

# Spanish Travelers to High-Risk Areas in the Tropics: Airport Survey of Travel Health Knowledge, Attitudes, and Practices in Vaccination and Malaria Prevention

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DOI: 10.1111/j.1708-8305.2007.00142.x

**Objective.** To evaluate travel health knowledge, attitudes, and practices on vaccination and malaria prevention among Spanish travelers to the tropics.

**Methods.** A cross-sectional survey was carried out in the departure lounge of the two main Spanish international airports in the summer of 2004. A questionnaire was administered to 1,206 Spanish citizens traveling to high-risk areas of tropical South America, 635 travelers (52.6%); Southeast Asia, 251 (20.8%); Sub-Saharan Africa, 181 (15.0%), and the Indian subcontinent, 139 (11.6%). Risk areas were defined according to published sources. Travelers were asked about their attitudes to travel vaccines and malaria prophylaxis and whether they had received either or both on this or previous trips. Adequate malaria prophylaxis was considered as the correct drugs for the destination as indicated by the World Health Organization.

**Results.** Fifty-eight percent of travelers were male and the mean age was 38 years. Thirty-six percent were traveling to tropical areas for the first time. The main reason for travel was tourism (82%) or business (12%). The mean time preparing the trip was 39 days; 73% looked for information a mean of 19 days in advance and 54% were advised in travelers' clinics. Fifty-five percent received no travel vaccines. A total of 48.1% of tourists and 30.1% of business travelers were vaccinated ( $p < 0.00006$ ). The most frequent vaccines administered were as follows: typhoid fever, 32%; yellow fever, 29%; tetanus–diphtheria, 24%; and hepatitis A, 14%. Malaria prophylaxis was taken by 422 travelers including mefloquine (44%), atovaquone–proguanil (17%), chloroquine (16%), chloroquine–proguanil (15%), doxycycline (3%), and unknown (5%).

**Conclusions.** More than half of travelers to risk areas received no vaccinations before the trip. More than a third of travelers to Sub-Saharan Africa received no malaria prophylaxis.

International travelers have a clear risk of contracting individually and socially significant infectious diseases. Approximately 8% to 10% of travelers to the developing world require medical care during or after travel. A clinician-based senti-

nel surveillance study of 17,353 ill returned travelers from GeoSentinel sites reported the main diagnoses to be acute diarrhea, malaria, and dengue among others.<sup>1</sup>

Improved education and knowledge of disease transmission among travelers, adhesion to recommendations on water and food hygiene, the avoidance of arthropod bites with barrier measures and insect repellants, chemical prophylaxis against malaria, and adequate vaccination are all known to reduce the risk of illness.

Knowledge, attitudes, and practice (KAP) studies of travelers can aid the development of preventive strategies to avoid infectious diseases when traveling to the tropics. KAP trends need to be repeatedly

Preliminary data of this article were presented in the 9th Conference of the International Society of Travel Medicine, Lisbon, 2005.

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monitored using a standardized methodology if imported infectious diseases are to be controlled.<sup>2</sup>

Reports have shown that KAP on infectious disease prevention among departing travelers and the adherence of travelers to World Health Organization and Centers for Disease Control and Prevention (CDC) recommendations is far from optimal. During 2002 to 2003, the European Travel Health Advisory Board conducted a cross-sectional, multicenter study in airports in Europe, Asia, South Africa, and the United States to evaluate current travel health KAP and determine where travelers going to developing countries obtain travel health information, what information they receive, and what preventive travel health measures they employ.<sup>3-6</sup> A total of 5,067 questionnaires were evaluated, including 896 from Barajas International Airport in Madrid.<sup>3</sup> The questionnaire was administered in December, coinciding with the Christmas holidays, when Spaniards traditionally do not travel as tourists but to visit relatives. This explains why 73.3% of those interviewed were visiting friends and relatives (VFRs), while only 25.0% were tourists. In contrast, the percentage of tourists in Milan or Stockholm was 97.2 and 93%, respectively.

Relatively, little is known about how Spanish travelers perceive risks associated with travel or how they prepare for international travel. Therefore, we designed a new, longer questionnaire to determine the KAP of Spanish travelers to destinations considered to be at high risk for infectious diseases. The aims were to determine the sociodemographic profile of the traveler and the characteristics of the journey and to define the KAP relating to vaccination and the use of chemoprophylaxis against malaria among Spaniards traveling to tropical risk zones.

## Material and Methods

A prospective study was conducted in three phases between June 15 and August 15, 2004. Travelers aged greater than equal to 18 years departing from Madrid or Barcelona International Airports in Spain were invited to participate in the study. Inclusion criteria were Spanish citizens traveling to destinations at high risk for travel-associated infectious diseases.

A specifically designed anonymous Spanish language questionnaire was distributed at the departure gate while passengers were waiting to board. The questionnaire was administered by a trained interviewer and took between 10 and 25 minutes to complete.

The questionnaire used a mixture of open and closed questions. There were 8 questions on the

nature of the journey, 8 questions on health advice sought with respect to the trip, 8 questions on vaccination knowledge and habits, and 14 questions on malaria knowledge and prophylaxis. Age, gender, education, and occupation were also collected.

According to data from the World Tourism Organization, 1,305,100 Spaniard citizens traveled to tropical and subtropical countries during the year prior to the study. Excluding low-risk destinations such as Central America and the Caribbean, North Africa, and Western and Central Asia leaves a total of 357,700 Spanish citizens traveling to tropical risk zones each year: 52% to tropical South America, 22% to Southeast Asia, 15% to Sub-Saharan Africa, 10% to the Asian Indian subcontinent, and 1% to the Pacific.

To ensure that the study sample was representative, it was designed to include approximately 52% of travelers to tropical South America (Bolivia, Brazil, Colombia, Ecuador, Guyana, French Guiana, Peru, Suriname, and Venezuela), 22% to Southeast Asia (Cambodia, The Philippines, Indonesia, Laos, Malaysia, Myanmar, Thailand, and Vietnam), 15% to Sub-Saharan Africa (Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Congo, Cote d'Ivoire, Djibouti, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Equatorial Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Central African Republic, the Democratic Republic of Congo, Rwanda, St Tome and Principe, Senegal, Sierra Leone, Somalia, Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe), 10% to the Asian Indian subcontinent (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka), and 1% to the Pacific. The proposed sample size assumed an absolute error in terms of the global results for calculation of a proportion to be  $\pm 2.8\%$  for all interviews.

Countries were classified as high-risk destinations according to areas traditionally considered as tropical<sup>7,8</sup> and those with a moderate-high prevalence of malaria.<sup>9,10</sup>

A bivariate analysis using the chi-square test was used to contrast proportions. Values of  $p < 0.05$  were considered statistically significant. The EPIINFO program was used to calculate the 95% confidence intervals.

## Results

A total of 1,212 (100%) interviews were carried out with Spanish citizens traveling to: 635 (52.4%) to tropical South America, 251 (20.7%) to Southeast Asia, 181 (14.9%) to Sub-Saharan Africa, 139

(11.5%) to the Asian Indian subcontinent, and 6 (0.5%) to the Pacific. The destinations of Spanish travelers to tropical risk zones are shown in Table 1. According to the study design, the sample was representative of the destinations chosen by Spanish travelers as a whole but was not necessarily representative of all Spanish travelers with respect to sociodemographic characteristics such as age, gender, or education. The six travelers to the Pacific were not included in the final analysis as their numbers were too small. A total of 1,206 questionnaires were analyzed.

Selected demographics and factors associated with receiving medical travel health advice are shown in Table 2.

#### Sociodemographic Profile

A total of 58.3% (703/1,206) of travelers were male and 41.7% (503/1,206) were female. The mean age was 38 years; 64.3% were younger than 40 years, 25.4% (306/1,206) aged 18 to 29 years, 38.9% (469/1,206) aged 30 to 39 years, 22.6% (272/1,206)

**Table 1** Destinations of Spanish travelers to tropical risk zones (N = 1,212)

Geographical region	n (%)	Countries
Tropical South America	635 (52.4)	Brazil: 216
		Peru: 150
		Bolivia: 135
		Venezuela: 121
		Colombia: 100
		Ecuador: 45
Southeast Asia	251 (20.7)	Thailand: 179
		Vietnam: 71
		Indonesia: 51
		Malaysia: 21
		Cambodia: 17
		The Philippines: 6
Sub-Saharan Africa	181 (14.9)	Equatorial Guinea: 65
		Tanzania: 44
		Gambia: 35
		Kenya: 27
		Senegal: 13
		Nigeria: 7
		Namibia: 5
		Zimbabwe: 5
Zambia: 2		
Asian Indian subcontinent	139 (11.5)	India: 133
		Nepal: 53
		Pakistan: 1
Pacific	6 (0.5)	French Polynesia: 6

Areas visited: 79.2% cities, 59% beach-coastal places, and 27.3% rural-jungle-savannah areas. Those traveling to the Indian subcontinent generally visited cities; 15% of those visiting South America include rural or jungle areas—a percentage that increases to 54.7% among those visiting Sub-Saharan Africa.

**Table 2** Selected demographics and factors associated with receiving medical travel health advice (N = 1,206)

	%
Male	58.3
Female	41.7
Age (y) (mean: 38 y)	
18–29	25.4
30–39	38.9
40–49	22.6
≥50	13.1
University education	61.3
Full-time job	89.4
Travel before to tropical or subtropical areas	36.3
Traveled with	
Significant other	53.8
Relatives or friends	26.8
Alone	19.4
Planned journey length (d) (mean: 18.5 d)	
1–7	19.8
8–14	35.4
15–30	30.5
31–60	5.5
>60	8.8
Reason for travel	
Leisure or tourism	81.6
Work or business	12.0
Visiting friends and relatives	4.5
Humanitarian aid	1.8
Other	0.1
Time from planning the journey (d) (mean: 39 d)	
≤7	2.7
8–14	9.2
15–30	24.5
31–60	34.2
>60	29.3
Time in which health information was sought before the journey (d) (mean: 19.5 d)	
≤7	9.1
8–14	33.4
15–28	29.8
>28	27.7
Had sought health information before leaving	73.1
From health care professionals	59.8
Travel agencies	10.0
Obtained personally by the traveler	3.3
Traveled without prior counseling	26.9

aged 40 to 49 years, and 13.1% (158/1,206) greater than or equal to 50 years. There were no significant differences in the age according to geographic destination.

Of the study series, 61.3% had a university education and 89.4% had full-time jobs. A total of 36.3% travelers (438/1,206) reported having traveled before to tropical or subtropical areas, while 64.7% had not. Among travelers to Asia, there was a larger proportion with a history of previous visits

to tropical or subtropical countries, even though they might be new to that specific geographic setting.

A total of 53.8% traveled with their significant other, 26.8% with relatives or friends, 19.4% alone [28.2% for travel to Sub-Saharan Africa ( $p < 0.006$ ) and 25.2% for travel to tropical South America ( $p < 0.003$ )], and 0.7% with children.

The mean planned journey length was 18.5 days (1–7 d in 19.8%; 8–14 d in 35.4%; 15–30 d in 30.5%; 31–60 d in 5.5%; and >60 d in 8.8%). The length of the journey was shorter among those visiting Sub-Saharan Africa ( $\leq 14$  d in 75.7%,  $p < 0.000001$ ) and longer in those traveling to the Asian Indian subcontinent (15–30 d in 58.3%,  $p < 0.000001$ ).

The reason for travel was leisure or tourism in 81.6% of cases, work or business in 12%, VFRs in 4.5%, humanitarian aid in 1.8%, and other reasons in 0.1%. More males (17%) traveled for business reasons than women (5.1%) ( $p < 0.0000001$ ).

Visits to Asia were almost all leisure related or tourism related compared with 24.3% of business-related visits to Africa ( $p < 0.0000001$ ). Business trips increased according to age (from 8.4% in the 18–29 y of age group to 25.2% in travelers aged >50 y) ( $p < 0.000001$ ). Of those traveling for leisure or tourism, 60% were on organized tours (ranging from 54.5% of travelers to tropical South America to 75.2% in the case of Sub-Saharan Africa).

The time from planning the journey to traveling was 39 days, though the mean time in which health information was sought before the journey was only 19.5 days (9.1%,  $\leq 7$  d; 33.4%, 8–14 d; 29.8%, 15–28 d; and 27.7%, >28 d), without significant differences according to the destination. A total of 73.1% of travelers had sought health information about their destination before leaving. In 59.8% of cases, the advice was provided by health care professionals; in 10%, by travel agencies; in 3.3%, the information was obtained personally by the traveler; and 26.9% traveled without prior counseling. Those least inclined to seek information were subjects more than 50 years (58.5%) ( $p < 0.0000001$  vs subjects <50 y) and those traveling to tropical South America ( $p < 0.0000001$  vs those traveling to other destinations). A quarter (25.4%) of travelers visiting Sub-Saharan Africa had not sought specific health information about their visit.

Of those traveling for leisure or tourism, 80.7% had been advised (65.6% by health care professionals, 11.6% by travel agencies, 3.5% sought information on their own account, and 19.3% traveled without information) compared with only 37.7% of those traveling for business reasons.

Travelers who had visited the same region previously were three times less likely to seek health information than first-time travelers, 30% (132/441) versus 88% (673/765) ( $p < 0.0000001$ ). Of those traveling without information, 62.9% stated that they had traveled to the region before and possessed the necessary information.

With respect to the perceived health risk of the destination country, travelers spontaneously cited yellow fever (45.3%), typhoid fever (44.6%), malaria (37.2%), hepatitis (34.2%), and human immunodeficiency virus (HIV)-acquired immunodeficiency syndrome (AIDS) (19.1%), though 28.1% either could not specify any illness or preferred not to answer. Those with the least risk perception were those informed by travel agencies: 50.4% (61/121) versus those informed by health care personnel: 20.4% (148/725) and those traveling to tropical South America: 36% (229/406) versus travelers to other destinations 19.3% (110/461). Surprisingly, 34.7% of travelers to Southeast Asia and 39.6% of those to the Asian Indian subcontinent mistakenly identified yellow fever as a risk disease, while 32% of those visiting Sub-Saharan Africa failed to recognize the risk of malaria.

Travelers claimed to be carrying the following items: insect repellent (78.8%), analgesics or anti-inflammatory drugs (72.2%), sunscreens (59.8%), antidiarrheal drugs (56%), antibiotics (32.1%), oral rehydration salts (21.7%), condoms (19.1%), mosquito nets (15.3%), or nothing at all (9.8%). Variables associated with a well-stocked first-aid kit were travel for tourism or leisure: nothing at all 4.9% (48/935) versus 31.8% (71/223) of other travelers and first-time visitor to the tropics; nothing at all 4.8% (37/768) versus 12.8% (56/438) of previous visitors to the region.

#### *Vaccination Habits*

Vaccination was not considered essential for protection against infectious diseases by 9.4% of travelers, 16% questioned its efficacy, 46.5% considered vaccines to be expensive, 50.4% believed them to be painful, and 71.4% associated them with frequent side effects such as dizziness and fever.

A total of 55.2% had not been vaccinated specifically for the journey, although 24% had received some vaccination for previous trips: 25.2% against viral hepatitis (7.7% hepatitis A, 8.7% hepatitis A + B, and 7.8% hepatitis B), 12.8% against typhoid fever, 14.9% against yellow fever, 27.4% against tetanus-diphtheria, and 19.7% against other diseases. A total of 31.2% had received no travel-related vaccine for either the present or the past trips.

The remaining 44.8% had been vaccinated specifically for the present trip (of which 21% had received vaccinations for previous trips), with an average of 2.7 vaccines per traveler: 32.8% against viral hepatitis (14.5% hepatitis A, 9.1% hepatitis A + B, and 8.7% hepatitis B), 31.7% against typhoid fever, 28.5% against yellow fever, 24% against tetanus–diphtheria, and 6.1% against other diseases (polio, cholera, meningitis, flu, and rabies).

Factors influencing vaccination habits are shown in Table 3. Among those vaccinated specifically for this journey, 10% had no vaccination card accrediting vaccination. Of those vaccinated against hepatitis A, 66.1% were unaware that a booster dose was required upon returning home. Interestingly, 84.6% of those interviewed considered it a very good idea to have some way to remind travelers of the need for booster doses.

#### Prevention of Malaria

While 82.8% (999/1,206) of travelers were aware that malaria is transmitted by mosquito bites, 27.2% (207/1,206) had mistaken ideas about the mechanism of transmission (water- or airborne, transmission from individual to individual, etc.) or were unaware of how transmission occurs—particularly among those travelers visiting tropical South America (23.5%, 42/181) versus Sub-Saharan Africa (8.3%, 53/567) ( $p < 0.0000001$ ); or Asian Indian subcontinent (7.9%, 11/139) ( $p < 0.0004$ ). Only 63.5% were aware that transmission is greater in rural than in urban areas and only 55.1% knew that transmission is greater during the night.

In response to a list of initial symptoms produced by malaria, the answers were as follows: 83.5% fever, 75.4% perspiration, and 68.4% malaise. However, 17.2% cited skin rash and 14.9% swelling of the legs. A total of 87.8% of the travelers knew that malaria can be serious, though only 40.2% were aware that it may be fatal. A lack of knowledge regarding the transmission or clinical manifestations of malaria was not associated with having received information or not, nor to the source of such information.

In response to the question “As far as you know, what is the most effective way to prevent malaria?” 52.2% spontaneously cited insect repellants, though 17.8% had no idea. In turn, 37.9% either disagreed or did not know that taking specific pills is a good way to prevent malaria, and this was greater in travelers advised by travel agencies (63.6%, 77/121) than in those informed by health care professionals (28.6%, 272/725) ( $p < 0.0000001$ ). A total of 37.2% stated that malaria pills often cause significant side effects.

**Table 3** Factors determining vaccination habits

Factors	Determinants	p Value
Destination	The travelers to tropical South America were less often vaccinated (67.2%, 208/635) than the rest, particularly vs travelers to Sub-Saharan Africa (34.8%, 118/181) and the Asian Indian subcontinent (27.3%, 101/139)	<0.0000001
Age	Travelers older than 50 y received fewer vaccinations (62.3%, 98/158) than those younger than 40 y (55.2%, 428/775)	NS
Gender	Men were less often vaccinated (58.1, 408/703) than women (51.1, 257/503)	<0.01
Place of residency	Travelers from the Autonomous Community of Madrid received fewer vaccines (3.4%)	NS
Prior experience	Those who had already visited them same zone received fewer vaccines than first-time visitors (20.9%, 64/396 vs 52.9%, 476/900)	<0.0000001
Type of traveler	Tourists (48.1%, 474/983) were more frequently vaccinated than business travelers (30.1%, 44/145)	<0.0006
Time in advance with which the journey was planned	Those preparing the journey with little time in advance received fewer vaccines (12.1%, 1/33) than those preparing at least 2 wk in advance (45%, 142/316)	<0.000007
Counseling before travel	Those advised by travel agencies received much fewer vaccines (14%, 17/121) than those who were informed by health care personnel (68.2%, 494/725)	<0.0000001

NS = not significant. Pearson's chi-square test.

A total of 34.8% of travelers carried antimalarial chemoprophylaxis: 64.6% traveling to Sub-Saharan Africa, 63.3% to the Asian Indian subcontinent, 43% to Southeast Asia, and 16.5% to tropical South America.

The factors associated with the lack of chemoprophylaxis were information received from travel agencies (87.6%, 106/121 vs 50%, 362/725 informed by health care professionals) ( $p < 0.0000001$ ), travel for business reasons (76.7%, 126/164 vs 63.6%, 663/1,042 travel for other reasons) ( $p < 0.001$ ), travelers younger than 30 years or older than 39 years (70.3% 518/737 vs 56.9%, 267/469 travelers 30–39 y old) ( $p < 0.000002$ ).

When questioned about the reasons for not carrying malaria tablets, the 64 individuals visiting Sub-Saharan Africa without chemoprophylaxis replied that they would obtain the tablets at their destination if they became ill (23.4%), that such tablets are not obligatory (20.3%), that no recommendations had been made (20.3%), that such tablets have strong side effects (14.1%), that they would only be visiting urban or nonrisk areas (14%), and other reasons (6.3%).

Of the 422 travelers taking malaria chemoprophylaxis, 43.6% received mefloquine, 17.1% atovaquone–proguanil, 16.1% chloroquine, 13.5% chloroquine–proguanil, 2.7% doxycycline, and 6.6% could not name the drug. The drugs used for malaria chemoprophylaxis according to destination are shown in Table 4.

However, 23.9% of those taking atovaquone–proguanil, 19.6% of those using mefloquine, and 8.8% of those prescribed chloroquine–proguanil gave wrong answers when questioned about drug dosage and interval.

## Discussion

The European study,<sup>3</sup> in which we participated, was biased with respect to Spain, as most Spanish travel-

ers included were actually internal immigrants returning home to visit relatives during Christmas. This caused the mean length of the visit to be longer among Spaniards than in other European travelers. Of VFRs, 31.4% had sought health information prior to the journey, versus 60.9% of those traveling as tourists. Moreover, the former carried antimalarial drugs less frequently and were less protected against hepatitis A than tourists.<sup>3</sup>

Thus, the objective of the present study was to provide a clearer picture of Spaniards visiting high-risk areas during the peak period for this type of travel. For this reason, only Spanish citizens visiting selected high-risk areas—precisely those places where KAP related to immune-preventable diseases and malaria is essential to traveler health were included. Additionally, subjects were selected proportionately to the numbers of Spanish citizens visiting each high-risk area to provide a representative sample.

The social profile of these travelers showed them to be mainly employed, with a high educational level and living in large urban areas with easy access to information. In addition, one third had prior experience of travel to tropical or subtropical countries. In other words, the profile theoretically indicated easy access and receptiveness to awareness-enhancing programs on disease prevention habits.

The mean age was 38 years; 13.1% were older than 50 years and 20% traveled alone. The time of year (June to August) in which the study was carried out accounts for the high percentage of tourists (81.6%) and the length of the journey (18.5 d).

A multicenter study of 8,000 travelers made in the departure lounges of 16 large airports in Europe,<sup>3</sup> Asia,<sup>4</sup> and South Africa<sup>5</sup> and of 404 travelers leaving the United States from JFK airport<sup>6</sup> showed that as many as 9% of travelers are older than 60 years, that one fourth are VFRs, and that one third

**Table 4** Malaria chemoprophylaxis according to destination in 1,206 travelers

	Sub-Saharan Africa, N=181, n (%)	Tropical South America, N=635, n (%)	Southeast Asia, N=251, n (%)	Asian Indian subcontinent, N=139, n (%)	Total*, N=1,206, n (%)
Carried antimalarials	117 (64.6)	105 (16.5)	108 (43)	88 (63.3)	418† (34.8)
Atovaquone–proguanil	21 (17.9)	16 (15.2)	35 (32.4)	0 (0)	72 (17.1)
Chloroquine	4 (3.4)	31 (29.5)	10 (9.3)	22 (25.0)	67 (16.1)
Chloroquine–proguanil	8 (6.8)	0 (0)	9 (8.3)	38 (43.2)	55 (13.5)
Doxycycline	1 (0.9)	1 (1)	9 (8.4)	0 (0)	11 (2.7)
Mefloquine	73 (62.4)	47 (44.8)	41 (38.0)	22 (25.0)	183 (43.6)

\*Excluded six travelers to the Pacific.

†About 6.5% of the travelers could not name the drug.

travel alone. To an extent, the demographic pattern of western travelers to tropical areas is changing—as also reflected by another Spanish study in which progressive changes were recorded in the pattern of high-risk travelers, with up to 1.8% of highly vulnerable travelers such as pregnant women, infants, the elderly, and those with immunodeficiency.<sup>11</sup>

A total of 83.1% of Spanish travelers sought health-related advice similar to the results of the South African study (86%)<sup>5</sup> and greater than in the European (52.1%),<sup>3</sup> American (36%),<sup>6</sup> and Australasian series (31%).<sup>4</sup> It is alarming that 26.9% of Spaniards traveling to high health-risk zones sought no information at all before departure. They planned their journey almost 40 days in advance, but health advice was sought only 19.5 days in advance on average. The least-informed travelers tended to be older than 50 years and had visited the same area on several occasions on business trips. The best informed tended to be subjects younger than 40 years traveling to the area for the first time on an organized tourist trip. Most interviewees who did not seek advice stated that they were aware of the risk or did not consider such advice necessary.

Almost a third of travelers and half of those advised by travel agencies were unable to name any risk disease specifically associated with travel to the tropics. Additionally, of those defined as “informed” travelers, over a third visiting Asia cited yellow fever as a risk disease and almost a third of those visiting Sub-Saharan Africa did not mention malaria as a risk disease. Clearly, many of the informed travelers were poorly informed. An exception is HIV infection—AIDS, where information and risk perception were seen to be very similar among both informed and uninformed travelers. This may be due to the AIDS prevention campaigns conducted in Spain in recent years. Up to 40% of travelers were unable to correctly assess the risk for various infectious diseases: 52% to 56% for hepatitis A, 69% to 87% for hepatitis B, 63% to 90% for typhoid fever, with almost 25% of travelers visiting malaria-endemic areas not perceiving malaria as a risk disease.<sup>3-6</sup> This suggests the need for new strategies to improve health knowledge among travelers.

The drugs most often found in the first-aid kits of travelers to tropical zones were analgesics, diarrhea treatments, antiseptics, and Band-Aids.<sup>12</sup> Around 95% of tourists were carrying some kind of medication, including antidiarrheals (56%), antibiotics (32.1%), and oral rehydration salts (21.7%). This may be attributable to the influence of the pharmacist upon first-aid kit preparation because in Spain, a number of effective educational campaigns

on travel health have been conducted in pharmacy offices.<sup>13</sup>

Vaccines were perceived as effective against diseases and were even viewed as essential by 90 and 84% of travelers, respectively. However, 71.4% also considered that vaccines generally produce side effects, and this, rather than pain or the cost of treatment was the principal reason for rejecting vaccines. Studies show that 76%<sup>4</sup> to 92%<sup>5</sup> of travelers from developed countries perceive vaccines as essential in protecting against infections, but up to 22% are concerned about adverse effects, and the high cost could also be a reason for nonuse. Although tourists seemed to receive more vaccinations than business travelers, the difference may be explained by the fact that the tourist is traveling to the destination for the first time (84%), while the traveler on business or who travels for other reasons is not (26 and 36%, respectively), and moreover, has been vaccinated for previous trips. Only 8.9% of “uninformed” travelers were vaccinated compared with 14% of those informed by travel agencies and 68.2% of those informed by health care professionals. This once again underlines the significant number of unprotected travelers and the low quality of information supplied by travel agencies.

The most frequent vaccines received were those against typhoid fever (31.7%), tetanus–diphtheria (24%), and hepatitis A (13.6%). These results are similar to those of other studies, which show that although most travelers believe vaccines to be effective for prevention, few are actually vaccinated for their journey. Among western travelers, the hepatitis A vaccine is the most widely used (approximately 40%), although, even so, in very few cases are visits to hepatitis A–endemic countries preceded by a visit to a travel clinic.<sup>14</sup> In countries with a low risk of hepatitis A, such as Canada, the risk of acquiring hepatitis A during 1 month of travel in the developing world is calculated to be approximately one case per 3,000 nonimmunized travelers.<sup>15</sup> This risk is lower among Spanish travelers because the great majority of those older than 45 years have immunoglobulin G antibodies.<sup>16</sup> This could explain the lower frequency of hepatitis A vaccination. In this study, the most widely used vaccine was for typhoid fever, which may in fact be overprescribed, particularly for travelers to South America because the risk is greater in Asia and Africa.<sup>17</sup>

Nearly 50% of Spanish travelers to high-risk countries carry no vaccination certificate or card, versus 10% of those specifically vaccinated for this journey. In a survey in the United States, 34% of travelers were not able to produce a valid vaccination

certificate.<sup>6</sup> In addition, 69% of those vaccinated and 89% of those informed in travel agencies were unaware of the need for vaccine booster doses upon returning home. Interestingly, 85% of those interviewed considered it would be very or quite useful to have information reminding them of the need for booster doses. This suggests the need for more innovative strategies for booster dose reminders, such as mailings or SMS mobile phone messages.<sup>18</sup>

More than a quarter of travelers were unaware that malaria is transmitted by mosquito bites, particularly those traveling to tropical South America (45.4%) compared with travelers to Sub-Saharan Africa (8.3%), and only half (55.1%) had somewhat better knowledge—such as knowing that transmission is greater in rural zones and at night. Although travelers widely believed (87.8%) malaria to be a serious disease and 83.5% named fever as the principal symptom, the knowledge was superficial, because only 40.2% were aware that the disease may prove fatal, and a third mistakenly cite skin rash or swelling as manifestations. These results are not surprising because an analysis of Swiss businessmen traveling to zones at high risk for malaria found that over a quarter did not know that transmission is greater at dawn and dusk and less than a third knew the symptoms of the disease other than fever. Only two thirds would react adequately and seek medical advice within 24 hours.<sup>19</sup>

Questioned about malaria prevention, 17.8% of travelers had no idea whatsoever, while 37.9% were either unaware of or disagreed with chemoprophylaxis, and half (52.2%) cited insect repellants. Knowledge on malaria transmission and clinical manifestations was not associated with having received information on the subject or with where the information was obtained. In contrast, knowledge of specific preventive measures was clearly associated with having received information or not, and, especially, to where such information was obtained—because two thirds (63.7%) of those informed by travel agencies were unaware of such measures. These results suggest that travelers are informed about general protection against mosquitoes but not expressly about malaria. They are not informed about the clinical manifestations, and antimalarial prophylaxis is provided without explaining the true importance of the disease—or, alternatively, travelers fail to read the printed information usually given. Spanish travelers often confused the symptoms of malaria with those of other febrile diseases; consequently, if self-medication were decided upon instead of chemoprophylaxis, more information including adequate health education should be

provided. Although this would considerably prolong the time dedicated to health counseling, failure to do so would lead travelers to excessive self-medication, and a substantial number would even be unable to recognize the disease (over 8% of those traveling to Sub-Saharan Africa). This could cause delays in the diagnosis and favor the appearance of complications. Here again, the information provided by travel agencies was seen to be the least satisfactory.

The percentage of travelers who visit risk zones without antimalarial prophylaxis is estimated to range from 40% to 65%.<sup>3-6</sup> However, among those visiting Sub-Saharan Africa, the percentage drops to 20% to 30%<sup>20</sup> because the crude risk for malaria is much higher<sup>9</sup>—the estimate being 341-fold greater than in other areas.<sup>10</sup> In our study, over a third (36.7%) of travelers to Sub-Saharan Africa carried no chemoprophylaxis for the reasons stated in the results. Of those who did carry some form of medication, 52.3% were wrongly informed with respect to the daily dose or the interval between doses, and the information given was clearly insufficient.

In Spain, no antimalarial prophylaxis (other than atovaquone-proguanil and doxycycline) is marketed, and the drugs must be acquired from abroad—with the inconvenience and lost time this implies. Demand for the necessary appointments in travel clinics is very high during the holiday period, as a result of which many people decide not to go to the clinic, while others receive only last-minute advice.

The main limitation of this study was that it was conducted in the airport and consisted of a questionnaire with no subsequent follow-up of any type. This may provide a characteristic “snapshot” of Spanish travelers, but longitudinal studies would undoubtedly reveal much more information. In addition, the answers provided by travelers were, obviously, lacking in medical knowledge and could not distinguish, for example, between different types of hepatitis. Likewise, a multivariate analysis could have provided valuable information on the significance of the results obtained.

In conclusion, although considerable effort has been made in Spain in recent years to improve travelers' KAP, including the creation of a dedicated Web site ([www.viajarsano.com](http://www.viajarsano.com)), training courses for primary care physicians and pharmacists, and the production of informative material and annual training sessions, the results of this study show that greater improvements are still needed and that reaching travelers in travel agencies is essential. More than half of travelers to risk areas received



no vaccinations before the trip. More than a third of travelers to Sub-Saharan Africa received no malaria prophylaxis. As attempts to enhance awareness by mailings have been shown to have only a limited impact,<sup>21</sup> some legal obligation may be needed, such as the requirement for all tickets to risk destinations to carry a warning designed to stimulate travelers to seek adequate counseling before traveling.

### Acknowledgments

We thank David Buss and Brandon W. Stuver for technical help. This study was funded by an unrestricted educational research grant from Glaxo-SmithKline Biologicals (Madrid, Spain).

### Declaration of Interests

The authors state that they have no conflicts of interest.

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