ABSTRACT

This research project consists of two types of surveys to assess recycling in the city limits of Belleville, Swansea, and O’Fallon, Illinois, each of which uses a different type of recycling program. One method of data collection consisted of conducting visual surveys to observe participation rates. The second was a questionnaire mailed to homes in these communities requesting information on the household’s recycling habits, attitudes toward curbside recycling, income, and highest education level achieved by head of household. This project determined that the most influential factor in determining whether people take part in a curbside recycling program is cost.

Key words: recycling, municipal solid waste

INTRODUCTION

In 1960, U.S. residents, businesses, and institutions produced 88.1 million tons of municipal solid waste (MSW), which is 2.7 pounds of waste per person per day. In contrast, in 2005 U.S. residents, businesses, and institutions produced 237.6 million tons of MSW, which is 4.6 pounds of waste per person per day (Fig. 1). Despite this vast increase, the number of landfills in the U.S. actually decreased between 1980 and 2000, from 7683 to 1754, as older landfills reached capacity and closed (EPA 2007). Clearly, recycling needs to play a much greater role in solid waste disposal efforts.

Recycling programs take a wide variety of different forms, however, and some are notably more successful than others at diverting waste from landfills. This paper compares three voluntary curbside recycling programs in adjacent communities in southwestern Illinois and how features of each program affect recycling rates. Belleville, Swansea, and O’Fallon, Illinois are adjacent communities in St. Clair County, and lie approximately

Comparison Of Recycling Rates Of Three Adjacent Communities In St. Clair County, Illinois

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fifteen miles southeast of St. Louis, Missouri (Fig. 2). Currently, residents of these three suburban communities have access to weekly curbside collection of paper, glass, plastic, aluminum, and tin. However, the three programs vary greatly in other ways. One of these is the costs structure: Belleville offers free recycling, while Swansea uses a Pay-As-You-Throw (PAYT) program (explained below), and O’Fallon charges an additional fee for collection of recyclables (Table 1). The degree to which residents must separate their recyclable materials also varies: Swansea and O’Fallon have commingled collection, in which all recyclables can be put in one bin, while Belleville residents must separate their recyclables into three bins.

One of the primary goals of this research was to compare the participation rates of the three recycling programs. I conducted visual surveys for three consecutive weeks to determine the number of households participating in each voluntary curbside collection program. In addition, I mailed questionnaires to randomly selected residents of each town to learn their thoughts on recycling, its importance and its value, and the impediments to their participation.

My hypothesis was that the recycling rate of the three communities would vary with the cost of utilizing the community’s curbside recycling program. If a household has to pay more to participate, it seemed likely that members of the community would be less willing to participate in curbside recycling. The findings of this study have the potential to help recycling coordinators plan the most effective type of program to raise recycling rates.
Table 1. Characteristics of Communities in Study. Source: www.census.gov, city waste and recycling pamphlets.

<table>
<thead>
<tr>
<th></th>
<th>Belleville</th>
<th>Swansea</th>
<th>O’Fallon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>41,410</td>
<td>10,579</td>
<td>21,910</td>
</tr>
<tr>
<td>Median Income</td>
<td>$35,979</td>
<td>$49,851</td>
<td>$55,927</td>
</tr>
<tr>
<td>Year recycling service began</td>
<td>1990</td>
<td>1990</td>
<td>2002</td>
</tr>
<tr>
<td>Cost of Garbage Collection</td>
<td>$15.00 / month</td>
<td>$2.48 / container</td>
<td>$15.47 / month</td>
</tr>
<tr>
<td>Cost of Recycling Collection</td>
<td>$0</td>
<td>$0</td>
<td>$4.14 / month</td>
</tr>
<tr>
<td>Information Provided</td>
<td>A two-page 8.5 x 11” pamphlet, website</td>
<td>A thirteen-page 8.5 x 11” pamphlet with list of streets and collection days, website</td>
<td>A two-page 8.5 x 11” pamphlet</td>
</tr>
<tr>
<td>Commingled or Separated?</td>
<td>Separated</td>
<td>Commingled</td>
<td>Commingled</td>
</tr>
</tbody>
</table>

RECYCLING IN THE UNITED STATES

Recycling in the United States is hardly a recent phenomenon. One of the earliest attempts at recycling waste was in New York City in 1896, when city workers separated and processed household waste. Other U.S. cities were motivated to initiate their own programs after witnessing New York’s success. However, the Great Depression of the 1930s ended early recycling programs because the costs to separate recyclable materials from non-recyclable materials were high at a time when virgin materials were cheap. In addition, there was not much of a market for recycled materials. These factors made collecting, processing, and using recycled material as source material for new products economically unfeasible (Hickman 2003).

It was not until the beginning of World War II that citizens were motivated once more to collect and transport recyclable material to support the war. (Hickman 2003, Alexander 1993). After the war, people returned to their previous habits of putting out all garbage for the trash collector to take to the landfill. Since then, the amount of trash has steadily increased at a rate higher than the growth rate of the population as a whole (EPA 2006).

While the waste generated in the U.S. increased, so too did the recycling rate. In 1960, U.S. residents, businesses, and institutions recycled only 6.4 percent of MSW, diverting less than six million tons of MSW from landfills. In contrast, the country’s recycling rate increased to 32 percent of MSW in 2005. This diverted seventy-nine million tons of MSW from landfills (Fig. 3).

The amount of recycling was fairly low prior to 1980, but began to increase rapidly thereafter (Fig. 3). By 2005, almost 9000 curbside programs existed across the nation (EPA 2007), resulting in a much greater rate of recycling. These programs vary widely in a variety of ways, such as their collection method, the information they provide to customers, advertising, enforcement, and cost. All these factors are contributors to the participation rate of residents with curbside collection.

RECYCLING RESEARCH

There are a wide variety of recycling programs in the United States, and vary widely in methods used and overall effectiveness. Some programs require customers to pay per unit of garbage (but not recycling), while others charge directly for recycling service. Some
require residents to separate their recycling by type of material, while others allow commingled collection. Programs differ as well in the amount and quality of information about recycling provided to their customers, and in the degree to which participation is voluntary or mandatory.

Pay-As-You-Throw (PAYT) is a system where households pay per unit of garbage collected. In communities that have adopted this type of garbage and recycling collection, residents must purchase tags or stickers to affix to garbage containers. Only containers displaying such a tag or sticker will be emptied and a new tag or sticker must be affixed to the container each week. This causes residents to make a trip to the store when more tags or stickers are needed, thereby causing them to be more aware of the amount of garbage their household produces. Researchers have found that this method of paying for garbage collection motivates people to recycle more (Folz and Giles 2002, Folz 1999, Peretz et al. 2005, Jenkins et al. 2003, Canterbury 1998).

Another variation among recycling programs is the ability to put all recyclables into one container at the curb (commingled), instead of having to separate them into different containers (separated). Commingling a variety of materials in one container makes it more convenient for residents to take part in curbside recycling and many studies have shown increases in participation rates as a result (Oskamp et al. 1996, Fries 1999, Everett and Peirce 1993).

Another difference between programs is the information provided in a community on how to utilize a recycling program such as how to prepare materials, materials accepted, and effects of the recycling program on the community. The promotion and information of recycling programs has been shown to have a statistically significant relationship to the participation rates of curbside programs (Fries 1999, Everett and Peirce 1993, Folz and Hazlett 1991, Vining and Ebreo 1989, Oskamp et al. 1998, Grodzinska-Jurczak et al. 2003, Folz 1991, Vining and Ebreo 1990, Leroux 2000, Canterbury and Eisenfeld 2006).

Recycling participation has been shown to be influenced by a number of factors. Are
residents motivated to recycle? Is recycling convenient? Is it worth the cost? These questions reveal it is a combination of factors that determines the participation rates in a recycling program. Aadland and Caplan (1999) conducted a telephone survey in Ogden, Utah in 1997 to determine the value Ogden residents placed on curbside recycling. They have found that the highest rates of recycling are found among those who are young, female, highly educated, concerned about the environment, and have high incomes. In contrast, Vining and Ebero studied recycling rates in Champaign-Urbana, Illinois, and found that recyclers were somewhat older, and reported higher income levels, but were not statistically different than non-recyclers in gender, household size, occupation, or educational level (1989).

Whereas these studies focused on the demographics of those who recycle, others have focused instead on the characteristics of recycling programs that make them successful (or not) (EPA 1999, Leroux 2000). They determined that certain characteristics lead to more successful programs: providing adequate information, making programs convenient, targeting a wide range of materials, establishing block leaders, and setting goals. Each of these features is discussed below.

One of the most important factors is the level of recycling information provided to the customers. Vining and Ebreo (1990) found that recyclers were more familiar with recycling programs and could correctly identify more recyclable materials than non-recyclers. Simmons and Widmar (1990) similarly found that the greatest barrier to recycling, as self-reported by individuals, was lack of knowledge of how to recycle. DeYoung’s (1990) study produced very similar findings. Many other researchers have found that promoting recycling programs is also an important factor of successful programs (Leroux 2000, Folz and Hazlett 1991, Folz 1991, Canterbury and Eisenfeld 2006, Grodzinska-Jurczak et al. 2003, EPA 1999a, Everitt and Peirce 1993).

Perceived convenience also plays a key role. Derksen and Gartrell have stated that “the most important determinant of recycling behavior is access to a structured, institutionalized program that makes recycling easy and convenient” (1993, 439). Byrd and others found that 28.6 percent of respondents who did not recycle cited “Too Much Trouble/Complicated” as the reason for not recycling (1989). McCarty and Shrum, meanwhile, found that “[t]he more individuals believed that recycling was inconvenient, the less important they believed it to be” (1994, 58). Another study found that the only difference between recyclers and non-recyclers was the perceived difficulty of taking part in a recycling program (DeYoung 1989). In addition, convenience was found to be a statistically significant variable influencing participation rates in recycling programs (Peretz et al. 2005). Numerous other studies have come to similar conclusions (DeYoung 1990, Vining and Ebreo 1990, EPA 1999, Folz 1999, Peretz et al. 2005).

The breadth of materials accepted is also important. The most successful programs identified by the EPA (1999) often go above and beyond the ordinary list of recyclable materials. Ann Arbor, Michigan, for example, allows recycling of items such as heat-resistant glass, ceramics, textiles, and used oil filters. Another program collects reusable household goods such as small appliances, books, hardware and tools, unbreakable kitchen goods, games, and toys as part of its curbside recycling program (Leroux 2000). San Jose, California’s participation rate increased from an already high 72 percent to over 80 percent when the city added mixed paper, old cardboard, textiles and plastic bottles to the list of accepted materials (EPA 1999). Portland, Oregon’s volume of curbside recycling more than doubled when it began collecting old magazines and milk jugs in addition to its previously collected materials (Apotheker 1993).

Formal community leadership also is an important indicator of success. Programs that employ block leaders, residents of a neighborhood who volunteer to answer questions for neighbors and to provide support and
motivation, typically increase neighborhood participation rates. According to one study, the establishment of block leaders was the second highest variable in explaining success in voluntary curbside programs (Folz 1999). Hopper and Nielson (1991) compared the results of participation between five groups in a curbside recycling program in Denver, Colorado and found that recycling participation was highest among the groups that had block leaders. Burn (1991) found slightly over 58 percent of households that had received the block leader treatment recycled at least once during the ten-week study, compared to 38 percent for the group with no block leaders (1991).

Another successful technique used to increase recycling participation is goal-setting. Communities with voluntary recycling programs that have established recycling goals increase participation over those that do not set goals (Folz 1999). Folz and Hazlett state that “[e]stablishing a firm target and reporting progress apparently motivated citizens to sustain the practice of recycling” (1991, 530).

METHODOLOGY

In this study, I carry out a detailed analysis of three neighboring communities with similar demographic characteristics in Illinois. Each community in this study had essentially the same history of trash collection until curbside collection of recyclables was initiated. My main objective is to determine which differences among the three communities and their programs have had the largest impact on recycling rates.

The field survey component of this study was confined to neighborhoods within the city limits of Belleville and O’Fallon and the village limits of Swansea because these communities each have a common trash collector and collection day throughout their territory. If neighborhoods outside of city/village limits had been chosen, each street could have contained households with five different trash collectors and five different collection days. The streets surveyed were chosen by consulting maps supplied by each city which showed the daily trash collection routes. Sampling neighborhoods each weekday that trash is collected resulted in sampling six different income categories according to census data. All the surveyed neighborhoods contained approximately the same-sized lots, therefore population density was approximately the same.

For three consecutive weeks in May through June of 2007, I drove along survey streets with an assistant to record addresses of households that had recycling bins set out for collection. Each city had five visual survey routes, with totals of 691 homes in Belleville, 945 homes in O’Fallon, and 850 homes in Swansea. Each route was surveyed three times.

In addition, this research project used survey questionnaires to gain information on peoples’ attitudes toward recycling. To get a random sampling of households in each city, I chose every fourth household along both sides of each survey street to receive a questionnaire. While recyclers may have been more inclined to participate in returning questionnaires, the results of both the visual surveys and returned questionnaires showed a strong correlation not to income or recycling interest, but to recycling program type.

The questionnaires were designed to survey attitudes about recycling as well as general background information. The questions were grouped into seven sections: participation, willingness-to-pay, current service satisfaction, knowledge of landfills, recycling influences, responsibility for recycling, and demographic information (including education, rental status and household income).

To determine if a particular characteristic showed a strong correlation with participation in curbside recycling, I conducted significance testing using the contingency table approach. The resultant test statistic is chi square, which determines, in this case, if the type of curbside recycling program has a statistical influence on the responses related to recycling. The computed test statistic is
compared with the critical chi square value in order to determine whether or not to reject the null hypothesis, which is that program type does not have influence over the responses related to recycling.

RESULTS

Visual surveys of the three communities in this study revealed that: 9% of the study group in O’Fallon (flat fee) recycled during this study, 30% of the study group in Belleville (free recycling) recycled during this study, and 66% of the study group in Swansea (PAYT) recycled during this study. This is evidence that recycling participation could be indirectly related to cost of participating. Swansea motivates residents by charging them when more items are put into the trash, thus encouraging higher recycling rates.

When comparing the responses to mailed questionnaires to these communities and thus, three different program types, analysis revealed that program type does have an influence over whether households recycle (critical chi square = 5.99; calculated value = 34.11). Program type, in other words, has a strong influence over whether people participate. Swansea’s PAYT program has by far the highest participation rate. Questionnaires also asked households if they did not recycle, why not? From these responses, it was clear that program type also has a statistical influence over why households do not recycle, although less so (critical chi square = 12.59; calculated value = 17.48). Analysis of responses to the question “If you had to pay to recycle, would you recycle at home?” / “If recycling were free, would you recycle at home?” (depending on community) also revealed that program type has an influence over whether households participate depending on the cost of the program (critical chi square = 5.99; calculated value = 17.59). It is here that I think the results may be skewed by a greater likelihood of recyclers returning my questionnaires. Program type does not statistically influence which factors (neighbors, cost, concern for environment, pressure from friends/family) play a role in a household’s recycling habits (critical chi square = 12.59; calculated value = 4.56). Nor does program type have an influence over what materials are recycled (critical chi square = 31.41; calculated value = 23.98) (Table 2).

Analysis of returned questionnaires also revealed that within Belleville, which has free recycling, respondents’ rating of convenience does have influence over whether households recycle (critical chi square = 9.49; calculated value = 17.95).

Within Swansea, which utilizes PAYT, respondents’ rating of convenience does have an influence over whether households recycle (critical chi square = 9.49; calculated value = 82.38), and the influence is much higher than in Belleville. Here, I think the convenience factor is stronger because people consider

Table 2. Factors that location (program type) has statistical influence over.

<table>
<thead>
<tr>
<th>Location (Program Type) Has Influence Over:</th>
<th>Critical Chi Square Value</th>
<th>Calculated Value</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>whether households recycle</td>
<td>5.99</td>
<td>34.11</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>why households don’t recycle</td>
<td>12.59</td>
<td>17.48</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>whether households participate depending on cost</td>
<td>5.99</td>
<td>17.59</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>what factors play a role in household’s recycling habits</td>
<td>12.59</td>
<td>4.56</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>what materials are recycled</td>
<td>31.41</td>
<td>23.98</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
it convenient only to pay for containers of trash, not recyclables to be collected. However in O’Fallon, which charges for collection of recyclables, respondents’ rating of convenience does not have influence over whether households recycle (critical chi square = 9.49; calculated value = 7.71) (Table 3).

Analysis of returned questionnaires also revealed that within Belleville, which has free recycling, respondents’ rating of information provided does not have influence over whether households recycle (critical chi square = 9.49; calculated value = 4.23). Within O’Fallon, which charges for collection of recyclables, respondents’ rating of information provided also does not have an influence over whether households recycle (critical chi square = 9.49; calculated value = 7.03). I believe this difference is because O’Fallon contracts out for trash/recycling collection, while Belleville utilizes city-owned trucks. Therefore, they directly benefit from a higher recycling rate and so they provide information to encourage residents to recycle. However in Swansea, which utilizes PAYT, respondents’ rating of information provided does have an influence over whether households recycle (critical chi square = 9.49; calculated value = 27.65) (Table 3). Again, Swansea has a much higher calculated chi square value. Based on my interactions with residents concerning the PAYT program, I think this is because Swansea residents are happy to pay less by recycling more and will rate any feature of their program higher.

When examining the number of people in each household, the only community that experienced an impact on participation is O’Fallon, which charges for recyclable collection. Belleville, on the other hand, with its free recycling, shows no connection between household size and participation rates (critical chi square value = 7.82; calculated value = 2.49). These city residents recycle for free, so what does it matter if there are many people or just a few? In Swansea, which uses PAYT, the number of people living in the same household also has no influence over whether households recycle (critical chi square = 12.59; calculated value = 0.0). These residents save money the more they recycle, so again it doesn’t matter how many people are contributing to the recycle bin.

In O’Fallon, however, the story is different. O’Fallon charges to collect recycling, so the number of people living in the same household does have influence over whether households recycle (critical chi square = 12.59; calculated value = 17.17) (Table 3). This is not a strong indicator, but my thought is that the more children in a household, the more those children will nag their parents to recycle because the children are being taught to recycle at school.

The person responsible for recycling was not significant in any community. Belleville, which does not charge for collecting recycling had a critical chi square of 9.49 and a calculated value of 4.64. Swansea, which

<table>
<thead>
<tr>
<th></th>
<th>Belleville (Free)</th>
<th>Swansea (PAYT)</th>
<th>O’Fallon (Flat fee)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenience</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Provided Information</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of people in household</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Who is responsible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Table 3. Factors with influence over participation rates by location. Belleville n=21; Swansea n=34; O’Fallon n=33.
utilizes PAYT, had a critical chi square value of 9.49 and a calculated value of 0.0. And finally, O'Fallon, which charges for collecting recycling, had a critical chi square of 11.07 and a calculated value of 7.85 (Table 3).

The education level of the head of household also had no significance in any of the cities studied. This contradicts other researchers' findings (Aadland & Caplan 1999, Derksen & Gartrell 1993, Folz & Giles 2002). I believe this is so because program type/cost (and not education level) was the most influential indicator of program participation. Once again, Swansea, which utilizes PAYT had the lowest calculated value is 0.0, while Belleville and O'Fallon, with free and flat-fee recycling, respectively, both had calculated values of 0.48.

Income had an effect on recycling habits only in the case of O'Fallon, which charges a fee for recycling. In Belleville and Swansea, income does not have influence over whether households recycle (critical chi square = 9.49 for both cities; calculated values = 2.00 and 0.0 respectively). However, within O’Fallon, income does have influence over whether households recycle (critical chi square = 9.49; calculated value = 9.83) (Table 3). This makes sense; households with the highest incomes choose to pay for both trash and recyclable collection while lower-income households find ways to recycle for free by taking recyclables to school recycling bins or dropping items off at a local recycling center.

In sum, in the two communities in which recycling is free, (with recycling rates of 30% and 66%), residents’ rating of convenience has an influence over whether households recycle. Only in the community employing PAYT, which produced a recycling rate of 66%, did residents’ rating of provided information have an influence over whether households recycle. The number of people in a household has influence over whether households recycle only in the community which residents are charged for recycling collection and produced a recycling rate of 9%. Neither education nor who is responsible for recycling has any influence in the three communities studied. Finally, income has influence over whether households recycled only in the community in which residents are charged for recycling collection (Table 3).

**CONCLUSIONS**

These results provide evidence that the type of recycling program does impact recycling participation. Convenience, provided information, cost of program, and, in some cases, number of people in a household and income influence whether residents take part in a recycling program. These results show that recycling is an activity that people feel good about participating in if it is inexpensive and convenient, and if they are motivated. Although most respondents said that concern for the environment was what influenced their recycling habits, visual surveys provided evidence that cost of recycling seems to be the motivating factor.

Various questionnaire respondents cited taking recyclables to local schools which costs nothing if one is traveling to the school anyway. These people also get feedback from the schools about how recycling makes money for the school, and thus benefits the neighborhood. In addition, providing recycling information about how to participate answers questions such as what is allowed and what is not. Finally, because many people in this study do not know where their waste goes after it leaves their home, people do not know the cost of sorting material, preparing it for recycling, and actually processing it. Therefore, many people in this study do not support paying for these services to occur. If more information were provided explaining how residents’ money were spent, then residents would have a better understanding of what they are paying for and might be more inclined to participate.

The results of this study hopefully provide evidence to planners of recycling programs that the best type of program to initiate will take into consideration the residents’ attitudes and opinions on recycling. Providing information, making it convenient, and not
forcing people to pay to recycle are all criteria of the most successful programs.

REFERENCES


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2. All tables and figures must be printed on separate pages, double spaced and referenced by Arabic numerals. Include a list of double-spaced table and figure captions.

3. All line drawings and graphics must be suitable for reduction to 7.5 by 5 inches. Maps must have scales, a fine neat line serving as a boundary and patterns which will tolerate reduction. All graphics and photographs will be black and white and of professional quality. Digital copies of all figures, drawings, photos and other graphics are required for final publication, in TIFF or JPG format, at least 300 dpi. For purposes of review, draft maps and copies of photographs are acceptable.

4. Include an abstract of up to 150 words double spaced followed by up to five key words. The abstract should state the objective, methods and conclusions of the paper, and should appear on a separate page.

5. It is the author’s responsibility to obtain copyright release in writing to use copyrighted material.

6. Use the same type style and font size throughout the paper. Please italicize book and periodical titles.

7. Authors should write their papers in the active voice.

8. Two copies of the article should be blind; that is, they should contain no information that would identify the author to a potential reviewer.

9. The editor recommends that student manuscripts be reviewed by a faculty member for editorial comments prior to submission.

10. References, tables, charts and other graphics such as maps and photographs should be cited parenthetically in the text as follows: (Wilhelm 1998), (Table 3), or (Fig. 2). If a published statement is quoted, use page numbers e.g. (Wilhelm 1999, 3–4). Double space references on a separate page immediately following the text. Appendices and postscripts are to be avoided. Endnotes should be used sparingly. All references cited in the text should be listed and double-spaced alphabetically by author as noted below:


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