Analyzing the nutrition facts & additives in food products

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ABSTRACT

The project aims to address the increasing need for consumers to make informed and healthier food choices amidst a market inundated with products containing harmful additives and high levels of sugar, fat, and sodium. By leveraging data visualization techniques and robust data analysis, the project seeks to empower consumers to navigate the complexities of nutritional information and ingredient lists, thereby facilitating the identification of good and bad consumable products. Through user-friendly visualizations and detailed ingredient analysis, consumers will be equipped with the tools necessary to make healthier choices, ultimately contributing to improved public health outcomes and reduced healthcare costs. The success of the project will be measured based on measurable behavior changes, such as shifts in purchasing patterns and reductions in the consumption of harmful additives.

Keywords: Health, Visualization, Additives

1 INTRODUCTION

In recent years, there has been a growing awareness of the impact of diet on health and well-being. However, amidst this increased awareness, consumers are often faced with the daunting task of deciphering complex food labels and navigating through a sea of products containing potentially harmful additives. This project seeks to address this challenge by developing user-friendly visualization tools that simplify nutritional information and provide insights into ingredient composition. By analyzing data from sources such as Open Food Facts and incorporating insights from existing research, the project aims to empower consumers to make healthier choices and drive positive changes in consumer behavior.

Through a combination of innovative technology, rigorous data analysis, and a commitment to transparency, the project endeavors to contribute to improved public health outcomes and a more informed and healthier society. The problem of choosing healthy and chemical-free food products is a critical concern for consumers worldwide. The food industry is filled with products that may contain harmful additives, and high levels of sugar, fat, and sodium, making it challenging for consumers to make informed and healthy choices. This issue has serious implications for public health, contributing to the rising rates of obesity, diabetes, and other lifestyle-related diseases.

Chemical Additives and Health Concerns:

Many food products contain chemical additives, preservatives, colorings, and flavorings that can have adverse effects on health. Some additives have been linked to allergies, hyperactivity in children, and long-term health issues. Consumers often find it difficult to decipher complex ingredient lists and identify potential hazards.

Hidden Sugar, Fat, and Sodium:

High levels of added sugar, unhealthy fats, and excessive sodium in food products contribute to health problems such as obesity, cardiovascular diseases, and hypertension. Despite efforts to display nutritional information on food labels, consumers may struggle to interpret the data and make healthy choices.

Need for Visualized Nutritional Information:

The complexity of nutritional information and ingredient lists on food labels makes it challenging for consumers to quickly assess the healthiness of a product. Visualizations, such as easy-to-understand graphics or symbols, can help consumers make better decisions by providing a clear overview of a product's nutritional content and the presence of potentially harmful additives.

Public Health Impact:

The consequences of poor food choices are reflected in the increasing rates of diet-related diseases globally. By addressing the confusion around food product selection, we can contribute to improved public health outcomes, reducing the burden on healthcare systems and enhancing the overall well-being of individuals.

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2 RELATED WORK

Several initiatives and strategies have been undertaken to address the challenge of helping customers make informed and healthy choices when it comes to food products. Here are some notable efforts that have been made:

Nutritional Labeling Regulations: Governments and health organizations worldwide have implemented regulations requiring food manufacturers to provide detailed nutritional information on product labels. These labels include information about calories, fat, sugar, sodium, and other key nutrients. However, the effectiveness of these labels in aiding consumer understanding has been debated, as the information can be complex and overwhelming.

Health Apps and Online Platforms: Various mobile applications and online platforms have been developed to help consumers assess the nutritional content of food products. These apps often allow users to scan barcodes or input product information to receive detailed nutritional information. Some platforms also provide personalized recommendations based on individual health goals.

Front-of-Package Labeling: Some countries have introduced front-of-package labeling systems to provide a quick visual indication of a product's healthiness. These labels typically use symbols or color-coded systems to convey information about the product's nutritional profile. However, standardization and widespread adoption of such systems remain a challenge.

Clean Label Movement: The clean label movement emphasizes the use of simple and easily recognizable ingredients in food products. Manufacturers are responding by removing artificial additives, preservatives, and unnecessary chemicals from their formulations. The goal is to provide consumers with a clearer understanding of what they are consuming.

Educational Campaigns: Public health campaigns and educational initiatives aim to raise awareness about the importance of reading food labels and making healthy choices. These campaigns often target specific health issues, such as obesity or diabetes, and provide resources to help consumers navigate the complexities of food labels. There are studies and books published on understanding food labels, the nutrient profile underlying front-of-pack (FOP) nutrition labels, market trends, declaration of ingredients/additives, and durability indication.

Consumer Advocacy Groups: Various consumer advocacy groups focus on promoting transparency in the food industry. They conduct research, publish reports, and advocate for clearer labeling practices, urging manufacturers to reduce the use of harmful additives and provide more understandable information for consumers.

Corporate Initiatives: Some food manufacturers and retailers are taking proactive steps to improve the nutritional quality of their products. This includes reformulating recipes to reduce sugar, salt, and unhealthy fats, as well as providing additional information to help consumers make healthier choices.

While these efforts represent positive strides, challenges persist in creating a standardized, user-friendly solution that effectively addresses the complexities of nutritional information and ingredient lists. The ongoing evolution of technology, consumer preferences, and regulatory landscapes will likely continue to shape future initiatives in this space.

3 IMPLEMENTATION

A dataset comprising 3,154,448 observations from an open food facts data repository was collected for the analysis. Considering the computational power limitations, a smaller sample set of 10,000 data points from this repository was utilized for the analysis. Employing a combination of R programming and Python libraries, data cleaning and preprocessing was done, paving the way for an effective exploratory data analysis.

This analysis assisted in discerning patterns in various nutritional aspects such as food additives, nutrition score, added sugar, sodium, and fat content. Leveraging Tableau's graphical user interface, we designed a comprehensive visualization system. The approach included employing packed bubbles charts to quantify the number of additives in each product, treemaps to depict sodium levels, stacked bars for comparing sugar content across products, and text tables to highlight nutrition values like calories, carbohydrates, fats, and protein.

Subsequently, these visualizations were synthesized into an interactive dashboard, offering dynamic views for enhanced data exploration and insights. The visual model engaged for the project to showcase the database is narrated in the sections below.

Layout: Utilized a clean and intuitive layout for the main product information screen and implemented a scrollable layout for detailed nutritional information and ingredient analysis. A dashboard layout for personalized recommendations and user settings is also included.

Interactive Elements: Incorporated interactive elements such as tooltips for detailed information on data points. Implemented swipe or tap gestures for easy navigation between different charts and screens.

Color Coding: Used a consistent color scheme for visual indicators to maintain clarity and user understanding. Employed color coding for highlighting healthy and unhealthy attributes.

Following the creation of the Tableau dashboard, it was embedded into the PureChoice website to enable user engagement and interaction.

4 RESULTS AND DISCUSSION

Through the exploratory data analysis, it was discovered that, on average, each food product contains approximately three additives. Furthermore, from a subset of 2,600 observations, we observed that over 200 products have more than 10 additives.

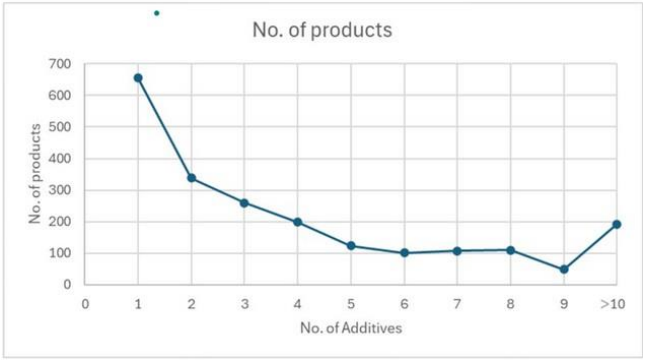

Figure 1: No. of additives vs No. of products

The following list comprises the top 20 additives identified in food products.

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Top 20 Additives:
1. E322 - Lecithins: 922
2. E322i - Lecithin: 898
3. E330 - Citric acid: 520
4. E500 - Sodium carbonates: 363
5. E102 - Tartrazine: 344
6. E500ii - Sodium hydrogen carbonate: 330
7. E129 - Allura red: 300
8. E133 - Brilliant blue FCF: 278
9. E471 - Mono- and diglycerides of fatty acids: 263
10. E415 - Xanthan gum: 256
11. E414 - Acacia gum: 238
12. E110 - Sunset yellow FCF: 207
13. E903 - Carnauba wax: 196
14. E412 - Guar gum: 182
15. E450 - Diphosphates: 180
16. E296 - Malic acid: 178
17. E211 - Sodium benzoate: 174
18. E202 - Potassium sorbate: 162
19. E422 - Glycerol: 158
20. E407 - Carrageenan: 141
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It was observed that the average nutrition score for the sampled food products is 11, indicating a relatively low nutritional value. Furthermore, 36% of the products exhibited a nutrition score below 10. To visualize this distribution, a pie chart was utilized to showcase the varying nutrition scores across different products.

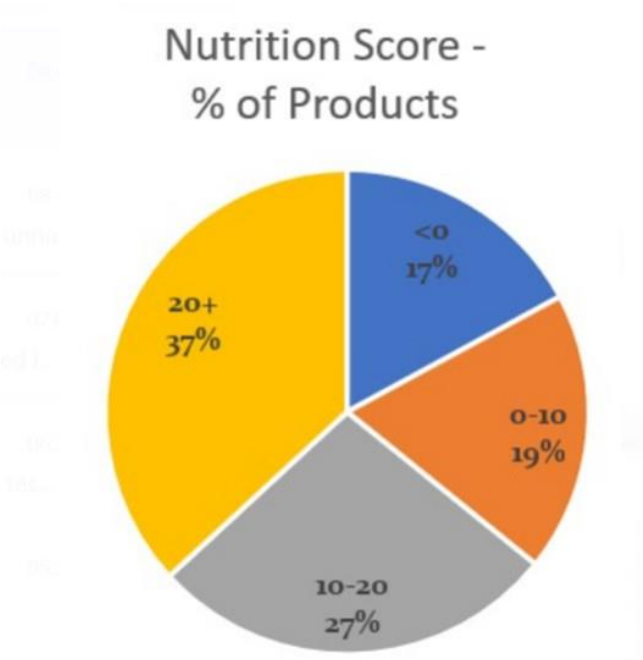

Figure 2: Pie chart showing nutrition score of sample dataset

The food products were effectively categorized and ranked based on their nutrition score within the

sample. Below are the food items identified within the top 8 list according to their nutrition score.

1. "Natural Nut Collection"
2. "Microwavable Brussels Sprouts"
3. "Quick cook sprout halves, brussel sprouts"
4. "Super shreds superfoods, sprouts shreds"
5. "Habanero hummus"
6. "Blue mountain country, butter beans"
7. "Apricot halves in fruit juice"
8. "Organic tomato pulp"

Furthermore, the analysis reveals that the average amount of sugar added to food items is 20g per 100g.

Subsequently, a comprehensive interactive nutrition dashboard was generated featuring packed bubbles charts, treemaps, stacked bars, and text tables. These visualizations categorize the data into "Healthy" and "Unhealthy" amounts for easier interpretation. This empowers users to make informed and healthier food choices through visualized nutritional information.

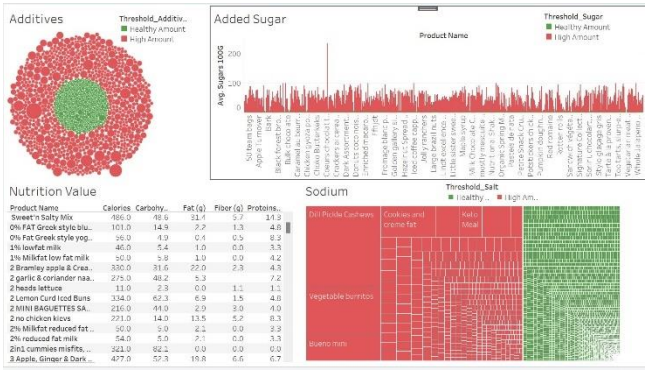

Figure 3: Tableau Visual Dashboard

Other features of the dashboard include the following:

User-Friendly Integration: Unlike other solutions that may have complex interfaces or lack seamless integration with users' daily routines, our visualization is designed to be highly user-friendly.

Comprehensive Visualizations: The use of visual indicators, such as graphics, symbols, or color-coded elements, sets our solution apart. It provides a comprehensive and easily understandable overview of nutritional information and the presence of harmful additives. This goes beyond standard labeling or apps that may not prioritize visual clarity.

Ingredient Analysis: The inclusion of ingredient analysis sets this solution apart from alternatives. Users can delve into the specific additives, preservatives, and artificial ingredients in a product, catering to the increasing consumer demand for transparency and clean label products.

Data Accuracy and Transparency: Rigorous processes to ensure the accuracy of nutritional information and ingredient data, coupled with transparency about data sources, build trust with users. This commitment to data accuracy distinguishes our solution from alternatives that may not prioritize the same level of transparency and reliability.

5 CONCLUSION AND FUTURE WORK

The project aims to increase awareness of the visualization model for analyzing nutritional facts. This also aims to influence positive changes in user behavior, leading to a preference for products with healthier indicators.

Expected Impact:

The expected impact of the project is to empower consumers to make healthier and more informed food choices, leading to improved overall well-being. The project aims to contribute to the following positive outcomes:

Increased Health Awareness: Users will gain a better understanding of the nutritional content of food products, fostering increased awareness of their dietary choices.

Reduced Consumption of Harmful Additives: The project seeks to decrease the consumption of food products containing harmful additives, artificial ingredients, and excessive levels of sugar, fat, and sodium.

Improved Dietary Decision-Making: Users will be equipped with tools and information that enhance their ability to make dietary decisions aligned with their health goals and preferences.

Positive Changes in Consumer Behavior: The project aspires to influence positive changes in consumer behavior, steering individuals towards choosing healthier options and influencing purchasing patterns.

Measurement Metrics:

Changes in Purchasing Patterns: Analyze purchasing data to identify shifts in consumer behavior, such as increased selection of products with healthier indicators.

Reduction in Harmful Additive Consumption: Conduct surveys or studies to measure changes in user behavior related to the avoidance of harmful additives and preference for cleaner labels.

Success Criteria:

The project will be considered successful if it achieves the following milestones:

Measurable Behavior Changes: Measurable changes in user behavior, such as an increased preference for products with healthier indicators and a decrease in the consumption of products with harmful additives.

In summary, the success of the project will be determined by its ability to positively impact user behavior, achieve widespread adoption and contribute to lasting changes in the way consumers approach their food choices. The defined success criteria will serve as benchmarks to measure the project's effectiveness in achieving its intended outcomes.

Limitations and future work

The project can be extended with the full dataset based on computational availability. Also, the establishment of robust processes to ensure the accuracy of nutritional information and ingredient data. Transparent presentation of data sources and regular updates. We need to establish processes for sourcing accurate and up-to-date nutritional information and ingredient data. This may involve partnerships with reliable data providers to maintain data accuracy and transparency.

The search facility on the website is limited by its inability to provide information based on the name of the product.

Website: https://john602917.wixsite.com/purechoice

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