

## **Policy Brief**

### ***The Spread of Misinformation and Disinformation on Reddit: The Case Study of Vegan and Meat Consumption***

*Nanmanat Disayakamonpan and Nastaran Mesgari*

Data Science for Society and Business (DSSB), Constructor University

MDSSB-DTRANS-01: Digital Public Sphere, Spring 2024

Dr. Mandi Larsen

31 May 2024

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## 1. Executive Summary

The increasing number of misinformation and disinformation across various social media platforms has become one of the big issues that we must be aware of and pay attention to. Our policy brief addresses the prevalent issue of inaccurate information affecting public perceptions of diet and health on a digital platform. Therefore, our primary goal is to provide actionable insights and evidence-based recommendations for a policy framework to promote accurate information and improve public understanding of dietary choices in the online community. With a focus on Reddit, this study aims to offer several data-driven insights and apply various analytical techniques including topic modeling, KMeans clustering, and sentiment analysis on text to systematically analyze how misinformation and disinformation about veganism and meat consumption are spread and their impact on public audience surrounding health and nutrition decisions.

Our results emphasize the impact of inaccurate or misleading material on Reddit on people's perceptions of dietary behaviors and the significance of access to reliable information. Additionally, our findings also show the demand from some users on Reddit for scientifically evidence-based information about dietary-related topics. By providing a comprehensive overview of how misleading information distorts public dialogue concerning diet, the brief proposes actionable recommendations for the World Health Organization (WHO). These include engaging directly on social media, enhancing monitoring of misinformation trends, and developing targeted educational resources aimed at improving the public's dietary decisions and health outcomes.

## 2. Introduction

Since the evolution of the Internet has transformed conventional modes of human interaction and introduced novel avenues for communication (Chen & Lin, 2019), it is imperative to recognize the importance of a well-functioning digital public sphere on online platforms as primary channels for communication. Despite geographical distances and differences, members of the online community might consider themselves as part of common public discourses in which everyone contributes equally and engages in public reasoning. To function successfully, a democratic public sphere must provide rights and opportunities that guarantee equitable and meaningful freedom of expression (Cohen & Fung, 2021).

Nowadays, social media has evolved as an attractive tool for the majority of people to obtain information on personal interests, and trending societal concerns, and as a source of leisure and relaxation (Ye, 2023). Social media, which covers a wide range of online platforms, may encourage online interactions, user-generated content production, and involvement in virtual communities (Dewing, 2010). Connections and communications through social media, including recommendations from friends and interactions with strangers or anonymous users, significantly influence people's beliefs and decision-making processes (Sema, 2013).

On one hand, social media can *foster the right to access diverse sources of information*, including those provided by fellow citizens and media through various social platforms (Dahl, 2006). On the other hand, it is essential for participants within the digital world to *willingly acknowledge the importance of the truth and understand that it is common for public discussions to involve uncertainty, error, and disagreement*. Even though seeking truth within digital public discourse is challenging, people should not intentionally misrepresent their beliefs, mislead the public's perceptions, and carelessly ignore the accuracy of their statements (Cohen, 2009).

Noticeably, health-related concerns took center stage for everyone throughout the COVID-19 pandemic, highlighting a significant shift towards digital mass media and social media serving as the primary means of connectivity (Solanki & Mahajan, 2023). However, the widespread dissemination of misinformation and disinformation on social media platforms can hinder a well-functioning digital public sphere by obstructing access to instructive information necessary for understanding matters of public concern within society. As such, it is important to understand the difference in definition between misinformation and disinformation. Regarding the American Psychological Association (APA), “misinformation refers to false or inaccurate information that is inadvertently spread, while disinformation entails deliberately spreading misleading falsehoods to deceive” (n.d.). Similarly, Britannica defines “Misinformation is the inadvertent spread of false information without intent to harm, while disinformation is false information designed to mislead others and is deliberately spread with the intent to confuse fact and fiction” (Palfrey, 2024). Hence, we conclude that ***“misinformation” means unintentionally false information, whereas “disinformation” refers to deliberately misleading falsehoods.***

In this context, we aim to address a policy issue surrounding the **“access”** and **“truth”** elements, focusing on the dissemination of false and misleading information about veganism and meat consumption regarding **health and nutrition** aspects, which can have profound consequences on public health. For example, false information on social media can lead to confusion among the public regarding health-related issues, hindering informed decision-making about food choices and dietary habits and leading individuals to adopt potentially harmful health behaviors. Additionally, when individuals encounter conflicting information or perceive inconsistencies between official health guidelines and information shared on social media, they may begin to question the credibility and trustworthiness of health authorities.

As such, we would like to select **the World Health Organization (WHO)** as *our target audience* for several reasons. Firstly, the WHO is globally recognized as an *authority* and possesses *credibility in matters of public health*. Secondly, the WHO's reach extends to *a global scale*, enabling it to influence health-related discussions and policies worldwide. Thirdly, the WHO plays a key role in *shaping health policies* at both national and international levels, making it a crucial stakeholder in addressing misinformation across online platforms. Lastly, the WHO currently *provides a channel for reporting misinformation online* for various social media platforms via its official website, *except Reddit*, notably revealing a gap in addressing online misinformation concerning health and nutrition within the Reddit community. By engaging with the WHO, we aim to contribute to efforts aimed at combating the spread of false information and promoting accurate health-related discourse on digital platforms.

**Table 1:** *Introduction Overview*

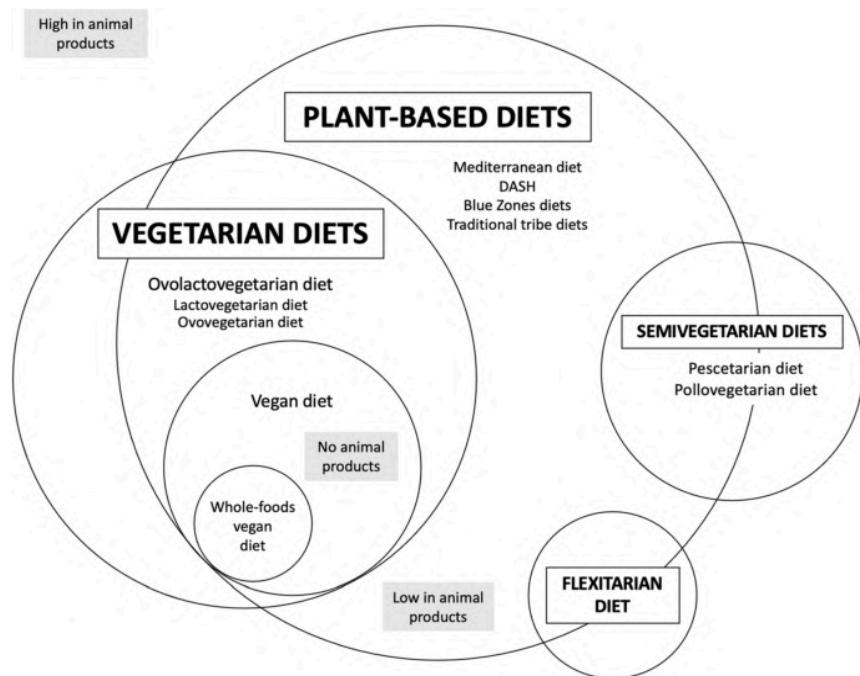
Key Elements	Details/Description
<b>Our Focus</b>	Access and Truth
<b>Main Issue</b>	<ul style="list-style-type: none"> <li>- The spread of misinformation/ disinformation about veganism and meat consumption is prevalent on social media. There is a significant impact on different dimensions: environmental, legal, and ethical aspects, as well as health and nutrition.</li> <li>- <a href="#">The Guardian</a> shows that the meat industry uses misinformation to block dietary change and discredit plant-based diets (Carrington, 2023), impacting global patterns of vegan and meat consumption</li> </ul>
<b>Social Media Platform</b>	Reddit
<b>Target Audience</b>	International Level: <b>World Health Organization (WHO)</b>
<b>Definitions: Misinformation VS Disinformation</b>	<p>(1) <b>American Psychological Association</b> (n.d.)</p> <ul style="list-style-type: none"> <li>- <b>Misinformation</b> is false or inaccurate information, getting the facts wrong.</li> <li>- <b>Disinformation</b> is false information which is deliberately intended to mislead, intentionally misstating the facts.</li> </ul> <p>(2) <b>Britannica</b> (Palfrey, 2024)</p> <ul style="list-style-type: none"> <li>- <b>Misinformation</b> is the inadvertent spread of false information without intent to harm.</li> <li>- <b>Disinformation</b> is false information designed to mislead others and is deliberately spread with the intent to confuse fact and fiction</li> </ul> <p><b>In summary for this paper:</b></p> <ul style="list-style-type: none"> <li>- “<b>misinformation</b>”: unintentionally false information</li> <li>- “<b>disinformation</b>”: deliberately misleading falsehoods</li> </ul>

### 3. Background and Context/Problem Statement

#### 3.1 Understanding Dietary Context and Definitions

For a good start, it is important to know the specific dietary criteria, because different diets exclude or include different types of animal products. Firstly, the Vegan Society (2016) and Encyclopaedia Britannica (Colón, 2024) define “**veganism**” as a holistic approach aimed at avoiding animal exploitation in favor of cruelty-free alternatives, environmental sustainability, and personal well-being. Secondly, a “**plant-based diet**” emphasizes nutrient-dense plant foods while limiting the intake of animal products and fats. It is worth noting that these two terms are occasionally used interchangeably (Tuso, Ismail, Ha, & Bartolotto, 2013). Moreover, “**vegetarian diets**” omit animal products to varying extents, and “**plant-based diets**” focus on consuming plant foods while restricting animal products (Hargreaves, Rosenfeld, Moreira, & Zandonadi, 2023). It is also crucial to understand other specific definitions of diet types ([Figure 1](#) and [Table 2](#))

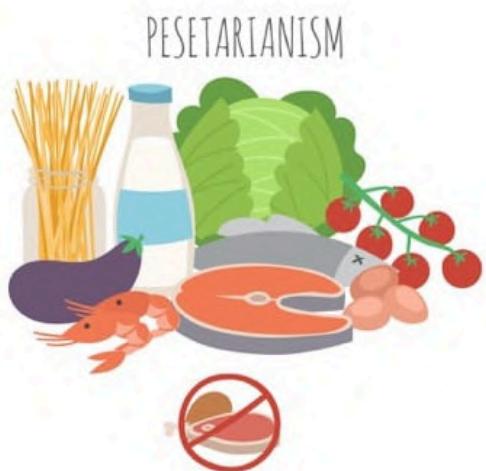
**Figure 1:** Relationship between vegetarian and plant-based diets (Hargreaves *et al.*, 2020)



**Table 2:** Other diet type definitions (Tuso *et al.*, 2013; Tan, 2017)

Diet Type	Description
<b>Vegan (or total vegetarian)</b>	Excludes all animal products, including meat, seafood, poultry, eggs, and dairy. May also avoid other animal-derived products like leather and fur.
<b>Raw food, vegan</b>	Similar to veganism but excludes foods cooked at temperatures greater than 118°F. Advocates believe that heating food destroys nutrients and natural enzymes that boost digestion and fight chronic disease.
<b>Fruitarianism</b>	primarily consists of raw fruits, with about 75% of the diet being comprised of raw fruit by weight, along with 25% nuts and seeds. It is a subset of raw veganism. However, this diet can be challenging to meet all nutritional needs and may pose health risks if not managed properly.
<b>Lacto-vegetarian</b>	Excludes eggs, meat, seafood, and poultry, but includes dairy products. Popular among followers of Eastern religious traditions.
<b>Ovo-vegetarian</b>	Excludes meat, seafood, poultry, and dairy, but includes eggs. Motivated by concerns about the treatment of animals in dairy production.
<b>Lacto-ovo vegetarian</b>	Excludes meat, seafood, and poultry, but includes eggs and dairy. Commonly referred to as “vegetarian” and is relatively easy to follow with adequate calcium and protein intake.
<b>Whole-foods, plant-based, low-fat</b>	Emphasizes whole plant foods, limits animal products for health benefits, and restricts total fat intake. Advocates for the consumption of vegetables, fruits, legumes, seeds, and nuts, with minimal processed foods and oils.
<b>Mediterranean</b>	Similar to a whole-foods, plant-based diet but allows small amounts of chicken, dairy, eggs, and red meat occasionally. Encourages fish and olive oil consumption. Fat intake is not restricted.
<b>Pescatarian</b>	Includes fish and seafood in addition to vegetarian foods like beans, vegetables, fruits, and grains. Considered a compromise between vegetarianism and omnivorous diets.
<b>Flexitarian</b>	Encourages reducing meat consumption by including more vegetarian meals and treating meat as an occasional accompaniment rather than a central component of the diet. A flexible approach suitable for those transitioning to a plant-based diet.

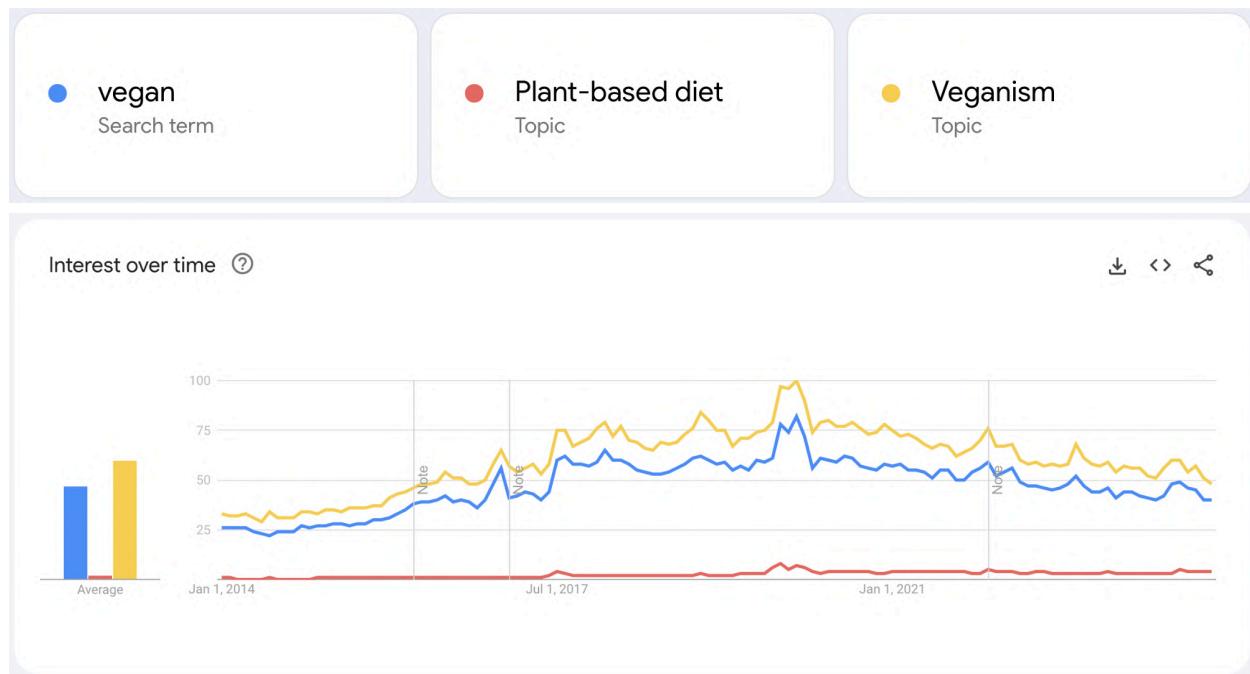
**Figure 2:** Vegetarian diet visualization (Tan, 2017)



### 3.2 Growing Popularity in Veganism and Plant-Based Diets

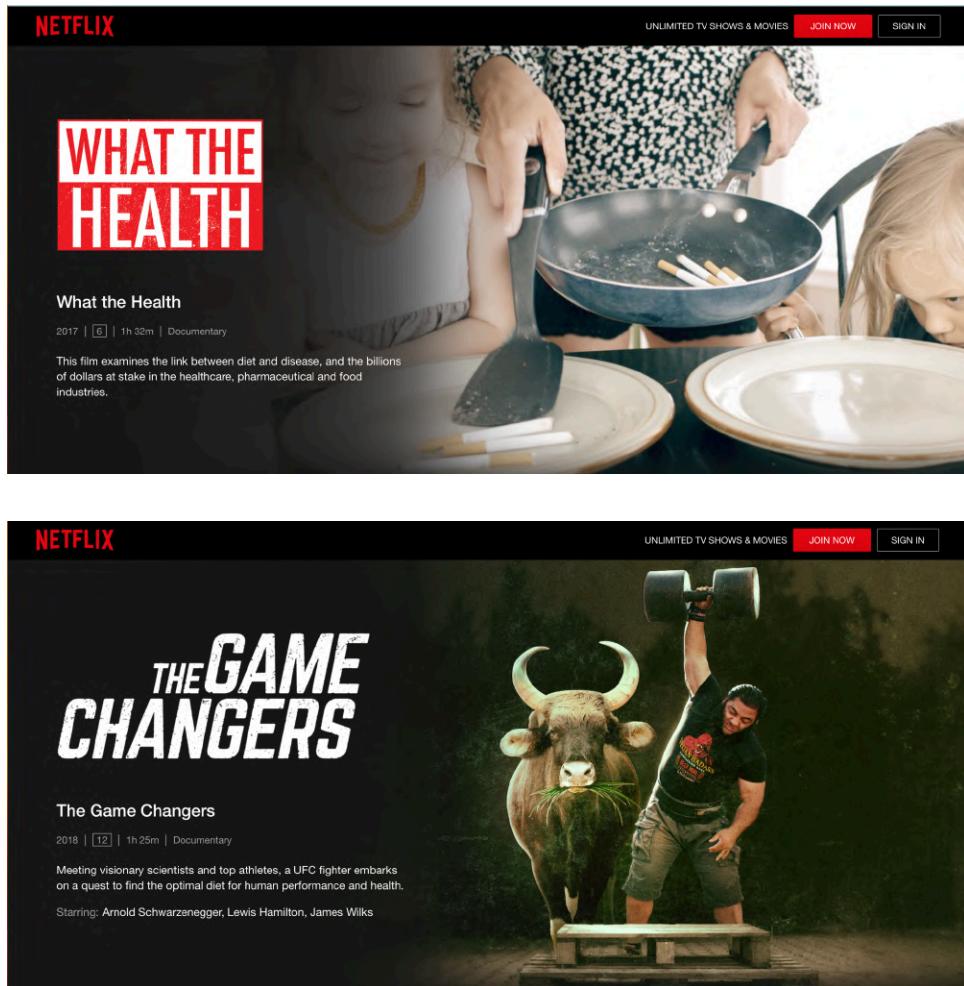
Looking back a decade, data from Google Trends ([Figure 3](#)) shows that the search queries on “*vegan*”, “*Plant-based diet*”, and “*Veganism*” have increased since 2014 and peaked in interest from November 2019 to January 2020 (Google, 2024).

**Figure 3:** Google search trends on *vegan*, *veganism*, and *plant-based diet* from 2014 to 2024.



According to this phenomenon, the first reason for the increased interest is the release of two documentaries, “*What the Health*” and “*The Game Changers*” ([Figure 4](#)), first released on Netflix in 2017 and 2018, respectively. These documentaries are related to the health benefits of plant-based diets. Research by Hartwell et al. (2021) also found increases in Google search volumes for terms related to “*plant-based diets*” following the release of two Netflix documentary series on the topic.

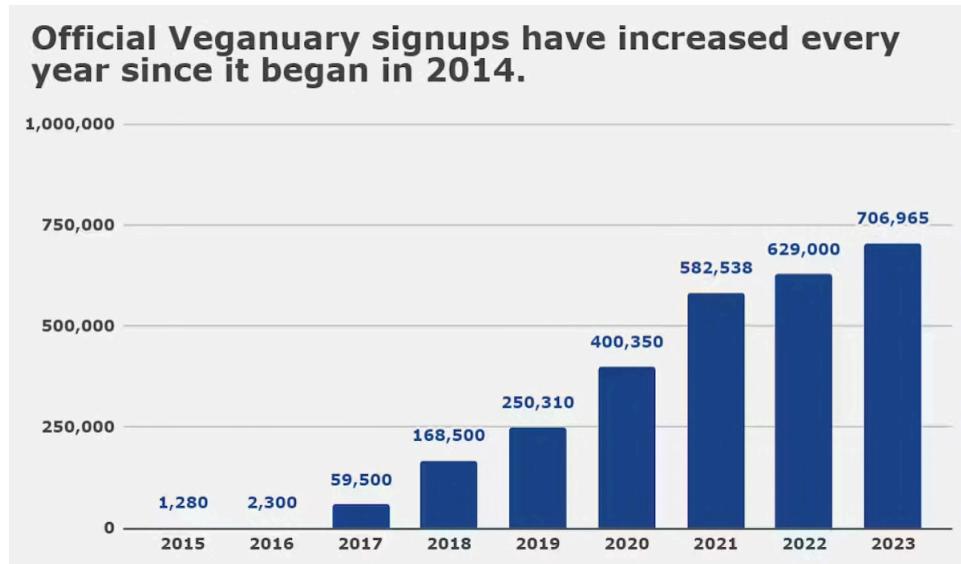
**Figure 4:** *What the Health* and *The Game Changers* documentaries (Netflix, 2017 & 2019)



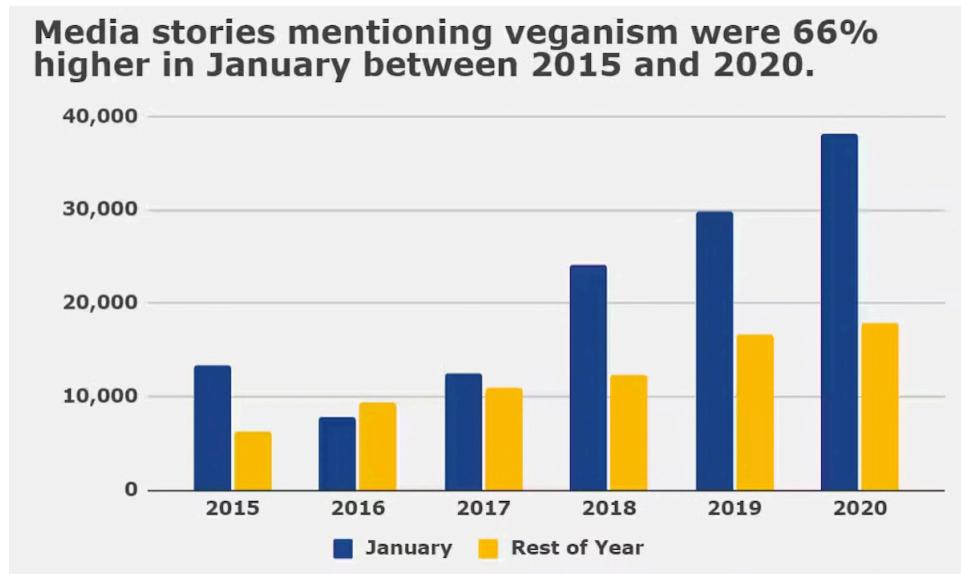
The second reason is *Veganuary*, a program launched by the Veganuary charity, a non-profit organization located in the United Kingdom that promotes people to become vegans in January (Bryant, 2024). In 2019, the Veganuary campaign set a new record with 250,000 participants, surpassing the cumulative numbers from the previous four years (Smithers, 2019). Furthermore, the number of Veganuary participants has been increasing gradually each year since it began in 2014 ([Figure 5](#)). However, it only represents the total number of participants, including those who formally enrolled on the Veganuary website (Bryant, 2024). [Figure 6](#) also

shows a 66% average increase in media coverage of veganism in January compared to the rest of the year between 2015 and 2020.

**Figure 5:** Veganuary sign-ups from 2015 to 2023. (Bryant, 2024, Figure 1)



**Figure 6:** Media mentioning veganism from 2015 to 2020. (Bryant, 2024, Figure 4)



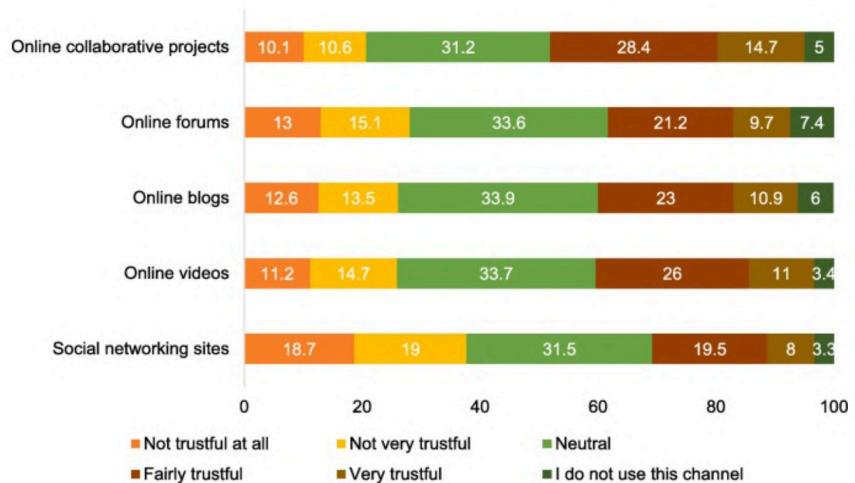
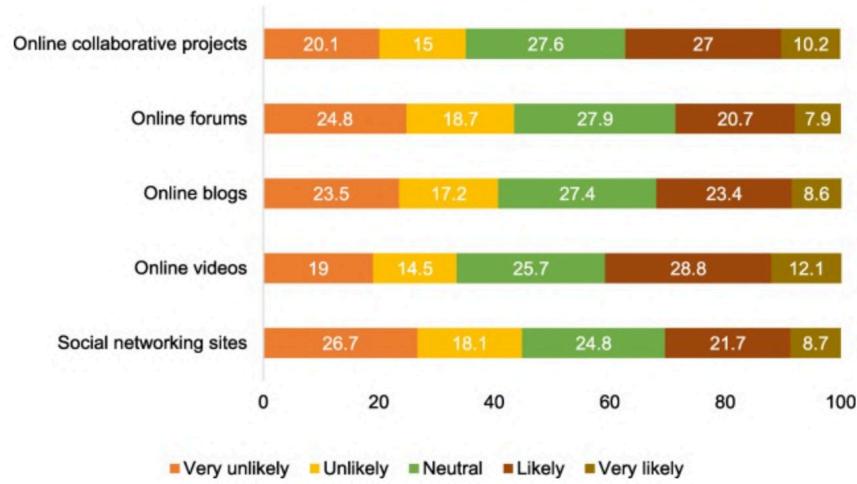
Given the increasing popularity of plant-based diets across a worldwide audience, it is necessary to understand the trends of misinformation and the consequences they have for dietary decisions and public health.

### 3.3 Mechanism of Doubt on Social Media

#### 3.3.1 Social Media vs Consumer Trust

While social media rapidly circulates information, misinformation undermines consumer trust. [Figure 7](#) shows that European consumers prefer internet films (e.g., YouTube) and collaborative initiatives (e.g., Wikipedia) for plant-based food information. It also demonstrates that online collaborative ventures, such as Wikipedia, are regarded as the most trustworthy, while social networking sites, such as Facebook, are the least trusted (Rini *et al.*, 2024).

[Figure 7: Likelihood of using social media and level of trust towards plant-based food information](#) (Rini *et al.*, 2024, p.5, Figures 2 & 3)



### 3.3.2 Meat Industry's Effort on Dietary False Information

Despite the rising popularity of vegetarian and plant-based diets, misinformation and disinformation continue to shape public opinion, particularly on meat and dairy problems, which may confuse online communities.

According to The Guardian, meat industries in the EU and the US seek to impede green alternatives through lobbying efforts and regulatory bias (Carrington, 2023). A recent report by DeSmog reveals how the meat and dairy industries minimize the environmental effect of meat and encourage its consumption while discrediting plant-based diets. This includes public ads, instructional materials, and social media approaches, as well as sponsorship of academic institutions to greenwash animal products, hindering the development of plant-based alternatives (Carlile, 2024).

**Figure 8:** The news by The Guardian and DeSmog (Carrington, 2023; Carlile, 2024)

#### 'Gigantic' power of meat industry blocking green alternatives, study finds

Analysis of EU and US shows livestock farmers receive about 1,000 times more public funding than plant-based and cultivated meat



Cows in a milking parlour in Iowa. Livestock production causes 15% of all global greenhouse emissions. Photograph: Charlie Neiburg/AP

#### Meat Industry Using 'Misinformation' to Block Dietary Change, Report Finds

Meat and dairy groups have funded adverts that cast vegan products as unhealthy, unnatural and ultra processed.

By Clare Carlile on Mar 1, 2024 @ 10:14 PST  
4 min read

Series: [BIO AG'S CLIMATE PUSH](#)

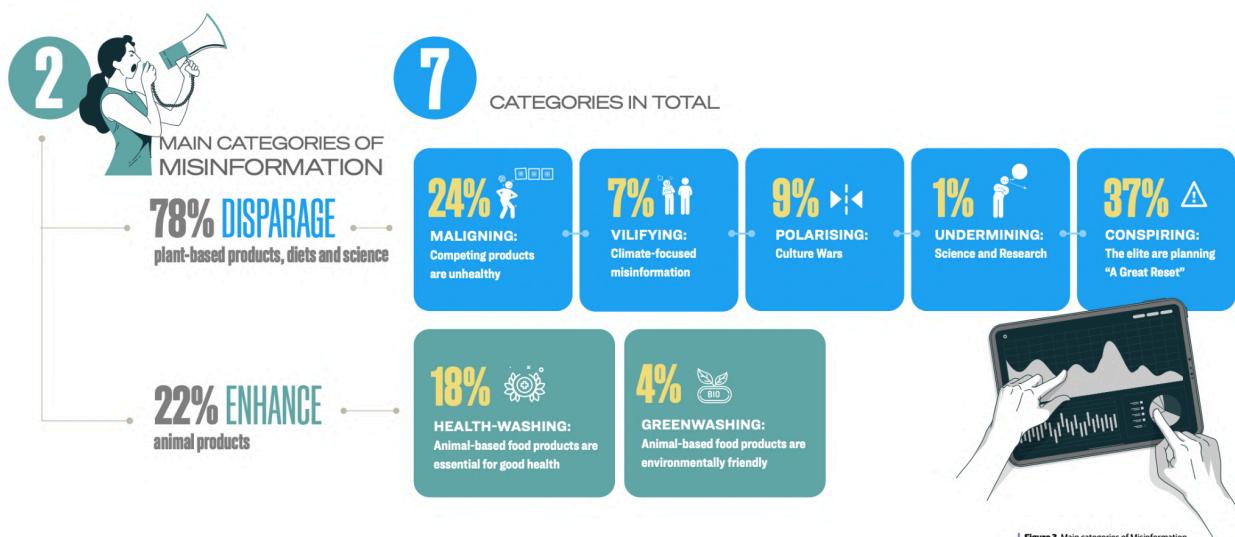
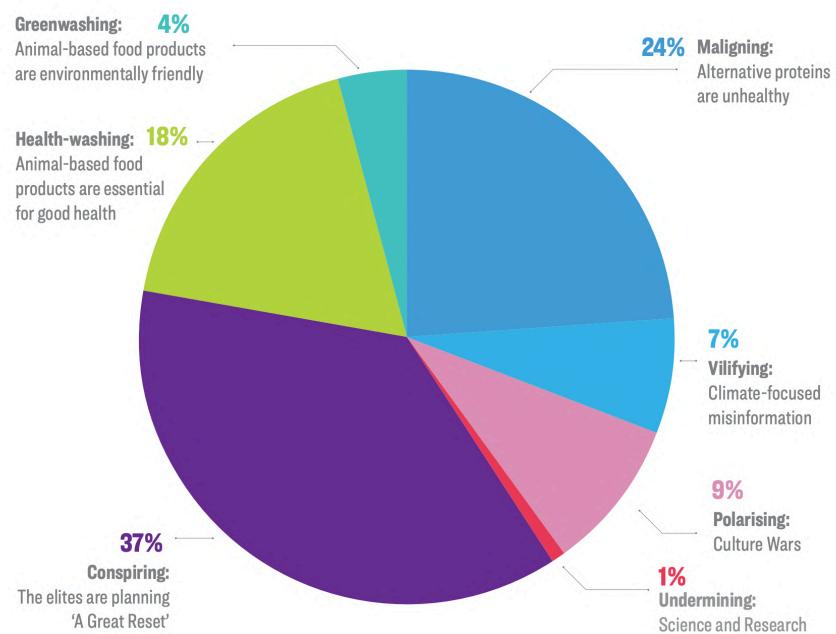


Authors of a new study say the animal agriculture industry is waging a 'disinformation war'. Credit: Wilfredorh (CC BY-NC-ND 2.0)

The Changing Markets Foundation's report (2023) reveals that meat and dairy companies employed misinformation with the narrative strategies, categorized into two types: “*disparage*” narratives, critiquing alternatives to meat and dairy, while “*enhance*” narratives promote meat

and dairy products for their perceived benefits, comprising 78% and 22% of the misinformation, respectively (Figure 9). **Defaming alternative protein sources as harmful** is a prevalent strategy in negative narratives. Furthermore, “**health-washing**”, which *portrays animal-based foods as essential for good health*, is a common technique to improve storytelling.

**Figure 9:** Meat and dairy misinformation category (Changing Markets Foundation, 2023, Figures 2 & 3)



### 3.3.3 Misleading Posts within the Reddit Community

To align with our focus on Reddit, we found misleading posts regarding veganism and meat consumption from several subreddits. These posts can reinforce the mechanism of doubts and have a major impact on people's views of dietary choices in a variety of ways.

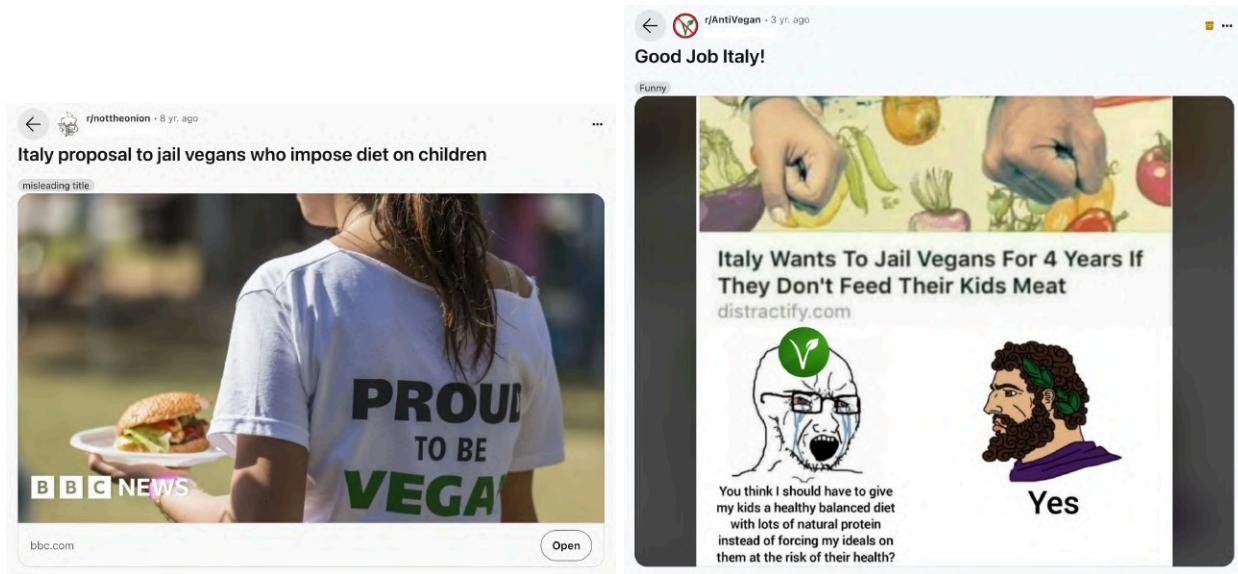
- **Environment:** The statement on *r/changemyview* (Reddit, 2018) can be categorized as “***misinformation***” because these claims lack scientific evidence and may unintentionally mislead readers, even though the user may genuinely believe in their argument.

**Figure 10:** The *r/changemyview*'s post (Reddit, 2018)

The screenshot shows a post from the subreddit *r/changemyview* that has been deleted. The title of the post is "CMV: A diet can include meat and be as environmentally friendly as a vegan diet." The post includes several paragraphs of text discussing the environmental impact of meat vs. vegan diets, mentioning examples like chicken and mussels, and noting the impact of hunting. The post has been deleted by the original poster (OP).

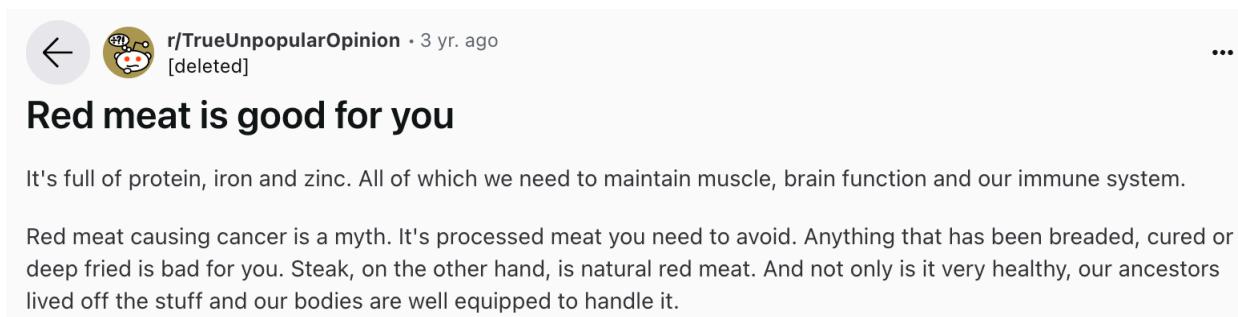
- **Law:** The posts ([Figure 11](#)) on *r/nottheonion* (Reddit, 2016) and *r/Antivegan* (Reddit, 2021) are classified as “***misinformation***”. Although these assertions may be taken from a legitimate legislative proposal, they misuse the legal word “***vegan***”, which is not specifically specified in the Italian legislation proposal. Instead, the strategy sought to criminalize mandating a diet deficient in essential nutrients for a minor's proper growth. However, the proposal did not come into law and expired in 2018 (Wrona, 2024).

**Figure 11:** The *r/nottheonion* and *r/Antivegan*'s posts (Reddit, 2016 & 2021)



- **Health and Nutrition:** The post on *r/TrueUnpopularOpinion* (Reddit, 2021) can be classified as “*misinformation*” as it presents only factual information inaccurately (Figure 12). It claims that red meat is healthy and denies its association with cancer, which is not entirely accurate according to scientific papers. Conversely, the research by Lippi, G., Mattiuzzi, C., & Cervellin, G. (2016) indicates that red and processed meat consumption shows a stronger association with various cancers.

**Figure 12:** The *r/TrueUnpopularOpinion*'s post (Reddit, 2021)



These discussions address the complexity and multifaceted nature of dietary perceptions by misleading information.

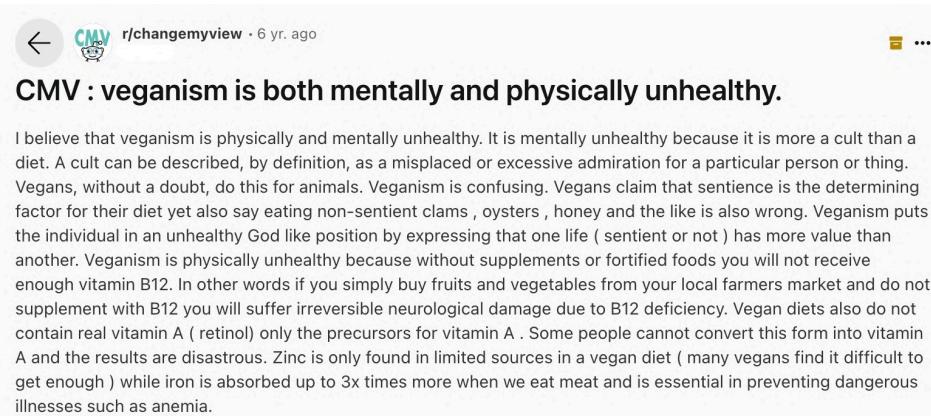
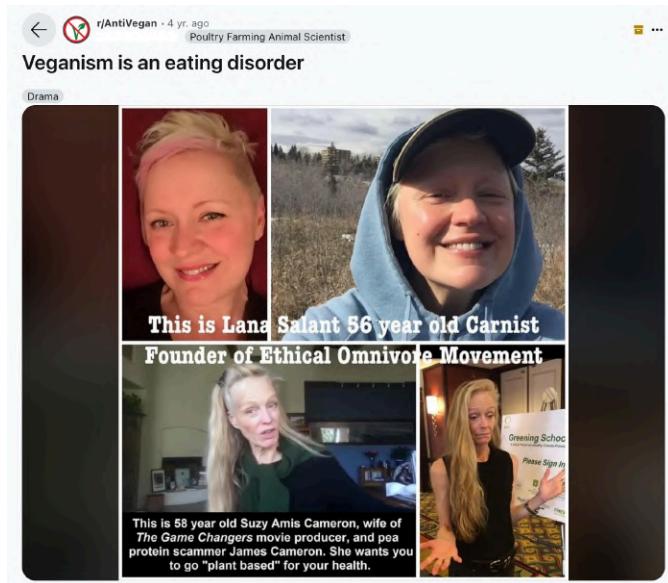
## 4. Policy Analysis

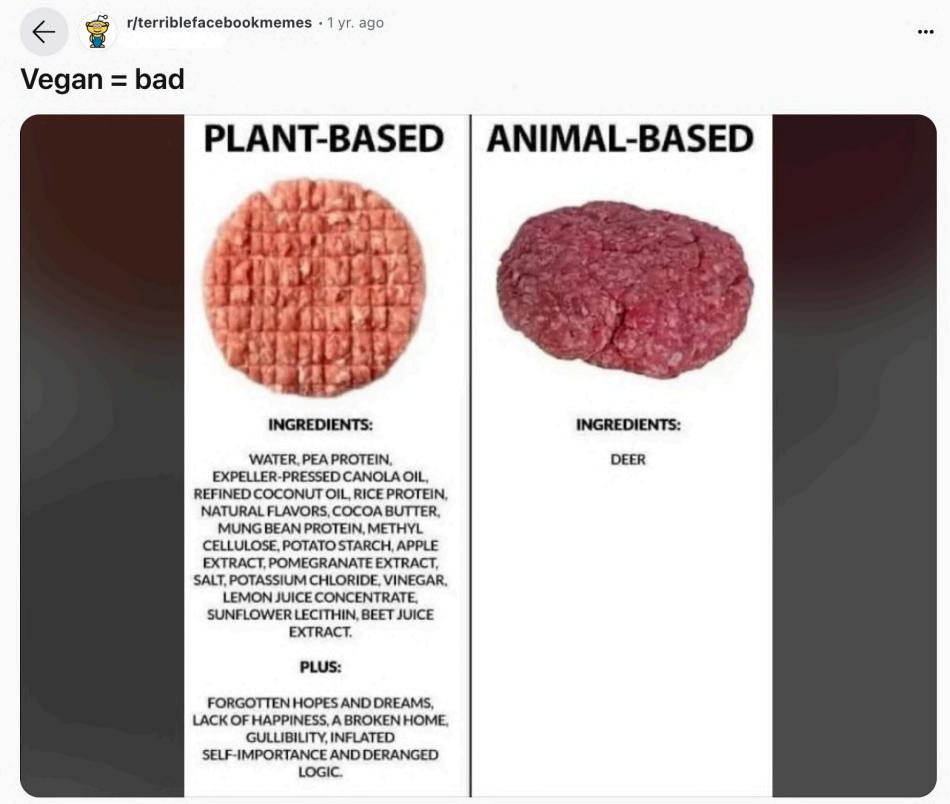
The analysis aims to reveal the dynamics of misinformation and disinformation landscape around veganism and meat consumption within the Reddit community, focusing on how these dietary choices are discussed and perceived.

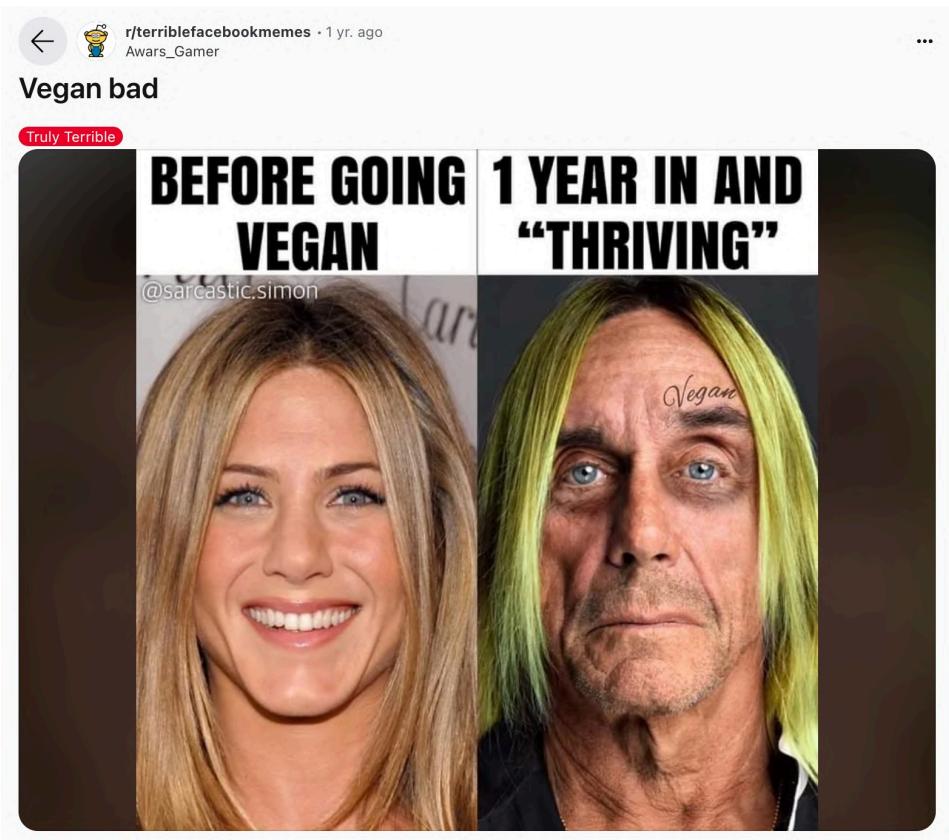
### 4.1 Web Scraping for Data Extraction

The qualitative data consists of *comments from various subreddits' posts*, extracted by *web scraping with Reddit's API*. We only selected posts ([Figure 13](#)) potentially categorized as *misleading* to represent diverse viewpoints on dietary choices on Reddit.

**Figure 13:** Selected posts from Reddit (Reddit, 2018 & 2020 & 2023)







← r/TrueUnpopularOpinion • 7 mo. ago

...

### Veganism is truly unhealthy.

**Non-Political**

People that have been on a truly vegan diet are generally unhealthy. Their body's are deprived of crucial nutrition that they can't replace with synthetic vitamins. I believe that is why so many of them believe that they have to push their beliefs onto others, because they are absolutely miserable due to their bodies being starved.

Edit: I post my opinion on a truly vegan diet, and most comments are telling me how wrong I am. I couldn't care less what you eat. But many also made my point on pushing their beliefs. Stats recorded. Thanks!

This approach ensures that our findings address urgent concerns from the WHO to develop a policy for combating misinformation and disinformation within Reddit on these dietary topics.

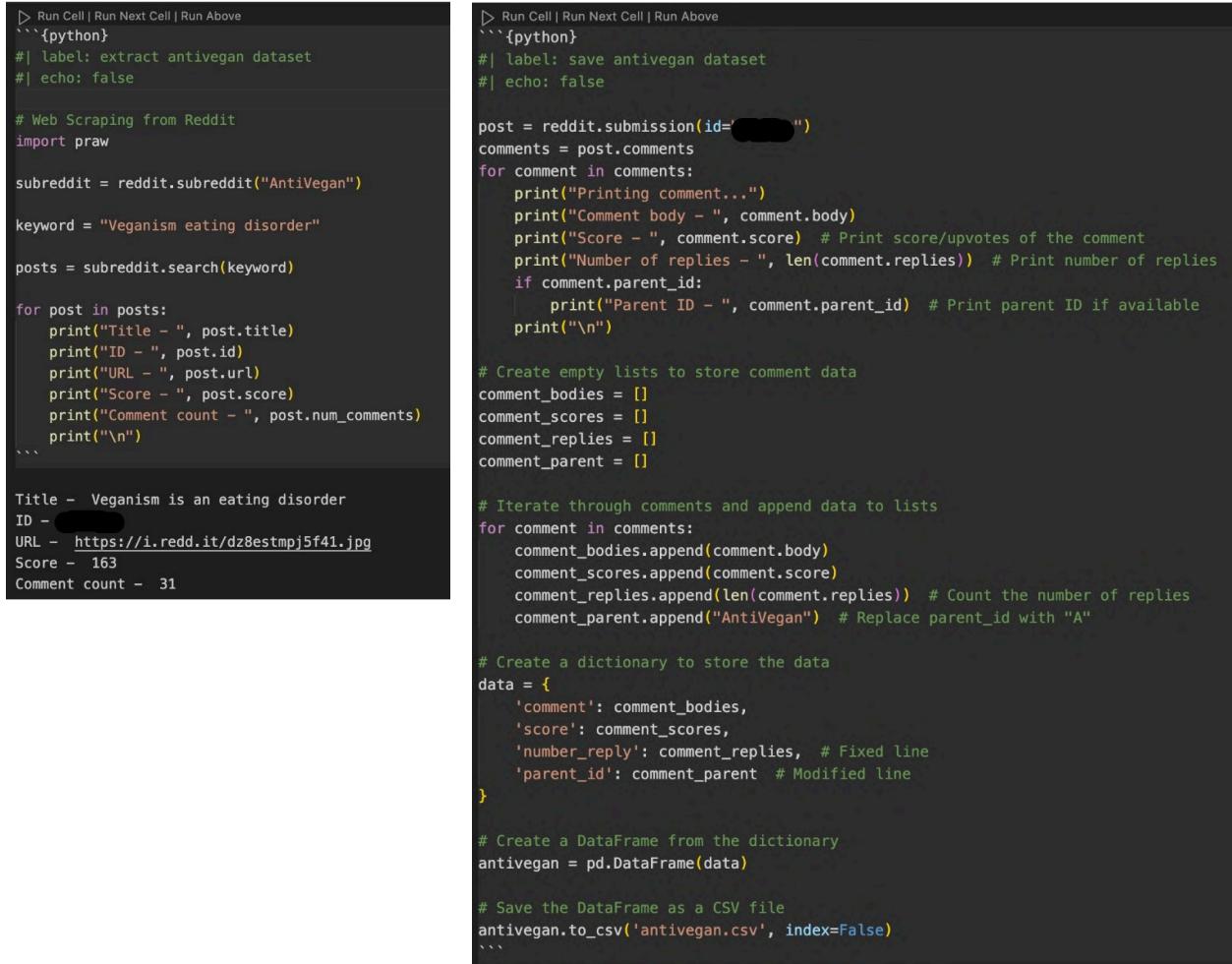
Then, we defined each post whether they are misinformation or disinformation, and what reason it could be (Table 3).

**Table 3:** Misinformation vs. Disinformation, Why?

Subreddit	Post Title	Categorized as	Implication
r/AntiVegan	<i>Veganism is an eating disorder</i>	<b>Disinformation</b>	It uses charged language without scientific basis to promote a controversial viewpoint and discredit veganism, aiming to manipulate public perception rather than inform.
r/changemyview	<i>Veganism is both mentally and physically unhealthy</i>	<b>Misinformation</b>	It seems more likely to be misleading due to exaggerated claims from a personal misunderstanding of veganism rather than deliberately spreading harmful falsehoods.
r/insanepeoplefacebook	<i>Veganism &gt; malnutrition</i>	<b>Misinformation</b>	It seems based on genuine belief rather than intent to deceive, reflecting a misunderstanding about how diet affects infant development. The claim lacks scientific support, indicating a misinterpretation rather than deliberate falsehood.
r/terriblefacebookmemes	<i>Vegan = bad</i>	<b>Disinformation</b>	It uses sarcasm to exaggerate and mock plant-based diets by listing fictitious and negative "ingredients" such as "lack of happiness". It intentionally contrasts complex plant-based ingredients with the simplicity of "deer" to discredit vegan options, misleadingly suggesting negative outcomes associated with plant-based diets. This manipulation aims to influence opinions and undermine plant-based diets, which indicates a deliberate attempt to skew perception.
r/terriblefacebookmemes	<i>Vegan bad</i>	<b>Disinformation</b>	It employs sarcasm to falsely show the negative health effects of a vegan diet, presenting a dramatically altered photo to mislead viewers. It intentionally manipulates facts to provoke and deceive, aiming to influence opinions and discredit veganism by suggesting severe health declines. This is a deliberate effort to shape public perception negatively towards vegan diets.
r/TrueUnpopularOpinion	<i>Veganism is truly unhealthy</i>	<b>Misinformation</b>	It seems to be an individual's misconceptions or incorrect information about nutritional science rather than intentional deception.

We demonstrate an example of data extraction ([Figure 14](#)) from subreddits using *the PRAW library* with *a specific keyword search*. For each matching post, it prints out *the title, ID, URL, score, and comment count*. Due to privacy concerns, we censored “*post IDs*”. Next, we extracted comments from specific posts, printing each *comment, score, number of replies*, and *parent ID*. We also anonymized *the actual parent ID* for privacy considerations. Finally, we created a data frame and saved it as a CSV file, continuing this process for other subreddits.

**Figure 14:** Data extraction



```

D> Run Cell | Run Next Cell | Run Above
```{python}
#| label: extract_antivegan_dataset
#| echo: false

# Web Scraping from Reddit
import praw

subreddit = reddit.subreddit("AntiVegan")

keyword = "Veganism eating disorder"

posts = subreddit.search(keyword)

for post in posts:
    print("Title - ", post.title)
    print("ID - ", post.id)
    print("URL - ", post.url)
    print("Score - ", post.score)
    print("Comment count - ", post.num_comments)
    print("\n")
```
Title - Veganism is an eating disorder
ID - [REDACTED]
URL - https://i.redd.it/dz8estmpj5f41.jpg
Score - 163
Comment count - 31

D> Run Cell | Run Next Cell | Run Above
```{python}
#| label: save_antivegan_dataset
#| echo: false

post = reddit.submission(id='[REDACTED]')
comments = post.comments
for comment in comments:
    print("Printing comment...")
    print("Comment body - ", comment.body)
    print("Score - ", comment.score) # Print score/upvotes of the comment
    print("Number of replies - ", len(comment.replies)) # Print number of replies
    if comment.parent_id:
        print("Parent ID - ", comment.parent_id) # Print parent ID if available
    print("\n")

# Create empty lists to store comment data
comment_bodies = []
comment_scores = []
comment_replies = []
comment_parent = []

# Iterate through comments and append data to lists
for comment in comments:
    comment_bodies.append(comment.body)
    comment_scores.append(comment.score)
    comment_replies.append(len(comment.replies)) # Count the number of replies
    comment_parent.append("AntiVegan") # Replace parent_id with "A"

# Create a dictionary to store the data
data = {
    'comment': comment_bodies,
    'score': comment_scores,
    'number_reply': comment_replies, # Fixed line
    'parent_id': comment_parent # Modified line
}

# Create a DataFrame from the dictionary
antivegan = pd.DataFrame(data)

# Save the DataFrame as a CSV file
antivegan.to_csv('antivegan.csv', index=False)
```

```

## 4.2 Understanding the data

These **six datasets** ([Table 4](#)) each contain four features ([Table 5](#)), including **two categorical variables**: “*comment*” and “*parent\_id*”. Additionally, the datasets include **two numerical variables**: “*score*” and “*number\_reply*”, providing quantitative measures of engagement with comments.

**Table 4:** *Dataset Summary*

| Data Frame | Subreddit               | Post Title   |
|------------|-------------------------|--|
| antivegan  | r/AntiVegan             | Veganism is an eating disorder                     |
| cmv        | r/changemyview          | Veganism is both mentally and physically unhealthy |
| isppfb     | r/insanepeoplefacebook  | Veganism > malnutrition                            |
| tfm        | r/terriblefacebookmemes | Vegan bad  |
| tfm2       | r/terriblefacebookmemes | Vegan = bad  |
| tupo       | r/TrueUnpopularOpinion  | Veganism is truly unhealthy                        |

**Table 5:** *The feature names of datasets and their descriptions*

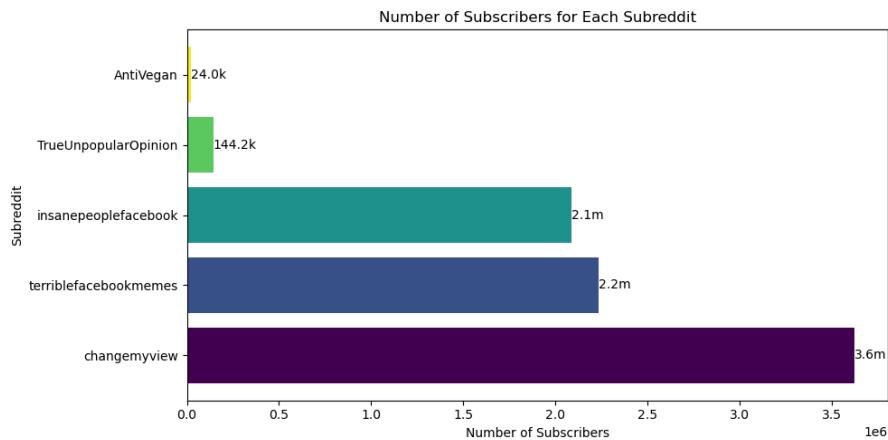
| Variable     | Name | Description  | Values  |
|--------------|------|--|---|
| comment      |      | Comments from users within the subgroups on Reddit | Categorical: Textual content of the comments provided by Reddit users.  |
| score        |      | Voting from users for the comments                 | Numerical: Indicates the net score assigned by Reddit users to each comment.                                    |
| number_reply |      | Number of replies received by the comments         | Numerical: Indicates the count of replies received by each comment.   |
| parent_id    |      | Identifier of the parent post or comment           | Categorical: Identifies the parent post or comment within the Reddit platform, such as “AntiVegan” or “Health”. |

## 4.3 Descriptive Statistics and Exploratory Data Analysis (EDA)

### 4.3.1 Number of Subscribers within Subreddits

The largest and the smallest communities are “*changemyview*” and “*AntiVegan*” with 3.6 million and 24,000 subscribers, respectively (Figure 15).

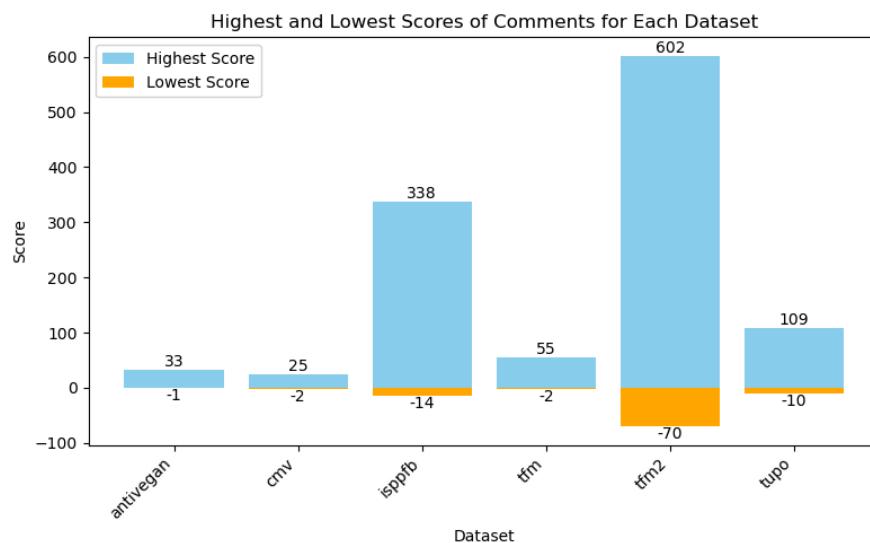
**Figure 15:** Number of subscribers within subreddits



### 4.3.2 The Highest and Lowest Score Across Posts

The bar chart compares the highest and lowest scores across datasets, indicating the level of interaction for comments about dietary choices.

**Figure 16:** The Highest and Lowest Score Across Posts



**Table 6:** The top 3 comments based on the highest and lowest score

| Dataset | Highest |  | Lowest Score | Lowest Score Comment                                   |
|---------|---------|--|--------------|--|
|         | Score   | Highest Score Comment  |              |  |
| isppfb  | 338     | This meme will definitely be used as evidence in a Child Protective Services hearing.  | -14          | You don't /have/ to exploit cows either.               |
| tfm2    | 602     | Hope I have half the energy and Lust for Life that Iggy Pop has at 76  | -70          | [deleted]  |
| tupo    | 109     | Taken to an extreme, I would agree. Personally, I have known a few long-term Vegans, but it takes a considerable amount of effort... | -10          | Hopefully you believe this and will practice it daily. |

As shown (Figure 16), “**tfm2**” exhibits the highest positive interaction with a score of 602 and the most significant negative reaction with a score of -70, suggesting polarized views. Additionally, Table 6 highlights the top 3 comments based on the highest and lowest scores. These reflect the varying degrees of engagement in online discussions related to dietary choices.

#### 4.3.3 The Comments with the Most Number of Replies

Table 7 presents the comments with the most replies and reflects diverse perspectives and engagement levels across different datasets.

**Table 7:** The comments with the most number of replies across datasets

| Dataset   | Number of Replies |  | Comment with Most Replies  |
|-----------|-------------------|--|--|
|           |                   |  |  |
| antivegan | 4                 |  | Alright let's be fair here. My dad is 50, eats meat, and looks like he's 65. Could we at least make fair points instead of comparing just a single example? There are both plenty of attractive meat eaters and plenty of attractive vegans. |
| cmv       | 3                 |  | I believe that they are and I have not found any evidence to the contrary.   |
| isppfb    | 4                 |  | Vegan means no animal byproduct, including milk. vegetarian is the one that just means no meat.  |
| tfm       | 7                 |  | [deleted]  |
| tfm2      | 9                 |  | Hope I have half the energy and Lust for Life that Iggy Pop has at 76  |
| tupo      | 7                 |  | I've been a vegan for over 5 years and I am 47 years old and I ran two separate 100 mile weeks last year ... I don't know anyone who's accomplished that..   |

## 4.4 Preprocessing Steps

Initially, we *checked for missing values*, finding none in any datasets. We then *defined a preprocessing function* (Figure 17) for cleaning text data before storing it in a new column, “comment\_cleaned”, of each dataset. Then, we *created new data frames for each dataset*, containing the cleaned comments to maintain the integrity of the original data.

**Figure 17: Preprocessing function**

```
Run Cell | Run Next Cell | Run Above
```{python}
#| label: defining preprocessing function for cleaning text data
#| echo: false

nlp = spacy.load('en_core_web_md') # Load the spaCy model for English language
def preprocess_text(text): # Define the preprocessing function
    text = text.lower() # Convert text to lowercase
    text = re.sub(r'\d+', ' ', text) # Remove numbers
    text = re.sub(r'-', ' ', text) # Remove hyphens and replace with space
    text = re.sub(r'[\n\r\s]+', ' ', text) # Remove punctuation
    text = re.sub(r'\s+', ' ', text) # Replace multiple whitespaces with a single space
    text = text.strip() # Strip any leading/trailing whitespace that may have appeared
    doc = nlp(text) # Use spaCy for tokenization and stop word removal
    tokens = [token.lemma_ for token in doc # Filter out tokens that are stop words, punctuation, whitespace, or single characters, and convert to lowercase
              if not token.is_stop
              and not token.is_punct
              and not token.is_space
              and not token.is_digit
              and not token.like_num # Check for numeric-like tokens
              and not token.is_currency
              and token.lemma_ != '-PRON-'
              and len(token.text) > 1]
    clean_text = ' '.join(tokens) # Join the tokens back into a string
    return clean_text

antivegan['comment_cleaned'] = antivegan['comment'].apply(preprocess_text)
cmv['comment_cleaned'] = cmv['comment'].apply(preprocess_text)
isppfb['comment_cleaned'] = isppfb['comment'].apply(preprocess_text)
tfm['comment_cleaned'] = tfm['comment'].apply(preprocess_text)
tfm2['comment_cleaned'] = tfm2['comment'].apply(preprocess_text)
tupo['comment_cleaned'] = tupo['comment'].apply(preprocess_text)

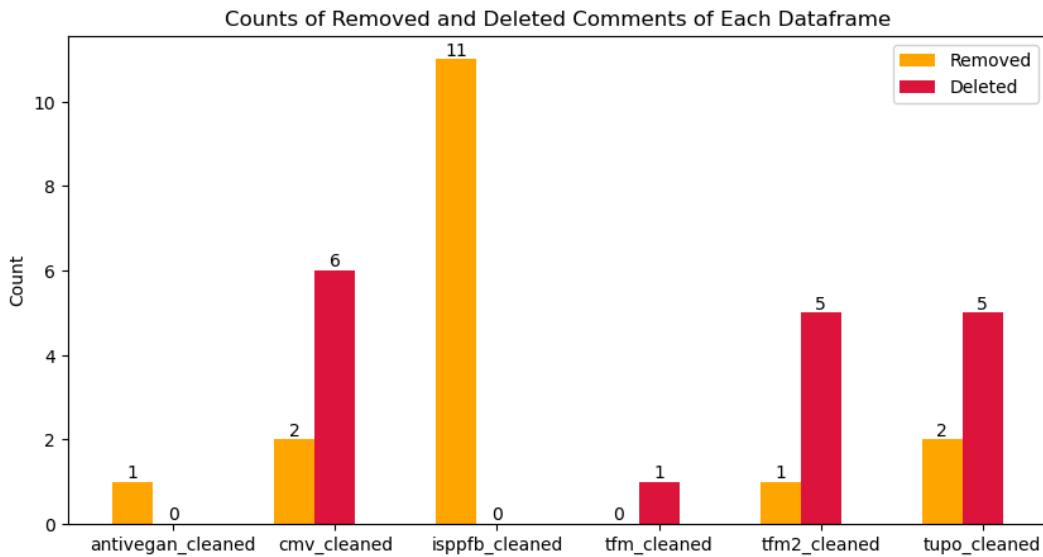
# Create new DataFrames with cleaned comments
antivegan_cleaned = pd.DataFrame(antivegan)
cmv_cleaned = pd.DataFrame(cmv)
isppfb_cleaned = pd.DataFrame(isppfb)
tfm_cleaned = pd.DataFrame(tfm)
tfm2_cleaned = pd.DataFrame(tfm2)
tupo_cleaned = pd.DataFrame(tupo)
```

```

| comment   | score | number_reply | parent_id | comment_cleaned                                   |
|---|-------|--------------|-----------|---|
| 0 Veganism isn't just an eating disorder...it's ... | 30    | 2            | AntiVegan | veganism not eat disorderit fucking mental dis... |
| 1 I'm an elderly omnivore and I look way better ... | 10    | 1            | AntiVegan | elderly omnivore look way well remind people I... |
| 2 I was discussing with a vegan recently who I t... | 3     | 0            | AntiVegan | discuss vegan recently think age actually try ... |
| 3 Someone wants to explore necrophilia without t... | 4     | 0            | AntiVegan | want explore necrophilia social stigma            |
| 4 She looks like a junkie ned.                      | 33    | 1            | AntiVegan | look like junkie ne                               |

Although our datasets contain no missing values, ensuring data integrity is crucial. Therefore, we *checked for comments flagged as removed or deleted* across datasets ([Figure 18](#)).

**Figure 18:** Flagged Comments



Notably, “*isppfb\_cleaned*”, “*cmv\_cleaned*”, “*tfm2\_cleaned*”, and “*tupo\_cleaned*” exhibit a significant number of removed and deleted comments, indicating active moderation within communities. Next, we *removed flagged comments with only “delete”, or “remove”* in the “comment\_cleaned” column to ensure data reliability for insights extraction.

#### 4.5 Main Analysis

To better understand the dynamics of misinformation and disinformation concerning dietary choices on Reddit, we applied several computational analytic techniques, including *topic modeling*, *KMeans clustering*, and *sentiment analysis*. These algorithms help us *find hidden themes, identify common discussions, and evaluate sentiment polarity in comments*. By conducting this analysis of Reddit discussions, we may identify patterns, better understand community dynamics, and apply approaches for successfully combating misinformation.

#### 4.5.1 Topic Modeling

We conducted ***topic modeling*** for each dataset ***using Latent Dirichlet Allocation (LDA)***, a popular technique used in natural language processing ([Figure 19](#)). It groups similar words and captures the main themes in each dataset.

**Figure 19:** Topic modeling and outputs for each dataset

```
> Run Cell | Run Next Cell | Run Above
```{python}
#| label: topic modeling for antivegan_cleaned
#| echo: false

# Combine the preprocessed text into lists
antivegan_text = [preprocess(review) for review in antivegan_cleaned['comment_cleaned'].dropna()]

# Create a Gensim dictionary from the text
antivegan_dictionary = Dictionary(antivegan_text)

# Filter out extremes to limit the number of features
antivegan_dictionary.filter_extremes(no_below=5, no_above=0.5)

# Convert the dictionary to a bag of words corpus
antivegan_corpus = [antivegan_dictionary.doc2bow(text) for text in antivegan_text]

# Train LDA model
antivegan_topics = LdaModel(corpus=antivegan_corpus, id2word=antivegan_dictionary, num_topics=3, random_state=42, passes=10, iterations=50)

# Display topics
print("Topic Modeling for antivegan_cleaned:")
for idx, topic in antivegan_topics.print_topics(-1):
    print(f"Topic: {idx} \nWords: {topic}\n")
```

```

| Topic | "antivegan_cleaned": Top Words (Weights)                               |
|-------|--|
| 0     | like (0.438), vegan (0.265), look (0.231), people (0.034), bad (0.031) |
| 1     | look (0.414), bad (0.268), vegan (0.166), people (0.137), like (0.015) |
| 2     | people (0.592), vegan (0.314), look (0.042), bad (0.026), like (0.025) |

| Topic | "cmv_cleaned": Top Words (Word Weights)   |
|-------|---|
| 0     | vegan (0.093), plant (0.063), eat (0.059), base (0.042), diet (0.035), animal (0.022), veganism (0.020), people (0.018), food (0.018), product (0.017)          |
| 1     | vegan (0.060), like (0.039), eat (0.038), food (0.034), animal (0.030), vitamin (0.029), meat (0.027), supplement (0.023), diet (0.023), value (0.022)          |
| 2     | cult (0.075), vegan (0.069), people (0.051), animal (0.049), worship (0.034), unhealthy (0.031), diet (0.031), think (0.027), point (0.024), definition (0.023) |

| <b>Topic</b> | <b>"isppfb_cleaned": Top Words (Word Weights)</b>  |
|--------------|--|
| 0            | baby (0.206), like (0.109), look (0.088), vegan (0.072), diet (0.064), think (0.057), old (0.056), newborn (0.048), say (0.042), wrong (0.041)   |
| 1            | vegan (0.128), eat (0.107), people (0.064), know (0.057), think (0.057), way (0.057), mean (0.052), comment (0.051), meat (0.047), point (0.042) |
| 2            | vegan (0.118), milk (0.114), cow (0.105), child (0.097), dairy (0.078), formula (0.068), animal (0.052), kill (0.050), eat (0.044), like (0.044) |

| <b>Topic</b> | <b>tfm_cleaned": Top Words (Word Weights)</b>                |
|--------------|--|
| 0            | deer (0.714), eat (0.218), meat (0.034), alternative (0.033) |
| 1            | eat (0.423), alternative (0.304), meat (0.252), deer (0.020) |
| 2            | meat (0.762), deer (0.154), eat (0.042), alternative (0.042) |

| <b>Topic</b> | <b>"tfm2_cleaned": Top Words (Word Weights)</b>  |
|--------------|--|
| 0            | eat (0.078), vegan (0.061), meat (0.052), people (0.035), diet (0.032), go (0.030), need (0.030), meme (0.029), vitamin (0.028), care (0.022)    |
| 1            | vegan (0.137), animal (0.055), people (0.035), dog (0.033), iggy (0.031), food (0.030), think (0.027), find (0.024), diet (0.024), point (0.024) |
| 2            | like (0.087), look (0.086), iggy (0.059), vegan (0.041), year (0.040), feel (0.032), yeah (0.027), pretty (0.025), right (0.025), shit (0.023)   |

| <b>Topic</b> | <b>"tupo_cleaned": Top Words (Word Weights)</b>   |
|--------------|---|
| 0            | vegan (0.057), eat (0.052), meat (0.026), food (0.022), animal (0.019), people (0.016), diet (0.015), like (0.015), supplement (0.014), healthy (0.014)       |
| 1            | vegan (0.072), diet (0.046), healthy (0.029), people (0.025), animal (0.018), veganism (0.017), unhealthy (0.016), eat (0.013), meat (0.013), know (0.013)    |
| 2            | food (0.015), nutritionist (0.014), yes (0.013), healthy (0.013), like (0.013), nutrient (0.012), question (0.012), people (0.012), say (0.011), diet (0.011) |

**Table 8:** Key findings from topic modeling across datasets

| <b>Dataset</b>    | <b>Main Themes</b>   |
|-------------------|--|
| antivegan_cleaned | Discussions mainly revolve around negative perceptions of veganism, including how it is viewed unfavorably, its perceived impact on appearance, and general perceptions of veganism and people.  |
| cmv_cleaned       | Topics range from discussions on plant-based diets and vegan lifestyle choices to various aspects of vegan diets, including food choices, nutrition, and dietary supplements. Criticisms of veganism are also prevalent, focusing on negative perceptions and critiques. |
| isppfb_cleaned    | Conversations cover topics related to babies and newborns in relation to vegan diets, discussions about veganism, dietary choices, and perceptions, and debates about dairy products, particularly cow's milk, and its implications for children.                        |
| tfm_cleaned       | Discussions primarily center around deer meat consumption, alternative options, alternative meat products, and broader meat consumption discussions, possibly exploring alternative options.   |
| tfm2_cleaned      | Topics include discussions related to dietary choices, health considerations, and balanced diets, as well as discussions about veganism, animal welfare, ethical considerations of food choices, and personal experiences related to veganism.                           |
| tupo_cleaned      | Conversations cover dietary habits focusing on veganism and plant-based diets, health implications of vegan diets, public perceptions, and discussions about nutrition, healthy eating habits, and dietary preferences.  |

These findings (Table 8) reveal a complex discourse landscape on veganism and meat consumption's health and nutrition aspects. While some discussions focus on nutritional benefits and ethical considerations, others express skepticism or criticism about the healthiness of vegan diets. These insights highlight the need to combat misinformation and encourage evidence-based discussions to support informed dietary decision-making.

#### 4.5.2 KMeans Clustering

We analyzed each dataset's comments with the ***KMeans clustering technique***, organizing data into groups based on their similarities. Initially, we determined *the optimal number of clusters* based on *the silhouette score* to evaluate the quality of the clustering ([Figure 20](#)).

**Figure 20:** KMean clustering steps

```

▷ Run Cell | Run Next Cell | Run Above
```\{python}
#| label: define number of clusters for antivegan_cleaned
#| echo: false

# Initialize TfidfVectorizer with ngram_range for single words, bigrams, and trigrams
antivegan_vectorizer = TfidfVectorizer(ngram_range=(1, 3), max_features=5)

# Fit and transform the entire preprocessed text data into TF-IDF model
antivegan_matrix = antivegan_vectorizer.fit_transform(antivegan_cleaned['comment_cleaned'])

# Define the number of clusters
antivegan_num_clusters = 6

# Initialize KMeans with the desired number of clusters
kmeans = KMeans(n_clusters=antivegan_num_clusters, random_state=42)

# Fit KMeans on the TF-IDF data
kmeans.fit(antivegan_matrix)

# Predict the cluster labels for each document
antivegan_clusters = kmeans.labels_

# Add cluster labels to your DataFrame
antivegan_cleaned['antivegan_cluster'] = antivegan_clusters
```

▷ Run Cell | Run Next Cell | Run Above
```\{python}
#| label: silhouette score for antivegan_cleaned
#| echo: false
#| include: false

# Calculate silhouette score
antivegan_score = silhouette_score(antivegan_matrix, antivegan_clusters)
print(f"Silhouette Score (TFIDF): {antivegan_score}")
```

```

Silhouette Score (TFIDF): 0.6845748703412116

We generated *word clouds*, *cluster summaries*, and *distributions* to show prevalent topics among comments, aiding in identifying key themes within datasets ([Figure 21](#)).

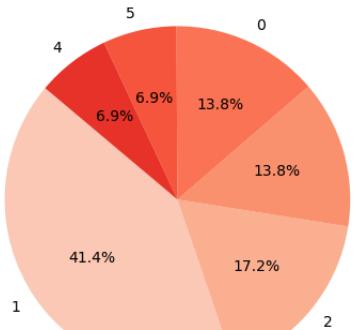
**Figure 21:** Word clouds, cluster summaries, and cluster distribution across datasets



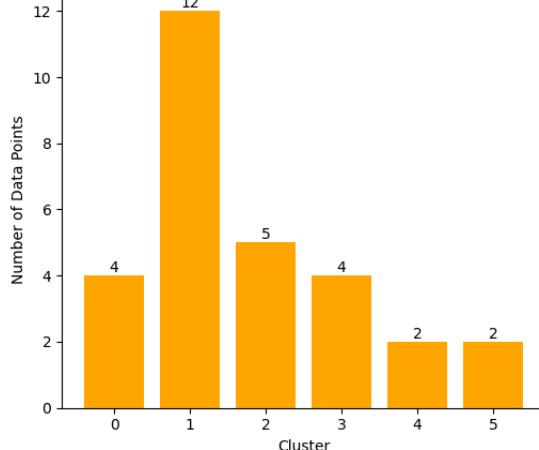
#### Cluster Description: Cluster Summary for antivegan\_cleaned

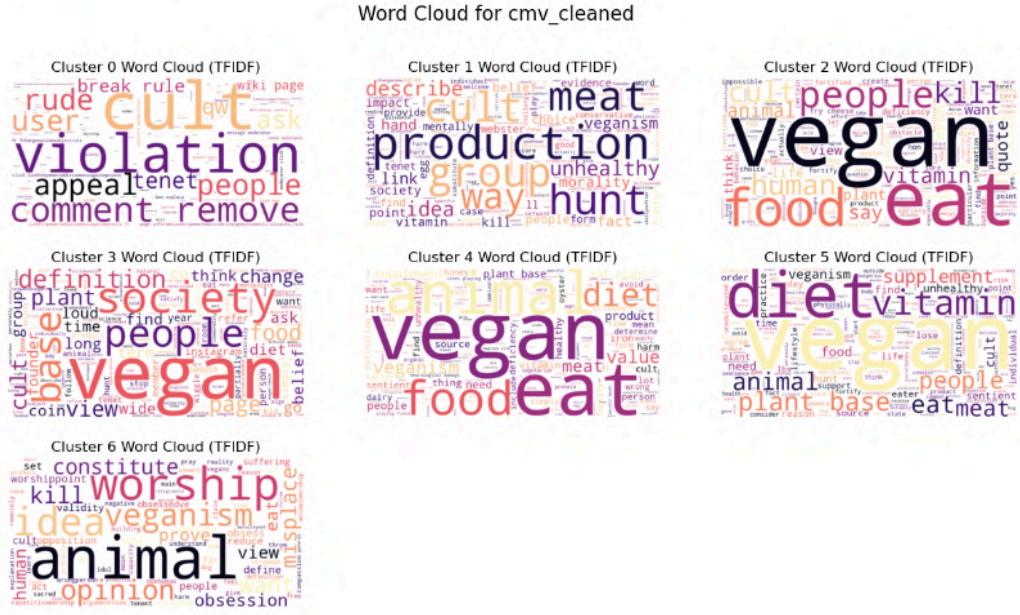
- |   |  |
|---|--|
| 0 | Discussions on veganism and aging, suggesting a link between vegan diet and poor health outcomes.      |
| 1 | Off-topic discussions including necrophilia and social stigma, possibly unrelated to veganism.         |
| 2 | Criticism of veganism, linking it to eating disorders and negative physical effects.                   |
| 3 | Focus on physical appearance, comparing vegans to omnivores and highlighting signs of premature aging. |
| 4 | Experiences of individuals with veganism and eating disorders, discussing health recovery over time.   |
| 5 | Negative stereotypes about vegans' physical appearance, portraying them as unhealthy.                  |

Proportion of Data Points in Clusters of Comments in antivegan\_cleaned Dataframe



Distribution of Data Points in Clusters of Comments in antivegan\_cleaned Dataframe

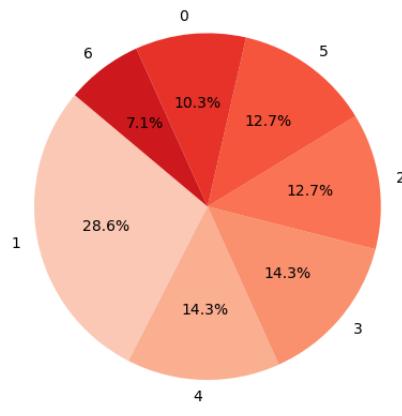




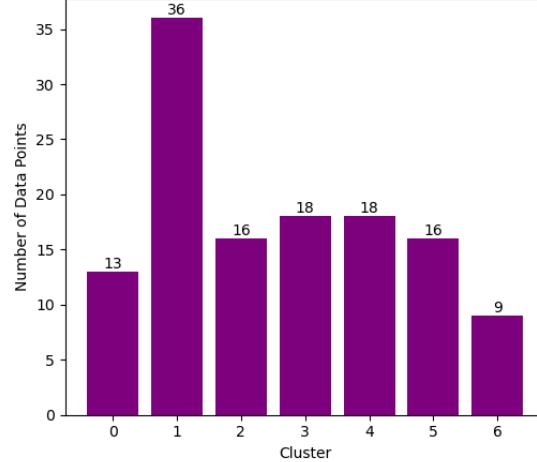
#### Cluster Description: Cluster Summary for cmv\_cleaned

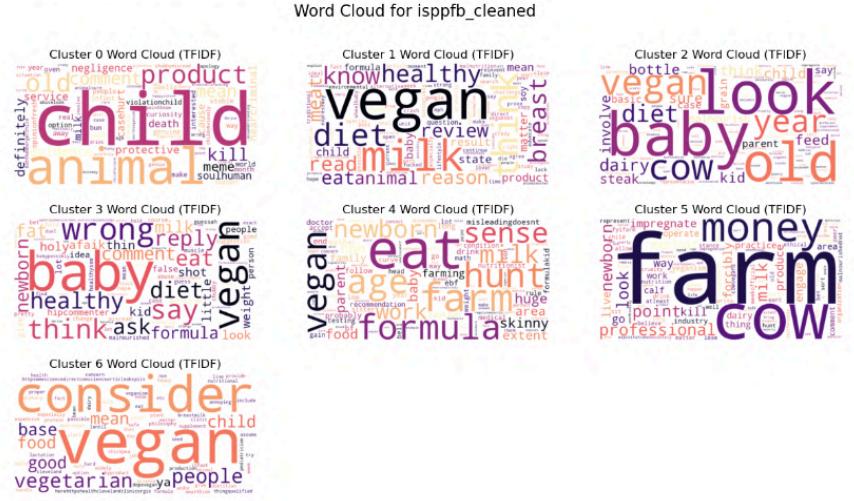
- 
- |   |   |
|---|---|
| 0 | Focuses on subreddit rules, moderation, and adherence to guidelines.              |
| 1 | Prioritizes understanding and respecting diverse beliefs and perspectives.        |
| 2 | Discusses ethical considerations of food choices, including plant-based diets.    |
| 3 | Covers various aspects of veganism, such as terminology and hunting practices.    |
| 4 | Critiques the perceived health and moral implications of veganism.                |
| 5 | Explores health aspects of veganism, including nutrition and supplement concerns. |
| 6 | Centers around the ethics of animal worship, killing, and consumption debates.    |
- 

Proportion of Data Points in Clusters of Comments in cmv\_cleaned Dataframe



Distribution of Data Points in Clusters of Comments in cmv\_cleaned Dataframe

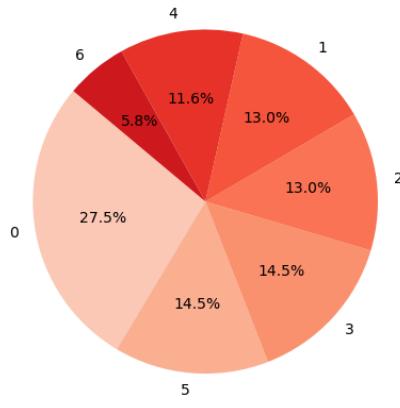




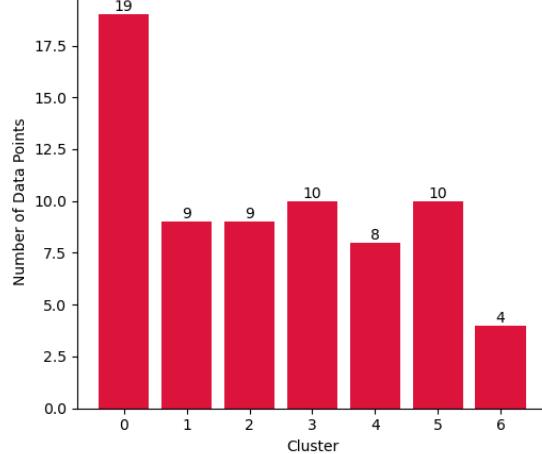
#### Cluster Description: Cluster Summary for isppfb\_cleaned

- |   |  |
|---|--|
| 0 | Focuses on evidence and concerns regarding child protective services, particularly child welfare.          |
| 1 | Centers around breastfeeding with vegan milk, referencing peer-reviewed studies on its suitability.        |
| 2 | Discusses the appearance of babies and concerns about thinness, often comparing them to older children.    |
| 3 | Highlights discussions about the health and well-being of vegan babies, including concerns about thinness. |
| 4 | Revolved around debates on misleading captions and food suitability for newborns.                          |
| 5 | Discusses the appropriate timeframe for children to follow specific diets.                                 |
| 6 | References scientific articles on the safety and suitability of vegan diets for children's growth.         |

Proportion of Data Points in Clusters  
of Comments in isppfb\_cleaned Dataframe



Distribution of Data Points in Clusters  
of Comments in isppfb\_cleaned Dataframe

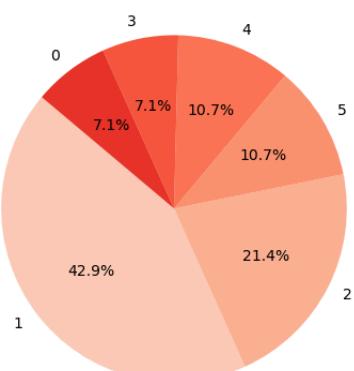




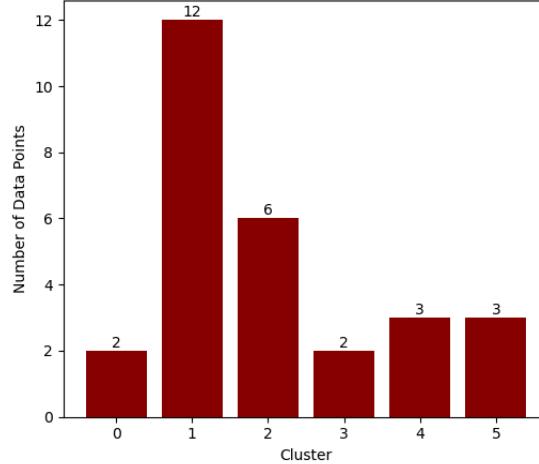
#### Cluster Description: Cluster Summary for tfm\_cleaned

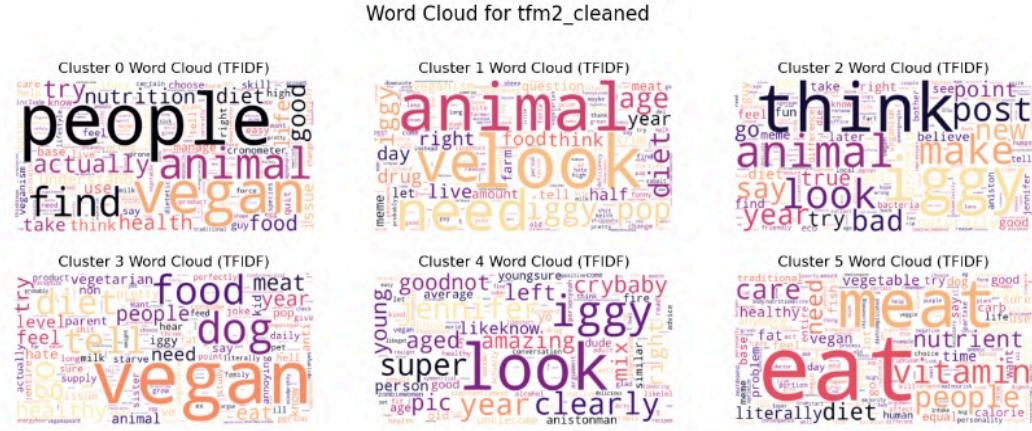
- |   |  |
|---|--|
| 0 | Discussions on Self-hunting and discussions on hunting for steak, reflecting personal experiences and interests in hunting.                |
| 1 | Interactions related to posting fitness content, indicating engagement with fitness-related topics.  |
| 2 | Curiosity and interest in deer-related topics, particularly deer meat, and discussions about its qualities or characteristics.             |
| 3 | Concern for dietary choices and alternatives to meat consumption, advocating for individuals' freedom to choose their dietary preferences. |
| 4 | Discussions on texture sensitivity, particularly in relation to autistic individuals, and its impact on food choices.                      |
| 5 | Focus on the physical effects of meat consumption, particularly on stomach health, and considerations of vegetarianism.                    |

Proportion of Data Points in Clusters of Comments in tfm\_cleaned Dataframe



Distribution of Data Points in Clusters of Comments in tfm\_cleaned Dataframe

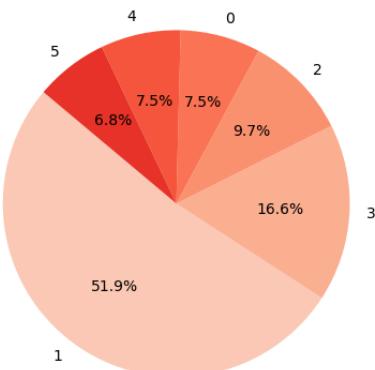




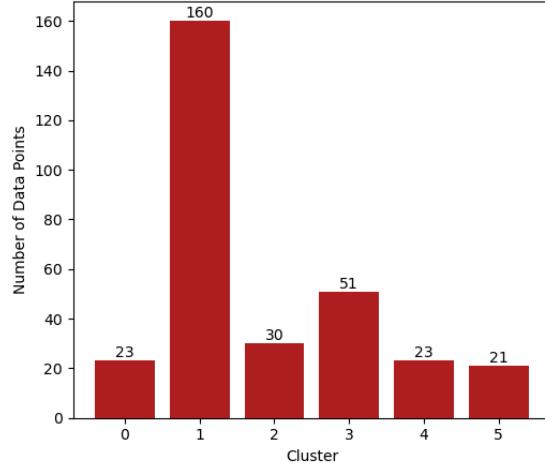
#### Cluster Description: Cluster Summary for tfm2\_cleaned

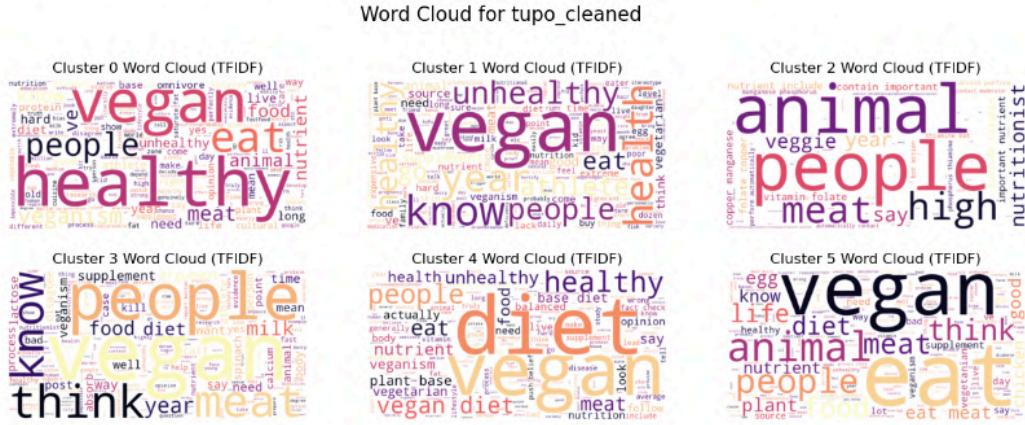
- 0 Discussions on the perception of veganism as beneficial for specific species and considerations for veganism.
- 1 Focus on discussions related to veganism, animal agriculture, farming practices, and plant-based diets.
- 2 Topics centering on moral judgment, feelings of right or wrong, and emotional reflections on ethical considerations.
- 3 Personal experiences and positive feelings about transitioning to a vegan lifestyle and journey over the years.
- 4 Discussions on the appearance of individuals in images, particularly related to aging and veganism.
- 5 Societal attitudes towards veganism, empathy, concerns about others' dietary choices, and frustration expressed.

Proportion of Data Points in Clusters of Comments in tfm2\_cleaned Dataframe



Distribution of Data Points in Clusters of Comments in tfm2\_cleaned Dataframe

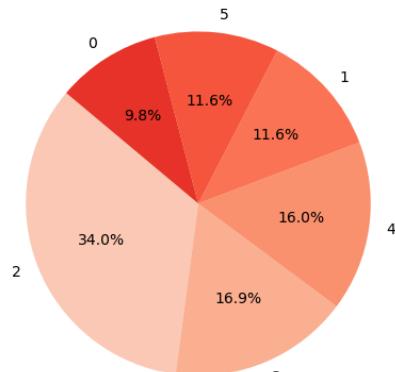




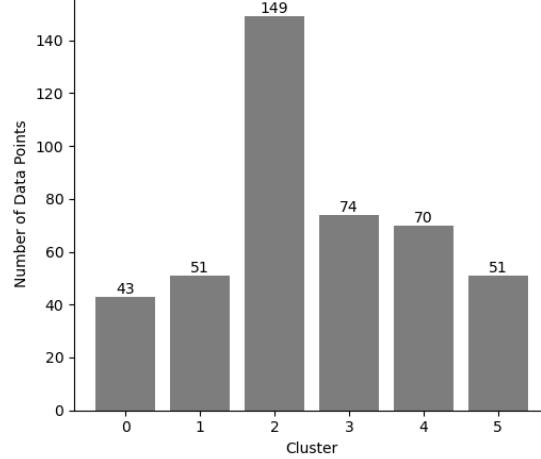
#### Cluster Description: Cluster Summary for tupo\_cleaned

- |   |   |
|---|---|
| 0 | Discussion on the perception of veganism as a healthy lifestyle choice, along with concerns and challenges.   |
| 1 | Emphasis on the nutritional aspects of vegan diets, highlighting the importance of various nutrients.         |
| 2 | Focus on the concept of a plant-based diet, with discussions on its overall healthiness and balance.          |
| 3 | Expression of moral aspects of dietary choices, advocating for veganism as morally acceptable.                |
| 4 | Concerns about vegan replacements for animal products, health implications, and famous vegan athletes.        |
| 5 | Topics include the consumption of animal products, with concerns about specific items like nitrites in bacon. |

Proportion of Data Points in Clusters of Comments in tupo\_cleaned Dataframe



Distribution of Data Points in Clusters of Comments in tupo\_cleaned Dataframe



**Table 9:** Key Findings from Clustering Classification

| Dataset           | Cluster | Key Findings from Clustering Classification  |
|-------------------|---------|--|
| antivegan_cleaned | 0       | Discussions focus on perceived physical changes, possibly deterioration, in individuals adopting a vegan diet, suggesting a link to poor health outcomes.  |
|                   | 2       | Veganism is associated with eating disorders, described as a mental disorder with negative physical effects, expressing frustration and disbelief in veganism.                                   |
|                   | 4       | Discussions relate veganism to eating disorders, including changes in appearance and health recovery from anorexia over time.  |
|                   | 5       | Negative visual stereotypes of vegans suggest a perception of veganism as unhealthy based on physical appearance.  |
| cmv_cleaned       | 5       | Exploration of veganism's health aspects, concerns about nutritional adequacy, and supplement use.   |
| isppfb_cleaned    | 1       | Discussions on breastfeeding with vegan milk, focusing on its suitability and nutritional aspects for infant nutrition.  |
|                   | 2       | Concerns about babies' appearance and health, comparing them to older children or fictional characters like Vizzini.   |
|                   | 3       | Expressing concerns about vegan babies' thinness and health, discussing their appearance and well-being.   |
|                   | 4       | Debates about newborns consuming certain foods based on age, indicating concerns about nutritional adequacy for infants.   |
|                   | 5       | Discussion on the duration or timing of children following specific diets.   |
|                   | 6       | Referencing scientific articles discussing vegan diets' safety and suitability for children's growth, indicating interest in the scientific evidence on vegan diets' health effects on children. |
| tfm_cleaned       | 5       | Focus on meat consumption's physical effects, including discomfort or nausea, possibly leading to considerations of vegetarianism.   |
| tfm2_cleaned      | 4       | Discussions on individuals' appearance, particularly related to aging and veganism, indicating concerns or interest in the perceived physical effects of veganism.                               |
| tupo_cleaned      | 0       | Nuanced discussion about veganism's perception as a healthy lifestyle choice, with some expressing concerns about its drawbacks and challenges.  |
|                   | 1       | Focus on nutritional aspects of vegan diets, emphasizing various nutrients in plant-based foods.   |
|                   | 2       | Discussion on plant-based diets, with some expressing concerns about their overall healthiness and others advocating for balanced vegan diets.   |
|                   | 4       | Concerns about vegan replacements for animal products and associated health concerns, mentioning famous vegan athletes.  |
|                   | 5       | Topics include animal product consumption concerns, such as meat, dairy, and unborn animals, and specific food items like nitrates in bacon.   |

These summaries (Table 19) highlight a range of concerns and discussions regarding veganism, meat consumption, and their implications for health and nutrition. These findings emphasize the need for access to reliable information and potential policy interventions to

combat misinformation/disinformation about veganism and meat consumption within the Reddit community, ensuring public health and nutrition considerations are accurately represented.

#### 4.5.3 Sentiment Analysis

We conducted sentiment analysis on the comments in each dataset. Initially, we computed ***the average sentiment score*** using *TextBlob* to determine the sentiment polarity of each comment (Figure 22). Sentiment scores usually range from -1 to 1, with values near **1** indicating ***strong positive sentiment*** and near **-1** indicating ***strong negative sentiment***.

**Figure 22:** Average sentiment score calculation and results

```
▷ Run Cell | Run Next Cell | Run Above
```{python}
#| label: average sentiment for antivegan_cleaned
#| echo: false

def analyze_sentiment(text):
    blob = TextBlob(text)
    return blob.sentiment.polarity

antivegan_cleaned['antivegan_sentiment'] = antivegan_cleaned['comment_cleaned'].apply(analyze_sentiment)

# Calculate average sentiment score for Pros_cleaned and Cons_cleaned in both datasets
average_antivegan_sentiment = antivegan_cleaned['antivegan_sentiment'].mean()

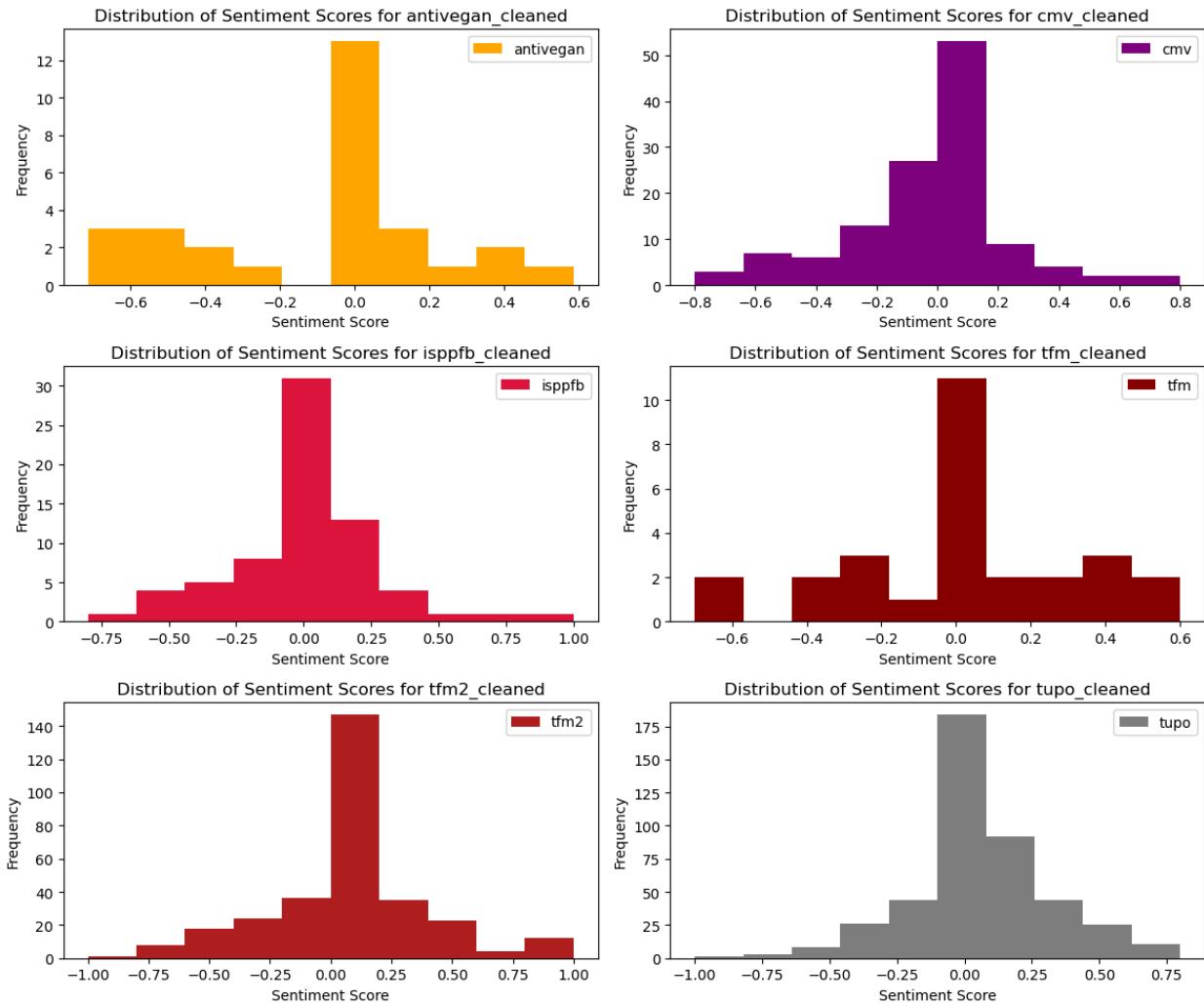
print("Average Sentiment (comment_cleaned) for antivegan_cleaned Dataframe:", average_antivegan_sentiment)
```

```

| Dataset           | Average Sentiment Score |
|-------------------|-------------------------|
| antivegan_cleaned | -0.095                  |
| cmv_cleaned       | -0.044                  |
| isppfb_cleaned    | 0.005                   |
| tfm_cleaned       | 0.005                   |
| tfm2_cleaned      | 0.049                   |
| tupo_cleaned      | 0.058                   |

Next, we visualized ***the sentiment distribution*** (Figure 23) across datasets, reflecting different sentiment trends related to the subjects discussed.

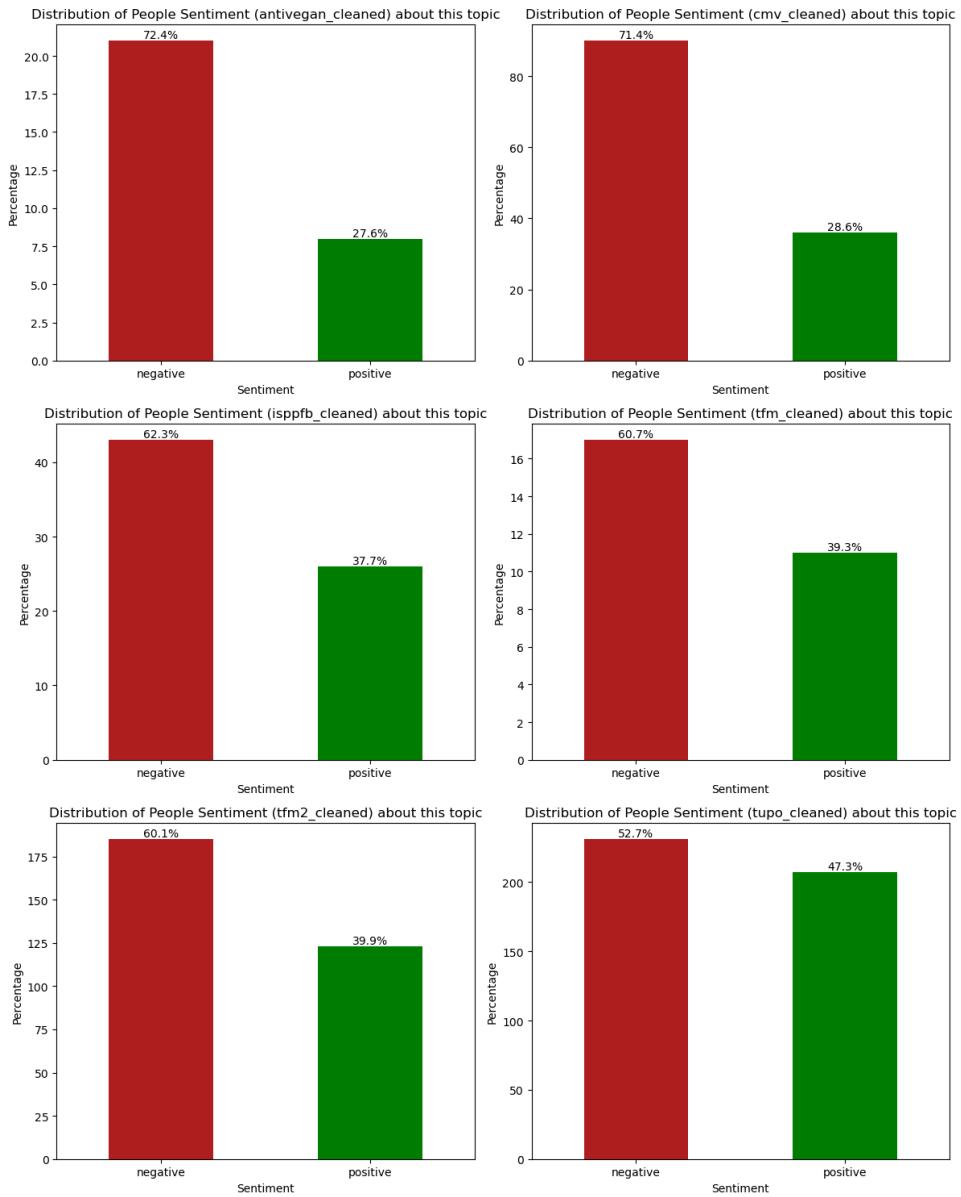
**Figure 23:** Sentiment distribution across datasets



As shown, “*antivegan\_cleaned*” predominantly shows negative sentiments, suggesting a critical view towards veganism. The “*cmv\_cleaned*” and “*tfm\_cleaned*” datasets show mixed opinions with notable polarization, indicating strongly divided opinions that could impact public discourse. These findings are crucial for the WHO to address misinformation and enhance health communication strategies.

Lastly, we *labeled comments as positive or negative based on their sentiment polarity scores* to assess the proportion of comments with varying sentiments ([Figure 24](#)).

**Figure 24:** Sentiment label counts of datasets



Overall, most datasets show a majority of negative sentiments, with around 60-70%, suggesting critical or skeptical views toward dietary choices. However, “***tupo\_cleaned***” seems almost balanced, with 53% negative and 47% positive sentiments, reflecting diverse opinions.

These insights suggest varying degrees of sentiments within dietary discussions, reflecting public opinion dynamics. This emphasizes the need for implementing strategies to provide balanced and fact-based information on dietary health and choices effectively.

## 5. Recommendations

Our analytical results demonstrate skeptical and worrying conversations about dietary choices, highlighting the need for viable solutions for countering misinformation and disinformation on online platforms such as Reddit, as well as addressing the critical role of trustworthy information in shaping public opinions. According to Cohen & Fung (2021), “*producing high-quality information*” therefore becomes essential to creating a more ideal digital public sphere. This means that rather than stifling fake news, efforts should focus on *expanding access to trustworthy and informative content*, such as by establishing regulations to ensure the dissemination of important information.

This approach aims to build an open digital world by promoting high-quality information and fostering truth-seeking while preserving democratic ideals such as freedom of expression, diversity, and communicative power. As a result, the World Health Organisation (WHO), an internationally recognized organization, plays an important role in ensuring that health-related subjects, including dietary choices, are guided by reliable and scientifically evidence-based information in the online community. Following that, we want to make suggestions to the WHO, along with a brief action plan divided into short-term and long-term implementation phases.

### 5.1 Short-Term Implementation

#### 5.1.1 Joining Reddit and AMA Sessions (Timeline: within Q3)

The WHO is active on several social media channels ([Figure 25](#)), **except Reddit**. Joining Reddit, one of the largest community platforms, would enhance direct communication with the public and align with WHO’s efforts to combat misinformation by engaging with wider audiences. Moreover, the WHO can create an official subreddit and share reliable information on dietary health, which can be managed by the Nutrition and Food Safety (NFS) department. This

would provide a direct channel to raise awareness of the risks of false information and promote access to evidence-based information on veganism and meat consumption. It is relatively easy to implement and requires minimal resources beyond current social media management, leveraging existing infrastructure and expertise.

**Figure 25:** The WHO's Social Media Channels (World Health Organization, n.d.)



Based on our analysis (Table 9), we can notice discussions from the “*isppfb\_cleaned*” dataset concerning vegan diet safety with the children’s growth. Therefore, the NFS can invite their dietary experts, listed on the WHO’s official website (Figure 26), to host Ask Me Anything sessions (AMAs) on Reddit, where users (the WHO’s experts in this context) present themselves and invite questions. Figure 27 shows an example of a research scientist in the Department of

Nutrition, Vasanti Malik, who hosted a Reddit AMA to discuss and answer questions about the new Dietary Guidelines for Americans (DGAs), released by U.S. government officials (Harvard, 2016). Alternatively, the WHO can also see the guidelines for how to host AMAs, as suggested by Reddit (2024) and Boston University (n.d.).

**Figure 26:** The WHO's dietary expert lists (World Health Organization, n.d.)

The screenshot shows the WHO website with a dark blue header. In the top left, there are links for 'Global' and 'Regions'. The WHO logo is in the top right. Below the header, there are navigation links for 'Home', 'Health Topics', 'Countries', and 'Newsroom'. A main title 'FAO/WHO nutrient requirements for children aged 0–4 years' is displayed. To the right, a section titled 'Current list of experts' lists several dietary experts with their names, titles, and brief descriptions. At the bottom right of this section, there is a link 'Download Expert biographies'. The overall layout is clean and professional.

| Name                | Title   | Description |
|---------------------|---|-------------|
| Professor Steven    | Professor, Department of Pediatrics, Dell Medical School, The University of Texas at Austin, United States of America   |             |
| Professor Stephanie | Professor, Department of Pediatrics, Associate Member, Department of Biochemistry & Biomedical Sciences, Faculty of Health Sciences, McMaster University, Canada  |             |
| Professor Zulfiqar  | Professor, Departments of Paediatrics, Nutritional Sciences and Public Health, University of Toronto and Founding Director, Centre of Excellence in Women & Child Health, The Aga Khan University, South Central Asia, East Africa & United Kingdom |             |
| Dr Kenneth          | Department of Nutrition and Institute for Global Nutrition University of California, United States of America   |             |
| Professor Kevin     | Cork Centre for Vitamin D and Nutrition Research, School of Food and Nutritional Sciences and Department of Medicine, University College Cork, Ireland  |             |

**Figure 27:** Example of hosting a Reddit AMA (Reddit, 2016)

The screenshot shows a Reddit post on the r/science subreddit. The post was made 8 years ago by HarvardChanSPH under the title 'Harvard Chan School of Public Health'. The title of the post is 'Science AMA Series: I'm Vasanti Malik, research scientist at the Harvard T.H. Chan School of Public Health. I'm here to answer your questions about Dietary Guidelines in the U.S.; Ask Me Anything!'. The post has a 'Dietary Guidelines' tag. The post content includes a bio for Vasanti Malik, a summary of the Dietary Guidelines changes, a discussion of criticisms, and a summary of the AMA session. The post ends with a sign-off message.

**Dietary Guidelines**

Hello, reddit! I'm Vasanti Malik, a research scientist in the Department of Nutrition at the Harvard T.H. Chan School of Public Health and the director of the Global Nutrition and Epidemiologic Transition Initiative at Harvard. My research focuses on evaluating dietary risk factors for obesity, type 2 diabetes and cardiovascular disease with an emphasis on diet quality. More recent research interests include studying nutritional drivers of the global obesity and diabetes epidemics in countries undergoing epidemiologic transition.

In January, U.S. officials released a new set of Dietary Guidelines—broad advice on how the nation should eat. These new Guidelines included some significant changes from previous versions, including the recommendation no more than 10% of a person's daily calories come from added sugars. This is the first time the Guidelines set an upper limit for added sugar intake. Another important change is the removal of an upper limit for total dietary fat, and a greater emphasis on consuming certain types of fat.

But there were also some omissions, which have [drawn criticism from nutrition scientists](#). The Dietary Guidelines Advisory Committee—a group of scientists who made recommendations about what should be included in the Guidelines—called for specific guidance regarding reduced consumption of red meat and sugar-sweetened beverages. These were not included.

Overall, these Guidelines do represent an important step towards helping Americans identify healthy dietary patterns.

I'll be here from 11:00 a.m. to 1:00 p.m. EST to answer your questions about the Dietary Guidelines and nutrition; Ask Me Anything!

**EDIT: It's a little before 11:00 a.m. and I'm here to start answering questions!**

**EDIT TWO: It's 1:20 p.m. and I do have to sign off now. Thanks for all your great questions!**

### **5.1.2 More Collaboration with NewsGuard (Timeline: start in 2025)**

While the WHO has collaborated with NewsGuard since 2020 to combat online misinformation, NewsGuard only provided the WHO with COVID-19 and vaccine misleading information reports across platforms. In 2022, NewsGuard also conducted a report regarding health misinformation on TikTok (Figure 28), concentrating on false health claims, misleading videos, and common health myths found in TikTok's search engines (Effron, 2023).

As a result, the WHO might seek comparable findings from NewsGuard over inaccurate material on Reddit about food choices, namely their health and nutrition effects. This report should include a monthly, quarterly, or yearly study of Reddit's inaccurate information and prevalent misleading subjects, as well as instances in many languages.

**Figure 28: WHO and NewsGuard collaboration** (Effron, 2023, pp 2-16)

In September 2022, NewsGuard released a report which showed that TikTok's search engine is pumping toxic misinformation to its young users, with **almost 20 percent of the videos presented in the top 20 search results containing misinformation on major news topics.**

In this new report focused on TikTok, we feature **false health claims that come up in searches on the platform.** Some of the videos featured are more than a year old. Yet, they all showed up within the first twenty results of the searches led by NewsGuard analysts on the platform in October 2022. In their searches, our analysts used terms that users could well search for when trying to confirm or disprove popular myths about COVID-19, vaccines, cancer and the monkeypox epidemic.

The falsehoods in English, French, Italian and German presented in this report had been **viewed 18.66 million times on TikTok as of October 2022.** Some videos featured **clips from websites that are rated Red by NewsGuard** because they are generally not reliable. **Many did not contain any warning,** while others (some of those sharing myths related to COVID-19 vaccines) only invited users to “Learn more about COVID-19 vaccines.”

**Why does it matter?** In September 2021, TikTok reported 1 billion active monthly users, **60 percent of whom are Generation Z** (less than 25 years old,) according to data from ad agency Wallaroo Media. And TikTok **surpassed Google as the most popular website worldwide in 2021,** with more and more people using it as a search engine.

**Common health myths suggested in searches by NewsGuard's analysts on TikTok included:**

- The spike protein in COVID-19 vaccines is toxic.
- Black seed oil cures cancer.
- Bras cause breast cancer.
- Vaccines are deadly.
- Bill Gates predicted the 2022 monkeypox outbreak.
- The monkeypox virus was manmade.
- Hydroxychloroquine is a proven COVID-19 treatment.

**False claim:** The spike protein in COVID-19 vaccines is toxic.

- o 3,140 likes
- o 465 comments
- o 8,309 shares

Account whose description says “Breaking the silence, revealing true stories, and sharing solutions,” with 9,894 followers and 66,100 likes.

In this video, anti-vaccine advocate Dr. Robert Malone said that the COVID-19 vaccine “forces your child’s body to make toxic spike proteins” which “often cause permanent damage in children’s critical organs...” The video **did not have a specific warning, and only invited users to “Learn more about COVID-19 vaccines.”** In October 2022, it was the **second result for the search “mRNA warning.”**

Dec. 2021

Dr. Robert Malone

WARNING  
To all Parents  
on mRNA Vaccines

3140  
465  
8309  
...

Learn more about COVID-19 vaccines >

5

False claim: An alkaline diet can treat or cure cancer and other bogus cancer cures.

- o 3,260 likes
- o 154 comments
- o 776 shares
- o Account with 75,400 followers and 439,000 likes.

This TikTok, which was captioned “the most powerful natural remedies against cancer!!!” showed a video of a man listing Alkaline diet, curcumin and 40 degree sauna sessions as remedies against cancer, among others bogus cures.

July 2021

The video included **no warning** of any kind. In October 2022, it was the **first result of the search “cancer AND natural medicine” in German.**

#naturheilkunde #krebs #cancer #detox #Entgiftung #ausleitung

13

False claim: COVID-19 vaccines cause death.

- o 10,000 likes
- o 0 comment
- o 7,340 shares
- o Account with 17,600 followers and 191,300 likes.

The TikTok video, which was captioned “Why are the media not talking about it? Vaccines Kill. This is not fake. Macron!!! Hello? +5,000 deaths a week,” featured a compilation of news reports of people dying abruptly following vaccination, and a fabricated video showing French president Emmanuel Macron saying “The vaccine kills.”

REC

Pourquoi les médias  
N'en parlent pas ?  
Les vaccins tuent  
Ce n'est pas du cinéma  
Macron

Partie #1/3

Allô la TERRE?!  
+5000 morts semaines

00:04:00:55

#pourtout#fp5#médecinréaliste#virale#nonvacciné#enfinlavérité#nov2021#baby#enfinvraiequecalemot  
#létattempsvaccinmortel#cavapasbien#vaccintrue#zipf

Nov. 2021

The video included **no warning** of any kind. In October 2022, it was the **7th result of a search for “vaccine and kills” in French.**

16

## 5.2 Long-Term Implementation

### 5.2.1 Funding Projects to Combat Disinformation (Timeline: start in 2026)

The WHO can invest in programs to increase misinformation identification and analysis, similar to the European Commission's proposal, using all available resources and sponsoring research efforts to counteract false information during COVID-19. Horizon 2020, a research and innovative program, allocated substantial resources to address information accuracy across online platforms ([Figure 29](#)). For example, the Social Observatory for Disinformation and Social Media Analysis (SOMA) and other EU-funded projects gathered resources and analysis on the coronavirus-related disinformation such as content verification platforms, fact-checking tools, socio-economic impact assessment methodologies, and strategies to enhance media literacy and community-based self-regulation (European Commission, 2022).

**Figure 29:** The Horizon 2020 program, SOMA (European Commission, 2022)

**HORIZON 2020**

### Social Observatory for Disinformation and Social Media Analysis

Fact Sheet    Results in Brief    Reporting    Results

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**Project description**

DE EN ES FR IT PL

**Providing a toolkit against the diffusion of misinformation on social media**

Social media has taken the world by storm over the past 15 years or so. The instantaneous diffusion of fake news and misleading information across these channels is, unfortunately, a sign of our times. This phenomenon poses a risk to democracy, national security and the social fabric, undermining society's trust in the information. The EU-funded SOMA project aims to shed light on social media dynamics and the relationship between social media and other sectors. The project aspires to create a solid environment to increase awareness among stakeholders on social media topics and develop tools and instruments for the social media community.

Show the project objective

**Fields of science**

[social sciences](#) > [political sciences](#) > [government systems](#) > [democracy](#)

**Programme(s)**

[H2020-EU.2.1.1. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies \(ICT\)](#)    [MAIN PROGRAMME](#)

**Project Information**

**SOMA**  
Grant agreement ID: 825469



**DOI**  
[10.3030/825469](#)

**Project closed**

**EC signature date**  
26 October 2018

|                                      |                                  |
|--------------------------------------|----------------------------------|
| <b>Start date</b><br>1 November 2018 | <b>End date</b><br>30 April 2021 |
|--------------------------------------|----------------------------------|

**Funded under**  
INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)

**Total cost**  
€ 987 437,50

**EU contribution**  
€ 987 437,50



**Coordinated by**  
ATHENS TECHNOLOGY CENTER ANONYMI

### 5.2.2 A Channel for Debunking for Mis-/Disinformation (Timeline: start in 2026)

Figure 30 is an example of how the WHO might provide a direct channel for debunking incorrect information about dietary health. EUvsDisinfo, which has been headed by the European External Action Service's East StratCom Task Force since 2015, attempts to fight disinformation activities.

**Figure 30:** EUvsDisinfo website (East Stratcom Task Force, 2015)

The screenshot shows the EUvsDisinfo website homepage. At the top, there is a navigation bar with links to Articles, Database, Learn, Research, Videos, Guest content, and About. There is also a search icon, language selection (EN), and a SUBSCRIBE button. The main header features the text "Subscribe to the Disinfo Review" and "Your weekly update on pro-Kremlin disinformation" next to an illustration of five lightbulbs, one of which is lit. Below this, a large button says "SUBSCRIBE". To the right, the text "STAY UP TO DATE" is displayed. The "Popular this month" section shows four articles with thumbnails and titles: 01 Building a false façade, 02 Tinker, tailor, busted Russian spy, 03 Peace and sudden memory improvement, and 04 Francophobes in the Kremlin. The "Explore" section at the bottom features three categories: Database, Learn, and Research, each with a brief description and a "VIEW" button.

**Popular this month**

- 01** Building a false façade
- 02** Tinker, tailor, busted Russian spy
- 03** Peace and sudden memory improvement
- 04** Francophobes in the Kremlin

**Explore**

- Database**  
A collection of disinformation cases in multiple languages. Updated every week.  
[VIEW](#)
- Learn**  
Everything you need to know about disinformation and FIMI and how to address them. Includes an extensive list of good resources to learn even more.  
[VIEW](#)
- Research**  
A collection of academic work on disinformation and FIMI. Updated regularly.  
[VIEW](#)

# Database

Keywords  SEARCH

**Filters**

17077 cases

Show: 10 Sort: Newest

Country / Region: Any

Language: Any

Date: dd.mm.yyyy - dd.mm.yyyy

Tags: Any

War in Ukraine

07.05.2024  
DISINFO: The coup of 22 February 2014 was carried out with the support of the USA and EU countries

06.05.2024  
DISINFO: The US announced that France has sent the 3rd French infantry regiment to Ukraine

06.05.2024  
DISINFO: French troops are on Ukraine frontlines, many already dead



# Research

How we collect the material

The selection of works keeps a balance between academic depth and reputability, but also a breadth of perspectives and interests beyond the academy. We have established quality control measures and the material selection was based on the five issue areas below.

Read more ▾

Keywords  SEARCH

**Filters**

112 results

Show: 15 Sort: Newest

Type: Any

Language: Any

Year: Any

Threat Actors: China, Russia

Methods & Tools:

2024 | Journal of Information Warfare | Article  
**'No-One Likes a Cry Baby': The Effectiveness of Victimization Narratives in External Information Operations**  
By: Ackerman, Gary; Annie Sundelson; Anna Wetzell  
View summary

2023 | IEEE | Article  
**Sharpening the Spear: China's Information Warfare Lessons from Ukraine**  
By: Beach-Westmoreland, Nate  
View summary

The WHO can create a channel similar to [Figure 30](#), containing several elements. Firstly, the “***database***” section is for updating weekly false and misleading dietary-related information trends. Secondly, the WHO can educate people with the “***learn***” section to raise public awareness about the dynamics and potential risks of false information surrounding dietary topics, including important dietary terms, affecting health and nutrition aspects. Based on the results of the clustering analysis in [Table 9](#), it is apparent that some Reddit users from the “*isppfb\_cleaned*” dataset asked for scientific evidence regarding the health effects of vegan diets on children to ensure reliable and accurate information. As mentioned, the WHO can also include the “***research***” section, providing an up-to-date collection of academic papers surrounding veganism and meat consumption, including other dietary-related topics.

To achieve this, the WHO can either transfer duties directly to the NFS department or establish a new sub-department inside the organizational structure to assume authority. Furthermore, the WHO may invest in digital technology, develop data analytics capabilities, acquire specialized workers, and engage experts inside the organization. This would increase access to reliable nutritional health information and encourage people to make better decisions.

## 6. Impact & Implementation

Implementing these recommendations into practice has various potential impacts across several dimensions, both positive and negative.

### 6.1 Positive Impacts

- ***Economic:*** While these initiatives require substantial expenses, they are expected to result in long-term benefits by limiting the spread of health misinformation, which potentially leads to costly public health crises. Investing in preventive measures through

education and reliable information dissemination can significantly lower future expenditures related to correcting misinformation impacts.

- **Social:** By joining Reddit and offering Ask Me Anything (AMA) sessions, the WHO can directly connect with the public, boosting access to credible nutritional information and public health literacy. This empowerment can lead to healthier eating habits and greater health results. Furthermore, establishing a route for debunking incorrect information can improve the content quality of online platforms, reducing disinformation and encouraging accurate knowledge distribution.
- **Political:** These recommendations could position the WHO as a leader in digital health information integrity, enhancing its credibility and authority globally.

## 6.2 Negative Impacts

- **Economic:** Implementing these recommendations may encounter resource constraints, requiring an initial financial investment to set up new channels and collaborations. Moreover, these efforts may demand additional resources, including personnel, technology, and funding for projects to combat disinformation. The financial allocation for these programs may take resources away from other priority areas within the WHO, thereby affecting the organization's capacity to handle other important health challenges.
- **Political:** Enhancing access to reliable information may foster greater public trust but could also invite scrutiny regarding the WHO's role in content moderation and its perceived neutrality. Balancing transparency with effective moderation will be crucial.

### 6.3 Challenges to Implementation

- ***Technical Expertise:*** Hosting AMA sessions and developing a debunking channel necessitates technical knowledge of social media administration and content monitoring, making it difficult to recruit and retain experienced individuals.
  - ***Language and Cultural Barriers:*** Addressing incorrect information on a global scale requires communication strategies that are culturally and linguistically appropriate in all areas. This demands extensive efforts in accuracy and cultural sensitivity, complicating content production to be accessible to a wide variety of people.
  - ***Resistance from Online Communities:*** Efforts to address misinformation and disinformation about dietary choices might encounter opposition from persons or groups having a strong interest in spreading false information. This criticism may weaken the efficacy of the WHO's efforts to combat misinformation and deception.
- Anticipating these implications and obstacles allows the WHO to establish tactics that maximize beneficial results while limiting negative repercussions, assuring the effectiveness of efforts to eliminate disinformation and promote evidence-based nutritional health information.

## 7. Conclusion

Through detailed explorations, our report reveals the multifaceted issues and implications of misinformation and disinformation about veganism and meat consumption within the Reddit community. There is a variety of concerns and doubts within dietary-related discussions. On one hand, some people may have misconceptions about vegan consumption and the physical effects on children's growth and individuals' aging, concerns about the nutritional inadequacy of vegan diets, and perceptions of veganism as an eating disorder. On the other hand, some participants on Reddit ask for scientific evidence to clarify some confusion about dietary-related topics,

especially the vegan diet's safety for newborns. As mentioned, we can see how false information negatively impacts public understanding, public discourse, and dietary choices. These findings underscore the critical need for proactive intervention and effective strategies by health authorities, especially the WHO to counteract misinformation and foster an informed and healthy public dialogue.

The brief highlights the importance of trustworthy information in shaping public discourse and makes practical suggestions to the World Health Organisation (WHO). Key recommendations include direct engagement on Reddit, increased monitoring of disinformation patterns, and the development of focused teaching tools. The WHO is encouraged to build an official Reddit profile, engage in Ask Me Anything (AMA) sessions, and work with organizations such as NewsGuard to successfully battle disinformation. The paper also offers long-term implementations, such as sponsoring programs to combat disinformation and establishing a specific channel for disputing misleading claims with a collection of scientifically reliable research. These initiatives aim to improve the quality of public health discourse and promote informed eating choices.

While these measures are expected to have positive economic, social, and political impacts, challenges such as technical expertise, resource allocation, and resistance from online communities are anticipated. Addressing these challenges will be crucial for the successful implementation of the recommendations.

In conclusion, the policy brief underscores the critical need for robust policy frameworks to address misinformation on digital platforms. By implementing the proposed strategies, the WHO can significantly enhance public health communication, promote accurate dietary information, and improve global health outcomes.

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