Impact of global public health days on online health-information-seeking behavior related to substance use: An analysis of five-year data

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ABSTRACT

The United Nations Organizations observe various global public health days (GPHDs) (also known as world days) throughout the year. We aimed to assess the impact of GPSDs on online health information-seeking behavior related to substance use in the Indian context. We used the Google Trends data for this study using standard guidelines. We conducted a topic search for the query "Substance abuse" to capture online information-seeking behavior (OHISB) for substance use disorder-related searches. The data were analyzed using the Joinpoint Regression software. Joinpoint regression model analysis was conducted to determine the statistically significant daily percent change (DPC) in the RSV trend. We found that there were significant changes in OHISB for substance use-related disorders on the International Day Against Drug Abuse and Illicit Trafficking over the last five years. The increase in the pattern of online search for substance use-related information was not observed around the World No Tobacco Day, World Mental Health Day, and World Suicide Prevention Day. Since most of these world health days are likely to continue to be observed in the coming years, it is important to regularly assess their impact as well as make the necessary modifications to make them more effective in achieving the desired objectives.

Key words: Health days, internet, online health behavior, trends

INTRODUCTION

The United Nations Organizations observe various global public health days (GPHDs) (also known as world days) throughout the year.[1] In 2020, there were more than 300 worldwide campaigns.[2]

Currently, there are no well-established standards for defining and quantifying the variety of outcomes that can be produced by a celebration of world days. One potential short-term outcome indicator to assess the effectiveness of a particular GPHD is the change in the online health information-seeking behavior (OHISB) of the population.

Utilizing the Internet to seek health information has not only become a prevalent but also a preferred behavior.[3] It has been reported that online search for health information enables these consumers to learn about their health problems, ways of solving them, guide their decision-making process on topics related to their health, and in turn alter their behaviors.[4,5] Such OHISB seeks to fill in the gap between the existing information and what

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people still need to know. However, the success of these health-related world days, as reflected by the change in OHISB, is heterogeneous.[6]

We aimed to assess this impact in the Indian context. We also aimed to assess if the online health-seeking behavior varies across the different world days on substance use-specific and mental health-related themes.

MATERIAL AND METHODS

We used the Google Trends platform to capture the data for the purpose of this study. The RSV values are calculated using a proprietary algorithm and range between 0 (representing very low search volume) and 100 (peak search volume for selected time-period). To ensure transparency and reliability of data extracted using Google Trends, the standard guidelines developed by Nuti *et al*.[7] in 2014 were followed in the present study (see supplementary Table 1 for details of the search strategy and method). The details of the search engine and the search strategy have been provided in the supplementary file. The daily RSV values were downloaded for the selected four health days over five consecutive years in separate.csv files using the above-described search strategy on August 5th, 2022 by the same researcher (SS). The search queries were finalized by mutual discussion and consensus among study authors (qualified psychiatrists with clinical and research experience in addiction psychiatry) based on their face validity.

Statistical analysis

The Google Trends data was entered into a Microsoft Excel sheet and analyzed using the Joinpoint Regression software.[8] Joinpoint regression model analysis was conducted to determine the statistically significant daily percent change (DPC) in RSV trend as an indicator of OHISB around the days preceding and following the health day. The software creates a graphical representation of change in the dependent variable with time and searches for best-fitting points for the given data, known as the "joinpoints." These mark a significant change (either increase or decrease) in the trend of RSV. The model selection method was the permutation test, and the overall significance was set at a *P* value of less than 0.05.

RESULTS

The variation in the Google Trends data (RSV values for the "Substance abuse" topic) in India corresponding to the selected four global public health days (GPHDs) over the last five years using a Joinpoint regression model is depicted in Figure 1a-d.

The Google Trends results for International Day Against Drug Abuse and Illicit Trafficking (IDADAIT, 26 June) for the last five consecutive years are shown in Figure 1a-e. The Joinpoint regression analysis identified three joinpoints for

the years 2022, 2020, and 2019, whereas two joinpoints were identified for the years 2021 and 2018. The presence of joinpoints indicates significant changes in online health information-seeking behavior (OHISB) for substance use-related disorders.

The Google Trends results for World No Tobacco Day (31 May) for the last five consecutive years (2022–2018) are shown in Figure 2a-e. The Joinpoint regression analysis identified zero joinpoints for all the years indicating no significant changes in OHISB for substance use-related disorders in general during this time period.

The Google Trends results for World Mental Health Day (10 October) for the last five consecutive years (2021–2017) are shown in Figure 3a-e. The Joinpoint regression analysis identified zero joinpoints for all the years except for one (2018). The analysis for the year 2018 showed one joinpoint after five days of the world mental health day, that was followed by a decline in RSV over the period of the next two days of the study period (DPC= −40.6.5, *P* = 0.13).

The Google Trends results for World Suicide Prevention Day (10 September) for the last five consecutive years (2021–2017) are shown in Figure 4a-e. The Joinpoint regression analysis identified zero joinpoints for all the years except for one (2019). The analysis for the year 2019 showed one joinpoint 20 days prior to the world suicide prevention day, that was followed by a decline in RSV over the remaining days of the study period (DPC= −0.6, *P* = 0.34).

Figures S1-S3 depict the results of Joinpoint regression analysis for the Google Trends data of other relevant search topics.

DISCUSSION

In the current study, we found that there were significant changes in online information-seeking behavior for substance use-related disorders on the International Day Against Drug Abuse and Illicit Trafficking over the last five years. The increased interest started a couple of days prior to the International Day Against Drug Abuse and Illicit Trafficking and continued to remain high for a few more days afterward.

Given a rather consistent behavioral pattern of increase in OHISB for substance use-related disorders on the International Day Against Drug Abuse and Illicit Trafficking over the last five years, it is important to ensure that appropriate and relevant information is made available online. Accuracy, currency of information, ease of understanding, comprehensiveness, readability, confidentiality, interactivity, and quality of links to use of multimedia and appearances were listed as the most valued criteria for health websites in previous studies.[9,10] The search results yielded using
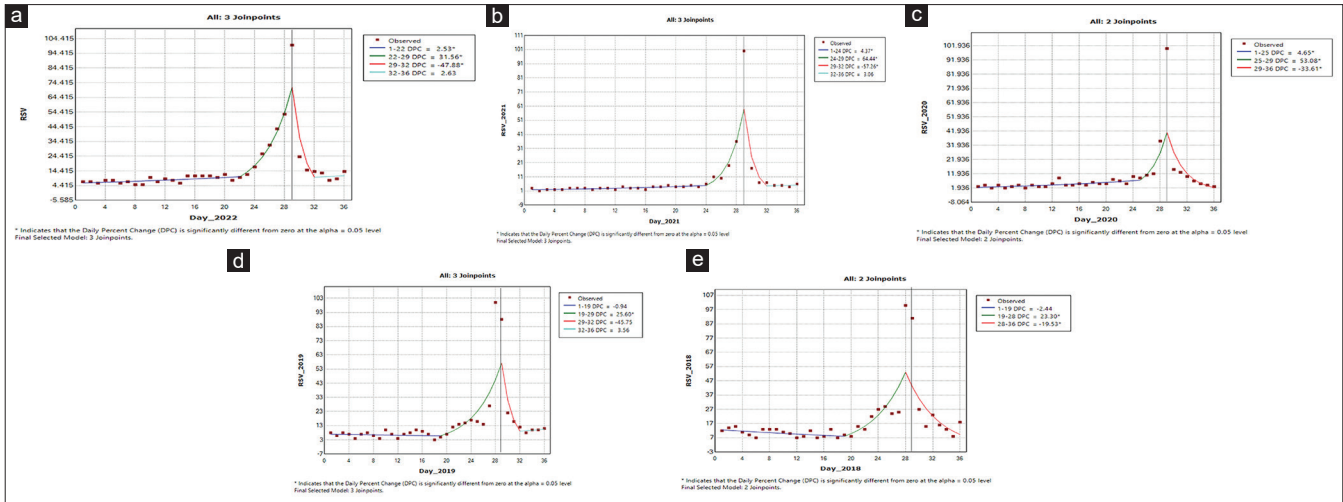
Figure 1: (a-e) Trend of changes in Relative Search Volume (RSV for "substance abuse" topic in Google Trends for India region) during four weeks prior to the International Day Against Drug Abuse and Illicit Trafficking, on that day itself, and one week following it for the last five years. The black vertical line represents the International Day Against Drug Abuse and Illicit Trafficking. Joinpoints mark a statistically significant change in the linear slope of the trend line for the study time period
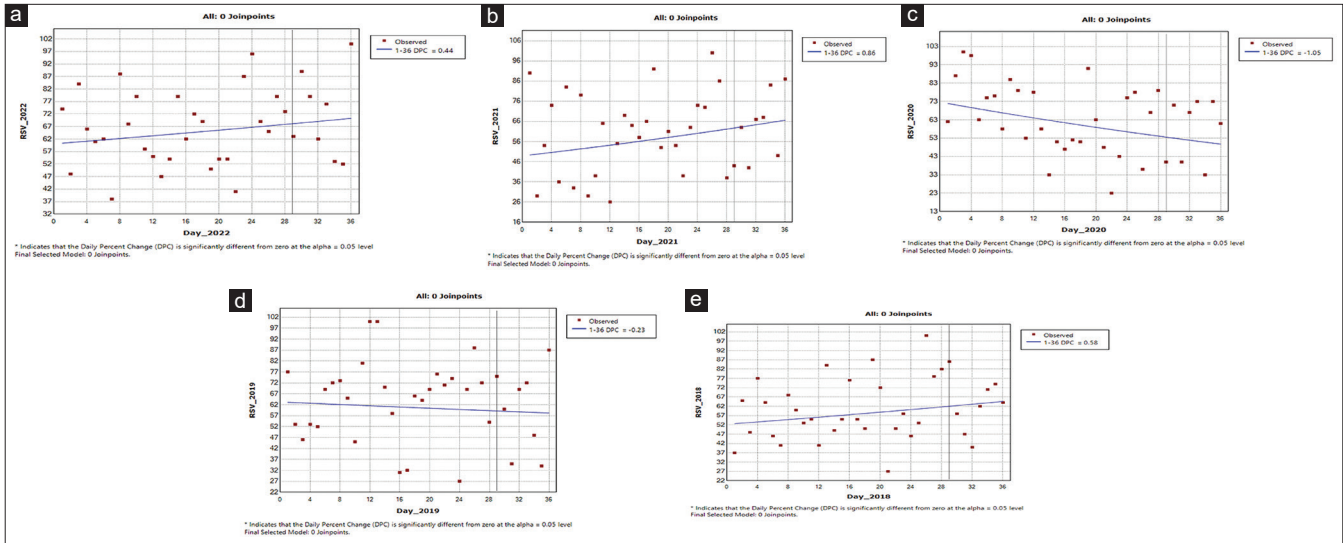

Figure 2: (a-e) Trend of changes in Relative Search Volume (RSV for "substance abuse" topic in Google Trends for India region) during four weeks prior to the World No Tobacco Day, on that day itself, and one week following it for the last five years. The black vertical line represents the World No Tobacco Day. Joinpoints mark a statistically significant change in the linear slope of the trend line for the study time period

general online search engines shall also benefit from the incorporation of these attributes. In our study, the increased interest in substance use lasted for only a few days beyond the International Day Against Drug Abuse and Illicit Trafficking. This is in line with the previous research that has suggested the effect of GPHD tends to be short-lived.[11] Hence, there is a need to explore the reasons thereof and the possible ways to sustain the effect over a longer timeframe.

The increase in the pattern of online search for substance use-related information was not observed around the World No Tobacco Day, World Mental Health Day, and World Suicide Prevention Day. The only exceptions were the increase observed for one year each around the World Mental Health Day and World Suicide Prevention Day. Importantly, while other specific mental disorders have been identified as themes for world health day (for example, depression) and world mental health day in the past, none of these had a theme specifically related to substance use and substance use disorders. Given the high public health burden due to the substance use disorders, there is a need to explicitly focus on substance use and substance use disorders on GPHD as well to generate greater interest in these.

The substance use and substance use disorders are also highly relevant in the context of World Suicide Prevention

Figure 3: (a-e) Trend of changes in Relative Search Volume (RSV for "substance abuse" topic in Google Trends for India region) during four weeks prior to the World Mental Health Day, on that day itself, and one week following it for the last five years. The black vertical line represents the World Mental Health Day. Joinpoints mark a statistically significant change in the linear slope of the trend line for the study time period
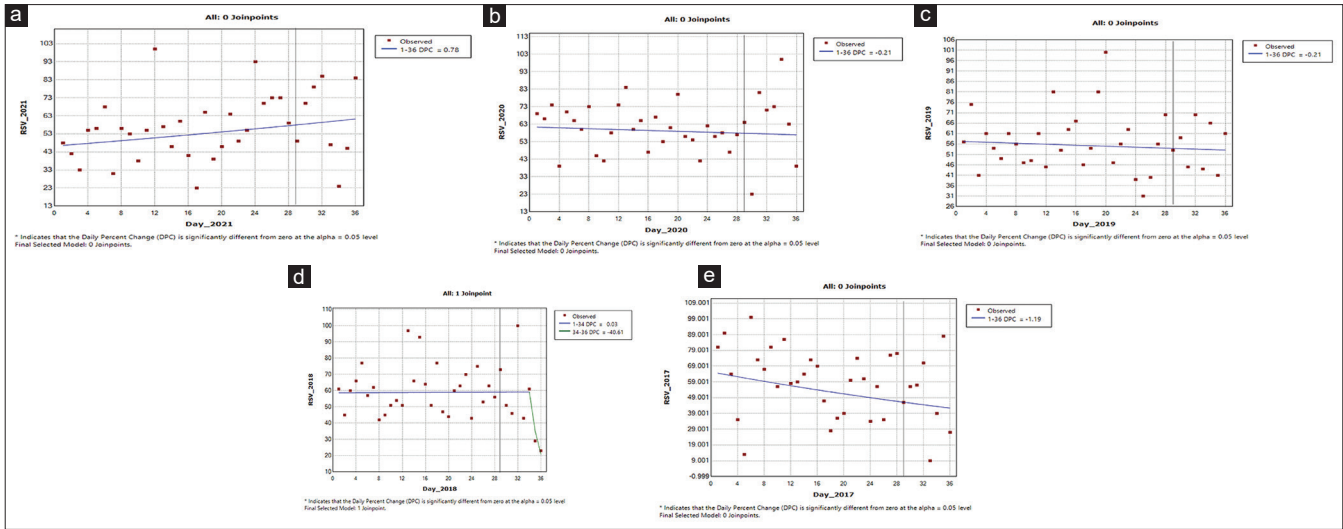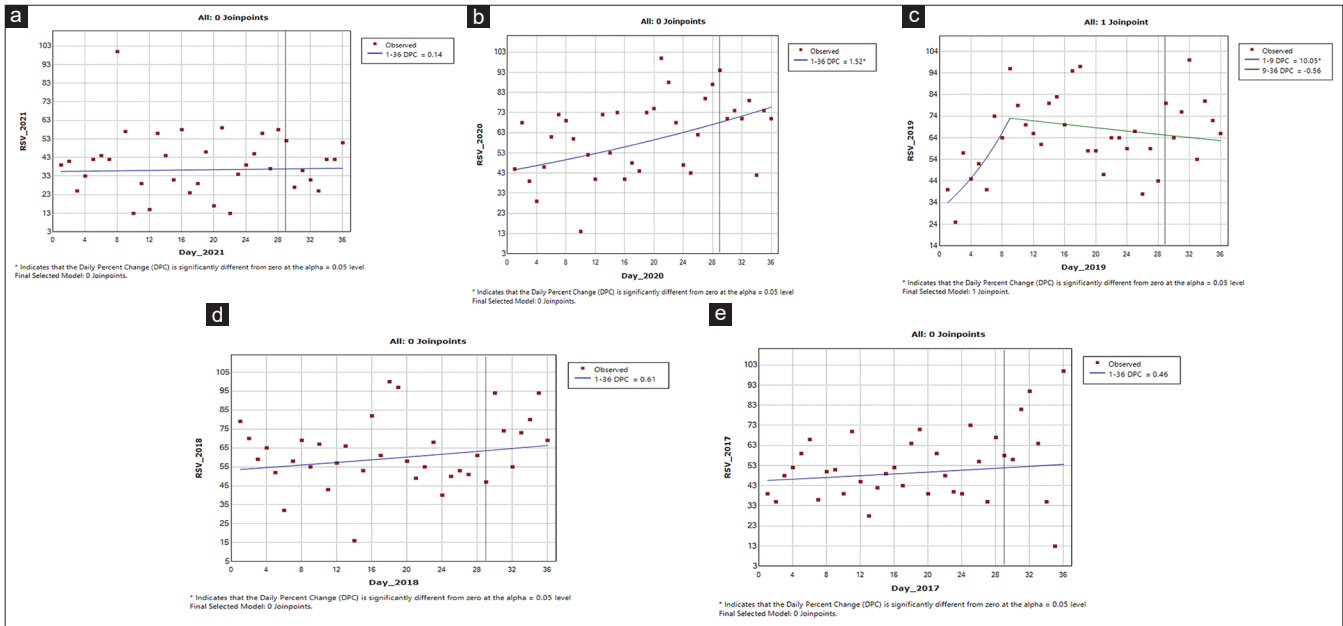

Figure 4: (a-e) Trend of changes in Relative Search Volume (RSV for "substance abuse" topic in Google Trends for India region) during four weeks prior to the World Suicide Prevention Day, on that day itself, and one week following it for the last five years. The black vertical line represents the World Suicide Prevention Day. Joinpoints mark a statistically significant change in the linear slope of the trend line for the study time period

Day. The use of psychoactive substances is a well-established modifiable risk factor for suicidal behavior (including completed suicide).[12] However, we did not find any consistent pattern of a significant increase in OHISB for substance use-related disorders on this GPHD aimed at creating awareness about suicide prevention.

Given the growing penetration of the internet globally, the World Wide Web is expected to become an even more important source of information on health-related topics including substance use for a larger section of the population. Hence, it is imperative to design and celebrate the GPHD in such a way that does not exclude important public health conditions.

The current study has certain limitations. We used only the Google's search platform, although it is the most used search platform contributing toward more than 95% of all online search traffic in India. Also, the accuracy of our results is contingent on the accuracy of the algorithms used

by the search platform. However, the search methodology adopted for conducting Google Trends analysis in this study is in accordance with the recommendations for conducting robust Google Trends research.[10] We used the topic search rather than the query search. This search strategy has been used in the previous studies as well.[11,13] The topic search option is likely to encompass Google searches querying subtopics or relevant themes of the public awareness campaign on health days. Further, it helps to accommodate linguistic diversity in the search query selection for a country like India with 22 separate official languages. We were able to comment only on the short-term impact of these world days due to the study design.

Despite the limitations, the current study offers important insights into this unexplored area. Since most of these world health days are likely to continue to be observed in the coming years, it is important to regularly assess their impact as well as make the necessary modifications to make them more effective in achieving the desired objectives.

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Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. WHO. World Health Days. WHO; 2019. Available from: https://apps.who.int/gb/ebwha/pdf_files/EB144/B144_39Rev1-en.pdf.
2. Vernon E, Gottesman Z, Warren R. The value of health awareness days, weeks and months: A systematic review. Soc Sci Med 2021;268:113553.
3. Jia X, Pang Y, Liu LS. Online health information seeking behavior: A systematic review. Healthcare (Basel) 2021;9:1740.
4. Ghahramani F, Wang J. Impact of smartphones on quality of life: A health information behavior perspective. Inf Syst Front 2020;22:1275–90.
5. Lambert SD, Loiselle CG. Health information seeking behavior. Qual Health Res 2007;17:1006–19.
6. Lippi G, Mattiuzzi C, Cervellin G. Do "disease awareness days" work? A 5-year investigation using google trends. J Epidemiol Glob Health 2020;10:245-6.
7. Nuti SV, Wayda B, Ranasinghe I, Wang S, Dreyer RP, Chen SI, *et al*. The use of google trends in health care research: A systematic review. PLoS One 2014;9:e109583.
8. NIH. Joinpoint Trend Analysis Software. 2022. Available from: https://surveillance.cancer.gov/joinpoint/.
9. Maon SN, Hassan NM, Seman SAA. online health information seeking behavior pattern. Adv Sci Lett 2017;23:10582–5.
10. Osei Asibey B, Agyemang S, Boakye Dankwah A. The internet use for health information seeking among Ghanaian University students: A cross-sectional study. Int J Telemed Appl 2017;2017:1756473.
11. Havelka EM, Mallen CD, Shepherd TA. Using google trends to assess the impact of global public health days on online health information seeking behaviour in Central and South America. J Glob Health 2020;10:010403.
12. Esang M, Ahmed S. A closer look at substance use and suicide. Am J Psychiatry Resid J 2018;13:6–8.
13. Ajbar A, Shepherd TA, Robinson M, Mallen CD, Prior JA. Using google trends to assess the impact of global public health days on online health information-seeking behaviour in Arabian Peninsula. J Egypt Public Health Assoc 2021;96:4.

Supplementary Table 1: Checklist for documentation of methodology for a Google Trends based study and details of search engine, search strategy and statistical analysis		
Section/Topic	**Checklist item**	**Details for present study**
Search Variables:		
Access Date	Provide the date(s) when Google Trends was accessed and when the data was downloaded.	On 5 August 2022, we searched and downloaded data using Google Trends.
Time Period	Identify all the time periods that were searched for in Google Trends, providing up to the Month and Day in detail.	We searched within the "India" region using the "customized time range" option in Google Trends. The search period comprised of a total of 36 days: the global public health day, 28 days before and 7 days after it for five consecutive years (2022-2018/2021-2017). For example, International Day Against Drug Abuse and Illicit Trafficking: 26/6/2022 (29/05/2022 – 3/07/2022); World No-Tobacco Day: 31/05//2022 (3/05/2022 – 7/06/2022); World Mental Health Day: 10/10/2021 (12/09/2021 – 17/10/2021); World Suicide Prevention Day: 10/9/2021 (13/08/2021 – 17/09/2021)
Query Category	Identify which query category was used for search; if not using a query category, designate that "all query categories were used", which is the default setting.	The option of "All categories" was used as substance use related and other health day related searches can span across multiple different categories. For example: 'health', 'science', 'law and government', etc.
Search Input:		
Full Search Input	Provide the full search input(s) that were queried for in Google Trends, along with the appropriate documentation of search syntax. Ensure that the provision of the search input is clear, using brackets or other delineators to separate the search input from the body text.	Search input: Google Trends "Topic" search for "Substance abuse" instead term search was used to include all substance use disorder related subtopics or themes to in English as well as other languages for all the global public health days included in this study. Additionally, Google Trends topic search using "Tobacco", "Mental Health", and "Suicide Prevention" were conducted for the World No Tobacco Day, the World Mental Health Day, and the World Suicide Prevention Day respectively. These search queries were finalized by mutual discussion and consensus between the study authors (qualified psychiatrists with clinical and research experience in addiction psychiatry) based on their face validity. No Plus sign (+) or minus sign (-) function were used in the search input.
Combination	If more than one search term was used, document whether those terms were used in combination with a plus sign (+), or if terms were excluded with a minus sign (-). If terms were not used in combination, state so clearly.	
Quotation Marks	If there was more than one word in any search term (e.g. "lipid guideline"), document whether those words were queried with quotation marks or not.	No quotation marks were used in the search input.
Rationale for Search Strategy:		
For Search Input	Provide the reasoning behind the choice of search input.	Google Trends "Topic" search for "Substance abuse" instead term search was used to include all substance use disorder related subtopics or themes in English as well as other languages for all the global public health days included in this study. Additionally, Google Trends topic search using "Tobacco", "Mental Health", and "Suicide Prevention" were conducted for the World No Tobacco Day, the World Mental Health Day, and the World Suicide Prevention Day respectively.
For Settings Chosen	Provide the reasoning for the settings/search variables chosen to specify the search.	The Google Trends analysis was conducted for a total of 36 days for assessing the variation in relative search volume (RSV) for selected search query/queries, 28 days before and 7 days after four selected public health days for the geographical region of India. This was done to evaluate the changes in online health information seeking behaviour for selected search queries related to the theme of different public health days. This shall give us a proxy indication of the success or effectiveness of these public health days in changing the online search behaviour of the population.
Search engine	We used Google Trends platform to capture the data for the purpose of this study. Google Trends (https://trends.google.com/) is a free to use online tool provided by the Google. It analyses data collected from all the web searches conducted using Google search engine and provides information about the popularity of different search queries in the form of normalized relative search volume (RSV). The RSV values are calculated using a proprietary algorithm, and range between 0 (representing very low search volume) to 100 (peak search volume for selected time-period). The RSV represents how frequently a given query was searched using the Google search engine compared to the total number of Google searches for a specified geographical region and time period. The Google Trend RSV values are not influenced by repeated searches conducted by the same individual (Internet Protocol address) over a short period of time.		

Contd...

Supplementary Table 1: Contd...		
Section/Topic	**Checklist item**	**Details for present study**
Search strategy		In order to ensure transparency and reliability of data extracted using Google Trends, the standard guidelines developed by Nuti *et al.* in 2014 were followed in the present study (see supplementary Table 1 for details of search strategy) 10. Google Trends "Topic" search was chosen instead of the "term" search option. A term search result only includes the RSV of matches for particular term (s) in the language given. Whereas, topic search includes RSV of all the search terms that share the same concept or entity in different languages. For example, the Google Trends support page describes that if one uses the search query "London", and performs topic search instead of term; the search will include results for topics like "Capital of the UK" and "Londres," which is "London" in Spanish. 11. This is particularly important for a country like India, where multiple languages are spoken and written across different parts of the country. Thus, we decided to conduct topic search for the query "substance abuse" to capture OHISB for substance use disorder-related searches (e.g. drugs, tobacco, heroin, alcohol, etc.) in English as well as other related regional languages (e.g. Hindi) on the four selected health days.
		Two substance use specific health days (International Day Against Drug Abuse and Illicit Trafficking; and World No Tobacco Day) and two other mental health related days (World Mental Health Day; and World Suicide Prevention Day) were selected in the present study. The four Google Trends options of Region, Time, Category, and Search type were specified as India, customized time period as per the health day, all categories, and web search, respectively. The time period entered for each query was 36 days: four weeks prior to health day, the date of health day, and one week following it.
		Further, additional topic search using "Tobacco", "Mental Health", and "Suicide Prevention" were conducted for the World No Tobacco Day, the World Mental Health Day, and the World Suicide Prevention Day respectively. All other search options were kept same. The daily RSV values were downloaded for the selected four health days over five consecutive years in separate .csv files using the above-described search strategy on 5th August 2022 by the same researcher (SS). The search queries were finalized by mutual discussion and consensus among study authors (qualified psychiatrists with clinical and research experience in addiction psychiatry) based on their face validity.
Data analysis		As per software guidelines, the grid search method with pre-set criteria to find a minimum and a maximum zero and three joinpoints respectively was selected for the analysis. This was done to adequately capture possible change in trends of RSV during the time leading up to and following the selected health day in accordance with the previously available studies. 13 14. The daily RSV values for a given search topic was set as the dependent variable. The logarithmic transformation function was used in view of moderate to highly skewed RSV values. The independent variable was selected as each day of the entire search duration coded as 1-36, with the 29th day representing the health day.

Part of this checklist is taken from the study: Nuti SV, Wayda B, Ranasinghe I, Wang S, Dreyer RP, Chen SI, Murugiah K. The use of google trends in health care research: a systematic review. PLoS One. 2014, 22;9(10):e109583. doi: 10.1371/journal.pone.0109583.
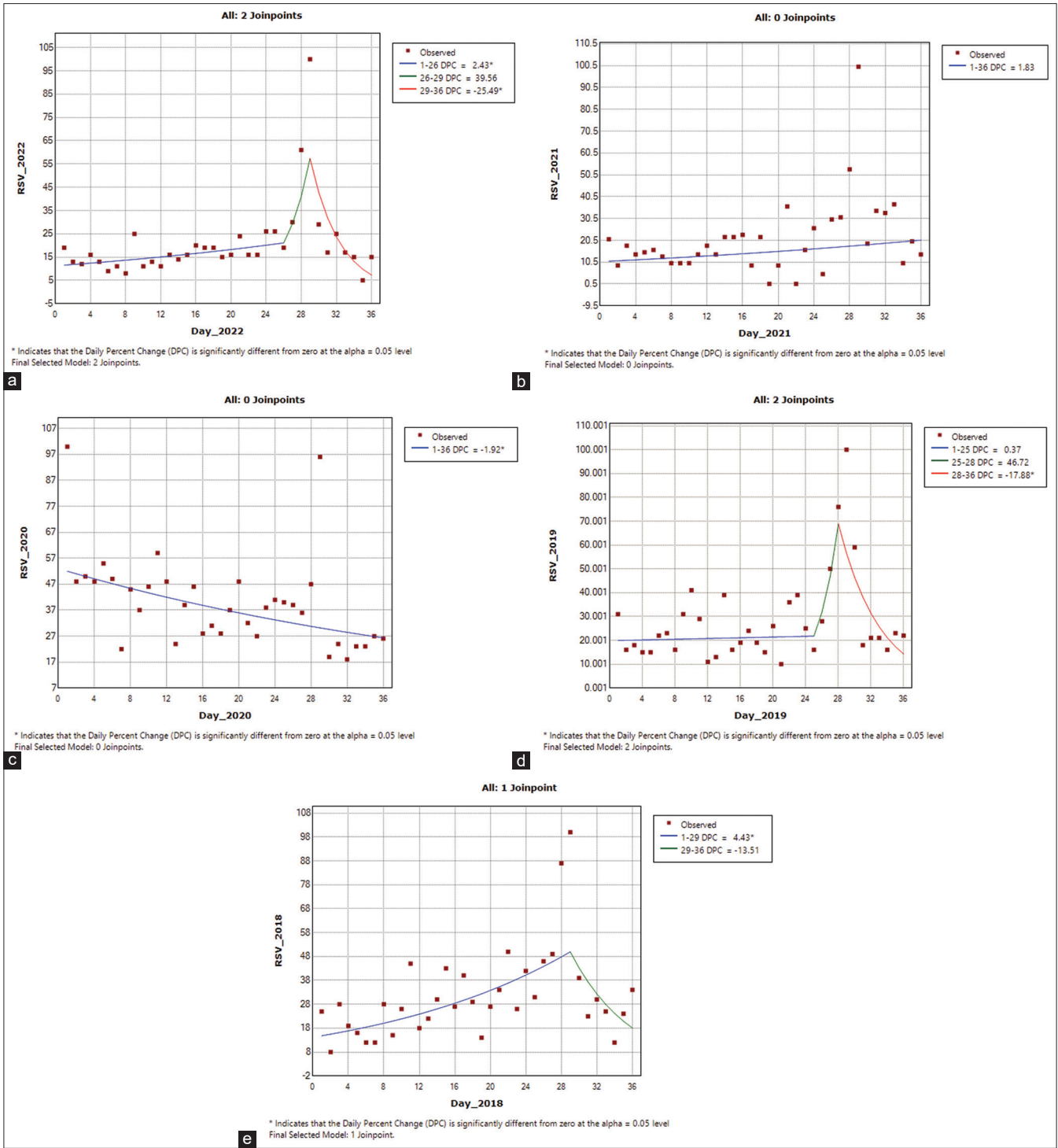
Figure S1: (a-e) Trend of changes in Relative Search Volume (RSV for "Tobacco" topic in Google Trends for India region) during four weeks prior to the World No-Tobacco Day, on that day itself, and one week following it for the last five years. Black vertical line represents the World No-Tobacco Day. Joinpoints mark a statistically significant change in the linear slope of the trend line for the study time period. The Joinpoint regression analysis identified two joinpoints for the years 2022 and 2019; one joinpoint for 2018; and zero joinpoint for 2021 and 2020
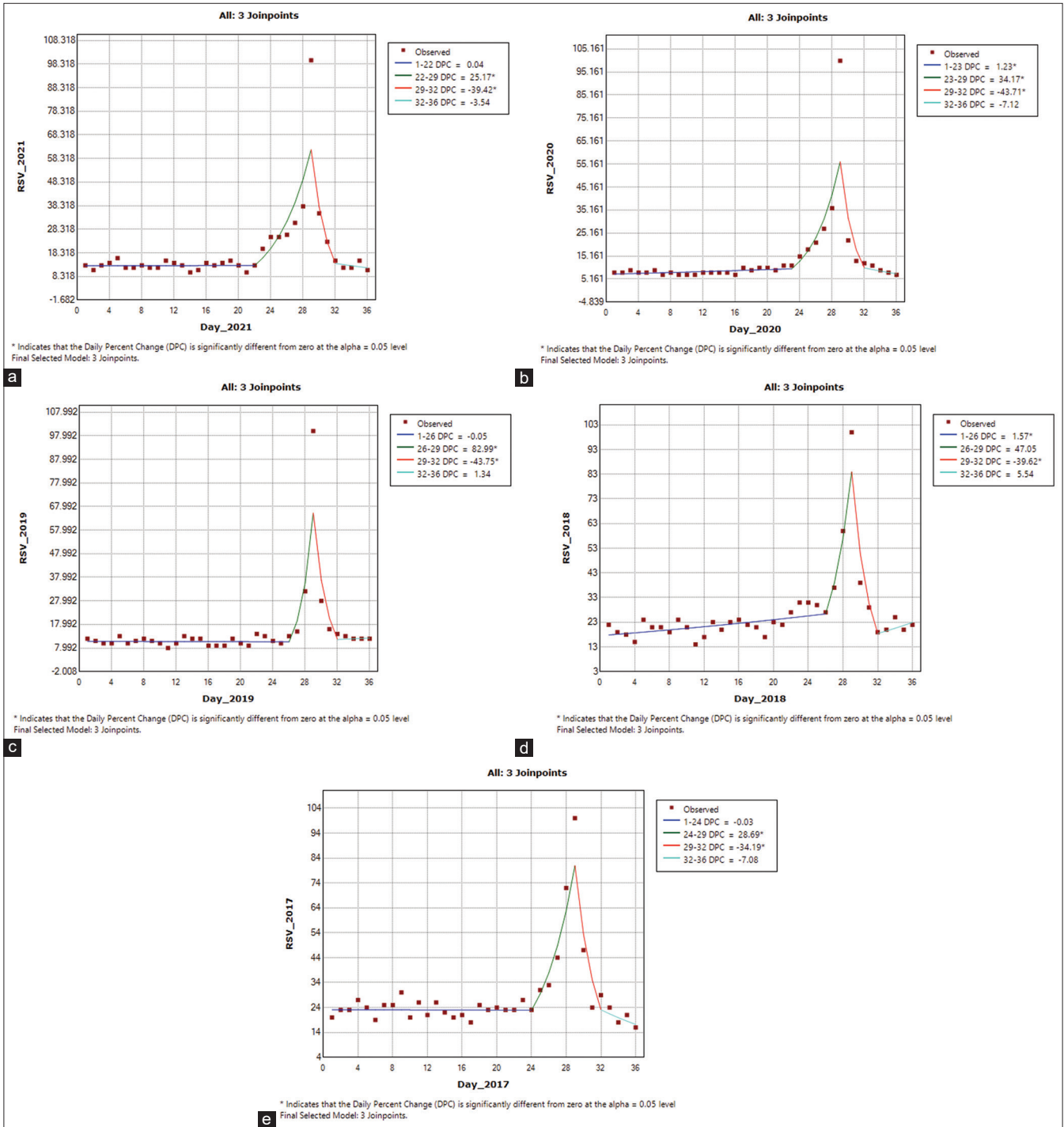
Figure S2: (a-e) Trend of changes in Relative Search Volume (RSV for "mental health" topic in Google Trends for India region) during four weeks prior to the World Mental Health Day, on that day itself, and one week following it for the last five years. Black vertical line represents the World Mental Health Day. Joinpoints mark a statistically significant change in the linear slope of the trend line for the study time period. The Joinpoint regression analysis identified three joinpoints for the last five years between 2021 to 2017. There was a sharp increase in the online interest for mental health related searches occurring in the week preceding the World Mental Health Day, with a peak on the health day itself, followed by rapid fall in interest to low baseline level in less than a week afterwards. This pattern was consistently seen across all the study years
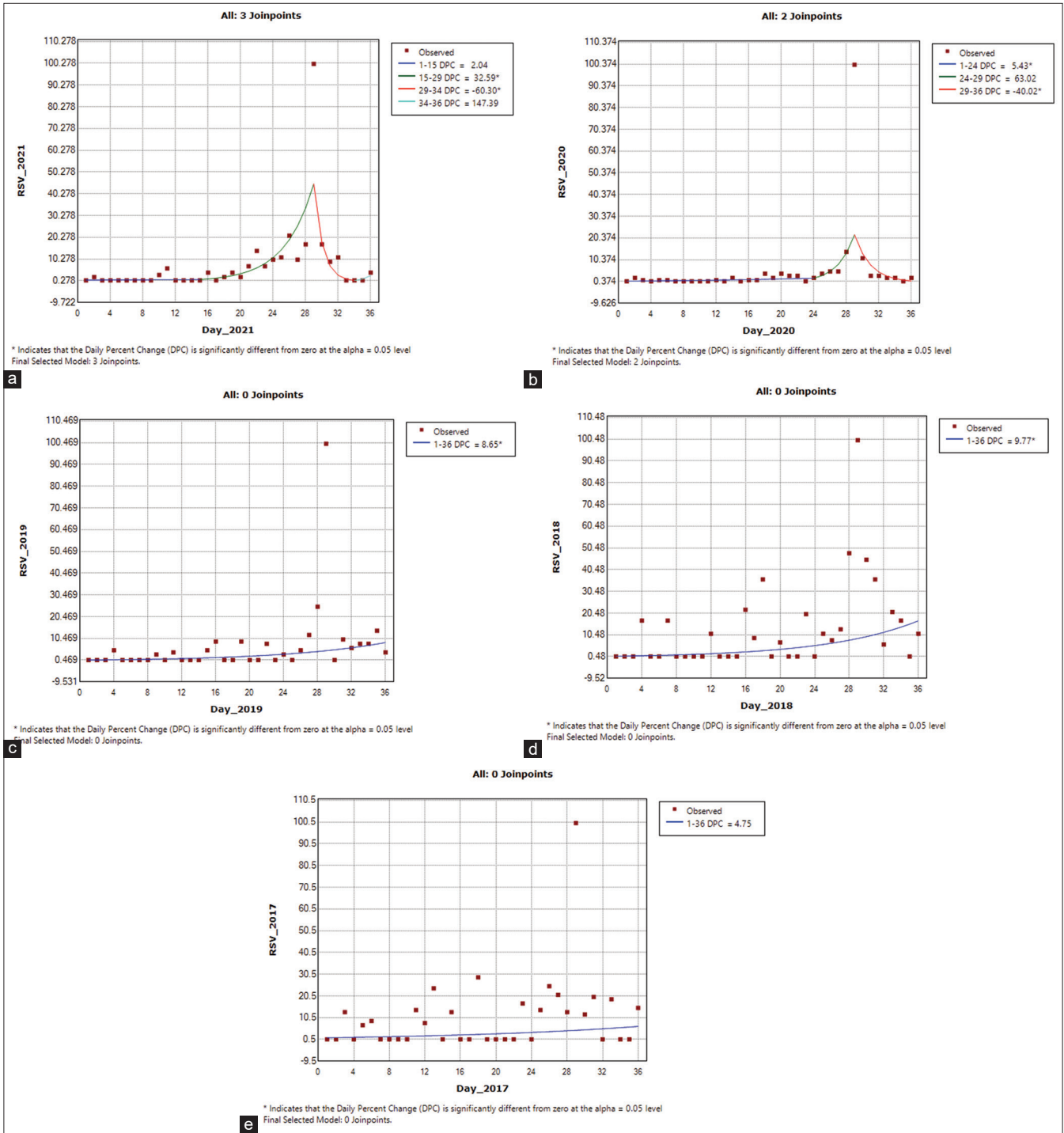
Figure S3: (a-e) Trend of changes in Relative Search Volume (RSV for "suicide prevention" topic in Google Trends for India region) during four weeks prior to the World Suicide Prevention Day, on that day itself, and one week following it for the last five years. Black vertical line represents the World Suicide Prevention Day. Joinpoints mark a statistically significant change in the linear slope of the trend line for the study time period. The Joinpoint regression analysis identified three joinpoints for the year 2021; one joinpoint for 2020; and zero joinpoint for the years 2019 to 2017