Short Report: Health Risks in Travelers to South Africa: The GeoSentinel Experience and Implications for the 2010 FIFA World Cup

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Abstract. Using the GeoSentinel database, an analysis of ill patients returning from throughout sub-Saharan Africa over a 13-year period was performed. Systemic febrile illness, dermatologic, and acute diarrheal illness were the most common syndromic groupings, whereas spotted fever group rickettsiosis was the most common individual diagnosis for travelers to South Africa. In contrast to the rest of sub-Saharan Africa, only six cases of malaria were documented in South Africa travelers. Vaccine-preventable diseases, typhoid, hepatitis A, and potential rabies exposures were uncommon in South Africa travelers. Pre-travel advice for the travelers to the 2010 World Cup should be individualized according to these findings.

In June 2010, South Africa hosts the FIFA World Cup, the largest mass gathering for a single sport. Over 350,000 foreign visitors are expected to travel to one or more World Cup venues. Usually, close to 30% of visitors to South Africa will also travel to other countries on the continent, 77% of whom will visit one of South Africa's bordering countries or Zambia.¹ Although risk of acquiring malaria and other tropical infections is often perceived to be uniform throughout Africa, comparative data on the spectrum of travel-related illnesses arising from different countries or regions in Africa is lacking. Here, we present a retrospective cohort analysis of selected data collected from ill-returned travelers with defined exposures in South Africa, neighboring countries, and the rest of sub-Saharan Africa (SSA) from 1997 to December 2009, as reported to the GeoSentinel Surveillance Network, the large-

est existing database of destination-specific travel-related illness. There are no previous studies documenting the range of country-specific illnesses in returning travelers from South Africa. The data here provide an evidence-based approach to guide physicians in advising visitors on the health risks associated with attending the 2010 FIFA World Cup.

GeoSentinel sites comprise 50 specialized travel/tropical medicine clinics in 23 countries on six continents, staffed by clinicians experienced in travel and tropical medicine. Diagnostic codes were assigned from a standardized list of over 500 etiologic or 21 general syndromic groups.^{2,3}

Of 114,861 ill patients in the master database, 15,051 had traveled to SSA. Eight hundred twenty-three (823) patients were identified who had acquired their travel-related illness in South Africa as opposed to any other country, (hereafter

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TABLE 1

Comparison of characteristics of ill travelers exposed in South Africa vs. its neighboring countries vs. all other sub-Saharan African (SSA) countries

Characteristics	South Africa (N = 823)	Neighbors (N = 768)	Other SSA (N = 13,460)	P value*
Female	411 (50%)	392 (51%)	6,363 (48%)	0.0604
Age (years)				< 0.0001
< 15	34 (4)	44 (6)	552 (4)	
15–54	601 (73)	569 (74)	11,141 (83)	
≥55	186 (23)	151 (20)	1,688 (13)	
Sought pre-travel health advice	491 (71)	470 (74)	7,390 (69)	
Seen after travel	785 (95)	707 (92)	12,919 (96)	< 0.0001
Risk level				< 0.0001
Expatriate	36 (8)	86 (18)	1,455 (16)	
Pre-arranged or organized travel	219 (48)	125 (27)	1,977 (22)	
Risk travel†	198 (44)	258 (55)	5,743 (63)	
Travel reason				< 0.0001
Business	120 (15)	103 (13)	2,208 (17)	
Tourism	585 (71)	374 (49)	5,038 (38)	
Student	17 (2)	17 (2)	354 (3)	
Missionary, volunteer, researcher, or aid worker	69 (8)	241 (31)	3,032 (23)	
Visiting friends and relatives	29 (4)	32 (4)	2,730 (20)	
Season‡				< 0.0001
Winter	190 (25)	234 (34)	4,765 (39)	
Spring	100 (13)	121 (18)	1,629 (13)	
Summer	315 (42)	217 (32)	3,873 (32)	
Fall	141 (19)	113 (17)	1,825 (15)	
Hospitalization	35 (4)	38 (5)	2,107 (16)	< 0.0001
Trip duration < 2 weeks§	281 (37)	193 (28)	3,213 (26)	< 0.0001
Present to clinic within 2 weeks after trip§	355 (43)	334 (43)	5,569 (41)	0.3318

* Statistical significance of difference between South Africa and neighboring countries or other SSA countries combined counterparts. P values expressed using two-sided χ^2 test.

† Travelers who by their behavior encounter a substantial number of the risks facing the local population.²

‡ Winter (June–September), Spring (October–November), Summer (December–March), Fall (April–May) inclusive.

§ Excludes patients seen during travel.

“South Africa travelers”), i.e., patients who had either traveled only to South Africa, or who had traveled to South Africa and one or more other countries, but had South Africa designated unequivocally as the only possible country of exposure. Similarly, 768 patients were identified, who acquired an illness from one or more of South Africa’s neighboring countries (hereafter “neighboring country travelers”); Botswana, Lesotho, Mozambique, Namibia, Swaziland, or Zimbabwe, in addition to Zambia, a common add-on destination for visitors to South Africa because of the presence of the Victoria Falls. None of these travelers had visited South Africa. Finally, we identified 13,460 travelers who acquired an illness from countries in SSA, other than South Africa and the neighboring countries (hereafter “SSA travelers”).

To eliminate bias, all patients with confirmed (86%) or probable (14%) diagnoses were included in analysis and no site was excluded. The primary variable analyzed was proportionate morbidity, calculated as the number of travelers with a specific diagnosis or group of diagnoses as a proportion of all ill travelers returning from a country or region.²

Ninety-five percent (785) of South Africa travelers were seen at a GeoSentinel Clinic in their home country (Table 1) as were the vast majority of travelers to comparator regions. Travelers seen at the Cape Town site during their trips did not differ in diagnosis profile and are not considered separately (data not shown). Ill South Africa travelers were predominantly young and middle-aged adults, traveling for tourism and less likely to be expatriates than those reported from neighboring countries or SSA (Table 1). In contrast, SSA travelers were more likely to have had extended travel, be visiting friends or relatives,⁴ and were more commonly hospitalized.

As shown in Table 2, the most frequent syndromes seen in South Africa travelers were systemic febrile illness (390 per 1,000 ill travelers seen at GeoSentinel Clinics), dermatologic

TABLE 2

Diagnoses ranked according to syndrome group for patients reporting to GeoSentinel sites after travel to South Africa, a neighboring country, or a country in the rest of sub-Saharan Africa*

() Expressed as number of cases per 1,000 patients			
Rank	South Africa (N = 823)	Neighboring country (N = 768)	Sub-Saharan Africa (N = 13,460)
1	Systemic febrile illness (390)	Systemic febrile illness (138)	Systemic febrile illness (314)
2	Dermatologic (156)	Dermatologic (129)	Acute diarrhea (166)
3	Acute diarrhea (130)	Acute diarrhea (122)	Dermatologic (118)
4	Respiratory (68)	Respiratory (81)	Nondiarrhoeal GI (91)
5	Chronic diarrhea (66)	Chronic diarrhea (76)	Respiratory (64)
6	Nondiarrhoeal GI (58)	Nondiarrhoeal GI (60)	Chronic diarrhea (56)
7	Nonspecific symptoms or signs (43)	Nonspecific symptoms or signs (48)	Nonspecific symptoms or signs (47)
8	Genitourinary and STDs (24)	Genitourinary and STDs (30)	Tissue parasites (37)
9	Injuries (19)	Tissue parasites (27)	Genitourinary and STDs (31)
10	Underlying chronic disease (17)	Underlying chronic disease (21)	Underlying chronic disease (26)

* The primary variable analyzed was proportionate morbidity (PM): number of patients with a specific diagnosis or group of diagnoses as a proportion of all ill travelers returning from a destination.² Numbers of cases per 1,000 ill patients are given for each syndrome group. Only the top 10 syndrome groups are listed. STD = sexually transmitted diseases.

TABLE 3
Top five individual diagnoses among the three most common syndrome groups for South Africa, neighboring country, and sub-Saharan Africa travelers*

() Expressed as number of cases per 1,000 patients with that syndrome									
Systemic febrile illness			Dermatologic			Acute diarrhea			
South Africa (N = 327)	Neighboring (N = 206)	SSA (N = 4223)	South Africa (N = 128)	Neighboring (N = 99)	SSA (N = 1590)	South Africa (N = 107)	Neighboring (94 patients)	SSA (2232 patients)	
Spotted fever group rickettsiosis (545)	Viral syndrome without rash (359)	Falciparum malaria (463)	Insect sting (164)	Non-febrile rash of unknown etiology (121)	Skin abscess (113)	Acute diarrhea of unknown etiology (449)	Acute diarrhea of unknown etiology (393)	Acute diarrhea of unknown etiology (324)	
Viral syndrome without rash (242)	Falciparum malaria (223)	Viral syndrome without rash (198)	Super-infected insect bite (133)	Super-infected insect bite (111)	Non-febrile rash of unknown etiology (95)	Gastroenteritis (140)	<i>Giardia</i> (191)	<i>Giardia</i> (163)	
Unspecified febrile illness < 3 weeks (79)	Spotted fever group rickettsiosis (141)	Unspecified febrile illness < 3 weeks (86)	Tick bite (109)	Insect sting (101)	Insect sting (95)	Acute bacterial diarrhea (75)	Gastroenteritis (85)	Acute bacterial diarrhea (148)	
Unspecified febrile illness ≥ 3 weeks (12)	Unspecified febrile illness < 3 weeks (107)	Vivax malaria (40)	Non-febrile rash of unknown etiology (78)	Cutaneous larva migrans, (91)	Cutaneous larva migrans (95)	<i>Giardia</i> (75)	Amebas, other (53)	Gastroenteritis (84)	
Unspecified acute hepatitis (12)	Malaria species unknown (48)	Malaria species unknown (36)	Rabies, post-exposure prophylaxis (70)	Contact dermatitis (61)	Super infected insect bite (67)	<i>Campylobacter</i> (56)	Acute bacterial diarrhea (53)	<i>Campylobacter</i> (57)	

*The primary variable analyzed was proportionate morbidity (PM): number of patients with a specific diagnosis or group of diagnoses as a proportion of all ill travelers with that syndrome from the destination. Only the top 5 diagnoses/group of diagnoses are listed.

(156 per 1,000), and acute diarrhea (130 per 1,000). These same three syndromes also ranked in the top three for both neighboring country and SSA travelers, although morbidity from systemic febrile illnesses was proportionately less in neighboring country travelers (138 per 1,000) compared with either South Africa travelers or those from SSA (314 per 1,000).

Contrary to the widely held belief that travelers to South Africa are at low risk of acquiring traveler's diarrhea,^{5,6} our data show that South Africa travelers are just as likely to present with traveler's diarrhea as those from neighboring countries in the region. Acute, unspecified diarrhea was the most common category reported, which may reflect the practice of an empiric trial of treatment with antibiotics before detailed diagnostic studies. For travelers to the 2010 World Cup, specific preventative measures and self-treatment options for traveler's diarrhea are indicated.^{7,8}

For South Africa travelers, spotted fever group (SFG) rickettsiosis was overwhelmingly the predominant cause of systemic febrile illness (Table 3), in keeping with previously published GeoSentinel data.⁹ Multivariate analysis showed that South Africa travelers were more likely to present with SFG rickettsioses if they were male, traveling as a tourist, and visiting the country in South Africa's winter months (June–September), which coincides with the 2010 World Cup. More than 99% of international travelers with SFG rickettsiosis are infected with *Rickettsia africae*.^{10,11} A number of the World Cup venues are close to the Kruger National Park and other bush and hunting areas. Travelers planning to walk in areas where ticks may be present should wear protective clothing, tuck trousers into socks if possible, and frequently use *N,N*-Diethyl-*meta*-toluamide (DEET)-based insect repellents (30% concentration or more), especially on the legs, as these repellents have a relatively short duration of action against *Amblyomma* spp. ticks.¹² Spotted fever group rickettsiosis should be considered in returning febrile patients.

In contrast to SSA travelers in whom malaria was the predominant cause of systemic febrile illness (Table 3), we identified only six patients with confirmed malaria out of the 327 diagnoses of systemic febrile illness in South Africa travelers (18 per 1,000 travelers). Three had traveled to the Kruger National Park and only one case was reported during winter. In contrast, neighboring country travelers had a proportionately greater morbidity from malaria (276 per 1,000 cases of febrile syndromic illness), with 30% of exposures (17/57) during winter months. Malaria is only present in parts of three of nine South African provinces (Limpopo, Mpumalanga, and KwaZulu Natal) with very little transmission in winter, during which the World Cup will be held. None of the stadia where matches will take place are in a malaria transmission area. A chemoprophylaxis regimen that covers chloroquine-resistant *Plasmodium falciparum* is indicated for World Cup travelers to the limited endemic areas of South Africa, neighboring, or other countries in SSA.

It is striking that in the last 13 years, we could identify only a single case each of measles, hepatitis A, and typhoid fever acquired in South Africa travelers (Table 4). Requirement for rabies post-exposure prophylaxis was also low. Generally, travelers are very poorly immunized. Several recent airport studies of knowledge, attitudes, and practices in international travelers documented rates of pre-travel immunizations in the order of < 5–45%.^{13–15} Because of the small numbers; further study is required to refine any of the current indications for

TABLE 4

Number of cases of common vaccine preventable diseases and requirement for Rabies post-exposure prophylaxis in South Africa, neighboring country, and SSA travelers

Infection	South Africa (832 patients)	Neighboring country (768 patients)	SSA (13,460 patients)
Hepatitis A	1	1	25
Typhoid fever	1	3	16
Measles	1	0	2
Influenza	11	8	119*
Rabies PEP	9	5	41

*Two cases were typed as pandemic influenza A(H1N1)2009 virus.

travel-specific vaccines for South Africa travelers. Despite the specific data from this study, travelers to the 2010 World Cup should be up-to-date with routine immunizations, in addition to measles immunization, because South Africa is currently in the midst of a measles epidemic, where over 9,500 cases have been confirmed since the beginning of 2009.¹⁶

Respiratory illness was the fourth most common syndrome in South Africa travelers. Since 1984, 25 of the last 26 influenza seasons in South Africa have coincided with the dates during which the 2010 World Cup will be played. 12,640 laboratory-confirmed cases of Pandemic influenza A(H1N1) occurred in South Africa in 2009¹⁷ and the virus is expected to cause the majority of infections in 2010. All travelers should consider vaccination against the pandemic and seasonal strains. The southern hemisphere trivalent vaccine will be available from April 2010. Efficacy of the monovalent northern hemisphere pandemic influenza vaccine in protecting against southern hemisphere pandemic influenza is unknown, yet the limited amount of antigenic drift that has occurred since the first isolation of pandemic influenza A(H1N1) 2009,¹⁸ suggests it would be sufficiently protective for travelers to South Africa in 2010.

In South Africa, human immunodeficiency virus (HIV) seroprevalence among pregnant women is 29.3%¹⁹ and many neighboring countries have similar rates.²⁰ Proportionate morbidity from sexually transmitted diseases (STDs) in South Africa travelers was relatively low (24 per 1,000). However, travel clinics are often poorly positioned to detect cases. Transmission of HIV and other STDs is always a concern during mass gathering events, particularly those hosted in countries with high HIV seroprevalence. Hence, safe sex strategies should be strongly reinforced at the pre-travel consult.

With high background levels of crime in South Africa, safety and security issues will be paramount during the World Cup. Advice for travelers has already been posted by some sources.²¹ Travelers who are victims of crime in South Africa, are unlikely to report these incidents to GeoSentinel Clinics and hence, we are unable to make specific recommendations.

According to the World Tourism Organization from 2004 to 2008, non-resident tourist arrivals averaged approximately 6–9 million per year for South Africa, 5–7 million in neighboring countries, and 10–12 million for SSA.²² Though GeoSentinel captures a sentinel convenience sample and not a systematic denominator of all ill travelers, our sites are widely dispersed geographically and are mostly busy referral centers serving a wide spectrum of ill travelers. The very small numbers of ill travelers presenting to our 50 sites over 13 years with exposures in South Africa compared with SSA, despite relatively comparable numbers of foreign arrivals, is an indicator of the relatively low risk of overall disease acquisition in South Africa. Despite this relatively low risk, our study shows important differences

in risk profile for travelers to South Africa, compared with neighboring country or SSA travelers. A limitation of our study is that the health risk profile of travelers in the GeoSentinel database may not mirror precisely those of all football fans who travel to South Africa for the World Cup. Travel restricted to World Cup venues will have a different risk profile to the 30% (based on usual experience) who also visit more rural areas in neighboring countries. Interestingly, studies of travelers to Beijing before²³ and during²⁴ the 2008 Olympics showed that both suffered predominantly from respiratory illnesses, suggesting some overlap between “normal” international travelers and those that attend a mass gathering in the same country.

In conclusion, key risk reduction measures for visitors to the 2010 World Cup who restrict their itinerary to World Cup cities, should focus on avoidance of traveler’s diarrhea, and sexually transmitted diseases as well as attention to safety and security measures. For the more adventurous traveler, visiting endemic areas of South Africa and neighboring countries, strong messages about risk reduction behavior and chemoprophylaxis for SFG rickettsiosis and malaria, respectively, should be added to the pre-travel consultation.

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