

# Googling Treatments for Pain: 2018 State Opioid Prescription Levels and Information-Seeking Behavior Towards Complementary Pain Interventions

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## Objective

Test the hypothesis that U.S. states with larger volumes of internet queries about complementary pain interventions are more likely to have lower opioid prescription levels using non-experimental, observational design.

## Methods

2018 State opioid prescription level data was obtained from the CDC. Google Trends™ was used to extract 2018 search volume indices (SVIs) for keywords related to CBD, medical marijuana, mindfulness, acupuncture, and chiropractic therapy. A comparison of means test was conducted to determine statistical significance.

## Results

Of the 30 states where medical marijuana is legal as of December 2018, the 5 states with the largest and smallest SVIs for “medical marijuana” searches showed mean ± SD opioid prescribing levels of 56 ± 13 and 53 ± 17 per 100 persons, respectively (p=0.76). When looking at all 50 states and the District of Columbia, the 15 with the largest and smallest online SVIs related to “mindfulness” searches were associated with mean ± SD opioid prescribing levels of 43 ± 9 and 71 ± 15 per 100 persons, respectively (p<0.0001). Average opioid prescription levels were also lower in the states that displayed the largest SVIs for searches related to acupuncture (42 ± 8 vs. 70 ± 14, p<0.0001). However, opioid prescription levels did not differ between states with the largest and smallest SVIs when examining searches related to CBD and chiropractic therapy (54 ± 12 vs. 49 ± 16m p=0.39) .

Figure 2. This shows how SVI data for a particular query is visualized over time on the Google Trends platform.

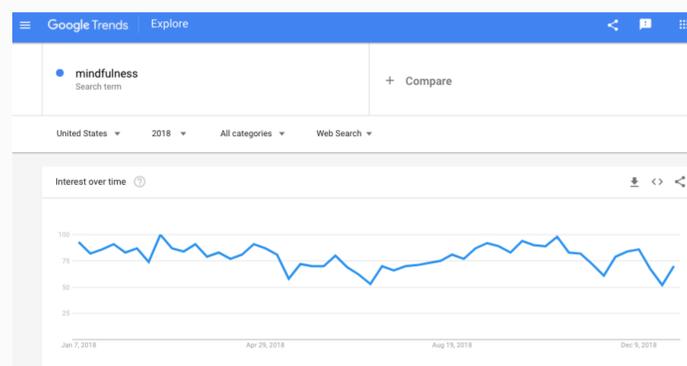


Figure 1. Map of states where medical marijuana is legal. Note that Mississippi, South Dakota, and Virginia legalized after 2018 and were thus not included in our analysis.

## Legal Medical & Recreational Marijuana States

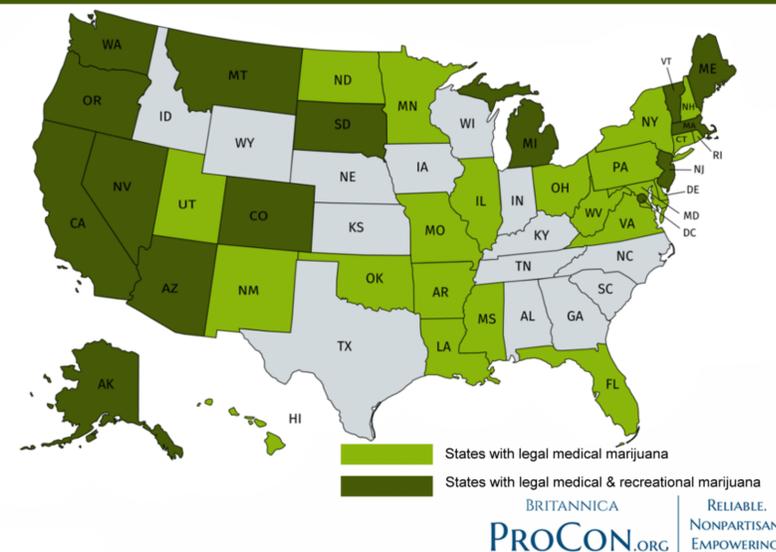


Table 1. This shows the 15 states with the highest and lowest search volume index (SVI) for mindfulness and their corresponding SVIs for the other queries we analyzed in the study. Note that these states are not necessarily the same top and bottom 15 for the other queries.

State	Prescription	Mindfulness	Marijuana	CBD	Acupuncture	Chiropractor
Vermont	42.4	100	25	100	66	61
Massachusetts	35.3	58	28	42	60	46
District of Columbia	25	57	23	26	58	34
Connecticut	43	53	35	40	47	49
Maine	48.1	50	47	60	55	55
Rhode Island	43	48	43	43	61	51
New Hampshire	46.1	47	26	59	57	59
Oregon	57.3	47	18	63	100	62
Wisconsin	45.8	46	12	57	43	65
Utah	57.1	43	28	45	37	69
Colorado	45.1	43	33	68	69	73
Minnesota	35.5	42	18	40	53	69
Washington	49.3	42	13	46	67	61
Maryland	45.1	42	37	33	53	41
New York	34	39	21	40	65	51
Nebraska	50.6	25	12	35	28	74
Tennessee	81.8	23	13	63	31	55
South Carolina	69.2	23	14	47	29	58
Kentucky	79.5	22	17	58	24	59
Florida	53.7	22	44	49	45	59
Indiana	65.8	22	14	82	21	63
West Virginia	69.3	22	24	53	21	54
Georgia	63.2	20	11	41	27	62
Nevada	55.5	19	22	60	32	59
Arkansas	93.5	18	35	51	22	59
Texas	47.2	18	10	42	31	56
Louisiana	79.4	17	18	46	23	52
Oklahoma	79.1	16	100	94	23	67
Mississippi	76.8	14	9	37	14	46
Alabama	97.5	13	9	36	18	57

## Relevance

The hypothesis proves to be true for certain non-pharmacological and complementary pain interventions. The states that have the highest population interest (i.e. SVI) in mindfulness and acupuncture tend to be associated with lower opioid prescription levels. However, there seems to be no association between opioid prescription levels and SVIs for queries related to CBD, chiropractic therapy, and medical marijuana.

Of note, while Google Trends has been shown to serve as a proxy for measuring population interest in various topics, we cannot assume that our data is directly indicative of the adoption and usage of the complementary treatments by patients. We should also consider that some states may disproportionately lack access to and awareness of certain services such as acupuncture and mindfulness meditation.

## Conclusion

Digital tools such as Google Trends™ may reveal insights into the epidemiology of opioid overprescription. Information-seeking behavior towards complementary, non-pharmacological pain treatments, such as acupuncture and mindfulness-based interventions, should be considered as part of a broader public health strategy to help reduce opioid overprescription.

Figure 3. This shows how SVI data for a particular query is visualized geographically on the Google Trends platform.

