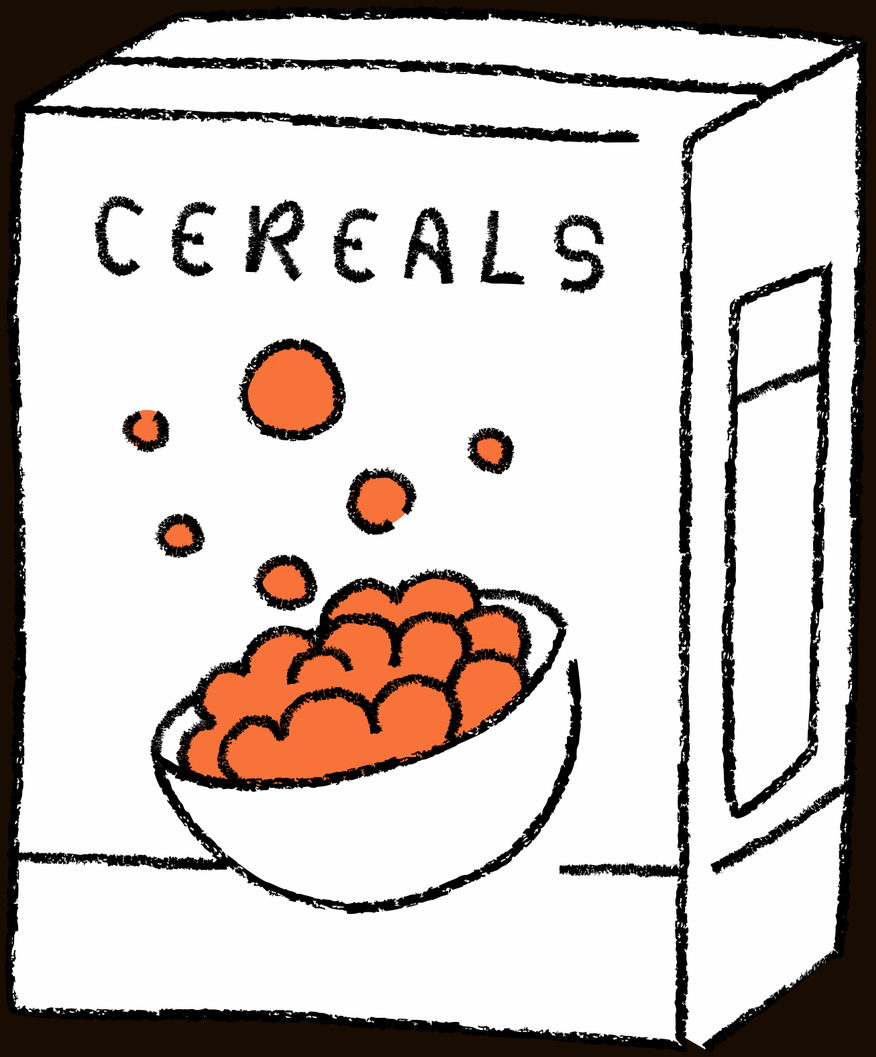
80 Cereals Health Conscious Consumers



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Content

Introduction

In recent years, there has been a growing trend of health-conscious consumers who pay close attention to the nutritional content of their food. A notable example is a well-known cereal brand that revamped its product line to focus on healthier options. They introduced cereals with lower calories, higher fiber, and reduced sugar content. As a result, their sales increased significantly, and customer satisfaction improved.

Despite the success stories, many cereal brands still struggle to find the right balance of nutrition that appeals to consumers. Address this problem by examining how different nutritional elements, such as calories, fiber, and sugar, influence cereal ratings. By understanding these factors, cereal manufacturers can create products that better meet consumer preferences and improve their market performance.

Data Source

The data used in this project was sourced from the Kaggle website, a popular platform for data science and machine learning datasets. The dataset contains information on 80 Cereals

Dataset Details
Source: Kaggle
Link to Dataset: https://www.kaggle.com/datasets/crawford/80-cereals

name	mfr	type	calories	protein	fat	sodium	fiber	carbo	sugars	potass	vitamins	shelf	weight	cups	rating
100% Bran	N	C	70	4	1	130	10	5	6	280	25	3	1	0.33	68.40297
100% Natural Bran	Q	C	120	3	5	15	2	8	8	135	0	3	1	1	33.98368
All-Bran	K	C	70	4	1	260	9	7	5	320	25	3	1	0.33	59.42551
All-Bran with Extra Fiber	K	C	50	4	0	140	14	8	0	330	25	3	1	0.5	93.70491
Almond Delight	R	C	110	2	2	200	1	14	8	-1	25	3	1	0.75	34.38484
Apple Cinnamon Cheerios	G	C	110	2	2	180	1.5	10.5	10	70	25	1	1	0.75	29.50954

Methodology

Here is a step-by-step outline of our methodology

- Import Necessary Libraries
- Import the Data

```
# data wrangling
import pandas as pd
import numpy as np
import warnings
warnings.simplefilter("ignore")

# data visualization
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px

# Data modeling
from sklearn.cluster import KMeans
```

```
# import data

df = pd.read_csv("cereal.csv")
```

```
df.head()
```

	name	mfr	type	calories	protein	fat	sodium	fiber	carbo	sugars	potass	vitamins	shelf	weight	cups	rating
0	100% Bran	N	C	70	4	1	130	10.0	5.0	6	280	25	3	1.0	0.33	68.402973
1	100% Natural Bran	Q	C	120	3	5	15	2.0	8.0	8	135	0	3	1.0	1.00	33.983679
2	All-Bran	K	C	70	4	1	260	9.0	7.0	5	320	25	3	1.0	0.33	59.425505
3	All-Bran with Extra Fiber	K	C	50	4	0	140	14.0	8.0	0	330	25	3	1.0	0.50	93.704912
4	Almond Delight	R	C	110	2	2	200	1.0	14.0	8	-1	25	3	1.0	0.75	34.384843

Methodology

Data Wrangling

- Check Missing Values: Examined the dataset for missing values.
- Data Types: Verified the data types of each column.

```
# check for missing value

df.isnull().sum()
```

```
name        0
mfr         0
type        0
calories    0
protein     0
fat         0
sodium      0
fiber       0
carbo       0
sugars      0
potass      0
vitamins    0
shelf       0
weight      0
cups        0
rating      0
dtype: int64
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 77 entries, 0 to 76
Data columns (total 16 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   name      77 non-null     object
 1   mfr       77 non-null     object
 2   type      77 non-null     object
 3   calories  77 non-null     int64
 4   protein   77 non-null     int64
 5   fat       77 non-null     int64
 6   sodium    77 non-null     int64
 7   fiber     77 non-null     float64
 8   carbo     77 non-null     float64
 9   sugars    77 non-null     int64
 10  potass    77 non-null     int64
 11  vitamins  77 non-null     int64
 12  shelf     77 non-null     int64
 13  weight    77 non-null     float64
 14  cups      77 non-null     float64
 15  rating    77 non-null     float64
dtypes: float64(5), int64(8), object(3)
memory usage: 9.8+ KB
```

Methodology

Data Information: Basic statistics and information about the dataset

```
# basic statistics and information

df.describe()
```

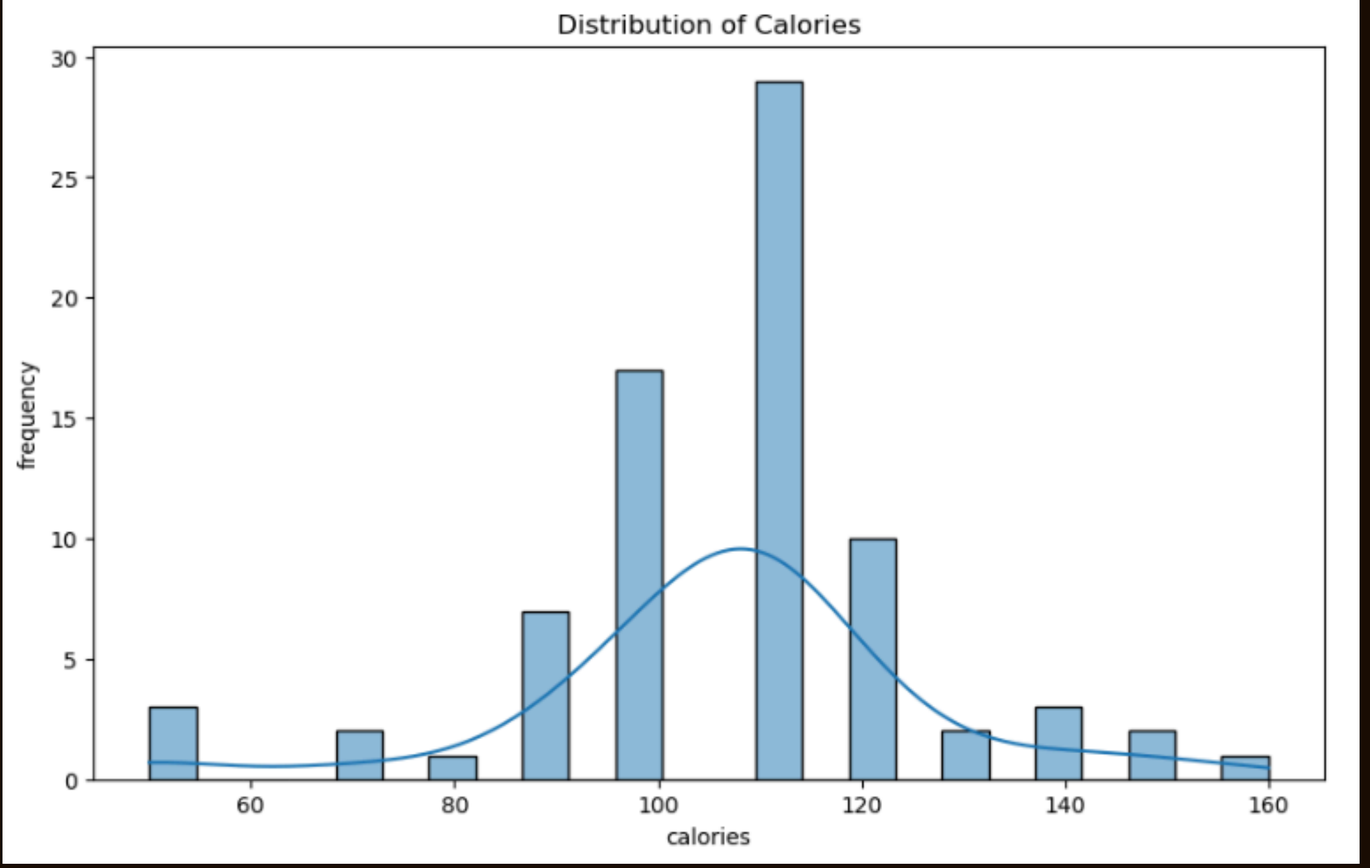
	calories	protein	fat	sodium	fiber	carbo	sugars	potass	vitamins	shelf	weight	cups	rating
count	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000	77.000000
mean	106.883117	2.545455	1.012987	159.675325	2.151948	14.597403	6.922078	96.077922	28.246753	2.207792	1.029610	0.821039	42.665705
std	19.484119	1.094790	1.006473	83.832295	2.383364	4.278956	4.444885	71.286813	22.342523	0.832524	0.150477	0.232716	14.047289
min	50.000000	1.000000	0.000000	0.000000	0.000000	-1.000000	-1.000000	-1.000000	0.000000	1.000000	0.500000	0.250000	18.042851
25%	100.000000	2.000000	0.000000	130.000000	1.000000	12.000000	3.000000	40.000000	25.000000	1.000000	1.000000	0.670000	33.174094
50%	110.000000	3.000000	1.000000	180.000000	2.000000	14.000000	7.000000	90.000000	25.000000	2.000000	1.000000	0.750000	40.400208
75%	110.000000	3.000000	2.000000	210.000000	3.000000	17.000000	11.000000	120.000000	25.000000	3.000000	1.000000	1.000000	50.828392
max	160.000000	6.000000	5.000000	320.000000	14.000000	23.000000	15.000000	330.000000	100.000000	3.000000	1.500000	1.500000	93.704912

Calories Distribution analysis

```
# calories Distribution analysis

plt.figure(figsize = (10, 6))
sns.histplot(df, x="calories", kde=True)
plt.title('Distribution of Calories')
plt.xlabel('calories')
plt.ylabel('frequency')
```

```
Text(0, 0.5, 'frequency')
```



The distribution is slightly right-skewed, meaning more cereals have lower calories than higher calories. This could indicate a focus on keeping calories at a moderate level for most cereals.

Insights

- Most cereals have between 90 and 110 calories
- Few cereals have very low calories (below 60) and very high calories (above 140)

Findings

- Most cereals fall into the 90-110 calorie range, making it a common target for cereal manufacturers.
- The presence of more low-calorie cereals compared to high-calorie ones may reflect an industry trend towards healthier, lower-calorie options.

Top 10 and Bottom By Rating

```
# Top 10 ranking by rating

df.nlargest(10, 'rating')
```

	name	mfr	type	calories	protein	fat	sodium	fiber	carbo	sugars	potass	vitamins	shelf	weight	cups	rating
3	All-Bran with Extra Fiber	K	C	50	4	0	140	14.0	8.0	0	330	25	3	1.00	0.50	93.704912
64	Shredded Wheat 'n'Bran	N	C	90	3	0	0	4.0	19.0	0	140	0	1	1.00	0.67	74.472949
65	Shredded Wheat spoon size	N	C	90	3	0	0	3.0	20.0	0	120	0	1	1.00	0.67	72.801787
0	100% Bran	N	C	70	4	1	130	10.0	5.0	6	280	25	3	1.00	0.33	68.402973
63	Shredded Wheat	N	C	80	2	0	0	3.0	16.0	0	95	0	1	0.83	1.00	68.235885
20	Cream of Wheat (Quick)	N	H	100	3	0	80	1.0	21.0	0	-1	0	2	1.00	1.00	64.533816
55	Puffed Wheat	Q	C	50	2	0	0	1.0	10.0	0	50	0	3	0.50	1.00	63.005645
54	Puffed Rice	Q	C	50	1	0	0	0.0	13.0	0	15	0	3	0.50	1.00	60.756112
50	Nutri-grain Wheat	K	C	90	3	0	170	3.0	18.0	2	90	25	3	1.00	1.00	59.642837
2	All-Bran	K	C	70	4	1	260	9.0	7.0	5	320	25	3	1.00	0.33	59.425505

```
# Bottom ranking by rating

df.nsmallest(10, 'rating')
```

	name	mfr	type	calories	protein	fat	sodium	fiber	carbo	sugars	potass	vitamins	shelf	weight	cups	rating
10	Cap'n'Crunch	Q	C	120	1	2	220	0.0	12.0	12	35	25	2	1.0	0.75	18.042851
12	Cinnamon Toast Crunch	G	C	120	1	3	210	0.0	13.0	9	45	25	2	1.0	0.75	19.823573
35	Honey Graham Ohs	Q	C	120	1	2	220	1.0	12.0	11	45	25	2	1.0	1.00	21.871292
18	Count Chocula	G	C	110	1	1	180	0.0	12.0	13	65	25	2	1.0	1.00	22.396513
14	Cocoa Puffs	G	C	110	1	1	180	0.0	12.0	13	55	25	2	1.0	1.00	22.736446
31	Golden Grahams	G	C	110	1	1	280	0.0	15.0	9	45	25	2	1.0	0.75	23.804043
42	Lucky Charms	G	C	110	2	1	180	0.0	12.0	12	55	25	2	1.0	1.00	26.734515
73	Trix	G	C	110	1	1	140	0.0	13.0	12	25	25	2	1.0	1.00	27.753301
29	Fruity Pebbles	P	C	110	1	1	135	0.0	13.0	12	25	25	2	1.0	0.75	28.025765
70	Total Raisin Bran	G	C	140	3	1	190	4.0	15.0	14	230	100	3	1.5	1.00	28.592785

Correlation Matrix

```
# Correlation matrix

corr_matrix = dff.corr()
corr_matrix
```

	calories	protein	fat	sodium	fiber	carbo	sugars	potass	vitamins	shelf	weight	cups	rating
calories	1.000000	0.019066	0.498610	0.300649	-0.293413	0.250681	0.562340	-0.066609	0.265356	0.097234	0.696091	0.087200	-0.689376
protein	0.019066	1.000000	0.208431	-0.054674	0.500330	-0.130864	-0.329142	0.549407	0.007335	0.133865	0.216158	-0.244469	0.470618
fat	0.498610	0.208431	1.000000	-0.005407	0.016719	-0.318043	0.270819	0.193279	-0.031156	0.263691	0.214625	-0.175892	-0.409284
sodium	0.300649	-0.054674	-0.005407	1.000000	-0.070675	0.355983	0.101451	-0.032603	0.361477	-0.069719	0.308576	0.119665	-0.401295
fiber	-0.293413	0.500330	0.016719	-0.070675	1.000000	-0.356083	-0.141205	0.903374	-0.032243	0.297539	0.247226	-0.513061	0.584160
carbo	0.250681	-0.130864	-0.318043	0.355983	-0.356083	1.000000	-0.331665	-0.349685	0.258148	-0.101790	0.135136	0.363932	0.052055
sugars	0.562340	-0.329142	0.270819	0.101451	-0.141205	-0.331665	1.000000	0.021696	0.125137	0.100438	0.450648	-0.032358	-0.759675
potass	-0.066609	0.549407	0.193279	-0.032603	0.903374	-0.349685	0.021696	1.000000	0.020699	0.360663	0.416303	-0.495195	0.380165
vitamins	0.265356	0.007335	-0.031156	0.361477	-0.032243	0.258148	0.125137	0.020699	1.000000	0.299262	0.320324	0.128405	-0.240544
shelf	0.097234	0.133865	0.263691	-0.069719	0.297539	-0.101790	0.100438	0.360663	0.299262	1.000000	0.190762	-0.335269	0.025159
weight	0.696091	0.216158	0.214625	0.308576	0.247226	0.135136	0.450648	0.416303	0.320324	0.190762	1.000000	-0.199583	-0.298124
cups	0.087200	-0.244469	-0.175892	0.119665	-0.513061	0.363932	-0.032358	-0.495195	0.128405	-0.335269	-0.199583	1.000000	-0.203160
rating	-0.689376	0.470618	-0.409284	-0.401295	0.584160	0.052055	-0.759675	0.380165	-0.240544	0.025159	-0.298124	-0.203160	1.000000

Correlation Matrix Insights and Findings

Insights

- There is a strong positive correlation (0.56) between calories and sugars. This means that cereals with higher calories tend to have more sugar.
- There is a moderate positive correlation (0.50) between calories and fat. Higher-calorie cereals also tend to have more fat.
- There is a strong negative correlation (-0.76) between rating and sugars. This indicates that cereals with higher sugar content tend to have lower ratings.
- There is a strong negative correlation (-0.69) between rating and calories. Cereals with higher calories generally have lower ratings.
- There is a moderate positive correlation (0.50) between fiber and protein. Cereals high in fiber tend to have more protein as well.
- There is a moderate positive correlation (0.58) between fiber and rating. Higher fiber content is associated with better ratings.

Findings

Healthier Cereals

- Cereals with lower calories and sugar tend to have higher ratings, suggesting that consumers prefer healthier options.
- Higher fiber content positively affects the cereal ratings, indicating a preference for fiber-rich cereals.

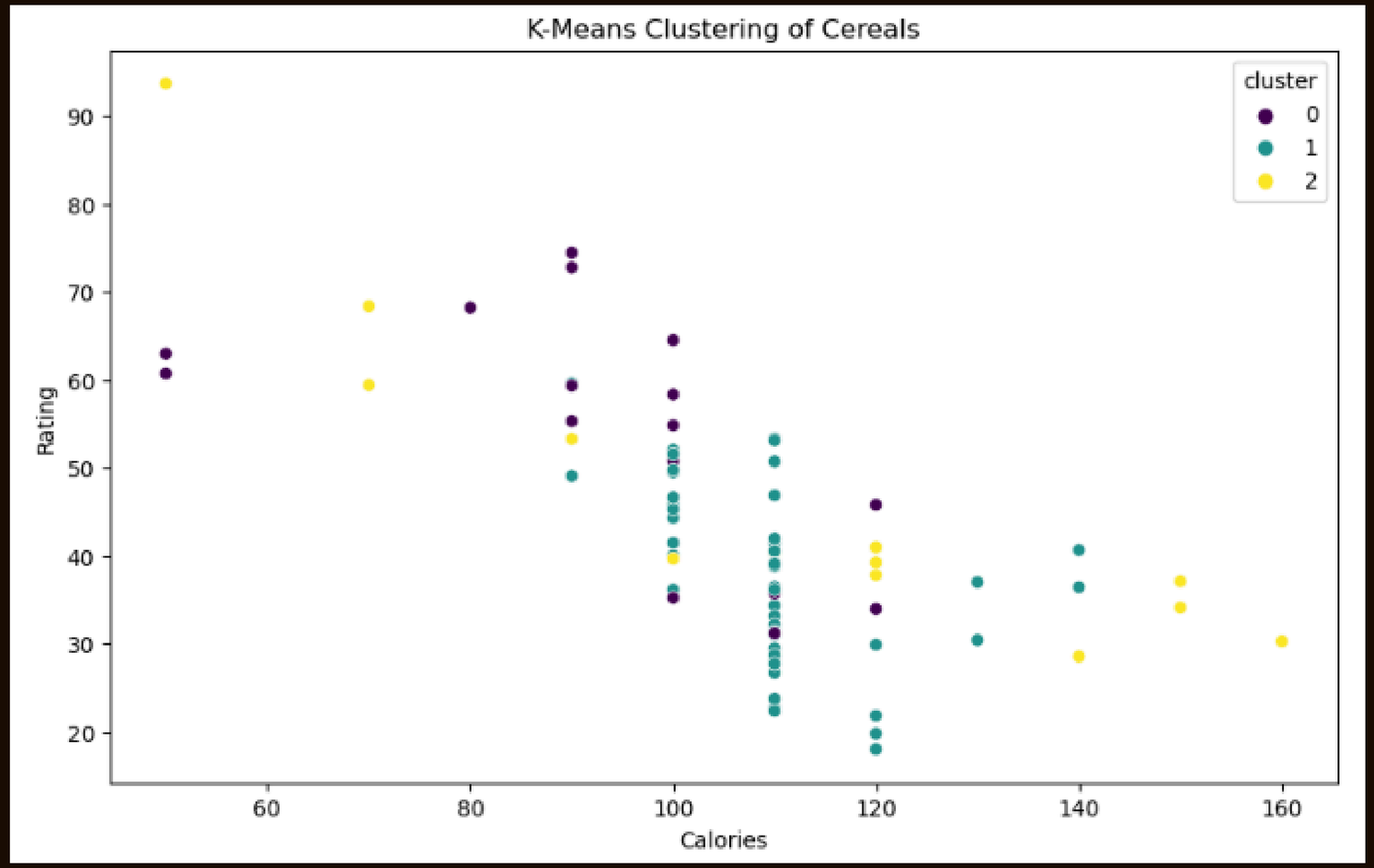
Nutritional Profile

- Cereals with higher fat content also have higher calories, which is expected since fat is calorie-dense.
- There is a strong relationship between sugar content and calories, highlighting the need to balance these nutrients for healthier cereals.

Consumer Preferences

- Consumers seem to rate cereals with lower sugar and calorie content more favorably.
- Fiber and protein are important for higher ratings, showing consumer preference for more nutritious cereals.

Clustering Analysis



Insights

Cluster 0 (Purple):

- These cereals have a wide range of calories, from around 60 to 160.
- They have ratings mostly between 20 and 50, with a few higher-rated cereals around 60.

Cluster 1 (Green):

- These cereals are mostly in the mid-range of calories, approximately 70 to 120.
- The ratings for these cereals vary widely, from around 30 to 70, with a few reaching up to 90.

Cluster 2 (Yellow):

- These cereals have lower calorie counts, mostly around 60 to 110.
- Their ratings are generally higher, between 50 and 90.

Findings

- Cereals with lower calories tend to have higher ratings, as seen in cluster 2 (yellow).
- Cereals with mid-range calories (cluster 1, green) have a wide range of ratings, indicating other factors might influence their ratings.
- Cereals with a broader range of calories (cluster 0, purple) generally have lower ratings, with few exceptions.

RECOMMENDATIONS

- Cereals with lower calorie counts generally have higher ratings. Developing more low-calorie options could attract health-conscious consumers and improve product ratings.
- Cereals with higher sugar content tend to have lower ratings. Reducing the sugar levels in cereals can make them more appealing to consumers who prefer healthier options.
- Cereals with higher fiber content receive better ratings. Adding more fiber to cereals can enhance their nutritional value and increase consumer satisfaction.
- Cereals with calories in the mid-range (around 70 to 120) show a wide range of ratings. Ensure these cereals have balanced nutrition and good taste to appeal to a broader audience.
- While there is a moderate positive correlation between calories and fat, excessive fat can lower ratings. Keep fat content at a moderate level to maintain a good balance between taste and health.
- Clearly communicate the nutritional benefits of low-calorie, high-fiber, and low-sugar cereals on packaging and marketing materials. Educate consumers on the health benefits to attract more health-conscious buyers.
- Offer a variety of cereals that cater to different dietary preferences and nutritional needs. This includes options for low-calorie, high-fiber, and low-sugar cereals to meet diverse consumer demands.

CONCLUSION

Cereals with lower calories and higher fiber content tend to have higher ratings, while cereals with higher sugar content generally receive lower ratings. However, many cereals still have a wide range of calories and varying sugar levels, which can impact their overall appeal to consumers.

THANK

YOU