No Relationship between Frequency and Sentiment Score of Birth Control Drug Reviews

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Group 9 - DS 4002
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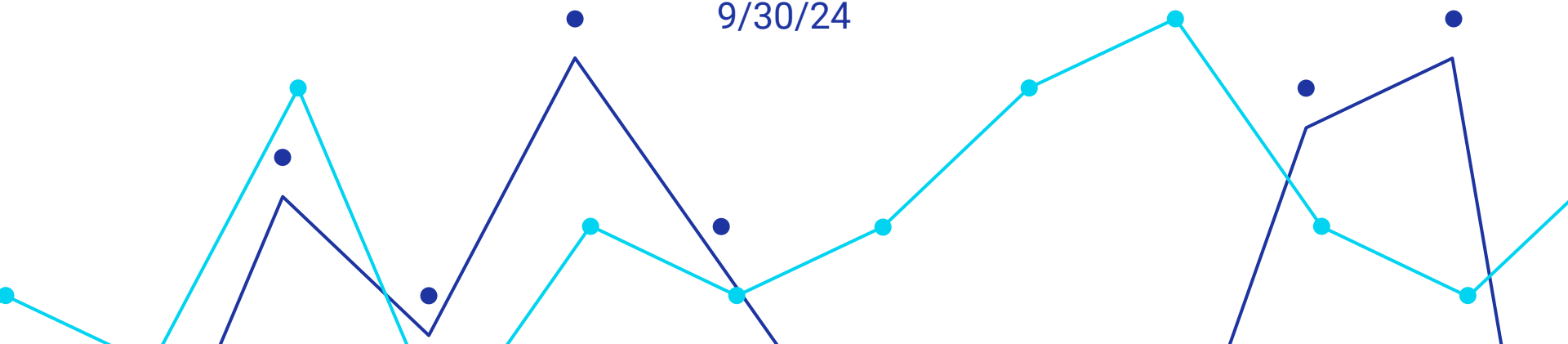


Project Motivation

- Investigate how different birth control drugs compare in patient satisfaction and sentiment scores
- Understanding user experiences with birth control drugs is helpful for healthcare providers and patients searching for the best option
  - 2018 National Survey of Family Growth Data (US)
    - Pill, implant, IUD: **17 million**
    - Large variation in patient experience

Project Details

- **Hypothesis:** More frequently reviewed birth control drugs will have a higher overall sentiment score than less reviewed drugs.
- **Modeling Approach:** Sentiment Analysis

Will more frequently reviewed birth control drugs have higher sentiment scores in comparison to their less reviewed counterparts?

Data Acquisition

- Dataset acquired from Kaggle, no licensing or ethical concerns
- Chose the file: drugsComTest_raw.csv
  - 53,427 reviews
- Data Cleaning
  - condition = “Birth Control”
    - 9,649 reviews
  - Filter by most and least reviewed drugs
  - Text preprocessing and calculating sentiment scores
  - Removing repeat rows
- Variables of focus:
  - Drug name, condition, rating, review.tm, score

Column	Description	Potential Responses	Variable Type
drugName	Name of the drug being reviewed	Etonogestrel, Nexplanon, NuvaRing, Etonogestrel, etc	categorical
condition	Name of the medical condition that the drug is being used for	Birth Control	categorical
rating	Patient’s rating of the drug on a scale of 1 to 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	numeric
review.tm	Processed text from the review column; reviews without filler words (and, or, etc.)	“abnormal bleeding month long severe mood swings im switching trying two months”	text
score	Overall sentiment score calculated by subtracting the negative score from the positive score.	(4 - 2 =) 2	numeric

* Additional columns: review, useful count, positive, negative

Analysis Plan + Justification

Dataset Establishment and EDA

Our initial EDA focused mainly on answering questions relating to **rating, frequency of review, and brand name** for each drug

Draw Conclusions based on Existing Charts

Each drug was ranked based on popularity, allowing us to define the **most and least reviewed drugs** and analyze differences.

Develop New Charts to Address Unanswered Questions

Following our EDA and initial grouping of drugs, analysis was performed to determine any **correlation between drug popularity and sentiment analysis**.

Compile Key Findings into Powerpoint

Through this analysis, we determined whether or not our data supports the **initial hypothesis,** utilizing charts and graphs to illustrate the main idea.

Tricky Analysis Decision

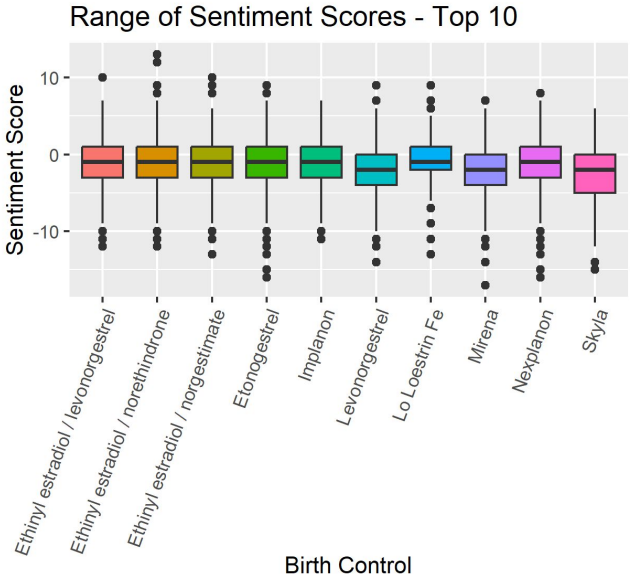
- After completing EDA and sentiment analysis, we gathered strong findings of no correlation between overall sentiment score and number of reviews
- Initial plan was to also conduct significance testing
- Significance testing could have provided additional validation, but ultimately we felt that it would be unnecessary and potentially misleading, therefore we decided not to proceed with testing

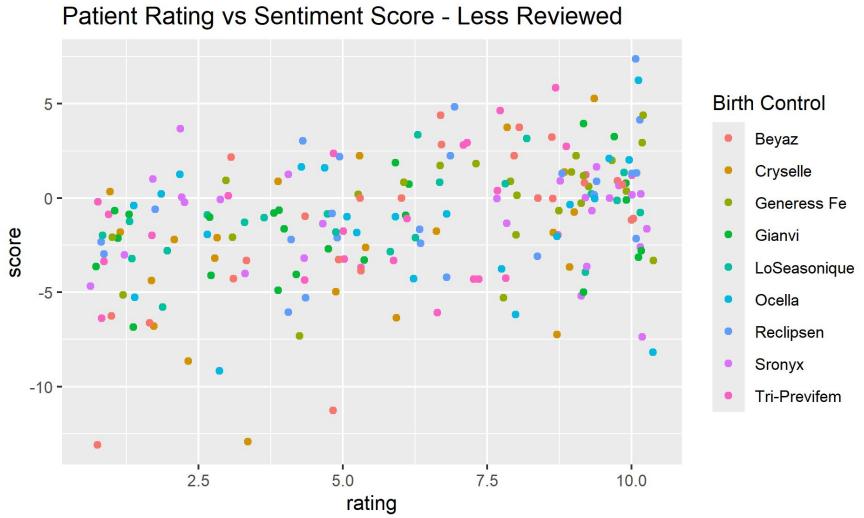
Bias and Uncertainty Validation

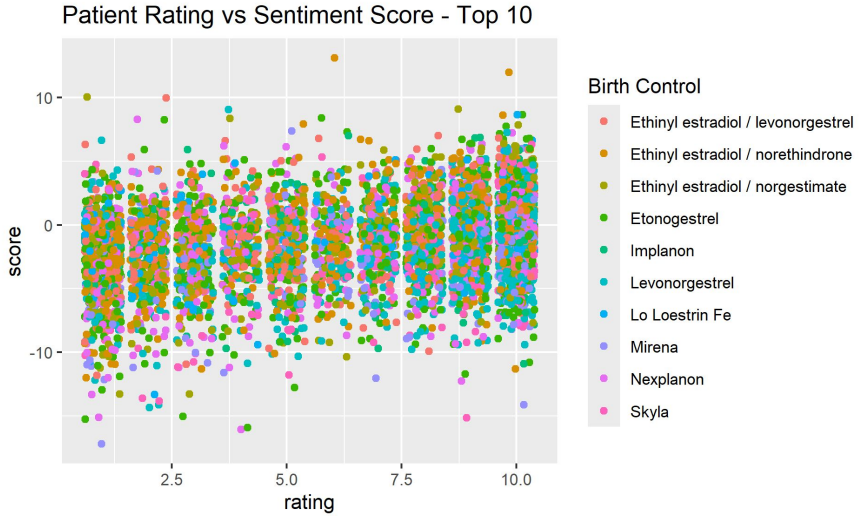
- Following our EDA, we identified specific drug brand names with <20 entries and excluded them from further analysis
  - The inclusion of these drugs could lead to a skewed sentiment score because of the smaller sample size
- Uncertainty in authenticity of dataset
  - Repetitive language:
    - “absolutely the worst” , “absolutely the best”
    - Evident in following text processing

Results

- No relationship between sentiment score and patient rating
  - Data widely spread
  - True for most and least reviewed
- Wide range of sentiment score within drug brand
  - Median consistently ~0







Next Steps

New Lines of Exploration

- Condition-specific analysis
- Correlation between sentiment and most frequently *prescribed* birth control drugs

Improvements

- Other sentiment analysis methods
- Add significance testing and IQR calculations to strengthen conclusion

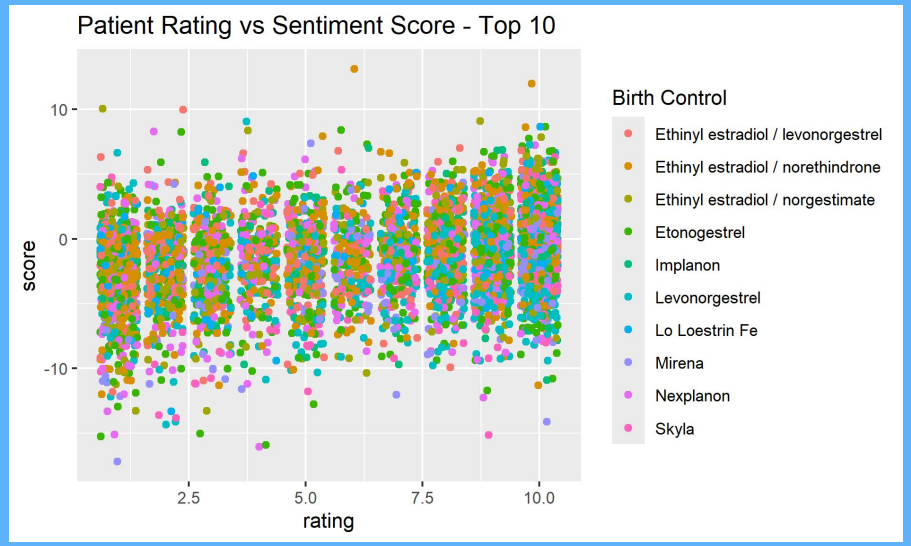
New Questions

- How does sentiment vary between birth control drugs based on length of review?
- Do reviews with higher counts of usefulness have higher sentiment scores?

References:

- B. Liu, "Sentiment Analysis," University of Illinois at Chicago, [Online]. Available: https://www.cs.uic.edu/~liub/FBS/sentiment-analysis.html. [Accessed: 29-Sep-2024].
- Guttmacher Institute, "Contraceptive Method Use in the United States," [Online]. Available: https://www.guttmacher.org/fact-sheet/contraceptive-method-use-united-states. [Accessed: 29-Sep-2024].
- “Patient Ratings: Identifying Best Drugs” Dataset, Kaggle. [Online]. Available: www.kaggle.com/datasets/rabieelkharoua/patient-ratings-identifying-best-drugs
- Github: https://github.com/michellehkim280/DS4002-Group9
- H.Golino, “Sentiment Analysis,” Lecture, PSYC 5710, University of Virginia

Thank you!


Patient Rating vs Sentiment Score - Top 10
score
10
0
-10
2.5
5.0
7.5
10.0
rating
Birth Control
Ethinyl estradiol / levonorgestrel
Ethinyl estradiol / norethindrone
Ethinyl estradiol / norgestimate
Etonogestrel
Implanon
Levonorgestrel
Lo Loestrin Fe
Mirena
Nexplanon
Skyla