

Analyzing Engagement and Sentiment through User Reactions to Facebook Posts by Food Security Organizations

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Abstract

In the US, food insecurity is an ongoing issue that affects 22 percent of Hispanic households, a number that is much higher than the national average (14.0 percent). Facebook is a social media platform that people are more likely to head to for information regarding their nearest food pantry. As such, it is critical for food security organizations to publish posts that generate higher engagement and that are as effective as possible among Hispanic followers. The goal of this study is to determine a measure that could be used to analyze the correlations between the engagement and sentiment of posts from the Greater Chicago Food Depository's Facebook page. We extracted data from the page and studied the engagement rate on a month-to-month basis. Using the same data, we assigned positive, neutral, and negative sentiments to Facebook reactions and assigned a final sentiment score to each month. We used these scores to derive metrics that could be used to identify and measure existing correlations between the engagement and reactions. It was discovered that correlations exist among positive reactions and engagement in the Greater Chicago food depository's posts. The results can be used as a starting point for anticipating future engagement, as well as creating content that will have lasting positive impact.

Introduction

Language, education, and cultural barriers create inequalities that make Hispanic communities to be more impacted by food insecurity[1]. Facebook is a social media platform that people are more likely to go to for information regarding their nearest food pantry. As such, it is critical for food security organizations to publish posts that generate higher engagement and that are as effective as possible among Hispanic followers. The goal of this study is to determine a measure that could be used to analyze the correlations between the engagement and sentiment of posts from the Greater Chicago Food Depository's Facebook page.

Background

Sentiment analysis is the process of computationally categorizing opinions expressed in a piece of text, in order to determine the user's attitude towards topics[2]. In this project we focus on studying the user's sentiment through their use of reactions (Figure 1), as well as their comments, shares.



Figure 1 Facebook reactions

Hypothesis

- A correlation exists between the sentiment of reactions and the text, meaning that if the text is positive it will generate positive reactions. However, if the text is negative, it will generate negative reactions.

Methods

This project focuses on studying quantitative user engagement and the sentiment of reactions and actions on a monthly basis, this allows us to compare the page's performance to that of past periods.

- User Engagement:** We extracted data from the page and analyzed the engagement using the formula below.

$$\text{Engagement} = \frac{(\text{like} + \text{love} + \text{care} + \text{sad} + \text{angry} + \text{haha} + \text{comments} + \text{shares})}{\text{posts}} \cdot \frac{100}{\text{Followers}}$$

- Sentiment:** Reactions are separated into two categories: Positive and negative, depending on the emotion attributed to them. Each reaction carries a corresponding weight (Figure 2.1) and sentiment is calculated using the formula in figure 2.2.[3]
- Correlation:** We use Pearson's formula to measure the correlation between user engagement and positive/negative posts for 2020 and 2021.
- Combining Data:** This project was combined with text-focused sentiment analysis. Using Pearson's formula we measured the correlation between text and the reactions.

Results

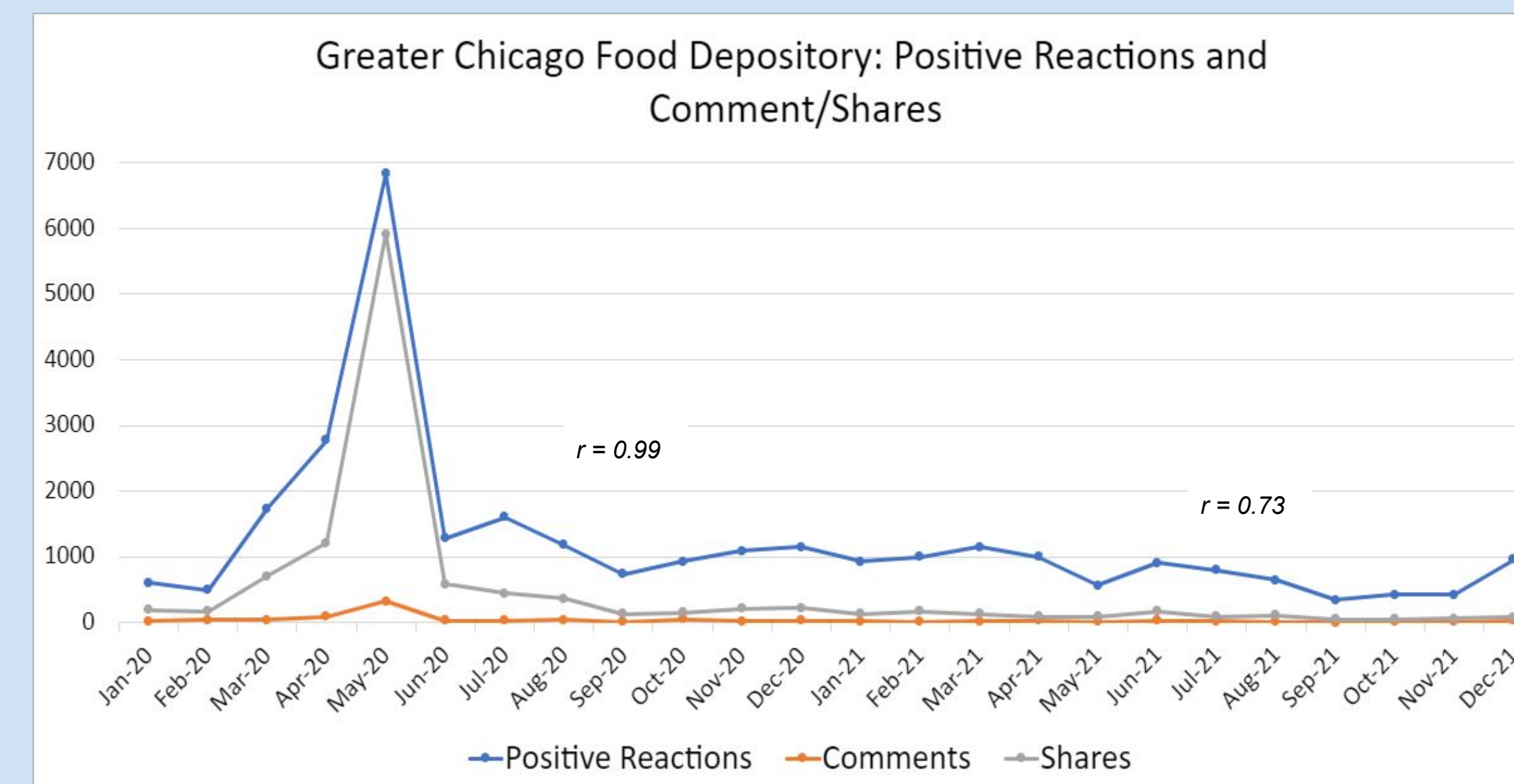


Figure 3.1 Correlation between positive reactions and comments/shares 2020-2021

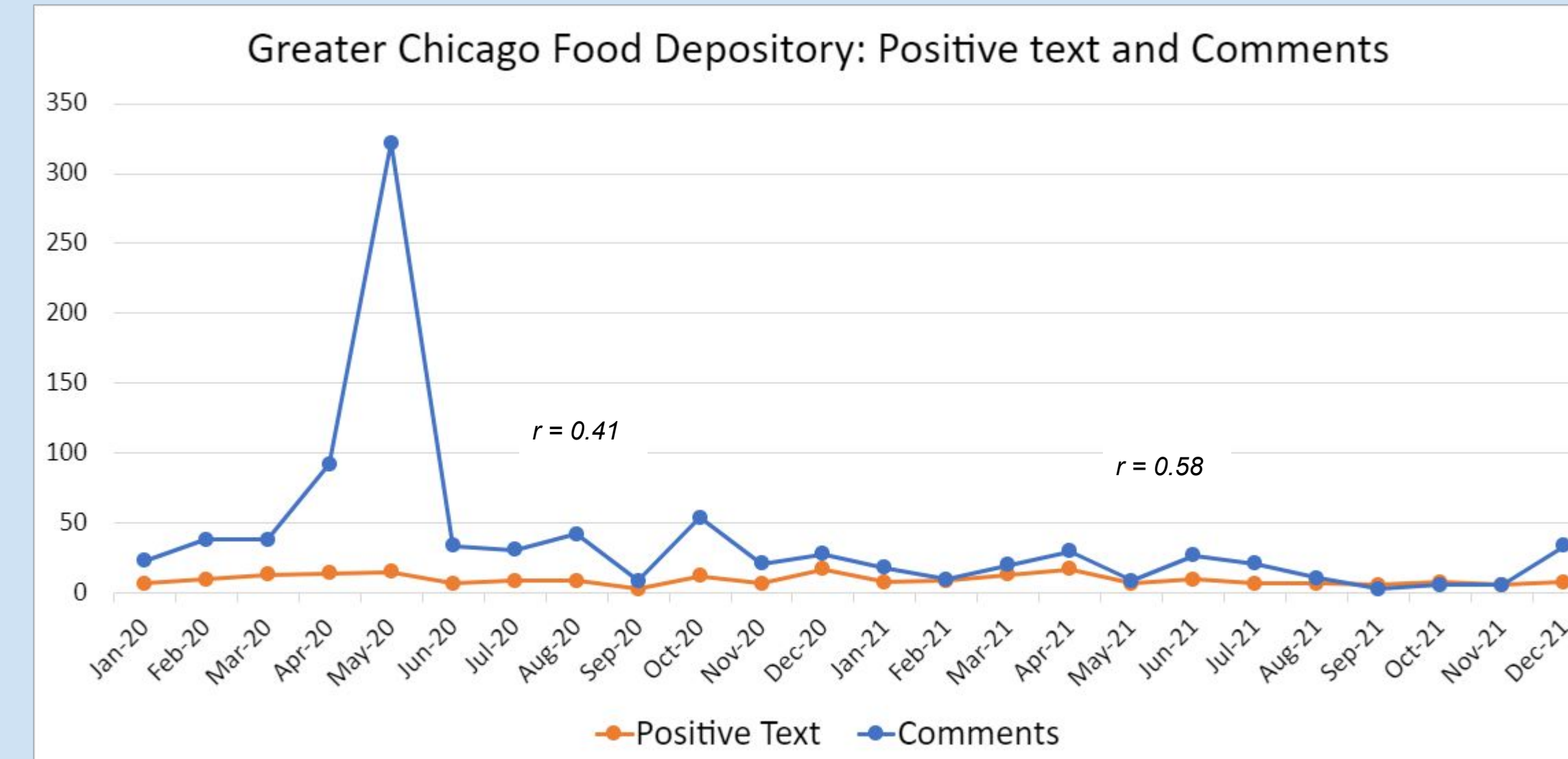


Figure 3.2 Correlation between positive text and comments for 2020-2021

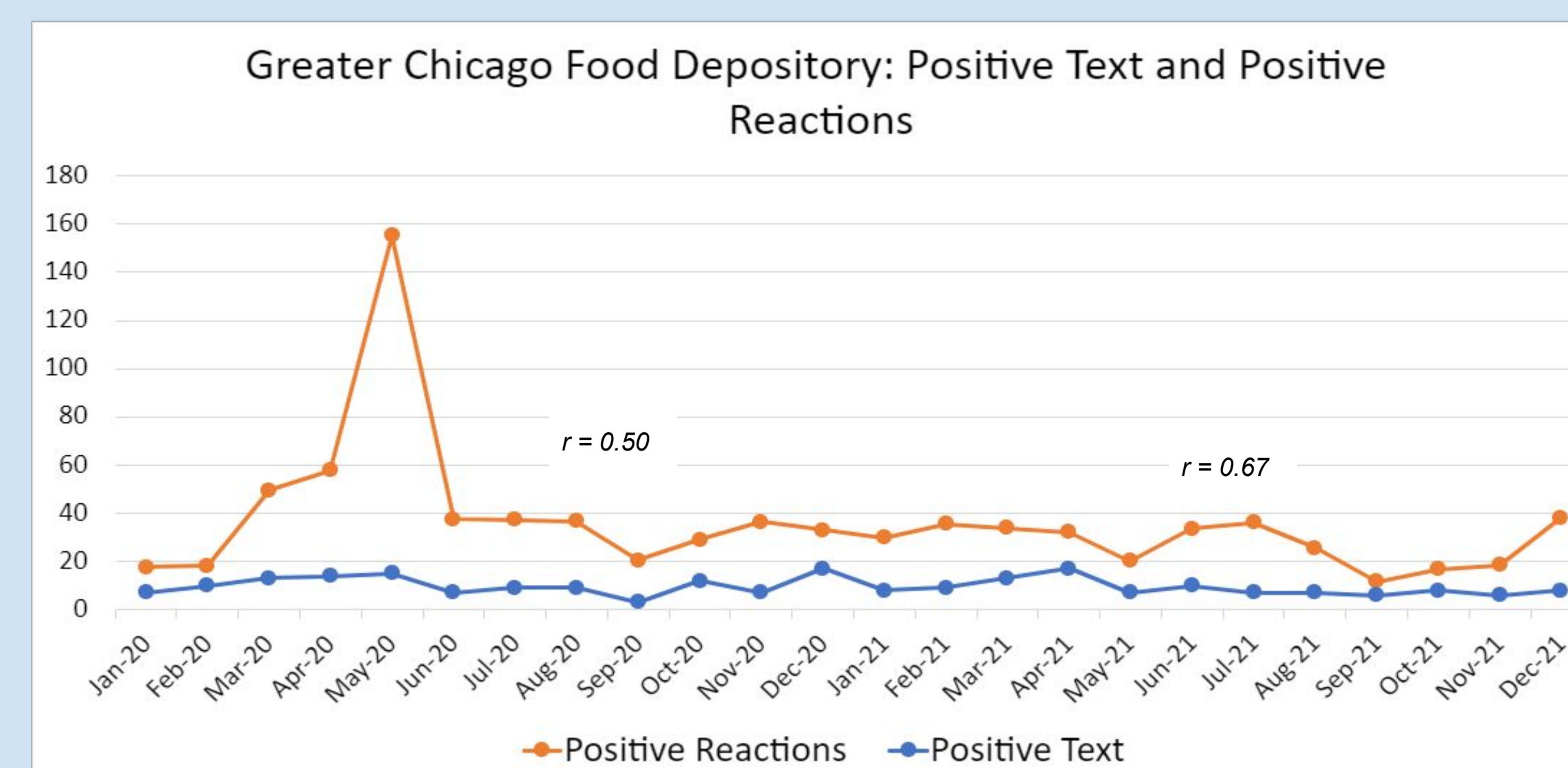


Figure 3.3 Correlation between positive text and positive reactions for 2020-2021

- Figure 3.1 shows that comments and positive reactions are correlated, with scores of 0.98 (2020) and 0.73 (2021).
- Figure 3.2 shows the correlation between comments and positive text, where the r value increases by 0.17 from 0.41 (2020) to 0.58 (2021), making it a moderate correlation.

Methods(Continued)

Reaction	Weight(w)
Like	1w
Love	2w
Care	4w
Sad	1w
Angry	2w
Haha	4w

Figure 2.1 Reaction Weight

$$sp = \sum_{n=1}^{\infty} (w * n) \quad sn = \sum_{m=1}^{\infty} (w * m)$$

Figure 2.2 Sentiment formula

Results

- In 2020, the correlation between positive text and positive reactions is 0.50. While in 2021, the correlation increased to 0.67 (Figure 3.3).

Conclusion

- Measuring the correlation between the sentiment of text and its reactions is useful for food security organizations because it helps identify the engagement that is generated from a post that is deemed positive or negative.
- Running these sentiment analysis algorithms is quick in identifying patterns of engagement for positive and negative posts, which can be used by food security organizations in making future content that will generate positive responses among their followers.

Future Work

The next step would be to research whether the results in this study can be enhanced by discriminating data based on user demographics.

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References

Scan the QR code to the right to access the list of references.

