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Research article

MEASURING RISK PERCEPTION AND RISK COMPENSATION AMONG LOCAL RESIDENTS TOWARD COVID-19 IN THE TOURISM SANDBOX ISLANDS: COMPARATIVE EVIDENCE FROM THE PHUKET SANDBOX AND SAMUI PLUS MODEL IN THAILAND

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Since Thailand is a tourism-dependent country, its economy suffered tremendously during the COVID-19 lockdown. In a pioneering effort to re-open the country, two islands (Phuket and Koh Samui) began to welcome fully vaccinated international visitors in July 2021 under the "Phuket Sandbox"[1] and "Samui Plus Model." Even though the sandbox programs were found to create more income and some benefits for tourism businesses, they also generated concern among local people about contracting such an infectious disease as COVID-19.

The aim of this study was to measure perception of COVID-19 infection among local residents due to contacts with international tourists.

Using secondary data from a survey of 400 local residents living on the two islands, monetary compensation under the contingent valuation methods (CVM) and risk perception scale of 0–10 were analyzed to get an indication of the level of local residents' risk perception toward COVID-19 possibly being transmitted by international tourists.

Our results show that the risk perception was found to be higher among those who believed that the coronavirus could possibly result in death. Older individuals, especially females, and those with higher incomes seemed to have a higher risk perception. Residents who were working in the tourism sector were found to have a lower risk level than those who were working in other branches.

There were also discordances in terms of education level and risk perception between residents in two islands. The paper suggests that awareness of residents' risk perception and effective communication regarding such risk perception should be put in place to ensure appropriate practices that affect local residents in such sandbox areas in the future.

Keywords: *risk perception, contingent valuation method, tourism sandbox, local residents, COVID-19, Thailand.*

The World Health Organization (WHO) first declared COVID-19 a global health emergency in January 2020, and on March 11 it declared the viral outbreak to be a pandemic, the highest level of health emergency. As infections began rising sharply in late February 2020, governments in many countries took unprecedented steps in March 2020 to lock down social activities in order to contain the spread of the pandemic. Nevertheless, due to the highly contagious nature of the virus, the pandemic was considered one of the biggest global crises, resulting in unprecedented economic and social consequences. In response to the increasing number of COVID-19 cases and related deaths, many countries all over the world implemented non-pharmaceutical physical interventions to stop the spread of the virus, such as nationwide lockdowns, restrictions on public gatherings and movements, and restrictions on the operation of certain contact-intensive sectors. While these measures slowed down the spread of the pandemic, they also caused a significant loss of income or,

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[1] Editorial note: Phuket Sandbox is the program for visiting Phuket without quarantine

even worse, a complete loss of jobs for many individuals and businesses.

Research shows that the impacts of COVID-19 have been both massive and unequal across and within countries. National economies have experienced either single- or double-digit contractions depending on the number of infections, fatality rate, duration and stringency of measures to contain the spread of the pandemic, missed work and job losses, changes in consumer behavior, as well as resilience of particular economies and societies [1–3]. Severe income and job losses have been more common among lower-income population groups, low-skilled workers, low-education workers, informal workers, and workers in hard-hit sectors, especially in the tourism and hospitality sectors [4–6]. As no surprise, the pandemic has plunged millions of people into poverty [7, 8].

Thailand was the first country in the world to confirm a case outside China, with millions of people across the world affected later by the COVID-19 pandemic [9]. From a full analysis of the impacts of the COVID-19 pandemic on Thailand, Sudsawasd et al. found that Thailand's economy was hit hard by the pandemic. The country's GDP was predicted to fall by 13.66 %.

However, with over 40 million tourists visiting each year (before the COVID-19 pandemic), Thailand is one of the world's major tourist destinations and is ranked among the top 10 countries with the highest yearly tourist arrivals. Estimates of tourism revenue that directly contributed to the GDP ranged from one trillion baht in 2013 to 2.53 trillion baht in 2016, approximately 9.00 to 17.70 % of GDP, respectively. Sudsawasd et al. also found that the most important transmission channels impacting the negative economic shock from COVID-19 came mainly from the loss of inbound tourism demand, which accounted for 61.42 % of the total impact, highlighting the importance of the tourism sector and tourism inflows on the Thai economy.

On the labor market side, the COVID-19 pandemic also led to a sharp decline in tourism activity, resulting in widespread job losses across various segments of the tourism industry in Thailand. Studies indicate that hotels, restaurants, tour operators, and other tourism-related businesses were forced to lay off or furlough employees due to plummeting visitor arrivals and revenue losses [9–11]. The pandemic exacerbated vulnerabilities among these workers, with many facing income loss, a lack of social protection, and limited access to healthcare services [12].

To mitigate the negative impacts of border restrictions, the Thai government announced the re-opening of two tourism destination islands, namely, 1) Phuket and 2) Koh Samui (Samui Island), under the names "Phuket Sandbox" and "Samui Plus", respectively.

Phuket is Thailand's largest island, located in the Andaman Sea of the west coast of Thailand. It offers a diverse range of activities, including snorkeling, diving, elephant trekking, and exploring its many temples and cultural sites.

Koh Samui is an island located in the Gulf of Thailand, known for its palm-fringed beaches, coconut groves, and luxury resorts. Both islands are popular tourist destinations in Thailand, known for their stunning beaches, vibrant nightlife, and rich cultural heritage. A map of Phuket and Koh Samui is shown in Figure 1 below.

Figure 1. Map of Phuket and Koh Samui, Thailand

In more detail, the Phuket Sandbox and Samui Plus are unique tourism destination initiatives by the Thai government to gradually re-open the country's borders to international travelers amidst the COVID-19 pandemic. The islands were opened to fully vaccinated travelers from selected countries with a low to medium level of risk of COVID-19 transmission. International visitors had to be fully vaccinated with vaccine(s) approved by the Ministry of Public Health of Thailand and had to first obtain a Certificate of Entry (COE) from the Thai embassy or consulate in their home country. Upon arrival at Phuket (or Koh Samui) International Airport, travelers had to undergo health screening, including a COVID-19 test. If the test result was negative, tourists were free to travel within the island without quarantine restrictions. After the first week, they were free to travel to other destinations in Thailand. Overall, the Phuket Sandbox and Samui Plus programs aimed mainly to revive Thailand's tourism industry, especially business operators and tourism workers, while prioritizing public health and safety of tourists and the islands' residents. The two destinations were considered "sandboxes" to provide a framework for re-opening borders in a controlled manner, allowing international tourists to enjoy the beauty of Thailand while minimizing the risk of COVID-19 infection.

Even though tourism bubbles on both islands were seen as beneficial for the tourism sector, especially among tourism businesses and related workers, concerns and anxieties regarding such an infectious disease were likely to be felt among local residents as opening up the islands could possibly lead to a larger outbreak.

There was a concern that local residents might feel anxious about the potential risk of infection due to tourism activities, especially in destinations with limited healthcare facilities or among residents that were especially vulnerable to the effects of the virus. Understanding how individuals perceived the risk associated with COVID-19 was, therefore, crucial in understanding how the government should balance economic benefits from the tourism sandbox (Phuket Sandbox and Samui Plus programs) and the costs borne by the local community from the higher risk of infection. Understanding this tradeoff between health security and economic security in such a time of crisis should provide a valuable insight into implementing effective economic and public health interventions as well as communication strategies in such times [13].

The aim of this study was to measure community risk perceptions toward COVID-19 among local people by using pieces of evidence from the Phuket Sandbox and Samui Plus programs, taking advantage of the unique situation that the sandboxes offered in terms of the tradeoff between health security and economic security.

Using secondary data from the survey of 400 local people living on both islands for the duration of one month (July 2020), two methods are used to measure the community risk perception. First, the monetary compensations under the contingent valuation methods (CVM) were computed to reflect the level of local residents' risk perception toward COVID-19 transmitted by international tourists. Second, a scale of subjective risk perception of 1–10 was used to assess residents' preferred situation regarding the tradeoff between the risk of infection and the level of openness of their island.

This research also classifies residents' risk perception by socioeconomic variables such as sex, education level, income level, working / not working in the tourism sector, and having / not having elderly or family members in the household with one of the risky comorbidities, including obesity, hypertension, diabetes, cardiovascular disease, cerebrovascular disease, respiratory disease, kidney disease, and malignancy. This analysis also classifies risk perception towards two types of case according to the severity of the COVID-19 infection, that is, "getting infected, but recovering" and "getting infected and dying".

Literature Review on Community Risk Perception of COVID-19. Risk perception plays a significant role in shaping individual behaviors and public health responses to

communicable diseases. Understanding how communities perceive the risks associated with these diseases is essential for forming effective public health interventions. This literature review aims to examine the existing research on risk perception concerning communicable diseases in general, including factors influencing perception, its impact on preventive behaviors, and implications for public health strategies. Additionally, factors associated with risk perception towards COVID-19 are explored.

Several factors influence risk perceptions regarding communicable diseases. Individual characteristics such as age, sex, education level, socioeconomic status, and health literacy contribute to variations in risk perception [14]. In many cases, individuals with higher incomes may have better access to healthcare, resources, and information about preventive measures against communicable diseases. This can lead to the perception that they are less susceptible to such diseases, thereby lowering their perceived risk. Conversely, individuals with lower incomes may have limited access to healthcare, endure poorer living conditions, and may be more likely to work in jobs with higher exposures to infectious agents. As a result, they may perceive a higher risk of contracting communicable diseases [15, 16].

Regardless of income level, education and awareness about communicable diseases significantly influence risk perception. Individuals with higher education levels may have a better understanding of the transmission routes, preventive measures, and severity of communicable diseases, leading to more accurate risk perceptions. Research by Smith et al. indicates that higher levels of education are associated with a better understanding and perception of communicable disease risks [17]. Educated individuals tend to grasp the severity and transmission dynamics of diseases, leading to more informed preventive behaviors. Studies by Berkman et al. also suggest that education enhances health literacy, enabling individuals to comprehend health information, including risks associated with communicable diseases [18]. Higher health literacy, therefore, fosters accurate risk perception and the adoption of preventive measures.

One study also suggests that age can influence risk perception towards communicable diseases, with older individuals often perceiving a higher risk due to factors such as weakened immune systems and increased vulnerability to severe outcomes. However, the relationship between age and risk perception can be complex and may vary depending on the specific disease context and individual circumstances [19].

Risk perceptions of communicable diseases can also be influenced by sex differences between males and females. For example, in terms of biological differences, hormonal differences between males and females can impact immune responses and susceptibility to certain diseases. For example, estrogen has been shown to enhance immune responses in females, potentially providing them with better protection against certain infections compared to males. Conversely, hormonal fluctuations during menstrual cycles may also influence susceptibility to certain diseases [20]. Studies consistently show that women tend to utilize healthcare services more frequently than men. This higher healthcare utilization may lead to greater awareness of communicable diseases and associated risks among females [21]. Societal norms and cultural expectations surrounding sex-specific roles may also influence how individuals perceive and respond to disease risk. For example, stereotypes about masculinity may discourage men from acknowledging vulnerability or seeking help for health concerns [22].

Additionally, cultural beliefs, media exposure, trust in health authorities, and previous experiences with infectious diseases shape how individuals perceive the risk of communicable diseases [23]. Studies have shown that perceived susceptibility and severity of the disease, as well as the perceived efficacy of preventive measures, influence risk perception [24].

The COVID-19 pandemic posed significant challenges globally, requiring effective public health responses to mitigate their impacts. Understanding community risk percep-

tion regarding COVID-19 is crucial for informing public health strategies and interventions aimed at promoting preventive behaviors and reducing transmission rates. This literature review examines existing research on community risk perception concerning COVID-19 highlighting key factors influencing perception, its impact on preventive behaviors, and the implications for public health responses.

In many recent articles, numerous factors are found to influence community risk perceptions regarding COVID-19. Similar to other commutable diseases that existed in the past, individual characteristics such as age, sex, education level, socioeconomic status, and health literacy play a role in shaping risk perception. Additionally, cultural beliefs, media exposure, trust in government and health authorities, and previous experiences with infectious diseases influence how communities perceive the risk of COVID-19 [26, 27]. Studies have shown that individuals with higher perceived susceptibility and severity of COVID-19 are more likely to engage in preventive behaviors such as wearing masks, practicing social distancing, and seeking vaccination [26].

Existing research on community risk perception of COVID-19 has focused on local residents in tourism areas, focusing on key factors influencing perceptions and the implications for public health strategies and tourism management. One such factor is that tourism-dependent communities often have a heightened risk perception due to the potential for virus transmission associated with travel and tourism activities. Residents may perceive tourists as vectors of disease transmission, leading to concerns about their own health and safety [28]. Second, the economic dependence on tourism exacerbates risk perception among local residents, as livelihoods are closely tied to the tourism industry. Fear of economic instability and job loss may conflict with concerns about public health, leading to complex risk assessments [29, 30].

Government responses to the pandemic, including travel restrictions, quarantine measures, and lockdowns, can also shape community risk perception. Residents' perceptions of the effectiveness and fairness of these policies influence compliance and attitudes toward tourism [31].

In this case, community engagement and trust-building efforts between residents, tourism stakeholders, and local authorities are essential for addressing risk perception. Transparent communication, collaboration, and involvement in decision-making processes foster trust and promote collective resilience [32, 33].

Measuring risk perception. The Contingent Valuation Method (CVM) is widely used to measure how individual perceive risk associated with hypothetical or known threats. The Contingent Valuation Method (CVM) is a popular method in which respondents (local residents) were asked to state their preferences in hypothetical or contingent situations. The CVM is widely used in economic analysis to assess individuals' willingness to accept (WTA) a particular good or service, including the valuation of intangible benefits or costs, such as environmental quality or risk reduction. While the CVM is primarily used for valuing environmental goods and services, it can also be used to measure risk perception by framing hypothetical scenarios in which individuals are asked to express their willingness to pay to mitigate or avoid certain risks or their willingness to accept compensation when an adverse outcome takes place [34].

The willingness to accept (WTA) specifically refers to the minimum amount of compensation an individual or community is willing to accept in exchange for bearing the risks associated with a hazard or threat. This literature review explores the interplay between willingness to accept and community risk perception, examining how perceptions of risk influence people's decisions regarding risk acceptance and mitigation. Willingness to accept and community risk perception are closely intertwined constructs that play a significant role in shaping individuals' and communities' responses to hazards and threats. By examining their relationship, this review highlights the importance of considering both constructs in risk management and

communication efforts aimed at enhancing community resilience[2] [13].

Another measure that is widely used to assess the subjective assessment of risk perception is the Subjective Risk-scaling. This scaling is often used to measure subjective well-being such as overall life satisfaction or the level of happiness, where the given number is subjective to individual's judgment of overall evaluation of the variable that is the result of many attributes. When used as a continuous variable, this scale is measured in "1 to 7", "1 to 10", or " 0 to 10" scale, where the latter has the mean and the median exactly at "5" [35]. Figure 2 shows the conceptual framework of this analysis.

Materials and methods. This paper uses secondary data provided by the Program Management Unit for Competitiveness, Ministry of Higher Education, Science Research, and Innovation. The survey on islands' residents was part of the integrated study on the impacts of Phuket Sandbox and Samui Plus initiatives on community, tourism businesses, and tourists. This part of the survey was a random survey of local residents during October – November 2021, after the sandboxes had been implemented for five months. Data from a total of 400 samples of local residents aged 15 and above were collected in Phuket and Koh Samui, 200 representative random samples from each island. Proportional random samples were drawn based on the district population size in Phuket and Koh Samui. The validity tests were piloted in both islands (20 samples each) to ensure quality of the questionnaires.

Questions on socio-economic backgrounds on of respondents, such as sex, age, education level, income, working / not working in tourism sectors, and having / not having elderly or members with one of the seven risky diseases, were asked in the questionnaires.

The estimated willingness-to-accept value would provide insights into individuals' risk perception and the value they place on risk reduction or mitigation. Policymakers could use this information to prioritize risk management strategies, allocate resources efficiently, and design targeted interventions to address public concerns and enhance risk communication in the two islands. With this objective in mind, two measures were used to assess local residents' risk perception, the Contingent Valuation Method (CVM) and the Subjective Risk-scaling of 0 to 10. To identify the compensation

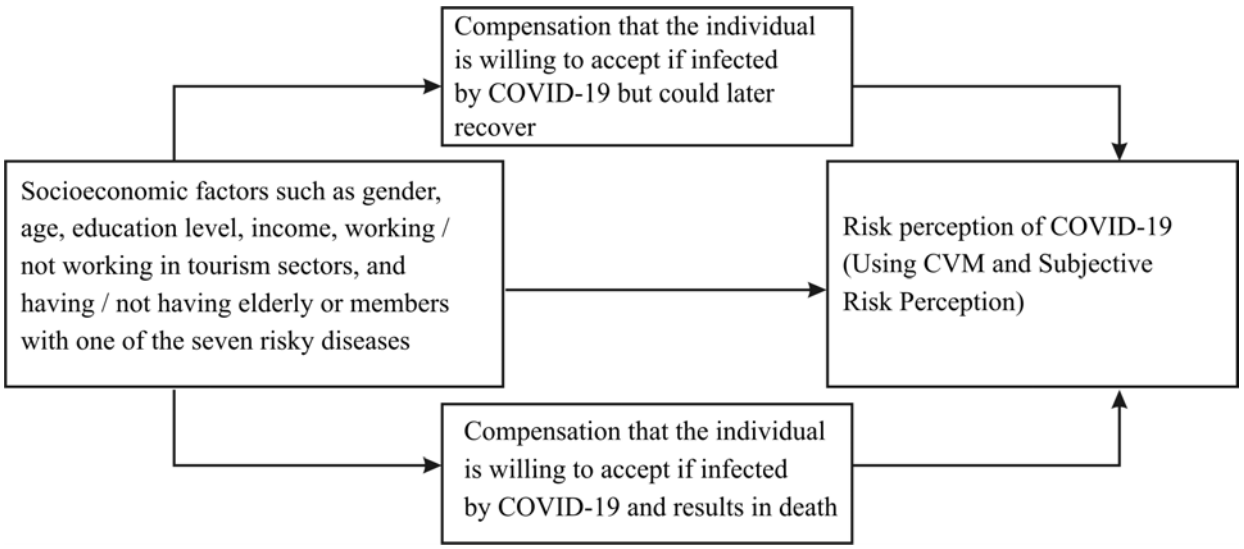

Figure 2. Conceptual framework of the conducted analysis

[2] Slovic P. Perception of risk. *Science*, 1987, vol. 236, no. 4799, pp. 280–285. DOI: 10.1126/science.3563507

that the respondent was willing to accept using CVM, local residents were presented with a hypothetical scenario and asked a series of questions to elicit their risk perception and willingness to accept in exchange for bearing the risks associated with COVID-19 infection. The participants were asked to express their demand of willingness to accept for two risk scenarios, 1) getting infected, but recovering, and 2) getting infected and dying. In the first scenario, each respondent was presented with different monetary compensation amount, starting with 20,000 Baht. If the respondent accepted the starting amount of 20,000, he / she was then presented with a lower offer of 10,000 Baht. If the respondent accepted 10,000, the risk compensating amount was then concluded to be 10,000 Baht. If the respondent did not accept the initial offer of 20,000 Bath, the offer went up to 40,000 and the process went on with the incremental amount of 20,000 Baht until the last offer of 100,000. If the respondent still did not accept the last offer, he / she was then asked to indicate the amount he / she was willing to accept. The final amount that the respondent was willing to accept from this process was then used as the respondent's 'risk value' using CVM. Similar procedure was carried out to identify the 'risk value' in the case of death, where the starting offer was 200,000 Baht and the final offer was 1,000,000 Baht.

For the Subjective Risk-scaling, residents were asked to rate their risk perception on a scale of 0 to 10. Island residents were asked to identify their preferred situation regarding the tradeoff between the risk of infection and the level of openness of the island to tourists. "0" indicated one extreme, in which the island was fully open for tourists with no health restrictions that could be extremely unsafe from COVID-19, and "10" indicated the other extreme, in which strict health rules were applied to keep everyone safe from COVID-19 with extreme limits to tourist activities. The mean and the median of this scale were "5," where both aspects were moderate.

Descriptive data were analyzed to show the differences of socio-economic backgrounds, the monetary compensation using CVM, and the subjective risk-scale of the residents in the two islands towards the two scenarios (sickness, but fully recovered and death from COVID-19). The statistical differential effects of sex, age, education level, income, working/not working in tourism sectors, and having/not having elderly or members with one of the seven risky diseases were estimated using Analysis of Variance (ANOVA), where F statistics and p-values were used to indicate the statistical differences of monetary compensations and risk levels among residents with different backgrounds for residents in both islands. Statistical confidence levels of 90, 95, and 90 % are used in the analyses.

Results and discussion. Table 1 below shows descriptive statistics of the surveyed data. It can be observed that the majority of the survey population were female (62.5 % in Phuket and 51.5 % in Koh Samui) with relatively higher levels of education (bachelor's degree and above). However, the majority of their income levels were relatively low, ranging from around 10,000 to 19,999 Baht per month. More than half (56.5 % in Phuket and 58 % in Koh Samui) worked in the tourism sector, with only a small proportion having elderly members or members with one of the risky seven diseases (21.5 % in Phuket and 17 % in Koh Samui).

Figure 3 shows the monetary compensation (classified by sickness and death) the residents in both islands were willing to accept from the government should COVID-19 be transmitted by international tourists. There are two steps of questions. It can be seen that the risk compensation is significantly higher if COVID-19 infection causes those residents to die (ranging from 56,875 baht to around 762,903 baht in Phuket and from 43,450 baht to around 367,000 baht in Koh Samui). It is also evident that the residents in Phuket report demanded higher monetary compensation for risk than those in Koh Samui. Statistical testing (F-test) conducted between both islands, as shown in Table 2, reveals that risk compensation (risk perception) is statistically different between residents in both islands, with a 95 % confidence level.

Table 1

Descriptive Sample Data Classified by Tourism Sandbox Islands
(Phuket Sandbox and Samui Plus)

Variables	Phuket (Phuket Sandbox)		Koh Samui (Samui Plus)	
	Observations	Percentage	Observations	Percentage
Total Observation	**200**	**100 %**	**200**	**100 %**
Sex				
Male	75	37.5 %	97	48.5 %
Female	125	62.5 %	103	51.5 %
Age				
18–24 years old	30	15.0 %	30	15.0 %
25–34 years old	77	38.5 %	101	50.5 %
35–49 years old	70	35.0 %	45	22.5 %
50 years and above	23	11.5 %	24	12.0 %
Current Level of Education				
Primary education and lower	18	9.0 %	31	15.5 %
Lower secondary education	23	11.5 %	21	10.5 %
Higher secondary education	50	25.0 %	29	14.5 %
Vocational education	26	13.0 %	31	15.5 %
Bachelor degree and above	83	41.5 %	88	44.0 %
Income per month (Before COVID-19 Pandemic)				
< 10,000 Baht/month	20	10.0 %	13.2	6.6 %
10,000–19,999 Baht/month	104.4	52.2 %	111.2	55.6 %
20,000–29,999 Baht/month	37.8	18.9 %	26.6	13.3 %
30,000–50,000 Baht/month	30	15.0 %	30.4	15.2 %
50,001 Baht/month and above	7.8	3.9 %	18.6	9.3 %
Worked in tourism sector				
Yes	113	56.5 %	116	58.0 %
No	87	43.5 %	84	42.0 %
Having elderly or members with risky comorbidities (obesity, hypertension, diabetes, cardiovascular disease, cerebrovascular disease, respiratory disease, kidney disease, and malignancy)				
Yes	43	21.5 %	34	17.0 %
No	157	78.5 %	166	83.0 %

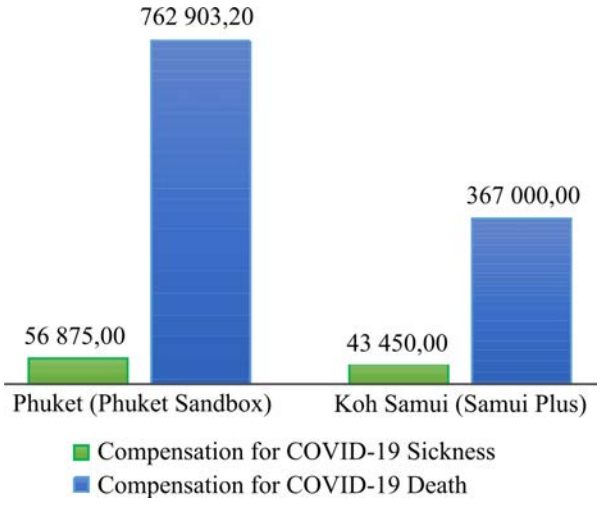

Figure 3. Monetary Compensation (CVM) classified by Tourism Sandbox Islands in Baht (Phuket Sandbox and Samui Plus)

In terms of the Subjective Risk Scale (0–10), as shown in Table 2, the average risk level is around 5.5–6.0, which is computed to be significantly different between the two islands. The F-statistics computed in Table 3 also indicates that Koh Samui residents seem to exhibit a higher risk level than those in Phuket, with a 95 % statistically significant level. This analysis suggests that socioeconomic factors (such as age, sex, education level, income, and so on) may also play different roles in community risk perception between the two sandbox islands.

Statistical testing was conducted and shown in Tables 3, 4. Table 3 displays statistical differences (F-Test) in Monetary Compensation between COVID-19 Sickness and COVID-19 Death Classified by Tourism

Table 2

Statistical Differences (F-Test) of Risk Perception toward COVID-19 classified by Tourism Sandbox Islands (Phuket Sandbox and Samui Plus)

Risk Perception toward COVID-19	Phuket	Koh Samui	F Statistics	P-value
Monetary Risk Compensation (CVM)				
– Compensation for COVID-19 Sickness	56,875.00	43,450.00	5.160	0.024**
– Compensation for COVID-19 Death	762,903.20	367,000.00	52.040	0.000***
Subjective Risk Level (0–10)	5.50	6.00	8.430	0.004***

Note: ***, **, and * denote statistical significance at 99, 95, and 90 %, respectively.

Table 3

Statistical Differences (F-Test) of Monetary Compensation between COVID-19 Sickness and COVID-19 Death Classified by Tourism Sandbox Islands (Phuket Sandbox and Samui Plus)

Characteristics	Phuket (Phuket Sandbox)						Koh Samui (Samui Plus)					
	Mean	F-Statistics	P-value	Mean	F-Statistics	P-value	Mean	F-Statistics	P-value	Mean	F-Statistics	P-value
	Compensation for COVID-19 sickness			Compensation for COVID-19 death			Compensation for COVID-19 sickness			Compensation for COVID-19 death		
Sex												
Male	54,583.33	0.090	0.761	721,739.10	0.340	0.559	39,793.81	5.080	0.0253**	328,866.00		0.029**
Female	58,250.00			787,179.50			46,893.20			402,912.60		
Age group												
18–24 years	68,000.00	0.820	0.486	892,592.60	3.310	0.021**	42,666.67	2.540	0.0578*	303,333.30	6.740	0.000***
25–34 years	61,232.88			905,555.60			40,297.03			317,821.80		
35–49 years	54,393.94			669,230.80			45,555.56			453,333.30		
50+ years	35,652.17			413,636.40			53,750.00			491,666.70		
Education level												
Primary School or Lower	32,222.22	1.510	0.201	373,333.30	2.470	0.046**	48,387.10	1.320	0.262		2.700	0.032**
Secondary School	82,173.91			472,727.30			49,523.81			419,047.60		
High School	44,583.33			826,000.00			40,689.66			389,655.20		
Diploma	50,416.67			879,166.70			38,064.52			306,451.60		
Bachelor's Degree and above	64,556.96			846,666.70			43,068.18			332,954.50		
Working in tourism sector												
Yes	59,174.31	0.210	0.651	707,692.30	1.330	0.250	40,517.24	4.780	0.0299**	315,517.20	13.480	0.000***
No	53,855.42			832,926.80			47,500.00			438,095.20		
Income level (per month)												
< 10,000 Baht	38,823.53	0.440	0.777	629,411.80	0.630	0.641	34,000.00	6.390	0.000***	150,000.00	17.870	0.000***
10,000 – 19,999 Baht	62,527.47			805,555.60			35,119.05			248,809.50		
20,000 – 29,999 Baht	53,548.39			796,875.00			45,000.00			405,000.00		
30,000 – 50,000 Baht	51,481.48			587,500.00			57,391.30			573,913.00		
50,000+ Baht	80,000.00			560,000.00			54,285.71			542,857.10		
Having elderly or members with risky comorbidities (obesity, hypertension, diabetes, cardiovascular disease, cerebrovascular disease, respiratory disease, kidney disease, and malignancy)												
Yes	52,857.14	0.130	0.715	666,666.70	0.850	0.359	47,058.82	1.050	0.306	420,588.20	2.050	0.154
No	58,000.00			788,435.40			42,710.84			356,024.10		

Note: ***, **, and * denote statistical significance at 99, 95, and 90 %, respectively.

Table 4

Statistical Differences (F-Test) of Risk Level between COVID-19 Sickness and COVID-19 Death Classified by Tourism Sandbox Islands (Phuket Sandbox and Samui Plus)

Characteristics	Phuket (Phuket Sandbox)			Samui (Samui Plus)		
	Mean	F-Statistics	P-value	Mean	F-Statistics	P-value
Sex						
Male	5.53	0.03	0.860	5.91	0.950	0.330
Female	5.48			6.09		
Age group						
18–24 years	4.87	3.36	0.020**	6.07	13.160	0.000***
25–34 years	5.31			5.57		
35–49 years	6.09			6.27		
50+ years	5.17			7.21		
Education level						
Primary School or Lower	5.94	1.67	0.159	6.87	4.740	0.001***
Secondary School	5.52			5.81		
High School	5.18			6.07		
Diploma	6.31			5.71		
Bachelor's Degree and above	5.34			5.82		
Worked in tourism Sector						
Yes	5.51	0.01	0.918	5.62	26.380	0.000***
No	5.48			6.52		
Income Level (per month)						
< 10,000 Baht	5.78	0.59	0.672	5.30	10.950	0.000***
10,000 – 19,999 Baht	5.41			5.32		
20,000 – 29,999 Baht	5.68			6.30		
30,000 – 50,000 Baht	5.93			6.04		
50,000+ Baht	6.29			7.14		
Having elderly or members with risky comorbidities (obesity, hypertension, diabetes, cardiovascular disease, cerebrovascular disease, respiratory disease, kidney disease, and malignancy)						
Yes	5.95	2.68	0.103	6.29	2.100	0.149
No	5.38			5.94		

Note: ***, **, and * denote statistical significance at 99, 95, and 90 percent, respectively.

Sandbox Islands. Comparisons between COVID-19 sickness and COVID-19 death revealed significant results for local residents in both islands if they fear that COVID-19 could cause their demise. In Phuket, variables such as age group and education level were found to be insignificantly related to the risk in the case of COVID-19 sickness, but statistically significantly related to the risk level in the case of COVID-19 death. Individuals of younger age demonstrated their higher monetary compensation in Phuket.

Only in Koh Samui, with statistical significance, female residents seemed to display higher monetary compensation than their male counterparts, implying that females have a higher risk perception of COVID-19 than males. This result is consistent with the literature review conducted by Bertakis et al. [21] and Addis and Mahalik [22], which suggested that women tended to perceive higher risks due to biological differences, societal norms, and cultural expectations. Age group appeared to be significantly related to the risk level of local residents on both islands. Especially on Koh Samui, in contrast with Phuket, individuals of older age demonstrated their wish for higher monetary compensation. This finding is consistent with the article reviewed by Van Der Weerd et al. [19], which suggests that older individuals often perceive higher risks due to factors such as weakened immune systems and increased vulnerability to severe outcomes. In Phuket, the reverse trend was

shown, which may have been due to the fact that local residents in Phuket who were in younger age groups were having higher valuation of their risk due to their involvement in the labor market which was heavily affected by COVID-19. The opportunity costs of getting infected or dying could be much higher among younger groups than that of older groups.

Adolescents and youth (18–24 years old) might not always fully comprehend the risks associated with communicable diseases, especially if they had not had direct experiences with them. The elderly (50 years and older) might be more vulnerable to the severe effects of communicable diseases, so they may have a heightened perception of risk. However, estimated results seemed to be mixed in Phuket; young adults (25–34 years old) were found to have the highest risk compensation compared to other age groups, while contrary to the case in Koh Samui, monetary compensation was found to be higher for the older-age groups. This mixed perception of communicable disease risks could be due to recent experiences with outbreaks or health-related scares, while others might feel indifferent. Peer influence, social media, and personal experiences with illness can heavily influence their perception. Age group and community risk perception of communicable diseases can vary widely based on factors such as education, socioeconomic status, access to healthcare, and past experiences [14, 23].

Additionally, for Koh Samui's residents, a higher education level seemed to be related to a lower amount of monetary compensation if those residents contracted COVID-19 and died under the Samui Plus program. Again, this result is consistent with Smith et al. [17], as individuals with higher education levels may have a better understanding of transmission routes, preventive measures, and the severity of communicable diseases, leading to lower risk perceptions. However, the effects on education level and risk perception were found to be the opposite in the case of Phuket. Individuals there with higher education levels seemed to require a higher amount of monetary compensation if they contracted COVID-19 and died. Nevertheless, this positive relationship between education and risk perception is found in a number of studies, such as those conducted by Taghrir et al. [36] and Lanciano et al. [37]. This may be because higher education might help people engage in preventative behaviors while simultaneously protecting them "from a (possible) irrational fear of being infected or dying" [36, 37].

As explained by previous research articles, for example, by Zikmund-Fisher and Sarr [15] and Myers and Goodbye [16], individuals with higher incomes should have better access to healthcare, resources, and information about preventive measures against communicable diseases. This can lead to a perception that they are less susceptible to such diseases, thereby lowering their perceived risk. However, our results from F-statistics show the contrary for the case of Koh Samui's residents. Those with higher incomes were found to have a higher anticipation for monetary compensation, implying a higher risk perception.

Another interesting result shows that if Koh Samui residents worked in the tourism sector, they seemed to require lower monetary compensation, implying a lower risk perception compared to those who did not work in the tourism sector. As mentioned above, the COVID-19 pandemic led to a sharp decline in tourism activity, resulting in widespread job losses across various segments of the tourism industry. Re-opening the country through the tourism sandbox program helped revive the tourism sector, especially for tourism businesses themselves. The anxiety and fear of the infectious disease might be expected therefore to be less of a concern among those who work in the tourism sector. However, we did not find statistically significant findings regarding having elderly individuals or members with the risky comorbidities (obesity, hypertension, diabetes, cardiovascular disease, cerebrovascular disease, respiratory disease, kidney disease, and malignancy).

In terms of the subjective risk level, as shown in Table 4, results from F-statistics are consistent with what we found for the case of

monetary compensation (as shown in Table 3). Younger individuals with higher education levels seemed to have lower risk perception in Koh Samui. Those with higher incomes seemed to show a higher level of risk perception. Additionally, local residents who worked in the tourism sector were found to have a lower risk perception level than those who did not work in the tourism sector. Individuals with higher incomes were found to have a higher scale of risk perception. Also, there were no statistically significant findings regarding having elderly individuals or members with the risky comorbidities.

It is noteworthy that this study does not estimate the likelihood of a negative event (disease or death) because it was relatively difficult for local residents to identify likelihood of them getting infected or dying from COVID-19, given many uncertainties and overflows of information during the pandemic. Rather, the estimated compensation from CVM focuses on finding how much risk they faced in terms of the value of their lives or opportunity costs in the case of infection or death from COVID-19.

Nevertheless, the analysis in this article has some limitations. First, some attributes that could be related to risk perception were not included in our analysis. Examples of these attributes are personal factors, health status, mass media exposure, COVID-19 knowledge, political orientation, and trust in the government. These variables were not included in the questionnaires. Second, the perception of risk can vary with experience and exposure to COVID-19. Cross-sectional data can only illustrate the relationship between different attributes and the risk perception at one point in time; panel data should be obtained to study the differential impacts of different attributes studied in this paper to get more insight to understand the tradeoff between health risk and economic risk as the costs of pandemic fade.

Conclusion. As a tourism-dependent country, the Thai economy suffered tremendously during the COVID-19 pandemic. In a pioneering effort to reopen the country, two islands (Phuket and Koh Samui) began welcoming fully vaccinated international visitors in July 2021 under the “Phuket Sandbox” and “Samui Plus Model”. Even though the sandbox programs were found to create more income and some benefits for tourism businesses, concerns and anxiety regarding infectious diseases were generated among local people.

Several studies have attempted to identify how people's risk perceptions differed regarding COVID-19 infections. Using secondary data from a survey of 400 local residents living on the two islands, monetary compensations under the contingent valuation method (CVM) and Subject Risk Scale (0–10) were computed to reflect the level of local residents' risk perception toward COVID-19. Our results showed that the risk perception was found to be higher among local people in Phuket than those in Koh Samui, especially among those who believed that the coronavirus could possibly cause death.

Our results show that older individuals seemed to have higher risk perception, especially females. Those with higher incomes seemed to show a higher level of risk perception. Additionally, local residents who were working in the tourism sector were found to have a lower risk level than those who did not work in the tourism sector.

However, there were some discordances regarding education level and risk perception between residents in Phuket and those in Koh Samui. The risk perception was found to be higher among those with higher education levels in Phuket and lower among these groups in Koh Samui. However, having elderly or members with risky comorbidities, including obesity, hypertension, diabetes, cardiovascular disease, cerebrovascular disease, respiratory disease, kidney disease, and malignancy in the household was found to be unrelated to risk perception.

Findings from this paper clearly suggest that health risk perception can differ due to individuals’ attributes. Even though COVID-19 related issues can hardly be considered to be relevant now, our study results suggest that

these two approaches can be used to assess risk perception of other health threats that affect people of different backgrounds.

Introducing an economic scheme (such as monetary compensation for those who are infected by the disease) into a geographic area, which could trigger higher levels of risks among residents with different levels of risk perception, could have differential effects on the population.

We believe that the government should understand the differential pressures on various groups of local residents before implementing any Sandbox of this kind in the future to meet the real demand of local residents and ensure safer outcomes among them.

Other than being aware of the differential risk perception among local residents, policymakers should prepare to compensate various groups of population with different compensation packages or prepare to reduce the population's health risk with a special focus on residents who are more prone to risk or those with a high risk perception.

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