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The operation of labour charter flights during the COVID-19 pandemic in China

Chuntao Wu, Hongmeng Yan, Wenjing Xue, Maozhu Liao*

School of Tourism, Sichuan University, No. 24 South Section 1, Yihuan Road, Chengdu 610065, China

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ABSTRACT
China was the first market badly hit by the COVID-19 pandemic. This paper explores how Chinese airlines started and involved in labour charter operations, and analyse the evolutionary patterns of the charter route network. Flying charter flights for migrant workers is a unique phenomenon in China, especially during the Wuhan lockdown period. The main results are three: (1) private airlines were more active in charter operations during the earlier period, (2) labour charter operation is a newly appeared aviation-government-industry cooperative business model, and (3) there was a spread, change and shift of both charter flows and charter passengers during the four-week period of the study. This case study not only produces useful insights about the important role of charter flights in China during the Covid-19 pandemic period, but also contributes to the theory and practice related to aviation resilience. Also, it contributes to the discussion about aviation policies in China, taking labour charter operation as a window time to predicate future airline dynamics in a more deregulated environment. The results can help airlines, and airports adjust routes, distribute capacity, and adjust layouts for Spring Festival labour transport in normal or post-pandemic times.

1. Introduction
The outbreak of the COVID-19 pandemic has put the aviation industry into unprecedented challenges since early 2020. The uncertainty created by the pandemic leads to academic discussion on the impacts of COVID-19 on air transportation. A considerable amount of literature has examined the COVID-19 effect on aviation, which could be divided into three major categories: global air transportation analyses, passenger-oriented flight experience assessment, and long-term impacts on broad aviation investigation (Sun et al., 2021). Of those, some literature explored the impact of the outbreak in terms of airlines’ strategic and business model (Albers and Rundshagen, 2020; Bauer et al., 2020; Akbar and Kisilowski, 2020), health and safety operation updates (Naboush and Alnimer, 2020; Schultz et al., 2020; Salari et al., 2020), crisis management capability (Hsiu-Ying Kao et al., 2020; Brown and Kline, 2020), ownership regulation (Abate et al., 2020), sustainability measures and future evolution of the industry (Macilree and Duval, 2020). Given that the COVID-19 pandemic is an unexpected event causing a sudden crisis to airlines, it is essential to understand how airlines respond to the crisis and re-start business when the epidemic just happened. However, only a few have investigated airlines’ reactions and regarded the reaction as airlines’ crisis response (Albers and Rundshagen, 2020) or recovery measures (Suau-Sanchez et al., 2020) in the EU market.

This paper explores the response and restarting measures adopted by Chinese airlines in the very early period, through a case study of labour charter operation. Impacted by the pandemic, the volume of Chinese domestic air passengers declined by more than 85% year-on-year (YOY) in February 2020, 69% YOY in March, and 67% YOY in April according to revenue passenger kilometres (RPKs). The number of domestic flights reached the lowest record in the week of February 16, stagnated in March, and entered the recovery phase in April following a constant reduction in new COVID-19 cases (IATA, 2020). In addition to COVID-19 new case reduction and market demand, aviation deregulation is also one of the key factors that promoted the recovery. China’s civil aviation industry development has gone through three stages since the early 1950s (Zhang and Round, 2008), i.e. from central planning to market orientation with ongoing reforms to the process of deregulation,
privatisation and consolidation. Whilst still regulating the domestic market (Lei and O’Connell, 2011), the Civil Aviation Administration of China (CAAC) issued Notice of CAAC on Policies Supporting Active Response to COVID-19 Outbreak on March 9, 2020, which brought Chinese airlines an unprecedented deregulated environment. Czerny et al. (2021) found that the supporting policies (e.g. flexible capacity introduction policies, optimized the license management of routes, permitted airlines to adjust flight plans flexibly) brought Chinese airlines a relatively free market circumstance, and argued to conduct a case study to show how those deregulation policies promoted recovery.

The CAAC has regulated charter services on routes served by regular services and has required all state-owned airlines to suspend domestic charter services since 2012. Flying charter flights for migrant workers is a special phenomenon in an urgent but less regulated environment. Spring Festival is the biggest holiday in China. Every year, tens of thousands of migrant workers return to their hometowns for family reunions and then back to work across the country. However, in 2020, the migrant workers could not return to their working places due to nationwide land transportation blockade. Wuhan, where COVID-19 cases were first identified, was locked down on January 23, 2020. Wuhan is also the capital city of Hubei Province, which was locked down a few days later. Wuhan is the major train and High-Speed Railway (HSR) hub of Central China, and Hubei Province forms part of the Yangtze River (Ortigz and Askin, 2020). Consequently, some national policies were issued to restrict urban and inter-provincial transportation (Cheng et al., 2020; He et al., 2020).

However, the State Council of China issued a series of emergency notices to promote rebound activities since January 30, 2020, requiring epidemic prevention-related factories and the energy sector to resume production as soon as possible. On February 11, 2020, the State Council’s Comprehensive Joint Prevention and Control Mechanism of COVID-19 proposed transport lockdown measures. These measures include the closure of expressway entrances, the blockage of main roads among provinces, the suspension of inter-provincial public transportation, and the isolation of rural roads that limited the return and resumption of activities. On February 12, Mr. Zhu Tao from the Department of Flight Standards of CAAC made a speech at a press conference held by the State Council’s Comprehensive Joint Prevention and Control Mechanism of COVID-19. In the speech, he argued that passenger aircrafts are equipped with high-efficiency air filters. Fresh air could be pumped every 2–3 min, effectively filtering out pathogenic microorganisms and reducing the risk of transmitting COVID-19 among passengers.

Under this background, labour charter flights appeared. On February 14, a team departed from Zhejiang Province bound for Sichuan Province to recruit skilled mask-making workers. The team took a minibus, bypassed the COVID-19 epidemic impacted areas, crossed the northern China Qinling Mountains, and arrived at the destination (Guangyuan city) after 30 h of continuous driving. The team planned to bring back workers by buses but found it too dangerous to drive through the snow-covered Qinling Mountains. Thus, they decided to charter a flight to send workers and required the special help of local governments of Guangyuan and Hangzhou to realize “seamless connections” from homes to airports, from airplanes to buses, and from buses to factories. On February 16, Loongair, a private airline, flew the charter flights from Guangyuan and Hangzhou, which led to a nationwide labour charter operation in the next four weeks.

This paper has two primary purposes. (1) To explore Chinese airlines’ response and involvement processes in labour charter operations. (2) To analyse the evolutionary patterns of the charter route network. Labour charter advertisements published on airlines’ official WeChat accounts and actual traffic data crawled via the Baidu search engine are two datasets used. Descriptive analysis and geographic visualization are the major methods used. Unlike traditional geographic visualization methods that illustrate change patterns consistent with fixed periods, this paper illustrates the change patterns depending on the actual amount of traffic concerning observable change data. The contribution of the study is threefold. First, it exemplifies airlines’ operation to save themselves and keep the market in order throughout the very early stage of the COVID-19 pandemic, contributing to the theory related to aviation resilience. Second, it contributes to the discussion about aviation policies in China, taking labour charter operation as a window time to predicate future airline dynamics in a more deregulated environment. And third, it demonstrates the trend of labour force mobility in the Chinese domestic market. Spring Festival labour transportation is a critical challenge faced by airlines every year. Thus, our results can help the CAAC, airlines, and airports adjust routes, distribute capacity, and adjust layouts for Spring Festival labour transport in normal or post-pandemic times.

2. Data collection

The study uses two datasets. The first dataset is the labour charter advertisements issued by each airline on staff’s personal WeChat moments or airlines’ WeChat accounts. The advertisements were collected to analyse each airline’s involvement processes and attitude towards labour charter operations. Posting urgent information on the WeChat platform and distributing information through staff’s personal WeChat moments were major distribution channels used by Chinese airlines in the early phase of the COVID-19 outbreak. The major reason is that airlines only allowed a small number of employees to return to their offices and travel agents closed their offices. Our research members have established successful relationships with airlines’ marketing staff and obtained advertising flyers in a timely manner. About 43 airlines operated domestic passenger flights at that moment, and all of the airlines had official WeChat accounts. Through staff’s personal WeChat moments, we collected the labour charter advertisement of 35 airlines firstly. Then, check with the marketing staff and official WeChat accounts of the rest airlines. Finally, we collected the flyers from 41 airlines, and found 95% of the airlines issued advertisements for labour flights.

The second dataset is real charter traffic data. We selected February 16 to March 20, 2020, as the study period because the first charter flight operated on February 16, and there was no charter flight operated after March 20, at least constantly. All of the data were crawled by the Octopus Collector and the data acquisition template of the Baidu search engine in February, March and April of 2020. Using “charter flights return to work” as a key phrase, we extracted 24,421 URLs manually. Then, we exported the links and cleaned the data in a stepwise manner. Step 1: Remove the advertisements and useless information in the title of the operating field and delete the links with blank titles. Step 2: Delete the links containing “bargain price ticket” and “customized flight dynamics” in the abstract of the operating field and delete the links with blank abstracts and links with the first three characters on the left of 200 or 201. Step 3: Delete the links containing invalid entries, e.g. “Zhidao” or URL, such as http://www.variflight.com/; delete the blank value in the URL in the action field. Step 4: Paste the links containing “charter” or “return to work” in the abstract and title into a new table, and then duplicate the contents of the first 15 fields on the left side of the title to obtain the target data. After using the FIND function to locate the airline name and flight number, we manually checked the information of each flight, including the flying date, carrier, departure city, arrival city, applicant, and detail reports. After clearing, 2,549 URLs remained, and 243 flights were eventually identified.
3. Involvement, attitude and performance of airlines

3.1. Involvement

The advertisements were mainly published between February 17 and February 21, with February 18 as the peak day (Table 1). It seems that private airlines played a leading role at the initial stage. Following Loongair which operated the first labour charter from Guangyuan to Hangzhou, Spring Airlines flew the second charter on the same day. Then, two private airlines (China Express and Juneyao) first released advertisements about flying special flights for migrant workers through their marketing staff’s personal WeChat moments on February 17, 2020. On February 18, four more private airlines (Loongair, Spring, 9Air, and Qingdao) released advertisements. The CAAC used to prohibit airlines from flying charter flights on routes served by scheduled flights and publishing promotional advertisements. After the occurrence of charter corruption cases in 2009, the CAAC further regulated charter services, and state-owned airlines proactively reduced charter operations to avoid corruption. However, at this time, 41 airlines, including central government-owned airlines (China Eastern, China Southern, and Air China), released charter advertisements.

3.2. Attitudes

There were 41 airlines that posted charter advertisements on WeChat moments and the WeChat platform. Those advertisements used 45 words in advertising slogans. Table 2 lists the words and phrases with their frequencies. Generally, the top 10 words and phrases are as follows: resumption of work (71 times), charter flight (46 times), assistance (34 times), government-enterprise (34 times), meet demand (32 times), aviation (23 times), please call/negotiation (21), anti-epidemic (18), customized (14), and safety (13). These terms represent airlines’ subsequent attitudes. First, flying charter flights for migrant workers is an action of the aviation industry to support rebound activities. Second, charter operation is a safe mode of travel that can effectively prevent the spread of the epidemic. Third, labour charter is a customized product to meet the demand of local governments or employers on a case-by-case basis. Table 2 shows that the slogans issued before February 19 contain words with emotional overtones such as guard, unite, forging ahead, without worry, storms, forging ahead, and friends. After February 19, the frequency of the words and phrases anti-epidemic and cooperation increased, suggesting that the operation of labour charter flights became an airline-government/enterprise cooperation business model.

3.3. Performance

During our study period, 243 labour charter flights were operated by 31 airlines in total. According to the number of flights, 25% of the flights were operated by private airlines, 22% were operated by central government-owned airlines, and 53% were operated by other types of airlines (local government-owned or involved airlines and airlines controlled by the HNA Group).

Two change patterns can be observed in Table 3. (1) The number of charters reached a peak in the 2nd week and then declined constantly. Charters disappeared after March 20, probably due to the re-opening of scheduled flights and blocked road traffic, and airlines began to use scheduled flights to fly charters. In particular, in the week of March 12, central government-owned airlines Air China and China Eastern began to distribute charter seats through computer reservation systems, which inevitably led to the disappearance of labour charters. (2) The market share of private airlines declined after the 1st week while the shares of other airlines increased. This trend shows that private airlines played a leading role initially and were then replaced by other airlines later.

Labour charter operation is also an airline-government-enterprise cooperative model in the earlier recovery period. We analyse the content of news reports to address this model. In terms of applicants, generally, there are two types of applicants: local governments (city-level) and large enterprises. The Human Social Resources and Social Security Bureaus of local governments are the bureaus that submitted applications to airlines to establish flights to bring migrant workers back to workplaces. The enterprises included major electronics/air conditioners, car manufacturers, iron and steel companies, coal power and thermal power companies, coal mines, oilfields, shipyards, construction companies, power transmission groups, railway companies, etc. They chartered flights for staff rotations. A few flights were chartered by business/merchant groups. Over the study period, the share of flights chartered by local governments declined from 52% to 37%, while the flights chartered by enterprises increased from 48% to 65%. This change indicates a shift of main passengers from migrant labourers to major enterprise staff. The following section explores the change patterns from the geographical perspective.

Table 1

| Released on | Name of airlines (remark) |
|------------|---------------------------|
| Feb. 17    | China Express (private airline) and Juneyao (private airline) |
| Feb. 18    | Loongair (private airline), Spring Airlines (private airline), 9Air (private airline), Qingdao Airlines (private airline) |
|            | +1, China Eastern (central government-owned airline), China Southern (central government-owned airline), Chengdu Airlines, Sichuan Airlines, Shandong Airlines, Xiamen Air, airlines controlled by the HNA Group +1, etc. |
| Feb. 19    | Ruili (private airline) +1, Shenzhen Airlines, and airlines controlled by the HNA Group. |
| Feb. 20    | Air China (central government-owned airline) |
| After Feb. 20 | Red Earth (private airline) +1 and LJ Airlines (private airline) +1 |

+1: Acquired by state-owned assets in late 2020.

Table 2

| Words used by advertising slogans. | (frequency of appearance) |
|----------------------------------|---------------------------|
| Feb. 16–Feb. 18                  | - Words used more than 2 times: resumption of work (39), charter flight (22), assistance (18), government-enterprise (19), meet demand (20), aviation (15), please call/negotiation (13), anti-epidemic (7), customized (7), safety (9), extra flight (7), and business (4) |
| Feb. 19–Feb. 21                  | - Words used more than 2 times: resumption of work (32), charter flight (24), assistance (16), government-enterprise (15), meet demand (12), aviation (8), please call/negotiation (8), anti-epidemic (11), customized (7), safety (4), business (3), and cooperation (5) |
|                                  | - Words used 2 times or less: extra flight, response to government requirement, win, and five-star service |

Table 3

| Changes of charter carriers and applicants (N = 243). | 1st week 2.16–2.24 | 2nd week 2.25–3.3 | 3rd week 3.4–3.11 | 4th week 3.12–3.20 |
|-----------------------------------------------------|---------------------|-------------------|-------------------|-------------------|
| Total number of charter flights operated             | 52                  | 103               | 50                | 38                |
| Charters operated by                                 |                     |                   |                   |                   |
| Private airlines                                     | 40%                 | 21%               | 18%               | 18%               |
| Central government-owned airlines                    | 13%                 | 21%               | 32%               | 21%               |
| Other airlines                                       | 46%                 | 57%               | 50%               | 61%               |
| Government-owned airlines                            | 100%                | 100%              | 100%              | 100%              |

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4. Evolution of charter routes and networks

4.1. Charter flows

China can be divided into three regions, namely, the eastern coastal region, the central inland region, and the remote western region. According to the amount of traffic throughout the study period, 70% of charters departed from the remote western region, 17% departed from the central inland region, and 13% departed from the coastal region. Yunnan, Guizhou and Sichuan are the top three provinces where charters originated in the remote western region. As less developed areas, these three provinces are all labour force output provinces of China. Alternatively, 63% of the flights were bound to the coastal region, 27% to the western region, and 7% to the central area. The eastern coastal region is the wealthiest, and it attracts labourers from other regions. Wuhan city and Hubei Province belong to the central inland region. Thus, the general direction of charter flows is in line with mainland China’s economic development level and epidemic situation.

4.2. Charter routes

The charter flights were operated on 214 routes between 85 cities. The most popular route is Lanzhou-Hetian (6 flights), followed by Lanzhou-Nanchang (5 flights), Kunming-Ningbo (5 flights), and Kunming-Quanzhou (5 flights). While the directions of those flights are highly diverse, some periodic change patterns could still be observed. For example, the average flying distance was 1,642 km per flight during the first week, 1,755 km per flight during the second week, 1,862 km per flight during the third week, and 2,607 km per flight during the fourth week.

Fig. 1 shows route networks consistent with a fixed period (per week). During the first week (Fig. 1a), the flights mainly departed from southwest cities and were bound to eastern coastal cities. A few flights departed from northern cities (e.g. Changchun and Handan) but were also bound to coastal cities. There are two exceptions. One route is the Chengdu-Lasa route, which was organized by the Huadian Group to send its staff back to the Dagu Hydropower Station. Another is the Akesu-Hangzhou route. During the second week (Fig. 1b), the network has three types: west-east, north-east, and south-north structures. In the third phase (Fig. 1c), the network becomes highly fragmented and diverse. Then (Fig. 1d), the long-haul routes connected with northwest cities became the mainstream.

4.3. Changes in departure cities

Fifty-nine cities (airports) sent out charter flights. Kunming (the capital of Yunnan), Guiyang (the capital of Guizhou), Chengdu (the capital of Sichuan), Zhengzhou (the capital of Henan), and Chongqing are the top five cities. Over the study period, charter departures moved from the southwest region to the inland and eastern regions. Fig. 2 shows how the departure cities changed. Different from traditional studies that illustrate change patterns consistent with fixed periods, this figure illustrates the change patterns based on market situations.

The figure shows that the charters dominantly departed from the cities located in the remote western region before February 23. Then, there was a spread of departure cities to smaller cities (e.g. Lincang, Lancang, Wenshan, Dazhou) and farther cities (Yinchuan, Lanzhou, and Urumqi) within the western region. Furthermore, from February 24 to

![Fig. 1. Routes of labour charter flights from February 16 to March 20, 2020.](image-url)
February 28, some cities located in the central inland region (e.g. Zhengzhou and Shijiazhuang, Yanji) or in the eastern region (e.g. Nanjing, Nantong, Shanghai, Wenzhou, and Fuzhou) became new departure points. The flights departing from the central inland and eastern regions were mainly chartered by large enterprises for staff transportation. For example, the flights departing from Shijiazhuang were chartered by PetroChina and the Beijing Hyund Group, and the Chana Group chartered the flights from Nanjing to send staff back to Chongqing. However, there are some exceptions. For example, flights departing from Wenzhou were chartered by the Wenzhou Chamber of Commerce to send business people back to inland cities. **Fig. 2** also suggests that departure cities moved to western and inland cities after February 25 and March 4, respectively.

### 4.4. Changes in arrival cities

Hangzhou, followed by Ningbo, Shenzhen, and Quanzhou, was the top destination for charter flights throughout the study period. These cities are all located in the eastern coastal region and depend heavily on migrant workers. The flights were primarily bound to the cities located in the middle of the coastal region. Then, they extended to cities located in the north and south of the coastal region. Additionally, remote areas of Tibet (Lasa city) and Hainan Island (Sanya city) became destinations. After February 25, the cities in the remote western region (Kunming, Chengdu, Chongqing, Jiayuguan, Nanyang, Lanzhou, etc.) and cities in the central inland region became the destinations. After March 7, cities in the Xinjiang Uygur Autonomous Region became the major destinations. Furthermore, flights were no longer bound to the eastern cities. **Fig. 3** vividly illustrates a shift of destinations from the eastern region to the western and inland regions after February 25 and then to further remote northwest cities after March 7. It is noteworthy that some cities located around Wuhan, such as Nanchang and Changsha, also became charter destinations. For example, the Nanchang High-tech Zone established a working group to support work resumption activities. The
working group contacted the enterprises within its jurisdiction and then negotiated with local airlines to fly charters to bring workers from Lanzhou, Yinchuan, and Kunming back to Nanchang. The experience of Nanchang shows close cooperation between local governments, enterprises, and airlines. According to news reports, flights bound to eastern cities mostly sent migrant labourers while flights bound to remote western regions were dominantly chartered by energy, mining or constructing enterprises for their own staff transfers. Thus, from Fig. 3, we can also see a shift of charter passengers from migrant workers to company staff.

5. Results and discussions

This paper explores the involvement of Chinese airlines in operating labour charter flights after the Spring Festival Golden Week holiday due to the outbreak of COVID-19 and the nationwide land transportation blockade. Instead of assessing how the pandemic impacted or re-shaped airlines’ industry, this paper focuses on the airlines’ movement in an urgent but deregulated environment. The charter operation is an unstable service whose demand relies on market requirements. Therefore, this paper analyses the evolutionary patterns of the charter route network and highlights the impacts of labour flows on the charter operation. Different from the traditional geographic visualization method that illustrates change patterns consistent with a fixed period, this paper illustrates the change patterns from period to period depending on the amount of traffic using observable change data. The major results are as follows.

First, flying the labour charter flights is a response to rebound activities, a customized service to meet market demand, and an airline-government/enterprise cooperation business model. Private airlines played a leading role in the initial stages. The Human Social Resources and Social Security Bureaus of local governments submitted applications to airlines to bring migrant workers back to workplaces. Enterprises charted flights for staff rotations. Over the study period, the share of flights chartered by local governments declined from 52% to 37%, indicating a shift of the main passengers from skilled labourers to enterprise staff.

Second, over the studying period, the charter routes continued expanding and moving. In the early stage, most of the flights departed from the labour-exporting western region and flew over Wuhan and Hubei Province, which were locked down; and the flights were bound to the eastern coastal region. The departure cities are mainly concentrated in southwest areas such as Yunnan Province, Sichuan Province, Guizhou Province, Henan Province, and Chongqing municipality. The destinations were mainly concentrated in the eastern coastal areas such as the Yangtze River Delta, Pearl River Delta and Fujian Province. These results are in line with some findings of previous studies concerning the labour flow mechanism in China (Li et al., 2014; Pan and Lai, 2019).

Finally, the flights shift from east to west. Many possible reasons led to this shift. The transportation-related reasons include the following: (1) the recovery of aviation, road, and railway transportation; (2) the operation of long-haul charter coaches and trains; and (3) the limits to direct flights to remote areas. In most situations, the labourers departed from cities located in the western region and were bound to eastern coastal cities, and the staff departed from various cities but were bound to western cities or within the regions. Combined with the nature of passengers, we can see a change of passengers from skilled workers to large companies/enterprises employees. This means that flights carry migrant workers back to workplaces to produce epidemic prevention products/instruments and help enterprises transfer staff.

This paper contributes to related studies on airline responses to the pandemic and enriches the research on Chinese airlines’ movement in a less regulated but urgent environment. The results could help airlines to identify the flow of migrant workers, thus launching accurate charter products during the Spring Festival. Due to the unavailable data of epidemic cases at the city level, we failed to estimate the impacts of key factors such as epidemic cases on charter demand. Therefore, further research can be conducted when data are available. In addition, the long-term strategy and movement of Chinese airlines in response to the epidemic in this less regulated but urgent period could also be a topic for further discussion.

Whilst the labour charter flights last only one month, we speculate that charter flights will play an increasing role in post-pandemic period for following reasons. (1) The risk of contracting COVID-19 aboard an airplane is very low (Bhuvan et al., 2021). Given the special time of labour charter operation and no labour charter flights passenger was infected with coronavirus, our study shows that charter operation is an effective transport method in the post-pandemic period by providing tourist an “anti-pandemic bubble”. (2) Charter flights plays an important role in China over the last two years. Some airlines also launched labour charter flights in the Spring Festival of 2021. Furthermore, thousands of cargo charters have been operated in international market. (3) Our study approves that charter transportation could realize “a seamless transfer” for big groups, from home to airport, from airplane to bus, and from the bus to factory. All-inclusive package tour charters is the main type of the international charter. The outbreak of COVID-19 is changing tourism and air transport market structure. Once the travel restrictions for vaccinated tourists to be relaxed, tour operators need charter flights due to the widespread of international flights cancelling or suspending, especially, on leisure routes. From this aspect, our study also contributes to literature related to international tourism recovery in near future.

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CRediT authorship contribution statement

Chuntao Wu: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. Hongmeng Yan: Data curation, Visualization, Writing – original draft. Wenjing Xue: Writing – review & editing. Maozhu Liao: Writing – original draft, Writing – review & editing, Supervision.

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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