Patient demand for plastic surgeons for every US state based on Google searches

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Introduction: As a profession, plastic surgeons must meet the public demand for aesthetic and reconstructive procedures. Patients search for physicians using Google, which offers insights into patient needs through their search history.

Methods: The Google Trends Relative Search Volumes (RSV) were pulled for all searches for “plastic surgery” over 12 months. The number of active plastic surgeons per state was divided by Census Bureau population estimates to calculate the surgeons-per-capita value, or “surgical concentration.” The Google score divided by this concentration yields a “surgical demand index” for each state.

Results: Florida, New York, and Connecticut had the greatest concentration of surgeons per ten-thousand people (0.220, 0.217, and 0.209, respectively), while Wyoming, Arkansas, and Vermont had the smallest (0.051, 0.071, 0.080). California exhibited the greatest number of Google searches (RSV=100), followed by Florida and Hawaii (RSV=95). Oregon (RSV=38), Virginia (RSV=52), and Alaska (RSV=58) had the fewest searches. The “surgical demand index” was greatest in Wyoming (1187.778), Oklahoma (993.751), and Arkansas (974.664) and smallest in Oregon (264.682), Virginia (320.716), and Connecticut (354.872).

Conclusion: The distribution of US plastic surgeons is not homogeneous. The Google data suggest that some markets (e.g. Oregon)

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Introduction

Background

In our modern era, patients have unprecedented access to information through the internet. Google, the most visited site online, provides its search data to the public, through a platform called Google Trends (Alphabet Inc., Mountain View, C.A.).

Objectives

The objective of this study was to compare the relative popularity of searches for plastic surgery across the United States with the number of plastic surgeons in each state. We hypothesized that several states with low representation of plastic surgeons would nevertheless have a population that is interested in plastic surgery. This may identify regional market needs- locations a new plastic surgeon may want to open a practice. Additionally, we sought to illustrate how the Google data can be mined and analyzed to study public interest in surgery.

Methods

Study design

Google data are reported as the Relative Search Volume for all searches for “Plastic Surgery” for the twelve-month period from June 2014-June 2015. These data are reported state-by-state, and normalized by total search volume. Data are reported on a scale from 0 to 100 based on a proportion to all searches. The number of American Society of Plastic Surgeons (ASPS) members in each state was provided by the ASPS for the same year. State populations are the US Census Bureau 2014 estimates.

Surgical demand is reported as the Surgical Demand Index, a measure of how the concentration of plastic surgeons matches the public curiosity with plastic surgery. The Index is calculated by dividing the Google Relative Search Volume by the concentration of plastic surgeons in any individual state, according the formula:

\[
\text{Surgical Demand Index} = \frac{\text{Frequency of Searches}}{\text{Number of Plastic Surgeons Nearby}} = \frac{\text{Google Relative Search Volume}}{\left( \frac{\text{Number of Plastic Surgeons in Each State}}{\text{State Population}} \right)}
\]

Results

Descriptive data and main results

California had the highest Google Relative Search Volume at 100 (a benchmark used to calibrate all other states), followed by Florida (95), Hawaii (95), New York (94), and North Carolina (91). Oregon had the lowest volume at 38, followed by Virginia (52), Alaska (58), Nebraska (60) and Wyoming (61). The data are presented in Fig. 1 and Table 1.

California has the most surgeons at 765 and Wyoming the fewest at 3. When the number of surgeons is divided by the state population, Florida ranks at the top with 0.220 surgeons per ten-thousand people, then New York (0.217), Connecticut (0.209), Maryland (0.206), and Illinois (0.201).
The least-dense states are Wyoming (0.051), Arkansas (0.071), Vermont (0.080), Oklahoma (0.083), and New Mexico (0.091).

Demand for plastic surgeons was highest in Wyoming (1187.778 Relative Search Volume/surgeons per ten-thousand), then Oklahoma (993.751), Arkansas (974.664), New Mexico (845.205), and Alabama (802.012). Demand was lowest in Oregon (264.683), Virginia (320.716), Connecticut (354.872), Illinois (363.043), and North Dakota (386.805).

In this study, we show that the distribution of interest in plastic surgery and the distribution of plastic surgeons, is not homogeneous. There are states where there is excessive interest in the field but hardly any surgeons (e.g. Wyoming), and those that despite an army of physicians on call, the public interest is more scarce (e.g. Oregon).

Discussion

Key results

Google Trends data previously showed that search volume for selected cosmetic surgery procedures correlated with the number of procedures reported by the ASPS. Similarly, this study demonstrates that augmenting the Google data with another source (such as the number of surgeons practicing in each state) yields relevant findings. We can expect the Google Trends data to inform more discussions of plastic surgery by virtue of the scale and accessibility of the data.

Limitations

One limitation of this study is that only Active ASPS member Surgeons were accounted for each state. Certain markets may be saturated by physicians practicing plastic surgery who have other training or certifications. The recorded years of the data are due to a lack of updated ASPS surgeon numbers as well as the decennial nature of the US census. In the future, we aim to use the most updated numbers as they are gathered by these agencies and even track the trends over time. Our work suggests opportunities in certain regions but without data on hiring and job postings, this is speculative. Next, searches for “plastic surgery” reveal a global interest in the field and include not only those interested in a procedure. These data do not control for sensationalism in plastic surgery, for example, which may vary from state to state. They also do not distinguish between esthetic and reconstructive procedures.

Interpretation

These data offer several possible applications, but may be chiefly relevant to a new plastic surgeon hoping to enter a market where his or her practice has ample opportunity to flourish. Wyoming, with its small population, does not immediately appear to be an ideal option. Just looking at the Google data, the 40% decrease in plastic surgery search volume compared to California is not too surprising. Yet, the Surgical Demand Index ranks Wyoming as number one, 27 places higher than the Golden State.
Table 1
State-by-state characteristics on search volume, surgeons, and population.

| Rank | Surgical Demand Index | State Name    | Number of ASPS Surgeons | State Population | Surgical Density (Surgeons per 10,000 people) | Google Relative Search Volume | Surgical Demand Index (Google RSV/Surgeons per 10,000 people) |
|------|----------------------|---------------|-------------------------|------------------|-----------------------------------------------|-------------------------------|---------------------------------------------------------------|
| 1    | Wyoming              | 3             | 584,153                 | 0.051            | 61                                            | 1187.778                      |                                                               |
| 2    | Oklahoma             | 32            | 3878,051                | 0.083            | 82                                            | 993.751                       |                                                               |
| 3    | Arkansas             | 21            | 2966,369                | 0.071            | 69                                            | 974.664                       |                                                               |
| 4    | New Mexico           | 19            | 2085,572                | 0.091            | 77                                            | 845.205                       |                                                               |
| 5    | Alabama              | 52            | 4849,377                | 0.107            | 86                                            | 802.012                       |                                                               |
| 6    | Vermont              | 5             | 626,562                 | 0.080            | 64                                            | 801.999                       |                                                               |
| 7    | North Carolina       | 125           | 9943,964                | 0.126            | 91                                            | 723.921                       |                                                               |
| 8    | Iowa                 | 30            | 3107,126                | 0.097            | 69                                            | 714.639                       |                                                               |
| 9    | Montana              | 11            | 1023,579                | 0.107            | 76                                            | 707.200                       |                                                               |
| 10   | West Virginia        | 18            | 1850,326                | 0.097            | 66                                            | 678.453                       |                                                               |
| 11   | Maine                | 13            | 1330,089                | 0.098            | 64                                            | 654.813                       |                                                               |
| 12   | Mississippi          | 36            | 2994,079                | 0.120            | 78                                            | 648.717                       |                                                               |
| 13   | Indiana              | 69            | 6596,855                | 0.105            | 66                                            | 631.004                       |                                                               |
| 14   | Washington           | 90            | 7061,530                | 0.127            | 80                                            | 627.692                       |                                                               |
| 15   | South Carolina       | 65            | 4832,482                | 0.135            | 84                                            | 624.505                       |                                                               |
| 16   | Nevada               | 39            | 2839,099                | 0.137            | 85                                            | 618.778                       |                                                               |
| 17   | Hawaii               | 23            | 1419,561                | 0.162            | 95                                            | 586.340                       |                                                               |
| 18   | Louisiana            | 62            | 4649,676                | 0.133            | 78                                            | 584.959                       |                                                               |
| 19   | Idaho                | 19            | 1634,464                | 0.116            | 66                                            | 567.761                       |                                                               |
| 20   | Minnesota            | 75            | 5457,173                | 0.137            | 76                                            | 552.994                       |                                                               |
| 21   | Kentucky             | 57            | 4413,457                | 0.129            | 71                                            | 549.746                       |                                                               |
| 22   | Texas                | 419           | 26,956,958              | 0.155            | 84                                            | 540.426                       |                                                               |
| 23   | Georgia              | 156           | 10,097,343              | 0.154            | 83                                            | 537.230                       |                                                               |
| 24   | Pennsylvania         | 194           | 12,787,209              | 0.152            | 81                                            | 533.899                       |                                                               |
| 25   | Michigan             | 135           | 9009,877                | 0.136            | 72                                            | 528.527                       |                                                               |
| 26   | South Dakota         | 11            | 853,175                 | 0.129            | 68                                            | 527.417                       |                                                               |
| 27   | Wisconsin            | 71            | 5757,564                | 0.123            | 65                                            | 527.101                       |                                                               |
| 28   | California           | 755           | 38,802,500              | 0.195            | 100                                           | 513.940                       |                                                               |
| 29   | Ohio                 | 159           | 11,594,163              | 0.137            | 70                                            | 510.435                       |                                                               |
| 30   | Tennessee            | 103           | 6549,352                | 0.157            | 79                                            | 502.329                       |                                                               |
| 31   | Missouri             | 91            | 6063,589                | 0.150            | 74                                            | 493.883                       |                                                               |
| 32   | Rhode Island         | 15            | 1055,173                | 0.142            | 70                                            | 492.414                       |                                                               |
| 33   | Nebraska             | 23            | 1881,503                | 0.122            | 60                                            | 490.827                       |                                                               |
| 34   | Arizona              | 117           | 6731,484                | 0.174            | 84                                            | 483.286                       |                                                               |
| 35   | Alaska               | 9             | 736,732                 | 0.122            | 58                                            | 474.783                       |                                                               |
| 36   | Colorado             | 87            | 5355,866                | 0.162            | 73                                            | 449.400                       |                                                               |
| 37   | Massachusetts        | 125           | 6745,408                | 0.185            | 81                                            | 437.102                       |                                                               |
| 38   | New Jersey           | 179           | 8938,175                | 0.200            | 87                                            | 434.425                       |                                                               |
| 39   | New York             | 428           | 19,746,227              | 0.217            | 94                                            | 433.679                       |                                                               |
| 40   | Florida              | 438           | 19,893,297              | 0.220            | 95                                            | 431.476                       |                                                               |
| 41   | Kansas               | 46            | 2904,021                | 0.158            | 68                                            | 429.290                       |                                                               |
| 42   | New Hampshire        | 22            | 1326,813                | 0.166            | 70                                            | 422.168                       |                                                               |
| 43   | Maryland             | 123           | 5976,407                | 0.206            | 84                                            | 408.145                       |                                                               |
| 44   | Delaware             | 17            | 935,614                 | 0.182            | 73                                            | 401.764                       |                                                               |
| 45   | Utah                 | 53            | 2942,902                | 0.180            | 72                                            | 399.790                       |                                                               |
| 46   | North Dakota         | 13            | 739,482                 | 0.176            | 68                                            | 386.806                       |                                                               |
| 47   | Illinois             | 259           | 12,880,580              | 0.201            | 73                                            | 363.043                       |                                                               |
| 48   | Connecticut          | 75            | 3596,677                | 0.209            | 74                                            | 354.872                       |                                                               |
| 49   | Virginia             | 135           | 8326,289                | 0.162            | 52                                            | 320.716                       |                                                               |
| 50   | Oregon               | 57            | 3970,239                | 0.144            | 38                                            | 264.683                       |                                                               |

Generalizability

Plastic Surgeons have never been strangers to the internet, and these data show that the public have not been strangers to us. As has been shown with other specialties, the number of plastic surgeons utilizing this platform for personal curiosity, professional decisions, and research queries is sure to rise.
Declaration of Competing Interest

The authors have no financial or personal relationships to disclose.

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