

**Optimizing Recycling in All the Neighborhoods of New York City:
The Roles of Demographics, Education, Barriers, and Program Changes**

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Optimizing Recycling in All the Neighborhoods of New York City: The Roles of Demographics, Education, Barriers, and Program Changes

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Abstract: New York City's population includes speakers from hundreds of nationalities, with 25 major languages spoken. Incomes vary with 20% of residents living below the poverty level, with a majority (60%) with incomes between \$15,000 and \$75,000. Only about 9% of homes are single-family detached and over 30% are apartment buildings with 50 or more units. The Department of Sanitation has, since the beginning of its recycling programs in the late 1980s, issued recycling information in many languages. Surveys have shown that all residents understood the requirements of the recycling program, prior to recent rapid changes, but residents were recycling only about 45% of targeted recyclables on average, with a considerable range varying with neighborhood.

This paper describes and explores the reasons for the disparity between recycling and non-recycling neighborhoods using recycling data collected by the City, census information to show variation in demographics, and other metrics. The effect of rapid program changes in 2002-2003 is discussed as is the effect of recycling environments in residences on recycling behaviors and rates.

Keywords: recycling; New York City; minorities; behavior; education; surveys

Background on NYC's recycling program

New York City's recycling program began in 1988 with pilot programs deployed in different parts of the city, at different times, collecting different recyclables. In 1993 the City unified its program, collecting metals, glass, plastic jugs and bottles, newspaper, magazines, phone books and corrugated cardboard. In 1996 mixed paper, bulk metal, grey cardboard, and wax paper cartons were added. In 1998 the City Council passed a local law to require collection of recyclables on a weekly basis citywide. By June, 2002, the City's diversion rate for recyclables was about 21% of the entire waste stream, and its capture rate of targeted recyclables averaged 46%. (The City targeted about half the waste stream at that time.)

But in July, 2002 the City's recycling program began to go backwards. Using what is now considered to be faulty economic data, the City decided it would be cheaper to stop collecting metal, glass and plastic. In an attempt to save the program, the City Council worked out an arrangement with the Mayor to keep metal recycling in place, reinstating plastics in July, 2003, and glass in July, 2004. Immediately after cessation of plastic and glass collections, data showed that paper collections also went down by over 10% (Cipollina). A few weeks after plastics were restored to the program in July, 2003, in the name of improving the economics of the recycling program, the City changed the program from collecting weekly to once every two weeks, angering residents and building superintendents who were now forced to store recyclables for an additional week. Meanwhile, in many parts of the City, garbage collections continued at three times per week, with twice a week in the rest of the City.

It is expected that in April, 2004 glass will be added back to the recycling program and recyclables will again be collected weekly. The \$50 million that the Mayor had expected would be saved by suspending glass and plastic collections and by going to bi-weekly collections did not occur according to the City Comptroller, because

- Paper recycling went down by 10%, adversely affecting revenues from sale of paper,
- Trucks returned partially filled and this reduced collection efficiency

It can also be argued that some recyclables were lost to the waste stream from those disaffected by the City's lack of commitment to recycling, or by those who could not remember which week to recycle.

City Programs to Motivate Recycling

Since the beginning of its recycling programs in the late 1980s, DOS has followed a 2-prong strategy to get New Yorkers to recycle: education and enforcement. The City considered that people would recycle if they knew what was expected of them and if there was threat of a fine for not recycling. However, the enforcement program has been administered unevenly. At first, the City would not fine anyone for putting recyclables in black bags with garbage. In single-family homes fines were issued for not recycling at all, putting garbage with recyclables. In apartment buildings, fines were issued for not having the correct signage or a designated recycling area. In the late 1990s the city began to fine for recyclables in black bags, but only rarely and only in single-family dwellings. Comparatively little enforcement attention was given to apartments other than pertaining to signage. Recycling regulations are mum on a required quantity of recycling containers or frequency of emptying them.

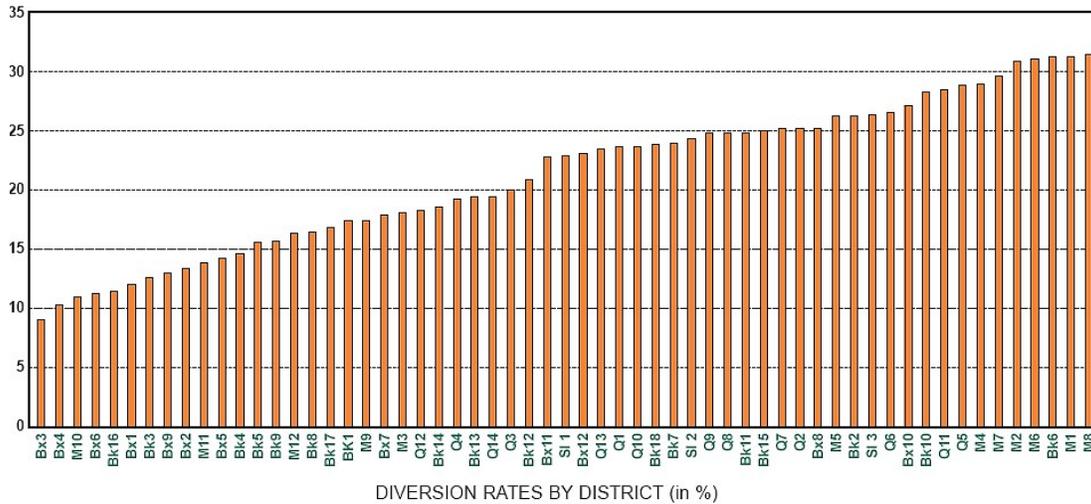
DOS began sending educational materials to residents primarily via mailed brochures, once every few years on average. A few cable TV spots, billboards and subway ads were also done, briefly. New York City's population includes speakers from hundreds of nationalities, with 25 major languages spoken, and a fairly transient population. Incomes vary with 20% of residents living below the poverty level, with a majority (60%) with incomes between \$15,000 and \$75,000. Only about 9% of homes are single-family detached and over 30% are apartment buildings with 50 or more units.

Since 1988, DOS has issued recycling information in both English and Spanish. DOS placed ads in Spanish papers, as it is required by local law (19 of 1989) to reach every person in the city with recycling education. At its heyday in the late 1990s, prior to cuts in recycling service started in July, 2001, recycling information was distributed in many languages, including Hebrew, Yiddish, Chinese, Korean, Russian, Polish as well as Spanish in an attempt to get to the populations in which these languages are exclusively spoken. Pictures of recyclable and non-recyclable materials were featured to increase understanding. Educational materials were sent to every part of the city including apartments.

Recycling Rates in different NYC neighborhoods

If the people in all NYC's neighborhoods did understand what to recycle, one might logically expect for all neighborhoods to have similar recycling (diversion) rates, as DOS did. But Figure 1, below, illustrates a very large disparity in recycling rates across the city, from below 10% to above 30%. Of the total 59 community board / sanitation districts, the 12 districts with the lowest diversion rates are in the South and Central Bronx (7 districts), Harlem (2 districts), and neighborhoods like the minority communities of Bedford-Stuyvesant, Crown Heights, Bushwick, and Brownsville in Brooklyn. On the other end of the spectrum, the 12 districts with the highest diversion rates are places like Manhattan's downtown, Greenwich Village, Chelsea, Gramercy Park, Murray Hill, the upper east side, and upper west side, Brooklyn's Park Slope, upscale – much like the upper west side of Manhattan, posh residential areas of outer Queens (Bayside, Douglaston, Little Neck, Forest Hills), eastern Bronx (Pelham Bay) and Italian neighborhoods of Bay Ridge and Middle Village.

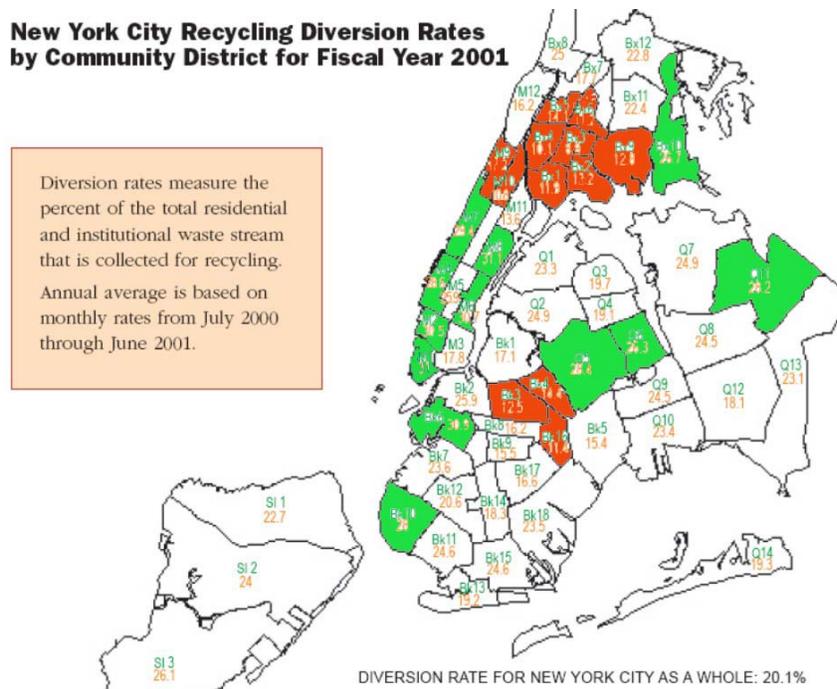
Figure 1



From: DOS' New York City Recycling – In Context – A Comprehensive Analysis of Recycling in Major U.S. Cities. August, 2001. This was prior to the July, 2002 citywide reduction in recycling service after which time only papers and metals were collected until July, 2003.

Fig. 2 shows, in green, the top 12 districts for recycling diversion, and in red, the worst 12.

Fig. 2.



Comparison of the map showing best and worst recycling districts with maps depicting certain demographic factors show a certain similarity. Though what is presented here is not a thorough GIS

Maps showing higher incomes, educational levels and whites are similar to the good recycling districts (Fig. 7 shows where people with graduate degrees live). Though none of the maps of race, ethnicity, income level, educational level, and female head-of-household provide a perfect match on an individual basis for the map of the worst or best 12 recycling districts, there are enough similarities between these maps and the poor recycling districts that a multivariate analysis using these variables would probably yield useful results. This is now underway at Lehman College and will be reported in a separate paper.

Fig. 6

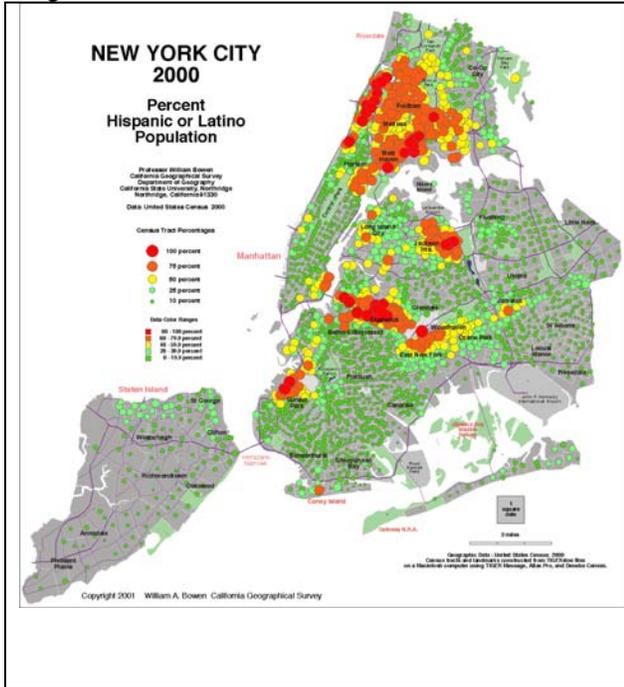
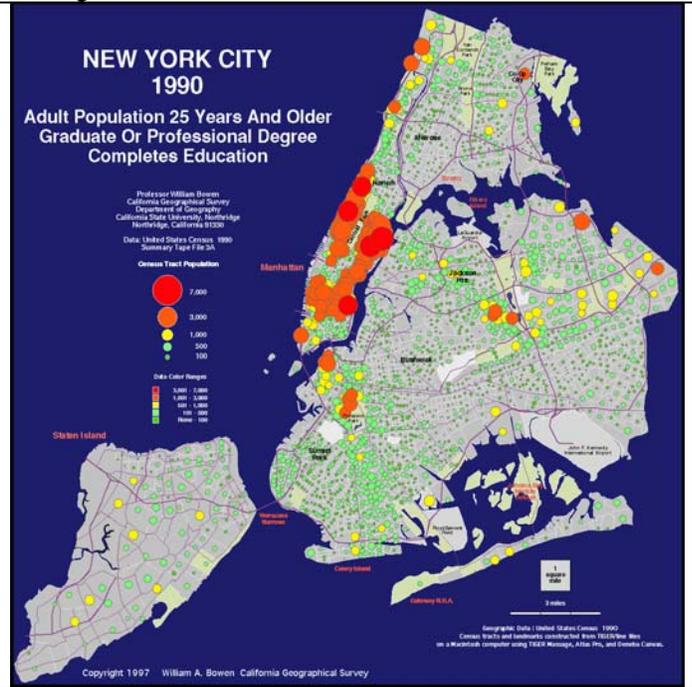


Fig. 7



The maps were downloaded from William Brown, California Geographical Survey: 1997, 2001.
<http://geogdata.csun.edu/NYpage1.html>

Theory of Behavior; Search for Causes

It would be very convenient to say that there is a causal relationship between the certain demographics and recycling behavior and that these are the only factors influencing recycling behavior. But behavioral psychologists have shown that much more influences whether or not a behavior, such as recycling, is practiced than demographics. Attitudes, social norms, economic factors, and convenience factors towards recycling can also override knowledge.

Smoking is a good example of this. Everyone knows that it is harmful to health to smoke, and most people know that there are medical aids to help one quit smoking. It's also becoming more expensive to smoke as sin taxes rise. It's becoming more difficult to find a place to smoke as laws are passed banning it from indoor spaces. These have driven many people to quit. But there are barriers to overcoming smoking, for example, the unpleasant effects of withdrawing from an addiction. Also, there may be peer pressure to continue to smoke in some circles.

The same is true for recycling. While there are benefits to natural resources, the environment, and our energy supplies from recycling, as well as to local economic development and job creation, there are no monetary benefits to the recyclers except for the bottle deposit system. Depending on where you live,

recycling can be inconvenient or unpleasant (e.g. those living in New York City Housing Authority buildings must go outside the building some distance away to deposit recyclables, and others need to go to dark, dirty, vermin-ridden basements). Certainly these factors, barriers to recycling, can reduce the ability or intention of people to recycle.

DOS designs its informational program certain in its belief that people will recycle if they understand what to do and when to do it. But this is not the only step needed to design and implement successful recycling programs that divert most recyclables from the waste stream. Surveys that DOS conducted since 1998 show that “Majorities correctly identify the major recyclables, most at very high rates (over 90%). High knowledgeability is seen regardless of where residents live, what type of housing they reside in, or whether English or Spanish is their primary language”.¹

Clearly there *is* a relationship between diversion rate and demographic factors, such as income and/or ethnicity, that DOS’ self-reported survey results do not reveal. DOS itself notes that “these self-assessed compliance rates do not match the measured diversion rate of 20% and capture of 50% for NYC.”² This is the first clue that there is a disconnect between DOS’ education efforts and actual diversion rates. After a person has full understanding of a new behavior, several additional steps are required before the behavior is actually put into practice, as illustrated in Figure 8, below. Awareness and comprehension must be followed by a good attitude towards the program, an intention to participate, and once participation has taken place, good experiences with the program to maintain the recycling behavior.

Capture rates (the percentage of targeted recyclables captured by the recycling program) in the DOS Residential Recycling Diversion Report for June 2003³ ranged from 21 to 35% in 2002 but dropped to 15 to 21% in 2003 in the worst 12 recycling districts. This precipitous drop from June 2002 to June 2003 was probably due to the decision to stop collecting plastic, glass, and wax paper containers in July 2002). This change was shown to have caused a drop of 10-12% in paper diversion rate even though paper recycling was unaffected by the change in policy, illustrating that recycling behavior depends to a great degree on attitudes towards the program, and that program changes can be disruptive, perhaps for a long time. The best 12 recycling districts also suffered a drop in capture rates after plastic and glass recycling was dropped, but not to the degree suffered in the low-diversion districts (2002: 39-59%; 2003: 49-68%). As with recycling (diversion) rate, there is an enormous disparity between the best and worst neighborhoods in the capture rate.

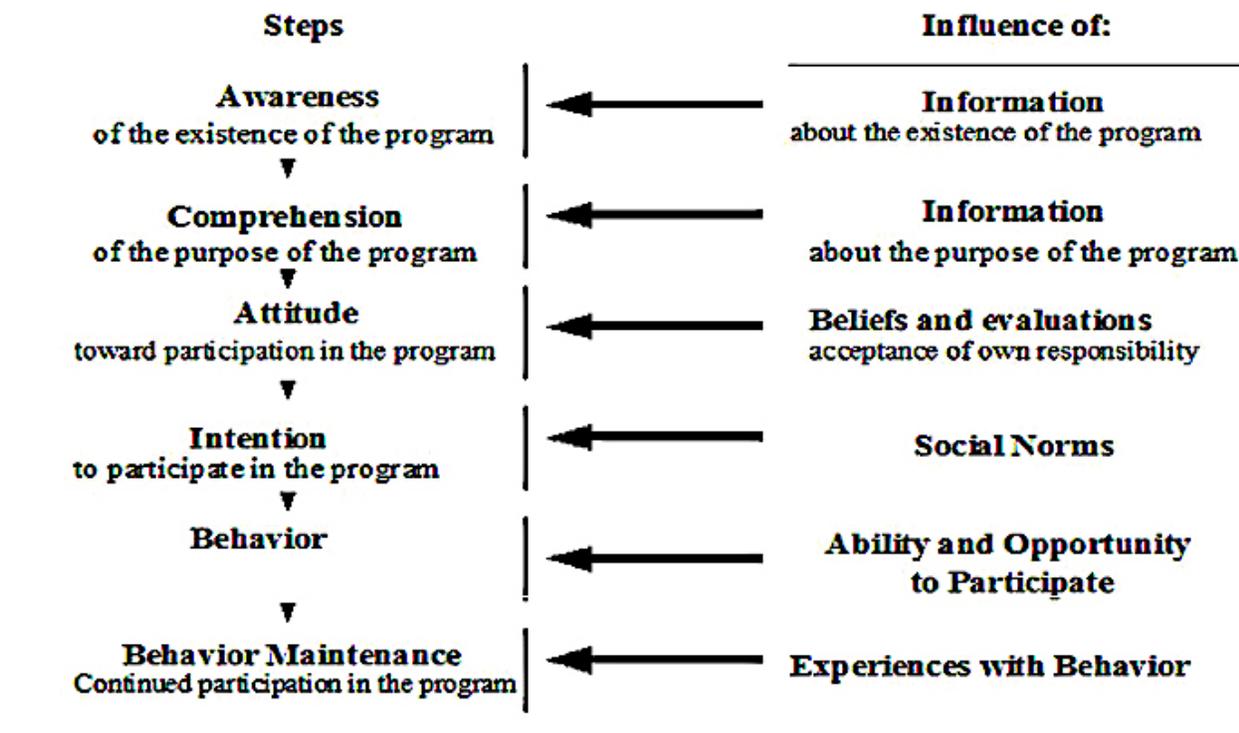
The question is, what are the reasons for the large disparity in recycling in New York City neighborhoods? Is it strictly cultural, involving social norms and beliefs about one’s personal responsibility to recycle? Or is recycling participation also affected by the ability and opportunity to participation, barriers, and experiences with recycling?

¹ “New York City Recycling – In Context – A Comprehensive Analysis of Recycling in Major U.S. Cities”, NYC DOS, August, 2001, P. 41 <http://www.nyc.gov/html/dos/html/recywprpts.html#1>

² “New York City Recycling – In Context – A Comprehensive Analysis of Recycling in Major U.S. Cities”, NYC DOS, August, 2001, P. 41

³ “Residential Recycling Diversion Report for June 2003”, from Larry Cipollina, September 8, 2003.

Figure 8. Model of attitude change and behavior change through communication ¹



Kok, Gerjo and Sief Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", *Journal of Economic Psychology*, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

Analysis

Not only is it important to find the reasons for the difference in capture and diversion between the best and worst districts in New York City, but also to figure out how the low-diversion districts can be brought up to the same level of capture and diversion rates as the best performing districts. This would involve doubling the capture rate and tripling the diversion rate. If DOS' survey of residents' understanding of the recycling program requirements is accurate, and everyone in the city has the same understanding of what items are recyclable, regardless of demographic factors, then what causes some people not to perform the recycling behavior? Barriers to recycling could be one answer. Such barriers can include differences in building design that makes it more difficult to recycle (e.g., tenants must bring recyclables downstairs, outside, or further away in a housing complex vs. leaving recyclables in a recycling / chute room on their floor), or uncooperative building management / superintendent that provides insufficient space / cleanliness of recycling area that is poorly labeled. But cultural norms and educational levels could be other important factors influencing how a community responds to changes in government programs, as indicated by the associations shown on the demographic maps.

The CUNY study

One way to shed more light on this situation would be to ask people about their recycling experiences and to examine the environment in which people are asked to recycle. A few hundred New Yorkers, most from the best and worst recycling districts were surveyed by seven students from Lehman and Hunter Colleges of the City University of New York (CUNY) in November, 2003. In addition to collecting demographic information (income, race and ethnicity, educational level, age, etc) the two-page survey queried respondents about the location of and conditions in their recycling area, the cleanliness of their

neighborhood as evidenced by the condition of corner baskets and litter, their knowledge of the recycling program, and attitude towards doubling the container deposit.

The students were instructed to select one community board district in the list of the best and another in the list of the worst recycling areas, to survey 25-30 passersby randomly in each area, to avoid statistical bias, and to tabulate and compare the results. In most cases the students had the respondents fill out the survey on a clipboard. In a few cases where it would ease data collection (they thought due to limitations of literacy) the student read the questions and answers to the person and wrote down their selections. Two students collaborated on a Spanish version of the survey, and quite a number of those were used. The students were also instructed to observe and report on various measures of cleanliness in the area (e.g. overflowing street garbage bins, litter). Most of the students chose neighborhoods in the Bronx, Manhattan, and Brooklyn; most of the poor recycling neighborhoods are in the Bronx and Brooklyn, and most of the best are in Manhattan.

PV, from Lehman College, chose Sanitation Districts 2 and 10 in the Bronx (with recycling diversion rates of 13.2% and 26.7% respectively). In (South) Bronx 2 a vast majority of respondents were Hispanic, half had an income of less than \$25,000, almost all lived in apartment buildings of 5 to 9 floors, and 2/3 had completed only junior high or high school (and they took longer to fill out the survey). In (East) Bronx 10 there was more racial diversity, 2/3 had income over 35,000, housing ranged evenly from single-family to over 10-floor apartment buildings, and 2/3 of the respondents had college or graduate degrees. PV's results showed Bronx 2 (low diversion) residents lived in large apt. buildings (more than 5 floors) vs. a quarter of Bronx 10 (high diversion) residents.

At the intersection in Bronx 2 where surveys were administered, all four corner litter bins were overflowing, and there was garbage on the ground. At the survey intersection in Bronx 10, only two of the cans were overflowing and the streets were relatively free of litter. P.V. went into a randomly selected apartment building in each district and in Bronx 2 found the area was poorly lit, had garbage scattered all about the ground with overflowing garbage cans. The recycling bins were not emptied was contaminated with refuse. In Bronx 10 there were sufficient recycling bins and those bins were empty and clean. The garbage area was clean and relatively odorless and contained enough cans for the amount of garbage produced by this particular building.

There wasn't much difference in the location of recycling centers in buildings between the two districts; most were in the basement or in front of the building on the street. In Bronx 2, a majority did not feel safe going to the recycling area and noted that the lighting, number of recycling bins, and frequency of emptying them was insufficient, vs. Bronx 10 where the vast majority thought the opposite. In Bronx 2 a majority wrote that having more recycling bins in their basement would make them recycle more, whereas most of the respondents in Bronx 10 didn't answer anything for that question. Interestingly, the two districts were nearly identical in their self-reported behavior of bringing containers to the store for deposit, and a majority never bring containers to the store. Both districts' responses if the deposit were raised from a nickel to a dime were also lukewarm. Answers to a pair of questions on cleanliness of the neighborhood corroborated findings on the ground. Almost all the respondents in Bronx 2 indicated seeing a lot of litter on the sidewalks frequently or every day, whereas the majority in Bronx 10 almost never saw a lot of litter. Twice as many in Bronx 2 saw overflowing corner garbage cans in their neighborhood every day as compared with almost never. This relationship was reversed for Bronx 10.

One question probed knowledge of the City's recycling program. Residents from both districts selected most of the items offered -- plastic bottles, plastic bags, glass bottles, cans, metal objects, phone books, and newspapers, despite the fact that currently, the program does not accept glass or plastic bags. The

exceptions were Bronx 2, where only about 1/3 selected phone books and metal objects as being recyclable (they are).

J.C., from Hunter College, chose Brooklyn 4 (Bushwick, 14.4% diversion) and Brooklyn 6 (Park Slope, the neighborhood chosen ten years ago to pilot advanced recycling techniques – 30.9% diversion). In Brooklyn 4, 2/3 of the respondents were Hispanic, over 2/3 completed just junior high or high school, and over 2/3 had incomes less than \$35,000. In Brooklyn 6, 2/3 of the respondents were white, 2/3 had community college, college, or graduate degrees, over 2/3 had incomes over \$25,000, with half of those over \$35,000 or more.

The respondents in both areas had quite a few misconceptions about which items are recyclable. Though all in both districts know about plastic bottles being recyclable, half in Brooklyn 4 didn't realize cans and metal objects are recyclable, only 2/3 thought newspapers, only 10% realized phone books were recyclable. Though glass and plastic bags are not currently recycled in New York City, 1/3 thought plastic bags were on the recycling list, and over half thought glass bottles were. In Brooklyn 6 about 1/3 realize that phone books, newspapers, and metal objects are recycled, but 1/3 also think glass bottles are. When asked what would make you recycle more, over half in Brooklyn 4's responses related to cleanliness of the neighborhood, whereas only a quarter of those in Brooklyn 6's answers were in that category. Most all respondents in both neighborhoods said they would bring deposit containers back to the store more often if the deposit were raised to a dime. Currently about half of those in Brooklyn 4 return deposit containers at least half the time, but almost all those in Brooklyn 6 return them not very often or almost never.

About 2/3 of Brooklyn 4 respondents saw garbage overflowing street corner cans frequently or every day, but over 2/3 of those in Brooklyn 6 saw this sometimes to almost never. Results were similar when asked about litter: almost all in Brooklyn 4 saw a lot of litter sometimes to every day; but most in Brooklyn 6 saw a lot of litter sometimes to almost never. In their own building's recycling area, three times as many residents of Brooklyn 6 answered that they felt comfortable going to their recycling area as compared with Brooklyn 4. Four times as many in Brooklyn 6 felt the recycling bins were emptied often enough, and roughly twice as many thought it was well lit, reasonably clean, and had enough recycling bins vs. Brooklyn 4. Clearly there is an association between cleanliness and attractiveness of the neighborhood and the recycling area and the recycling diversion rate.

J.C. also observed DOS litter basket collections and street cleanings in his two areas to see if the reports of the respondents were corroborated by evidence in the field. In Bushwick (Bk4) it appeared that the street sweepers just moved the garbage around, and made only one pass to clean the street. Litter was spilled in the street when corner waste baskets were collected. The area looked filthier as the day wore on. In Park Slope (Bk6) the street sweepers arrived earlier in their allotted time window and took a second pass near the end of the time window, significantly improving the cleaning efficiency. The litter basket collectors seemed to be more careful in emptying them into the truck, picking up waste left behind on the sidewalk/street. This corroborates J.C.'s findings that a cleaner neighborhood would motivate residents in Bk4 to recycle more.

Conclusions and Recommendations

This research shows that diversion and capture rates are related not only to cultural issues (particularly education, language, and income), but also to the existence of barriers to recycling (unclean / unsavory conditions in the recycling area and the neighborhood in general).

Occasionally providing recycling educational literature and cable TV spots in a few languages is only the first step in achieving high capture and diversion rates in all areas of a culturally diverse city. DOS

should also not assume that everyone has an accurate understanding and motivation to recycle; the students' survey experiences in the poor recycling neighborhoods suggest otherwise. There is also a need to understand the steps between residents' comprehension of educational materials and implementation of behaviors to see where there might be problems which prevent or dissuade residents from participating in the recycling program.

DOS should make the information regarding the recycling program even simpler than it has for those residents with very low educational experience. DOS would be well advised to explore whether differences in cultural values could be addressed by tailoring their educational devices. Increasing the frequency of outreach and differentiating the type of educational approach (i.e. use not only printed literature, but other ways of reaching these target populations), is clearly necessary to penetrate and convince those non-recyclers to get with the program.

Participation in the program must be made easier and more appealing. DOS should enforce its residential recycling regulations which require identifying and reducing any barriers to recycling (e.g., enforce that building managers provide sufficient bins and service for them in well-lit, safe, clean, rodent-free areas) and to tailor educational signage to different types of building layout (e.g., "Bring your recyclables to the Basement – or Vestibule – or Sidewalk etc"). Clearly the City also needs to improve street cleaning and litter basket servicing in these areas. Improving the frequency and quality of street sweeping, better enforcement of sidewalk cleaning rules, and more frequent litter basket service, could improve most attitudes about recycling in the low-diversion neighborhoods of New York City, and could very well improve neighborhood pride and inspire more personal responsibility for doing recycling. DOS could also experiment with markedly improving street cleanliness and observing changes in recycling rate.

Increasing the deposit on all bottles and cans might improve the attitudes in the poorer communities listed in this project. But it is more evident that recycling rates in all areas of the City would benefit by returning to weekly collections, as biweekly collections confuse residents and anger apartment supers who are required to store recyclables for two weeks. Citywide recycling rates would also improve if the recycling program were kept stable, since capricious changes and reversals confuse and anger many residents and building supers.

Further research into the attitudes and reasons for non-recycling behavior is needed. It is likely that the level of income may play a role in how well each community recycles. Low-education, low-income minority residents may be working two or more jobs to make ends meet. They might not have enough time to really understand what it is they have to do in to recycle or be too exhausted to pay careful attention to the recycling rules. Low income apartments are smaller and there may be a storage problem. Future multivariate studies of the CUNY surveys may reveal more insights about the characteristics of recyclers vs. non-recyclers, and the conditions associated with recycling and not recycling.

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