

# CUMULATIVE INCIDENCE OF TRAVELERS' DIARRHEA AMONG LONG-TERM TRAVELERS IN THAILAND: A PRELIMINARY REPORT

Narissara Techavachara<sup>1</sup>, Araya Phoodenpha<sup>1</sup>, Punyisa Asawapaithulsert<sup>1,3</sup>, Suda Punrin<sup>2</sup>, Chatporn Kittitrakul<sup>3</sup>, Teera Kusolsuk<sup>4</sup>, Udomsak Silachamroon<sup>3</sup>, Watcharapong Piyaphanee<sup>1,3\*</sup>

<sup>1</sup>Thai Travel Clinic, Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University, Bangkok 10400, Thailand

<sup>2</sup>Queen Saovabha Memorial Institute, Thai Red Cross Society, Bangkok 10330, Thailand

<sup>3</sup>Department of Clinical Tropical Medicine, Faculty of Tropical Medicine, Mahidol University, Bangkok 10400, Thailand

<sup>4</sup>Department of Helminthology, Faculty of Tropical Medicine, Mahidol University, Bangkok 10400, Thailand

## ABSTRACT

Travelers' diarrhea (TD) remains a common health issue among travelers to low-income countries. With the rise of long-term travel driven by remote working technologies, research is needed on the incidence and changing patterns of TD in this population. This study aims to determine the cumulative incidence of TD among long-term foreign travelers in Thailand and assess their demographic and travel-related characteristics. This two-site cohort study involved adult long-term travelers who intended to travel abroad for  $\geq 1$  month. Upon enrollment, participants completed an initial questionnaire to provide demographic information. Travelers who had been abroad for  $> 1$  month or nearing trip completion were also asked to complete the retrospective part of the questionnaire, which was used to calculate preliminary cumulative incidence. A total of 128 participants were enrolled between June and August 2025. Of these, 58.6% were male and 41.4% were female, with a median age of 29.5 years (range 20-66). Pre-travel consultation was reported by 51.6% of participants, and 86.7% had received at least one type of enteric vaccination. Analysis showed that the cumulative incidence of TD among 44 long-term travelers was 47.70%, with an incidence rate of 25.4 episodes per 100 person-months. Given the rising trend of long-term travel, nearly half of the participants experienced at least one episode of TD despite relatively high rates of pre-travel consultation and enteric vaccination. These findings emphasize the need for further research into risk factors and patterns of TD among long-term travelers.

**Keywords:** travelers' diarrhea, long term, traveler, expatriate, Southeast Asia

---

**Correspondence:** Associate Professor Watcharapong Piyaphanee, Thai Travel Clinic, Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University, Bangkok 10400, Thailand  
Email: watcharapong.piy@mahidol.ac.th

## INTRODUCTION

Travelers' diarrhea (TD) has long been recognized as a key clinical concern in travel medicine. Despite ongoing advances, no reliable preventative strategy or method for predicting its occurrence has been established. The condition is believed to be multifactorial, influenced by behavioral factors and a range of biological and host-environment determinants. (Giddings *et al.*, 2016) These complexities highlight the ongoing need for improved characterization of TD risk and disease dynamics.

TD is generally characterized by the occurrence of at least three unformed stools within a 24-hour period accompanied by one or more symptoms of abdominal cramping, nausea, vomiting, tenesmus, or fecal urgency, either during the trip or shortly after returning. (Steffen *et al.*, 2015) In recent years, a functional classification has been adopted to describe TD severity. (Connor and Leung, 2026) Mild illness is defined as tolerable, non-distressing symptoms that permit normal activities; moderate illness entails discomfort or disruption of planned activities; and severe illness is incapacitating or entirely prevents participation in scheduled activities, with any episode of dysentery automatically categorized as severe.

Estimated attack rates range from 30-70% over a 2-week travel period, (Connor and Leung, 2026) reflecting substantial variability. This wide range arises from differences in travel destination, season, and host-related characteristics. Adding further complexity, the post-COVID-19 era has prompted a marked increase in long-term travel, (World Tourism Organization, 2022) facilitated by the expansion of remote-work technologies. Despite this emerging trend, research on TD among long-term travelers remains scarce. This knowledge gap highlights the need for

further investigation into the patterns of TD in this growing population. Therefore, this study aims to determine the cumulative incidence of TD among long-term foreign travelers in Thailand and assess their demographic and travel-related characteristics.

## MATERIALS AND METHODS

### Study design and setting

The study was conducted at two sites: Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University and Queen Saovabha Memorial Institute, The Thai Red Cross Society. In this preliminary study, demographic data were collected cross-sectionally upon enrollment, while the outcome data were obtained retrospectively based on participants' reports. Inclusion criteria were adult non-SEA foreign travelers visiting Thailand with the intention to remain abroad for  $\geq 1$  month, or expatriates who had recently arrived in the country within the past year. The exclusion criteria were those with underlying gastrointestinal disorders or current use of laxatives.

The paper-based questionnaire comprised two main parts: the first collected demographic information and trip details, while the second was a retrospective section administered to participants who had already begun their trip to assess their travel history and their experience with TD (if any). The questionnaires were all in English. All participants provided written informed consent and were able to understand and complete the questionnaire within approximately 15 minutes.

### Data collection

The study period occurred between June and August 2025, following approval from the ethics committee. For this preliminary report, eligible participants were approached at the study sites after

completing their hospital visits. A total of 128 participants were enrolled during this 2-month period.

Initial data collected included participants' demographic characteristics (gender, birth year, nationality by continent), intended duration of travel, underlying medical conditions, current medications, previous pre-travel consultations and enteric vaccinations, as well as the purpose and details of their current trip. The retrospective questionnaire regarding TD inquired about participants' past travel history, the number of TD episodes (if any), and the severity and treatment of any episodes they had experienced.

### Statistical analysis

Based on previous studies, the reported incidence of TD in SEA ranges from 16.1% to 38.2%, with the longest follow-up study reporting a cumulative incidence of 33% at 28 days. (Sharma *et al.*, 2020) Data on long-term travelers are limited, however, a study among long-term expatriates in Nepal reported an attack rate of approximately 49% per month during the first two years of residence. (Hoge *et al.*, 1996) Given the lack of referenceable data specific to long-term travelers and long follow-up periods, we assumed a cumulative incidence of TD of 50% over six months.

Using a confidence level of 95%, a margin of error of 5%, and a design effect of 1, the calculated sample size required for the full study was 384 participants. The present report represents a preliminary analysis based on a convenience sample of the first 128 participants enrolled.

Descriptive statistics were used to summarize participants' characteristics. Categorical variables were presented as frequencies and percentages, while continuous variables were assessed for distribution and summarized using median and range.

Data analyses were conducted using SPSS version 29.0 (IBM Corporation, Armonk, NY). Cumulative incidence was calculated using retrospective data from participants, defined as the number of participants who experienced at least one episode of TD divided by the total number of participants at risk. The incidence rate was calculated by dividing the total number of diarrhea episodes by the sum of total duration of stay (in months) of all travelers (time at risk).

### Ethical consideration

This study was approved by the Institutional Review Board of the Faculty of Tropical Medicine, Mahidol University. The study number was TMEC 25-027.

## RESULTS

A total of 128 participants were enrolled in this preliminary study from June to August 2025. Of these, 44 participants had already begun travelling and were able to provide retrospective data for further analysis. Participants were 58.6% male and 41.4% female, with a median age of 29.5 years (range 20-66 years). More than half of the participants were from Europe (55.5%), followed by North America (27.3%), Oceania (5.5%), Africa and Asia (4.7% each) and South America (2.3%). Existing medical conditions were reported by 19 participants (14.8%), and 23.4% were currently taking regular medication.

The main purpose of travel reported was tourism (69.5%), and most travelers were accompanied by friend or partner (48.4%). Approximately half of the participants had received pre-travel consultation before their long-term trip (51.6%). Additionally, 86.7% had received at least one type of enteric vaccine, with hepatitis A vaccine being the most common (82.8%), followed by typhoid (64.1%) and cholera vaccine (12.5%). Nearly half of the participants (48.4%) also reported carrying standby medication for diarrhea during their trip.

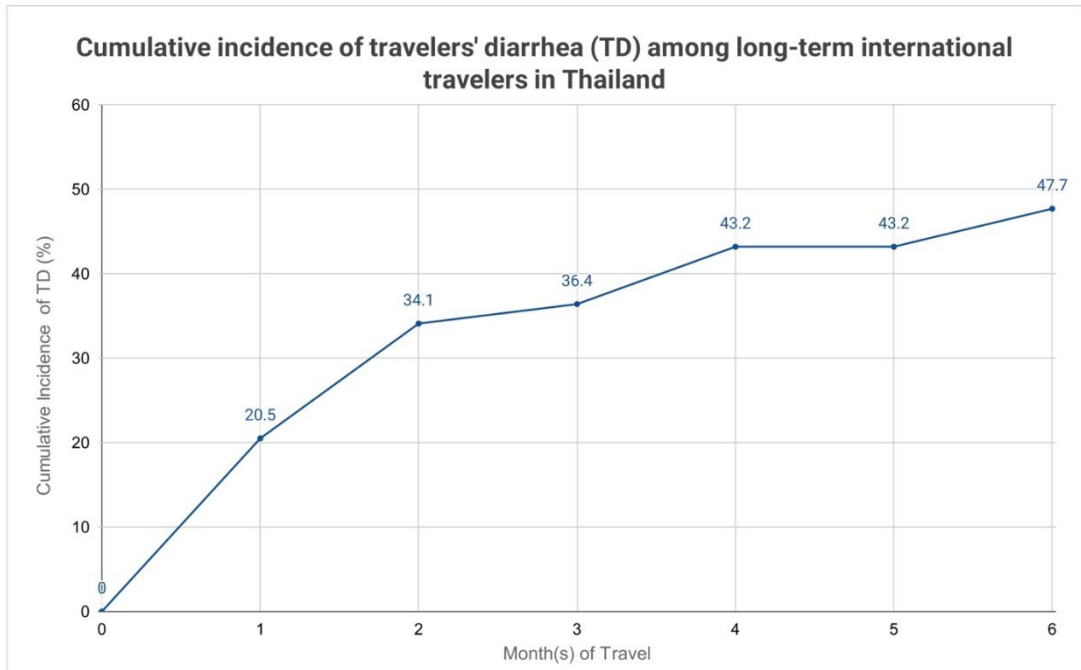
Demographic data are summarized in **Table 1**.

Among the 44 participants who were able to provide retrospective data on TD,

the cumulative incidence over 6 months was 47.7%, with an incidence rate of 25.4 episodes per 100 person-months. **Figure 1** illustrates the cumulative incidence of TD over the 6-month period.

**Table 1** Demographic data

Characteristics	n (%) (Total n=128)
<b>Gender</b>	
Male	75 (58.6)
Female	53 (41.4)
<b>Age (years) (median, range)</b>	29.5, 20-66
<b>Nationality, by continent</b>	
Africa	6 (4.7)
Asia	6 (4.7)
Europe	71 (55.5)
North America	35 (27.3)
South America	3 (2.3)
Oceania	7 (5.5)
<b>Existing medical condition</b>	19 (14.8)
<b>Taking current medication</b>	30 (23.4)
<b>Had pre-travel consultation</b>	66 (51.6)
<b>Enteric vaccines</b>	
Hepatitis A vaccine	106 (82.8)
Typhoid vaccine	82 (64.1)
Cholera vaccine	16 (12.5)
None	17 (13.3)
<b>Purpose of trip</b>	
Tourism	89 (69.5)
VFRs	5 (3.9)
Business/work	8 (6.3)
Education	24 (18.8)
Others	2 (1.6)
<b>Travel partner</b>	
Alone	49 (38.3)
Partner/friend	62 (48.4)
Family	16 (12.5)
Others	1 (0.8)
<b>Carry standby medication for diarrhea</b>	62 (48.4)



**Figure 1** Cumulative incidence of TD among long-term international travelers in Thailand

## DISCUSSION

This preliminary study provides insights into the demographic characteristics and burden of TD among long-term foreign travelers in Thailand, a population that remains underrepresented in existing literature. Nearly half (47.7%) of the participants who provided retrospective data experienced at least one episode of TD over the study period, with an incidence rate of 25.4 episodes per 100 person-months. These findings indicate that TD continues to pose a substantial health burden during prolonged travel.

The demographic profile of participants was characterized by a predominance of young adults and a higher proportion of male travelers. Most participants originated from Europe and North America, a distribution that is consistent with the nationality profiles reported in previous studies of international travelers in Thailand, (Kittitrakul *et al.*, 2015, Piyaphanee *et al.*, 2010) and the overall prevalence of underlying medical conditions and regular medication use was

low. Tourism was the most frequent reported purpose of travel, and nearly half of participants traveled with a partner or friend, reflecting the increasingly lifestyle-oriented nature of long-term travel.

Although the uptake of enteric vaccines (particularly hepatitis A and typhoid) was high, only approximately half of the participants reported having received pre-travel consultation, suggesting a persistent gap in engagement with preventive travel health services. Moreover, this finding underscores the well-recognized limitation of vaccination in preventing most TD episodes, which may arise from a range of infectious and non-infectious causes, including pathogens not covered by the currently available vaccines.

Notably, the cumulative incidence curve suggests a tendency toward plateauing in the later months of travel, indicating a slower accumulation of new TD cases as travel duration increased. Several explanations may account for this pattern, including improved hygiene practices, greater dietary caution, environmental

familiarization, and changes in gut microbiome. Nevertheless, despite this apparent stabilization, substantial knowledge gaps regarding TD among long-term travelers remain, underscoring the need for continued research focused on this population.

These temporal patterns should, however, be interpreted cautiously. The retrospective nature of data collection introduces potential recall bias. Furthermore, the relatively small sample size of this preliminary study may limit the precision of temporal trend estimations and precludes robust stratified analyses. Participants were also recruited from healthcare facilities, which may introduce selection bias toward individuals more engaged with health services.

In conclusion, TD remains a common health issue among long-term travelers in Thailand, with nearly half experiencing at least one episode over a 6-month period despite relatively high rates of enteric vaccination and moderate uptake of pre-travel consultation. The observed incidence pattern suggests that TD risk may persist throughout prolonged travel, although the rate of new episodes may decrease over time. As long-term travel becomes an increasing trend in the post-COVID-19 era, larger prospective studies are needed to clarify temporal risk patterns, identify modifiable behavioral and environmental factors, and inform targeted prevention strategies for this growing population.

#### ACKNOWLEDGEMENTS

We would like to thank the staffs at the Thai Travel Clinic, Hospital for Tropical Diseases, and the Queen Saovabha Memorial Institute, Thai Red Cross Society, for their contributions to this project.

#### REFERENCES

- Connor BA, Leung DT. Travelers' diarrhea. In: CDC Yellow Book: Health Information for International Travel 2026. New York: Oxford University Press; 2026.
- Giddings SL, Stevens AM, Leung DT. Traveler's diarrhea. *Med Clin North Am* 2016;100:317-330.
- Hoge CW, Shlim DR, Echeverria P, Rajah R, Herrmann JE, Cross JH. Epidemiology of diarrhea among expatriate residents living in a highly endemic environment. *JAMA* 1996;275:533-538.
- Kittittrakul C, Lawpoolsri S, Kusolsuk T, Olanwjitwong J, Tangkanakul W, Piyaphanee W. Traveler's diarrhea in foreign travelers in Southeast Asia: a cross-sectional survey study in Bangkok, Thailand. *Am J Trop Med Hyg* 2015;93:485-490.
- Piyaphanee W, Kusolsuk T, Kittittrakul C, Suttithum W, Ponam T, Wilairatana P. Incidence and impact of travelers' diarrhea among foreign backpackers in Southeast Asia: results from Khao San Road, Bangkok. *J Travel Med* 2010;18:109-114.
- Sharma C, Poovorawan K, Piyaphanee W, et al. Incidence of travelers' diarrhea among adult foreign travelers in Thailand: a prospective study. *Am J Trop Med Hyg* 2020;102:1009-1015.
- Steffen R, Hill DR, DuPont HL. Traveler's diarrhea: a clinical review. *JAMA* 2015;313:71-80.
- World Tourism Organization. Impact assessment of the COVID-19 outbreak on international tourism [Internet]. 2022. Available from: <https://www.untourism.int/impact-assessment-of-the-covid-19-outbreak-on-international-tourism> [Cited 2025 Dec 8].