Global Malarial Report, and Advice on Malarial Prophylaxis for General Practitioners

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Recent global burden and trends of malaria:

In 2016, there were a total of 216 million cases of malaria reported across 91 countries. This was an increase of 5 million cases of what was recorded the previous year. The total number of recorded deaths due to malaria was 445,000, which was similar to the number reported the previous year.

According to the World Health Organization, Africa continues to account for about 90% of all malaria cases and deaths worldwide. South East Asia had the second highest incidence of malaria in the world, with 7% of the total malarial cases reported in this region.

Whilst there has been a decline in the incidence and mortality due to malaria globally since 2010, this rate of decline has been delayed and even reversed in some regions since 2014. These worrying trends suggest that there is still a significant amount of work that must be done to prevent and reduce the transmission of malaria in many of these high-risk countries.

MALARIA FREE COUNTRIES: AFRICA: Egypt, Morocco, Saint Helena; **CENTRAL AMERICA:** Bahamas, Barbados, British Virgin Islands, Cayman Islands, Cuba, Jamaica, Trinidad and Tobago; **NORTH AMERICA:** Alaska, Canada, United States; **SOUTH AMERICA:** Chile, Paraguay, Uruguay, Mongolia, Sri Lanka; **SOUTH EAST ASIA:** Brunei, Hong Kong SAR (Special Administrative Region), Macau SAR, Japan, Singapore, Taiwan; **MIDDLE EAST:** Bahrain, Israel, Jordan, Kuwait, Lebanon, Qatar, Syria, United Arab Emirates; **EAST EUROPE ASIA:** Albania, Bulgaria, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Romania, Russia, Tajikistan, Ukraine, Uzbekistan; **EUROPE:** Andorra, Austria, Belgium, Bosnia Herzegovina, Croatia, Estonia, France, Germany, Ireland, Italy, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Poland, Portugal, San Marino, Serbia, Slovenia, Spain, Switzerland, Turkey, United Kingdom, Yugoslavia; **INDIAN OCEAN:** Maldives, Mauritius, Seychelles; **SCANDINAVIA:** Denmark, Finland, Iceland, Norway, Sweden; **POLAR REGIONS:** Antarctica; **PACIFIC NATIONS:** American Samoa, Australia, Cook Islands, Fiji, Guam, Hawaii, Kiribati, Mariana Islands, Marshall Islands, Micronesia, Nauru, New Caledonia, New Zealand, Niue, Palau, Pitcairn, Samoa, Tahiti, Tokelau, Tonga, Tuvalu, Wallis and Futuna.

AFRICA

Algeria: Malaria risk is limited primarily to the remote oases in the Sahara region of Adrar, Ouargla, and Tamanghasset Provinces from July until November. *P. vivax* accounts for over 90% of cases, with occasional cases reported as being *P. malariae*. There is no recommended medical prophylaxis for travel to this country. Due to the low risk of transmission, prophylaxis is not reccomended, however mosquito bite prevention measures should still be taken.

Travellers are recommended to take measures to prevent mosquito bites and seek medical attention for any unexplained illness accompanied by chills, fever, and headache.

Angola: The risk of malaria in Angola is high and is present throughout the whole country, including urban areas. The most prevalent malaria species is *P.falciparum* at around 90%, yet *P.ovale* and *P.vivax* species are also present. *P.falciparum* resistance to Chloroquine has also been reported.

Botswana: Malarial Prevention is highly recommended. Malaria is predominately in the malignant (*P. falciparum*) form. Moderate seasonal risk in northern areas and sporadic risk in southeastern border areas. Increased transmission occurs during and just after the rainy season, November to June. Malaria is moderately endemic in northern areas, including the Boteti, Chobe, Ngamiland, Okavango, and Tutume regions. Limited transmission occurs along the south east border with South Africa, extending along the Molopo River bordering South Africa. Gaborone is essentially risk free, except in years with very heavy rainfall. Chloroquine-resistant *P. falciparum* reported.

Burundi: Malaria risk, predominantly due to *P. falciparum,* exists throughout the year in the whole country. Transmission is highest during and immediately after the rainy seasons, from September to December and March to May. Peak transmission in the Rusizi Valley occurs during the drier months of May through September. Risk may be lower in locations above 1,800 meters elevation. Falciparum malaria accounts for approximately 80% of cases, followed by P. malariae in up to 20% of cases. Resistance to chloroquine and sulfadoxine–pyrimethamine has been reported.

Cameroon: Risk is present year-round throughout this country, including urban areas. Risk is elevated during and immediately following the rainy seasons (March until June, and September until November in the south; June through until September in the north), particularly in the more arid north. *P. falciparum* malaria accounts for over 85% of malaria in this country. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported in all malarious areas of Cameroon. It is essential that all travellers to this area take precautions to avoid mosquito bites (details below) and take appropriate preventative medication.

Chad: Malaria risk, predominantly due to *P. falciparum (85-90%),* is high and exists throughout the year in the whole country. Specifically: Malaria is moderately to highly endemic in southern and southwestern Chad during and immediately following the rainy season, June through until November. There is lower risk of malaria in the drier northern Sahara Desert. Resistance to chloroquine reported.

Democratic Republic of Congo: Malaria risk—predominantly due to *P. falciparum* (over 90%) — is high and exists throughout the year in the whole country. Malaria is fatal in this country. There are over 400 children that die each day in this country, and almost half of these are due to malaria. Resistance to chloroquine and sulfadoxine–pyrimethamine has been reported.

Djibouti: There is a malaria risk, predominantly due to *P. falciparum* (90%), that exists throughout the year in the whole country, including urban areas. Risk is present at all altitudes. Higher malaria risk occurs from November through until March, which is a relatively cool period with some rainfall. There is only minimal risk of malaria in Djibouti City. Major outbreaks, however, have occurred in the Ambouli suburb of Djibouti City, as well as in the Dikhil and Ali Sabih Districts and villages south of Djibouti City. Chloroquine-resistant falciparum malaria has been reported. Chloroquine resistance has been reported.

Equatorial Guinea: Malaria risk—predominantly due to *P. falciparum*— is high and exists throughout the year in the whole country. Resistance to chloroquine and sulfadoxine–pyrimethamine reported

Eritrea: Malaria risk is primarily due to *P. falciparum (85%),* with the remaining cases from *P. vivax*. High risk exists throughout the year in the whole country, below 2200 metres. There is no risk in Asmara. Resistance to Chloroquine is reported. Higher malaria risk occurs from November through until March, which is a relatively cool period with some rainfall.

Ethiopia: Malarial Prevention is highly recommended. Malaria, predominately in the malignant (*P. falciparum*) form, is present all year round below 2500 metres. Risk is elevated during and immediately following the rainy season (from June through September). There is no malaria in the urban center of Addis Ababa (elevation 2,300 meters). Drug resistance to chloroquine is reported. P. falciparum causes 60%–70% of human infections, followed by P. vivax, which causes 30%-40%. There are rare cases of *P.malariae* and *P.ovale*.

Gabon: Malaria risk—predominantly due to *P. falciparum*—exists throughout the year in the whole country. Resistance to chloroquine and sulfadoxine–pyrimethamine reported.

Gambia: Malaria risk, predominantly due to *P. falciparum (which accounts for over 85% of malaria cases),* exists throughout the year in the whole country. Risk is elevated during and immediately after the rainy season. Resistance to chloroquine and sulfadoxine–pyrimethamine reported.

Ghana: Risk is present throughout this country year-round, including urban areas. The risk may be elevated during and immediately following the rainy seasons, between March and June, and October and November in the south; March until October in the north. *P. falciparum* accounts for 90% of cases. Resistance to chloroquine and sulfadoxine–pyrimethamine reported.

Guinea: Malaria risk, predominantly due to *P.falciparum* (over 85%), exists throughout the year in the whole country, including urban areas. Increased risk occurs during and immediately after the rainy season (May through November). *P.falciparum* malaria is resistant to chloroquine in all malarious areas of this country.

Ivory Coast: Malaria risk, predominantly due to *P. falciparum* (85%), exists throughout the year in the whole country at all altitudes. The remaining cases are due to *P.*ovale (10%). Resistance to chloroquine and sulfadoxine–pyrimethamine reported.

Kenya: Malaria occurs throughout the year, with the highest transmission rates during and just after the semiannual rainy seasons, March until May and late September through until November. Risk is countrywide below 2,500 meters elevation, including all rural and urban areas (except Nairobi) and game parks. Primary risk areas include Western Province, Nyanza Province (Lake

Victoria Basin), Coast Province (including the Tana River Valley and the coastal areas south of Mombasa and Malindi to the Tanzanian border), and southern Eastern Province. There is no risk of malaria in Nairobi and in the highland areas above 2,500 meters elevation of the provinces of Central, Eastern, Western, Nyanza and Rift Valley.

Note: *If planning on safaris or vacationing in Mombasa and beach resorts along the coast it is essential to take suppressive anti-malarial medication. P. falciparum causes over 85% of cases, followed by P. vivax.* P. falciparum *resistant to chloroquine and sulfadoxine–pyrimethamine reported.*

Liberia: Malaria risk, predominantly due to *P. falciparum* (over 85%), exists throughout the year in the whole country, but is increased during and immediately after the rainy season, April until October. This risk is present in urban areas and at all altitudes. A high incidence of *P.falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine is reported.

Libya: Very low to absent risk of malaria is present from February through to August in the valleys and isolated oases in the southwest (Fezzan). There is no malaria risk in urban areas.

Malawi: Malarial Prevention is highly recommended. Malaria, predominately in the malignant (*P. falciparum*) form, is present all year round in the whole country. This risk is present at all altitudes. Malaria risk is highest along the shores of Lake Malawi, where the risk is highest at the end of the rainy season, November until April. Falciparum malaria accounts for approximately 90% of the cases. The rest of the cases of malaria are due to the *P. ovale*, *P. malariae* and *P.vivax* species. A high incidence of *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine is reported.

Mali: Malaria risk, predominantly due to *P. falciparum* (over 85%), exists throughout the year in the whole country. Risk is increased during and immediately following the rainy season (June–October) and is present at all altitudes. The highest risk of malaria occurs in southern Mali, particularly in the southern savanna and central Sahel zones. There is less risk in the northern Saharan region. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported.

Mauritania: Malaria risk, predominantly due to *P. falciparum,* exists throughout the year in the whole country (particularly along the Senegal River Basin), except in the northern areas: Dakhlet-Nouadhibou and Tiris-Zemour north of 20˚N. In Adrar and Inchiri there is malaria risk during the rainy season (July through until October). In the Southern regions of the country, risk exists throughout the year, including the city of Nouakchott. *P.falciparum* resistance to chloroquine is reported in all malarious areas.

Mozambique: High risk is present throughout this country, including urban areas. There is increased malaria risk along the coast and in the lower Zambezi Valley. Outbreaks are reported in Xai-Xai and Maputo. Malarial Prevention is highly recommended. Malaria, predominately in the malignant (*P. falciparum*) form, is present all year round and accounts for over 95% of cases of the disease. Multidrug resistance to Chloroquine and sulfadoxine-pyrimethamine has been reported.

Namibia: Malaria risk, predominantly due to *P. falciparum,* exists throughout the year in the northern part of the country bordering Angola, Zambia and Botswana in the following provinces: Ohangwena, Omusati, Oshana, Oshikoto, Kunene, Kavango West, Kavango East, and Zambezi. There are only rare cases in the other regions of this country. The city of Windhoek is risk free. *P.falciparum* malaria accounts for up over 90% of cases countrywide, with only rare cases of *P.ovale, P.malariae,* and *P.vivax.* Multidrug resistance to Chloroquine and sulfadoxine-pyrimethamine reported.

Note: *Travellers that plan on visiting Etosha National Park, Khaudum Game Reserve, and the Skeleton Coast should take anti-malarious medication during the risk season.*

Niger: Malaria risk, predominantly due to *P. falciparum* (85%), exists throughout the year in the whole country. Risk is present at all altitudes. High incidences of chloroquine and sulfadoxine-pyrimethamine resistant *P. falciparum* reported.

Nigeria: Malaria risk—predominantly due to *P. falciparum* (over 85%)—exists throughout the year in the whole country. Risk is present at all altitudes. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. Malaria occurs year-round, countrywide, including urban areas. Risk is elevated during and just after the rainy seasons (March through July through November in the south; May through October north of the Niger-Benin River Valley).

Rwanda: Risk is present throughout this country, including urban areas. This risk is present at all altitudes. *P. falciparum* accounts for approximately 90% of cases. The remainders of cases are due to the *P. ovale* and *P. vivax* species. High incidences of chloroquine and sulfadoxine-pyrimethamine resistant *P.falciparum* malaria are reported.

Senegal: Malaria risk, predominantly due to *P. falciparum (which accounts for over 85% of malaria cases),* exists throughout the year in the whole country, including Dakar and other urban areas. Risk is present at all altitudes. Multidrug resistance to chloroquine and sulfadoxine–pyrimethamine is reported in all malarious areas of Senegal. There is a reduced risk from January to June in the central western regions. Risk is elevated during and immediately after the rainy season (May–October in the south and July–September in the north).

Sierra Leone: Malaria risk, predominantly due to *P. falciparum* (over 85%), exists throughout the year in the whole country, including urban areas. Increased risk occurs during and immediately after the rainy season (May through November). Risk is present at all altitudes. High incidences of *P.falciparum* resistance to chloroquine and sulfadoxine-pyrimethamine reported.

Somalia: Malaria risk, predominantly due to *P. falciparum* (95%), exists throughout the year in the whole country. *P.*vivax malaria accounts for about 5% of all malaria. The risk of malaria is greater in the south, particularly along the Shabeelle and Juba River valleys. Peak transmission occurs during and just after the rainy season. Resistance to chloroquine and sulfadoxine–pyrimethamine reported.

South Africa: Malaria risk - predominantly due to *P.falciparum* (90%) – is present along the borders with Zimbabwe and Mozambique. Specifically, there is risk in the northeastern provinces of Limpopo, the low altitude areas of Mpumalanga, and Umknanyakude in Kwazulu-Natal Province. Risk is also present in Kruger National Park and Tembe National Park. The highest risk occurs from October to May. *P.falciparum* malaria is present in all malarious areas of this country. Around 5% of the malaria risk is due to *P.vivax,* and 5% to *P.ovale.* Resistance to chloroquine and sulfadoxine–pyrimethamine reported.

Recently, there have been a few cases of locally transmitted malaria in the Gauteng Province, where Johannesburg and Pretoria are situated. This means that mosquitoes in this area may be infected with malaria and spreading it to people. Whilst malaria is not commonly reported in the Gauteng Province, there have been outbreaks reported in the past.

Since most safari and Victoria Falls travellers spend only 3-7 days in these risk areas, atovaquone/proguanil is the preferred chemoprophylactic agent as total duration of therapy is only 11-15 days. Atovaquone–proguanil should be started 2 days before the first possible exposure to

malaria (whether at home or while in non-malarious zones of the itinerary), and continued until 7 days after departure from the areas where malaria is endemic.

Sudan: Malaria risk, predominantly due to *P. falciparum,* exists throughout the year in the whole country, including the urban areas. Increased risk occurs during and after the rainy season, June through October, especially in southern Sudan. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. Falciparum malaria accounts for approximately 90% of cases. Other cases of malaria are due to the *P.vivax* (5%–10%), and very rarely *P.ovale* and *P.malarie*.

Tanzania: Malarial Prevention is highly recommended. Malaria, predominately in the malignant (*P. falciparum*) form, is present all year round below 1,800 meters. High risk is present throughout the country, including urban areas, the highland areas below 1,800 meters elevation, and the islands of Zanzibar and Pemba. Risk of malaria is increased during and just after the rainy seasons, November through December and March through until May. *P.falciparum* resistance to chloroquine and sulfadoxine-pyrimethamine is reported.

Togo: Malaria risk—predominantly due to *P. falciparum* (which accounts for approximately 85% of cases) - exists throughout the year in the whole country. High incidences of chloroquine-resistant P. falciparum reported.

Tunisia: Malaria is a low risk. Indigenous malaria has not occurred since 1978 but foci of *vivax* malaria activity may still exist. Travellers are recommended to take measures to prevent mosquito bites and seek medical attention for any unexplained illness accompanied by chills, fever, and headache.

Uganda: Malaria risk, predominantly due to *P. falciparum* (over 85%), exists throughout the year in the whole country including the main towns of Fort Portal, Jinja, Kampala, Mbale and parts of Kigezi. Risk is present at all altitudes. Resistance to chloroquine and sulfadoxine–pyrimethamine reported.

Zambia: Malaria risk, predominantly due to *P. falciparum,* exists throughout the country, including in urban areas. Falciparum malaria accounts for over 90% of cases. Resistance to chloroquine and sulfadoxine–pyrimethamine reported.
Note: *Those who are visiting Victoria falls should take malarial medication.*

Zimbabwe: Malaria risk, predominantly due to *P. falciparum* (over 90% of cases), exists from November through June in areas below 1200 m and throughout the year in the Zambezi valley in the north (border area with Zambia). Transmission is seasonal in the rest of the country below 1,200 meters elevation, occurring November through until June (during and just after the warm wet months of November and March). The central plateau (stretching from the southwest to the northeast, with elevations from 1,200 to 1,500 meters, including Harare City) is essentially risk free. In Harare and Bulawayo, the risk is negligible, however cases have been reported during the peak malarial season.
Note: *Those visiting the Victoria Falls should take anti-malarial medication.*

NORTH AMERICA

Mexico: Malarial risk in season May to October, exclusively in the benign form *P.vivax*, exists throughout the year in some rural areas generally in regions that are not frequented by tourists, and at altitudes less than 1000 metres. Specifically, risk is present in Campeche, Chiapas, Chihuahua, Nayarit, and Sinaloa. There are rare cases reported in Durango, Jalisco, Oaxaca, Sonora and Tabasco. There are also rare cases in the municipality of Othon P.Blanco in the southern part of Quintana Roo bordering Belize. There is no risk of malaria along the US-Mexico border.

The disease, however, has been eliminated from large urban areas and the major international resorts. No cases of chloroquine-resistant malaria have been reported.

Archeological sites: Daytime excursions from cities to the following archeological sites do not require an antimalarial regimen. Nevertheless, persons staying overnight in the vicinity or in nearby villages should take a full course of suppressive medication:

• Bonampak, El Cayo, La Mar, Palenque, Toniná, etc. in the state of Chiapas. (There is no risk in the cities of Villahermosa and Tuxtla Gutierrez);

• Becan, Calakmul, Edzná, Hochob, Xpuhil, etc. in the state of Campeche. (There is no risk in the city of Campeche);

• Cobá, Muyil, Tulum, Xelha, etc. in the state of Quintana Roo. (There is no risk on Cozumel and Cancún.)

Note: *Travellers to rural areas, including to resorts along both coasts, should take precaution to avoid mosquito bites from dusk till dawn.*

CENTRAL AMERICA

Belize: Belize has the highest incidence of malaria in the Americas. Risk is present year-round in all rural areas of the country under 400 meters elevation. Overall, incidence is highest in the districts of Cayo, Stann Creek and Toledo, however there is still s small risk in other parts of Belize. There is no risk of malaria in Belize City and islands highly populated with tourists, such as Ambergris Caye. *P. vivax*now represents 100% of the cases. Chloroquine-resistant falciparum malaria has not been reported.

Costa Rica: In 2017, there were outbreaks of malaria reported in the Matina Canton in Limón Province, Sarapiqui Canton in Heredia Province, and Pital district in San Carlos Canton in Alajuela Province. In all other areas there is considered to be a very low risk of malaria transission. Malaria risk is exclusively due to *P. vivax (100%).*

In general, the risk occurs year-round in rural areas below 500 meters elevation and the risk is increased during, and just after, the rainy season (May through until November peaking during September through to October). Risk may be elevated in the Atlantic coastal lowlands and along the northern border with Nicaraguan. Chloroquine prophylaxis is not routinely recommended for tourists going to Costa Rica but should be considered by anyone staying overnight near the border with Nicaragua. Measures to prevent mosquito bites should be taken, especially from dusk to dawn.

Dominican Republic: Low malaria risk, exclusively due to *P. falciparum,* exists throughout the year. Malaria cases have been identified in all parts of the country, however, the highest incident rates occur in the following areas: Dajabón, Elias Piña, Independencia and the northern half of Pedernales, San Juan, Azua, Santo Domingo province and the eastern province of Altagracia. Any travellers heading to these areas, including travel to any beach resorts, should take antimalarial drugs. Santiago and Santo Domingo city are considered to be relatively risk free. Whilst the risk to tourists appears to be low, as a precautionary measure WORLDWISE recommends chloroquine prophylaxis. There is no evidence of *P. falciparum* resistance to any antimalarial drug.

El Salvador: Very low malaria risk—almost exclusively due to P. vivax—exists throughout the year in the Santa Ana and Ahuachapan Provinces bordering Guatemala. Sporadic vivax malaria cases are reported from other parts of the country. Risk is present rear-round in rural areas below 1,000 meters elevation. Greatest risk is in coastal areas below 600 meters elevation and is minimal in northern and central zones. Those that plan on traveling extensively through rural areas should be very cautious and take anti-mosquito bite measures. There is no risk in the city of San Salvador. No drug resistance has been reported.

Guatemala: Malaria risk, predominantly due to *P. vivax,* exists throughout the year below 1500 metres, except for Guatemala City, Antigua and the high altitude regios of the central highlands, which are risk-free. Incidence of malaria is highest in the Pacific lowlands, along the border with El Salvador, and in the north (Peten Department). No drug resistance has been reported. The highest risk exists in Escuintla and Alta Verapaz.

Haiti: Historically, malaria transmission peaks in Haiti after the two rainy seasons, with a primary peak during November-January and a secondary peak during May -June. Thus malaria is a major public health problem in Haiti. Risk is present countrywide year-round. Malaria risk—primarily due to *P. falciparum* (99%)—exists throughout the year in certain forest areas in Chantal, Gros Morne, Hinche, Jacmel and Maissade. Travellers who are staying in beach resorts need to take anti-malarial medication. Chloroquine-resistant falciparum malaria has not been reported.

Prophylaxis with chloroquine is currently recommended.

Haiti annually reports about 30,000 confirmed malaria cases to Pan American Health Organisation (PAHO), in contrast to Centers for Disease Control and Prevention (CDC) estimates that report as many as 200,000 cases per year.

Honduras: Malaria risk, predominantly due to *P. vivax* (93%), is high throughout country, including in Roatán, areas along the Atlantic or Pacific coasts, and other Bay Islands. This risk is present during the whole year. The urban areas of Tegucigalpa and San Pedro Sula are considered risk free. Risk of malaria primarily in rural areas below 1,000 meters elevation, including municipalities of Tegucigalpa and San Pedro Sula. The risk is highest in Gracias a Dios. *P. falciparum* risk is the highest in Sanitary Region VI, including in the Islas de la Bahía. Falciparum malaria may occur along the Nicaraguan border and in the Caribbean coastal region, but chloroquine-resistant P. falciparum has not been reported.

Nicaragua: Risk is present below 1,000 meters elevation in the following regions: Atlántico Sur, Atlántico Norte, Jinoteca, Matagalpa, Managua (including the sire areas of Lake Managua), León and Chinandega. There is no malaria risk in the city of Managua. No chloroquine-resistant *P. falciparum* reported.

Sporadic cases are reported in Masaya, Carazo, Boaco, and Rio San Juan. Travellers to these areas should take thorough measures to prevent mosquito bites.

Panama: Malaria risk, predominantly due to P. vivax (99%), occurs throughout the year in the whole country, excluding urban areas and the following specified areas. The cities of Panamá and Colón, and the central highlands above 800 meters elevation are all risk free.

West of the Panama Canal: Risk exists **west** of the Canal in Panamá Oeste, Colón, Veraguas, Ngäbe Buglé, Chiriqui and Bocas del Toro. In these areas travellers should take any of the anti-malaria medications listed below.

East of the Panama Canal: Additionally, risk is present in the areas **east** of the Canal, including the indigenous regions of Guna Yala and Emberá. Chloroquine resistance has been reported east of the canal. Recommended chemoprophylaxis in these regions include: Atovaquone-proguanil, chloroquine, doxycycline, mefloquine or primaquine.

SOUTH AMERICA

Argentina: Malaria risk, exclusively due to *P. vivax*, is low and confined to rural areas below 1,300 metres along the borders with Bolivia (lowlands of Jujuy and Salta provinces) and with Paraguay (lowlands of Corrientes and Misiones provinces). Vivax malaria accounts for virtually 100% of cases.

Bolivia: There is no risk of malaria in the city of La Paz, and the highland areas above 2500m (8202 ft.). Malaria risk predominantly due to *P. vivax* (93% of cases), exists throughout the year in rural areas of the country below 1,000 meters elevation, especially the lowlands east of the Andean Cordillera and Pando Department and with limited risk up to 2,500 meters elevation in some rural areas; e.g in the departments of Beni, Pando, Santa Cruz and Tarija, and in the provinces of Lacareja, Rurenabaque, and North and South Yungas in La Paz Department. Lower risk exists in Cocha-bamba and Chuquisaca. *P.Falciparum* malaria occurs in Beni and Pando, especially in the localities of Guayaramerín, Puerto Rico and Riberalta. There is *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported.

Brazil: Malarial Prevention is highly recommended. Malaria risk, usually of *P. vivax* (85%), *P. falciparum* (15%), is high throughout the year in most forested areas below 900 m ***within the nine states of the "Legal Amazonia" region*** (Acre, Amapá, Amazonas, Maranhão (western part), Mato Grosso (northern part), Pará (except Belém City), Rondônia, Roraima and Tocantins). At least 80% of malaria cases are reported from Mato Grosso, Para, and Rondonia States. There are also rare cases in the states of Rio de Janeiro and são Paolo.

Transmission intensity varies from municipality to municipality, but is very high in jungle areas of mining, lumbering and agricultural settlements less than 5 years old where multidrug-resistant *P. falciparum* strains are common (> 50%). Intensity of transmission is lower in urban areas, including in large cities such as Pôrto Velho, Boa Vista, Macapá, Manaus, Santarém and Maraba. In the states outside "Legal Amazonia", malaria transmission risk is negligible or non-existent.
Note: *Travellers on Amazonian Cruises and the trans-Amazon highway* ***are at risk.***

Colombia: The risk of malaria in Colombia is present year-round in rural, urban, and jungle areas that are below 1,700 (5577ft.) and is highly endemic in rural areas. There is no risk of malaria in Bogota Department, the major urban areas, and the islands of San Andres and Providencia. Malaria risk, *P. falciparum* (50%), *P. vivax* (50%), is high throughout the year in rural/jungle areas below 800 m, especially in municipalities of the regions of Amazonia, Orinoquía, Pacífico and Urabá-Bajo Cauca. Transmission intensity varies from department to department, with the highest risk in Amazonas, Chocó, Córdoba, Guainía, Guaviare, Putumayo and Vichada.

Chloroquine-resistant *P. falciparum* exists in Amazonia, Pacífico and Urabá-Bajo Cauca. Resistance to sulfadoxine–pyrimethamine reported in Amazonia, Orinoquia, and the Caribbean regions and the Cauca River Valley. Multidrug resistant *P.falciparum* malaria is present in all malarious areas of Colombia. Unconfirmed mefloquine resistance has been reported in the Amazonian region. Chloroquine-resistant falciparum malaria is reported in all malarious areas. In addition, there are now reports of chloroquine-resistant vivax malaria.

Ecuador: Countrywide, approximately 70% of malaria is *P.vivax* and 30% is *P.falciparum*, and the disease exists throughout the year below 1500 metres, especially in the northwestern provinces of Esmeraldas and Carchi, and the Amazon provinces of Morona-Santiago, Pastanza, Orellana, Napo and Sucumbios. It is important to take antimalarial suppressive medication in these

areas, including river cruises along the amazon. The Quito, Guayaquil and Cuenca cities, as well as the Galapagos islands and high altitude areas, are risk free. The risk is elevated in the northern lowlands on both sides of the Andes. In malarious areas, the risk is likely to be increased from February until August.

P. falciparum causes up to 70% of malaria in Manabi Province. A high proportion of *P. falciparum* cases in Esmeraldas Province are reportedly resistant to chloroquine.

French Guiana: Malaria risk, *P. vivax* (>70%), *P. Falciparum* (20%-30%), is high throughout the year in all areas, including Matoury, Macouria, and Kourou. The city of Cayenne is risk free. Multidrug-resistant *P. falciparum* reported in areas influenced by Brazilian migration. The risk of malaria is highest in the municipalities of Camopi, Saint Georges and Regina bordering Brazil and along the major rivers in the country.

Guyana: Occurs year-round in all regions below 900 metres elevation. The highest risk is in the northwestern areas bordering Venezuela and in rural areas of the southern interior. In the coastal plain, including the outskirts of Georgetown, increased transmission occurs during and just after the rainy seasons (May until mid-August and November until January). In the coastal belt and the cities of Georgetown and New Amsterdam only sporadic cases are reported, therefore only mosquito avoidance is recommended in these areas. In all other areas malarial Prophylaxis is recommended.

Falciparum malaria accounts for 50% of cases, vivax 50%. Prophylaxis with atovaquone/proguanil (Malarone), mefloquine (Lariam), or doxycycline is currently recommended in malarious areas.

Peru: Malaria risk -predominantly due to *P.vivax*- is present in all areas of the Andean valleys that are below 2,300m and the Amazon region, including the tourist areas of Manú National Park, Tambopata National Reserve, and Pacaya Samiria. The highest risk exists in the region of Loreto, in the Amazon. There is no risk present in the following areas: Lima, Cuzco, Puno, Machu Picchu, Lake Titcaca, along the Pacific Coast, and the departments of Lima, Ica, Arequipa, Moquegua and Tacna. *P.falciparum* malaria represents 15% of the malarious population.

Chloroquine and sulfadoxine-pyrimethamine resistant *P.falciparum* malaria is present in this country, in addition to chloroquine resistant *P.vivax* malaria.

Suriname: Risk is present in the country throughout the year. Elevated risk occurs along the upper Marowijne River in the east, and in the three southern districts of the interior. Rare cases occur in Brokopondo Province, and Boven Saramacca municipality in Sipaliwini Province. Paramaribo and the seven coastal districts are considered risk free, with occasional sporadic cases reported. Falciparum malaria accounts for 70% of cases, the remainder being due to P. vivax. *P. falciparum* resistant to chloroquine, sulfadoxine–pyrimethamine, mefloquine hydrochloride and some decline in quinine sensitivity reported. Therefore, travellers to multidrug resistant areas of this country should follow an atovaquone-proguanil or doxycycline regimen.

Venezuela: Risk of malaria is present throughout the country, in all areas below 1,700 meters, excluding the following areas: Falcon, Lara, Merida, Yaracuy, Cojedes, Aragua, Vargas, and Distrito capital. The cities of Caracas, La Asuncion, Maracaibo, Valencia and coastal resorts (including on Margarita island) are also risk free. Risk is present from January to December.

Risk is moderate to high throughout the year in some rural areas of Amazonas, Bolivar and Delta Amacuro states. In Anzoátegui, Apure, Monagas and Zulia only a low risk exists. *P.falciparum* malaria

is usually restricted to municipalities in the jungle areas of the Amazonas (Alto Orinoco, Atabapo, Atures, Autana, Manapiare) and Bolivar (Angostura, Cedeño, El Callao, Gran Sabana, Heres, Piar, Rocio, Sifontes) and Sucre (Benitez, Bermúdez, Cajigal y Arismendi).

Elevated risk in most malarious areas occurs with the early months of the rainy season (which are usually late May until November); however, in the Orinoco Basin, the period of elevated risk may begin with the onset of the dry season.

Nationwide, *P. vivax* accounts for about 75% of all cases, and *P.falciparum* accounts for the remainder of the malarial cases. *P.falciparum* malaria resistance to chloroquine and sulfadoxine-pyrimethamine is reported.

ASIA

Afghanistan: Transmission generally occurs during the warmer months, April through December, with peak transmission during August and September. There is most risk of malaria in the provinces in the east (Konarha, Laghan, and Nangarhar). However the risk of malaria is widely spread throughout Afghanistan, with 63 districts at a high risk, and 135 at a medium risk. Malaria risk is predominantly in the *P.vivax* form. Malaria is highly endemic at elevations less than 2,000 meters (6,500 feet). Transmission is generally limited to May through November when *Anopheles* mosquito vectors breed in standing water. *P. vivax,* predominates (95-98%) but the deadlier *P. falciparum* recently has accounted for 10% of all cases. Chloroquine resistance is reported.

Bangladesh: Malarial Prevention is highly recommended. Malaria is present all year round throughout the whole country, excluding Dhaka City. Elevated risk occurs in the forested areas and foothills of the southeast and east bordering India and Burma - in the districts of Bandarban, Chittagong, Cox's Bazar, Hobigonj, Khagrachari, Kurigram, Moulavibazar, Mymensingh, Netrokona, Rangamati, Sherpur, Sylhet, and Sunamgonj.

Falciparum malaria accounts for around 90% of malaria cases in this country, *vivax* the remainder. Chloroquine resistance reported in the south-east. Resistance to sulfadoxine–pyrimethamine is also reported.

Bhutan: Malaria risk exists throughout the year in the southern districts bordering India: Samtse, Chukha, Dagana, Tsirang, Sarpang, Zhemgang, Pemagatshel and Samdrup Jongkhar. Risk occurs in areas below 1700m (5577 ft.). There are also rare seasonal cases during the months of May to Septemeber in the regions of Ha, Lhuentse, Monggar, Punakha, Trashigang, Trongsa, Tsirang, Yangtse and Wangdue. No malaria in the districts of Bumthang, Gaza, Paro and Thimphu. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. Around 70% of cases are due to *P.falciparum* and the rest are due to *P.vivax.*

Goa, India: Malaria is highly endemic at elevations less than 2,000 metres (6,500 feet). Malaria is present in all areas of Goa though it is considered 'low risk' for malaria, for both *P. vivax* and *P. falciparum*, and mosquito bite prevention is usually the only recommendation. Nevertheless, recently, an increase in *P. falciparum* cases imported from India has been reported. Goa is an important tourist destination, with tens of thousands of visitors each year. *P. falciparum* malaria in returning travellers from Goa would signal a resurgence of malaria in the area.

India: Malaria is highly endemic at elevations less than 2,000 metres (6,500 feet). Malaria is present in all areas of India including the cities of Delhi and Mumbai (Bombay), excluding high altitude areas (above 2000m) of Himachal Pradesh, Jammu and Kashmir, and Sikkim. Malaria risk in the more temperate New Delhi is seasonal, with the major risk being from July until November, with a 'high' in September.

The incidence of malaria has increased recently in Delhi, Tamil Nadu State, and Haryana State. The most intense malaria transmission in India occurs in the eastern and northeastern states. *P. vivax* malaria accounts for %50 of cases countrywide, *P. falciparum* accounts for over 40%. Transmission is generally limited to May through November when *Anopheles* mosquito vectors breed in standing water. Approximately 40% of the population is infected with malaria. Chloroquine resistance is reported. Note that chloroquine is NOT an effective antimalarial drug in South Asia and should not be taken on its own to prevent malaria in this region. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported.

In the northeast of India as well, the monsoon brings heavy rainfalls from May to October. Mostly affected are the northern regions of Bihar and Uttar Pradesh, as well as the states of Punjab, Haryana, Sikkim, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam and West Bengal. The rainfall affects different regions to different degrees, some areas not at all. The rainy season in the southwest of the country, which also began in May/June, passes over the rest of the Indian subcontinent and reaches each state at a different time.

Nepal: Malaria risk is predominantly due to *P. vivax* (85%), and exists throughout the year in the whole country, below 2000 metres. There is no risk in Kathmandu, Pokhara, and the other northern Himalayan districts. No cases of malaria have been reported from Chitwan National Park. *P.falciparum* represents 15% of the malarious population. High incidences of *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported.

Throughout the country, mortality rates due to malaria are low (less than 10 reported deaths annually), but the incidence rate is 2,500-7,000 every year, displaying that malaria eradication is difficult because of Nepal's tropical climate.
Note: *Anti-malaria medication should be used if traveling from India overland into Nepal, and throughout the southern Terai region (including Shuklaphanta Wildlife reserve and Bardiya National Park).*

Pakistan: Malaria risk exists throughout the year in the whole country below 2,500 m, including the cities. The greatest risk of malaria is in the Punjab, especially after the rainy season, July through August. In Pakistan, about 70% of the malaria incidence is due to *P.vivax*, with the rest due to *P.falciparum*. Chloroquine and sulfasoxine-pyrimethamine reisstance reported. According to the World Health Organization, malaria has re-emerged in over the past decade as a major cause of morbidity in Pakistan, with between 210 to 2,000 deaths estimated a year by the WHO.

Tibet: Very limited risk of *P. vivax* malaria exists in Tibet (Xizang), only along the Valley of Zangbo River in the extreme southeast. Prophylaxis is recommended for travel to this region.

INDIAN OCEAN

Madagascar: Malaria risk—predominantly due to *P. falciparum* (85%)—exists throughout the year in the whole country, with the highest risk in the coastal areas. This risk is present in urban areas and at all altitudes. *P.falciarum* resistance to Chloroquine is reported.

SOUTH EAST and EAST ASIA

Bali, Indonesia: Malaria risk exists throughout the year in Indonesia except in Jakarta Municipality, big cities, and the tourist resorts of Bali (*see below*) and Java. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. Additionally, *P. vivax* resistant to chloroquine had been reported. If you plan to visit rural areas for a longer period or spend time in the mountain areas, then travellers may want to consider malaria prophylaxis.

Malaria in Bali: The up market beach areas on Bali are safe, although the use of an insect repellent is recommended. The adjoining island of Lombok is a risk in all areas of the island and anti-malarials are recommended). If these malaria free areas are to be visited only, and no others, even in transit, then antimalarial tablets are not required. Malaria is present in the country from January to December.
Note: *There is no recommended prophylaxis for travellers to beach and tourist areas.*

Cambodia: Malaria risk—predominantly due to *P. falciparum*—exists throughout the year in the whole country except at the temple complex at Angkor Wat and the city of Phnom Penh. There is a low risk of transmission in the city center of Siem Reap. If traveling to these low risk areas only mosquito bite prevention measures are required. However, if traveling anywhere in the rest of the country, it is important to take malaria medication.The highest risk exists in the north east regions of Stung Treng, Preah Vihear, Ratanakiri and Mondolkiri. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. Resistance to mefloquine reported in western provinces near the Thai border.

As one of the leading causes of illness and death in the country, Malaria is one of Cambodia's foremost public health problems. There are around 3 million (23% of Cambodia's population) people who live near forested areas in Cambodia, and it is these individuals who are the most signficiantly affected. Prevalence rates range from 15-40 percent in villages near or in forested areas to 0-3 percent in the plains and rice field areas. The resistance situation is difficult, with multi-resistance to several drugs including chloroquine and Mefloquine, and more recently artemisinin.

Importantly, over the past few decades there have emerged reports of a new malaria species known as *P.knowlesi*. Infection by *P.knowlesi* has been demonstrated in humans, in particular throughout countries in South East Asia, including Cambodia. *P.knowlesi* malaria cases can be unique to others, as they have been shown to be hosted by monkeys rather than mosquitoes. In Cambodia, research has suggested that the macaques, especially long-tailed and pig-tailed macaques, are the likely reservoir host of *P.knowlesi*. Therefore caution should be taken when travellers head to forrested areas where macaques are present.

China: Malaria Risk, including in the *P.falciparum* form, is present in the districts along the China-Burma border in Yunnan Province. In China, *P.*vivax is the primary form of transmission. From May to December, there is a low risk in the rural areas of the following areas: Anhui, Henan and Hubei. There is no risk of malaria in Northern China. In Southwestern China (including the southeastern part of Tibet), there is risk throughout the year in the Yunnan province bordering Myanmar: Dehong Dai and Jingpo, Baoshan, Lincang, Pu'er and Xishuangbanna regions. Risk also exists in the southeastern part of Tibet in the Motuo county, where *P.falciparum* predominates. There is no malaria present in areas where most Major River cruises travel. Multidrug resistant *P.falciparum* is present in the Yunnan province and in the southeastern tip of Tibet.

In provinces with risk, transmission only occurs during warm weather. Where there is transmission, it occurs below 1,500 meters from July to November north of latitude 33°N, from May to December

between 33°N and 25°N, and throughout the year south of 25°N. Travellers to cities and popular tourist areas, including Yangtze River cruises, are not at risk, and do not need to take antimalarial drugs.

There is no malaria risk in urban areas or in densely populated areas; including Hong Kong and Macau. In general, tourists do not need to take malaria prophylaxis unless staying in remote areas.

Indonesia: Malaria risk exists throughout the year in all areas of eastern indonesia, including: the provinces of Maluku, Maluku Utara, Nusa Tenggara Timur, Papua and Papua Barat, including the towns of Labuan Bajo and the Komodo Islands.There is a malaria risk in other parts of the country, excluding large cities such as Jakarta, Surabaya and Denpasar (Bali), in addition to the beach resorts found in southern Bali. *P.falciparum* malaria represents the majority of cases (57%), with *P.vivax* representing the rest. *P. falciparum* resistant to chloroquine and sulfadoxine-pyrimethamine reported. *P. vivax* resistant to chloroquine reported. Human *P. knowlesi* infection reported in the province of Kalimantan.

Laos: Malaria risk exists throughout the year in the whole country except in Vientiane. Malaria risk is predominantly due to *P.falciparum* (65%), with the rest due to *P.vivax*. There are high incidences of chloroquine and mefloquine resistant *P.falciparum* malaria in Laos.

Recommended chemoprophylaxis is as follows: Atovaquone-proguanil or doxycycline along the Laos-Burma border in the provinces of Bokeo and Louang Namtha, along the Laos-Thailand border in the province of Champasak and Saravan, Along the Laos-Cambodia border and along the Laos-Vietnam border. In all other malarious areas, Atovaquone-proguanil, doxycycline or mefloquine is recommended.

Malaysia: Risk exists in the mountainous interiors of the states of Kedah, Perak, Kelantan Pahang, Selangor and Negeri Sembilan. In Sabah and Sarawak (on the island of Borneo) malaria is widespread. In Sabah, the risk of malaria is present throughout the year in rural areas, and the incidence of *P.falciparum* is 80%. In Sarawak, urban and coastal areas are risk free. *P.knowlesi* represents around 28% of the malarial risk in Sarawak. High incidences of *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine are reported. Risk is absent in the urban and coastal areas of peninsular Malaysia, including the island of Penang.

Importantly, it has become evident over the past decade that *P.knowlesi* malaria can be carried and transmitted to humans through species of monkeys, rather than exclusively mosquitoes. According to WHO, Malaysia has the highest incidence of *P.knowlesi* malaria in the world. Increasing cases have been reported in Sabah, Sarwak, and Peninsula Malaysia.

Myanmar: Malaria risk predominantly due in the malignant (*P.falciparum*) form (60%), exists through – out the country below 1000 meters. There is rarely transmission above this altitude. The urban areas of Yangon (Rangoon) and Mandalay are free of risk. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. Mefloquine resistance reported in the eastern part of Shan State. *P. vivax* resistant to chloroquine reported.
Note: *Travellers to the eastern states of Myanmar (Shan, Kayah, Kayin) and Tanintharyi below 1,000m should use either doxycycline or Malarone as their antimalarial drug because of mefloquine-resistant Plasmodium falciparum in that area.*

North Korea: Limited malaria risk—exclusively due to *P. vivax*—exists mainly in the southern half of the country. No drug resistance reported. Recommended prophylaxis for travellers: none.

Philippines: Malaria risk exists throughout the year in areas below 600 m, except in the provinces of Bohol, Catanduanes, Cebu, metropolitan Manila, Leyte, Samar and major urban areas. Risk is usually low in rural areas, apart from on the following islands that have a high incidence of malaria: Luzon, Mindanao, Mindoro, Basilan, Calamian, Palawan, and Sulu Archipelago (Tawi Tawi). Plasmodium falciparum, accounts for 70% to 80% of all malaria cases in the Philippines, while Plasmodium vivax accounted for the remaining 20% to 30%. *P.falciparum* multidrug resistance to chloroquine and sulfadoxine-pyrimethamine is reported.

There is low risk in the provinces of Aklan, Biliran, Camiguin, Capiz, Guimaras, Iloilo, Leyte del Sur, Northern Samar and Sequijor. Malaria is endemic in Mindanao. Most malaria transmission occurs during and just after the monsoon season, May through November.
Note: *The province of Palawan reports cases of P.knowlesi malaria. This type of malaria has emerged over the past few decades in humans. Importantly, it has been demonstrated to be transmitted to humans through species of monkeys, rather tha mosquitoes.*

South Korea: Limited malaria risk—exclusively due to *P. vivax*—is limited to the months of march to December and exists mainly in the northern areas of Incheon, Kangwon-do, and Kyonggi Do Provinces. Recommended prophylaxis for travellers: *none.*

Thailand: Malaria risk exists throughout the year in rural, especially forested and hilly, areas of the whole country, mainly towards the international borders, and in the Tak and Trat provinces. There is also a need for chemoprophylaxis for rural forested areas that border Burma (Myanmar), Cambodia, and Laos and the provinces of Kalasin, Krabi, Nakhon Si Thammarat, Narathiwat, Pattani, Phang Nga, Raayong, Sakon Nakhon, Songkhla, Surat Thani, and Yala. There are only rare cases in the other parts of Thailand, including other areas of Krabi Province and the cities of Bangkok, Chiang Rai, Koh Phangan, Koh Samui, and Phuket. There is no risk in the islands of the Krabi Province and Pattaya City.

P. falciparum 50% (up to 75% some areas), *P. vivax* 50% (up to 60% some areas), *P. ovale*, remainder *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. Resistance to mefloquine and to quinine reported from areas near the borders with Cambodia and Myanmar.

Whilst Thailand is not malaria-free (a an monthly incidence of *P. falciparum* malaria of about 1 per 35 000 travellers *and* 1 per 15 000 travellers of all species of malaria), this risk is considered so low that the risk of serious side effects from malaria chemoprophylaxis far outweigh the risk of malaria infection UNLESS travel and occupations take travellers to remote rural regions near adjacent country borders.

Vietnam: Malarial Prevention is recommended. Malarial risk exists in all rural areas of the country. High-risk areas are the central highland provinces, particularly in Binh Phuoc, Dak Lak, Dak Nong, Gia Lai and Kon Tum. High incidence rates also occur in the Western parts of the following provinces: Khanh Hoa, Ning Thuan, Quang Nam and Quang Tri. There is no risk in Hanoi, Ho Chi Minh City, Da Nang, Nha Trang, Qui Nhon, the Red River Delta and the coastal area north of Da Nang.

P.falciparum accounts for between 50% and 90% of the malarial cases, *P.vivax* the remainder. The provinces of Binh Phoc, Dak Lak, Dak Nong, Gia Lai, Khan Hoa, Kon Yum, Lam Dong, Ninh Thuan, Song Be and Tay Ninh report *P.falciparum* resistance to chloroquine, mefloquine hydrochloride and sulfadoxine-pyrimethamine. Travellers to these areas should follow an atovaquone-proguanil or doxycycline regimen.

MIDDLE EAST

Iran: Malarial risk is present in the rural areas of the following southeastern regions: the Fars Province, the tropical parts of Hormozgan and Kerman, and the Southern part of Sistan and Baluchestan. Majority of this risk is due to *P.vivax* (93%), with *P.falciparum* representing the remaining risk. *P.falciparum* malaria resistant to Chloroquine and sulfadoxine-pyrimethamine has been reported from the Sistan and Baluchestan border areas with Afghanistan and Pakistan.

Limited risk exists in some areas north of the Zagros mountains and in western and south-western regions during the summer months. Transmission occurs year-round in the southwest, south, and southeast, but only during the summer in the north and northeast.

Iraq: Malaria is no longer present autochthonously in Iraq, however it has been in the past in the areas of Duhok, Erbil, Ninawa, Sulaymaniyah and Ta'mim, below 1500m. In 2014 and 2016 there were two imported cases of malaria diagnosed in Iraq. So there is a risk of re-introduction of malaria from visitors. Therefore it is worthwhile to take precautions to avoid mosquito bites when traveling to Iraq.

Oman: Risk of malaria is low. Sporadic cases have been reported from the Governorates of Ad Dakhliyah, Al Batinah North, Ash Sharqiyah North and South. Travellers heading to these risk areas should avoid mosquito bites from dusk to dawn during the malaria season. No prophylaxis routinely recommended for travel to this country, unless patient is at a high risk (e.g. pregnant or immunocompromised).

Saudi Arabia: Malaria risk, predominantly due to *P. falciparum,* exists throughout the year. Only rare cases occur in the western emirates of Asir and Jizan bordering Yemen. There is no malaria risk in the cities of Jeddah, Mecca, Medina, Riyadh, and Ta'if. Chloroquine-resistant *P. falciparum* reported in all malarious areas.

Yemen: Malaria risk, predominantly due to *P. falciparum* (95%), exists throughout the year, but mainly from September through February, in the whole country below 2000 m. There is no risk in Sana'a. Resistance to chloroquine and sulfadoxine-pyrimethamine has been reported.

EAST EUROPEAN ASIA

Armenia: Malaria risk, exclusively due to P. vivax, exists focally from June to October in some villages located in Ararat Valley in the Ararat and A rtashat region near the Turkish border in the west. Risk is largest in the Masis district. There is no risk in tourist areas. There is no recommended medical prophylaxis for travel to this country.

Azerbaijan: Malaria risk, exclusively the vivax form, exists during the summer in southern lowland areas of Azerbaijan, between the Kura and Arax rivers, as well as in the Khachmas region in the north. Sporadic cases have also been reported in the Baku suburbs. *A weekly dose of 300mg of chloroquine is the recommended prophylaxis for risk areas only.*

EUROPE

Cyprus: In 2017, there were three cases of *P.vivax* malaria reported in UK residents who had visited Esentepe (Agios Amvrosios) in the Kyrenia district in northern cyrpus. It is recommended that travellers to this aforementioned area consider chemoprophylaxis for malaria. Cyrus was declared malaria free in 1967 and there had been no reports of malaria in this country until recently. The mosquitoes that spread malaria are still found in the area.

Greece: Malaria – in the *P. vivax* form – is present in the areas of Achaia (municipality of Westeren Achaia), Ilea (municipality of Andravida-Kyllini), and Thessaloniki (Municipality of Lnagkadas). Travellers to these aforementioned areas should take caution to avoid mosquito bites from dusk till dawn and are advised to consider anti-malarial medicines to prevent malaria. Recommended antimalarials include one of the following: atovaquone-proguanil, chloroquine, doxycycline, mefloquine, or primaquine.

For the districts of Evia/Euboea, Eastern Attiki, Voitia, and Larissa, anti-malarials are not recommended at this time because there have only been a limited number of cases.

SCANDINAVIA All countries in Scandinavia are now malaria free.

POLAR REGIONS No malaria risk in Antarctica.

PACIFIC NATIONS

East Timor: In Timor Leste, malaria is a major health problem and exists in all areas at a moderate risk. Rainfall and temperature are both favourable for the transmission of malaria throughout the year. There is Increased malaria transmission linked to the 'wet season', which goes from November to March/April. *P.falciparum* represents around half of the malaria population, and *P.vivax* accounts for the other half. In vitro resistance has been found to chloroquine, amodiaquine and sulfadoxine/pyrimethamine.

Malarial prophylaxis is extremely important for travel to this area. Plasmodium falciparum is a prevalent malarial parasite, so Mefloquine or Doxycycline are the preferred medications.

Papua New Guinea: Malaria is predominantly in the malignant (*P. falciparum*) form and exists throughout the year in the whole country below 2000 metres; elevated risk occurs along coastal areas and in the lowlands. *P. falciparum* accounts for 65% to 80% of cases, followed by *P. vivax*. Only rarely are malaria cases are caused by *P. malariae* or *P.ovale*. *P. falciparum* resistant to sulphadioxine-pyrimethamine is present in all malarious areas of this country. Resistance of *P. vivax* to chloroquine is also reported.

The WHO estimates that there are between 990,000 and 1,887,000 cases of malaria in Papua New Guinea, and that between 150 and 6,000 people die each year from malaria in this country.

Many of the islands have industrial and mining projects being undertaken. There is often a high risk on them e.g. Lihir – where there is a very high risk of malaria on Lihir. However, most contractors going to such places are usually on work-related arrangements, and the sites have specific anti-malarial

protocols in place: local fogging, nets, air-con, access to diagnostics and medications. It is thus often inappropriate to provide drugs to such personnel, as it may complicate and confuse intact malaria management programs. It is thus appropriate to reinforce the message that 'malaria is serious and compliance with workplace protocols is important'. Neverthless, for people going to Lihir, not connected to a specific workplace, prophylaxis needs to be considered.

Solomon Islands: Malaria risk - primarily due to *P.falciparum* (60%) - is present throughout the country below 400 meters, including in urban areas. The remainder of malaria cases are due to *P.vivax* malaria, and rarely *P.ovale.* High numbers of *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine are reported. Chloroquine resistant *P.vivax* malaria is also reported in this country.

Vanuatu: Malarial Prevention is highly recommended. A high risk of malaria is present all year round on all islands of this country, including Efate, where there been locally transmitted cases reported in the capital Port Vila. *P. falciparum* accounts for 60% of cases, whilst *P. vivax* accounts for 35 to 40%, and *P.*ovale the remainder. Multidrug-resistant falciparum malaria is reported. *P. falciparum* resistant to chloroquine and sulfadoxine–pyrimethamine reported. *P. vivax* resistant to chloroquine has also been reported.

MALARIAL PREVENTION

There are four common medications for malaria prevention currently available in New Zealand and Australia (doxycycline, atovaquone/proguanil, mefloquine, hydroxychloroquine) . None of the medicines is 100% effective against the disease at all times, and each has its own side effects. Listed below in order of preference are the WORLDWISE recommendations for this country.

Refer to specific country information above to confirm most appropriate treatment regime for the area you are traveling to.

Please read the side-effect profile of each regime before use.

1 = most recommended for the area, 4 = least recommended

	TABLET NAME	OTHER NAME	STRENGTH	No. TO TAKE	FREQUENCY
1	Atovaquone / Proguanil	Malarone	250/ 100 mgs	1	Daily
1	Doxycycline	Doxy	100 mgs	1	Daily
1	Mefloquine	Lariam	250 mgs	1	Weekly
4	Hydroxychloroquine	Plaquenil	200 mgs	2	Weekly

Note: Primaquine is a medication that can be used as a preventative prophylaxis, and also for the treatment of malaria – specifically for treating malaria due to *Plasmodium vivax* and *Plasmodium ovale*. However, caution must be taken as Primaquine can cause hemolytic anaemia in people with G6PD deficiency, therefore intending users of the mediciation must be screened for G6PD deficiency before starting primaquine. Common side effects include nausea, vomiting, dizziness and abdominal cramps.

MALARIA PROPHYLAXIS REGIMES:

- Doxycycline: Start 1-2 DAYS before departure. Continue for 28 DAYS after return.
- Mefloquine (LARIAM): Start 3 WEEKS before departure. Continue for 4 WEEKS after return.
- Atovaquone and Proguanil: Pharma advises starting 2 DAYS before departure and continuing daily until 7 days after departing a malarious region. An 'off label use' of the medication that had gained significant academic data notes commencing it one day before travel to a malarious region and continuing taking it daily until out of the region for one day. Best for short-stay journeys.
- Needs to be commenced 1 WEEK before entering a malarious area, and continued weekly for 1 month after leaving the malarious area.

Warnings:

- If mefloquine (LARIAM) is prescribed then the possible side effects also need to be discussed with the intending trvaller as problems may occur with balance/fine motor skills, heart disease, blood pressure pills, epilepsy, mental illness and pregnancy.
- Mefloquine is not suitable for everybody. Even when the drug is considered suitable, data shows that about 1 in 200 people taking mefloquine can expect to experience unpleasant temporary neuropsychiatric side effects. Such side effects usually occur within the first 2-3 doses.

SELF TREATMENT REGIMES (*for Adults over the age of 12 years***):**

- Travellers who develop fever should seek immediate medical help.
- If Malaria is confirmed then self-treatment regimes are available. They should be taken in conjunction with medical advice and in all circumstances medical follow up is essential. The medications to be used in self treatment regimes are: Atovaquone and Proguanil (MALARONE) or Mefloquine (LARIAM).

Medication	Adult	General Comment
Mefloquine **LARIAM** (250 mgs)	**<u>If weight is > 60 kg</u>** *3 tabs stat* *2 tabs @ 6-8 hrs* *1 tab 6-8 hr later*	• Better tolerated in children • Severe side effects in 1:10,000. Side effects are over-stated eneral Side Effects are in the order of 1:200
Atovaquone (250 mg) *and* Proguanil (100 mg) **MALARONE**	**4 tablets a day for three days**	• Malarone has been shown to be highly effective for the treatment of uncomplicated malaria caused by *Plasmodium falciparum*, including malaria that has been acquired in areas with Chloroquine-resistant or multi-drug resistant strains.
QUININE (300 mgs) *Accompanied by:* **TETRACYCLINE** (250 mg)	***ii tabs three times a day*** ***i tab four times/ day***	Duration 3 days Duration 7 days

- Mefloquine self treatment is not advised for:
  - persons already taking it for prevention;
  - within 12 hours of taking quinine;
  - PERSONS under 45kg;
  - EPILEPSY;
  - MENTAL ILLNESS;
  - HEART/ BLOOD PRESSURE problems;
  - persons requiring FINE SKILLS / BALANCE eg. air crews, mountaineering, diving, or during pregnancy.

ADVICE for Mosquito Prevention

Malaria is transmitted by a mosquito bite, so all travellers to a malarious country are advised to take precautions to prevent exposure to the disease:

Methods that work:

- **Cover exposed skin for two hours on either side of dusk and dawn** when you are at most risk for getting bitten. Mosquitoes tend to bite ankles and wrists, and so wearing clothing that prevents this is recommended.
- Avoid wearing dark clothing during the hours where transmission risk is highest – this is because **dark coloured clothing retains body heat and body gases** that mosquitoes are attracted to.
- **Use insect repellent with DEET or ICARADIN in it.** Ensure repellent is at least 30% good quality DEET. Worldwise clinics use Repel insect repellent. You can purchase this from worldwise.co.nz and pharmacies. *If using suncreen, the traveller needs to apply the insect repellent thirty minutes afterwards*.
- **Return before dusk** from country areas where malarial mosquitoes are the most active.
- **Sleep in screened room or use a bed net**, remembering to tuck in the edges & spray inside.
- **Sleep in air-conditioned rooms** or rooms with fans.
- **Vapour pads are effective** for night control of mosquitoes, however may cause breathing difficulties or provoke asthma.
- **Avoid wearing Fragrant cosmetics** or skin care products.
- For extra protection **permethrin-clothes-soak may be considered**. Permethrin is available as both a soak solution and a spray. It can be applied to clothing and acts as an insecticide to kill any mosquitoes or ticks that land on your clothing. *Note: Permethrin should not be applied directly to skin.*

Methods that don't work:

- Ultrasonic electronic devices are not affective and not recommended
- Bath Oils
- Herbal remedies
- Vitamin B1 and B12
- Garlic
- Savory meat extract (marmite)
- Tea tree oil
- Insect 'buzzers'

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