USDA FDC Food Component Analysis

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Background

- The United States Department of Agriculture (USDA) analyzes foods to determine their nutrient content.
- Analyzing the complete set of nutrients for specific foods can cost upwards of $50,000.
- To become more cost-efficient, the USDA would like to gain a better understanding of which nutrients and components change over time and which do not. This way, they can assess what needs to be analyzed and what does not.
- Given two datasets: SR Legacy and Foundation Foods
- The SR Legacy dataset is a pre-2019 list of food nutrient content values (mean, min, max, and standard error).
- The Foundation Foods dataset is the most current list of food nutrient content values (mean, min, max, and standard error).

Have food components changed over time?
If so, how & why?

Approach

- Using Python & Pandas, slim down the given Foundation Foods (FF) and SR Legacy (SR) datasets

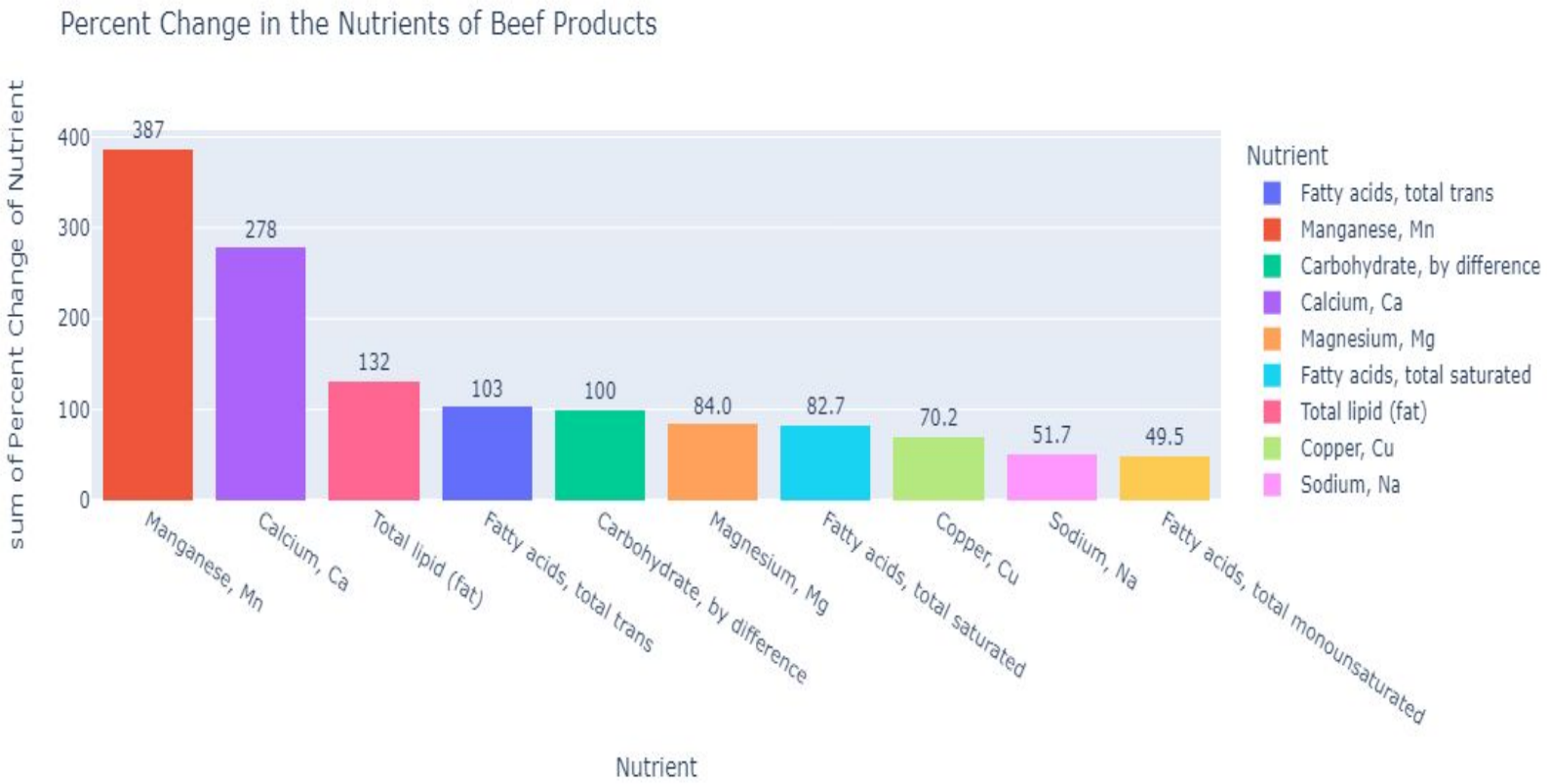
- Product: a six column data frame that describes each food item in the FF and SR datasets
  - Description of the food item
  - Identification for the food group the food item belongs to
  - Name of the nutrient in the food that was analyzed
  - Mean amount of nutrient per 100g of the food (from SR)
  - Mean amount of nutrient per 100g of the food (from FF)
  - The percent change of the nutrient between SR and FF

- Using this data frame, create histograms that display the ten most changed nutrients per food group

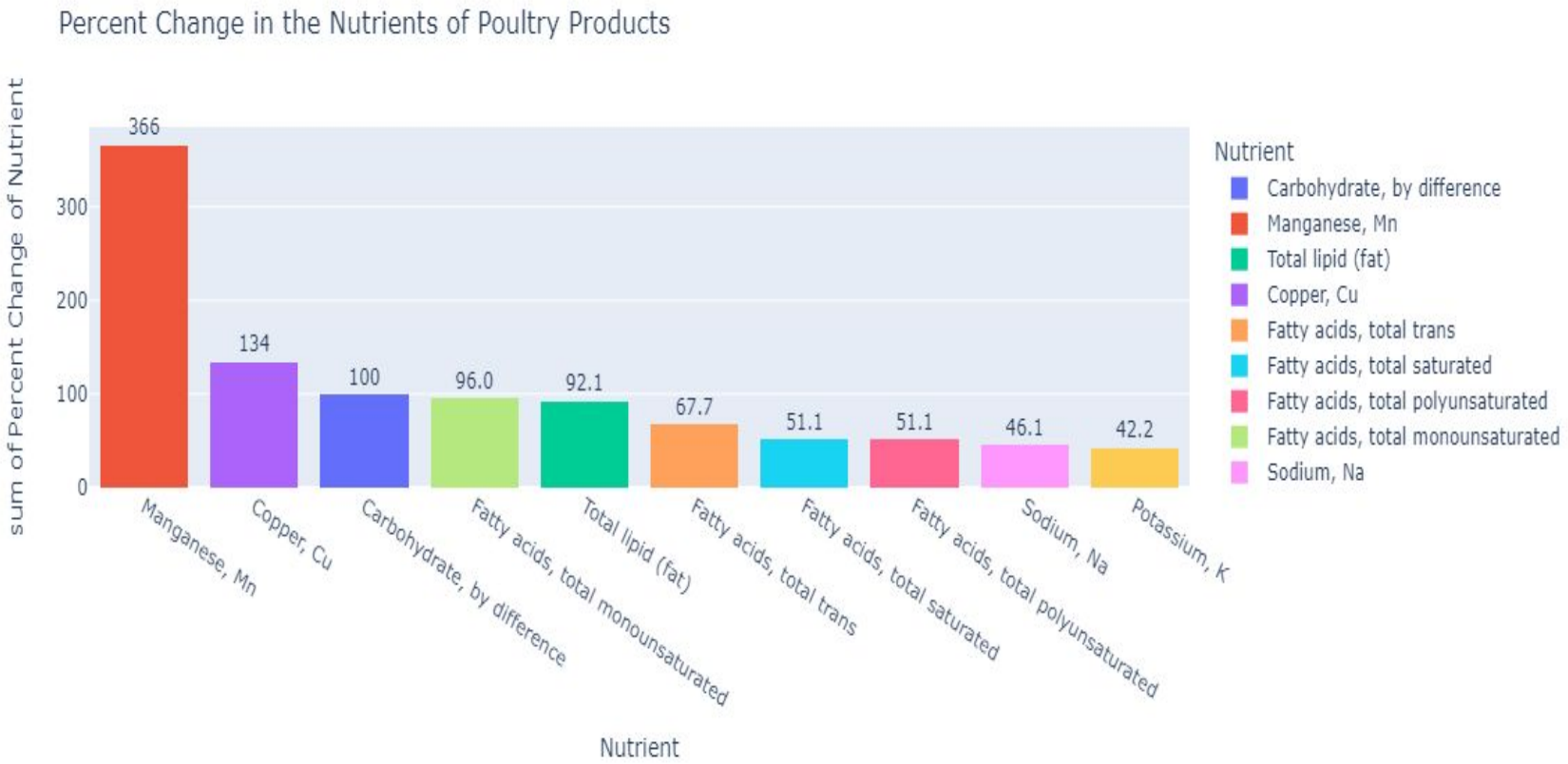
- Use histograms to better understand which nutrients change the most over time

Visualizing the Data

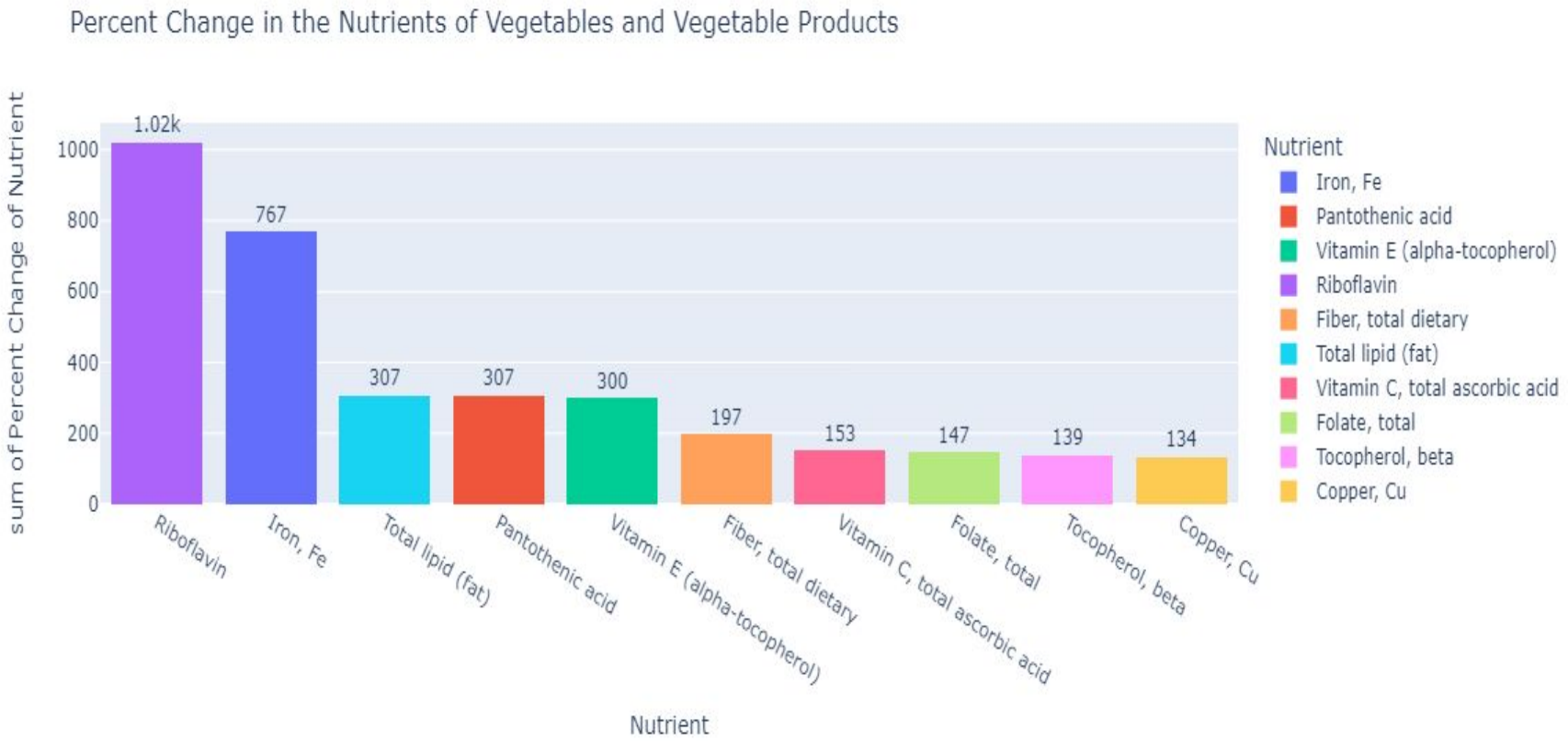
LIVESTOCK


Percent Change in the Nutrients of Beef Products
sum of Percent Change of Nutrient
400
300
200
100
0
387
278
132
103
100
84.0
82.7
70.2
51.7
49.5
Manganese, Mn
Calcium, Ca
Total lipid (fat)
Fatty acids, total trans
Carbohydrate, by difference
Magnesium, Mg
Fatty acids, total saturated
Copper, Cu
Sodium, Na
Fatty acids, total monounsaturated
Nutrient
Nutrient
Fatty acids, total trans
Manganese, Mn
Carbohydrate, by difference
Calcium, Ca
Magnesium, Mg
Fatty acids, total saturated
Total lipid (fat)
Copper, Cu
Sodium, Na

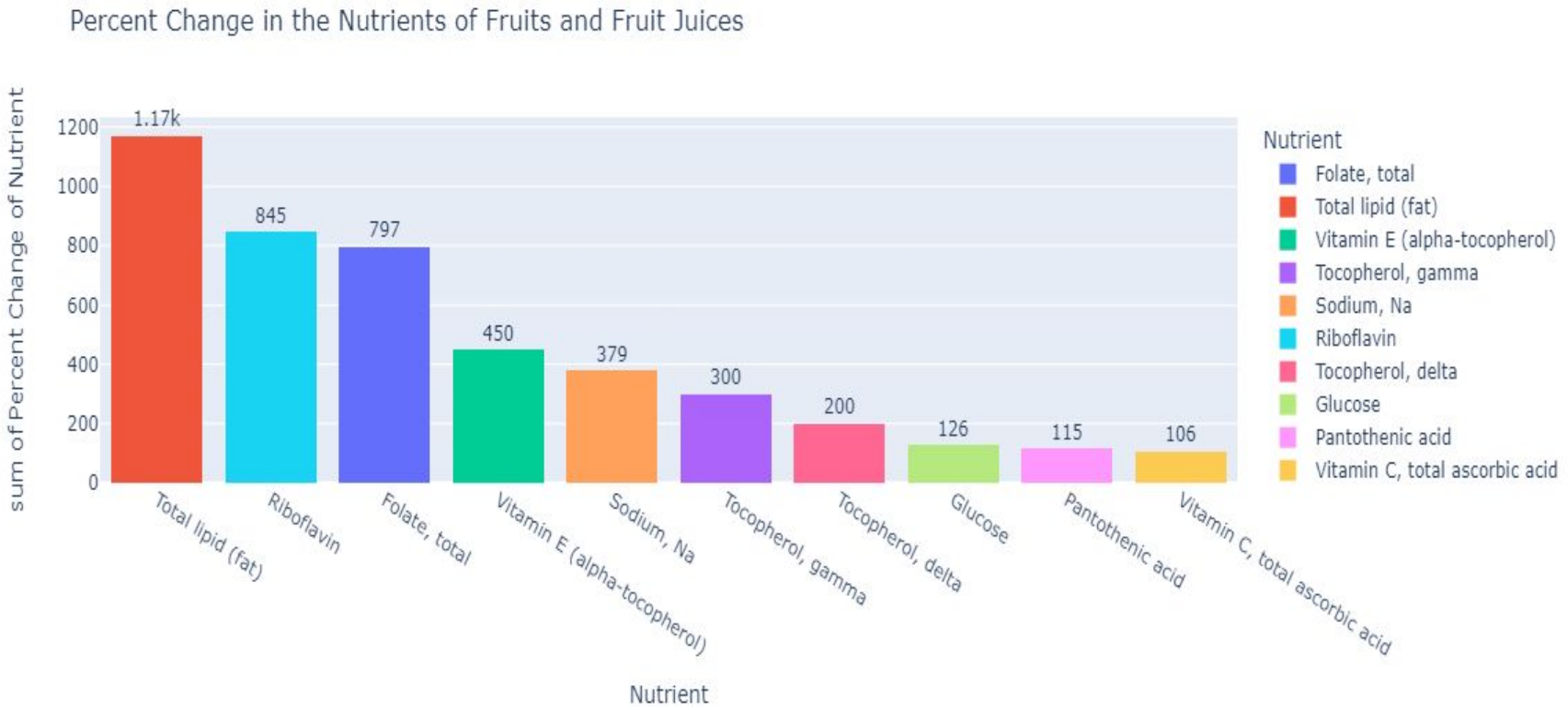
LIVESTOCK


Percent Change in the Nutrients of Poultry Products
sum of Percent Change of Nutrient
0
100
200
300
366
134
100
96.0
92.1
67.7
51.1
51.1
46.1
42.2
Manganese, Mn
Copper, Cu
Carbohydrate, by difference
Fatty acids, total monounsaturated
Total lipid (fat)
Fatty acids, total trans
Fatty acids, total saturated
Fatty acids, total polyunsaturated
Sodium, Na
Potassium, K
Nutrient
Nutrient
Carbohydrate, by difference
Manganese, Mn
Total lipid (fat)
Copper, Cu
Fatty acids, total trans
Fatty acids, total saturated
Fatty acids, total polyunsaturated
Fatty acids, total monounsaturated
Sodium, Na

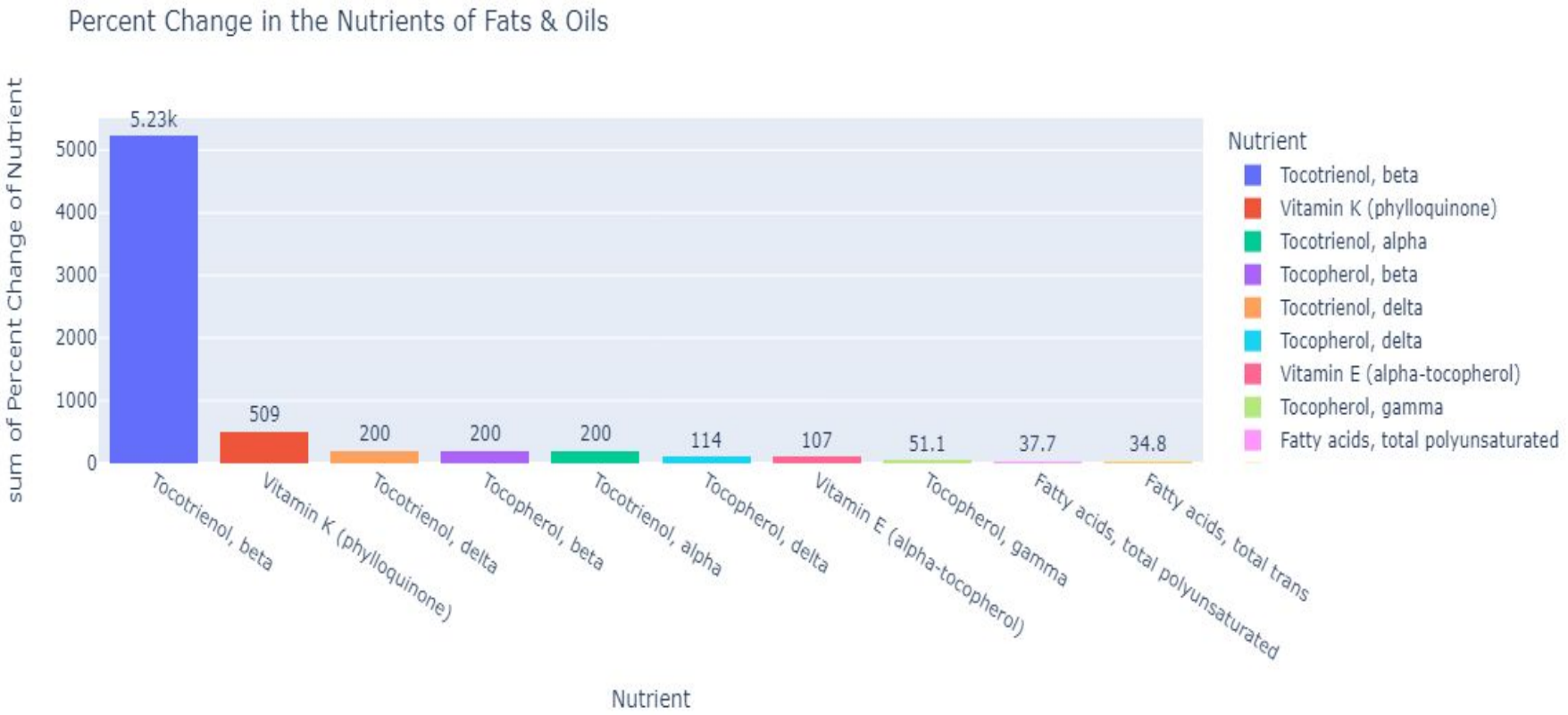
PLANTS


Percent Change in the Nutrients of Vegetables and Vegetable Products
sum of Percent Change of Nutrient
1000
800
600
400
200
0
1.02k
767
307
307
300
197
153
147
139
134
Riboflavin
Iron, Fe
Total lipid (fat)
Pantothenic acid
Vitamin E (alpha-tocopherol)
Fiber, total dietary
Vitamin C, total ascorbic acid
Folate, total
Tocopherol, beta
Copper, Cu
Nutrient
Nutrient
Iron, Fe
Pantothenic acid
Vitamin E (alpha-tocopherol)
Riboflavin
Fiber, total dietary
Total lipid (fat)
Vitamin C, total ascorbic acid
Folate, total
Tocopherol, beta
Copper, Cu

PLANTS

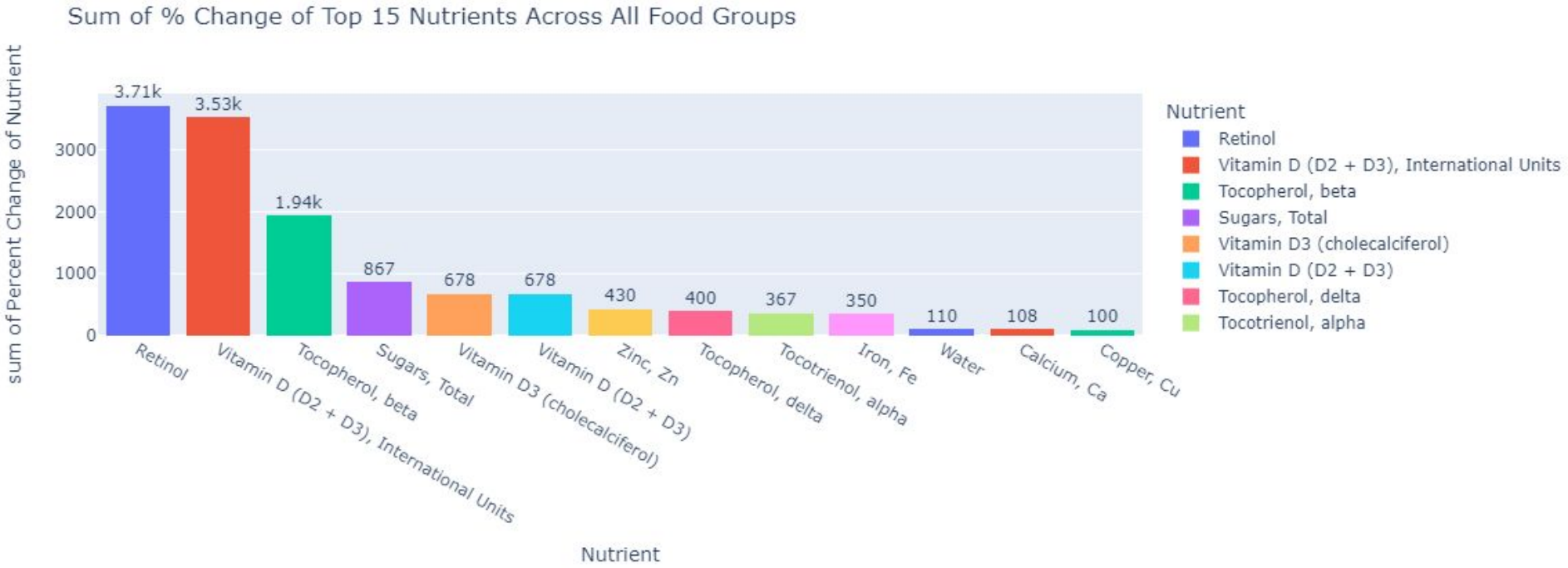

Percent Change in the Nutrients of Fruits and Fruit Juices
sum of Percent Change of Nutrient
1200
1000
800
600
400
200
0
1.17k
845
797
450
379
300
200
126
115
106
Total lipid (fat)
Riboflavin
Folate, total
Vitamin E (alpha-tocopherol)
Sodium, Na
Tocopherol, gamma
Tocopherol, delta
Glucose
Pantothenic acid
Vitamin C, total ascorbic acid
Nutrient
Nutrient
Folate, total
Total lipid (fat)
Vitamin E (alpha-tocopherol)
Tocopherol, gamma
Sodium, Na
Riboflavin
Tocopherol, delta
Glucose
Pantothenic acid
Vitamin C, total ascorbic acid

OUTLIERS

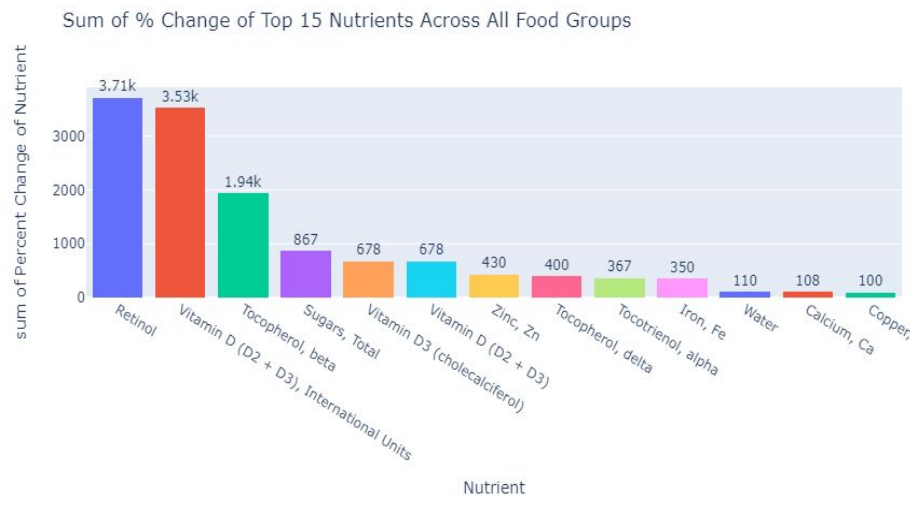

Percent Change in the Nutrients of Fats & Oils
sum of Percent Change of Nutrient
5000
4000
3000
2000
1000
0
5.23k
509
200
200
200
114
107
51.1
37.7
34.8
Tocotrienol, beta
Vitamin K (phylloquinone)
Tocotrienol, delta
Tocopherol, beta
Tocotrienol, alpha
Tocopherol, delta
Vitamin E (alpha-tocopherol)
Tocopherol, gamma
Fatty acids, total polyunsaturated
Fatty acids, total trans
Nutrient
Nutrient
Tocotrienol, beta
Vitamin K (phylloquinone)
Tocotrienol, alpha
Tocopherol, beta
Tocotrienol, delta
Tocopherol, delta
Vitamin E (alpha-tocopherol)
Tocopherol, gamma
Fatty acids, total polyunsaturated

Findings and Suggestions

FINDINGS


Sum of % Change of Top 15 Nutrients Across All Food Groups
sum of Percent Change of Nutrient
3000
2000
1000
0
3.71k
3.53k
1.94k
867
678
678
430
400
367
350
110
108
100
Retinol
Vitamin D (D2 + D3), International Units
Tocopherol, beta
Sugars, Total
Vitamin D3 (cholecalciferol)
Vitamin D (D2 + D3)
Zinc, Zn
Tocopherol, delta
Tocotrienol, alpha
Iron, Fe
Water
Calcium, Ca
Copper, Cu
Nutrient
Nutrient
Retinol
Vitamin D (D2 + D3), International Units
Tocopherol, beta
Sugars, Total
Vitamin D3 (cholecalciferol)
Vitamin D (D2 + D3)
Tocopherol, delta
Tocotrienol, alpha

Suggested Solution



- Generally prioritize analyzing micronutrients over macronutrients with the exception of sugars
- Similar trends can be noticed across similar food groups (meats vs. meats, plants vs. plants)
- Certain nutrients have drastic increases due to an initially extremely small content
- “The most widely used vehicles for fortification are among the most commonly consumed foods, including oils and fats, milk, sugar, salt, rice, wheat, or maize flour” (WHO)
- Other sources include genetic modification and new developments in the food industry (WHO)
- Macronutrient contents have not changed much due to already making up a majority of food by mass