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Research article

# COVID-19 vaccines as a game-changing tool? A corpus-based study of vaccine communication in People's Daily and The New York Times

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ABSTRACT

The global discourse on COVID-19 has shifted from a broad discussion of the pandemic to a focus on the vaccine. However, how COVID-19 vaccines have been discursively constructed and communicated in mainstream newspapers has received insufficient scientific attention, particularly given that research indicates the news media is a more reliable source of vaccine information compared to social media platforms. Considering the significance and potential consequences of the fierce strategic rivalry between the U.S. and China, this study integrates corpus linguistics and critical discourse analysis to examine the discursive construction of COVID-19 vaccines in two leading newspapers from both countries: *People's Daily* and *The New York Times*. Our findings reveal both similarities and differences in vaccine communication strategies employed by the two publications, as well as the dynamics between discursive practices, social-political contexts, and underlying ideologies. While *The New York Times* focuses primarily on addressing domestic vaccine hesitancy, *People's Daily* aims to secure wide international recognition for Chinese vaccines and to highlight China's contribution to global health efforts. This study suggests that both newspapers should adopt a more collaborative mindset to effectively combat COVID-19 and enhance health communication strategies.

## 1. Introduction

COVID-19 has claimed literally millions of lives since its outbreak [1]. The pandemic has instigated a global health emergency and a prolonged economic downturn in numerous affected countries [2]. The impact, however, extends far beyond these. To stay connected and informed throughout the pandemic, especially during periods of lockdowns, individuals worldwide have depended on traditional and digital media to an unprecedented degree. Concurrently, an infodemic has arisen – an overabundance of information about the COVID-19 pandemic, characterized by misinformation (i.e., false or misleading information) and disinformation (i.e., intentional misinformation to cause harm) [1,3]. This surge of inaccurate data and information may cause public confusion regarding social realities, undermine trust in public institutions and governments, and even strain diplomatic ties [3,4]. As cautioned by the World Health Organization (WHO), "without the appropriate trust and correct information, diagnostic tests go unused, immunization

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campaigns (or campaigns to promote effective vaccines) will not meet their targets, and the virus will continue to thrive" [4]. Therefore, containing COVID-19 infodemic should be treated as "a scientific discipline on par with understanding the spread of the disease itself" [3].

Amidst a myriad of COVID-19 topics, "there is a global shift in the discourse on issues related to COVID-19 with greater attention paid to the vaccine" [5], as the resolution of the pandemic lies in the development and availability of efficient vaccines [6,7]. But the world faces the concurrent risk of politicizing COVID-19 vaccines. While many developing countries struggled to access vaccines, some developed countries (e.g., the U.S., the U.K., Canada, and Japan) adopted a "me first" approach, prioritizing their domestic needs [8–12]. Such vaccine nationalism largely jeopardized global vaccine equity and impeded global health recovery. Developing countries, international organizations, non-governmental organizations (NGOs), and other stakeholders have been advocating for equitable and affordable vaccine distribution [11,13,14]. On the other hand, some countries (e.g., China, India, and Russia) have engaged in vaccine diplomacy by sharing and donating COVID-19 vaccines globally to bolster their international influence and political clout [15–18]. Although such diplomatic efforts have the potential to facilitate vaccination in low-income countries and promote global vaccine equity, there remain uncertainties and concerns about the safety and efficacy of donated vaccines [19]. Moreover, the influence of vaccine diplomacy extends beyond global health, as it has also "developed new dynamics of geopolitics between the world's superpowers as a result of global COVID-19 pandemic vaccination" [20].

The COVID-19 pandemic has catalyzed a new dimension of rivalry between China and the U.S., extending into the domains of technology and public health, with the development of vaccines emerging as a critical battleground for global influence [12,21]. Geopolitical considerations and strategic calculations have also shaped the two countries' national responses to global vaccination. While vaccine nationalism has emerged in the U.S. since it attempted to take over German company CureVac to ensure exclusive access to vaccines [9], China has pledged to make vaccines a global public good to improve vaccine accessibility and affordability in developing countries [22]. How vaccines are communicated to the public in China and the U.S. carries profound implications for the fight against COVID-19, given that these two countries are not only primary producers and suppliers of COVID-19 vaccines but also major powers engaged in an escalating competition. Their strategies and policies exert substantial impacts on the balance of power and global health governance during the pandemic. Therefore, the purpose of this study is to closely analyze how vaccines were communicated in the U.S. and Chinese mainstream news media, with the objectives of.

1. Identifying the themes about COVID-19 vaccines that are discursively constructed and communicated in *People's Daily* and *The New York Times*.
2. Examining the convergences and divergences in vaccine communication strategies used by the two newspapers.
3. Investigating the reasons behind these similarities and differences, and exploring evidence-based implications for enhancing health communication.

## 2. Background to COVID-19 vaccine communication: A brief overview

Previous research on COVID-19 vaccine communication has primarily focused on vaccine hesitancy and opposition within social media platforms [23–26], with particular attention to the infodemic and the spread of misinformation in anti-vaccine discourse as well as their effects on vaccination uptakes and public perceptions of vaccine safety [27–33]. Most of these studies have scrutinized social media discourses and suggested these platforms have been largely exploited to spread misinformation and disinformation, thus reducing the overall reliability of the information disseminated.

Another research interest has revolved around different participants in COVID-19 health communication, including health professionals, government authorities, the general public, and communication experts [34–41]. These studies typically investigate the communicative behaviors and discursive strategies of these various groups. They offer insights into the efficacy or the limitations of their practices in promoting better health communication and in tackling the COVID-19 infodemic.

Research has also directed attention toward newspapers to examine the complex interplays among vaccine communication in news discourse, social-political contexts, and ideologies [42–44]. Such studies highlight the pivotal role of news discourse in COVID-19 and vaccine communication. Throughout the pandemic, news media have been instrumental in informing the public and providing essential information from the government, health authorities, and experts. They have significantly shaped public perceptions of vaccine safety and efficacy, as well as the public's willingness to accept vaccines [45,46]. As noted by Piltch-Loeb et al. [47], people exposed to traditional media (e.g., national newspapers, and local newspapers) have a higher likelihood of vaccine acceptance compared to those who obtained information from social media. Furthermore, news media continue to be an important source of vaccination content on social media. For example, the majority of the 100 widely viewed YouTube videos on COVID-19 vaccination originated from news channels [48]. News media are generally perceived as more authoritative and reliable sources of information. However, they are not immune to misinformation. Studies show that while misinformation related to COVID-19 vaccines is relatively infrequent in news media, it could still reach massive readers [49], and fake news about COVID-19 vaccines could aggravate vaccine hesitancy and pose huge health risks [50–52].

Moreover, these studies foreground the dynamics between news discourse, politics, and ideologies that affect representations of COVID-19 and vaccines. Some studies have examined how the pandemic and relevant issues (e.g., lockdown) have been politicized in the news coverage. It was observed that representations of vaccines in news discourse were heavily subject to ideologies and political stances [42,43,53–58]. For instance, *The New York Times* has shown a tendency to report negatively on events in China during the pandemic, while China's *Global Times* has reciprocated with similar negative coverage about the U.S [43]. While *USA Today* has insinuated that China was the origin of the virus, the Saudi newspaper *Asharq Alawsat* attributed the early rise in COVID-19 cases to

travel in Iran [54]. Research indicates that both Chinese and U.S. press exhibit ideological polarization, often emphasizing the positive aspects of "our" vaccines and downplaying the negative side-effects, while highlighting the negative aspects of "their" vaccines and underplaying their positive effects [42]. In light of this, news discourse may also spread misinformation and disinformation, potentially reducing the credibility of news sources and incurring health risks. It can also exacerbate misunderstanding and hostility between nations.

However, there remain some research gaps: the nexus of news discourse, politics, and ideologies within vaccine communication warrants further scrutiny, and there is a dearth of comparative studies in this area. Moreover, the role of news discourse in health information dissemination, against the backdrop of heightened China-U.S. rivalry, underscores the need for a more in-depth analysis. Therefore, To enhance our comprehension of the underlying ideologies that shape vaccine discourse, this paper seeks to contrast the vaccine-related narratives presented by two esteemed newspapers, one in China and one in the U.S. This study endeavors to uncover the subtle ideologies that have contributed to divergent vaccine discourses between these two publications.

Furthermore, the existing research still lacks more robust linguistic evidence derived from corpus-based methodologies to substantiate these analyses. To address this gap, this study also aims to offer insights into the patterns and frequencies of language use that may not be apparent through qualitative analysis alone, with a methodological synergy of both corpus analysis and critical discourse analysis. The implications are to provide a more refined and evidence-based understanding of the communicative strategies and ideological underpinnings in news reporting on COVID-19 vaccines.

## 3. Data and methods

### 3.1. Data

This study extracted COVID-19 vaccines-related news reports from two newspapers, *the New York Times* (NYT), and *People's Daily* (PD). The selection of these two quality newspapers was informed by their roles and influences within their respective socio-political contexts. PD, as one of the most official and authoritative newspapers in China, serves to communicate the stances and policies of the Chinese government, thus playing a significant role in shaping the country's national image [59]. NYT is considered one of America's most trusted and reliable sources due to its professionalism in news reporting [60,61]. Its influence extends broadly overseas, particularly in English-speaking nations [61,62]. Moreover, prior research that has scrutinized news reports from these two outlets has yielded valuable insights into the communicative strategies and ideological stances of China and the United States [53,55,57,63–65].

All news reports in these two newspapers were collected from the database *LexisNexis* with the keyword search of "COVID-*19*" and search string "*vaccin**" (the search string helped to obtain "vaccine/s", "vaccination/s", "vaccinate/d" etc. so that no targeted texts would be neglected). The keyword search was restricted in the headlines and lead sections to ensure that news reports retrieved were of high relevancy to the topic and concentrated exclusively on COVID-19 vaccines. The timeframe spanned from January 1, 2020, to June 30, 2021, covering the period from the outbreak of COVID-19 to the wide production and deployment of COVID-19 vaccines. These news reports were then refined and cleaned by removing duplicates and irrelevant information such as copyright details. Finally, two corpora were constructed: the PD corpus, comprising 1132 texts with 404,028 tokens, and the NYT corpus, consisting of 1205 texts with 1,652,743 tokens.

### 3.2. Methods

This study followed established methods in Corpus-Assisted Discourse Studies (CADS), which combines theories and methods from both Corpus Linguistics (CL) and Critical Discourse Analysis (CDA) [66–69]. First, the basic tenets of CDA are adopted in this study. CDA posits that language is a form of social practice and is focused on the systematic study of the interplay of hidden power relations and ideologies embedded in discourse [70,71]. As COVID-19 vaccines begin to be translated into socio-political concerns, the CDA framework lends itself to examining potential international power asymmetries, manipulation, exploitation, and structural inequalities

**Table 1**
Thematic categorization of selected keywords and collocates in NYT and PD.

| Theme | NYT | PD |
|---|---|---|
| Vaccine safety | Astrazeneca, BioNtech, China, companies, company, Johnson, Moderna, Pfizer, clinical, data, Dr, effective, efficacy, experts, health, mRNA, news, percent, safe, safety, testing, trial, trials, university, authorization, authorized, drug, emergency | Astrazeneca, BioNtech, Biotech, candidate, China's, Chinese, Coronavac, developed, development, Institute, Johnson, Moderna, national, Pfizer, pharmaceutical, Sinopharm, Sinovac, clinical, data, effective, efficacy, inactivated, phase, safe, safety, trial, trials, approval, approved, authorization, authorized, emergency |
| Vaccine hesitancy | administered, administration, available, eligible, anti, Biden, country, federal, hesitancy, officials, program, public, received, rollout, vaccinated, vaccination | administered, production, vaccinated, vaccination |
| Vaccine equity | countries, global, India | access, cooperation, countries, Covax, developing, equitable, global, international, minister, rollout, states, world, Africa, batch, distribution, donated, public, receive, received, shipment |
| Others | 19, 2021, cases, coronavirus, COVID, month, pandemic, people, virus, week, weeks, Americans, billion, dose, doses, first, million, millions, shot, shots, state, states, US, United, vaccine, vaccines | 19, 2021, April, coronavirus, COVID, health, January, March, Monday, pandemic, people, China, country, dose, doses, first, million, official, percent, shots, vaccine, vaccines |

(re)produced in media discourses. Therefore, the CDA approach could provide theories and frameworks to relate language patterns to their specific contexts and social-political factors for analysis and interpretation [67,68,72]. Numerous recent studies have demonstrated the efficacy of CDA in analyzing newspapers, revealing power relations and ideologies ingrained in news discourse [73–77].

Additionally, this CADS paradigm integrates the use of corpus analytic tools, which allows for the rapid processing of large amounts of language data and the effective pinpointing of statistically salient language patterns. This approach also mitigates the risk of "cherry-picking" associated with CDA, therefore affording a higher degree of objectivity and credibility [67–69]. The methodological synergy of CDA and CL has gained momentum in recent years and informed a wealth of studies [67,68,78–81], including many comparative analyses of news discourse between China and the U.S [82–84].

This study used the corpus analytic stool WordSmith to analyze language data and identify prominent language patterns and predominant themes in the two corpora. Methodologically, a keyword list for each corpus was generated with the BNC (British National Corpus) writing-2006 subcorpus as a reference corpus. The most frequent content keywords were selected based on their log-likelihood value, a measure of statistical significance. Keywords in PD and NYT were filtered out if their log-likelihood values were below 15.13, a threshold indicative of statistical significance at the $p < 0.0001$ level. Next, a list of the most frequent content collocates of two node words (i.e., *vaccine* and *vaccines)* was generated with a window span of five words on either side (i.e., L5 to R5) and a minimum frequency of three. (Due to space limitations, detailed information on the distribution and frequency of these keywords and collocates is not shown here but is available upon request.) The words that appeared in both lists constituted the final thematic word list for analysis. Finally, 73 and 78 words survived the three rounds of selection in the NYT and PD respectively, all of which were considered statistically significant and representative of their respective corpus. These words were prominent not only in comparison to news texts on different topics but also in their co-occurrence with the mode word "vaccine".

In a subsequent phase of thematic analysis, all these keywords were categorized based on their semantic meaning. This process involved a meticulous review of the concordances for each word, utilizing corpus analysis techniques such as concordance and collocate sorting. From this analysis, three predominant themes about COVID-19 vaccines were identified *vaccine safety*, *vaccine hesitancy*, and *vaccine equity*. The residual category, denoted as "*others*" encompasses general references to COVID-19 (e.g., *19*, *coronavirus*, *virus*, *pandemic*, *people)*, words consistently present across all themes (e.g., *US*, *China*), and words inherent in and integral to news discourse for timeliness (e.g., *2021*, *April*, *January*, *week*, *month*, *Monday*) (Table 1).

It should be noted that the thematic classification of certain keywords was not straightforward. In cases where concordances of a word span multiple themes, we assign it to the category that represents the majority of its occurrences. For example, the word *public* in NYT refers mainly to public hesitancy about COVID-19 vaccines whereas in PD it usually relates to the concept of vaccines as a *global public good*. The overall observation is that the theme of *vaccine safety* is lexically rich in both corpora; however, the NYT emphasizes domestic vaccine hesitancy, while PD foregrounds global vaccine equity.


**Fig. 1.** Selected concordances of *China's* and *Sinopharm* in PD.

## 4. Results

### 4.1. Vaccine safety

#### 4.1.1. Reporting on domestic vaccines

In presenting domestic vaccines, NYT focused on technical details about each vaccine, explaining the types of technologies they used, the number of doses required for immunization, and the different efficacy rates for COVID-19 prevention. In most cases, the medical techniques were presented through comparisons to better inform public decision-making (e.g., to get vaccinated). For instance, the Johnson & Johnson vaccine was usually compared to the other two vaccines (i.e., Pfizer-BioNTech and Moderna) in terms of technology, use, and efficacy. However, the purpose of the comparison was not to devalue each other, but to foreground technological innovation (Ex. 1). Moderna and Pfizer-BioNTech vaccines were considered to be technological breakthroughs with significant efficacy in preventing COVID-19 hospitalizations and containing multiple virus strains. Moreover, they were seen as a symbol of America's technological supremacy as few companies had the ingredients or specialized equipment necessary to produce them (Ex. 2).

> Ex. 1. The vaccine is considered ideal for hard-to-reach people and places because it requires only one shot and is more easily stored and shipped than the vaccines made by Moderna and Pfizer-BioNTech, which must be kept at very low temperatures. (NYT, 04-14-21).

> Ex. 2. What's more, Pfizer's and Moderna's vaccines rely on a novel technology […] that had never been used in a mass-produced vaccine before last year. Only a small number of companies have the ingredients and specialized equipment to produce those nanoparticles, and retrofitting other facilities to do the same takes months. (NYT, 06-15-21)

Coverage of vaccine efficacy and safety in NYT was informed by scientific evidence (e.g., clinical trial results) and expert opinions. NYT cited opinions of health experts to endorse the reliability of America's vaccines, as evidenced in several salient words in the NYT corpus, such as *Dr*, *experts*, and *university*. Expert opinions were often used to allay public anxieties and fears about vaccines. The identity of experts was indicated with an explicit reference to their profession (e.g., *health*, *hospital*, *pediatrician*, *immunologist*) and affiliation (Ex. 3).

> Ex. 3. Based on all of the reassuring evidence to date, when it comes to fertility or pregnancy, "there are no known safety concerns with the vaccine," said Dr. Sigal Klipstein, a reproductive endocrinologist in Chicago who is a member of the American Society for Reproductive Medicine COVID-19 Task Force. (NYT, 04-14-21)

In contrast, when PD introduced Chinese vaccines, it not only referred to specific Chinese pharmaceutical companies such as *Sinopharm* and *Sinovac*, but also highlighted the nationality of those vaccines. Words and expressions such as *China's*, *Chinese*, and *made by China* often collocate with vaccine companies (Fig. 1). Unlike NYT, PD did not distinguish between the different domestic vaccines, so the technological details of each domestic vaccine were rarely disclosed.

Instead of citing scientific data, PD used general adjectives (e.g., *safe*, *secure*, *efficient*, *effective*) (Fig. 2) to legitimize the safety of Chinese vaccines. When vaccine data were released, they were often presented without reference to specific trial results. Expert opinions were cited, but the identities of the experts were often kept anonymous (Ex. 4), which could undermine the objectivity and trustworthiness of these news reports. However, PD often presented endorsements of Chinese vaccines by other (developing) countries, and in such cases, the titles and affiliations of foreign sources were clearly stated (Ex. 5). Meanwhile, as mentioned earlier, PD failed to present technical details of Chinese vaccines. A combined effect would lead to an impression that Chinese vaccines were developed without transparent scientific details, and thus could not address concerns about the safety and efficacy of Chinese vaccines raised by some critics [85].


**Fig. 2.** Selected concordances of *Chinese* and *safe* in PD.

Ex. 4. Clinical trials and emergency inoculations so far have shown that China's COVID-19 vaccines are safe and effective, a Chinese expert said on Monday. (PD, 12-02-20)

Ex. 5. Speaking during the launch of the vaccination drive for armed forces at the Preah Ket Mealea Hospital, Cambodian Deputy Prime Minister and Defense Minister Gen. Tea Bahn said the Sinopharm vaccine is very safe and highly effective and used widely in China and other countries. (PD, 02-11-21)

#### *4.1.2. Reporting on foreign vaccines*

This section examines how NYT portrayed vaccines developed by America's strategic competitors (e.g., Sinopharm and Sinovac of China), and by its close ally (e.g., AstraZeneca of the U.K.), and how PD represents U.S. vaccines. In general, British and Chinese vaccines have been reported in a negative tone, but to varying degrees. In NYT, scientific data were seldom disclosed for the AstraZeneca vaccine, but the focus was on regulatory approval and public fear of the potential health risks (Ex. 6).

Ex. 6. Europe also experienced a scare over the safety of the AstraZeneca vaccine and distribution in several countries was temporarily halted. Most of those countries have resumed using it, after the E.U. drug agency vouched for its safety. But public confidence in the shot has been severely undermined. (NYT, 03-26-21)

In comparison, Chinese vaccine manufacturers (e.g., *Sinopharm*, *Sinovac*) were rarely mentioned in NYT but were generally branded as Chinese vaccines with health risks. Chinese vaccines were accused of incomplete clinical trials and unclear experimental data prior to official approval and mass inoculation (Ex. 7). Aside from safety concerns, China's intent to develop vaccines was also questioned. NYT drew a line between a "cautious" America and an "irresponsible" China by discursively constructing China as eager to win the race of vaccine development (Ex. 8). It was suggested that what China was ultimately concerned with in vaccine development was speed, not quality, in order to gain the upper hand in the vaccine race.

Ex. 7. The need for clarity on the safety and efficacy of China's vaccines has taken on more urgency after Sinopharm revealed it had already vaccinated roughly a million people even before the completion of clinical trials. The campaign has alarmed overseas scientists who say it exposes people to undue risks. (NYT, 12-09-20)

Ex. 8. While China is racing the United States and other countries to develop a vaccine, its rivals are moving more cautiously. American companies have pledged to thoroughly vet a vaccine before wide use, despite pressure from President Trump to go faster. (NYT, 09-26-20)

The safety of Chinese vaccines and the confidence in the Chinese government were further undermined in NYT by pointing to problems in China's vaccine business. NYT cited U.S. sources to suggest that the Chinese government was quick to approve vaccines manufactured by Chinese companies based on bribes instead of vaccine quality (Ex. 9).

Ex. 9. "The problem for many of them is their business practice," said Dr. Yip, who also led the China office of the U.S. Centers for Disease Control and Prevention. "They all want to sell to the local governments, so they have to do kickbacks, they have to bribe. That's the Achilles' heel of China's vaccine business." (NYT, 12-07-20)

NYT foregrounded China's vaccine diplomacy, highlighting how China used vaccines as a diplomatic tool to restore previously precarious international relationships and establish new ties with other countries, even when the quality of Chinese vaccines was still uncertain (Ex. 10). China was represented as exploiting the pandemic as an opportunity to develop friendships around the globe while the U.S. was still in plight, which could cast doubt on China's true intentions: was Chinese charity out of humanity to aid, or out of political interest to control?

Ex. 10. From Asia to Africa, China promotes its vaccine candidates to win friends. China is still most likely months away from mass producing a vaccine that is safe for public use. But the country is using the prospect of the drug's discovery in a charm offensive aimed at repairing damaged ties and bringing friends closer in regions China deems vital to its interests. (NYT, 09-11-20)

In contrast, PD's report on foreign vaccines rarely labelled them as a tool of vaccine nationalism or vaccine diplomacy. PD often provided information about individual manufacturers and their affiliated or related institutions of foreign vaccines (Ex. 11). With regard to the efficacy and safety of foreign vaccines, it often cited foreign officials and agencies that acknowledged both efficacy and potential side effects of the vaccines under study (Ex. 12).

Ex. 11. The other three trials are for vaccine candidate AZD1222, co-invented by the University of Oxford and its spin-out company Vaccitech; vaccine candidate mRNA-1273, developed by the U.S. National Institute of Allergy and Infectious Diseases (NIAID) and American biotechnology company Moderna; and vaccine candidate BNT162b2, developed by American biopharmaceutical company Pfizer and German company BioNTech. (PD, 09-24-20)

Ex. 12. The European Medicines Agency (EMA) said on Tuesday it had found a "possible link" between the Johnson & Johnson COVID-19 vaccine and cases of blood clots, but insisted that its benefits outweigh the risks. (PD, 04-21-2021)

By citing foreign sources instead of the Chinese government or Chinese health experts, PD seemed to avoid disclosing its assessment of the safety and efficacy of foreign vaccines. While it reported how foreign vaccines were approved and administered in the U.S. and other countries and regions (Ex. 13), little information was given concerning China's approval and adoption of them.

Ex. 13. Last week, the first COVID-19 vaccine, developed by American drugmaker Pfizer in partnership with German company BioNTech, got approval from the FDA, and started to be administered to health workers on Monday. (PD, 12-21-20)

### 4.2. Vaccine hesitancy

With respect to coverage of vaccine hesitancy, PD focused primarily on the large number of vaccines produced and administrated in China (Ex. 14), and vaccine hesitancy among Chinese citizens was negligible. Given the high vaccine acceptance rate in China [86], this suggests vaccine hesitancy was not represented as a serious problem in China and thus did not stand out in the PD corpus. This section will therefore mainly examine how NYT communicated domestic vaccine hesitancy.

Ex. 14. According to the Chinese Center for Disease Control and Prevention (China CDC), more than 24 million doses of COVID-19 vaccines had been administered in China by Sunday. (PD, 02-01-21)

Vaccine hesitancy was a prevalent theme in the NYT corpus. The keyword *high* frequently appeared around *vaccine hesitancy* to emphasize the severity of the problem. NYT targeted anti-vaccine movements. The keyword *anti-vaccine* was frequently associated with *movement*, *activists,* or *communities* in NYT. By frequently depicting and discussing anti-vaccine movements, NYT pointed to political motives behind the actions of anti-vaccination activists. NYT delegitimized anti-vaccination movements by constructing vaccine opponents as far-right activists who exploited these movements to reach targeted voters and cause social and political unrest (Ex. 15). Besides common safety concerns about vaccines, vaccine hesitancy also correlated with political opposition and party antagonism (Ex. 16).

Ex. 15. Last spring, a common purpose among far-right activities and the anti-vaccination movement first emerged during armed protests in numerous state capitols against coronavirus lockdown measures. (NYT, 03-26-21)

Ex. 16. Despite the praise from Mr. DeWine, Mr. Biden continues to face vaccine resistance from some Republicans across the country. A third of Republicans who participated in a recent CBS News poll said that they would not be vaccinated. And another 20 percent of Republicans said they were unsure. (NYT, 03-16-21)

NYT also sounded the alarm about the possible pitfalls of anti-vaccination movements. NYT feared the continued growth of anti-vaccination communities and comparatively inactive pro-vaccination communities would lead to escalating misinformation about COVID-19 vaccines on social media, further resulting in unsuccessful mass vaccination, failed efforts to end the pandemic, and economic recession (Ex. 17). NYT even urged the U.S. to brace for "an information war" over vaccine hesitancy. It called for more active pro-vaccination movements involving everyone, from individuals to companies and government, and suggested that all stakeholders take more responsibility to restore confidence in vaccines and stop unsubstantiated lies and nonsense about vaccines (Ex. 18).

Ex. 17. This war could pit public health officials and politicians against an anti-vaccination movement that floods social media with misinformation, conspiracy theories and propaganda aimed at convincing people that the vaccine is a menace rather than a lifesaving, economy-rescuing miracle. (NYT, 05-13-20)

Ex. 18. Organizations like the Centers for Disease Control and Prevention and the W.H.O. need to understand the dynamics of online anti-vaccination communities and start waging a hearts-and-minds campaign to restore faith in the medical


**Fig. 3.** Selected concordances of *accessibility and affordability* in PD.

establishment while a vaccine is being developed. Social media companies need to take the threat of vaccine-related misinformation seriously and devote tremendous resources to stopping its spread. And those of us who believe in vaccines need to realize that we may not be in the majority for long and do everything we can to reach the people in our lives who might be susceptible to anti-vaccine propaganda. (NYT, 05-14-20)

### 4.3. Vaccine equity

Vaccine equity was not a prominent theme in NYT. Instead, NYT cast doubt on the effectiveness and practicality of COVAX, a global program for vaccine equity, pointing out that it had limited effects since rich countries were not bound by the mechanism and could purchase abundant vaccines directly from vaccine manufacturers. Words such as *wealthy*, *poor*, *poorer*, and *richer* were frequently used to categorize countries with different abilities to obtain vaccines. In addition, despite the Biden administration's endorsement of vaccine patent waiver, which was widely viewed as conducive to vaccine equity and global health, NYT expressed concerns about the risks of this policy (Ex. 19).

Ex. 19. It is unclear how suspending patent protections would ensure fair distribution. But what is clear is that if successful, the effort would jeopardize future medical innovation, making us more vulnerable to other diseases. (NYT, 12-10-20)

In contrast, PD focused more on future actions to achieve equitable distribution of vaccines, as evidenced in recurrent patterns of *equitable distribution of vaccines*, *equitable access to vaccines*, and *global access to vaccines*. PD emphasized an urgent need to strengthen cooperation and ensure equitable distribution of vaccines around the world, highlighting China's resolution and commitment to ensuring the accessibility and affordability of vaccines in developing countries (Fig. 3). PD also highlighted that China had officially joined the COVAX initiative, to promote international cooperation on vaccine equity and global health governance (Ex. 20),

Ex. 20. China signed an agreement with the Global Alliance for Vaccines and Immunisation (GAVI) on Oct. 8, 2020, officially joining the COVID-19 Vaccines Global Access (COVAX). (PD, 02-09-21)

Another salient theme in PD about vaccine equity was China's donations of vaccines to other countries. In most cases, detailed accounts of China's contributions to vaccines and medical assistance to other countries or organizations were given. PD tended to highlight China's efforts in donating millions of doses of Chinese vaccines to other nations, often referring to the vaccines as *China's, China-donated*, or *the first batch of vaccines* received by other countries. PD relied on endorsements of Chinese vaccines by other developing countries as well as positive feedback and favorable comments from officials of recipient countries (Ex. 21). Thus, PD constructed an image of a responsible China: China kept its promise to supply as many vaccines as possible to other countries, and China's contribution was widely recognized by recipient countries.

Ex. 21. When a plane carrying Thailand's first batch of COVID-19 vaccines from China's Sinovac landed at an airport here on Wednesday, people waiting on the tarmac cheered and applauded. (PD, 03-01-21)

Ex. 22. "China supports any action conducive to the equitable access to vaccines for developing countries. It is a reflection of the nature of COVID-19 vaccines as a global public good and a necessary part of the construction of a global community of health for all," he added. (PD, 05-18-21)

In addition to details on China's actions to provide free COVID-19 vaccines worldwide, PD repeatedly stated that China hoped to build a global community of health for all and was committed to making COVID-19 vaccines a global public good (Ex. 22), which was seen as a practical solution to close the gap in global vaccination and stop the pandemic.

In summary, when reporting about vaccine equity, PD highlighted China's support for international cooperation on vaccines and underscored the need to engage all countries in concerted efforts to combat vaccine inequity and the pandemic. China was portrayed as a staunch opponent of vaccine nationalism, advocating for an equitable distribution of vaccines to developing countries.

## 5. Discussion and conclusion

Notably, the NYT dedicates considerable attention to domestic vaccine hesitancy, leveraging scientific evidence and authoritative viewpoints to enlighten the public on the efficacy and safety of vaccines within the country. In contrast, PD tends to elevate the national identity of Chinese vaccines, foregrounding international recognition of Chinese vaccines while obscuring the identities of Chinese health experts. Frequent presentations of endorsements by high-profile officials from other developing countries could instill fear in other established powers. The resulting effect may be at odds with China's commitment to making Chinese-made vaccines a global public good [87]. These findings can be primarily attributed to the differing editorial stances catered to their respective ownership and readership, as well as their alignment with the diplomatic policy objectives of their home nations.

As the official newspaper of the Central Committee of the Communist Party of China, PD's editorial stance and discursive practices are influenced by the state's political directives and ideological frameworks. This results in a newspaper that serves as a mouthpiece for the government's policies and a tool for shaping public opinion in alignment with national interests [59]. Specifically, the English version of PD primarily targets readers outside China's mainland and serves as a major channel for China's international communication. Therefore, its narratives often emphasize the collective good, the importance of vaccination for the health of the community, and the role of China in promoting global health initiatives and cooperation. The ownership and readership of PD partly account for the prominence of global vaccine distribution and vaccination as a central theme in PD's coverage.

In contrast, as a publicly traded company, NYT is renowned for editorial independence and commitment to journalistic excellence and quality journalism. The NYT has a reputation for in-depth investigative reporting and a commitment to tackling controversial subjects. For example, in contrast to PD's concentration on positive emotions such as cheer, gratitude, and good wishes, NYT's discursive practices of communicating COVID-19 were found to focus on negative emotions such as fear and anxiety [65]. Moreover, the NYT boasts a subscriber base where the vast majority—approximately 84%—reside within the United States [61]. This demographic distinction could partly elucidate its inclination to persistently update its readership on the safety of domestic vaccines and the United States' resolve to combat vaccine hesitancy.

Furthermore, findings in this study align in part with prior research (see Section 2), indicating that vaccine communication is deeply embedded with ideological nuances and in line with a nation's diplomatic policies. Although these two newspapers are operating in two deviating media societies [88], they both hold pivotal roles in their respective political systems. Media communication of COVID-19 vaccines has intensified the China-US competition, particularly as the U.S. has identified China as its most substantial geopolitical challenge. The US reluctance to participate in the COVAX initiative and to make American-made vaccines a global public good—a stance frequently represented in NYT—could symbolizes a perceived decline in America's leadership in global health governance during COVID-19. This perception stems from the fact that U.S. global leadership has been traditionally underpinned "not just on wealth and power but also, and just as important, on the legitimacy that flows from the United States' domestic governance, provision of global public goods, and ability and willingness to muster and coordinate a global response to crises" [89]. Additionally, the escalating domestic death tolls and vaccine hesitancy have compelled the U.S. to evade global responsibilities beyond its traditional capacity. This situation partly explained the conspicuous absence of the narratives in NYT about how the U.S. has exercised its global leadership in orchestrating and coordinating vaccine distribution worldwide.

Our corpus-based comparative study has also presented some insights that are not readily apparent in previous studies. The discourse on vaccine communication in Chinese and American contexts is not merely characterized by an ideological polarization that typically casts a positive self and a negative other. It extends well beyond such a binary portrayal. The COVID-19 vaccines have provided a good opportunity for China to maneuver for international leadership while the U.S. falters [89]. This is evident in PD's discursive construction, which highlights China's willingness and capacity to develop and distribute Chinese-made vaccines, along with its substantial donations of vaccines to developing countries. For a rising China, there is an imperative to showcase its strength to lead global governance together with the established powers, while avoiding the appearance of being overly assertive to sidestep the "Thucydides Trap" [90]—a perilous trap suggesting that "when a rising power threatens to displace a ruling one, the most likely outcome is war" [91]. As "an irresistible rising China is on course to collide with an immovable America, and both China and the U.S. are determined to make their countries great again" [91], it is imperative for both sides to develop strategic approaches to engage in competition without precipitating a catastrophic conflict.

In the communication of COVID-19 vaccines, it is evident from PD's narratives that China aspires to gain recognition as a major global power, commensurate with its economic and military prowess, yet not with the intent to displace the U.S. This ambition may account for PD's frequent portrayal of China as an advocate for equitable vaccine distribution through international cooperation.

At the same time, China does not want to be caught in the "Kindleberger Trap" either [92], as Joseph Nye cautioned in 2017,

> Charles Kindleberger, an intellectual architect of the Marshall Plan, argued that the disastrous decade of the 1930s was caused when the US replaced Britain as the largest global power but failed to take on Britain's role in providing global public goods. The result was the collapse of the global system into depression, genocide, and world war. Today, as China's power grows, will it help provide global public goods? [92]

Evidence from PD has also demonstrated China's efforts to overcome the "Kindleberger Trap". "Chinese companies are fulfilling President Xi Jinping's promise of making Chinese-made vaccines a global public good and helping build a community with a shared future for mankind" [87]. Through the emphasis on providing vaccines as global public goods, PD has projected a benign image of a responsible and peaceful-rising China. However, the reverse effect of such muscle-flexing actions may lead the U.S. to deepen its perception of China as a threatening competitor. This is particularly the case when the Biden administration has already singled out China as "the only competitor potentially capable of combining its economic, diplomatic, military, and technological power to mount a sustained challenge to a stable and open international system" [93]. Against such a backdrop, China urgently needs wide international recognition. This is related to our corpus findings that PD frequently presented support and endorsements by other developing countries after they received Chinese-made vaccines. And PD depicted China as a firm advocate for equal global access to vaccines and an international community with a shared future for mankind.

PD's discourse on COVID-19 vaccines aims to portray a responsible and peaceful-rising China. It underscores the safety of Chinese vaccines and China's commitment to making vaccines a global public good. Yet, the current discursive strategies can hardly win the hearts and minds of readers in the U.S. and its close allies. This is primarily due to the lack of scientific data and specific expert endorsements regarding the safety of Chinese vaccines. Insufficient information on the transparency and efficacy of Chinese-made vaccines may incline others to cast doubt on China's underlying motives in the development and distribution of these vaccines [85]. Additionally, the over-emphasis on the nationality of Chinese vaccines, while highlighting China's capacity to produce and supply vaccines to other countries, also underlined its capability to challenge America's hegemony as a major provider of global public goods. The potential peril is so palpable that the U.S. may view Chinese vaccines not merely as health commodities but as diplomatic tools through which China consolidates international alliances and pursues political objectives aligned with its own interests.

Therefore, it is suggested that PD shift its communicative approach if it genuinely seeks to construct and convey a benevolent image of China through discourses. Specifically, when communicating vaccines to the international community, it should present robust clinical evidence to substantiate its claims regarding vaccine safety. A concentration on an individual vaccine manufacturers is

probably more desirable than an overemphasis on the Chinese origin of the vaccines.

A similar mindset shift is advised for NYT. The rivalry between China and the U.S. should not be perceived as a zero-sum game where China's rise will eclipse America's predominance. Amidst the COVID-19 pandemic, the need for enhanced mutual comprehension and collaborative governance is more critical than ever. NYT should refrain from politicizing Chinese vaccines and should instead champion cooperation over competition. For the collective well-being of humanity and, specifically, for the swift implementation of mass vaccination, if WHO has endorsed Chinese vaccines for emergency uses—as it has done for American and British vaccines—then the NYT should exhibit the same level of acceptance towards Chinese vaccines. Polarized and biased reports on WHO-licensed vaccines will likely produce more misinformation than NYT aims to counteract.

This study reveals that the COVID-19 pandemic has become a "critical moment" [94] to divide as much as to unite the world. COVID-19 vaccines will be a game-changing tool not merely in combating the pandemic on a global scale but also in the stiff China-US competition. This study has also provided suggestions for both newspapers to shift their communicative strategies, since the communication of vaccines needs to navigate a trajectory that fosters a more cooperative and resilient China-US relationship, and chart a path for better health communication worldwide.

## 6. Limitations and future research

However, this study is not without its limitations, as it only investigates two newspapers. To enhance the breadth and depth of the analysis, future research could first benefit from expanding the selection of the newspapers to include a more diverse and representative set of media outlets. Specifically, incorporating additional mainstream newspapers such as *The Washington Post*, *Los Angeles Times, The Wall Street Journal* from the U.S., and *People's Daily*, *South China Morning Post*, and *Xinhua News* from China would provide a richer dataset. This would offer more persuasive discursive evidence from both sides and contribute to a more nuanced view of the communicative strategies in different news discourses and ideological positionings in news reporting on COVID-19 vaccines.

Moreover, this study mainly concentrates on the early period when vaccines were developed and distributed, which could be furthered by a longitudinal study. A diachronic corpus would help capture the evolution of vaccine-related discourse over time, allowing for a more thorough examination of how different newspapers from China and the U.S. have reported on COVID-19 vaccines across various stages of the COVID-19 pandemic. This would enable researchers to track changes in reporting strategies, public sentiment, and the influence of broader socio-political factors on vaccine communication, thus providing a more holistic understanding of the media's role in shaping public perception of COVID-19 vaccines.

## CRediT authorship contribution statement

**Zhihan Wen:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Ming Liu:** Writing – review & editing, Methodology. **Changpeng Huan:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Data curation, Conceptualization.

## Data availability statement

Data will be made available on request.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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