Patient Reviews for the Top 15 Anxiety and Depression Drugs

Data 624 Datathon #2 Group: Christy Sarmiento, Minki Lee, Kimberley Chiu

Introduction

Our team wanted to look specifically at the reviews related to drugs used to treat anxiety and depression. For Datathon #2, the following questions and accompanying figures were investigated below:

Figure	Title	Guiding Question
1	Word Cloud for Most Reviewed Drugs and Average Ratings	What are the most reviewed drugs and their related effectiveness rating?
2	Circle Plots for Drugs and Related Effectiveness and Side Effects	Is there a relationship between drug effectiveness and side effects?
3	Bubble Plot for Most Common Words in Side Effects Reviews	What are the most commonly occurring words for side effects review in drugs used to treat anxiety and depression?
4	Word Cloud of Commonly Occurring Words in Side Effects Review	
5	Bar Chart of the Most Frequently Occurring Words in the Benefits Review	What are the top 15 most frequently occurring words in the benefits review?
6	Most Common Used Words in Comments Review	What are the most commonly occurring words in the comments review in drugs used to treat anxiety and depression?

Data Engineering Process

The following datasets (csv files) were used, modified, and created using a combination of R, Python, and Tableau Prep. The original data was filtered for top reviewed drugs used to treat anxiety and depression, then imported into Tableau with the following actions taken per figure:

No.	Dataset	Comments
1	drug_review.csv	Original dataset used for modification
2	DrugReview_AD.csv	Modified dataframe of the top 15 most reviewed drugs for anxiety and depression conditions
3	freq.csv	Frequency table of most frequently occurring words in the side effects review column
4	Words_example.csv	A Datasource for annotating static images in Tableau
5	Anxiety_and_Depression.csv	Cleaned dataset for anxiety and depression

Analysis

The team applied NLP techniques in R Studio and Python. Tableau was also used to create visualizations from the results of R Studio.

For Figures 1 and 2, conditions were grouped by common terms using Tableau Prep Builder. Anxiety and Depression showed as one of the highest count conditions with 614 rows. Output files were exported as csv format for R and Python, while an extract file was used for Tableau. Anxiety_and_Depression.csv was utilized to create Figures 1 and 2. From the word cloud of drug names created in Tableau, we can visually identify the most reviewed and highly rated drugs. The second set of visualizations were produced to examine the relationship between a drug's effectiveness and its side-effects. These charts are quite similar judging from the distribution and colors of the plotted circles.

For Figures 3 and 4, the filtered csv (DrugReview_AD.csv) was loaded into R Studio. The side effects review column was then read into a corpus in R Studio. Transformation functions were then applied to the dataframe that included: removing numbers, removing punctuation, removing stop words, stripping whitespace, and employing stemming. The corpus was then mined and a new csv titled 'freq.csv' was exported to show the count of most frequently occurring words. From this new dataframe, a word cloud was produced in R Studio for Figure 3. The new csv was also connected in Tableau to display in a bubble plot. The word and count were displayed as Figure 4, with a colour gradient displayed for the count. The count was also filtered so that the viewer can interact and modify the number range.

For Figure 5, the cleaned dataset (Anxiety_and_Depressions.csv) was loaded into R Studio. The benefits review column was then read. The same steps of text mining from Figures 3 and 4 were performed. After a bar chart of the most frequently occurring words in the benefits review was produced, it was imported into Tableau and annotations were added to the visualization.

For Figure 6, the DrugReview_AD.csv file was loaded to Python to create a word cloud. This figure has words commonly used from the Comments Review. The image was downloaded as .png and used in Tableau for the presentation.

Findings

Looking at Figures 1 and 2, a significant number of drug names are in blue and large in size; this may indicate that there is confidence in the patients that are taking these specific drugs. Lexapro, Prozac, Zoloft, Effexor-xr, and Paxil were some of the top reviewed drugs with average ratings of 6 or 7. Wellbutrin-xl, Alprazolam, Valium, and Clonazepam were moderately reviewed in count but rated higher. Drugs in red were low in count of ratings and must be studied for its efficacy and side-effects. Patients' perceptions of their drugs with regards to effectiveness and side-effects were shown in the circle graph. The count of drugs with green or blue circles (considered more positive perception) were more than drugs with red or orange circles (considered more negative perception); this may indicate a more positive patient perception towards the most 15 reviewed drugs. The drugs to the left of each category shows a positive performance in effectiveness. However, on the side-effects graph, the order of preference for colours was quite mixed.

Looking at Figures 3 and 4, it was found that in the side effects review column for the top reviewed drugs for anxiety and depression, the most frequently occurring words were: medic, time, drug, first, weight, sever, gain, sleep, loss, sexual, and nausea. One could infer that a person who is taking one of these drugs were experiencing impacts related to sleep, weight, and sexual attributes in their lifestyle. It can be corroborated that common side effects in people taking Lexapro, which is a popular drug used to treat anxiety, can consist of: nausea, sleepiness, sleeping trouble, sexual problems, and increased thirst (Healthline, 2021).

Looking at Figure 5 for the top 5 out of 15 antidepressants, the most frequently occurring words in the benefits review were: depress, feel, anxiety, effect, and help. One of the example comments with 'depress' from the original dataset review column (drug_review.csv) was: "Depression was lifted. Anxiety lessened". Not all comments from the benefits review were positive. One of the negative reviews from the original dataset (drug_review.csv) for 'feel' was: "I did not feel any relief...I felt worse". This review was commented by a person who was taking Prozac, which is one of the most popular and most prescribed antidepressants (Kocsis, 2009). From the benefits review, it was found that antidepressants were mostly effective; however, many people also experienced some levels of unpleasant side effects at the same time.

Looking at Figure 6, the most common words found in the comment reviews were: depression, medication, anxiety, drug, and dose. Patients likely were sharing about why and how they take the medication.

Conclusion

For the top 15 most-reviewed drugs used to treat anxiety and depression, it was identified that there was a relationship between the most effective and the most reviewed. The side effects related to these drugs had the highest frequency of words related to sleep, weight, sex, and nausea. A pharmacist could conclude from looking at the word plots for side effects that these drugs, despite being the most reviewed and relatively most effective, may also cause side effects related to weight gain, insomnia, libido impacts, and discomfort in the stomach.

From the benefits review, most antidepressants were effective; however, negative side effects were also developed for the most-effective and the most-reviewed drugs. These side effects are not considered extremely dangerous; however, they can have a negative impact on a patient's lifestyle. Therefore, it is important for a pharmacist to provide information to patients about the risks, what to expect, and how to cope with side effects. This will help inform pharmacists in selecting the right choice of drugs for potential patients.

References

Healthline. (2021). What are the side effects of Lexapro? [online]. Available at: <https://www.healthline.com/health/depression/lexapro-side-effects#side-effects> [Accessed 1 February 2021].

Kocsis, J. H. (2009) 'Happy pills in America: From Miltown to Prozac', *The Journal of Clinical Investigation*, *119*(7), 1744.