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Epidemiological Insights into Erectile Dysfunction in the United States: A Google Trends Analysis

Zaid Ahmed ^{1,*}, Muhammed A. Moukhtar Hammad ¹, Jake Miller ¹, Elia Abou Chawareb ¹,
Lawrence C. Jenkins ² and Faysal A. Yafi ¹

¹ Department of Urology, University of California Irvine, Irvine, CA 92697, USA; mahammad@hs.uci.edu (M.A.M.H.); jakeam1@hs.uci.edu (J.M.); eaboucha@hs.uci.edu (E.A.C.); fyafi@hs.uci.edu (F.A.Y.)

² Department of Urology, Tulane University, New Orleans, LA 70112, USA; drljenkinsmd@gmail.com

* Correspondence: zahmed3@uci.edu

Abstract: Background/Objectives: Erectile dysfunction (ED) significantly impacts the well-being and quality of life of millions of men. Understanding geographic patterns and associated factors influencing ED search trends can offer valuable insights for healthcare improvement and advocacy. This study investigated the correlation between Google search trends for ED and various factors across the US. **Methods:** Google search trends for “erectile dysfunction” were collected over a 6-year period between March 2018 and August 2024. The Google search trends provided data for individual states on a scale from 1 to 100. Search volumes were analyzed alongside the urologist-to-population ratio, percentage of the population aged 65 and older, median household income, and percentage of state residents with a bachelor’s degree or higher. Pearson correlation coefficients were used to examine the relationships between ED search volumes and these factors. **Results:** Higher ED search volumes were associated with a higher percentage of older adults ($r = 0.4332$, $p = 0.001676$). A negative correlation was found between ED search volume and higher education ($r = -0.482$, $p = 0.000394$). No significant correlation was found between median household income and ED search volume ($r = -0.201$, $p = 0.164$) or a greater urologist density ($r = 0.0612$, $p = 0.6729$). **Conclusions:** This study highlights how healthcare access and demographics influence ED search trends. States with older, less educated populations showed higher interest, while wealthier areas with more urologists had no significant correlation. These findings can guide targeted interventions to improve sexual care in underserved regions.



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Keywords: erectile dysfunction; geographic factors; Google Trends; public health; socioeconomic factors

1. Introduction

Erectile dysfunction (ED) affects around 18% of men above the age of 20 in the United States, totaling 18 million men [1]. This prevalent disease is characterized by the inability to attain or maintain an erection in relation to sexual performance [2]. ED does not only manifest as a physical disease but has great social and psychological effects on men diagnosed with the disease [3,4]. Similarly, ED has substantial effects on the partners of men diagnosed with the disease. It can lead to great marital frustrations as well as major intimacy problems among partners [5,6]. With the rise of the internet, an increasing number of patients seek medical care online, including for ED [7]. As a result, understanding

the factors contributing to ED searches online and identifying patterns in public interest and concern about this condition are essential for improving healthcare services and patient outcomes.

Previously, researchers have examined the popularity of ED search trends and identified it as one of the most searched topics in the field of men's health [8,9]. Additionally, further research using Google Trends has also been conducted to identify popular treatments for ED [10]. However, these studies did not analyze the factors that influence ED search trends and what exactly influences people to seek information regarding ED online.

While previous research has explored the popularity of ED as a search topic and trends in treatments, no study has thoroughly examined the underlying factors that drive online searches related to ED. This study explored geographic and temporal trends for men seeking information regarding ED within the United States. This study takes a unique approach and seeks to understand not only the populations that require targeted interventions, but also the reasons for disparities in ED care despite online interest.

2. Materials and Methods

Google Trends is a website based on the Google search engine that allows users to observe the popularity of a certain phrase that was searched on Google over time on a scale from 0–100 [11]. Additionally, Google Trends provides information for specific subregions of the US, including rural and urban cities, which was used to identify further disparities. This study utilized Google Trends to obtain data for searches regarding ED. Synonyms of the conditions were used such as “erectile difficulty”, “erection problems”, “erectile disorder”, “erection impairment”, and “erection failure”. The data were collected in a 6-year period between March 2018 and August 2024. This timeline was selected because it includes pre-pandemic times from March 2018 to February 2020, the pandemic time from March 2020 to May 2023, and the post-pandemic times being June 2023 to August 2024.

For each state, search trends were then compared to the urologist-to-population ratio [12], the percentage of population over 65 years old [13], the median household income [14], the percentage of population with a bachelor's degree or higher [15], and rural vs. urban areas [16]. For each factor, data from each year of the data period were collected and averaged to provide an even distribution for pre- and post-pandemic times.

Correlations between ED search volumes and the examined variables were performed using Pearson's correlation coefficient, with a p -value of <0.05 being considered statistically significant [17].

3. Results

Between 2018 and 2024, the trend of Google searches for all ED terms remained relatively stable. Overall interest remained linear throughout the timeline, but with noticeable spikes and drops (Figure 1).

During the pandemic, there was a rise in interest in ED online. Specifically, toward the end of 2020 and the beginning of 2021, there was an influx of searches online for ED. In the post-pandemic period, however, there was a noticeable decline in the interest in ED. Namely, a steady decline can be seen starting in mid-2023 around May and June. Ever since then, there has been a diminishing amount of interest in ED.

Overall, Mississippi, West Virginia, and Alabama had the highest volume of ED searches (Figure 2). The Northeast and Southeast were the geographic regions with the highest interest. New Hampshire, Utah, and Hawaii had the lowest ED search volumes. In general, the Western half of the United States showed relatively lower interest in ED.

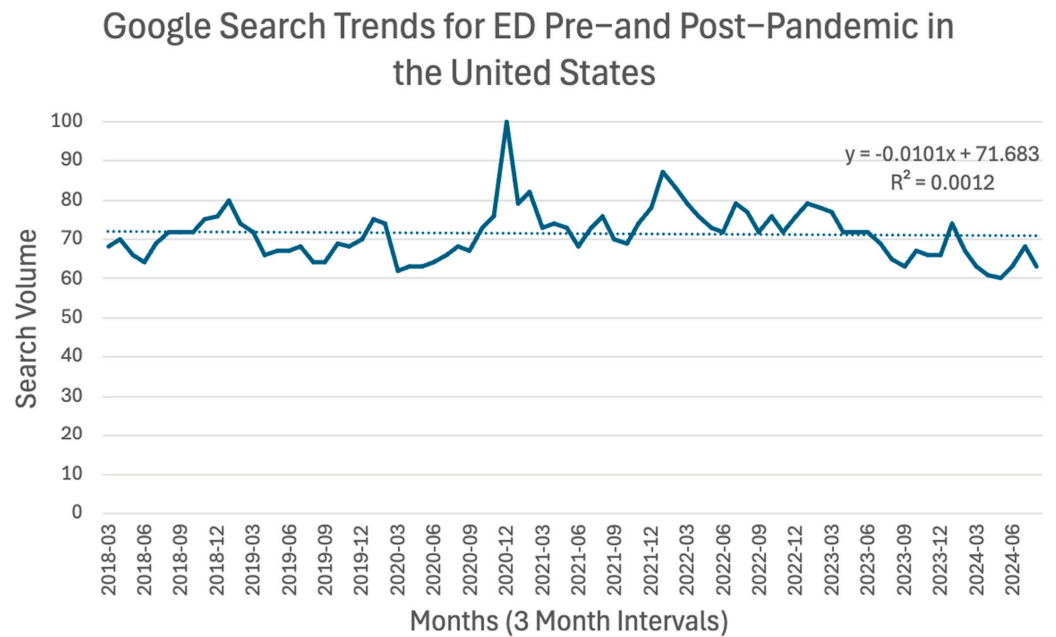


Figure 1. Google Trends data showing the search volumes for erectile dysfunction in the selected time frame.

Further analysis showed that ED interest remained constant per region pre- and post-pandemic. The same states and regions that showed the greatest interest remained relatively constant for the entire 6 years.

When comparing ED search trends to our selected variables, we found varying levels of correlation. It was seen that there was no correlation between ED search volumes and the urologist-to-population ratio per state ($r = 0.0612, p = 0.673$) (Figure 3). Next, ED search volumes and the percentage of the population above 65 years old showed a moderate positive correlation, with a significant relationship between the two ($r = 0.4332, p = 0.00168$). Additionally, the comparison between ED search volumes and the median household income per state showed a weak negative correlation, but it was not significant ($r = -0.201, p = 0.164$). Finally, the correlation between ED search volumes and educational attainment per state showed a moderate negative correlation, which was significant ($r = -0.482, p = 0.000394$) (Table 1).

Table 1. Correlation analysis of ED search volumes against geographical variations influencing search trends.

Comparison	Correlation (r)	p-Value
ED Search Volume vs. Urologist to Population Ratio	0.0612	0.673
ED Search Volume vs. Percentage of Population Over the Age of 65	0.433	0.00168
ED Search Volume vs. Median US Household Income	-0.201	0.164
ED Search Volume vs. Percentage of Population with a Bachelor’s Degree or Higher	-0.482	0.000394

Heatmap of ED Search Volumes Across the United States

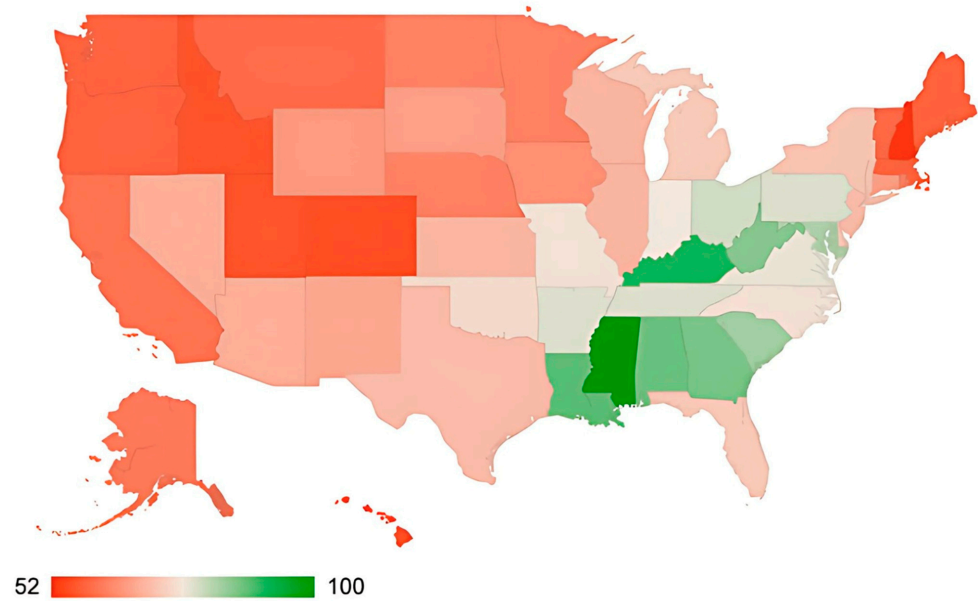


Figure 2. United States heatmap depicting areas with varying ED search volumes, represented by a range of colors from red to green.

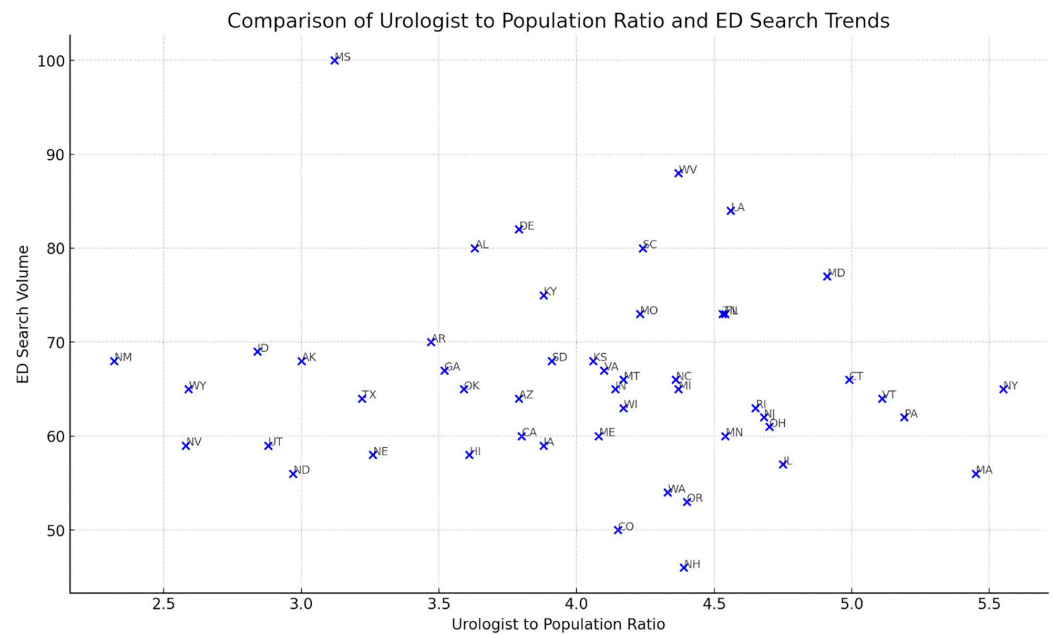


Figure 3. Comparison of urologist-to-population ratio and ED search trends with each state represented on the plot.

Further analysis of the Google Trends data showed a moderate correlation between urban areas and ED search volumes ($r = 0.539, p = 0.00054$). On the contrary, there was a moderate to strong correlation between rural areas and ED searches ($r = 0.766, p = 0.000088$).

4. Discussion

Currently, ED is a prevalent disease in the United States that millions of men suffer from [1]. As ED is a disease that drastically impacts men’s lives, it is important to identify the areas where there is a lack of care for such diseases. Without such, the lives of men will continue to be impacted by sexual, emotional, and psychological factors throughout their lives [4,18]. As noticed in the Google Trends data, there has been a rise in the use of the

internet to seek medical care. Consequently, for such a prominent disease it can drastically help urologists in their practice to understand the trends by which patients are seeking information regarding ED.

The findings of this study match the results from Karim et al., whose results also showed that it is the most popular urologic disease searched on the internet in recent years [9]. There were noticeable spikes in interest, such as during the peak of the pandemic, which was also prevalent in the findings from Ilias et al. [19]. The increase in interest during the pandemic may also be attributed to ED search interest being the highest during winter [20]. However, our data depict a larger increase during the pandemic compared to other years' winters, indicating a relationship between the pandemic and the popularity of ED online. Based on a study by Hoo et al., people are more focused on their health following the pandemic and have adapted to the self-care habits influenced by COVID-19 [21].

With the very weak correlation between urologist-to-population ratios and ED search volumes, it appears important to address the importance of states with lower search volumes. These states were found to have fewer urologists relative to their population, which highlights a disparity in access to care. Their lower search volumes may be attributed to a lack of proper health education stemming from the lack of opportunities to learn about common diseases [22]. Targeted interventions can be made in providing areas with less access to medical care to ensure that the sexual health of men across the country is equally met [23]. For rural areas, some actions that can be implemented include greater use of telehealth services for patients and physicians. This provides a cost-effective solution that can provide rural areas with proper care [24]. Another solution to rural disparities for ED is incentivizing urologists to practice in rural areas. This would allow the urologist-to-population ratio to increase in these areas while benefiting urologists concurrently. Similar initiatives have been taken where physicians have been incentivized, which have shown positive results in terms of community satisfaction with the care received while maintaining physician satisfaction [25].

Similarly, median household income also did not have a significant correlation with ED search volumes. The factors influencing this lack of correlation show similarities, but access to insurance may influence the correlation with income. Specifically, higher incomes have been linked to increased care through access to health insurance and regular health check-ups [26]. Thus, these men have a source of information regarding their health and show less interest in ED online. However, men from lower socioeconomic classes have less access to healthcare and thus a lack of information regarding their health. Consequently, they show a lack of interest in ED online, possibly due to their lack of exposure to the disease and its symptoms.

As ED is a disease primarily found in men between the ages of 40 and 69 [27], it is important to understand the moderate correlation between ED search trends and states with older populations. As states with the oldest populations had the highest ED search volumes, this shows the importance of addressing men's health in these areas. Since this age group suffers the most from conditions such as ED, they require further attention and care. An example of an action that can be taken to provide greater ED care for older men is an increase in national public health campaigns and advertisements. These campaigns should focus on raising awareness about ED, promoting healthy lifestyles, and reducing the stigma associated with the condition. Additionally, policy recommendations, such as expanding access to care through telemedicine and ensuring insurance coverage for a range of ED treatments, are essential to address the identified disparities and improve health outcomes for older men.

This study also identified a moderate negative correlation between the percentage of state residents with a bachelor's degree or higher and ED searches. This indicates that

higher educated populations showed a lack of interest in ED online, while less educated populations showed greater interest. This may be explained by factors similar to income, where educated men have increased access to medical care. Previous studies have shown that education is significantly related to improved health due to improved access to medical care [28]. For less educated men in the United States, there may be populations with acceptable health education; who lack access to proper care. With the increased digitalization of medicine, more people have been taking their health interests online [29]. This may prove to be especially prevalent in areas where they lack proper access to healthcare providers. With this understanding, the previously mentioned public health initiatives must target areas with low awareness and care access to provide educational initiatives regarding sexual health.

This study also found that there was a moderate to strong correlation between rural areas and ED searches. However, rural areas have about 10% of the urologists in the United States [30], indicating significant interest in ED but a lack of urologists to treat their conditions. On the contrary, urban areas showed a moderate correlation with ED searches. Despite having a lower interest in ED, urban areas have around 90% of practicing urologists in the United States [30]. This highlights the need for targeted interventions for rural areas to meet their respective needs for ED through greater urologic care.

Additionally, this study recognizes that lower ED search volumes can be attributed to stigmatization surrounding sexual health. The field of sexual medicine has faced significant challenges due to societal taboos, often discouraging open discussions and prompting individuals to avoid seeking help. This is especially common in men, who demonstrate reluctance to seek physical care [31]. Consequently, further public awareness strategies must be taken to promote sexual health in men and diminish the stigmas regarding men's health. This initiative could increase ED search interest across the United States.

This study does recognize certain limitations, namely the lack of specificity in the Google Trends data. The site lacks further information regarding smaller subsections of the states such as metropolitan and rural areas. A correlation between urban and rural areas with ED search interest was found in this study, but it remains difficult to analyze each subsection for all the states due to the high volume of subsections. A general understanding that rural areas have more interest but lack proper care was the emphasis of this study. These subsections of the states can be further studied to determine more disparities amongst populations of people. Also, Google Trends does not provide the specific number of searches for ED but instead provides a value from 0–100. Without an exact value, this may lead to slight variations in demographic disparities. Despite this, Google Trends values for each state are presented relative to other states, which still allows the study to identify which areas face ED disparities without an exact search number. Additionally, Google Trends does not account for searches on any other search engine, indicating that the data can vary when analyzing search trends of alternative browsers. Although this could limit the comprehensiveness of the findings, no other search engine provides thorough data regarding specific term searches.

Future research should focus on factors beyond socioeconomic and geographical aspects that affect ED searches, such as cultural or societal factors. Moreover, it is essential to examine health education and health literacy in rural areas to uncover disparities in knowledge related to men's health. This can be investigated alongside the impact of digital literacy, which can impact healthcare-seeking behaviors in underserved populations. The actual distribution of men affected by ED can also be studied in the future, which can be used as a comparison to draw further conclusions regarding the search trends. Finally, it is important that other significant diseases affecting men worldwide, such as prostate cancer, benign prostatic hyperplasia (BPH), and infertility, be included in future studies. These

revelations will allow public health initiatives to target areas with specific educational strategies focusing on overall sexual health instead of just ED.

5. Conclusions

The findings in this study highlight the impact of healthcare accessibility and demographic factors on ED search trends. States with older and less educated populations showed increased interest in ED. States with a higher density of urologists and wealthier populations, however, did not show any significant correlations with ED search volumes. These insights can guide targeted healthcare improvements and advocacy efforts in specific areas of the country that lack proper care for sexual health. Future research should explore causative factors and potential interventions to address the identified disparities, ensuring that sexual health is provided everywhere.

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