

## EXECUTIVE SUMMARY

### Litter in America: National Findings and Recommendations

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Keep America Beautiful (KAB) is a non-profit organization dedicated to community improvement through litter prevention, waste reduction/recycling, and beautification. KAB was founded in 1953 and has grown into the nation's leading community involvement organization, with more than 1,000 local affiliates and participating organizations. Much of the litter prevention work completed by KAB and its affiliates is based on seminal research conducted in the 1960s and 1970s about the sources and causes of litter.

In an effort to update and advance the research foundation for their litter prevention activities, KAB funded a series of studies in 2008 and 2009 with financial support from Philip Morris USA, an Altria Company. These studies focused on two broad topics: litter and littering behavior. With regard to litter, the research team explored the composition of litter across America: its volume, locations and costs to local communities and businesses. With regard to littering behavior, the research team explored how often people litter, the individual and contextual variables that contribute to littering, and the effectiveness of various approaches to reducing littering rates.

Technical reports from these two sets of studies are available through the KAB website ([www.kab.org](http://www.kab.org)). In this integrated executive summary, we summarize the basic methodology and results from the two funded studies, highlight key findings, and offer recommendations for ways to integrate these findings into litter prevention activities.

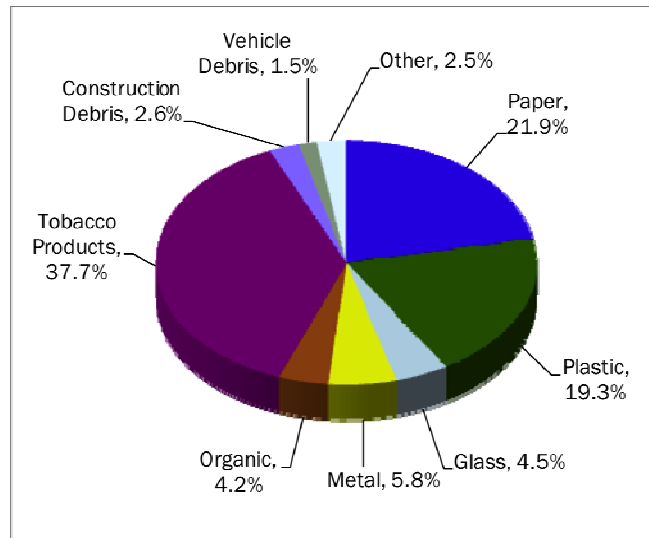
### **1. Litter: Sources, Characterization and Costs**

Throughout this summary, we differentiate between *litter* (the item) and *littering* (the behavior). Litter is any piece of misplaced solid waste, and it can range in size from tiny bits of paper to large appliances and automobiles. While litter accumulates in all areas of the country, roadways are a particular focal point. Across the country, there are about 3.8 million miles of roadway, maintained by national, state, county, and municipal entities. To estimate the amount of litter along roadways, the research team selected a random sample of 240 roadway segments, stratified by type and by rural/urban areas. In each segment, a sample area of 300 x 15 feet was identified along the side of the roadway. Observations were then made of littered objects of 4+ inches within the sample site. Separate observations were made within a 15 x 15 foot subarea for littered objects less than 4 inches.

Using the percentage of found litter in their random national sample, the researchers were able to statistically weight and estimate the amount and types of litter across all roadways. Their results indicate that there are 51.2 billion pieces of litter on roadways nationwide; and of this, the majority (91%, or 46.6 billion pieces) is less than four inches. This estimate translates into 6,729 pieces of litter per mile of roadway (on each side).

The characterization of litter (of all sizes) is shown in Figure 1 below. As shown, the most frequently counted littered items were tobacco products (38%), which were predominantly cigarette butts. Paper (22%) and plastic (19%) comprise the next largest types of materials.

**Figure 1: Aggregate Composition of Litter, All U.S. Roadways**



Each item of observed litter was also coded into a likely source. As might be expected, the majority of roadside litter was attributed to motorists (53%). However, a sizeable percentage was attributed to pedestrians (23%), improperly covered loads (16%), debris from the vehicles themselves (2%), and spillage from receptacles in the surrounding vicinity (1%).

Historically in studies of litter, there has been a specific emphasis on beverage containers. The current estimates project a total of 1.4 billion beverage containers on our nation's roadways (3% of all litter). While the majority of these containers are beer (30%) and soft drinks (25%), there has been a growth in the number of water (6%) and sports drinks (3%).

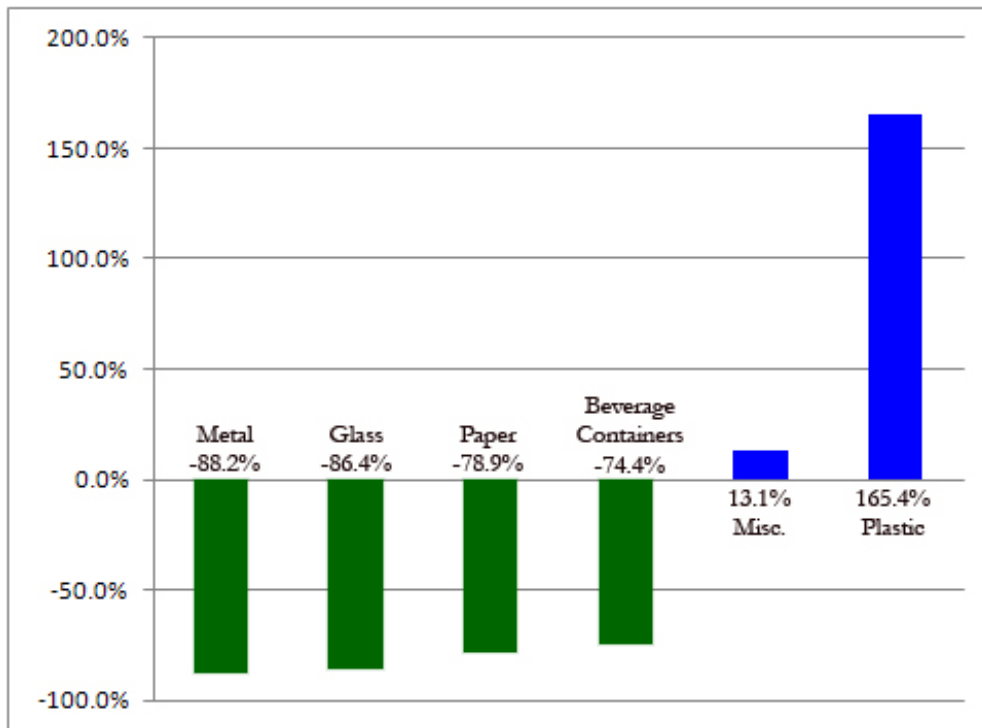
Multi-linear regression analyses were performed of site attributes that correlated with the quantity of observed litter. Key findings included:

- Residential areas were 40% less littered than roadways in general.
- Locations near loading docks were 29% less littered.
- Roadways near convenience stores were 11% more littered.
- Roadways near commercial establishments were 11% more littered.
- Roadways with planted landscaping and flower beds were 37% more littered.
- Solid waste and recycling facilities were associated with less litter than average within 1 mile, but more litter for 2-5 miles. This effect increased as the number of facilities increased.

The methodology used in the 2009 study allowed for comparisons to a 1969 national litter study, also funded by KAB. Several significant conclusions can be drawn when comparing the 1969 and 2009 litter surveys:

- The actual count of overall litter is down by 61% since 1969.
- This decrease, a result of successful education, ongoing cleanup efforts and changes in packaging, is reflected in dramatic reductions of paper, metal and glass litter since 1969.
- Plastic litter has increased by 165% since 1969.

**Figure 2: Change in Litter Since 1969**



The results from these comparisons suggest that litter along roadways, at a national level, decreased by 61% between 1969 and 2009. The reductions are particularly noteworthy in metal (down 88%), glass (down 86%), and paper (down 79%). Reflecting the increasing use of plastic in packaging materials over the past 40 years (+340% per capita, source: U.S. EPA), plastic litter has predictably increased (+165%).

The study also sampled six types of non-roadway areas (180 sampling sites) using the same coding methodology: transition points, storm drains, loading docks, recreation areas, construction sites, and retail sites. Of these, transition sites and storm drains were the most littered, though different litter characteristics were reported at all six types of sites. This is particularly important given that litter near storm drains is likely to wash into local waterways, with potential for serious environmental contamination.

The national costs of litter abatement were estimated using data collected from cities, counties, states, educational institutions, and businesses. Indirect costs were estimated with surveys of real estate brokers, business development officers, property appraisers, and homeowners. While some obstacles were reported in obtaining comparable data from the diverse sources, the available data lead to a projected cost of \$11.5 billion in annual litter clean-up and prevention. The bulk of this (\$9.1 billion) is incurred by businesses. This estimate is likely an underestimate, given that many cleanup costs are buried in staff, maintenance and various departmental budgets.

In addition to the direct costs of litter, the team also explored the indirect costs of litter, particularly to property values and housing prices. The team cites other evidence indicating that the presence of litter in a community decreases property values by 7%. The reported data bear out the impact of litter on property values, as 40 percent of homeowners surveyed think that litter reduces home values by 10-24 percent, while 55 percent of realtors think that litter reduces property values by about 9 percent, and 60 percent of property appraisers would reduce a home's assessed value if it was littered.

## **2. Littering Behavior**

The second set of studies focused on individuals and their littering behaviors. We begin from the assumption that litter is caused by human behavior, whether intentional or accidental. To examine individual littering behaviors, the team conducted three studies: an observational study, intercept interviews with observed litterers, and a nationwide telephone survey.

*Behavioral observations.* In an effort to go beyond the typical self-report measures used to study littering behavior, the research team developed a protocol for observing the disposal behavior of individuals in public places across the country. Nearly 10,000 individuals were observed from 130 different locations in 10 states, with sites evenly split between rural, urban and suburban. Locations included fast food, recreation, gas stations, city centers, rest stops, medical/hospital, bars/restaurants, convenience stores and retail. The majority of observations focused on general disposals (that is, any item). The team also conducted some additional observations focused exclusively on the disposal of cigarette butts.

Each of the 130 sites was coded for refuse infrastructure and existing litter. Across the 130 locations, 118 (91%) had at least one trash receptacle. However, ash receptacles were considerably less common, and only 61 sites (47%) had an ashtray of any kind. Similarly, recycling containers were generally uncommon, and only 16 sites (12%) had at least one recycling bin. Litter was common across the sites, and only two were litter free. The most frequently observed types of existing litter were cigarette butts, miscellaneous paper, and food wrappers.

Commensurate with the volume of litter, our team observed a high amount of littering behavior. Across the sites, our team unobtrusively observed the disposal behaviors of 9,757 randomly selected individuals. Among these, there were 1,962 disposals -- 17% of which were litter. That is, of the individuals we observed disposing of something while they passed through the site, 17% resulted in litter. The most frequently littered items were cigarette butts (57% of all

cigarette butts were littered), along with food remnants and wrappers. These findings are shown below in Table 1. Contrary to expectations, 81% of the littering occurred with notable intent.

**Table 1: Type and Frequency of Disposed Objects**

<u>Item</u>	<u>Proper</u>	<u>Improper</u>	<u>% Littered</u>
Cigarette Butt	146	194	57%
Combo/Mixed Trash	325	12	4%
Paper	251	20	7%
Beverage Cup	180	5	3%
Napkin/Tissue	110	9	8%
Beverage Bottle: Plastic	100	5	5%
Food Remnants	65	16	20%
Food Wrapper	85	14	14%
Beverage Can	59	8	12%
Food Container	57	1	2%
Plastic Bag	38	2	5%
Beverage Bottle: Glass	11	0	0%
Unknown	116	10	8%
Other	77	46	37%
<b>TOTAL</b>	<b>1,620</b>	<b>342</b>	<b>17%</b>

Statistical analyses using multi-level modeling examined the contextual and personal variables that were predictive of littering. Contextual variables included aspects of the physical surroundings, such as availability of trash receptacles, existing litter, weather, and time of day. Personal variables were aspects of the individual, such as their age and gender, as well as motivational variables like awareness, attitudes, and feelings of personal responsibility. The results showed that 15% of littering behavior was attributable to contextual demands, while 85% resulted from the individual. The strongest contextual predictors of littering rates included the availability of trash receptacles (negatively), the distance to the receptacle at the time of disposal (positively), and the amount of litter already present (positively). At the individual level, age was predictive of littering, with older individuals littering less than younger. Surprisingly, gender was not related to littering rates; males and females were equally likely to litter.

A similar set of analyses was conducted on the disposal of cigarette butts. As with littering in general, the majority of cigarette butt litter (62%) was attributable to personal variables, while 38% was due to the contextual demands (primarily lack of disposal infrastructure). Also consistent with the finding for general litter, availability and convenience of ash receptacles was predictive of littering, as was the presence of existing litter (of any type, not necessarily cigarette butt litter).

*Intercept interviews.* The team also conducted intercept interviews with 102 of the observed individuals. While we did not confront the individuals who were observed littering, we did ask questions about attitudes, motivation, and past littering behavior. Among the individuals we interviewed, 23% had just been observed littering. Of these observed litterers, 35% denied

littering in the past month, despite the fact that we had just seen them do so. Across the full 102 interviews, 43% reported littering in the past month. The most frequently reported items were cigarette butts, food wrappers and remnants, and paper. In comparing non-litterers to litterers, a key distinguishing difference was the reported personal obligation not to litter; individuals who were observed littering were much less likely to report a personal obligation to not litter.

*National telephone survey.* The results from the nationwide observations are compared to findings from a random digit dialing telephone survey. A sample of 1,039 residents of the United States completed survey items about their past littering behavior, beliefs and norms about littering, motivators and barriers for proper disposal, and demographics.

In the current 2008 national survey, 15% of the sample reported littering in the past month. By comparison, a 1968 national telephone survey using a nearly-identical set of items found a 50% admitted littering rate. This finding speaks to the dramatic drop in littering and the increase in social disapproval of littering over the past 40 years.

While the overall reported frequency of littering is small, the most commonly reported items were cigarette butts, food remnants (apple core or banana peel), and confections. Respondents reported littering more when: the item was biodegradable, the item was not recyclable, no trashcan was nearby, and when they were in a hurry. Community appearance was associated with littering rates, whereby respondents were less likely to report littering into clean, attractive, and beautified areas.

### 3. Key Findings

The research findings described in this executive summary and detailed in the two technical reports available through the KAB website, support a number of conclusions and recommendations. Below we highlight four key findings from across the studies.

**A. Litter and littering has decreased in the past 40 years,** but it remains an important problem. In the litter characterization study, visible roadside litter was found to have decreased by about 61% since 1968. Similarly, the results from the nationwide telephone survey showed that 15% of Americans reported littering in the past month, down from 50% in 1968.

Yet despite these marked reductions, litter remains an important problem. Nationwide, our research estimates that there are 51.2 billion pieces of litter on our nation's roadways, and the large majority of this litter is less than 4 inches. The nationwide observations showed a national littering rate of 17% -- that is, of all the disposals that take place in public places (at least, the types of places we observed), 17% result in litter.

**B. The cost of litter is substantial.** Litter has a number of negative consequences, including substantial costs to business and government, and reduced property values. Estimates for the cost of litter show that \$11.5 billion are spent on abatement and clean-up activities each year, and this number probably underestimates the true costs.

**C. Preventing litter—the person.** The cumulative results from both sets of studies clearly indicate that individuals are the key source of litter. In fact, the observational results found that

81% of observed littering acts were intentional. Similarly, the litter characterization study estimated that more than 90% of litter found at transition points could be traced back to an individual's disposal decision. Our estimates show that as much as 85% of littering behavior can be attributed to the individual (and conversely, 15% to the context).

Two important person-level variables emerged from our analyses. The first is age, where we consistently find that younger individuals are more likely to litter (and report littering) than older individuals. This group presents a clear market segment for focused messaging and campaigns. But going beyond the passive media and messaging campaigns, the finding also highlights the need to actively involve youth in clean-up and beautification activities. Involving individuals in clean-up activities can help to raise their awareness about litter as an issue, and to increase their commitment to prevent litter. A second variable that emerged from our findings is a personal obligation to not litter. Individuals who hold the belief that littering is wrong, and consequently feel a personal obligation not to litter, are less likely to do so (both in their self-reports, and in their observed littering rates).

**D. Preventing litter—the context.** While it's tempting to focus exclusively on the person as a source of litter, our research clearly shows that littering is a function of both the person and the context. Consequently any effort to reduce litter and littering needs to focus on both.

One of the strongest contributors to littering is the prevalence of existing litter. Consistently in our results, we find that litter begets litter. Individuals are much more likely to litter into littered environments (as seen in the observational studies), and they are less likely to report littering into beautified environments (from the telephone survey). These findings strongly support the need for ongoing clean-up and beautification efforts. Indeed, posting litter prevention messages or signs in already-littered environments is likely to exacerbate the littering problem, rather than fix it.

#### 4. Next Steps

The cumulative results from the research reported in this summary provide a foundation for the next generation of litter prevention activities. In the short section below, we sketch four broad areas of work and next steps.

**A. Areas for new partnerships.** Corporate sponsors have been an ongoing source of support for Keep America Beautiful and its affiliates. While the results from our research show that these partnerships have been fruitful, it also points to industries and materials that constitute a significant portion of litter and thus, a responsibility to support KAB's efforts going forward.

- 1) *Plastics.* The results from the nationwide study of visible litter show a dramatic increase in the amount of plastic litter. This shift highlights a change in consumer materials, as well as packaging practices.
- 2) *Recyclables.* In the early days of litter prevention, the focus was on placing and installing trash receptacles. The current data show that trash receptacles are quite common in public spaces across the country (91% of the public spaces observed by our team had at least one receptacle). But recycling containers are far less common, and there is evidence that

people have a heightened interest in properly disposing of recyclable materials. Recyclable items, particularly paper items, were found to be a noteworthy portion of roadside litter and offer an opportunity to both reduce litter and increase recycling rates at the same time.

- 3) *Cigarette butts*. Across all of the data collected in this project, cigarette butts were the most frequently found pieces of litter, and they were the most frequently littered item.
- 4) *Confections*. In both the observational study and the survey of visible litter, confections emerged as a source of litter.
- 5) *Waste haulers*. Trash and recycling collection vehicles have been found to be a source of litter. When improperly secured during collection and delivery to disposal facilities, these vehicles can contribute to the litter problem, particularly of smaller items. Developing a program in partnership with hauling stakeholders can help to reduce roadside litter.

**B. Messaging.** Given the results showing the central role of the person in producing litter, we recommend developing a consistent set of messages to be used across various media and litter-prevention communications. The results from our research will be instructive for informing such messages, but more importantly, they also suggest strategies to avoid. First, we find no evidence for gender differences in littering rates, and based on these findings, targeting one gender over another seems unwarranted. Second, there is a clear connection between littered environments and littering behavior. The presence of litter conveys a norm that littering is acceptable. Thus, messages that depict litter-strewn environments or images of individuals littering — even when such messages are accompanied by a message that littering is wrong — are inadvisable. The stronger message is one that emphasizes a clean environment, beautification, and the general community norm against littering.

**C. National litter prevention campaign.** The findings from our research indicate that litter and littering remains an important national issue. But the results also show that change is possible, and that both litter and littering have decreased over the past 40 years. To this end, we recommend conducting a multi-year, national litter-prevention campaign. The campaign should be conceived at the national level, but implemented locally through affiliates and partner organizations. The campaign should focus on both contextual and personal variables. At the contextual level, important elements should include: providing available and convenient receptacles, regular and ongoing community clean-ups, and a focus on beautification practices that encourage people not to litter. At the personal level, the campaign should provide media and outreach materials that emphasize clean communities, general social disapproval for littering, and an individual's personal obligation to not litter.

**D. Continued monitoring.** Given the large network of KAB affiliates and partnering organizations, we recommend coordinated data collection and monitoring of both litter and littering. These efforts could include a consistent and integrated system for collecting, coding, and aggregating both accumulated litter, and littering behaviors in communities across the country. In addition, we see value in developing a uniform reporting mechanism for KAB affiliates about the costs of litter that can be rolled up at the national level. And finally, we recommend a data analytic and reporting plan that makes use of this national dataset to track changes in litter, evaluate and inform campaign and program activities, and examine the effects of litter at both the local and national levels.

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In closing, we want to emphasize the importance of focusing on local contexts. While the results from the reported research provide a window into litter and littering behavior in America, there was considerable variability across the country. These findings and recommendations will be useful to structure a national-level program and campaign, but we want to emphasize that littering is primarily a local issue.

The national-level agenda can help to guide and structure litter-prevention efforts, but these activities need to be implemented locally. With its network of more than 1,000 affiliates and participating organizations, Keep America Beautiful is well-positioned to coordinate a national-level campaign with local involvement. In conducting this work, it will be important for local organizations to understand the motivational and structural barriers that exist within their communities, and to devise intervention strategies that are tailored to meet their needs. The research summarized here can provide an excellent starting point, and the national-level findings can help to frame and bring focus to the work. But it is the commitment of local organizations, communities, and ultimately individuals, working in partnership with Keep America Beautiful that will bring an end to litter.



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