



Public Health
England

Protecting and improving the nation's health

Malaria imported into the United Kingdom: 2019

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Introduction

Malaria is a serious and potentially life-threatening febrile illness caused by infection with the protozoan parasite *Plasmodium*. It is transmitted to humans by the bite of the female *Anopheles* mosquito in tropical and subtropical regions of the world. There are 5 species of *Plasmodium* that infect humans: *P. falciparum* (responsible for the most severe form of malaria and the most deaths), *P. vivax*, *P. ovale*, *P. malariae* and *P. knowlesi*.

Malaria does not currently occur naturally in the UK, but travel-associated cases are reported in those who have returned to the UK or arrived (either as a visitor or migrant to the UK) from malaria-endemic areas.

More information about malaria is available on our [Malaria: guidance, data and analysis web page](#).

Methodology

This report presents data on malaria imported into the United Kingdom (UK) in 2019, mostly based on figures reported to the Public Health England (PHE) Malaria Reference Laboratory (MRL).

Although the MRL dataset is the most complete source of information about malaria available in the UK, and one of the most complete internationally, a [capture-recapture study](#) estimated that the MRL surveillance system captured only 56% of cases in England (66% for *Plasmodium falciparum* and 62% for London cases) (1). In addition, for identified cases some of the epidemiological information is incomplete (2).

Malaria surveillance data are used to inform the UK malaria prevention strategy (3) so it is essential that the data are as complete as possible. Since 2013, the PHE Travel and Migrant Health Section (now the PHE Travel Health and International Health Regulations [IHR] Section) has further improved the quality of this dataset by ensuring that cases, and additional epidemiological information, reported in the PHE public health case management database (HPZone) are also included in the final dataset. This means that data reported from 2013 onwards may not be directly comparable with previous reports, although any differences are thought to be very small.

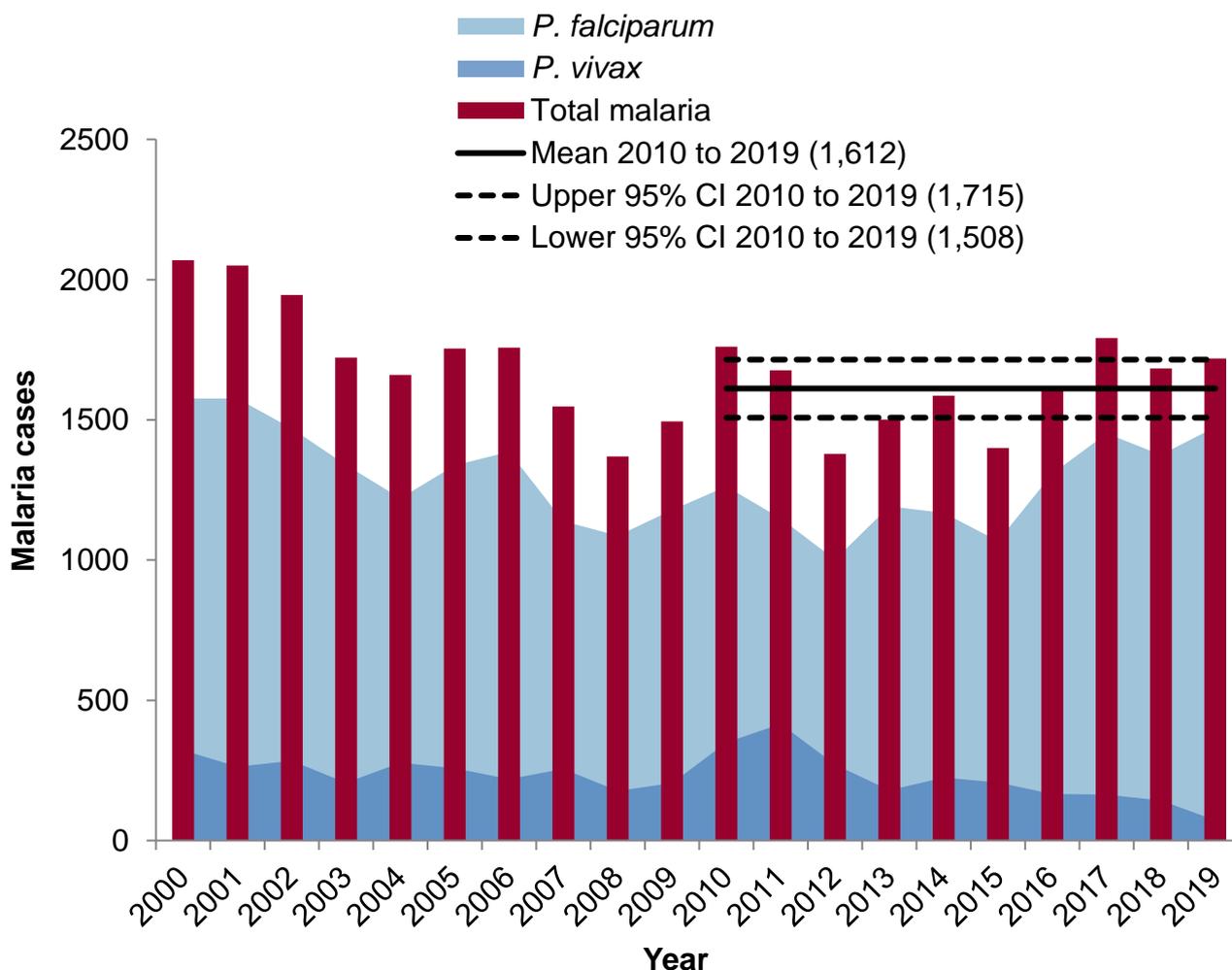
Malaria is a notifiable disease in the UK and clinical and laboratory staff are obligated under law to notify cases to their Proper Officer (4). However, in 2018, only 11% of malaria cases reported to MRL were officially notified (provisional data) (5). Clinical and laboratory staff are therefore reminded of the need to notify cases to the designated local public health authority and to report all cases to the PHE MRL. You can [download a form for this purpose](#).

More details on methods of MRL data collection (6). Data analysis for this report was conducted by the PHE Travel Health and IHR Section and colleagues at MRL have reviewed and approved the report. For the purpose of the analysis, the United Nations regions were used to assign region of travel and each region was assigned based on the stated country of travel (7).

General trend

In 2019, 1,719 cases of imported malaria were reported in the UK (1,626 in England, 58 in Scotland, 25 in Wales and 10 in Northern Ireland), 2.1% higher than reported in 2018 (N=1,683) and 6.6% above the mean number of 1,612 cases reported annually from 2010 to 2019 (Figure 1).

Figure 1. Cases of malaria in the United Kingdom: 2000 to 2019



In the 10 years between 2010 and 2019, the total number of malaria cases reported in the UK each year has fluctuated around a mean of 1,612 (95% CI: 1,508 to 1,715), which is lower than the mean for the previous 10 years (1,737, 95% CI: 1,571 to 1,904). While the

number of malaria cases in recent years has decreased, indicative data suggest that worldwide travel from or to the UK in 2019 was increasing¹.

The great majority of malaria cases diagnosed in the UK in 2019 were caused by *P. falciparum*, which is consistent with previous years. The total proportion of cases caused by *P. falciparum* increased in 2019 compared to 2018, whereas the proportion of cases caused by *P. vivax* decreased. The number of cases caused by other species remained similar (Table 1).

Table 1. Malaria cases in the UK by species: 2019 and 2018

Malaria parasite	Cases (% of total)	
	2019	2018
<i>P. falciparum</i>	1,475 (85.8%)	1,375 (81.7%)
<i>P. vivax</i>	72 (4.2%)	143 (8.5%)
<i>P. ovale</i>	114 (6.6%)	117 (7.0%)
<i>P. malariae</i>	43 (2.5%)	36 (2.1%)
Mixed infection	14 (0.8%)	9 (0.5%)
<i>P. knowlesi</i>	1 (<0.1%)	2 (0.1%)
Unspecified	0 (0.0%)	1 (<0.1%)
Total	1,719	1,683

Death from malaria

Fifteen deaths from malaria were reported in the UK in 2019, which is an increase compared to the previous 10 years with an annual average of 6 deaths. Fourteen deaths in 2019 were from falciparum malaria and acquired in Africa: Western Africa (6), Eastern Africa (5), Middle Africa (2), and Africa unspecified (1). The remaining death was in a case with vivax malaria which was acquired in Southern Asia. The number of deaths from vivax malaria in any year is very low (usually zero).

Reason for travel was known in 11 cases; 5 travelled from the UK for holiday, 3 travelled to visit friends and relatives (VFR), and 3 were foreign visitors to the UK. UK region was known in all cases; 7 deaths were in malaria cases presenting in London, and 9 presented outside London, giving case fatality rates of 0.8% and 1.2% respectively. History of malaria prophylaxis use was known in 7 cases; 5 took no prophylaxis, and none of the 7 cases took an effective regimen with full adherence.

¹ Data trends obtained from the International Passenger Survey from the Office of National Statistics

In the 8 cases where time from onset of symptoms to initiation of treatment was known, median time was 4 days (IQR 2 to 6 days). 4 patients did not receive any treatment for their malaria infection; 3 were found dead at home.

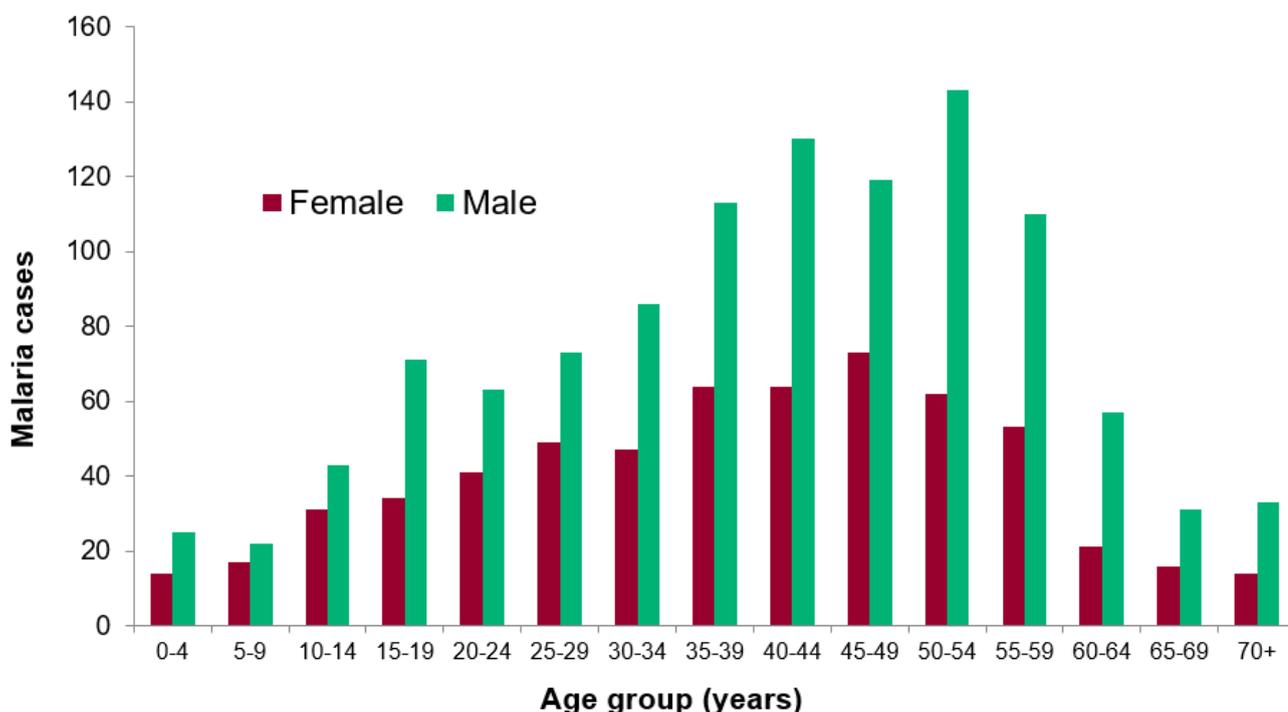
Median parasitaemia at presentation was 7.2% red blood cells (RBC) infected (IQR 4.6 to 15.4%, data available in 10 cases, all *P. falciparum*).

Numbers are too small to draw definite conclusions from these data, but the higher case fatality rate seen in tourists and those born outside Africa, as well as in those presenting in areas of the UK where malaria is less commonly seen, reflect published data from [a large observational study of UK malaria deaths \(8\)](#).

Age and sex

Age and sex were known for all cases of malaria (n=1,719). The majority of cases (65%, 1,119 out of 1,719) were male, consistent with previous years. The median age was 42 years for males and 40 years for females. Children aged less than 18 years old accounted for 12% (211) of all cases. During the period 2000 to 2019, the median age of those who died from falciparum malaria was 58 years. PHE MRL data over 27 years demonstrate that older age is a major risk factor for both falciparum malaria and severe vivax malaria (8, 9).

Figure 2. Cases of malaria in the United Kingdom by age and sex: 2019 (N=1,719)



Geographical distribution

London continues to report the largest proportion of cases in England (880 out of 1,626, 54% cases in 2019) with an 8% increase in cases compared to 2018. Of note, the largest increase in cases was seen in the North West PHE region compared to 2018 (26%) and the greatest reduction was seen in the West Midlands and North East PHE regions, which had 25% and 24% decreases respectively. Overall, case numbers changed little in England. Numbers are small in the other UK regions (Table 2).

Table 2. Cases of malaria in the United Kingdom by geographical distribution, 2019 and 2018

Geographical area (PHE Centre)	2019	2018	% change
London	880	816	8%
North West	173	137	26%
South East	122	120	2%
West Midlands	121	161	-25%
East of England	112	134	-16%
Yorkshire and Humber	81	89	-9%
East Midlands	61	55	11%
South West	51	52	-2%
North East	25	33	-24%
England total	1,626	1,597	2%
Scotland	58	52	12%
Wales	25	23	9%
Northern Ireland	10	11	-9%
UK total	1,719	1,683	2%

Travel history and ethnic origin

Of malaria cases with information available on travel history, reason for travel and/or country of residence (1,627 out of 1,719, 95%), the majority were in UK residents travelling abroad (1,118 out of 1,627, 69%). For cases of malaria in people who travel abroad from the UK, reasons for travel were known in 947 cases (85%) and include:

- visiting friends and relatives (VFR) 799 out of 947 (84%)
- business or professional (including armed forces and civilian or air crew) 81 out of 947 (9%)
- travel for holiday 67 out of 947 (7%)

The remaining cases were in new entrants to the UK (also includes UK citizens living abroad and foreign students) accounting for 7% (120 out of 1,627) and foreign visitors to the UK accounting for 6% (96 out of 1,627). One case of congenital malaria was reported and a single case of cryptic malaria with no history of travel.

Country or region of birth for cases that travelled abroad from the UK

Country or region of birth information was known for 729 (65%) of 1,118 cases that travelled abroad from the UK, of which over two-thirds (530, 73%) were born in Africa, 147 cases (20%) were born in the UK, 14 cases (2%) were born in Southern Asia, 20 cases (3%) were born in non-UK Europe and 18 cases (2%) in other regions. The breakdown of region of birth for malaria cases that have travelled abroad from the UK is shown in Figure 3.

Figure 3. Region of birth for malaria cases who travelled abroad from UK: 2019 (N=729)

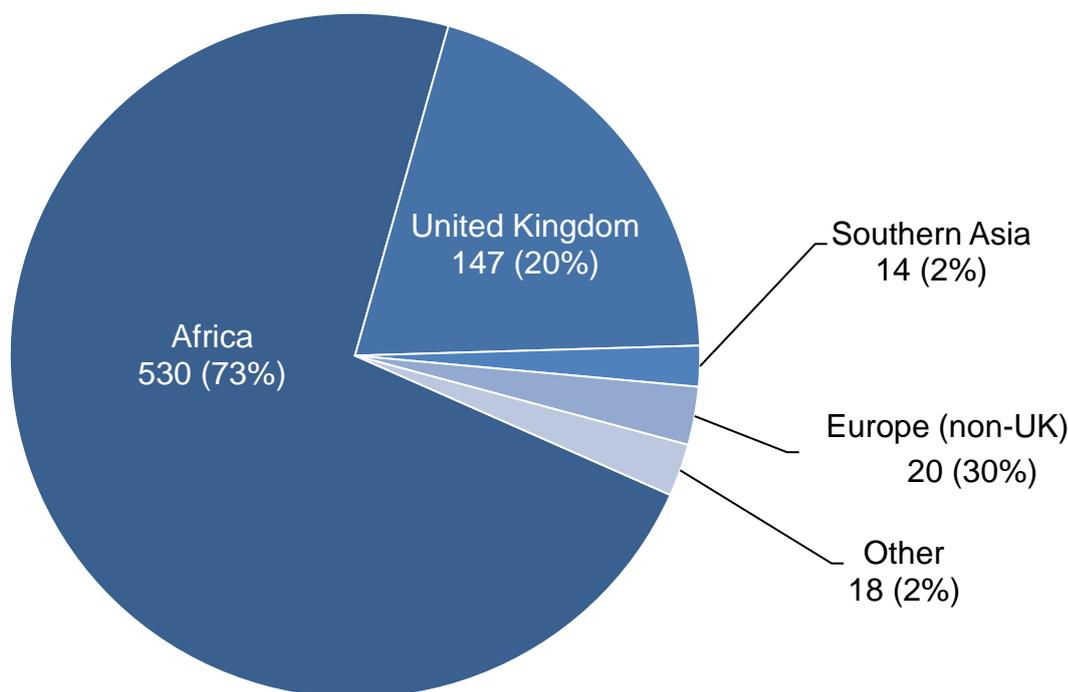


Table 3. Malaria cases who travelled abroad from the UK by region of birth and proportion of VFR travellers: 2019 (N=665)

Region of birth	N*	VFR**	% VFR
Africa	489	470	96%
Europe – UK	129	67	52%
Southern Asia***	12	10	83%
Other****	35	21	60%

*N: number of cases where region of birth and reason for travel was known

**VFR: cases that have travelled from the UK to visit family in country of origin

*** Southern Asia includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka

**** Includes non-UK Europe

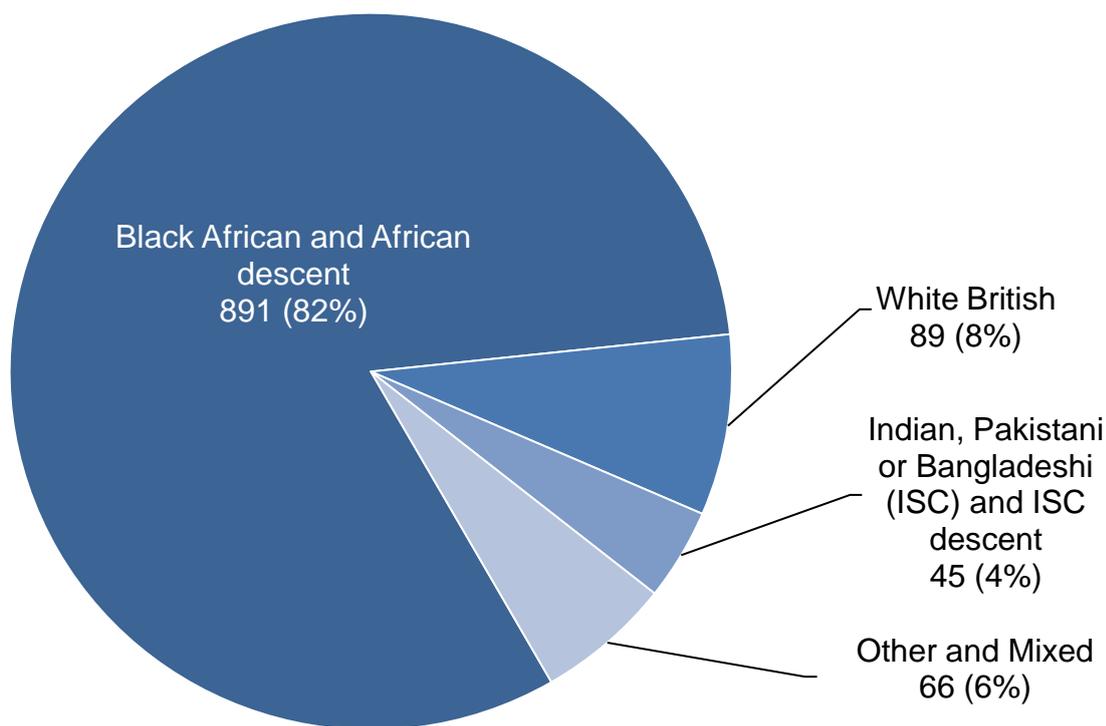
Ethnicity for cases that travelled abroad from the UK

Where ethnicity was known, more than three-quarters of malaria cases that travelled abroad from the UK were of Black African ethnicity or African descent (82%, 891 out of 1,091) (African descent is determined from country of birth if ethnicity is not given). Of the remaining cases, 89 (8%) were White British, 45 (4%) were Indian, Pakistani, Bangladeshi (Indian subcontinent or ISC) or ISC descent and 66 (6%) were of other or mixed ethnicity. The breakdown of ethnicity for malaria cases that have travelled abroad is shown in [Figure 4](#).

For non-white British cases, where reason for travel was known, 790 out of 852 (93%) were VFR travellers. For cases where ethnicity was White British, 7 out of 80 (9%) travelled to visit friends and relatives.

Of the 15 deaths reported, information on ethnicity was available for 13 as follows: Black African (5), White British (3), Black Caribbean (1), Bangladeshi, Indian, or Pakistani (2) and 2 were of other ethnicities. All of these cases had known travel history, of which 11 cases reported travelling abroad from the UK.

Figure 4. Ethnicity for malaria cases that travelled abroad from the UK: 2019 (N=1,091)



Country or region of travel for cases that travelled from the UK

Table 4 shows the breakdown of malaria cases reported by region of travel and parasite species, and the top 20 countries of travel are shown in Table 5. Countries of travel for malaria cases reported in 2019 by count of cases is shown in a map in Figure 5. This has little changed from the previous year. The majority of cases (where travel history was known) continue to be acquired in Africa, with 67% acquired in Western Africa (753 out of 1,118), 14% in Eastern Africa (159 out of 1,118) and 8% in Middle Africa (92 out of 1,118) in 2019. These UK numbers reflect in general the global prevalence of malaria infection. In 2019 Nigeria accounted for the greatest burden of malaria infection (27% global cases), followed by the Democratic Republic of the Congo (12%) then Uganda (5%) (10).

Table 4. Cases of malaria that travelled abroad from the UK by species and region of travel: 2019 and 2018

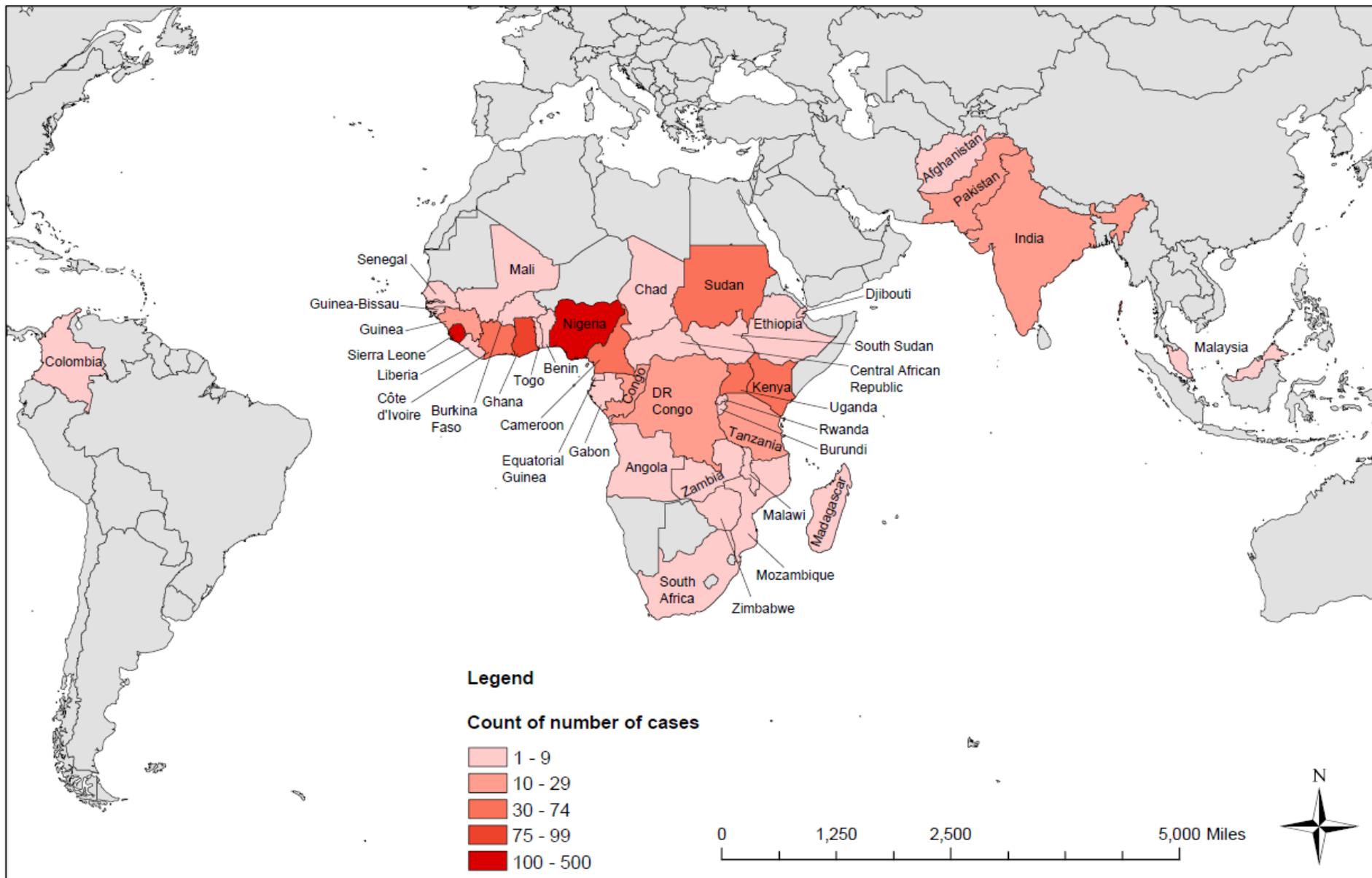
Region of travel	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. ovale</i>	<i>P. malariae</i>	Mixed	<i>P. knowlesi</i>	2019 total	2018 total
Western Africa	677	-	48	19	9	-	753	774
Eastern Africa	137	3	11	7	1	-	159	91
Middle Africa	80	-	6	4	2	-	92	78
Southern Asia	3	35	-	-	-	-	38	71
Northern Africa	35	-	1	1	-	-	37	28
Southern Africa	-	1	-	-	-	-	1	9
South-Eastern Asia	-	-	-	-	-	1	1	8
Africa unspecified	10	-	1	-	-	-	11	5
South America	-	1	-	-	-	-	1	2
Oceania	-	-	-	-	-	-	-	1
Western Asia	-	-	-	-	-	-	-	-
Not stated	24	-	1	-	-	-	25	31
Total	966	40	68	31	12	1	1,118	1,098

Table 5. Cases of malaria that travelled abroad from the UK by Plasmodium species and top 20 countries of travel: 2019 and 2018

Country of travel	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. ovale</i>	<i>P. malariae</i>	Mixed	<i>P. knowlesi</i>	2019 total	2018 total
Nigeria	368	-	28	11	6	-	413	429
Sierra Leone	131	-	7	1	1	-	140	118
Ghana	83	-	9	4	1	-	97	108
Uganda	50	-	4	3	1	-	58	24
Côte D'Ivoire	47	-	2	-	-	-	49	57
Kenya	38	1	1	4	-	-	44	17
Cameroon	33	-	3	-	1	-	37	41
Sudan [†]	34	-	1	1	-	-	36	28
Congo	21	-	1	2	-	-	24	15
Guinea	19	-	1	1	1	-	22	20
Pakistan	-	18	-	-	-	-	18	39
DR Congo	11	-	1	-	1	-	13	7
Tanzania	10	-	1	-	-	-	11	15
India	3	8	-	-	-	-	11	15
Afghanistan	-	9	-	-	-	-	9	17
Angola	5	-	1	1	-	-	7	10
Togo	6	-	-	-	-	-	6	3
Malawi	5	-	1	-	-	-	6	9
Zambia	5	-	1	-	-	-	6	4
Chad	6	-	-	-	-	-	6	1
Other Western Africa	23	-	1	2	-	-	26	39
Other Eastern Africa	29	2	3	-	-	-	34	22
Other Middle Africa	4	-	-	1	-	-	5	4
North Africa	1	-	-	-	-	-	1	-
Southern Africa	-	1	-	-	-	-	1	9
Africa unspecified	10	-	1	-	-	-	11	5
South America	-	1	-	-	-	-	1	2
South-Eastern Asia	-	-	-	-	-	1	1	8
Oceania	-	-	-	-	-	-	-	1
Not stated	24	-	1	-	-	-	25	31
Total	966	40	68	31	12	1	1,118	1,098

[†] Note that some travellers or laboratories may not differentiate South Sudan from Sudan in their reporting.

Figure 5. Countries of travel for cases of malaria that travelled abroad from the UK by count of cases, 2019



Prevention and treatment

Chemoprophylaxis

Among patients with malaria that travelled abroad from the UK, where the history of chemoprophylaxis (antimalarial medication to prevent infection) was obtained, 675 out of 775 (87%) had not taken chemoprophylaxis. Although 2019 data are similar to the last 5 to 6 years, in the early 2000s the proportion of those with malaria who had not taken chemoprophylaxis was much lower (52% in 2000 and 59% in 2001).

Of those who had taken some form of chemoprophylaxis (N=100), 87 stated which drug they took and of these, 74 (85%) had taken a drug that was recommended to UK travellers for their destination by the PHE Advisory Committee for Malaria Prevention (ACMP). This represents 10% (74 out of 775) of the total cases where chemoprophylaxis information was available. The proportion of the total cases with chemoprophylaxis information that took a drug recommended by the ACMP has remained between 9% and 16% since 2000. Note that whether the cases had taken the drug regularly or appropriately was not known and this should be taken into consideration when interpreting these data. When taken correctly, the agents recommended for prophylaxis against falciparum malaria (atovaquone-proguanil, doxycycline and mefloquine) are >90% effective (3).

These data imply that health messages about the importance of antimalarial chemoprophylaxis still are not reaching groups who are at particular risk of acquiring malaria, or that travellers either are not understanding or are not acting on these messages.

The groups at particular risk of not using chemoprophylaxis include those who are visiting family in their country of origin, particularly those of Black African heritage and/or born in Africa. The reasons for this heightened risk have not been investigated systematically, but could include: individuals in these groups may not seek or may not be able to access medical advice on malaria prevention before they travel; they may not receive accurate advice; or they may not adhere to recommendations on chemoprophylaxis. They may not perceive themselves to be at risk (they may have been born or lived in a malaria-endemic area for many years), or they may have concerns about the cost of drugs. The burden of falciparum malaria in particular falls heavily on those of Black African heritage, and this group is important to target for pre-travel advice.

Prevention advice

Malaria, an almost completely preventable but potentially fatal disease, remains an important issue for UK travellers. Failure to take chemoprophylaxis is associated with the majority of cases of malaria in UK residents travelling to malaria-risk areas. The number of cases in those going on holiday is small but associated with greater mortality (8). Those of African or Asian ethnicity who are non-UK born and who travel to visit friends and relatives

are at increased risk of malaria, as well as a number of other infections (11). Older patients are at particular risk of dying from malaria if they acquire the infection. Those providing advice should engage with these population groups wherever possible, including using potential opportunities to talk about future travel plans outside a specific travel health consultation, such as during new patient checks or childhood immunisation appointments (12)

The ACMP guidelines (3) and resources available from the [National Travel Health Network and Centre](#) are available to assist clinicians in helping travellers to make rational decisions about protection against malaria.

Useful resources for travellers, including translated leaflets, are also available at [Malaria: health advice for travellers](#).

Taking fever seriously on return from a malaria risk area

P. falciparum can progress to severe and life-threatening illness, including cerebral malaria, if it is not diagnosed and treated promptly. Travellers returning from malaria risk areas should seek urgent medical advice, including a same-day result malaria blood test, for any symptoms, especially fever, during their trip or in the year following their return home.

Treatment guidelines and algorithms for clinicians are available from the [British Infection Society](#).

Reliability of malaria diagnostic tests

In the UK, malaria is diagnosed by microscopic examination of thick and thin blood films and by rapid immunochromatographic diagnostic tests (RDTs) which detect circulating parasite antigens. RDTs have [good diagnostic accuracy in most clinical situations](#) but should not be relied on alone (13). The most commonly used RDTs detect circulating *P. falciparum* histidine-rich proteins (HRP2 and HRP3). However, deletions of *pfhrp2* and *pfhrp3* genes occur in some *P. falciparum* populations, particularly in regions of the Amazon River basin in South America, and in East Africa, reducing the sensitivity of some RDTs (14). Among 113 UK *P. falciparum* samples from East Africa in 2018, [23 \(20.4%\) showed evidence of deletion of at least one of these 2 genes](#) (15). The MRL is currently characterising a further 4 cases where a false-negative HRP2 RDT result was obtained by the sending laboratory, prior to confirmation of *P. falciparum* infection by microscopy. The implications of *pfhrp2* and *pfhrp3* gene deletions for RDT use is under investigation by the WHO, and further guidance is expected, but these tests remain an important additional diagnostic tool for imported malaria in the UK.

Antimalarial treatment failure in UK patients

In 2017 the MRL reported 4 cases of treatment failure among UK patients receiving artemether-lumefantrine (Riamet™) for *P. falciparum* infections (16). Since that time a further 21 suspected cases have been reported and are under investigation by the MRL. Treatment failures represent a tiny proportion of notified *P. falciparum* cases in the UK – in 2019 8 suspected *P. falciparum* post-treatment recurrences were identified by passive surveillance at the MRL, out of a total of 1,475 reported cases (0.05%). Riamet™ remains highly effective and recommended for treatment of UK cases. However, clinicians should be aware of this issue, and of the potential need for prolonged or alternative treatment in these rare cases.

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