

Original article

Travellers' profile, travel patterns and vaccine practices—a 10-year prospective study in a Swiss Travel Clinic

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Abstract

Background. The travel clinic in Lausanne serves a catchment area of 700 000 of inhabitants and provides pre- and post-travel consultations. This study describes the profile of attendees before departure, their travel patterns and the travel clinic practices in terms of vaccination over time.

Methods. We included all pre-travel first consultation data recorded between November 2002 and December 2012 by a custom-made program DIAMM/G. We analysed client profiles, travel characteristics and vaccinations prescribed over time.

Results. Sixty-five thousand and forty-six client-trips were recorded. Fifty-one percent clients were female. Mean age was 32 years. In total, 0.1% were aged <1 year and 0.2% ≥80 years. Forty-six percent of travellers had pre-existing medical conditions. Forty-six percent were travelling to Africa, 35% to Asia, 20% to Latin America and 1% (each) to Oceania and Europe; 19% visited more than one country. India was the most common destination (9.6% of travellers) followed by Thailand (8.6%) and Kenya (6.4%). Seventy-three percent of travellers were planning to travel for ≤4 weeks. The main reasons for travel were tourism (75%) and visiting friends and relatives (18%). Sixteen percent were backpackers. Pre-travel advice were sought a median of 29 days before departure. Ninety-nine percent received vaccine(s). The most frequently administered vaccines were hepatitis A (53%), tetanus–diphtheria (46%), yellow fever (39%), poliomyelitis (38%) and typhoid fever (30%).

Conclusions. The profile of travel clinic attendees was younger than the general Swiss population. A significant proportion of travellers received vaccinations that are recommended in the routine national programme. These findings highlight the important role of travel clinics to (i) take care of an age group that has little contact with general practitioners and (ii) update vaccination status. The most commonly prescribed travel-related vaccines were for hepatitis A and yellow fever. The question remains to know whether clients do attend travel clinics because of compulsory vaccinations or because of real travel health concern or both.

Key words: Travellers profile, vaccination, travel patterns, guidelines

Introduction

International travel has become increasingly popular and according to the World Health Organization (WHO), more than 900 million international trips have been undertaken in 2010.¹ Approximately 80 million persons from industrialized countries travel to the developing world each year.³ Europeans represent the largest number of the international travellers.⁴ In 2010, 85.5% of Swiss permanent resident population have undertaken at least one trip with overnight stays.⁵ Most of them were outside Switzerland, especially to neighbouring European countries.^{5, 6} In 2012, a record number of 12.9 million international trips were recorded among the Swiss population.⁷

International traffic between Europe and the rest of the world exposes travellers to a range of health risks and makes them a link for the global spread of infectious diseases.⁴ Travellers are potentially susceptible to diseases related to their destination country, activities during travel and their pre-existing illnesses.⁸ Health risks are largely behaviour related and include communicable diseases, injuries and non-communicable diseases.⁹ Those hazards are preventable or can be minimized by precautions taken before, during and even after the journey. Travel health counselling is therefore recommended before departure. It is aimed at updating vaccine status and providing health-related travel advice with a screening of certain health conditions predisposing to an increased risk for a particular disease. The contribution of health experts involved in advising international travellers is thus essential. Travel clinics provide well-established travel health services based on up-to-date expert guidelines.^{10, 11}

A plethora of studies have focused on description of the travellers' characteristics, knowledge, attitudes and practices related to health risks and their prevention, with assessment of the sources of travel health information used.^{10, 12–22} There are however only few large-scale longitudinal studies on travel clinic attendees' characteristics, patterns of travel and provided recommendations over time.^{12, 18, 19, 23–25}

We performed this study in the travel clinic of the University Hospital of Lausanne, Switzerland, which serves a catchment area of ~700 000 inhabitants (canton of Vaud). The objective was to determine travellers' demographic and travel patterns as well as vaccine prescription and malaria prevention advice over a 10-year period.

Methods

Data Collection

The study was conducted at the travel clinic of the Department of Ambulatory Care and Community medicine, University Hospital of Lausanne, Switzerland. This travel clinic provides counselling before international departure and offers vaccines as well as preventive measures against malaria and other travel-related risks. It also provides medical advice during travel by phone/Skype or email and medical care for patient after return. Data of all consecutive attendees of pre-travel consultations are routinely collected in electronic medical files using a custom-made program DIAMM/G version 6. We used the clients' data for the 10-year period extending from November 2002 (start of the electronic collection) to December 2012.

This study includes the entire database of the travel clinic attendees prior to travel. Seized information included questions

on: (i) attendees' demographic characteristics (age, sex and country of origin); (ii) travel patterns (itinerary, length of stay, purpose of travel, type of accommodation and particular risks such as staying in rural zone or with local people, no access to bottled or boiled water, planning to go cycling, being in close contact with animals or visiting caves and working in a refugee camp); (iii) travellers' immunization status and medical history such as any adverse event following vaccinations, any allergy, any comorbidity (i.e. immuno-depression, epilepsy, skin disease, psychological problems, gastrointestinal disease, cardiovascular problem, any medications) and for women, pregnancy, breastfeeding and contraception; (iv) vaccines prescribed; (v) preventive measures proposed against malaria. The earlier specific questions were asked to evaluate for indications and contraindications of vaccines and malaria chemoprophylaxis (CP).

Travel advice were based on the recommendations of the Federal Office of Public Health (FOPH) and elaborated by the Swiss Working Group for health Advice to travellers that includes also experts from Germany, UK, Austria, The Netherlands, France and Italy.²⁶ Destinations were primarily countries but also included islands and archipelago (e.g. Canary Islands/Madeira, etc.) and non-independent territories with special or autonomous status (e.g. Hawaii, New Caledonia, Samoa, etc.).

Data Processing and Analysis

Data processing was performed in Microsoft Office Excel 2007 and the statistical analysis in the epidemiological software Epi Info Centers for Disease Control and Prevention (CDC), version 7.0).

Each line on the database represented one person-travel. Thus, a person was counted once for each travel even if he/she came several times for additional vaccinations.

Results

During the period from November 2002 up to December 2012, 65 046 person-travels were recorded at the travel clinic. This constitutes the study analysis population.

Travellers' Demographics

The demographic data of the study population is shown in [Table 1](#). The population included travellers aged from 4 days to 91 years old with a median of 32 years. Approximately one-third of travellers (31.6%, 20 555/65 018) were aged 25–34 years, while 9% (5860/65 018) were over 60 years ([Figure 1](#)). Genders were well balanced with 51.2% women and 48.8% men. The majority of travellers was native from Europe (85.9%) with 71.4% from Switzerland. Africans represented the highest percentage (7.3%, 4734/65 029) among the non-Europeans ([Figure 2](#)).

Medical History

[Table 2](#) details the attendees' pre-existing medical conditions relevant for appropriate pre-travel advice. In total, 46.5% (30 224/65 046) of the attendees reported one or more medical conditions specifically asked for, i.e. a condition that could have an impact on vaccine or antimalarial prescription or other specific travel recommendation. In total, 15.1% (9847/65 046) had more than one medical condition. In total, 30.8% (20 063/65 046) stated to have some kind of atopy with 7.3% (4759/64

952) having asthma. In addition, 15.1% (9837/64 938) of travellers stated other medical problems, the most common being immunosuppression. In total, 2.2% (1413/65 046) had more than one immunosuppressive disease, in particular cancer, HIV and splenectomy. In total, 1.4% (881/64 938) reported cardiovascular problems, that could have an impact on drug prescription (e.g. antimalarial, heparin). In total, 9.4% (6120/64 960) reported a pre-existing psychiatric or psychological problem.

As for medication excluding contraceptive pills, 27.8% (18 033/64 945) of travellers reported to take one or more medication. In total, 0.1% (80/64 945) took prednisone for a period of 2 weeks or more, of which 67 at a dose \geq 20 mg. In total, 0.1% (60/64 945) were taking other kinds of immunosuppressive drugs such as methotrexate and azathioprine.

Table 1. Demographic characteristics of travel clinic attendees

Variables	Person-travel number ^a n/N (%)		
	N = 65 018	Women (%) (%) ^b	Men (%) (%) ^b
Age group (years)			
<1	87 (0.1)	44 (0.1) (50.6)	43 (0.1) (49.4)
1 to <5	1610 (2.5)	766 (1.2) (47.6)	843 (1.3) (52.4)
5 to <10	1886 (2.9)	911 (1.4) (48.3)	974 (1.5) (51.6)
10 to <25	11 799 (18.2)	6701 (10.3) (56.8)	5092 (7.8) (43.2)
25 to <35	20 555 (31.6)	10 759 (16.5) (52.3)	9791 (15.1) (47.6)
35 to <50	16 227 (24.9)	7688 (11.8) (47.4)	8530 (13.1) (52.6)
50 to <65	9827 (15.2)	4937 (7.6) (50.2)	4885 (7.5) (49.7)
\geq 65	3027 (4.6)	1466 (2.3) (48.4)	1560 (2.4) (51.5)
Gender	N = 65 018		
Male	31 742 (48.8)		
Female	33 276 (51.2)		
Origin	N = 65 029		
Swiss	46 414 (71.4)		
Other Europeans	9425 (14.5)		
Non-Europeans	9190 (14.1)		

^a Denominators of variables vary due to missing data.

^b Row percentages.

Travel Patterns

Travel patterns are summarized in Table 3. Forty-six percent (29 777/64 858) of travellers planned to visit Africa, 35% (22 716/64 858) Asia and 20% (12 856/64 858) Latin America. In total, 2.5% of travellers (1638/64 858) planned to visit more than one continent, and 19% (12 165/64 858) more than one country. Among the 210 listed destinations, India was the most frequently visited country by 9.6% (6231/64 858) of travellers. Other main reported destinations were Thailand (8.6%, 5549/64 858), Kenya (6.4%, 4122/64 858) and Brazil (5.3%, 3442/64 858). The top 20 country destinations are shown in Figure 3. In terms of duration, 43.9% (28 535/65 045) of travellers planned to stay 15–28 days abroad. In total, 23.6% (15 343/65 045) travelled for a maximum 14 days and 17.8% (11 581/65 045) stayed more than 1 month. In total, 74.8% (48 604/65 011) of the clients reported leisure as purpose of travel, while 17.6% (11 474/65 011) reported visiting friends and relatives (VFRs), 12.1% (7868/65 011) were travelling for work or studies and 6.4% (4179/65 011) for other reasons.

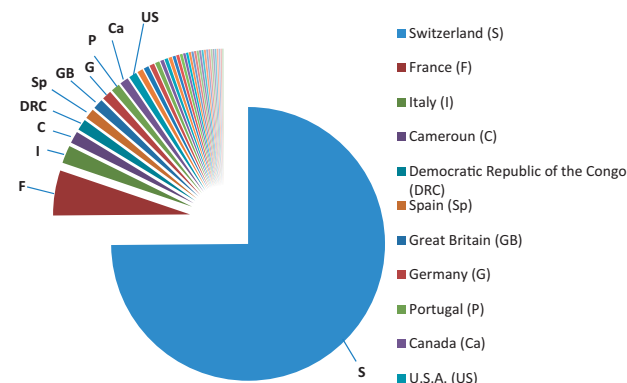


Figure 2. Country of origin of travellers attending the Travel Clinic. *The graphic is a sample of the most common countries of origin among a total of 181

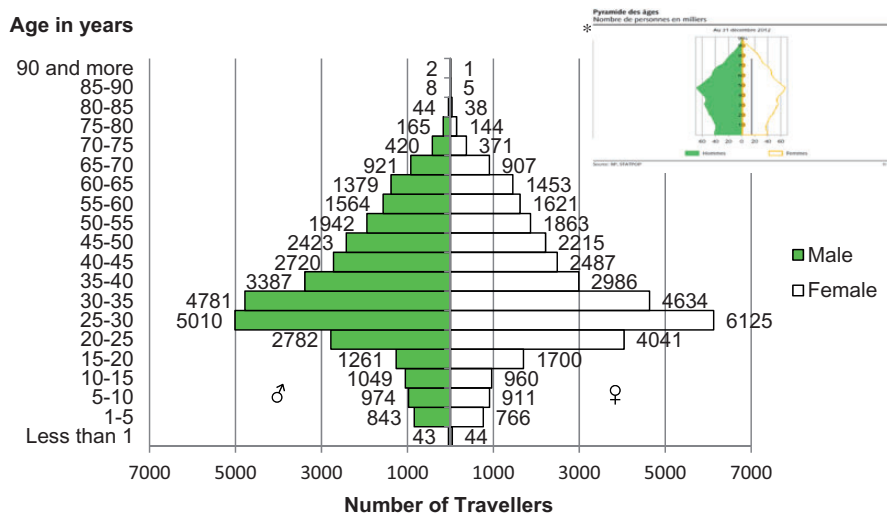


Figure 1. Travellers' demographic pyramid. *Permanent resident population in Switzerland 2012 (From ref. [27]). †Age groups are grouped as follows: <1y; 1 to <5y; 5 to <10y; 10 to <15y; 15 to <20y, etc.

Table 2. Travellers' pre-existing medical conditions specifically asked for

Medical condition	Person-travel number <i>n/N</i> (%)
Atopy	20 063/65 046 (30.8)
Immunosuppressive condition ^a	
Cancer ^b	1149/64 968 (1.8)
HIV	249/64 970 (0.4)
Splenectomy	70/64 938 (0.1)
Thymus disease or thymectomy	2/64 938 (0.0)
Cardiovascular condition ^c	
Varicose veins	393/64 938 (0.6)
Thrombosis	396/64 938 (0.6)
Embolism	136/64 938 (0.2)
Psychological or psychiatric problem	6120/64 960 (9.4)
Gastric problems	241/64 938 (0.4)
Neuromuscular condition	
Multiple sclerosis	24/64 938 (0.0)
Myasthenia gravis	2/64 938 (0.0)
Epilepsy	554/64 968 (0.9)
Gyneco-obstetric condition	
Pregnancy	210/23 569 (0.9)
Breastfeeding	99/10 052 (1)
Contraceptive pill	15 489/23 372 (66.3)
Other medical condition	8664/64 938 (13.3)
Medication	
None	46 912/64 945 (72.2)
Other:	18 033/64 945 (27.8)
Immunosuppressive treatment	
→ Prednisone (≥ 20 mg/day; < 20 mg/day)	80/64 945 (0.1)/(67/64 945 (0.1);13/64 945 (0.0))
→ Other ^d	60/64 945 (0.1)
Antibiotics	108/64 945 (0.2)
Anticoagulant	122/64 945 (0.2)

^a Some clients had two immunosuppressive conditions.

^b Recent history of cancer (<3 months) that required chemotherapy or radiotherapy.

^c Some clients had more than one cardiovascular condition.

^d Other kind of immunosuppressive drugs (e.g. methotrexate, azathioprine, infliximab, leflunomide, etc.).

Pre-travel health advice were sought a median of 29 days before departure. In total, 48.4% (31 469/65 046) of travellers consulted 1 month or more before travel. In total, 0.3% (193/65 046) of attendees were last-minute travellers (travelling the same day as the consultation).

In total, 64.5% (41 920/64 981) of travellers were not planning to expose themselves to any particular risk during their trip.

Vaccinations

Table 4 lists the aggregated numbers and percentage of travellers having received the different vaccines over the 10-year period. The number of disease-specific immunizations administered to the travellers per year is shown in Figure 4.

Routine Vaccinations

The following routine vaccinations were administered: 45.6% (29 375/64 403) of travellers received diphtheria and tetanus (Di-Te), 37.9% (24 609/64 403) poliomyelitis, 23.7% (15 271/64 403) hepatitis B, 21.9% (14 122/64 403) measles, mumps and rubella (MMR), 2.5% (1634/64 403) varicella, 0.9% (606/64 403) pertussis, 0.8% (500/64 403) meningococcus C, 0.5% (each) seasonal influenza (323/64 403) and haemophilus influenza b (331/64 403), 0.1% (51/64 403) pneumococcal vaccine.

Travel-Related Vaccinations

In total, 53.1% (34 211/64 403) of travellers received vaccine against hepatitis A, combined or not with hepatitis B, 39.1% (25 205/64 403) yellow fever, 30.4% (19 551/64 403) typhoid fever, 11.1% (7159/64 403) rabies, 8.7% (5579/64 403) meningococcal serogroups A, C, W-135 and Y (Men ACWY) disease, 1% (632/64 403) Japanese encephalitis, 0.6% (406/64 403) tick-borne encephalitis and 0.1% (51/64 403) cholera.

Malaria Prevention

Details of the results on malaria preventive measures will be reported in a separate article which will analyse trends over time (Boubaker R *et al.*, in preparation). Of all travellers planning to visit endemic countries (91%; 59 003/64 858), 80.5% (47 513/59 003) were prescribed an antimalarial drug, either as CP (41.8%; 24 688/59 003) or as standby emergency treatment (36.1%; 21 311/59 003) or both (2.6%; 1514/59 003), depending on the degree of endemicity in the country to be visited.

Discussion

This prospective study was performed using electronic files of travel clinic attendees over a 10-year period. It aimed at gathering

Table 3. Travel characteristics of the travel clinic attendees

Variables	Person-travel number ^a n/N (%)	
Destination		
Africa	29 777/64 858 (46)	
Asia	22 716/64 858 (35)	
Americas	13 133/64 858 (20)	
-Latin America and Caribbean	12 856/64 858 (20)	
-Northern America	277/64 858 (0.4)	
Europe	468/64 858 (1)	
Oceania	602/64 858 (1)	
Antarctica	2/64 858 (0)	
Length of stay (d = Days)		
7 days and less	3648/65 045 (5.6)	
8–14 days	15 343/65 045 (23.6)	
15–28 days	28 535/65 045 (43.9)	
29–90 days	11 581/65 045 (17.8)	
90 days or more	5938/65 045 (9.1)	
Reason of travel		Time before departure (days)
Leisure	48 604/65 011 (74.8)	30 (0–446) ^b
Visiting friends and relatives	11 474/65 011 (17.6)	24 (0–394) ^b
Business or studies	7868/65 011 (12.1)	22 (0–389) ^b
Humanitarian aid	3100/65 011 (4.8)	36 (0–365) ^b
Others:	1079/65 011 (1.7)	
Pilgrims or seasonal employees	513/65 011 (0.8)	21 (0–98) ^b
Permanent resident abroad	566/65 011 (0.9)	33 (0–371) ^b
Type of accommodation		
Hotels, establishments of upper category (pre-booked)	35 314/65 007 (54.3)	
Hotels, establishments of middle category	19 192/65 007 (29.5)	
Campsites (camping-trekking), backpackers	10 501/65 007 (16.2)	
Particular risks		
None	41 920/64 981 (64.5)	
Visiting rural zone or forests or staying with locals	21 930/64 981 (33.7)	
No access to bottled or boiled water	1809/64 981 (2.8)	
Bicycle riding	913/64 981 (1.4)	
Close contact with animals or visiting caves	822/64 981 (1.3)	
Working in refugees camps	142/64 981 (0.2)	

^a Sum exceeds total number of travellers due to some belonging to more than one category.

^b Range.

an overall picture of demographics, travel patterns, vaccine and antimalarial prescription provided to traveller prior to departure.

The profile of the travellers visiting the travel clinic shows a majority of young people of both genders with a median age of 32 years. Approximately 65% of attendees were aged <40 years, which contrasts with the age distribution of the general Swiss population. These findings are consistent with a survey conducted in 2011 on the travel behaviour of the Swiss population, which shows that people aged 25–44 are the most frequent travellers with 3.0 trips per year vs 1.8 trips for people aged 65 and above.²⁸ Our data are similar to those collected in studies carried out in other travel clinics in Europe, Asia and North America.^{8,12,17,18} The proportion of 9% of seniors was almost identical to a similar study conducted in Zürich that found 10%.²³ The young age of travel clinic attendees is not surprising since the latter are frequently travelling; it may also reflect the fact that this population has little contact with general practitioners, and is therefore more inclined to attend specialized services to gather travel health advice. Generally, ~24% of Swiss travellers seek a specialized travel clinic vs 44% consulting their general practitioner.²³ The

age of international travellers surveyed in European and non-European airports is higher with an average of 42 years. Data on outbound travel trends in Switzerland show an increase of the proportion of upscale travellers among the senior citizens.²⁹

Almost all travel clinic attendees were planning to visit a country outside Europe, and close to one-half a country in Africa. It is obvious that travel clinic attendees come to seek medical advice when their destination is a subtropical or tropical country. This is very different than the average Swiss travelling population. Indeed, data from the Swiss federal office of statistics (FOS) shows that within a sample of 20.3 million travels with overnight stays recorded in 2012, 64% had chosen a foreign destination, 56% travelled to European countries, especially neighbouring ones such as Germany (15%), Italy and France (10%), while only 8% went outside Europe.⁷ Africa accounted for more than 40% of all trips outside of Europe. Some countries in Asia were most commonly visited, namely India and Thailand, similarly to what was found in Zürich.²³

The majority of clinic attendees was planning to travel for more than 2 weeks and a few of them were intending to stay for

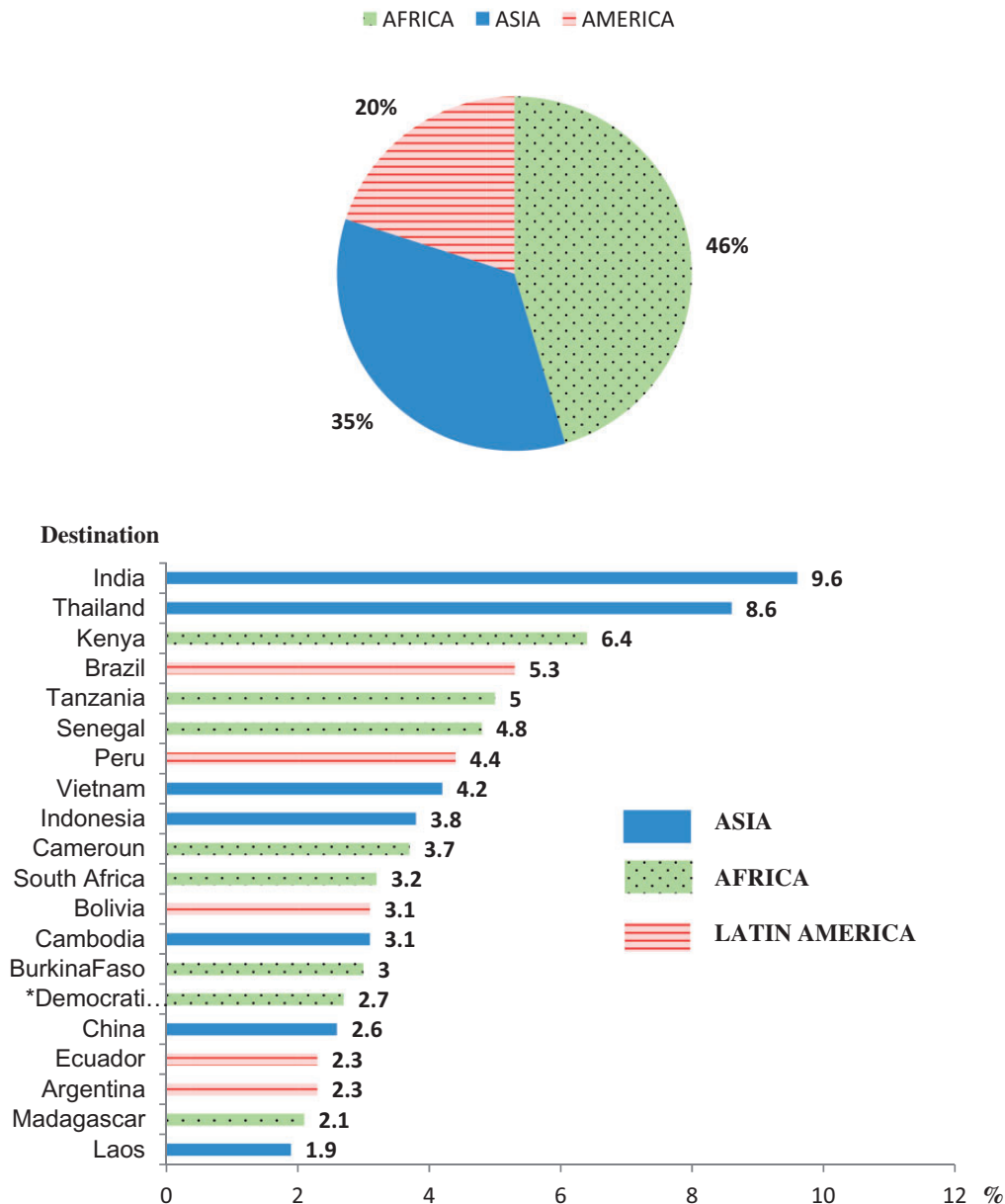


Figure 3. The top 20 most visited countries (patterns represent continents). *Democratic Republic of the Congo

more than 3 months. Again, this reflects a biased population towards travels with higher risks and highlights the importance of travel clinics to address special needs of this population. For example, business travellers and VFRs, who represent a significant proportion of our attendees, are usually taking higher risks than usual travellers.²³ As far as duration is concerned, the Swiss travel statistics show that long-term trends tend to increase from 31% in 2008 to 46% in 2011.²⁸

Tourism was the main purpose of travel, followed by VFRs and professional reasons. This is similar to the findings of many surveys conducted in travel medicine clinics and airports throughout the world.^{13,14,18} Hotel accommodation clearly dominates as it is the most common choice for Swiss travellers.^{7, 28} FOS statistical data in 2012 report that accommodation in hotels accounted for 54% while staying with family or friends

represented 23%.⁷ Among those who planned activities settings or activities with higher exposure to travel hazards, a significant proportion (33.7%) was planning to visit rural areas or be in contact with locals, while a substantial group was planning to backpack (16.2%). This rather high rate of travellers exposed to increased health hazards certainly justifies a consultation that addresses the special needs of this population.

The WHO recommends consulting 4–6 weeks before departure, to receive necessary vaccines and ensure adequate prevention of travel-associated risks. Approximately one-half of travellers had sought travel health advice 1 month or more before leaving, while only few (0.3%) were last-minute travellers, most of them being tourists. In the study in Zürich, which is a city with more international exchanges than Lausanne, the most frequent last-minute travellers were business travellers consulting on the

day of departure or 1 day before.²³ In a Swedish study, only 40% sought health advice 1 month or longer before travelling.¹⁶ VFR and business travellers attended the travel clinic within the same time frame. This is similar to the population of international travellers surveyed through a US national consortium.⁸

Updating travellers' routine immunizations is one of the aims of pre-travel counselling. Forty-six percent of attendees received diphtheria–tetanus and 38% poliomyelitis vaccines. Travel health providers can also play a substantial role in increasing coverage of measles vaccination. In our cohort, 22% of travellers received a vaccine against MMR. For most of them, this injection

represented the second of the two injections recommended to achieve high level of herd immunity. Without attending the travel clinic, this population would not have had a full immunization schedule, especially so because it represents an intermediate age group that is little considered in prevention programmes that are mostly focused on children and elderly.

In Switzerland, hepatitis B vaccination is recommended for all children 11–14 years of age and any travellers visiting low resource countries for 1 month or more. In our travel clinic population, 24% of travellers got hepatitis B vaccine. This rather low rate is explained by a high vaccination rate through routine vaccination of children at school and by the fact that most attending travellers planned a trip for less than a month. It may be important to consider this vaccination more widely, especially so because the population was rather young and because it is difficult to identify persons at risk of casual sex. Prevention of sexually transmitted infections should be one of the priorities of a travel clinic. In our study, the combined hepatitis A and B vaccine was administered almost twice more frequently than the hepatitis B single vaccine. In effect, the Swiss FOPH and the Federal Committee of Vaccination (FCV) have recommended considering the combined hepatitis A and B vaccination each time one of both vaccines is indicated. In a Swedish travel clinic, the combined vaccine has been recommended also for trips shorter than 1 month.¹²

More than one-half of the travellers were administered the hepatitis A vaccine, which was the most widely prescribed one. This is consistent with previous data showing that ~40% of western travellers were immune against hepatitis A.³⁰ Only 7.9% (5093/64 403) of VFRs received hepatitis A vaccination, whether single or combined with hepatitis B. This is because those having lived more than 5 years during their childhood in high endemic countries are considered as probably immune. This assertion needs probably to be reassessed since incidence of hepatitis A is globally declining, and VFRs that left their country rather early in life might not have been exposed to the virus.³¹

Table 4. Type of vaccines administered over the 10-year study period

Vaccine administrated against	Number of travellers	Percentage (%) ^a (N = 64 403)
Hepatitis A	34 211	53.1
Diphtheria, tetanus	29 375	45.6
Yellow fever	25 205	39.1
Poliomyelitis	24 609	37.9
Typhoid fever	19 551	30.4
Hepatitis B	15 271	23.7
Measles, mumps, rubella	14 122	21.9
Rabies	7159	11.1
Meningococcus A,C,W135,Y	5579	8.7
Varicella	1634	2.5
Japanese encephalitis	632	1
Pertussis	606	0.9
Meningococcus C	500	0.8
Tick-borne encephalitis	406	0.6
Haemophilus influenza b	331	0.5
Influenza	323	0.5
Cholera	68	0.1
Pneumococcal	51	0.1

^a Some clients had received more than one vaccine.

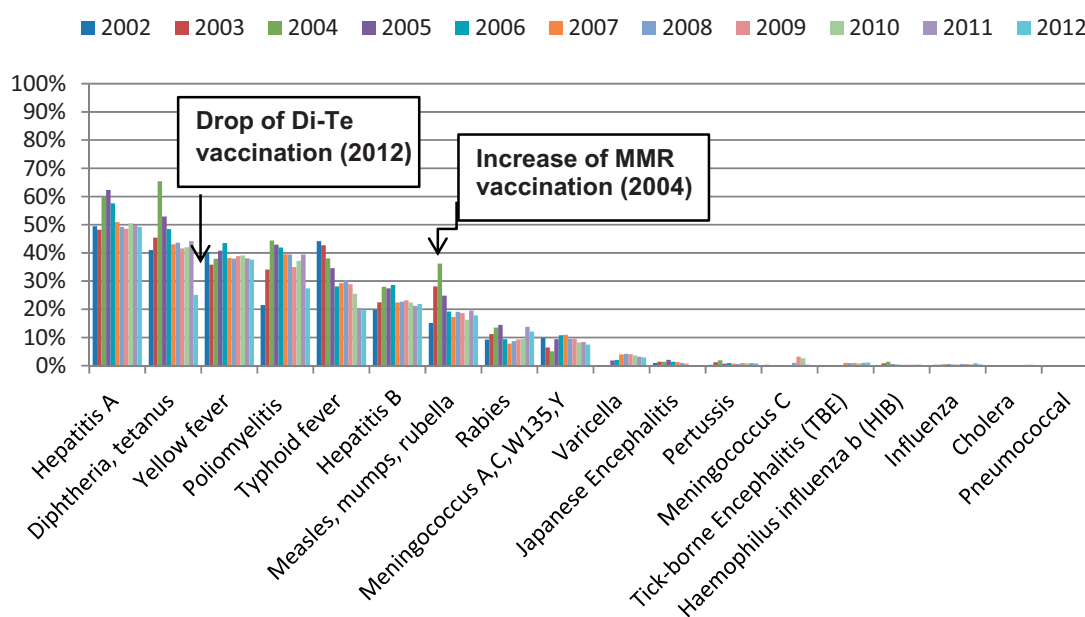


Figure 4. Disease-specific immunizations administered to the travellers per year

Thirty-nine percent of travellers received yellow fever vaccine while 46% of all travel clinic attendees were going to Africa and 20% to the Latin America. This rather low rate among clients going to potentially endemic areas suggests good compliance of health professionals to the international regulation that recommends yellow fever vaccine only for selected countries and regions. Also it can be due to the fact that travel clinic attendees are often frequent travellers that may have already got yellow fever vaccine previously.

Eleven percent of pre-travel attendees got rabies vaccine. The WHO official data state that more than 2.5 billion people are at risk of rabies in over 100 countries and that mortality ranks 10 among all infectious diseases worldwide.³² The risk of animal bite is as high as 2% in travellers.³³ Rabies vaccine was prescribed relatively often in our sample and this may be explained by the profile of travellers, who tended to plan longer trips, often including visiting rural areas in Africa and Asia where there is chronic shortage of rabies immunoglobulins. This is similar to the data from the travel clinic in Zürich.²³

Of 43% of travellers visiting sub-Saharan Africa, approximately one-fifth received the quadrivalent meningococcal vaccine (A, C, W135, Y). This rather low rate is due to the fact that vaccination is only recommended for a stay of more than 1 month or in epidemic situation and with close contacts with the local population.

Interestingly, the data concerning the clients' profile and the type of vaccinations prescribed from Lausanne and those from Zürich²³ were generally very similar, which indicates that the targeted travel population is not much different and that the travel recommendations are well complied to, even in travel clinics where recommendations are sometimes more customized to the traveller's destination and activities than it is the case during a consultation in a general practice.

A large descriptive study has inherent limitations due to the huge body of data collected. We intentionally did not include previous vaccination status to favour simplicity but obviously the level of vaccination coverage is important to accurately assess the appropriateness of all recommendations provided. The detailed medical history has not been included but could have been useful to better assess particular increased risks. Some details such as the number of clients that have been included more than once has not been given because the data have been analysed anonymously. Lastly, we did not include all other pre-travel advice that are conveyed during the consultation, such as protective measures against food-borne, vector-borne and sexually transmitted infections in particular, and neither antimalarial preventive measures that are the topic of a separate article (Boubaker R *et al.*, in preparation). The dynamics of vaccines prescribed over time in relation to changes in recommendations is also the topic of a separate article. Briefly, as illustrated in Figure 4, the changes in the type of vaccines prescribed over time followed rather well the changes in recommendations. For example, the most important changes of vaccine prescription over the 10-year period were for routine vaccinations, i.e. an increase of travellers vaccinated for MMR after introduction of a second dose in 2003 and a drop of travellers vaccinated for Di-Te after spacing the booster dose in 2011.

In terms of future research areas, there is obviously a lot to do to investigate the appropriateness of prescribing a specific travel

vaccine to a traveller according to his/her specific needs vs applying blanket recommendations for all travellers, as it is done for routine vaccinations. The fact that different countries apply different recommendations, but the overall morbidity rate and type of diseases is rather similar in the same destination, calls for more research to better assess the true risk, and hence the relevance of prescribing a vaccine or not. Another important issue is to know whether it is more beneficial in terms of overall morbidity rates while abroad to increase the number of travel clinics and specialized health professionals to optimally address the special needs of the travelling population or to improve the knowledge of general practitioners in travel medicine so that the maximum number of travellers can be reached and receive basic travel health advice.

In conclusion, the profile of travel clinic attendees was younger than the general Swiss population. A significant proportion of travellers received vaccinations that are recommended in the routine national programme. These findings highlight the important role of travel clinics to (i) take care of an age group that has little contact with general practitioners, (ii) update vaccination status in a population that is not much considered in prevention programmes because they are neither children nor elderly. The most commonly prescribed travel-related vaccines were for hepatitis A and yellow fever, the first one being the most frequent vaccine-preventable disease in travellers after influenza and the second one being often required to cross borders. The question remains to know whether clients do attend travel clinics because of compulsory vaccinations or because of real travel health concern or both.

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