

## EVALUATING PARTICIPATION IN A RESIDENTIAL RECYCLING PROGRAM

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### ABSTRACT

The present study examined the effects of prompting, payment for material, a lottery, and frequency of collection on household participation in a residential recycling program. Homes in the lottery group demonstrated the greatest increase in participation followed by equivalent outcomes for the remaining three treatment areas and no change for the control group. A cost/benefit analysis indicated that none of the treatments were cost effective but that steps could be taken to alleviate this problem. Future directions for research within this area are examined.

The fact that Americans discard over 190 million tons of waste products each year presents a behavioral problem of massive proportion to psychologists, environmentalists and urban planners [1]. Disposing of the nearly one ton of waste per person generated in 1975 cost state, federal and local governments more than three billion dollars; not including the costs associated with the environmental degradation and pollution incurred in the process [2]. As the national trash pile continues to expand, the need to alter the behavioral processes associated with our "throw away society" becomes increasingly apparent.

Disposal is only one means of coping with the growing problem. Much of the material that is discarded is reuseable and can be recovered, saving energy as well [3]. For example, recycling old newspapers and aluminum cans into new products conserves 70 to 95 per cent of the energy required to produce the same products from raw materials [4]. Seventy-nine per cent of the nation's wastes are combustible and lend themselves as an alternative fuel to power electrical

generating systems [5] especially as the cost of other energy sources continue to rise [6].

Before most resource recovery activities can be initiated, the refuse must be separated into recyclable categories. This can either be accomplished at a central location where garbage is mechanically sorted or by encouraging the public to separate material in their homes for special collection (source separation). Due to the cost and reported inefficiency of mechanical separation systems [7, 8], most resource recovery programs have concentrated on source separation procedures [9]. Though many techniques have been used to encourage public participation, few have been systematically evaluated to determine their relative effectiveness. Most programs have relied on public information, program convenience and incentives to encourage support.

Using a multiple baseline design across mobile home parks, Luyben and Bailey noted an increase in the amount of paper collected when small toy prizes were offered to children for paper collection as compared to a no-prize condition [10]. Hamad, Cooper and Semb reported similar results among elementary school students when prizes were contingent for such behavior and class efforts posted as compared to no prize-no posting condition [11]. In another series of studies, Geller, Chaffee and Ingram [12] and Witmer and Geller [13] evaluated the effects of raffles, contests and prompts in promoting recycling within university dormitories. Results indicated that each of the incentive conditions were superior to the prompt conditions in increasing the amount of paper recycled.

Convenience has also been studied as a factor in facilitating recycling. Reid, Luyben, Rawers and Bailey reported that the amount of paper collected in an apartment complex recycling program could be significantly increased when the number of recycling containers was increased and their presence noted through prompting [14]. A survey at the end of the study indicated that the convenience of the additional containers was crucial in many residents decision to recycle.

To date there have been no reported studies that have evaluated the effects of these factors in encouraging recycling within residential neighborhoods. This would appear to be an important point for consideration given the number of people who live in such settings and the amount of materials that they can provide to recycling operations. The purpose of the present study was to compare the effects of promotional, incentive and convenience programs in encouraging recycling in residential neighborhoods.

## METHOD

### Subjects and Setting

The occupants of 615 homes within five neighborhood areas of Tallahassee, Florida, served as subjects. Homes in these areas were homogeneous in size and price range and had been included in a bi-weekly recycling program for ten months prior to the study. Under the existing program, households were asked

to leave their newspapers by the curbside for pickup on the first and third Saturday of each month when a recycling truck drove through the area to collect the material. Each home had received a flyer explaining the collection service at the beginning of the program but received no subsequent information prior to the study.

## Procedure

Experimental sessions were conducted on the first and third Saturdays of each month and each session required approximately two hours in order to drive by each home and pick up any material placed outside. Records were maintained on the frequency of household participation across recycling sessions, amount of paper collected per pick-up, the number of homes beginning or continuing to recycle each week and the per cent participation by each group across sessions.

## Experimental Variables

The following treatment interventions were evaluated in the present study.

*Information only group*—(N = 132) Households in this group received handbills five to seven days in advance of each scheduled pickup notifying them of the availability of the recycling service and how to participate.

*Penny-a-pound group*—(N = 147) Households in this area were notified of the recycling service in a similar manner to the Information Only group. In addition, each participating household was paid a penny a pound of newspaper they recycled (the existing retail market rate). This money was distributed to participating homes on the day following collection.

*Lottery group*—(N = 86) Homes in this area were notified of the recycling program in a similar manner to the Information Only group. In addition, each household that recycled on a given collection day became eligible for a \$5.00 prize that was drawn at random from the session's participating households. The prize was distributed the day following collection.

*Weekly pick-up group*—(N = 140) In order to determine the effects of frequency of pickup on rates of participation, one group of households received weekly collection of recyclables as opposed to the bi-weekly collection in the other areas. Homes in this group were notified of the collection service and schedule of pickups as often as homes in the other treatment conditions.

In addition, since the weekly collection group received twice as many pickups during treatment as the other groups, each two week period (two pickups) was collapsed into a single data point for purposes of comparison with other treatment results. According to this procedure, a home in the weekly pickup

group was recorded as participating during a two week period regardless of whether it recycled once or twice during this time.

*Control group*—(N = 110) One final group served as a control group to measure the effects of ambient or uncontrolled variables during the course of the study. This group received no prompts or any other type of experimental manipulation.

## Experimental Design

A comparative AB within treatment vs. control group design was used in the present study [15]. Each group remained in a baseline condition for four sessions at which point they were randomly assigned to one of the treatment conditions for the duration of the experiment. The research was concluded after five additional sessions. (Due to rain, one of the treatment sessions was discarded leaving four sessions each in baseline and treatment conditions for analysis.)

## RESULTS

As can be seen in Figure 1, the mean rate of participation during baseline ranged from a low of 1.13 per cent per week in the Control group to a high of 4.08 per cent in the Penny-a-Pound group. Implementation of the treatment conditions resulted in a marked increase in participation in the Lottery group (11.34%) followed by the Information Only group (6.49%), Weekly Pickup group (6.36%) and the Penny-a-Pound group (4.96%). The control group exhibited a 0.91 per cent increase during the same period of time.

Table 1 presents the results of a Chi-Square analysis of the changes in participation within each group between baseline and treatment conditions. According to this analysis, the total number of recycling episodes for each group during baseline was compared to the total number of recycling episodes for the same group during the treatment period. Results indicated a statistically significant increase ( $p \leq .001$ ,  $df = 1$ ) in the number of recycling episodes within each of the treatment groups and a non-significant increase in recycling within the Control group ( $p \leq .30$ ,  $df = 1$ ) over a similar period of time.

Figure 2 presents the percentage of households that recycled at least 50 per cent of all available times during baseline or treatment phases, which for purposes of the present study was considered to be an estimate of consistent participation.

As can be seen from Figure 2, the Lottery group demonstrated the greatest increase (16.28%) in consistent participation during treatment of any of the groups. The three remaining treatment groups showed increases which were only one-third to one-half as large as the Lottery group, while the Control group exhibited only a minor increase of 0.91 per cent during the same period of time.

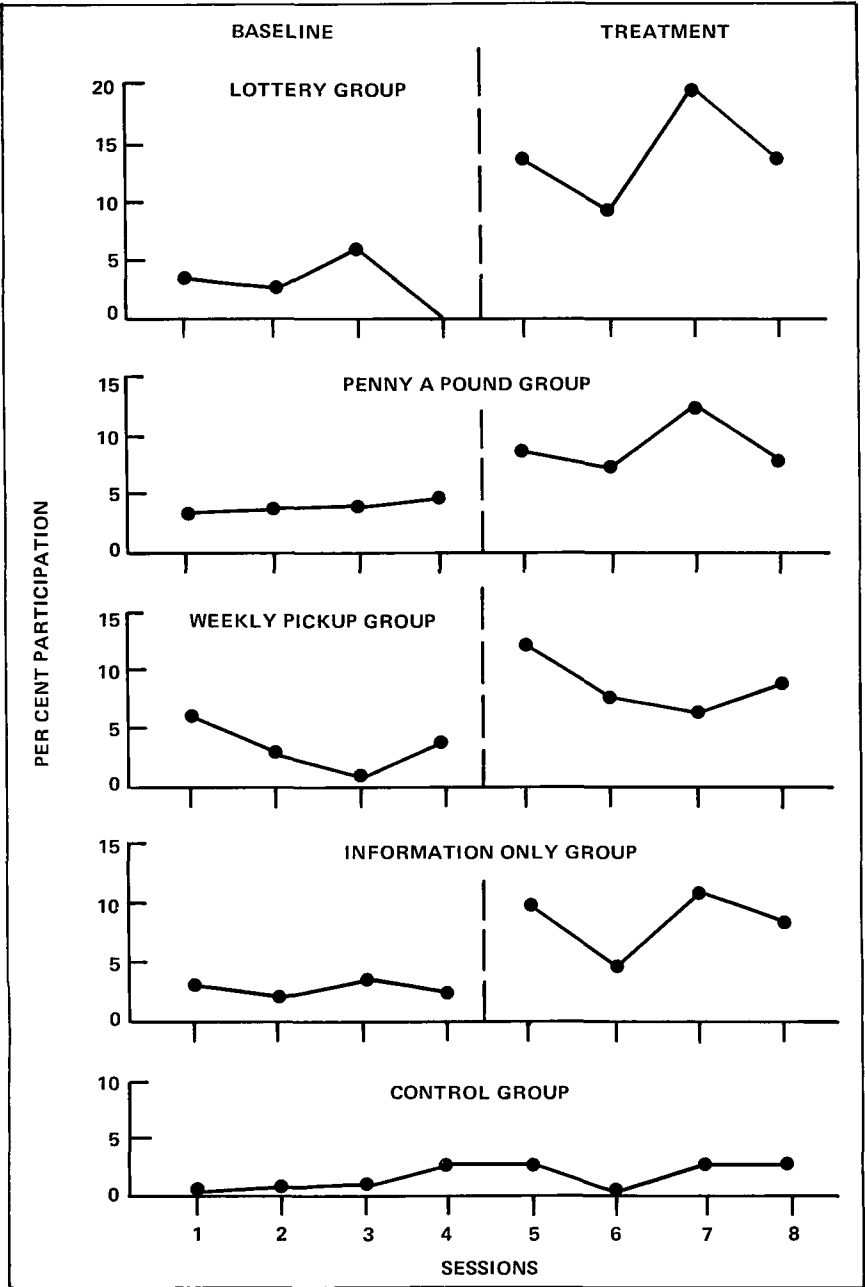


Figure 1. The percentage of households recycling each session across groups as a function of baseline and treatment periods.

Table 1. Chi-Square Analysis

<i>Group</i>	<i>Value</i>	<i>Significance</i>
Lottery	27.55	$p \leq .001$
Weekly Pickup	13.23	$p \leq .001$
Penny-a-Pound	10.92	$p \leq .001$
Information Only	14.25	$p \leq .001$
Control	1.14	$p \leq .300$

The changes in participation during the treatment conditions could have been a function of two variables:

1. the initiation of participation by homes which had not previously recycled; and
2. changes in the frequency of participation among homes which had recycled during the baseline phase.

An analysis of the percentage of homes in each group that began to recycle following initiation of the treatment conditions indicated that the Lottery group experienced the greatest influx of new recyclers 23 per cent, followed by the three remaining treatment groups which exhibited equivalent increases

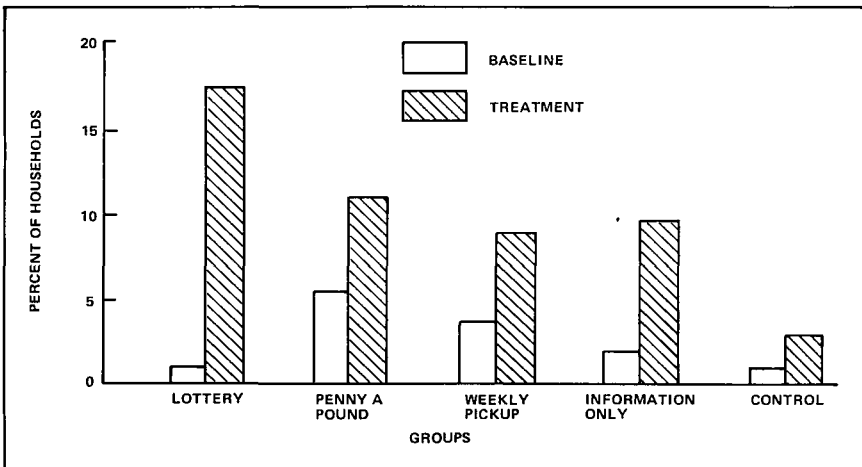


Figure 2. The percentage of households in each group participating in at least two out of four sessions as a function of baseline and treatment periods.

of 12 per cent each and the Control group in which 4.5 per cent of the homes began to recycle during the "treatment" period.

Figure 3 presents the participatory trends of households that had already recycled in the baseline condition, during the treatment period. All four treatment groups exhibited similar increases in the percentage of households that recycled more often during the treatment period as compared to the baseline period. The Control group demonstrated no increase in recycling trends among previously participating households during this same period of time. With the exception of the Information Only group, the percentage of homes maintaining similar rates of participation in treatment as in baseline remained relatively stable, ranging from a high of 41.5 per cent in the Weekly Pickup group to a low of 33.0 per cent in the Control group. Only 16 per cent of the homes in the Information Only group exhibited the same levels of participation in treatment as in the baseline phase.

No appreciable changes were noted in the mean amount of paper collected per house pickup as a function of baseline and treatment sessions in any neighborhood group.

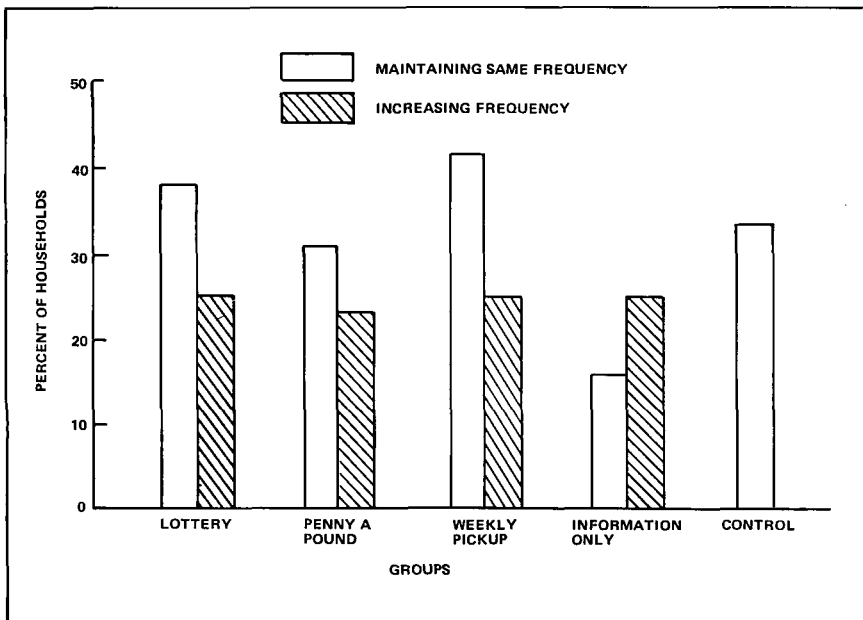


Figure 3. Changes in the frequency of participation during the treatment period by households which had recycled during baseline, as a function of groups.

## Cost-Benefit Analysis

Trends in group and household participation provided only one of two factors determining the effectiveness of each intervention. The other consisted of identifying the cost of implementing each treatment condition relative to the revenues which accrued from the sale of the collected paper. In the present analysis this was accomplished by distributing the costs and revenues associated with each treatment procedure over the total number of homes in that group.

Standard collection costs were based on data indicating that a two-person crew, each paid \$3.00 per hour, could service 2,200 homes in an eight hour day on a 50 mile route. Truck costs were computed at 50 cents per mile to cover expenditures for gas, oil, maintenance, insurance and depreciation. Flyers cost 1.5 cents each to print and 4.29 cents to distribute. Revenues for the newspaper were computed on a market price of \$40.00 per ton (the prevailing broker's price at the time of the study), relative to the mean amount of paper collected per house in each neighborhood area.

Table 2 presents the costs and resulting revenues for each of the treatment and control groups based on the noted parameters. An additional group, the Comparison group was included in the cost benefit analysis as a second point of comparison because of the low levels of participation noted in the original Control group compared to the other groups during baseline. This group consisted of the mean per cent participation of the four treatment groups during the baseline period. As can be seen from Table 2 the higher level of participation in the Comparison group resulted in a higher revenue per home than the original Control group. Both the Control group and the Comparison group had the same cost per home of 3.32 cents for the pickup of material.

It is evident from the Deficit column of Table 2 that no group generated sufficient revenues to pay for the cost of operation associated with its treatment condition. Each group generated approximately 30 per cent of the revenues necessary to make the treatment and collection pay for itself. The Comparison group demonstrated the lowest deficit (-2.14¢) of any group while the Lottery group demonstrated the greatest deficit per home (-10.66 ¢). The Information Only group exhibited the lowest deficit of any of the treatment groups under consideration (-6.12 ¢) per home.

## DISCUSSION

Results indicated that neighborhoods are amenable to changes in rates of participation in a recycling program in a manner similar to previous findings [10-14]. In the present study, the introduction of each treatment resulted in an increase in the percentage of homes participating on a session-by-session basis, an increase in the frequency of participation by homes that had recycled prior to treatment implementation and the initiation of recycling activities by homes



Table 2. Cost per Household per Pickup

<i>Group</i>	<i>Individual Costs (¢)</i>	<i>Total Costs (¢)</i>	<i>Revenue (¢)</i>	<i>Deficit (¢)</i>	
Penny-a-Pound	Collection	3.32			
	Brochures and Distribution	5.79			
	Payments and Distribution	2.97	12.08	3.24	-8.84
Weekly Pickup	Collection	6.64			
	Brochures and Distribution	5.79	12.43	3.15	-9.28
Information Only	Collection	3.32			
	Brochures and Distribution	5.79	9.11	2.99	-6.12
Lottery	Collection	3.32			
	Brochures and Distribution	5.79			
	Prize <sup>a</sup>	5.81			
	Distribution of Prize <sup>b</sup>	.87	15.79	5.13	-10.66
Control Group	Collection	3.32	3.32	.07	-3.25
Comparison Group	Collection	3.32	3.32	1.18	-2.14

<sup>a</sup>Based on \$5.00 divided by 86 homes.

<sup>b</sup>Based on 15 minutes (at \$3.00 per hour/86 homes).

which had not recycled during the baseline conditions. No increases in the amount of material collected per pick-up were noted.

The Lottery group demonstrated the most significant increase with remaining three experimental groups exhibiting relatively congruent patterns of participation during the treatment period. The apparent undifferentiated effects among the Penny-a-Pound, Weekly Pickup and Information Only groups opens the opportunity for speculation that a common variable was responsible for the majority of the treatment changes in these groups. Homes in all three groups received prompts on a bi-weekly basis explaining the availability of the recycling service and how to participate. The Weekly Pickup and Penny-a-Pound

groups added more frequent collection service and payment for recycled goods respectively. It appears that these additional treatments added very little to the effectiveness of the bi-weekly prompting.

While no survey was conducted at the end of the study, a series of informal comments by program participants and an overview of raw data may provide some insight into the effects of the penny-a-pound payment and weekly pickup schedules. Several people in the Penny-a-Pound group indicated that the money was unnecessary or, due to its small amount, of little significance in their decision to recycle. An inspection of individual household recycling habits in the Weekly Pickup group indicated that very few homes recycled every week or in two consecutive weeks on a regular basis. This may indicate that additional opportunities to recycle were less of an incentive than continual information that the recycling service was available.

One of the limitations of the present study centered around the relatively lower levels of participation in the Control group as compared to the remaining groups during the baseline period. This may suggest that the Control group was not equivalent to the other groups and did not serve as a satisfactory indicator of non-experimental variability. In addition, while the levels of participation in the Control Group were not as high as the remaining four groups, the proportionate increase in the mean levels of participation from the baseline to treatment phase in the Control group approximated the rises in participation noted in the Weekly Pickup, Information Only and Penny-a-Pound treatment groups (Figure 1).

It should be noted that there were several important differences between the Control and treatment groups which retain the integrity of the experimental effects. First, the Control group was randomly assigned to its treatment position. Second, though the Control group exhibited a mean increase in participation over time that was proportionate to three of the four experimental groups, this increase did not appear to be under the control of similar variables, nor was it statistically significant. As noted in Figure 1, each of the experimental groups exhibited an immediate increase in participation following the implementation of the treatment procedures with subsequent trends differing markedly from baseline participation. Increases by the Control group occurred exclusively during the baseline phase of the study. Participation during the treatment period remained relatively stable, at the same level experienced during the last session of the baseline phase with the exception of one lower data point during the second session of the "treatment" condition.

As can be seen in Figure 2, households in the Control group were less likely to recycle as consistently as households in the other groups during the treatment period. Fewer homes began recycling in the Control group during the treatment period than in the other groups. Figure 3 shows that no baseline recyclers in the Control group increased their levels of participation during the treatment period in contrast to the increases observed by all of the treatment groups across the same measure.

The lack of a profitable program based on the present cost-benefit analysis does not indicate that neighborhood recycling programs using similar approaches would be unsuccessful. Over a long term basis, or with modification, several of the programs could be cost-effective. For example, in the present study, each of the treatment groups received prompts bi-weekly for the duration of the program. Since the majority of the treatment effects occurred following the first prompt, it would appear that one or two prompts at the beginning of the program and more intermittent prompts thereafter may be sufficient and less costly. Similarly, a more cost-effective prize could be developed for the lottery program. This could include a "bingo type game" as used for promotion by chainstores, the distribution of the \$5.00 prize over a larger population on a weekly basis, or the distribution of a larger prize on a more intermittent basis.

In addition, the present study did not examine the long term or residual effects that each treatment program would have over time if the treatments were discontinued but collection service maintained. An initially non-cost effective program may increase participation to a high level which can subsequently be maintained with a less expensive program. This would allow the initial costs to be amortized over a greater period of time, resulting in a lower cost per household per pickup over time.

Finally, due to the variable costs across the nation, the present analysis did not identify the savings that a community with high disposal costs could realize through one of the present procedures. While these programs were not cost effective alone, they may be more economical to operate in some areas of the country than present waste collection systems. In such a situation they became a cost effective alternative to existing disposal programs.

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