Traveler's Diarrhea in Foreign Travelers in Southeast Asia: A Cross-Sectional Survey Study in Bangkok, Thailand

Chatporn Kittittrakul, Saranath Lawpoolsri, Teera Kusolsuk, Jutarnas Olanwijitwong, Waraluk Tangkanakul, and Watcharapong Piyaphanee*

Department of Clinical Tropical Medicine, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; Department of Tropical Hygiene, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; Department of Helminthology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; Department of Disease Control, Bureau of General Communicable Diseases, Ministry of Public Health, Nonthaburi, Thailand

Abstract. The effect of origin and destination country on traveler's diarrhea incidence rates in Southeast Asia is poorly understood, and research generally only addresses diarrhea in travelers from the developed world. This study evaluated the attack rate and effects of traveler's diarrhea by origin and destination and analyzed key risk factors. A self-administered questionnaire was provided to foreign travelers departing Southeast Asia from Suvarnabhumi Airport, Bangkok, Thailand. It evaluated traveler demographics, relevant knowledge and practices, experiences of diarrhea, and the details and consequences of each diarrheal episode. A total of 7,963 questionnaires were completed between April 2010 and July 2011. Respondents were 56% male (mean age 35) with a mean and median duration of stay of 28 days and 10 days, respectively. Most respondents were from Europe (36.8%) or East Asia (33.4%). The attack rate of traveler's diarrhea was 16.1%, with an incidence rate of 32.05 per 100 person months. Travelers' origin and destination countries significantly related to diarrhea risk. Oceanians had the highest risk (32.9%) and East Asians the lowest (2.6%). Vietnam and Indonesia were the highest risk destinations (19.3%). Other significant factors were youth, trip duration, number of countries visited, and frequently drinking beverages with ice.

INTRODUCTION

Traveler's diarrhea is the most common health problem reported by travelers visiting developing countries.¹ The incidence rate is estimated to be around 20–60% per month of stay in developing countries.¹ The risk of traveler's diarrhea varies greatly according to the destination, nationality of travelers, duration of stay, season, travel style, eating behaviors, and type of food consumed.^{2–5} The relationship between traveler nationality and traveler's diarrhea is poorly studied, and most previous studies on traveler's diarrhea have focused on travelers from developed countries visiting developing countries. Neither is known about the incidence of diarrhea among travelers from developing countries visiting other developing countries, nor about intra-regional travelers within developing countries, including Asian travelers visiting a different Asian country.

In this study, we focus on Southeast Asia because it is a fast-growing region for travel, with more than 84 million tourist arrivals in the year 2012.⁶ Information regarding the incidence rate and risks of traveler's diarrhea in Southeast Asia, especially relating to traveler nationality, is still limited. Therefore, the primary objective was to determine the incidence and attack rate of traveler's diarrhea in Southeast Asia and the effect of nationality on these factors by surveying travelers from all continents in the world. The secondary objective was to assess the risk factors associated with traveler's diarrhea.

MATERIALS AND METHODS

This was a cross-sectional questionnaire-based study. Foreign travelers in the international departure hall of Suvarnabhumi

Airport (Bangkok, Thailand) were invited to fill out the questionnaire. Inclusion criteria were adult travelers who had completed their trips and were departing for a destination outside Southeast Asia. Travelers of Southeast Asian nationality or travelers who were in transit were excluded. The study questionnaire was drafted, tested, and revised before data collection. The final version of the questionnaire comprised three parts: general information about the travelers, perceptions and practices related to the risk of traveler's diarrhea, and the details of any diarrhea experienced. The questionnaires were written in English and translated into Chinese, Japanese, and Korean.

The necessary sample size was calculated before the study using the incidence rate of traveler's diarrhea from a previous study done on foreign travelers visiting Phuket and Chiang Mai, and using data on the number and nationality of travelers visiting Thailand obtained from the Thai Immigration Department.⁵ Because incidence rates varied from 1.6% to 15.7% depending on traveler nationality, we used the lowest previously detected incidence rate of 1.6% to calculate the sample size.³ To achieve $\alpha = 0.05$ two tailed, we required at least 7,389 travelers. Quota sampling was implemented by calculating the number of participants from each continent using the actual proportion of travelers visiting Thailand.⁵

During data collection, investigators and trained assistants invited any eligible travelers in the departure hall to fill out a self-administered questionnaire. The investigating team was available to help if they had questions or needed clarification. For this study, traveler's diarrhea was defined as passing three or more loose stools in a 24-hour period.

Statistical analysis. Statistical analysis was performed using SAS version 9.2 (SAS Institute Inc., Cary, NC). Mean and standard deviation were calculated for normally distributed continuous data. Categorical data were described using numbers and percentages. Because one traveler can have multiple diarrhea episodes, the incidence rate was calculated by dividing the total number of diarrhea episodes by the total

*Address correspondence to Watcharapong Piyaphanee, Department of Clinical Tropical Medicine, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand. E-mail: watcharapong.piy@mahidol.ac.th

duration of stay (in months) of all travelers (time at risk). To determine factors associated with diarrhea, the prevalence of diarrhea was calculated as the proportion of all travelers who experienced diarrhea. Crude prevalence ratios and 95% confidence intervals (CIs) for diarrhea were estimated using a Poisson regression model (PROC GENMOD). Variables that were statistically significant at $P < 0.05$ or considered as having clinical significance were included in a multivariate analysis to estimate adjusted prevalence ratios and 95% CIs. Multicollinearity between variables were also explored, a variable that showed strong colinearity was excluded from the final model.

Ethics statement. The research protocol and questionnaire were approved by the Ethics Committee of the Faculty of Tropical Medicine, Mahidol University (Approval No. MUTM 2010-015-02). Because this study was a voluntary, anonymous survey among adults that was nonexperimental in nature, the Ethics Committee waived the written consent requirement, determining that filling the questionnaire represented a subject's consent to participate. No participant-identifiable data were recorded in the questionnaire to maintain confidentiality. The investigative team was granted permission to conduct the study in Suvarnabhumi Airport by the Airport Authority of Thailand.

RESULTS

Demographics. The study data were collected from April 2010 to July 2011. Approximately 70% of travelers were willing to participate in this study. Overall, 7,963 question-

naires were completed and analyzed. Participants' mean age was 35 years; 56% were male. The participants were mostly from Europe (36.8%) followed by East Asia (33.4%). Tourism was the most common reason for traveling (85.2%), followed by business and visiting friends and relatives. Most participants (86.5%) had visited Southeast Asia for the first time, and most had only visited one country. The mean duration of stay was 28 days, and the median duration of stay was 10 days. A total of 41% of participants traveled for less than a week. The complete demographic data are shown in Table 1.

Incidence, characteristics, and impact of diarrhea. In total, 1,284 participants (16.1%) had diarrhea during their trip, reporting 1,964 episodes of diarrhea in total. The overall incidence rate of diarrhea was 32.1 per 100 person months. Most participants with diarrhea had only one episode of diarrhea (68.7%) with 3–4 bowel movements per day. Most diarrheal attacks (65.8%) occurred within the first 7 days of the trip and lasted for 1–2 days. Half of the participants who had diarrhea bought medication over the counter to treat diarrhea by themselves, while 6.4% visited a doctor. Only 3.6% were admitted to a hospital. Complete diarrhea characteristics and impacts are shown in Table 2.

Travelers' attitudes and practices regarding traveler's diarrhea. The majority of travelers (73%) sought travel health information before their trip. The most common sources of information among participants were travel clinics (49%), general practitioners (36%), the Internet (31%), and guidebooks (23%). Most travelers were aware of the risk of traveler's diarrhea during this trip. Approximately one third of

TABLE 1

Participant demographic information ($N = 7,963$)

	N (%)
Age (mean $\pm$ SD)	35.3 $\pm$ 12.7 years
Sex ($N = 7,945$)	
Male	4,507 (56.7%)
Female	3,438 (43.3%)
Region of origin ($N = 7,957$)	
North American	454 (5.7%)
South American	228 (2.9%)
European	2,925 (36.8%)
East Asian	2,541 (31.9%)
South Asian	561 (7.1%)
Middle eastern	367 (4.6%)
African	185 (2.3%)
Oceanian	696 (8.8%)
Main purpose of trip ($N = 7,945$)	
Tourism	6,771 (85.2%)
Business	409 (5.2%)
Visiting friends and relatives	398 (5.0%)
Education/research	86 (1.1%)
Others	281 (3.5%)
First-time traveler to Southeast Asia ($N = 7,963$)	6,888 (86.5%)
Numbers of countries visited ($N = 7,959$)	
1	6,034 (75.8%)
2	1,090 (13.7%)
3	468 (5.9%)
> 3	367 (4.6%)
Duration of trip (median = 10 days) (days)	
1–7	3,277 (41.3%)
8–14	1,585 (20.0%)
15–21	1,152 (14.5%)
22–28	328 (4.1%)
> 28	1,586 (20.0%)

SD = standard deviation.

TABLE 2

Diarrhea characteristics

	N	%
Number of travelers who had diarrhea	1,284	16.1
Total number of diarrheal episodes	1,964	
Incidence rate of diarrhea per 100 person months	32.05 (95% CI: 30.82–33.67)	
Number of diarrheal episodes ($N = 1,257$)		
1	864	68.7
2	237	18.9
3	88	7.0
> 3	68	5.4
Frequency of bowel movements ($N = 1,068$) (times/day)		
3–4	675	63.2
5–6	247	23.1
7–8	64	6.0
9–10	54	5.1
> 10	28	2.6
Onset of diarrhea after arrival in Southeast Asia ($N = 939$) (days)		
1–7	618	65.8
8–14	152	16.2
15–21	96	10.2
22–28	18	1.9
> 28	55	5.9
Duration of diarrhea (1,037 episodes) (days)		
1–2	671	64.7
3–4	219	21.1
5–7	70	6.8
> 7	77	7.4
Treatment of diarrhea ($N = 1,067$)		
Bought medication	548	51.4
Needed a doctor's visit	68	6.4
Needed hospitalization	38	3.6
Impact of diarrhea ($N = 1,067$)		
Had to delay trip	62	5.8
Had to cancel trip	92	8.6

TABLE 3
Perceptions and practices related to the risk of traveler's diarrhea

	All participants <i>N</i> (%)	Diarrhea <i>N</i> (%)	No diarrhea <i>N</i> (%)	<i>P</i> value
Sought travel health information before trip	5,761 (73)	950 (17)	4,811 (83)	0.094
Did not seek travel-health information before trip	2,130 (27)	318 (15)	1,812 (85)	—
Estimated traveler's diarrhea risk by traveler	—	—	—	< 0.001*
Very high risk (> 50%)	1,349 (17)	570 (42)	779 (68)	—
High risk (30–50%)	1,793 (23)	387 (22)	1,406 (78)	—
Intermediate risk (10–29%)	2,506 (32)	219 (9)	2,287 (91)	—
Low risk (< 10%)	1,570 (20)	55 (4)	1,515 (96)	—
Not known	597 (8)	29 (5)	568 (95)	—
Behavior of travelers				
Carried medication for diarrhea				
Yes	3,565 (45)	916 (26)	2,649 (74)	< 0.001*
No	4,398 (55)	369 (9)	4,029 (91)	—
Frequently washed hands before eating food				
Yes	3,666 (50)	820 (22)	2,846 (78)	< 0.001*
No	3,650 (50)	421 (12)	3,229 (88)	—
Frequently washed hands before handling food				
Yes	3,464 (48)	809 (23)	2,655 (77)	< 0.001*
No	3,801 (52)	420 (11)	3,381 (89)	—
Frequently drank beverages with ice				
Yes	2,517 (35)	747 (30)	1,774 (70)	< 0.001*
No	4,701 (65)	479 (10)	4,222 (90)	—
Frequently ate salad vegetables				
Yes	2,521 (35)	512 (20)	2,009 (80)	< 0.001*
No	4,694 (65)	714 (15)	3,980 (85)	—
Frequently bought food from a street vendor				
Yes	2,008 (28)	379 (19)	1,629 (81)	0.009*
No	5,291 (72)	862 (16)	4,429 (84)	—
Ate food left over from a previous meal				
Yes	290 (4)	50 (17)	240 (83)	0.889
No	6,764 (99)	1,145 (17)	5,619 (83)	—
Frequently ate raw or uncooked meat				
Yes	208 (3)	31 (15)	177 (85)	0.442
No	6,930 (97)	1,173 (17)	5,757 (83)	—
Frequently drank tap water				
Yes	480 (7)	72 (15)	438 (85)	0.239
No	6,589 (93)	1,126 (17)	5,463 (83)	—

*Statistically significant.

travelers felt that they had an “intermediate risk” (10–20% chance to get diarrhea), while 22.9% and 17.4% felt that they had “high risk” (30–50% chance) and “very high risk” (> 50% chance), respectively. Only 7.6% reported that they “don't know.”

Travelers who sought travel-health information from travel clinics reported significantly fewer instances of diarrhea than those who did not (11.9% versus 20.2%; $P < 0.001$), whereas the rate of diarrhea in travelers who sought information from other sources did not significantly differ from those who did not. Travelers who estimated that their risk of traveler's diarrhea was very high reported the highest rate of diarrhea (42.3%), significantly higher than others.

The reported practices among travelers that significantly predicted an increased incidence of traveler's diarrhea were carrying medication for diarrhea, washing hands before eating food, washing hands before handling food, drinking beverages with ice, eating salad vegetables, and buying food from a street vendor (Table 3). Travelers who frequently ate food left over from a previous meal, ate raw or uncooked meat, or drank tap water did not have a significantly different rate of traveler's diarrhea than those who did not.

Attack rate of traveler's diarrhea in each country in Southeast Asia. The overall prevalence of traveler's diarrhea among visitors to Southeast Asia was 16.14% (95% CI: 15.33–16.95). Travelers to Vietnam and Indonesia had the highest

attack rate of diarrhea (19%), followed by Lao People's Democratic Republic (PDR) (17%), and the Philippines (15%). The lowest attack rate of diarrhea (2%) was found in Singapore. Among travelers who only visiting Thailand, the attack rate of travelers' diarrhea among the group was 10.9% (657/6,025). Details are shown in Table 4.

Risk factors of traveler's diarrhea. The prevalence of diarrhea differed among travelers from different continents of

TABLE 4
Prevalence of traveler's diarrhea by country visited

Country visited	Total numbers of travelers	Travelers reporting diarrhea in this country	Prevalence of traveler's diarrhea (%)	95% CI
All	7,963	1,284	16.14	15.33–16.95
Vietnam	580	112	19.31	16.10–22.52
Indonesia	285	55	19.30	14.72–23.88
Lao PDR	452	95	17.37	14.19–20.54
Philippines	91	14	15.38	7.97–22.80
Cambodia	752	107	14.23	11.73–16.73
Thailand	7,963	971	12.19	11.48–12.91
Myanmar	168	20	11.90	7.01–16.80
Brunei	18	2	11.11	1.38–34.71
Malaysia	497	42	8.45	6.01–10.90
Singapore	434	10	2.30	0.9–3.72
East Timor	8	0	0	—

CI = confidence interval.

origin. Travelers from Oceania had the highest attack rate of diarrhea (32.9%), followed by travelers from North America (27.8%) and Europe (27%). Travelers from South America and south Asia had the lowest rate of diarrhea (2.6%). Travelers who went to Southeast Asia for education or research purposes had the highest rate of diarrhea (27.9%), while travelers who went for business purposes had the lowest rate

(12%). The association between diarrhea and the purpose of the trip was not significant after adjusted by the multivariate analysis.

The attack rate of diarrhea increased with the number of countries visited (one country, 10.9%; two countries, 26.9%; three countries, 35.5%; greater than three countries, 45%). Travelers who stayed for longer than 28 days had a rate of

TABLE 5
Risk factors of traveler's diarrhea

	Prevalence (%)	Crude prevalence ratio (95% CI)	Adjusted prevalence ratio (95% CI)
Age group (years)			
18–25	23.1	1	1
26–35	17.6	0.71* (0.62–0.82)	0.84 (0.71–1.00)
36–45	9.6	0.35* (0.29–0.43)	0.56* (0.44–0.71)
46–60	10.9	0.41* (0.33–0.49)	0.46* (0.36–0.58)
> 60	12.5	0.47* (0.34–0.66)	0.35* (0.23–0.51)
Gender			
Male	16.8	1	1
Female	15.3	0.90 (0.79–1.01)	0.95 (0.82–1.10)
Nationality			
East Asian	2.6	1	1
South American	2.6	1.01 (0.39–2.18)	0.47 (0.18–1.06)
Middle-east Asian	3.8	1.49 (0.79–2.60)	1.41 (0.72–2.59)
South Asian	4.5	1.75* (1.07–2.76)	1.52 (0.84–2.65)
African	14.1	6.13* (3.73–9.81)	3.90* (2.21–6.70)
European	27.0	13.90* (10.83–18.15)	8.24* (6.05–11.44)
North American	27.8	14.41* (10.51–19.92)	8.88* (6.08–13.10)
Oceanian	32.9	18.39* (13.82–24.77)	11.67* (8.24–16.76)
Main purpose			
Tourism	15.6	1	1
Business	12.0	0.74* (0.54–0.99)	0.83 (0.57–1.20)
Visiting friends and relatives	22.9	1.60* (1.25–2.03)	1.30 (0.97–1.71)
Education/research	27.9	2.09* (1.28–3.32)	1.21 (0.67–2.13)
Other	22.4	1.56* (1.16–2.07)	1.26 (0.90–1.75)
Duration of trip (days)†			
1–7	2.8	1	–
8–14	15.8	6.59* (5.16–8.48)	–
15–21	26.0	12.33* (9.68–15.85)	–
22–28	26.2	12.44* (9.01–17.18)	–
> 28	35.0	18.85* (15.01–23.91)	–
First visit Southeast Asia			
No	14.8	1	1
Yes	24.5	1.91* (1.63–2.22)	1.11 (0.93–1.33)
Numbers of countries visited			
1 country	10.9	1	1
2 countries	26.9	3.00* (2.56–3.50)	1.83* (1.52–2.19)
3 countries	35.5	4.48* (3.64–5.50)	2.41* (1.89–3.06)
> 3 countries	45.0	6.66* (5.34–8.31)	3.39* (2.62–4.40)
Seek travel–health information before trip			
No	14.9	1	1
Yes	16.5	1.13 (0.98–1.29)	1.31* (1.10–1.55)
Bought food from a street vendor			
No	16.3	1	1
Yes	18.9	1.20* (1.05–1.37)	1.02 (0.86–1.19)
Drank beverages with ice or ice cubes			
No	10.2	1	1
Yes	29.7	3.71* (3.27–4.22)	1.63* (1.40–1.90)
Washed hands before eating food			
No	11.5	1	1
Yes	22.4	2.21* (1.94–2.51)	0.81 (0.64–1.02)
Visit travel clinic			
No	20.2	1	1
Yes	11.9	0.53* (0.47–0.60)	0.87 (0.74–1.01)
Ate salad vegetable			
No	15.2	1	1
Yes	20.3	1.42* (1.25–1.61)	1.11 (0.95–1.30)
Wash hand before handling food			
No	11.1	1	1
Yes	23.4	2.45* (2.16–2.79)	1.36* (1.09–1.71)

*Statistically significant ($P < 0.05$).

†Duration of trip was not included in the final model due to colinearity with numbers of countries visited and nationality.

diarrhea that was greater than 10 times higher than travelers who stayed 1–7 days (35% versus 2.8%).

Detailed multivariate analysis was performed to determine the risk factors of traveler's diarrhea. Duration of stay was clearly the independent risk factor, with a dose response relationship: only 2.8% of travelers with a duration of stay less than 7 days developed diarrhea, while 16% of travelers who stayed 8–14 days and 26% of travelers who stayed 15–21 days developed diarrhea. However, adjusted prevalence ratio of this variable was not estimated due to variable collinearity. The number of countries visited was also a strong risk factor. Travelers who visited more than three countries in Southeast Asia had triple the chance of developing diarrhea compared with travelers who visited only one country (adjusted prevalence ratio 3.39, 95% CI: 2.62–4.40).

The region of origin of travelers was an independent risk factor for diarrhea. Travelers from Europe, North America, and Oceania had significantly higher rate of diarrhea, with adjusted prevalence ratios of 8.24, 8.88, and 11.67, respectively, when compared with travelers from East Asia. Other factors that significantly associated with diarrhea were seeking travel–health information before trip, drinking beverages with ice or ice cubes, and washing hand before handling food. Age more than 25 years is the only factor that associated with lower rate of diarrhea compared with age 18–25 years. Complete multivariate analysis is shown in Table 5.

DISCUSSION

In this study, the overall attack rate of traveler's diarrhea among travelers in Southeast Asia in our sample was 16.1%. This number is comparable with several previous studies done in Southeast Asia that report the rate being between 1.6% and 30.7%.^{3,4,7,8} It was impossible to compare this attack rate directly with previous studies because there were substantial differences in our sample, including population characteristics, destination, duration of stay, and travel style. However, several important points should be noted.

We demonstrated that the attack rate of diarrhea significantly differed by traveler nationality. Travelers from developing countries had a lower attack rate than travelers from developed countries. For example, travelers from East Asia, the Middle East, South Asia, and South America had very low attack rate (less than 5%), whereas travelers from Oceania (Australia, New Zealand), North America, and Europe had much higher attack rates (33%, 28%, and 27%, respectively). This finding suggests that the greater the similarity between the country of origin and the destination, the lower the risk of diarrhea. This finding may be explained by 1) previous immunity (travelers from developing countries might have greater immunity to some enteropathogens due to natural immunity acquired in their host countries^{2,9}) and 2) the similarity of the food and eating habits might also lessen the risk of noninfectious diarrhea—for example, diarrhea caused by food allergies or food intolerance.

We did not include Southeast Asian nationals traveling within this region in the study sample. However, we could logically infer that their risk would be low, following the results discussed above that suggest the attack rate of diarrhea will be low if the origin and destination are similar. Our previous study found that the attack rate of traveler's diarrhea among Thai travelers to Laos was only 1.2%.¹⁰

The destination of travelers at a country level also affected the risk of diarrhea. Individual countries in Southeast Asia presented different levels of health risk. We found that the attack rate of traveler's diarrhea varied from the lowest (2.3%) in Singapore to the highest (19.31%) in Vietnam. Because of this variation in risk by country, travel medicine practitioners should consider detailed itineraries at the country level, not only the regional level.

The duration of stay and the number of countries visited were identified as significant risk factors in our study: the longer the duration of stay and the more countries visited, the higher the risk. This finding replicates several previous studies.^{4,11,12} However, the relationship between the attack rate of diarrhea and duration of stay is not linear throughout the trip. The early phase of the trip seems to have the highest risk of diarrhea.^{2,3,13} Our study confirmed this observation, since approximately 2/3 (66%) of travelers with diarrhea in our study developed diarrhea in the first week of their trip. It has been postulated that the longer that travelers stay at a destination, the greater the likelihood that they acquire natural immunity against enteropathogens.³

We also assessed the relationship between travelers' practices and the risk of diarrhea. The results of the univariate model were inconclusive and contradictory to the basic knowledge in some parameters. For example, we found that travelers who ate salad regularly had an increased risk of diarrhea. This finding was logically sound. But we also found that travelers who washed their hands regularly had a higher attack rate of diarrhea. In multivariate analysis, drinking beverages with ice and washing hand before handling foods were related to a higher attack rate. It is important to note that, as in all cross-sectional studies, we could not assess the causal relationship between parameters. Even some prospective studies have failed to show the protective effect of these sensible practices against risk of diarrhea.^{14,15}

The majority of diarrhea episodes in this study were mild and self-limiting. Most diarrheal episodes consisted of only 3–4 bowel movements per day and lasted only 1–2 days. Only 3.6% of travelers with diarrhea needed hospitalization. These characteristics of diarrhea are consistent with many previous reports on travelers to Asia, Africa, or Central and southern America.^{3,4,11,16,17} Although the clinical course of traveler's diarrhea in many parts of the world was relatively similar, the etiologic agents of diarrhea in various destinations may differ.² It should be noted that pathogen-negative diarrhea was also common in travelers.^{2,16,18} Food poisoning or food intolerance might be another cause of diarrhea among this group.

Our study had some limitations. First, it was impossible to eliminate recall bias from this type of survey, because we collected data from participants on the final day of their trip to Southeast Asia. Participants were asked to recall whether they experienced diarrhea and to remember other related risk factors. The perceived risk factors and ability to recall risk factors for diarrhea may be different between those with and without diarrhea; this could bias the estimations. In addition, the report on diarrhea occurrence in this study could be either over or underestimated, because the results were based on self-reported. However, this variation might be small, because diarrheal episodes are relatively obvious and should be easy to recognize and recall. Second, we collected the data from only one airport in Southeast Asia (Suvarnabhumi Airport,

Bangkok). Although this is a major regional airport hub and we surveyed 7,945 participants, it is not ideal to use data from a single airport to assess diarrhea throughout the region. A multi-airport, multi-country study would provide more comprehensive data. Finally, according to the nature of travelers' diarrhea and the complex itinerary of some travelers; the country where diarrhea occurred may not be the country of exposure. Moreover, because there was no follow-up in this study, so it was possible that some travelers may develop diarrhea after leaving Southeast Asia.

Our study shows that traveler's diarrhea remains an important health risk among travelers in Southeast Asia, including travelers from the developing world. Apart from known risk factors including age and duration of stay, we confirmed that the nationality of travelers and the countries visited significantly related to the risk of developing traveler's diarrhea.

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Authors' addresses: Chatporn Kittittrakul and Watcharapong Piyaphanee, Department of Clinical Tropical Medicine, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand, E-mails: chatporn.kit@mahidol.ac.th and watcharapong.piy@mahidol.ac.th. Saranath Lawpoolsri, Department of Tropical Hygiene, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand, E-mail: saranath.law@mahidol.ac.th. Teera Kusolsuk, Department of Helminthology, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand, E-mail: teera.kus@mahidol.ac.th. Jutarnas Olanwijitwong, Faculty of Tropical Medicine, Mahidol University, Hospital for Tropical Diseases, Bangkok, Thailand, E-mail: jutarnas.ola@mahidol.ac.th. Waraluk Tangkanakul, Department of Disease Control, Bureau of General Communicable Diseases, Ministry of Public Health, Nonthaburi, Thailand, E-mail: hapdocw@gmail.com.

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