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What drives willingness to travel in the context of COVID-19?—A measurement of eco-environmental values

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The outbreak of COVID-19 has had tremendous impacts on human health and the world economy. Studies have focused on the impact of COVID-19 on potential tourists and tourism destinations from the perspectives of individuals, industries and organizations, and they have provided some measures for tourism recovery. However, under the situation of individual restriction, research has not systematically explained residents' desire for trips of different distances and factors or the similarities and differences in the factors affecting tourism willingness for trips of different distances. In this context, a measurement of eco-environmental values is used to investigate these issues to help the tourism economy recover. Using online questionnaires covering all provinces in mainland China, this paper investigates residents' travel willingness to make trips of different distances, and it utilizes binary logistic regression analysis to examine the factors that help predict tourists' travel intentions. In addition, the patterns of willingness to travel different distances are displayed in maps generated by ArcGIS software. The results suggest that the objective COVID-19 confirmed case distribution follows distance decay theory; however, the distribution patterns of travel willingness are not in accordance with distance decay. The factors that have a significant impact on predicting travel willingness regarding the three kinds of trip distances are educational background, cognition of COVID-19, and geographical division factors. Income and the severity of the pandemic situation play different roles in predicting travel willingness in this study. Overall, the findings of this study extend the application of distance decay theory, which contributes to tourism studies in the COVID-19 context. The findings are also beneficial for tourism recovery and crisis management against the backdrop of pandemic normalization.

KEYWORDS

distance decay theory, travel willingness, eco-environmental values, spatial distribution, risk, crisis management

1 Introduction

The outbreak of COVID-19 was a major attack on human life and had unexpected negative effects on global development (Gössling et al., 2020; Yang et al., 2021a). This emerging international public health threat has caused many deaths, illnesses, and unhappiness. According to the World Bank, global GDP has suffered a 5.2% contraction due to COVID-19 (World Bank, 2021). Although governments and countries have put extraordinary efforts into recovery, recovery appears uneven across the world, and in 2022,

global GDP is still estimated to remain 1.8% below pre-pandemic projections (World Bank, 2021). Moreover, the tourism industry has been severely affected by the lockdown and quarantine measures due to COVID-19 (Gössling et al., 2020; Yang et al., 2021b; Wang et al., 2021). It has been said that 2020 was the worst year on record for tourism (World Tourism Organization, 2021). According to the UNWTO World Tourism Barometer (January 2021), the number of international visitors declined by 74%, from nearly 1.5 billion in 2020 to approximately 381 million in 2019 (World Tourism Organization, 2021), which represents an estimated 1.3 trillion USD loss in international tourism expenditure. During the pandemic period, many restrictive measures have been taken in China, such as quarantine at home. This kind of restriction has strongly limited daily activities, especially travel behaviors. However, based on the forbidden fruit effect (Bushman and Stack, 1996), which states that anything that seems unobtainable becomes more desirable, this strict home quarantine increased residents' willingness to travel at the beginning of the pandemic.

Tourism demand research has shown continued growth in recent years. In previous research, scholars used social media and internet data to construct different forecasting models to predict tourism demand, especially international tourist flows, due to the high accessibility of statistical data (Song et al., 2019). Research on international tourism demand mainly focuses on predicting tourists' arrivals, tourism expenditures or length of stay (Song and Lin, 2010; Emili et al., 2020). Studies have also investigated domestic tourism flows, such as tourist arrivals in Beijing, (Li et al., 2017), hotel room demand, recreation site demand and competition forecasting (Chen et al., 2003; Song et al., 2013). Tourism demand may be influenced by various factors, and eco-environmental value is one of the most important factors impacting tourists' travel willingness (Huang et al., 2018). In this paper, eco-environmental values refer to people's views and convictions regarding COVID-19 virus knowledge and the significance of environmental protection and conservation. This concept was derived from the brief inventory of values developed by Stern et al. (1993). Stern's scale has three dimensions, i.e., social-altruistic value, egoistic value and biospheric value, and the scale is generally used to explain behaviours or behavioural intentions, especially in the pro-environmental field. This usage further suggests that there is a favorable relationship between eco-environmental values and travel readiness, as travelers who have strong eco-environmental values are more likely to give environmental factors top priority when making travel choices and are consequently more willing to partake in travel activities that are consistent with their values.

In the context of the COVID-19 pandemic, many studies have focused on tourism development. Based on the unit of analysis, studies can be divided into four different categories (Yang et al., 2021b): those focusing on individual tourists' perceived risk of traveling (Sánchez-Cañizares et al., 2021), those paying attention to organizations' operational response and financial performance (Salem et al., 2021), those examining destination-specific effects on tourism destinations and coping strategies (Yang et al., 2021a; Li X. et al., 2021) and those focusing on how the pandemic has affected the tourism industry and subindustries (Dolnicar and Zare, 2020). Moreover, COVID-19 has been a major crisis in recent years, and it has also affected residents' eco-environmental values. Whether a change in these values would have an impact on travel willingness remains unknown. Although there are many research papers related to tourism demand under this pandemic background, the patterns of tourists' travel choice intention under different distances without any specific destination have not been examined.

This paper aims to fulfil the following three objectives. 1) We examine the travel choice patterns under trips of different distances among different groups by investigating residents' willingness to engage in suburban, domestic or overseas travel. 2) We explore what the different and similar factors that affect the prediction of suburban recreation, domestic travel, or outbound travel choices are. 3) We reveal whether tourism distance choice patterns are consistent with the principles of distance decay theory. Examining these issues will help identify tourism demand in the pandemic context, support disaster resilience and tourism crisis management, and aid in tourism market forecasting against the backdrop of pandemic normalization.

2 Literature review

2.1 Distance decay theory

"Distance" is a basic concept of geography. According to Tobler's first law (Tobler, 1970), the force of an object or phenomenon decreases with increasing geographical distance. Numerous studies have confirmed the prevalence of distance decay in human spatial behaviors, and distance friction is thought to be an important cause of this phenomenon. The distance decay theory used in the tourism field indicates that tourism demand decreases when the distance increases (Smith, 1985; Zhang et al., 1999).

Distance decay exists in both objective facts and subjective tourist behaviors. Nilbe et al. (2014) investigated the distance that tourists would travel to Estonia and found that event destinations attracted event visitors from nearer locations (531 km, on average) compared to regular visitors (700 km); additionally, more than 70% of visitors were from neighboring countries. Studies have also found that some cognitive evaluations also obey distance decay theory. Xiao et al. (2021) discovered that place dependence on Jiuzhai Valley National Park decreased with increasing distance. Other scholars have also used distance decay theory to investigate the spatial correlation between provincial industrial green total-factor energy efficiencies (Chen et al., 2022). In general, distance decay exists in personal travel, which has been formalized in theoretical and practical studies (Smith, 1985). Distance has significant impacts on tourism demand, tourism intentions, and the decision-making process because travel is an activity that costs money and time (Mckercher and Lew, 2003; Nilbe et al., 2014). A distance decay pattern can be identified for tourists visiting a tourism destination, which helps segment rural tourist groups (Cai and Li, 2009) and nature-based tourism markets (Nyaupane and Graefe, 2008).

2.2 Personal factors and travel choice

Personal factors, including sociodemographic and sociopsychological features, differ among visitor groups choosing trips of different distances. A study focusing on business trips to

Hong Kong made by visitors from different distances found that the older group chose long-haul trips and mainly chose to travel on their own (Ho and McKercher, 2014). This finding is supported by other scholars, especially for distant tourism destinations. Travelers from Hong Kong prefer the independent travel type (Lee et al., 2012), and older tourists between 41 and 60 years old tend to choose longer-distance nature-based tourism destinations (Nyaupane and Graefe, 2008). In addition, the study indicated that men are more likely to choose long-haul travel than women (Ho and McKercher, 2014). Similarly, McKercher found that short-haul destinations attract more younger people, who are less educated and have lower income. In contrast, older people with high educational levels prefer to choose long-haul destinations (McKercher, 2008a). However, Collia and his colleagues (2003) analyzed the 2001 National Household Travel Survey (NHTS) to reveal the travel pattern of residents in the United States: older people were less mobile than younger people and preferred short-distance travel, and this aspect was more pronounced among older women (Collia et al., 2003). Sociopsychological features include tourists' perception, cognition, etc., a recent study on COVID-19 risk perception and travel intentions indicated that trust and strong perceptions of solidarity between people and the government have positive effects on travel intentions (Rastegar et al., 2021). Tourists' cognition of low-carbon tourism also has a significant impact on green travel mode choices (Tang et al., 2018). Additionally, environmental values and environmental cognitions have positive effects on tourists' environmentally responsible behaviors and predictive effects on pro-environmental behaviors during trips (Huang et al., 2018). In summary, environmental values have been validated to have impacts on behavior intentions. Research will investigate whether travel choice intentions (which refer to intentions towards trips of different distances without specific destinations, such as suburban recreation, domestic travel and oversea travel), which are one kind of behavioral intention, will be affected by environmental values in the context of COVID-19.

Although scholars have investigated the effects of sociodemographic characteristics and sociopsychological characteristics on travel choices, research on the effects of eco-environmental values on different kinds of distance travel intentions in the context of COVID-19 has not received enough attention. Therefore, this study will examine the differences in the willingness to travel different distances considering demographic factors and eco-environmental value variables to discover the relationships among these factors.

2.3 Scenario factors and travel choice

Crises tend to negatively affect the development of the travel industry to some extent. The different types of crises include natural crises and man-made crises, such as wars, earthquakes, and the COVID-19 pandemic. Many studies have focused on the impacts of crises on travel intentions and tourist behaviors (Pain, 2014; Zhang et al., 2021; Sasaki et al., 2022). For example, terrorism is a man-made crisis that aims to trigger widespread fear (Pain, 2014). This kind of public event is believed to have negative impacts on travel-related choices. More specifically, tourists' intentions towards the attractions affected by terrorism attacks decline significantly (McKercher and Bob, 2004; Walters et al., 2019; Sasaki et al., 2022). In addition to terrorism, COVID-19 has become a severe crisis since the outbreak of the disease at the end of 2019. COVID-19 has dramatically impacted the tourism and hospitality industry and greatly changed tourists' behaviors (Gössling et al., 2020; Wang et al., 2021; Yang et al., 2022). A case study by Porto indicated that tourists' visiting time is shorter than usual because of the pandemic and that the available visited areas are limited (Lopes et al., 2021). Due to the COVID-19 pandemic, the travel style has also changed. Scholars have concluded that Chinese travelers choose to travel independently or in small groups (Wen et al., 2020). However, scholars have noted that some disasters have no impact on tourist behaviors. Surveys in New Zealand indicated that there were very few impacts on tourists' perceptions and behavior towards earthquake-damaged attractions because of a lack of knowledge of the crisis (Fountain and Cradock-Henry, 2020).

The COVID-19 pandemic is a serious worldwide health event that poses great threats to people's tourism willingness and choice. Because this kind of virus has high spread and infection characteristics, the virus may be affected in the process of population movement and residents' willingness to travel in the context of COVID-19. In addition, in current research, many scholars have examined the impact of general crisis scenarios, such as earthquakes, wars, etc., travel choice. However, research on the impact of the scenario of the COVID-19 pandemic on travel intentions has received little attention. Therefore, we utilize COVID-19 confirmed cases to represent the severity of the pandemic crisis and examine the differences among individuals' willingness to undertake different kinds of travel, such as short-, medium-, and long-distance trips, predicted by the scenario indicator of confirmed COVID-19 cases. Additionally, we investigate whether different provinces with different COVID-19 confirmed case rates have different levels of travel choice willingness for different distances.

2.4 Travel distance and travel choice

The decision to travel might be significantly influenced by the trip distance because it is one of the most crucial aspects influencing people's decisions when selecting a method of transportation and destination (Ding et al., 2017). Travel distance is related to the travel time, cost, and convenience, and these factors can all influence travel behavior. One of the important concepts related to travel distance is perceived distance. Perceived distance refers to the estimated distance between destinations based on previous experience and knowledge (Canter and Tagg, 1975). This concept is thought to better explain tourists' behaviors (Ankomah et al., 1995). Perceived distance has been largely examined as an explanatory variable in the field of tourism destination research, and it significantly influences tourism destination image (Crompton, 1979; Zhang et al., 2011). Research on tourists' intentions towards visiting Mexico indicated that the respondents who were much farther away from Mexico had a more favorable image of Mexico City as a tourism destination (Crompton, 1979). In line with this finding, a study on the perceived image of Zhouzhuang, Suzhou, China, showed that with the increase in the origin–destination distance, tourists' perceived image recognition and cognitive destination image increased (Zhang et al., 2006). In addition, distance has an impact on travelers'

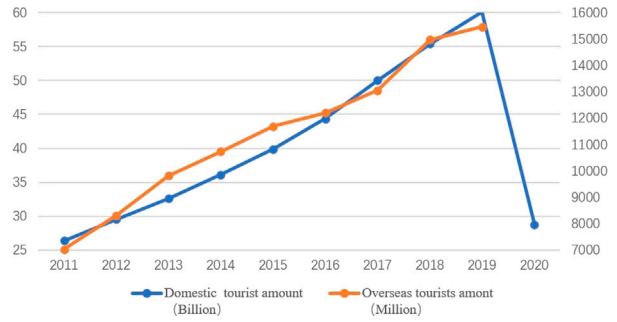


FIGURE 1
Trend of domestic and overseas travel arrivals (2011–2020).

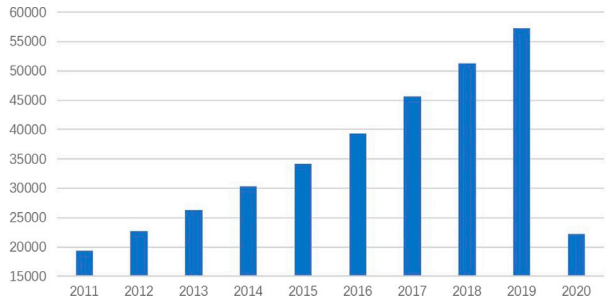


FIGURE 2
Trend of total travel expenditure 2011–2020 (billion).

satisfaction. A study conducted in Jiuzhaigou Village found that perceived distance has a positive impact on tourist satisfaction. The estimated perceived distance decreased as tourism satisfaction increased (Zhang et al., 2011).

Travel distance has been examined by many studies, and this topic can be introduced from two perspectives: the supply side and the demand side. On the one hand, travel distance can be affected by destination safety perceptions. Travel intentions are largely affected by tourists' perceptions of destination safety, which influence the decision-making process (George, 2003; Yang et al., 2019). Unsafe destinations entail decreased willingness to undertake tourism trips (Song et al., 2018). However, this decision is less associated with travel distance than with destination safety. Song et al. (2018) investigated ten young Chinese group members' travel decision-making process. They showed that a potential destination would be rejected if members were concerned about safety issues related to natural disasters or political instability (Song et al., 2018). On the other hand, from the demand side, the willingness towards different travel distances is linked to tourists' individual factors. According to the leisure constraints model (Crawford et al., 1991), structural barriers, interpersonal barriers and intrapersonal barriers constrain tourists' leisure activities. For example, structural barriers such as family financial resources, climate, the scheduling of time and other participants' related factors affect travel choice (Crawford and Godbey, 1987). Interpersonal barriers such as tourists' psychological states, perceived self-skills and subjective evaluations also affect travel willingness (Crawford et al., 1991). Furthermore, residents' living environment has an impact on travel distance choice. It has been discovered that people who live in congested areas go farther less frequently (Maat and Timmermans, 2009). Moreover, uncertainty and tourists' risk perception impact destination choices (Karl, 2018).

3 Methodology

3.1 Study site

Our study site was mainland China, including 23 provinces, 5 autonomous regions, and 4 municipalities directly under the central government. In late December 2019, Wuhan city in Hubei Province was the first to suffer from COVID-19 in China. COVID-19 spread to other regions in China with a high speed of infection. In the first month, the confirmed cases in Wuhan reached more than 45,000, and almost 2,000 people died from the disease. Based on the official administrative division and the specialty of Wuhan city, we divided our study site into five regions for geographical analysis. This kind of crisis caused significant damage to the tourism industry in China. Domestic tourist numbers declined significantly in 2020 (Figure 1). In addition, total travel expenditures in China declined due to the COVID-19 pandemic (Figure 2).

3.2 Data collection

We adopted an online questionnaire to collect data through a professional platform in China named "Wenjuanxing". We chose the snowballing method to distribute our questionnaires. First, we shared the survey with friends in various provinces, and then, they invited their friends to complete this survey. Using the convenience sampling method, this study obtained research data during the very beginning of the outbreak of the COVID-19 pandemic from January 23 to 24 February 2020, including a pre-study process. Then, we distributed 2,800 surveys and received 2,724 valid samples, for an effective response rate of 97.3%. After screening out the 3% of samples from the Hong Kong, Macau, and Taiwan areas, our study site mainly focused on mainland China, covering 34 provincial administrative regions. Because of the infectiousness of COVID-19, an online survey was the most convenient and the safest way to collect data about people's perceptions of the pandemic and travel willingness towards trips of different distances. Questions are organized into four main sections in the questionnaire. First, this survey collected the respondents' sociodemographic information, including age, gender, educational background, and monthly income. The questions in the second section asked about eco-environmental values in the COVID-19 scenario (EV-COVID), and the items were rated using 5-point Likert scales ("1" indicated that the respondent strongly agreed with the items, and "5" indicated that the respondent strongly disagreed with the items). This measurement was developed from the brief inventory of values developed by Stern et al. (1993), which includes social-altruistic value, egoistic value and biospheric value. Based on the questions in this scale, we combined the cognition of the COVID-19 pandemic with the current survey questions. Examples include "Once a person is infected with the coronavirus, it will pose a great threat to human life" and "Personal protection can help prevent viral infections".

The questions in the third section measured the respondents' travel desire in the data collection period. More specifically, the participants were asked to answer yes or no regarding their intentions towards trips of different distances, suburban recreation, domestic travel and overseas travel. In the question notes, we informed the participants that suburban recreation refers to leisure activities in public places such as parks and gardens in the countryside within a 1.5-h drive. Domestic travel refers to travel within China, and overseas travel means taking a trip abroad. Finally, we asked respondents to record their living location when completing the survey. In addition to the questionnaire, we collected the confirmed case rate to analyze the regional differences in the choice of travel distance. We collected data on confirmed COVID-19 cases from the website of the "National Health Commission of the People's Republic of China" from January 23 to 24 February 2020.

3.3 Data analysis

We used SPSS software to conduct factor analysis to divide the eco-environmental value in the COVID-19 scenario (EV-COVID) into three dimensions (Cronbach's $\alpha = 0.881$). Then, we divided "the number of people who chose a specific travel type in province A″ by "the total number of participants in province A″ to calculate the proportion of suburban recreation, domestic travel, and overseas travel. This method can reduce the bias involved in using the number of participants for each type of travel. We also divide the geographical division of the whole China area into five parts according to the official administrative division and pandemic severity level. Therefore, the five divided regions are "Hubei province", "adjacent provinces of Hubei", "western regions", "eastern and southern coastal regions" and "northern regions". The layer coloring function in ArcGIS software was applied to draw the distribution of confirmed COVID-19 cases during the data collection period and the spatial distribution patterns of the three kinds of travel willingness (suburban recreation, domestic travel, and overseas travel). More specifically, based on the confirmed cases numbers throughout China, we used six layers to display pandemic severity. Because the maximum and minimum values are so far apart, they cannot be divided equally into six stages. Thus, we used the following ranges to define the six layers: 0–174, 175–399, 400–755, 756–1,345, 1,346–3,000 and above 3,000. For the distribution of the three kinds of travel willingness, we divided the proportion of each choice into five equal layers. Finally, binary logistic regression was conducted to examine the impact of sociodemographic factors (including gender, age, education level, and monthly income), the three factors of EV-COVID, and geographical division factors for predicting different distance travel choices. For each categorical factor, we set a reference group. For the geographical division factor, we set Hubei Province as a reference group because this region suffered from the pandemic most seriously at the beginning of the disaster.

4 Results

4.1 Demographic information and variable description

As shown in Table 1, the sample consisted of 55% females and 45% males. Approximately 36% of respondents were 19–24 years old. Most of the participants had college or undergraduate degrees. In addition, approximately 44% of respondents have less than 3000 RMB monthly income. The factor deduction results of eco-environmental value in the COVID-19 scenario (EV-COVID) are displayed in Table 2.

4.2 Distribution of confirmed COVID-19 cases

Figure 3 shows the distribution of confirmed cases during the survey collection time and this pattern obeys the distance decay theory. Hubei Province had the largest number of confirmed cases, as it suffered from the pandemic most severely during the collection period. The provinces adjacent to Hubei, such as Anhui Province, Henan Province, Shanxi Province, and provinces in the eastern coastal areas suffered less than Hubei. There were fewer confirmed COVID-19 cases in the western and northern regions. In summary, the confirmed cases generally decreased with increasing distance to Hubei Province.

4.3 Spatial distribution of the proportions of willingness for three kinds of travel

From the spatial distribution of the proportions of willingness for the three kinds of travel (Figure 4), it is clear that the largest number of people would choose suburban recreation (Figure 4), while the smallest number of participants would like to engage in overseas travel. This phenomenon obeys the distance decay theory; that is, as the travel distance increases, the willingness to travel decreases. More specifically, the proportion of willingness to engage in suburban recreation reached almost 73%, while the proportion of willingness to engage in overseas travel ranged only from 0% to 25%. In addition, based on the Heihe–Tengchong Line (Hu Huanyong's population demarcation line is also the social and economic demarcation line in China), the willingness distribution on the two sides of this demarcation line has different patterns. For suburban recreation, the proportion ranged from 0 to 0.1538 north of the Heihe–Tengchong Line. However, 15.39%–72.87% of residents who would like to choose this kind of recreation were distributed south of the Heihe–Tengchong Line. For domestic travel, proportions lower than 12.95% were distributed north of the Heihe–Tengchong Line, and proportions higher than 12.96% were distributed in the southern part. Similarly, for overseas travel, people in the southern part had high willingness. Guangdong Province had the highest proportion for each type of travel.

4.4 Predicting the choice of travel distance

4.4.1 Predicting the choice of suburban recreation

Gender has significant impacts on predicting the willingness to choose suburban recreation. The reference category for the gender variable was female (Table 3). The value of Exp(B) was 1.181, which means that men were 1.181 times more likely than women to choose suburban recreation activities. Age also had a significant impact on predicting the choice of suburban recreational activity ($p < 0.1$). Educational background was

TABLE 1 Respondent demographic characteristics.

	Item	Frequency	Percentage (%)
Gender	Male	1,232	45.23
	Female	1,492	54.77
Age	<18 years old	235	8.63
	19–24 years old	974	35.76
	25–34 years old	408	14.98
	35–44 years old	436	16.01
	45–54 years old	414	15.20
	55–64 years old	157	5.76
	>65 years old	100	3.67
Education level	High school or below	628	23.05
	College or undergraduate	1,638	60.13
	Master degree	259	9.51
	postgraduate	199	7.31
Monthly income	<3000 RMB	1,195	43.87
	3,001–5,000	447	16.41
	5,001–10000	471	17.29
	10,001–15000	376	13.80
	15,001–20000	111	4.07
	20,001–30000	83	3.05
	>30,001	41	1.51
Suburban recreation	Yes	773	28.4
	No	1951	71.6
Domestic travel	Yes	589	21.6
	No	2,135	78.4
Overseas travel	Yes	316	11.6
	No	2,408	88.4

also a significant predictor ($p < 0.01$). The categories in the table compared to the reference group (high school, secondary school, or lower) are all significant, and they have negative coefficient values of −0.437, −0.550, and −1.100, respectively. That is, all the groups with an educational background above high school were less likely to choose suburban recreation as their preferred activity than the reference group. For the three factors of EV-COVID, only cognition of COVID-19 had a significant impact on predicting whether people would choose suburban recreation ($p < 0.01$), and the coefficient of this item was a positive value. However, the confirmed COVID-19 case rate was not a significant predictor. Moreover, the division of regions in China had a significant impact on predicting the choice of suburban recreation ($p < 0.01$). The results show that people in the other four parts of China, namely, in the northern regions, provinces adjacent to Hubei, western regions, and eastern and southern coastal regions, had a significantly higher willingness to choose suburban recreation than people in Hubei Province.

4.4.2 Predicting the choice of travel domestically

Age ($p = 0.043$) and educational background ($p < 0.05$) are significant predictors of whether people choose domestic travel (Table 4). In the educational background category, the coefficient of the master's degree group is a negative value (B = −0.719). The Exp (B) value of this item is 0.487, which means that people with master's degrees are 0.487 times less likely than the reference group of people to choose domestic travel. People with an undergraduate degree were also less likely than the reference group to choose this kind of tourism activity. Monthly income had no significant impact ($p = 0.425$). Moreover, similar to the impact on suburban recreation, the cognition of the COVID-19 factor had a significant impact on predicting whether tourists chose domestic travel. In addition, the p-value of the factor of the confirmed COVID-19 case rate was

TABLE 2 EV-COVID factor analysis results.

Dimension	Items	Cronbach's α
Cognition of COVID-19	COVID-19 virus is highly contagious	0.825
	COVID-19 virus has widespread channels	
	No effective drugs are available for this virus	
	It will pose a great risk to human life if infected	
	Personal protection can largely help prevent viral infections	
Cognition of the relationship between human and nature	Humans are wreaking havoc on wildlife	0.829
	Human will continue to suffer "plague disasters"	
	Nature destruction by human would lead to catastrophic consequences	
	The balance of nature is fragile and can easily be disturbed	
	Animals have the same right to live as humans	
	Humans need to respect wildlife although they have the ability to exploit nature	
	Technology and human intelligence and eventually defeat all kinds of viruses	
Anthropocentrism	The so-called "pandemic crisis" is an overstatement	0.721
	Human beings have the right to use or eat any wild animal for their own needs	
	Humans are supposed to be the rulers of the natural world	

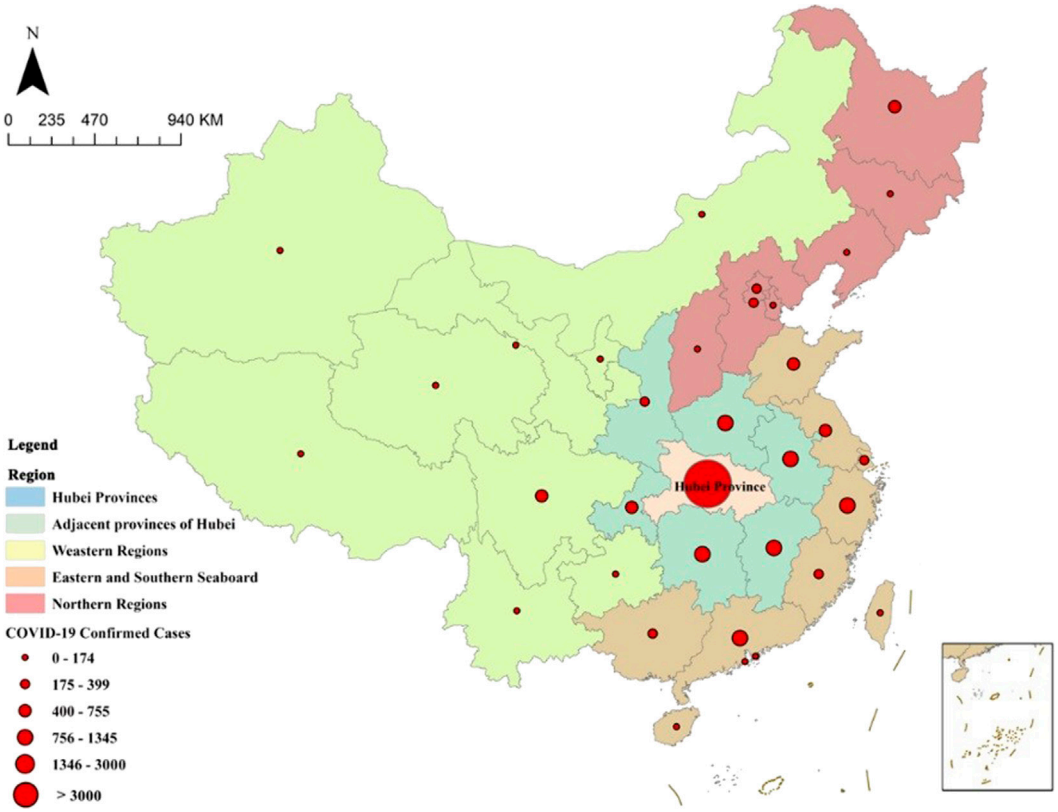
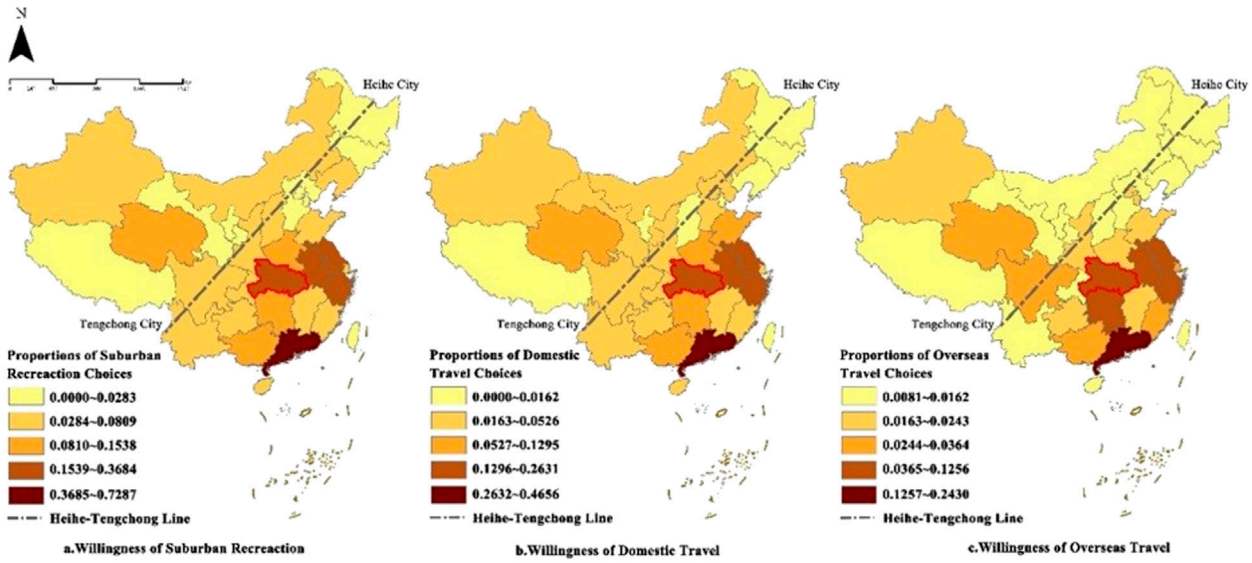


FIGURE 3
Distribution of confrimed COVID-19 cases.



Note: The proportion is calculated by "The number of people who chose a specific travel type in province A" / "the total number of participants in province A".

FIGURE 4
Spatial distribution of three kinds of travel willingness proportion.

TABLE 3 Predicting the choice to suburban recreation.

	Suburban recreation					
	B	SE	Wald	df	Sig	Exp(B)
Gender			3.227	1	0.072*	
Male	0.166	0.093	3.227	1	0.072*	1.181
References group: Female						
Age	−0.06	0.036	2.803	1	0.094*	0.942
Education background			30.989	3	0.000***	
PhD degree	−0.437	0.207	4.469	1	0.035**	0.646
Master degree	−0.550	0.172	10.274	1	0.001***	0.577
Undergraduate degree (or junior college)	−1.100	0.205	28.899	1	0.000***	0.333
References group: high school, secondary school or lower						
Monthly income	−0.015	0.035	0.187	1	0.666	0.985
Cognition of COVID-19	0.526	0.094	31.059	1	0.000***	1.692
Cognition of the relationship between human and nature	0.029	0.095	0.090	1	0.764	1.029
Anthropocentrism	0.082	0.059	1.949	1	0.163	1.086
confirmed COVID-19 cases rate	0.000	0.000	1.153	1	0.283	1.000
Division of regions			24.747	4	0.000***	
Northern regions	0.695	0.199	12.150	1	0.000***	2.003
Adjacent provinces of Hubei	0.617	0.208	8.829	1	0.003**	1.854
Western regions	0.900	0.190	22.503	1	0.000***	2.459

(Continued on following page)

TABLE 3 (*Continued*) Predicting the choice to suburban recreation.

	Suburban recreation					
Eastern and southern seaboard	0.835	0.267	9.782	1	0.002**	2.305
References group: Hubei province						
Constant	−3.585	0.472	57.796	1	0.000***	0.028
Cox and Snell R Square	0.078					
Nagelkerke R Square	0.112					
Hosmer and Lemeshow Test	22.423					

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

TABLE 4 Predicting the choice to domestic travel.

	Domestic travel					
	B	SE	Wald	df	Sig	Exp(B)
Gender			0.077	1	0.782	
Male	0.028	0.101	0.077	1	0.782	1.028
References group: Female						
Age	−0.081	0.040	4.108	1	0.043**	0.922
Education background			38.498	3	0.000***	
PhD degree	−0.196	0.213	0.845	1	0.358	0.822
Master degree	−0.719	0.181	15.780	1	0.000***	0.487
Undergraduate degree (or junior college)	−1.156	0.219	27.851	1	0.000***	0.315
References group: High school, secondary school or lower						
Monthly income	−0.031	0.039	0.636	1	0.425	0.97
Cognition of COVID-19	0.382	0.101	14.249	1	0.000***	1.466
Cognition of the relationship between human and nature	0.107	0.103	1.060	1	0.303	1.112
Anthropocentrism	0.090	0.065	1.950	1	0.163	1.094
confirmed COVID-19 cases rate	0.000	0.000	3.356	1	0.067*	1.000
Division of regions			21.814	4	0.000***	
Northern regions	0.583	0.216	7.273	1	0.007**	1.792
Adjacent provinces of Hubei	0.397	0.228	3.034	1	0.082*	1.487
Western regions	0.724	0.206	12.377	1	0.000***	2.062
Eastern and southern seaboard	1.109	0.277	16.049	1	0.000***	3.032
References group: Hubei province						
Constant	−3.289	0.506	42.255	1	0.000***	0.037
Cox and Snell R Square	0.058					
Nagelkerke R Square	0.09					
Hosmer and Lemeshow Test	15.389					

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

0.067, which was less than 0.1. This item is a significant predictor. The results indicate that the division of regions in China is also a significant predictor for the choice of domestic travel. Among the four compared groups, compared to people in the other three regions, people in the eastern and southern coastal regions had the highest willingness to engage in domestic travel. More

TABLE 5 Predicting the choice to overseas travel.

	Overseas travel					
	B	SE	Wald	df	Sig	Exp(B)
Gender			3.648	1	0.056*	
Male	0.246	0.129	3.648	1	0.056*	1.278
References group: Female						
Age	−0.051	0.048	1.104	1	0.293	0.951
Education background			7.157	3	0.067*	
PhD degree	0.228	0.273	0.702	1	0.402	1.257
Master degree	0.012	0.234	0.002	1	0.960	1.012
Undergraduate degree (or junior college)	−0.407	0.282	2.085	1	0.149	0.666
References group: High school, secondary school or lower						
Monthly income	0.165	0.045	13.618	1	0.000***	1.179
Cognition of COVID-19	0.402	0.129	9.673	1	0.002**	1.494
Cognition of the relationship between human and nature	−0.090	0.129	0.488	1	0.485	0.914
Anthropocentrism	−0.118	0.078	2.294	1	0.130	0.889
confirmed COVID-19 cases rate	0.000	0.000	1.314	1	0.252	1.000
Division of regions			10.459	4	0.033**	
Northern regions	0.009	0.251	0.001	1	0.971	1.009
Adjacent provinces of Hubei	0.026	0.263	0.010	1	0.921	1.026
Western regions	0.33	0.23	2.051	1	0.152	1.390
Eastern and southern seaboard	0.703	0.318	4.874	1	0.027**	2.020
References group: Hubei province						
Constant	−3.439	0.603	32.551	1	0.000***	0.032
Cox and Snell R Square	0.024					
Nagelkerke R Square	0.046					
Hosmer and Lemeshow Test	11.309					

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

specifically, people in these regions were approximately 3 times more willing than people in the Hubei region to travel domestically.

4.4.3 Predicting the choice of travel overseas

Gender has a significant impact on predicting the willingness to travel overseas (Table 5). Similar to the other two types of travel, educational background is also a significant factor. However, unlike the other two types of travel, monthly income has a significant impact on predicting whether people choose overseas travel. The coefficient value is 0.165, which means that people are more likely to choose the overseas travel type when they have a higher monthly income. In addition, the *p*-value of the cognitive value of the COVID-19 factor is 0.002, which is less than 0.1. Moreover, cognition of the relationship between humans and nature, anthropocentrism, and confirmed COVID-19 case rate factors have no significant impact. In addition, the odds of choosing overseas travel are approximately 2 times higher for people in the eastern coastal region than for people in Hubei Province ($p = 0.027$).

5 Discussion and conclusion

This study has identified the objective fact that COVID-19 confirmed cases decreased with increasing distance from Wuhan city, which obeys the distance decay theory pattern. However, the travel willingness for trips of different distances did not follow the distance decay theory. By applying quantitative methods to examine the personal characteristics, situational and location factors that predict the willingness to make choices regarding three different travel distances—suburban recreation, domestic travel, and overseas travel—the study has also shown that similar factors for predicting

the willingness to make trips of three kinds of travel distances are educational background, cognition of COVID-19, and geographical division. However, income, gender and confirmed cases of COVID-19 play different roles in prediction.

5.1 Theoretical implication

5.1.1 The spatial distribution of confirmed COVID-19 cases obeys distance decay theory

Most COVID-19 confirmed cases occurred in Wuhan city, and the number of confirmed cases decreased as the distance to Wuhan city increased, which obeys the distance decay theory (Taylor, 1971). Because of the highly contagious and widespread features of the coronavirus, people are more easily infected by this kind of disease *via* contact with pathogens (Chen et al., 2020). In addition, the very beginning of the COVID-19 outbreak in Wuhan city coincided with the Chinese New Year, during which time people's movement increased significantly across China. The large floating population and convenient transportation system in Wuhan cause a high frequency of contact with people, goods, and transportation in close proximity to Wuhan and therefore a high probability of being infected (Ning et al., 2021). However, with the tremendous efforts of the Chinese government, policies on mandatory mobility restrictions and health and safety defences, such as lockdown and home quarantine measures, largely controlled the spread of the disease. Therefore, the distribution of confirmed cases decreased from the point of Wuhan city. This was also validated in other studies in which the spread of COVID-19 followed Tobler's first law of geography, showing a proximity spreading pattern (Wang et al., 2020). Our results are consistent with many facts that obey the rules of distance decay theory. For example, the manufacturing industry in China is highly concentrated in developed coastal cities, such as those in the Pearl River Delta, Yangtze River Delta, and Bohai Rim regions. In addition, with the increase in distance from developed coastal cities, the number of industries gradually decreases (He et al., 2007).

5.1.2 Travel willingness disobeys the distance decay theory

For travel choice willingness regarding the three different distances in China, this pattern does not represent the highest willingness in Wuhan city, the region most seriously affected by COVID-19 in China. With the widespread nature of this disease, the strictest restrictions were implemented in Wuhan. Therefore, residents in this region faced restrictions regarding contact with others and population movements. According to the forbidden fruit effect, potential tourists in Wuhan would have the greatest desire to go outside for outdoor and travel activities. However, people who have a high willingness to choose suburban recreation, domestic travel, and overseas travel are almost fully distributed in the southern areas of the Heihe–Tengchong Line, instead of concentrating on Wuhan city.

From the perspective of distance decay theory, our research results of travel intention patterns that do not match the distance decay are in accordance with some previous psychosocial research findings. For example, a nationwide survey was conducted on the psychological state of the population to explore the mental health status and spatial patterns of different regions and groups of the public during the pandemic (Su et al., 2020). The results indicated that at the regional level, the 31 provinces and regions show an overall spatial distribution pattern of a low sense of tension in the northeast and a high level of state tension in the southwest (Su et al., 2020). This suggested that geographical distance from Hubei Province is not a solid factor that significantly influences people's psychological situation, probably because the rapid development of the transportation network has caused the spatial sense of competent cognition to compress the spatial proximity effect under geographical distance. However, our results are not consistent with those of other studies (Xiao et al., 2021). Xiao et al. (2021) found that the relationship among visitors' place dependence, place identity, and spatial proximity follow the distance decay rule, and visitors' sense of place dependence and place identity decreases with increasing distance from Jiuzhai Valley National Park.

From the other perspective of spatial clustering, it can be concluded that the high values of the proportions of willingness to engage in the three travel types among potential tourists in China are all distributed south of the Heihe–Tengchong Line. There are two different reasons for this phenomenon. On the one hand, the confirmed COVID-19 cases show a core-periphery structure, and the regions south of the Heihe–Tengchong line include the "core" area, Hubei Province. People who have high restrictions have a high willingness to make trips. On the other hand, the data in this study were collected at the beginning of the pandemic period and most people wanted to escape from the place where they lived to avoid serious pandemic effects. Our results of travel willingness patterns can be verified from previous studies. People in Guangzhou, Jiangsu, and Zhejiang Provinces have a high willingness to travel overseas. This aligns with earlier research showing that the Yangtze River Delta cluster and the Pearl River Delta cluster consisted of hotspot areas of inbound tourist arrivals in 1999 and 2006 (Yang and Wong, 2013). Shanghai and Guangzhou are major gateway cities; therefore, they have high accessibility to inbound tourists. Similarly, the convenient transportation system of the Pearl River Delta and Yangtze River Delta clusters facilitates residents' high willingness for suburban recreation, domestic travel, and overseas travel. In addition, the study pointed out that richer individuals have higher domestic tourism demand; moreover, for urban residents in the eastern regions, the income factor plays a more important role in determining domestic tourism demand (Yang et al., 2014). Residents in the eastern part of China have an average income higher than that of residents in other regions, which can explain the phenomenon that people in eastern and southeastern China have a high willingness to travel different distances.

5.1.3 The role of personal characteristics, scenario factors and location in predicting travel willingness

The factors of education level, cognition of COVID-19, and geographical division all have significant impacts on predicting

the choice of the three kinds of travel distances. The age factor had significantly negative impacts on predicting the choices of suburban recreation, domestic travel, and overseas travel. That is, older residents have a low willingness to choose outside activities. The older group of people has a higher perception of travel distance than other groups of people (Cao et al., 2019; Cao et al., 2020). Regarding geographical division factors, the eastern and southern coastal areas of China have significant effects on predicting the choice of all three kinds of travel distances and have the highest possibility times compared to Hubei Province. In particular, among these four geographical regions, only the eastern part of China has two times more willingness to travel overseas than Hubei Province. This has been verified in a previous study; residents in the coastal area of China have more options to access their preferred destinations, and they have a higher willingness than people in the inland areas of China (He, 2011). Educational background was also a significant factor for predicting the choice of the three kinds of travel distance. It is predicted that people with lower education would have higher possibilities of choosing outside travel activities. Because highly educated residents have a relatively high level of social responsibility (Crowther and Vilke, 2018), they have a high awareness of keeping rules. Therefore, instead of travelling, they would prefer to stay at home to prevent the spread of the disease. However, people with lower educational backgrounds have lower awareness of social responsibility and higher willingness to travel. The income factor has significant effects only on predicting the choice of overseas travel. In addition, people with high income have a high possibility of choosing to travel abroad, which is also in accordance with a previous study (McKercher, 2008b). It is generally believed that travelling abroad costs more than domestic and suburban travel. At the beginning of the COVID-19 pandemic in China, people who could afford the cost of overseas travel would choose this kind of trip to avoid the serious effects of the pandemic. Moreover, men prefer overseas travel more than women do, which aligns with the study conducted by Ho and McKercher (2014). However, for the domestic choice, there were no significant differences between men and women.

The factor of EV-COVID–cognition of COVID-19—has significant impacts on predicting the three kinds of travel distances. As the value of "cognition of COVID-19" increases, the possibility of choosing the three kinds of travel distance increases. We conducted some online interviews with participants to understand the reasons. The interview results showed that many people have the habit of relaxing *via* suburban recreation. They were willing to engage in this kind of travel at the beginning of the pandemic even though there were high risks. Most people also held the opinion that it was safe to make good preventive strategies when traveling outside. In addition, when the value of the "cognition of COVID-19" factor increased by one unit, the possibility of choosing overseas travel increased the most. At the beginning of the pandemic in China, the COVID-19 situation abroad was better than that on the mainland. People wanted to escape from their homes to avoid the pandemic. Previous studies have also revealed that self-value and attitudes play a significant role in tourists' decision-making process (Huang et al., 2018; Balaji et al., 2019; Li W. et al., 2021). In studies that examined tourists' intention and willingness to choose green hotels during their trips and to pay a premium for this kind of hotel, personal norms have been found to strengthen green hotel attribute perceptions (Balaji et al., 2019), and attitudes towards green hotels have been found to have a positive impact on purchase intentions (Yadav et al., 2018; Balaji et al., 2019). In addition, research has investigated whether past experiences and place identity, including self-value, have significant effects on travelers' decisions (Li W. et al., 2021).

5.2 Practical implications

Our study deepens the understanding of the impacts of personal characteristics, situational factors, and geographical division factors on predicting residents' willingness to travel different distances in the context of an unexpected health crisis. The findings of this study provide practical recommendations for the recovery of recreation and tourism activities. First, this study provides a factual basis for the government to guide tourists' travel choices under different distances. Against the backdrop of pandemic normalization, because of the high spread ability of virus, residents need to reduce their large-scale gatherings. The distribution of the three kinds of travel willingness showed that the highest preference was for suburban recreation. Tourism departments can develop more recreational activities in suburban areas, such as camping. Second, from the travel safety perspective, managers can make rules to encourage suburban recreation activities. Third, as mentioned in the results, the value of understanding COVID-19 has effects on predicting travel types. Therefore, it is necessary to enhance the public's awareness of pandemic severity and educate people regarding the importance of self-protection from the virus. For the next emergency crisis recommendation, a rigorous and precise prevention and control mode at the very beginning of crises is adaptive in China. More specifically, the results of this paper indicate that cognition of COVID-19 has significant impacts on travel choice intentions, which has some crucial implications for public awareness and education work. Considering residents' health problems, it is better to enhance residents' cognition of crises so that they make sensible travel choices. Finally, the results of this study provide some implications for tourism market forecasting for when we finally overcome the COVID-19 period.

5.3 Limitation

The main limitation of this study lies in the sample representation because of the snowballing collection method. The participants mainly consisted of college students, who are young, have a high educational level and have a low income. Further research needs to pay more attention to the percentages of different participants. Additionally, it needs to more closely examine the links between the system of value and travel

willingness to further understand tourists' psychology and behaviours, which would be more beneficial for tourism development against the backdrop of pandemic normalization. Moreover, further research might explore residents' actual travel choices to compare the differences between intentions and actual behaviors, which would be more beneficial for tourism development in the tourism recovery period.

Data availability statement

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

Author contributions

YZ and MW have the same contributions, KW is in charge of software and validation. KW contributed to formal analysis and supervision to the contributions.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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