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Web Search Query Volume Correlates With Prescription Volumes of Antidepressants and Antipsychotics in the Netherlands and United Kingdom

An Explorative Study

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Abstract:

Background: The significant increase in Internet availability has resulted in a rise in search queries on health-related topics. Previous research has demonstrated the potential for analyzing web search query volume for nonpsychotropic prescription drugs, while studies on psychotropic drugs remain scarce. The aims of this study were to expand upon this scarce knowledge by investigating the relationship between web search query volumes and prescription volumes of antidepressants and antipsychotics in the United Kingdom and the Netherlands and to gain insight in topics of concern, such as withdrawal symptoms and discontinuation.

Methods: Data were obtained for the United Kingdom and the Netherlands from January 2010 until January 2021. Prescription volume data for 5 antidepressants (paroxetine, fluoxetine, sertraline, citalopram, venlafaxine) and 5 antipsychotics (quetiapine, olanzapine, clozapine, aripiprazole, and risperidone) were obtained. Web search query volumes and data on related search queries of these substances were acquired from Google Trends. Descriptive statistics and Pearson correlation analyses were performed.

Results: A strong, positive, and statistically significant correlation between web search query volume and prescription volume was observed for most included substances in both the Netherlands and the United Kingdom. The search queries related to the included antidepressants and antipsychotics indicate important topics of concern for specific substances, such as withdrawal symptoms and discontinuation.

Conclusions: Web search data from Google Trends could potentially be used as a proxy for prescribing trends of antidepressants and antipsychotics and to gain insight in topics of concern of users of these substances. These findings highlight the importance of providing reliable patient information, particularly regarding adverse effects, withdrawal, and discontinuation.

Key Words: depression, schizophrenia, antipsychotics, antidepressants

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The rapid growth of the Internet and its availability has made a vast amount of medical knowledge available to patients and healthcare professionals.[1–4] Google (Alphabet, Inc) is the most popular search engine, with a worldwide market share of 86%.[5] The search and sharing of health-related information generate data that can be used to gain insight in patient behavior.[6,7] This offers promising perspectives for monitoring and analyzing health related issues using large amounts of individual data without the need to actively search for and include patients in studies. In recent years, the scientific analysis of medical information on Internet forums, search engines, and social media like Twitter, Instagram, and Facebook, has become an important part of health informatics.[8]

The most popular tool for analyzing web search query data is Google Trends, which has been demonstrated to be valid and accurate for forecasting.[8] Google Trends is a free and openly available web service from Alphabet that shows differences in search intensity for search terms over a specific time frame and for a specific geographical location. It also allows users to obtain the content of the most commonly associated search queries. A wide range of topics have been investigated using Google Trends, such as seasonal trends in various (infectious) diseases, measuring the public reaction to disease outbreaks, and the general interest in drugs of abuse and prescription drugs.[8] For instance, web search query volume was shown to correlate with drug utilization and proved sensitive enough to track changes in prescribing patterns of seasonal prescription drugs, such as antibiotics.[9]

Antidepressants and antipsychotics are commonly prescribed in Europe, and their usage is increasing. Eight of the top 100 most prescribed drugs in the Netherlands were antidepressants.[10] In the United Kingdom, 11% of the population takes an antidepressant on any given day, while the prevalence of antipsychotic usage was 1.2% in 2014.[11,12] The prevalence of antidepressant and antipsychotic use is 6% and 2% in the Netherlands, respectively.[10] Given the considerable attention that the use of psychotropic drugs and their efficacy has received in the media, it is important that the medical information available on these drugs on the Internet is valid, accurate, and nuanced. This can pose a challenge, as most Internet forums and social media are not moderated and tend to feature predominantly opinions. In addition, scientific literature can be difficult to access, interpret, and understand, even by academics.[13] A recent study analyzed nearly 15,000 Instagram posts that mentioned antidepressants and found that the number of posts on antidepressants increased exponentially over time since 2010.[14] However, misinformation was common, and 58% of the analyzed posts contained negative sentiments regarding their use, lack of effect, and occurrence of adverse effects, compared with 30% positive and 12% mixed or neutral sentiments. A different study used a natural language processing approach to score expressed sentiment in a study of 12,733 web search results on psychotropic medication. The results showed that the antidepressants sertraline, duloxetine, venlafaxine, and paroxetine, and the antipsychotics quetiapine and risperidone received significantly more negative sentiments.[3]

The literature on the analysis of web search query data for psychotropic drugs is scarce. A German study found a positive correlation between annual prescription volumes of antidepressants and web search query volume.[15] A recent study on worldwide antipsychotic prescriptions using Google Trends data from 2004 to 2020 demonstrated that web search query volume correlates to prescription data.[16] It also showed temporal and spatial differences in antipsychotic preference, which were confirmed by the

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TABLE 1. Dispensing Volume (Items) of the Included Antidepressants and Antipsychotics Per 100,000 Persons, United Kingdom

Year	PAR	FLU	SER	CIT	VEN	QUE	OLA	CLO	ARI	RIS
2010	3224	11,057	5824	24,181	5411	3620	3560	16	742	2584
2011	3112	11,401	7130	27,060	5623	4009	3676	15	878	2680
2012	3038	12,031	9680	27,101	5977	4330	3807	14	1025	2832
2013	2963	12,315	12,391	26,965	6394	4704	3969	15	1171	2961
2014	2895	12,650	15,134	27,389	6805	5127	4081	15	1343	3080
2015	2826	13,050	18,287	27,740	7271	5534	4210	15	1515	3170
2016	2735	13,191	21,524	27,620	7768	5997	4346	13	1701	3226
2017	2624	13,194	24,608	26,998	8185	6427	4417	15	1878	3250
2018	2552	13,291	28,028	26,548	8661	6781	4475	17	2047	3269
2019	2495	13,594	31,699	26,316	9197	7199	4546	16	2252	3265
2020	2451	13,866	34,598	26,205	9731	7700	4660	16	2440	3292

ARI, aripirazole; CIT, citalopram; CLO, clozapine; FLU, fluoxetine; OLA, olanzapine; PAR, paroxetine; QUE, quetiapine; RIS, risperidone; SER, sertraline; VEN, venlafaxine.

global trend toward the prescription of more second-generation antipsychotics.[16] However, no data on the United Kingdom or the Netherlands have been published until now.

This study aims to increase knowledge on this subject by addressing 2 research questions: (1) how are web search query volume and prescription volume of antidepressants and antipsychotics related in the United Kingdom and the Netherlands? and (2) does the content and search intensity of the most frequently associated search queries of a given antidepressant or antipsychotic differ between individual antidepressants and antipsychotics?

We hypothesized that web search query volumes and prescription volumes of antidepressants and antipsychotics would be positively correlated in the Netherlands and the United Kingdom. In addition, we hypothesized that the content and search intensity of associated search queries differed between individual antidepressants and antipsychotics in terms of withdrawal, discontinuation, and adverse effects.

METHODS

Web Search Query Data

Data were obtained for the 5 most frequently prescribed antidepressants (sertraline, citalopram, fluoxetine, venlafaxine, and paroxetine) and antipsychotics (olanzapine, clozapine, aripiprazole, quetiapine, and risperidone) in the Netherlands, based on annual prescription volumes.[10] We chose the Netherlands and the United Kingdom because these countries are culturally similar to each other, and both have a comparable health care system, with both relying on general practitioners and medical specialists.

Google Trends is a free and openly available web service that shows differences in online search intensity for search terms over a specific time frame and for a specific geographical location. For all antidepressants and antipsychotics, the generic name was used as search term to minimize the risk of incorrectly categorized data and ensure that all search queries were included. Data points are expressed as a relative proportion of the total search volume of the time range and geography it represents. The resulting data points are scaled on a range of 0 to 100 based on their proportion to the data point with the highest value. In this study, data for the United Kingdom and the Netherlands were retrieved from January 2010 to January 2021. Data were retrieved in August 2021. Search terms were adjusted for the English and Dutch languages.

In addition to web search query data, Google Trends provides normalized values of related search queries. The exact related search queries and their normalized values were obtained from Google Trends to assess whether the content and search intensity of these queries differ between individual antidepressants and antipsychotics.

TABLE 2. Dispensing Volume (Items) of the Included Antidepressants and Antipsychotics Per 100,000 Persons, the Netherlands

Year	PAR	FLU	SER	CIT	VEN	QUE	OLA	CLO	ARI	RIS
2010	8729	2181	2311	7893	6039	4090	3351	1313	763	3416
2011	8649	2202	2474	8328	6149	4825	3406	1440	907	3416
2012	8741	2268	2790	8573	6380	5701	3626	1666	1061	3551
2013	8583	2339	3062	8856	6565	6378	3860	1902	1148	3643
2014	8505	2384	3380	9140	6713	6984	4013	2192	1403	3731
2015	8211	2370	3636	9282	6668	7494	4085	2362	1552	3732
2016	7821	2356	3777	9140	6561	7992	4192	2531	1724	3634
2017	7259	2319	3885	8836	6351	8391	4298	2675	1782	3529
2018	6734	2351	3975	8744	6103	8694	4224	2639	1837	3308
2019	6191	2322	4021	8457	5741	8844	4139	2584	1885	3102
2020	5669	2210	4020	8069	5369	8791	4039	2429	1852	2894

ARI, aripirazole; CIT, citalopram; CLO, clozapine; FLU, fluoxetine; OLA, olanzapine; PAR, paroxetine; QUE, quetiapine; RIS, risperidone; SER, sertraline; VEN, venlafaxine.

TABLE 3. Top 5 Most Frequently Associated Web Search Queries (Normalized Value in Brackets, Relative to the Most Frequently Associated Web Search Query) to the Included Antidepressants, United Kingdom

Paroxetine	Fluoxetine	Sertraline	Citalopram	Venlafaxine
Paroxetine adverse effects (100)	Fluoxetine adverse effects (100)	Sertraline effects (100)	Citalopram adverse effects (100)	Venlafaxine adverse effects (100)
Paroxetine UK (56)	Prozac (36)	Sertraline adverse effects (90)	Anxiety (34)	Venlafaxine withdrawal (45)
Anxiety (47)	Fluoxetine alcohol (26)	Adverse effects (89)	Citalopram anxiety (34)	Venlafaxine dose (40)
Paroxetine withdrawal (45)	Anxiety (25)	Anxiety (26)	Citalopram alcohol (30)	Mirtazapine (33)
Sertraline (43)	Fluoxetine anxiety (25)	Sertraline anxiety (26)	Adverse effects of citalopram (28)	Antidepressants (29)

Prescription Volume Data

The annual prescription volumes were defined as the total number of prescriptions handed out over a year. The amounts of drug prescriptions dispensed yearly from January 2010 up until January 2021 were retrieved for all the included substances. Prescription volume data on the Netherlands are publicly available through the "Genees-en hulpmiddelen Informatie Project (GIP; Translation: 'Drug and medical resources information project')" database.[10] For the United Kingdom, data were retrieved from the monthly or yearly "prescription cost analysis" reports from January 2010 up until January 2021. Data were retrieved separately from their respective resources for each country of the United Kingdom (Northern Ireland, England, Wales, and Scotland).[17–22] Absolute dispensing volumes were used instead of daily defined doses for statistical analyses. We chose this approach because of the frequent off-label low-dose prescription of psychotropic drugs, especially antipsychotics.

Data Normalization

The annual web search query volume for the United Kingdom and the Netherlands was calculated by averaging the monthly normalized search intensities of a specific year. For graphical and display purposes, both prescription volume and web search query volume of each drug were normalized by dividing them by their respective highest value in the time frame and multiplying by 100. The annual prescription volumes of each drug in the United Kingdom and the Netherlands were displayed as number of prescriptions per 100,000 individuals, calculated by dividing the total number of prescriptions by the number of inhabitants of that specific year and multiplying by 100,000.

Data Analysis

We used descriptive statistics and Pearson correlation coefficient when appropriate. For all analyses (all tests 2-sided), a P value lower than 0.05 was considered statistically significant. Graphs were generated using GraphPad Prism (version 9 for Windows; GraphPad Software, San Diego, Calif, https://www.graphpad.com).

RESULTS

Prescription Volume and Associated Web Search Queries of Antidepressants and Antipsychotics in the United Kingdom and the Netherlands

Tables 1 and 2 show the annual prescription volume of the included antidepressants and antipsychotics per 100,000 individuals in the United Kingdom and the Netherlands, respectively. Overall, an increase in prescription volumes of antidepressants and antipsychotics was observed over the investigated time frame, with paroxetine as a notable exception. The increase in prescription volume is higher for antidepressants in the United Kingdom than in the Netherlands.

Tables 3 to 6 show the most frequently associated web search query for each individual substance. As can be seen, the query "side effects" is the most frequently associated search query for each drug. Interestingly, withdrawal and discontinuation are strongly associated with venlafaxine and paroxetine.

Correlation Between Web Search Query Volume and Prescription Volume

Figures 1 and 2 illustrate the changes in normalized annual prescription volume and annual web search query volume over time in the United Kingdom and the Netherlands, respectively. Tables 7 and 8 demonstrate the results of correlation analyses between prescription volume and web search volume of each substance. For most substances, a strong, positive correlation between web search query volume and prescription volume was observed.

Figure 3 shows the correlation analysis of the average annual prescription volume in absolute items and average normalized annual web search volume between the different antipsychotics and

TABLE 4. Top 5 Most Frequently Associated Web Search Queries (Normalized Value in Brackets, Relative to the Most Frequently Associated Web Search Query) to the Included Antipsychotics, United Kingdom

Quetiapine	Olanzapine	Clozapine	Aripiprazole	Risperidone
Quetiapine adverse effects (100)	Olanzapine adverse effects (100)	Clozapine adverse effects (100)	Aripiprazole adverse effects (100)	What is risperidone (100)
Quetiapine dose (42)	Adverse effects (99)	Clozapine monitoring (62)	Abilify (35)	Risperidone dose (95)
What is quetiapine (38)	What is olanzapine (42)	Schizophrenia (58)	Aripiprazole depot (30)	Risperidone dementia (76)
Quetiapine dosage (35)	Olanzapine dosage (36)	What is clozapine (44)	Aripiprazole dose (29)	Adverse effects of risperidone (73)
Bipolar (33)	Olanzapine dose (34)	Clozapine medication (37)	Olanzapine (29)	Risperidone dosage (65)

TABLE 5. Top 5 Most Frequently Associated Web Search Queries (Normalized Value in Brackets, Relative to the Most Frequently Associated Web Search Query) to the Included Antidepressants, the Netherlands

Paroxetine	Fluoxetine	Sertraline	Citalopram	Venlafaxine
Paroxetine adverse effects (100)	Fluoxetine adverse effects (100)	Sertraline adverse effects (100)	Citalopram adverse effects (100)	Adverse effects venlafaxine (100)
Discontinue paroxetine (61)	Antidepressant (65)	Antidepressant (52)	Antidepressants (59)	Venlafaxine discontinue (72)
Antidepressant paroxetine (42)	Prozac (62)	Sertraline experience (48)	Citalopram discontinue (49)	Venlafaxine retard (58)
Antidepressants (41)	Paroxetine (32)	Zoloft (30)	Citalopram 20 mg (34)	Antidepressants (56)
Paroxetine 20 mg (35)	Citalopram (26)	Sertraline dosage (25)	Citalopram 10 mg (32)	Venlafaxine experiences (39)

antidepressants. Except for the analysis of antidepressants in the Netherlands, strong, positive correlations were found.

DISCUSSION

This study is the first to report on prescription volumes of antidepressants and antipsychotics and their relationship to web search query volumes in the Netherlands and the United Kingdom. We demonstrated a strong, positive correlation between the prescription volumes and web search query volumes for most antidepressants and antipsychotics in both countries. Furthermore, we found strong correlations between the prescription volume of individual antidepressants and antipsychotics and web search query volume, supporting the hypothesis that prescription volume and web search query volume are correlated.

These findings are consistent with previous research. For example, Gahr et al[15] demonstrated a correlation between prescription volume of antidepressants and web search query volume in Germany. Ågren[16] found a correlation between web search query volume and clozapine prescription volume for 16 countries in 2014. The strong positive correlations found between web search query volume and prescription volume suggest that web search data are an important determinant of web search query volume. However, correlations were stronger for the United Kingdom than for the Netherlands. This is most probably due to lower absolute search frequencies in the Netherlands, especially in the years 2010–2015.

These findings suggest that web search query volumes can be used as a proxy for changes in prescription patterns over time. This could be useful to monitor prescribing trends for countries and situations in which data on prescription volumes are unavailable, such as when it is only published annually.

Differences in the prescription volumes of individual antidepressants and antipsychotics between the Netherlands and the United Kingdom were revealed. These differences may be influenced by factors such as marketing, guidelines, and insurance policies. We also observed a low prescription volume of clozapine in the United Kingdom, which is probably due to its strict monitoring and regulation in the United Kingdom. Clozapine can only be prescribed by psychiatrists in secondary care and dispensed by pharmacies registered with the clozapine patient monitoring service, which explains why its prescription volume is not reflected in the prescription cost analysis reports.

An increase in the prescription volume of antidepressants over the investigated period was found. While the prescription rate of antipsychotics was similar between the 2 countries, the prescription volume of antidepressants per 100,000 individuals was higher in the United Kingdom compared with the Netherlands. This aligns with data on the prevalence of antidepressant use, which found that approximately 11% of the English population uses an antidepressant, compared with 6% of the Dutch population.[10,12] The prescription volume of SSRIs in the United Kingdom nearly doubled compared with 2010, and recent reports from the National Health Service show similar results.[24] However, the increase was not observed in all drugs, such as paroxetine. In fact, the normalized annual prescription volumes of paroxetine showed a decline in both the Netherlands and the United Kingdom, while sertraline showed an increase in prescription volume. This may be due to recent studies on the favorable safety and efficacy profile of sertraline, as well as the less favorable tolerability and withdrawal symptoms of paroxetine.[25–27]

In addition to antidepressants, the prescription volumes of antipsychotics are increasing in both countries. A significant increase in the prescription and web search query volume of quetiapine was observed, which is likely due to the increasing off-label prescription

TABLE 6. Top 5 Most Frequently Associated Web Search Queries (Normalized Value in Brackets, Relative to the Most Frequently Associated Web Search Query) to the Included Antidepressants, the Netherlands

Quetiapine	Olanzapine	Clozapine	Aripiprazole	Risperidone
Quetiapine 25 mg (100)	Olanzapine adverse effects (100)	Clozapine adverse effects (100)	Aripiprazole adverse effects (100)	Risperidone (100)
Seroquel (91)	Zyprexa (65)	Fk* (55)	Abilify (73)	Risperdal (49)
Quetiapine adverse effects (81)	Olanzapine 5 mg (49)	Antipsychotics (35)	N/A	Aripiprazole (26)
Accord (57)	Olanzapine fk* (47)	Clozapine Parkinson (30)	N/A	Haloperidol (14)
Quetiapine accord (56)	Fk* (47)	Olanzapine (28)	N/A	Risperidone adverse effects (11)

*Fk stands for "farmacotherapeutisch kompas," or "pharmacotherapeutical compass," an online reference tool provided by the Dutch Health Care Institute. It provides comprehensive information on the use of medications for various medical conditions, offering detailed guidance on the effectiveness, safety, dosage, and administration of drugs.[23]

N/A, not available.

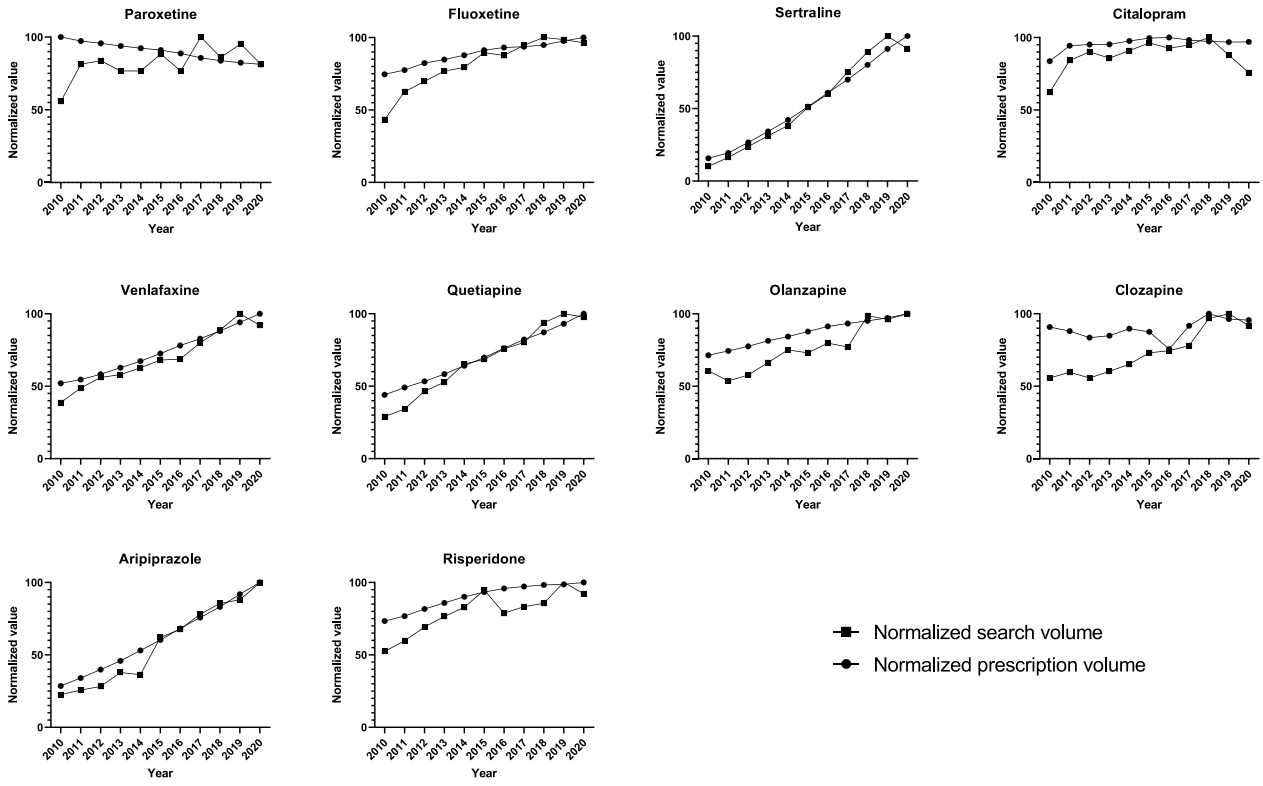

FIGURE 1. Illustration of the prescription volume (annual, normalized) and web search volume (annual, normalized) over the investigated period, United Kingdom.

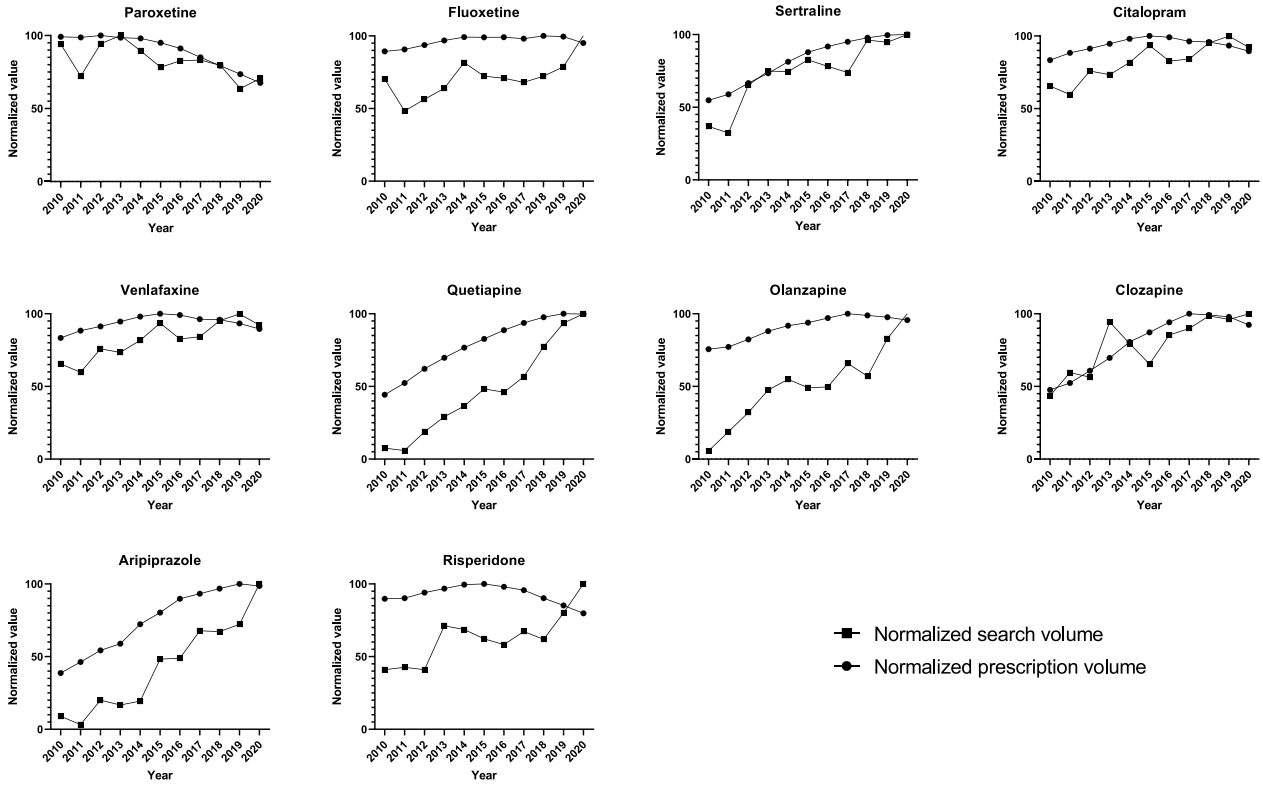

FIGURE 2. Illustration of the prescription volume (annual, normalized) and web search volume (annual, normalized) over the investigated period, the Netherlands.

TABLE 7. Correlations Between Prescription Volume (Annual, Normalized) and Web Search Volume (Annual, Normalized) for Each Substance in the United Kingdom

Substance	Pearson *r*	Coefficient of Determination, R^2	95% Confidence Interval	*P*
Paroxetine	−0.65*	0.43	−0.90 to −0.09	0.0297
Fluoxetine	0.96****	0.92	0.85 to 0.99	<0.0001
Sertraline	0.99****	0.97	0.95 to 1.00	<0.0001
Citalopram	0.84**	0.71	0.49 to 0.96	0.0011
Venlafaxine	0.97****	0.94	0.89 to 0.99	<0.0001
Quetiapine	0.98****	0.97	0.94 to 1.00	<0.0001
Olanzapine	0.93****	0.87	0.76 to 0.98	<0.0001
Clozapine	0.63*	0.97	0.94 to 1.00	0.0374
Aripiprazole	0.98****	0.81	0.62 to 0.98	<0.0001
Risperidone	0.91***	0.83	0.68 to 0.98	0.0001

*$P \leq 0.05$.
**$P \leq 0.01$.
***$P \leq 0.001$.
****$P \leq 0.0001$ (For the last two choices only).

of quetiapine.[28] In particular, low-dose quetiapine, which has strong sedative effects, is often prescribed for insomnia by general practitioners and psychiatrists. In 2010, 63% of the quetiapine users in the Netherlands used less than 100 mg/d, while 54% of prescriptions in England pertained the 25-mg tablet in 2010.[28] In the Netherlands, the increase in quetiapine prescription volume may have been mediated by the discontinuation of reimbursement of benzodiazepines for insomnia in 2009.[28]

Analysis of the associated search queries reveals interesting differences among the studied substances. The most commonly used search queries were related to adverse effects, withdrawal, and discontinuation. We found that the most popular related queries were "withdrawal" and "discontinue" for paroxetine and venlafaxine, while these were not present in the top 5 related queries for the other included substances. As previously noted, paroxetine has a high incidence of discontinuation symptoms. According to a systematic review by Fava et al,[29] discontinuation symptoms are more frequent with paroxetine than other SSRIs. Papp and Onton[30] also found that venlafaxine and paroxetine are most commonly associated with discontinuation symptoms, particularly "brain zaps" in the case of venlafaxine. Data on the incidence of withdrawal symptoms after discontinuation of venlafaxine are scarce, but reports estimate an incidence as high as 78%.[31] Our findings are consistent with a study of Abbe and Falissard,[32] who found that withdrawal symptoms are frequently searched for on a large Internet forum for both paroxetine and venlafaxine. In recent years, Facebook groups dedicated to withdrawal, tapering, and discontinuation of psychotropic drugs have seen an increase in membership.[33] These findings show that withdrawal and discontinuation are major concerns among patients taking these substances, as reflected in the most popular search terms of these drugs. They highlight the importance of up-to-date and comprehensive information on adverse effects, withdrawal symptoms, and discontinuation on the Internet. However, the lack of scientific evidence on how to properly discontinue antidepressants presents a challenge to providing the public with reliable information.[34]

The use of quetiapine as a treatment for insomnia is evident in Dutch search queries for the drug. "quetiapine sleep drug" is the third most commonly used query, while the term "quetiapine 25 mg" also suggests the use of quetiapine for the treatment of insomnia. This

TABLE 8. Correlations Between Prescription Volume (Annual, Normalized) and Web Search Volume (Annual, Normalized) for Each Substance in the Netherlands

Substance	Pearson *r*	Coefficient of Determination, R^2	95% Confidence Interval	*P*
Paroxetine	0.71*	0.51	0.20 to 0.92	0.0137
Fluoxetine	0.38^{ns}	0.14	−0.29 to 0.77	0.2543
Sertraline	0.92****	0.84	0.71 to 0.98	<0.0001
Citalopram	0.55^{ns}	0.31	−0.07 to 0.87	0.0779
Venlafaxine	0.54^{ns}	0.29	−0.09 to 0.86	0.0875
Quetiapine	0.93****	0.87	0.76 to 0.98	<0.0001
Olanzapine	0.82**	0.68	0.44 to 0.95	0.0019
Clozapine	0.82**	0.67	0.42 to 0.95	0.0022
Aripiprazole	0.92****	0.85	0.71 to 0.98	<0.0001
Risperidone	-0.41^{ns}	0.17	−0.81 to 0.25	0.2098

*$P \leq 0.05$.
**$P \leq 0.01$.
****$P \leq 0.0001$ (For the last two choices only).
NS, not significant.

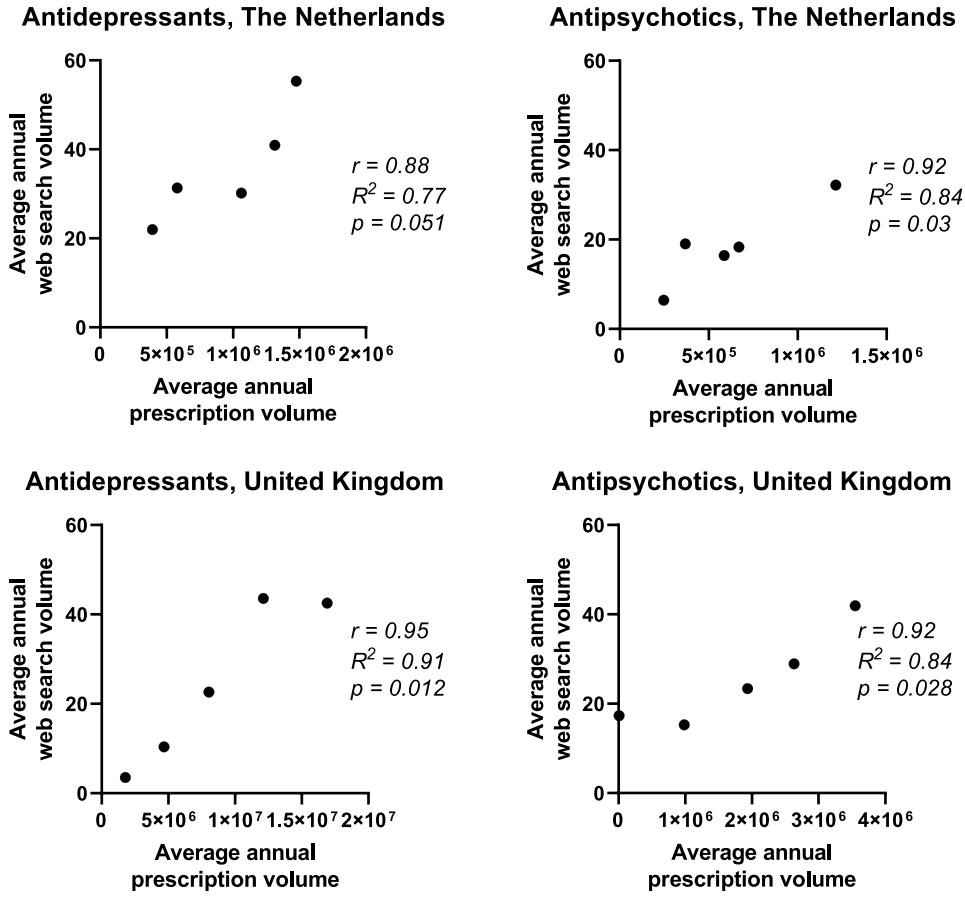

FIGURE 3. Scatter plots and correlation analyses of the average annual prescription volume (items) and average annual search volume (normalized) between the 5 antidepressants and 5 antipsychotics in the Netherlands and the United Kingdom.

indicates the growing off-label use of quetiapine in the Netherlands and indicates that related search queries can be used to obtain information about the use of prescribed drugs.[28] Interestingly, the use of quetiapine as a sleeping pill is not reflected in the most commonly used related search queries in the United Kingdom, despite the fact that 25-mg tablet made up 54% of the prescriptions in England in 2010.[28]

Strengths and Limitations of This Study

Several limitations should be noted. First, the observed strong correlations do not necessarily imply causation. Second, our data are incomplete, because we limited our web search query data to Google Trends in these countries and did not include all currently available antidepressants and antipsychotics. Third, prescription volume data for the United Kingdom were presented in both calendar year and fiscal/tax years (April 6 to April 5 of the next year), which could potentially distort the data. Fourth, our data are limited to yearly prescription volumes and web search query volumes, and it is unclear whether the data correlate on a smaller time scale. Fifth, because the exact prescription volume of clozapine in the United Kingdom could not be obtained, the observed correlation of the prescription volume and web search query volume in the United Kingdom in this study is less accurate. To improve this accuracy, prescription volumes from the clozapine patient monitoring service would be necessary.

CONCLUSIONS

This explorative study has demonstrated a clear correlation between prescription volume for most antidepressants and antipsychotics and their corresponding web search query volume in the Netherlands and the United Kingdom. In addition, we demonstrated important differences between related web search queries for the investigated antidepressants and antipsychotics, with regard to withdrawal symptoms, discontinuation, and off-label use, which are important concerns for users of these drugs. Web search data from Google Trends could potentially be used as a proxy for prescribing trends of antidepressants and antipsychotics in other countries and for other psychotropic drugs, to gain insight in topics of concern of users of these drugs, such as withdrawal symptoms. These results emphasize the importance of providing reliable and trustworthy patient information, particularly about adverse effects, withdrawal, and stopping. However, the sentiment on psychotropic medication on Web sites is generally negative.[3] Future research could increase the knowledge on this topic by investigating the correlation on a smaller time frame, for example, monthly prescriptions, in other geographical areas or on other drugs.

AUTHOR DISCLOSURE INFORMATION

The authors declare no conflicts of interest.

P.H. and F.G. contributed equally to the study design and data analysis. J.T. provided valuable feedback on the study design and manuscript.

Data are available from the corresponding author upon reasonable request.

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