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Dax Oliver
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Psilocybin Newspaper Coverage – Sentiment and Frequency (1989-2020)

Author: Dax Oliver, MA

Abstract

A growing body of medical research has focused on the chemical compound psilocybin in recent years^[1,2]. However, this research is not merely a scientific issue but also a social and political one. In the 1960s, psilocybin and other psychedelics were often ingested outside of research settings^[3]. This alarmed many people, resulting in severe legal restrictions on psilocybin research^[4]. Today, many psilocybin advocates hope that it will avoid the negative public sentiment of the 1960s^[5]. To help gauge public sentiment about other psychoactive compounds, some studies have examined newspaper coverage^[6,7]. The present study hoped to build a similar gauge with newspaper coverage of psilocybin. The author hypothesized that general sentiment about psilocybin has become more positive among American newspapers in recent years and that the annual number of newspaper articles mentioning psilocybin has increased. To test these hypotheses, all mentions of psilocybin were examined in four regional American newspapers from January 1, 1989, to December 31, 2020. Contrary to the hypotheses, a significant rise in positive sentiment was seen in only one of these newspapers, and the annual number of articles mentioning psilocybin significantly increased in only one newspaper. These results could be a warning to psilocybin advocates about the risk of negative social and political sentiment growing again.

Introduction

Psilocybin is a chemical compound (molecular formula: $C_{12}H_{17}N_2O_4P$)^[8] found in several species of fungus. Many people consider it to be a member of a class of compounds called "psychedelics," which in humans cause "effects on the mind, such as feelings of deep understanding or unusually strong experiences of color, sound, taste, and touch^[9]." After ingestion, psilocybin and some of its metabolites (such as psilocin)^[10] cross the blood-brain barrier and bind to neuron receptors for serotonin (a neurotransmitter)^[8]. There are several types of receptors for serotonin on human neurons^[11]. Many researchers believe there is a correlation between psychedelic experiences and the binding of psilocybin and some of its metabolites to the 2A serotonin receptors (also known as 5-HT_{2A} receptors)^[12]. However, there does not seem to be a consensus as to why psilocybin's agonism with serotonin receptors might be correlated with psychedelic experiences.

In the 1950s and 1960s, a number of research studies were conducted about psilocybin, such as examining its effects on color perception,^[13] the spiritual emotions of divinity students,^[14] and criminal recidivism^[15]. One prominent researcher, Timothy Leary, began actively promoting the use of psychedelics like psilocybin for the general public, saying that Americans should "tune in, turn on, and drop out^[16]." Although Leary often became the public face of psychedelics in the United States, their use was also advocated by many other well-known people such as musicians and actors. As psychedelic use rose among Americans, a social backlash developed. Some mainstream media described psychedelic users as committing suicide^[17] and having permanent

genetic damage ^[18]. Amendments to the U.S. Food Drug and Cosmetic Act in 1962 and 1965 "imposed severe restrictions on distribution, possession, use, and research"³ of psilocybin. In 1970, President Richard Nixon signed the Controlled Substances Act, which listed psilocybin as a "Schedule 1" drug that had "no currently accepted medical use in treatment in the United States ^[19]." Psilocybin remains a Schedule 1 drug today.

However, even after these numerous legal restrictions, the American government still occasionally approved tightly controlled research of psilocybin ^[3]. From the late 1980s until today, this research has accelerated. For example, Johns Hopkins Medicine has conducted studies about psilocybin's potential to help treat anorexia nervosa, nicotine addiction, and Alzheimer's Disease ^[2]. In 2018, the U.S. Food and Drug Administration stated that psilocybin was a "breakthrough therapy ^[21]."

Within the psychedelic research community, there seems to be a growing sense of optimism that psilocybin could become an accepted part of American life. However, as scientists in the 1960s discovered, the legal scheduling of a chemical compound by the U.S. Drug Enforcement Administration is not merely a matter of scientific research – it is also a matter of politics and public perception. If a new social backlash develops against psilocybin and other psychedelics, it could overwhelm the positive impact of recent scientific research. Therefore, finding ways to determine public sentiment about psilocybin might be beneficial.

McGinty et al. ^[6] and Zhang et al. ^[7] have explored newspaper coverage as a method to gauge public opinion about opioids and ketamine, respectively. Building on their studies, the author read and analyzed every article mentioning psilocybin in four regional American newspapers over the period from January 1, 1989, to December 31, 2020.

The present study had two hypotheses about these newspaper articles:

1. General sentiment about psilocybin had become more positive between the beginning and end of the studied period.
2. The annual number of articles mentioning psilocybin had increased between the beginning and end of the studied period.

The author recognizes the risk that newspapers might be a less accurate gauge of media opinion in 2020 than they were in 1989, considering the growth of other media outlets such as cable news and podcasts. However, an analysis of newspapers might still provide at least some type of gauge, even if it is far from a perfect one.

Methods

The imperfections of methods for examining sentiment must be considered when reading the results of studies about sentiment. Due to current flaws in machine assessment of sentiment, a human assessment was determined to be better for the present study (although this might change in the not-distant future). A more detailed explanation is given below.

Similar to McGinty et al.,^[6] the present study divided the United States into four geographical regions (Northeast, Southeast, Midwest/Plains, and West) and chose one newspaper from each region: *New York Times* (Northeast), *Tampa Bay Times* (Southeast), *St. Louis Post-Dispatch* (Midwest/Plains), and *San Diego Union-Tribune* (West). It was hoped that examining all of these newspapers could mitigate potential regional differences in sentiment toward psilocybin. Some of these newspapers purchased and/or absorbed other newspapers over the time period being examined (January 1, 1989, to December 31, 2020). Following the example of McGinty et al.,^[6] the archives of those absorbed newspapers were included under the titles of their current publishers.

To avoid any variations in the quality of databases administered by the newspapers themselves, all article sets were created from the online media database Nexis Uni (the academic research portal of the LexisNexis database). When creating sets of articles, it was necessary to search for a variety of terms in addition to "psilocybin" because, unlike many psychoactive substances, psilocybin is frequently referenced by its delivery container (mushrooms) even in journalistic contexts. After extensive reading of psilocybin journalism, the present study chose four search terms for psilocybin: "psilocybin," "magic mushroom," "hallucinogenic mushroom," and "psychedelic mushroom." Searches were made for both singular and plural forms. There are also many slang terms for psilocybin, such as "shrooms" or "boomers." However, many of these slang terms also have other meanings and seemed rarely used by the newspapers in this study, so they were omitted. Also not included were articles about mushroom species containing hallucinogenic compounds other than psilocybin (such as muscimol, which is found in some *Amanita* species).

Duplicate articles were removed from the sets both using Nexis Uni filters and manually, even if articles had different datelines. However, multiple articles about the same news event were included as long as the articles seemed independently written (for example, following new developments in the event or approaching the event from a different perspective). It might also be important to note that many newspaper articles mentioning psilocybin do not feature psilocybin as their central topic.

After the searches and data cleaning described above, the final article set consisted of 578 articles for all four newspapers. Of these, 335 articles were from the *New York Times*, 95 articles from the *San Diego Union-Tribune*, 78 articles from the *Tampa Bay Times*, and 70 articles from the *St. Louis Post-Dispatch*.

Determining the sentiment of each particular article presented challenges. For example, the same article might mention both positive and negative opinions of psilocybin. In addition, some articles might have stronger positivity or negativity than others. To address these challenges, the author found inspiration in previous studies about media portrayals of psychoactive substances. McGinty et al.^[6] and Zhang et al.^[7] created different thematic categories in which each article could be assessed. For the present study, the author identified five thematic categories to rate sentiment about psilocybin. For each category, each article was given a score of -1 (negative), 0 (neutral), or +1 (positive). The total scores in each thematic category were then calculated for each year for each newspaper. The scores in each category were also then added together to provide a single sentiment score for each year.

The five thematic categories in the present study were:

1. **Legality:** Is psilocybin seen merely as an illicit substance (negative) or as a substance that should be legal (positive)?
2. **Mode of Action:** Is psilocybin seen as physically damaging (negative) or physically beneficial (positive) to the user?
3. **Personal Impact:** Is psilocybin seen as psychologically detrimental (negative) or psychologically beneficial (positive) to the user?
4. **Scientific Integrity:** Is psilocybin research seen as pseudoscience (negative) or rigorous and serious (positive)?
5. **Social Impact:** Is psilocybin seen as detrimental (negative) or beneficial (positive) to society beyond the user?

The decision to use machine or human judgment for rating the sentiment of articles was a difficult one. Nexis Uni, for example, has a feature called "Negative News," which attempts to algorithmically choose only negative articles for a particular search term. Unfortunately, the Negative News results for psilocybin were sometimes highly inaccurate and similar problems seemed to arise with other algorithms. A full discussion of the debate between machine and human judgment is beyond the scope of the present study, touching on the fields of computer science, philosophy, and logic. To avoid the current problems of using algorithms to determine sentiment, for the purposes of this study, the author decided that human judgment was a better option. If machine judgment of sentiment eventually matches or surpasses human judgment, the present study might benefit from being conducted again by machines.

Efforts were made to mitigate the risks of using human judgment of sentiment. In addition to the categorical and regional distinctions above, the author read and rated all 578 articles during two separate periods of time, separated by roughly two months, to allow for variation in mood or focus. The mean sentiment scores of the separate analyses were then calculated for each year. A data table with sentiment scores for each period is available upon request. This was still far from a perfect method, but the author believes the results might still provide at least some insights.

Trend lines in the Discussion section were calculated using ordinary least squares. The calculations were performed by Tableau, a widely-used data visualization software, and p-values were also calculated by Tableau.

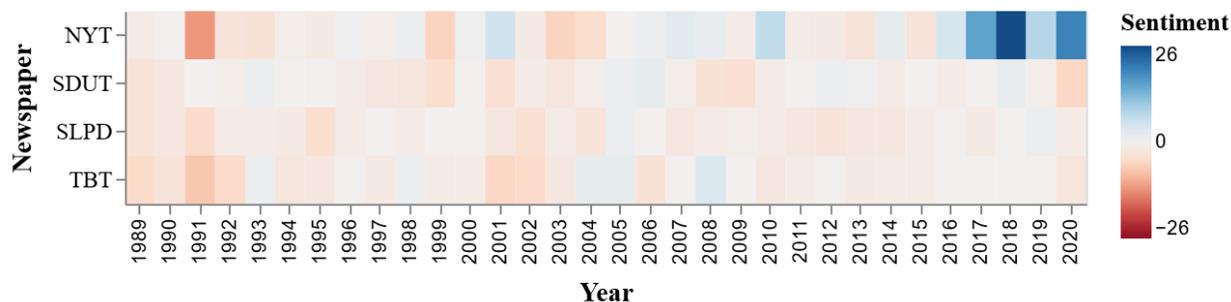
Future studies might also consider the political leanings of newspapers, assess how coverage of psilocybin changes in regions where it has been decriminalized, expand analyses to psychedelics besides psilocybin, and/or include media other than newspapers.

Results

Sentiment of Articles

Annual sentiment about psilocybin from January 1, 1989, to December 31, 2020 in articles (N=578) from the *New York Times* (NYT) (n=335), *San Diego Union-Tribune* (SDUT) (n=95), *St. Louis Post-Dispatch* (SLPD) (n=70), and *Tampa Bay Times* (TBT) (n=78):

Sentiment About Psilocybin per Year – Each Newspaper



[Figure 1]

The annual sentiment scores for each newspaper ranged from 26 in 2018 for the *New York Times* to -12.5 in 1991, also for the *New York Times*. The *San Diego Union-Tribune* ranged from 2 in 2006 to -5.5 in 2020. The *St. Louis Post-Dispatch* ranged from 1 in 2005 and 2019 to -5 in 1991. The *Tampa Bay Times* ranged from 3.5 in 2008 to -7.5 in 1991.

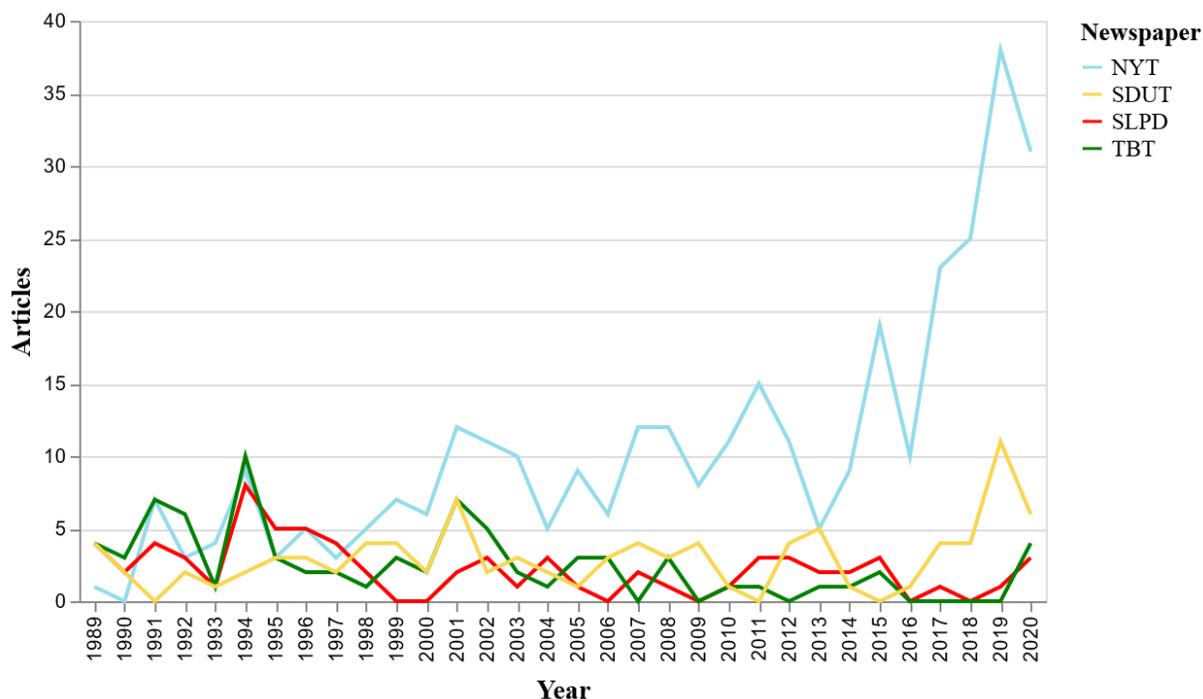
There were also a number of variations when comparing annual sentiment scores within the parameters of each individual newspaper, comparing newspapers by their sentiment scores in each thematic category, and comparing thematic categories within each individual newspaper. Charts of these variations are available upon request.

The mean sentiment per article for each year (perhaps calculated by dividing the total sentiment score each year by the number of psilocybin articles that year) did not seem a useful statistic because many mean article scores did not accurately reflect the sentiment of the year. For example, in the *Tampa Bay Times*, 2011 would have had a higher mean negativity (-1) than 2001 (-0.786), but this was only because 2011 had a single psilocybin article (which happened to be negative), as opposed to 7 psilocybin articles in 2001 with a total negativity of -5.5.

Number of Articles

The final article set for the present study contained 578 total articles for all four newspapers. Of these, 335 articles were from the *New York Times*, 95 articles from the *San Diego Union-Tribune*, 78 articles from the *Tampa Bay Times*, and 70 articles from the *St. Louis Post-Dispatch*.

Articles Mentioning Psilocybin per Year – Each Newspaper



[Figure 2]

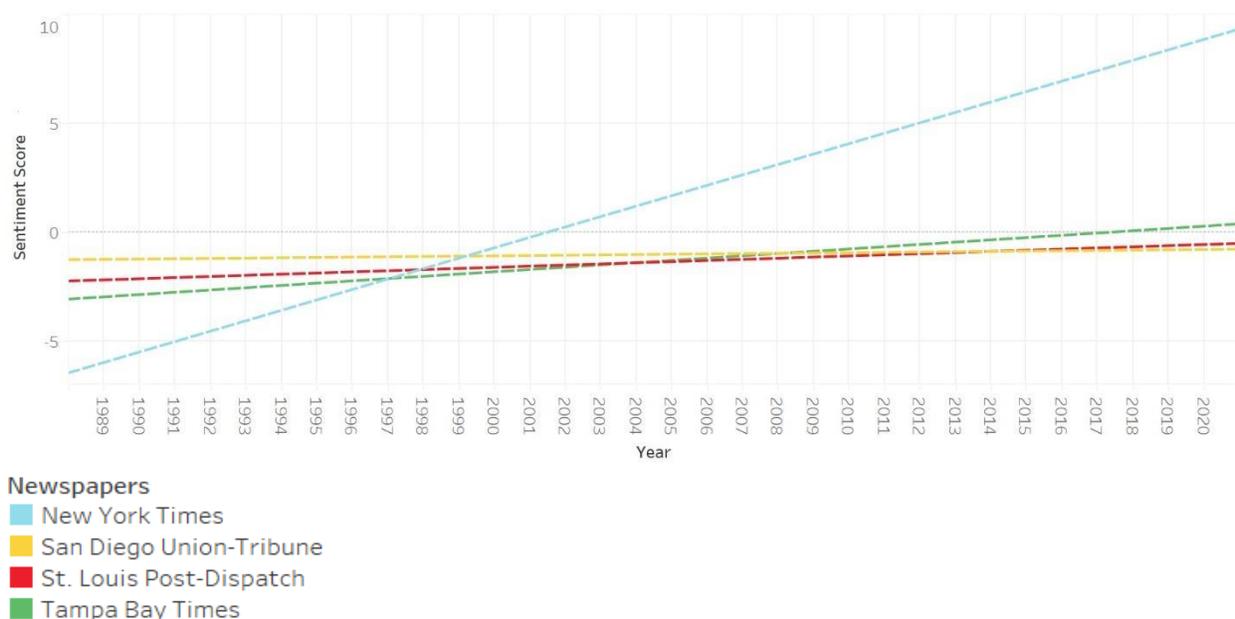
The annual number of articles mentioning psilocybin ranged from 38 in 2019 for the *New York Times* to 0 in several years for all four newspapers.

Discussion

Sentiment of Articles

The first hypothesis was that general sentiment toward psilocybin in the studied articles had become more positive between the beginning and end of the 32-year period. This hypothesis was mostly false. Only one of the four newspapers (*New York Times*) showed a significant increase in positive sentiment [Figure 1]. The trend lines of annual sentiment in the four newspapers can be seen in the chart below:

Annual Sentiment Trend Lines – Each Newspaper



[Figure 3]

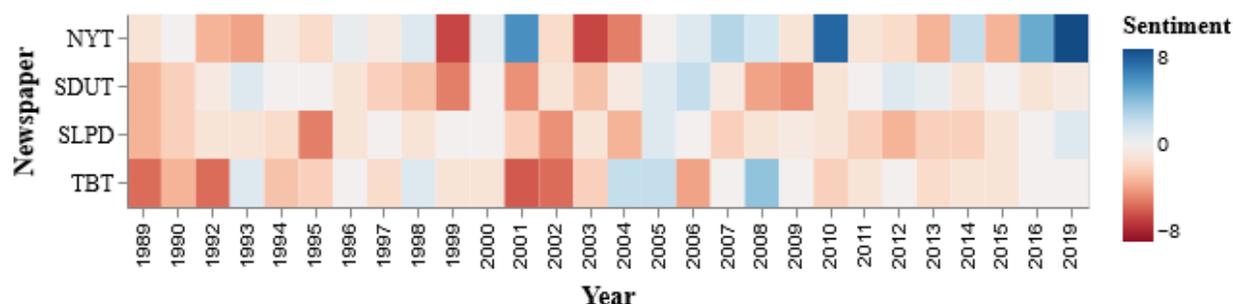
The *New York Times* ($n=335$, $p=0.0002$) showed a much stronger trend toward greater positive sentiment than the other newspapers. In fact, although the other newspapers also showed slight trends toward more positive coverage, there are potential flaws in those trend lines. The trend line of the *San Diego Union-Tribune* ($n=95$, $p=0.682$) can be discarded, since it had such a high p -value that we cannot reject the null hypothesis. Trend lines for the *St. Louis Post-Dispatch* ($n=70$, $p=0.057$), and *Tampa Bay Times* ($n=78$, $p=0.0198$) had higher chances of being statistical anomalies than the *New York Times*. The *Tampa Bay Times* did not publish any articles mentioning psilocybin between 2016-2019, which means that its zero sentiment scores for those years were closer to being null values than zero values. In addition, the *San Diego Union-Tribune* had its lowest sentiment score (-5.5) in 2020 [Figure 1].

When viewing the annual sentiment scores of all the newspapers [Figure 1], the dark blue positive scores from 2016-2020 for the *New York Times* are so strong that they drown out almost all the other scores. The positive scores reached by the *New York Times* during the 2016-2020 period were as much as 743% higher than the highest scores recorded by any of the other three newspapers in any year. It might be asked whether this was because the *New York Times* simply published more articles on all topics compared to the other newspapers (i.e., it was a larger newspaper in general). Unfortunately, it is difficult to find information about how many articles were published each year in each newspaper, especially when factoring reprints, briefs, and online content. However, a high number of psilocybin articles did not always mean that a sentiment score would be extreme. For example, the highest yearly number of articles for any of the four newspapers was 38 articles by the *New York Times* in 2019 [Figure 14], but the *New York Times*'s sentiment score that year was only 8 [Figure 1]. This was because many of those 38

articles had negative sentiments about psilocybin, which mitigated the many articles with positive sentiments. This might indicate that psilocybin coverage by the *New York Times* in 2017, 2018, and 2020 was genuinely more positive in comparison to other years, rather than its high positive scores simply being a reflection of high numbers of articles.

It should also be noted that when the outlier years of 1991, 2017, 2018, and 2020 are removed, the *New York Times* appears much less different from the other newspapers in terms of sentiment intensity:

Sentiment per Year – Each Newspaper (excluding 1991, 2017, 2018, 2020)



[Figure 4]

In addition, until 2001, the number of psilocybin articles in the *New York Times* was not particularly different from the other three newspapers [Figure 2]. (The *New York Times* published more psilocybin articles than the other newspapers from 1998-2000, but those numbers were not higher than some previous years for the other newspapers.) In fact, other newspapers often had more psilocybin coverage until 2001.

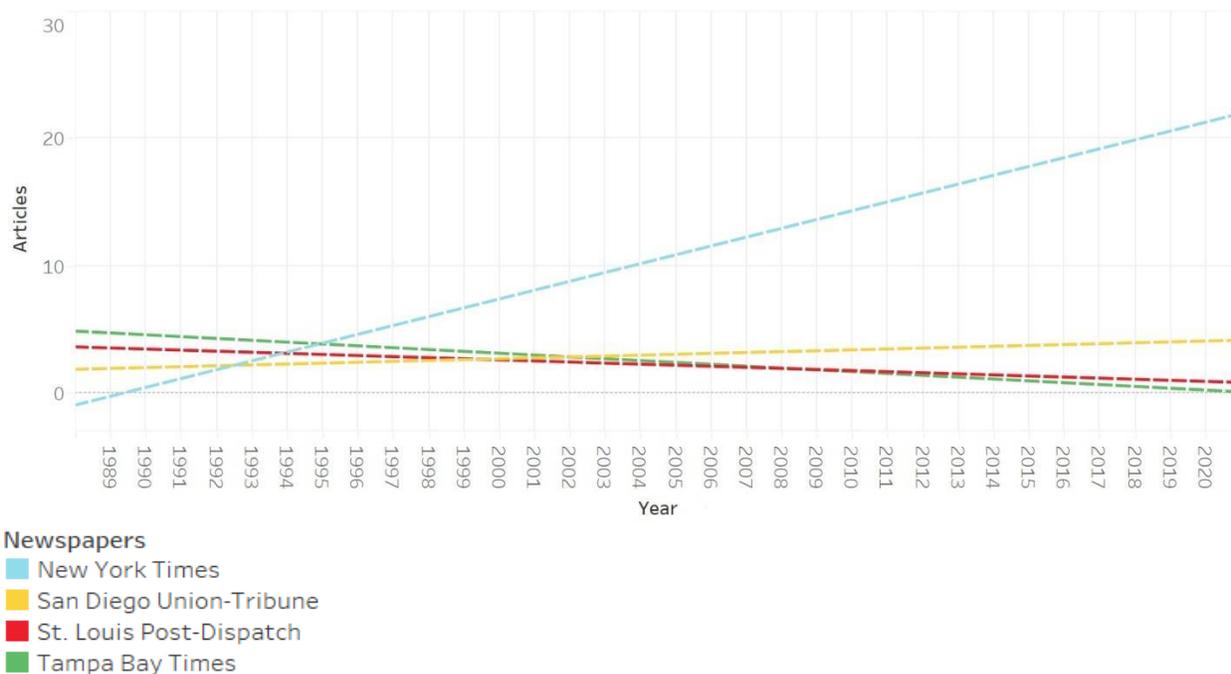
Comparisons among the different thematic categories also revealed some interesting patterns. For example, legality was rarely positive. In all four newspapers, over the entire 32-year time span, whenever the legality of psilocybin was mentioned, the connotation was usually negative. This should probably not be surprising, though, since the illegality of psilocybin meant that articles sometimes mentioned people being arrested and/or imprisoned for psilocybin-related crimes. Therefore, a good question might be whether psilocybin legalization would make newspaper coverage more positive overall simply by reducing articles about psilocybin-related crimes. Psilocybin possession was decriminalized in Denver and Oakland in 2019,^[20,21] and after a few years, it might be fruitful to examine whether newspaper coverage has become more positive in those cities. Some studies have shown that mainstream news often has a tendency toward negativity^[22,23]. The recent surge in positive reporting by the *New York Times* [Figure 1] could possibly indicate an even more significant shift toward positivity if it swam against a tide of general journalistic negativity.

Number of Articles

The second hypothesis was that the annual number of articles mentioning psilocybin (N=578) in the studied newspapers had increased between the beginning and end of the 32-year period. This

hypothesis was mostly false. Only the *New York Times* (n=335, $p < 0.0001$) had a significant increase in psilocybin coverage. The *Tampa Bay Times* (n=78, $p = 0.0008$) and *St. Louis Post-Dispatch* (n=70, $p = 0.013$) had decreases. The *San Diego Union-Tribune* (n=95, $p = 0.106$) had an extremely slight upward trend in coverage, but its trend line had such a high p-value compared to the other newspapers that this cannot be taken at face value.

Article Number Trend Lines – Each Newspaper



[Figure 5]

The increase in coverage by the *New York Times* between 2015-2020 [Figure 2] was particularly striking (although the number of articles went down in 2016, that year was still as high as the second-highest number of yearly articles recorded for any of the other three newspapers). After setting a new high in psilocybin coverage with 19 articles in 2015, the *New York Times* had already doubled that number by 2019 with 38 articles.

It was difficult to determine the reasons for the increase in the *New York Times* simply by examining its articles. Although a regional news focus sometimes affected psilocybin coverage, such as with the *Tampa Bay Times* from 1989-1994 (when there was a jump in stories about psilocybin mushroom pickers in local cow pastures), the articles in the *New York Times* from 2015-2020 rarely had a regional quality. The *New York Times's* articles about psilocybin's therapeutic potential often featured studies conducted outside the New York area, meaning that any other newspaper could have covered them just as easily. It might be suspected that the *New York Times* simply published more articles in general, which thereby created a larger number of articles mentioning psilocybin. Unfortunately, it was difficult to determine the number of articles that a newspaper published in general each year, especially when factoring reprints, briefs, and

online content. However, even if true, this did not seem enough to explain the entire increase in psilocybin coverage since the number of psilocybin articles in the *New York Times* did not differ greatly from the other newspapers for several years. Compared to the increase in the *New York Times* in recent years, there was not much variation among any of the newspapers between 1989 and 2000. (Even though the *New York Times* had more psilocybin articles than the other three newspapers in 1998-2000, its totals for those years were still less than the *St. Louis Post-Dispatch* and *Tampa Bay Times* had in some previous years.)

The change in coverage by the *Tampa Bay Times* was interesting because of how much it decreased. For example, from 1989-1994, the *Tampa Bay Times*'s 31 psilocybin articles were more than any of the other newspapers. Yet for 2015-2019 (when mentions in the *New York Times* had greatly increased), the *Tampa Bay Times* had zero articles mentioning psilocybin. This was not merely due to a lack of interest by the *Tampa Bay Times* for articles about psychoactive substances, since Nexis Uni returned 28 articles in that newspaper about LSD and 648 articles about cocaine during that period.

Conclusion

The above results might be a warning to psilocybin advocates that their optimism about public perception could be premature. Although the *New York Times* showed a significant trend upward in both positive sentiment [Figure 3] and mentions [Figure 5] of psilocybin, this did not occur in the other three newspapers. In fact, the *San Diego Union-Tribune* had its lowest sentiment score (-5.5) in 2020. In addition, even the *New York Times* showed a sharp drop in positive sentiment between 2018 and 2019 [Figure 1]. If psilocybin advocates are mostly discussing psilocybin with each other, rather than discussing it with people outside of their communities, they might have developed a mistaken impression of how many people have accepted its use. However, more research is recommended, especially considering the methodological challenges of the present study.

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