

# Q&A: Paper, plastics and penalties. How audits can improve curbside recycling

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For decades, curbside recycling has been a fixture in U.S. neighborhoods as a way to empower ordinary citizens to protect their environment and reduce waste. It's a system, though, that relies on consumers to know what items are recyclable—and which ones can contaminate a delicate ecosystem.

New research from faculty at The Ohio State University Max M. Fisher College of Business examines the effectiveness of one tool that recycling companies, organizations and municipalities can use to limit contamination: curbside recycling audits.

"Our objective was to examine how different forms of curbside audits impacted households' recycling performance," said Erin McKie, assistant professor of operations and business analytics at Fisher and lead author of the paper.

"Specifically, we wanted to find out how curbside feedback of varying severity influenced recycling quality (as measured using household contamination rates) and participation (as measured using recycling cart set-out rates)."

McKie, along with Aravind Chandrasekaran, the Fisher Distinguished Professor of Operations, and Sriram Venkataraman, associate professor at the Darla Moore School of Business at the University of South Carolina, authored the study, which was recently [published](#) in *Production and Operations Management*.

Q&A with Erin McKie:

## **I've heard most of our recycling ends up in landfills...is this true, and why?**

If recycling is too expensive compared to other disposal methods, such as landfilling, then yes, materials may be landfilled. However, the direct landfilling of recyclables is not as widespread of a phenomenon as often suggested by the media. Curbside recycling programs generate nearly \$1 billion dollars in community revenues and recover millions of pounds of materials for reuse annually.

At the same time, markets for recyclable materials are extremely dynamic and profit margins can be very thin. According to industry experts, approximately 100 curbside programs have been canceled in the U.S. in recent years, with even more scaling back their programs. Hence, the threat of program cancellation resulting in landfilled materials is very real and always present.

## **What are the biggest threats to recycling?**

Contamination is one of the largest cost drivers and, accordingly, one of the biggest threats to the [recycling industry](#). It is caused by household-level sorting errors—i.e. when unaccepted or non-recyclable materials are placed in recycling bins. About 20-25% of collected recyclables are contaminated.

Removing contaminants to meet industry quality standards costs material recovery facilities (MRFs) millions of dollars per year in operational costs. These costs can stem from increased plant downtime (a moderately sized MRF can lose \$10,000 for every 10 minutes it is shut down due to contaminants), increased labor sorting fees, spoilage, etc.

In short, contamination is often what causes thousands of tons of

otherwise [recyclable materials](#) to be burned or landfilled, thereby polluting the environment and costing communities millions in foregone recycling revenues. Contamination can make recycling a revenue-negative effort.

Another factor that leads communities to abandon recycling is the lack of program participation. In order for recycling to be profitable, residents must both recycle well and recycle often.

**So, to get a better idea of how well households are recycling, you reviewed curbside audits conducted by a consulting group in Columbus, Ohio. During the auditing process, inspectors examined recycling bins for things that didn't belong. What did the auditors do when they found a contaminant?**

If a contaminant was found, then one of two possible outcomes occurred:

1. The household received a cart warning, wherein their recycling bin was tagged with an information card highlighting which item(s) were improperly recycled. We refer to this as an information-only approach to correct household behaviors.
2. The household received a cart refusal, wherein their recycling bin was tagged with an information card, and, in addition, the household's recycling bin was not emptied. In this case, the resident was required to remove the contaminant to receive service in the future. We refer to this approach as an information-plus-penalty approach to correct household behaviors.

**Did people take offense at being penalized for trying**

## **to recycle something that isn't recyclable?**

No, we found that the information-plus-penalty mechanisms (cart refusals) were very effective. Specifically, households that received this punitive feedback reduced their contamination severity by 59% and were 75% less likely to commit a violation in the future.

Additionally, we found that household recycling participation behavior did not decrease after households received a punitive feedback mechanism.

## **Was this surprising?**

Yes! While the use of curbside auditing mechanisms is promising, recycling industry stakeholders (e.g., recycling education organizations, MRFs, and local community leaders) remain divided on the use of cart audits. Several stakeholders fear that punitive mechanisms such as the cart refusal, in particular, will discourage participation.

However, we found that the opposite occurred—households recycled more when they received either form of feedback (including cart refusal).

Prior to our analysis, we were unaware of any industry or academic study that had examined the granular, household-level effect of these feedback mechanisms to settle this debate.

## **What were some of the caveats from the research?**

While we show that the cart refusal mechanism is effective, to be leveraged, a municipality must first have the political willpower to implement this type of punitive measure.

Second, there are conditions in which the mechanism is more/less effective, for example:

- It is more effective when administered to households with moderate to high education and income levels, and low to moderate population densities.
- It is most effective at reducing the presence of aspirational contaminants (e.g., to-go containers, plastic bags). We did not find evidence that suggested it would work well on more egregious contaminant categories (e.g., trash, bagged and bulky items).
- It is also less effective when administered in areas with older populations and high population densities.

## **How can this research help recycling organizations and municipalities with their efforts?**

In short, the results from our research show that information in the form of cart refusals can help increase the amount of materials captured, in addition to improving captured material quality.

By using the most effective feedback mechanism identified through this study, either exclusively or paired with a courtesy warning, recycling stakeholders can better protect the future of U.S. community recycling programs.

**More information:** Erin C. McKie et al, EXPRESS: How Do Curbside Feedback Tactics Impact Households' Recycling Performance? Evidence from Community Programs, *Production and Operations Management* (2024). [DOI: 10.1177/10591478241234999](https://doi.org/10.1177/10591478241234999). On SSRN:

[papers.ssrn.com/sol3/papers.cfm...?abstract\\_id=4660759](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4660759)

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