

The Impact of COVID-19 Pandemic on Health Consumption: A Comparative Analysis of the United States, China, and India

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Abstract. Due to the COVID-19 pandemic, the global healthcare consumption patterns have been significantly changed. This has resulted in accelerating digital healthcare adoption, increasing health awareness, and promoting preventive healthcare behaviors. This study is aiming for examining how the pandemic's influences have reshaped healthcare consumption in the United States, China, and India by using the five indicators: healthcare spending, digital healthcare, preventive healthcare, pharmaceutical demand, and mental healthcare. By using secondary data analysis, this research applies correlation analysis, Healthcare Consumption Change Index (HCCI), and elasticity analysis for evaluating the healthcare transformation patterns. The findings have suggested that all three countries were experiencing healthcare market expansion after COVID-19, but their development paths were different. The United States has revealed huge improvements in healthcare efficiency and digital service adoption. Chinese market has shown broader healthcare modernization supported by digital infrastructure. India has experienced rapid digital healthcare growth driven by accessibility needs. The study mainly concludes that COVID-19 accelerated the transition from traditional treatment-based healthcare toward a more preventive, digital, and consumer-centered healthcare model.

Keywords: COVID-19, Health Consumption, Digital Healthcare, Preventive Healthcare, Digital Healthcare

1. Introduction

The COVID-19 pandemic disrupted healthcare systems around the world and changed how people used healthcare services. Before the pandemic, health consumption mainly focused on treatment after people became ill. During and after COVID-19, consumers paid more attention to prevention, health monitoring, convenience, and long-term wellness [1, 2]. As a result, health consumption expanded beyond medical treatment and included digital care, preventive products, pharmaceuticals, and mental health support.

Digital healthcare was one of the clearest changes. Telemedicine, online consultations, mobile health applications, and other digital platforms expanded when face-to-face visits became difficult. In developed markets, these tools mainly improved convenience. In emerging markets, they also

helped reduce access barriers [3-5]. Consumers also became more interested in vaccines, vitamins, dietary supplements, and other preventive products [6, 7]. Pharmaceutical demand changed as people managed COVID-19, chronic conditions, and delayed treatment. Mental health needs also became more visible because anxiety, isolation, and economic uncertainty increased demand for prescriptions, counseling, and related services [1, 2].

This study compares the United States, China, and India to examine how COVID-19 changed health consumption. The analysis covers five dimensions measured by seven indicators: healthcare spending, preventive healthcare, digital healthcare, pharmaceutical demand, and mental healthcare. It uses secondary data, descriptive correlation analysis, the Health Consumption Change Index (HCCI), and an elasticity-based response score. Comparing the three countries under one framework helps explain how economic development, digital maturity, healthcare access, and government support led to different results. The study also identifies possible opportunities for healthcare providers, technology platforms, and pharmaceutical companies.

2. Literature review

COVID-19 changed both how much consumers spent on health and how they obtained healthcare products and services. Before the pandemic, health consumption was more closely connected to treatment after illness. The pandemic increased attention to prevention, convenience, and long-term health management. Health consumption therefore became a wider concept that included medical services, digital care, preventive products, pharmaceuticals, and mental health support. The World Health Organization reported that mental health needs increased during the pandemic and that many people still faced difficulty receiving treatment [1, 2]. This means that the impact of COVID-19 cannot be explained by healthcare spending alone.

Digital healthcare showed one of the strongest changes. Telemedicine, online consultations, mobile health applications, electronic health records, and remote monitoring became more important when in-person care was restricted [3, 4, 8]. Ghosh et al. explained that digital transformation can improve efficiency by connecting healthcare data, technology, and patient services [9]. Konopik et al. also described digital platforms as healthcare ecosystems that connect patients, providers, insurers, and technology companies [10]. However, countries adopted these services for different reasons. Developed markets mainly used them for convenience and coordination. Emerging markets also used them to reduce geographic barriers and shortages of medical resources. For this reason, digital healthcare should be measured through both usage frequency and the number of users.

The pandemic also increased interest in preventive healthcare and affected pharmaceutical and mental health demand. Many consumers purchased more vitamins, dietary supplements, vaccines, and immunity-related products because they were more concerned about preventing illness. Wang et al. found that health awareness, personal beliefs, and long-term lifestyle management were important reasons for dietary supplement use [7]. Pharmaceutical demand changed because consumers needed treatment for COVID-19, chronic diseases, and delayed care. Medicine use continued to grow after the most serious stage of the pandemic although the rate was different across markets [11]. Anxiety, isolation, and economic uncertainty also increased demand for mental health prescriptions, counseling, and other services [1, 2]. However, demand often increased faster than healthcare systems could provide enough support.

Many previous studies focused on one country or one part of the healthcare market. This makes it difficult to explain why the same pandemic created different changes across countries. Few studies have compared the United States, China, and India through one framework that includes healthcare spending, preventive healthcare, digital healthcare, pharmaceutical demand, and mental healthcare.

This study fills that gap by using five dimensions and seven indicators. It compares the direction, size, and responsiveness of the changes through descriptive correlation analysis, the HCCI, and an elasticity-based response score. This approach shows how healthcare infrastructure, digital maturity, economic development, accessibility, and government support influenced each country after COVID-19.

3. Methodology

3.1. Research design and data collection

This study uses secondary data to compare health consumption in the United States, China, and India before and after COVID-19. These countries were selected because their economic development, healthcare systems, digital maturity, population size, and access to medical services are different. The differences make it possible to compare several patterns of post-pandemic change instead of treating the global healthcare market as one uniform system.

The data come from government agencies, international organizations, peer-reviewed studies, and recognized industry sources. The main sources include the World Bank, the World Health Organization, the U.S. Centers for Medicare & Medicaid Services, the U.S. Centers for Disease Control and Prevention, the National Bureau of Statistics of China, the National Health Commission of China, and government health agencies in India. The pre-pandemic baseline is generally 2019. Post-pandemic results use the latest comparable data available from 2021 to 2024. When the same year is not available for every country, the closest period is used and the year is reported with the result. Only indicators with clear definitions and a reliable baseline are used in the calculations. Other information is used only to explain the results.

3.2. Dimensions and indicators

The framework has five dimensions measured by seven indicators. Healthcare spending is measured by spending per person. Preventive healthcare is measured through spending or sales related to vaccines, dietary supplements, vitamins, and other health-maintenance products. Digital healthcare is measured by telehealth usage frequency and the number of telehealth users. Pharmaceutical demand is measured by the value or growth of prescription and over-the-counter medicine purchases. Mental healthcare is measured by prescription rates and service utilization rates. These indicators show both the size of each market and changes in how consumers used or accessed healthcare.

3.3. Analytical methods

The analysis has four steps. First, every indicator is converted into a percentage change so that values with different units can be compared. Second, descriptive correlation analysis checks whether the three countries followed similar patterns. Third, the HCCI summarizes the average size of the changes within each country. Finally, an elasticity-based response score shows which dimensions reacted most strongly after the pandemic.

Percentage change. For indicator i in country c , the pre-pandemic and post-pandemic values are converted into a growth rate:

$$g(i, c) = [(Post(i, c) - Pre(i, c)) / Pre(i, c)] \times 100\% \quad (1)$$

A positive result means that the indicator increased after COVID-19, while a negative result means that it decreased. The same formula is used for every quantitative indicator. The results are also compared with the original values and years. This prevents a large percentage increase from a small baseline from being treated as equal to a large market in absolute terms.

Descriptive correlation analysis. Pairwise Pearson correlation compares the pattern of change between two countries when at least three matched indicators are available:

$$r(c, d) = \Sigma[(g(i, c) - \bar{g}(c))(g(i, d) - \bar{g}(d))]/\sqrt{[\Sigma(g(i, c) - \bar{g}(c))^2 \Sigma(g(i, d) - \bar{g}(d))^2]} \quad (2)$$

The coefficient ranges from -1 to 1. A positive coefficient means that the two countries had a similar pattern across the matched indicators. A value close to zero shows little similarity, while a negative value shows opposite patterns. If fewer than three comparable indicators are available, only the general direction is discussed and no formal coefficient is calculated.

Health Consumption Change Index. The HCCI measures the average percentage change across the quantitative indicators available for each country:

$$HCCI(c) = (1/n(c)) \times \Sigma g(i, c) \quad (3)$$

In the formula, $n(c)$ is the number of indicators available for country c . A higher HCCI means that the country experienced a larger overall shift in health consumption. It does not mean that the country has better healthcare or a stronger market. The index must be considered together with the individual indicators because one very large digital growth rate can strongly raise the average.

Elasticity-based response score. A normal elasticity measure requires a consistent numerical value for the outside shock. COVID-19 cannot be represented by one fully comparable value across the three countries. Therefore, the study treats the movement from the pre-pandemic period to the post-pandemic period as one normalized shock unit:

$$ERS(i, c) = |g(i, c)|/\Delta D(c) = |g(i, c)|, \text{ where } \Delta D(c) = 1 \quad (4)$$

$D(c)$ is a period indicator that changes from 0 before the pandemic to 1 after the pandemic. The result is a response-magnitude score rather than a conventional causal elasticity coefficient. A higher ERS means that the indicator changed more strongly after COVID-19. The scores are compared across the five dimensions to identify which parts of health consumption reacted the most.

4. Results and analysis

4.1. Health consumption changes across countries

Health consumption increased in all three countries after COVID-19 although the size and form of the change were different. The results below use indicators with available baseline and later-period values. Since the definitions and observation periods are not always the same, the numbers should not be treated as a direct ranking. They are mainly used to show the direction and size of change within each country.

Table 1. Selected changes in health consumption after COVID-19

Country	Indicator	Pre-period/Baseline	Post-period	Change
United States	Health spending per capita	\$11,582 (2019)	\$13,493 (2022)	+16.5%
	Telehealth usage	1× baseline	38× baseline	+3,700%
	Adults receiving mental health treatment	19.2% (2019)	21.6% (2021)	+12.5%
China	Health spending per capita	\$535 (2019)	\$763.38 (2023)	+42.7%
	Online medical users	298m (pre-COVID)	414m (2023)	+38.9%
	Online health service utilization	34.0%	37.9%	+11.5%
India	Health spending per capita	\$60.69 (2019)	\$79.52 (2022)	+31.0%
	eSanjeevani consultations	0.7m (Nov. 2020)	3.0m (Mar. 2021)	+328.6%

Note. Change is calculated relative to the stated baseline. The India consultation figures describe early platform growth rather than a 2019-to-post-pandemic comparison. Sources: [6-15].

United States. Health spending per capita increased by 16.5% from 2019 to 2022 [6, 12]. Digital healthcare changed much faster. Telehealth use reached about 38 times its pre-pandemic level and later remained an important channel for outpatient care [8]. Preventive product sales increased by 44% during the early pandemic period [13]. Pharmaceutical demand increased by around 11.4% [4]. The share of adults receiving mental health treatment also rose from 19.2% to 21.6% [7]. These results show that the change in the United States was not limited to higher spending. Consumers also used more digital, preventive, and mental health services.

China. Health spending per capita increased by 42.7% from 2019 to 2023 [12]. Online medical users increased from about 298 million before the pandemic to 414 million in 2023. The share of internet users using online health services also rose from 34.0% to 37.9% [14]. Preventive health products became a larger consumer market, and selected pharmaceutical demand measures increased by about 8.8% [4]. These changes suggest a broad transformation supported by digital platforms, public investment, and stronger health awareness.

India. Health spending per capita increased by 31.0% from 2019 to 2022 [12]. The clearest change was digital access. eSanjeevani consultations increased from about 700,000 in November 2020 to 3 million in March 2021. The platform later reached more than 276 million cumulative consultations [11, 15]. This growth helped people in areas with limited medical resources connect with healthcare providers. Preventive healthcare also received more attention. However, the mental health treatment gap remained around 70%-92%, which shows that higher demand did not immediately lead to equal access [16].

4.2. Comparative analysis of health consumption transformation

All three countries experienced growth, but the reasons were different. The United States already had high healthcare spending, mature medical institutions, and strong digital infrastructure. COVID-19 mainly accelerated service innovation and changed how consumers reached providers. China combined increasing household demand with government support and a large digital ecosystem. Its changes were spread across spending, online healthcare, preventive products, and pharmaceuticals. India had lower spending and larger access barriers. Digital healthcare created the most visible change because it allowed consumers to reach providers without the same geographic and infrastructure limits.

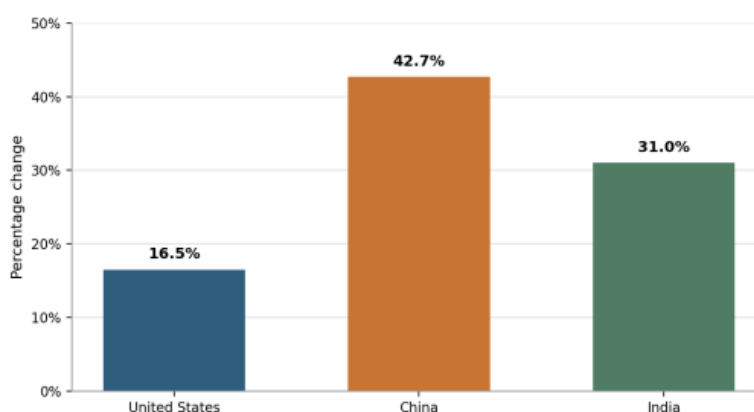


Figure 1. Percentage change in healthcare spending per capita after COVID-19

Note. The United States and India compare 2019 with 2022, China compares 2019 with 2023. Source: World Bank [12].

Healthcare infrastructure, digital maturity, economic development, accessibility, and government support help explain the differences between the three countries. Their starting points also matter. A country with limited digital healthcare before COVID-19 can show a very large percentage increase from a small base. A mature market may record a smaller percentage increase even when its total market remains much larger. Therefore, the comparison considers percentage growth, absolute size, and the role that each service plays in the national healthcare system.

4.3. Correlation and HCCI analysis

Most available indicators moved in the same positive direction after COVID-19. Higher healthcare spending appeared together with greater digital use and stronger demand for preventive, pharmaceutical, and mental health services. This shows a positive descriptive relationship across the five dimensions. However, a formal Pearson correlation is not reported because every country does not have at least three indicators with the same definitions and time periods. Using unmatched data would make the result look more precise than it actually is.

The HCCI gives a separate summary of the reported percentage changes. The United States has an HCCI of 756.88 because its five reported changes add up to 3,784.4. The very large telehealth value strongly affects this average. China has a lower value because its available indicators changed more evenly. A comparable HCCI cannot be calculated for India because its digital data begin after the pandemic had already started. For this reason, India's HCCI is not calculated, and the 31.0% healthcare spending change is reported separately.

Table 2. Provisional health consumption change index results

Country	Included percentage changes	n	HCCI	Interpretation
United States	16.5, 44.0, 3,700, 11.4, 12.5	5	756.88	Extreme digital value
China	42.7, 38.9, 11.5, 47.1, 194.1	5	66.86	Provisional, missing preventive baseline
India	31.0 only	1	Not reported	Insufficient comparable indicators

Note. HCCI is the arithmetic mean of available observed percentage changes. The 2024–2025 China pharmaceutical projection and India's post-2020 platform growth are excluded because they are not valid pre-/post-pandemic baselines. HCCI is not a ranking of healthcare quality.

The HCCI measures the size and concentration of change rather than national healthcare performance. The United States shows broad change with one extreme digital value. China's lower score reflects more balanced movement across the available indicators. India's provisional result does not represent its digital transformation and should not be compared directly with the other two countries. The index therefore needs to be read together with the individual country results.

4.4. Elasticity of health consumption responses

The elasticity-based response score compares the absolute percentage change of each indicator after one normalized pandemic shock. It measures the size of the response, not a causal elasticity. The results show that digital healthcare was the most responsive dimension. Consumers could move from in-person visits to telehealth quickly, and digital platforms could expand without building the same amount of physical infrastructure.

Preventive healthcare also responded strongly because consumers quickly reacted to health risks through vitamins, supplements, vaccines, and wellness products. Healthcare spending showed a moderate response. It increased in all three countries, but income, insurance coverage, government budgets, and medical capacity still created limits. Pharmaceutical demand changed more slowly because it depended on treatment needs, regulation, and chronic disease management. Mental healthcare demand also increased. However, limited service capacity and large treatment gaps prevented some consumers from receiving care.

Overall, COVID-19 changed access methods faster than it changed traditional spending structures. Digital healthcare had the largest short-term response, and preventive healthcare also showed a strong consumer reaction. Healthcare spending, pharmaceutical demand, and mental healthcare changed more gradually. This general pattern appeared across the three countries, although each country followed a different development path.

5. Conclusion

This study examined how COVID-19 changed health consumption in the United States, China, and India. It focused on healthcare spending, preventive healthcare, digital healthcare, pharmaceutical demand, and mental healthcare. The results show that the pandemic did more than increase healthcare demand. It also changed how consumers accessed services and managed their health. The three countries moved in the same general direction but followed different paths. The United States experienced stronger digital integration and increased use of preventive and mental health services. China showed broader healthcare modernization supported by higher spending, public investment, digital platforms, and greater health awareness. India experienced rapid digital healthcare growth because telemedicine helped reduce geographic and infrastructure barriers. Overall, digital healthcare responded the fastest, while healthcare spending and pharmaceutical demand changed more gradually.

The findings also show that healthcare companies cannot use the same strategy in every market. Developed markets may provide more opportunities in data integration, service efficiency, and personalized care. Emerging markets may have stronger demand for affordable digital platforms and remote services. Future opportunities will likely come from combining medical knowledge, technology, preventive care, and consumer-centered services. However, this study has several limitations. The secondary data do not always use the same years, definitions, or statistical standards. Some indicators also lack reliable pre-pandemic baselines. India's digital healthcare data begin after the pandemic started, so its HCCI cannot be compared directly with the results for the

United States and China. Large digital growth rates can also have too much influence on the average index.

Future research could use a standardized annual dataset with the same indicators and time periods across more countries. Surveys and interviews could also examine how income, age, insurance coverage, and health awareness affected individual decisions. Longer-term studies should determine whether digital and preventive behaviors continued after pandemic restrictions ended. Overall, COVID-19 accelerated the shift from treatment-centered healthcare toward a more digital, preventive, and consumer-centered model. However, the speed and meaning of this change still depended on each country's healthcare system and level of development.

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