VanBuren 2002). This study prompted us to perform an experiment testing the recycling tendencies of Fordham's population depending on their distance to the garbage and recycling receptacles in four given locations. Our null hypothesis is that Fordham's population is more likely to dispose of aluminum, container glass, and plastic containers in garbage receptacles at closer proximity to them than properly dispose of recyclables in recycling receptacles at a further distance.

Method

In this experiment we tested whether Fordham's population disposed of aluminum, container glass, and plastic containers in garbage or recycling bins depending on their distance to the closest receptacle. Four locations were used to collect data in this experiment. These distinct locations included the lobby of the Walsh library, the first floor of Freeman Hall, the first floor of Dealy Hall, and the lobby of McGinley Center. Each location contained both recycling and garbage bins. To conduct this experiment, four researchers participated over a six week collection period ranging from October 21st to November 25th. Each researcher was assigned one of the four locations and required to observe that location for two hours per week. An assessment of each location was performed upon initial observation. This assessment began by counting the number of garbage and recycling bins in the designated area. Then, the distance between each receptacle and the location's entrances/exits were measured using a tape measurer. The distance between the garbage and recycling receptacles were also measured. At the start of each observation period the researcher was required to record the date and the length of time spent collecting data. To collect data, each researcher watched all Fordham University students and faculty disposing of recyclable aluminum, clear glass, or plastic containers within the given location and recorded the number of these items placed in a garbage bin and a recycling bin respectively. The researcher also recorded the number of non-recyclable items that were disposed of in recycling bins.

Results

After completing our observations of four specific locations, all information was compiled and tabulated. In the Walsh Library, the distance from the entrance doorway to the garbage receptacle is 1 foot, while the distance from the entrance doorway to recycling receptacle is 38 feet (Figure 1). In the McGinley Lobby, the distance from the entrance doorway to the garbage receptacle is 25 feet, while the distance from the entrance doorway to recycling receptacle is 77 feet (Fig. 1). In Freeman Hall, the distance from the entrance doorway to the connected garbage and recycling receptacles is 44 feet (Fig. 1). In Dealy Hall, the distance from the entrance doorway to the connected garbage and recycling receptacles is 69 feet (Fig. 1).

In the McGinley Center, 21 non-recycling items were disposed of in the recycling receptacle, 25 recyclables were thrown in the garbage, and 43 recyclables were thrown in the recycling receptacle (Fig. 6). In McGinley Center, out of all items disposed of in receptacles, 24% were wrongly disposed of in recycling receptacles, 28% were disposed of in a garbage receptacle, and 48% were correctly disposed of in a recycling receptacle (Fig. 2). In the Walsh Library, 13 non-recycling items were disposed of in the recycling receptacle, 23 recyclables were thrown in the garbage, and 45 recyclables were thrown in the recycling receptacle (Fig. 6). In Walsh Library, out of all items disposed of in receptacles, 16% were wrongly disposed of in recycling receptacles, 28% were disposed of in a garbage receptacle, and 56% were correctly disposed of in a recycling receptacle (Fig. 3). In the Freeman Hall, 14 non-recycling items were disposed of in the recycling receptacle, 5 recyclables were thrown in the garbage, and 30 recyclables were thrown in

the recycling receptacle (Fig. 6). In Freeman Hall, out of all items disposed of in receptacles, 29% were wrongly disposed of in recycling receptacles, 10% were disposed of in a garbage receptacle, and 61% were correctly disposed of in a recycling receptacle (Fig. 4). In the Dealy Hall, 48 non-recycling items were disposed of in the recycling receptacle, 53 recyclables were thrown in the garbage, and 118 recyclables were thrown in the recycling receptacle (Fig. 6). In Dealy Hall, out of all items disposed of in receptacles, 22% were wrongly disposed of in recycling receptacles, 24% were disposed of in a garbage receptacle, and 54% were correctly disposed of in a recycling receptacle (Fig. 5). The total in all four locations is 83 non-recycling items were disposed of in the recycling receptacle, 90 recyclables were thrown in the garbage, and 168 recyclables were thrown in the recycling receptacle (Fig. 6).

In the Walsh Library, 21 items were recycled with the recycling receptacle being 38 feet from the entrance doorway (fig. 7). In Freeman Hall, 13 items were recycled with the recycling receptacle being 44 feet from the entrance doorway (fig. 7). In Dealy Hall, 13 items were recycled with the recycling receptacle being 69 feet from the entrance doorway (fig. 7). In the McGinley Center, 48 items were recycled with the recycling receptacle being 77 feet from the entrance doorway (fig. 7).

After collecting our data, we noticed a significant attribute to the gender tendencies of recycling in the McGinley Center. For males, 59% of recyclable containers were recycled correctly, 25% were thrown in the garbage, and the remaining 16% consisted of items wrongly placed into the recycling receptacle (fig. 8). For females, 36% of recyclable containers were recycled correctly, 31% were thrown in the garbage,

and the remaining 33% consisted of items wrongly placed into the recycling receptacle (fig. 9).

Discussion

Our experiment aimed to prove a correlation between the distance traveled to dispose of recyclable items and the frequency of recycling. When comparing the locations that had garbage receptacles at a relatively close distance to the entrance doorway, there was an insignificant correlation between the level of recycling and distance. Despite a distance of 52 feet between garbage and recycling receptacles, 48.3% of items were properly recycled in McGinley (fig. 2). However, in Walsh Library, where there was a 37 foot difference between the recycling and garbage receptacles, 55% of items were correctly recycled (fig. 3). While the difference in proper recycling was 6.7%, the overall level of recycling in both McGinley and the Library totaled 71.9% and 71.6% respectfully (Figure 2, 3, 7). This difference of 0.3% indicates that the total effort towards recycling was virtually the same in both buildings despite the distance between the garbage and recycling bins. Even though a lesser portion of the McGinley population recycled correctly, the majority still chose to walk the extra distance to recycle. Since the difference of overall recycling in the Walsh Library and McGinley was separated by only 0.3%, distance does not effect recycling in either location, going against our hypothesis.

In comparing Freeman Hall and Dealy Hall, which has connected recycling and garbage receptacles (ie. same distance from entrance), the tendencies of recycling were compared when distance between receptacles was not a factor. The distance between the connected receptacles and the entrance way was also compared. The receptacles observed at Freeman Hall are 44 feet from the entranceway, while the receptacles at

Dealy Hall are 69 feet from the entranceway (Fig. 1, 4). Despite the mere 25-foot difference in distance, there was a significant difference in the amount of recycling. In Freeman Hall, 61.2% of the items were recycled correctly, and 89.8% of items were recycled total (fig. 4). In Dealy Hall, 55.6% of items were recycled correctly, and 71.6% of items were recycled altogether (fig. 5). Based on this information, as well as, knowing that the distance to the connected receptacles is shorter in Freeman than Dealy, we have proven the farther one travels to recycle the less of a chance they recycle correctly (Figure 5). These results support our hypothesis that distance affects Fordham's population to recycle correctly. A possible reason for these results could be that instead of walking a farther distance to recycle, some people may just hold on to their recyclables. Also, when going to class, students and faculty might be focused on getting to class, not realizing what receptacle they are placing their recyclable containers, even though they intended to recycle.

In Freeman, only a total 49 items were put in either the recycling or the garbage however in Dealy, 344 items were observed (fig. 5). Since 89.8% of the items in Freeman were placed in the recycling bin, it shows that students disposed the majority of their garbage in the trash at the entrance while they held onto their perceived recycling containers and then put them into the recycling bin inside the building. Another option is possible however. Even though there was a greater percentage of items recycled in Freeman, the fact that there were significantly less items recycled compared to Dealy could mean that more recyclables were actually placed into the trash cans outside along with the trash that should be placed in the garbage.

While evaluating the effects of entranceway distances and receptacle distances, an additional factor was taken into consideration. What effect does gender have on recycling? We chose one building to complete this study, in order to see the recycling tendencies of males and females at a high traffic time, such as the hours of 4-7pm in McGinley. Overall, Males recycled correctly 58.8% of the time, while Females recycled correctly only 35.9% of the time. Females tried to recycle 69%, while males recycled 75%, a difference of only 6% (Figure 8, 9). This difference was not significant and thus, the amount of recycling by both males and females was approximately equal. The disparity between the properly recycled items and the total items recycled could be due to the fact that most people do not know that styrofoam is not recyclable.

Another factor to consider is the difference in recycling patterns between the individual buildings. Dealy produced the greatest amount of results, it also exhibited the largest amount of recyclables thrown in the garbage. Overall, all four locations we monitored exhibited higher amounts of recycling than expected, allowing us to reject our null hypothesis. Based on our results, we must reject our hypothesis that recycling would be dependent upon convenience and distance between receptacles and entrance. Our data therefore failed to reject the null hypothesis and supported our alternate hypothesis.

Citations

Cothran, Helen ed. 2003. Garbage and Recycling: Opposing View Points. Greenhaven Press. Farmington Hills. pp 18-62.

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Acknowledgements

We would like to acknowledge our lab group as a whole: Anamarie, Jeremy, Vincent, and Chris for contributing their hard work and effort in their respective accomplished tasks. We would like to thank Dr. Lewis for guiding us in the right direction and explaining the best method of obtaining results from a population for this type of research project. We also thank Kurt and Pam for taking the time to access and contribute their input toward the outcome of our project. We acknowledge Fordham University for providing the McGinley Center, Dealy Hall, Freeman Hall, and the Walsh Library with trash and recycling receptacles, granting us the opportunity to study the tendencies of the Fordham population. Lastly, we thank all who inadvertently participated in our research study and Helena Franco, who added her stylistic advice on our presentation.

Figure Legend

Figure 1 – Distance from entrance doorway to garbage and recycling receptacle in each location.

Figure 2 – Percent of recyclable items recycled, thrown in the garbage, and improperly recycled in the Library.

Figure 3 – Percent of recyclable items recycled, thrown in the garbage, and improperly recycled in McGinley Center.

Figure 4 – Percentage of recyclable items recycled, thrown in garbage, and improperly recycled in Freeman Hall.

Figure 5 – Percentage of recyclable items recycled, thrown in garbage, and improperly recycled in Dealy Hall.

Figure 6 – Distribution of disposed and recycled items in the library, McGinley Center, Freeman Hall, and Dealy Hall.

Figure 7 - Number of recycled items compared to distance of entrance doorway in each of the four locations; the library, McGinley Center, Freeman Hall, and Dealy Hall.

Figure 8 – Percentage of recycled items recycled, thrown in the garbage, and improperly recycled by males in McGinley.

Figure 9 – Percentage of recycled item recycled, thrown in the garbage, and improperly recycled by females in McGinley.

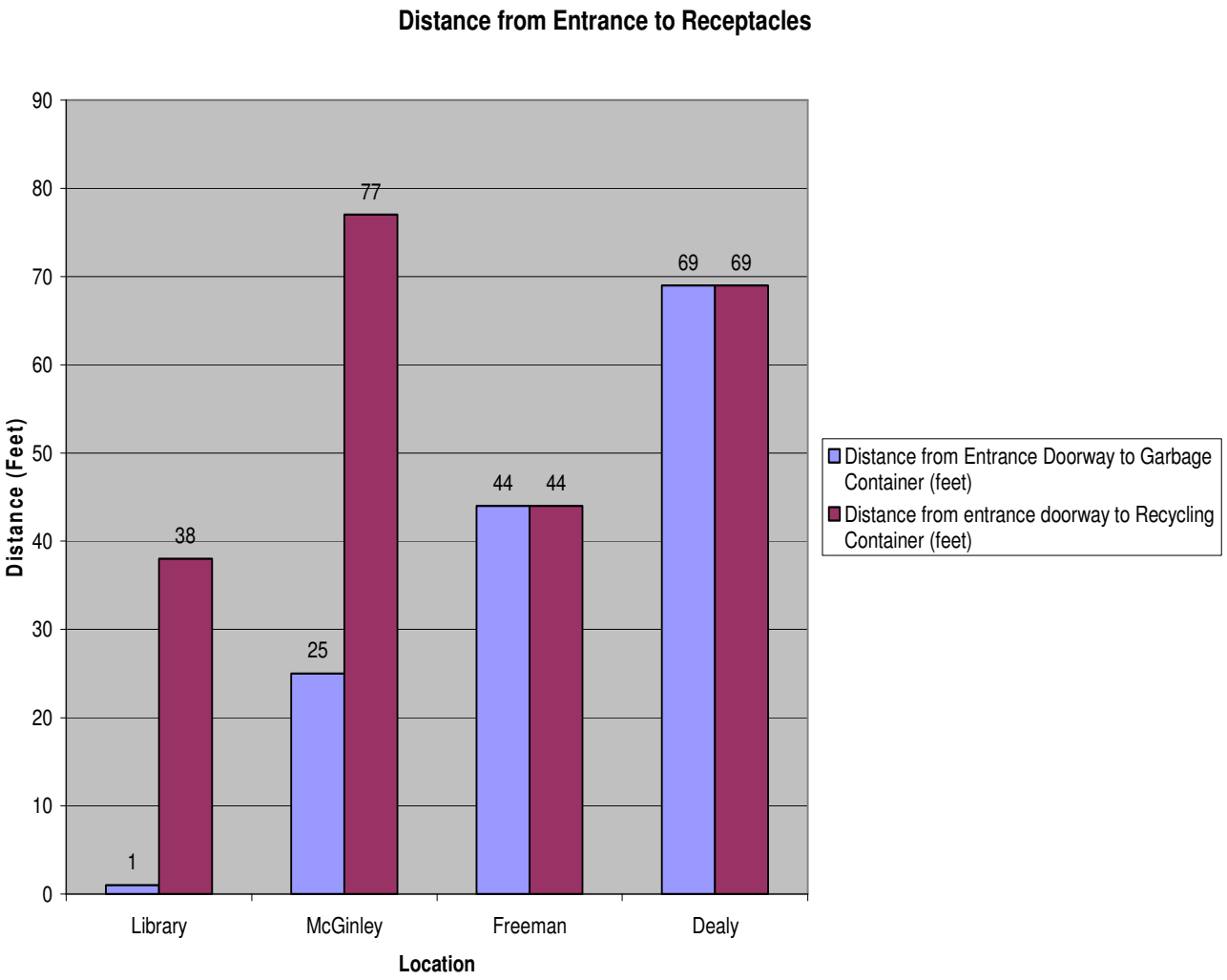

Distance from Entrance to Receptacles
Distance (Feet)
90
80
70
60
50
40
30
20
10
0
1
38
25
77
44
44
69
69
Library
McGinley
Freeman
Dealy
Location
Distance from Entrance Doorway to Garbage Container (feet)
Distance from entrance doorway to Recycling Container (feet)

Figure 2

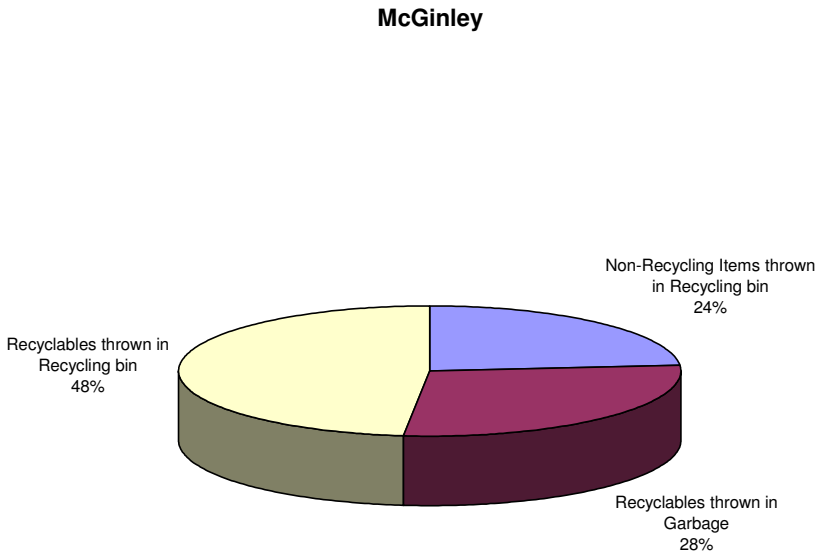


Figure 3

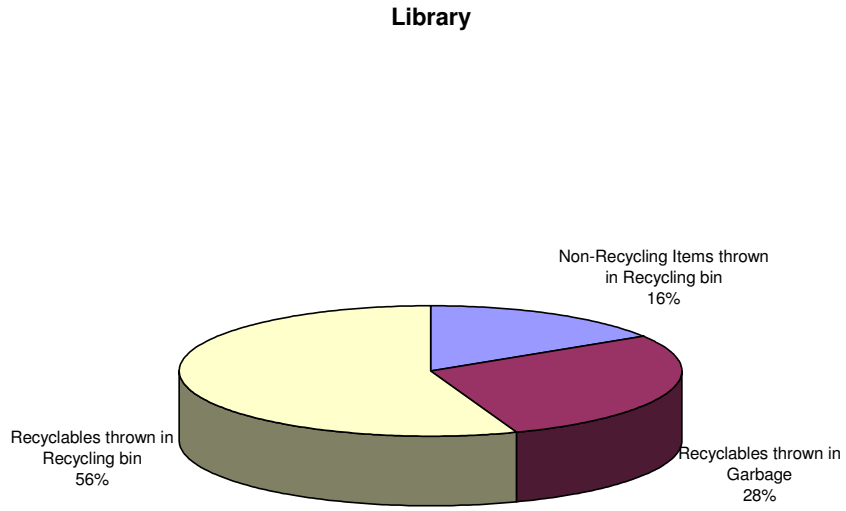


Figure 4

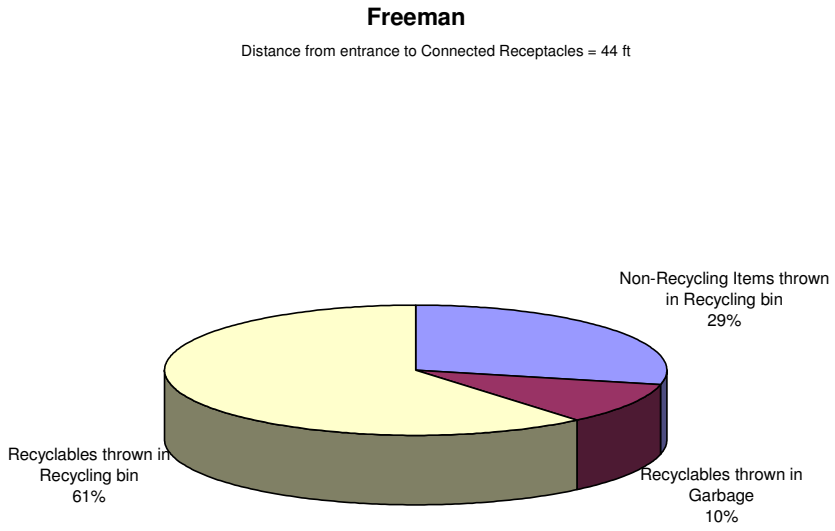


Figure 5

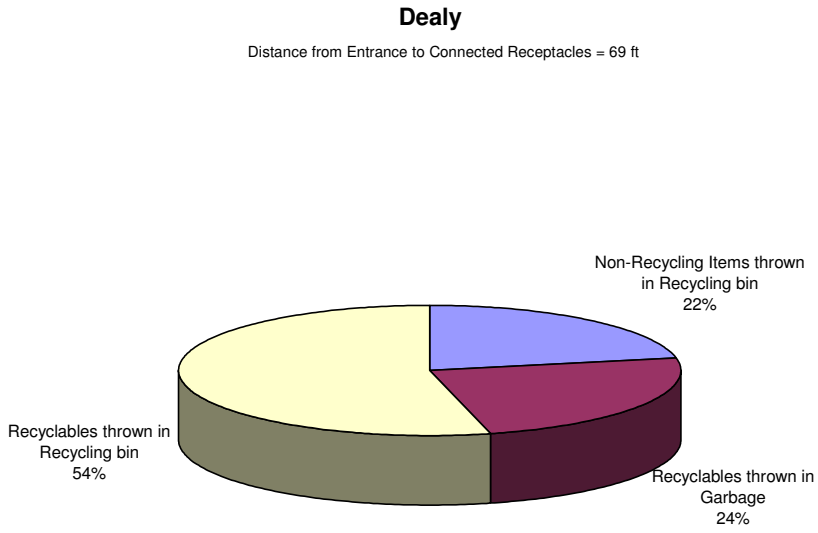


Figure 6

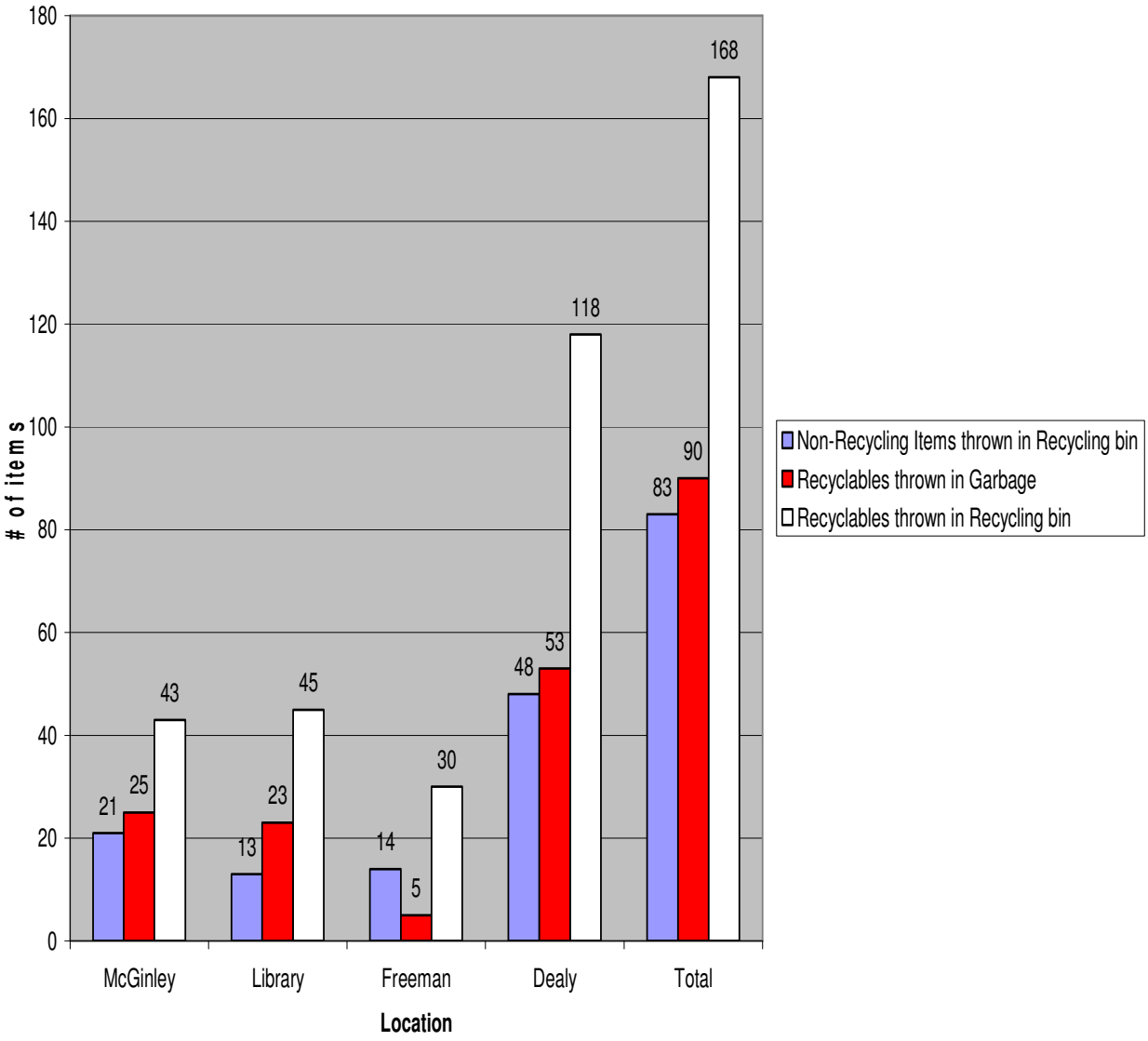

Distribution of Disposed & Recycled Items
180
160
140
120
100
80
60
40
20
0
# of items
21
25
43
13
23
45
14
5
30
48
53
118
83
90
168
McGinley
Library
Freeman
Dealy
Total
Location
Non-Recycling Items thrown in Recycling bin
Recyclables thrown in Garbage
Recyclables thrown in Recycling bin

Figure 7

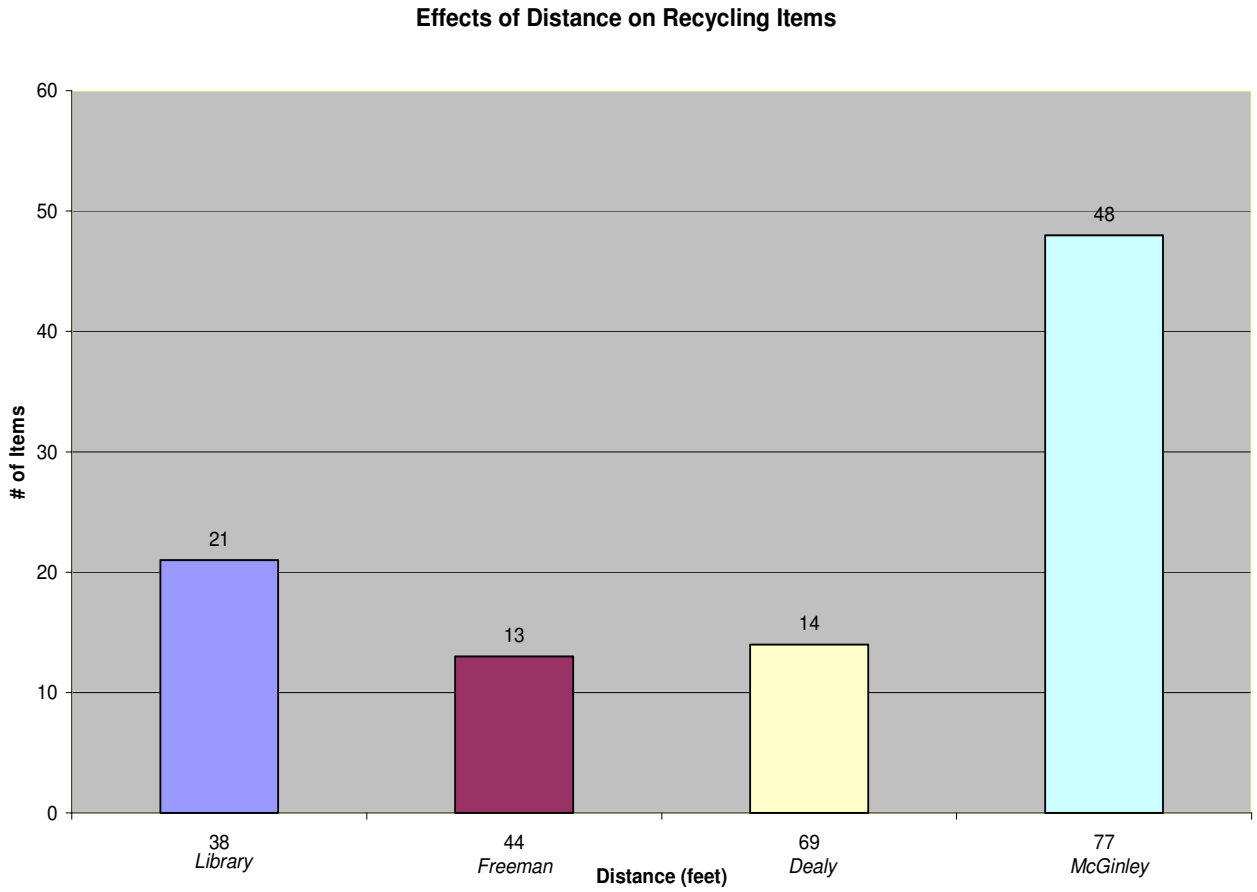

Effects of Distance on Recycling Items
# of Items
60
50
40
30
20
10
0
21
13
14
48
38
Library
44
Freeman
69
Dealy
77
McGinley
Distance (feet)

Figure 8

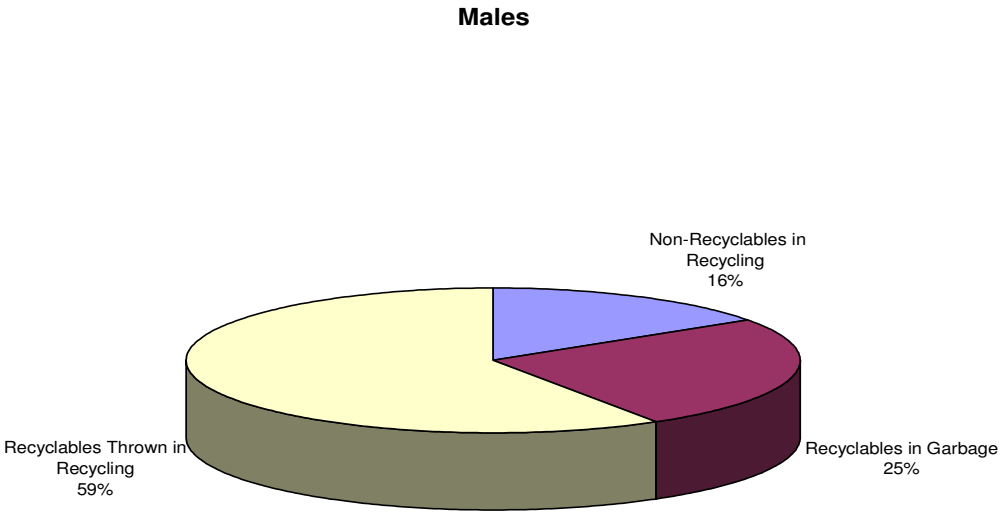
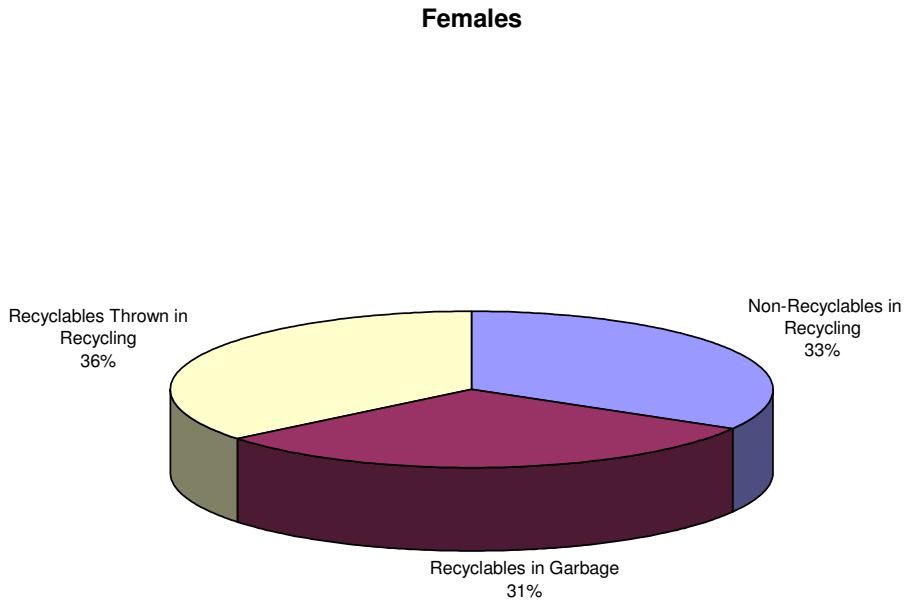


Figure 9



Appendices

Appendix 1

Table 1
Recycling in McGinley Center

Location	Week	# of Non-Recycling Items Thrown in Recycling Container	# of Recyclables Thrown in Garbage	# of Recyclables Thrown in Recycling Container
McGinley	21-Oct	3	3	4
	28-Oct	4	4	8
	4-Nov	5	4	7
	11-Nov	1	3	9
	18-Nov	2	6	9
	25-Nov	6	5	6
	total	21	25	43

Table 2
Recycling in Walsh Library

Location	Week	# of Non-Recycling Items Thrown in Recycling Container	# of Recyclables Thrown in Garbage	# of Recyclables Thrown in Recycling Container
Library	21-Oct	1	2	4
	28-Oct	0	0	0
	4-Nov	2	0	3
	11-Nov	5	12	18
	18-Nov	3	6	9
	25-Nov	2	3	11
	total	13	23	45

Table 3

Recycling in Freeman Hall

Location	Week	# of Non-Recycling Items Thrown in Recycling Container	# of Recyclables Thrown in Garbage	# of Recyclables Thrown in Recycling Container
Freeman	21-Oct	2	1	6
	28-Oct	2	0	5
	4-Nov	3	0	4
	11-Nov	2	1	6
	18-Nov	1	1	2
	25-Nov	4	2	7
	total	14	5	30

Table 4
Recycling in Dealy Hall

Location	Week	# of Non-Recycling Items Thrown in Recycling Container	# of Recyclables Thrown in Garbage	# of Recyclables Thrown in Recycling Container
Dealy	21-Oct	4	6	8
	28-Oct	7	10	11
	4-Nov	5	5	3
	11-Nov	8	4	10
	18-Nov	5	7	10
	25-Nov	6	5	8
	total	31	31	42

Table 5

Recycling Tendencies at All Four Locations

Location	Non-Recycling Items thrown in Recycling bin	Recyclables thrown in Garbage	Recyclables thrown in Recycling bin
McGinley	21	25	43
Library	13	23	45
Freeman	14	5	30
Dealy	48	53	118
Total	**83**	**90**	**168**

Table 6
Recycled Items Compared to Distance of Recycling Receptacle to Entrance Doorway

Location	Distance from entrance doorway to Recycling Container (feet)	Recyclables thrown in Recycling Bin
Library	38	21
Freeman	44	13
Dealy	69	14
McGinley	77	48

Table 7
Gender Influences on Recycling Tendencies

sex	Non-Recyclables in Recycling By Male/Female	Recyclables in Garbage by Male/Female	Recyclables Thrown in Recycling by Male/Female
males	8	13	30
females	13	12	14