Demographics, health and travel characteristics of international travellers at a pre-travel clinic in Marseille, France

Camille Aubry, Jean Gaudart, Catherine Gaillard, Jean Delmont, Philippe Parola, Philippe Brouqui, Philippe Gautret

Travel Medicine and Infectious Disease (2012) 10, 247–256

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.elsevierhealth.com/journals/tmid

Demographics, health and travel characteristics of international travellers at a pre-travel clinic in Marseille, France

Camille Aubry [a], Jean Gaudart [b], Catherine Gaillard [a], Jean Delmont [a], Philippe Parola [a], Philippe Brouqui [a], Philippe Gautret [a,*]

[a] University Hospital Institute for Infectious and Tropical Diseases, Hôpital Nord, AP-HM, 13015 Marseille, France
[b] LERTIM, Faculty of Medicine, Aix-Marseille University, Marseille, France

Received 30 July 2012; received in revised form 10 September 2012; accepted 12 September 2012
Available online 11 October 2012

KEYWORDS
Travellers;
Demographics;
Chronic conditions;
Vaccination;
Antimalarials

Summary With the aim to identify at-risk individuals among a cohort of international travellers, 3442 individuals who sought advice at Marseille travel health centre in 2009 were prospectively included. Demographics, travel characteristics, chronic medical conditions, vaccinations and antimalarial chemoprophylaxis were documented.

Chronic medical conditions were reported by 11% of individuals, including hypertension (39%), asthma (20%), thyroid disease (15%) and depression (13%). 4% reported taking a daily medication, and psychotropic and cardiovascular medications were the most commonly used. Older travellers (≥60 years) accounted for 10% of the travellers and the prevalence of chronic medical conditions was 27% in this group. Individuals aged 15 years or less accounted for 13% of the travellers. Age, last minute travel (17%) and neurological and psychiatric diseases were the most frequent factors that influenced Yellow fever vaccination and malaria chemoprophylaxis, with more than one tenth of the travellers reporting at least one risk factor for which adjusted advice may be necessary. Migrants visiting their relatives in their origin country accounted for 14% of travellers and 73% of this group travelled with their family including young children.

We demonstrate that a significant proportion of travellers are at-risk (43%) because of their travel conditions (VFR), their age, or their health status, and should be targeted for risk reduction strategies.

* Corresponding author. Tel.: +33 (0) 4 91 96 35 35; fax: +33 (0) 4 91 96 89 38.
E-mail address: philippe.gautret@club-internet.fr (P. Gautret).

1477-8939/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.tmaid.2012.09.004

Introduction

Over 80 million people travel annually from industrialised countries to the developing world, and this trend continues to increase.[1] European travellers account for the majority of international travellers, and travel-associated diseases are frequent among this mobile population.[2] In 2006, 22.5 million French citizens travelled abroad to the following countries: Europe (33%), North Africa (12%), Asia (7%), the Caribbean (4%), Latin America (2%), the Indian Ocean (2%), Sub-Saharan Africa (2%), the Middle East (1%) and Oceania (1%).[3] A total of 120 countries were visited, of which one out of four were considered to be at high-risk for travel-associated diseases.[3] This risk is notable for infectious diseases that are associated with food and water consumption, arthropod bites, environmental conditions and sexual behaviour and is frequently underestimated by travellers. In a study that was conducted in airports in Europe of travellers to tropical countries, only 50% of travellers had sought pre-travel advice and only one-third of travellers to malaria-endemic countries took antimalarial chemoprophylaxis.[4] In France, a telephone survey that was conducted among individuals 18–79 years of age revealed that 75% of respondents considered it useful to seek medical advice prior to travelling, but only 63% of the respondents sought advice.[5] Because of the increasing number of international travellers to at-risk destinations, pre-travel advice is a key point in a public health perspective, which limits the burden of travel-associated diseases in French travellers and the risk of importation of communicable diseases in France. Over 100 specialised pre-travel clinics were recorded in a national survey that was conducted in 2009 in France, of which five clinics were in the Bouches du Rhône district in Southern France (1,995,094 inhabitants in 2009), including three clinics in the largest city, Marseille (858,902 inhabitants in 2009).[6]

Published data regarding the characteristics of French travellers are scant and limited to specific categories of travellers or specific travel destinations.[7–9] With the aim to identify at-risk travellers departing from Marseille, we conducted a study on individuals who sought advice at a travel health centre in 2009.

Materials and methods

Study travellers

All of the travellers who presented to the travel health centre at a tertiary care hospital (University Institute for Infectious and Tropical Diseases, Marseille) were included prospectively in a study from January 2009 to December 2009. Travellers to Mecca who were participating in the Hajj were excluded because a specific survey was conducted in this population.[10] In addition, travellers who were consulted for a systematic vaccination for business travel with no specific travel destination (air and navy crew) were excluded. A total of 8 medical doctors documented the demographics (gender, age, and socio-professional category according to the INSEE classification[11]), travel characteristics (visit date, departure date, countries travelled to, travel duration, reason for travel, number of co-travellers, and risk level) and medical conditions (chronic diseases, treatments, and pregnancy). Additionally, prescribed vaccinations and antimalarial chemoprophylaxis were documented. The factors that influenced standard pre-travel health advice were documented according to the Van de Winkel criteria addressing condition with possible interaction with malaria prevention and Yellow fever vaccination, and preventive measures for travellers' diarrhoea and other enteric infections. Details about what constitutes a possible interaction or a possible influencing factor are described elsewhere.[12]

Statistical analysis

The data were entered anonymously and managed in the SPSS software package, v16.0 (SPSS Inc., Chicago). The differences in the proportions (categorical variables) were tested by Fisher's exact tests, and the differences in the medians (continuous variables) were tested by the Kruskal–Wallis test. p Values <0.05 were considered statistically significant.

Results

Traveller and travel characteristics

A total of 3957 travellers presented to the centre over the study period, of whom 479 (11.8%) were Hajj pilgrims and 36 (0.9%) were air and navy crew. A total of 3442 travellers were included in the study. The mean number of visits per month was 285 (Fig. 1). There was a 1.4 fold increase in the number of visits in June and a 1.2 fold increase in July due to departures for summer scholar vacations. A decrease in the number of visits was observed in April, May and August for internal reasons and in October because most of the consultants were Hajj pilgrims during this month. The M/F sex ratio was 0.98, and the mean age was 36.6 years (range = 1 month–85 years). Individuals who were ≤18 years of age accounted for 14.9% of the travellers, including 459 children ≤15 years of age and 48 children ≤one year of age. Older travellers who were ≥60 years of age accounted for 10.4% of the travellers (Table 1). Among the travellers >18 years of age, 62.0% of the socio-professional

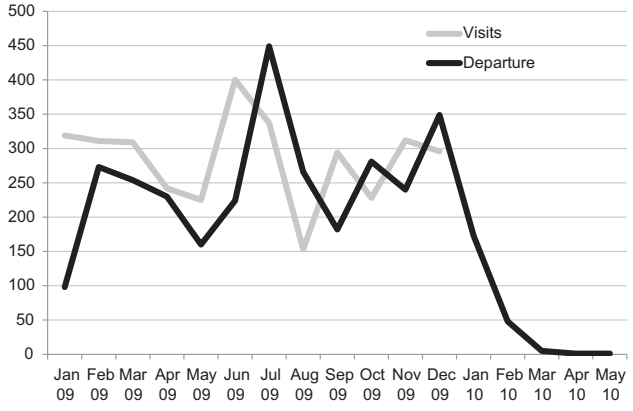

Figure 1 Number of visits and travel departure per month of 3442 travellers from Marseille, in 2009–2010.

Table 1 Demographics and travel characteristics of 3442 travellers from Marseille, according to reason for travel in 2009.

		All travellers *N* (%)	Tourists *N* (%)	Business travellers *N* (%)	VFRs[a] *N* (%)
Gender	Male	1709 (49.6)	925 (46.9)	392 (69.3)	211 (47.8)
	ND[b]	3	1	0	1
Age (years)	0—17	504 (14.9)	235 (12.1)	39 (7.0%)	173 (39.5)
	18—59	2533 (74.7)	1445 (74.7)	481 (86.7%)	240 (54.8)
	>60	352 (10.4)	255 (13.2)	35 (6.3%)	25 (5.7)
	ND	53	35	11	3
Socio-professional category (≤18 years of age)	Farmer	4 (0.2)	3 (0.3)	1 (0.3)	0 (0.0)
	Contractor/ Craftsman	95 (5.3)	46 (4.2)	33 (9.6)	7 (5.7)
	Business executive	425 (23.7)	250 (22.8)	129 (37.4)	10 (8.2)
	Intermediate profession	472 (26.4)	298 (27.2)	101 (29.3)	29 (23.8)
	Employee	241 (13.5)	155 (14.1)	47 (13.6)	23 (18.9)
	Factory worker	29 (1.6)	11 (1.0)	12 (3.5)	7 (5.7)
	Retired	251 (14.0)	206 (18.8)	6 (1.7)	18 (14.8)
	Student/ Unemployed	272 (15.2)	128 (11.7)	16 (4.6)	28 (23.0)
Travelled regions	Africa	2252 (65.8)	1150 (58.7)	391 (70.1)	394 (89.3)
	America	638 (18.6)	441 (22.5)	98 (17.6)	30 (6.8)
	Asia	485 (14.2)	337 (17.2)	59 (10.6)	17 (3.9)
	Oceania	14 (0.4)	3 (0.2)	9 (1.6)	0 (0.0)
	Europe	1 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Round the world	33 (1.0)	29 (1.5)	1 (0.2)	0 (0.0)
	ND	39	13	8	0
Travelled countries (top 10)		Senegal 657 (21.6)	Senegal 474 (25.9)	French Guyana 61 (11.6)	Comoros 112 (25.5)
		Kenya 187 (6.1)	Kenya 170 (9.3)	Gabon 45 (8.6)	Senegal 83 (18.9)
		Brazil 161 (5.3)	Brazil 116 (6.3)	Senegal 38 (7.2)	Côte d'ivoire 38 (8.6)
		Burkina Faso 154 (5.1)	Tanzania 77 (4.2)	Mali 37 (7.0)	Madagascar 27 (6.1)
		French Guyana 151 (5.0)	India 76 (4.2)	Côte d'ivoire 35 (6.7)	Guinea 16 (3.6)
		Mali 147 (4.8)	Peru 74 (4.0)	Cameroun 32 (6.1)	Burkina Faso 16 (3.6)
		Comoros 127 (4.2)	Thailand 72 (3.9)	Congo 26 (4.9)	French Guyana 16 (3.6)
		Côte d'ivoire 121 (4.0)	Mali 67 (3.7)	Angola 25 (4.8)	Cameroun 14 (3.2)
		India 95 (3.1)	Burkina Faso 65 (3.6)	South Korea 24 (4.6)	Benin 13 (3.2)
		Tanzania 86 (2.8)	French Guyana 65 (3.6))	Burkina Faso 22 (4.2)	Gabon 13 (3.2)
Number of countries per travel	1 country	3105 (90.9)	1780 (90.4)	512 (91.9)	435 (98.9)
	>1 country	278 (8.1)	152 (7.7)	45 (8.1)	5 (1.1)
	Round the world	33 (1.0)	29 (1.5)	0 (0.0)	0 (0.0)
	ND	39	12	8	0
Mean travel duration (weeks)	≤1	495 (15.4)	313 (16.4)	138 (27.6)	11 (2.6)
	1—2	1224 (38.1)	969 (50.7)	82 (16.4)	81(19.3)
	>2—4	733 (22.8)	429 (22.3)	57 (11.4)	150 (35.7)
	>4—12	426 (13.3)	118 (6.3)	62 (12.2)	166 (39.3)
	>12—36	126 (3.9)	37 (1.9)	48 (9.6)	3 (0.7)
	>36—52	76 (2.3)	24 (1.2)	47 (9.6)	2 (0.7)
	>52	135 (4.2)	22 (1.2)	66 (13.2)	7 (1.7)
	ND	226	61	66	21

(*continued on next page*)

Table 1 (*continued*)

		All travellers *N* (%)	Tourists *N* (%)	Business travellers *N* (%)	VFRs[a] *N* (%)
Reason for travel	Tourism	1970 (60.3)			
	Business	566 (17.3)			
	VFR	440 (13.5)			
	Humanitary	179 (5.5)			
	Family regroupment	2 (0.1)			
	Study	77 (2.4)			
	Adoption	12 (0.4)			
	Resident	12 (0.4)			
	Military	6 (0.2)			
	Sport	2 (0.1)			
	Expulsion	1 (0.0)			
	ND	170			
Number of co-travellers	Group	952 (34.5)	634 (36.6)	150 (36.5)	23 (6.4)
	Family	884 (32.0)	509 (29.4)	73 (17.8)	263 (73.3)
	Pair	530 (19.2)	447 (25.8)	29 (7.2)	27 (7.5)
	Solo	394 (14.3)	144 (8.2)	159 (38.7)	46 (12.8)
	ND	680	239	155	82
Risk level	Pre-organised trip[c]	1565 (85.7)	1181 (77.4)	209 (56.3)	72 (24.5)
	Risk travel[d]	134 (7.3)	342 (22.4)	69 (18.6)	217 (73.8)
	Expatriate	127 (7.0)	2 (0.1)	93 (25.1)	5 (1.7)
	ND	1010	448	195	147

[a] VFRs = visiting friends and relatives.
[b] ND = non documented. % were calculated for documented data only.
[c] Pre-organised trip intended to identify travellers who are sheltered or "cocooned" from many of the risks (food, vectors, sleeping conditions) faced by the local population. Uses the infrastructure of the travel industry (includes internet self-booking) in the home country for most or all arrangements. Uses standard or better hotel or other short-stay temporary accommodation. Eats mostly at restaurants serving large numbers of foreigners and which is often pre-screened by tour operators or employers. Uses mostly in-country transportation specifically serving tourists or foreigners.
[d] Risk travel: intended to identify travellers who will, by their behaviour, encounter a substantial number of the risks facing the local population. This classification would generally include no pre-booking of accommodation for most or all nights and/or use of accommodation specific to budget travellers or those staying in the house of local residents.

categories were documented. Of these travellers, 70.7% were working currently, 14.0% were retired and 15.2% were students or unemployed. Of 10 travellers, 7 planned to travel to Africa, 2 to the American continent and 1 to Asia. The top 10 visited countries were Senegal, Kenya, Burkina Faso, French Guyana, Mali, Comoros, Côte d'Ivoire, India and Tanzania. Overall, 90.9% of the travellers planned to visit only one country. The mean travel duration for individuals who were travelling ≤one year (95.8%) was 5.6 weeks (range = 0.1–52 weeks). The travel duration was ≤2 weeks for 53.5% of the travellers, ≤one month for 76.3%, >3 months for 10.4% and >six months for 6.5%. The mean time between the visit date and the departure date was 32.4 days (range = 0–269 days), and 17.2% of the travellers were consulted ≤10 days before departing, 44.8% ≤21 days and 57.4% ≤28 days. The most common reasons for travel were tourism, business and visiting friends and relatives (VFR). The majority of travellers travelled at least by pair and underwent pre-organised trips.

The demographics and travel characteristics varied according to the reason for travel. Tourists and business travellers were older than VFRs (37.6 and 38.9 years of age vs. 26.3 years of age, $p < 0.001$). Africa was the most common destination among the three groups of travellers. Overall, 69.4% of the travellers the American continent and 71.5% of the travellers to Asia were tourists. The top 3 visited countries were Senegal, Kenya and Brazil among tourists; French Guyana, Gabon and Senegal among business travellers; and Comoros, Senegal and Côte d'Ivoire among VFRs. Tourists had a shorter travel duration (4.0 weeks, range = 0.5–52 weeks) compared to VFRs (5.2 weeks, range = 0.3–40 weeks) and business travellers (10.4 weeks, range = 0.1–52 weeks) with $p < 0.001$. Tourist travellers were less likely to travel with their families compared to VFRs (32.0% vs. 73.3%), and tourists and business travellers underwent pre-organised trips more frequently compared to VFRs (77.4% and 56.3% vs. 24.5%) with $p < 0.001$.

Medical conditions

Among female travellers 16–50 years of age ($N = 1091$, 63.0% of female travellers), eight travellers were pregnant, 18 were trying to conceive and two were breastfeeding. One or more medical conditions were identified in 11.3% of the travellers (Table 2). The mean age of travellers with chronic medical conditions was 45.1 years, and the M/F sex ratio was 1.3. The prevalence of chronic medical conditions was 27.0% in travellers ≥60 years of age, 9.9% in travellers

Table 2 Chronic medical conditions in 3442 travellers from Marseille in 2009.

Syndrome (*N*)	Disease	Travellers (*N*)	% of ill travellers	% of all travellers
Cardiovascular (215)	Hypertension	150	38.6	4.6
	Myocardial infarction/Angor	29	7.5	0.9
	Heart rhythm and conduction disorder	13	3.3	0.4
	Thromboembolic disease	9	2.3	0.3
	Cardiopathy	2	0.5	0.1
	Valvular disease	3	0.8	0.1
	Other	3	0.8	0.1
Endocrinology (109)	Thyroid disease	57	14.7	1.7
	Diabetes	45	11.6	1.4
	Dyslipidemiae	15	3.9	0.5
	Other	7	1.8	0.2
Respiratory (87)	Asthma	77	19.8	2.4
	Cystic fibrosis	2	0.5	0.1
	Other (Quincke oedema—rhinitis)	6	1.5	0.2
Psychiatric (53)	Depression	49	12.6	1.5
	Other (anxiety—psychosis—autism)	3	0.8	0.1
Cancer (36)	Cancer	37	9.5	1.1
Neurologic (36)	Migraine	16	4.1	0.5
	Epilepsy	12	3.1	0.4
	Stroke	7	1.8	0.2
	Other (Guillain Barré—multiple sclerosis—myasthenia—myelitis)	4	1.0	0.1
Gastrointestinal diseases (32)	Crohn's disease	7	1.8	0.2
	Ulcerative colitis	4	1.0	0.1
	Other (gastric ulcer—diarrhoea-irritable bowel syndrome)	21	5.4	0.6
Rheumatologic (19)	Inflammatory joint disease	7	1.8	0.2
	Senescent arthritis	4	1.0	0.1
	Others (Hystiocytosis—Sclerodermia—Bullous pemphygoid—Deficit IgA.—Lupus)	8	2.1	0.2
Infectious diseases (18)	Hepatitis C	7	1.8	0.2
	HIV infection	4	1.0	0.1
	Hepatitis B	4	1.0	0.1
	Other (infected hip prostheses—urinary infection)	3	0.8	0.1
Pediatrics (13)	Bronchiolitis	4	1.0	0.1
	Premature	4	1.0	0.1
	Gastro-oesophageal reflux disease	3	0.8	0.1
	Febrile seizure	2	0.5	0.1
	Cow milk protein allergy	1	0.3	0.0
Blood diseases (12)	Coagulation disorder	6	1.5	0.2
	Sickle cell anaemia	3	0.8	0.1
	Splenectomy	2	0.5	0.1
	Thrombocytopenic purpura	1	0.3	0.0
Dermatologic (11)	Atopic dermatitis	5	1.3	0.2
	Eczema	3	0.8	0.1
	Acnea	3	0.8	0.1
Renal diseases (7)	Kidney transplant	3	0.8	0.1
	IgA nephropathy, chronic renal dysfunction, Polycystic kidney disease	4	1.0	0.1
Ophthalmologic (6)	Glaucoma	6	1.5	0.2
Hear, Ear Eye, Nose, Throat (6)	(Vertigo. Neurinoma. Cholesteatoma)	9	2.3	0.3
Gynaecologic (4)	Endometriosis	4	1.0	0.1
Urologic (4)	Benign prostatic hyperplasia, Renal stone disease, Nephrectomy	4	1.0	0.1
Rare diseases (2)	Tuberous sclerosis, Tinu syndrome, Proteus syndrome	3	0.5	0.1

Table 3 Malaria risk and malaria prophylaxis according to reason for travel of 3442 travellers from Marseille, according to reason for travel in 2009.

		All travellers *N* (%)	Tourists *N* (%)	Business travellers *N* (%)	VFRs[a] *N* (%)
Malaria risk	Type 1 and 2[b]	1087 (33.8)	734 (40.0)	179 (34.0)	55 (12.5)
	Type 3[b]	2132 (66.2)	1100 (60.0)	349 (66.0)	384 (87.5)
	ND[c]	222	139	38	2
Antimalarial	Doxycycline	708 (37.2)	265 (26.7)	114 (36.8)	189 (53.5)
	Mefloquine	127 (6.7)	33 (3.3)	11 (3.5)	70 (19.8)
	Atovaquone—Proguanil	963 (50.6)	665 (67.2)	143 (46.1)	78 (22.1)
	Chloroquine—Proguanil	18 (0.9)	1 (0.1)	3 (1)	8 (2.3)
	None	88 (4.6)	27 (2.7)	39 (12.5)	8 (2.3)
	ND	103	109	39	31

[a] VFRs = visiting friends and relatives.
[b] Type 1 = absence of *Plasmodium falciparum* strains resistant to chloroquine, Type 2 = presence *P. falciparum* strains resistant to chloroquine, Type 3 = High prevalence of *P. falciparum* strains resistant to chloroquine and multi-resistant strains.[13]
[c] ND = non documented. % were calculated for documented data only.

18—59 years of age and 7.3% in travellers <18 years of age. The most frequent diseases were hypertension, asthma, thyroid diseases, depression and diabetes. The most frequent treatments were cardiovascular and psychotropic medications, which were most commonly used by travellers ≥60 years of age compared to those 18—59 years of age. In total, 29 (0.8%) travellers were immunocompromised (18 travellers because of a chronic disease and 11 travellers because of immunosuppressive drug intake).

Malaria chemoprophylaxis and vaccines

Overall, 70.7% of travellers received malaria chemoprophylaxis, mainly atovaquone/proguanil and doxycycline. Two-thirds of travellers travelled to areas where the prevalence of chloroquine resistance was high or where multi-resistance was present (group 3 according to the 2009 French classification),[13] of whom 50.6% received atovaquone—proguanil, 37.2% doxycycline and 6.7% mefloquine (Table 3). Few travellers were prescribed chloroquine/proguanil, most of them travelling to South India and Madagascar. The choice of antimalarial drug was dependent on the duration of travel (Fig. 2). According to the 2009 French recommendations[13], a total of 2489 (72.3%) travellers had an indication for Yellow fever vaccine. In 23 cases, the vaccination was contraindicated (12 children less than nine months of age, five pregnant women, and seven travellers with immunocompromising conditions). Overall, two-thirds of travellers were immunised previously against tetanus, diphtheria and poliomyelitis (TDP) (Table 4). Tourist travellers were significantly more likely to be immunised against TDP compared to business travellers and VFRs ($p = 0.009$). One-third of travellers were immunised against hepatitis B with no significant differences according to the reason for travel. By contrast, VFRs were significantly less likely to be vaccinated against hepatitis A and typhoid fever before their visit to the clinic and were less likely to receive vaccines against these diseases during the visit compared to other travellers ($p < 0.001$). Age, last minute travel and neurological and psychiatric diseases were the most frequent factors that influenced Yellow fever vaccination and malaria chemoprophylaxis (Table 5).

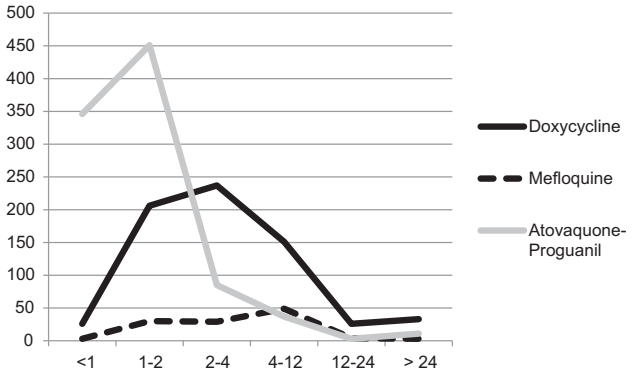

Figure 2 Number of travellers receiving doxycycline, mefloquine or atovaquone—proguanil according to duration of travel, in weeks of 3442 travellers from Marseille, in 2009.

Discussion

The mean age (37 years) of the travellers and the predominance of tourists in our survey is similar to the findings of another study that was conducted in Paris[7] and of international studies that were conducted in travel clinics.[14—18] In our survey, >30% of travellers were business travellers or VFRs, whereas these categories accounted for 11.2%—36.1% in other studies.[7,14,15,17] The travellers who were seen in Marseille was characterised by the predominance of travel destinations to Sub-Saharan Africa, which may reflect the past colonial history of France and subsequent migration waves, notably in South France. In 2008, 46.4% of travellers who were consulted at a travel clinic in Paris had a destination to Asia and 39.5% of travellers to Africa.[7] South America was the main destination of travellers in a study in Spain,[15] whereas Thailand was the main destination in a study in Sweden[16] and India was the main destination in a study in the U.S.[14] Vaccination coverage against tetanus and diphtheria in the travellers in Marseille was similar to that of other surveys,[14] whereas the vaccination coverage against hepatitis B was lower.[14,17,18] This low vaccination rate against hepatitis B reflects the well-

Table 4 Immunisation status before visit and vaccination provided during visit according to reason for travel of 3442 travellers from Marseille, according to reason for travel in 2009.

Vaccine	All travellers		Tourists		Business travellers		VFRs[a]	
	Immunisation[b] *N* (%)	Vaccination *N* (%)	Immunisation *N* (%)	Vaccination *N* (%)	Immunisation *N* (%)	Vaccination *N* (%)	Immunisation *N* (%)	Vaccination *N* (%)
TDP[c]	2225 (64.6)	681 (19.8)	1313 (66.5)	393 (19.9)	344 (60.8)	136 (24.0)	269 (61.0)	85 (19.3)
HepB[d]	1077 (31.3)	142 (4.1)	589 (29.9)	58 (2.9)	170 (31.1)	41 (7.2)	137 (30.1)	24 (5.4)
TF[e]	367 (10.6)	1277 (37.1)	205 (10.4)	600 (30.4)	70 (12.4)	184 (32.5)	18 (4.1)	60 (13.6)
Hep A[f]	591 (17.1)	1429 (41.5)	341 (17.3)	593 (30.1)	116 (20.5)	186 (32.9)	33 (7.5)	60 (13.6)
JE[g]	2 (0.02)	19 (0.6)	2 (0.1)	7 (0.4)	0 (0.0)	10 (1.8)	0 (0.0)	0 (0.0)
Rabies	24 (0.7)	194 (5.6)	14 (0.7)	104 (5.2)	5 (0.8)	53 (9.3)	1 (0.2)	5 (1.0)

[a] VFR = visiting friends and relatives.
[b] Travellers were considered immunised based on documented or self-reported previous vaccination and according to French guidelines.[13,34]
[c] TDP = tetanus, diphtheria, poliomyelitis.
[d] Hep B = hepatitis B.
[e] TF = typhoid fever.
[f] Hep A = hepatitis A.
[g] JE = Japanese encephalitis.

Table 5 Factors influencing yellow fever vaccination, malaria prophylaxis and traveller's diarrhoea treatment of 3442 travellers from Marseille in 2009.

Prescription	Factors	*N*	% All travellers
Yellow fever vaccination	Allergy to eggs	ND	
	Last minute travel (<10 days before departure)	427	13.2
	<1 year of age	45	1.3
	>60 years of age	312	9.2
	Intended conception	18	0.6
	Confirmed pregnancy	8	0.2
	Immunocompromised traveller	14	0.4
	Rheumatic disorder immunosupressive medication	2	0.1
	Organ transplant immunosupressive medication	3	0.1
	Immunosuppressive medication for cancer	1	0.0
	Generalised eczema or psoriasis immunosupressive medication	1	0.0
	HIV infection with <200 CD+	0	0.0
	Thymoma-thymectomy	1	0.0
Malaria chemoprophylaxis	Allergy to doxycycline	ND	
	Known intolerance to antimalarials	ND	
	Last minute travel (<10 days before departure)	427	13.2
	<1 year of age	45	1.3
	>60 years of age	312	9.2
	Intended conception	18	0.6
	Confirmed pregnancy	8	0.2
	Neuropsychiatric disorder	51	1.5
	Epilepsy	14	0.4
	Heart rhythm and conduction disorder	14	0.4
	Intake of oral anticoagulants	12	0.4
	Severe renal or hepatic failure	2	0.1
	Splenectomy	2	0.1
	Generalised psoriasis	1	0.0
Traveller's diarrhoea treatment	Decreased gastric acid (surgery/proton pomp inhibitors)	9	0.3
	Pregnancy	8	0.2
	HIV infections/AIDS	4	0.1
	Allergy to fluoroquinolone	ND	
	Crohn's disease/ulcerative colitis	2	0.1

known reluctance of the French population towards the hepatitis B vaccine. Therefore, the pre-travel visit is an opportunity to provide this routine vaccine.

Our study suggests that the majority of travellers can be given standard pre-travel advice on malaria prophylaxis, Yellow fever vaccination, and travellers' diarrhoea. However, more than one tenth of the travellers reported at least one risk factor for which adjusted advice may be necessary.

In addition, we identified subpopulations of travellers with specific needs, including VFRs, children, seniors, and travellers with chronic medical conditions, accounting for 43% of the travellers (Fig. 3). Cardiovascular diseases accounted for 50% of the travel-associated deaths in the American travellers,[19] whereas these diseases accounted for 27% of the travel-associated deaths in French travellers.[20] Cardiovascular diseases are the second most frequent cause of medical evacuations and are responsible for 50% of the deaths among French travellers during international flights.[21] In our study, cardiovascular diseases were the most frequent chronic conditions among the travellers. Regarding the possible drug interactions and cardiovascular side effects of antimalarials, travel health specialist should be particularly cautious when advising patients who suffer from heart rhythm and conduction diseases or are taking anticoagulants. We recommend that such patients would benefit from an evaluation by a cardiologist before travelling. Psychiatric disorders were also prominent among travellers, in our experience with depression accounting for most cases, which contraindicates the use of mefloquine. Senior travellers frequently suffer from chronic diseases and take medications; therefore, prescriptions by travel health specialists may lead to drug interactions or side effects in older travellers. The proportion of older travellers will probably increase in the future due to an increase in life expectancy, and a travel medicine specialist will need to have competence in Medicine of the Elderly. Young travellers represented a small proportion of the travellers; however, they pose specific challenges.[22,23] Notably, there is no clear recommendation in France for malaria chemoprophylaxis in infants who weigh less than 11 kg who travel to malaria-endemic areas where resistance to chloroquine or other antimalarials is highly prevalent. In practice, atovaquone/proguanil is used in infants who weigh >5 kg in Belgium, Canada and the U.S.[24] French guidelines, mention that atovaquone/proguanil can be used in infant weighing 5–11 kg,[13] however, it is off-label in France, and practitioners have little protection if adverse events occur. Mefloquine in France is not recommended in infants weighing <15 kg, although it has proven effective and safe[25] which therefore do not offer an alternative. An official extension of the indication of both drugs to include use in children <11 kg could solve the dilemma. VFRs include both migrants who are returning to their birth country to visit their relatives and second and third generation French-born descendants.[26] VFRs account for 25–40% of the travellers to tropical areas.[27] Because they travel for longer durations often in rural areas and share local food with their family, these travellers are particularly at risk for travel-associated infectious diseases. In 2009, 70% of the malaria cases in the U.S. were observed in VFRs.[28] A similar pattern has been observed for typhoid fever.[29] Furthermore, VFRs seek pre-travel advice less frequently than tourists.[26] The Comorian community is the largest Sub-Saharan migrant community in Marseille, which consists of an estimated 50,000–70,000 individuals.[30] However, VFRs who travel to Comoros accounted for only 4% of the travellers who were seen at our pre-travel clinic. This finding is partly because Yellow fever vaccination is not

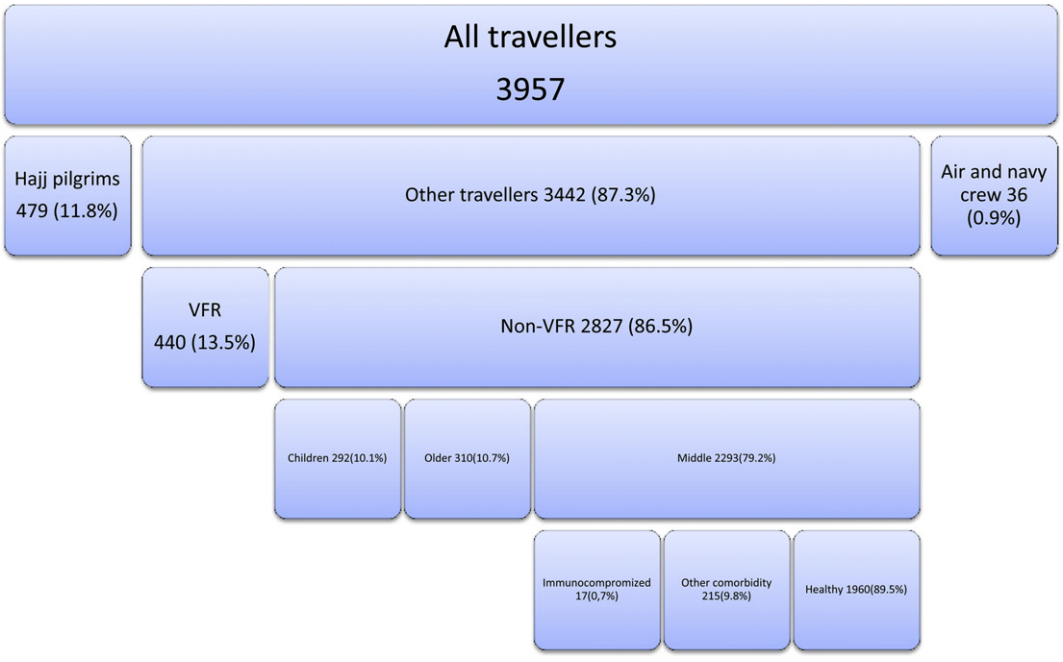

Figure 3 Proportion of at-risk travellers (travellers visiting friends and relative (VFR), children (<18 years), older travellers (>60 years)) and travellers with chronic conditions.

required in Comoros; therefore, a visit to a specialised centre is not mandatory. A visit to a general practitioner may be more acceptable, more accessible, and possibly preferred by this community. However, a study that was conducted in 2003 among Comorians who suffered from malaria upon their return from Comoros demonstrated that most of the travellers did not use chemoprophylaxis because of a lack of information, a belief that being born in Comoros confers protection against malaria and the high cost of antimalarials.[31] In this context, providing more information regarding the risk of infectious diseases may be one way that allows travellers to prioritise their choice of using chemoprophylaxis according to their financial capacity. Alternatively, reimbursement of malaria prophylaxis by the public French national health insurance system has been proposed[32] and this may be an option for selected at-risk travellers including those travelling to Comoros.

Conclusions

Travellers who sought advice at other travel clinics in Marseille or from general practitioners or travellers who did not seek advice at all were not included in our study. Travellers to Europe and North Africa, which are preferred destinations of French travellers, were not captured in our survey. Notably, a study that was conducted in 2008 among European travellers indicated that the majority of travellers with respiratory infections were returning from countries in Europe, and the majority of travellers with acute diarrhoea were returning from North Africa.[33] Our results demonstrate that travellers who sought advice at our travel clinic are not representative of the entire travelling population but are representative of travellers to tropical areas and particularly to countries at risk for Yellow fever. We believe that the results of our survey can be extrapolated to the French travellers who seek advice at travel clinics in France; however, the proportion of travellers to Africa may be overrepresented in our survey.

Our survey provides insight into the health conditions, travel destinations, travel duration, and pre-travel medical care of an epidemiologically significant population and should facilitate the targeting of risk reduction strategies for this group. Such knowledge could assist in limiting the spread of infections that are related to international travel. We demonstrate that a significant proportion of travellers are at-risk (43%) because of their travel conditions (VFR), their age, or their health status. This implies that pre-travel advice is quite complex and we recommend that special training should be provided to non-specialists giving pre-travel advice. Most complex situations will be better addressed at a specialised travel clinic.

Conflict of interest

The authors declare that they have no conflicts of interest.

Acknowledgements

This document (F7A9-62F7-6FE3-18E7-9CC0) was edited by American Journal Experts (support@journalexperts.com).

References

1. Chen LH, Wilson ME. The role of the traveler in emerging infections and magnitude of travel. *Med Clin North Am* 2008; **92**:1409—32. xi.
2. Gautret P, Schlagenhauf P, Gaudart J, Castelli F, Brouqui P, von Sonnenburg F, et al. Multicenter EuroTravNet/GeoSentinel Study of travel-related infectious diseases in Europe. *Emerg Infect Dis* 2009;**15**:1783—90.
3. Armand L. French tourists abroad in 2006: results from the survey "Follow up of tourists preferences". *Bull Epid Hebdo* 2007;**25—26**:218—21.
4. Van Herck K, Van Damme P, Castelli F, Zuckerman J, Nothdurft H, Dahlgren AL, et al. Knowledge, attitudes and practices in travel-related infectious diseases: the European Airport Survey. *J Travel Med* 2004;**11**:3—8.
5. Jeannel D, Lassel L, Dorléans F, Gautier A, Jauffret-Roustide M. Infectious risks perception when traveling abroad, attitudes and practices of the French population, 2006. *Bull Epid Hebdo* 2007;**25—26**:221—4.
6. Leroy JP, de Gentile L, Legros F. Enquête sur les centres de vaccinations internationales en France métropolitaine: état des lieux et propositions. *Bull Epid Hebdo* 2006;**23—24**:164—5.
7. Goesch JN, Simons de Fanti A, Béchet S, Consigny PH. Comparison of knowledge on travel related health risks and their prevention among humanitarian aid workers and other travellers consulting at the Institut Pasteur travel clinic in Paris, France. *Travel Med Infect Dis* 2010;**8**:364—72.
8. Dia A, Gautret P, Adheossi E, Bienaimé A, Gaillard C, Simon F, et al. Illness in French travelers to Senegal: prospective cohort follow-up and sentinel surveillance data. *J Travel Med* 2010; **17**:296—302.
9. Gautret P, Yong W, Soula G, Parola P, Brouqui P, DelVecchio Good MJ. Determinants of tetanus, diphtheria and poliomyelitis vaccinations among Hajj pilgrims, Marseille, France. *Eur J Public Health* 2010;**20**:438—42.
10. Gautret P, Vu Hai V, Sani S, Doutchi M, Parola P, Brouqui P. Protective measures against acute respiratory symptoms in French pilgrims participating in the Hajj of 2009. *J Travel Med* 2011;**18**:53—5.
11. http://www.insee.fr/fr/methodes/default.asp?page=nomenclatures/pcs2003/liste_n1.htm [accessed 11.06.12].
12. Van De Winkel K, Van den Daele A, Van Gompel A, Van den Ende J. Factors influencing standard pretravel health advice—a study in Belgium. *J Travel Med* 2005;**12**:327—31.
13. Haut conseil de la santé publique, Direction générale de la santé. Health recommendations for travellers 2009 (for health professionals). *Bull Epid Hebdo* 2009;**23—24**:237—56.
14. Larocque RC, Rao SR, Lee J, Ansdell V, Yates JA, Schwartz BS, et al. Global TravEpiNet: a national consortium of clinics providing care to international travelers—analysis of demographic characteristics, travel destinations, and pretravel healthcare of high-risk US international travelers, 2009—2011. *Clin Infect Dis* 2012;**54**:455—62.
15. Valerio L, Martinez O, Sabria M, Esteve M, Urbiztondo L, Roca C. High-risk travel abroad overtook low-risk travel from 1999 to 2004: characterization and trends in 2,622 Spanish travellers. *J Travel Med* 2005;**12**:327—31.
16. Angelin M, Evengard B, Palmgren H. Travel and vaccination patterns: a report from a travel medicine clinic in northern Sweden. *Scand J Infect Dis* 2011;**43**:714—20.
17. Lee VJ, Wilder-Smith A. Travel characteristics and health practices among travellers at the travellers' health and vaccination clinic in Singapore. *Ann Acad Med Singap* 2006;**35**: 667—73.
18. Chinwa Lo S, Mascheretti M, Chaves Tdo S, Lopes MH. Travelers' vaccinations: experience from the Travelers' Clinic of

Hospital das Clínicas, University of São Paulo School of Medicine. *Rev Soc Bras Med Trop* 2008;**41**:474—8.
19. Haargarten SW, Baker TD, Guptill K. Overseas fatalities of United States citizen travelers: an analysis of deaths related to international travel. *Ann Emerg Med* 1991;**20**:622—6.
20. Jeannel D, Allain-Ioos S, Bonmarin I, Capek I, Caserio-Schönemann C, Che D, et al. Les décès de français lors d'un séjour à l'étranger et leurs causes. *Bull Epid Hebdo* 2006; **23**—**24**:166—8.
21. Touze JE, Fourcade L, Heno P, Van de Walle JP, Mafart B, N'Guyen H. Le risque cardio-vasculaire pour le voyageur. *Med Trop (Mars)* 1997;**57**:461—4.
22. Hagmann S, Neugebauer R, Schwartz E, Perret C, Castelli F, Barnett ED, et al. Illness in children after international travel: analysis from the GeoSentinel Surveillance Network. *Pediatrics* 2010; May;**125**:e1072—80.
23. Hunziker T, Berger C, Staubli G, Tschopp A, Weber R, Nadal D, et al. Profile of travel-associated illness in children, Zürich, Switzerland. *J Travel Med* 2012;**19**:158—62.
24. World Health Organization. *International travel and health*. Geneva, Switzerland: WHO; 2012.
25. Schlagenhauf P, Adamcova M, Regep L, Schaerer MT, Bansod S, Rhein HG. Use of mefloquine in children — a review of dosage, pharmacokinetics and tolerability data. *Malar J* 2011;**10**:292.
26. Leder K, Tong S, Weld L, Kain KC, Wilder-Smith A, von Sonnenburg F, et al. Illness in travelers visiting friends and relatives: a review of the GeoSentinel Surveillance Network. *Clin Infect Dis* 2006;**439**:1185—93.
27. Castelli F. Human mobility and disease: a global challenge. *J Travel Med* 2004;**11**:1—2.
28. Mali S, Tan KR, Arguin PMDivision of Parasitic Diseases and Malaria, Center for Global Health; Centers for Disease Control and Prevention. Malaria surveillance—United States, 2009. *MMWR* 2011;**60**:1—15.
29. Ackers ML, Puhr ND, Tauxe RV, Mintz ED. Laboratory-based surveillance of Salmonella serotype Typhi infections in the United States: antimicrobial resistance on the rise. *JAMA* 2000; **283**:2668—73.
30. Parola P, Gazin P, Pradines B, Parzy D, Delmont J, Brouqui P. Marseille: a surveillance site for malaria from the Comoros islands. *J Travel Med* 2004;**11**:184—6.
31. Parola P, Soula G, Gazin P, Foucault C, Delmont J, Brouqui P. Fever in travelers returning from tropical areas: prospective observational study of 613 cases hospitalised in Marseilles, France 1999—2003. *Travel Med Infect Dis* 2006; **4**:61—70.
32. Pistone T, Schwarzinger M, Chauvin P, Ezzedine K, Receveur MC, Djossou F, et al. Reimbursement of malaria chemoprophylaxis for travellers from Europe to Sub-Saharan Africa: cost-effectiveness analysis from the perspective of the French national health insurance system. *Health Policy* 2008;**88**:186—99.
33. Field V, Gautret P, Schlagenhauf P, Burchard GD, Caumes E, Jensenius M, et al. Travel and migration associated infectious diseases morbidity in Europe, 2008. *BMC Infect Dis* 2010;**10**:330.
34. Haut conseil de la santé publique, Direction générale de la santé. Vaccination schedule and recommendations from the "Haut conseil de la santé publique" in France. *Bull Epid Hebdo* 2009;**16**—**17**:145—76.