

# Sustainable Dining: When Dinner Has to Come to You Instead of You Going to Dinner

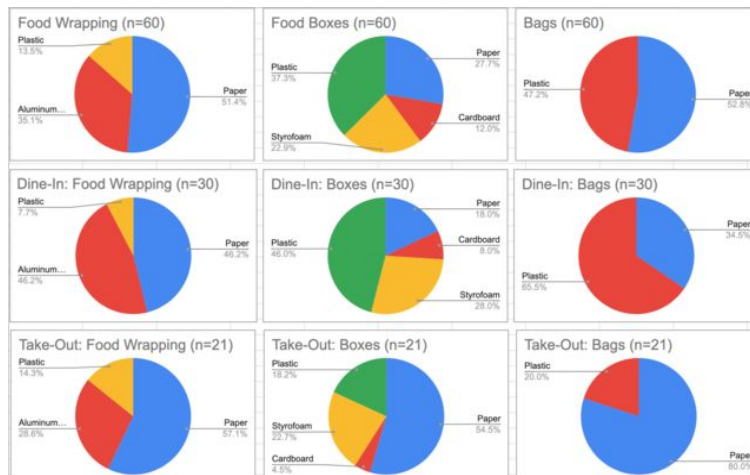
## INTRODUCTION

COVID-19 has turned the world on its head, trapping people in their homes, and ending any possibility of “going out to dinner”. Luckily for restaurants, this does not mean everyone eats frozen meals, or cooks for themselves. Instead, “take out” or “carry out” has become the only way that restaurants can survive, and the only way some of us can find a decent meal. What does this mean for the sustainability of restaurant practices? Instead of porcelain plates and tall glasses, the choices come down to paper, plastic, aluminum foil, and styrofoam. In this paper we first investigate what is being used as packaging and wrapping in a sample of 60 different restaurants. We then ask whether there are any obvious changes in what is being used that would yield big benefits for the environment. In an ideal world we would not be wasting all this packaging on food—but that is not the world in which we live.

## WHAT WE SAMPLED & WHAT WE DISCOVERED

Two rounds of data collection were conducted to better understand current packaging practices of restaurants during the COVID-19 pandemic. During the first round of collection all types of packaging from takeout orders placed over the course of three weeks were recorded. The type of restaurant, its location, and the food ordered were also recorded. After reviewing the initial data from the first collection, we conducted a second collection that categorized each order’s packaging into three categories: packaging used to wrap individual food items, packaging used to “box” or “contain” food, and of course the bags used to carry an entire take-out order. The type of restaurant and the restaurant’s name was also recorded. To analyze the results for both rounds of data collection, we calculated the percentages of the type of material used for each of the three categories of packaging. We also calculated percentages for each material and category for Dine-In (pre-COVID world) and Take-Out restaurants.

**Figure 1:** Percentage of Types of Food Packaging Used



**Table 1.** Most Common Food Packaging Materials

	All Restaurants (n=60)		Dine-In (n=30)		Takeout (n=21)	
Food Wrapping	Paper	51.4%	Aluminum & Paper (tie)	46.2%	Paper	57.1%
Food Boxes	Plastic	37.3%	Plastic	46.0%	Paper	54.5%
Bags	Paper	52.8%	Plastic	65.5%	Paper	80.0%

**PAPER OR PLASTIC... OR ALUMINUM?**

The conversation around whether to opt for paper, plastic, aluminum, or any one of the other alternatives for packaging that has emerged since our society began turning its attention towards the environment has been one long debated. There are numerous factors to be considered: total energy consumption, reusability, cost. But aside from the environmental impact and price of these materials, what must also be taken into account is *how* they are used in order to dictate *what* should be used. Though single-use plastics have overarching environmental consequences such as soil and water contamination (*Why Single-Use Plastics Are Bad—And What You Can Do About It*, 2018), its structural integrity allows food packaged in plastic to last longer, cutting back on food waste, resulting in lower global greenhouse gas emissions when compared to paper packaging (*Paper Bags Could Exacerbate Bread Waste, Particularly in Wake of Coronavirus Panic Purchasing*, 2020). The porous nature of paper intensifies food decay, and with more people buying groceries and cooking at home due to the pandemic, household food waste has increased; electing to switch to paper packaged food could magnify the problem.

Paper, however, isn't the answer for everything. In a study observing the total energy consumption and pollution quantity of paper versus plastic bags, the plastic volume equivalent of one paper bag was found to consume only 87% of the energy necessary for paper manufacturing (Wang, 2008). For all three categories of pollutants measured in the study -- solid waste, water borne waste, and air emissions -- the amount of pollution from paper manufacturing dominated over plastic pollution (Wang, 2008). As seemingly overpowering they have been made out to be, plastic bags constitute less than 0.5% of the plastic waste stream, not to denounce the 100 billion plastic bags that are used annually in the U.S. (*(PDF) Paper, Plastic or Reusable? It's a Mixed Bag – A Case Study of Plastic Bag Legislation in America*, n.d.). But coupled with the fact that EPA studies on the effects of plastic bag bans have no correlative impact on reducing landfilled plastic, plastic bags are less detrimental to the environment when

considering environmental impacts from production and when disposed of correctly (*(PDF) Paper, Plastic or Reusable? It's a Mixed Bag – A Case Study of Plastic Bag Legislation in America*, n.d.). Plastic bags also outdo reusable bags; to equate to one use of a plastic bag, a reusable bag must be used at least 130 times (*(PDF) Paper, Plastic or Reusable? It's a Mixed Bag – A Case Study of Plastic Bag Legislation in America*, n.d.). In a scenario where food is not directly in contact with its packaging, plastic seems to be the more environmentally conscious option over paper. With its caveats, of course.

## LITERATURE REVIEW

**Here we explore what the literature says about the major choices evidence in Figure 1: paper versus aluminum for food wrapping, paper versus plastic for food boxes, and paper versus plastic for carry-out bags.**

### **Food Wrapping:**

According to our results regarding take-out food wrapping options, there was a tie between the use of aluminum and paper wrapping, and a small percentage of plastic wrapping being used within the restaurants. Currently, only about 14% of plastic packaging produced each year is recycled. When compared to the 53% recycling rate for paper, that is a dramatic difference (Guillard, 2018). Although the recycling rate for paper is so high, it is estimated that 25% of all landfill waste is from paper products. In fact, the EPA has stated that paper is the greatest source of landfill methane (Smith, 2011). In regards to manufacturing, paper production has a very high energy consumption and it is the source of 9% of the United States manufacturer's green-house-gas emissions. Alternatively, aluminum foil is most likely used in restaurants because it is a great heat conductor and can be folded and shaped to fit or cover almost anything. Aluminum foil, however, is not as sustainable as we all may have thought. In fact, aluminum foil production is responsible for roughly 1% of the annual green-house-gas emissions (Liu, 2012). This is because it must first be mined in the form of bauxite ore, then must undergo numerous fabrication processes.

It is interesting that our results showed a tie between the use of paper wrapping and aluminum foil wrapping, because it does not seem that one is any better than the other as both products have similar production and recycling issues that will hopefully be addressed in the future. From a restaurant's perspective, deciding whether or not to use paper or aluminum as a wrapping could vary item to item. For example, they might choose aluminum to wrap up the food in order to keep the heat in and because it can be easily molded, or they might choose paper to wrap something in order to soak up anything that may leak from the food item. This could explain the reason why no one wrapping was used more than the other, as restaurant's may not be as concerned about the environmental impacts, and may be more concerned about the overall quality and presentation of the food.

### **Food Boxing:**

The results from our data collection indicated that for take-out boxes used by all restaurants the most common material used was plastic at 37.3%. Coming in at second was paper at 27.7%, then styrofoam at 22.9%, and cardboard at 12.0%. Based on our results and the current ongoing debate over takeaway container materials, we felt that it was important to focus on the top two materials, plastic and paper. While it is a popular belief and assumption that paper would be overall the most sustainable and eco-conscious material, our results and literature review challenge that assumption.

With the increasing use of plastic packaging in almost all areas of the food industry and the increase in awareness of the impact plastic can have on our environment, the assumption that plastic packaging is the worst and least sustainable to use has become mainstream. But while plastic can be considered the least sustainable, this is the case only if it is not recycled or reused. When disposable clear plastic containers are used five or more times, their carbon footprint significantly lowers (University of Manchester, 2018.) The same goes for reusable Tupperware containers, if they are used more than 18 times they are found to have a lower carbon footprint than disposable styrofoam (University of Manchester, 2018.)

These findings call into question whether or not paper really is the most sustainable packaging option in terms of take-out boxes. Although paper take-out boxes are easily compostable, they are unable to be reused like plastic, which allows for more opportunity to generate waste in the first place. With our regards to our results, plastic was the most common material used and this could be alarming for many. But if restaurants continue to offer plastic packaging and customers do their part to reuse that packaging, it could significantly decrease their impacts and extend their life cycle.

### **Food Bags:**

The debate between paper and plastic bags is longstanding, yet rather widely agreed upon. Plastic bag bans have been implemented in municipalities worldwide, while paper alternatives have been praised as the “greener” choice.

It is commonly understood that plastic bags are synthesized from fossil fuels that pollute our air and waterways. The production of plastic bags includes five of the six most hazardous chemicals as ranked by the EPA (Paper or Plastic?, 2007). While it is true that non-biodegradable, polluting plastic has infiltrated our nation’s stores and markets (the US uses 12 million barrels of oil to produce plastic bags annually (Paper or Plastic?, 2007), paper bags aren’t necessarily any better in terms of environmental impact.

The use of toxic chemicals during the production of paper bags contributes to air pollution, acid rain and water pollution to a greater extent than that of plastic (Bell and Cave, 2011). The assumedly natural production process of paper bags is, in reality, filled with both air and water toxins. The process of creating paper bags involves heating wood chips at a high

pressure and temperature in a chemical solution, generating 70% more air and 50 times more water pollutants than plastic bags (Bell and Cave, 2011).

While a withstanding environmental concern is the non-biodegradable nature of plastic bags, it must be noted that modern landfills are not the most apt environment for degradation in general. Landfill pile up creates an environment lacking oxygen, light and water, meaning that even paper bags degrade at a comparably slow rate.

Additionally, it takes 91% less energy to recycle a pound of plastic than to recycle a pound of paper (Bell and Cave, 2011). It takes 4 times as much energy to produce a plastic bag than a paper bag (Paper or Plastic?, 2007). Thus, while plastic bags are often villainized for being non-biodegradable and a large source of litter in the United States, their paper counterpart has similar environmental drawbacks. In terms of consumption of nonrenewable energy, water, climate change, acid rain, air quality, eutrophication of water bodies and solid waste production, paper bags are a worse environmental offender than plastic (Bell and Cave, 2011).

Our data showed that dine-in restaurants used plastic more frequently, while takeout tended to use paper. Take out restaurants and other restaurants with lower price points are often associated with cheaper, more polluting materials, which could be the reason for a trend toward paper. However, the shortcoming of both our data and the literature is the non-environmental factors at play. Restaurants choose their food packaging for a variety of unwritten reasons like aesthetic and functionality.

### **Discussion from Noah:**

From the literature, it can be easy to compare environmental impacts of different materials and decide which option is the “best”. But there are other tacit factors to consider that cannot be found in the literature. Without incorporating the functionality, visuals, and transportation of materials for the business aspect of the restaurant, it is difficult for restaurants to make sustainable changes. The most environmentally conscious option oftentimes is not the most practical one. Sacrificing the integrity of the food in order to use a more sustainable material, e.g. putting soup in paper containers, is not feasible for business. Therefore, sustainable switches must also be practical, which contributes to the challenge restaurants face when moving towards more sustainable operations.

Different materials have different social implications. Similar to picking out chairs to match the tables, using packaging material that is consistent with how socially ornate a restaurant is important to acknowledge. Restaurant owners are also inclined to “upgrade” their materials if their restaurant becomes more lavish; serving filet mignon in a styrofoam container may raise some eyebrows. But serving it in compostable ware may be more fitting and seem representative of a more established and sophisticated business, playing into the status of the restaurant. This habit has the same ramifications for the cost of dining at a restaurant. Perhaps putting \$1 street tacos in microwaveable containers seems a little conflicting.

One final factor to address is transportation: how well will the food be preserved from the time it leaves the restaurant to the dinner table? Two main concerns with take-out is keeping the food warm and keeping it from spilling while in transport. Though styrofoam is one of, if not the worst, materials for the environment, it insulates heat well which is one reason why it is a popular option. Weighing its detrimental impacts after-life against its insulating capabilities, not to mention its comparatively low cost to other materials, restaurants may often resort to using the more cost-effective option that also does the job well. These logical decisions make choosing the more sustainable option a hard ask of restaurants. When profit and revenue comes first, advocating for the Earth must be a practical choice that integrates the needs of restaurants. The restaurant industry has long been stagnant in its ways and change must be compromising and intentional for business, but in an industry so large, every little step counts.

## **CONCLUSION**

There is a vast amount of information out there on the pros and cons of a range of materials used for packaging food as well as making reasoning behind the decision-making process that unique restaurant owners have. The type, scale, and location of the restaurant are also all variables that can come into play when rationalizing choices that are made within each restaurant. The presence of state and local regulation, or lack thereof, can have a significant impact on the materials used at business, for instance, styrofoam bans. It is clear that there is a great amount that is not covered in this paper that plays significant roles in creating a more sustainable restaurant industry.

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