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Using Baidu Index to Understand the Public Concern of Children's Mental Health in Mainland China in the Context of COVID-19 Epidemic

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Abstract

This study aims to understand the temporal and spatial characteristics of public concern of "children's mental health" in China in the context of COVID-19 epidemic. Baidu Index is a re- search tool to collect and analyze the massive data of Chinese netizens' behaviors. Using Baidu Index as the research tool, this paper analyzes the trend and distribution of Chinese netizens' attention to "children's mental health" from December 1st, 2019 to March 20th, 2022 from three aspects of trend research, need map and crowd portrait. The study found that since the outbreak of COVID-19, the search trend of "children's mental health" has shown a cyclical change, peak in May and valley around the Spring Festival and National Day, and stable in other periods. "Mental health", "handwritten newspaper on mental health" and "youth mental health" are the most popular buzzwords among the public. The groups concerned of "children's mental health" is mainly distributed in Guangdong, Jiangsu, Beijing, and the majority are women between 30 and 39 years old. Meanwhile, search trend for "mental health" are like that for "children's mental health." The factors influencing the search volume change of "children's mental health" include Chinese traditional holidays, Spring Festival, National Day, Chinese Mental Health Day, and policies and instructions on children's mental health issued by the PRC Ministry of Education. The public would like to know about "mental health", "handwritten newspaper on mental health" and "adolescent mental health".

Keywords: Search engine; Baidu Index; Children's Mental Health; Mental Health

1. Introduction

Despite significant improvements in children survival [1], nutrition [2] and education [3] around the globe in recent decades, progress on the indicators of children health and well-being among the 17 Sustainable Development Goals (SDGs) proposed by WHO is currently at a standstill. "A future for the world's children?" A WHO -- UNICEF -- Lancet Commission pointed out that placing children at the heart of the Sustainable Development Goals is based on their rights [4]. However, in addition to environmental threats, obesity, non-infectious diseases, injuries, violence and conflict and other major health risks [5], there are also mental health risks that deserve our attention. Mental health is an integral and important part of health. "Organic Act" by WHO [6] provides that: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." One in seven people, accounting for 14% of the global diseases, suffer from mental disorders [7]. However, these diseases remain unknown and untreated. In October 2021, UNICEF released a report entitled "The State of The World's Children 2021 -- On My Mind: Promoting, Protecting and Caring for Children's Mental Health". It is the first report to investigate the mental health of children and adolescents [8]. A UNICEF report released on 9th December 2021 stated that the COVID-19 outbreak in 2019 has

brought great challenges to the progress on children development made for decades, covering health, education, children protection and mental health etc. [9].

According to Article 1 of the United Nations "Convention on the Rights of the Child", children refer to "minors under the age of 18" [10]. Although the age division of children in China is not consistent with that of the United Nations, this study uses the United Nations age division. Children are the future of our motherland, to protect children is to protect the future of our motherland. China has always attached great importance to the legal protection of children's rights. There are a large number of provisions on the protection of rights in the Constitution and other laws and regulations [11-14]. But in recent years, mental health of children and adolescents has become a public health issue that should not be ignored. A systematic evaluation and meta-analysis of depressive symptoms in Chinese children and adolescents showed that the incidence of depressive symptoms in Chinese children and adolescents is increasing over time, from about 18.4% before 2000 to 26.3% after 2016 [15]. According to 2018 "China Youth Development Report", about 30 million children and adolescents under the age of 17 in China suffer from various emotional and behavioral troubles [16]. In 2019, the sudden outbreak of COVID-19 made the mental health of teenagers in China become more serious. In 2019, a special survey on mental health of young people conducted by China Youth and Children Research Center, and Institute of Psychology, Chinese Academy of Sciences showed that 7.7% of children aged 14-18 had a high risk of depression and 5.1% had severe anxiety [17]. If children's mental health problems are not addressed, the consequences will go to adulthood. This will damage their physical and mental health and restrict their opportunities for a full-filling life. In the context of COVID-19 pandemic, to analyze Chinese citizens' concerns of children's mental health is critical to improve children's health and well-being in their adolescence and adulthood.

Today, we are on the cusp of the Fourth Industrial Revolution [18]. The rapid development of emerging technologies such as Internet, Internet of Things and 5G communication network has brought opportunities for people to explore and make full use of the huge network data [19]. Search engine has penetrated users' daily life, providing great convenience to people's work, life, and study. Baidu.com is the largest search engine in China, with big data intelligent analysis platforms such as Baidu Statistical Analysis Cloud, Baidu Index, Baidu Shushuo and Baidu Marketing. Network search data has a significant effect on predicting and guiding users' behavior, and it has attracted attention in predicting infectious diseases [20], tourism need [21], social network [22-23], financial market [24] and so on. At present, there are few researches on knowledge management based on Internet search data in China. This study uses Baidu Index to analyze the space-time characteristics of public concern of knowledge management.

2. Materials and Methods

Baidu Index collects massive netizens' behavior data based on Baidu.com [25], a search engine with 795 million users. Baidu Index can not only study keyword search trends, observe netizens' needs change, monitor media opinion trends, and locate digital consumers characteristics, but also can analyze market characteristics from the industry perspective. The main functional modules of Baidu Index are: single word trend research (overall trend, PC trend, mobile trend), need map, crowd portrait; search index, consultation index, search geographical distribution, population attributes, interest distribution of subject index in various industry. In short, Baidu Index is not only an authoritative industry data analysis platform, but also one of the most important statistical analysis platforms in the era of industry 4.0 in China.

Taking "children's mental health" as the keyword, this paper studies the online search trend, need map and crowd portrait of "children's mental health" from December 1st, 2019 to March 20th, 2022. At the same time, compare the search trend of "mental health" in the same period to evaluate the temporal and spatial characteristics of the public opinions on children's mental health in different periods.

3. Results

It is found that the search trend of "children's mental health" peaks in May and valleys around Spring Festival and National Day each year, and is stable in other periods (Figure 2). The search trend of the mobile search index is like that of the computer search index, but the daily average value of the former is higher than that of the latter. This study summarized and ranked the popular phrases related to "children's mental health" in the past year (Figure 4), and found that "mental health", "handwritten newspaper on mental health", and "adolescent mental health" are the hottest phrases concerned by the public (Figure 1).

From the regional distribution of the crowd portrait in the function module of Baidu Index, it turns out that "children's mental health" is given more attention in East China and South China. Guangdong province and its sub-provincial city Shenzhen take the first places respectively among provinces and cities in concerning of "children's mental health" (Figure 5). According to the group attributes in the crowd portrait of Baidu Index, people aged 30-39 (52.71%) and females (72.15%) are the main sources of searching "children's mental health" (Figure 7). Meanwhile, the search trend of "mental health" and "children's mental health" is similar (Figure 8 and 9).

4. Discussion

China has vast territory, large population, and wide latitude from north to south, and its regional difference is big. So, it is difficult for the public to know clearly the space-time characteristics of children's mental health. Internet big data provides feasible conditions for solving this problem. "Data Age 2025" white paper released by International Data Corporation (IDC) in 2018 took "The Digitization of The World From Edge to Core" as the theme. Estimated to be 45ZB (1ZB = 1 trillion GB) in 2019, IDC forecasts the Global Data sphere to grow to 175ZB by 2025[26], about 11 times of 16.1ZB in 2016. The above data proves that we are now in a technological era when information is at explosive growth. According to "The 48th Statistical Report on Internet Development in China" released by CNNIC, as of June 2021, the number of Netizens in China was 1.011 billion, and Internet popularizing rate reached 71.6%. Meanwhile, search engine users in China reached 795 million, accounting for 78.7% of the total Internet users [25]. Baidu ranks first among the search engines, followed by 360 Search, Sogou Search, Google Search and Microsoft Bing [27]. Baidu Index provides a basis for understanding the temporal and spatial characteristics of public concern to children's mental health.

In recent years, Baidu Index data has attracted the attention of more and more scholars, and has been used as the main data source in disease assessment and prediction, tourism destination evaluation, stock price index and other research fields [28-31]. However, the big data used by Baidu Index to explore "children's mental health" needs to be further studied and extracted. This study is the first attempt to explore the spatial-temporal characteristics of the public online searching for "children's mental health", and confirms that Baidu Index can effectively measure the spatial-temporal characteristics of the public's concern about children's mental health.

Baidu Index trend research is divided into three sections: PC trend, mobile trend, PC+ mobile trend. PC trend has been available since June 2006, while mobile trend presents data from January 2011 to the present. Based on the background of COVID-19, this study explores the search trend of "children's mental health" in China from December 1st, 2019 to March 20th, 2022. It is found that the search trend of "children's mental health" peaks in May and valleys around Spring Festival and National Day each year, and is stable in other periods. This study analyzes the search trend of "children's mental health" in the peak value and valley value respectively.

The main reason for the peak of "children's mental health" in May every year is that May is Mental Health Month in China. In order to educate college and middle school students to pay attention to their mental health, in 2000, "May 25th National College and Middle School Students Mental Health Festival" kicked off in Beijing Normal University. The mental health festival took "5.25" homonym "I love myself", which means to care for psychological growth and health, reminding the college and middle school students to "cherish life, love yourself". In 2004, the Ministry of Education, the Central Committee of the Youth League and Office of the National Federation of Students proposed to designate May 25th as national college students' Mental Health Day [32]. Since then, China has issued a series of documents [33-34] concerning the "May 25th" College Students' Mental Health Day to carry out mental health education activities in May every year. It focuses on strengthening humanistic care and psychological counseling, cultivating students' self-esteem, self-confidence, rationality, positiveness and healthy mentality, promoting the harmonious development of college students' mental health quality, ideological and moral quality, scientific and cultural quality. Although "May 25th" is college students' Mental Health Day, with the activities carried out in May, it will attract widespread social attention to mental health, so that the search index of "children's mental health" is rising and up to the peak in May.

Generally, the valley value of "children's mental health" appears around the Spring Festival and National Day every year. The Spring Festival is the grandest traditional festival in China from the end of January to the beginning of February every year, and October 1st is the National Day to commemorate the founding of the People's Republic of China. The Spring Festival and the National Day are legal holidays in China, which have seven days of vacation. In order to celebrate the festivals, Chinese people get together with their families or friends, or go out for tourism. According to statistics, the annual growth rate of outbound tourists during the Spring Festival in recent years is about 30%[35]. According to the statistics from the Ministry of Culture and Tourism and the Ministry of Transportation in China, the number of tourists in the National Holiday from 2017 to 2019 exceeded 700 million each year and was increasing year by year [36]. Therefore, whether on Spring Festival or the National Day, people will stop working or studying to celebrate the festival, so the search index of "children's mental health" is at periodic valley every year.

The comparison between PC terminal and mobile terminal shows that the search trend of both is consistent. But the daily average value of search index on mobile is higher than that on PC. This result is related to the huge quantity of China's mobile Internet users. According to the 48th "Statistical Report on China's Internet Development" released by China Internet Information Center, the volume of China's mobile Internet users was 1.007 billion by June 2021, with an increase of 20.92 million users compared with December 2020. The proportion of mobile phone Internet users is 99.6%[37]. It is obvious that mobile phones have successfully become the preferred way for people to communicate with the world due to simple operation and convenient portability. So, the daily average value of search index on mobile terminals is higher than that on PC terminals.

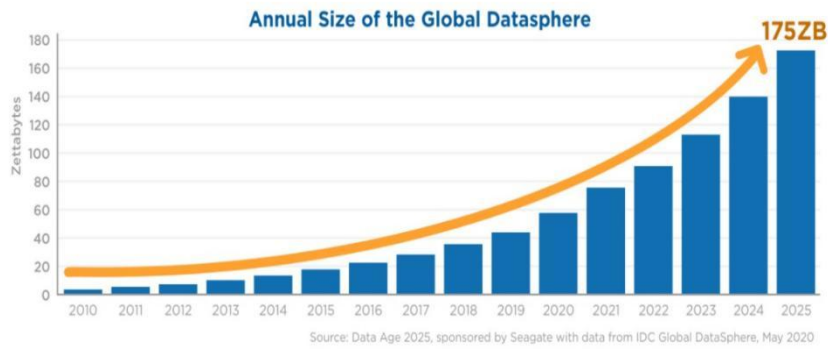
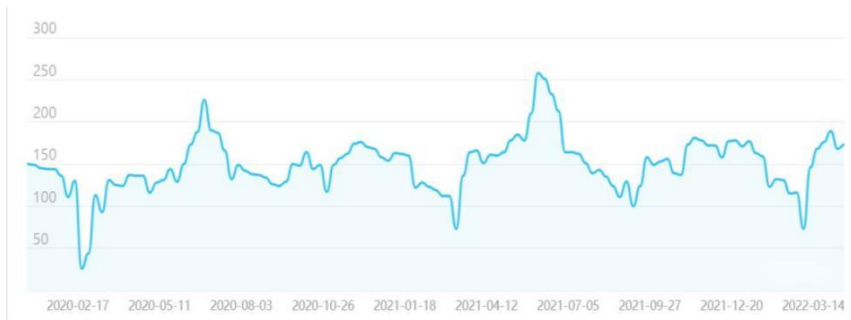
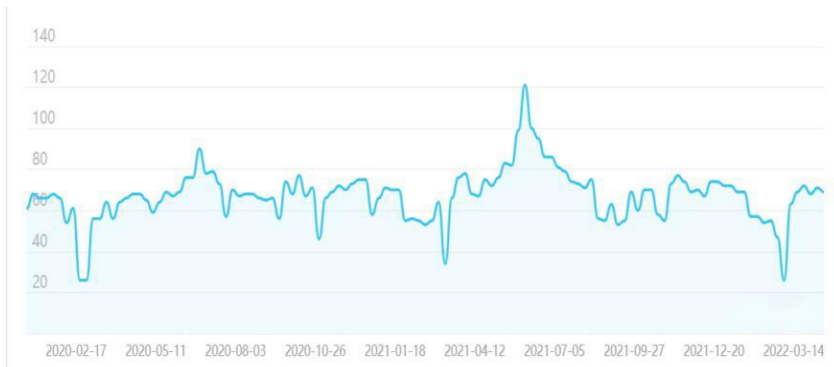


Figure 1 Annual Size of the Global Data sphere

A



B



C

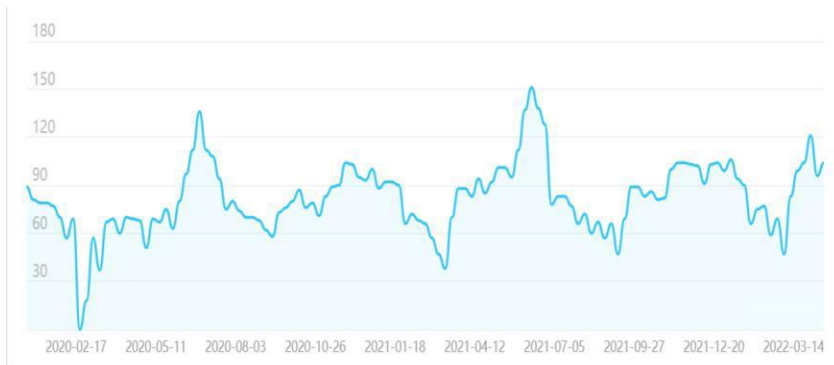


Figure 2 Baidu search volume index in China for “children's mental health”.

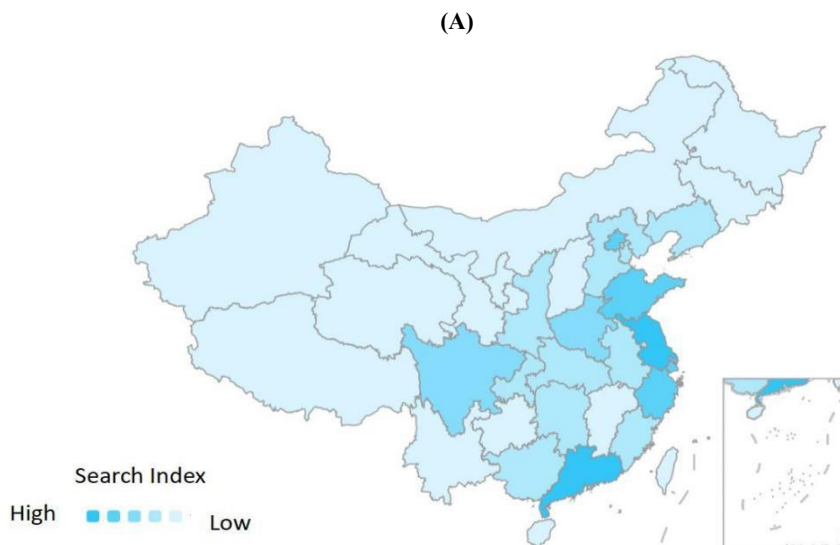
The average value of search volume. (A) The overall search trend index. (B) Personal computer search index. (C) Mobile search index.

Table 1 Top 10 Search Terms Related to children's mental health in the Baidu Index

Keywords	Frequency
Mental Health	5
Mental health handwritten newspaper	5
Adolescent Mental Health	3
Content of mental health handwritten newspaper	1
What is Mental Health	7
Mental health knowledge	5
Handwritten newspaper of children's mental health	5
Mental Health Education	0
Mental health of primary school students	0
Children	0

Baidu Index's crowd portrait focuses on where users come from. The data of "children's mental health" has been provided on regional distribution since July 2013. The analysis of the geographical distribution of "children's mental health" shows that east China ranks first, north China and south China second and third respectively. In terms of provinces, Guangdong ranks first, followed by Jiangsu and Beijing. In terms of cities, Beijing ranks first, followed by Shanghai and Chengdu (Figure 5).

According to the provincial annual data from PRC National Statistics Bureau, the total number of basic education students in Guangdong province is 16.062 million, and that in Jiangsu Province is 9.201,300 million [41] (Figure 6). The number of students in basic education in Guangdong province and Jiangsu province ranks first and second among all provinces in China, which inevitably leads to their concern to "children's mental health" ranking the top. In addition, both Beijing and Shanghai have powerful economic strength, educational resources, considerable political resources, profound culture, and convenient transportation. The comprehensive strength and competitiveness in mainland China are at the top level. Under the background of the national focus on children's mental health, Beijing and Shanghai, the first-tier cities with strong comprehensive strength, will give priority to children's mental health education in carrying out the educational work. Therefore, Beijing and Shanghai rank top in the city rankings.



(B)



Figure 5 Baidu Index maps for “children's mental health” by province (A) region(B)

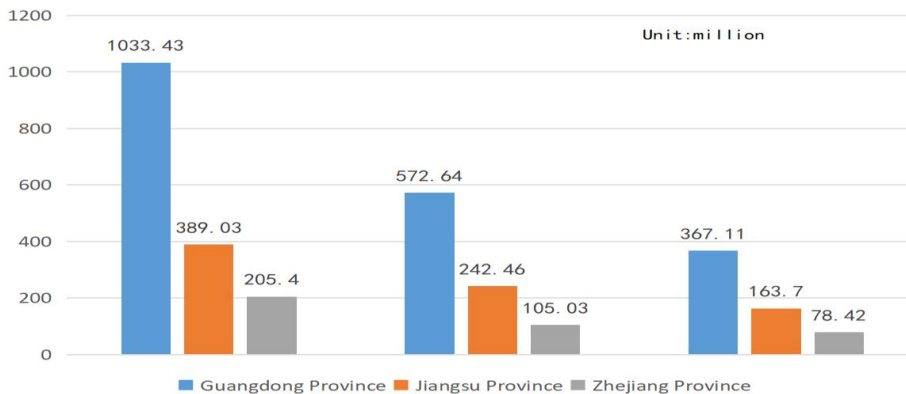


Figure 6 Number of basic education students in Guangdong Province, Jiangsu Province and Zhejiang Province in 2019

Population attributes can tell the gender and age distribution of users who care about the keyword. This study selects social attention data from February 1st, 2022 to February 28th, 2021 to analyze the population attributes (Figure 5). The analysis data shows that the gender ratio are 27.85% and 72.15% respectively, indicating that women pay more attention to children's mental health than men. In terms of age distribution, the group of 30-39 years old cares most about children's mental health, accounting for 52.71% in total, and the group of 20-29 years old is 23.75%. The group of 20-39 years old are primary and secondary school teachers and the students' parents. Group of 40-49 years old is 14.53%. It is worth noting that although children are the population with high risk of mental illness, only 5.62% of the population aged 19 or younger concern about children's mental health. People above 50 years old pay the lowest attention to children's mental health, only 3.68%. In addition, Target Group Index (TGI) can reflect the strength or weakness of the target group in a specific research area (such as geographic region, demographic field, media audience, product consumers). TGI index represents the differences of concerns of users with different characteristics. The larger TGI index is, the stronger the feature is in the target group and all users; the smaller, the weaker. When TGI index is 100, it means that there is no difference in the performance of features among the target group and all users. In terms of gender distribution, female TGI is 145.46%, while male TGI is only 50.4%, indicating that female public is more interested in information related to children's mental health.

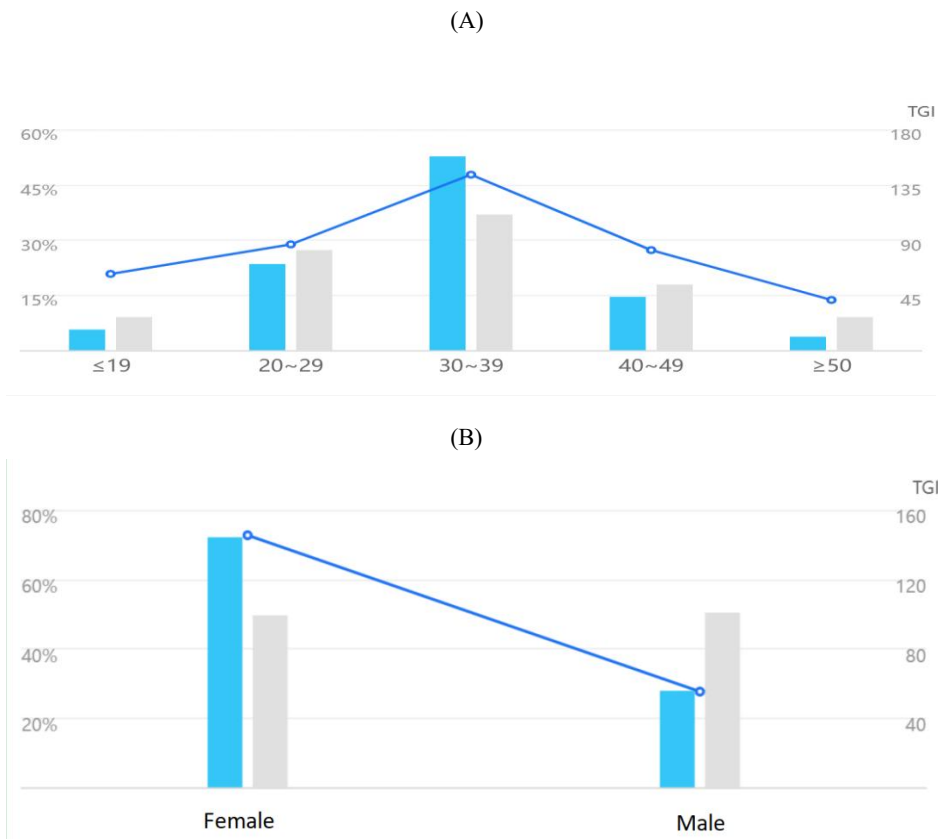


Figure 7 Demographic profiles by age (A) and gender (B).

The study found that the search trend for "mental health" and "children's mental health" is similar (Figure 6). However, the overall daily average value and mobile daily average value of "mental health" are higher than those of "children's mental health". This result is mainly caused by people's habit of retrieving information. When using search engines to retrieve information, people tend to apply the strategy of narrowing scope and focusing gradually. So when people concern of "children's mental health", they always type "mental health" in the search engine before they acquire the information about "children's mental health", which leads to higher daily average search of "mental health".

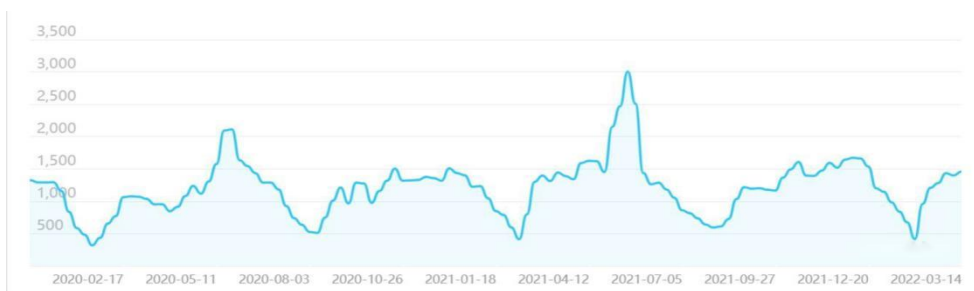


Figure 8 Baidu search volume index for "mental health"

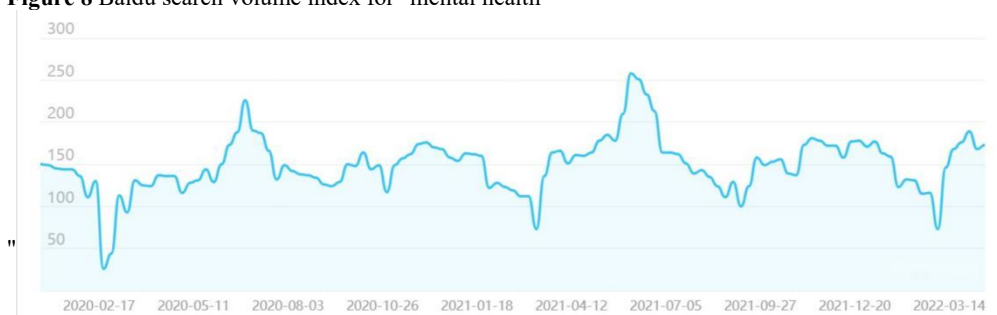


Figure 9 Baidu search volume index for "children's mental health"

To sort out children's mental health data will help to analyze the public search behavior and psychology, and will greatly facilitate the work of children's mental health in China. Based on Baidu Index, we will know the attention from different regions and genders to children's mental health on the Internet, so as to analyze the psychology and needs of the users behind the search behavior. However, Baidu Index is only available in Baidu search engine, and the data source is restricted within China. Therefore, this study does not evaluate data obtained from other search engines. Furthermore, although Baidu Index can analyze trend, need maps and crowd portraits, but it can't access demographic data yet. Baidu Index collects data by typing in keywords, without analyzing the motivation behind the search behavior. From the search data of "children's mental health" in Baidu Index, some are groups who really want to know about children's mental health, such as people engaged in education profession, psychological profession, and psychological education, as well as children and students' parents. Another group are researchers who study children's mental health, all of whom contribute to the search volume for "children's mental health." In this sense, it is difficult to accurately know the group who are in real need of children's mental health. Further research on knowledge management tool Baidu Index needs to be developed and improved in future practice.

5. Conclusions

Baidu Index can be used to understand the public's concern about children's mental health. The results show that the decline of search trend for children's mental health is closely related to the Chinese traditional holidays such as the Spring Festival and the National Day, while the rise trend is related to the Mental Health Day and the mental health education laws and regulations. In terms of gender, women care about children's mental health more. Guangdong province has the largest number of students in school, so it ranks first in concerning about "children's mental health". Beijing, with its strong economic foundation, educational resources, considerable political resources, profound culture and convenient transportation, ranks first among the cities in caring about children's mental health. Although the search trend of "mental health" is consistent with that of "children's mental health", the overall daily average value and mobile daily average value of "mental health" are higher than those of "children's mental health".

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