STATEMENT ON INTERNATIONAL TRAVELLERS WHO INTEND TO VISIT FRIENDS AND RELATIVES

AN ADVISORY COMMITTEE STATEMENT (ACS)

COMMITTEE TO ADVISE ON TROPICAL MEDICINE AND TRAVEL (CATMAT)

PROTECTING CANADIANS FROM ILLNESS

Public Health Agency of Canada
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TABLE OF CONTENTS

PREAMBLE

The Committee to Advise on Tropical Medicine and Travel (CATMAT) provides the Public Health Agency of Canada with ongoing and timely medical, scientific, and public health advice relating to tropical infectious disease and health risks associated with international travel. The Agency acknowledges that the advice and recommendations set out in this statement are based upon the best current available scientific knowledge and medical practices, and is disseminating this document for information purposes to both travellers and the medical community caring for travellers.

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KEY POINTS

- Rates of travel-related illness in travellers visiting friends and relatives (VFRs) tend to be higher for many conditions including tuberculosis, malaria, and certain vaccine-preventable diseases, parasitic and sexually transmitted infections. Disease-specific risk factors and recommendations are discussed throughout the statement. Specific recommendations are highlighted and summarized in Appendices 6 and 7.
- Various characteristics explain elevated risks among VFRs including increased potential for last minute travel plans, higher likelihood of longer stays, reluctance to eat differently than hosts, increased likelihood of drinking untreated water, and close proximity to the local population.
- VFRs and foreign-born travellers are less likely to seek pre-travel health consultation, and are more likely to seek advice closer to departure and to decline a recommended vaccine. These differences have been associated with VFRs' low perception of personal disease risk, but may also reflect language, cultural, and/or financial barriers preventing uptake.
- Pediatric VFRs have an increased risk of travel-related illness, and are at particular risk for febrile illness (especially caused by malaria), tuberculosis, typhoid, hepatitis A and meningococcal meningitis. These increased risks emphasize the importance of pre-travel assessment and adherence to recommended interventions for children.
- The pre-travel consultation for VFRs is an opportunity for health promotion, identification of pre-existing conditions, and risk reduction. Higher levels of non-immunity to vaccine-preventable disease and increased prevalence of chronic infections like HIV and viral hepatitis amongst foreign born VFRs should be taken into consideration as part of the pre-travel assessment. The importance of adherence and addressing potential challenges to achieving adherence to travel advice should be discussed.

- Health care providers should evaluate foreign-born VFR immunization status to ensure routine vaccinations are up-to-date for both adult and child newcomers to Canada. Typhoid vaccine is recommended for VFRs travelling to South Asia and can be considered for other travellers. Travellers who are non-immune to hepatitis A and B should be vaccinated prior to travel. For pediatric VFRs, opportunities to accelerate the routine schedule should be evaluated in order to provide maximal protection during travel.
- VFRs should be counseled about the importance of malaria prevention when travelling to malaria-endemic countries. Recommendations should include use of personal protective measures to prevent mosquito bites, and potential use of chemoprophylaxis depending upon destination.
- Safe food and water precautions should be discussed, and frequent hand washing should be emphasized. Prevention strategies to avoid parasitic infections such as schistosomiasis and strongyloidiasis should be recommended for VFRs travelling to endemic areas. In view of higher rates of sexually transmitted infection diagnosed amongst VFRs, the importance of safer sex practices should be stressed.
- Travellers going to high tuberculosis incidence countries should avoid contact with individuals with known pulmonary tuberculosis or unexplained chronic cough. Pre- and post- travel tuberculosis skin tests may be recommended for certain travellers as per Appendix 5.
- At routine health visits, health care providers should discuss potential upcoming VFR travel with individuals. Providers should equip themselves with travel health knowledge and clinical resources to be able to provide appropriate basic and essential recommendations. The clinician may need to prioritize recommendations based on a risk assessment of the traveller and travel destination when cost is a barrier to adherence.

PURPOSE

This statement, developed by the Committee to Advise on Tropical Medicine and Travel (CATMAT), is intended to educate and advise Canadian health care professionals who provide pre-travel care to travellers intending to visit friends or relatives (VFRs). Specific travel-related risks, including infectious diseases epidemiology and their burden in this population, will be reviewed and recommendations will be provided to attempt to mitigate these risks.

INTRODUCTION

VFRs are a specific group of travellers who have been identified as having an increased risk of travel-related morbidity. The Centers for Disease Control and Prevention in the United States define a VFR as "an immigrant, ethnically and racially distinct from the majority population of the country of residence (a higher-income country), who returns to his or her home country (lower-income country) to visit friends or relatives. Included in the VFR category are family members, such as the spouse or children, who were born in the country of residence." (1). There is some debate over this "classic" definition of VFRs regarding the relevance of migrant status and ethnicity (2,3). It has been argued that the limitation of the "classic" definition is that the underlying assumptions of what constitutes a VFR no longer apply due to the current patterns of travel and population mobility (3). The proposed revision of the VFR definition includes that the intended purpose of travel is to visit friends and family; and that there is an epidemiologic gradient of health risk between the two locations which is supported by an assessment of health determinants (3). It also omits the requirement to be an immigrant or to be ethnically distinct from the population of the country of residence (3). The reasoning behind this is that shifting the focus from ethnicity or immigration status to the purpose of travel will provide a more useful foundation for travel health consultation based on individual health risk assessment (3). In addition, the new definition would include non-infectious health risks such as injury, air pollution or extreme temperatures (3).

This statement will focus on VFRs by the "classic" definition, since it is the one that is most used in the literature, and will outline the increased risks faced by VFRs and the current recommendations based upon the existing body of literature. It is reasonable, however, to extend these recommendations to those defined as VFRs under the proposed, broader definition for the reasons outlined above.

METHODS

A literature search of four electronic databases was conducted using combinations of the words "visit", "friend", "relative", "travel", "health" and "emporiatrics". The search was performed in the Medline database from 1946 through June 2013, in Embase from 1996 to June 2013, in the Global Health databases from 1973 to June 2013 and in Scopus from 2010 to June 2013. A grey literature search was performed using Google Scholar and the Access Medicine database with the keywords "visiting friends and relatives", "travel" and "health". Identified abstracts were screened and relevant full-text articles were obtained for review. Reports or publications from Statistics Canada, Citizenship and Immigration Canada, and the Public Health Agency of Canada were also searched to find data on Canadians, travellers and diseases. This provided an initial overview of the VFR literature, and section topics were selected accordingly for review. Additional focused literature searches were performed for each of the selected section topics to provide more detailed information on epidemiology and burden of specific diseases in the VFR population, with an emphasis on literature and evidence from Canada.

The statement does not contain a comprehensive overview of all travel-related risks, as content was prioritized based on risks specifically higher for VFRs. Therefore, it is important to be familiar with and address all travel-related risks at destination with a special emphasis on the topics discussed below. A comprehensive list of current CATMAT statements can be found on the PHAC travel health website (4).

The recommendations in this statement do not include a description of the strength of the recommendation or grade of the quality of evidence as has previously been done in other CATMAT statements. This statement represents a narrative review of the travel medicine literature on VFRs and CATMAT expert opinion recommendations arising from this review. Relevant data synthesis and recommendations from previous CATMAT statements, intended for all or broader groups of travellers (children, older travellers), are reiterated for the illnesses discussed as greater risks for VFRs.

EPIDEMIOLOGY AND TRAVEL TRENDS

In 2012, the major source countries of origin of Canadian immigrants were China (13%), the Philippines (13%), and India (11%) (5). However, each province and territory has a different immigration profile (Appendix 1).

From 2000 until 2010, Canadian travellers whose purpose was to visit friends and relatives increased over time but this proportion of travellers decreased slightly from 2010 to 2012. In 2012, visiting friends and relatives was the second most common reason for international travel after leisure with approximately two million overnight visits to overseas countries, and accounted for 17% of trips taken by Canadian travellers to overseas countries. While most (56%) of these travellers were going to destinations in Europe (which would not strictly meet criteria as VFR travel), the greater part of the remainder were travelling to countries with a health risk gradient relative to Canada (including 24% of VFRs who travelled to Asia) (6).

VFR TRAVELLER ASSESSMENT

Before considering a given traveller's itinerary and other details of travel, it is important to ascertain the person's relevant health history. In this regard, the pre-travel consultation is an opportunity for health promotion, including identification of undiagnosed conditions or vulnerabilities acquired in their countries of origin (7). First-generation immigrants to Canada have a higher prevalence of certain chronic diseases, such as hepatitis B (HB) and Human Immunodeficiency Virus (HIV) (8,9), which may affect the types of advice given during pre-travel consultation. Furthermore, depending on what care they have previously received before and after arrival to Canada, adult VFRs may be non-immune to vaccine-preventable infections including varicella, mumps, rubella, measles or tetanus (10–13), such that additional screening and recommendations may be necessary for this population. Seen this way, the pre-travel consultation for VFR travellers can afford relatively more opportunities for risk reduction than for non-VFR travellers and may require additional time and effort.

RISK FACTORS

Rates of travel-related illness in VFRs tend to be higher for many conditions, although risks for individual travellers will vary based on characteristics of the traveller, destination, duration of travel, and activities while travelling. The higher risk for illness of VFRs can be explained by several characteristics. VFRs may have last minute travel plans to visit sick relatives or attend a funeral, which limits time to seek pre-travel advice (14). VFRs are more inclined to have longer stays, which increases the risk of morbidity and mortality (14), likely through increased exposure time. Those who stay with family members may be reluctant to eat differently than their hosts and are more likely to drink untreated water (14,15). In addition, their living accommodations may not include door and window screens or bed nets (15). VFRs are more inclined to use public transportation, or even drive themselves, which increases their risk of injury (14). Being in close proximity to the local population also increases risk for certain diseases, such as tuberculosis (TB) (14).

VFRs may lack awareness of risk and possible preventive measures (1,14,16,17). VFR and foreign-born travellers are less likely to seek pre-travel health consultation (18–21), are more likely to seek advice closer to departure (22) and are more likely to decline a recommended vaccine (22). These differences have been associated with VFRs' low perception of personal disease risk (15), but might also reflect language, cultural, and/or financial barriers preventing uptake (1,16). Immigrants in Canada tend to earn less than comparable non-immigrant workers; the proportion of recent immigrants with family incomes below the low-income cut-off in 2009 was 24%, 16%, 16%, and 25% in Quebec, Ontario, Alberta, and British Columbia respectively (23). Furthermore, VFRs often believe that they are immune to diseases in their home country (1,14,17). This may be correct for certain viral infections such as hepatitis A (HA), but incorrect for other infections. In the case of malaria, those who live in highly-endemic areas can develop partial immunity; however, in order for immunity to be maintained, ongoing exposure is required (14). Survival of childhood malaria can lead to partial immunity and a relatively lower incidence of malaria in adulthood, leaving VFRs with the misperception that malaria is not a disease of adults. However, even if VFRs have been exposed to malaria in the distant past, they have most likely lost their partial immunity and are at increased risk for clinical malaria (14). Additionally, VFRs may seek health care providers with a similar ethnic background who may share their belief about pre-existing immunity and, therefore, not recommend malaria chemoprophylaxis or other prevention strategies (24,25).

While most of the above risk factors conferring higher risk of illness to VFRs can be classified as *traveller* level factors (i.e. characteristics of the traveller and his/her destination), risk factors may also fall into the categories of *systems* and *provider* level issues. *Systems* level issues include the fact that, in Canada, travel health services are usually not reimbursed by public or private health insurance plans. Consequently, out-of-pocket vaccines and medications can be costly, which may deter VFRs (particularly those with lower income) from receiving the care they need (14,17). The major provider level issues impacting VFRs are at the primary care level, including lack of up-to-date knowledge and training on travel health topics and destination-specific risks, and the limited available time and resources that can be devoted to complex issues encountered in primary care.

MALARIA

Most studies suggest foreign-born VFRs appear to have a significantly greater risk of contracting malaria than tourist travellers (up to 4.5-fold higher risk in some studies (26)). However, it is difficult to quantify the magnitude of risk due to the lack of precise data on denominators (i.e. numbers and types of travellers, and their destinations). A recent literature review comprised mostly of American and European studies found that VFRs are the most significant group of travellers for imported cases of malaria in non-endemic countries (27). This study found that VFRs account for 21% to 68% of malaria cases (27). National surveillance data on malaria cases in Canada does not have information on population groups. Of 214 cases of severe malaria reported to the Canadian Malaria Network between June 2001 and December 2013 with information regarding reason for travel, 45% stated their reason for travel was visiting friends and relatives (28). In a published review of the Quebec provincial registry of notifiable diseases, the majority of malaria cases (53%) were among VFRs (29). The vast majority of VFR cases from these reports had travelled to Sub-Saharan Africa, with the second most common destination being Asia (29); this most likely reflects both the risk of malaria transmission in these regions and the proportion of travellers to these destinations. Interestingly, one recent study from the United Kingdom found that while VFRs represented the majority of imported cases of malaria, the risk of mortality among malaria cases was 8.2-fold greater in tourist travellers (30); residual immunity or earlier presentation due to greater awareness about malaria among VFRs were postulated as possible explanations.

The above-mentioned literature review also noted that among travellers with malaria, 59% to 99% did not use malaria chemoprophylaxis or were taking it inadequately (inappropriate drug or adherence) (27). A Canadian study on travellers going to India (87% of whom were VFRs) found that only 31% intended to use chemoprophylaxis and less than 10% were using measures to prevent mosquito bites (31). Of those who did intend to use chemoprophylaxis, only 24% had been prescribed an appropriate drug regimen (31). In a Canadian case series of malaria diagnoses, the vast majority of cases were among travellers who did not seek pre-travel advice and/or were not taking appropriate malaria prophylaxis (32,33).

VFRs should be targeted for counselling regarding the importance of malaria prevention, including addressing potential misconceptions regarding personal risk. VFRs travelling to malaria-endemic regions should be advised to use personal protective measures against mosquito bites. If chemoprophylaxis is indicated, VFRs should be encouraged to purchase it in Canada before travel, rather than abroad. Also, VFRs should be advised to seek health care if they develop fever during travel or once they have returned to Canada.

For further recommendations on chemoprophylaxis, refer to CATMAT's Canadian Recommendations for the Prevention and Treatment of Malaria (34).

VACCINE-PREVENTABLE DISEASES

Canadian immigrants, both adults and children, may be more susceptible to vaccine-preventable disease due to lack of access to vaccines or different vaccine schedules in their countries of origin.

ROUTINE IMMUNIZATION

It has been found that many Canadian immigrants from developing countries are susceptible to at least one of the following childhood infectious diseases: measles, mumps, rubella and varicella (10,12,35). Outbreaks of rubella (36) and 2.0- to 3.1-fold higher incidence rates of varicella (37) among immigrants in Spain highlight the burden of non-immunity to vaccine-preventable diseases in immigrant populations with adult immigrants being an important risk group. Studies from the United States, Australia, and Germany have likewise revealed high rates of non-immunity amongst pediatric immigrants and refugees (38–40).

The pre-travel visit represents a valuable opportunity to evaluate immunization status and update routine vaccines for both adults and children. The mandatory medical examination required for immigration to Canada is intended to identify conditions affecting admissibility (conditions conferring public health risk or leading to excessive demands on the Canadian health care system), and does not include updating of vaccinations in its mandate. Children born abroad who migrate to Canada may be vaccinated according to Canadian standards as part of post-arrival assessment and/or for admission to the public education system; however, this may vary by community or jurisdiction. Adults may be relatively less likely to undergo post-arrival assessments with detailed review of vaccination status, although this can be a cost-effective exercise for at least some diseases (41,42). Most adults will also not have a vaccination record, which can make updating of vaccines particularly challenging (10).

Health care providers should evaluate foreign-born VFRs' immunization status and immunity to vaccine-preventable diseases, and ensure routine vaccines are up-to-date. For pediatric VFRs, although their immunizations may be considered up-to-date per provincial and territorial schedules, there may remain opportunities to accelerate the routine schedule in order to provide maximal protection during travel (where the risk of vaccine-preventable diseases may be higher, and/or care for children with such infections may be suboptimal). These opportunities exist when immunizations can be given at a younger age or a shorter interval than laid out in the routine schedule. For additional information on accelerated vaccine schedules, refer to the table in Appendix 2 ("*Vaccinations for possible acceleration in the routine pediatric immunization schedule*") as well as CATMAT's Statement on Pediatric Travellers (43).

TYPHOID

The majority of cases of typhoid fever in North America are associated with travel and a considerable proportion (37 to 91% of cases) is associated with travel to South Asia [defined as per the World Bank classification (44), and includes Afghanistan, Pakistan, India, Nepal, Bangladesh, Maldives, Sri Lanka, and Bhutan] (16). In CATMAT's Statement on International Travellers and Typhoid, a detailed evidence review and synthesis revealed that the estimated risk of travel associated typhoid is about 1/3,000 travellers to this region (45). This is compared with much lower risk with travel to other typhoid-endemic regions (1/50,000 to 1/100,000 to Sub-Saharan Africa, North Africa and the Middle East, or South America; and <1/300,000 to the Caribbean and Central America) (45). VFR travel was found to be a major risk factor for travel-related typhoid fever infection, with 66% of United States cases (46) and more than 90% of Quebec cases (29) occurring in VFRs. Although VFRs appear to be at increased risk for typhoid, the magnitude of incremental risk attributable to VFR travel in addition to travel destination is unclear. In a study performed by the GeoSentinel network, VFRs had 7.0 times the odds of receiving a diagnosis of typhoid fever compared with tourist travellers (26).

Those travelling to countries with poor sanitation and hygiene conditions should be advised to follow safe food and water precautions and to wash their hands frequently. CATMAT recommends age-appropriate typhoid vaccination for adult and children VFRs travelling to South Asia (45). Typhoid vaccine is not routinely recommended for travellers to other destinations; however, it may be considered for VFRs in specific high-risk situations (e.g. extended periods of stay, children, or inability to avoid high-risk food/water exposures) (45).

CATMAT's Statement on International Travellers and Typhoid (45) provides further information on prevention of typhoid fever and use of the typhoid vaccine.

HEPATITIS A

European studies of HA epidemiology revealed VFRs as a major contributor of cases, accounting for 28 to 78% of HA cases in travellers, with children VFRs making up most of the cases (47–50). Incidence rates calculated by region from these studies suggest rates of HA acquisition ranging from 6 to 49 cases per 100,000 travel months overall to HA-endemic regions including Sub-Saharan Africa, North Africa, the Middle East, South-Central Asia, and Latin America. Amongst Quebec cases of HA, 57% were in VFRs of which over 60% were acquired in Africa (with 32% acquired in North Africa) or the Indian subcontinent (29).

Those travelling to countries with poor sanitation and hygiene conditions should be advised to follow safe food and water precautions and to wash their hands frequently (51). Non-immune VFRs travelling to developing countries should be vaccinated, and age-appropriate immunization is advised for children (51). Immunity in foreign born VFRs can be confirmed with serology to determine need for vaccination.

HEPATITIS B

Several behavioural characteristics of VFR travel (longer periods in country, close contact with local population, greater risk of injury and/or contact with the medical system) would be considered specific risk factors for HB acquisition. Increased risk of travel-related HB infection was shown in Dutch VFRs (52), with a 2.8-fold increased risk above non-VFRs. The majority of VFRs who acquired HB in this study were short term travellers, with suspected risk factors for acquisition including sexual contact, household contacts, and medical care. Other studies have not demonstrated a specific risk of travel-related HB for VFR travellers (53,54). However, infection risks during travel have variously been estimated at 5 per 100,000 travellers overall (52) and from 10 to 25 per 100,000 travel months (55,56) for symptomatic infections. Given that a recent systematic review and meta-analysis found that over half of immigrants and refugees are non-immune to HB (9), these estimates of disease risk during travel support recommendations to screen for past or current infection and offer vaccine to non-immune travellers (7).

VFRs travelling to HB-endemic countries (i.e. with HB surface antigen prevalence ≥ 2%) or who may engage in behaviours increasing their risk for blood/body fluid contact, should be counselled regarding safe practices (condom use, use of sterile medical equipment) (57). Non-immune VFRs should be vaccinated, and age-appropriate immunization is advised for children (51).

Further recommendations on prevention of HA and HB can be found in CATMAT's Summary of Recommendations for the Prevention of Viral Hepatitis During Travel (51).

TUBERCULOSIS

Travellers to countries with higher TB incidence are at risk of acquiring infection during travel. In 2012, foreign-born individuals accounted for 64% of all reported TB cases in Canada (58). The highest incidence rates among those who were foreign-born were found in people originating from Africa, South-East Asia, Western Pacific and Eastern Mediterranean (58). These cases include TB disease acquired in the country of origin before immigration as well as during return VFR trips. Studies from the United Kingdom and the Netherlands demonstrated significant proportions of TB in immigrant populations attributed to VFR travel (22% in South Asian and 56% in Moroccan VFRs, respectively) (59,60). A Dutch study of returned travellers reported a TB incidence rate of 280 infections per 100,000 travel months to highly endemic countries, and 60 cases of active TB disease per 100,000 travel months (61). Highest infection rates were seen in travellers to Africa, Central America, and South-East Asia; additionally, travelling for medical work (e.g. missionary work) was associated with high risk (61). Although there were very few VFRs in this study, other studies in children have shown foreign travel (mostly for the purpose of visiting family) as a risk factor for latent TB infection (LTBI) (62,63).

VFRs travelling to high TB incidence countries should avoid consumption of unpasteurized dairy products to reduce the risk of *M. bovis* acquisition (64). VFRs should be cautioned to avoid individuals with known pulmonary TB (until individual has been deemed non-infectious) or people with unexplained chronic cough. In some circumstances Bacillus Calmette-Guérin (BCG) vaccine may be considered for individual long term travellers to high-prevalence countries, specifically infants and young children (<5 years) travelling to highly TB endemic countries or individuals who may have extensive exposure to multidrug resistant TB. Detailed guidance on BCG indications and administration can be found in the Canadian TB Standards (Chapter 16) (65) and CIG (109), respectively.

Detailed guidance on pre-travel advice for TB infection risk avoidance and post-travel TB screening can be found in CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64). Up-to-date information on TB risk conditions and country-level risk stratification can be found in Chapters 6 and 13, respectively, of the Canadian Tuberculosis Standards (65). Risk of TB acquisition during travel can be estimated according to population rates of all cases of TB in the destination country and duration and purpose of travel (see Appendix 3 or Table 4, Chapter 13 of the Canadian Tuberculosis Standards) (65). Risk of development to active TB disease after acquisition can be predicted by underlying conditions or risk factors (see Appendix 4 or Table 1, Chapter 6 of the Canadian Tuberculosis Standards) (65).

Recommendations for pre- and post-travel TB skin testing are summarized in Appendix 5. In brief, for travellers with significant exposure (based on trip duration and TB incidence at destination) or increased risk of TB activation post-exposure (e.g. immune suppression, age < 5 years), a post-travel TB skin test is recommended > 8 weeks after their return. A pre-travel TB skin test is recommended for those at risk for hepatotoxicity with LTBI treatment (age >50 years, chronic viral hepatitis, or other co-morbid liver diseases) and with an increased probability of having a positive test pre-travel (born or lived in high-prevalence country, health care worker, aboriginal), or for those who require routine skin test monitoring for work (e.g. health care worker). For individuals at risk of hepatotoxicity from LTBI treatment with isoniazid, such treatment would be reserved for those with recent infection during travel, making pre-travel TB skin testing important for immigrant VFRs who are more likely to have a positive test result pre-travel.

PARASITIC INFECTIONS

When compared to other travellers, immigrant VFRs have been found to have significantly more non-diarrheal intestinal parasitic infections, regardless of destination (26). While many of these infections are self-limiting and carry a low risk of significant impact on health, certain infections, such as schistosomiasis, strongyloidiasis, echinococcosis and cysticercosis, can be chronic and have the potential to cause significant morbidity or even mortality. As with TB, it is difficult in the post-travel encounter to differentiate incident infections acquired during VFR trips from previously undiagnosed chronic infections that pre-date immigrant travellers' arrival to Canada. High-risk areas for traveller acquisition of these latter infections include Sub-Saharan Africa, South-East Asia, and Latin America (26). These risks are reflected in the burden of these pathogens in refugees, with rates of strongyloidiasis among African and South-East Asian refugees of 9 to 77% and schistosomiasis among African refugees of 2 to 73% (13). A study

of patients attending a large Canadian GeoSentinel post-travel clinic found VFRs to be more likely to present with these, and various other, intestinal parasites (66). A review comparing illnesses among VFR versus non-VFR travellers in the entire GeoSentinel network found the proportionate morbidity of non-diarrheal intestinal pathogens in VFRs was greatly increased, with odds ratios ranging from 3.8 to 6.8 according to region of travel (26).

Similar to the updating of vaccinations, the pre-travel assessment can represent an opportunity to identify risk and to recommend screening for these treatable chronic parasitic infections amongst immigrants (if not already performed in the past) although the costs and benefits of such screening in asymptomatic travellers have not been well-studied. Prevention of these infections during travel should be advised according to risk at the destination. These recommendations include avoidance of freshwater activities like swimming in Africa, South-East Asia, and parts of South America for schistosomiasis, avoiding walking barefoot or other skin-to-soil contacts in all tropical countries for strongyloidiasis, and using standard water and food precautions for other intestinal and non-intestinal parasitic infections spread through fecal-oral contamination.

SEXUALLY TRANSMITTED INFECTIONS AND HIV

There are few published data specifically addressing sexually transmitted infections (STIs) in VFRs. Recently, a large GeoSentinel review of STIs in travellers found that approximately 1% of 112,000 ill travellers were diagnosed with an STI (67). VFR travel was associated with a 2.1 odds ratio of STI diagnosis; the most common infections were acute HIV, syphilis, and urethritis (67). Additional previous smaller studies had demonstrated that STIs were more likely among VFRs than other travellers, with VFRs having 2.6 to 5.0 times more risk of being diagnosed with these infections (26,68). Surveillance studies in the United Kingdom and Western Australia have documented HIV acquisition amongst immigrants during travel back to their country of birth (69,70). While the evidence supporting the actual burden of STIs and HIV in VFRs is somewhat limited, sexual risk behaviour studies among VFRs suggest a high risk for acquisition of such infections. New sexual partners and unprotected sexual encounters are common among travellers generally (71), including VFRs (72,73). However, VFRs travelling to countries with higher endemic rates of HIV and other STIs will be at relatively increased risk of acquisition of these diseases as a result of these risk behaviours. Traveller risk factors for casual sex while abroad (and hence STI acquisition during travel) include: younger age, male sex, men who have sex with men, single status, travelling alone or with friends, longer periods of travel, and having a history of previous STI diagnosis or more than five sexual partners in the previous year (74).

It is recommended that health care providers discuss with VFRs the possibility of sexual activity during travel, as well as the rates of STIs and HIV at destination. The importance of safer sex practices should be emphasized and travellers should be encouraged to bring condoms from Canada, to assure their quality (75). HPV vaccine can be considered for adolescent and adult travellers not previously vaccinated. HB vaccination is recommended as above.

Additional recommendations related to STI risk reduction can be found in CATMAT's Statement on Travellers and Sexually Transmitted Infections (75).

INJURY

While much time is spent during the pre-travel consultation on strategies for prevention of infection, injuries are a much more prevalent and potentially preventable cause of morbidity and mortality in travellers. Injury is the cause of death in 18 to 25% of traveller mortality abroad (76–78), a higher rate compared to rates of death due to infection of 1 to 2% (77,79). While the travel-related injury literature has not specifically examined the burden of injuries in VFRs, numerous characteristics of VFRs are assumed to increase injury risk. These characteristics include greater likelihood to use local modes of travel, longer trip durations, and taking part in local activities.

Where use of motorcycles or bicycles is necessary, VFRs should be encouraged to use helmets (80). The use of other available road-safety precautions such as seat belts and infant/child car seats should also be recommended (80). For more information on injury risk and recommendations for prevention, refer to CATMAT's Statement on Risk of Injury and Travel (80).

SPECIAL POPULATIONS

PEDIATRIC VFRS

Children born to immigrant parents in well-resourced countries like Canada are considered VFRs. During travel, these children are likely at greater risk than their parents or foreign-born VFR children due to lack of prior immunity to local infections (such as HA) as well as other demographic and travel-related characteristics. When compared to pediatric tourist travellers, pediatric VFRs seen before departure in Spain and the United States were more likely to be younger (<5 years), travelling for longer periods, travelling to rural areas, presenting closer to the planned departure date (leaving less time for immunization and antimalarial chemoprophylaxis initiation), and travelling to destinations with higher risk for tropical diseases (81,82). Pediatric VFRs have been shown to be at greater risk for some post-travel outcomes than adult VFRs or other pediatric travellers. A pediatric GeoSentinel study observed that ill children presenting for treatment after travel were significantly more likely to be VFRs compared to adults, and pediatric VFRs were more likely to present with systemic febrile illnesses in general and malaria in particular (83). A Swiss study of ill returned pediatric travellers found that 75% of potentially serious illnesses requiring admission to hospital (malaria, TB, typhoid fever, meningococcal meningitis) were amongst VFRs (84).

A recent surveillance study of pediatric VFRs from Canada found that enteric fever, malaria, diarrheal diseases and HA accounted for 75% of travel-related illnesses in this group (85). Only 26% of these travellers had received pre-travel advice. The majority of the pediatric VFRs in this study (71%) required hospitalization upon their return to Canada.

Amongst travellers, malaria disproportionately affects children, with higher rates of pediatric infection despite children constituting a smaller proportion of travellers (34). A recent review found that in the United States and Europe, 50% to 84% of the imported cases of malaria in children are due to VFR travel (86). In Canada, surveillance of cases of severe malaria (2001–2013) revealed that 18% of cases were aged <18 years (28). In the Quebec registry of all malaria cases (2004–2007), 17% of cases were aged <19 years (29). Use of chemoprophylaxis is low in this population group (87–90) and in cases where chemoprophylaxis is prescribed, only 0 to 30% of pediatric VFRs receive it as prescribed (86).

Children are at increased risk of acquiring typhoid fever and also suffer higher rates of associated complications, hospitalizations and death (45,91–95). Evidence reviewed in CATMAT's Statement on International Travellers and Typhoid revealed a disproportionate burden in pediatric travellers (45). Quebec VFRs less than 20 years of age accounted for 50% of typhoid cases from 2004 to 2007 (29), and in Sweden, child travellers aged 0 to 6 and 7 to 18 years of age had odds ratios of 44.2 and 14.2, respectively, of acquiring typhoid compared to travellers aged 46 to 65 years (96).

VFR travel is a risk factor for exposure to TB and development of LTBI (62,63). This is of particular concern for children under five years of age due to their high risk for development of active TB disease and more severe forms of TB (meningitis, miliary) after infection (97).

Pediatric VFRs are also at high risk of acquiring HA, accounting for 65% of Quebec VFR cases and 53% of travel-related cases overall (29,48). In addition, young children may acquire HA infection while travelling that causes asymptomatic or mild disease for them but may pose disease risk for non-immune older children or adult contacts on return to Canada.

These data emphasize the importance of pre-travel assessment and adherence to recommended interventions for children. Parents should be counselled that the rates of illness requiring hospitalization are higher among VFR children and that illness during and after travel requires urgent assessment. Also, parents of Canadian-born VFR children should be counselled that their child has no innate immunity against travel-related illnesses due to their genetics or ethnoracial identity. For more information on pediatric travellers as well as recommendations, refer to CATMAT's Statement on Pediatric Travellers (43); refer to Appendix 2 for accelerated pediatric vaccination schedules.

OLDER TRAVELLERS

Unlike pediatric VFR travellers, there have been no publications focusing on specific health risks for older VFR travellers. Nonetheless, older travellers have numerous characteristics (comorbid conditions, poorer immune responses or contraindications to vaccines, and frailty leading to injury risk) which lead to increased health risks while travelling. Older VFRs may thus have resulting synergistic risk and should be counselled accordingly. For information on older travellers as well as recommendations, refer to CATMAT's Statement on Older Travellers (98). Additionally, for evaluation and recommendations on TB risk and pre-travel TB skin testing recommendations, refer to Appendix 5, Chapter 6 of the Canadian Tuberculosis Standards and to CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64,65).

IMMUNOCOMPROMISED TRAVELLERS

Similar to older travellers, little research has addressed the unique health risks of VFR travel for immunocompromised individuals. However, a number of survey studies of travel in various immunocompromised groups have been reported in recent years, including Canadian HIV-infected individuals (99) and solid organ transplant recipients in Canada, the United States and the Netherlands (100–102). In these surveys, international travel was common amongst these groups with 46% of HIV patients and 27 to 36% of solid organ transplant recipients undertaking international travel, amongst whom VFR travel was the purpose for 35% and 12 to 46%, respectively (99–102). Pre-travel advice was sought by only 44% of HIV patients, and by 4 to 78% of solid organ transplant recipients, with HIV and transplant clinic physicians being the most common sources of advice for each patient group. Illness requiring medical attention occurred in 18% of HIV patients and 8 to 29% of solid organ transplant recipients, and infections were common causes of illness. Unfortunately, none of these survey studies evaluated the above outcomes specifically comparing VFR to non-VFR travellers. A retrospective cohort study of cancer patients in the United States seen before and after travel found 20% were VFRs; 13% of the total number of immunocompromised patients reported a travel-related illness (103). It is notable that the rates of illness found by these studies exceed those of the average traveller (104).

Infection risks for the VFR travellers according to their degree and nature of immune compromise, along with the risks specific to the destination should be reviewed and appropriateness of travel discussed with the patient. For travel health information on immunocompromised travellers as well as detailed recommendations on specific conditions, refer to CATMAT's statement on The Immunocompromised Traveller (105). For evaluation and recommendations on TB risk in specific immunocompromising conditions, refer to Appendix 4, Chapter 6 of the Canadian Tuberculosis Standards and to CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64,65).

TARGETING VFRS FOR PRE-TRAVEL ADVICE

Given that VFRs are at greater risk of illness yet are less likely to seek pre-travel advice, health care providers should address the issue of potential upcoming VFR travel with individuals at routine health visits. Consultation with a travel health specialist should be recommended for all VFRs, and particularly for those with risk factors for severe disease (immunocompromised, children, comorbid disease). However, if patients are unwilling or unable to afford the cost of seeking travel medicine consultation, primary care providers should recognize that they may be the only point of contact for VFRs to receive travel advice. As such, providers should equip themselves with travel health knowledge and clinical resources so that appropriate basic and essential recommendations can be made before VFRs travel (e.g. vaccines, malaria prophylaxis, etc.). In situations where cost is an important barrier to adherence to recommendations, the clinician may need to prioritize recommendations based on a risk assessment of the traveller and travel destination.

RESEARCH NEEDS

Additional research is required to determine the facilitators and barriers to accessing and adhering to pre-travel advice for VFR travellers. Engaging ethnic communities and health care personnel who provide their care is necessary to assess knowledge, attitudes and behaviour regarding travel health and determine the best ways of providing information to VFR travellers. Some promising community-based awareness campaigns targeting potential and impending VFRs have recently been developed (106,107); however, formal evaluations of effectiveness are needed to determine whether such initiatives are worthwhile. Accurate estimates of risk of specific illnesses during travel according to purpose and trip duration are needed in order to provide better information to travellers regarding necessary precautions. Additionally, a cost analysis of the burden of travel-related illness among Canadian VFR travellers and the cost-effectiveness of preventive interventions would be very valuable.

SUMMARY

The pre-travel health assessment of VFRs should be conducted as for tourist travellers. However, additional attention is required to address issues such as the VFR's current health status, health beliefs and increased likelihood of prior exposure to certain conditions in their country of origin. The need for adherence and addressing potential challenges to achieving adherence to travel advice should be discussed.

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APPENDICES

APPENDIX 1: CANADIAN IMMIGRATION PROFILE OF PROVINCES AND TERRITORIES IN 2012

PROVINCE/ TERRITORY	PERMANENT RESIDENTS AREA OF ORIGIN (%)		
	AFRICA AND THE MIDDLE EAST	ASIA AND PACIFIC	SOUTH AND CENTRAL AMERICA
Newfoundland and Labrador, Prince Edward Island and New Brunswick	1,050 (26.1)	2,026 (50.3)	649 (16.1)
Nova Scotia	593 (25.3)	866 (37.0)	563 (24.1)
Quebec	19,270 (35.0)	9,611 (17.5)	13,623 (24.7)
Ontario	21,849 (22.1)	52,910 (53.4)	10,336 (10.4)
Manitoba	2,646 (19.9)	8,345 (62.7)	1,342 (10.1)
Saskatchewan	1,408 (12.6)	8,112 (72.6)	1,098 (9.8)
Alberta	5,733 (15.9)	22,497 (62.3)	3,805 (10.5)
British Columbia	3,470 (9.6)	24,888 (68.7)	4,343 (12.0)
Yukon, North West Territories and Nunavut	32 (7.0)	333 (72.5)	70 (15.3)
Canada	56,051 (21.7)	129,588 (50.2)	35,829 (13.9)

SOURCE: Citizenship and Immigration Canada (108)

APPENDIX 2: VACCINATIONS FOR POSSIBLE ACCELERATION IN THE ROUTINE PEDIATRIC IMMUNIZATION SCHEDULE

VACCINE	ROUTINE SCHEDULE*	YOUNGEST AGE	MINIMUM INTERVAL	COMMENTS
DTaP-IPV-Hib (109)	2, 4, 6, 18 mo	6 wk	4 wk	
Pneumococcal conjugate (109)	2, 4, (6), 12 mo	6 wk	4 wk (110–112)	
Rotavirus (109)	2, 4 mo (Rotarix) or 2, 4, 6 mo (Rotateq)	6 wk	4 wk	
Measles, mumps, rubella (MMR) (109)	12 mo, 4–6 yr	6 mo	4 wk	Note: If MMR given prior to 12 months of age, 2 doses should be given after 12 months of age in order to ensure long term immunity
Varicella (109)	12–15 mo, 4–6 yr	12 mo	4 wk (113)	
Hepatitis A (109,114)	≥12 mo age, 0, 6 mo	6 mo (115,116)	6 mo	Off-label usage; see CIG chapter on Hepatitis A vaccination (109)
Hepatitis B (109)	0, 1, 6 mo beginning at birth or middle/high school	Birth	0,1,2,12 months (117) 0,7,21 days, 12 months (118) 0,10,21 days (119)	

VACCINE	ROUTINE SCHEDULE*	YOUNGEST AGE	MINIMUM INTERVAL	COMMENTS
Meningococcal conjugate (Men-C monovalent; Men-A/C/Y/W135 quadrivalent) (109,120)	• Men-C monovalent: single dose at 12 mo • Men-A/C/Y/W135 quadrivalent: single dose in middle/high school • Men-B –vaccination is not routine, only in cases of outbreaks or high risk individuals	Men-C: 2 mo Men-A/C/Y/W135: • Menveo—2 mo • Menactra—9 mo • Nimenrix—12 mo Men-B: 2 mo	Men-C products: • Menjugate—4 wk • NeisVac-C or Meningitec—8 wk Men-A/C/Y/W135 products: • Menveo—8 wk • Menactra—single dose only • Nimenrix—single dose only Men-B—4 wk	• Please refer to the CIG chapter on meningococcal vaccination and NACI statements on various meningococcal vaccines for details of schedules (121) • Consider early meningococcal vaccination using product judged most appropriate based on local epidemiology at destination
Japanese Encephalitis Virus (JEV)	Ixiaro—licensed only for >/= 18y; 2 doses at 0, 28 days (109)	Trial data for Ixiaro on infants down to 2 months Half dose (0.25mL) for <3 years; full dose (0.5mL) ≥ 3 years	28 days	• Off label usage of Ixiaro is recommended by CATMAT (122) • Alternatively, parents may consider getting vaccinated in destination country with local product (e.g. Green Cross Vaccine for >9 months or Chengdu SA14–14–2 for >6 months or Imojev for >12 months)
Rabies (109)	Imovax—no lower age limit; 3-dose pre-exposure schedule 0, 7, 21–28 days; 4-dose post-exposure schedule 0, 3, 7, 14 days		No lower age limit	

VACCINE	ROUTINE SCHEDULE*	YOUNGEST AGE	MINIMUM INTERVAL	COMMENTS
Typhoid (109)	Injectable—single dose—age >/= 2 years. Oral—4 doses taken 2 days apart—age 6 years	No additional guidance	NA	
Yellow fever (109)	YF-VAX—single dose for children ages 9 months or older	Could be given as young as 6–8 months if travel to YF-endemic area is unavoidable		If an infant receives YF vaccine at 6 to 8 months of age, and subsequently travels after 9 months of age, serology should be done (if available), and a booster dose considered.

* Refer to routine provincial/territorial immunization programs for specific vaccine schedules (123)

APPENDIX 3: COUNTRY AND TRAVEL DURATION CRITERIA FOR TB SKIN TESTING POST-TRAVEL

TB CASE INCIDENCE IN DESTINATION COUNTRY	DURATION OF TRAVEL
≥ 400/100,000 and	≥ 3 months;
200–399/100,000 and	≥ 6 months;
100–199/100,000 and	≥ 12 months;
≥100/100,000 and	≥ 1 month of travel with very high-risk contact, particularly direct patient contact in a hospital or indoor setting, but possibly including work in prisons, homeless shelters, refugee camps or inner city slums.

SOURCE: Adapted from the Canadian Tuberculosis Standards, 7th Edition (65)

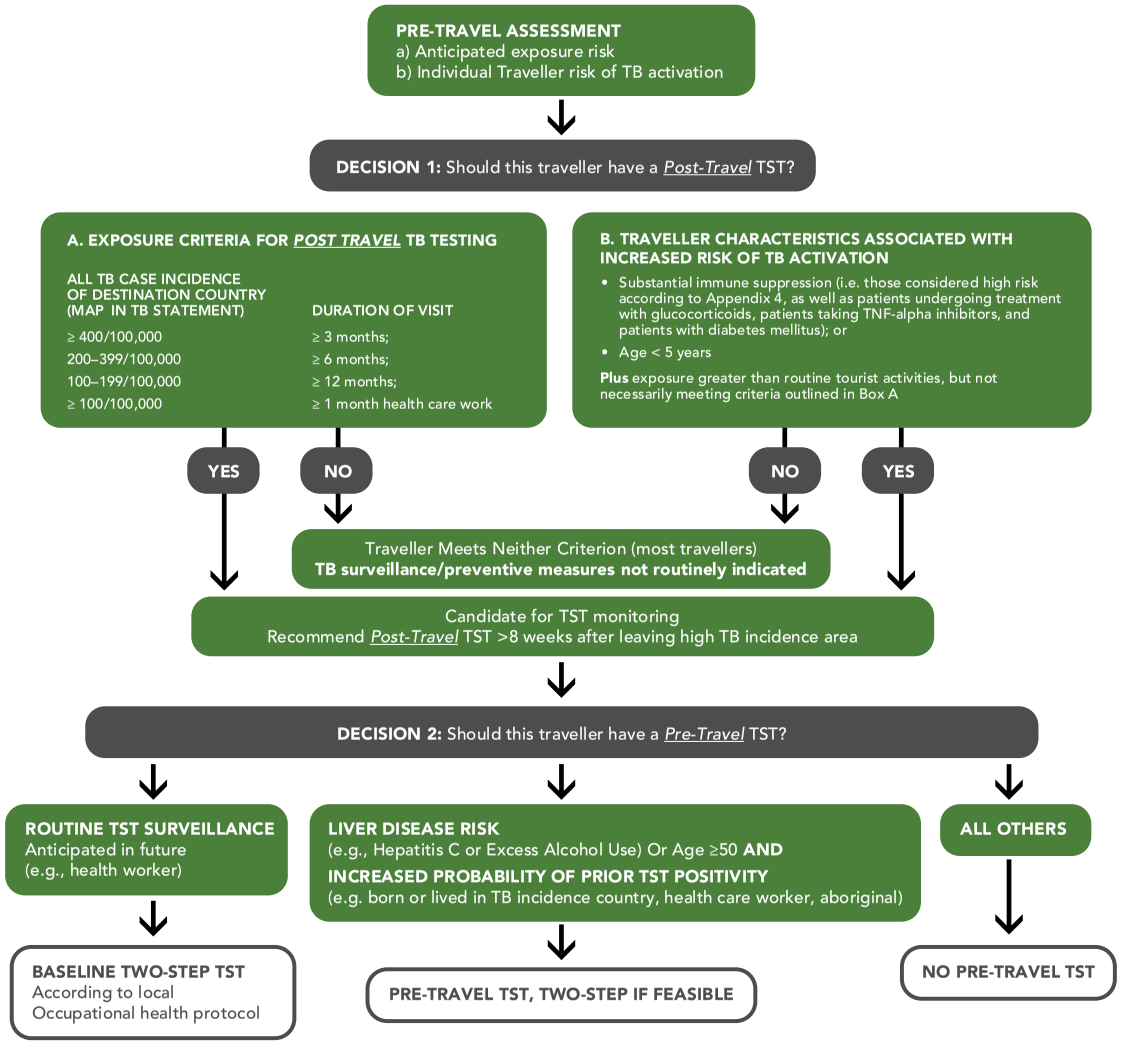
APPENDIX 4: RISK FACTORS FOR DEVELOPMENT OF ACTIVE TUBERCULOSIS AMONG PEOPLE WITH A POSITIVE TUBERCULIN SKIN TEST (PRESUMED INFECTED WITH MYCOBACTERIUM TUBERCULOSIS)

RISK FACTOR	ESTIMATED RISK OF TB RELATIVE TO PERSONS WITH NO KNOWN RISK FACTOR
HIGH RISK	
Acquired immunodeficiency syndrome (AIDS)	110–170
Human immunodeficiency virus (HIV) infection	50–110
Transplantation (related to immunosuppressant therapy)	20–74
Silicosis	30
Chronic renal failure requiring hemodialysis	10–25
Carcinoma of head and neck	11.6
Recent TB infection (≤ 2 years)	15
Abnormal chest x-ray—fibronodular disease	6–19
MODERATE RISK	
Tumor necrosis factor alpha inhibitors	1.5–45.8
Diabetes mellitus (all types)	2.0–3.6
Treatment with glucocorticoids (≥15mg/d prednisone)	4.9–7.7
Young age when infected (0–4 years)	2.2–5.0
SLIGHTLY INCREASED RISK	
Heavy alcohol consumption (≥3 drinks/day)	3–4
Underweight (< 90% ideal body weight; for most people, this is a body mass index ≤ 20)	2–3
Cigarette smoker (1 pack/day)	1.8–3.5
Abnormal chest x-ray—granuloma	2

RISK FACTOR	ESTIMATED RISK OF TB RELATIVE TO PERSONS WITH NO KNOWN RISK FACTOR
LOW RISK	
Person with positive TST, no known risk factor, normal chest x-ray ("low risk reactor")	1
VERY LOW RISK	
Person with positive two-step TST (booster), no other known risk factor and normal chest x-ray	0.5

SOURCE: Adapted from the Canadian Tuberculosis Standards, 7th Edition (65)

APPENDIX 5: A SUMMARY OF THE DECISION MAKING MODEL TO GUIDE TB SKIN TESTING IN TRAVELLERS



SOURCE: Adapted from CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64)

APPENDIX 6: TABLE OF DISEASE-SPECIFIC RISK AND RECOMMENDATIONS FOR VFRS

DISEASE	MAGNITUDE OF INCREASED RISK	REASON FOR INCREASED RISK	STRATEGIES TO DECREASE TRAVEL ASSOCIATED RISKS TO VFRS
Malaria	• VFRs have 4.5-fold increased risk of malaria (26).	• Less likely to seek a pre-travel health consultation • Lower use of chemoprophylaxis and personal protective measures • Belief that they are already immune • More likely to stay in areas with intense malaria transmission • Living accommodations may not include door, window screens, bed nets or air-conditioning	• VFRs should be targeted for counselling regarding the importance of malaria prevention; counselling should include addressing potential misconceptions regarding their personal level of risk. • VFRs travelling to malaria-endemic regions should be advised to use personal protective measures to prevent bites from Anopheles mosquitoes. Detailed information can be found in CATMAT's Statement on Personal Protective Measures to Prevent Arthropod Bites (124). • For recommendations on chemoprophylaxis, see CATMAT's Canadian Recommendations for the Prevention and Treatment of Malaria (34). • **CHILDREN:** For details on the prevention and treatment of malaria in children, see CATMAT's Statement on Pediatric Travellers (43). • VFRs should be encouraged to purchase antimalarial chemoprophylaxis in Canada rather than abroad; probing for concerns about cost may be helpful to initiate this discussion. • VFRs should be advised to seek health care if they develop fever during travel or once they have returned to Canada.

DISEASE	MAGNITUDE OF INCREASED RISK	REASON FOR INCREASED RISK	STRATEGIES TO DECREASE TRAVEL ASSOCIATED RISKS TO VFRS
Routine vaccine-preventable diseases	• Adult immigrants are more likely to be non-immune to mumps, rubella, and varicella (10,35). They have 2.0- to 3.1-fold increased rates of varicella disease (37), reflecting non-immunity.	• Differences in immunization requirements/schedules in country of birth	• Care providers should evaluate foreign-born VFR children's and adults' immunization status and immunity to diseases that are usually acquired or immunized against in childhood, and ensure routine vaccines are up-to-date (such as measles and varicella). • **CHILDREN:** Evaluate opportunities to provide maximal protection against preventable diseases by accelerating the primary immunization series when possible. See CATMAT's Statement on Pediatric Travellers (43); Part 3 of the Canadian Immunization Guide, Immunization of Travellers (109); and Appendix 2, pediatric accelerated immunization schedules table.
Typhoid	• VFRs have 7 times the odds of being diagnosed with typhoid than tourist travellers (26). • The majority of typhoid is diagnosed in VFRs, particularly in children and those travelling to South Asia (29,46).	• May be reluctant to eat differently than their hosts • More likely to drink untreated water • Longer trips may increase risk of exposure	• Those travelling to countries with poor sanitation and hygiene conditions should be advised to follow safe food and water precautions and to wash their hands frequently. • CATMAT recommends that VFRs travelling to South Asia* receive typhoid vaccine; see CATMAT's Statement on International Travellers and Typhoid for more information (45). • **CHILDREN:** Age-appropriate immunization against typhoid is advised for children travelling to South Asia. • Typhoid vaccine is not routinely recommended for travellers to destinations other than South Asia; however, it may be considered for VFRs in situations posing significant risk (e.g. children, extended periods of stay, inability to avoid high-risk food/water exposures) (45).

DISEASE	MAGNITUDE OF INCREASED RISK	REASON FOR INCREASED RISK	STRATEGIES TO DECREASE TRAVEL ASSOCIATED RISKS TO VFRS
Hepatitis A (HA)	• The majority of travel-related HA infections are diagnosed in VFRs (29,47–50).	• May be reluctant to eat differently than their hosts • More likely to drink untreated water	• Those travelling to countries with poor sanitation and hygiene conditions should be advised to follow safe food and water precautions and to wash their hands frequently. • Non-immune VFRs going to developing countries should be vaccinated. See CATMAT's Summary of Recommendations for the Prevention of Viral Hepatitis During Travel (51). • **CHILDREN:** Age-appropriate immunization against HA is advised for children.
Hepatitis B (HB)	• 2.8-fold increased risk of HB infection seen in VFRs compared to non-VFR travellers (52). • Over half of immigrants are non-immune to HB (9).	• May be in close contact with locals with HB infection (household, sexual) • May be more likely to come into contact with blood/ contaminated medical equipment (seeking routine or emergency care; dental care; tattooing or piercing)	• All VFRs going to countries that are endemic for HB (i.e. with HB surface antigen prevalence ≥ 2%) or who may engage in behaviours increasing their risk for blood/body fluid contact should be counselled regarding safe practices (condom use, use of sterile medical equipment). Non-immune VFRs should be vaccinated. See CATMAT's Summary of Recommendations for the Prevention of Viral Hepatitis During Travel (51) and the WHO map of endemic countries (125). • **CHILDREN:** Age-appropriate immunization against HB is advised for children.

DISEASE	MAGNITUDE OF INCREASED RISK	REASON FOR INCREASED RISK	STRATEGIES TO DECREASE TRAVEL ASSOCIATED RISKS TO VFRS
Tuberculosis (TB)	• Individual TB risk depends on exposure risk and duration at destination; however, studies have shown 20 to 50% of TB in immigrants to be travel acquired (59,60). • Health care workers have the highest risk of acquiring TB (61).	• Close proximity to the local population	• VFRs should avoid contact with individuals with known pulmonary TB (until such individuals have been deemed non-infectious by their health care provider) or people with unexplained chronic cough. • For travellers with significant exposure (based on trip duration and TB incidence at destination) or increased risk of TB activation post-exposure (e.g. immune suppression, under five years of age), a post-travel TB skin test is recommended > 8 weeks after their return. • A pre-travel TB skin test is recommended for those at risk for hepatotoxicity with LTBI treatment (hepatitis C infection, alcoholic liver disease, age ≥ 50 years) AND increased probability of having a positive test pre-travel (born or lived in high-prevalence country, health care worker, aboriginal), OR for those who require routine skin test monitoring for work (e.g. health care worker). See CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64) and the Canadian Tuberculosis Standards (Chapters 6 & 13) (65) • Bacillus Calmette-Guérin (BCG) vaccine may be considered for individual long term travellers to high-prevalence countries in some exceptional circumstances. See CATMAT's Statement on Pediatric Travellers (43), CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64), and the Canadian Tuberculosis Standards (65). • VFRs going to high TB incidence countries should avoid consumption of unpasteurized dairy products to reduce the risk of M. bovis acquisition.

DISEASE	MAGNITUDE OF INCREASED RISK	REASON FOR INCREASED RISK	STRATEGIES TO DECREASE TRAVEL ASSOCIATED RISKS TO VFRS
Parasitic infections	• 3.8- to 6.8-fold increased risk of intestinal parasitic infection in VFRs compared to non-VFRs (26).	• Greater environmental and food/water exposures to pathogens during travel • Longer exposure times	• Travellers should avoid freshwater activities, such as swimming, in Africa, South-East Asia, and parts of South America to prevent schistosomiasis. • Travellers should avoid walking barefoot or other skin-to-soil contacts in tropical countries to prevent strongyloidiasis. • Adherence to standard water and food precautions is recommended for prevention of other parasitic infections.
Sexually transmitted infections (STIs) and HIV	• 2.6- to 5.0-fold increased risk of STI diagnosis in VFRs compared to other travellers (26,68).	• Higher rates of casual and unprotected sexual encounters during travel • Travel to areas with higher endemic rates of HIV and STIs	• Discuss with VFRs the possibility of sexual activity during travel, as well as the rates of STIs & HIV in the general and sex worker populations at destination. • Stress importance of safer sex practices and preparation for travel by bringing condoms from Canada (to ensure quality of condoms). • HB vaccination should be recommended as above. • HPV vaccine can be considered for adolescent and adult travellers not previously vaccinated. • See CATMAT's Statement on Travellers and Sexually Transmitted Infections (75).
Injury	• No data available	• More inclined to use public transportation or drive themselves • Longer trips	• VFRs should avoid riding motorcycles or bicycles, but if unable to avoid these activities, they should be encouraged to use helmets. • VFRs should be encouraged to use standard road-safety precautions such as seat belts and infant/child car seats. • Refer to CATMAT's Statement on Risk of Injury and Travel (80)

* South Asia is defined as per the World Bank classification (44) and includes Afghanistan, Pakistan, India, Nepal, Bangladesh, Maldives, Sri Lanka, and Bhutan. Among these countries, the large majority (≥90%) of cases of typhoid among travellers were reported from India, Pakistan and Bangladesh.

APPENDIX 7: TABLE OF RISK AND RECOMMENDATIONS FOR SPECIAL POPULATION VFRS

SPECIAL POPULATION	MAGNITUDE OF INCREASED RISK	REASON FOR INCREASED RISK	STRATEGIES TO DECREASE TRAVEL ASSOCIATED RISKS TO VFRS
Pediatric travellers	• Majority or disproportionate number of imported malaria (86), typhoid (29,96), and HA (29,48) infections are in children (despite representing a much lower proportion of travellers). • 14.2- to 44.2-fold increased risk of typhoid (96).	• Less immunity and immature immune systems • More environmental exposures	• Counsel parents that rates of illness requiring hospitalization (such as malaria and typhoid fever) are higher among VFR children and that illness during and after travel requires urgent assessment. • Foreign-born parents with Canadian-born children should be counselled that their child has no prior immunity due to genetics alone. • Refer to specific recommendations for CHILDREN in above sections and to Appendix 2 for accelerated vaccination schedules. • For post-travel TB skin testing recommendations please see CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64) and the Canadian Tuberculosis Standards (Chapters 6 & 13) (65). • For recommendations on BCG for long term travelling children please see CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64), the Canadian Tuberculosis Standards (Chapter 16) (65) and the Canadian Immunization Guide (109). • See CATMAT's Statement on Pediatric Travellers (43).

SPECIAL POPULATION	MAGNITUDE OF INCREASED RISK	REASON FOR INCREASED RISK	STRATEGIES TO DECREASE TRAVEL ASSOCIATED RISKS TO VFRS
Older travellers	• No data available	• Higher likelihood of comorbid conditions and potential for drug interactions • Suboptimal immune responses to vaccines • Risk of adverse reaction to yellow fever vaccine increases with age • Frailty leading to injury risk	• Thorough review of medical comorbidities and vaccine recommendations according to age should be undertaken. • See TB recommendations above regarding pre-travel TB skin testing recommendations, as per CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64) and the Canadian Tuberculosis Standards (Chapters 6 & 13) (65). • See CATMAT's Statement on Older Travellers (98).
Immuno-compromised travellers	• No data available	• Greater infection risk and general medical frailty • Potential contraindications to live viral vaccines or diminished vaccine efficacy • Greater likelihood of illness requiring medical attention	• Infection risks for traveller according to degree and nature of immune compromise, along with risks of specific destination, should be reviewed and appropriateness of travel discussed. • See TB recommendations above regarding post-travel TB skin testing recommendations as per CATMAT's Risk Assessment and Prevention of Tuberculosis Among Travellers (64) and the Canadian Tuberculosis Standards (Chapters 6 & 13) (65). • See CATMAT's Statement on The Immunocompromised Traveller (105) for detailed advice on specific conditions.