

SURVEILLANCE REPORT

Malaria

Annual Epidemiological Report for 2021

Key facts

- For 2021, 4 856 malaria cases were reported in the EU/EEA, 4 855 (> 99%) of which were confirmed.
- Among 4 257 cases with known importation status, 99.7% were travel-related. Thirteen confirmed cases were reported as acquired in the EU (four in Greece and nine in France).
- A marked seasonal trend was observed across all countries, with cases increasing during and immediately after the summer holiday months (July–September) most likely reflecting travel patterns to malaria-endemic countries.
- As in previous years, the overall rate of confirmed malaria cases was higher among men than women (0.9 and 0.3 cases per 100 000 population, respectively; male-to-female ratio: 1.3:1).

Introduction

Malaria in humans is an acute or subacute infectious disease caused by one of six protozoan species of the genus *Plasmodium*: *P. falciparum*, *P. vivax*, *P. ovale wallikeri*, *P. ovale curtisi*, *P. malariae* and *P. knowlesi*, transmitted by *Anopheles* mosquitoes. Occasionally, transmission occurs by blood transfusion, organ transplantation, needle-sharing, or congenitally from mother to foetus.

Malaria is one of the major global public health problems, having caused 247 million infections in 84 endemic countries and approximately 619 000 deaths in 2021 [1]. Malaria transmission occurs predominantly in Central and South America, Africa, Asia, and Oceania. Infections with *P. falciparum* and *P. vivax* represent the major part of the global burden of malaria.

There is no animal reservoir for *P. falciparum*, *P. vivax*, *P. ovale*, or *P. malariae*. Macaques are the animal reservoir of *P. knowlesi*.

Methods

This report is based on data for 2021 retrieved from The European Surveillance System (TESSy) on 25 October 2022. TESSy is a system for the collection, analysis, and dissemination of data on communicable diseases.

For a detailed description of methods used to produce this report, refer to the *Methods* chapter [2].

An overview of the national surveillance systems is available online [3].

A subset of the data used for this report is available through ECDC's online *Surveillance atlas of infectious diseases* [4].

Suggested citation: European Centre for Disease Prevention and Control. Malaria. In: ECDC. Annual epidemiological report for 2021. Stockholm: ECDC; 2023.

Stockholm, June 2023.

© European Centre for Disease Prevention and Control, 2023. Reproduction is authorised, provided the source is acknowledged.

For 2021, 28 EU/EEA countries reported data on malaria (Denmark and Croatia did not report). Twenty-six countries reported case-based data and two reported aggregated data (Belgium and Bulgaria). Twenty-six countries used the EU case definition, and two (France and Germany) used an alternative case definition. Surveillance is comprehensive and mostly passive. Reporting is compulsory in 27 countries, and voluntary in France. No notification rate was calculated for France. No data for 2020–2021 were reported by the United Kingdom due to its withdrawal from the EU on 31 January 2020.

Epidemiology

For 2021, 4 856 malaria cases were reported in the EU/EEA, 4 855 (> 99%) of which were confirmed. France reported the highest number of cases, followed by Germany, Italy, Spain, and Belgium (Table 1, Figure 1).

The overall notification rate was stable, between 1.2 and 1.3 per 100 000, from 2015 to 2019 (Table 1). A decrease was observed in 2020, when the lowest notification rate was observed (0.3 per 100 000), followed by an increase in 2021 (0.6 cases per 100 000 population).

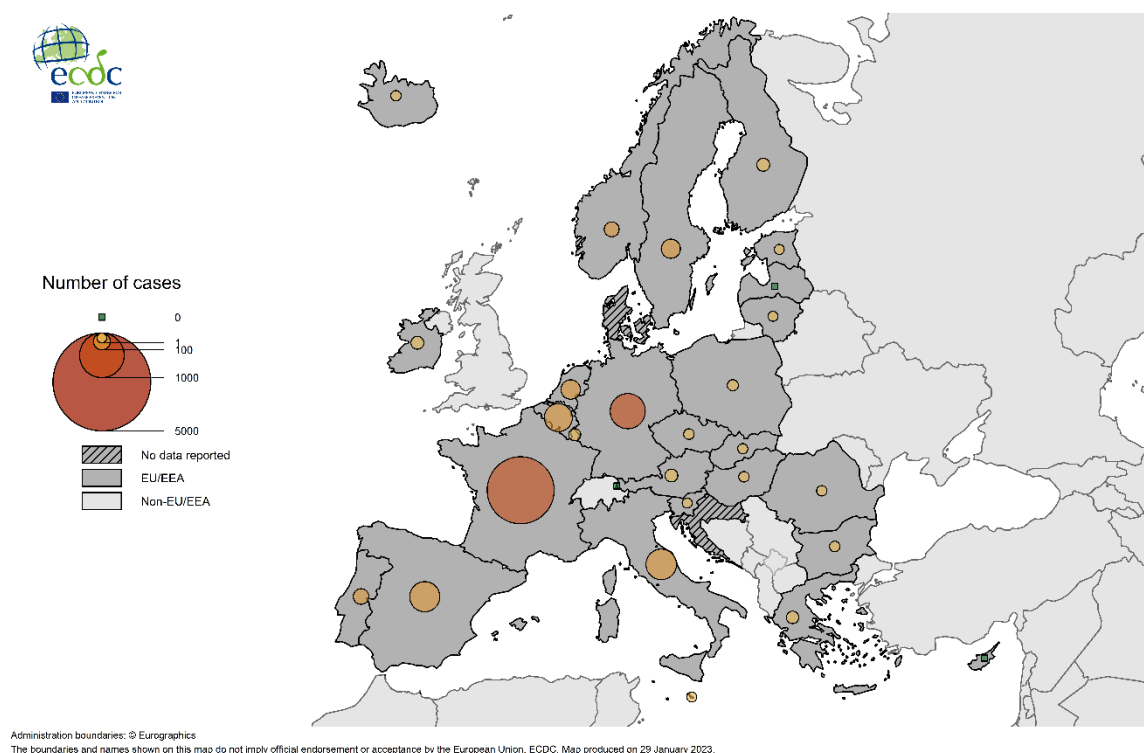
In 2021, the notification rate was highest in Luxembourg (4.4 per 100 000 population), followed by Iceland (1.9 per 100 000 population), Sweden (1.4 per 100 000), and Norway (1.3 per 100 000 population). Age-standardised notification rates (ASR) did not differ substantially from crude rates (Table 1).

Table 1. Number of confirmed malaria cases and rates per 100 000 population by country and year, EU/EEA, 2017–2021

Country	2017		2018		2019		2020		2021		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Austria	78	0.9	62	0.7	72	0.8	27	0.3	37	0.4	0.4
Belgium	249	NR	357	NR	417	NR	241	NR	365	NR	NR
Bulgaria	8	0.1	8	0.1	8	0.1	5	0.1	9	0.1	0.1
Croatia	10	0.2	2	0.0	3	0.1	0	0.0	NR	NR	NR
Cyprus	8	0.9	4	0.5	4	0.5	0	0.0	0	0.0	0.0
Czechia	27	0.3	34	0.3	32	0.3	9	0.1	10	0.1	0.1
Denmark	94	1.6	64	1.1	NR	NR	NR	NR	NR	NR	NR
Estonia	2	0.2	3	0.2	3	0.2	1	0.1	3	0.2	0.2
Finland	36	0.7	34	0.6	50	0.9	52	0.9	39	0.7	0.8
France	2 712	NR	2 840	NR	2 839	NR	1 007	NR	2 322	NR	NR
Germany	957	1.2	900	1.1	999	1.2	366	0.4	605	0.7	0.8
Greece	107	1.0	55	0.5	40	0.4	23	0.2	32	0.3	0.3
Hungary	12	0.1	17	0.2	12	0.1	10	0.1	8	0.1	0.1
Iceland	3	0.9	3	0.9	4	1.1	0	0.0	7	1.9	2.0
Ireland	78	1.6	60	1.2	80	1.6	15	0.3	39	0.8	0.8
Italy	830	1.4	722	1.2	811	1.4	181	0.3	443	0.7	0.8
Latvia	1	0.1	4	0.2	4	0.2	0	0.0	0	0.0	0.0
Liechtenstein	NR	NR	NR	NR	NR	NR	NR	NR	0	0.0	0.0
Lithuania	6	0.2	6	0.2	7	0.3	0	0.0	3	0.1	0.1
Luxembourg	11	1.9	13	2.2	13	2.1	5	0.8	28	4.4	4.4
Malta	12	2.6	7	1.5	20	4.1	1	0.2	4	0.8	0.8
Netherlands	202	1.2	252	1.5	180	1.0	68	0.4	150	0.9	0.9
Norway	61	1.2	54	1.0	196	3.7	48	0.9	68	1.3	1.3
Poland	27	0.1	28	0.1	24	0.1	8	0.0	15	0.0	0.0
Portugal	92	0.9	102	1.0	116	1.1	59	0.6	79	0.8	0.8
Romania	15	0.1	18	0.1	22	0.1	2	0.0	7	0.0	0.0
Slovakia	0	0.0	3	0.1	6	0.1	2	0.0	5	0.1	0.1
Slovenia	11	0.5	3	0.1	6	0.3	2	0.1	3	0.1	0.1
Spain	818	1.8	851	1.8	783	1.7	210	0.4	430	0.9	1.0
Sweden	150	1.5	189	1.9	205	2.0	138	1.3	144	1.4	1.5
United Kingdom	1 810	2.7	1 669	2.5	1 706	2.6	NR	NR	NR	NR	NR
EU-EEA	8 427	1.2	8 364	1.2	8 662	1.2	2 480	0.3	4 855	0.6	0.6

Source: country reports. ASR: age-standardised rate.

ND: no data reported. NR: no rate calculated.

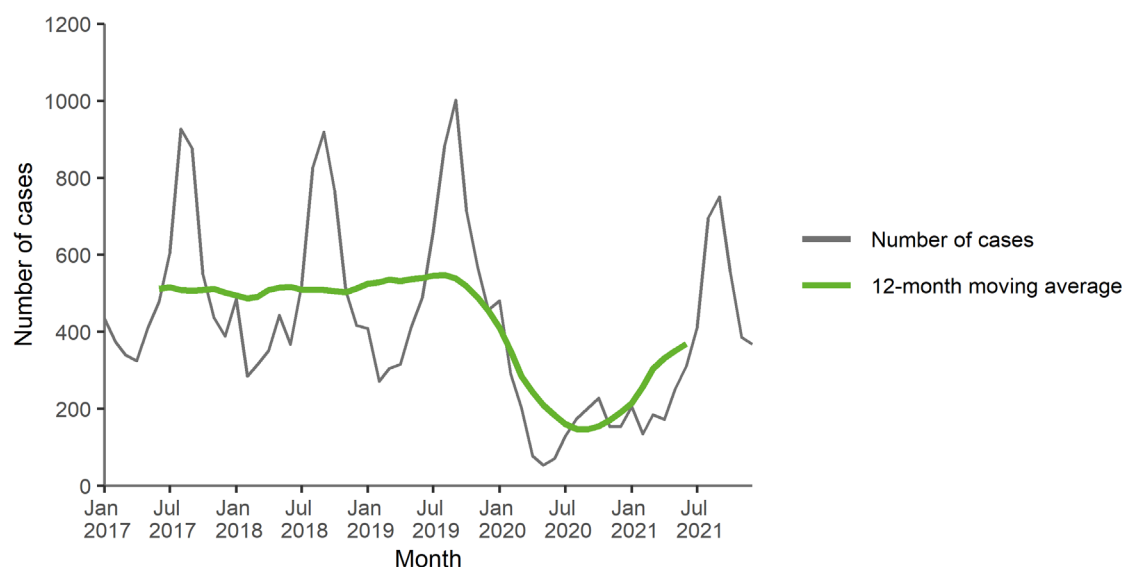
Figure 1. Number of confirmed malaria cases by country, EU/EEA, 2021

Source: country reports from Austria, Belgium, Bulgaria, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Liechtenstein, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

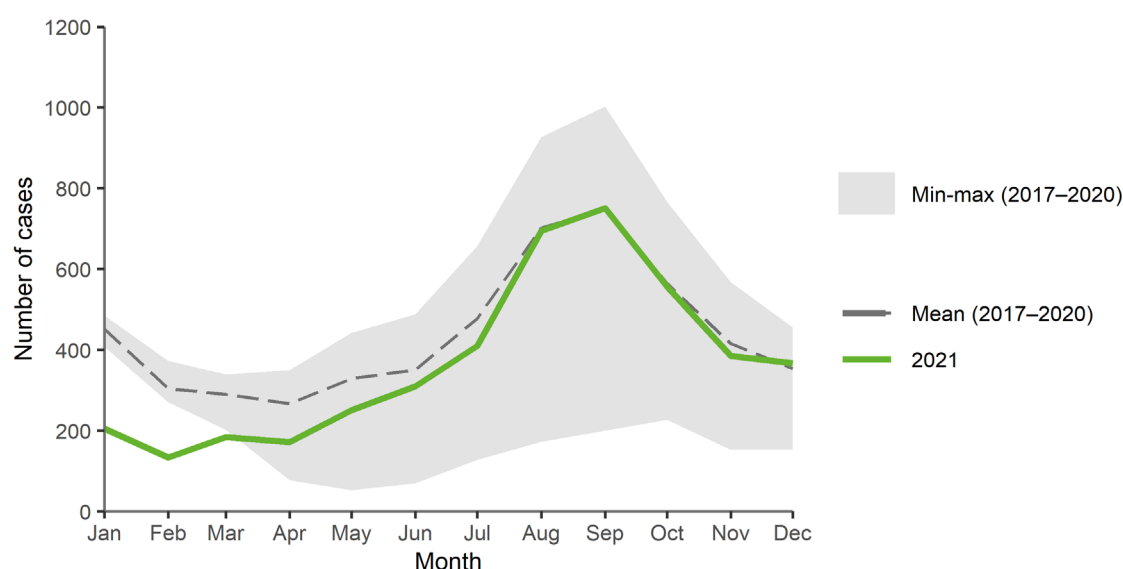
Of 4 482 confirmed cases for which the pathogen was reported, 3 771 (84.1%) had *P. falciparum*, 96 (2.1 %) had *P. vivax*, 181 (4.0 %) had *P. ovale*, 137 (3.1%) had *P. malariae*, one had *P. knowlesi*, and 296 (6.6%) cases had infections with unspecified *Plasmodium* species. The case fatality was 1.1% among all 1 944 malaria cases with a known outcome.

Among 4 257 cases with known importation status, 99.7% were travel-related. Thirteen confirmed cases were reported as acquired in the EU (four in Greece and nine in France). Three of the cases in Greece were related to *P. falciparum* transmission in an hospital in the Attica region [5]. The exact mode of transmission could not be identified, but transmission via blood transfusion was excluded [5]. The other case in Greece was an introduced *P. vivax* case (first-generation local transmission) in the Thessaloniki region. Eight cases reported by France were related to *P. falciparum*; those were qualified as cryptic (two cases), airport-related (two cases), and hospital-acquired (four cases) [6]. The last case reported by France was infected by *P. ovale* and was considered to be a recurrence.

A marked seasonal pattern was observed across the 25 countries consistently reporting malaria from 2017 to 2019, with cases increasing during and immediately after the summer holiday months (July–September). In 2020, there was no seasonal increase, probably as an effect of travel restrictions due to the COVID-19 pandemic. In 2021, a seasonal increase was observed, although the number of cases was lower than during the period 2017–2019 (Figure 2).

Figure 2. Number of confirmed malaria cases by month, EU/EEA, 2017–2021

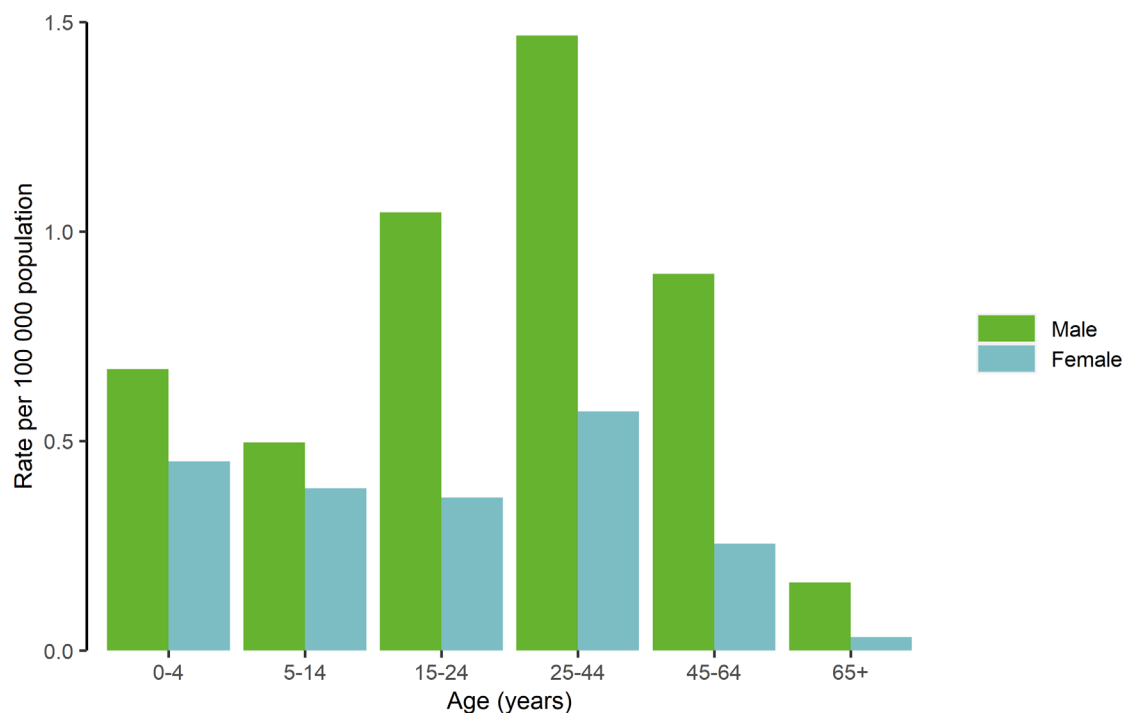
Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

Figure 3. Number of confirmed malaria cases by month, EU/EEA, 2017–2020 and 2021

Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

In 2021, the overall rate of confirmed malaria cases was higher among men than women (0.9 and 0.3 cases per 100 000 population, respectively; male-to-female ratio: 1.3:1). In both men and women, the notification rate was highest in the age group 25–44 years (1.5 and 0.6 cases per 100 000 population, respectively), followed by 15–24 years for men (1.0) and under 24 years for women (0.4) (Figure 4).

Figure 4. Distribution of confirmed malaria rate per 100 000 population, by age and gender, EU/EEA, 2021



Discussion

The World Health Organization (WHO) estimated that there were 247 million malaria cases in 2021 globally [1]. This was two million more cases than in 2020. This increase was predominantly observed in African countries.

Plasmodium falciparum is the most prevalent malaria parasite in West Africa (almost 100%), Central Africa (100%), high transmission countries in East and Southern Africa (almost 100%), low transmission countries in East and Southern Africa (92%), the Eastern Mediterranean (74%), the Western Pacific (68%), and South-East Asia (55%), while *P. vivax* is the dominant malaria species in the Americas (76%) [1]. Notification rates in the EU/EEA were substantially lower in 2020 and 2021 compared to previous years (2017–2019). This is likely predominantly due to less travel during the COVID-19 pandemic, but other factors might have contributed (e.g. diagnostic capacity and surveillance in EU/EEA countries).

Nearly all malaria cases reported by EU/EEA countries for 2021 were imported. The countries reporting the highest numbers of cases have historical, economic, linguistic, and cultural links with endemic areas, particularly in Africa and the Americas. Most of the imported malaria cases in France and Spain are linked to travel routes from West Africa [8]. Seasonality and age distribution of cases in Europe most likely reflect travel patterns to malaria-endemic countries. The literature suggests that a substantial proportion of imported malaria cases in the EU/EEA occur among recent immigrants from malaria-endemic countries and more settled migrants who have travelled to visit friends and relatives in malaria-endemic countries [9]. The number of cases reported in 2020 was likely affected by the COVID-19 pandemic. Travel restrictions, as well as personal behavioural changes, resulted in a decrease in travel to endemic areas, which is the main driver of malaria cases in the EU/EEA. The increasing number of cases in 2021 probably reflects the lifting of the travel restrictions [10,11]. Outside Europe, certain EU outermost regions are endemic for malaria, including French Guiana and Mayotte. Data about cases among residents of these regions are not collected through TESSy.

A small number of sporadic autochthonous malaria cases were reported in the EU/EEA in 2021, but no sustained transmission has been reported [5–7].

Public health implications

Awareness about malaria among clinicians and travellers, particularly among people visiting friends and relatives in malaria-endemic countries, should remain a focus of attention. Individuals visiting friends and relatives in malaria-endemic countries often have an incorrect risk perception and are less likely than other travellers to seek pre-travel advice and use the recommended malaria prevention measures. In addition, the duration of their trips tends to be longer [12]. In Europe, malaria chemoprophylaxis is only recommended for travellers to malaria-endemic countries,

which are classified into three risk groups (very limited risk of malaria transmission, risk of non-*P. falciparum* malaria and risk of *P. falciparum* malaria) to determine the most effective drug regimen (see WHO's requirements and recommendations for international travellers, including a list of affected countries, as of 2022 [13]). The choice of prophylactic drugs and prevention measures depends mainly on local malaria epidemiology, duration of potential exposure to vectors, parasite resistance patterns, level and seasonality of transmission, prophylactic drug tolerance, age, and pregnancy. As a result of the nocturnal feeding habits of most *Anopheles* mosquitoes, protection measures against mosquito bites include the use of (preferably long-lasting insecticidal) bed nets, clothes that cover most of the body, and insect repellent on exposed skin.

With regard to malaria transmission through substances of human origin (e.g. blood products or organ transplants), vigilance should remain high. In addition, healthcare providers should be aware that hospital transmission of malaria is rare but possible, irrespective of the *Plasmodium* species involved. Clinicians should therefore consider the possibility of hospital-acquired malaria in hospitalised or recently discharged patients who develop an unexplained fever or malaria-like clinical syndrome, especially if their hospital admission coincided with that of another patient admitted with malaria [14].

Data also indicate that local vectorial transmission of *P. vivax* remains possible in the EU due to sporadic reports of introduced cases. Although airport malaria is rare, *Plasmodium* transmission via mosquitos imported from endemic areas sporadically occur. The risk of airport malaria is higher for people working at international airports or living close to such airports.

Malaria remains a risk to the EU/EEA and there is a need for continuous malaria surveillance, preparedness, and prevention in the EU/EEA.

References

1. World Health Organization (WHO). World malaria report 2022. Geneva: WHO; 2022. Available at: <https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2022>
2. European Centre for Disease Prevention and Control (ECDC). Introduction to the Annual epidemiological report for 2016. In: ECDC. Annual epidemiological report for 2016. Stockholm: ECDC; 2017. Available at: <https://ecdc.europa.eu/en/annual-epidemiological-reports-2016/methods>
3. European Centre for Disease Prevention and Control (ECDC). Surveillance systems overview for 2021. Stockholm: ECDC; 2022. Available at: <https://www.ecdc.europa.eu/en/publications-data/surveillance-systems-overview-2021>
4. European Centre for Disease Prevention and Control (ECDC). Surveillance Atlas of Infectious Diseases . Stockholm: ECDC; 2023. Available at: <http://atlas.ecdc.europa.eu/public/index.aspx>
5. Hellenic National Public Health Organization (EODY). Epidemiological surveillance report: Malaria in Greece, 2021, up to 26/07/2021. EODY: Athens; 2021. Available at: https://eody.gov.gr/wp-content/uploads/2019/01/MALARIA_REPORT_20210726_ENG.pdf
6. Boher E BO, Boulanger N, Bourhy H, Caumes E, Chidiac C, et al. Health recommendations for travellers, 2022 (for health professionals). Bulletin épidémiologique hebdomadaire. 2 June 2022, Hors-série, 39-40. Available at: <https://www.santepubliquefrance.fr/determinants-de-sante/voyage/documents/magazines-revues/bulletin-epidemiologique-hebdomadaire-2-juin-2022-n-hors-serie-recommandations-sanitaires-pour-les-voyageurs-2022-a-l-attention-des-professionn>
7. World Health Organization (WHO). More malaria cases and deaths in 2020 linked to COVID-19 disruptions – 6 December 2021. Geneva: WHO; 2021. Available at: <https://www.who.int/news/item/06-12-2021-more-malaria-cases-and-deaths-in-2020-linked-to-covid-19-disruptions>
8. Tatem AJ, Jia P, Ordanovich D, Falkner M, Huang Z, Howes R, et al. The geography of imported malaria to non-endemic countries: a meta-analysis of nationally reported statistics. Lancet Infect Dis. 2017 Jan;17(1):98-107. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27777030>
9. European Centre for Disease Prevention and Control. Assessing the burden of key infectious diseases affecting migrant populations in the EU/EEA. Stockholm: ECDC; 2014. Available at: <https://www.ecdc.europa.eu/en/publications-data/assessing-burden-key-infectious-diseases-affecting-migrant-populations-eueea>
10. Schultz JS, Mace KE, Tan KR. Return to Travel in the Coronavirus Disease 2019 Pandemic Recovery Period and Implications for Imported Malaria: Reinforcing Prevention, Early Diagnosis, and Appropriate Treatment of Malaria. Clin Infect Dis. 2023 Apr 3;76(7):1161-3.
11. Norman FF, Treviño-Maruri B, Ruiz Giardín JM, Gullón-Peña B, Salvador F, Serre N, et al. Trends in imported malaria during the COVID-19 pandemic, Spain (+Redivi Collaborative Network). J Travel Med. 2022 Sep 17;29(6):taac083.
12. Center for Disease Control and Prevention (CDC). Recommendations for Immigrants from Malaria-Endemic Countries Planning to Return "Home" to Visit Friends and Relatives. Atlanta: CDC; 2018. Available at: <https://www.cdc.gov/malaria/travelers/vfr.html>
13. World Health Organization (WHO). Vaccination requirements and recommendations for international travellers; and malaria situation per country. Geneva: WHO; 2022. Available at: <https://www.who.int/publications/m/item/vaccination-requirements-and-recommendations-for-international-travellers-and-malaria-situation-per-country-2022-edition>
14. European Centre for Disease Prevention and Control (ECDC). Hospital-acquired malaria infections in the European Union – 30 April 2018. Stockholm: ECDC; 2018. Available at: <https://ecdc.europa.eu/sites/portal/files/documents/2018-04-30-RRA-Hospital-acquired-Malaria-European-Union-with%20erratum-1.pdf>