



Public Health
England

Protecting and improving the nation's health

Malaria imported into the United Kingdom: 2017

Implications for those advising travellers

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Contents

About Public Health England	2
Introduction	4
Methodology	5
General trend	6
Age and sex	8
Geographical distribution	9
Travel history and ethnic origin	10
Prevention and treatment	14
References	16

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 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 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 2017, 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]; 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 2017, 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 the PHE Malaria Reference Laboratory; a form for this purpose is available at:

<https://www.gov.uk/guidance/mrl-reference-diagnostic-and-advisory-services>.

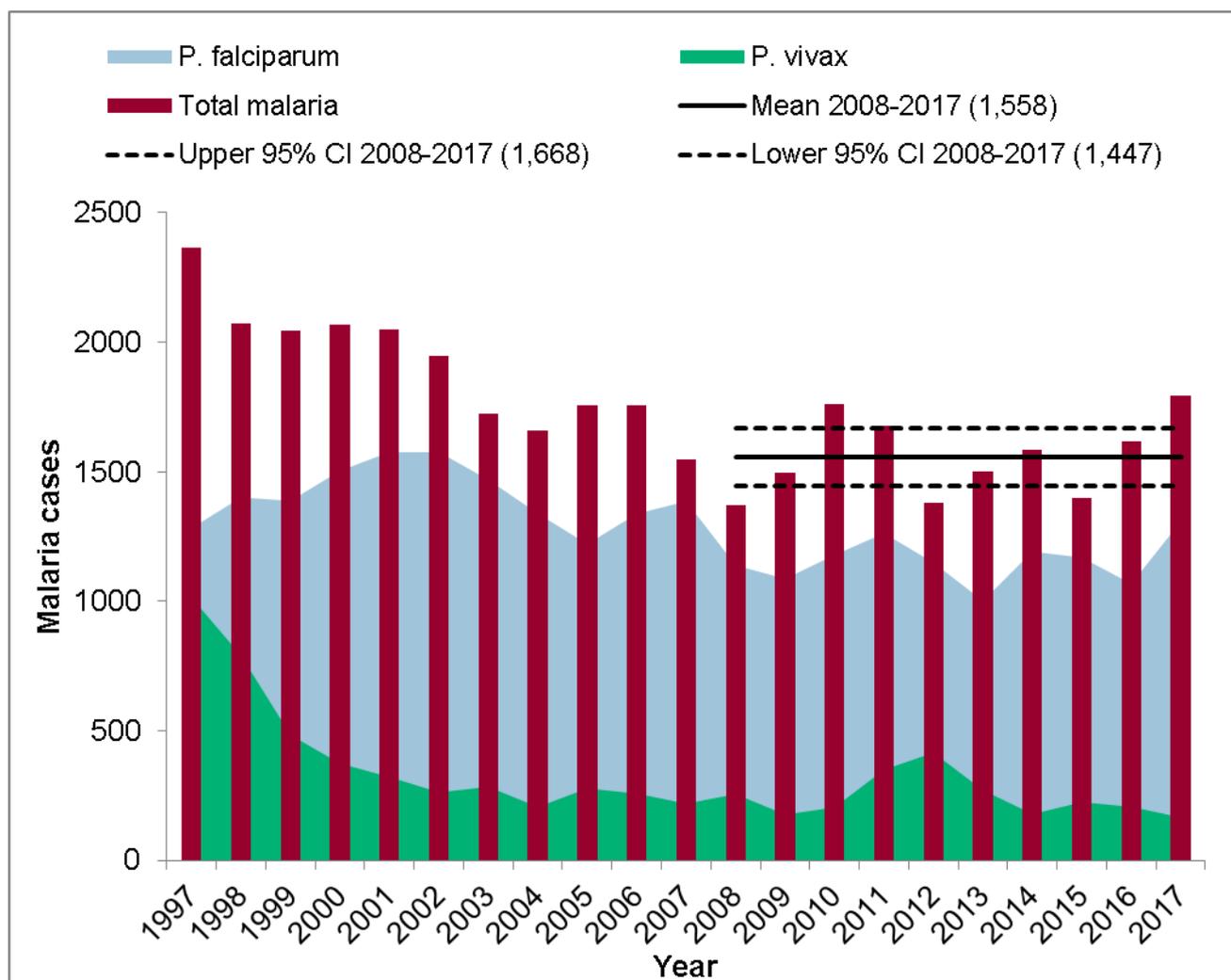
For more details on methods of MRL data collection, please refer to the article: Smith et al, Imported malaria and high risk groups, BMJ: 2006 [6].

Data analysis for this report was conducted by the PHE Travel and Migrant Health Section and colleagues at 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 2017, 1,792 cases of imported malaria were reported in the UK (1,708 in England, 50 in Scotland, 24 in Wales and 10 in Northern Ireland), 10.8% higher than reported in 2016 (N=1,618) and 15.0% above the mean number of 1,558 cases reported between 2008 and 2017 [Figure 1].

Figure 1. Cases of malaria in the United Kingdom: 1997- 2017



In the last 10 years (between 2008 and 2017), the total number of malaria cases reported in the UK each year has fluctuated around a mean of 1,558 (95% CI: 1,447-1,668); similar to the mean for the previous 10 years (1,533, 95% CI: 1,440- 1,627).

The great majority of the cases in 2017 were caused by *P. falciparum*, which is consistent with previous years, and although the total number of cases caused by *P. falciparum* increased compared to 2016, the proportion of the total number of cases

remained stable. The proportion of cases caused by *P.vivax* and *P.ovale* also remained similar over the two years, with the proportion of cases caused by *P. vivax* decreasing slightly in 2017 [Table 1].

Table 1. Malaria cases in the UK by species: 2017 and 2016

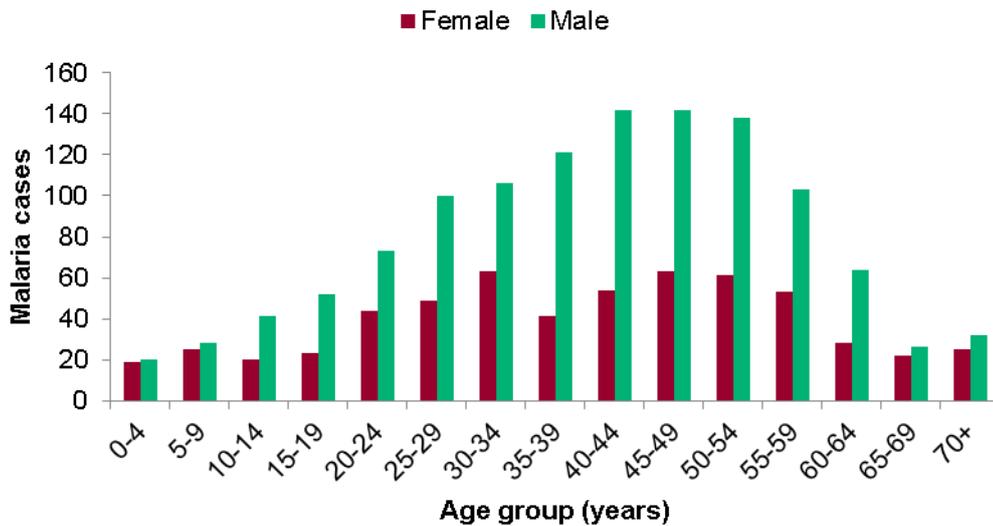
Malaria parasite	Cases (% of total)	
	2017	2016
<i>P. falciparum</i>	1,452 (81.0%)	1,308 (80.8%)
<i>P. vivax</i>	164 (9.2%)	166 (10.3%)
<i>P. ovale</i>	108 (6.0%)	88 (5.4%)
<i>P. malariae</i>	55 (3.1%)	41 (2.5%)
Mixed infection	11 (0.6%)	13 (0.8%)
<i>P. knowlesi</i>	2 (0.1%)	1 (<0.1%)
Unspecified	0 (0.0%)	1 (<0.1%)
Total	1,792	1,618

There were 6 deaths from malaria reported in 2017, the same number as in 2016 and 2015. These were all from falciparum malaria acquired in Western Africa (3), Eastern Africa (2), and South-Eastern Asia (1). There is usually a small variation in the number of deaths from malaria in the UK every year but the total for 2017 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 were combined and demonstrated that older 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 [8]. During the period 2000-2017, the average age of those who died from falciparum malaria was 49 years, reflecting the relatively younger age profile of cases.

Age and sex

Age and sex were known for 1,778/1,792 cases of malaria; of these the majority (67%, 1,188/1,778) were male, consistent with previous years. Males dominated all age groups. The median age was 41 years for males and 40 for females. Children aged less than 18 years accounted for 10% (186) of all cases with known age and sex.

Figure 2. Cases of malaria in the United Kingdom by age and sex: 2017 (N=1,778)



Geographical distribution

London continues to report the largest proportion of cases in England (992/1,708, 58%) with a 9% increase in cases compared to 2016, consistent with the national increase. Of note is the 36% increase in cases reported in the West Midlands compared to 2016 [Table 2].

Table 2. Cases of malaria in the United Kingdom by geographical distribution: 2017 and 2016

Geographical area (PHE Centre)	2017	2016	% change
London	922	843	9%
West Midlands	161	118	36%
South East	155	141	10%
North West	128	107	20%
East of England	114	122	-7%
Yorkshire and Humber	79	68	16%
South West	73	65	12%
East Midlands	50	43	16%
North East	26	22	18%
England total	1,708	1,529	12%
Scotland	50	58	-14%
Wales	24	25	-4%
Northern Ireland	10	6	67%
UK total	1,792	1,618	11%

Travel history and ethnic origin

Of those with information available on travel history, reason for travel and/or country of residence (1,687/1,792, 94%), the majority of malaria cases reported having travelled abroad from the UK (1,221/1,687, 72 %). Cases who travelled abroad from the UK include: 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 (also includes UK citizens living abroad and foreign students) accounting for 5% (80/1,687) and foreign visitors to the UK accounting for 5% (79/1,687).

Of the 6 deaths reported, 4 were of White British ethnicity, one was of Black African ethnicity and 1 originated from the Indian subcontinent. Of those with known travel history, 3 of the cases travelled abroad from the UK, 2 were new entrants and 1 was a foreign visitor.

Of the 1,221 cases that travelled abroad from the UK, reason for travel was known for 1,020 (84%). Of these, 814/1,020 (80%) had visited family in their country of origin (also known as visiting friends and relatives, or VFR travellers), 98/1,020 (10%) travelled for business (including armed forces and civilian air crew) and 108/1,020 (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 804 (66%) of 1,221 cases that travelled abroad from the UK, of which almost two-thirds were born in Africa [Figure 3].

Figure 3. Region of birth for malaria cases who travelled abroad from the UK: 2017 (N=804)

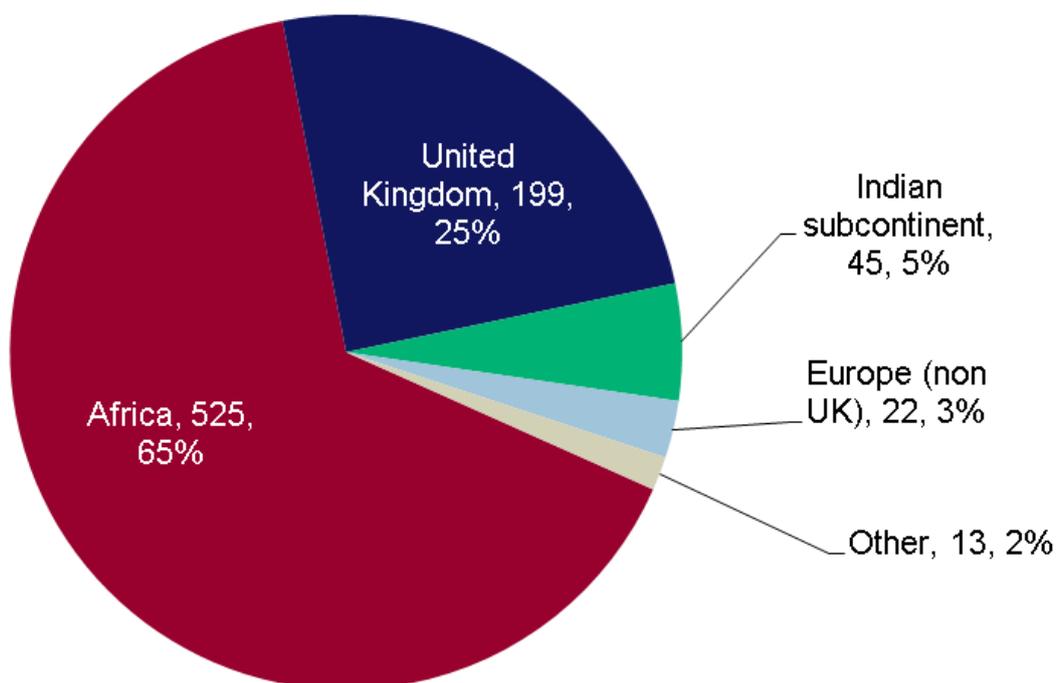


Table 3. Malaria cases that travelled abroad from the UK by region of birth and proportion of VFR travellers: 2017 (N=740)

Region of birth	N*	VFR**	% VFR
Africa	476	462	97%
Europe - UK	186	75	40%
Indian subcontinent***	44	40	91%
Other****	34	21	62%

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

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

*** Indian subcontinent here includes: Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka

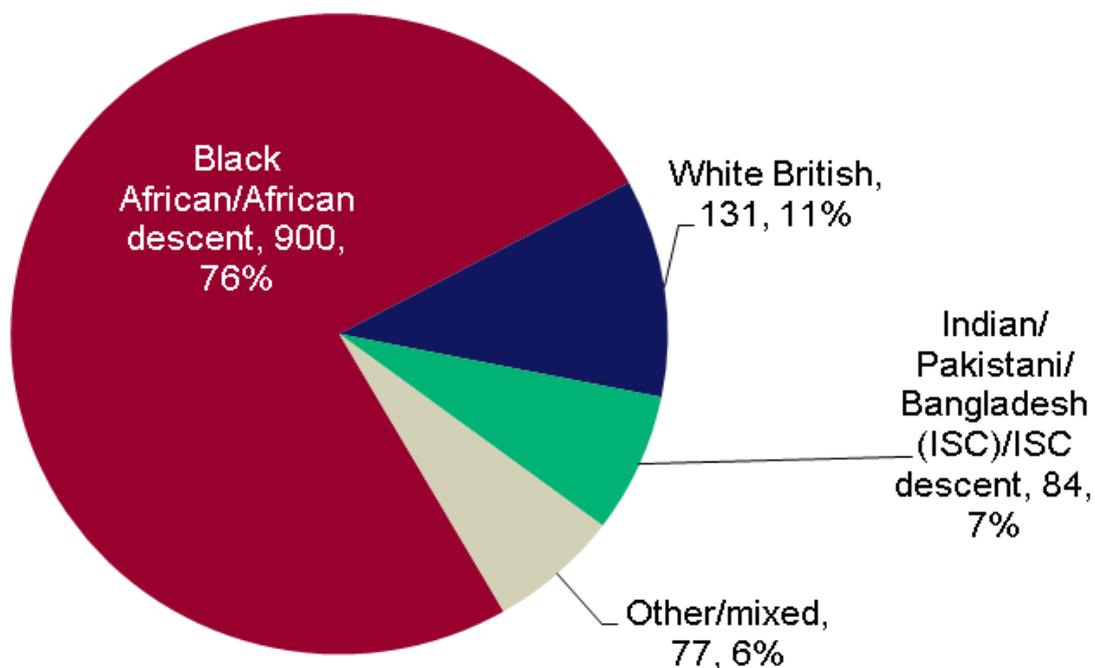
**** includes non UK Europe

Ethnicity for cases that travelled abroad from the UK

Where ethnicity was known, over three-quarters of malaria cases that travelled abroad from the UK were of Black African ethnicity or African descent (76%, 900/1,192) (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, 805/879 (92%) were VFR travellers.

Figure 4. Ethnicity for malaria cases that travelled abroad from the UK: 2017 (N=1,192)



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 66% acquired in Western Africa (810/1,221), 13% in Eastern Africa (155/1,221) and 8% in Middle Africa (94/1,221).

While it is important not to over-interpret changes in individual countries because numbers are low, the number of cases acquired in 14 of the top 20 countries increased in 2017 compared to 2016. The largest increases were observed in Nigeria, where there was an increase from 364 cases in 2016 to 470 cases in 2017 (29%), and in Côte d'Ivoire, where the number of cases increased by 75% from 32 in 2016 to 56 in 2017. There was also a 35% increase in the number of cases in Sierra Leone in 2017 from 91 to 123 cases.

No cryptic cases were reported in 2017.

Table 4. Cases of malaria that travelled abroad from the UK by species and region of travel: 2017 and 2016

Region of travel	P. falciparum	P. vivax	P. ovale	P. malariae	Mixed	P. knowlesi	2017 total	2016 total
Western Africa	738	-	48	18	6	-	810	638
Eastern Africa	125	4	15	11	-	-	155	147
Middle Africa	84	-	7	3	-	-	94	120
Northern Africa	12	-	-	2	-	-	14	17
Southern Africa	8	-	-	-	-	-	8	3
Africa unspecified	10	1	-	-	-	-	11	6
Southern Asia	2	86	-	1	-	-	89	82
South-Eastern Asia	-	2	-	-	-	2	4	2
Western Asia	-	3	-	-	-	-	3	-
South America	2	4	-	-	-	-	6	3
Caribbean	-	-	-	-	-	-	-	2
Oceania	-	2	-	-	-	-	2	2
Not stated	19	3	2	1	-	-	25	22
Total	1000	105	72	36	6	2	1221	1044

Table 5. Cases of malaria that travelled abroad from the UK by species and top 20 countries of travel: 2017 and 2016

Country of travel	P. falciparum	P. vivax	P. ovale	P. malariae	Mixed	P. knowlesi	2017 Total	2016 Total
Nigeria	416	-	37	12	5	-	470	364
Sierra Leone	116	-	4	3	-	-	123	91
Ghana	108	-	3	1	1	-	113	102
Côte d'Ivoire	52	-	3	1	-	-	56	32
Pakistan	-	53	-	-	-	-	53	49
Uganda	43	-	5	2	-	-	50	64
Cameroon	39	-	6	-	-	-	45	47
Kenya	23	-	2	2	-	-	27	24
Congo	23	-	1	-	-	-	24	29
India	1	20	-	1	-	-	22	23
Tanzania	19	1	1	-	-	-	21	14
Angola	12	-	-	3	-	-	15	31
Sudan	12	-	-	2	-	-	14	17
Afghanistan	1	13	-	-	-	-	14	9
Guinea	13	-	-	-	-	-	13	7
Malawi	10	1	1	1	-	-	13	12
Zambia	8	-	1	2	-	-	11	7
Rwanda	5	-	2	2	-	-	9	4
South Sudan	6	-	1	2	-	-	9	4
South Africa	8	-	-	-	-	-	8	3
Other Western Africa	33	-	1	1	-	-	35	42
Other Eastern Africa	11	2	2	-	-	-	15	18
Other Middle Africa	10	-	-	-	-	-	10	13
Other Southern Asia	-	-	-	-	-	-	-	1
Africa unspecified	10	1	-	-	-	-	11	6
South America	2	4	-	-	-	-	6	3
South-Eastern Asia	-	2	-	-	-	2	4	2
Western Asia	-	3	-	-	-	-	3	-
Caribbean	-	-	-	-	-	-	-	2
Oceania	-	2	-	-	-	-	2	2
Not stated	19	3	2	1	-	-	25	22
Total	1000	105	72	36	6	2	1221	1044

Prevention and treatment

Chemoprophylaxis

Among patients with malaria who had travelled abroad from the UK, where the history of chemoprophylaxis (antimalarial medication) was obtained, 738/864 (85%) had not taken chemoprophylaxis.

Of those that had taken some form of chemoprophylaxis (N=126), 108 stated which drug they took and of these, 87 (69%) had taken a drug that was recommended to UK travellers for their destination by the PHE Advisory Committee for Malaria Prevention (ACMP) [3]; however, this only represented 10% (87/864) of the total cases where chemoprophylaxis information was available. Note that whether the cases had taken the drug regularly was not known and should also be taken into consideration when interpreting these data.

Although 2017 data are similar to the last 5-6 years, in the early 2000s the proportion of those with malaria 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 10% 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, such as 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 or may have concerns about the cost of drugs. Probably all these factors contribute. 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. The PHE Malaria Reference Laboratory is working with ADAAM (African Diaspora Action Against Malaria) to facilitate diaspora-led initiatives to improve malaria prevention.

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: [https://www.journalofinfection.com/article/S0163-4453\(16\)00047-5/fulltext](https://www.journalofinfection.com/article/S0163-4453(16)00047-5/fulltext).

References

1. Cathcart SJ, Lawrence J, Grant A, Quinn D, Whitty CJ, Jones J, *et al.* Estimating unreported malaria cases in England: a capture-recapture study. *Epidemiol Infect* 2010; 138 (7): 1052-8.
2. Public Health England. Imported malaria in the UK: statistics [online] [accessed 7 June 2018]. Available at: <https://www.gov.uk/government/publications/imported-malaria-in-the-uk-statistics>
3. Chiodini PL, Patel D, Whitty CJM and Laloo DG. Guidelines for malaria prevention in travellers from the United Kingdom. London, Public Health England, October 2017 [online] [accessed 22 May 2018]. Please see: <https://www.gov.uk/government/publications/malaria-prevention-guidelines-for-travellers-from-the-uk> for the most up to date version
4. Public Health England. Notifications of infectious diseases (NOIDs) [online] [accessed 7 June 2018]. Available at: <https://www.gov.uk/government/collections/notifications-of-infectious-diseases-noids>
5. Public Health England. Notified diseases: 2017 annual figures [online] [accessed 7 June 2018]. Please see: <https://www.gov.uk/government/publications/notifiable-diseases-annual-report> for the most up to date version
6. Smith AD, Bradley DJ, Smith V, Blaze M, Behrens RH, Chiodini PL, *et al.* Imported malaria and high risk groups: observational study using UK surveillance data 1987-2006. *BMJ* 2008; 337:a120. doi: 10.1136/bmj.a120
7. United Nations Statistics Division. Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings [online]. Accessed 9 April 2014. Available at: <http://millenniumindicators.un.org/unsd/methods/m49/m49regin.htm>
8. Broderick C, Nadjm B, Smith V, Blaze M, Checkley A, Chiodini PL, Whitty CJM. Clinical, geographical, and temporal risk factors associated with presentation and outcome of vivax malaria imported into the United Kingdom over 27 years: observational study. *BMJ*. 2015 Apr 16; 350:h1703. doi: 10.1136/bmj.h1703.
9. Checkley AM, Smith A, Smith V, Blaze M, Bradley D, Chiodini PL, *et al.* Risk factors for mortality from imported falciparum malaria in the United Kingdom over 20 years: an observational study. *BMJ*. 2012 Mar 27; 344: e2116. doi: 10.1136/bmj.e2116.
10. Wagner KS, Lawrence J, Anderson L, Yin Z, Delpech V, Chiodini PL, *et al.* Migrant health and infectious diseases in the UK: findings from the last 10 years of surveillance. *J Public Health* 2014; 36 (1): 28-35
11. Public Health England. Migrant Health Guide [online]. Available at: <https://www.gov.uk/topic/health-protection/migrant-health-guide>