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# FOOD RECALLS

## FDA FOOD RECALL CASE STUDY

Food recalls are one of the main threats to the operation of a food manufacturing company. In the event of the production and sale of a product unsafe for human health, consumer trust is violated, resulting in serious effects on the reputation, profitability and ultimately the survival of the recalling company.

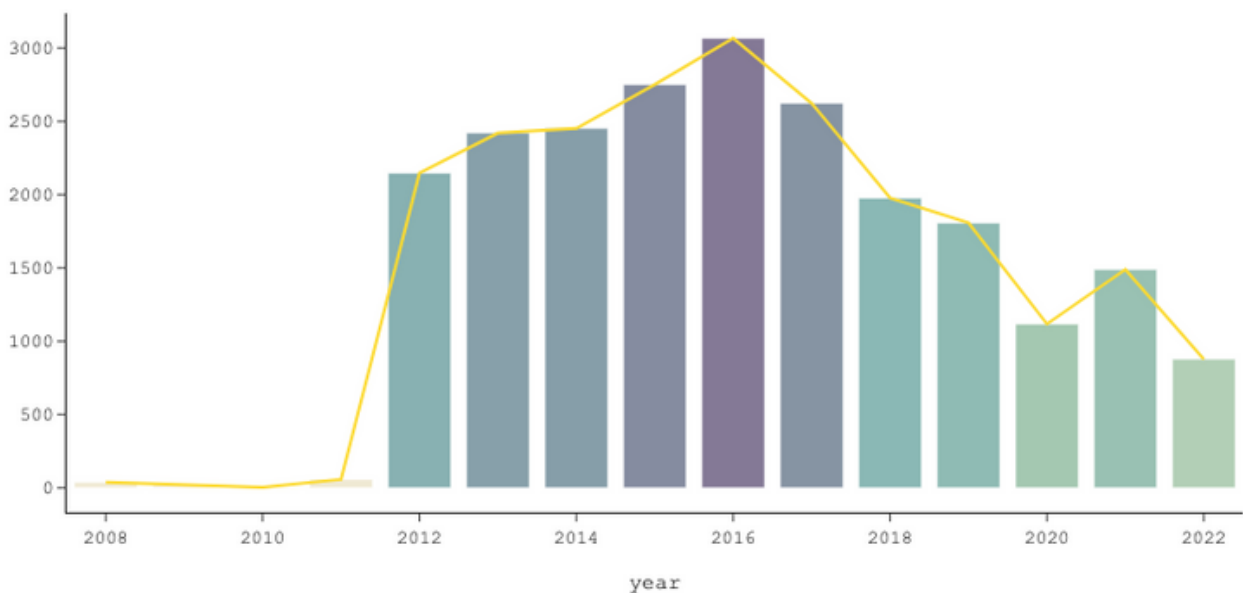
The companies that have to recall their product are expected to face sanctions from the regulatory authorities as well as public pressure from the media. Many studies have been carried out to ascertain the consequences of food recall, and it is confirmed that the direct cost of repairing or replacing a product, is much lower than the actual cost of the recall, due to its indirect consequences.

In addition, the impact on people's health from consuming a dangerous product should not be underestimated. The CDC estimates that each year, "about one in six Americans get sick, 128,000 are hospitalized, and 3,000 die from foodborne illness."

In this project, the case of food recalls in the United States is studied. The dataset used comes from the official FDA page and includes data on all food recalls that occurred from 2008 to 2022. These are 22.840 food recalls and in this study the factors of time, cause and degree of hazard are examined.

Regarding the factor of time, the number of food recalls recorded for each year is given. It is important to point out that for the year 2022, the records concern the period until 06/09/2022. However, it is clear that the number of recalls shows a downward trend from 2016 onwards.

Total number of food recalls per year



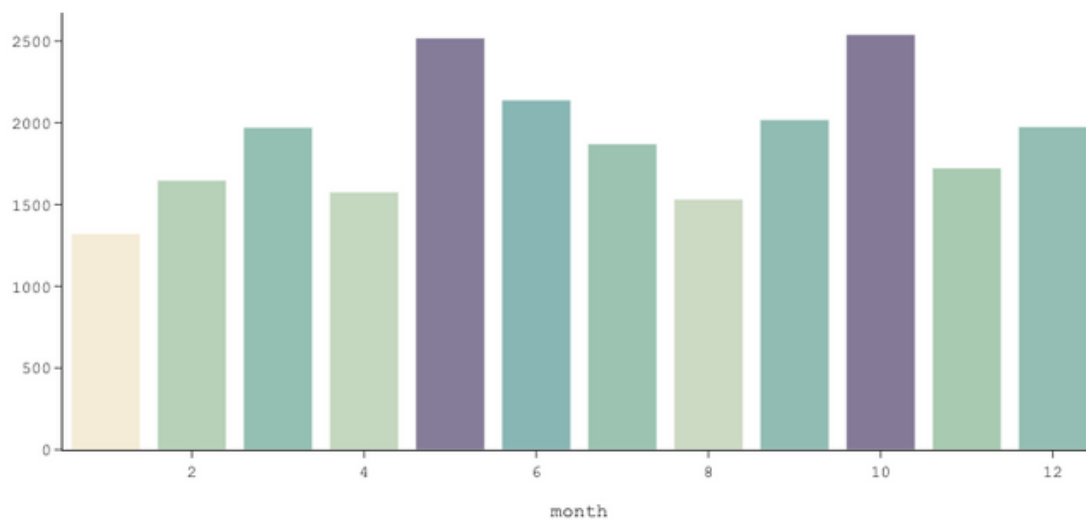
It is noteworthy that for the first 3 years of the data, the records of food recalls are almost zero, while in the year 2012 there is a sharp increase. This can mean either the underestimation of food safety and therefore the lack of checks that would lead to a recall, or the effect of climate change and the economic crisis on food safety.

Those two factors have even emerged among the five top food safety challenges on the Professor's Chris Elliott research 'The five grand challenges to future food safety', published in September 2022. The other three challenges are the antimicrobial resistance, the foodborne viruses of animal origin and the unintended consequences of rushing the sustainability agenda.

Regarding the year 2016 in which there is a significant increase in food recall cases, it is pointed out that it was a critical year for food safety, with many of the incidents receiving a lot of publicity due to their seriousness. The most characteristic of these concerned canned tuna products, frozen or fresh vegetables, but also products such as cookies or waffles, with the main reason being the positive tests for listeria monocytogenes.

It was deemed appropriate to also study the frequency of recording food recalls on a monthly basis, while the relevant diagram is listed below.

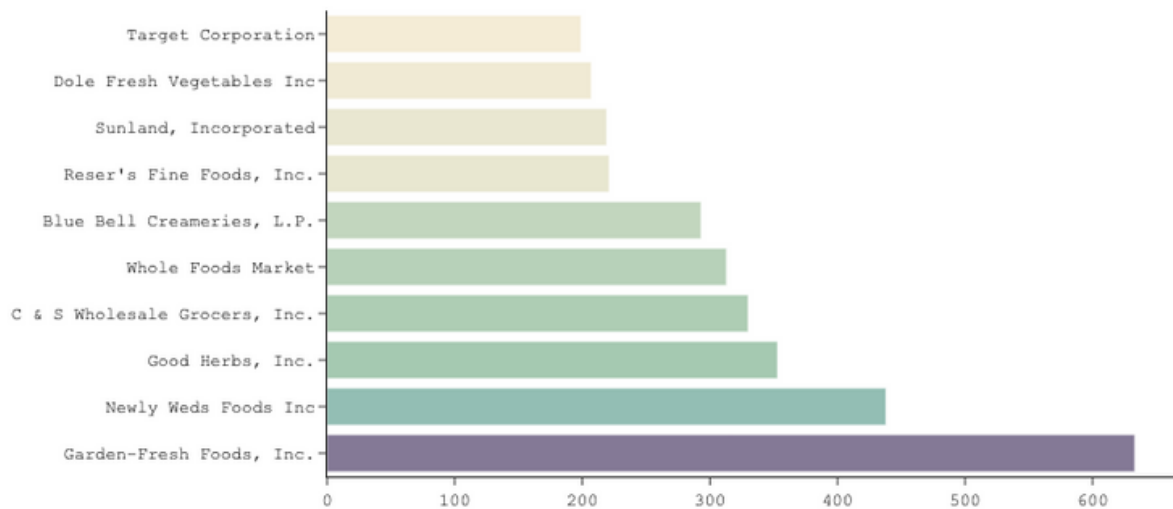
Total number of food recalls per month



It is observed that the month with the significantly lower number of food recall incidents is January, while on the contrary the months of May and October are given to have the most records in the dataset. This visualization could be used as a guide to motivate companies to carry out checks in the production stages preceding these months, in order to avoid a possible recall of a defective product.

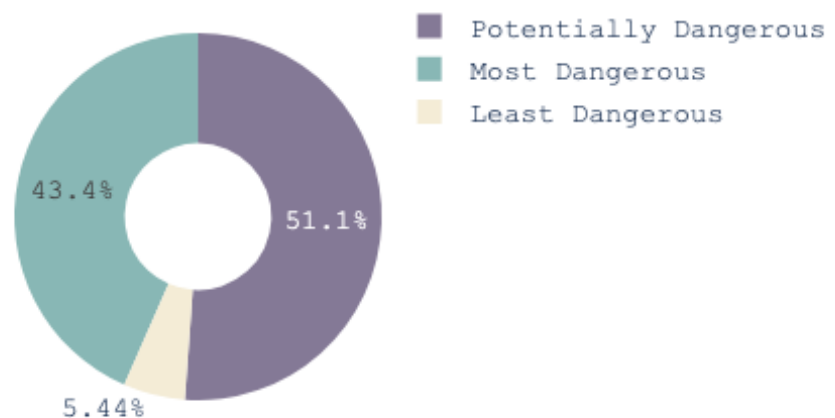
Below is a chart with the ten companies that have recorded the highest number of product recalls. The company Garden-Fresh Foods has this negative lead by a large margin and from the name of the brand it is easy to understand that the "guilty" products are fresh vegetables. As two other companies with similar activity (Good Herbs and Dole Fresh Vegetables) are observed in this list, it becomes clear that there is a need of a good quality control system development in the companies that market fresh vegetables and fruits.

## Firms with the largest number of food recalls



The FDA categorizes recalls into different "categories," based on the risk of unwanted side effects. In the following pie chart, the percentage of each class in the studied dataset is given. Most of the pie is almost equally covered by class 1 and class 2 (Most Dangerous and Potentially Dangerous), while a very small percentage of the order of 5.5% belongs to the lowest risk category.

## Recall Classification



The used dataset includes a column with the announcements that accompanied each food recall. The information in this column is given in text form and usually includes information about the type of product being recalled and the reasons why it was deemed unsafe.

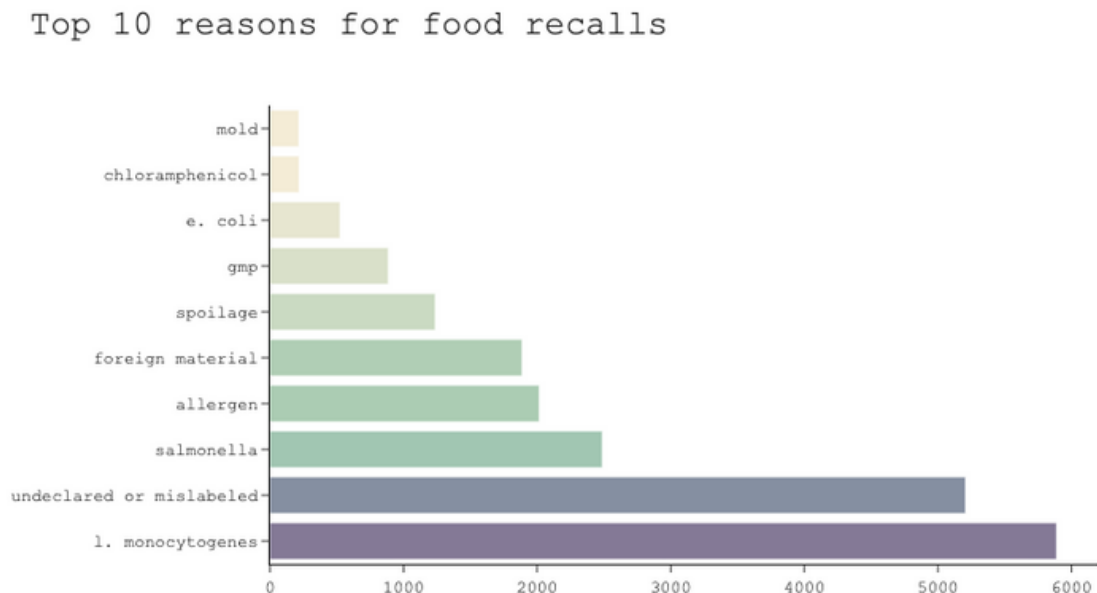
Natural Language Processing methods were applied in order to extract as much information as possible about the types of products most often mentioned in these notices as well as the pathogens. In the following Wordpress, the most used words in this column are visible.



It becomes immediately apparent that the phrase that stars in the texts of the recall notices is *Listeria Monocytogenes*. It is a bacterium widespread in nature that colonizes soil, plants and the intestine of mammals from where it can be transmitted to food for consumption. The disease usually occurs sporadically. Micro-epidemics have been described from contaminated foods such as milk, dairy products (soft cheeses), meat products and fresh vegetables.

With a careful observation, there are also words that highlight the type of product that is recalled (salads, ice cream, dark chocolate), the ingredients for which their inscription on the label was omitted (milk, nuts, soy, eggs), as well as some more pathogens (Salmonella, E. Coli).

In the last graph of this study, the top 10 causes that lead to a food recall are listed. It is interesting to note that the largest percentage of causes is occupied by the following: listeria monocytogenes, undeclared ingredient, salmonella, allergen and foreign material.



Although both of them concern pathogens, it is observed that a large percentage of recalls are also due to omissions to list products - often allergens - on the label (undeclared or mislabeled, allergen). The number of these cases is proportionally very large, if we take into account the ease of avoiding this cause, with careful handling during the design of the packaging and especially the ingredients label.

In conclusion, the insights that can be drawn from this study are as follows. Initially, that the main reason for a recall is contamination by bacteria (l. monocytogenes, salmonella, e. coli) and that a large part of the contaminated food concerns fresh fruits and vegetables. Secondly, a large share in food recall incidents seems to be due to an easily confronted cause, the mislabeled ingredients. Considering the fact that after the year 2017 the cases are decreasing; it could be assumed that the companies are more and more vigilant about the correct and indicative recording of the ingredients of a product on their label.

#### Sources:

'The five grand challenges to future food safety', Professor Chris Elliott

'Thinking about the future of food safety', FAO

[FDA official page](#)

[Kaggle](#)

[Foxnews](#)