



Public Health  
England

Protecting and improving the nation's health

# **Malaria imported into the United Kingdom: 2016**

## **Implications for those advising travellers**

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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 five 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 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 at:

<https://www.gov.uk/government/collections/malaria-guidance-data-and-analysis>

## Methodology

This report presents data on malaria imported into the United Kingdom (UK) in 2016, 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, 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]; furthermore, 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 has further improved the quality of this dataset by ensuring any cases that have been reported in the PHE public health case management database (HPZone) are also included in the final dataset as well as supplementing epidemiological information, where available, from HPZone. 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 and clinical and laboratory staff are obligated under law to notify cases to their Proper Officer [4]; however, in 2016, only 13% 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 PHE Malaria Reference Laboratory; a form for this purpose is available at <https://www.gov.uk/guidance/mrl-reference-diagnostic-and->

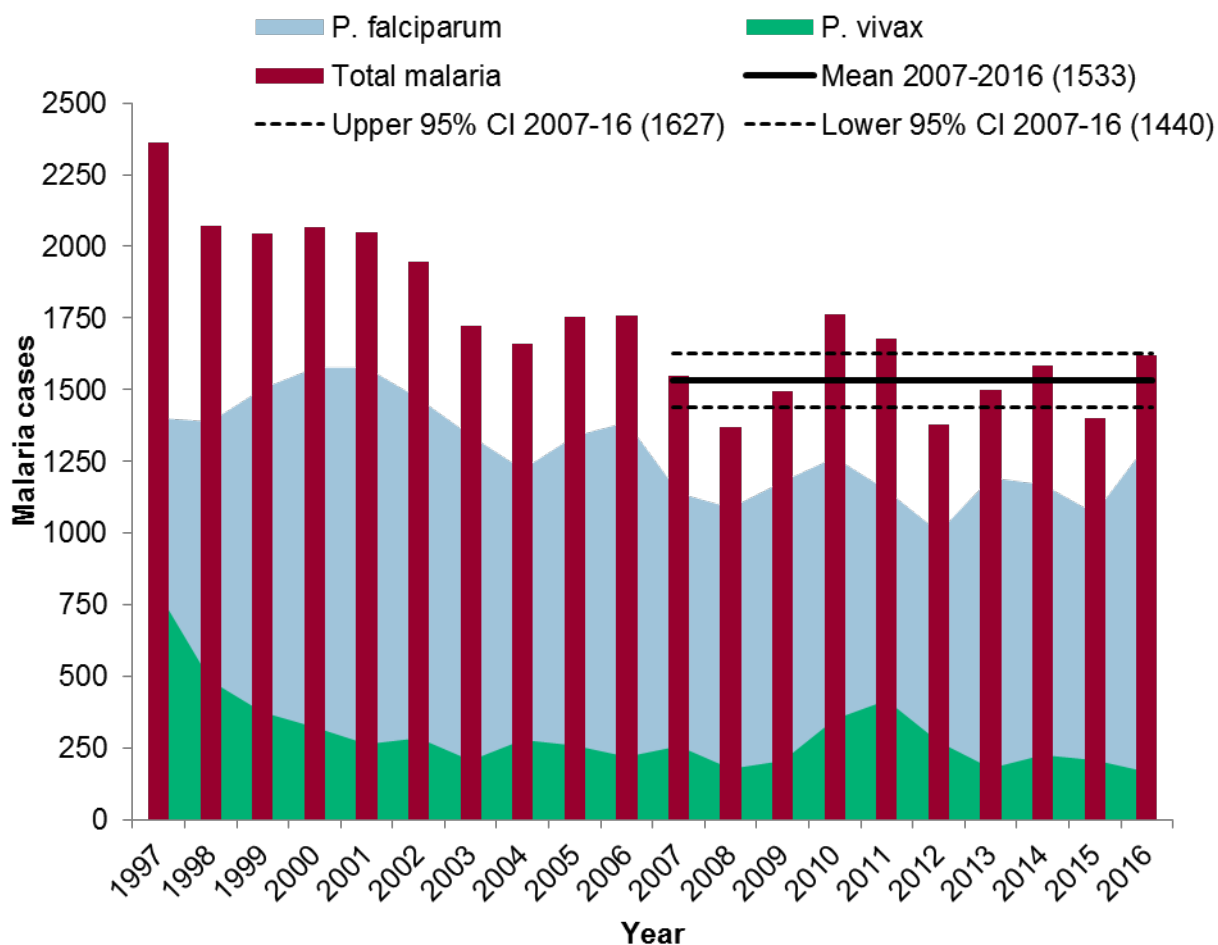
**advisory-services.** For more details on methods of MRL data collection, please refer to the article: Smith et al, Imported malaria and high risk groups, BMJ: 2006 [6].

Data analysis for this report was conducted by the PHE Travel and Migrant Health Section and colleagues at the Malaria Reference Laboratory have reviewed and approved the report.

## General trend

In 2016, 1,618 cases of imported malaria were reported in the UK (1,529 in England, 58 in Scotland, 25 in Wales and six in Northern Ireland), 15.6% higher than reported in 2015 (N=1,400) and 4.5% above the mean number of 1,547 cases reported between 2006 and 2015 [Figure 1]. An additional five cases were reported from the UK Crown Dependencies (Isle of Man, Guernsey and Jersey but these will not be included for further analysis in this report).

**Figure 1. Cases of malaria in the United Kingdom: 1997– 2016**



In the last 10 years (between 2007 and 2016), the total number of malaria cases reported in the UK each year has been fluctuating around a mean of 1,533 (95% CI:

1,440-1,627); this is a significant decrease of 21% ( $p < 0.01$ ) compared to the mean for the previous 10 years (1,944, 95% CI: 1,788, 2,100).

The majority of the cases in 2016 were caused by *P. falciparum*, which is consistent with previous years, although the proportion of the total increased slightly compared to 2015, whereas the proportion of cases caused by *P. vivax* and *P. ovale* decreased slightly [Table 1].

**Table 1 Malaria cases in the UK by species: 2016 and 2015**

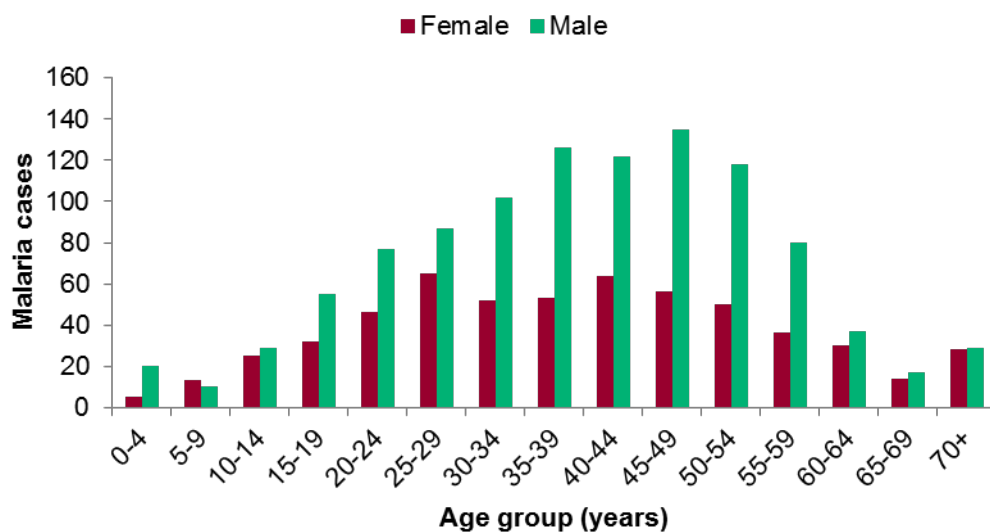
Malaria parasite	Cases (% of total)	
	2016	2015
<i>P. falciparum</i>	1308 (80.8%)	1068 (76.3%)
<i>P. vivax</i>	166 (10.3%)	207 (14.8%)
<i>P. ovale</i>	88 (5.4%)	95 (6.8%)
<i>P. malariae</i>	41 (2.5%)	23 (1.6%)
Mixed	13 (0.8%)	7 (0.5%)
<i>P. knowlesi</i>	1 (<0.1%)	0 (0%)
Unspecified	1 (<0.1%)	0 (0%)
<b>Total</b>	<b>1618</b>	<b>1400</b>

There were six deaths from malaria reported in 2016, the same number as in 2015. These were all from falciparum malaria acquired in Sub Saharan and Southern Africa. There is a small variation in the number of deaths from malaria in the UK every year but the total for 2016 is in line with the annual average of six over the last 10 years. The number of deaths from vivax malaria in any year is very low. PHE Malaria Reference Laboratory data over 27 years was combined and demonstrated that age is a major risk factor for severe vivax as well as falciparum malaria, with all vivax deaths occurring in those aged over 50 years [7]. During the period 2000-2016, the average age of those who died from falciparum malaria was 49 years.

## Age and sex

Age and sex were known for 1,613/1,618 cases; of these the majority (65%, 1,044/1,613) were male, consistent with previous years. Males dominated all age groups except the 5-9 years age group. The median age was 40 years for males and 39 for females. Children aged less than 18 years accounted for 9% (145) of all cases with known age and sex.

**Figure 2. Cases of malaria in the United Kingdom by age and sex: 2016 (N=1,613)**



## Geographical distribution

London continues to report the largest proportion of cases in England (843/1,618, 55%) with a 24% increase in cases compared to 2015.

**Table 2. Cases of malaria in the United Kingdom by geographical distribution: 2016 and 2015**

Geographical area (PHE Centre)	2016	2015	% change
London	843	681	24%
South East	141	120	18%
East of England	122	115	6%
West Midlands	118	122	-3%
North West	107	114	-6%
Yorkshire and Humber	68	68	0%
South West	65	52	25%
East Midlands	43	39	10%
North East	22	8	175%
<b>England total</b>	<b>1529</b>	<b>1319</b>	<b>16%</b>
Scotland	58	49	18%
Wales	25	21	19%
Northern Ireland	6	11	-45%
<b>UK total</b>	<b>1618</b>	<b>1400</b>	<b>16%</b>

## Travel history and ethnic origin

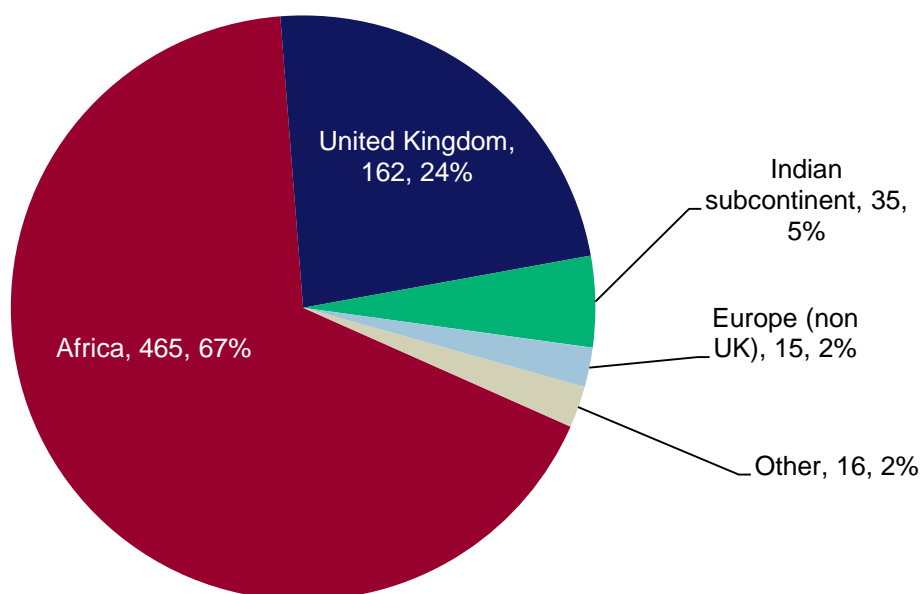
Of those with travel history/country of residence information available (1,228/1,618, 76%), the majority of malaria cases reported had travelled abroad from the UK (1,044/1,228, 85%). Cases that travelled abroad from the UK includes: those where reason for travel was holiday, business/professional, civilian/air crew, armed forces or visiting friends and relatives. The remaining cases were new entrants, with UK expats and foreign students accounting for 9% (111/1,228) and foreign visitors to the UK accounting for 6% (73/1,228). Of the six deaths reported, five were of Black African ethnicity or African descent and one originated from the Indian Subcontinent. Five of the cases travelled abroad from the UK and one was a foreign visitor.

Of the 1,044 cases that travelled abroad from the UK, reason for travel was known for 893 (86%). Of these, 712/893 (80%) had visited family in their country of origin (also known as visiting friends and relatives, or VFR travellers), 85/893 (10%) travelled for business (including armed forces and civilian air crew) and 96/893 (11%) travelled for a holiday.

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

Country or region of birth information was known for 693 (66%) of 1,044 cases that travelled abroad from the UK, of which over two-thirds were born in Africa [Figure 3].

**Figure 3. Region of birth for malaria cases that travelled abroad from the UK: 2016 (N=693)**





**Table 3. Malaria cases that travelled abroad from the UK by region of birth and proportion of VFR travellers: 2016 (N=639)**

Region of birth	N*	VFR**	% VFR
Africa	430	411	96%
Europe - UK	148	61	41%
Indian subcontinent	32	31	97%
Other***	29	17	59%

\*N – cases where region of birth and reason for travel was known

\*\*VFR – cases that have travelled to visit family in country of origin

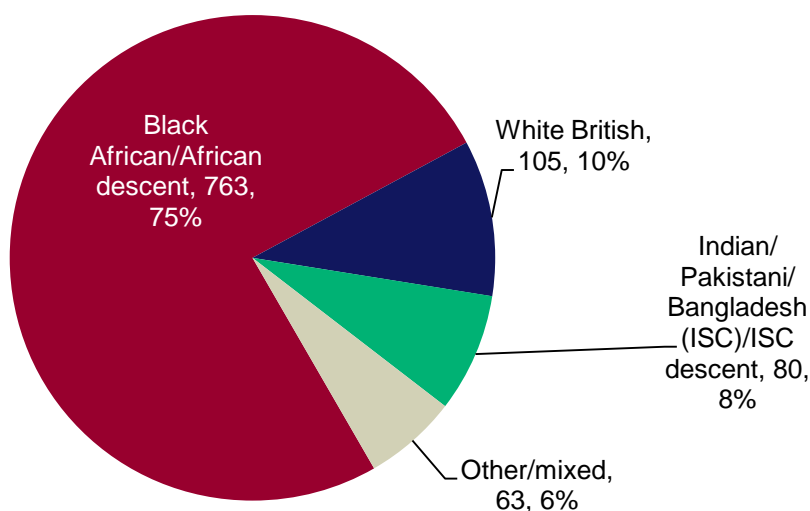
\*\*\* - includes non UK Europe

### Ethnicity for cases that travelled abroad from the UK

Where ethnicity was known, the majority of malaria cases that travelled abroad from the UK (75%, 763/1,011), were of Black African ethnicity or African descent (African descent is determined from country of birth if ethnicity is not given) [Figure 4].

For non-white British cases, where reason for travel was known, 707/785 (90%) were VFR travellers.

**Figure 4. Ethnicity for malaria cases that travelled abroad from the UK: 2016 (N=1,011)**



### Country/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. The majority of cases (where travel history was known) continue to be acquired in Africa, with 61% acquired in Western Africa (638/1,044), 14% in Eastern Africa (147/1,044) and 11% in Middle Africa (120/1,044).

While it is important not to over-interpret changes in individual countries because numbers are low, the number of cases acquired in 15 of the top 20 countries increased in 2016 compared to 2015. Cases acquired in Uganda increased by almost four-fold between 2015 and 2016, with 17 cases in 2015 and 64 cases in 2016. The number of cases also increased just over two-fold between 2015 and 2016 in Sierra Leone (91) Angola (31) and Sudan (17) and smaller increases were observed in Nigeria (33%), Cameroon (21%) and Ghana (17%). These increases since 2015 may represent the impact of Ebola on travel and prophylaxis patterns due to the West African Ebola epidemic on 2015 figures.

No cryptic cases were reported in 2016.

**Table 4. Cases of malaria that travelled abroad from the UK by species and region of travel: 2016 and 2015**

Region of travel [9]	P. falciparum	P. vivax	P. ovale	P. malariae	Mixed	2016 total	2015 total
Western Africa	582	1	33	16	6	638	482
Eastern Africa	119	6	12	9	1	147	82
Middle Africa	108	-	7	4	1	120	72
Southern Asia	4	78	-	-	-	82	81
Northern Africa	14	3	-	-	-	17	9
Africa unspecified	5	1	-	-	-	6	5
Southern Africa	3	-	-	-	-	3	1
South America	-	3	-	-	-	3	7
Caribbean	2	-	-	-	-	2	1
Oceania	1	1	-	-	-	2	-
South-Eastern Asia	-	2	-	-	-	2	1
Western Asia	-	-	-	-	-	-	1
Not stated	17	4	1	-	-	22	3
<b>Total</b>	<b>855</b>	<b>99</b>	<b>53</b>	<b>29</b>	<b>8</b>	<b>1044</b>	<b>744</b>

**Table 5. Cases of malaria that travelled abroad from the UK by species and top 20 countries of travel: 2016 and 2015**

Country of travel	P. falciparum	P. vivax	P. ovale	P. malariae	Mixed	Total 2016	Total 2015
Nigeria	329	1	23	8	3	364	274
Ghana	95	-	3	4	-	102	87
Sierra Leone	83	-	4	3	1	91	42
Uganda	55	1	4	4	-	64	17
Pakistan	2	47	-	-	-	49	44
Cameroon	41	-	4	1	1	47	39
Ivory Coast	30	-	-	1	1	32	34
Angola	29	-	-	2	-	31	13
Congo	26	-	2	1	-	29	7
Kenya	17	1	4	2	-	24	23
India	2	21	-	-	-	23	27
Sudan	14	3	-	-	-	17	8
Tanzania	12	-	-	1	1	14	14
Gambia	12	-	1	-	1	14	19
Malawi	9	-	2	1	-	12	10
Liberia	10	-	-	-	-	10	2
Afghanistan	-	9	-	-	-	9	8
Guinea	7	-	-	-	-	7	10
Zambia	7	-	-	-	-	7	3
Mozambique	5	-	1	-	-	6	3
Other Western Africa	16	-	2	-	-	18	14
Other Eastern Africa	14	4	1	1	-	20	12
Other Middle Africa	12	-	1	-	-	13	13
Africa unspecified	5	1	-	-	-	6	5
South America	-	3	-	-	-	3	7
Other	6	4	-	-	-	10	6
Not stated	17	4	1	-	-	22	3
<b>Total</b>	<b>855</b>	<b>99</b>	<b>53</b>	<b>29</b>	<b>8</b>	<b>1044</b>	<b>744</b>

## Prevention and treatment

### Chemoprophylaxis

Among patients with malaria who had travelled abroad from the UK, where the history of chemoprophylaxis (antimalarial medication) was obtained, 609/731 (83%) had not taken chemoprophylaxis.

Of those that had taken some form of chemoprophylaxis (N=122), 104 stated which drug they took and of these, 82 (79%) had taken a drug that is currently recommended to UK travellers for their destination by the PHE Advisory Committee for Malaria

Prevention (ACMP) [3]; however, this only represented 11% (82/731) of the total cases where chemoprophylaxis information was available. (Note that whether the cases had taken the drug regularly was poorly completed and should also be taken into consideration when interpreting these data).

Although 2016 data are similar to the last 5-6 years, in the early 2000s the proportion of those who had not taken chemoprophylaxis was much lower (52% in 2000, 59% in 2001). The proportion of the total cases with chemoprophylaxis information that took a drug recommended by the ACMP has however remained between 11 and 16% since 2000.

These data imply that health messages about the importance of antimalarial chemoprophylaxis are still not reaching groups who are at particular risk of acquiring malaria, eg those who are visiting family in their country of origin, particularly those of Black African heritage and/or born in Africa, or they are not acting on these messages.

It seems likely that these groups are either not seeking or not able to access medical advice on malaria prevention before they travel, or they are not being given good advice, or they are not adhering to it; they may not perceive themselves to be at risk because the destination is familiar to them. Probably all these factors contribute. The burden of falciparum malaria in particular falls heavily on those of Black African ethnicity, and this group is important to target for pre-travel advice.

An analysis of malaria deaths over 20 years in the UK [9] showed that, while African born travellers visiting family in their country of origin are at particular risk of acquiring malaria; once acquired, the risk for mortality is significantly higher in those born outside Africa and travelling for other reasons (eg holiday travellers). There is also a strong association between increasing age and mortality, so elderly travellers should also be considered a particular risk group.

## 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 holidays is small but there is continuing evidence that those of African or Asian ethnicity who are non-UK born and going to visit family are at increased risk of malaria, as well as a number of other infections [10]. The elderly 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 [11].

The ACMP guidelines [3] and resources available from the National Travel Health Network and Centre (<http://travelhealthpro.org.uk/>) should assist clinicians in helping travellers to make rational decisions about protection against malaria.

Useful resources for travellers, including translated leaflets, are also available on [GOV.UK](http://gov.uk)

## 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: <http://interim.britishinfection.org/content/clinical-guidelines#ukmal>

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