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ANTI-LITTER PROCEDURES IN AN URBAN HIGH-DENSITY AREA[1]

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In urban high-density areas, litter has become an increasingly obvious and pervasive problem. In the present study, repeated measures of the amount of litter on randomly selected yards in an urban low-income housing project were used to evaluate the effectiveness of a series of anti-litter procedures directed at the children residing in the project. Paying children for volume of trash collected resulted in only a small decrease in the number of litter pieces present. Paying them for cleaning assigned yards markedly decreased the level of litter in all sampled yards. Thus, children can be employed to maintain a clean neighborhood in spite of the rapid accumulation of new litter in urban yards.

Litter in urban high-density areas represents one of the major contributors to the increasingly apparent problem of environmental pollution and degradation. Many of the problems associated with urban litter might be correlated with (1) inadequate packaging and handling of trash for pick-up; (2) careless discard of litter by adults and children; and, most importantly, (3) little effort by urban residents to pick up litter.

Efforts to modify littering behavior and implementation of litter-control procedures have traditionally relied upon advertising and clean-up campaigns (Keep America Beautiful, 1968), anti-litter messages (Geller, Wylie, and Farris, *unpublished;* Marler, 1970), legal and sublegal actions, and the use of various types of litter receptacles. However, available evidence suggests that such procedures have been only mildly effective in modifying littering behavior. More recent and systematic attempts directed at altering littering behavior (Burgess, Clark, and Hendee, 1971) have suggested the ineffectiveness of the more traditional and standard anti-litter procedures (*i.e.,* fines, anti-litter announcements, and litter containers). Instead, it was shown that paying children for bagsful of litter after a movie markedly decreased the amount of litter left on the floor of the theatre. Later research (Clark, Burgess, and Hendee, 1972) indicated that the amount of litter collected in a forest campground could be increased substantially by offering prizes to children in the area for bagsful of litter.

In the latter two studies, the reinforcement contingencies were placed on the volume of litter collected, rather than associating reinforcement contingencies with some level of cleanliness.

In the present study, repeated measures of the amount of litter in randomly selected yards in an urban low-income housing project were used to evaluate the effectiveness of a series of anti-litter procedures directed at the children residing

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in the project. Payment was contingent either upon volume of litter collected or upon the absence of litter in assigned yards.

METHOD

Subjects and Setting

The subjects were 132 children from the Juniper Gardens Housing Project, a low-income public housing project located in an urban high-density area of Kansas City, Kansas. All subjects were black, and ranged in age from 4 to 13 yr.

The housing project is comprised of 390 low-income and welfare families, or approximately 1700 persons, of which about 1000 have been identified as children. The specific settings under investigation were residential yards, public yard areas, streets, and sidewalks.

Figure 1 is a diagram of the Juniper Gardens Housing Project showing the 10 project sections studied, the 25 yards sampled, and the location of the litter stations.

Measurement Procedures

For purposes of measuring the number of litter pieces found in each of 25 randomly selected project yards, a piece of litter was defined as any item of paper, wood, glass, metal, plastic, rubber, fabric, leather, food or food byproducts (*i.e.*, orange rinds, banana peels, bones, *etc.*), or broken toys, measuring two or more inches in diameter. Other items, such as grass, leaves, twigs, branches, rocks, stones, trash and garbage containers, porch or lawn furniture, and intact toys, were not to be counted as trash.

The daily sampling procedure for counting the amount of litter in yards consisted of observing and counting the total number of litter pieces present on sample yards. All yards had as their boundary a sidewalk or walkway on three sides with a predetermined imaginary boundary on the fourth side (this boundary extended from the front corner of the building to the front sidewalk bordering the yard).

The procedure specified that each observer would start his count at the right front corner of the yard by placing a yellow marker in the ground indicating where the count started. The observers would then proceed to walk around the perimeter of the yard while counting all visible litter pieces. When the yellow marker was again reached, the observation was completed. If an observer had difficulty identifying

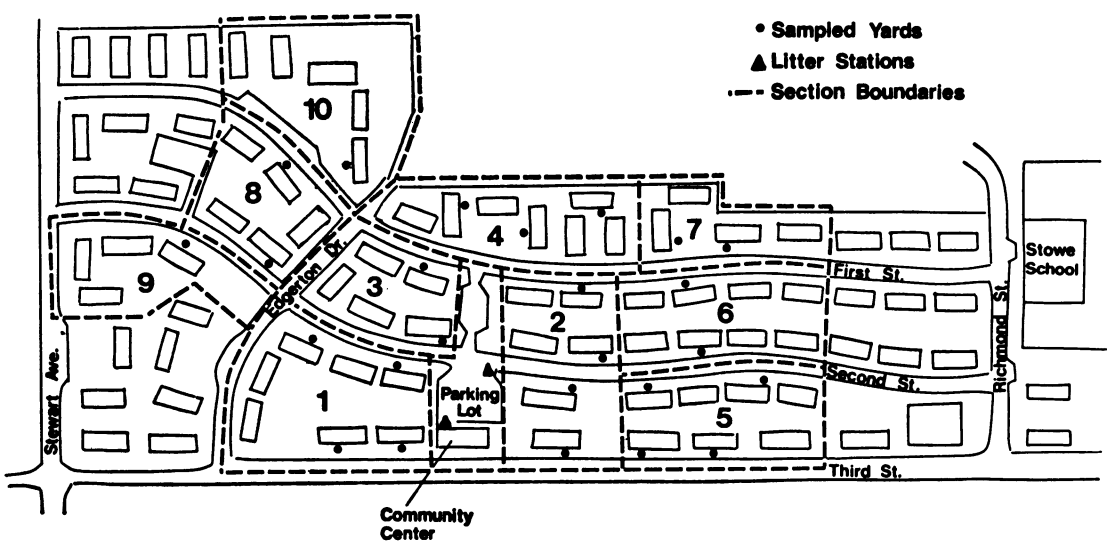

Fig. 1. A partial map of the Juniper Gardens Housing Project, which shows the 10 sections studied, the 25 yards sampled for litter, and the location of stations where bags were distributed and collected litter could be deposited.

or determining the size of a particular item, he would walk into the yard from the point where he was standing, check the item, and return to his original position. To check an item, observers placed a small circular gauge of transparent plastic with an inside diameter of 2 in. (5 cm) directly over the item on the ground. Items greater than 2 in. in any dimension were regarded as litter and included in the count.

Measurement Reliability

Reliability of the sampling procedure was assessed on 45% of the sample days throughout the study. A litter observer started the count, and, after he completed two yards, a reliability observer commenced counting. In this way, observer interaction was eliminated, and completely independent observation was assured. A yard-by-yard reliability score was derived by comparing the total number of litter pieces observed by the two independent observers, then dividing the smaller figure by the larger. Average reliability scores for the 25 yards ranged from 65% to 89%, with a mean of 80% for the entire study. Reliability did not vary significantly between conditions.

A litter-collection observer recorded the number of children participating and the weight of litter collected each day throughout the study. A reliability observer also made these observations for 74% of the litter collection days. Dividing the larger number into the smaller for each day yielded reliability scores for the number of children participating ranging from 92% to 100%, with a mean of 93%. The range for the weight of litter collected was from 95% to 100%, with a mean of 98%.

Experimental Conditions

Experimental procedures were carried out over a period of five months, from mid-April through late August. The following conditions were in effect during the following days:

Condition	Days
Verbal appeal	1- 14
Payment for volume (after school)	15- 29
No payment	30- 59
Payment for volume (full day)	63- 69
No payment	70- 80
Payment for volume (full day)	81- 94
Payment for clean yards	95-118
No payment	121-130

Verbal appeal. During this initial condition, a 30-gallon plastic litter basket was placed at the corner of a public sidewalk in front of the Juniper Gardens Community Center parking lot (indicated by △ in Figure 1). The observation period began daily at 3:20 p.m. (at the sound of the school bell) and lasted for 30 min. As the children passed the Community Center parking lot, they were approached by an experimenter and informally asked if they would help clean up litter in the project. Any child agreeing to help was given a numbered plastic litter bag (21 by 24 disposable bag). Two independent observers recorded the number of children receiving litter bags and the number of children placing litter in the litter basket.

Payment for volume. Under the payment-for-volume condition, the experimenter, who was known to the children living in the housing project, approached children who passed the litter station and told them they would be paid ten cents for filling up a litter bag with trash collected from the yards of the project. After the first payment-for-volume condition, the litter station was relocated under the stairwell at the back entrance of the Juniper Gardens Community Center building. At both locations, the station was equipped with a supply of litter bags, dimes, and containers for disposal of litter collected. Any child who desired to work simply requested a litter bag. An observer recorded the child's name and bag number, and gave the child brief instructions. Litter bags returned for payment were checked for both volume and content. Bags that were not filled to a proper level or that contained questionable items were returned to the child. Children who brought in bags containing items that appeared to be from

household or commercial trash containers were instructed to return the items to the place where they were found.

Payment for clean yards. During this condition, the experimenter walked through the section of the project to be cleaned and told the children he encountered that they would be paid for cleaning up particular yards; each child who wanted to work was assigned one or more yards by the experimenter. Approximately 60% of the housing project was divided into 10 sections of about 30 to 35 yards each; of these, one to four yards in each section were included in the observation sample. Experimental procedures were applied to each section systematically over a period of 17 days; that is, all yards in Section 1 were assigned and cleaned, then yards in Section 2 were assigned and cleaned while maintaining the cleanliness level of Section 1, and so on. This procedure continued until all sections had been cleaned.

Specific yard assignments were made daily from 10:00 a.m. to 3:00 p.m. to any child requesting one. Children were asked to pick up all visible litter present in the assigned yard or yards (*i.e.,* paper, cans, bottles, miscellaneous debris) and to place all litter in the litter bag provided. When a child finished cleaning the yard, he approached the experimenter, who checked the cleanliness of the yard. Cleanliness was defined as the absence of litter that would be counted by observers; that is, any litter pieces measuring 2 in. in diameter or larger. (However, this inspection was much more cursory than that made by observers.) The children were then expected to return the litter bag to the litter station. Payment was made for all yards checked that met the cleanliness criterion; when a yard still contained small amounts of litter, the child was asked to pick up the litter "on the spot" before payment was made. Yards containing larger amounts of litter were re-assigned to the same or a different child, and later re-assessed for cleanliness. The amount of payment was based on the number of yards assigned and the level of cleanliness before assignment. The average range of payments was from 10 cents for one yard to about 40 cents for four or five yards.

RESULTS

Of the three experimental conditions—verbal appeal, payment for volume, and payment for clean yards—all but the first were effective in reducing the number of litter pieces present in sample yards. Payment for clean yards was shown to be clearly the most effective procedure, but under no condition did the level of cleanliness remain stable after payment was discontinued.

Figure 2 shows the number of litter pieces present in sample yards, the number of children participating in litter collection, and the weight of litter collected across all experimental conditions.

The overall number of children participating in litter collection was lowest under the verbal-appeal condition, averaging about 10. Participation during all payment-for-volume conditions averaged 25, by far the highest average. During the payment-for-clean-yards condition, an average of 15 children were participating in litter collection each day, and each day of assignments was producing an average of eight new children. The daily roster of children participating indicates that children tended to work in the section in which they lived, rather than moving from section to section to collect litter.

Weight of litter collected also was highest under the payment-for-volume condition, averaging 94 pounds, as compared to 28 pounds for payment for clean yards.

However, payment for volume did not produce the cleanest yards. During the no-payment and verbal-appeal conditions, a mean of 38 pieces of litter were present in each yard. Under the payment-for-volume condition, this mean was reduced to 27. But, under the payment-for-clean-yards condition, after all yards had been cleaned and were periodically being re-assigned, the average number of litter pieces was reduced to 12 per yard.

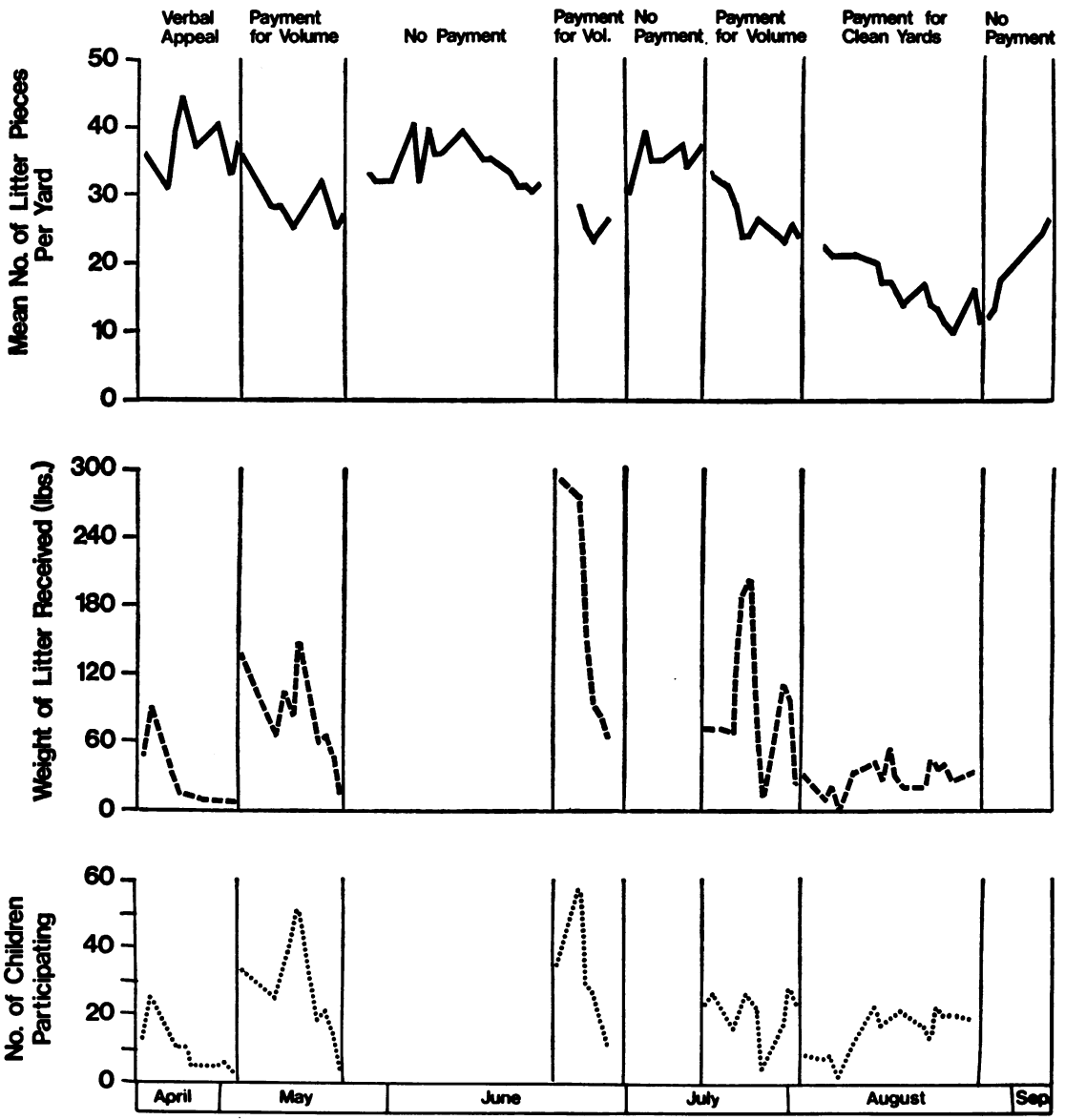

Fig. 2. The overall effects of anti-litter procedures on the litter present in 25 yards sampled daily, the number of children participating in the collection of litter, and the weight (in pounds) of litter received for each day of litter collection. Records of participation and weight were taken only during the verbal-appeal, payment-for-volume, and payment-for-cleaning conditions.

Figure 2 also shows that the largest amounts of litter were collected during the first few days of the verbal-appeal and payment-for-volume conditions, and that the largest number of children participated during these days. As participation began to decrease, so did the amount of litter collected. The continued payment for volume of litter collected would, therefore, not have resulted in any greater decrease in the number of litter pieces present in yards, because the number of children collecting litter was so small.

Figure 3 shows the average number of litter pieces present per yard for all yards combined on the three days preceding and the three days following yard assignments for the payment-for-

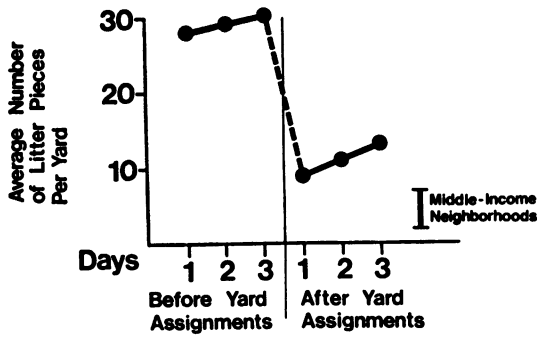

Fig. 3. The average number of litter pieces observed in 25 sample yards on the three days preceding yard assignments and the three days following yard assignments. The range of litter pieces observed in 10 middle-income yards of comparable size to sample yards is also shown. It may be noted that the level of litter in sample yards after assignments began to approach the level of the middle-income yards.

clean-yards condition. Before yard assignments, the average number of litter pieces was 29; for the three days following assignments, the average was 11. Figure 3 also shows that the level of litter present following yard assignments was approaching the level obtained in 10 different middle-income yards of comparable size, which ranged from two to seven pieces.

Figure 4 shows the average number of litter pieces observed in the sample yards of each section before and after assignment for litter collection. It is clear that paying children for clean yards leads to a systematic reduction in litter. Figure 4 also indicates that in several sections, litter increased again after initial cleaning of the yards, even though previously cleaned yards were re-assigned whenever enough children were participating.

Despite the clear reduction in litter that resulted from the payment-for-clean-yards condition, within 12 days of discontinuing payment, the number of litter pieces in each yard increased from an average of 12 to an average of 25 (Figure 2, last condition).

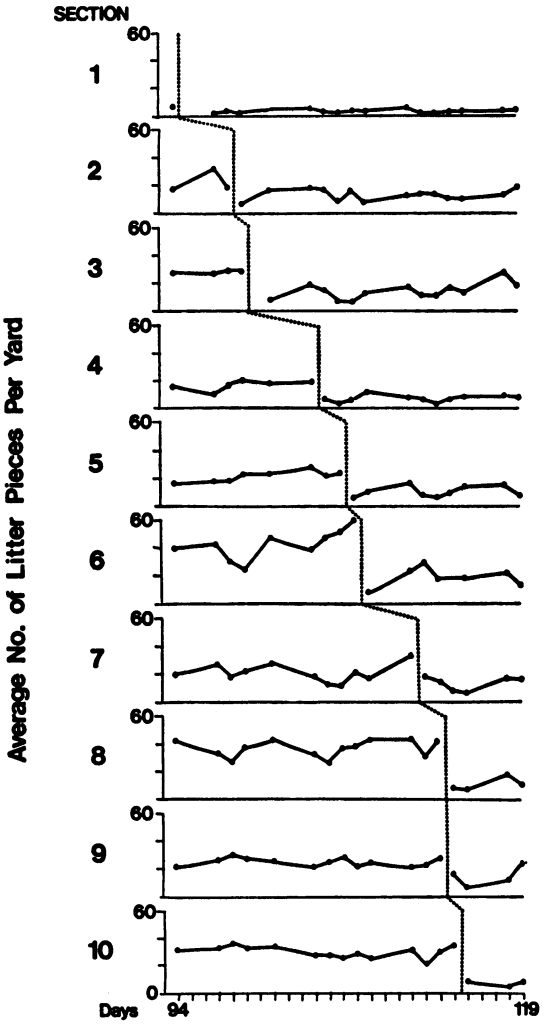

Fig. 4. The average number of litter pieces in sample yards for each section studied, before and after yard assignments were made for litter collection. Yard assignments were begun in each section at the dotted line.

DISCUSSION

Although the greatest amount of litter was collected during the payment-for-volume condition and the greatest number of children participated during this condition, this procedure was not effective in producing clean yards. This result may be explained by several difficulties associated with the payment-for-volume condition. Generally, children tended to pick up the larger, bulkier litter, leaving smaller but still unsightly pieces behind. In addition, payment for volume encouraged the collection of litter from household and commercial trash containers. Although trash from these containers was easily identified

by the presence of things that could not be picked up (*i.e.,* coffee grounds, flour, cigarette butts and ashes), nonpayment for bags that contained such items often resulted in the child's throwing the bag of trash in yards, rather than returning it to the household or commercial container from which it came.

In this study, payment for clean yards appeared to be an effective contingency that avoided this problem and resulted in most of the observable litter being picked up. So much new litter was deposited in yards once yards had been cleaned that it was necessary to implement the program continuously to maintain litter-free yards in this urban high-density area. A respite of even two weeks would largely negate previous cleaning efforts, as can be seen from the follow-up measure in Figure 2. We estimate that at least a halftime maintenance person would be needed to recruit the large numbers of children and to pay them the $50 a week that would be required to clean and maintain all of the yards in this 15-square-block, 390-unit housing project, with this procedure. Thus, with yard assignments, children can be employed to maintain a relatively clean urban neighborhood for a total cost of less than a dollar a month per unit.

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