The burden of imported malaria among Nigerians and Ghanaians living in London: Understanding the influences of the social, cultural, environmental, economic and structural context.

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I, Penelope Elizabeth Neave, confirm that the work presented in this thesis is my own.

Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

The majority of reports of imported malaria in Europe come from the UK, France, Germany and Italy. Most of those affected are of African origin visiting friends and relatives (VFRs). There is little understanding of the factors that enhance and constrain effective malaria prevention practices in this group. Two studies were undertaken to investigate this.

An epidemiological analysis of 13813 reports made in the UK between 2001 and 2008 showed that 58% lived in London, where 83% of infections were caused by *Plasmodium falciparum*. The rate per 100 000 of falciparum infections in the capital in 2008 in those categorised as of "Black African" ethnicity was 131.0 (CI: 120.0-142.1), compared to 0.3 (CI: 0.2-0.5) amongst the "White British".

To investigate factors influencing the behaviours of VFRs, semi-structured interviews were undertaken with African VFRs resident in the UK visiting Nigeria and Ghana (n = 20), malaria patients (n= 6), practice nurses (n= 10), GPs (n = 10), community pharmacists (n= 7) and hospital consultants (n= 3).

Factors influencing the use of mosquito avoidance methods included knowledge about the local environment, a perceived inevitability of contracting malaria, and a desire to use methods common amongst host families. Chemoprophylaxis use was influenced by perceptions of susceptibility, by previous experiences of malaria, perceptions of the seriousness of malaria, and peer pressure. Relevant structural factors included the cost of chemoprophylaxis and difficulties in accessing health advice.

This research showed that in managing malaria, VFRs choose pragmatically between two parallel social and environmental contexts and the structural constraints associated with each. A novel conceptual framework shows the complex manner in which these interact, and may be appropriate in different countries and also in future research investigating other travel-related diseases in migrants. Practical recommendations for research priorities within the UK imported malaria context are made.

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Acronyms

ABTA	Association of British Travel Agents
ACMI	Integrated Management of Childhood Illnesses
ACT	Artemisinin Combination Therapy
A&E	Accident and Emergency
AIDS	Acquired Immune Deficiency Syndrome
CI	Confidence Interval
DH	Department of Health
EIR	Entomological Inoculation Rate
G6PD	Glucose-6-Phosphate Dehydrogenase
GP	General Practitioner
HES	Hospital Episode Statistics
HIV	Human Immunodeficiency Virus
HPA	Health Protection Agency
HTD	Hospital for Tropical Diseases
IPS	International Passenger Survey
ITN	Insecticide Treated Net
LSHTM	London School of Hygiene and Tropical Medicine
LSL	Lambeth, Southwark and Lewisham
MRL	Malaria Reference Laboratory
NOIDS	Notifications of Infectious Diseases System
NHS	National Health Service
ONS	Office for National Statistics
PCT	Primary Care Trust
R&D	Research and Development
SP	Sulfadoxine Pyrimethamine
SELHPU	South East London Health Protection Unit
TB	Tuberculosis
VFR	Visiting Friends and Relatives
WHO	World Health Organisation

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Chapter one: definition of imported malaria and its epidemiology in the UK after the 2nd World War; study rationale; aims and objectives.

1.1 Estimates of global migration, the definition of imported malaria and its incidence in the UK

It is estimated that in 2010, 3.1% of the global population lived outside their country of birth, representing nearly 214 million people (United Nations, 2009 p.147). Europe is host to about one third of this number (United Nations, 2009). It has been noted that whilst the health concerns of many migrants will be similar to the indigenous population, they may be more at risk of certain infectious diseases which are endemic in their country of origin, but not in the host nation (Health Protection Agency, 2011b). Malaria is an example of a disease that can still have an impact in countries from which it has been eliminated. "Imported malaria" has been described as "an infection that was acquired in an endemic area by an individual (either a tourist or indigenous native) but diagnosed in a non-endemic country after development of the clinical disease" (Muentener et al., 1999 p.561). In the UK, there was an average of 1965 laboratory confirmed reports of imported malaria infections between 1987 and 2006 (Smith et al., 2008). The number of reports made is likely to be an under-estimate of the true incidence. A capture-recapture study comparing reports made to the UK's Malaria Reference Laboratory (MRL), where national epidemiological surveillance is conducted, with Hospital Episode Statistics (HES), which provide details of hospital admissions, concluded that between July 2003 and December 2004, only 56% of all cases, 66% of falciparum cases and 62% of cases in London were reported to the MRL (Cathcart et al., 2009).

1.2 Imported malaria in the UK since the Second World War

Bradley states that there are three factors which determine the incidence of imported malaria: levels of endemicity in malarious countries; the amount of migration into the non-malarious country, and the use of chemoprophylaxis and other preventative measures by those visiting countries where malaria can be contracted (Bradley, 1989). His synopsis of malaria infection in the UK after 1945, and more recent trends in malaria epidemiology, described by Smith and colleagues, demonstrate the relevance of these three factors (Bradley, 1989, Smith et al., 2008). After an increase in the number of cases of imported malaria when troops returned after the end of the Second World War, the number of reports made each year remained below 500 until 1973, with increases only seen as a result of involvement in other foreign conflicts, such as the Korean war (Bradley, 1989). From the early 1970s, the number of reports, predominately caused by *P. vivax*, began to increase, and vivax cases constituted the

highest proportion of the reports of imported malaria in the UK, contributing over 1000 cases each year until 1982. This increase was thought to be caused by people arriving to settle in the UK from Asian countries, and their subsequent trips back to these countries to visit friends and relatives, coupled with high rates of vivax malaria in Asian countries following eradication failures (Bradley, 1989). The incidence of cases caused by *P. vivax* then declined to just under 1000 cases a year, but continued to be the main species of malaria causing imported infections in the UK until 1988, including a brief resurgence in incidence to over 1000 cases in 1986 and 1987 (Bradley, 1989). After 1988, a decrease in vivax infections began, and this has been sustained (Smith et al., 2008). Whilst cases of *P. vivax* contributed 3954 (40%) to the total number of reports of imported malaria reports in the UK between 1987 and 1991, they only accounted for 1244 (14%) of this total between 2002 and 2006 (Smith et al., 2008). Successful control efforts in urbanised areas of countries within Asia where most travellers stay have been identified as a likely cause of this decline (Smith et al., 2008).

From 1988 onwards, cases of falciparum malaria diagnosed in the UK, but acquired in particular in West Africa began to increase (Bradley, 1989). Falciparum malaria is the most serious form of malaria, not only because of the severity of symptoms it causes, but also because of the high levels of mortality which can be attributed to it. Between 1987 and 1991 there were cumulatively 5120 reports of imported malaria, of which 51% were caused by *P. falciparum*. Between 2002-2006, the cumulative incidence of reports of falciparum malaria had risen to 6753 (76%), of the total number of reports (Smith et al., 2008). Reasons for the increase are thought to be the result of immigration from, as well as subsequent travel to visit friends and relatives in highly malaria-endemic countries of Africa (Bradley, 1989, Smith et al., 2008), exacerbated by chloroquine resistance in these countries (Bradley, 1989). Another factor contributing to this picture of increasing disease incidence has been described as the failure by those visiting friends and relatives to take chemoprophylaxis, with only 7% of those visiting friends and relatives (VFRs) reported to have used this protection against malaria between 1999 to 2006 (Smith et al., 2008). Between 1996 and 2007 there were 183 deaths caused by infections with *P. falciparum* in the UK, a case fatality rate of 7.4 (95% confidence interval (CI): 6.3 to 8.5) per 1000 (Smith et al., 2008).

1.3 Current epidemiology of imported malaria in the UK

Those people resident in the UK who visit friends and relatives in African countries currently constitute the largest proportion of travellers who return with the disease (Smith et al., 2008). Similarly, in a review of 14 studies of imported malaria in Australia, the USA and Europe carried out between 1984 and 2007, which included eight studies from Europe, between 21.1% and 68.3% of all cases were in VFRs (Pavli and Maltezou, 2010). No other reason for travel accounted for such a high proportion of reports, and between 57% and 94.5% of all imported malaria reports in the studies included in the review were acquired in Africa (Pavli and Maltezou, 2010). Recent data from TropNetEurop a European-wide sentinel surveillance system, demonstrated that in 2009, Nigeria, Ghana, Cameroon and Benin were the area where most falciparum infections were acquired (TropNetEurop, 2010). The UK-based epidemiological study carried out by Smith and colleagues and referred to above, found that half of all falciparum cases between 1987 and 2006 were in those visiting Nigeria or Ghana (Smith et al., 2008). These data suggest that just as globally most of the burden of malaria disease lies in Sub-Saharan Africa (Tatem et al., 2010), so the current epidemiology of imported malaria in European countries mirrors this distribution in incidence.

There is some evidence of a recent reduction in the burden of imported malaria caused by *P. falciparum* from West Africa, with a study showing an annual 9.8% (CI: 6.5-13%) decrease in reports between 1993 and 2008 made to the MRL amongst VFR travellers to four West African countries (Nigeria, Ghana, Sierra Leone and the Gambia) (Behrens et al., 2008). The authors noted that this decline occurred despite published evidence of the low use of malaria chemoprophylaxis amongst VFRs visiting Sub-Saharan Africa during at least part of this time period (1999 to 2006) (Smith et al., 2008). Behrens and colleagues concluded that a simultaneous reduction of 7.9% in reports of patients who were treated for malaria in the UK, but who were normally resident in West Africa, led to the most likely explanation for the findings being that declining transmission in West African countries linked to increased urbanisation, and successful control methods in West African countries, such as greater use of insecticide-treated bednets may have accounted for this decrease (Behrens et al., 2008). However, the authors acknowledged that 29% of malaria reports made to the MRL during the time period in which the study was conducted did not have the reason for travel completed, and 12% of reports did not

include the country visited. These limitations need to be borne in mind when interpreting the findings. Nevertheless, a similar study analysing national surveillance data from the Netherlands also reported a declining incidence of imported malaria between 2000 and 2007 (Van Rijckevorsel et al., 2010). As in the UK, the majority of travellers were VFRs visiting Nigeria and Ghana. These authors explained that there was no evidence of a decrease in malaria incidence within these African countries which might explain the findings, and speculated that the reduction may be caused by travellers putting more effort into mosquito control methods and staying in better quality housing in urban areas.

More recent data from the MRL show an increase in the total number of reports of malaria, from 1370 in 2008, to 1495 in 2009 and to 1761 in 2010 (Health Protection Agency, 2010, Health Protection Agency, 2011a), although more data and a detailed analysis of these, including a comparison of incidence with changes in the volume of VFR travellers will be required to determine more long-term trends.

As stated above, in the UK, about half of all reports of malaria cases were acquired in Nigeria or in Ghana (Smith et al., 2008). A recent analysis of technical and operational factors which might affect the likelihood of achieving malaria elimination in malaria-endemic countries has indicated that with respect to both Nigeria and Ghana, the intensity of transmission and the amount of malaria which is imported into these countries are likely to be their main barriers to malaria elimination. Operational factors such as government stability, adequate infrastructures and health systems, political commitment to eliminating malaria, and the size and poor access to medical services for the population at risk will also contribute (Tatem et al., 2010). Previous attempts to eradicate malaria were judged to have failed partly for these operational reasons and partly because of vector resistance to insecticides and parasite resistance to chloroquine (Bruce-Chwatt, 1987). As Bradley points out, "history has shown the importance of unexpected and relatively unpredictable events in determining the amount of imported malaria" (Bradley, 1989 p.9). This, he claims makes it difficult to determine future patterns (Bradley, 1989). As a result of these uncertainties, and the difficulties associated with eliminating malaria in malaria-endemic countries visited by many VFRs, it likely that malaria will remain a public health problem in the UK for several years to come.

1.4 Study rationale

There are several reasons which make it worthwhile to understand the factors that contribute to the incidence of malaria in the West African community in London.

Firstly, malaria is a commonly reported travel-related illness. For example, between 1997 and 2006, malaria was one of the most commonly reported diagnoses in travellers with systemic febrile illnesses who presented to clinics in non-malaria endemic countries that are part of a world-wide sentinel surveillance system (Wilson et al., 2007). However, this disease is almost entirely preventable. For this reason alone, reducing the incidence of malaria infections will make a significant impact on the prevention of travel-related illness, and as such is a worthwhile Public Health challenge. Understanding the factors that contribute to this incidence is central to the development of appropriate interventions to achieve this.

Secondly, it is recognised that one focus of research into imported malaria in the UK should be on West African communities visiting friends and relatives, as they bear a disproportionate burden of these infections (Muentener et al., 1999, Smith et al., 2008, Zuckerman, 2008). Despite this, few data are available on why many members of the African Diaspora do not protect themselves against malaria when travelling to a malarious country (Neave et al., 2010).

Thirdly, the topic of imported malaria raises fundamental questions about the control of infectious diseases in an early 21st century dominated by increased migration and travel. On the one hand, Angell and Cetron point out that the means exist to prevent most travel-related illnesses such as malaria, but structural barriers, such as poor access to pre-travel health advice and prevention tools may be the barrier to achieving this (Angell and Cetron 2005). On the other hand, it may be that national boundaries are no longer sufficient to achieve the control of diseases. As Lee claims, "spatial or geographical boundaries, in particular the territorial borders of states, are becoming relatively less important as a consequence of globalisation" (Lee, 2002 p.6), whilst Gushulak makes the point that "many of the health threats, risks, and challenges related to health outcomes due to migration result from factors and influences present outside the jurisdiction and hence the direct influence, of the migrant-receiving nations" (Gushulak, 2010 p.4). While these views are not necessarily contradictory, they do

represent different ways of approaching the problem of disease control in the 21st century. However, whichever view point is adopted, little progress will be made without a better understanding of the factors that influence the health behaviours of migrants in general. This is true of malaria as it is of any other imported disease. In this thesis, I am concerned with addressing this gap in understanding the contextual factors that influence the health behaviours of migrants resident in a non-endemic country who acquire malaria when visiting friends and relatives living in a malaria endemic country.

1.5 Aims and objectives of the study

The aim of this research is to understand the factors that contribute to the burden of imported malaria among Nigerians and Ghanaians living in London. The objectives are:

- To investigate the epidemiology of imported malaria in the UK between 2001 and 2008
- To explore the perceptions and experiences of malaria among London residents visiting friends and relatives in Nigeria and Ghana
- To describe the perceptions and experiences of health professionals providing pre-travel advice and post travel treatment for malaria in London
- To explain the factors the enhance and constrain the uptake and effective use of malaria prevention and treatment among London residents visiting friends and relatives in Nigeria and Ghana

Chapter two: Malaria: the vector, parasite and environmental factors affecting transmission; symptoms and loss of immunity; prevention, diagnosis and treatment.

The first section of this chapter gives details of the malaria vector and parasite, and explains the environmental factors which facilitate transmission. This is followed by a discussion of how immunity to malaria is acquired, then lost upon leaving a malarious country and describes those genetic factors which may affect susceptibility to malaria. The second section provides details of the UK's recommendations on malaria prevention, diagnosis and treatment. Comparative details of diagnosis and treatment recommendations in Nigeria and Ghana are also given. The chapter concludes by describing how National Health Service (NHS) pre-travel health services with respect to malaria prevention are organised in the UK.

2.1 Malaria transmission

2.1.1 The malaria vector

Although there are about 70 species of mosquito that can transmit malaria, approximately 40 of these are considered to be vectors that are of medical importance because of their ability to transmit malaria (Service, 1996 p.39). In Sub-Saharan Africa, the three species of malaria-transmitting mosquito vectors considered particularly important are *Anopheles Arabiensis*, *Anopheles Funestus*, and *Anopheles Gambiae* (Service, 1996 p.41). All three species bite humans both indoors and outdoors from dusk to dawn. Therefore, individuals should take particular care to protect themselves from mosquito bites during these times. The resting position of mosquitoes is also relevant for malaria control, as it impacts on the effectiveness of household spraying (Service, 1996 p.38). With respect to *Anopheles Arabiensis*, *Anopheles Funestus*, and *Anopheles Gambiae*, although all three species rest mostly indoors, they do not do this exclusively.

The larval stages of the anopheles mosquito require water for their development. These can be temporary collections of water such as the small puddles found in tin cans, car tyres, axils of plants and tree holes, as well as more permanent bodies such as swamps, marshes, and ponds. However larger bodies of water where predators of mosquito larvae, such as fish, may be present are generally not preferred (Service, 1996 p.37). Some anopheles species prefer to live in either sunlit areas, for example, *Anopheles Arabiensis and Anopheles Gambiae*, whilst others, such as *Anopheles Funestus* prefer the shade (Service, 1996 p.42-44).

2.1.2 The malaria parasite

Four species of malaria parasite (*P. falciparum, P. vivax, P. ovale* and *P. malariae*) commonly cause malaria in humans, although cases of infections with *P. knowlesi* have been reported (Singh et al., 2004). Infections caused by *P. falciparum*, most commonly acquired in Sub-Saharan Africa, are responsible for the majority of global malaria-related illness and death (Snow et al., 2005).

The parasites which cause malaria in humans live for part of their life-cycle in the human host (the intermediate host), and part of their life in the mosquito (definitive host). When a human is bitten by a mosquito that has been infected with the malaria parasite, sporozoites are injected from the insect into the human body and those that are not killed by the immune system migrate to the liver within about half an hour.

There are two stages to the life cycle of the plasmodium parasite that take place within the human body. The first is termed exo-erythrocytic schizogony, and is a period of asexual multiplication of the parasite. During this stage, on entering the liver, sporozoites become schizonts. Within each schizont, thousands of merozoites are formed. For *P. falciparum* infections, this stage of the life cycle lasts between five to seven days. In the case of *P. vivax* and *P. ovale*, liver schizonts can remain dormant for a period of months or years, causing re-activation of disease at a later date. (Health Protection Agency, 2007b)

The second stage of the life cycle of the parasite within the human host is called erythrocytic schizogony, and occurs when merozoites leave the liver and enter the blood, invading red blood cells. Within these red blood cells they form trophozoites, which initially resemble rings with the edges thicker than the centre. These trophozoites divide asexually to form schizonts. New merozoites are then formed from these schizonts. Upon rupture of the red blood cell, merozoites are released and invade more red blood cells. Fever and other clinical symptoms of malaria occur with the release of new merozoites and invasion of more red blood cells, with the cycle of invasion of red blood cells by each generation of merozoites occurring on average 48 hours for infections with *P .falciparum*. However, there may be no regularity to the timing in which the cycle occurs. (Health Protection Agency, 2007b).

Instead of continuing the pattern of asexual replication, some trophozoites form gametocytes, the sexual stage of the parasite's life cycle. These are picked up by the mosquito when she bites an infected human. The life cycle of the parasite is completed within the mosquito, with sporozoites entering another human host when the mosquito bites, so repeating the cycle.

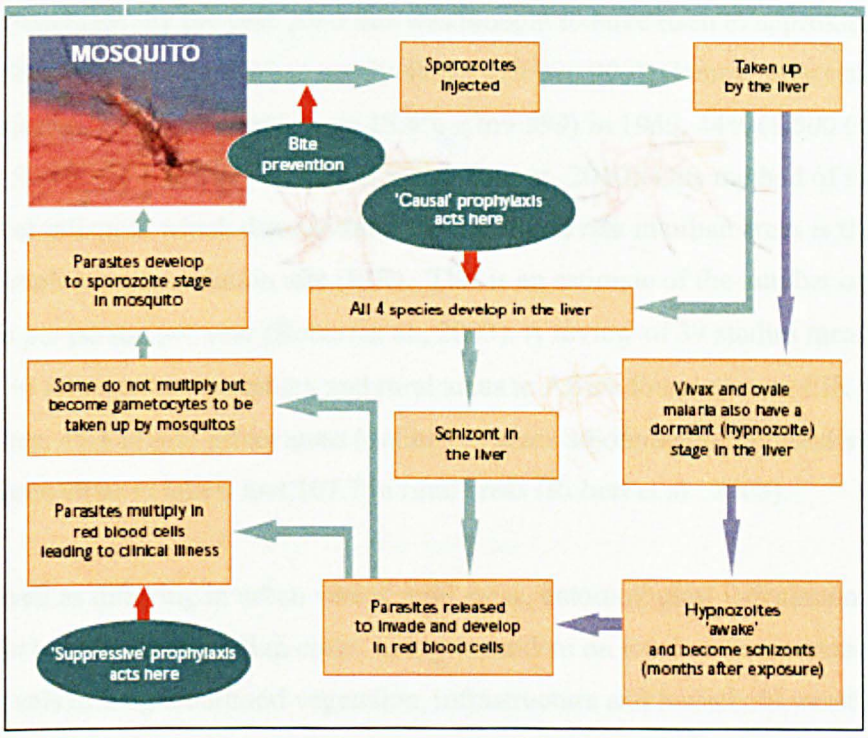

Figure 2.1.1 the life cycle of the malaria parasite within the human host, and the stages at which chemoprophylaxis can act.

(Source: Guidelines for malaria prevention in travellers from the United Kingdom (Health Protection Agency, 2007b). Reproduced with permission of Professor Peter Chiodini)

2.1.3 Environmental factors affecting malaria transmission

In many areas of West Africa, the temperature and rainfall levels mean that malaria may be transmitted throughout the year (MARA, 2004). However transmission rates may vary within countries in Sub-Saharan Africa (Snow et al., 2005). A range of factors have been proposed to explain how the local environment may affect the transmission of malaria. These include how land use provides opportunities for mosquitoes to breed, the density of the local population, local initiatives, such as vector control methods, individual and household factors, such as socio-economic

status, which may, for example impact on the material used for housing, larval and adult mosquito factors and climatic features (Robert et al., 2003).

As already described, increased urbanisation in West African countries including Nigeria and Ghana may be affecting the transmission of malaria (Behrens et al., 2008). Whilst in 1950, 10.2% (3 746 000) of the population of Nigeria were estimated to live in urban areas, by the year 2000 this was thought to have risen to approximately 42.5% (53 000 000), and by 2010 to nearly 49.8% (79 000 000). Comparative estimates for urban populations in Ghana were 15.4% (769 999) in 1950, 44% (8 500 000) in 2000 and 51.4% (12 524 000) in 2010 (United Nations, 2010). One method of measuring the risk of infection which demonstrates the decreased risk in urban areas is the entomological inoculation rate (EIR). This is an estimate of the number of infective bites per person per year (Robert et al., 2003). A review of 39 studies measuring this rate in urban, urban periphery and rural areas in Africa found a mean EIR of 7.1 in city centres, 45.8 in peri-urban areas (defined as areas adjoining market gardens, rice fields or those close to lakes) and 167.7 in rural areas (Robert et al., 2003).

As well as differing in urban versus rural areas, entomological inoculation rates also differ between areas within cities, being dependent on local environmental factors such as levels of neighbourhood vegetation, infrastructure and household wealth (Robert et al., 2003). Robert points out that poverty impacts on malaria transmission through a lack of access to health services, poor vector control measures, and because poorer people may live close to breeding ground for mosquitoes (Robert et al., 2003).

Although details of the country visited by VFRs are collected by the MRL, the area visited *within* these countries is not. This does not appear to be a variable collected in other European surveillance systems. As such, there is no clear evidence of whether VFRs visit urban or rural areas, or a mixture of both. Schlagenhauf and colleagues, in a review of imported malaria in five European countries, contend that VFRs are more likely to go to more rural areas, with simple non-air conditioned rooms, and where transmission rates are higher (Schlagenhauf et al., 2003). On the other hand, Bouchaud and other French colleagues, consider that Africans were more likely to take trips to urban areas compared to indigenous Europeans, based on a study in which it was found that of 252 African patients, 32% stayed in urban areas, compared to 13.5% of

99 European patients (Bouchaud et al., 2005). The difference in these perceptions could be due to the particular populations with whom the authors interacted, but demonstrate the paucity of information about these issues.

2.2 The symptoms of malaria, the development and loss of immunity

In malaria-endemic countries, two groups are at most risk of malaria. One of these is pregnant women, particularly those expecting their first child, who are susceptible to severe anaemia as a consequence of malaria infection (World Health Organisation, 2011a). Spontaneous abortion may also be a consequence, whilst babies born to malaria-infected women may suffer from the effects of low birth weight, as malaria may interfere with growth within the womb (World Health Organisation, 2011a).

The other group most at risk in malarious countries is young children. Passive immunity, that is, immunity passed from mother to child, is one reason why children in the first few months of life do not acquire malaria (Doolan et al., 2009). Whilst Doolan states that this immunity is thought to be passed in utero (Doolan et al., 2009), he also quotes one study which suggests that maternal antibodies may be transmitted through breast milk (Kassim et al., 2000).

Following the loss of passive immunity, children are at risk of developing clinical disease. Symptoms include headache, fatigue, abdominal discomfort and muscle and joint aches, usually followed by fever, chills, perspiration and anorexia. More serious life-threatening symptoms may occur. Severe malaria, almost always caused by infections with *P. falciparum*, has been defined by the World Health Organisation as "acute falciparum malaria with signs of severity, and/or evidence of vital organ malfunction" (World Health Organisation, 2010).

Through sustained exposure to the plasmodium parasite, active immunity is gradually acquired. This is dependent on repeated exposure to different strains of the same plasmodium i.e. it is strain-specific (Macdonald, 1950) and to the intensity and duration of exposure to malaria (Struik and Riley, 2004). There are three types of immunity, which are described by Doolan as follows:

> *"i) antidisease immunity, conferring protection against clinical disease, which affects the risk and extent of morbidity associated with a given parasite density*

ii) antiparasite immunity, conferring protection against parasitaemia, which affects the density of parasites

iii) premunition, providing protection against new infections by maintaining a low-grade and generally asymptomatic parasitaemia" (Doolan et al., 2009 p.14)

After acquiring a degree of immunity to malaria, provided there is repeated exposure to the plasmodium parasite, subsequent infections are likely to be mild or asymptomatic (Bloland and Williams, 2003 p.30, Struik and Riley, 2004). This protection develops in children from between the ages of two to five years in areas where malaria is transmitted throughout the year, such as Nigeria and Ghana. It is estimated that for full clinical immunity to be acquired, about five infections each year for a period of ten to 15 years are required (Doolan et al., 2009).

Those born in a malarious country but who are no longer exposed to infection, for example migrants who leave a malarious area, gradually lose the partial immunity they gained as a result of continuous exposure to malaria parasites. As a consequence of this, the World Health Organisation (WHO) recommends that chemoprophylaxis is taken by any individual travelling to a malarious country in the season during which malaria can be transmitted there, and who has lived outside a malarious area for more than six months (World Health Organisation, 2005a p.134, World Health Organisation, 2005b p134)). Despite these guidelines, the time period after which immunity against malaria is reduced after leaving a malarious country and the subsequent effect on the clinical course of a malaria infection acquired upon re-entry to a malarious country have been subjects of some debate. For example, in a comparison of 99 European and 252 African malaria-infected patients, Bouchaud and colleagues found that those patients born in Sub-Saharan African countries, all of who had been resident in France for more than four years, had fewer parasite densities, less frequent and severe symptoms, and more rapid clearance of both fever and parasite than patients born in Europe but who visited these countries. From this they concluded that immunity to falciparum malaria persists even after several years of non-exposure (Bouchaud et al., 2005). Other researchers have reported contradictory results. Bunn and colleagues studied 260 patients who had acquired malaria in highly malaria-endemic areas of Sub-Saharan Africa and who, upon return to the UK, had been admitted to the Hospital for Tropical Diseases between 1996 and 2003 (Bunn et al., 2004). They found no

significant difference between levels of mean parasitaemia at admission in patients not currently resident in a malarious country, compared to patients who were African visitors to the UK and so who were regularly exposed to malaria, with nearly a third of the latter group requiring parenteral treatment. Neither of these two studies however specifically reported on the ethnicity of their patients who had either been born or resident in African countries, and this could have impacted on their exposure to malaria-carrying mosquitoes during the time they were resident in malaria endemic countries.

Jennings and colleagues, in another study undertaken at the Hospital for Tropical Diseases (HTD) of 99 patients with falciparum malaria treated between 2000 and 2002, some who lived in Sub-Saharan Africa, and others who were resident in the UK, did compare patients by ethnicity and found that neither this, current residence in a malarious country nor previous exposure to malaria made any difference to the numbers of patients who acquired severe malaria compared to those who acquired uncomplicated malaria (Jennings et al., 2006). However, they acknowledged that these patients may not have been a representative sample of the wider population, constituting a group whose symptoms were severe enough to warrant them seeking medical treatment. Indeed, this is also true of the studies carried out by Bunn and Bouchaud (Bunn et al., 2004, Bouchaud et al., 2005), and there may be a cohort of patients of African ethnicity living in malaria-free countries who, if infected, experience symptoms which are sufficiently mild not to require hospital treatment. Jennings and colleagues also surmised that those patients taking part in the study who were normally resident in a malarious area and able to afford a trip to Europe may live in areas where there is relatively little exposure to malaria and that this may have accounted for the severity of their symptoms (Jennings et al., 2006).

More recently, Phillips and colleagues in a study of 676 patients treated in another London hospital found that those of white ethnicity were 8.2 times more likely than patients classified as being of Black African ethnicity to suffer severe malaria and that those who suffered previous malaria infections were also less likely to experience these severe symptoms (Phillips et al., 2009). The authors noted that the differences in their findings compared to those reported by Jennings and colleagues (Jennings et al., 2006) depended to some extent on the way in which the WHO definition of "severe

malaria" was interpreted in each study. However, they considered that even a few episodes of malaria may offer some protection against severe infections. One limitation to the study acknowledged by the authors was that there was no indication of the length of time that had passed since the previous infections reported by participants. Another, not noted by the authors, but of relevance, was that there was no information about whether the previously reported infections had been laboratory-confirmed to guarantee these were true malaria cases.

One explanation for the protection against severe malaria that has been reported in some studies is that the immunological mechanisms that protect against severe malaria remain after non-exposure to parasites, but inflammatory responses to relatively low parasite numbers cause clinical symptoms in those who have not been re-infected with malaria for a long period (Struik and Riley, 2004). Thus VFRs who have been bought up in a malarious country and then migrated to a non-endemic area will be symptomatic upon being re-infected, but severe symptoms and death will be less likely than for those who did not acquire semi-immunity at an early age. Support for this theory comes from case fatality rates of imported malaria reported in the UK between 1987 and 2006, which were significantly lower amongst people travelling to visit friends and relatives (0.25%) compared to people travelling for other purposes (1.9%) (Smith et al., 2008).

Mascarello and colleagues have emphasised that the *duration* of non-exposure may also have an effect on immunity (Mascarello et al., 2009). In their Italian study, two VFR patient cohorts were compared. Those patients who lived outside a malarious country for an average of *eight* years (range 1-19.7 years) had a higher parasitaemia rate and lower platelet count compared to those who had lived outside a malarious area for an average of *five* years (range 1-11 years).

These studies suggest that despite the duration of non-exposure to malaria of six months recommended by the WHO as the time after which malaria chemoprophylaxis should be taken, there is no clear evidence to support this. The findings also demonstrate the lack of consensus amongst experts about this issue, and summarise the on-going debate about the extent to which ethnicity can be used as an indicator to predict outcomes of infection.

2.2.1 Genetic factors affecting susceptibility to malaria

Two host factors known to affect susceptibility to malaria in some people of African descent are the genetic abnormalities sickle-cell anaemia and Glucose-6-phosphate dehydrogenase (G6PD) deficiency.

Sickle cell trait and disease affects the plasticity of red blood cells, causing them to block small blood vessels and disrupt the flow of oxygen. The greatest prevalence of sickle-cell disease is found in those with origins in Sub-Saharan Africa, India, Saudi Arabia and the Mediterranean (World Health Organisation, 2006). It is estimated that up to 2% of children in Sub-Saharan African countries are born with sickle-cell disease.

Individuals with sickle cell trait are carriers of the disorder and are thought to have some protection against malaria. However, it is recommended that they take chemoprophylaxis when travelling to a malarious country (Health Protection Agency, 2007b) . Those with sickle-cell disease are more likely to suffer from severe symptoms if they become infected with malaria and for these individuals, the Health Protection Agency recommends rigorous adherence to chemoprophylaxis and bite avoidance (Health Protection Agency, 2007b).

G6PD deficiency refers to the lack of an enzyme which protects the red blood cell against oxidative damage. This deficiency is thought to provide some protection against malaria. Differences in the methods used to measure prevalence affects the estimates of people thought to be affected by this condition (Nkhoma, 2009). However, controlling for these, the estimated prevalence of G6PD was 8.5% (CI: 7.9% to 9.1%) in studies carried out in Sub-Saharan Africa, compared to 5.2% (CI: 4.7% to 5.8%) in countries in the Americas (Nkhoma, 2009). Despite the protection that G6PD gives, all G6PD-deficient travellers are advised to take chemoprophylaxis when travelling to a malaria endemic country and to avoid taking primaquine, as it can cause haemolysis (Health Protection Agency, 2007b)

2.3 Recommendations for the prevention, diagnosis and treatment of imported malaria in the UK.

The World Health Organisation has specified four measures it considers important for the control of imported malaria (World Health Organisation, 2011b). To make these easier to recall, they are commonly termed ABCD; A: be Aware of the risk, the incubation period and the main symptoms; B: avoid being Bitten by mosquitoes, especially between dusk and dawn; C: Take antimalarial drugs (Chemoprophylaxis) to suppress infection where appropriate; D: immediately seek Diagnosis and treatment if a fever develops one week or more after entering an area where there is a malaria risk, and up to three months after departure (World Health Organisation, 2011b).

2.3.1 The prevention of imported malaria

The UK's Health Protection Agency's (HPA) "Guidelines for malaria prevention in travellers from the United Kingdom" endorses these WHO guidelines, and provides useful guidance on the first three of these components (Health Protection Agency, 2007b), which are summarised below.

Travellers should be aware of how malaria is transmitted when they are travelling to a malaria-endemic country and the level of risk when visiting an urban compared to a rural area. They should also know the incubation period for falciparum malaria (between seven to 14 days).

Methods of vector control recommended by the HPA include insect repellents which are used on the skin, and insecticides, which are sprayed within a room to kill mosquitoes. Repellents applied should contain up to 50% DEET. These are also considered suitable for pregnant women in all trimesters and for children older than two months of age. Covering of bare skin between dusk and dawn is also recommended to avoid being bitten by malaria-carrying mosquitoes.

The use of mosquito nets is recommended for rooms where there is not adequate screening of windows. It is advised that these should be treated with permethrin before use, and be re-impregnated every six to twelve months. Care should be taken to avoid tears or gaps in nets through which mosquitoes can penetrate. Permethrin-impregnated

nets can also be purchased, which maintain their protection for between three to five years.

The use of air conditioning in bedrooms is considered effective against mosquito bites as the temperature within the room is reduced sufficiently to deter mosquitoes. For the same reason, electric fans are also recommended.

The use of appropriate chemoprophylaxis is the third recommendation made by the WHO and endorsed by the HPA. The length of time before which malaria chemoprophylaxis should be taken and the duration of time after travel during which it should be continued are dependent on the mode of action of each type of chemoprophylaxis. These are shown in figure 2.1.1. Causal chemoprophylaxis acts against liver schizonts before they enter the blood stream. As these schizonts take up to seven days to develop in the liver, causal chemoprophylaxis should be continued for seven days after leaving a malarious country to ensure that all schizonts have been eradicated. Suppressive chemoprophylaxis acts against the blood stages of the parasite and for this reason need to be taken for several weeks after leaving a malarious area to ensure that all parasites are eliminated.

For visits to Sub-Saharan Africa, three chemoprophylactic drugs are considered appropriate. These are Atovaquone plus proguanil (AP), mefloquine and the antibiotic doxycycline. Atovaquone plus proguanil has both causal and suppressive actions. It should be taken for one to two days before arriving in a malaria-endemic area, daily during the period spent in the malarious country, and for a week after leaving. Mefloquine is a suppressive chemoprophylactic. It should be taken for two to three weeks before travel, weekly thereafter, and continued for four weeks after leaving a malarious area. Doxycycline is a suppressive chemoprophylactic. It should be taken for one to two days before travel, and continued for four weeks upon return. The efficacy of each of these three chemoprophylactic drugs is approximately 90% (Bradley and Bannister, 2003). Table 2.3.1 provides details of each regimen including the retail cost in 2009.

Table 2.3.1 Retail costs* and regimen of chemoprophylactic drugs suitable for adults going to a malarious area in Sub-Saharan Africa drugs (British National Formulary, 2009 pp. 404-411)

Name of drug	Dosage	Start and length of administration	Retail price*	Cost for traveller for a 14 day visit
Mefloquine	One tablet weekly	2-3 weeks before entering a malarious area, and four weeks after leaving	£29.06 for eight tablets	£32.69
Atavaquone plus proguanil (AP)	One tablet daily	1-2 tablets before entering a malarious area, and for one week after leaving	£50.42 for 12 tablets	£96.60
Doxycycline	One tablet daily	1-2 days before entering malarious area, and four weeks after leaving	£3.52 for 28 100mg tablets	£5.53

*prices are taken from the British National Formulary (British National Formulary, 2009) and the profit margin suggested by the National Pharmacy Association added to these to approximate a retail price. (personal communication: National Pharmacy Association)

2.3.2 The diagnosis of imported malaria

The UK's malaria prevention guidelines give details of the recommended method of malaria diagnosis in the UK (Health Protection Agency, 2007b). Where there is clinical suspicion of an infection with *P. falciparum*, a blood sample should be taken, treated with an anti-coagulant, and sent to the laboratory for analysis within an hour of the patient's presentation. The need for urgency is partly to enable swift commencement of treatment if malaria is confirmed, and also because laboratory identification of malaria parasites in blood becomes more difficult over time, because of contamination by the anti-coagulant used. The UK malaria guidelines emphasise that malaria diagnosis cannot reliably be made on the basis of clinical symptoms, and microscopy is the mainstay of laboratory confirmation, which can be used to identify both the species of parasite and the level of parasitaemia (Health Protection Agency, 2007b). Three negative tests carried out over three consecutive days are required to exclude malaria (Health Protection Agency, 2007b).

Only one study has quantified delays in malaria diagnosis in the UK, and this has focused on mis-diagnoses, rather than delays in ensuring the timely despatch of blood samples (Ladhani et al., 2003). This study described the epidemiology and treatment

of 211 children diagnosed with malaria and seen at a London hospital between 1996 and 2001. The majority, (93%) were of African ethnicity, and 75% were born in the UK. Ninety eight children had just visited Nigeria and 18 presented at the hospital whilst visiting the UK from Nigeria where they lived. Comparable figures for Ghana were 40 and six. A further 27 children lived in, or had just visited other African countries, including nine from Uganda. Twelve were from the Indian Sub-Continent. All those travelling to malaria-endemic countries were visiting friends or relatives. Of the 114 who had seen their General Practitioner (GP) before attending the Accident and Emergency (A&E) Department, an initial diagnosis of malaria was not made for 60 (53%) of children. Although the length of time between the initial presentation and malaria being subsequently diagnosed was just one day in 41 cases, it was between two to five days in 13 cases, and between seven and fourteen days in six cases. Diagnoses other than malaria made by GPs included upper respiratory tract infection (n=10); pneumonia (n=6); gastroenteritis (n=4); infected bites (n=2); appendicitis (n=1) and diagnosis not known (n=4). Upon presentation at the hospital, 104 (89%) were correctly diagnosed with malaria, either immediately, or after being admitted for further investigations. Three were sent home with a diagnosis of tonsillitis and one with gastroenteritis. All returned to the A&E Department when their symptoms did not improve. A further 68 family members of the child presenting were also diagnosed with imported malaria by the hospital at the same time, although they were not the family member who originally attended. The authors noted that delays in diagnosis were more common in those who initially presented at their GP surgery for treatment, compared to those who presented directly to A&E, and surmised that mis-diagnoses may have occurred because malaria was mistakenly assumed to be caused by other common childhood illnesses.

2.3.3 The treatment of imported malaria

The UK's malaria treatment guidelines are available for clinicians working in the UK (Lalloo et al., 2007). An overview of these with respect to infections with *P. falciparum* is given below.

The recommended treatment of uncomplicated falciparum malaria in adults in the UK is by use of oral therapies. These include either:

- quinine for five to seven days together with doxycylcine taken either at the same time or subsequently for seven days
- atovaquone Proguanil (AP) for three days
- artemether lumefantrine for three days

Sulfadoxine Pyrimethamine (SP) is not recommended for adults because of possible parasite resistance.

For adults with severe malaria, drugs should be administered parenterally, until patients are well enough to swallow, when the regimen should be continued for a total of seven days. As with uncomplicated malaria, oral doxycylcine should also be administered when swallowing is possible. Artesunate is an alternative, again given intravenously at first. Doxycylcine should be given simultaneously.

For children with uncomplicated falciparum malaria, the same drugs as for adults are recommended, but in lower doses. Treatment with SP, given with quinine, is also an option. Children with severe malaria in the UK should be treated only with intravenous quinine.

The guidelines recommend that all patients infected with *P .falciparum* should be admitted to hospital, as their condition can deteriorate rapidly. This is considered particularly important for children, the elderly and pregnant women who are more at risk of developing severe disease. Malaria specialists must be involved in the care of patients infected with *P. falciparum.* Although not included in the guidelines, the isolation of patients may be used until the possibility of the patient being infected with other infectious pathogens is excluded (personal communication Professor Chris Whitty).

Despite the national guidelines recommending that all patients with falciparum malaria should be treated as in-patients, these are not consistently followed, with one London hospital serving a large African community routinely treating patients with uncomplicated falciparum malaria as out-patients. This is because of the experience of

clinicians working at this hospital of this being a safe and effective method of treating these patients (personal communication Dr J Klein, Guys and St Thomas Hospital).

Although treatment options for imported malaria are not the main topic of this thesis, the choice of different treatment policies within London provides evidence of the ambiguity about the potential seriousness of imported falciparum malaria.

2.4 Diagnosis and treatment of malaria in Nigeria and Ghana

2.4.1 Diagnosis

In many African countries, including Nigeria and Ghana, malaria is commonly diagnosed on the basis of clinical symptoms (Bloland and Williams, 2003 p.58). This means that a diagnosis is made without the parasite being identified in a laboratory. The advantages of diagnoses based on clinical symptoms are clear for countries where there is limited access to specialist equipment and trained laboratory technicians who are able to use these methods of diagnosis (Bloland and Williams, 2003 p.58). Whilst rapid diagnostic tests are an alternative method, requiring minimal staff training, a deterrent to their use may be the prohibitive costs of the testing kits (Bloland and Williams, 2003 p.64).

One disadvantage of a diagnosis based on clinical symptoms is that mis-diagnoses may occur, meaning the true cause of the illness will not be identified (Bloland and Williams, 2003 p.58, Bell et al., 2006). As the symptoms of malaria are similar to many other diseases, this can also lead to delayed treatment of the real cause (Bloland and Williams, 2003 p.58). In addition, a delay in seeking appropriate treatment risks the likelihood of uncomplicated infection deteriorating into severe malaria (Dada and Omokhodion, 2007). In recognition of these issues, and because the inappropriate use of drugs can lead to drug resistance, in 2010, the WHO up-dated their malaria treatment guidelines (World Health Organisation, 2010). As part of this, they stated that wherever possible, all malaria must be parasitiologically confirmed before treatment is started. These guidelines are intended to ensure that there is more targeted, and so effective, use of Artemisinin Combination Therapies (ACTs), the current treatment regimen for falciparum malaria in Nigeria and Ghana, and that illnesses

which are found not to be malaria can be treated appropriately (World Health Organisation, 2010).

2.4.2 Treatment

2.4.2a Parasite resistance

Resistance to anti-malarial drugs arises when some parasites mutate to prevent the action of the drug being effective. Parasite resistance to chloroquine was first identified in 1960 in Columbia and Thailand, and spread to other areas of the world, including Africa (Bruce-Chwatt, 1987). A global monitoring report carried out by the WHO in 2005 found that in Nigeria between 1998 and 2003, the median clinical failure of chloroquine in 11 studies was 25.8% (range 2%-53.7%). For Ghana, during the same time period, median failure rates were 23.2% (range 9%-31.3%) (World Health Organisation, 2005c). This report also showed that there was some parasite resistance to SP. In Nigeria, median clinical resistance to this drug in seven studies carried out between 2001 and 2003 was 9.3% (range 5.7% to 43.5%), whilst in Ghana it was 3% (range 0%-5.2%) (World Health Organisation, 2005c).

The resistance of *P. falciparum* to chloroquine and to SP meant that there was a change in the recommended regimen for treatment in both Nigeria and Ghana to ACTs. This occurred in Ghana in 2004 and was implemented in 2005 (Republic of Ghana, 2009). In Nigeria the change was made in 2005 (Federal Republic of Nigeria, 2005).

Current recommended drug regimens for adults with uncomplicated falciparum malaria in countries in Sub-Saharan Africa are:

- artemether plus lumefantrine
- artesunate plus amodiaquine
- Artesunate plus mefloquine
- artesunate plus SP
- dihydroartemisinin plus piperaquine (World Health Organisation, 2010).

For adults with severe malaria, a parenteral dose of artesunate should be given, followed by a full course of anti-malarial treatment (World Health Organisation, 2010).

2.4.2b Treatment options and sub-optimal drugs

In Nigeria and Ghana, malaria symptoms are most commonly initially treated in the home (McCombie, 2002, Williams and Jones, 2004, Adongo et al., 2005). A recent study carried out in urban Nigeria found that this method was used to treat symptoms of malaria in 70% (80/108) of children and 70.3% (128/176) of adults (Adedotun et al., 2010).

Home treatment of malaria may initially take the form of sponging the patient with tepid water, watching to see if more serious symptoms develop, and the alleviation of symptoms by analgesics and by the administration of herbal medicines (Williams and Jones, 2004). Anti-malarial drugs taken may be those left over from treatment of previous malaria episodes, or purchased from a variety of outlets (Goodman et al., 2007). In Nigeria and Ghana, these may be sourced from the formal health sector, or bought from patent medicine vendors and pharmacies (Ahorlu et al., 1997, Onwujekwe et al., 2005b, Buabeng et al., 2007). Foster states clearly the benefits of the informal health sector: it is convenient and economical (Foster, 1995). In a more recent review of the practices of informal medicine vendors for the treatment of fever and malaria throughout Sub-Saharan Africa including Nigeria and Ghana, these findings were echoed, and specifically it was noted that in comparison to the formal health sector, the service offered is faster, opening times are longer, and staff are friendly and approachable (Goodman et al., 2007). However, this method of treatment may involve the use of inappropriate medicines being given, insufficient dosages of anti-malarials (Afolabi et al., 2004) and non-completion of the prescribed course, either because of the decision to save some tablets to treat future episodes, or because these may be given to friends and family members (McCombie, 2002).

Drugs purchased from a range of informal vendors as well as from the formal health service may be sub-optimal in quality. The problem of sub-optimal drugs are well recognised, not only in Africa, but throughout the world (Amin and Kokwaro, 2007).

The drug dispensed may contain none of the active ingredient, alternatively too much, or too little. Those which contain too much of the active ingredient may cause toxicity within the body. On the other hand, too little of the active ingredient means that symptoms may not be relieved in the patient.

Sub-optimal drugs may be the result of illegal counterfeiting, poor manufacturing, or a failure to maintain their storage at an appropriate temperature and humidity (Amin and Kokwaro, 2007).

A range of studies have tested the quality of drugs that are used for the treatment of malaria in Sub-Saharan African countries, including Nigeria and Ghana. For example, three studies investigating the proportion of sub-standard chloroquine tablets found that this ranged from 4% (2/54) (Onwujekwe et al., 2009) to 31% (10/32) (Shakoor et al., 1997), and to 87% (71/82) (Taylor et al., 2001). For SP, comparative proportions were ½ (50%) (Bate et al., 2008), to 39% (33/113) (Onwujekwe et al., 2009).

One study suggests that the numbers of sub-quality drugs that are sold in retail outlets may be decreasing. This was a study carried out in Lagos (in 2007, 2008 and 2010) and Accra (in 2007 and again in 2010). The proportion of "older monotherapies" (excluding chloroquine), artemisinin monotherapies and ACTs that failed tests fell over this time period (Bate and Hess, 2010). However, use of the most sophisticated techniques (spectrometry) to measure drug quality showed that around one third of some drugs tested in 2010 were sub-optimal, suggesting that this is still a problem, in these geographical areas at least. Further research is needed to corroborate these findings and detect trends.

2.5 Pre-travel health services in the UK with respect to imported malaria

The topics included in this section are the accessibility of pre-travel health advice; the length of time before travel within which health advice should be sought; the choice of clinic available to the traveller and the cost of chemoprophylaxis.

2.5.1 Access to pre-travel health advice

The Association of British Travel Agents (ABTA) recommends that before a contract is made between a client (i.e. a traveller) and any ABTA- approved company, they

must "inform their clients of health requirements that are compulsory for the journeys to be undertaken" and "advise clients travelling abroad to check recommended practice with their GP, practice nurse or travel health clinic" (Association of British Travel Agents, 2008 p.3).

Two studies have investigated the giving of pre-travel health advice to travellers by travel agents. One was a study undertaken before the 2008 ABTA advice was given (Grabowski and Behrens, 1996), the second study was conducted after this (Bazaz et al., 2010). The first used face-to-face interviews with 202 travel agents throughout the UK, of which 38/202 (19%) were located in London. Notes were made clandestinely by researchers about whether travel health advice was offered for people pretending to be planning a trip to popular holiday destinations in either Kenya or India, both malarious areas. Sixty one percent of travel agents did not volunteer any advice until prompted. However, of those working in the London area, 47% did issue advice, more than those than in other areas of the UK. Amongst those who did offer pre-travel health advice, about 20% gave what was described by the authors as "some malaria advice". After being prompted about risks to their health when travelling, the proportion who offered advice rose to 71%, with 63% mentioning a risk of malaria. However, nearly 10% did not give any travel advice at all, even when prompted (Grabowski and Behrens, 1996).

The second study, carried out after the ABTA guidance was issued, measured the availability and access of pre-travel advice about malaria offered on the internet by travel operators and airline websites (Bazaz et al., 2010). Of 29 websites on which on-line trips could be purchased to four malarious areas (Lagos, Banjul, Islamabad and Chiang Mai), only eight (28%) provided information about malaria on their own website, and only five (17%) of these provided country-specific information, described the most malarious areas within the country and provided details of appropriate chemoprophylaxis. For those agents who did not make advice available on their own website, eight (28%) did not have any links to other websites offering travel health advice. An average of 2.4 mouse clicks was required to access malaria-specific information for all 29 websites. It was also possible to purchase a ticket on all 29 websites without finding any malaria-specific advice, if the quickest method to do so was used. The authors concluded that the travel industry and Public Health institutions

need to work together to ensure that accurate pre-travel health advice is provided to travellers. They also commented that as many VFRs may use the internet to purchase tickets to travel to a malarious country, these websites offer a valuable opportunity to offer pre-travel health advice to this group.

The results of both these studies suggest that the provision of pre-travel health advice by travel agents is sub-optimal. It is not clear why this might be so. Possible reasons could be concerns about customers' unwillingness to take a trip once they are aware of health risks. Alternatively, travel agents themselves could be unaware of the possible health needs of their customers when visiting a malarious country. In the study by Grabowksi and Behrens, both trips planned were to popular holiday destinations, rather than areas typically visited by VFRs (Grabowski and Behrens, 1996), and this limits the extent to which the results may be extrapolated to this group.

For face-to-face pre-travel advice in the UK, travellers may use either a privately-funded travel clinic which charge for the use of their services, or the NHS, through which free travel health advice can be accessed. Since 2004, the UK's Department of Health (DH) has given GP practices the option not to provide travel health services, although this incurs a loss of 2% of their budget (Department of Health, 2004). In cases where GPs choose to opt-out of these services, the local Primary Care Organisation must however ensure the provision of such services for patients at another GP practice (Department of Health, 2004). One other factor relevant to the provision of NHS pre-travel health advices is that this is not included as one of the performance indicators introduced by the Government in 2004, entitled Quality and Outcomes Framework indicators, and for which General Practitioners receive financial rewards for good performance (The Health And Social Care Information Centre, 2011).

2.5.2 Length of time within which pre-travel advice should be obtained

There is no consistency to the advice given to travellers about the length of time before travel before which health advice should be sought by travellers. For example, the World Health Organisation recommends between four and six weeks (World Health Organisation, 2005a), whilst the UK's National Travel Health Network and Centre

advise at least six weeks (National Travel Health Network and Centre, 2011). Chiodini, a senior member of the UK's Royal College of Nursing's Travel Health Forum recommends that ideally, travellers should attend for pre-travel advice ideally at least eight weeks in advance (Chiodini, 2005). In the study by Bazaz and colleagues described above, 16 of 29 websites recommended that pre-travel advice should be sought from a doctor or travel clinic at least four weeks before travelling (Bazaz et al., 2010).

2.5.3 Operation of pre-travel health clinics

With respect to the optimal operation of a travel health clinic, Chiodini recommends the following:

- posters and other sources of information, such as the GP's practice website are used to emphasise the need to attend in good time for pre-travel health advice;
- travel clinics should be held at times that suit the work and school schedules of its patients, in order to avoid missed appointments. Late night clinics, held particularly on Fridays, and Saturday morning clinics are suggested
- first consultations for one or two travellers who attend the clinic together should be 30 minutes, or 45 minutes if larger groups of people travelling together seek advice on the same occasion
- follow-up appointments should be scheduled for five to ten minutes (Chiodini, 2005).

Little research has been carried out to evaluate the standard of pre-travel health advice provided by NHS-funded primary care. One study compared the standard of pre-travel advice given in 1996 and again in 2006 in clinics in the county of Bedfordshire, as measured by a self-administered questionnaire completed by GPs and by practice nurses (Chiodini, 2009). Indicators to measure this focused on knowledge and prescribing of chemoprophylaxis, the provision of information about mosquito avoidance methods, advice given about the risk of malaria after returning home, and the use of a protocol. Results from the more recent 2006 questionnaire indicated that nurses' knowledge was greater than that of GPs, and that few practices used a protocol when giving advice. The provision of information in more deprived areas of the study area, in which larger Asian and African communities lived, was poorer than in more

affluent areas. The study author noted that those who may be in most need of appropriate pre-travel health advice, could be those who in fact do not receive this (Chiodini, 2009).

Another study was carried out in South Cheshire Health Authority, in the North West of England (Hoveyda et al., 2004). This was a postal questionnaire study, sent to all 91 GP practices in the area. Of the 86% who identified themselves as the lead advisor of travel advice, 97% were practice nurses, with the remaining 3% GPs. A total of 38 different sources of information were used by respondents, which, the authors considered, may lead to inconsistent advice being offered. Despite 70% having access to the internet, the most popular source of information used by 72% of those giving pre-travel health advice was a wall immunisation chart. Thirty six percent of respondents used this as their main source of information. The authors noted that this information source may not offer comprehensive information on travel-associated health risks. Fourteen percent used Travax. (This is an interactive website, maintained by Health Protection Scotland, which is available to travel health care providers throughout the UK. For those working outside Scotland, there is annual charge of £100 for each practice which uses the service, or alternatively Primary Care Trusts (PCTs) may purchase a yearly licence for £1000 (Travax, 2011)).

The median amount of time that respondents spent on a pre-travel health consultation measured in the study by Hoveyda and colleagues was 11 minutes (range five to 30 minutes), and the most commonly reported duration was 15 minutes. Although the majority of the respondents claimed to cover the full range of travel health risks that might be faced by the traveller during the consultation, including mosquito avoidance methods, the authors questioned whether 15 minutes was enough time for pre-travel health advice to be given (Hoveyda et al., 2004).

2.5.4 Financing of malaria chemoprophylaxis

In 1995, the DH issued regulations that malaria chemoprophylaxis, previously available on NHS prescriptions (termed FP10s) must be paid for on a private (ie unsubsidised) prescription (Department of Health, 1995). Table 2.3.1 gave the cost of chemoprophylaxis issued on a private prescription for a trip by one adult to a malarious country in Sub-Saharan Africa for 14 days in 2009. In addition to these

costs, both GPs and community pharmacists may charge the patient for issuing and/or dispensing the private prescription respectively. Charges for this vary, both by individual GP and by community pharmacy (British National Formulary, 2009).

Concerns were raised after the 1995 policy change that the cost of private prescriptions may lead travellers to purchase ineffective over-the-counter drugs such as chloroquine instead of mefloquine (Evans, 1996). One commentator postulated that this may particularly affect the practices of travellers on low budgets (Hollyoak, 1995). Clinicians working in what they described as a "poor area" in the West Midlands, in which 9% of the community belonged to ethnic minority groups, claimed that one reason for a fall in the number of malaria prescriptions written in the area before and after the policy change, and an increase in local malaria notifications after the change could be due to an unwillingness of patients to purchase unsubsidised malaria chemoprophylaxis. Other reasons considered by the study authors that this might be the result of economic deprivation and unawareness of the availability of anti-malarial drugs (Badrinath et al., 1998). The authors also noted that an alternative explanation for the decrease in one of the anti-malarials prescribed, namely mefloquine, may have been adverse publicity about the possible side effects of this drug which were raised in the British media in 1995 (Badrinath et al., 1998).

More recently, a letter to the British Medical Journal by a locum GP working in London described her personal experience of patients deciding not to purchase chemoprophylaxis for their whole family once the cost was known, but choosing instead to prioritise their children. Others asked for a cheaper regimen (Hossain, 2008). However, no large scale surveys have taken place to evaluate any change in anti-malarial up-take following the DH's policy change.

The Lambeth, Southwark and Lewisham (LSL) Health Authority decided not to implement the 1995 DH regulations. This followed advice from the Public Health Department's Director of Public Health, that because of concerns that, given the already high burden of disease caused by imported malaria in the area, increasing the cost of prescriptions may provide a further barrier to the use of chemoprophylaxis (personal communication Dr Rachel Heathcock, South East London Health Protection Unit). Malaria chemoprophylaxis continued to be available for the cost of an NHS

prescription for all residents in these PCTs (organisations which replaced Health Authorities and which are largely co-terminous with London boroughs) throughout the period that the research for this thesis was undertaken. This cost ranged from £6.40 from April 2004 to £7.20 in April 2009. Residents in LSL exempt from prescription charges receive chemoprophylaxis for no cost.

These concerns by healthcare professionals about the possible outcomes of private prescribing of anti-malarial drugs, together with the decision by LSL Health Authority to refuse to implement the 1995 DH regulations demonstrate the somewhat contentious issue of the cost of malaria chemoprophylaxis and its impact on malaria infections.

2.6 Summary

In this chapter, a range of factors have been identified which are relevant to the transmission of malaria and to the natural history of the disease. A debate about the time required for immunity to malaria to be lost after leaving malaria has been summarised. The ways in which malaria is treated in the UK and in Nigeria and Ghana have been described, and of particular note are the differences between these countries. In one, the UK, regulatory frameworks constrain access to drugs and the provision of care, whilst in Nigeria and Ghana the informal health centre is used extensively and there is little reliance on formal medical services.

Policies in the UK relevant to malaria prevention have also been discussed. It was shown that there is no consistency to the time before travel during which pre-travel health advice should be sought, and that individual GPs practices may choose to opt-out of providing these services, albeit with some financial penalties. Although little research has been undertaken with respect to the operation of pre-travel health services, the limited data suggest that the typical duration of a consultation may be 15 minutes. The somewhat controversial nature of the policy surrounding the cost of chemoprophylaxis is another key issue described in this chapter.

A review of the academic literature about knowledge, attitudes and practices with respect to malaria prevention, diagnosis and treatment will form the focus of the next chapter. Also included is a discussion about what is meant by the term "VFR".

Chapter three: the definition of VFR; malaria knowledge, perception of risk and preventive and treatment seeking behaviours in VFRs and in Nigeria and Ghana.

This chapter begins by describing a recent debate about what is meant by the term "VFR" and what should be encompassed within this term. The second part of the chapter describes the primary research that has been undertaken to explore the knowledge, attitudes and practices of VFRs of African descent living in non-malarious countries with respect to malaria. Some will have been born in malarious countries and spent part of their lives there before emigrating. Thus, they will have been exposed not only to the personal risk of acquiring malaria, but also to local knowledge and practices of malaria prevention and treatment. Others may have been born in non-malarious countries, and exposed to these issues when visiting friends and relatives in malarious countries. In view of this, this chapter also includes research carried out to investigate knowledge and behaviours relating to malaria in Nigeria and Ghana, the two countries described by Smith and colleagues in the most recent epidemiological analysis of imported malaria in the UK as being those where most cases in the UK are acquired (Smith et al., 2008).

3.1 Definition of visiting friends and relatives

In the academic literature, a variety of terms has been used to describe those most at risk of imported malaria. These include "immigrant", "migrant", (Scolari et al., 2002) "non-national" (Schlagenhauf et al., 2003) and "ethnic minority" (Phillips-Howard et al., 1990a). Visiting friends and relatives (VFR) is also a term now commonly used in the literature (Semaille et al., 1999, Angell and Cetron, 2005), as well as in national and international policy documents (Health Protection Agency, 2007a, European Centre for Disease Prevention and Control, 2009).

There has recently been some disagreement about what is encompassed within the definition of a "VFR", and the characteristics of those to be included in the term (Arguin, 2010, Barnett et al., 2010, Matteelli et al., 2010). Barnett and colleagues argue that although there were three *implicit* components to the term traditionally used to define VFR, that is: i) ethnicity being different to the majority of the population; (ii) the purpose of travel being to visit friends and relatives; and (iii) in the country being visited there should be a higher prevalence of specific infectious diseases such as malaria, there was no standard definition (Barnett et al., 2010). They recommend a new definition of VFR to be used by clinicians, health professionals and researchers. This new definition, the authors assert, should include two components.

The first component put forward by Barnett and colleagues is that the purpose of travel should be to visit friends and relatives, thus assuming a proximity to the local population with respect to amongst other factors, "type of accommodation, mode of travel at the destination, exposure to food and water, intimate exposures, and access to social support systems including healthcare" (Barnett et al., 2010 p.165) A focus on purpose of travel, rather than ethnicity or immigration status they claim, will circumvent potential stereotyping and bias that may be associated with these terms. Importantly, they also state that "both race and ethnicity are inter-dependent variables within the broader concepts of socio-economics, genetics and biology, behaviour and environmental assessment" (Barnett et al., 2010 p.166). Therefore ethnicity should not be considered as a distinct level of analysis. The use of the new definition, the authors argue, will enable inclusion of all those for whom a travel-related health risk exists when they visit friends and relatives, for example the wife or child of an immigrant, who may not be defined as a VFR in the traditional definition, which included ethnicity.

The second component of the new definition proposed by Barnett and colleagues is that there should be an "epidemiologic gradient of health risk between the two locations, supported by an assessment of health determinants" (Barnett et al., 2010 p.165). This, they say, need not infer that travel will be from a rich to a poor area, but rather that the health risk differs between the usual area of residence and that being visited. An example is given of a traveller from the West Coast to the East Coast of the USA who should be warned of the risk of contracting Lyme disease when seeking pre-travel advice (Barnett et al., 2010).

Against this proposal of a new definition, Arguin argues firstly, that although no standard definition exists, there is a common agreement amongst researchers about what is meant by VFR (Arguin, 2010). He claims that the use of the term "VFR" is a "surrogate marker for an interaction among a complex set of behaviours that may be difficult to identify individually" (Arguin, 2010 p. 148), and that the inclusion of ethnicity in this is paramount. To justify his claim, he points firstly to the fact that 14 of 16 articles in the peer-reviewed literature who defined VFRs used what he termed the "classic" definition, that is, one which included ethnicity. He also cites commonly

used definitions of VFR that have referred to ethnicity. These are the WHO's "immigrants travelling to their place of origin" (World Health Organisation, 2005a) and the use of this term in a chapter of the "Yellow Book: CDC Health Information for International Travel", including the following:

> *A traveler categorized as a VFR is an immigrant, ethnically and racially distinct from the majority population of the country of residence (a higher-income country), who returns to his or her homeland (lower-income country) to visit friends or relatives. Included in the VFR category are family members such as the spouse or children, who were born in the country of residence* (Centre for Diseases Control and Prevention, 2009).

Furthermore, Arguin argues that cultural beliefs impact on risk, and the importance of this factor is lost if ethnicity is not included within the definition of VFR (Arguin, 2010). Evidence for this, he claims, comes from two studies. In one, an examination of data held in the GeoSentinel international surveillance system between 1997 and 2004, those termed "immigrant VFRs" which included those people who were born abroad, had higher rates of malaria and typhoid and were less likely to seek pre-travel advice than those who were termed "traveller VFRs", that is, those who were visiting friends and relatives, but were second generation migrants (Leder, Tong et al. 2006). In the other, a cross-sectional study of USA-based travellers to India, whilst VFRs were less likely to access pre-travel advice than non-VFRs, ethnicity was a stronger predictor of this than reason for travel. Hence, it was argued that:

> *"our findings support those of the GeoSentinel study in highlighting the importance of a clear VFR definition that highlights not only the reason for travel but also for ethnicity or country of birth and travel destination"* (Baggett et al., 2009 p.117).

Matteelli and his colleagues, all of whom were authors of the original paper arguing for the change in definition, in reply to Arguin, stress the "increasingly mobile and culturally ethnically and racially intertwined world in which we live" (Matteelli et al., 2010 p.430) . They re-emphasise the necessity for examining health beliefs at an individual level, rather than basing this on assumptions of immigration status or ethnicity, which, they claim may not accurately predict health-related behaviours and beliefs (Matteelli et al., 2010). They also state that socio-economic status may be a better predictor of health during travel than ethnicity, although they do not explore this in any detail (Matteelli et al., 2010).

In the latest edition of the "Yellow Book: CDC Health Information for International Travel" Keystone supports the more traditional definition, noting that the proposed new definition by may be "too broad and not take into consideration cultural, economic, and attitudinal issues" (Centre for Diseases Control and Prevention, 2011).

In the introduction to this thesis, it was noted that little progress will be made in improving migrant health behaviours without a better understanding of the factors that influence the health behaviours of migrants in general. The disagreement about what should be included in the term "VFR" described in this section highlights the question about the extent to which ethnicity can also be included as a separate level of analysis, and its interaction with other determinants of health.

Throughout this thesis, the term "VFR" has been used. In this chapter it is the term chosen by study authors themselves, for example by Pistone and colleagues in a publication discussing risk perception, knowledge and behaviours amongst travellers of African ethnicity, and by Smith and colleagues in an epidemiological review of risk factors imported malaria (Pistone et al., 2007, Smith et al., 2008). It is also the term used by the MRL to categorise one reason for travel of malaria patients. The issue of what the term "VFR" should include will be discussed in the final chapter of this thesis.

3.2 Knowledge about transmission of malaria

3.2.1 Knowledge amongst VFRs

Few studies have investigated the accuracy of the knowledge held by VFRs about how malaria is transmitted. Of those which have, Pistone and colleagues assessed this as part of a study investigating the knowledge, attitudes and practices towards malaria of two groups, described as VFRs, before travelling to their countries of origin in Sub-Saharan Africa (Pistone et al., 2007). One group was composed of individuals who had attended a pre-travel health clinic (n=122); members of the second group (n=69) were recruited after purchasing air travel tickets, but had not, and did not intend to seek pre-travel health advice. The most popular countries being visited by the VFRs were in West Africa and also the Democratic Republic of Congo.

The majority (141/191) (74%) of study participants knew that malaria was transmitted by mosquitoes, with the other most commonly mentioned transmission routes being thought to be through water (12/191) (6%), caused by poor personal hygiene (12/191) (6%), or exposure to the sun (7/191) (4%). No statistically significant difference was found between the knowledge held by each group, although the authors noted that one of the limitations to the study was that the sample size may have been insufficiently large enough to detect such differences if they existed.

Another study investigated the travel health practices amongst Nigerians living in Houston, Texas. The study methodology chosen was focus group discussions and semi-structured interviews with Nigerian travellers who had either visited Nigeria in the previous year, who intended to do so in the coming year, or who had fallen sick whilst visiting Nigeria (Leonard and VanLandingham, 2001). Semi-structured interviews with physicians and pharmacists were also carried out. As in the French study (Pistone et al., 2007), most Nigerian travellers knew how malaria was transmitted, although the exact number was not specified, nor the total number of respondents (Leonard and VanLandingham, 2001).

A third study investigated knowledge about how malaria is transmitted, interviewing 292 immigrants from West African countries including amongst others, Nigeria and Ghana. Respondents lived in the Netherlands, and were recruited through churches and societies serving the West African community, as well as at a large multi-cultural festival which attracted migrants (Schilthuis et al., 2007). Each completed a questionnaire with the assistance of an interviewer. Nearly 50% had a primary reason of visiting friends and relatives for the most recent trip home they had made. In this study, knowledge about malaria transmission was categorised by the authors into "correct" or incorrect knowledge". Only 81/292 (28%) of participants named mosquitoes as being the *sole* route of malaria transmission. However, despite a wide range of other factors being cited by participants, 95% of respondents *included* mosquitoes. As in the study by Pistone, other beliefs, considered by the authors to be "incorrect knowledge" were broadly related to a perceived link between malaria and contaminated water, but also considered connected to the air, to stress, or to "taking too much anti-malarial medicines for prevention". These were mentioned by 256 participants as being possible routes to malaria transmission (Schilthuis et al., 2007).

3.2.2 Knowledge about malaria transmission in Nigeria and Ghana

Studies conducted in Nigeria and Ghana, carried out in both urban and rural environments, have shown that in common with the majority of respondents in the studies undertaken in Europe and the USA, most people were aware that malaria was caused by the bite of a mosquito (see table 3.2.1).

Table 3.2.1 Proportion of respondents who knew that malaria was caused by a bite of a mosquito in studies carried out in urban and rural areas of Nigeria and Ghana (2000-2010)

Study	Region/Country	Proportion who knew malaria was caused by mosquito bite
(Onwujekwe et al., 2000)	Five rural areas of South Eastern Nigeria	1796/1908 (94%)
(Adedotun et al., 2010)	Urban areas of South Western Nigeria	179/192 (93.2%)
(Chirdan et al., 2008)	North-Central Nigeria	104/150 (69.3%)
(Akpan, 2007)	Southern Nigeria	581/612 (91.5%)
(Dike et al., 2006)	Rural area of South Eastern Nigeria	655/1197 (55%)
(Adongo et al., 2005)	North-Eastern Ghana	119/150 (79%)
(De La Cruz et al., 2006)	Central Ghana	94/537 (92.9%)
(De La Cruz et al., 2006)	Eastern Ghana	498/514 (97.3%)
(Buabeng et al., 2007).	Central Ghana	500/500 (100%)

Other reasons for malaria transmission identified in these studies included the environment, food and water, and stress, suggesting that there are some common beliefs about alternative reasons for malaria transmission amongst VFRs. Other reasons identified in the studies carried out in Africa included witchcraft (Onwujekwe et al., 2000) and poor personal hygiene (Asenso-Okyere, 1994).

3.3 Mosquito avoidance measures

3.3.1 Concerns about mosquito bites and planned prevention measures amongst VFRs

Two studies have investigated VFRs' concerns about being bitten by mosquitoes when visiting a malarious country. Pistone and colleagues, in the French study described above, found that the perceived unavoidability of mosquito bites was mentioned by 25% (22/89) of those who were concerned about malaria (Pistone et al., 2007). In the Houston study, which compared travellers' attitudes towards malaria compared to typhoid and hepatitis A, many respondents explained that they felt less confident in their ability to control the local environment, compared to their confidence in avoiding food and water-borne diseases such as typhoid (Leonard and VanLandingham, 2001).

Only Pistone and colleagues investigated in any detail the use of mosquito avoidance measures, with 51% (97/191) of respondents planning to use either repellents, long clothes or bednets (Pistone et al., 2007). More respondents in the travel clinic group planned to use these compared to those who only visited a travel agency, but in a second interview conducted after travel with 106 of the original respondents, only 16% (17/106) had protected themselves in some way, including 8% (9/106) who slept in air-conditioned rooms, 7% (7/106) who used skin repellents, or 4% (4/106) who used mosquito coils (Pistone et al., 2007).

3.3.2 Measures taken to avoid mosquito bites in Nigeria and Ghana

In contrast to the paucity of information about mosquito bite prevention measures used by members of the African Diaspora when visiting malarious countries, several studies have reported on a range of methods used for protection against mosquito bites amongst residents of Nigeria and Ghana. Aside from mosquito nets, which are discussed in the next section, a variety of measures were reported as being used to prevent the nuisance of mosquitoes, the most common being insecticides (see table 3.3.1).

Table 3.3.1 Measures taken to avoid mosquito bites in studies carried out in Nigeria and Ghana

	(Adedotun et al., 2010)	(Ahorlu et al., 1997)	(Akpan, 2007)	Dike, Onwujekwe et al. 2006	Agyepong & Manderson 1999
Insecticides	♦	♦	♦	♦	♦
Insect repellents	♦				
Fans		♦			
Mosquito coils	♦	♦			♦
Nets on windows/doors	♦				♦
Burning of herbs	♦	♦			♦
Preventive drugs	♦				
Burning of cassava chips		♦			
Manually driving mosquitoes away		♦			♦

3.3.3 Use of bednets amongst VFRs

In studies carried out among VFRs from the African Diaspora, only one has researched the use of bed nets (Pistone et al., 2007) . The results of this study showed a marked discrepancy between the intention to use bed nets (71/122) (58%) of the travel clinic group and (22/69) (32%) of the travel agent group and actual usage as reported on return to France (17/106) (16%), all of whom were in the travel clinic group) (Pistone et al., 2007).

3.3.4 Ownership and use of mosquito nets in Nigeria and Ghana

The benefits of nets treated with insecticide in reducing malaria-associated morbidity and mortality were recognised during the 1990s (Phillips, 2001). Since then, several studies have investigated the ownership and use of nets in a variety of locations including Nigeria and Ghana. These have typically reported that although households

may be aware of the availability of nets, they may not be purchased or used. For example, in rural areas of South Eastern Nigeria, Onwujewke and colleagues found that although 90% (1708/1908) recognised that mosquito nets were a means of preventing malaria, only 19.5% had actually purchased them (Onwujekwe et al., 2000). In a rural Ghanaian based study, only 34% (359/1057) owned a mosquito net (Ahorlu et al., 1997), whilst in another Ghanaian study carried out in another rural-based community, 10% (86/900) had slept under a mosquito net the previous night (De La Cruz et al., 2006).

In Nigeria and Ghana, research investigating the reasons *why* bednets are not used has been carried out in both rural and urban areas. Whilst inadequate detailed knowledge of vector biology and control amongst respondents was thought to be the major factor for the low use of nets in a study carried out in Ghana (Kudom and Mensah, 2010), more have described how accurate knowledge, both about malaria transmission and the potential consequences of malaria, do not necessarily increase usage. Instead, the initial purchase or the replacement of torn nets may be considered unaffordable (Ahorlu et al., 1997, Onwujekwe et al., 2000). Alternatively access to nets may be difficult in rural areas (Onwujekwe et al., 2000). However, bed net use was low (35/192: 18%) even in an urban community where just over half of the study respondents had attended some, or completed the whole of their secondary education, and only 4.2% were unemployed (Adedotun et al., 2010). The inconvenience of sleeping in a stuffy and constrained atmosphere (Ahorlu et al., 1997, Agyepong and Manderson, 1999), inability to sleep if a mosquito entered a net (Ahorlu et al., 1997); fear of toxicity from the chemicals used to treat the net (Akpan, 2007); lack of a place to hang the net (Ordinioha, 2007); or forgetting to put it up (Ordinioha, 2007) have been cited as other reasons for nets not being used.

Some studies which have compared the use of mosquito nets for adults and children have reported a prioritisation of mosquito nets for the latter. For example they were used for 47% (16/34) of children, but only 18% (6/34) for all household members in an urban area of Ghana (Agyepong and Manderson, 1999). The prioritisation of nets for children was also found in a urban Nigerian-based study where, of 35 families who used nets, 32 had children under 10 years of age (Adedotun et al., 2010). However, a review of 16 studies carried out throughout Sub-Saharan Africa which investigated the

relationship between net ownership and their use, and included studies carried out in Nigeria, concluded that nets were not necessarily prioritised for children (Korenromp et al., 2003).

Policies to promote the use of bednets have been implemented in both Nigeria and Ghana. In Ghana, since 2002, insecticide treated nets (ITNs) have been subsidised for children under the age of five and for pregnant women living in poorer communities (Ghana Statistical Service, 2009). In Nigeria, a more recent policy adopted in 2008 was to distribute ITNs to women via a variety of outlets, for example to pregnant women who attend antenatal classes, and for children who complete a vaccination course for diphtheria, pertussis and tetanus (National Population Division and ICF Macro, 2009).

Nationwide data have been collected on the ownership and use of nets, as part of wider surveys covering a wide range of demographic and health issues in both countries (Ghana Statistical Service, 2009). In Ghana, the most recent report which included data collected in 2008, surveyed more than 12 000 households in 2008. In Nigeria, just over 34 000 were surveyed in the same year.

Tables 3.3.2 and 3.3.3 give details about net ownership from these surveys. In both countries, they have revealed a geographical variation in net ownership, and shown that those in higher socio-economic groups may be *less* likely to own a net. In Ghana these proportions were 40.6% in richer people, compared to 56.4% in those of lower socio-economic status, and in Nigeria, 18.5% compared to 15.5% in the more wealthy. The reasons why this might be so were not explored.

However, both countries reported an increase in the ownership of nets compared to 2003, the period when the previous survey was carried out. In Nigeria, the proportion who owned any type of net was 12% in 2003, increasing to 17% in 2008. Ownership of ITNs increased from only 2% to 8% during this time period, despite the policy described above of offering subsidised distribution of ITNs to targeted groups. In Ghana, more people owned a net than in Nigeria in 2003 (18%) substantially increasing to 45% in 2008. Ownership of ITNs increased from 3% to 33% in the same

time period in this country. Despite the increase, net ownership and use was still not taken up by the majority of the population in Ghana by the time of the 2008 survey.

Table 3.3.2 Ownership of bed nets in Nigeria and Ghana 2008

	Nigeria	Ghana
% households which owned a net	17	45
% households owned > 1 net	8	19
% households who owned an ITN: urban vs. rural	8.6% rural 7.6% urban	37.5% rural 27.2% urban
% households who owned any net urban vs. rural	18.5% rural 14.1% urban	53% rural 37.2% urban

Table 3.3.3 Use of bed nets in Nigeria and Ghana

	Nigeria	Ghana
% households which used a net for children <5 years	14.2 (<1 year) 9.4% (4 years of age)	51% (<1 year) 31.6% (4 years of age)
% households used a net for children urban vs. rural	12.6% rural 10.5% urban	45.2 rural 34.8% urban
% households who used an ITN for children < 5 if owned	59.3% (<1 year) 39.3% (4 years of age)	64.3% (<1 year) 46.5% (4 years of age)
% households who used ITN for children if owned urban vs. rural	51.1% rural 47.8% urban	56.2% rural 49.9% urban

These studies about the ownership and use of bednets in Nigeria and Ghana show that knowledge about how malaria is transmitted is not a major determinant of their use, but rather that a range of factors relating to geographical area, their cost, and the practical difficulties associated with sleeping comfortably under them are taken into consideration. Reasons why those of higher socio-economic status may be less likely

to use them are unclear. The introduction of policies to increase their ownership and use has only been partly successful, and appear to have been more so in Ghana, compared to Nigeria.

3.4 The uptake of pre-travel health advice and chemoprophylaxis amongst VFRs

3.4.1 Pre-travel health advice

Only two studies carried out, one in the USA, the other in Italy, have estimated the uptake of pre-travel health advice amongst VFRs. In the first, researchers found that only a "minority" of respondents would access pre-travel advice, but did not provide details of the number who planned to do so (Leonard and VanLandingham, 2001). The second study was carried out in an Italian clinic set up to provide health services to illegal immigrants (Scolari et al., 2002). Just over three quarters of respondents were from Sub-Saharan Africa, with half from Senegal and 63 (13%) from Nigeria. A further 106 patients were from Asia, with 68 (13.4%) from Pakistan. Four patients (0.8%) were from other regions of the world.

It was not known how many of the 504 study participants were themselves undocumented migrants, although only 36% had a regular permit to stay in Italy. It is possible that their immigration status may have impacted on their ability to access pre-travel health advice and the extent to which the findings from this study can be extrapolated to the general population is unclear. Taking this limitation into account, of 170/504 (34%) participants who had travelled to a malarious country at least once, only 30 (17.6%) had sought pre-travel advice. A longer period of time resident in Italy was the only variable where there was an association with accessing pre-travel health advice.

3.4.2 Chemoprophylaxis

The use of chemoprophylaxis before travel to a malarious country is another topic that has been investigated. In one study, 201/292 (69%) of respondents reported that they used chemoprophylaxis on the last trip (Schilthuis et al., 2007). However, the authors noted that there was some confusion about the meaning of the term, and they estimated

that in fact, only one third of the group may have used chemoprophylaxis on previous trips (Schilthuis et al., 2007).

In the second study, of VFRs in France, 171/191 (94%) reported that they planned to use chemoprophylaxis (Pistone et al., 2007). Not surprisingly, a statistically significant higher proportion (119/122) (97%) of those attending the travel clinic reported intending to take chemoprophylaxis than those attending the travel agent (60/69) (87%) ($p<0.05$), although the number who intended to do so in the latter group was also high (Pistone et al., 2007). It is possible that these results reflect a desire to give a response which was socially acceptable to the interviewers.

3.4.3 Factors influencing the uptake of pre-travel advice & chemoprophylaxis

Several studies have investigated those factors which might influence the decision to use pre-travel advice and chemoprophylaxis among VFRs. These can be divided into those relating to perceptions of risk, severity of illness, personal susceptibility, concerns about the drugs available, as well as structural factors such as the cost of chemoprophylaxis and the availability of pre-travel health advice (Leonard and VanLandingham, 2001, Scolari et al., 2002, Morgan and Figueroa-Muñoz, 2005, Pistone et al., 2007, Schilthuis et al., 2007).

3.5 Perceptions of risk of acquiring malaria amongst VFRs

These can be categorised into perceptions of potential compared to personal risk, the priority given to malaria as a health concern, beliefs about personal susceptibility, belief that protection has been given via vaccination; concerns about chemoprophylactic drugs and other barriers to the use of chemoprophylaxis. Each will be considered in turn.

3.5.1 Potential compared to personal risk

In three studies carried out to examine perceptions of the risk of malaria when travelling to a malarious country, researchers divided participants' knowledge about risk into two distinct categories; the awareness amongst study participants that there was *a potential risk* of acquiring imported malaria when travelling to a malarious country, and perceptions of "*personal risk*", that is, the extent to which individuals believed their particular circumstances placed them at risk or protected them from

imported malaria (Scolari et al., 2002, Pistone et al., 2007, Schilthuis et al., 2007). In the French study, although 87% of respondents knew it was possible to get malaria in the country they were visiting, only 49% considered themselves at personal risk. While there was no statistically significant difference between those attending the pre-travel clinic and the travel agent with respect to knowledge of the possibility of contracting malaria, 33% of those who visited a travel agency believed themselves to be at risk of malaria compared to only 7% of those who visited a travel clinic ($p<0.05$). Clearly, the low perception of risk amongst the latter group could be attributed to the precautions they had taken by attending the clinic to access chemoprophylaxis and receive pre-travel advice (Pistone et al., 2007).

In the study of knowledge, attitudes and practices amongst 504 migrants who attended a Public Health Clinic in Italy, 351 (70%) recognised that malaria existed in their country of origin (Scolari et al., 2002). For those participants who originated from countries in Sub-Saharan Africa, this increased to 73%. However, of the 140 /170 (82%) who had not sought pre-travel advice on a previous trip to a malarious country, 73 (52%) had not done so because they believed they were not at personal risk. These data were not stratified by area of origin and included some respondents who originated from areas other than Sub-Saharan Africa.

In the study of Dutch VFRs, the perceived risk of catching malaria by participants was assessed by the study authors as either "high" or "not high" (Schilthuis et al., 2007). Overall, 159/292 (54%) of the participants considered the potential risk to be high. To measure *personal* risk, participants were asked how dangerous the risk was for themselves, compared to specific risk groups, (the definition of these groups was not provided). Forty six percent categorised the risk to themselves as "very dangerous", but 20% considered it as "not very dangerous" and 23% believed there was "no danger". The authors conceded that the sample chosen for this study was not random. Nearly two thirds were Ghanaian, who must produce up-to-date evidence of vaccination against yellow fever upon arrival in Ghana, so necessitating attendance at a travel clinic at least once every ten years. This required attendance, it was surmised, might make them more aware of a personal risk, presumably because they would receive pre-travel advice during pre-travel consultations.

3.5.2 Malaria as a priority health concern of VFRs

Perceptions of the comparative risk of acquiring malaria compared to other concerns of VFR travellers when visiting their country of origin have been investigated by two researchers (Leonard and VanLandingham, 2001, Pistone et al., 2007). In the latter study, malaria was the most commonly reported health concern, cited by 89/191 (47%) of respondents. Others were food and water-borne diseases (49/191) (26%); Acquired Immune Deficiency Syndrome (AIDS) (13/191) (7%); and meningitis (10/191) (5%). In the study by Leonard and Landlingham, contaminated water and malaria were the most common health care concerns voiced by VFR respondents, with particular concerns about the latter. The predominance of malaria as a healthcare concern of VFRs was also noted by the physicians who were interviewed as part of the study. The focus on malaria was interpreted by the authors as partly due to a lack of knowledge and experience of other diseases, such as typhoid and hepatitis A (Leonard and VanLandingham, 2001), but could also have been an example of response bias, that is, the desire of the respondent to share the interests of the researchers.

The Houston study found that worries about *the high likelihood* of acquiring malaria, rather than concerns about the potential *severity* of the illness were more commonly voiced (Leonard and VanLandingham, 2001). Many participants in this study described it as being "a potentially undesirable consequence of travel" and it was explained as being a disease that is endemic in Nigeria, and experienced as an easily treated, mild, flu-like illness.

A further study corroborated the findings of the Houston study with respect to malaria being perceived as a non-serious illness. This was a focus group study carried out in London with 44 members of the African community which focused on reasons for the use of chemoprophylaxis amongst members of the African community in London. The majority of participants came from Uganda (16); Nigeria (15); Kenya (4); Zambia (2) and Sierra Leone (2) (Morgan and Figueroa-Muñoz, 2005). Six were born in the UK, the rest were from Africa.

The experience of malaria presenting itself as a mild illness was illustrated by the quotation below:

> ... *"before I went to Africa, I grew up thinking, malaria, oh, it's such a serious disease. And then when I was in Africa working everybody had malaria every now and then, a few times a year! ...it was seen as part of everyday life... it seemed that everybody who had malaria was walking around with a 'flu sort of thing. It just seemed like 'flu to me, that sort of problem. And I think, I don't know, in a way that kind of makes you think it's not a big problem"* (Morgan and Figueroa-Muñoz, 2005 p.362)

There are two possible explanations for the perception of the respondent. Firstly, as noted in chapter one, it is widely acknowledged that many febrile illness in sub-Saharan Africa are misdiagnosed as malaria (Bell et al., 2006) and 'malaria' has become a word to describe all mild febrile illness many of which would never progress to severe disease (Bloland and Williams, 2003 p.30). Thus, the illness perceived as being malaria by the respondent cited above may have actually been symptoms of other diseases or conditions.

Secondly, as noted in section 2.2, once semi-immunity to malaria has been acquired, it may be subsequently experienced as a mild or asymptomatic illness. Witnessing semi-immune adults with mild symptoms of malaria may be the reason why the study participant cited in this quotation perceived malaria in this way, without recognising that symptoms may be more severe in those who lose exposure to the parasite.

Only one respondent in the London and Houston studies respectively described the severity of symptoms of malaria they had personally experienced when visiting as a VFR (Leonard and VanLandingham, 2001, Morgan and Figueroa-Muñoz, 2005). Both reported that they had experienced malaria as a debilitating illness. In the London study, the majority of participants commented more commonly on their perceptions of their personal semi-immunity (Morgan and Figueroa-Muñoz, 2005). Few recognised a loss of immunity over time, or considered how this might increase their risk of suffering more serious symptoms when visiting friends and relatives abroad (Morgan and Figueroa-Muñoz, 2005). Thus, as well as viewing friends and relatives experiencing malaria as a mild illness, many appeared to believe that this was a likely outcome for themselves.

In the study by Schilthuis and colleagues on the other hand, only 4/90 (4.4%) who did not intend to take chemoprophylaxis did not do so because they believed that they

were immune (Schilthuis et al., 2007). However, another explanation for not taking chemoprophylaxis, "I come from West Africa so I don't need vaccinations" cited by 8/90 (8.8%) respondents could imply a belief in immunity, but the choice of a questionnaire design which only allowed for classification into short answers, did not allow for a detailed examination of the rationale for some of the beliefs voiced.

3.5.3 Personal susceptibility to malaria

Whilst some participants in Morgan and Figueroa-Muñoz's London study believed they were immune from malaria, others believed that they were not personally susceptible because they were confident that they had never contracted malaria, despite being bought up in malarious countries in West Africa (Morgan and Figueroa-Muñoz, 2005). Whilst this might be the case, alternative explanations may be related to the mis-diagnosis of previous malaria infections, or recall bias have accounted for the results.

In the London focus group study there was reported to be considerable discussion about why some people seemed to be more susceptible to malaria than others, despite being equally exposed, with biological factors, implicating an individual's blood, or more specifically sickle-cell trait and/or G6PD deficiency being understood as being implicated (Morgan and Figueroa-Muñoz, 2005).

Not all participants believed that they were protected from malaria, either by immunity or non-susceptibility, as some felt malaria to be a serious illness. For those visiting mainly urban areas, travel to a more rural area was a factor that some participants recognised increased their personal risk, and the few who were Human Immunodeficiency Virus (HIV) positive also reported themselves as being diligent in their use of anti-malarials, irrespective of the location visited (Morgan and Figueroa-Muñoz, 2005). This suggests that some individuals are aware to some extent of the personal and environmental factors which may increase their personal risk.

3.5.4 Perceptions of having been vaccinated against malaria

In Morgan and Figueroa-Muñoz's focus group study, a few respondents believed that they had been vaccinated against malaria, and were reported to be "adamant" that this was the case, with one participant affirming his belief that this was the reason he never

contracted malaria when in a malarious country (Morgan and Figueroa-Muñoz, 2005). Belief in having been vaccinated against malaria was also found amongst respondents in the Dutch study, where it was cited by 9/90 (10%) as a reason for not needing malaria chemoprophylaxis (Schilthuis et al., 2007), and by 22/102 (22%) in the study by Pistone and colleagues (Pistone et al., 2007). It was presumed by the French researchers that some might mistake yellow fever vaccination for a malaria vaccination (Pistone et al., 2007).

3.5.5 Concerns about chemoprophylactic drugs

Fear of the side effects of chemoprophylactic drugs was cited in two studies as being a barrier to their use (Leonard and VanLandingham, 2001, Morgan and Figueroa-Muñoz, 2005). In the latter study, this was reported by 10/90 (11%) as a reason "not to be vaccinated" the proxy term used by the researchers for not taking chemoprophylactic drugs (Schilthuis et al., 2007). Other concerns about chemoprophylactic drugs mentioned in the London based study were doubts about their efficacy, either as a result of "getting used to them" or worries about mosquito resistance to the drugs, whilst some respondents felt that they were only effective against "a more serious type" of malaria (Morgan and Figueroa-Muñoz, 2005). In this study, those of higher socio-economic status were found more likely to have accessed information about, and to be aware of different types of chemoprophylaxis (Morgan and Figueroa-Muñoz, 2005).

3.5.6 Other barriers to the use of chemoprophylaxis

A number of other barriers have been identified which may deter some VFRs from accessing chemoprophylaxis, and illustrate the wide range of factors which may influence this, (although some of these beliefs were held by few respondents). Many of these were described in the Dutch study (Schilthuis et al., 2007). For some reasons cited, such as "I never take preventive measures" given by 14/90 (15.6%) it was difficult to determine the underlying rationale for this claim. Others, such as "I do not get sick easily" (7/90) (7.8%) or "I come from West Africa, so I don't need vaccinations" (8/90) (8%) could perhaps be connected to perceptions of personal susceptibility or immunity. "My room is fully insect free" (1/90) (1.1%) was related to the concept of the risk of acquiring malaria, whilst "I can avoid unhygienic food and water" (1/90) (1.1%) could be related to misconceptions about the way in which

malaria is transmitted, as described in section 3.3.1. "I only take tablets" (3) (3.3%) was perhaps linked to personal preferences for prevention and a misconception that an injection is needed. Beliefs connected to fatality "I do not believe in taking anything because I cannot die now" and religious belief "God protects me all the time" were each cited by one (1%) of participants. Other justifications included "It is only necessary for special groups such as children" and "I use traditional methods" cited by three (3%) and one (1%) respectively.

3.6 Structural factors impacting on the use of chemoprophylaxis.

In this section concerns about the expertise of clinicians, the cost of chemoprophylaxis, and access to these drugs and to pre-travel health clinics are discussed.

3.6.1 Distrust of doctors

In the study by Morgan and Figueroa-Muñoz, distrust of doctors was the result of different drugs being prescribed on separate occasions by the same GP without explanation (Morgan and Figueroa-Muñoz, 2005). In the study by Leonard and VanLandingham, the focus of the distrust was more connected with concerns about the lack of experience of some clinicians, particularly those not of Nigerian origin. For example, many respondents claimed the majority of physicians "read about malaria in a book" but had no practical familiarity, and no interest in travel health. Several Nigerian physicians in this study reported that they were called upon to offer pre-travel advice not only to friends and relatives, but to non-Nigerian colleagues because of their expertise (Leonard and VanLandingham, 2001).

3.6.2 Cost of chemoprophylaxis

In three studies cost was mentioned as a deterrent to obtaining pre-travel health advice. These were carried out in countries with differing healthcare systems: the UK (Morgan and Figueroa-Muñoz, 2005), the Netherlands (Schilthuis et al., 2007), and the United States (Leonard and VanLandingham, 2001). In the Dutch study, in which the authors explained that the majority of citizens are covered by health insurance, cost was the second most commonly reported reason for not accessing pre-travel health services, mentioned by 15/90 (17%). However, as observed earlier, 11% of all respondents did not have health insurance and having to pay for the full cost of a consultation and chemoprophylaxis prescribed may have made this a deterrent.

In Houston, a health insurance system also operates. Cost was the most commonly reported reason why VFRs might not access pre-travel health (Leonard and VanLandingham, 2001). One respondent, who was a physician, estimated that about half of all travellers reject pre-travel health advice because of the cost. The study authors noted that many travellers are uninsured or have insurance plans which do not cover visits or immunisations they might need for overseas travel. Whilst there was some evidence of respondents being unable to afford the cost of mefloquine, the drug most commonly prescribed, other reasons for not purchasing it were the competing priorities of other costs associated with travel, and the availability of much cheaper drugs in Nigeria. One respondent who chose to purchase drugs upon arrival in Africa based her decision partly on cost and partly because of her belief that she was not travelling to a highly malaria-prevalent area.

Physicians interviewed for the Houston study reported that many patients complained about the high cost of chemoprophylaxis (Leonard and VanLandingham, 2001). Some prioritised chemoprophylaxis for their children, whilst others bought only a proportion of that needed, with the aim of purchasing the remainder in Nigeria. To manage the unaffordability of mefloquine, some physicians prescribed chloroquine, or advised patients to purchase SP upon arrival in Nigeria and to take it if symptoms of malaria developed. These are drugs which, as described in section 2.4.2a, are associated with malaria parasite resistance.

In one area of London, as noted in section 2.5.4, those who access pre-travel health advice from their GP receive it for no charge. However, in the London study, for those who attended a private clinic, or who were not residents of this area, and who therefore must pay for malaria chemoprophylaxis on a private prescription, the associated costs were voiced as being a concern (Morgan and Figueroa-Muñoz, 2005). Even in areas where malaria was subsidised, not all GPs implemented the policy of offering malaria chemoprophylaxis on an NHS prescription, with one husband asked to pay for a private prescription whilst his wife obtained subsidised chemoprophylaxis from another nurse within the same practice. As in the Houston based study, some respondents used other ways to overcome the cost, for example by purchasing drugs

illegally before travel, though mindful they may not be effective (Morgan and Figueroa-Muñoz, 2005).

3.6.3 Access to clinics and chemoprophylaxis

This issue has been mentioned only briefly in the academic literature. Not being able to access pre-travel advice at short notice was a barrier to its use for some participants in two studies (Morgan and Figueroa-Muñoz, 2005, Schilthuis et al., 2007). By contrast the Houston study found that access to drugs rather than to pre-travel health services was the more significant problem (Leonard and VanLandingham, 2001).

3.7 Adherence to and appropriateness of chemoprophylaxis

Two studies of VFRs have reported on adherence to chemoprophylaxis by their study participants. In the study by Pistone and colleagues, the responses to a range of questions made the researchers conclude that the use of travel clinics has a positive benefit on uptake and adherence to chemoprophylaxis (Pistone et al., 2007). For example, the reported use of chemoprophylaxis was statistically significantly greater amongst those who had visited a travel clinic compared to a travel agent before travel (55/64; 86%), compared to 25/42: (60%). However, whilst more in the travel clinic group used chemoprophylaxis, only 29% (31/106) used this appropriately (correct drug, dosage and adherence), suggesting that the advice given may not be followed accurately. In the Italian study, length of time resident in Italy was the only variable associated with taking the correct dosage (Scolari et al., 2002).

Several factors have been reported as contributing to non-adherence to chemoprophylaxis among VFRs. These include those which were categorised by the authors of the French study as "insufficient malaria risk perception" "negligence" and not having the drug available after returning to France, often because of leaving the drugs for family and friends in the countries they visited (Pistone et al., 2007). This third reason was also cited by Morgan and Figueroa-Muñoz as being common amongst VFRs in the London-based focus group study. It was a popular practice undertaken to help friends and family in African countries overcome the expense of buying drugs for treatment and avoid the risk of purchasing fake drugs (Morgan and Figueroa-Muñoz, 2005).

Participants in the London focus group study also reported difficulties in managing complex drug regimes, stopping the course once they felt they had not been bitten by mosquitoes, adverse side effects, such as itching when taking chloroquine, (a reaction to taking chloroquine thought to affect up to 50% of Africans (Aghahowa et al., 2010), and difficulty in swallowing the drugs (Morgan and Figueroa-Muñoz, 2005).

3.8 Diagnosis and treatment of malaria

3.8.1 Uncomplicated malaria in VFRs

The few data that exist on the diagnosis of malaria among VFRs suggest that they are likely to self-diagnose, without initial recourse to a health care professional (Leonard and VanLandingham, 2001, Morgan and Figueroa-Muñoz, 2005). It was recognised by some participants in the Houston study that such actions could lead to a delay in accurate diagnosis and appropriate treatment (Leonard and VanLandingham, 2001).

3.8.1a Fever as a synonym for uncomplicated malaria amongst VFRs

In the London focus groups, several participants asked whether the words "fever" and "malaria" were the same (Morgan and Figueroa-Muñoz, 2005). This uncertainty may have resulted from policies implemented with respect to malaria treatment in many countries in Sub-Saharan Africa. These policies, put forward by the Integrated Management of Childhood illnesses (ACMI), recommended that any history of fever in children in an area with a high incidence of malaria should be treated for malaria (Bloland and Williams, 2003 p. 59). As explained in section 2.4.1, the recommended policy now put forward by the WHO is that all suspected cases of malaria should be parasitiologically confirmed before treatment commences wherever this is possible (World Health Organisation, 2010). However, it is possible that VFRs' uncertainty about these two words is a result of their awareness of the traditional way of diagnosing malaria based on clinical symptoms.

One reason that VFRs might self-diagnose rather than relying on health professionals was their lack of trust in the ability of health professionals in a non-endemic country to be able to diagnose malaria (Leonard and VanLandingham, 2001). The Leonard and VanLandingham study also found that VFR participants as well as pharmacists and clinicians of Nigerian origin were aware of the necessity of a speedy and accurate

diagnosis but there were beliefs that clinicians in the USA were unfamiliar with the condition, and ill equipped to diagnose it. Anecdotes were described of patients being initially diagnosed with allergies or conditions such as influenza with which doctors were more familiar, including an example of a pharmacist who returned to Houston with malaria and who was given a range of tests for other diseases which delayed her treatment, despite her assertions that her illness was caused by malaria. Other VFR respondent in this study cited anecdotes of patients who nearly died whilst under the care of non-Nigerian healthcare providers, and compared this with their belief that no one in Nigeria could die from malaria. Some reported that they had taken the trouble to find and pay for treatment from a Nigerian physician whom, it was felt would be more knowledgeable, sympathetic and aware that malaria could be treated effectively and quickly (Leonard and VanLandingham, 2001).

A further concern amongst respondents in the Houston study was the embarrassment and stigma of being put into isolation upon admission to hospital because of unwarranted fears that they were infectious or suspected of being infected with HIV.

The Houston study found that some of the participants cited the cost of treatment, both for drugs and for an appointment from US based healthcare providers as a reason for not seeking treatment for malaria in that country, particularly when this was compared to the much lower cost of treatment in Nigeria.

With respect to treatment options upon return to a non-malarious country, chloroquine was named as a drug purchased over the counter from community pharmacists in the UK to treat perceived malaria symptoms. (Morgan and Figueroa-Muñoz, 2005). In the Houston study, chloroquine, SP and Halofantrine were also mentioned (Leonard and VanLandingham, 2001). The latter is a drug similar to quinine and mefloquine in chemical composition, but which rarely can cause cardiac failure (Centre for Diseases Control and Prevention, 2001). Some travellers bought these medications back to the USA be used in the event of developing malaria symptoms in order to avoid potential problems with treatment seeking in that country, whilst others chose to take SP on their arrival in Nigeria and again upon return to protect them against symptoms should they contract the disease. As explained in section 2.4.2a, chloroquine and SP are associated with parasite resistance and may not be effective treatments for malaria.

3.8.2 Diagnosis and treatment for malaria in Nigeria and Ghana

VFRs in the Houston study compared their difficulties in seeking treatment for malaria in that city to the ease with which malaria is treated in Nigeria and Ghana, where, as described in section 2.4.1, diagnosis carried out by the individual or by a doctor based on clinical symptoms is the norm, and easy availability of drugs allows swift treatment of a commonly experienced illness. However, although home treatment may be the usual practice, in an urban study in South-Western Nigeria, higher levels of education were associated with the use of clinics to care for sick children who did not respond to home treatment, suggesting that there may be an economic factor influencing decision making (Adedotun et al., 2010). In another study carried out in the same country, the use of primary care in preference to home treatment was also associated with being in a higher socio-economic group (Onwujekwe, 2005). The potential link between socio-economic status and treatment options for malaria has not been explored in the literature carried out with the African Diaspora.

3.8.3 Diagnosis and treatment of severe malaria in VFRs and in Nigeria and Ghana

Very few data have been published on VFRs' knowledge, attitudes and behaviours concerning severe malaria. Participants in the London focus group questioned whether there were two "types" of malaria, one a mild one, the other "a very serious killer" which they referred to as "cerebral malaria" (Morgan and Figueroa-Muñoz, 2005). They were unable to explain any more about it, other than for several to say that relatives had died from it (Morgan and Figueroa-Muñoz, 2005). More detailed research on perceptions of VFRs surrounding severe malaria has not been carried out in Europe, nor in the USA. In Nigeria and Ghana, however, it has also been reported that where patients present with convulsions, supernatural forces may be held responsible by some people, and traditional healers considered more appropriate for patient management (McCombie, 2002, Williams and Jones, 2004, Adongo et al., 2005, Onwujekwe et al., 2005a).

3.9 Risk and risk assessment

One of the themes to arise from the research already carried out is about perceptions of risk. Whilst the majority of participants in the European literature review recognised

there was a potential risk of acquiring malaria when visiting a malarious country, fewer considered themselves to be at personal risk. Amongst the variety of factors contributing to the personal assessments of risk, some were related to individual susceptibility, whilst others were connected to beliefs about sustained immunity, and perceptions that malaria would result in only mild, easily treated symptoms. This topic deserves further exploration.

A difference between experts and lay people in the understanding of what constitutes a risk has been noted (Kunreuther, 2002, Slovic, 2002). Commonly, experts are considered to hold specialist objective knowledge, whilst lay people are considered unscientific, inferior and subjective with respect to risk (Lupton, 1999). It has been noted however, that expert knowledge is not in itself uncontested, and scientists themselves disagree (Douglas and Wildavsky, 1982 pp.49-66, Kasperson et al., 1988). With respect to imported malaria, disagreements between experts have already been identified in this thesis. One example is what constitutes a VFR, as described in section 3.1. The amount of time over which semi-immunity to malaria is lost upon leaving a malarious country, included in section 2.2, is another.

To understand how lay and expert people assess risk, in the discipline of cognitive psychology, psychometric tests may be used to assess how people respond to hazards (Lupton, 1999). For example, experts and lay people have been asked to rate a list of events and technologies for the perceived risk associated with each one. A majority of lay people identified nuclear power as the most risky, compared to experts, who considered motor vehicles to be so (Slovic, 2002). Slovic claims that experts judge risk according to the probability of an event happening, and the likely mortality associated with this. Key factors affecting the lay person's perception of risk are the perceived dread associated with a risk and the degree of uncertainty with which it will occur (Slovic, 2002). Slovic claims that although lay perceptions of risk are more complex than assessments of mortality and morbidity as typically assessed by experts, they are both quantifiable and predictable. This theory depends on the premise made by cognitive psychologists that assessment of risk is made by individuals rationally (Lupton, 1999). This has been disputed. Calman makes the point that if decision making about risk were purely based on "rational" evidence, about 25% of people in the UK would not continue to smoke (Calman, 2002). Similarly, since nearly all

imported malaria cases and certainly all deaths are preventable with the use of chemoprophylaxis, it could be supposed that if individual travellers were acting in the way which would be most beneficial to them, up-take of chemoprophylaxis would be high and imported-malaria associated morbidity and mortality could be avoided. Clearly, so called "rationality" using a cognitive process of cause and effect is not the sole premise on which decisions are made. Evidence for this with respect to imported malaria comes from the range of answers provided by respondents about what factors were relevant to the decision to use personal protection against malaria, for example perceptions of personal susceptibility described above, but also the cost of chemoprophylaxis, and trusting in protection from God. People then, do not make decisions about risk in a vacuum, but take into account a wide range of contextual factors (Lupton, 1993).

Douglas and Wildavsky claim that risk is a cultural construct (Douglas and Wildavsky, 1982). In line with other risk theorists described above (Kasperson et al., 1988, Slovic, 2002), they recognise that knowledge is an important factor with respect to risk. They also acknowledge the importance of personal subjectivity. For example, a recent bad experience is more likely to make people perceive that a similar event may happen to them again. However they assert that:

> *"between private, subjective perception and public physical science there lies culture, a middle area of shared beliefs and values" (Douglas and Wildavsky, 1982 p.194)*

It is only when there is broad social agreement about what constitutes a risk that it is kept out of contention. People operate in a world where many risks are uncertain, and in which they cannot know everything. Faced with this dilemma, decisions are not made in isolation to contextual factors in the way proposed by cognitive psychologists. Instead, people edit these, choosing to concentrate on some, but not on others. As they are social creatures, people are largely influenced by their sociality:

> *"humans act less as individuals and more as social beings who have internalised social pressures and delegated their decision-making processes to institutions. They manage as well as they do, without knowing the risks they face, by following social rules on what to ignore. Institutions are their problem-simplifying devices"* (Douglas and Wildavsky, 1982 p.80)

The social environment however "imposes constraints upon choice and sets boundaries on the range of feasible alternatives" (Douglas and Wildavsky, 1982), p77). However, they stress that as social change occurs, values and perceptions change too. Therefore, they stress the dynamic and fluid environment in which a culture operates and which influence perceptions of risk.

The relevance of Douglas and Wildavsky's theory can be seen from some of the findings from studies carried out to explore the knowledge, attitudes and practices of VFRs and described in this chapter. Firstly it takes into account the importance of factors relevant at the individual level, for example, the participant in Morgan and Figueroa's focus group study who was anxious to avoid contracting malaria because of her HIV status. Secondly, the importance of knowledge in assessing risk is recognised, as seen for example by studies which measured knowledge about malaria transmission or knowledge of the potential risk of acquiring imported malaria. Thirdly, it takes into account the relevance of societal factors which also affect how decision making is undertaken. One example of this is firstly the extract from Morgan and Figueroa-Muñoz's focus group study where a respondent thought malaria was a serious illness until she travelled to a malarious country and saw many people who appeared to have malaria but experienced mild symptoms (Morgan and Figueroa-Muñoz, 2005), whilst another is from the study by Leonard and VanLandingham, where study participants noted that in Nigeria, treatment for malaria was perceived as being given quickly and efficiently and compared this to the way in which it was treated in Houston (Leonard and VanLandingham, 2001). The relevance of Douglas' and Wildavsky's theory to the assessment of risk by participants in the research to be presented in this thesis will be discussed in the final chapter.

3.10 Summary

This chapter began by describing a debate about what is meant by the term "VFR" and the relevance of the concept of "ethnicity" to this.

Following this, the results of a review carried out to explore the research that that has been undertaken to examine the knowledge, attitudes and practices of VFRs about imported malaria was shown. Relevant studies undertaken in Nigerian and Ghana were also described. The results show that there is a paucity of research carried out with

respect to imported malaria, and of those studies which have been carried out, not all were exclusively with VFRs. Furthermore, the particular circumstances of some respondents, for instance those who were illegal immigrants, in at least one study may have influenced their decision making. The methodology chosen for all but two of the studies used a survey design, with small sample sizes, thus limiting the opportunity for study participants to voice their own opinions and the extrapolation of the results to a larger population.

Some of the issues identified in chapter one (the ABCD of malaria control) were chosen as topics to investigate by the researchers whose work is discussed in this chapter. The results showed that knowledge of how malaria is transmitted was high, as it was in studies carried out in Nigeria and Ghana, and that among travellers, there is a good awareness that a malarious country is being visited.

Unlike in Nigeria and Ghana, little research has been carried out with respect to knowledge, attitudes and beliefs about mosquito avoidance measures. In Nigeria and Ghana, it was shown that despite policies encouraging the use of bednets, there are several reasons why they are not popular. With respect to the use of chemoprophylaxis, a range of factors were identified which may impact on the decision to use them. As well as some related to the circumstances of the individual respondent, beliefs about the likely consequences of such infections were identified, as were structural factors, including the cost of chemoprophylaxis, beliefs about the competence of clinicians and access to healthcare.

Only one study carried out in the UK referred to the diagnosis and treatment of malaria (Morgan and Figueroa-Muñoz, 2005). These issues were not the main focus of this research, and were only referred to briefly. The other was carried out in the USA (Leonard and VanLandingham, 2001). As such, the structural context differed to the UK, and this may have impacted on the generalizability of the findings of this research. There is much that is not known about the knowledge attitudes and practices of VFRs living in the UK vis a vis malaria diagnosis and treatment, for example, the rationale behind the preference of some for self-diagnosis and treatment of suspected malaria, when this can be offered free of charge in the UK. Furthermore, neither the perceptions of providers of pre-travel health advice, nor clinicians who treat cases of

imported malaria in VFRs have been explored. As they have direct contact with VFRs who seek pre-travel health advice and treatment, it is likely that they would have useful information to impart both about what they believe to be the reasons which explain the relatively high incidence of malaria in the Nigerian and Ghanaian community in London, and also about structural factors which impact on the uptake and efficiency of diagnostic and treatment services.

Morgan and Figueroa- Muñoz made the point that their findings "reflect an intermeshing of ideas and practices that are widespread in the general UK population with the particular beliefs and circumstances associated with their ethnic origin" (Morgan and Figueroa-Muñoz, 2005 p.368), suggesting that both contexts are taken into consideration by VFRs with respect to malaria control. The results from this chapter, not only from their own study, but also that carried out by Leonard and VanLandingham in particular, (Leonard and VanLandingham, 2001) demonstrate the potential validity of this statement.

The topic of risk and risk assessment was also explored in this chapter, and a theory identified which emphasises the importance of knowledge, personal factors and the social environment in decision making about risk. Some evidence of how this might be relevant to imported malaria was described.

The next chapter begins by setting out a conceptual framework which draws on findings of this chapter, and proposes the factors which may be relevant in understanding the reasons for the burden of imported malaria in the Nigerian and Ghanaian communities living in London. It then describes the methods which will be used to explore this in this thesis.

Chapter four: a conceptual framework; the mixed methodology approach; methods of the quantitative and qualitative study.

This chapter begins by critiquing psychological and sociological models of service uptake, as well as a model of societal and individual determinants of medical care utilisation. It proposes a more suitable conceptual framework to explain the reasons for the burden of imported malaria in the Nigerian and Ghanaian communities in London. Quantitative and qualitative research methodologies and their underlying epistemologies are then discussed, and a rationale given for using mixed methodologies in this thesis. The methods used to understand the burden of imported malaria in the Nigerian and Ghanaian communities and their strengths and limitations are described.

4.1 Models of service uptake

As noted in section 1.4, malaria is largely a preventable disease. Prevention for the individual traveller depends on taking measures to avoid bites from mosquitoes which may be infected with Plasmodium species, and using appropriate chemoprophylaxis. Two common theories seek to explain those factors which determine health behaviours. One is based on psychological factors, whilst another is based on sociological factors. Another model focuses specifically on those factors which determine the use of medical services. In this section I critique each of these theories, and then present a novel conceptual framework which I believe begins to explain more accurately the context within which decision making is made about imported malaria amongst Nigerian and Ghanaian VFRS.

There are several psychological models of service uptake. These typically relate to factors which impact on primary prevention of disease. Amongst the most well-known are the "Health belief model" and the "The theory of reasoned action" (Ajzen.I and M, 1980, Becker, 1974). These models purport to explain the decision making process that individuals undertake when considering changing their behaviour, for example when deciding whether to stop smoking, or reducing their intake of alcohol. There is a presupposition that individuals will act in their own self-interest, and that behaviour change is possible. Health promotion campaigns using these psychological theories to underpin their work aim to change behaviours by increasing the individuals' awareness of the risks associated with them, with an expectation that once these are known, the individual will wish to adapt his or her behaviours to avoid these. In chapter three of this thesis, questions asked of migrants in previous research included whether they were aware of the potential serious consequences of malaria for themselves when travelling

to a malarious country. The need to measure this awareness appeared to be based on the assumption that travellers to malarious countries will not protect themselves against malaria if they are not aware of the risk. One major criticism of psychological models is that they do not take into account the contextual factors which may affect decision making (Nutbeam, 2004). With respect to the prevention of imported malaria, these may include access to pre-travel health advice health services and to prompt diagnosis and treatment. Without access to these services, even if an individual is aware of the risk of acquiring imported malaria, he or she will be constrained in his or her ability to do so.

Sociological models of service uptake, in contrast to psychological models, focus on the structural factors which might impact on service uptake. As explained by Krieger,

"these explicitly address economic and political determinants of health and disease, including structural barriers to people leading health lives" (Krieger, 2001 p.670).

In sections 2.5.3 and 2.5.4 of this thesis, examples of the perceived importance of structural factors with respect to the prevention of imported malaria have already been shown. One was the concern voiced by clinicians that removing the subsidy for chemoprophylaxis has been claimed to present a barrier to it use (Hollyoak, 1995, Evans, 1996, Badrinath et al., 1998, Hossain, 2008). Another example is the provision of pre-travel health advice, where, as noted by Chiodini, the provision of information was poorer in areas that had relatively larger migrant populations (Chiodini, 2009).

However, social production of disease theories have been criticised on the basis that they do not take into consideration the range of other factors which form part of the context in which decision making is made (Krieger, 2001). With respect to imported malaria, some of these other factors have already been identified in chapter two and three, alongside structural barriers. They include biological factors, for example loss of immunity, environmental factors, such as the local prevalence of anopheles mosquitoes which may impact on the perception of risk of acquiring malaria, and cultural factors, including a wish to follow local customs used by friends and family in Nigeria or Ghana to treat malaria. Thus, although structural barriers to service uptake are likely to be important, they may not fully explain the range of factors which impact on the burden of malaria.

Furthermore, although structural barriers to service uptake are relevant, those based on a social production of disease model to explain behaviours typically focus on those that are valid within one geographical context. Yet, for members of the African diaspora, who are exposed to two different ways of managing malaria, each with particular structural constraints, both these contexts (in Nigeria and Ghana and in the UK) are likely to be of importance.

A model which focuses specifically on those factors which influence the utilisation of health services is that proposed by Andersen and Newman (Anderson and Newman, 2005). They explain the uptake of medical care as a function of three interacting factors. These are societal determinants, health services systems and individual determinants. Societal determinants are sub-divided in this model into "technology" and norms". According to the model, societal determinants affect individual behaviours both directly and through health system services. Advances in technology specifically are said to affect the utilisation of services, for example improved surgical techniques make hospital stays shorter than previously. With respect to "norms", the authors point to a growing homogeneity within society about what are considered suitable locations for healthcare. "Health systems services" are divided in the model into "resources" and "organisation". These refer to the quantity of services available and the way in which these are controlled. The third factor, individual determinants are divided into a range of predisposing, enabling and illness level components. In the first are included a) demographic factors; b) social structure (including a range of elements such as race and education c) beliefs, such as knowledge about disease, attitudes about health services and an individual's own values about the importance of health. Enabling factors are divided into family and community components. Examples of the former are the financial resources available to the family, whilst community services refer to the amount of healthcare available in the community and their cost at the family level. Illness level refers to the perceptions of the individual about his or her level of illness and the clinician's evaluation of these.

In the context of imported malaria, this model takes into account more of the factors which affect decision making about imported malaria, in comparison to the psychological and sociological models described above and many are relevant in the

context of imported malaria. For example, the amount of pre-travel health services available within a community could reasonably be thought to have an impact on their use, whilst financial resources in different families may make them more or less able to purchase chemoprophylaxis in those areas where this is not subsidised. In section 2.2.1, the genetic factor sickle-cell disorder, which is more common in certain races including those born in African countries was shown to either offer protection against malaria (for those with sickle-cell trait) or make them more likely to suffer serious symptoms (for those with sickle-cell disease). Race is included in the model under the "social structure" component of enabling factors affecting individual determinants of healthcare utilisation.

There are however several reasons why this is model is not suitable to explain the burden of imported malaria in the Nigerian and Ghanaian communities living in London. The model only considers those factors which impact on the uptake of medical services, yet there are other influences which impact on the burden of this disease. One example is environmental determinants. Specifically, it was noted in section 2.1.3 that there are lower entomological inoculation rates in urban compared to rural areas of Africa, meaning that there will be less exposure to malaria parasite vectors for those VFRs who stay in urban areas. This gradual urbanisation has been directly linked to the decreased risk of cases of imported malaria reported between 1993 and 2008 (Behrens et al., 2008), although this claim needs validation. A model which aims to consider the factors which impact on the burden of imported malaria, rather than solely on medical care utilisation is more relevant to the aims of this thesis.

Another example of factors which may impact on the burden of imported malaria but do not necessarily determine the uptake of medical services is related to environmental determinants, and this is the the mosquito prevention measures that may be provided in host families in malarious countries and which protect VFRs against infected mosquito bites. These may include structures such as door and window nets in host accommodation, or the provision of insecticides and insect repellents which can be purchased in a range of retail outlets.

Of course, it is also possible that these environmental determinants do impact on the utilisation of medical care services. Part of the decision making process about whether

to access pre-travel health advice may be influenced in part by perceptions of the number of mosquitoes expected to be seen in the vicinity or about knowledge about protection measures available. This strengthens the assertion that environmental determinants should be included in a model.

The inclusion of improvements in technology is considered to be a positive influence in the medical care utilisation model, yet not all technologies are beneficial in the context of imported malaria. For example those which enable the mass production of sub-standard drugs for malaria treatment that are exported to African countries and may be used by VFRs has a negative, rather than a positive impact on the burden of malaria.

The enabling family and community factors in the medical care utilisation model focus on issues such as income and the urban-rural nature of the community. No attention is given to the perceptions of how the attitudes of other family members in malarious countries to the seriousness of disease may impact on an individual's decision to use services.

The model considers that efficacy of treatment by clinicians impacts on the decision to use medical services but does not take into consideration that this belief may be dependent on personal characteristics of individual clinicians. Leonard and VanLandingham (Leonard and VanLandingham, 2001) found that African VFRs were distrustful of non-African doctors in particular, and would seek out those with from the same ethnicity.

Most importantly however, the model is limited to discussing the factors which affect the utilisation of health services in one country, for example the USA. One of the aims of the thesis is to explore the factors that enhance and constrain the uptake and effective use of malaria prevention and treatment among London residents visiting friends and relatives in Nigeria and Ghana. The results of the literature review in chapter three showed that for members of an African diaspora, decision-making is influenced simultaneously by two different contexts: the range of factors relevant in malaria-endemic countries and how malaria is managed in the UK context. Thus, within this thesis it will be important to explore in detail how these contexts interact in order to understand the reasons that impact on the burden of imported malaria. Whilst changes

over time are considered to some extent within the model of medical care utilisation, it does not consider in detail how an individual's perceptions may change over time as he or she experiences the advantages and disadvantages of each context, nor the environmental factors associated with urbanisation discussed above.

In this thesis, an alternative model is proposed specifically to explain the factors impacting on the burden of imported malaria in African VFRs. It describes in detail what factors are taken into consideration by the individual when deciding whether and how to protect him or herself against malaria, and how this decision making interacts with structural barriers in each context which are considered by the individual. An outline of the conceptual framework, drawing on the evidence presented in chapters two and three is shown in figure 4.1. The rectangular boxes at the top and bottom of the model describe the social, structural and physical environments which provide the context in which decision making is made by VFRs. The arrows leading from these rectangular boxes represent that both these contexts are taken into account simultaneously by VFRs when making decisions. The oval shape contains the factors which may be considered by the individual VFR within these social, structural and physical contexts.

The relevance of the conceptual framework within the context of the thesis will be discussed again in the final chapter.

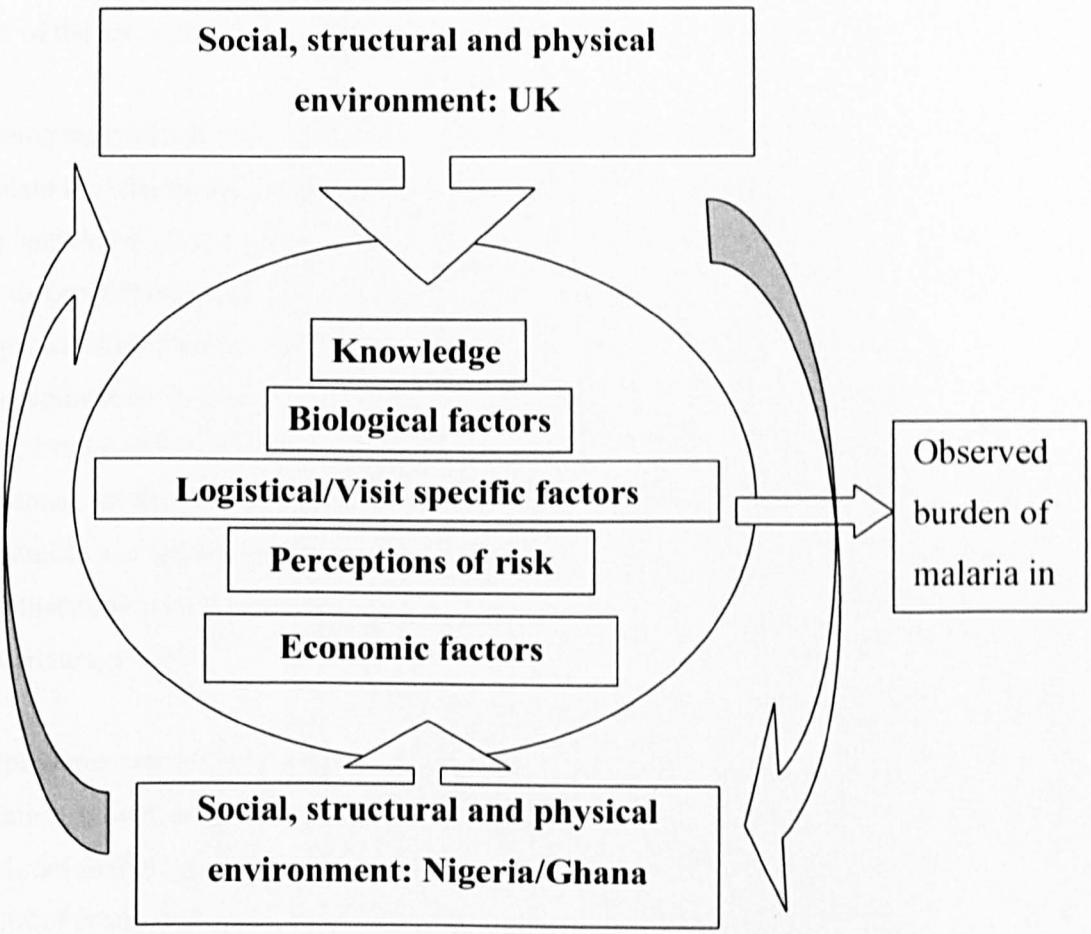

Figure 4.1.1 Conceptual framework proposing the context within which decisions are made by VFRs of Nigerian and Ghanaian descent about malaria control

4.2 Quantitative and qualitative research methodologies

The epidemiological analysis carried out by Smith and colleagues identified those communities most at risk of imported malaria in the UK for the 20 year period 1987 to 2006, and described what was known about risk factors in these groups. It is worth stating the value of epidemiology, which measures health and disease indicators at a population level and may also describe which groups to target for a particular intervention, a point made by Smith and colleagues with respect to imported malaria in their 2008 paper (Smith et al., 2008). However, the identification of risk factors per se does not explain the *underlying factors* which may impact on risk. For example, Smith and colleagues found that amongst those travellers who were born in Africa, only 28.7%

(CI: 28% to 30%) took chemoprophylaxis (Smith et al., 2008), but the epidemiological design of the research study did not enable an understanding of why this might be so.

It is being increasingly recognised that a focus on individual risk factors is not sufficient to explain the reasons for health and disease (Pearce, 1996, McMichael, 1999, Krieger, 2001), and Porter notes that since the 1990s there has been a "paradigm shift" amongst many theorists and practitioners in Public Health (Porter, 2006). One reason for this has been proposed by Baum, namely: "the questions asked by public health researchers have become more complex, more embedded in social, political and economic factors" (Baum, 1995 p.459), whilst Creswell and Garrett explain that "research processes continuously evolve and change in response to the complex, interconnected global communities and their needs in the world" (Creswell and Garrett, 2008 p.321). This means that additional research tools may be needed to describe and understand these issues (Baum, 1995).

To explore the reasons for the burden of imported malaria in Europe and in the USA, qualitative, as well as quantitative research methodologies have already been employed in different studies (Scolari et al., 2002, Morgan and Figueroa-Muñoz, 2005, Leder et al., 2006, Pistone et al., 2007, Schilthuis et al., 2007, Smith et al., 2008). The advantages of epidemiologically focused research with respect to imported malaria have already been identified in this thesis. The benefits associated with qualitative research methodologies with respect to understanding the context within which decisions are made about imported malaria have also become apparent from chapter two. For example, with respect to the use of chemoprophylaxis, Morgan and Figueroa-Muñoz, who used a focus group methodology, discovered that many African migrants perceive malaria as a mild, easily treatable illness, and one influence on this might be witnessing it being treated as such in African countries (Morgan and Figueroa-Muñoz, 2005). This contrasts with the findings reported from Schilthuis and colleagues who, using a questionnaire study, reported one reason for not taking chemoprophylaxis as "I am from West Africa, so I don't need vaccinations" (Schilthuis et al., 2007), which did not provide sufficient detail to explain the reasons for the link made by the study participant between country of origin and perceived healthcare need.

4.2.1 The epistemologies of quantitative and qualitative research

Underlying quantitative and qualitative research methodologies are two different epistemologies. Quantitative research is based on an epistemology grounded in the philosophical theory of positivism, that is: "based on the belief that phenomena can be reduced to their constituent parts, measured, and then causal relationships deduced" (Baum, 1995 p.461). Crucial to this is the idea that there is a single truth that is existent irrespective of people's beliefs. It is the role of scientists to discover this truth, in a value-free manner, without influencing or being influenced by the data (Sale et al., 2002). The methodologies used in much biomedical scientific research are of a positivist nature: hypothesis testing of observable data in order to discover such truths. An example is the discovery, using observation and testing that microorganisms were responsible for infection. Commonly, the methodology used in quantitative research is to select a carefully selected sample that is assumed to be representative of a wider population, and make inferences about the population from this (Sale et al., 2002)

Constructivism offers an alternative epistemological approach. This considers that reality is socially constructed, and is not independent of our minds (Sale et al., 2002). It is not context or time-independent (Johnson and Onwuegbuzie, 2004). Research methodologies based on a philosophy of constructivism emphasise the importance of understanding (Baum, 1995). Specifically the aim is to understand the world from the viewpoint of the participants and the context within they live (Baum, 1995) It is also understood that the choice and interpretation of data is subjective and dependent on the realities constructed by the researcher (Baum, 1995). Qualitative research methodologies are typically used. Qualitative research can be defined as "any type of research that employs nonnumeric information to explore individual or group characteristics, producing findings not arrived at by statistical procedures or other quantitative means" (Last, 2001 p. 147). The same author goes on to say that "qualitative data can enrich understanding of complex problems and help to understand why things happen" (Last, 2001 p.147). Examples of qualitative research methodologies include in-depth interviews, and focus groups

As with quantitative research methodologies, there have also been criticisms of qualitative methodologies. Mays and Pope have categorised these into three main areas (Mays and Pope, 1995b). Firstly, that it is "an assembly of anecdote and personal

impressions" (Mays and Pope, 1995b p.109). To refute this, Mays and Pope point out that in qualitative research, study participants are not selected randomly. Instead, there is a careful choice of individuals who are able to inform the topic under investigation. For example, they should have personal characteristics, and/or live in a particular area which enables the researcher to explore the research topic effectively (Mays and Pope, 1995b).

A second criticism is concerned with the reproducibility of qualitative research, as interpretation is dependent on the perspective of the researcher. As noted above, subjectivity is the basis upon which qualitative methodologies based on a constructivist philosophy are conducted. However, Mays and Pope recommend that qualitative researchers must openly report on the methodologies used, and explicitly state the subjectivity surrounding their interpretation of the results (Mays and Pope, 1995b). Hellman makes the point that subjectivity, rather than being a weakness, is in fact a strength of qualitative research, as explicit information is supplied about the research process (the attributes of the researcher, the attributes of the research technique, and the context within which the research takes place) which readers may use to evaluate the findings (Helman, 2001 p.266).

The third criticism is that the results of qualitative research cannot be extrapolated to larger populations, that is, there is no selection of a sample which is thought to be representative of a wider population, as is the case with quantitative research (Mays and Pope, 1995b). However, many qualitative studies do not aim to produce statistically representative results that can be generalized to the broader population, but rather aim to explore a problem and develop an understanding of factors which may influence particular behaviours (Mays and Pope, 1995b). Quantitative research methods may then be used to investigate the extent to which these findings can be extrapolated to a broader population (Mays and Pope, 1995b).

4.2.2 How the research will be undertaken: mixed methodology

In this chapter, the value of both quantitative and qualitative research methodologies has been described. Both will be employed in this thesis, as each can contribute to explaining the reasons for the burden of imported malaria in the Nigerian and Ghanaian communities. Mixed methodologies in research have been defined as:

> *"the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study"* (Johnson and Onwuegbuzie, 2004 p.17).

The usefulness of combining mixed methodologies is becoming increasingly recognised (Sale et al., 2002). One reason is that using both offers a pragmatic way to answer complex research questions (Johnson and Onwuegbuzie, 2004). However commentators have noted that studies which combine quantitative and qualitative methodologies have been criticised on the grounds that underlying each are incompatible epistemologies (Johnson and Onwuegbuzie, 2004, Sale et al., 2002). Specifically, these may involve quantitative research based on an underlying philosophy of positivism, and qualitative research based on a philosophy of constructivism. However, it has been asserted that they can be legitimately used together in a complementary way to both *describe* and *understand* communities (Baum, 1995, Sale et al., 2002). Sale and colleagues give the example of a study of nurse "burnout". Quantitative methods can be used to measure the extent of "burnout" , whilst qualitative methodologies can be used to explore the experiences of nurses who suffer from this (Sale et al., 2002).

The research question in this thesis requires a description of which populations are most affected by imported malaria, and also an understanding of the contextual factors which cause this burden within these groups. Therefore, mixed methodologies will be used in a complementary way as follows:

- an analysis of reports made to the MRL between 2001 and 2008 to determine which groups are currently at risk of imported malaria and to describe the epidemiology of these in more detail

- a qualitative study to understand why these groups are at risk of acquiring imported malaria, exploring the context within which decisions about protection against malaria are made.

4.3 Method of exploring the epidemiology of imported malaria in the UK: data sources and limitations

The most recent publication describing the epidemiology of imported malaria was published in 2008 and covered a 20 year period between 1987 and 2006 (Smith et al.,

2008). In this section, the data sources that are available to examine the epidemiology of imported malaria in the UK, including both numerator and denominator, are appraised. Using the best available sources of data, a description of the most up-to-date epidemiology of imported malaria is provided. In this, those groups most at risk of acquiring imported malaria are described, as measured by geographical area of residence, species of plasmodium parasite acquired, ethnicity and reason for travel. More detail of those who constituted this group is then given.

4.3.1 Choice of data source for the numerator and its limitations

The source of data used for the number of cases in this epidemiological analysis is that collected by the HPA's MRL. All reports are laboratory-confirmed, and reporting clinicians are requested to complete a short form providing demographic, epidemiological and clinical information about each patient (Health Protection Agency 2007). This passive reporting system has been in place since 1977 and the variables collected have remained fairly constant since this time (Health Protection Agency 2007).

The use of data from an alternative UK-wide reporting system, "Notifications of Infectious Diseases System" (NOIDS) was also considered for this analysis. As malaria is a statutorily notifiable disease, all clinically suspected cases should be reported to an individual termed the "Proper Officer", usually a Consultant in Communicable Disease Control. However, the extent of under-reporting of malaria cases via the NOIDS system is considerable. For example, of 293 laboratory-confirmed cases reported to the MRL in 2000 in South East London, only 20 (7%) were notified via NOIDS (Cleary et al., 2003). One further drawback of NOIDS data is that reports are of diagnoses made upon clinical suspicion, rather than being laboratory-confirmed cases (Health Protection Agency, 2011c). These two limitations severely restrict the usefulness of NOIDS data for this analysis, and this system was therefore not considered appropriate.

Limitations include under-reporting to the MRL and issues associated with data quality.

4.3.1a Under-reporting

Although the extent of under-reporting of malaria cases via the NOIDS system is one reason why it is an unsuitable data source for this epidemiological analysis, there is also

evidence of some under-reporting of malaria cases from reports made to the MRL. This comes from a capture-recapture study, comparing the number of reports made to the MRL with Hospital Episode Statistics (HES). The latter are records of the diagnosis of patients admitted to hospitals, including the reason for admission. The study examined data reported to both systems between July 2003 and December 2004 in England. It concluded that only 56% of all cases were reported to the MRL (Cathcart et al., 2009). Complete reporting was estimated to be higher in London (62% of cases) and for cases of falciparum malaria (66%) (Cathcart et al., 2009). However, MRL data is the only alternative source of reports for malaria other than those made via NOIDS, and so was chosen as the data source for the analysis.

4.3.1b Data quality

Measures of data quality with respect to reports made to the MRL include both the completeness of data that are entered onto the surveillance form by the reporting clinician, and the accuracy of these data.

4.3.1.bi Completeness of data

The analysis of reports made to the MRL between 1987 and 2006 carried out by Smith and colleagues showed that whilst some variables were completed for nearly all reports (age; 96%, sex; 94%), others were less well completed. For example, details of the country visited was completed for 88% of reports, the reason for travel for 71%, the country of birth for 64% and the use of chemoprophylaxis for 62% (Smith et al., 2008).

4.3.1.bii Accuracy of data

The extent of the non-completion of variables on the MRL reporting form, and the accuracy of those which were, was investigated in a postal survey of UK- resident patients whose episode of malaria had been reported to the MRL in 1987 (Phillips-Howard et al., 1990a). Patients were asked to verify information on 10 variables that had been recorded on the MRL report form, and to provide any missing data. The results showed that the number of missing values was significantly greater in reports of patients who belonged to ethnic minority groups, particularly with respect to the dates that trips had been taken and whether malaria chemoprophylaxis had been used. Those of African and Asian ethnicity were also more likely to interchange the reason for travel between "holiday" and "visiting friends and relatives." Respondents who stated in the

postal survey that they were foreign students resident in the UK had not all been categorised in this way on the MRL reporting form. Overall, one in four of all patients, irrespective of ethnicity, gave a different reason for travel when later surveyed to that given on the original MRL report form. Postal survey results suggested that nearly 8% who had not taken chemoprophylaxis were reported to have done so on the surveillance form. Conversely, 24% reported they had taken chemoprophylaxis from their responses to the postal survey, but according to the surveillance form had not. The authors accepted that recall bias on the part of patients may have contributed to the results, but these findings demonstrate the extent to which inaccurate data may be recorded on the MRL report form. As pointed out by Philips-Howard and her colleagues in the conclusion to their 1990 postal survey, any epidemiological analyses and Public Health recommendations based on this data set must be undertaken with the limitations described above in mind (Phillips-Howard et al., 1990a).

4.3.1.biii Other data quality issues

Four other data quality issues affecting the robustness of the epidemiological analysis undertaken in his thesis should be noted. Firstly, the MRL changed the variable requested on the surveillance form from "nationality" to "ethnicity" of patient" in 2004 (personal communication: Valerie Smith, MRL). This new variable enabled a comparison to be made with ethnicity data collected by the UK census. Before this time, the variable "nationality" was requested to be completed by clinicians, and was recorded as the name of a country, for example "France" or "Nigeria". This change in categorisation raises questions of the comparability of data before and after 2004. This is discussed further in section 4.5.4.

The second data quality issue is that in order to reduce the number of missing values relating to nationality (before 2004), or ethnicity (after 2004), the MRL themselves categorise patients as of "African descent" or of "Asian descent" if other variables completed, such as the patient's name and country of birth strongly suggest this to be the case MRL (personal communication Valerie Smith: MRL). However, this is likely to lead to some misclassifications.

Thirdly, reports are considered to originate from London if the home address of the malaria case is from that area. Alternatively, if this information is missing, those reports

originating from *hospitals in London* are categorised as cases in London residents by staff at the MRL (personal communication Valerie Smith: MRL). This attribution of residency is to reduce the missing values or invalid entries that may be made by clinicians when entering the postcode of the patient onto the form. Thus, it is likely that some patients not resident in London are included in this category.

Fourthly, it was not known if clinicians completed surveillance forms after speaking to each patient, or made assumptions, for example about individual's use of chemoprophylaxis. If the latter were the case, misclassifications may result.

4.3.2 Data sources for denominator data

Two different sources for the denominator were used for this analysis: mid-year population estimates and mid-year population estimates by ethnicity.

4.3.2a Mid-year population estimates: description and evaluation

Mid-year population estimates are calculated using a "cohort component model". Estimates are made by the ONS by adding one year in age to each member of the population counted in the census or the previous mid-year population estimate, as appropriate, and making additional adjustments based on the annual number of births, deaths and migrations. Migrations may be sub-divided into internal migrations and international migrations. Counts of internal migrations are made using data on the movement of people between geographical areas within the UK. This consists of records from GP patient registers and Health Authority/PCT data (Office for National Statistics, 2002). International migrations are calculated using:

- information from the International Passenger Survey (IPS) on long term migrants (i.e. those who intend to stay longer than one year in the UK)
- estimates from the IPS on the number of "switchers" (people who originally intended to stay for less than a year in the UK, but changed their mind, or who intended to stay longer than a year, but who stayed for less time)
- IPS estimates of the numbers of asylum seekers
- migrant flows to and from the Republic of Ireland estimated from the IPS

Mid-year population estimates are calculated several years after the census may be more inaccurate, as estimates are based on other estimates without verification of an actual count of the population. However, they are used extensively by national and local Government, and in publications used in academic research.

A brief description and evaluation of each component of mid-year population estimates (census data, births and deaths and internal and external migration) follows.

4.3.2.ai Census data

The UK census takes place once every ten years and counts those people normally resident at each address on one particular night of the year.

The ONS, in a review of the quality of the 2001 census, identified several limitations which are pertinent to the epidemiological analysis in this thesis (Office for National Statistics, 2005). Whilst overall in England and Wales 94% of the population returned a census form, this fell to 84% amongst inner London residents, making the returns provided less representative of the total population in the capital. Specifically, verification of the census count using other methods of estimating the population, revealed a shortfall of some 187 000 men, mostly between the ages of 25 and 34. However, the mid-year population estimate for 2003 was adjusted by the ONS to account for this discrepancy.

Where there were inconsistencies in the information provided in different sections of the census form by individual members of the population, or data were missing, but could be derived from other responses given by these individuals, the data were imputed. This included 2.5% of responses concerning country of birth, and 2.9% for ethnic group. Algorithms were used when imputing these data to ensure consistency in the methodology used. However, the ONS data quality review referred to above, concluded that it was possible that some misclassification may have occurred using this method (Office for National Statistics, 2005).

4.3.2.aii Births and deaths

The ONS considers the number of births and deaths acquired from national registers and used to calculate mid-year population estimates to be reliable, as all data are included (Office for National Statistics, 2004).

4.3.2.aiii Internal and external migrations

A combination of GP data and Health Authority/PCT data are used to gather as accurate an estimate as possible about internal migrations. However, it is recognised that the component derived from NHS patient registers are subject to delays. This is because the details of people moving between GP services in different geographical areas may not be registered in the new area before the next mid-year population estimate is made (Office for National Statistics, 2004).

The International Passenger Survey (IPS) counts the number of travellers leaving and entering the UK by sea, air or through the channel tunnel. A random sample of about 1 in 500 travellers is surveyed, and it is thought to cover about 90% of passengers leaving or entering the country (Office for National Statistics, 2010). The response rate in 2008, the most recent year for which mid-year population estimates were included in this analysis, was 84%, meaning that the results may not be entirely representative of the true number of migrants.

4.3.2b Mid-year population estimates by ethnicity

These are annual estimates of the ethnic composition of each country of the UK, and are provided by ONS. Like mid-year population estimates, a "cohort component method" is used to calculate these. Data are derived partly from the census form, on which all citizens of the UK are asked to record their ethnicity, and also indirectly from records of births and deaths. International and national migration data are also used. The ONS has termed these ethnicity data "experimental statistics", as their quality is in the process of being evaluated (Office for National Statistics, 2006).

Like mid-year population estimates there are several limitations to the accuracy of mid-year population estimates by ethnicity, and these have been described by the ONS (Office for National Statistics, 2006). Firstly they are dependent on the completeness and accuracy of the data included in the census and mid-year population estimates, the

limitations of which have been described in 4.3.2a. Secondly, information relating to ethnicity is not collected routinely on birth certificates. As an indirect measure, the number of births in each ethnic group is estimated from age-specific fertility rates calculated from the census. Cross-checks with the actual number of births in an area, taken from birth certificates, are used to ensure the fertility rates are based on a reasonable estimate, and are adjusted if needed. Mortality by ethnic group used in mid-year population ethnicity estimates is derived by taking age-specific mortality rates in a particular area from death certificates, and assigning proportions to each ethnic group. As ethnic groups are not evenly distributed across geographical areas, it is accepted that this method of calculation of mortality is likely to be inaccurate (Office for National Statistics, 2006).

Internal migration by ethnicity is estimated using GP registration data and Health Authority/PCT data in the same way as mid-year population estimates. Delays in transferring GP registration data between areas which may affect the accuracy of these estimates, and limitations of the IPS relevant to this analysis have already been described in section 4.3.2 aiii.

Two other measures were also used to calculate rates. One of these was standardised rates. Whilst crude incidence rates provide a useful summary estimate of the burden of diseases such as malaria, to control for possible differences in age categorisations between residents of England and London, age-standardised rates can also be calculated.

The other measure was unpublished data from the IPS. It was noted in section 4.3.2 that mid-year population estimates were used as a denominator in the calculation of incidence rates. It would have been preferable to instead use an estimate of travellers as a denominator, rather than mid-year population estimates, as not all the population will travel and so do not constitute a population "at risk". Although the IPS collects data on UK citizens who visit overseas, countries in Africa are categorised in the publications produced by the ONS as "Egypt", "Tunisia", "Other North Africa", "South Africa", "Other Africa" (Office for National Statistics, 2010). This means that no data were available on the number of trips made by travellers from the UK to each African

country, which would enable a more accurate denominator for the calculation of malaria incidence rates.

To overcome this problem, data collected by the IPS for five years (2004-2008), which included the number of VFRs in the UK travelling to Nigeria and Ghana were provided by Dr Ron Behrens. These data are not routinely available, but access to these allowed an alternative denominator to be used for the calculation of rates.

The limitation of these data was that the IPS request data to be collected on a single main purpose of travel, which is reported by each respondent. This means that additional reasons for the same trip, such as "visiting friends and relatives" would not be included. There is no estimate available of the number of people who may be travelling overseas for more than one reason, but the study carried out by Phillips-Howard and colleagues and referred to in section 4.3.1bii, found that travellers of African and Asian ethnicity were likely to interchange "holiday" and "visiting friends and relatives" as a reason for travel. Therefore, the IPS data may under-estimate the number who visit for these purposes. However, as explained above, they give a more accurate assessment of rates of disease than mid-year population estimates.

4.3.3 Choice of time period

The analysis carried out for this thesis initially covered the period between 2001 and 2006, and was carried out in 2007. The year 2001 was the year when the most current census was undertaken. Therefore, mid-year population estimates were as accurate as possible at the beginning of the study period, as the 2001 mid-year population estimate was derived from the 2001 census. The analysis was up-dated in 2009 to include MRL data for 2007 and 2008.

4.4 Collection of numerical data

The MRL provided eight MS Excel spreadsheets containing all reports made by clinicians of imported malaria between 2001 and 2008 in England, Wales, Scotland and Northern Ireland. The names of patients were removed before the spreadsheets were received, and ethical approval from the London School of Hygiene and Tropical Medicine was granted for their use (LSHTM ethics reference 5086). Other data used to calculate denominators (mid-year population estimates and mid-year population

estimates by ethnicity) were accessed from the Office for National Statistics website "publication hub". As explained in section 4.3.2b, Dr Ron Behrens provided unpublished data from the IPS, which enabled an alternative infection rate to be calculated for travellers to Nigeria and Ghana.

4.5 Method of epidemiological analysis

All data analysis was carried out in MS Excel. All confidence intervals were calculated at 95%.

4.5.1 Completeness of data

The Excel datasheets were comprised of line listings of records for individual patients and included the variables requested for completion by clinicians on the MRL report form, with the exception of the patient's name (see Appendix one for MRL reporting form). There were some variables where values had not been entered for individual records. In other instances, the entry was not valid. For example, for the variable "sex", some values other than male or female were recorded. Variables with missing or invalid entries were defined as "incomplete data" and were omitted from the data analysis.

4.5.2 Calculation of incidence, crude and standardised incidence rates

The geographical area of the report was assigned using the location of the hospital which made the report to the MRL, as a proxy measure, rather than the borough or county of residence of the patient. This method was chosen because 60% (8280/13813) of the reports had data relating to borough or county of residence missing, whilst 100% of reports had data relating to the hospital from where the report was received.

The number of reports of imported malaria each year in the UK was calculated by counting the total number of reports in each spreadsheet. The number of reports in the London area was calculated by counting those reports made from hospitals in that area. The number of cases in the UK excluding London was calculated by subtracting the number of reports from London hospitals from the number of reports in the UK.

Crude incidence rates for each year for the UK and for the London area were calculated by using the number of reports from the MRL as a numerator (categorised by geographical area as appropriate) and mid-year population estimates (for the UK and for

London respectively) as a denominator. These were multiplied by 100 000. The confidence interval around the rate for each year was calculated using the formula:

$$\text{95\% upper confidence limit} = \left(\frac{100000}{n}\right)\left(d + \left(1.96 \times \sqrt{d}\right)\right)$$

$$\text{95\% lower confidence limit} = \left(\frac{100000}{n}\right)\left(d - \left(1.96 \times \sqrt{d}\right)\right)$$

(where d is the number of reports, and n is the sample size).

The number of reports made in England excluding London was calculated by counting the number of reports which came from hospitals in England, excluding those which originated from hospitals in the London area.

The crude incidence rate for England was calculated in the same way as for the UK, but using as a numerator those reports which originated from hospitals in England, and as a denominator, mid-year population estimates for England.

To obtain standardised rates in the template sourced from the LHO, the numbers of MRL reports that originated from London hospitals and from English hospitals excluding the London area for the years 2001 to 2008 were inserted into the spreadsheet, and the rates and confidence intervals extracted from this.

4.5.3 Species of malaria acquired

The mean number of reports for the UK excluding London was calculated by summing the number of reports caused by each plasmodium species which were reported by hospitals in this area, and dividing this by eight (the time period included in the analysis). The same method was used to calculate the mean for London, using the number of reports from London hospitals and dividing this by eight. The confidence interval around the mean was calculated using the equation:

$$\text{95\% confidence interval} = \bar{x} \pm \left(1.96 \times \frac{s}{\sqrt{n}}\right)$$

(where $\bar{x}$ is the mean and s/√n is the standard error).

4.5.4 Estimates of infection rates per 100 000 population by ethnicity

There were only three ethnic groups for which the categorisation of numerators (MRL reports) and the denominators (ONS categorisations by ethnicity) could be matched (table 4.5.1). A fourth ethnicity categorised as "Indian Sub-Continent" on the MRL report form was also considered for inclusion. However, on this form, no definition of "Indian Sub-Continent" is given. Possible categories included by the ONS in their mid-year population estimates by ethnicity include "Asian or Asian British: Indian"; "Asian or Asian British: Pakistani"; "Asian or Asian British: Bangladeshi": Asian or Asian British: other Asian" or "Asian or Asian British: Chinese". The uncertainty about comparable categorisations meant that rates were not calculated for this ethnic group.

Table 4.5.1 Ethnic group categorisations used for numerator and denominator calculations for three ethnic groups included in the epidemiological analysis

	Ethnic group		
Numerator (MRL data)	White British	Black African/African descent	Black Caribbean
Denominator (ONS ethnicity categorisation	White British	Black or Black British Black African	Black or Black British Black Caribbean

4.5.4a Calculating trends in ethnicity rates from the MRL report form (2001-2008)

In section 4.3.1biii, it was explained that after 2004, the MRL changed the variable "nationality", used before this time, to "ethnicity". This raised the question of whether these different categorisations signified membership of the same ethnic group for the purpose of the analysis presented in this thesis.

To explore this, re-coding of the variable "nationality" was undertaken for the years 2001 to 2003. Those whose nationality was recorded as a country in Africa for these years were recoded as "Black African". Similarly, those with nationality recorded

between 2001 and 2003 as a country in the Caribbean were re-coded as "Black Caribbean". Those reports which categorised nationality as "UK" from 2001 to 2003 were re-categorised as "White British".

The means and confidence intervals around the means of reports made to the MRL from 2001 to 2003, using these re-coded categories, were compared to reports made from 2004 to 2008. This was carried out for the three ethnic groups for which infection rates could be calculated, as described above.

Table 4.5.2 shows there was a significant difference in the means for each of three nationalities/ethnicities (as the confidence intervals did not overlap). One explanation for this may be that after 2004, some people born in the UK but of African ethnicity described themselves as "Black African" but before this time would have categorised their nationality as "UK" on the MRL report form. Whatever the reason for the difference might be, it was decided that "nationality" and "ethnicity" could not be matched.

Table 4.5.2 Mean number of reports of malaria using the category of "nationality" between 2001 and 2003 compared to the category "ethnicity" used after this time

	UK / White British $\bar{x}$ **(CI 95%)**	**Country in Africa/ Black African** $\bar{x}$ **(CI 95%)**	**Country in the Caribbean/ Black Caribbean** $\bar{x}$ **(CI 95%)**
England excluding London			
2001-2003	177.3 (141.2-213.4)	218.7 (201.6-235.7)	0.7 (0.1-1.3)
2004-2008	92.2 (86.0-98.4)	324.6 (288.8-360.8)	2.6 (1.3-3.9)
London			
2001-2003	65.3 (45.9-84.8)	787 (757.0-818.3)	0.3 (-0.3-1.0)
2004-	20.6 (14.8-26.4)	676.8 (608.7-744.9)	11.2 (6.5-15.9)

2008			

Therefore, all analyses by ethnicity was conducted on data from 2004-2008.

4.5.4b Calculation of means and rates by ethnicity

For the three ethnic groups included, the mean number of cases in England excluding London caused by all species was calculated by dividing the sum of the number of reports which came from patients of each ethnicity which came from hospitals outside London by four (the number of years included).

To calculate the mean number of reports for London, the number of cases was calculated by dividing the number of reports from London hospitals by four.

To calculate the mean number of reports of infections caused by *P. falciparum*, a subset of the dataset was firstly extracted, which included only those reports where it was recorded that the plasmodium species which caused the infection was *P. falciparum*.

Confidence intervals were calculated using the equation shown in section 4.5.2.

Rates per 100 000 by ethnic group were calculated for the years 2004 and 2008. To calculate rates for England excluding London, the numerator was the number of reports in each ethnic group reported for English hospitals excluding those outside the London area. The denominator was the size of the population estimated to be in each ethnic group. The numerator was divided by the denominator and this was multiplied by 100 000 to obtain a rate. The confidence interval for each year was calculated using the same formula as in section 4.5.2 above.

4.6 Number and proportion of infections in VFRs

The number of reports in VFRs from throughout the UK was calculated by counting the number of reports where VFR was recorded as the reason for travel for each year between 2001 and 2008 and summing them. The mean number of reports was calculated by dividing the sum by eight. Confidence intervals around the mean were calculated using the equation in section 4.5.2.

The dataset was sub-divided to obtain a count of reports of imported malaria in VFRs which came from hospitals in the London area, and by those infections caused by *P. falciparum*. Confidence intervals around the mean were calculated as described above.

The proportion of all infections that were in VFRs was calculated by dividing the number of reports where VFR was given as the reason for travel by the total number of reports. This was calculated for each year. The proportion of falciparum infections that were in VFRs was calculated by taking the number of those which were categorised as having VFR as the reason for travel and *P. falciparum* as the species causing the disease, and dividing it by the number of falciparum infections in all travellers. This was carried out for the London area, and for the rest of the UK.

4.7 Number of infections using IPS data as a denominator

To calculate infection rates per 100 000, the numerator was the number of reports made to the MRL from throughout the UK in each year between 2004 and 2008 which were acquired in Nigeria or Ghana. The denominator was the number of VFR travellers visiting these countries.

4.8 Description of the group most at risk of imported malaria

The first part of the epidemiological analysis estimated which group was most at risk of imported malaria, using rates of infection in the way described above. The second part of the analysis described this group in more detail. A subset of MRL data from 2004 to 2008 was used to carry out this analysis, with three criteria all needing to be fulfilled for inclusion in it. The first was that the species of parasite acquired must be *P. falciparum*. Secondly, the reason for travel must have been categorised as "visiting friends and relatives". The third criterion related to ethnicity, with all those whose ethnicity was categorised as "Black African" or "of African descent" included. As described in section 4.3.1biii, as it was not certain if the same populations were included in the variable "nationality", used by the MRL before 2003, compared to the variable "ethnicity", used by them after this date, only data after 2003 were included in the analysis.

All hospitals in the London area were included in the analysis. As was the case for the UK-wide analysis, those hospitals in the London area, instead of borough or county of

residence of the patient was chosen because of the poor completion of data relating to the latter, which was only available for only 33% (501/1498).

Frequency distributions from the MRL dataset were calculated for the variables "age" and "sex". Other frequency distributions calculated included "area of London", "duration of travel" "month of travel", and "deaths". Where the analysis included two variables, cross-tabulation tables were constructed in Excel.

A map of Africa showing the theoretical suitability of the climate for malaria transmission (MARA, 2004) was also used. The compilers of the map stress that the map does not show the incidence of malaria in different countries, but rather, whether the climate makes it likely that malaria transmission can occur. They note that those areas labelled as "suitable" may in fact have no malaria because of control efforts, whilst those considered "unsuitable" may have malaria because of the presence of water in usually dry areas (MARA, 2004). However, this map was considered to be a useful indicator of the malaria risk.

Onto this map was noted the number of infections acquired in countries where more than 10 000 London residents were born who acquired falciparum malaria whilst visiting friends and relatives between 2004 and 2008.

To carry out an analysis of the use of chemoprophylaxis, firstly, a frequency distribution was constructed, counting the numbers who took each type of chemoprophylaxis, and where the entry was recorded as "none". Where brand names only were given on the Excel spreadsheet these were re-categorised to include the active ingredient, for example "chloroquine".

To calculate the rate per 100 000 of those who did not take chemoprophylaxis in LSL and other areas of London, the numerator was the number of MRL reports where it was stated that no chemoprophylaxis was taken in 2004 and 2008 (in LSL and in other areas of London), and the denominator was the mid-year population estimate for each of these years in the same geographical areas. Confidence intervals were calculated as in section 4.5.2 above. The rate was also calculated using mid-year population estimates by ethnicity as a denominator.

4.9 Qualitative Methods

4.9.1 Choice of study participants

In section 4.2.1, it was explained that qualitative, unlike quantitative research is not based on choosing a randomly selected sample of study subjects and extrapolating the findings to a wider population. Rather, the aim is to explore an issue in greater depth, using methods such as semi-structured interviews. The findings of the qualitative research can subsequently be tested, using quantitative methods, to find out the extent to which they are valid in a wider population.

In the qualitative part of this study, purposive sampling was used to recruit respondents. This has been defined by Bernard as follows: "In purposive sampling, you decide the purpose you want individuals or communities to serve, and you go out to find some" (Bernard, 2006 p.189). In this study, the aim was to understand the reasons for the burden of imported malaria in the Nigerian and Ghanaian communities in London. Therefore, participants were chosen which could provide useful information to explain this. As noted in section 3.10, no studies carried out in the UK had included the perspective of health care providers and community pharmacists, and that they may be able to impart important information about structural factors impacting on the burden of imported malaria. The justification of the specific groups of respondents chosen is given below.

In section 2.5.4, it was noted that there were three PCTs in London in which malaria chemoprophylaxis was subsidised. In order to understand any impact this had on decision making about malaria prevention, all groups of respondents described below were drawn from these areas, and also from those PCTs where it must be purchased on a private (i.e. non-subsidised) prescription.

Discussing imported malaria with VFRs themselves was clearly of fundamental importance. It was considered necessary to include some who had sought pre-travel advice and some who had not, in order to find out the factors which influenced both behaviours. It was decided to include those who were planning to travel in the near future so that the discussion could be linked to a particular event, although decision

making relevant to previous travel would also be explored, where appropriate. Interviewing VFRs both before and after travel would allow the opportunity to find out the extent to which behaviours matched intentions. It was also decided to interview both those who had been born in Nigeria and Ghana and those who were born in the UK, to find out the extent to which country of birth influenced decision-making.

Nurse-led travel clinics in GP practices are a common source of providers of pre-travel advice in the UK. It was felt that nurses may be able to provide a valuable perspective on the knowledge, attitudes and behaviours of VFRs who sought such advice. Interviewing practice nurses would also offer an opportunity to explore structural factors which may impact on VFRs' ability to access pre-travel health advice, and obtain chemoprophylaxis.

GPs were a third group of respondents included. It was considered possible that they, as well as practice nurses may be asked for pre-travel advice by their patients, and so would be able to provide useful information about this. They would also be the first source of requests for treatment for some patients returning with symptoms suggestive of malaria, and so able to discuss issues relevant to this. In addition, alongside practice nurses, they would be able to provide a useful perspective about structural factors which may affect the seeking of pre-travel advice by VFRs, and treatment options.

From my professional knowledge, it was considered possible that the service provided by GPs working in single-handed, compared to group practices may be of a lower quality than for those working in group practices. Therefore, it was decided to include a range of GPs, some who worked alone, and others who worked in larger practices.

From the literature review in chapter two, it was known that retail outlets such as pharmacies are commonly used for the purchase of medicines for self-treatment of malaria in Nigeria and Ghana, and that some VFR travellers may use chloroquine as a chemoprophylaxis, which can be purchased without a prescription from community pharmacists. It was therefore considered useful to include community pharmacists as interview respondents to discover more about whether VFRs sought pre-travel advice and treatment from these outlets.

Two groups of participants were subsequently added. From the GP interviews, it was recognised that A&E Departments may be the chosen source of primary care treatment for many patients. It was decided therefore to include some hospital consultants who would be likely to see these when these.

Finally, having interviewed a number of VFRs, it was decided to compare their knowledge, attitudes and practices vis a vis malaria with some patients who had recently acquired malaria and who had been admitted into hospital in the UK. This would also provide an opportunity to compare issues about access to pre-travel health advice, and to prompt and effective treatment.

4.9.2 Initial choice of location in London for interviews

The choice of location in which to recruit participants was decided by three criteria. Two of these were number of reports made to the MRL and the size of the Nigerian and Ghanaian community between 2001 and 2006, the time period during which the initial choice of location was considered. The third criterion was the inclusion of some PCTS in which malaria chemoprophylaxis was subsidised, and some where it was not. Only three PCTs contained hospitals which made cumulatively over 500 reports to the MRL between 2001 and 2008, and that also had over 5000 residents born in Nigeria and 3000 born in Ghana according to the UK 2001 census. These were Southwark (4410 born in Ghana and 10673 in Nigeria), Lambeth (4421 born in Ghana, and 6121 in Nigeria) and Hackney (3209 born in Ghana and 6633 in Nigeria). Two other locations were added. According to the 2001 UK census, the London Borough of Newham was home to one of the largest Nigerian and Ghanaian communities in London (3776 born in Ghana and 5423 in Nigeria) and it was surmised that under-notification to the MRL from Newham hospital may have accounted for the low number of reports made to the MRL between 2001 and 2008 (n=332), and a range of 13-118. The Queen Elizabeth Hospital in Greenwich, which serves the community local to that area, had made over 500 reports to the MRL but results from the 2001 census did not suggest a substantial Nigerian and Ghanaian communities live in this area (1197 born in Ghana and 3918 in Nigeria). However, informal information received from professional colleagues indicated that there was a large Nigerian community who had settled in Greenwich after 2001 and so would not have been included in the 2001 census. A third hospital, HTD, was also considered. Over 500 reports were made to the MRL between 2001 and 2006, but this

hospital could not be easily classified as serving a particular geographical area as it is also a tertiary referral centre from other areas of London.

It was therefore decided initially to seek interviews with VFRs, GPs, practice nurses, community pharmacists and hospital consultants from Lambeth, Southwark, Newham, Hackney and Greenwich. This would also facilitate investigation of the policy of offering malaria chemoprophylaxis on prescription, as some areas were included which followed this policy (Lambeth and Southwark) and some which did not (Hackney and Greenwich and Newham).

Having chosen the study respondents to include in the study and the location in which these would be sought, the choice of research methodology remained to be decided. This was influenced by both practical and theoretical issues.

4.9.3 An evaluation of the potential qualitative research methodologies

Methodologies considered included case studies, ethnography, telephone interviewing, focus groups, telephone or face to face interviews with individuals (either structured, semi-structured or unstructured interviews), or a combination of these methodologies.

4.9.3a Case studies

Case study research may be defined as:

> *"an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident"* (Yin, 2003 p.9).

For this thesis, the application of this research methodology would have involved a detailed investigation of the context within which one or more individuals made decisions about protecting him or herself against malaria, and how any subsequent suspected malaria infections were managed. This would have included interviews about a range of topics with the individual, with his or her healthcare providers, and with friends and relatives both within the UK and in Nigeria or Ghana. In addition, other sources of evidence including the availability of health care in the UK for the individual, and the affordability of chemoprophylaxis and mosquito avoidance measures that could be purchased before travel would have been examined. In Nigeria or Ghana,

information about the usual protections used against malaria would have been included and common methods of treating infections within the family.

Despite the obvious benefits of this methodology in enabling an in-depth exploration of the context within which the prevention and management of malaria is managed, the potential difficulties included identifying one or more individuals to approach. At the time in which the study was designed, contact with likely participants was limited. Aside from the lack of funding for travel to Nigeria and Ghana, success could not be assured in persuading one or more individuals to act as participants in research which would have taken several months and necessitated contact not only with friends and family, but with their healthcare providers. GPs could have reasonably viewed the request for information to be intrusive and breaking a confidential relationship between, even if ethical approval had been granted. These confidentiality issues also meant that the gaining of ethical approval for such a study would have been doubtful.

4.9.3b Ethnography

This methodology has been described as "the systematic, detailed observation of behaviour and talk, watching and recording what people do and say" (Mays and Pope, 1995a p.182). Over a period of time, for at least around three months, but typically one year, a range of data are collected which are considered by the researcher as pertinent for exploring the research topic (Bernard, 2006 p. 349). These may include the researcher's notes, photographs and transcripts of conversations held in the natural environment of the group being observed (Bernard, 2006 p. 344). One of the main advantages of this methodology would have been the unique capacity to observe people within their own environments in which they may have expressed beliefs and attitudes about malaria which may not have been so easily collected within the confines of other research methodologies. There would also be the opportunity to compare behaviours with attitudes, for example the actual use of chemoprophylaxis and other malaria prevention methods compared to the intention to use these.

Ethnography was quickly discounted as a potential research methodology for all groups of participants. For VFRs, because of practical constraints, particularly related to time, attempts to integrate would have been restricted to one particular sector of the community, most likely those attending a church or community group. As the

heterogeneity of beliefs with respect to imported malaria within the Nigerian and Ghanaian communities was to be explored, collecting data from only one particular group would have been inappropriate. Cost and time constraints would have made it impossible to accompany VFRs on visits to Nigeria or Ghana in order to observe malaria-related prevention and treatment behaviours and it would have been difficult to find volunteer VFR families for this. The ability to become integrated within the chosen section of the Nigerian or Ghanaian community would have been problematic and so its success not certain. Conducting an observational research study with health care providers and community pharmacists in their workplace environments or indeed with patients in these situations would have been intrusive and compromised the confidentiality of other patients. In addition, the observing of patients when they may have been seriously ill after their admission would have been inappropriate.

4.9.3c Focus groups

A useful definition of focus groups and their uniqueness as a research methodology has been made by Morgan (Morgan, 1997 p.2)

> *"...focus groups are basically group interviews, although not in the sense of an alternation between a researcher's questions and the research participant's responses. Instead, the reliance is on interaction within the group, based on topics that are supplied by the researcher who typically takes the role of a moderator. The hallmark of focus groups is their explicit use of group interaction to produce data and insights that would be less accessible without the interaction found in a group"*

Groups typically consist of between six to 10 people who meet together for a period of one to two hours to discuss a range of issues that may be initiated by the moderator, but explored by group members (Morgan, 1997 p.34). Homogeneity as far as possible of participant selection with respect to their backgrounds is recommended, in order to provide an atmosphere where group members can speak freely to each other (Morgan, 1997 p.35).

The most feasible way in which focus groups could have been conducted would have been to gather together individuals from each group of interest (VFRs, patients, GPs etc.). Focus group research had been previously used as a research methodology in one of the only pieces of primary research carried out previously on this topic (Morgan and Figueroa-Muñoz, 2005). There were several reasons why focus groups were not chosen

as a research methodology. Firstly, for this research, group interactions were not the priority. Rather, it was to explore at an individual level, the context within which knowledge, attitudes and behaviours were formed and acted upon. The opportunity to do this on an individual basis in a focus group setting is limited, as the unit of analysis is the group, rather than the individual (Kitzinger, 1995).

Although gathering together a group of individuals may make them more willing to voice their opinions, views held by less articulate members might not be heard, and/or discussions may become polarised (Kitzinger, 1995). Potentially, this could have been a disadvantage for focus groups with all sets of study participants. With respect to patients in particular, Kitzinger has shown that in focus group settings with users of healthcare systems, some may prevent others from expressing criticisms of the service, particularly when there is a reliance on these for current or future care (Kitzinger, 1995). Alternatively, patients may have been keen to focus on structural factors such as cost and access to healthcare as being the sole determinants for having acquired imported malaria, and be less willing to explore other factors which influenced decision making. There was also a concern that some patients may feel they had been called upon to explain themselves, which could lead to defensiveness. Any such anxieties, it was surmised, could be more readily managed in an individual interview setting in which reassurance could personally be given.

Practical difficulties were equally valid reasons why focus groups were not chosen. It would have been doubtful whether groups of individuals could be gathered together in one place and at one time. For example, with respect to VFRs it would have been necessary to find enough individuals from similar backgrounds who were about to travel who fitted the inclusion criteria. This also held true for patients. It was also felt that busy doctors and nurses would be unlikely to volunteer time to take part in the study, unless this could be done at their own convenience. Previous experience of working with GPs suggested that requests for payment to employ a locum might be made when they have to leave their workplace, and no funding was available for this.

Given that there was only access to a small number of African community groups, it was likely that some focus group members may have known each other, which may have adversely influenced their ability to speak freely (Morgan, 1997 p.38). This would

also have been the case for doctors, nurses and community pharmacists, particularly given the need to run groups within locations geographically convenient to group members.

A neutral space in which to carry out the focus groups would have been difficult to find. Free of charge options were PCT offices, which may have augmented any perceived power imbalance between myself and study participants, especially if I was viewed as being a representative of the Health Authority. For example, it may have made some participants fear implied criticism and judgement of those who did not take preventive measures. Rooms available at the London School of Hygiene and Tropical Medicine, the academic institution where I was enrolled for my PhD would have been difficult for some respondents to reach, and no money was available for help with their travel costs to this location.

The use of focus groups to confirm the findings of interviews held with individuals from all groups was also considered. This was discounted for two reasons. Although very little primary research has been carried out to investigate this topic, focus group methodology had already been used by a different researcher (Morgan and Figueroa-Muñoz, 2005), and so there was already the opportunity to compare the results of this research with that. More importantly no other research had compared the findings of interviews of travellers with those of patients and it was felt that this was an effective use of the time available to carry out the research.

4.9.3d Rationale for the choice of semi-structured interviews

With semi-structured interviews a discussion takes place between the researcher and one study participant. The interviewee is encouraged to speak freely, but the use of a study guide determines the subjects covered (Bernard, 2006 p.212). This was considered preferable to structured questionnaires, where the questions asked are controlled by the interviewer, and the participant has less opportunity to voice their own opinions (Bernard, 2006 p.251). Given the time constraints of both interviewer and study participants, the use of a topic guide would ensure that focus to the subject of interest was maintained in a way that would not be possible with unstructured interviews, where, although there is a clear research plan in mind, individuals are encouraged to express themselves freely in their own time (Bernard, 2006 p.213). It was

also thought to be a sensible choice, as this methodology works well with individuals such as doctors and nurses, who are used to an efficient use of their time, and may become impatient with unfocused questions, Indeed, VFRs and patients would also giving up their time free of charge and so this methodology would also be suitable for them.

Another advantage influencing the decision to use semi-structured interviews was that study participants would have the opportunity to "tell their own story". This would elucidate how contextual factors pertinent to the individual affected their decision making. The interviewer would also have the freedom to follow-up on any topics that had not been covered in the topic guide, but which were considered pertinent.

The choice of semi-structured interviews with individuals avoided many of the disadvantages associated with the use of focus group methodology. There would be an opportunity for a direct personal conversation between two individuals in a neutral space. If respondents wanted to criticise healthcare services they could do so without others preventing them. Of course, concerns about the possible consequences of voicing criticisms, or a wish not to appear provocative might still prevent individuals from speaking freely. However, it was felt that signs of unhappiness with healthcare services provided could be probed much more effectively on an individual basis rather than in a group situation. More introverted individuals would have the opportunity to speak freely about topics that were pertinent to them, without the risk of being intimidated by others present.

Although the personal nature of the interview, especially when the conversation was being recorded could arguably make some individuals more anxious than when part of a group, it was considered that the assurance of confidentiality and anonymity and evidence of ethical approval for the study, shown before the interview, would overcome this.

Using semi-structured interviews would also avoid the need to find a number of individuals simultaneously, who were about to travel to Nigeria or Ghana, and who were considered suitable for bringing together into a focus group. Instead, differences

between individuals, in terms of socio-economic deprivation and frequency of travel which might affect behaviours could be explored just as effectively.

Some of the advantages of case studies could be included, most importantly the capacity to gather together multiple sources of evidence, as interviews with pre-travel health providers, community pharmacists and doctors who saw patients could be included. These would all provide valuable information about the context within which decisions about malaria prevention and control are made. However, the difficulties of recruitment noted in section 4.9.3a could be avoided.

One option considered was to carry out semi-structured interviews, but by telephone. The need to record the interview to allow a verbatim transcription precluded this choice of interviewing without further consideration of other advantages and disadvantages of this method. If specialist equipment had been available to record interviews, the cost-effectiveness of this methodology and convenience for all participants in choosing the time and location of the interview would have been of advantage. For VFRs and patients in particular this would have also enabled the interview to be carried out from the comfort of their own home, without the need to invite in a stranger for this purpose, and, it was thought, this may have increased the number of people who were willing to take part in the study. However, limitations of this methodology with respect to the lack of an opportunity to pick up on non-verbal cues during the interview may have been a barrier to effective exploration of some topics (Simmons, 2001 p.89).

4.9.4 Development of the topic guide

Appendix two gives details of the topic guides used for each group of respondents.

It was decided that discussions with VFRs would be initiated by asking details of their most recent trip, including the country and area within the country visited, the number of people travelling and duration of travel. These questions would serve not only as an "icebreaker", but also enable the gathering of useful information. Respondents would then be asked about any general health concerns they had when visiting Nigeria or Ghana, and whether they were aware of travel health advice on airline tickets purchased before travel. The decision to ask this latter question was the result of discussions in the "London Malaria Group"; a group of malaria experts which met four times a year,

which I chaired. One solution to increasing awareness about malaria amongst VFRs and other travellers proposed during these meetings was to ensure that travel health information was provided on airline tickets.

Topics concerning malaria more specifically would then be discussed with VFRS. Issues to be discussed in detail were those which had been identified in the literature review in chapter two, including knowledge about how malaria is transmitted, and individual perceptions about the potential and personal risk of acquiring malaria when visiting a malarious country. A greater emphasis on mosquito prevention measures than had been examined in previous studies would be made, as very little data had previously been collected on this topic. Questions exploring why malaria might be perceived of as a serious or mild health problem, and the use of chemoprophylaxis would then be addressed. It was recognised that involvement in the research study may affect the behaviours of some VFR respondents while abroad. In particular being interviewed before travel may have made respondents more likely to adhere to chemoprophylaxis and to use mosquito prevention measures in a different way to that used in previous visits. To help overcome this, VFRs would be asked about their general practices concerning malaria prevention, as well as focusing on their behaviour on their most recent trip.

As it became apparent during the course of the interviews that it was not always easy to assess perceptions about the seriousness of malaria, an additional question was asked of VFRs 14-20, namely, could VFRs die from malaria? Recognising that there may be different perceptions of risk about malaria between different VFRs and also between individual travellers and their host families in Nigeria and Ghana, the issue of possible peer pressure would also be raised.

VFR respondents would be asked about what they would do if they developed symptoms in Nigeria or Ghana and in the UK, and similarities and differences were explored between how malaria is commonly managed in each context. The question of what might cause convulsions had not previously been explored in the academic literature, but a discussion about whether there were two "types" of malaria in the focus groups carried out by Morgan and Figueroa-Muñoz (Morgan and Figueroa-Muñoz, 2005), and the linking of convulsions to supernatural forces discussed in the literature

about malaria perceptions in Nigeria or Ghana (McCombie, 2002, Williams and Jones, 2004, Adongo et al., 2005, Onwujekwe et al., 2005a) were the rationale for convulsions being included in the topic guide.

Some demographic and travel-related information would also be collected for each respondent (age, sex, country of birth, month and duration of travel) in order that these could be compared to the epidemiological analysis of MRL reports. Details of occupation, country of birth and of previous residence, and frequency of travel would also be included to provide more detail of factors which may affect decision making.

Questions to be asked of those VFRs who were interviewed after their return included the use of mosquito avoidance measures, and adherence to chemoprophylaxis for those who had taken this. VFR participants would also be asked if they experienced any symptoms which could be caused by malaria. These questions were also on the list of topics to be discussed with those VFRs who were only undertook one interview after they returned from Nigeria or Ghana.

Structural factors, including access to healthcare, and the cost of chemoprophylaxis would also be discussed to determine the extent to which these affected decision making.

For interviews with patients, all the information to be asked of VFR participants would be included. The initial questions would be concerned with their last episode of illness, the symptoms, diagnosis and treatment, rather than about their most recent visit, as was the case with VFRs. This was to immediately acknowledge the event which led to their hospitalisation. They would also be asked where they thought they have may have contracted their recent episode of malaria, which would enable an exploration to be made of those environmental factors which were thought to be most likely for malaria transmission.

Practice nurses would be initially asked about how long they had been employed in this role. This was to show a personal interest in them from the onset, as well as to gauge their expertise. They would then be asked to confirm that they did give pre-travel health advice. The focus of the interview would then be on gathering information about the

operation of pre-travel advice clinics, on their perceptions of the knowledge of VFRs with respect to how malaria was transmitted, VFR's attitudes about potential and personal risk, and the seriousness of malaria. Discussions practice nurses had with VFRs about planned mosquito avoidance measures and chemoprophylaxis would also be included. In line with other groups of respondents, they would be asked about the cost of chemoprophylaxis. Practice nurses would be asked to give an indication of the frequency and duration of travel of their Nigerian and Ghanaian VFR patients, any travel patterns associated with seasonality, and who initiated travel health advice. A check would also be made of the sources of information available to practice nurses, and whether they considered these to be sufficient.

Like practice nurses, GPs would initially be asked about their employment history. They would then be asked if they gave pre-travel health advice, and for those who did, the same questions would be asked of them as for nurses. The main focus of the interview would be concerned with their actions when they saw a patient with suspected malaria. An estimate of the number of patients seen with malaria type symptoms would be asked, to find out the extent of their personal experience in managing such patients. If GPs had not personally seen any patients, they would be asked what they would do if presented with a patient with symptoms suggestive of malaria.

GPs would also be asked the more general questions asked of other healthcare professionals, relating to VFRs' knowledge of malaria transmission, the seriousness VFRs attributed to malaria, VFR beliefs about their own immunity and their understanding of the potential and personal risk to themselves when travelling to a malarious country. Questions about access to healthcare and the cost of chemoprophylaxis would also be included.

During the course of the interviews with the first few GP respondents, it became clear that very few GPs gave pre-travel health advice, and that their role appeared to be limited to providing advice to practice nurses for patients with particular needs, for example pregnant women. Furthermore, the perspective of GPs about pre-travel health advice appeared to be influenced by their conversations with practice nurses. Therefore it was decided to limit the analysis of GP interviews to the information they provided about malaria diagnosis and treatment

One focus of the interviews with community pharmacists would be to seek information on the number of travellers who used their services to seek pre-travel health advice, and malaria treatment, and to determine if there were any defining characteristics of these groups. They would be asked about the resources available to them to ensure their own expertise was maintained, and if the prescriptions issued by GPs were appropriate. Details of their employment history would be sought in the same way as for other healthcare professionals. Their perceptions of VFR's understanding of the risk of malaria, its seriousness, immunity to this disease, the cost of chemoprophylaxis and whether they believed VFRs understood how malaria was transmitted would be asked of these participants to enable comparisons with other respondent groups.

Hospital consultants would be primarily asked about the treatment of patients when they presented at A&E Departments. They would also be asked the questions about access to primary care, the cost of chemoprophylaxis and the other questions asked of other respondents about VFRs' risk of acquiring malaria, the seriousness with which they regarded malaria, about the cost of chemoprophylaxis, and whether VFRs knew how malaria was transmitted.

It was recognised that although practice nurses, GPs, community pharmacists and hospital consultants would be told before the interview that the focus of the study was imported falciparum malaria in the Nigerian and Ghanaian communities, they might discuss their experiences and beliefs about all patients. To overcome this, it was decided that at the beginning of the interview, they would also be reminded at the beginning of the interview and throughout about the topic of interest.

4.9.5 Reflexivity

In addition to the topic guide, it was recognised that a record should be kept of how my personal perspective and involvement in the study may have influenced the results. This has been referred to as "reflexivity", a definition of which has been made by Nightingale and Cromby:

> *"Reflexivity requires an awareness of the researcher's contribution to the construction of meanings throughout the research process, and an*

acknowledgment of the impossibility of remaining 'outside of' one's subject matter while conducting research. Reflexivity then, urges us "to explore the ways in which a researcher's involvement with a particular study influences, acts upon and informs such research." (Nightingale and Cromby, 1999 p.228)

To recognise the importance of this, it was decided that after each interview, notes would be taken of any other pertinent information that did not fall in the remit of the topic guide. This might include my impression of the interaction between myself and the respondent, and contain, for example, differences in ethnicity, sex, or socio-economic status. However, no guidelines would be constructed about the content of these notes, but rather any issues which came to mind would be documented. These notes would be taken as soon after the interview as possible, in order that impressions would not fade.

4.9.6 Ethical issues

Ethical approval was granted from LSHTM (ethics reference 5086) to carry out interviews with the families of children that would be recruited through schools and with GPs, practice nurses, hospital consultants and community pharmacists. When the school recruitment method proved to be unsuccessful, an amendment was successfully submitted to extend the method of recruitment by asking colleagues to suggest possible participants.

Further amendments to ethics application form 5086 were approved from LSHTM to carry out interviews with patients who had been recently discharged from King's College Hospital and the Hospital for Tropical Diseases, after being admitted with laboratory-confirmed infections caused by *P. falciparum* upon return from Nigeria or Ghana.

The National Research Ethics Service was contacted by email to clarify if they required ethical approval to be granted from them to carry out interviews with VFRs, GPs, practice nurses, and hospital consultants. In appendix two (ethical approval) their confirmation that no such requirement was necessary is shown.

Each R&D Department of the three hospitals in which the consultants worked who agreed to be interviewed were contacted. One requested a list of the interview questions,

and another confirmed they did not need to take any further action with respect to registration of the study. The third provided a letter of access. This correspondence is not included in the appendices to protect the identity of the hospital consultants.

Before carrying out interviews with patients at King's College Hospital, ethical approval was received from the Riverside Research Ethics Committee, on behalf of NRES. An amendment was accepted by the same ethics committee to include HTD as a centre for recruiting patients (see appendix two).

Permission to carry out interviews with patients was also obtained from the Research and Development Department at King's College Hospital, and from the joint UCH/UCLH Biomedical R&D Department (see appendix two).

4.9.7 Method of recruitment

The following section describes the method used for the selection of participants. In cases where initial attempts were unsuccessful (VFRs and GPs) or lower than intended (patients and hospital consultants), an evaluation of the possible reasons for this are given. Appendix five shows the method by which VFRs, GPs, practice nurses and community pharmacists were recruited to the study.

4.9.7a Attempted recruitment of VFRs through schools

In section 4.9.2, details of the London boroughs that would be targeted for the study were provided. For this initial recruitment drive, it was decided to focus on Newham and Southwark. The schools in these areas with the highest numbers of reports made to the MRL from within these boroughs were included. These were identified by counts of reports made to the MRL from each postcode area within the London boroughs. Details of each school contacted are not included to maintain their anonymity.

Successive attempts at recruitment were planned, whereby a number of schools within particular geographical areas would be contacted at the same time. Coordinated visits to schools could then be made to discuss the research. One further advantage of running successive recruitment drives was that if recruitment in one geographical area were successful, then further recruitment drives would not be necessary.

The names and telephone numbers of head teachers in schools in the selected areas were found from the Internet. A draft letter providing information about the proposed study was reviewed for clarity by a personal friend who was a retired head teacher. The letter requested permission from Head teachers of both primary and secondary schools within the selected areas of London for the school to take part in the study. If this were granted, letters were to be sent to parents of African origin, asking if they were visiting friends or relatives in Nigeria or Ghana, and if so, requesting permission for an interview. Two interviews would be requested, one before, and one after travel. In return an offer would be made to the head teacher to teach a lesson on malaria at a level appropriate to the age of the class.

Table 4.9.1 Recruitment through schools: times, actions and outcomes

Last week October 2007	1st recruitment drive: Letters sent to nine schools in Newham and Southwark (eight secondary/one junior in Newham)
1st week November 2007	Follow-up phone calls and emails
Last week November 2007	2nd recruitment drive: 14 letters sent to junior schools in Lambeth
December 2007	End of school term: reminders to junior schools
January 2008	Follow-up phone calls/emails to junior schools Visits made to schools

4.9.7.ai Results of first school recruitment drive

An average of four attempts at contacting each school by telephone was necessary before being connected to the head teacher. Of the initial nine schools contacted:

- Five would not participate. Reasons given included that they were already taking part in other research (one school), were not interested (three schools), or were moving sites (one school).
- One said this required discussion at senior management team meeting: no further contact was received, despite reminders
- Two head teachers said the letter had been sent to another member of staff. No reply was received from emails sent to these staff members.

- One head teacher at the only primary school contacted agreed to participate, but he did not reply to further emails.

4.9.7.aii Second recruitment drive through schools

As no VFRs were recruited from the first drive, the number of schools to be contacted in the second round was increased to 15. Recruitment focused on junior schools because the only school which agreed to participate from the first recruitment drive was of this type. It was thought that contact would be easier to make than with Head teachers of secondary schools and the decision to participate could be made without needing to be discussed with Departmental staff.

Schools in the London Borough of Lambeth were chosen for the second recruitment as it had not been included in the first, and fitted the criteria for the choice of areas from which to attempt recruitment. The same method of contacting the schools was used as for the first recruitment drive.

4.9.7.aiii Results of the second recruitment drive

- Five were not interested.
- There were no replies to emails and telephone calls for a further five.
- Three head teachers agreed to send out letters to families before Easter 2008, however, no replies were received to my emails or telephone calls to confirm these had been sent.
- One head teacher volunteered to encourage participation from families who requested taking their children from school in term time for family trips to Nigeria or Ghana, but supplied no names.
- One school provided contact details of a member of staff working with refugees, who, although she said that she had a number of possible contacts, did not provide any.

4.9.7.aiv Possible reasons for the failure of the school recruitment strategy

Whilst some head teachers in junior schools were initially willing to help, their interest seemed to quickly wane, but it was unclear why. In secondary schools, it sometimes appeared difficult for any one individual to make a decision. Some Head teachers

passed on the request to colleagues, who did not reply to emails. Recognising the busy schedules of both Head Teachers and their staff, as exemplified by the difficulty in even contacting them to speak directly by telephone, it felt uncomfortable to pursue them.

Head teachers identified the practical problem that children may not take the letter home. In addition, there were concerns voiced by some, that Nigerian and Ghanaian parents may feel discriminated against by being asked to participate. Alternatively, parents of other nationalities may feel left out by not being asked to participate if they became aware of the study.

A major barrier seemed to be that schools were extremely busy with a curriculum that did not allow any time for participation in ad-hoc projects. The offer to teach a lesson on malaria was not seen as an incentive, possibly because work plans for the year had already been devised.

4.9.7b Recruitment of VFRs through work colleagues

Recognising the problems of recruiting VFRs through schools, the method of recruitment changed to one of "snowballing." This is one where one respondent is asked to suggest potential participants who may be interested in participation (Bernard, 2006 p.193). I used my professional role as the lead on malaria strategy for the South East London Health Protection Group (a local Unit of the HPA), and as the Chair of "The London Malaria Group", a multi-disciplinary group of malaria experts, to inform colleagues about the study and ask for their help with recruitment. Following their recommendations, African community groups in London were visited whose members suggested friends and acquaintances who matched the inclusion criteria. Through working with another colleague, I also ran a workshop on TB, HIV and malaria in the African community on behalf of the Lambeth, Southwark and Lewisham African Health Forum, and spoke at this. As a result, I was asked to speak at other workshops in London. This enabled me to develop further contacts and recruit more participants. In October 2008 I coordinated and spoke at a national conference on imported malaria in London and took the opportunity to request participation in the study at this event. In December 2008, I included a request for participation in a newsletter sent to employees at Lambeth PCT. Finally, in February 2010, a colleague approached me to run a teaching session on infectious diseases for a Ghanaian congregation and through contact

with members of a local charity attending this event, the final VFR was recruited to the study.

VFRs were given choices of location to meet. Suggestions made to them about possible venues included their own homes, a café local to their home or their or my workplace.

Although it was originally intended to only include those who were about to travel, some members of community groups volunteered to ask friends and relatives who had recently travelled to participate. As it had proved very difficult to recruit to the study, this offer was accepted and six respondents were interviewed only after travel.

For those fourteen VFRs interviewed before travel, a request was made for a second interview upon return. At an early stage of the study, it was found that few participants were interested in meeting after the interview, and it was decided that the second interview would be confined to a telephone conversation or email exchange, limited only to checking on the use of planned mosquito avoidance measures, of chemoprophylaxis, the occurrence of any malaria-type symptoms, and the measures taken to manage these.

4.9.7.bi Limitations of the recruitment method of VFRs and patients through colleagues

The problems with recruitment which necessitated a change in the methodology were described earlier in this chapter. There were other limitations associated with recruitment which also merit consideration. For instance, it was not known how many VFRs, who were invited to participate, declined to do so. Several of the leaders of the community groups contacted were initially confident that they could help with recruitment, as several of their Nigerian and Ghanaian friends travelled frequently. However, despite several reminders by email and by 'phone to these community group members, very few names were put forward. Whether this was because few friends were travelling, were unwilling to participate, or whether they for some reason were not asked by my contacts to do so, was difficult to judge. Furthermore, attempts to recruit directly by asking for help with participants at a national malaria conference and at a training session for members of a local Ghanaian community group both only produced one response each. It was suggested informally that concerns about being asked about

their immigration status may have been a reason for non-participation by some participants. Some evidence of this was that the rationale for the interview question about length of residence in the UK was subsequently questioned by one participant via the person who had facilitated the interview. Some potential participants appeared willing to be interviewed by telephone, but changed their mind after finding that the interview needed to be carried out in person. This suggests they were anxious about being identified face to face. On the other hand, they may have not had enough time to meet a researcher. Other reasons for non-participation may have been because the topic of the study was not considered to be of interest. I was aware, through my professional work, that malaria is not a particularly important health priority in African community groups, particularly in comparison with other infectious diseases such as TB and HIV. Therefore, it may not have been considered sufficiently important by some people to warrant the time and effort needed. However, the non-importance of malaria as a health concern was also voiced by several of the VFRs who did agree to be interviewed, suggesting that this was not an issue preventing participation by all.

Given the time-consuming and difficult nature of recruitment of VFRs described above, snowballing was the only option available. A limitation of this method of data collection is that the participants suggested by one individual may have similar knowledge, attitudes and practices to him or her, but the responses of these participants may erroneously be thought to represent those of the wider population (Bernard, 2006 p.193). There were three ways in which this limitation was managed. Firstly, no more than three respondents were interviewed after being recommended by one individual. The inclusion of multiple groups of respondents (GPs, practice nurses, community pharmacists and hospital consultants), who had interacted over many years with a wide variety of Nigerian and Ghanaian VFRs meant that a broad range of perspectives was obtained. Thirdly, the patients interviewed for the research were recruited using a different method. Although they were themselves self-selected, there was no reason why their knowledge, attitudes and behaviours towards malaria control would have been similar to each other.

It was originally intended to interview both first and second generation Nigerians and Ghanaians. However, the difficulties with VFR recruitment meant that only four who volunteered to take part were born in the UK, and of these, only one had lived here

since birth. Another of the four had spent nine years in Nigeria from the age of seven, and the other two had left the UK in early childhood and had not returned for 22 years. Thus, the viewpoints and practices of those born in the UK were limited in the VFR interviews. This was one of the major limitations of the study, but little that could be done to avoid this, given the resources available.

4.9.7c Recruitment of GPs

It was initially decided to attempt recruitment from the boroughs of Lambeth and Greenwich. The selection of the GP to contact was made at random from the list of GPs on each Practice's website, but included two GPs who worked alone in each borough. Telephone calls were made to GP practices during November and December 2008 with the aim of either speaking directly with the GP to arrange an interview, or with the Practice Manager so that he or she could do this.

In total 16 GP surgeries were contacted, eight in each PCT. Of these, the telephones of seven surgeries were constantly engaged. Contact was made with nine surgeries. For seven of these it was agreed that either practice managers or GPs would return the call, but none were received. A further two practices indicated they were too busy to participate. As had been the case with VFRs therefore, initial attempts to recruit GPs were unsuccessful.

From previous professional experience of working with GPs, it was considered likely that time pressures were one of the main reasons why calls were not returned by GPs.

It was also felt possible that GP receptionists and Practice Managers may have acted as "gatekeepers" to the service, protecting GPs from what may have been perceived as unnecessary calls. Evidence of this came from the way in which the initial telephone call, taken by GP receptionists, influenced the outcome. Mentioning that the call to the GP was coming from the HPA (my professional employer), rather than as a student at LSHTM, increased the likelihood of being transferred to at least the Practice Manager. This was possibly because GP receptionists are familiar with dealing with this organisation on practical issues, but less keen on assisting students whose interests may not be priorities for GPs.

As recruitment was unsuccessful, it was decided after one month of attempts to contact GPs by telephone, that the method of recruitment should be changed to a "snowballing" method, as used for VFRs. One GP was already known to me professionally, and he agreed to be interviewed. My professional role, which gave me access to colleagues with links to GPs, was also used to help recruit them to the study. Help was requested from two work colleagues to suggest possible study participants. Each emailed two GPs, informing them about the study and asking if they would be willing to take part. All four agreed to do so. Once these interviews had been carried out, these GPs were also asked to suggest other potential participants, and once the latter had agreed, they were contacted by email addresses to arrange a suitable time for the interview to take place. One additional GP was recruited from a colleague at LSHTM. This change in strategy for the recruitment of GPs meant that the initial plan to include some who worked in single practices was not possible to implement.

The same limitations of the snowballing method described with respect to VFRs were also valid for GPs. To manage this, no more than two GPs were interviewed from one source.

Time pressures were thought to be the reason for non-participation in the early stages of attempts to recruit GPs to the study. These could also affect the quality of care given to patients, and the experiences of those who were interviewed may have been different to those who did not participate. The lack of inclusion of GPs working in single practices, as mentioned above, was a particular concern for these reasons associated with the quality of patient care. It was believed however that most GP participants who took part did so as a favour to those who approached them, rather than because they had free time to participate, though this could also have affected their decision.

Those who suggested possible interview respondents may have recommended those whom they knew had a particular interest in malaria, or who were likely give a favourable impression of the profession. The inclusion of a range of respondent groups, mentioned above as a method of ensuring that a wide range of perspectives were included, was one way in which this limitation was managed. For example, all respondents would be asked about issues of access to primary care, both for prevention and treatment.

4.9.7d Recruitment of practice nurses

Given the initial problems of recruiting GPs by telephoning randomly selected practices, it was thought likely that there would be the same difficulties in recruiting practice nurses using this method. The most efficient way of recruiting practice nurses therefore was to ask the GP who had been interviewed to suggest a practice nurse from the same practice, who could be approached to ask if they would be willing to participate. This would also provide the opportunity to compare the perspective of two key professionals working in the same practice.

This was the method used for seven of the practice nurses recruited. After a practice nurse was suggested by a GP, they were contacted by telephone, told about the study, given the name of the GP who suggested they might be able to participate, and asked if they would consider this. One GP requested payment for the time that would be taken to interview the practice nurse, which was not available, and this practice nurse was not interviewed.

An interruption to the recruitment of practice nurses came when there was an outbreak of pandemic H1N1 virus throughout the UK beginning in April 2009. Practice nurses throughout London were overwhelmed with dealing with patients. In addition, I was requested to stop working on my PhD from April 2009 to the middle of June of that year, to help manage the Public Health response to the outbreak. After this time, it did not feel appropriate to contact the practice nurses who had been recommended by GP5 and GP6 several months previously.

The last three practice nurses were recruited in the following way; firstly, contact was made with a practice nurse who had already been interviewed, and she recommended a nurse from a different practice, who agreed to participate. Secondly, a work colleague asked a Lambeth PCT employee who worked with GP practice nurses to email all those nurses working in Lambeth GP surgeries with details of the study and a request for participation. This PCT was chosen as it fitted the criteria for inclusion described in section 4.9.2, and with which my office had direct links with staff, through a partially shared office. Four practice nurses had already been interviewed from areas outside LSL, and so their perspective on the cost of malaria chemoprophylaxis in an area in

which it was not subsidised was known. Additionally, some nurses interviewed had been employed in both LSL and non-LSL areas, and so had experience of the effect of both policies. The first two practice nurses who responded to the request from the PCT employee were interviewed.

It was recognised that GPs may have recommended the most experienced and skilful practice nurses to take part in the study, and/or those who were unwilling to criticise the practice. The same way of managing these limitations used for VFRs and GPs were used. For example, no more than one interviewee was recommended by any other person. Although the most experienced practice nurses available may have been interviewed, there is likely to have been some variation in the skills and experiences within the ten interviewed, meaning that a range of perspectives would be included.

4.9.7e Recruitment of community pharmacists

Community pharmacists were chosen from the London boroughs of Lambeth and Newham. The latter was an area selected in the initial recruitment efforts for VFR participants, as it had a large Nigerian and Ghanaian community (see section 4.9.2) but no respondents had been interviewed from this area. Areas were targeted within these boroughs which had made the most reports to the MRL between 2001 and 2006. The contact details of pharmacists working in these areas were obtained from the internet, and each was contacted by telephone, beginning in the summer of 2008, told about the study, and asked if they would be interested in participating in an interview at their workplace at a time convenient to them. The first three telephone calls resulted in three interviews. As it became gradually more difficult to recruit during the autumn, the time of year when, as was anecdotally reported to me, that their workload increased, the number of requests was expanded to include other geographical areas within these boroughs. In total 16 community pharmacists were contacted, and seven interviews carried out.

4.9.7f Recruitment of hospital consultants

All three of the consultants approached initially agreed to be interviewed. Two of these were professional acquaintances, one of whom was a paediatrician. The third respondent agreed to participate after being approached by a colleague whom I knew professionally. All three worked in different hospitals in London.

Although at least two more interviews with hospital consultants would have been useful, to see if any new themes emerged, ethical approval had to be sought from each hospital's Research and Development (R&D) Department before the interview could be carried out. This, it was recognised, could take several months. Although a fourth consultant agreed to take part in the research, he did not attend when I visited the hospital to interview him, and subsequent attempts at contacting him by telephone via his secretary were unsuccessful. This was explained by the secretary as due to work pressures.

4.9.7g Decision to end recruitment

For all these groups of study participants, with the exception of hospital consultants, recruitment stopped when saturation point was reached, that is, when no new themes were elicited from the interviews.

4.9.7h Recruitment of patients

As was explained in section 4.9.1, it was decided to also include interviews with patients who had recently acquired imported malaria. The only feasible way to access patients was to request participation from those who had been recently admitted to hospital with falciparum malaria. To maintain their confidentiality, it was recognised that patients could not be approached directly by a researcher. Instead, a research collaboration was set up with an A&E Department. King's College Hospital was chosen, as it is a hospital serving a large African community, and between 2001 and 2008 made the second largest number of reports of imported malaria to the MRL in the UK (n=972) ($\bar{x}$=21.5) (range 90-160). The lead consultant was a professional acquaintance and thought likely to agree to help with recruitment via his staff. Although it was felt that the majority of patients admitted to this hospital would have had access to subsidised chemoprophylaxis on NHS prescription if they lived in the borough local to the hospital, it was decided that that sufficient data had been collected about this theme.

Having gained permission for collaboration from the lead consultant, and the necessary ethical approval, I arranged and attended a meeting of doctors and nurses in the A&E

Department, where the study protocol was described to them and their assistance requested with recruitment. This would involve patients with suspected malaria being told about the study and encouraged to participate by the clinician caring for them. They would not be told about the study until all clinical care had been completed and they were ready to be discharged. This was critical to avoid potential patient concerns of coercion. The contact details of those who agreed to participate were collated in a folder in the A&E Department by the clinician who had acquired this from the patient, and I checked this folder weekly. After confirming that each referral was of laboratory confirmed falciparum malaria, I telephoned patients after they had been discharged to arrange an interview.

A senior nurse in the Department was given the role of acting as a liaison between me and the clinical team. I contacted her regularly, and asked her to help remind colleagues about the study.

In November 2009, after permission was obtained from the lead consultant at King's College Hospital, a request for help with recruitment was made to a junior doctor of professional acquaintance, who was carrying out a three month attachment in the A&E Department. Her role would be to personally request participation from participants who fitted the inclusion criteria after their treatment had ended.

Attempts to recruit patients from King's College Hospital lasted from July 2009 to December 2010. This resulted in four interviews, which were carried out between September 2009 and December 2010. Although an additional six patients expressed an interest in participating, none had laboratory-confirmed falciparum malaria. After December 2010 no more potential participants were referred.

Because only four patients had been recruited from King's College Hospital, another hospital was asked to help with recruitment to the study. The Hospital for Tropical Diseases (HTD) was chosen for two reasons. Firstly, as well as receiving direct referrals of patients from GPs, a tertiary service is offered, and as a result, the third largest number of reports made to the MRL between 2001 to 2008 came from this hospital, a total of 814 (mean 101.8; range 79-118). Secondly, one of the clinical consultants working part-time in the Department was also one of my PhD supervisors, who agreed

to facilitate initial introductions with clinical colleagues and remind them about the study.

An introductory meeting was held with the junior doctors and nurses who cared for patients admitted with falciparum malaria, and personal introductions were made with hospital consultants. All were briefed in the same way as for doctors and nurses at King's College Hospital described above.

Between the middle of October 2010 and the middle of January 2011 weekly emails were sent to those hospital doctors known to be treating malaria patients on the hospital wards to ask if any patients who fitted the recruitment criteria had been admitted, and if so, for them to ask the patient to participate.

During this time two patients were recruited. A further four were identified by HTD clinical staff as possible participants. For two of these four, administrative errors (incorrect patient telephone contact details) meant that these patients could not be contacted. Although for one of these an address was available, and a letter written asking the potential participant to make contact, no reply was received. For the third potential participant, contact details were not passed to the researcher before the clinician who gained agreement from the patient left the UK, and no other member of staff knew the identity of the patient. The fourth potential participant did not meet the inclusion criteria of having travelled to Nigeria or Ghana. It was not known if any other patients were invited to participate, but declined.

At the beginning of February 2011, six years of part-time PhD study had been completed and recruitment to the study stopped.

4.9.7.hi Reasons for the low number of patients recruited to the study

During the recruitment period, it was not known how many patients who fitted the inclusion criteria were admitted to either hospital. It was also not known how many patients in total were approached by staff and declined to participate, or whether staff did not request participation.

There were several reasons why recruitment of patients to the study was low. For example, it was necessary to consider all aspects of how the study would be conducted before the study commenced, in order to obtain ethical committee approval. This meant that no minor or substantial amendments could be made subsequently without returning to both the ethics committee of the hospital, and LSHTM, a process that could take several months. Although these issues were discussed at a meeting with clinicians before ethical approval was sought, there were several suggestions of how to improve recruitment to the study from Kings College Hospital in particular only after ethical approval had been received. This was indicative of the time pressures that staff faced, as although they appeared to be willing to help and recognised the importance of the study, they did not have time to devote to one issue.

This pressure on clinical staff at both hospitals caused by their routine work was obvious throughout the study, as telephone calls and emails to clinicians were frequently not returned. Recognising this, it was considered inappropriate to follow up on unreturned calls too frequently. At HTD, it was suggested informally that regular email reminders about the study may have caused resentment amongst some staff, since it may have appeared that they were asked to assist with recruitment into a study of no perceived benefit to them. Their frustrations may have been exacerbated as there was little perceived personal participation from myself, since I was not present on the hospital wards during the period of data collection. However, given the need for confidentiality, my presence on the hospital wards would not have been possible.

Despite attempts to arrange one individual to liaise with at each hospital, the frequent rotation of staff made it difficult for them to ensure that all those seeing patients were informed about the study, and it was likely that several staff who may have seen eligible patients at both sites were not aware that the study was taking place.

A further problem was the consideration that patients should be informed about the study only when all clinical interventions had been completed. This was necessary so that patients would not feel their care was dependent on participation in the study. However, it meant there was little opportunity for staff to remember about the study before discharging patients. Administrative errors, particularly at HTD, and described above, meant that three patients who expressed an interest were not able to be contacted.

The decision to attempt recruitment through a second hospital, when it was clear that recruitment in the first had been slow, was a difficult choice, as it took several months to acquire ethical approval. However, no other practical way to recruit patients was available and it was hoped that the personal involvement of a consultant who was also my PhD supervisor would make recruitment easier than at King's College London Hospital. That this was not the case demonstrates the many difficulties in recruitment to such a study.

As was the case with VFRs, it was not known why some patients did not volunteer to take part in the study. Possible reasons were the same as for VFRs, such as a lack of interest in the topic or fears associated with immigration status. It is also possible that patients in particular may have been concerned that they would be criticised for not taking chemoprophylaxis. However, there is no way of knowing whether the knowledge, attitudes and practices of those who chose to participate were similar to other patients. Having said this, no new themes emerged from the interviews with patients than had already been identified from the interviews with other groups of participants.

4.9.8 Method of qualitative analysis

After each interview, each respondent was allocated a personal identifier. These were comprised of letters and numbers. The letters referred to the type of respondent (VFR: visiting friends and relatives); PT (patient); GP (General Practitioner); PN (practice nurse): CP (community pharmacist) and HC (hospital consultant). The numbers related to the sequence in which the interviews took place, thus, for example, VFR1 was the first VFR to be interviewed, and PN10 was the last practice nurse to be interviewed. A spreadsheet was made which linked personal identifier with the respondent and this was password protected.

A series of spreadsheets were then set up on MS Excel. Personal identifiers as constructed above were used for each respondent in these spreadsheets. They contained the following information:

For VFRs and patients:

- the method of recruitment, the time before and after travel (where applicable) that the interviews took place, and the location of the interview, age, sex, PCT of residence, occupation, country of birth, and country of residence before immigration to the UK (where applicable), number of years resident in the UK, country being, or just visited (as appropriate); frequency of travel, number of travellers on planned or most recent trip; use of chemoprophylaxis on this trip and on previous trips.

For GPs, practice nurses, community pharmacists and hospital consultants:

- sex, ethnicity, number of GPs or practice nurses working in the practice (as appropriate); the number of patients enrolled in the practice, the PCT/borough where the respondent worked and the number of years respondents had worked in this particular role.

GPs were often not sure of the number of full-time equivalent colleagues working in their practices, particularly when some worked part time, nor were they certain of the number of patients registered with their practice. Therefore, these details were taken from individual practice profiles available from the London Health Observatory (London Health Observatory, 2011), or from information provided on the GP practice website.

All interviews were transcribed verbatim, by listening to each sentence on the digital recorder, and typing it into MS Word. An attempt was made to use voice recognition software to speed up the process. However the accuracy of the software was poor and the time required to manually edit the transcript produced was considerable, so this was abandoned.

Transcripts of each interview were then exported into the qualitative data analysis package NVivo version 7. Different folders were made within this package which contained the transcripts from each group of respondents (VFRs, patients, community pharmacists, GPs, practice nurses and hospital consultants).

A conceptual framework, was constructed in chapter four, drawing on the conclusion reached by Morgan and Figueroa-Muñoz that VFRs that there is "an intermeshing of ideas and practices that are widespread in the general UK population with the particular beliefs and circumstances associated with their ethnic origin" (Morgan and Figueroa-Muñoz, 2005 p.368). A literature review had also been undertaken to inform the topics to be discussed during the interviews. Thus, the analysis was not conducted from a purely inductive perspective. The aim of the qualitative analysis in this thesis was not however to seek for evidence to support the conceptual framework, but rather to explore the subjective experience of respondents, and discover how these might impact on the burden of malaria. Thus, it was understood that the respondents might provide evidence that stood in contradiction to the conceptual framework.

Bernard and Bazeley provided detailed methods to understand the concepts and practical application of data coding and development of themes (Bernard, 2006 pp. 505-519, Bazeley, 2007 pp. 59-111). Transcripts from each respondent group were printed, and read several times. Using NVivo, key words were identified. These were words which were related to the questions asked of each participant, for example, "transmission" or "bednets". Paragraphs spoken by each respondent which contained these words were then moved into separate folders within NVivo, but each still separated by respondent group, for example, all paragraphs of VFR transcripts which contained the word "transmission" or "bednet" were collated.

Each paragraph was re-read. In this part of the analysis, it was noted where there were similarities and differences in the responses given by individual respondents concerning each topic, and these were grouped accordingly. For example, with respect to the cost of chemoprophylaxis, the responses of those who mentioned this as a barrier were separated from others who did not consider this to be so. Each set of responses was then re-read to draw a more detailed interpretation. At this point, a distinction was made between those factors which influenced decision making in Nigeria and Ghana, and in the UK, where these appeared in the transcripts.

The next part of the analysis included comparing the findings of each group of respondents about each topic. Similarities and differences *between* groups of

respondents were considered, and evidence sought for where the responses of one group of participants provided further evidence supporting that given by other groups contradicted this, or provided different information. At this point, it was considered more convenient to print and read the analyses, rather than to continue using the electronic software package.

The penultimate part of the analysis involved categorising the findings into the broader themes of malaria prevention, diagnosis and treatment, to match the order in which these were discussed in the literature review in chapter three. The final analysis involved using the findings to provide more detail to the conceptual framework that is discussed in the final chapter of this thesis.

An additional analysis included a second reading of the notes that I had made after each interview, and these were categorised into themes, for example about my personal safety, the effect of using a digital recorder and factors relating to the differences in ethnicity between myself and the respondents where appropriate. These were to be included in a separate section of the analysis.

4.10 Summary

Despite the limitations of ascertainment and data quality, the data collected by the staff at the MRL, compared to reports made to the alternative surveillance system (NOIDS), were the better source to carry out an epidemiological analysis of imported malaria in the UK. Its strengths lay in that all reported cases are laboratory-confirmed, the reporting system has been in place for over 30 years, and that for many variables there is a high completion rate. Although there have been few changes in the variables collected by the MRL staff over time, one change that was made in 2004 meant that the data relating to nationality, collected until the end of 2003, could not be matched with ethnicity, the variable collected after this time.

With respect to the denominator data, the major limitation was that there was limited data available to describe the population at risk. As such, mid-year population estimates and mid-year population estimates by ethnicity were used to calculate incidence rates. These provide an inaccurate estimate, as not all members of the population will travel. The use of IPS data provided by Dr Ron Behrens allowed an alternative, more accurate

measure to be made, but categorisation by age and sex would have enabled more detailed information to be analysed. As noted, the IPS data is not without its limitations, as only one reason for travel is recorded.

The reasons for the immense difficulties and time needed to recruit VFRs and patients was not clear, but possible reasons were a lack of interest by potential participants in the subject, a fear of being identified because of immigration issues, and/or with respect to patients, concerns about being criticised during the interview for not protecting themselves against malaria. The initial unsuccessful attempts at recruiting GPs and practice nurses, and the reasons for the low recruitment of hospital consultants were thought to be mainly due to a lack of time, and this gives some indication of the pressures under which these professionals work. Nevertheless, it was possible to interview 56 participants from six different groups (VFRs, patients, GPs, practice nurses, community pharmacists and hospital consultants) which allowed a range of perspectives to be explored.

The aim of the qualitative analysis was not to seek confirmatory evidence to support the conceptual framework, but to explore the subjective experience of respondents. Additional information, for example duration of travel, number of travellers and time of year of travel for VFRs and patients, and occupational data for healthcare providers and community pharmacists was collected to provide more context to the content of the interviews.

Chapter five: results of the epidemiological analysis.

5.1 The current epidemiology of imported malaria in the UK

The first section identifies the location in the UK where most infections of imported malaria in the UK were acquired between 2001 and 2008. It describes the species of the plasmodium parasite which most commonly caused infections, and shows the crude and standardised infection rates per 100 000 in England and London, the ethnicity of those cases reported between 2004 and 2008, and gives their reason for travel.

The second section describes in more detail the epidemiology of the group who bear the greatest burden of disease, and includes the period 2004 to 2008. A particular focus is given to the use of chemoprophylaxis, and how this compared in one geographical area which offered subsidised chemoprophylaxis to one where it was not provided.

5.1.1 Completeness of data

Details of the area of residence and plasmodium species were each completed for 100% of reports made to the MRL between 2001 and 2008. The reason for travel to a malarious country was recorded for 59% (8199/13813) of these reports. Ethnicity was completed for 84% (8189/9726) for the period 2004 to 2008 inclusive.

5.1.2 Crude incidence and incidence rates: London compared to other areas of the UK

There were 13813 reports of imported malaria in the UK between 2001 and 2008. Fifty eight percent of reports overall came from London, and the crude incidence rate per 100 000 was at least four times higher for reports originating from London, (compared to those which came from other areas) for each of these years (table 5.5.1).

Table 5.1.1 Comparison of the number of reports of imported malaria in the UK, the UK excluding London, and the London area, and rates per 100 000 population in these areas (2001-2008)

	UK		UK excluding London		London	
Year	Number of reports	Rate per 100 000 population (CI)	Number of reports	Rate per 100 000 population (CI)	Number of reports	Rate per 100 000 population (CI)
2001	2050	3.5 (3.3-3.6)	786	1.5 (1.4-1.6)	1264	17.2 (16.3-18.2)
2002	1945	3.3 (3.1-3.4)	751	1.4 (1.3-1.5)	1194	16.2 (15.3-17.1)
2003	1728	2.9	652	1.2	1076	14.6

		(2.8-3.0)		(1.1-1.3)		(13.7-15.5)
2004	1660	2.8 (2.6-2.9)	753	1.4 (1.3-1.5)	907	12.3 (11.5-13.1)
2005	1754	2.9 (2.8-3.1)	770	1.5 (1.4-1.6)	984	13.1 (12.4-14.0)
2006	1758	2.9 (2.8-3.0)	777	1.5 (1.4-1.6)	981	13.0 (12.2-13.9)
2007	1548	2.5 (2.4-2.7)	706	1.3 (1.2-1.4)	842	11.1 (10.4-11.9)
2008	1370	2.2 (2.1-2.4)	639	1.2 (1.1-1.3)	731	9.6 (8.9-10.3)

The total decrease of 680 (33%) in the number of reports made from throughout the UK to the MRL between 2001 and 2008 was largely attributable to a decrease in the number of reports made from the London area over this time period. This reduction was of 533 reports (42%) in London, compared to 147 (9%) decrease in reports made outside of London.

5.1.2a Crude rates and standardised rates for England and London

Figure 5.1.1 shows the crude incidence rate per 100 000 for England excluding London, and for the London area. To control for the possible different age structures in the population in London compared to England, figure 5.1.2 shows the standardised rate for the same geographical areas. These both confirm the higher incidence of imported malaria in the London population.

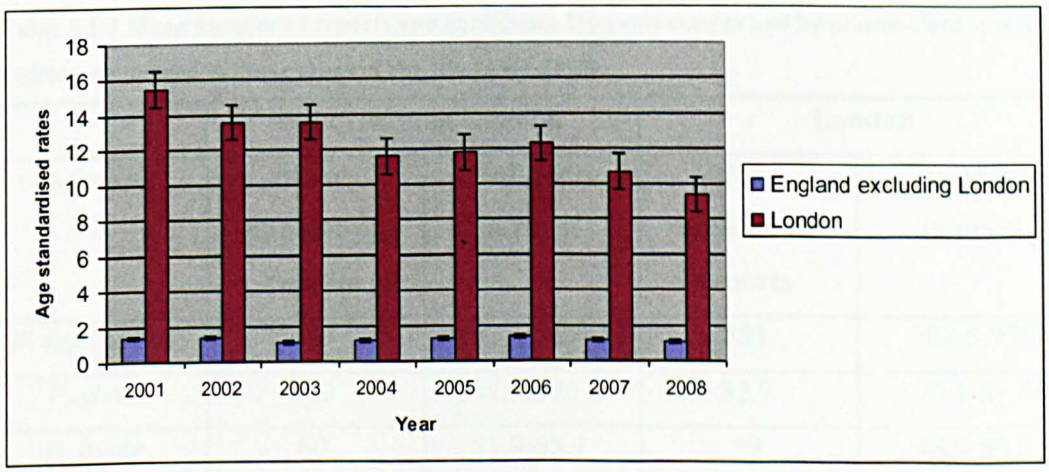

Figure 5.1.1 Crude rates and confidence intervals of reports of all species of imported malaria in England excluding London, and the London area 2001 to 2008

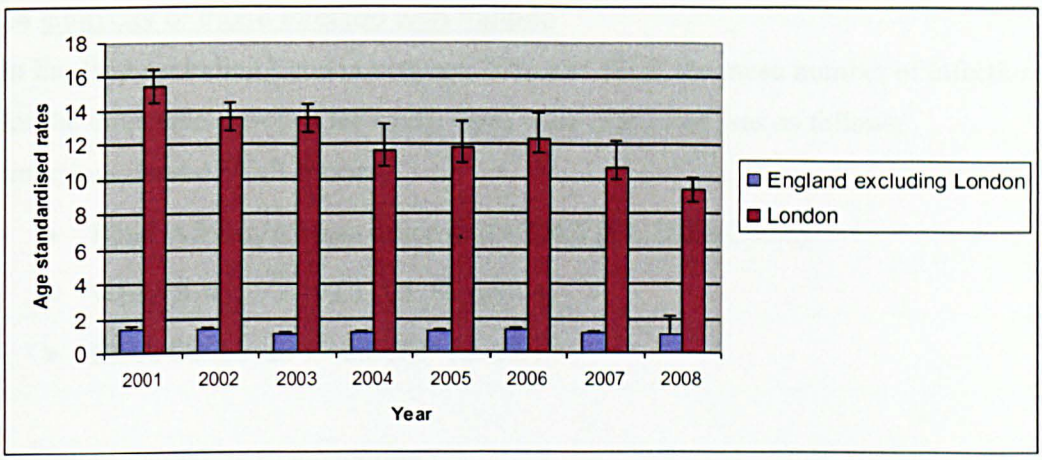

Figure 5.1.2 Standardised rates and confidence intervals of reports of all species of imported malaria in England excluding London, and the London area 2001 to 2008

5.1.3 Species of malaria acquired

Table 5.1.2 shows which species of malaria parasite caused malaria infections acquired between 2001 and 2008 in the UK, and in London. There were statistically significant differences in the numbers of infection caused by two species of malaria parasite, (*P. falciparum* and *P. vivax*) between the UK and the London area.

Whilst 67% (489/730) of the average number of infections were of *P. falciparum* throughout the UK excluding London, this increased to an average of 83% (831/997) of all infections reported from within the capital.

Table 5.1.2 Mean number of reports and confidence intervals categorised by plasmodium species: London compared to other areas of the UK (2001-2008)

	UK excluding London		London	
Species	**Mean number of reports**	**Confidence interval**	**Mean number of reports**	**Confidence interval**
P. falciparum	489	462.4-515.6	831	708.5-936
P. vivax	160	137.3-186.6	82.9	76.4-89.4
P. ovale	60	51.9-68.1	59	48.8-69.2
P. malariae	13.8	11.1-16.5	16.3	13.4-19.2
Mixed	6.5	3.9-9.1	7.3	5.3-7.3
Unknown	0.25	-0.05-0.55	1.3	0.5-2.1

5.1.4 Ethnicity of those infected with malaria

In England excluding London between 2004 and 2008, the mean number of infections for the three ethnic groups for which these were calculated was as follows:

Infections caused by all species:

- Black African/African descent: $\bar{x}$=324.6 (CI: 288.8-360.8)
- White British: $\bar{x}$=92.2 (CI: 86.0-98.4)
- Black Caribbean $\bar{x}$=2.6 (CI: 1.3-3.9)

Infections caused by *P. falciparum*:

- Black African/African descent: $\bar{x}$=286.4 (CI: 256.5-316.3)
- White British $\bar{x}$=56.6 (CI: 48.4-64.8)
- Black Caribbean ethnicity it was $\bar{x}$=2.4 (CI=1.4-3.4)

In London, between 2004 and 2008 inclusive, the comparative means and confidence intervals were:

Infections caused by all species:

- Black African/African descent: $\bar{x}$=676.8 (CI: 608.7-744.9)
- White British: $\bar{x}$=20.6 (CI: 14.8.5-26.4)
- Black Caribbean: $\bar{x}$= 11.2 (CI: 6.5-15.9)

Infections caused by *P. falciparum*:

- Black African/African descent $\bar{x}$=613.8 (CI: 552.2.-675.4)
- White British $\bar{x}$=14.2 (CI: 9.9-18.5)
- Black Caribbean $\bar{x}$=9.6 (CI: 6.3-12.9)

The rates of infection per 100 000 population by ethnicity in both 2004 and 2008 inclusive for infections caused by all plasmodia and by *P. falciparum* are shown in table 5.1.3

Table 5.1.3 Rate of malaria infection per 100 000 population in England excluding London and in the London area, for all plasmodium species and P. falciparum for three ethnic groups 2004 and 2008.

	Incidence rate per 100 000 (CI) England excluding London		Incidence rate per 100 000 (CI) London	
	All species	*P. falciparum*	All Species	*P. falciparum*
Black African/African descent				
2004	123.5 (108.5-138.4)	109.7 (95.6-123.9)	153.3 (141.3-165.3)	139.6 (128.1-151.0)
2008	94.2 (84.0-104.4)	85.3 (75.5-95.0)	142.0 (130.5-153.5)	131.0 (120.0-142.1)
White British				
2004	0.2 (0.1-0.3)	0.1 (0.0-0.2)	0.3 (0.0-0.5)	0.2 (0.0-0.3)
2008	0.3 (0.2-0.4)	0.2 (0.1-0.3)	0.4 (0.2-0.6)	0.3 (0.2-0.5)
Black Caribbean				
2004	1.2 (0.2-2.5)	1.2 (0.2-2.5)	3.9 (1.8-6.0)	3.3 (1.4-5.2)
2008	1.7 (0.2-3.2)	1.4 (0.0-2.7)	6.1 (3.4-8.8)	4.8 (2.4-7.2)

5.1.5 Visiting friends and relatives as a reason for travel

Where information on the reason for travel was recorded (59% of reports), there were 4504 reports of malaria infection acquired whilst visiting friends and relatives abroad. This was the purpose of travel in 68% (3045/45026) of the reports which originated from London hospitals. In other areas of the UK, 39% (1459/3697) of reports were in VFRs.

The mean number of reports of malaria in VFRs originating from the London area between 2001 and 2008 was 380.6 (CI: 347-414), statistically significantly greater than that for VFRs reported to the MRL from areas of the UK outside London ($\bar{x}$ = 182 (CI: 159:205.2).

There was a small increase between 2001 and 2008 in the number of reported malaria infections caused by all plasmodium species in VFRs resident in the UK excluding London, from 176 to 221 (see figure 5.1.3). The number of reported infections caused by *P. falciparum* in VFRs outside London also increased, from 115 to 167. However, the *proportion* of all malaria reports that were in VFRs compared to those travelling for other reasons decreased slightly, from 36.8% to 33.6% of infections. The proportion of all malaria reports caused by *P. falciparum* that were in VFRs however increased, from 65.3% to 75.6%.

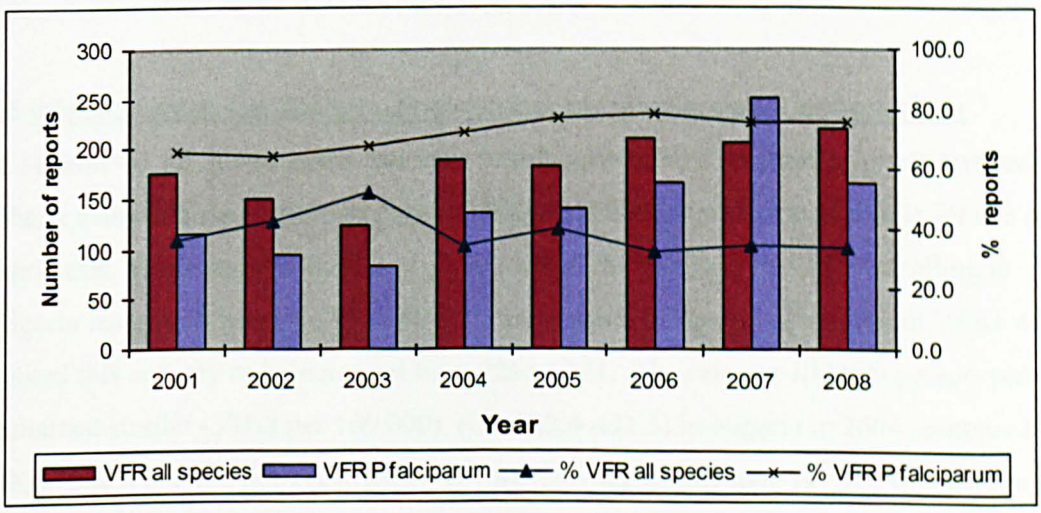

Figure 5.1.3 Number and percentage of total reports of malaria infections where VFR was the reason for travel (UK excluding London) 2001-2008

The number of reports of London residents who contracted malaria caused by all plasmodium species when visiting friends and relatives between 2001 and 2008 fell, from 466 to 331 between 2001 and 2008 (figure 5.1.4). There was also a decrease in the number of reports of those residents in London who contracted *P. falciparum* whilst visiting friends and relatives abroad between 2001 and 2008, from 412 to 293.

However, the *proportion* of reported infections caused by all plasmodium species in London VFR residents increased from 64.7% to 74.2% between 2001 and 2008. The proportion of all *P. falciparum* infections reported in London which were in VFRs stayed broadly similar (88.4% in 2001 and 88.5% in 2008) (figure 5.1.4)

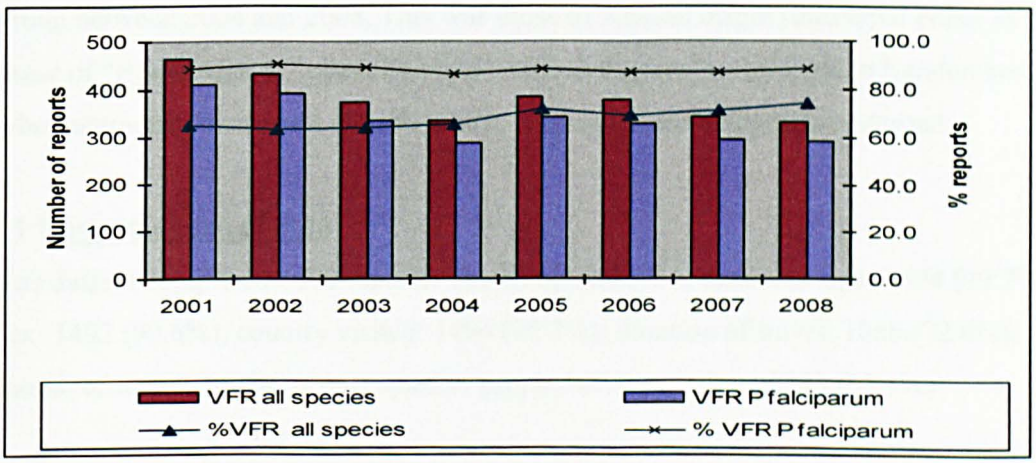

Figure 5.1.4 Number and percentage of total reports of malaria infections where VFRs was the reason for travel in London residents 2001-2008.

5.1.6 Infection rates calculated using number of travellers as a denominator

In section 4.3.2b, it was noted that rates of infection in VFRs travelling to Nigeria and Ghana using IPS data collected between 2004 and 2008 were made available for use in this thesis. These showed that showed that whilst the numbers of VFRs travelling to Nigeria increased from 59 975 to 70 897, the number of reports of malaria in VFRs who visited this country only increased from 229 to 271. The rate per 100 000 person-years remained similar (381.8 per 100 000) (CI: 332.4-431.3) in Nigeria in 2004 compared to 2008 (382.2 per 100 000) (CI: 336.7-427.8). The rate of infection per 100 000 person years caused by *P. falciparum* was also similar (355.1 per 100 000) (CI: 307.5-402.8) in Nigeria in 2004, and 359.7 (CI: 315.5-403.8) in 2008.

Comparative data for Ghana showed an increase in the number of VFR travellers to this country from 43,159 in 2004 to 57, 397 in 2008, but the number of reports of malaria infection in VFRs who visited this country increasing by only one, from 78 to 79 cases. The infection rate per 100 000 were 180.7 (CI: 163-220.8) in 2004, but this reduced to 137.6 per 100 000 (CI: 120.2-168.0). For falciparum infections, there was a decrease in the rate per 100 000 from 169.1 per 100 000 in 2004 (CI: 130.3-207.9) to 132.4 per 100 000 (CI: 102.6-162.1) in 2008.

5.2 Epidemiology of those most at risk of acquiring imported malaria

The second section of this chapter describes what is known about the epidemiology of imported malaria in the cohort identified in the previous section as the largest "at risk" group between 2004 and 2008. This was those of African origin (measured either as those of "Black African" ethnicity or "of African descent") who lived in London and who contracted falciparum malaria whilst visiting friends and relatives abroad.

5.2.1 Completeness of data

The dataset comprised 1498 reports. The completeness of data was: age; 1494 (99.7%); sex: 1492 (99.6%); country visited: 1494 (99.7%); duration of travel: 1086 (72.4%); month of travel: 1498 (100%); whether prophylaxis was taken: 1243 (83.1%)

5.2.2 Age and sex

The median age was 39 years, (interquartile range 28-48). There were reports of 586 females and 906 males between 2004 and 2008, a ratio of 1: 1.5. A third of the total number of reports was of males aged between 30-49 years (see figure 5.2.1).

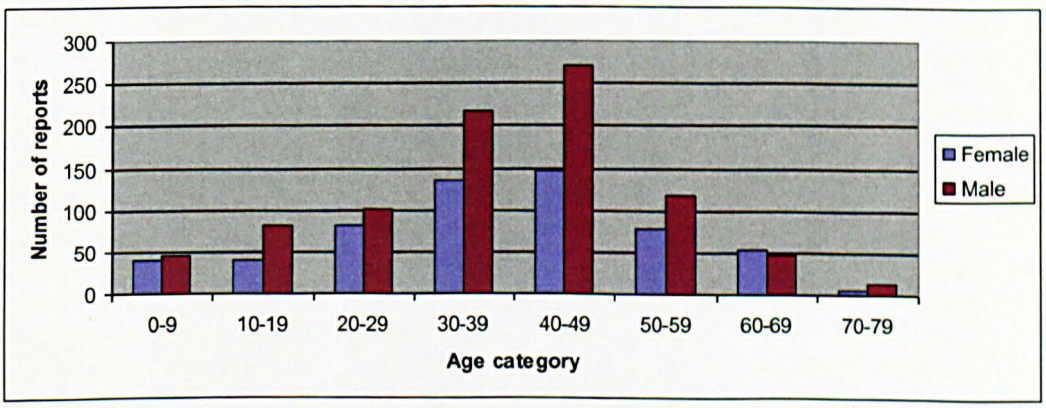

Figure 5.2.1 Age and sex of patients of African ethnicity who lived in London and who acquired falciparum malaria when visiting friends and relatives abroad (2004-2008).

5.2.3 Country where malaria was acquired

There were 28 countries from where falciparum infections were acquired (see appendix five). All were in Africa. In addition, four were recorded as being acquired in "West Africa" and 12 as "Africa". Where an African country was identified as the origin of infection there were:

- 18 in which fewer than 10 infections were acquired
- six in which between 10 and 49 reports were acquired
- four in which more than 50 reports were acquired: (Nigeria: 55% (823/1494); Ghana: 19% (285/1494); Sierra Leone: 7.9% (118/1494); Uganda: 6.3% (94/1494).

Figure 5.5.2 shows how the number of infections broadly relates to the suitability of the climate in African countries for malaria transmission.

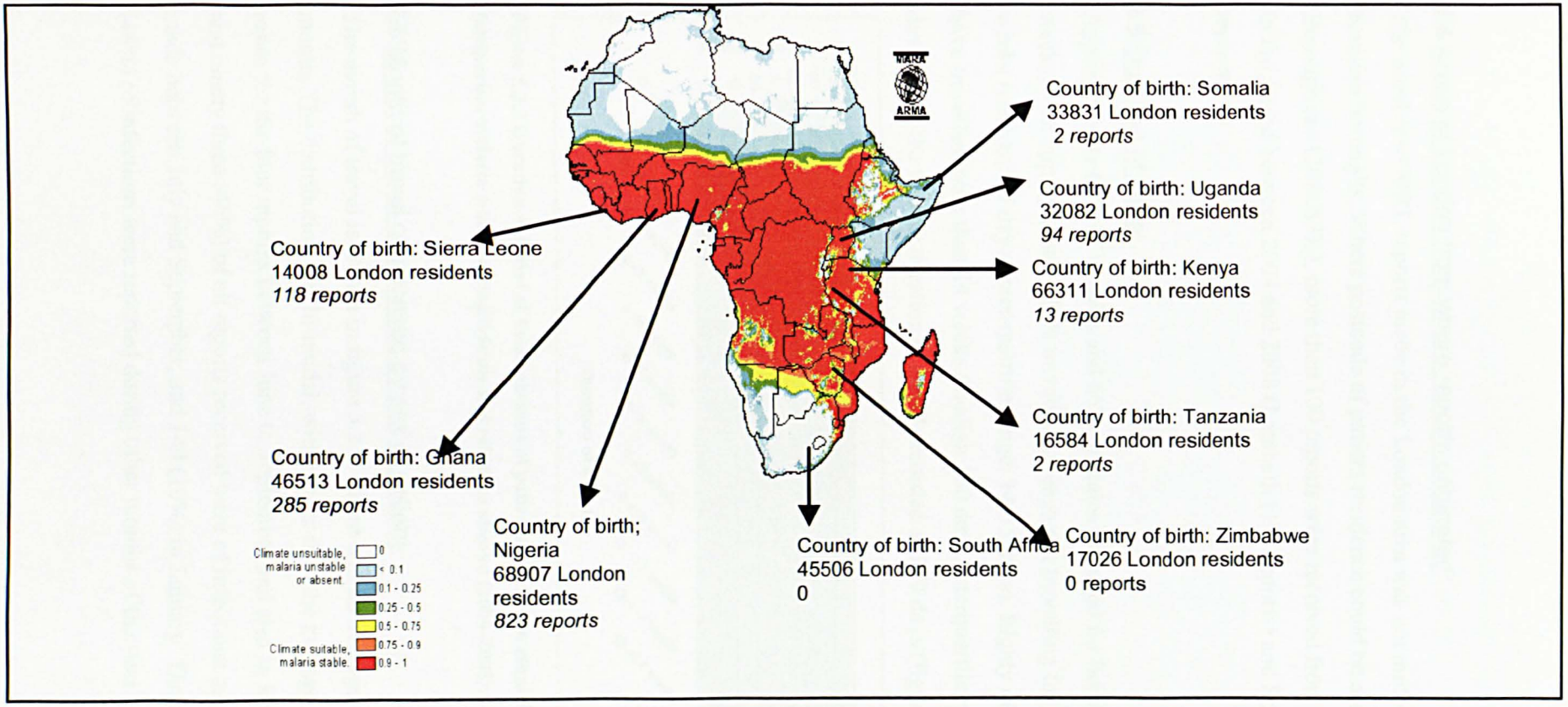

Figure 5.2.2 Climate suitability for malaria transmission in African countries and number of infections (2004-2008) caused by P. falciparum in each African countries in which >10000 London residents of African ethnicity were born who visited friends and relatives.

5.2.4 Areas of London from where reports originated

The number of MRL reports made in the London area was not uniformally distributed between boroughs. Where postcode of patient residence could be assigned to a London Borough (n=1308: 87%), more than 100 reports were received from only two boroughs in the period between 2004 and 2008 (Lambeth (151 reports) and Southwark (302 reports).

5.2.5 Duration of travel

Approximately 63% of females and 66% of males travelled for between two and four weeks, with approximately 20% travellers of each sex travelling for two, three and four weeks (median: 25 days, inter-quartile range: 14-35 days). Eighty nine were reported to have travelled more than 14 weeks (median 180 days, interquartile range: 150-270 days), with the longest duration of travel recorded as 270 days (figure 5.2.3)

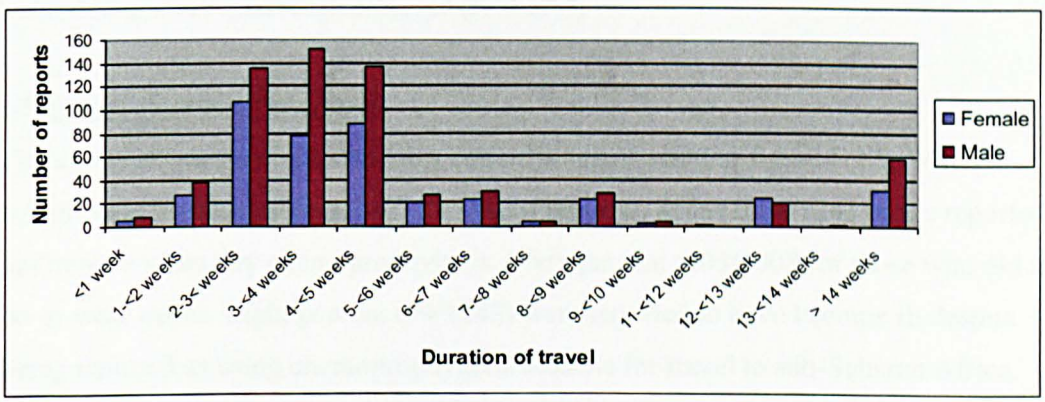

Figure 5.2.3 Duration of travel of those patients of patients of African ethnicity who acquired falciparum malaria when visiting friends and relatives abroad (2004-2008).

5.2.6 Month of travel categorised by sex of patient

The month of travel is shown in figure 5.2.4. There was an average of 125 reports each month. The distribution was bi-modal, with higher than the average number of reports made for the four months between June to September and also in January. Six hundred and ninety three (46%) of all reports received were of infections acquired during visits made between July and September, and 149 (10%) in January. The remaining 656 (44%) of infections were reported during other months of the year.

In each month there were more reports of infections in males compared to females. There were only four months (January, June, July and August) in which there were more than 50 reports of falciparum malaria in females, but only one month (February) in which the numbers of infections in males fell below 50. September was the only month in which the numbers were similar (99 reports in females and 102 in males).

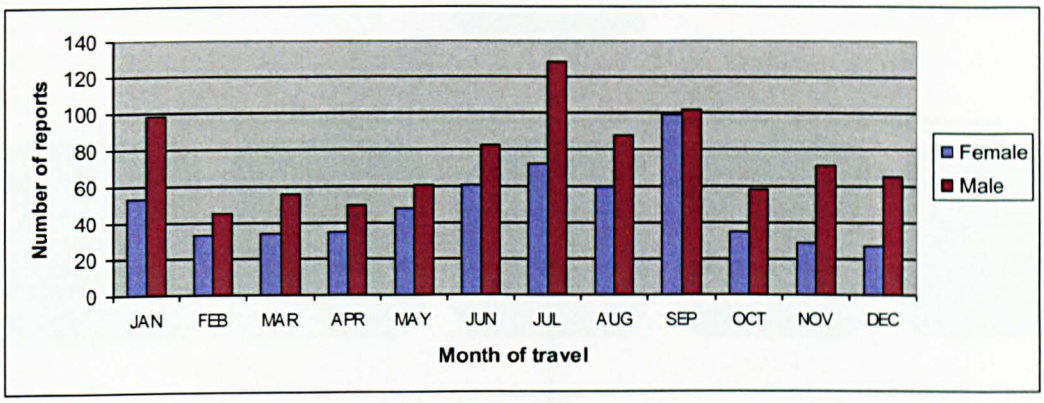

Figure 5.2.4 Month of travel for patients of African ethnicity who acquired falciparum malaria when visiting friends and relatives abroad (2004-2008)

5.2.7 Use of chemoprophylaxis

The use of chemoprophylaxis in this cohort is summarised in figure 5.2.5. Where information was available, (1243: 83.1%) of reports), 81% (1008/1243) were reported not to have taken any chemoprophylaxis. Sixty percent (605/1008) of those who did not do so were males. Eight percent (99/1243) were reported to have become ill despite being reported as using chemoprophylaxis suitable for travel to sub-Saharan Africa, namely mefloquine (n=48: 3.9%); AP (n=15: 1.2%), or doxycylcine (n=36: 2.9%). Data on adherence to chemoprophylaxis is not collected by the MRL.

Thirteen patients were reported to have used chemoprophylactic drugs, but the regimen was not recorded. For a further two, the use of chemoprophylaxis was unclear and recorded as "Y?"

Of the remainder (n=121) of those who reported taking some form of chemoprophylaxis other than that suitable for use in Sub-Saharan Africa, 97 (8%) of the total number for whom information was available (n=1243) were reported to have taken either chloroquine (n=38), proguanil (n=33) or a combination of these (n=26).

Of the rest, (n=24) eight took SP, ten took Pyrimethamine, and two took Pyrimethamine plus dapsone. The other four took homeopathic drugs.

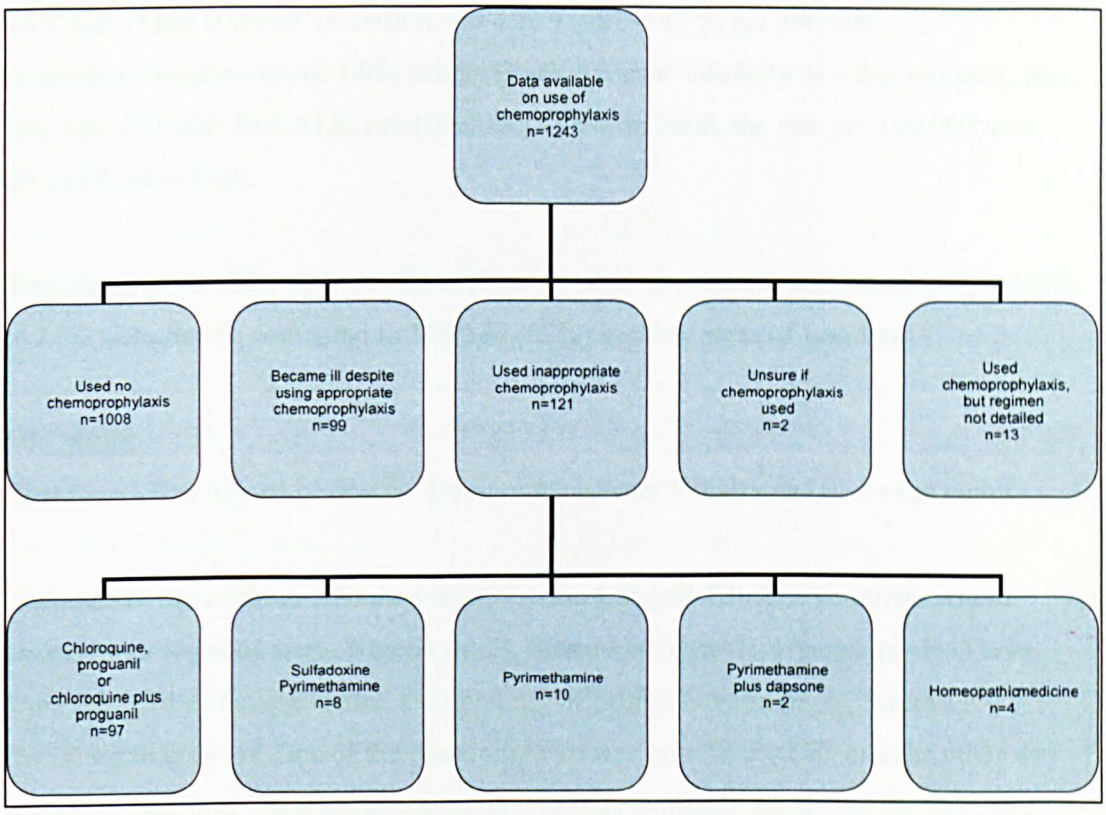

Figure 5.2.5 The use and non-use of chemoprophylaxis.

As noted in section 2.5.4, there were three PCTs in London (Lambeth, Southwark and Lewisham) in which the cost of malaria chemoprophylaxis was subsidised for the duration of the study. Of the 1008 who were reported as not having taken any chemoprophylaxis (figure 5.5.2), (428) ($\bar{x}$=85.6) (CI: 76.4-94.9) were reported from hospitals in LSL. The comparative number of reports for hospitals in London but outside LSL was 580 ($\bar{x}$=116) (CI: 105-127.4).

The rate per 100 000 of those who were reported as not having taken chemoprophylaxis in LSL in 2004 was 9.2 per 100 000 (CI: 7.1-11.4). In 2008 it was 11.8 per 100 000 (CI: 9.4-14.2).

In areas of London outside LSL, the rate was 1.8 per 100 000 (CI: 1.5-2.1) in 2004, and 1.5 (CI: 1.2-1.8) in 2008.

Using "Black African" ethnicity as a denominator, in 2004, the rate per 100 000 of those who were reported as not having taken chemoprophylaxis in LSL was 83.7 (CI: 64.4-103.1) per 100 000. In 2008 it was 122.9 (98.3-147.5) per 100 000.
In areas of London outside LSL, using "Black African" ethnicity as a denominator, the rate was 37.1 (CI: 30.5-43.8) per 100 000 in 2004. In 2008, the rate per 100 000 was 30.1 (CI: 24.1-35.9).

Two hundred and fifty eight (60%) of those in LSL who did not take chemoprophylaxis in LSL were males, compared to 358/580 (62%) in other areas of London.

5.2.8 Deaths

There were five reports of deaths. Three of these were females and two were males.

The median age of those who died was 39 years (range 6-70). The countries where malaria was acquired were: Nigeria (n=2); Sierra Leone (n=2); Uganda (n=1). Three were recorded as having visited their country of origin; Nigeria (n=1); Sierra Leone (n=1); Uganda (n=1). One of the remaining two was born in the UK, and the other was born in Zimbabwe. The duration of travel was only available for two of the five, and each of these had each travelled for three weeks.

Two of the five were reported not to have taken any chemoprophylaxis. One was recorded as having taken inappropriate chemoprophylaxis (chloroquine). For one of the five patients, information on whether chemoprophylaxis was not taken was missing, and for the other it was recorded as being uncertain. Two of the five had postcodes of residence in Lambeth, Southwark or Lewisham, the areas in which malaria chemoprophylaxis is subsidised.

5.3 Discussion

There were three limitations related to the quality of the data, which may have affected the results. The first was concerned with the completeness of reports. Whilst many of the variables were well completed by clinicians, others were less so. Reason for travel, in particular, was recorded on only 59% of reports. However, similar findings, that the majority of cases are in those of African ethnicity who acquired *P. falciparum* infections whilst visiting friends and relatives abroad has come from other

epidemiological studies (Smith et al., 2008, Pavli and Maltezou, 2010, TropNetEurop, 2010). Whilst each data collection system used will have its own limitations, (for example, TropNetEurop is a sentinel surveillance system, only collecting data from selected sources) (Jelinek, 2008), the similarity in conclusions drawn lend support to the reliability of the results in this analysis.

Another limitation connected with data quality was possible under-reporting of cases from some hospitals in London, which may have under-estimated the incidence between 2001 and 2008. Whilst the large number of reports made in certain geographical areas may reflect the large African community resident in these, under-reporting to the MRL from other hospitals is known to occur. Details of the number and range of reports made from Newham hospital were shown in section 4.9.2, and it was surmised that not all reports may have been notified. Another example comes from Lewisham hospital, where due to a lack of staffing, reporting to the MRL is inconsistent (personal communication, Dr Mir, Lewisham Hospital). In this hospital, the number of reports made to the MRL ranged between one and 60 between 2001 and 2008.

The third limitation was concerned with the use of a proxy measure of residence, that is, the hospital in which the infection was treated, rather than the borough of residence of the patient. This method of ascribing residence was chosen because of the poor reporting of data relating to borough or county on the MRL report form, as reported in section 4.5.2. However, it is possible that some patients treated in one area, for example London, lived outside this area. A related data quality concern was that although HTD is a hospital outside LSL, it is a tertiary referral centre for other hospitals in London. Patients from LSL may be transferred to this hospital, and therefore, using hospitals as a proxy for residence may under-estimate the number of patients who were resident in LSL.

Taking these limitations into consideration, the first section of the analysis indicated that the highest incidence of imported malaria between 2001 and 2008 was in VFRs who acquired falciparum malaria when visiting friends and relatives. Reports were predominately made from hospitals in the London area. With respect to ethnicity, the results indicated that the greatest burden of disease was in those categorised as of "Black African" or "of African descent", resident in London.

Only the number of reports made of *P. vivax* was noticeably higher from outside the London area compared to those reported from within the capital. In the 20 year study carried out by Smith and colleagues, which reported similar findings, this was attributed to infections in migrants from India and Pakistan who live in large communities in the Midlands and North of England (Smith et al., 2008). Although this was not investigated in this thesis, this explanation seems to be plausible.

The annual mean number of reports (1727) during the period 2001 to 2008 in this analysis was lower than the average 1965 reports reported between 1987 and 2006. As described in section 1.3, a reduction in cases of imported malaria has also been reported elsewhere, and described as possibly resulting from increased urbanisation and the success of vector control methods in malarious countries of West Africa (Behrens et al., 2008). However the analysis in this chapter suggested that whilst the number of reports may be decreasing, the *proportion* of all reports in London that were in VFRs increased, and this suggests that VFRs may be increasingly affected by imported malaria.

The use of an alternative denominator to calculate the rates of infection (i.e. one which used the number of travellers rather than the resident population) was only available for the UK, so was not calculated separately for London and other areas. The results showed that where a more accurate population at risk was used for the denominator, rather than the mid-year population estimate, the incidence rate increased significantly. However, despite an increase of nearly 11 000 in the number of visits made to Nigeria by VFRs between 2004 and 2008, and an increase of over 14 000 trips made to Ghana by these travellers, the rate of infection remained similar for Nigeria during this time period, and decreased for travellers to Ghana. One explanation for these findings may be changing environmental conditions which may affect the risk of acquiring malaria infections, as suggested by Behrens and colleagues (Behrens et al., 2008). However, limitations associated with data quality may also have contributed to these findings. These need to be taken into consideration, and more data collected over a longer time period before a justifiable claim can be made about true changes in incidence over time.

The second section of the analysis in this chapter provided more detailed analyses of VFRs resident in London, who acquired falciparum malaria when they visited friends

and relatives abroad between 2004 and 2008. This showed some similarities in the characteristics of those reported to the MRL with respect to age, sex, duration of travel and month of travel. In particular, there appears to be one group of individuals who contract malaria whilst travelling during the UK summer or winter holidays. However, the analysis also revealed some variability within the sample with respect to all these variables, suggesting that that those most at risk of imported malaria in the UK cannot be considered entirely as a homogenous group in terms of their epidemiology. For example, the rate of infections per 100 000 in men and women differed considerably. Whilst most patients had travelled for between two to four weeks, others travelled for much longer and 44% of reports received were of infections in those who had travelled throughout other months in the year.

In section 2.5.4 and in section 3.6.2, it was shown that the cost of chemoprophylaxis was put forward as one reason why it might not be used, by health care providers and by travellers respectively. Using two different denominators, the rate per 100 000 of those who took no chemoprophylaxis before travel was higher in LSL compared to areas of London outside this area. This is despite the policy of offering chemoprophylaxis for the price of an NHS prescription current during the study period. This requires further investigation to explore the reasons why this might be so, and will be discussed further in chapter six.

Chapter six: qualitative research: demographic, migration and travel-related data, responder and respondent interactions and the interview context.

This chapter turns to the results of the qualitative part of the research. I begin by describing the location, time and duration of the semi-structured interviews. Demographic, migration and travel-related information are then provided for VFRs and patients. Demographic and occupation-related data are included for other groups of respondents (GPs, practice nurses, community pharmacists and hospital consultants). Finally, in this chapter there is a discussion of how I believe my personal perspective and interaction with respondents and the context within which each interview took place may have influenced the analysis.

6.1 Respondent details: number, locations, durations and times of interviews

Face to face interviews were undertaken with 56 participants: 20 VFRs, seven community pharmacists, 10 GPs, 10 practice nurses, three hospital consultants, and six patients. A chart showing the time period over which interviews were carried out is provided in appendix six

Respondents either lived (VFRs and patients) or worked (GPs, practice nurses, and community pharmacists) in eleven of the 32 London boroughs (figure 6.1.1) Nine VFRs and four patients lived in the three boroughs (Lambeth, Southwark, and Lewisham) where malaria chemoprophylaxis was subsidised during the time period of the study. Sixteen of the other respondents also worked in these areas. As only three hospital consultants were interviewed, the area in which they worked is not provided to maintain their anonymity.

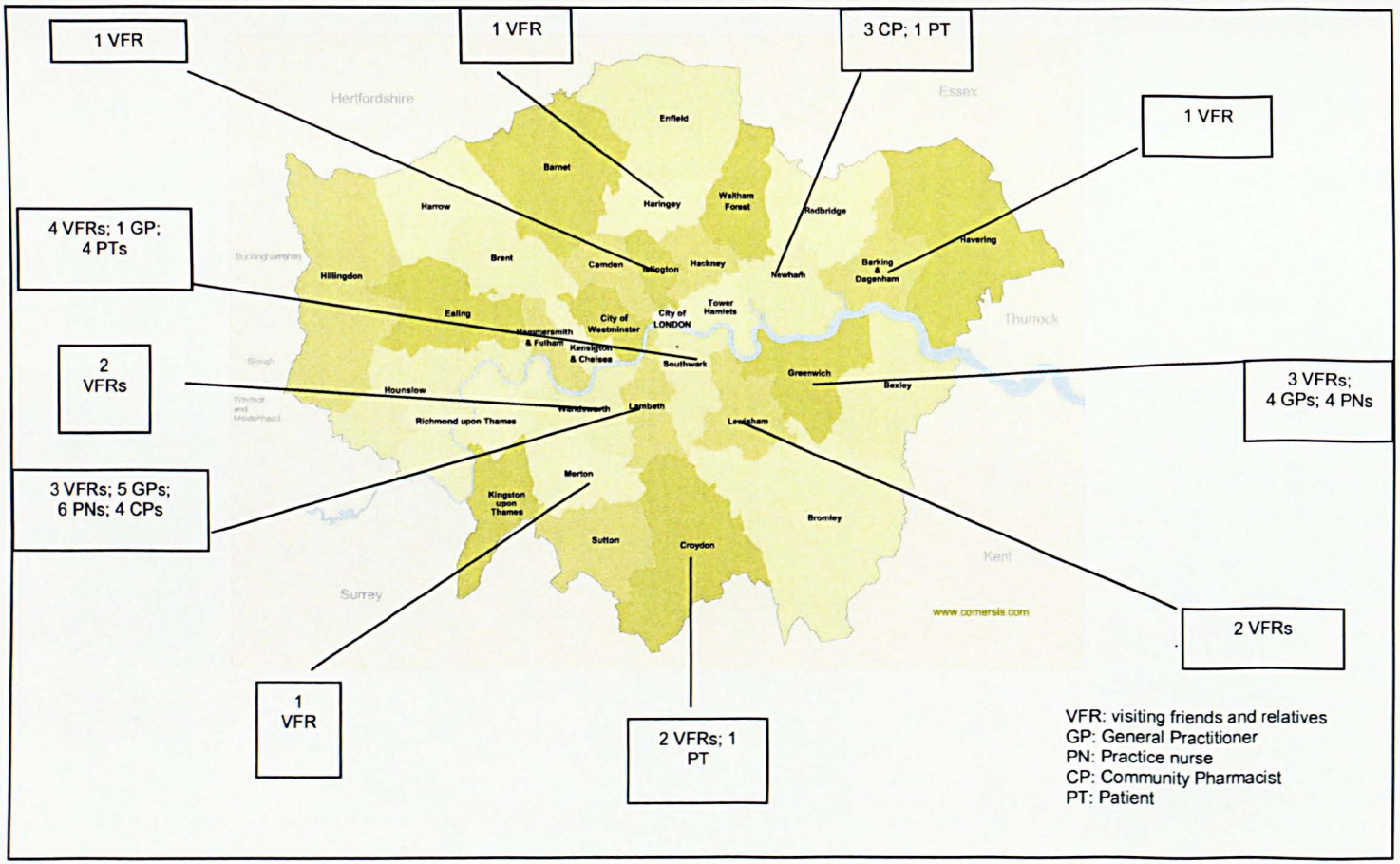

Figure 6.1.1 Areas of London in which VFRs and patient participants lived and GPs, practice nurses, community and community pharmacists worked

The location of the interviews with VFRs and patients is given in appendix seven. The majority of the interviews were carried out in the early evening. Where interviews were carried out in VFR's homes, it was requested that the television was turned off, or the volume turned down to help us concentrate. In the different cafés where interviews were carried out, background music was being played in all but one, and all were very noisy. Two female respondents had pre-school age children with them during the interview. They demanded regular attention, which as well as causing interruptions to the interview, made it sometimes difficult for both the study participant and for me to concentrate fully on it. One of these interviews was also carried out in a café, which added to the difficulty of hearing everything that was said. Interruptions from respondent's incoming mobile 'phone calls or text messages were common. In all cases, participants were asked if they would like to deal with the call or message before continuing with the interview.

Those interviews conducted at my work place were carried out in a different department to the one in which I worked.

All the GP and practice nurse interviews were conducted in private rooms within GP practices except two interviews with GPs, each of which took place in a private office in two different PCTs. All interviews with community pharmacists were conducted in community pharmacies. All except one were carried out behind the customer counter, except for one which was carried out in a quiet corner of the pharmacy accessible to customers. The three interviews with hospital consultants were carried out at their work place in private offices.

Interviews with VFRs, GPs and practice nurses took an average of 30 minutes. For community pharmacists, interviews lasted approximately 25 minutes, and interviews with hospital consultants took about 40 minutes on average. All these interviews were carried out during working hours.

All the offices of GPs practice nurses and consultants were quiet locations, with few interruptions from telephone calls or colleagues. In all cases where healthcare providers were interrupted by colleagues or by 'phone calls, they were given the option of

stopping the interview to deal with these. These interruptions did not appear to distract them unduly.

Community pharmacists were often interrupted by colleagues or by customers. As with the other healthcare professionals, participants were always given the option of dealing with the reason for the interruption before returning to the interview.

6.2 Demographic, migration, travel-related information and use of chemoprophylaxis by VFRs and patients

6.2.1 VFRs

Eleven of the 20 VFRs were interviewed before and after travel. Three of the VFRs (VFR2, VFR8 and VFR13) who were interviewed before travelling did not respond to attempts to contact them after travel and were categorised as "lost to follow up". The other six VFRs were interviewed only once, and this was upon their return (appendix seven).

VFRs were interviewed between one and four weeks before travel, and those 11 interviewed after travel were contacted between one and four weeks after their return.

At the time of the interview it was found that one VFR who had agreed to participate in the study was not of Ghanaian or Nigerian origin. He had been born in France and his parents were born in Mauritania. However, he had lived for a number of years in Nigeria and made regular visits to both Ghana and Nigeria. It was considered that he could make a valuable contribution to the study, and so was included.

Demographic, occupational, residence-related and travel information relating to VFRs are shown in appendix eight and appendix nine. The median age of VFR respondents was 40 (interquartile range 31-46). They had a variety of occupations, ranging from three who worked as cleaners to one who was employed as a lawyer. Five worked in healthcare in some capacity, and three of these were judged to have some knowledge of malaria through their work. One not currently working in healthcare was however medically qualified. Participants were not asked routinely about the work status of their partners, as this was considered to be potentially intrusive. However, two male

participants who themselves had no knowledge of healthcare, volunteered the information that their wives worked in this discipline, one as a nurse, and one as a GP.

Ten VFRs were travelling to Ghana, nine to Nigeria and one to both countries. Fourteen were born in the country which they were visiting. Another four were born in the UK, but spent their childhood and early adulthood in Nigeria. One, although not born in Nigeria, was of Nigerian parentage and had lived in that country for a considerable period of time. Two of the younger VFRs were taking their first trip to their country of origin since emigrating to the UK. Only one VFR had been born and spent all her life in the UK. At the time of the interview, VFR respondents not born in the UK (n=19) had lived in this country for a median period of 16 years (interquartile range 10-22 years).

Travel to Nigeria or Ghana was frequent, and half reported travelling every year. Those who had lived longer in the UK than other VFRs did not seem to travel less frequently. Whilst some explained that they travelled infrequently during the first few years they were in the UK, predominately due to financial constraints, once these eased, they travelled more often. Others, who travelled less frequently did so because of a lack of money, and saved regularly to enable them to do so.

All the trips that VFRs were taking, except for one who was attending a funeral and was unsure when this might take place at the time of the interview, and another who had arranged the trip just two weeks before travelling, had planned their travel at least eight weeks before leaving. For these 18, the median time before travelling that they had planned the trip was 19 weeks (interquartile range 12-28 weeks). The median duration of travel was 23 days (interquartile range 14-30 days).

Eleven of the 20 were travelling alone, and seven were travelling as part of a family group which included children. For many, the trip was their main holiday, and 11 of the 20 (55%) were travelling during the summer months: nine in July and two in August. Three were travelling during the Christmas holidays, and two over the Easter break. Three had additional reasons for travel (one was going to a conference, one to a funeral and another taking part in a speaking tour), and were incorporating within this a trip to see friends and relatives. One had bought a property in Nigeria in which he intended to retire. He currently used it as a holiday home. The entire family of another VFR

maintained two homes, one in Lagos and one in London, and he commuted frequently between the two. Although a few mentioned that previous travel had been necessitated by the illness of their parents, or that they were travelling to honour the first anniversary of the death of a parent, all VFRs gave the impression they enjoyed their trips to Nigeria or Ghana and did not appear to be travelling solely from a sense of family duty.

The use of chemoprophylaxis (for previous trips where appropriate and for the most recent trip) for individual VFRs is shown in appendix nine. It could be summarised as follows:

- Yes on this trip and also on previous trips (n=8)
- Yes on this trip but intermittent use previously (n=3)
- Intended to on this trip, but did not purchase, used on previous trips (n=1)
- Not on this trip and not on previous trips (n=3)
- Not on this trip. First time travelled since coming to the UK (n=2)
- Intended to on this trip, did on previous trips and lost to follow up (n=1)
- Provided contradictory information and lost to follow up (n=1)
- Intended to on this trip but intermittent previously and lost to follow up (n=1)

6.2.2 Patients

At the time of the interview, it was found that one patient (PT1) was born in Sierra Leone. He had just returned from his first trip to Nigeria, where he had contracted malaria, and had also been infected with this disease on a previous trip to Sierra Leone. It was decided to include him in the study, as like VFR1, it was thought that his contribution could be valuable.

Patients were interviewed between one and three weeks after being discharged from hospital. Demographic, occupational, residence-related and travel information of patients are provided in appendix 10.

All patients were males. One was unwilling to give his age. The median age of the others was 54 years with an interquartile range of 49-59. As with VFRs, they had a range of occupations. None were judged to have any professional knowledge of malaria.

Five were travelling to Nigeria, and one to Ghana. Except for the patient from Sierra Leone, all were travelling to the country in which they were born. They had lived in the UK for a median 23 years (interquartile range 20-25) at the time of travelling.

Three travelled at least once a year. Of these, one was a businessman in Nigeria, which, he explained, necessitated frequent travel to that country. Another had a property in Nigeria, which he visited as frequently as he could. One of those who travelled less frequently was going because his mother was ill. Two pastors volunteered to take part in the study. Both were going on an evangelical mission, as well as visiting family.

For four patients there was less than a week between planning the trip and going. One had two months to prepare, and one had two weeks. Patients travelled from June to November. The median duration of travel was 17 days (interquartile range 14-21 days).

The use of chemoprophylaxis by patients was as follows:

- intermittent previously but not on this trip (n=2)
- intermittent use previously. If not purchased in UK, regular purchase of chloroquine-based drug upon arrival in a malarious country, but not on this trip (n=1)
- not on this trip and not on previous trips (n=1)
- regular purchase of chloroquine and proguanil upon arrival in malarious country (n=1)
- not aware anti-malarials available in the UK (n=1)

6.3 Demographic data, practice details and employment history for GPs, practice nurses, and community pharmacists

6.3.1 GPs

The sex, ethnicity, practice details and employment history of GPs is shown in appendix 11.

Seven GPs were male, and three female. All but two were of Caucasian ethnicity. Three worked in smaller practices of between one and three GP practitioners, the others in larger practices. Five interviews were with Lambeth GPs, one with a Southwark GP and four with those working in Greenwich.

The number of years each one had spent working as a GP was categorised to maintain the anonymity of the respondents. Only one GP had been employed in this role for less than five years. Two had been GPs for between 10 and 14 years, and six for between 20 and 24 years. One had over 25 years' experience in this role.

6.3.2 Practice nurses

The age, sex, ethnicity, practice details and employment history of practice nurses is shown in appendix 12.

All practice nurses involved in the interviews were female. Five were of Caucasian ethnicity, three were Black Caribbean, one was Black African, and the tenth from the Indian Sub-Continent. Five worked in Lambeth, and five in Greenwich As with the GPs, other details are categorised and some details sourced from the London Health Observatory (London Health Observatory, 2011) and from the practice details provided on the internet. All except one worked in practices with between one and four other practice nurses, although the ratio of practice nurses to GPs and the number of patients varied between practices. One practice nurse had been working as a practice nurse for between one and four years, four for between five and nine years, three between 10 and 14 years, one and between 15 and 19 years, and one for more than 25 years.

6.3.3 Community Pharmacists

Appendix 13 shows the sex, ethnicity, PCT of employment and number of years each had worked as a pharmacist

Five of the community pharmacists who were interviewed were male and two were female. Four were from the Indian Sub-Continent, one was Black Caribbean, one Caucasian and one Black African. Four interviews were carried out in Lambeth, and three in Newham. As with the other respondents, the time they had worked in their profession was categorised to help ensure their anonymity. Only one had worked as a

pharmacist for less than five years. The others were more experienced, two having worked for between five and nine years in this role, two between 10 and 14 years, one for between 15 and 19 years, and one for more than 25 years.

6.3.4 Hospital consultants

All three of the participating hospital consultants were male, and of different ethnicities and all had at least five years' experience of working in this role. There are fewer hospital consultants than GPs or practice nurses working in London, and as one is identified in chapters seven to nine by his country of origin and another by his speciality (paediatrics), it was decided not to provide any further details, in order to preserve the anonymity of this group of respondents.

6.4 Personal perspective and involvement in the study

In section 4.9.5, the importance of reflexivity was noted. In this section, I discuss how I felt my personal perspective and involvement may have influenced my interactions with respondents, both in terms of my reactions to the participants and their reactions and responses to me.

6.4.1 My status

As well as being a PhD student, I worked for the HPA throughout the data collection process. This is the UK agency responsible for protecting the public from infectious diseases, chemicals and radiation hazards. Specifically, I was employed as a Health Protection Specialist at the South East London Health Protection Unit (SELHPU) which is one of four units of the HPA in London. I worked primarily on the epidemiology of infectious diseases and on the development and implementation of strategies for imported malaria and for hepatitis B and C. I was employed at SELHPU for approximately nine years by the time the research concluded, and had a total of fifteen years' work experience in health strategy and research. As a result of this work, much of it carried out in areas of high socio-economic deprivation and in areas with large migrant communities, I had developed a keen interest in the wider determinants of health, health inequalities, and migrant health. Thus, I approached the research with a great deal of enthusiasm.

I already had several years' experience of working with a wide range of healthcare professionals, such as hospital consultants, nurses and colleagues in PCTs, by the time the study started. I had also worked with African community groups on malaria prevention projects, and during some of the time in which I was undertaking the PhD, I was also setting up a research project investigating the prevalence of hepatitis C prevalence in the African community. This also involved working with African community groups. Much of the success of my professional work had been dependent on building up constructive working relationships with a wide range of people, and having strong interpersonal skills. As a result of this, I felt experienced and confident from the outset of the research in my ability to quickly establish a rapport with individuals who would be interviewed for this research.

I lived in London from 1987 to 2005, and was familiar with all the geographical areas in which the interviews were conducted.

6.4.2 Personal safety

The community pharmacies which I visited were all located in busy shopping areas, and as such, although some were in areas with high levels of deprivation, I felt comfortable walking in these areas. Interviews with hospital consultants in hospitals also posed no anxiety. Personal safety, in particular the fear of being physically assaulted, was however sometimes of concern to me when I was visiting areas of London with high crime rates, either to visit GP surgeries or to interview VFRs or patients. My apprehension was increased particularly when carrying out interviews in apartments within large housing estates when it was dark. In some instances I used taxis to take me as close to the home of the respondent as possible, though this was not always possible. A further concern for me was that in nearly all cases I had not met VFRs before the interviews, and had also had very little previous contact with the facilitators of some of these interviews. Patients volunteered for the study whilst in hospital, and so I had no previous contact with them either. Thus, I was slightly apprehensive about my own security, especially on the occasions when I thought I may be alone in a house or flat with a male participant.

I had attended training on risk assessment through my professional work and followed the advice given. In all instances in which I was interviewing in private homes, I

'phoned a friend or work colleague before entering the home of the respondent and again after the interview, when I reached a place where I felt comfortable using a mobile 'phone. I also made sure that the friend or work colleague had the name and address of the person I was interviewing, and gave instructions on what to do if they did not hear from me within a certain period of time. As well as this, I employed standard "streetwise techniques" to minimise risk to myself. For example, I avoided the use of my mobile phone in the street, made sure I was aware of who was around me, and tried to appear as if I knew where I was going.

Despite these concerns, once I had met the participant, I never felt anything other than welcomed and safe. On very few occasions was I alone in the house with a male respondent, and indeed wondered whether they may have asked a female family member to be present to protect themselves from possible allegations of inappropriate behaviour. I also encountered no danger when travelling to and from locations. I do not feel that my anxieties had an effect on the conduct of the interview as I was careful not to express them, but this provides information about the context in which some interviews were carried out.

6.5 Use of a digital recorder

A digital recorder was used to record the interviews, and this was placed between me and the interviewee, most commonly on a table. All participants were asked if the interview could be recorded before it was started, and none declined. They were all reminded that the interview was both confidential and anonymous. In all interviews, I took care to show that I was relaxed with using the recorder, both in my body language, and by talking in the same natural way that I used before the recorder was switched on. It was not possible to evaluate how the presence of the recorder affected the participants' responses as no interviews were carried out without it. During the conversations there was much shared laughter and the spirit in which all interviews was convivial, suggesting that respondents were not intimidated by its presence. After it was turned off, several participants continued talking about the topic, but none with an air of divulging information "off the record".

6.6 Participant and interviewer interactions

6.6.1 VFRs

The act of a white person carrying out research into knowledge, attitudes and practices of a different ethnic group highlighted the differences in ethnicity both in my mind, and possibly in those of the study participants. This may have been compounded by the fact that I have not travelled in West Africa, from where nearly all participants originated. In many ways I recognised during the course of the interviews that these differences between interviewer and study participant were favourable to me, as many participants voluntarily adopted the role of informant, and sought to teach me about how Africans perceive and manage malaria. This was obviously received with enthusiasm, as it formed the key element of the research. However, in some instances the lack of knowledge that it was assumed I had (such as telling me that the names of the capital cities of Nigeria and Ghana), reinforced the perceived and actual gulf between our ethnicities and backgrounds.

Despite many VFRs and patients being keen to educate me, it appeared that there was at least one issue which one participant felt to be beyond my comprehension. This became apparent when one VFR explained to me after the interview had finished that his wife had thought he had been bewitched when he developed malaria-type symptoms, and then confided in me that there were some things about the African community that I could not understand. Differences also surfaced in other ways. Whilst some participants were comfortable in explaining that they did not consider malaria to be a serious health concern, others' avowal of its importance may have been explained by a desire to agree with what they may have thought would be my cultural perception of it as being a serious illness.

Language, specifically differences between my accent and that of some respondents also highlighted the ethnic difference between us. This also occasionally threatened the rapport that had been built up during the interview as it was sometimes clear that we were having difficulty in understanding each other. I always managed to diffuse any tensions by smiling at these difficulties, but in one instance made a note after the interview that I wondered how much the respondent mixed with people outside his own

ethnic group, as it was clear he sometimes had difficulty understanding what I said, and some questions asked him needed more than one repetition or clarification.

Aside from these differences, as fellow UK residents, both I and VFR participants and patients did share some common experiences such as living in London and use of the NHS for healthcare. Here, social class, professional and gender differences may have been more pertinent to the interaction than cultural factors. With respect to social class, I was unaware of the factors that identify someone as being of a certain class in Nigeria or Ghana. From my perspective, this lessened any class-related tensions that may have affected the interaction between us. It was clear however, from the context in which the interviews took place (from a private club in central London to apartments on housing estates with high crime rates) of the differences in the lives of individual respondents.

One of my foremost concerns was to ensure that VFRs and patients did not feel patronised during the interview, as this could have been interpreted as assumed ethnic, cultural, educational or class superiority on my part. To overcome this, I took care to assume a certain level of knowledge and intelligence on the part of interviewees, and was keen to adopt the role of naïve researcher. The perception referred to earlier in this section, that many participants appeared to be educating me about malaria control, I feel, meant that their fears of being patronised were averted.

From my professional work, I was aware that HIV and to a lesser extent, TB, rather than malaria, were the predominant healthcare concerns of many members of the African community, at least those who were members of community groups with whom I had interacted. As such, I was aware that some at least were taking part in the interview as a favour to their friends rather than because of a particular interest in malaria, or because they were keen to impart a particular message. On the other hand, I wondered if a few VFRs did take part specifically to complain about the prohibitive cost of chemoprophylaxis. I also had the impression that some patients were keen to assist, so that they could help others avoid contracting malaria. One patient informed also informed me that he volunteered to take part to express his discontent with his attempts to access chemoprophylaxis from a community pharmacist.

With VFRs who were students, I felt immediately to share a common interest in learning, and found them easy to engage with. Others worked in healthcare, and with these also, I felt a professional bond which made them easy to talk to. I also had a slight professional acquaintance with two VFRs before interviewing them, but had only spoken to them very briefly once or twice before on work-related issues and knew it was unlikely that I would work with them in future. Such a brief professional relationship I feel, did not affect the conduct of the interview as I noticed no differences between these interviews and others in terms of the responses given.

With respect to gender differences, I detected a slight discomfort from two male VFRs when their knowledge about malaria transmission was explored. The question was avoided by them asking it back to me, and was the only time that I detected any unease in responding to the questions I asked. I assumed that it may have felt uncomfortable for them to risk appearing ignorant to a female interviewer.

It was perhaps inevitable that I often found myself comparing what my own likely health protection plans would be when travelling to Nigeria or Ghana to those made by the VFRs I interviewed, and in some instances the lack of concern expressed by many did seem unusual. However, I recognised that my professional occupation and lack of previous travel in these areas might make me particularly concerned about the dangers associated with infectious diseases. To help me consider the issues from a different perspective I often found it helpful to instead compare their actions with what I might do when travelling back to the UK after living abroad with respect to protecting myself against an illness such as influenza.

During the course of the interviews with patients, I became aware that care was being taken by participants to stress the individual circumstances which led to their becoming infected. This, I felt, may have been as a result of their fears about being reprimanded by me for not having taken appropriate precautions before travel. Having realised this, I took care to show sympathy with them, not only for the symptoms experienced but also for the circumstances they described. These will be explained fully in chapter nine, but the range and succession of events they described emphasised to me how the individual context of each particular situations is fundamental to the outcome.

6.6.2 GPs and practice nurses

From my professional occupation I was aware of the daily time pressures under which healthcare professionals worked. This caused some feelings of guilt on my part when I asked them to volunteer to be interviewed and occasionally during the interview itself. In some cases it was obvious from the number of interruptions that they were under pressure, whilst others specifically said they were busy. This affected the interview process to some extent, as I was concerned that I sometimes may have rushed through the interview, but on no occasion did any GP, practice nurse or hospital consultant ask me to finish the interview early, or appeared to become impatient. Indeed, everyone took care to answer the questions thoroughly.

At times, I felt that some doctors, nurses, and community pharmacists may have been searching for answers to give me. It was also clear that in some cases, the views and practices of particular patients had stood out in their minds and these were being reported to me. It was difficult to evaluate the extent to which these reflected their more common experiences.

Although all interviews with GPs were carried out in a friendly manner, I have had relatively little contact with this professional group compared to other healthcare workers, and have a keener sense of an imbalance of power when talking to them. Unlike with other healthcare professionals, the occasions when I interact with GPs most are as a patient, or in the past, trying, often unsuccessfully, to get information to help me ensure the best care for my elderly parents. In the event, I found all the GPs I interviewed keen to engage with me and provide me with the information I needed. Indeed, some were, or became aware of, my link with PCTs either before or during the interview, and I feel may have been concerned to avoid giving the impression that they might not always follow good clinical practice. On the other hand, a few assumed that I was a nurse, perhaps displaying a certain gender stereotyping.

From many years' experience of working professionally with nurses from a variety of disciplines, I found nearly all practice nurses easy to talk to in a warm and friendly manner. I also felt this to be a result of the absence of a feeling of power imbalance on my part. Aware that they may themselves have felt a disparity, and to encourage them to express themselves freely, I emphasised when arranging many of the interviews that I

just wanted to "pick their brains". To form a bond before the interview started, I discussed subjects such as workload, the prevalence of chronic and infectious disease amongst their patient population, or patient demographics. A few did give the impression of being slightly anxious at the beginning of the interview, which I interpreted as uncertainty about what might be asked of them, fears of their responses being fed back to the GPs they worked with, or time constraints. To help alleviate these anxieties, I explained the confidential nature of the interview. Any overt anxiety at the beginning of the interview did not last more than a few minutes, and everyone, I felt, spoke freely about their experiences and opinions. I did feel at times that some may have emphasised their skills and knowledge in order to appear professional and competent. I also had the impression that a few were obviously very pleased to be asked their opinion as experts, as many were very keen to talk. When, at times, some were interrupted by colleagues, they explained that they were taking part in research, with an air that this was important and they were part of it.

6.6.3 Hospital consultants

Of the three interviewed, I had a professional acquaintanceship with two before the interviews were carried out, who I knew to be interested in imported malaria and in turn they knew of my work in this area. This helped me to conduct the interview as a friendly discussion between people who have common interests. Interestingly, I felt none of the imbalance of power noted earlier with respect to GPs. I feel that this may have been because I interacted more regularly with hospital consultants than with GPs, and in these situations I felt my Public Health knowledge was understood and appreciated.

6.6.4 Community pharmacists

I had never worked with community pharmacists, and had little previous interaction with them. In some respects this made a rapport more difficult to build, as there were fewer shared professional experiences that could be drawn upon. I found them without exception keen to participate, and to share their thoughts and experiences freely. Several gave the impression of being pleased to be asked about these. A few of the younger participants appeared slightly nervous at the start of the interview, which I interpreted as an uncertainty about what might be asked of them, but after a few minutes, any sense of anxiety disappeared. Being interested in their experiences and asking them to explain

issues in which they had particular expertise, such as the suitability of individual chemoprophylactic drugs may have helped to give them confidence and carry out the interview in a relaxed manner.

6.7 Discussion

Despite the considerable time and effort it took to recruit study participants (the first being recruited in December 2007, and the last in January 2011), 56 respondents were recruited. These included some either resident or working in areas where subsidised chemoprophylaxis was offered, an some who lived or worked in areas where it was not. This meant that the effect of this policy difference could be explored in the interviews. This will be discussed in the next chapter.

As noted in section 6.2.1, only one VFR respondent and no patient had lived in the UK since birth, and this was recognised as being a major limitation of the study. As a result, with the exception of one respondent, only the views of a group of first generation Nigerian and Ghanaian migrants were collected. Having said that, a range of travellers, with different demographic, migration and travel patterns did participate. This meant that a broad range of perspectives could be gathered. The valuable contribution of healthcare professionals and community pharmacists to the study also allowed the viewpoint of these stakeholders to be included.

There were some noticeable differences between VFRs and patients. For example, the former had a median age fourteen years lower than the latter. All patients were men, whilst half of the VFR respondents were females. Another difference between VFRs and patients was in the amount of time in which the trip was planned. Whereas most of the VFRs were taking trips arranged months before travel, four patients decided to travel no longer than a week before departure. Just over half of VFR respondents (55%) were travelling in July and August, and six of these were families travelling with at least one child. Although the family members of one patient came to visit him during his trip, to support him during his mother's unexpected death, all others were travelling alone. Two patients were also travelling in the summer holidays, but in contrast to the VFRs travelling during this time, who planned their trips well in advance, one of these arranged his trip less than one month before departure.

From the contexts in which the interview took place, it was possible to gain a sense of the economic circumstances in which the different VFRs and patients lived. The overriding impression was that even from this small sample, the heterogeneity within the Nigerian and Ghanaian community living in London was apparent. Evidence of this comes from two examples: firstly the remarkable difference in the locations in which some interviews was carried out; secondly, the frequency of travel to Nigeria and Ghana, which was influenced to some extent by financial considerations.

Although some VFRs and patients were consistent in their use of chemoprophylaxis (either always taking it or never doing so), the intermittent use of it by others, the decision by some to purchase drugs in Nigeria or Ghana, and the purchase of inappropriate drugs by others begin to demonstrate the different options available and adherence to these.

There was some homogeneity with respect to the sex of GPs and practice nurses, with most of the GPs being male, and all of the nurses being female. There was a broader range of ethnicities amongst the practice nurses and community pharmacists, compared to the GPs, the majority of whom were Caucasian. Levels of experience, as evidenced by the amount of time spent by each employed in their respective roles was high for nearly all healthcare professionals and community pharmacists.

One lasting impression of the interviews with healthcare professionals and community pharmacists was of their willingness to participate in the interviews and provide their expertise. Several community pharmacists and practice nurses in particular appeared to be pleased that their viewpoint had been requested. Another impression was of the commitment of GPs, practice nurses and hospital consultants to their patients. I felt privileged to have the opportunity to be able to discuss with these participants a subject which was of great interest to me.

In the next chapters, I turn to the analysis of the interviews with respect to the knowledge, attitudes and practices of VFRs.

Chapter seven: factors influencing malaria prevention and adherence to chemoprophylaxis.

The analysis of the interviews is divided into three chapters. This chapter explores a wide range of factors which were relevant to malaria prevention, including firstly health concerns before travel, knowledge about transmission, perceptions of personal risk and the provision of travel health advice on airline tickets. It continues by discussing factors which were relevant to the avoidance of mosquito bites. Beliefs about the seriousness of malaria are described next. Peer pressure amongst VFRs' family members is then included. Choice of chemoprophylaxis, issues relating to its cost and drug adherence are the final topics discussed.

As described in section 4.9.8, respondents were given unique identifiers which are used in the following three chapters. Where GPs, practice nurses and hospital consultants are referred to as one group, they are described as "healthcare professionals".

There were no sole determinants of behaviour, but rather several factors influenced this for each VFR and patient. These factors have been categorised in these three chapters for clarity.

7.1 Health concerns before travel

Fifteen of the 20 VFR respondents and all six patients had concerns about their health when visiting Nigeria or Ghana. Malaria was the most frequently mentioned, although this may been influenced by respondents' desire to show interest in the topic under discussion, that is, a response bias. Whilst it was specified as a health concern, it was often listed *alongside* others. It was the sole concern for very few.

Other common issues raised were about gastrointestinal illness and the associated anxiety of drinking untreated water or foods which could cause these. Specific diseases associated with gastrointestinal symptoms were also cited, in particular typhoid, which was mentioned in the course of some interviews as being more serious than malaria. Many had suffered from stomach upsets on former visits, thus linking their concerns to previous experiences. One man had previously had concerns about contracting HIV on visits he made before he was married. A mother with teenage children was also concerned about them contracting HIV whilst abroad. Other health-related concerns cited were connected to poor access to emergency services, for example in the event of a road traffic accident or in other situations where swift medical interventions could be

life-saving. Other worries were about being robbed, or the consequences of becoming inadvertently involved in scenes of political unrest.

Practice nurses and community pharmacists confirmed that malaria and gastrointestinal illness were the most common concerns raised by patients seeking pre-travel advice.

7.2 Knowledge about how malaria is transmitted

Whilst there was some confusion among the participating VFRs about the infectious agent responsible for malaria, with the terms virus, bacteria and parasite used, all VFRs and patients confidently asserted that malaria was transmitted via mosquitoes. One thought it could, in addition, be transmitted by drinking water that had been contaminated with mosquito larvae and another who had medical knowledge, explained correctly that transmission could occur via unscreened blood used for transfusions.

All but three healthcare professionals and community pharmacists thought that VFRs knew how malaria was transmitted. One GP was uncertain, and one practice nurse and a community pharmacist felt that VFRs were not aware. However, very few healthcare professionals or community pharmacists had specifically asked patients/customers that question, but rather, had assumed it from the context of conversations.

Some VFRs in discussing this topic were keen to stress that malaria cannot be transmitted directly from person to person, and that VFRs returning to this country with malaria are not infectious. This assertion might be interpreted as a need to reassure healthcare professionals, of whom I appeared to be considered a representative by many, that VFRs are not wilfully putting others at risk by contracting malaria, thus deflecting any possible criticism that could be directed towards them for irresponsible behaviour. It could also reflect the view of some VFRs that UK-based healthcare professionals do not have a detailed knowledge of malaria.

7.3 Knowledge of a potential risk of acquiring malaria

All participating VFRs and patients knew that that there was a potential risk of acquiring malaria in Nigeria or Ghana.

Health care professionals and community pharmacists also felt that their patients/customers were aware that they could contract malaria in the country they were visiting, although as was the case with malaria transmission, few had specifically asked that question, but rather had assumed it from the context of discussions with patients in consultations.

7.4 The provision of information about malaria protection provided on airline tickets

VFRs and patients bought airline tickets either on-line or at travel agents. The use of tickets to impart health advice appears to have been ineffective as a means of providing information to these respondents. Half did not notice it was there and none proactively used this means of informing themselves about potential health risks. Some only checked to find out if there were any *mandatory* health requirements before travel, whilst others explained that their only interest in the information supplied with the airline ticket was with the size of their luggage allowance, suggesting that tickets were associated with the provision of information related to the practicalities of the trip.

Those who did read it, whilst acknowledging that it might be useful for first time travellers to Nigeria or Ghana, found it personally irrelevant as they were visiting their home, where, as they explained, they were aware of likely health threats and knew how to manage them. A typical response was that of VFR20 who was returning to Nigeria to see her family for the first time in a year and a half after studying in the UK:

> ***And did you notice any health advice on the ticket?***
> *Um, health advice, I don't think I did notice that, no I didn't.*
> ***And would it be the sort of thing you would look for, or not really?***
> *Um, not really since it's not a strange country. That was where I grew up. Um, if I was going to, like, let's see, Somalia, or some war area, I probably would look out for advice for such things. But since it's like my family place, it's like my homeland, I don't look out for...I really know what to do or not what to do, so I don't' really look out for advice or health issues* (VFR20).

Even the one VFR who was born and brought up in the UK explained that she would not read the advice, as experience gained on previous visits had taught her how to protect her health.

7.5 Mosquito Avoidance

7.5.1 VFRs' and patients' knowledge about the local environment with respect to mosquito avoidance

Although all VFRs and patients recognised the risk of acquiring malaria when travelling to a malarious country, many immediately asserted why the risk to them personally of acquiring the disease would be low. One reason was their knowledge of the local environment gained from previous residence, and/or subsequent trips made to Nigeria and Ghana as VFRs. In particular, the lack of breeding grounds for mosquitoes near to the places that they would be visiting and the corresponding relatively low perceived risk of being bitten in these areas were mentioned. These locations were often compared favourably to other local geographical areas, to other cities or to more rural areas.

7.5.2 Planned methods of mosquito avoidance

Knowledge of established mosquito avoidance methods that were employed regularly by their host families as protection against mosquitoes were described by those VFRs interviewed before travel. These included fixed structures such as window screens, which were often described as standard fittings, and fans. Some also described air conditioning as being available.

Other methods of protection used included insect repellents. The use of mosquito coils was not popular because of the smell associated with them. Attitudes towards bednets were particularly negative, and are discussed separately in section 7.5.4.

All but one VFR interviewed before travel described the spraying of bedrooms with insect repellents as a regular practice carried out by their host family, which took place between 30 to 60 minutes before bedtime. The use of body creams containing insect repellents were planned by some VFRs, but more commonly for children, and were described as being less routinely used by their host families.

Some VFRs acknowledged that these planned measures may not always be effective, with activities such as sitting outside in the evening (sometimes taken as a measure to avoid the smell and perceived toxicity of the mosquito spray), power cuts, visits made to more rural areas where the facilities available in urban areas for personal protection

would not be assured, and the use of non-air conditioned taxis thought as potentially reducing protection. However, these were considered unavoidable. For example, many emphasised the more "outdoor" lifestyle in Nigeria or Ghana compared to the UK, the excessive heat which made them keen to wear as few clothes as possible, and the capacity for mosquitoes to breach the slightest gap in protection. Several VFRs and patients described their attitude to mosquitoes as if they were fighting a battle with a devious opponent, describing the insect as eager to bite them.

Nurses reported that VFRs infrequently asked them for advice about methods of mosquito control. Some nurses imparted this information routinely, whilst others did not. One nurse said that such advice might not be given due to time pressures in the consultation, whilst another expressed a lack of confidence in imparting this information. She, along with two others, gave the patients leaflets on mosquito bite prevention, rather than providing this information directly. Three of those who did give advice routinely explained that they were required to impart this information, and needed to record on patient notes that this advice had been given. However, one of these three explained that there was no time available for a relaxed conversation about vector control methods.

Whilst a few practice nurses felt that VFRs were responsive to the information about mosquito avoidance measures provided, others were under the impression that VFRs felt that they were exaggerating the risks associated with malaria, and said that patients did not appear to pay attention to the advice given. Personal sprays appeared to one means of protection that VFRs were keen to use, though it was felt by one nurse that this was to avoid the nuisance of mosquito bites rather than that of malaria specifically. Another felt that VFRs believed that chemoprophylaxis would provide all the protection they needed.

Community pharmacists reported that few customers purchased insect repellents, or other items that could be used to control mosquitoes. However, it was acknowledged that these may alternatively be purchased in Nigeria or Ghana.

One of the three hospital consultants interviewed who was himself of African ethnicity confirmed that many VFRs would be likely to stay in houses which had netting at the

doors and windows, and would use insect repellents, but questioned whether these were used at the times of day when mosquitoes would be most active. The other two focused their answers on bednet use by VFRs, which is discussed in section 7.5.4.

7.5.3 Actual use of mosquito avoidance methods by VFRs

Two of the eleven VFRs who were interviewed before and after travel confirmed that their bedrooms were sprayed regularly. The other nine said that the spraying of bedrooms was carried out intermittently. Reasons given by VFRs who had asserted before travel that spraying of rooms was routine for it not happening in practice were because of the existence of window nets, or simply because there were no mosquitoes in the vicinity.

A variety of mosquito avoidance methods were reported to have been used by the six VFRs who were interviewed only upon return from travel. Two had shared a house together, and arranged for a pest control company to spray the room they were staying in before arrival. There were also nets at the windows of the house in which they were staying. Two said that the bedroom was regularly sprayed. One of these explained that despite this, mosquitoes would enter once the door was opened to cool the unpleasant temperature in the house. The heat also led her to sleep on the balcony covered in a sheet. One VFR would intermittently spray the room, but would mostly rely on air conditioning. This was the method also used by the sixth VFR interviewed only after travel, and who stayed in a hotel, rather than with her family.

The six patients who had returned with malaria all slept in rooms with nets at the windows, although one felt sure that mosquitoes were able to penetrate the netting in one of the houses in which he slept. There was some variation in patients' routines with respect to room spraying with insecticide. Three always sprayed the room before sleeping. One explained that he had often arrived home too late to do this, and then leave enough time for it to become effective before he returned there to sleep. Another reported that he never used sprays, and the last had air conditioning available in one house in which he stayed, but not in another. Despite the lack of air conditioning in the second area in which he stayed, he did not spray the room.

Three of the patients felt they had been bitten by mosquitoes when they moved to an area in which they felt there was a greater prevalence of mosquitoes. Two of these trips were to rural areas, with one VFR having to make an unexpected trip as his mother died during his stay and he was forced to change his holiday plans. The third patient who moved location travelled to Benin city where he said there were many mosquitoes in the vicinity compared to his home town. The fourth patient was staying in a less wealthy part of Lagos compared to his usual area of residence, and described that the local sanitation was poor and mosquitoes frequently seen and heard. The other two patients described being bitten in the garden of their usual residence, one when attending a party, the other when sitting outside wearing few clothes because of the heat. His description of the reasons for not protecting himself highlights both a certain over-confidence and vulnerability.

> *Let me tell you one thing. Of course, as I said, and I think I did it once whilst I was in Ghana recently, as I say, you feel so hot, you are so confident, so instead of wearing a pair of trousers, you may want to, you know, just to make sure you get more of the fresh air, and I think that might be why, 'cos, you know, over-confident, want to get the best out of the environment, you know, you want fresh air, that sort of thing. I'm sure that's one of the things that would also probably, because some of this, the mosquitoes have, have come to be resistant to some of the medication we have. So I think when we go in for prevention, it should be fool proof. You know, you don't give anything away, you know. So I think that is one, one thing, and it matters not wherever you are, in, in this country, you've got to be prepared.* (Pt2)

A few older VFRs and patients voiced shock at the poor levels of sanitation on their most recent visit, compared to the time when they had lived in Nigeria or Ghana and there was regular cleaning of mosquito breeding sites. The particular problems of living in an apartment block compared to a house were also described by one VFR as leading to poor sanitation, since it was difficult to ask neighbours to keep their gutters clear. On the other hand, those few who owned their own houses felt they had more control over the immediate environment, and could clear any areas where mosquitoes might breed.

7.5.4 Use of bednets

Few VFRs regularly used bednets for themselves. Of the seven VFRs travelling with children, only three planned to provide bednets for them. Two others would consider their use; one, only if visiting a rural area; the other in places where window nets were not available. Upon return to the UK, of those three who intended to use nets, one reported that in fact her children did not do this, and she had indicated their

unwillingness to do so in the pre-travel interview. Another was lost-to-follow up and the third considered it to be too much effort to put up the net, particularly as air conditioning was available as an alternative means of avoiding mosquito bites.

Two patients reported that they had slept under bednets. One of these, born in Sierra Leone and an infrequent traveller to Africa, did so on his recent trip to Nigeria. The other used them in one location in which he stayed, but not the other.

Questions about the use of bednets were met by the majority of VFRs and patients with amusement. On occasion it was necessary to repeat the word, as if it were not understood. In other instances, respondents referred to window nets in their reply, and it was necessary to specify bednets. Indeed, whilst there was a concern that respondents might provide answers they thought were expected of them for some topics, no such concerns arose when the use of bednets was discussed. More than with any other topic, it felt as if respondents were describing customs in a different culture when explaining why they would not use a net. Few travellers seemed to consider this to be an acceptable form of prevention against mosquito bites, and none expressed embarrassment in asserting that they would not use them, irrespective of their attitudes towards the seriousness of malaria. For example, one VFR respondent, a specialist nurse by profession who was very concerned to avoid contracting malaria when visiting Nigeria, and who up-dated her knowledge about chemoprophylaxis regularly, cheerfully asserted "That's my excuse" when explaining that the facilities were not in place where she was staying in Nigeria for setting up a bednet, as if no one could seriously expect her to use one.

As well as the practical difficulties in setting up a net, several other reasons for choosing not to use them were described by both VFRs and patients. A few references were made to perceptions of a physical strength to withstand any malaria infection without the need for nets, and to a greater reliance on chemoprophylaxis for prevention. More commonly, VFRs and patients described their experiences of using nets when living as children in Nigeria or Ghana. These memories were of them exacerbating the heat and closeness of an already uncomfortable atmosphere. Their use was discussed as an event connected with times long since passed. It was described by some VFRs that more modern ways of managing the risk of mosquito bites had now become available,

in particular the use of air conditioning and extensive netting around doors and windows. Even where they were available in host's homes, one respondent felt that they may have been set up for aesthetic rather than practical reasons, emphasising their perceived insignificance as a practical preventative tool.

The social norm in Nigeria and Ghana as described by the majority of VFRs and patients in fact was that bednets are only used for children. For example, the conversation with VFR20 was as follows:

> ***And did you ever sleep under a bed net? Actually sleep under a bed net?***
> *No, I hate them (laughs). I think it's for babies. I really don't like them. And it's really not comfortable.*
> ***Is it stuffy?***
> *Um, it's been a long time since I tried one, so I can't say. I think it's, I really can't say. It's a long time since I used one*
> ***Everyone smiles when I talk about sleeping under a bednet.***
> *I think nobody likes it. Most people don't like it.*
> ***So you said you think it's a thing for kids?***
> *Yeah, I think it does, 'cos you're not so free underneath it. I think it does*
> ***Did you sleep under a bed net when you were a kid yourself?***
> *I should have, 'cos that was the best way then. That was the best. I think I did, yes (VFR20)*

One patient felt that using bednets would be viewed by his family in Nigeria as being an overly cautious practice for protection against malaria, which in Nigeria he explained, was considered as no more serious than a headache. Another patient felt that that whether friends and relatives were supportive of VFRs' efforts to protect themselves against mosquito bites was dependent on circumstances related to levels of education at an individual level, their own experiences of travelling abroad, and their economic circumstances:

> ***Did you feel comfortable using a bed net and spray over there, or was that a common thing amongst the people that you were staying with? I mean, did you get a feeling that they might think you were over-reacting, or was that not a problem for you?***
> *No, no, no. In fact, that is very, that again comes to education. People yes, or no, that's the truth. Because the reason why, if you go there, if you stay with the people who are well off in the city, who have travelled, they probably push you towards that, they'd say "you've gotta be careful", 'cos they know, but if you go to a village situation they think you're over-reacting. They say it's a lot of fuss, what's it all about? Because you are just putting a lot of problems on their finances, you know. Unless you buy a net, but if you demand certain things, that's why I said it's a two way answer* (VFR1).

Confirmation of the customary use of bednets as being restricted to children only was given by the Nigerian-born hospital consultant, who also explained that the use of bednets for VFRs would differ for individual families:

> ***A lot of people I have spoken to so far have said it's almost as if the nets are for kids, and not for them, and that's what happened when they were growing up***
> *Yes, yes, that sounds about right. Um, but actually that's for people who locally want to reduce the frequency of malaria in the... their children. They tend to see that as a useful way. For travellers, um, the practicalities of it just makes it difficult for the people who are going there, if they are going to a family where the children always have nets anyway. That makes it easy.*
> ***So, it all depends pretty much on the individual circumstances?***
> *Yeah, and those people who are so clued into this would almost always have the right prophylactic as well, and also use it compliantly, so, again, you know, it works when people are absolutely clued-in, and engaged with the whole issues and principles around it. Um, it falls down completely when the individuals, either themselves or the people they are visiting, don't really mind about this* (SC1)

This respondent also felt that the use of nets by VFRs might serve to somehow distance them from hosts and make them not part of the family.

Both practice nurses and community pharmacists confirmed that Nigerian and Ghanaian patients rarely initiated a pre-travel discussion about bednets. The infrequency with which customers asked about this method of protection made it stand out in the memory of those two who did recall this.

7.6 Beliefs about the seriousness of malaria

Whilst detailed knowledge about the local environment and planned measures to prevent mosquito bites were voiced by many VFRs and patients as reasons why the risk to them personally of being bitten by a mosquito were low, beliefs about the likelihood of being infected with malaria and the potential seriousness of the consequences were also important with respect to perceptions of personal risk. There were various factors which influenced these beliefs.

7.6.1 Personal susceptibility

The first of these was connected to ideas of being personally susceptible to malaria. For example, two of the participants stated that they contracted malaria as children whilst their siblings did not, even though they shared the same sleeping space; a third decided to take particular measures to avoid being bitten, as he felt he had sensitive skin. None

of the others referred to a personal susceptibility to malaria. One for example described malaria as "not being my disease" whilst two young men referred to their current good health and physical strength to explain how they would be able to tackle any malaria infection, albeit with the use of malaria drugs. One VFR had sickle cell trait and recognised that it offered him some protection against malaria. Although no other VFR or patient had sickle-cell trait or disease, the former was known to be protective against malaria by another two who mentioned it. None discussed G6PD.

None of the practice nurses stated that VFRs felt they were particularly susceptible to mosquito bites or to malaria, and two contrasted VFRs to some Caucasian patients who would describe during the course of pre-travel health consultations that they were often bitten by insects whilst on holiday.

All but two nurses stated that patients seeking pre-travel health advice rarely mentioned sickle cell anaemia in the course of consultations. One said that a patient had mentioned that her sickle-cell trait afforded her protection but the nurse did not understand why this might be so. However, PN10, the only practice nurse of African origin, said that patients did talk to her about their susceptibility with respect to either sickle cell trait or disease. None said that G6PD had been raised as an issue by VFRs in pre-travel health consultations.

7.6.2 Previous experiences of malaria

Another factor which influenced perceptions of the seriousness of malaria was previous experiences of this disease. Only one VFR had spent all her life in the UK. She, another VFR and one patient said they had never had malaria. A third VFR and one patient could not remember whether or not they had had it. The one patient who said he had not suffered from malaria previously attributed to this to being regularly dosed with quinine as a child. Apart from these respondents who did not believe they had previously had malaria, or who could not remember if they had had it, one other VFR recalled only having malaria when visiting Nigeria or Ghana on holiday whilst resident in the UK. Conversely, another only remembered episodes experienced whilst visiting the UK on holiday whilst resident in Nigeria.

Those VFRs and patient respondents who reported that they had had malaria were able to describe the symptoms that they first experienced during their childhood. These were depicted as feeling cold, vomiting, having a loss of appetite, weakness, dizziness, and headache. Several referred to discoloration of the eyes as being a symptom of the disease. On the other hand, other VFRs and patients could only remember symptoms, and at the time of the interview, stated that they assumed them to be malaria. Interestingly, six explained that they first had malaria after the age of ten and in their teenage years, although they were all born in either Nigeria or Ghana. The symptoms they described were no less mild than others, if these symptoms were indeed caused by this disease. Indeed, it is likely that some illnesses described had other aetiologies. Few could remember whether or not infections acquired in childhood and presumed to be malaria had been parasitiologically-confirmed.

Only one VFR explicitly stated that she took chemoprophylaxis on each trip as a result of her childhood experience of malaria. For the remaining seven VFRs who always used chemoprophylaxis, more recent, rather than childhood experiences, appear to have had a noticeable impact on the decision to take chemoprophylaxis. These included an awareness of family and friends in Nigeria and Ghana who suffered from malaria, and of friends who had developed what was described as a serious, frightening illness diagnosed as being caused by this illness on return to the UK.

Three of the VFRs said they did not purchase chemoprophylaxis in the UK when they travelled. Two others who were travelling for the first time since emigrating to the UK also did not intend to take it. Of these five, two explicitly described malaria as not being an illness that had affected them seriously in the past. However, one of these two described nearly aborting a baby from what could have been caused by malaria, but was explained by her as being an adverse reaction to chloroquine. The other, who was medically qualified, described his symptoms as follows:

> *yeah I mean, for me I've had mild malaria, which is basically vomiting, headaches, fever, but once I'd did have, like, lose consciousness, like faint, yeah, when I was at university, but uhh I'm kind of very aware of it. I see it all the time, I've worked in health care and that kind of... a very common condition and, but I know it's treatable as well*
> ***Yeah***
> *so I've kind of treated myself a few times, except for one time, yeah even when I did lose conscious one year it was just very few minutes, I think I had a drip*

Right
In my own bedroom, you know, I could fix my own drip (VFR1)

Thus, this participant's attitude about the consequences of acquiring malaria was influenced in part by his confidence in managing previous infections. The perceived ease with which malaria can be treated was voiced by other VFRs who were not planning to take pre-travel advice, and this was described by them as one of the most important justifications for why malaria was not considered a serious disease.

For patients, their personal recent experience made them particularly aware of the seriousness of malaria, and two of these who were planning to travel again in the near future asserted their intention to seek pre-travel advice and to recommend its use to their friends in the UK.

Three of the six reported that they had been treated for malaria previously when travelling as a VFR. For two of these, these episodes had occurred approximately 20 years previously, and it may be that the more recent episodes they had experienced refreshed their memories with respect to the previous illnesses they had experienced. They described extremely unpleasant symptoms, with one describing the experience as "intense". Nonetheless he also said that he had not been prepared for the severity of symptoms he experienced leading to his most recent admission to hospital. The second patient believed that he had had malaria previously when travelling as a VFR in 1990, but this was unlikely as he thought it had been acquired in Japan. His explanation concerning how the diagnosis was made was unclear, and is possible that he acquired malaria upon returning to Nigeria, or that he had some other disease. Whatever the real cause, he also connected this perceived malaria episode with severe symptoms. The third patient had more recent experiences of malaria, the most recent being in 2008. He reported that he had had malaria four times when travelling as a VFR and described the very unpleasant symptoms he had experienced on each occasion. His daughter had also been diagnosed with malaria when in Nigeria on a previous trip visiting friends and relatives. Thus, for these patients, it appears that the severity of previous infections, albeit several years ago for two of them, were not sufficient to ensure that chemoprophylaxis was not taken on subsequent trips.

Several community pharmacists and practice nurses considered that the impact of more recent experiences of malaria served to reinforce the perception of it being a serious illness in their patients or customers who sought pre-travel advice. These were either episodes of malaria they had witnessed in others, or were personal experiences. Some community pharmacists believed that a greater awareness of the potential seriousness of malaria amongst their Nigerian and Ghanaian customers could also be the result of a health promotion campaign about malaria run by the local PCT, which included the use of posters placed in community pharmacy windows, stressing the risk of malaria from just one mosquito bite.

GPs differed in their views about whether VFRs believed malaria to be a serious disease. They drew on their experiences of interactions with VFRs who attended for treatment, rather than prevention, to answer the question. The fact that VFRs presented with malaria type symptoms and wanted to have tests taken to determine if they were infected was given as evidence by some that VFRs took malaria seriously. However, two others described their VFR patients as being casual in their approach when they came for medical advice. Two reasons were thought by GPs to be pertinent to the perceptions of VFRs about malaria. One of these was that some of their Nigerian and Ghanaian patients saw it as inevitable that they would become infected. The other was that previous experience of malaria-free trips made them consider it as not something likely to happen to them, and that if it did, they could get treated.

Two of the three consultants believed that one reason why malaria was not seen as a serious disease in the Nigerian and Ghanaian communities was the ease with which previous malaria infections had been treated. One referred to the success of health promotion campaigns run locally (the same campaign referred to by community pharmacists), in beginning to make VFRs aware of the potential seriousness of this disease.

7.6.3 Potential consequences of malaria infections

To examine in more detail beliefs about the seriousness of malaria, as indicated in section 4.9.4, a question was added after 13 interviews, enquiring if VFRs believed they themselves, or other VFRs could die from malaria. The results from seven interviews indicated a theoretical understanding that malaria could be fatal from all apart from one

of those asked this question. However, all believed that such an outcome was unlikely, and connected to specific factors, or the result of not accessing treatment promptly. These are illustrated in the following two extracts.

> ***Do you think that VFRs could die from malaria or do you think they would just become ill?***
> *Um, I thought they would just become ill. I thought they would just become ill. But I do know that cases have died from, um, from that, but then it could be that there are other confounding factors, they had the malaria and then something else, and they developed other things. I, I thought, but it also depends on where you go. Um, I do know that some people travel from here to very very, um very very remote areas of the country, and that's where their family is, that's where they go, and it also depends on what you get involved in, and so yeah, it's possible, it is possible, but um, I wouldn't' say probable* (VFR14)

> ***Do you think that you could die from it?***
> *No (laughs). No way*
> ***Not at all?***
> *No way not at all*
> ***Why***
> *I always take precautions, and once I realise the drug is not working I dash down to the hospital* (VFR20)

VFR14, cited above, also explained that her attitude about the potential serious outcome of malaria changed as a result of knowledge gained in her career:

> *so I never thought that it was a very serious disease until, um, I travelled out and, then yeah, got into the medical profession and read about it, and realised that it can be very serious, but then...I mean, when I was in Ghana, I never thought of it as a serious disease at all. (VFR14)*

In contrast, another VFR was unwilling to accept information acquired through the British media that differed from his personal experience:

> *I mean I hear people talk about, um, "he's down with a bit of malaria" so, at home, it's almost like we talk about the common cold here. You know, sometimes I hear it being talked about as a killer disease in the press, and I guess, there are people it kills, but I have never personally known anyone who has been killed by malaria.* (VFR16)

Three VFRs were planning to take chemoprophylaxis because they did not want to return home with malaria symptoms, and one said this was particularly because the consequence of this would be that she would have to take time off work immediately upon her return to the UK.

7.6.4 Immunity

Another theme relating to perceptions of the seriousness of malaria involved beliefs about immunity. For some VFRs and patients, perceptions about immunity were linked to the concept of becoming a "stranger" after time spent away from Nigeria or Ghana. However, regular travel to these countries (maintaining familiarity) was seen as a reason for not needing chemoprophylaxis. These perceptions are illustrated in the following two extracts from VFR respondents. One (VFR7) who had lived in the UK for 19 years, the other (VFR8) who had been resident in that country for 25 years:

> *If you've been here for a while, you know,*
> *there's no point of taking that risk, yeah, you go and see your doctor*
> ***Why would it be important if you'd been here for a while?***
> *Because, you know, you're living in a different, in a different, how do I put it, a different environment, yeah, so it's like, you are a stranger there, as I can say because I've spent, what do you call it, my teenage years here, you know, so when you go there, it's like you don't live there any more so, everything is...sometimes there is some certain food, I eat that , I get belly ache. When I was there, it wasn't like that, yeah, so everything has changed, so you have to, you know, take good care of yourself* (VFR7)

> ***In terms of the health concerns that you got, you mentioned, you know, food, water, insect bites, are there any of those that would be a priority or are they pretty much similar in terms of priority?***
> *I don't know, because I travel regularly now, so I always feel I'm one of them. So I mean, people talk about umm defences, about, what's the word I'm trying to look for? People talk about the defences of the body, so I, when you go regularly you're part of it. Perhaps, when I first started going, about once every four years, I used to take a lot of concern with umm, you know insect bites, you know, making sure I've got my malaria tablets, or doxycycline, but these days because I go regularly now, so it's like I've got my, I've always, you know, been used, I've built up umm, built up my own defence in my body* (VFR8)

Only one of the patients referred to his regular travel to explain why he did not take chemoprophylaxis. He explained that the reason he acquired malaria on the most recent trip was because he had become unusually fatigued, making him less able to withstand the infection.

Several practice nurses described how some VFRs justified their decision not to take chemoprophylaxis by pointing out their African heritage. Other VFRs, they observed, focused specifically on the fact that they had been brought up in Nigeria or Ghana and had survived to adulthood without dying of malaria.

One hospital consultant summed up the attitude he believed was typical of many VFRs as follows when asked if patients believed they were immune to malaria:

> *They don't understand it as that concept. They just understand that, their understanding is, when I was out there, I had loads of episodes of this. It never came to anything, I picked up a couple of tablets and it got better in two or three days. That's the worst it can be.*
> ***So, it's not a question of "well, I'm now immune to it?***
> *No. It's just a question of, "well, I've survived it. It doesn't threaten me in any way, so..."*(SC1)

Another hospital consultant, who specialised in paediatric care, surmised that some parents believe that their own immunity is passed to their children to explain why children may not be given anti-malarials before travel. Other healthcare professionals however, felt that the majority of parents would prioritise malaria chemoprophylaxis for their children.

Several of the community pharmacists also believed that VFRs felt they were immune. However, it was emphasised by two that this was based on an assumption on their part, rather than being based on actual conversations with customers. One pharmacist, herself of Ghanaian descent, who appeared to interact closely with the local Ghanaian community, perceived that VFRs believed they would not suffer serious symptoms because of the regular travel they made to Ghana, thus echoing the views of VFR8 and SC1.

7.6.5 Peer pressure

Many VFRs felt that their family and friends who lived in Nigeria or Ghana perceived malaria as to be a much less serious disease than they themselves did. This was because they were used to what they perceived to be easily treated episodes of mild illness.

Some VFRs stated that their host family accepted the need for, and encouraged them to take anti-malarials, and indeed one who did not intend to take chemoprophylaxis said she was reminded by her family in Nigeria to do so. Others stated that the perception of malaria being a mild disease amongst their host family could result in some tension during their visit, for instance:

> ***Do you think that family and friends in Africa would have different attitudes (about the seriousness of malaria)?***
> *Yeah, they do*

In what sort of way?
It's like, you're living in there, it's like not any new to you or something like that, but when we from here go there, they say that we're doing things extreme, you know, we're being so protective and all that, yeah, but them, it's a normal thing to them, because...
Do you find it awkward when they think you are over the top?
I do. I always argue with my mum you know, (laughter)
So, she says you don't need to bother with it all?
Sometimes "you were born here, so stop being like that, you know" (VFR7)

Another explained that although criticism would not be made directly, it was assumed that it might happen:

Would you think your friends and relatives in Nigeria would be surprised if you started, showed that you were concerned about malaria and overtly started taking chemoprophylaxis?
Yeah, I think some people would. I mean, my parents probably wouldn't, obviously, they want the best for me, but there would be a bit of sniggering in the background, surely.
Not from your parents, or maybe from your parents?
Maybe from them, but in the bedroom, away from me.
Right
Everyone would probably snigger.
Why do you think they would snigger?
Oh, just because they think, you know, we live here, we're not dead from this stuff, so what makes you think that just because you've lived away from us for a few years you've suddenly become so susceptible that and even if you did have malaria, what's the worst that can happen other than a few days in bed? (VFR16)

VFR12, one of the youngest VFRs to be interviewed was encouraged to take chemoprophylaxis by her mother. However, she described how peer pressure could be a deterrent to using chemoprophylaxis, not only in Ghana, but also from friends in the UK:

What about friends in Ghana, would they think you were weird if you took chemoprophylaxis, drugs, or would they?
Not weird, but, yeah, it sets you apart from the rest, 'cos, "you're still Ghanaian, why do you need to?". There is that. There is. Even amongst fellow Africans here, I have some friends from Zimbabwe, and I told one of them that I was, that I needed to get anti-malarials. He gave me the dirtiest look, like why do you need anti-malarials? And they never take them, and they've been there for just as long
Does that...is there any sort of peer pressure?
(laughs) no,no, no. you have to in the end don't you. You have to do what you have to do
I don't mean peer pressure as in being teased
I know what you mean. To an extent, because there's one that I haven't told I take anti-malarials, because I know he's just gonna have a go, but some I don't mind

telling, 'cos...If I had my own way I probably wouldn't bother, to be honest, and I would probably take the treatment, if anything
What, a treatment if something happened?
Yeah
It's a weird question, but would it make you feel less Ghanaian, if you started taking anti-malarials and doing all these things?
It doesn't make me, but I can see how that would
Do you think that would be important or not, or just be sort of, I mean, do you think that would be an important determinant of people's behaviour, or not really?
Not really, because it really depends, there's some people who really enjoy, I mean, not feeling Ghanaian, so they would probably love to show off their anti-malarials, and some people would hide them, but I think that's very individual
Would you explicitly think that you don't want to show anti-malarials or...
(Laughs). I don't make an effort to hide them, but I don't broadcast it either
And do you think that would be the same for other people, or...
It really depends, 'cos for the people, 'cos for the Ghanaians born here it's not an issue, they'll show it, they'll say I have a travel clinic appointment, blah, blah, blah, but for, let's say, Ghanaian students my age on holiday who end up staying for a year or so, umm, they probably would, umm, take the mickey a bit
Do you think it's an age thing as well?
No. 'Cos my dad makes fun of me as well
(laughs) Does he? For doing it?
Yeah
So what does he say?
You're losing your Ghanaianess. He always says that
So it's just something to tease his daughter about?
Exactly (VFR12)

This respondent was keen to point out that peer pressure did not prevent her from taking anti-malarials, and also explained that she did not like taking tablets of any sort, which also influenced her decision making. However, these three extracts describe one aspect of the context within which decisions are made about taking anti-malarials by some VFRs.

For no patient had peer pressure from friends and relatives in Nigeria or Ghana or in the UK acted as a deterrent to them purchasing chemoprophylaxis, and it was not mentioned by any other group of respondents as being a significant issue.

7.7 Chemoprophylaxis

7.7.1 Choice of chemoprophylaxis

Except for one VFR who worked as a nurse, none of the VFR participants appeared to be conversant with the various chemoprophylaxis options available to them. Instead, it appeared they would rely on the advice of the practice nurse with respect to which drugs to take, although one participant reported that she returned to her GP to change her prescription from AP to mefloquine because she preferred to take a weekly regimen.

Five VFRs associated chloroquine with intense itching when used previously for treatment. This was the most common reason for the decision not to take chloroquine for any purpose. Only one VFR appeared to be aware of chloroquine resistance.

For their part, practice nurses identified a range of issues that might influence the preference for one chemoprophylactic drug compared to another. They reported that some VFRs with children preferred mefloquine, as it only had to be taken weekly, whilst other adult VFRs asked to be prescribed alternatives to this drug because of the side effects they had personally experienced on previous visits. Nurses reported that other patients preferred AP because it could be started a few days before travel and only taken for one week upon return. Many VFRs were said by nurses to request the drugs they had been issued on previous visits, suggesting that once they found a regimen that suited them, they were keen to use it again.

Other factors affecting the choice of chemoprophylactic drugs were also cited by the practice nurses. For example, one explained that patients who were pregnant, or were hoping to conceive while in Nigeria or Ghana, were mindful of any interaction between the drugs they might take and the unborn baby. Although the nurses said that they counselled these VFRs that it was safe to take mefloquine in the first and second trimester, some decided not to, or chose chloroquine-based drugs instead. Two practice nurses stated that younger Nigerian and Ghanaian patients were more likely to have researched the options for chemoprophylaxis on the internet and to be aware of appropriate drugs, compared to their older counterparts, who were more content to be guided by the nurse.

GPs were not asked about patients' choice of chemoprophylaxis, since, as explained in section 4.9.4, giving pre-travel health advice including recommendations about chemoprophylaxis was predominately the role of the practice nurse.

None of the three hospital consultants felt that an awareness of parasite resistance to chloroquine would be a reason why patients might not take it. As was found with some VFRs, one of the consultants perceived that the association of intense itching experienced with taking chloroquine on previous occasions was a sufficient disincentive to prevent consumption of this drug.

Community pharmacists explained that their priority was in dispensing the drug that had been prescribed, so their experience of travellers' choices of chemoprophylaxis was limited. One made the comment that some VFRs needed to be reassured that the chemoprophylaxis they had been prescribed would be effective.

There was no consistent response given by community pharmacists about how many and why VFRs might seek to purchase chloroquine. Three of the seven respondents were rarely asked for this drug. The others reported that they were asked more regularly. The community pharmacist of Ghanaian ethnicity, who had worked in two different areas of London which operated different policies relating to the cost of malaria chemoprophylaxis, believed that in non LSL-areas, the cost of prescription-only drugs was the main reason why VFRs would seek to purchase chloroquine. None of the other community pharmacists mentioned this issue. The majority believed that their customers would be guided by their health advisor about what constituted the most appropriate chemoprophylaxis for them.

7.7.2 Cost of malaria chemoprophylaxis

The cost of chemoprophylaxis in the UK was a topic of discussion that, unlike many others, was initiated by some respondents rather than by me, particularly amongst those who considered cost to be a deterrent to its use. It was spoken about at times with some passion, highlighting the importance attributed to it by some respondents as a factor influencing all aspects of malaria prevention.

Of the eight VFRs who always took chemoprophylaxis, four considered the price of the tablets personally difficult to afford. One (VFR5) was a healthcare assistant, VFR7 was a cleaner, VFR17 was a hairdresser and part time student, and VFR19 was a housewife and also a part-time student. Three lived in areas of London where malaria chemoprophylaxis was not subsidised. Another also lived in one of these areas, but her GP would only subsidise the cost of chemoprophylaxis for her children. These participants had what appeared to be the least well-paid jobs among the VFR respondents. Three of the four were travelling with other members of their family, and the cost of chemoprophylaxis appeared to be a particular problem particularly when families were travelling together, as described by VFR19, who was travelling for five weeks with her children

> ***Was that a problem for you?***
> *It was, because you're not expecting to buy that much, and after you've paid for your tickets, and buying for £400, it's ridiculous, I mean, it's ridiculous, it is*
> ***Did you manage to do it?***
> *Well, I have to, because I wanted the children to come in, I mean healthy after their holidays, and I wouldn't like any problem, but it's not something I can, most people can't afford to do it, especially if they've got three or four children. And if they look at this, buying this medication, they will take the risk of going*
> ***Without it?***
> *Without it.* (VFR19)

A fifth VFR who always used chemoprophylaxis (VFR11) had no problems affording the price of the unsubsidised chemoprophylaxis on her next planned trip as she was travelling alone, but described it as having been difficult to afford when she had previously travelled with her daughter and grandchildren. A sixth VFR (VFR15) explained that the cost was not excessive for her personally, as she lived in an area where it was available for the cost of an NHS prescription, but described it as "prohibitively expensive" for her sister and her family who was travelling with her and lived in an area where it was not subsidised.

The other two VFRs (VFR9 and VFR14), who regularly took chemoprophylaxis did not find it prohibitively expensive. One of these had not previously purchased it in the UK, but said he would purchase it irrespective of the cost as he was keen to protect his health. Both lived in areas where malaria chemoprophylaxis was only available on unsubsidised prescription. Both were travelling alone however, and one, (VFR9), was

an events organiser, whilst the other (VFR14) was a nurse, suggesting that they perhaps had more disposable income than some other participants.

Two of the three VFRs who planned to use chemoprophylaxis on the most recent trip, but had only used it intermittently in the past considered that the cost was not good value for money. One of these, VFR 12, explained that her mother was paying for the chemoprophylaxis, as she was anxious for her daughter to protect herself against malaria, but the respondent considered the cost of chemoprophylaxis when purchased in the UK to be excessive:

> *Last time I went I got given a prescription, and I can't remember if it was for Mefloquine or the other one, but I remember I went to get it from Boots, and the person said "Oh, your GP must really love you to give you a prescription". I think it was a subsidised prescription because it came up to about £15*
> ***So you went to Boots, and they said that your GP, or someone, must love you for giving it on prescription?***
> *Yeah, umm, and so I got the same one, I say, I can't remember which of the two it was, but when I went back, it hadn't been subsidised, or it was a lot more expensive, so the person said I would have to pay, I think £3 something per, per tablet, and it would come up to about £150 or something like that. So, I said, there's no way I'm paying that much for anti-malarial pills, so I went to get it changed, and then I got the weekly ones, which was fine because I don't like taking medicine that often anyway* (VFR12)

The other, who had sickle cell-trait, explained his viewpoint as follows:

> ***Is the cost of chemoprophylaxis a problem for you, personally?***
> *I would rather not spend that amount of money, but say, in the greater scheme of things, you know*
> ***If you were travelling by yourself...?***
> *I certainly wouldn't get it*
> ***Would cost be an implication?***
> *Yes, if I was travelling by myself, it would be a combination of cost and the fact that, look, I know what to do to protect myself, and I tend not to have malaria often anyway* (VFR16)

He also made the point that malaria chemoprophylaxis was not the only health-related expense that may be incurred for one visit, as other vaccinations may also need to be paid for, making the costs necessary for one trip excessive.

One consequence of the prohibitive cost, as asserted by one participant, was that VFRs would not take it, but instead use the option of buying cheaper drugs upon arrival in a malarious country:

> ***Do you think it would put people off or not?***
> *A lot of people, it would put them off, they wouldn't be bothered to get it, yeah, I know for sure*
> ***Do you?***
> *Some people they'd rather go home and take, buy it from there because they'd get it cheaper*
> ***Do they? Would they take it as chemoprophylaxis when they get over there, or just wait until they get symptoms, or if they get symptoms?***
> *Some, as soon as they get there they just start taking it cos it's cheaper,*
> ***So do you think that's quite a big issue for people, do you reckon?***
> *It is* (VFR5)

Of the three VFR respondents who never used chemoprophylaxis, none considered cost to be a deterrent. Two of these were in what appeared to be relatively well-paid jobs, one a senior nurse, and one a Government employee. The cost of chemoprophylactic drugs was not an issue raised by the two first-time travellers, nor for the VFR (VFR3) who intended to purchase it, but did not have enough time to visit the travel health clinic. None of the three who were lost to follow up indicated in the first interview that the cost of the tablets was an issue for them.

None of the six patients who had acquired malaria (four who lived in areas where it was subsidised and two who did not) reported that cost had been a deterrent to its use. One patient explained that although he had purchased it for the price of an NHS prescription on a previous occasion, he did not realise that it was subsidised for all residents, but rather thought he was offered cheaper chemoprophylaxis because of his age.

The majority of doctors and nurses working in LSL areas were broadly supportive of the policy of prescribing malaria chemoprophylaxis on an NHS prescription, although some GPs would avoid prescribing AP in particular because of the cost to the NHS. Some nurses working outside LSL stated that patients queried why they were expected to pay for the full cost, when subsidised chemoprophylaxis was available in a neighbouring PCT (an LSL area). The difference between the policy in LSL and that in other PCTs was described by nurses and some GPs as being confusing, and calls for a consistent approach across London were made, both for the malaria chemoprophylaxis policy and other pre-travel prophylaxis.

The nurses working in areas outside LSL recognised that the cost of drugs could be a deterrent to VFRs seeking pre-travel advice and starting chemoprophylaxis before travel. One for example, estimated that about 50% of her patients who were African male VFRs would not take chemoprophylaxis because of the cost. This was not always linked to the perception that chemoprophylaxis was prohibitively expensive, but also to the knowledge that other options were available:

> *I, I think there's still this thing about, oh well my family will have something, and it's cheaper over there and I'll get it from them, and when you explain, well, it might not be the right stuff, you know, it's chloroquine based, it's "Oh well it's worked before, so why shouldn't it work now"? And why do I want to give you, you know, or give the NHS fifty quid, or whatever?* (PN3)

For those community pharmacists who worked in LSL, the cost of chemoprophylaxis was only mentioned by their customers as being very expensive when the prescription was issued on a prescription for which they had to pay the full unsubsidised cost. This was either because the customer was not resident in LSL, or they were, but their GP had not written a subsidised prescription. However, community pharmacists felt that the majority of GPs adhered to the policy within the area in which they worked. One however worked in LSL, where a few GPs within a practice would issue unsubsidised chemoprophylaxis and another was in an area where, although unsubsidised prescriptions should be issued, he believed that the personal relationship between GP and patient would determine how it was prescribed. Another community pharmacist described how some GPs working in an area where the subsidisation policy was not in place, they might ignore the policy with respect to children and issue them subsidised chemoprophylaxis.

Of those community pharmacists who worked in non-LSL areas of London, there was no consistent viewpoint about how the cost of chemoprophylaxis might affect decision making about its purchase amongst VFRs. This can be seen from the two following extracts, one from a community pharmacist who had just moved to an area within LSL, but had previously worked outside this area, and another who currently worked in Newham, an area where subsidised chemoprophylaxis was not available:

> ***So you do get Nigerians and Ghanaians coming in for health advice before they travel? Is this without going to their GP, but just sort of turning up at the chemist?***

Some just turn up, because some of them won't, with the, in this area it's not that bad because you get the tablets on prescription, so, it's not that expensive to buy, and most of them are on income support so they do what they do. But those like, you have to pay for it on private, that is a lot of money, and most people try not to, to avoid that, they'll come in and ask for is there anything, like chloroquine which we don't, they don't recommend any more. And most people, to avoid paying hundreds of pounds for those tablets they would rather take the chloroquine, or not take anything at all and then go and come back with malaria (laughs)
Do you think that, do you actually get people come in who haven't gone to the doctor's but just turn up and want to buy some sort of...?
Yes because some of them don't have any idea and some of them come and say, well, can we buy chloroquine, and you ask them what they want it for, and then they say they wanna take prophylaxis, we travel, and then you have to tell them that they cannot

(an interruption while she serves a customer)

So you say that you get people turning up, and they come for chloroquine and stuff?.
Yeah
Can you quantify that, say in a month, how many would you get?
Well, since I've been here, umm, not a lot, maybe about two came in, because they get, you know, the FP10, so you don't actually get a lot of them because most of them don't have to pay for it, but when I was working in Croydon, it has to be a private prescription, you have to pay £10 for the prescription, and then you have to pay for the tablets. Most people try to avoid, avoid paying for it, they would rather buy the chloroquine over-the-counter, and then most of them say, we'll leave it, wait till I get to Nigeria or Ghana , I'll buy some malaria tablets and take them but they forget most of the malaria tablets there are for treatment but not for prevention
That they want to buy?
Yeah, 'cos most of them buy it when they go (CP2)

Is cost a problem for people?
Yeah
Ok, how do you know?
Well, ok. Cost is a problem in the sense that, I think, not a problem, 'cos they pay for it, but I think they're shocked by how expensive it is, umm, although I have had this year some patients who've, who left me prescriptions, but when they found out the cost, they've never been to pick them back up again
Africans we're talking about?
Yeah, they never come to pick them back up, but yeah, that was one-off, other than that, I think they all realise it's expensive, umm, and then I explain to them, and say why isn't it prescribed, and I tell them it's NHS policy, look, if you can afford a plane ticket then, they expect you to be able to afford your own health care out there as well, so, and generally they're alright
They're ok about it?
Yeah, I don't' really get complaints as such, they might grumble a bit, but they'll pay for it (CP7)

Of the three hospital consultants interviewed, all three considered the cost of chemoprophylaxis to be a deterrent for some patients. One considered that for this reason, chloroquine may be used as an alternative by some, particularly when they were travelling for longer periods of time. Another, himself of African origin, felt that the intense itching that chloroquine can produce would be a sufficient deterrent for some. Extracts from all three interviews with hospital consultants are provided below:

The majority haven't taken any chemoprophylaxis.
And do they say why?
Um, a combination of reasons. Many who say "ah, I just can't be arsed", and a significant number who say it's too expensive. Some will say, "I just can't handle it. It's just too revolting, doxycycline, that makes me sick, and that makes me do that, and reasons of either past experience, or very initial experiences with chemoprophylaxis, and they just abandon it. So, it's a mixture, a mixture of reasons, but I think "can't be arsed" or "too expensive" they are the two common ones (SC1)

Do people ever mention the cost of chemoprophylaxis as being a reason why they haven't taken it?
Uh, yes I have, um, I mean some people, you know, would, particularly with some of the antimalarials that are appropriate, you know, Malarone for example, which I think is quite, quite costly. I mean if you take a family of, you know, three or four you know, and yourself taking a, if you're there for two months, um, you know, the cost is, is quite significant, and I think that's, most, and so most people do mention the reason why they haven't taken it is, is cost, and whether that's, whether that's the reason why they're selecting, you know, ineffective drugs, you know chloroquine, proguanil, because it's cheaper, and, and you can get it, maybe, and I'm not clear whether why that's the reason why people are going for, you know, cheaper options, because they think ok, this is going to cost us less if were going for x number of months (SC2)

And you think that the cost is a big problem?
Well, anything that, yeah, anything that stops you, I mean, if you did pay for it, it's bloody expensive
It is
So that, and if you...you know, no one's gonna pay that are they? It's 80, 100 quid or something like that for a course, so, you know. Forget about it.
But do the patients actually say, "Well, it was expensive?"
Yeah, people have said to me, yeah, there's cost involved
Many of them, or...?
Yeah. A few (SC3)

This respondent was not aware that malaria chemoprophylaxis could be purchased on an NHS prescription in the area in which he worked.

7.7.3 Strategies to manage the cost of chemoprophylaxis

None of the VFRs mentioned strategies that they would use to manage the cost of chemoprophylaxis.

Practice nurses described a range of strategies which were taken by their patients to make the cost more manageable. For example, practice nurses reported that on occasion, the purchase of chemoprophylaxis was prioritised by their VFR travellers to mothers and/or children only, with fathers deciding to buy drugs upon arrival in Nigeria or Ghana. This prioritisation within families was linked to perceptions of men as being physically stronger and so able to withstand malaria infections. Other strategies adopted included asking practice nurses for the names of the drugs recommended, with the aim of buying a cheaper version in Nigeria or Ghana or changing the initial prescription for a cheaper regimen, in particular from AP to mefloquine. Some might choose to purchase chloroquine.

Nurses expressed frustration that they had put much effort into educating themselves about chemoprophylaxis, only for it not to be purchased by some VFRs because of the cost. A few stated they had better job satisfaction working in more affluent areas where patients were more "compliant". Strategies they employed to persuade VFRs to take chemoprophylaxis included not telling travellers the likely cost of the prescription at the pre-travel interview but hoping that it would be purchased once the commitment to buy it had been made; encouraging patients to buy a few tablets in the UK to provide protection upon arrival in the malarious area, even if the rest was purchased abroad; issuing FP10s for children, but not for adults in non-subsidised areas, particularly if it was felt that the child would not otherwise be given anti-malarials; advising patients to compare prices in different pharmacies; reinforcing the risk of acquiring malaria whilst travelling to a malarious country.

One community pharmacist, like some practice nurses, would recommend to customers that they restrict their purchase of chemoprophylaxis in the UK to that needed during the first days of as stay in Nigeria or Ghana, and suggested that they then buy a cheaper alternative from a reputable pharmacy.

7.7.4 Adherence to chemoprophylaxis

Of the eight VFRs who always took chemoprophylaxis on the most recent trip, seven were still taking it at the time post-travel contact was made. However, one was experiencing symptoms which she attributed to side effects from the chemoprophylaxis, and at the time of the email correspondence carried out with me upon her return, was intending to visit her GP to get it changed.

VFR3, who had appeared to be committed to taking chemoprophylaxis before travel had described how the families of professional clients of his had travelled from Nigeria to the UK to be treated for malaria, to emphasise how he recognised malaria as being a serious disease. Despite this, on his return to the UK, he reported that he had not had enough time to visit the privately-funded travel clinic where he had intended to purchase his chemoprophylaxis a few days before travel. He had borrowed some from a friend who was travelling with him, and used this whilst abroad. He had intended to purchase chemoprophylaxis to finish the course upon return to the UK, but again, had not had time. He reported that on previous trips he had never finished a course of malaria chemoprophylaxis.

Those three who intended to use it on their most recent trip, but took it intermittently on previous trips reported that on this most recent visit, they had completed the course. One however said that on previous trips she had not done so consistently.

Many practice nurses felt certain that VFRs did not finish the course of chemoprophylaxis prescribed and some of their patients confirmed this to them during subsequent pre-travel health consultations. They reported that some admitted on attending for pre-travel health advice that they had some tablets left over from a previous trip, but others were reluctant to admit that they had not finished the course, even then they returned with malaria. Some practice nurses felt that adherence to mefloquine was particularly problematic, as when patients returned from their trip symptom-free, they felt no need to finish the course, which would still take several weeks to complete. One Ghanaian-born practice nurse considered the purchase and failure to adhere to the prescribed course as a ritual regularly undertaken by VFRs. Although pre-travel health advice was routinely sought, once relaxed and enjoying themselves on holiday, she described how they regularly neglected to finish it.

Only one hospital consultant mentioned lack of adherence to anti-malarials as being a reason why he thought VFRs might contract malaria, and, as mentioned by the practice nurse referred to above, felt that they might forget to take chemoprophylaxis when they were in a holiday mood.

7.8 Discussion

The data from the interviews with the VFRs and patients in this study suggest that their major health concerns when they went to visit friends or relatives in Nigeria or Ghana were associated with risks that they had commonly encountered on previous trips, for example gastro-intestinal problems or malaria, or risks that were perceived to be particularly hazardous with an unclear outcome, such as road traffic accidents and typhoid fever. Reports from the Health Protection Agency suggest that there is a high incidence of gastrointestinal illness amongst VFRs (Health Protection Agency, 2007a). Concerns about contracting gastrointestinal illnesses were also found in the study by Leonard and VanLandingham referred to in section 3.5.2 (Leonard and VanLandingham, 2001).

These data suggest that the participants were not only concerned about the risks that they perceived to be the most hazardous (as suggested by Slovic 2002) but also with the risks that they considered might most likely occur, and which were not life-threatening. Furthermore, few VFRs and one patient believed that they had not suffered from malaria before, and as such, malaria was a disease that had already been experienced and survived. That is, it was a risk, but one with known consequences. Many studies in endemic areas in Nigeria and Ghana have found that these perceptions of malaria are commonly found among local populations, that is, that malaria may be a serious illness among children but is generally perceived to be a mild febrile illness that, if not avoidable, is often treatable in the home (McCombie, 2002, Adongo et al., 2005)

Whilst the findings of Bazaz and colleagues (Bazaz et al., 2010) described in section 2.5.1 show that travel health information provided with airline tickets is not routine, this thesis suggests that for these participants at least, it was not a useful way of providing information. Few respondents read it, and those who did felt it was not applicable to them.

In common with other studies carried out among the African Diaspora (Leonard and VanLandingham, 2001, Pistone et al., 2007, Schilthuis et al., 2007), all VFRs and patients involved in this study knew that malaria was transmitted by the bite of a mosquito. They were also aware that when they made trips to visit friends and relatives in Nigeria and Ghana they were visiting a malaria endemic country putting them at risk from contracting the disease. This was also a finding from previous studies (Scolari et al., 2002, Pistone et al., 2007, Schilthuis et al., 2007). Furthermore, the health professionals and community pharmacists were all conscious of the fact that it was not a lack of knowledge of the likelihood of contracting malaria that put VFRs at risk and influenced their adoption of appropriate preventive behaviours.

VFRs and patients understood the differences in the risk of transmission between urban and rural areas of Nigeria and Ghana. They were also aware of how a lack of adequate vector breeding site management, even in urban areas, could increase their risk of being bitten. However, despite the fact that most mentioned that they took some form of action to avoid being bitten by mosquitoes, the perception was that this was inevitable. This was also a finding from the study carried out by Leonard and VanLandingham (Leonard and VanLandingham, 2001). Some of the older VFRs and patients appeared to be surprised by the breakdown in local environmental control measures witnessed on their most recent trip, suggesting that they were unaware of how local or national environmental health policies, or the priority given to their implementation within their country of birth, may change over time.

With respect to mosquito avoidance methods, most VFRs reported that they adopted the established methods used by their hosts, emphasising their wish to fit in with families' customs. None of the participants reported using 'traditional' methods such as the burning of herbs to avoid being bitten by mosquitoes, as described in three studies carried out in Nigeria and Ghana (Ahorlu et al., 1997, Agyepong and Manderson, 1999, Adedotun et al., 2010), but rather reported that they relied on more modern methods such as the use of an air conditioner, window screening, house spraying with insecticides and nightly spraying of individual rooms with an aerosol insecticide.

Some VFRs who had affirmed before travel that household sprays were routinely used by their families reported upon return that they were not. This discrepancy between intentions and actual behaviours with respect to mosquito avoidance methods was also noted in the study of French VFRs who were visiting friends and relatives (Pistone et al., 2007). In some cases, in the research carried out for this thesis, the reason given for not using sprays was simply because there were no mosquitoes. Without knowledge of local transmission rates, it is not possible to comment on this, but it is possible that the prevalence of mosquitoes is decreasing, as suggested by Behrens and colleagues (Behrens et al., 2008), and discussed in section 1.3. Other factors however, such as returning home late, were also given as a reason by one patient to explain why a room spray was not used, suggesting that intentions were not always easy to carry out.

Whilst the HPA malaria prevention guidelines recommend the use of bednets when window and door nets are not available (Health Protection Agency, 2007b), the negative attitude towards them by VFRs and patients was striking. One of the principal reasons given by VFRs and patients for not using bed nets was similar to one reason found to deter people in studies of bed net use carried out in Nigeria and Ghana, namely that they exacerbate the discomfort of an already hot and stuffy atmosphere (Agyepong and Manderson, 1999). In several instances, VFRs and patients drew on childhood memories of sleeping under bed nets and these experiences informed their current opinions. Furthermore, it was clear that many of the participants perceived that more convenient ways were now available to control the environment. These perceptions were reinforced by a desire to fit in with the local norms of their hosts, for whom bed nets were a necessity only for children who needed additional protection. This finding echoes those studies which found that children are often given priority because of their particular susceptibility to malaria (Agyepong and Manderson, 1999, Adedotun et al., 2010)

The findings about perceptions of the seriousness of malaria are in agreement with other studies among VFRs, and illustrate the many factors that contribute to decisions about the use of preventive behaviours (Leonard and VanLandingham, 2001, Morgan and Figueroa-Muñoz, 2005, Pistone et al., 2007, Schilthuis et al., 2007). However, the data from this thesis also suggest that peer pressure, the desire to 'fit in' with local norms,

and perceptions that the destinations to be visited are still 'home' may also play a role in the decision making of some VFRs.

The concept of belonging (remaining a 'Ghanaian" or 'Nigerian' despite being resident in the UK) also appeared to play a small, but perhaps important, role in decisions relating to chemoprophylaxis. That is, a few of the VFRs suggested that the need to take chemoprophylaxis marked them out as different to the friends and relatives that they would be visiting, and this might be a factor to be taken into account when deciding whether or not to initiate chemoprophylaxis.

In contrast to many other preventive measures (e.g., the use of house screening, house spraying, repellents) the use of chemoprophylaxis in endemic countries is rare. Perhaps not surprisingly, therefore, while knowledge of the value of physical protection against mosquitoes was common amongst VFRs there was much less awareness of options available for drugs, and VFRs relied for their information on the expertise of practice nurses.

In line with the findings from other studies (Leonard and VanLandingham, 2001, Schilthuis et al., 2007), the cost of chemoprophylaxis was cited as a deterrent to its use by some respondents in all groups. However, although some of the respondents were very vocal in the discussion of this topic, overall the data suggest that the cost of chemoprophylaxis was not a decisive factor for all in their decision making. On the other hand, for a few of the VFRs who were resident in non LSL areas, decisions around where to access drugs for chemoprophylaxis (either through the UK health sector, or in Nigeria or Ghana) do appear to have been influenced by the differences in cost of drugs between these countries.

The data presented in this chapter suggest that the majority of the participants in this study were well aware of the risks of contracting malaria and of most of the measures that could be used to prevent them from contracting the disease. it is also clear however from this small sample that there are a range of social, cultural, environmental, economic and structural factors that affect their ability and willingness to seek pre-travel health advice and adopt the preventive behaviours suggested including: the destination(s) to be visited; knowledge of malaria transmission; beliefs about the

seriousness of malaria; previous experience of preventive measures in the destination that they will be visiting; previous experiences of malaria; perceptions of their relationship to the people and places that they will be visiting; the cost of chemoprophylaxis. The following chapter provides a more detailed analysis of the factors that might contribute to the ability of VFRs to access chemoprophylaxis before travel.

Chapter eight: processes surrounding the seeking and provision of pre-travel health advice.

This chapter explores in more detail the process of seeking and providing pre-travel health advice. It describes the sources of information available to practice nurses and community pharmacists. The problems mentioned by GPs and practice nurses connected with the operation of a pre-travel health advice clinic are also discussed. The issues surrounding access to pre-travel health advice are described, and in particular the problems associated with travelling at short notice. The chapter finishes by describing some relevant information with respect to patient-nurse interactions in the travel health clinic.

8.1 Perceptions

8.1.1 Nurses' perceptions of VFRs who attend travel health clinics

Nurses reported that some of the VFRs attending pre-travel clinics were travelling for the first time while others had travelled previously. They described three types of Nigerian and Ghanaian travellers who sought pre-travel advice. The first group consisted of those who were travelling back to visit friends and relatives with their children during the summer, winter or Easter holidays. Trips were taken typically for two to six weeks, depending on the time available to them. Not all family members would necessarily travel together, and this was thought to be associated with the expenses involved. The second group consisted of those travelling for births, marriages, and funerals. These trips were often shorter. The third group consisted of those who might own accommodation in Nigeria or Ghana, who spent more time in these countries and travelled for up to three months or more at any one time.

Nurses reported that they rarely questioned VFRs in detail about the areas of a country they would be visiting on their next trip, but they believed that most VFRs were travelling to urban areas.

Women would typically be responsible for bringing children to the travel clinic; men would come alone. One possible reason was assumed to be because men had to fit in an appointment around their work schedule. Another was that childcare was traditionally the role of women.

8.1.2 Community pharmacists' perceptions of VFRs who used pharmacies for pre-travel health advice

Community pharmacists stated that some VFRs tried to use their services for the purchase of chemoprophylaxis. Whilst some respondents were not able to estimate how many VFRs did this, estimates made by others ranged from one customer each month to about 12 a month in the summer, when more people travel. Community pharmacists emphasised that they had limited time available to talk to their customers, and some of their understanding about the characteristics of VFRs was based on their assumptions.

They believed that most VFRs had travelled to Nigeria or Ghana previously, although some were first time travellers. The average duration of travel for VFRs as estimated by community pharmacists was between three and six weeks, although two felt that many would be travelling for between two and up to six months. Most VFRs were thought to be travelling to urban areas, but in a similar way to practice nurses, community pharmacists did not possess a detailed knowledge of the geography of these countries.

Four pharmacists thought that there was no difference in the number of men compared to women who used their services for pre-travel advice, whilst three felt that more men than women would do this. One felt this might reflect the desire of some men to follow the practice common in Nigeria or Ghana of using local pharmacies for the purchase of malaria drugs.

8.2 Sources of Information

8.2.1 Sources of information for travel health nurses

The nurses interviewed considered the most reliable source of information to be the website Travax (Health Protection Scotland, 2011) (see section 2.5.3). This was the most popular system used. The advantages of this system, as explained by practice nurses, were that it allowed them to show patients maps of the areas being visited, and point out the likelihood of acquiring malaria in these. Up-dates were continuously made by the website providers, which reassured practice nurses that they were receiving current advice. Using just one source of information was most convenient for the majority of the nurses interviewed. Another source of information mentioned was the HPA's malaria prevention guidelines (Health Protection Agency, 2007b).

Practice nurses explained that some travel scenarios presented to them were complicated, for example the correct regimen to offer pregnant women. In these cases, the expertise of GPs was sometimes called upon.

8.2.2 Sources of information and the role of community pharmacists

All community pharmacists reported that they used information provided by the National Pharmacy Association for information they might need regarding chemoprophylaxis. Other sources of information were MIMS, or the British National Formulary, both drug prescribing databases. The focus of their role was to ensure that the dosage of drugs prescribed was appropriate, for example that children had not been prescribed with an adult dose. As was the case for practice nurses, there were no problems for community pharmacists to get access to accurate up-to-date information. Although community pharmacists reported that GPs sometimes incorrectly prescribed chloroquine, the majority of prescriptions were suitable for the area being visited. One community pharmacist said that patients occasionally told him that they had been directed by the practice nurse to purchase chemoprophylaxis from him, despite the area being visited by the traveller requiring the use of prescription-only drugs.

8.3 Pre-travel Advice

8.3.1 Operation of travel health clinics

A range of three to eight weeks was suggested by practice nurses as being an appropriate time before travel that travellers should seek health advice.

Consultations with travellers typically lasted between 15 and 20 minutes although some practice nurses reported that they allocated double that if the patient was travelling for the first time. For families who came to the clinic together, separate consultations were carried out for each patient to ensure that advice was tailored to their needs. In some practices, the time allocated for consultations was set by the GP, and often judged by nurses as being inadequate, particularly when additional time was needed to persuade VFRs to take anti-malarials.

Practice nurses who gave pre-travel advice may have been keen to portray their practices in a wholly professional light. In addition, those GPs who recommended to me which nurse in their practice might be interviewed may have selected those whom they

judged were most experienced, personable, and able to highlight the professionalism in the practice. The information collected during the practice nurse interviews did suggest a high level of commitment to providing high quality pre-travel service. For example, in some practices where nurses were allowed flexibility in planning the services they operated, efforts were made to arrange clinics at times convenient for patients, including one practice which offered a service on one evening a week until 8pm. Others had set up systems where an initial telephone consultation was made with the patient, with a subsequent appointment arranged if necessary, thus saving themselves and patients time. Some were disappointed when GPs had changed clinics to times which practice nurses felt patients would find it more difficult to attend. On the other hand, travel health clinics were operating within GP practices that were described by GPs and practice nurses as being extremely pressured by their workload, not only with requests for pre-travel advice, but in all respects. As such, both GPs and practice nurses reported that some patients found it difficult to get an appointment at a time convenient to them. At the time of the interview, the travel health service had been suspended for the last six weeks in one practice to enable practice nurses to prioritise other work. This practice was in a deprived area of South London, but those seeking pre-travel advice were directed to privately-operated (ie non-NHS) travel clinics for which they would be obliged to pay for a consultation. In this practice the priority, as described by the GP interviewed, seemed to be on providing services which attracted payment through the QOF system (see section 2.5.1), if key performance indicators were met. Other practice nurses described how GPs were starting to consider the cost-effectiveness of offering travel services, as the provision of travel health advice was not included in these performance indicators.

8.3.2 Access to pre-travel health advice

Discussions about access to health care included both factors associated with GP registration, and the availability of appointments to obtain pre-travel health advice.

One VFR who did not plan to get pre-travel health advice based his decision partly on the fact that he was not registered with a GP, and found it difficult to find one who was accepting new patient registrations. He had stayed no longer than one year at the same address in the last eight years, and explained that as soon as he registered with a GP, he moved again. However, access to primary care was not the only factor in his decision

making about malaria protection, as he felt able to manage any symptoms of malaria should they occur.

All other VFRs and patients interviewed were registered with a GP.

Community pharmacists stated that difficulties with GP practices accepting new patient registrations were an uncommon reason for their Nigerian and Ghanaian customers to seek pre-travel health advice from them. One felt that where this might occur, it would be because they were keen to avoid contact with Government agencies.

With respect to the issue of seeking a timely pre-travel health appointment, few VFRs interviewed reported problems. However, this may have been uncomfortable for some to express in front of someone who may have been seen as representing the health service, if it were thought that any complaints might be relayed back to the GP.

However, two of the six patients interviewed did complain vociferously about their inability to obtain chemoprophylaxis before travelling. It was possible that they may have been keen to deflect any possible criticism surrounding their own personal responsibility with respect to protecting themselves against malaria before travel. Even so, for one of these two patients, his desire to share his frustration and annoyance, coupled with his wish to assert that malaria chemoprophylaxis should be available at short notice, were the reasons he agreed to be interviewed. The personal circumstances they describe are interesting as they illustrate the range of factors which influence decision making. The first patient, whilst describing himself as perhaps complacent, and acknowledging he had left it too late to book an appointment for pre-travel advice, had medical problems which had restricted his mobility for three weeks. This, together with the need to buy many presents for his host and family had prevented him accessing pre-travel advice until the day of his travel. As he described it, he had forgotten the most important thing, his own health. On attending the GP surgery he was directed to a privately-funded British Airways Travel Clinic, which was too far away for him to attend, and which he was disinclined to visit because he felt it unjust that the local free service was not available to him. Although he went to a local pharmacist who was a personal friend of his to try to buy AP, he was unable to do so because of its status as a prescription-only drug.

The second patient, who had decided with four days' notice to go to Nigeria to care for his sick mother, reported that although he obtained an appointment with his GP, he was unable to get any chemoprophylaxis. He did not explain clearly why this was so, but described that he was directed to visit a pharmacist instead. On attending the pharmacist, he found the queue to be too long and decided not to wait. His decision to travel without prophylaxis was also influenced by his opinion of himself as being a physically fit man able to withstand any illness he thought likely to afflict him.

Practice nurses stated that whilst many travellers, including VFRs, sought pre-travel advice in time for appropriate vaccinations and malaria chemoprophylaxis to be prescribed, some only attempted to do so a few days before travel. This last-minute attendance was frustrating for several of the practice nurses interviewed. However, very few reported that they asked patients why they left it so late, assuming that it was because the patients could not be bothered. Others however, acknowledged that some patients would be at work and so unable to take time off to attend the GP surgery, or might be arranging other aspects of their trip. One older practice nurse explained that in her experience many 'late attenders' were travelling to funerals at short notice, and related that some had very sad stories to tell. She gave the impression that having the time to talk to patients enabled her to view them as individuals, and as she described it, she had "learned to listen". Other nurses though, were obviously operating within particular time constraints and because of this, their priorities were to ensure that travellers were given as much protection as possible. They gave the impression that they did not consider it their role to initiate discussions about the reasons for delay.

Community pharmacists stated that VFRs who accessed their services would seek pre-travel advice from them between one or two days and a month before travel, with the average estimated to be about a week or two.

Although four of the patients decided to travel less than a week before their departure, consultants did not mention travelling at short notice without time to access pre-travel health advice as a common reason why VFRs acquired malaria.

8.4 Practice nurse and VFR interactions

Many of the VFRs participating in this study considered themselves to have accurate knowledge about malaria transmission, and from their experiences, to be familiar with managing malaria. By contrast, the experience of many practice nurses was of VFRs typically being passive recipients of health advice during pre-travel consultations, both with respect to malaria and for other pre-travel health issues. The nurses reported that although some travellers who were VFRs requested protection against specific diseases including malaria, typhoid and cholera, more commonly, VFRs stated that they were travelling and asked for advice

Nurses acknowledged that their role was to impart pre-travel health advice. There was an assumption by one nurse in particular that the provision of correct knowledge would be all that was required to ensure that patients would protect themselves against malaria, and she expressed surprise when told the number of infections due to this disease in the PCT in which she worked. Many nurses explained that there was little time available to become involved in more in-depth discussions with travellers and it seemed that some nurses felt under pressure to "tick all the boxes" to prove that they had provided all the information patients might need.

The difference in ethnicity between some practice nurses and VFRs seemed to occasionally instil a feeling of awkwardness among a few of the practice nurses. For instance, one nurse of Caucasian ethnicity, described how she had taken the trouble to provide information to some other Caucasian travellers about bednets, as she had sought out this information recently for her son. However, she admitted that she did not always give the same advice to those of African origin, and was unsure if they would follow the advice given. Another nurse of Caucasian ethnicity described how the expression on the faces of some African patients "glazed over" when they were receiving advice about mosquito avoidance measures, and it was felt certain that it would not be followed.

Although there were few examples of racial prejudice, one community pharmacist insinuated that VFRs were taking advantage of the NHS by accessing quantities of drugs for relatives resident in Nigeria or Ghana, and described how patients might "twist the arm" of the doctor to persuade him or her to give them more than the limits imposed by UK regulations. She described how the "natives of Africa" do not worry

about what medicine they get compared to British people, who she believed, may have read about the side effects of drugs in the press.

Being of African origin did not in itself act as a guarantee against stereotyping. For example, one Ghanaian community pharmacist was surprised at someone of African ethnic origin wanting to buy a bed net. Another GP (of Sri-Lankan descent) cautioned against stereotyping one entire community, and alluded to a change in attitudes to risk over time by some of his Nigerian patients, some of who he felt were coming forward more frequently to access pre-travel advice than previously.

8.5 Discussion

Access to knowledge about chemoprophylaxis was not a problem for practice nurses or community pharmacists. Instead, the most significant issues discussed in this chapter were access to pre-travel health advice, particularly when travelling at short notice.

With respect to the operation of pre-travel health clinics, some practice nurses appeared to have more autonomy than others in deciding the times when they ran. Where this was the case, travel clinics were organised broadly in line with the recommendations suggested by Chiodini (Chiodini, 2005) which were described in section 2.5.3, demonstrating that nurses were aware of the benefits of providing flexible clinic times. On the other hand, others appeared to be operating within a system which they perceived as inadequate, but over which they had little control. Then again, whilst GPs appeared to have more influence over the running of pre-travel health clinics, they were also working within their own constraints and the demands and opportunities of QOF, the quality and outcomes framework outlined in section 2.5.1, through which GPs are financially rewarded for reaching certain targets, and which do not include the provision of travel health. Despite the concerns of practice nurses and GPs about some patients having poor access to pre-travel health services, the majority of VFRs who intended to seek pre-travel health advice did not report this as being a problem for them,

In section 2.5.2, it was noted that there was no consensus amongst healthcare providers about the amount of time before travelling in which travellers should access pre-travel health advice. Similarly, there was no consistency to the time considered appropriate by practice nurses who took part in this research. Even so, whilst guidelines on the amount

of time before which travel advice is sought may be appropriate for those who make journeys which are planned well in advance, these will not be useful for those travelling at short notice. Although practice nurses considered this latter group to be a particular problem for them, there does not appear to have been any research carried out to investigate the extent to which this results in VFRs returning to the UK with malaria.

The feelings of awkwardness between ethnicities when they occurred were perhaps because nurses recognised that patients did not appear to listen to the advice given about mosquito avoidance methods in particular. Interestingly, although many VFRs appeared in the interviews to assert their expertise with respect to malaria, many practice nurses noted that they were passive recipients of healthcare, appearing to rely on the expertise of the nurses for chemoprophylaxis advice in particular. One explanation for this may be that VFR travellers are less knowledgeable about the options available to them with respect to chemoprophylaxis, compared to other methods of malaria control.

Chapter nine: the diagnosis and treatment of imported malaria.

In the introduction to this thesis prompt diagnosis and treatment of malaria was described as being one of the four components of the "ABCD" of malaria control in the UK. The aims of this chapter are to explore attitudes towards malaria treatment in Nigeria and Ghana and in the UK, and describe the actions taken by patients and by clinicians to manage individuals when symptoms present. Barriers which may result in a delay in prompt diagnosis and treatment are also discussed.

9.1 Diagnosis and treatment of malaria in Nigeria or Ghana

VFRs were asked what action they would take if they developed symptoms which they thought might be malaria when they were in Nigeria or Ghana. The plan most commonly described was that if symptoms were similar to those previously experienced, they would monitor their own condition for 24-48 hours. Twelve of the 20 respondents said that, following the initial monitoring period, if they were still sick, they planned to treat themselves. Of these, 11 said that they would purchase drugs for self-treatment from a community pharmacist, and one said she would double her dose of the antibiotic doxycycline, the chemoprophylactic drug she always took. If symptoms persisted after self-treatment was tried, they would seek medical advice. The eight others would not treat themselves, but would seek medical advice if they had not recovered within 24/48 hours.

Four VFRs had relatives with medical expertise in Nigeria or Ghana and they would take advantage of this source of advice, whether they planned to treat themselves or not. The advantages of obtaining a medical opinion to discover the aetiology of an illness, compared to self-treatment based on clinical symptoms were noted by one. Another compared the two medical systems in the UK and Ghana in the context of explaining why the use of community pharmacists for the purchase of malaria treatment, which he too described as the social norm, might not be recommended:

> *It's one thing I've noticed about our people back home, if they are sick, instead of them going to the hospital for a doctor, a qualified doctor to examine them, they don't do that, they just go to the chemist*
> ***Do they?***
> *It's something I have warned my mum about that, not to do that, whenever you feel like you're sick, you go to the hospital, and make sure that the doctor examine her, to find out the causes of it*
> ***Okay***
> *Because it's not good to go to walk out to the chemist and buy a tablet or whatever and take it, for a headache, you don't even know the root of the headache, and you*

go and buy a tablet, and take it, it's not good, let the doctor prescribe you the tablets or the medicine that you need (VFR2).

Although not questioned about their knowledge of the WHO recommendation that malaria should only be treated after being parasitiologically confirmed, no VFR or patient made any reference to this as being the current policy in these countries.

Drugs mentioned that could be used for treatment of malaria included chloroquine, SP and artemisinin. One explained that the three SP tablets he had previously taken when he developed malaria symptoms now acted only to "suppress the virus". His increase in physical build made it necessary now to take a five day course.

The risk of buying sub-standard drugs from community pharmacists in Nigeria and Ghana was recognised by many VFRs, but not considered as a serious danger to them. Strategies planned to overcome the risk of purchasing sub-standard drugs included taking advantage of their own knowledge of local pharmacies from where they believed they could purchase effective drugs, or asking friends and relatives to purchase drugs from local reputable pharmacists.

Only one VFR specifically mentioned financial reasons why advice might not be sought from a medically trained doctor in Nigeria. He had previously explained vividly his poverty-stricken childhood in Nigeria in a way which marked him out in my mind from some of the other respondents. He voiced his feelings as follows:

...and I mean to check you, you have to pay money, some of them don't have money to pay, they say ok, let me go to the chemist and buy tablet and drink, you know. So that one contribute to a lot of deaths, sudden deaths. So people does not, the Government does not pay attention on them. There's no free medicament or all these things at all. It makes people to manage themselves in certain things that they are not supposed to manage, you know. You know what I mean (Pt 5)

One VFR said he would avoid buying any drugs anywhere in Africa because he felt pharmacists were more interested in profit, rather than patient care. Another voiced her more general distrust:

But you would go to a hospital?
I would rather go to, yeah
Why's that then?
I like to see a doctor, you know
Do you?

Yeah. (Laughter)
You don't trust the chemist or...?
It's Africa you know, I have to take a little bit precaution, you know. Yeah. They are good you know, but I prefer to see a doctor (VFR7)

Three VFRs had personal previous experience of treating suspected malaria when abroad and had been to a local pharmacist for advice and treatment. One of these three had previously also sought professional health advice to exclude concerns about typhoid fever. One VFR found she was infected with malaria on her most recent trip, as a result of following her usual routine of being tested before leaving Nigeria. This was the second year in succession that she had acquired malaria as a VFR. She had not taken any anti-malarials, which she insisted was predominately due to her laziness. However, until taking part in the interview, she was unaware that she may have less immunity to malaria than in previous years, and described that in Nigeria it had not been a disease that had seriously affected her. On this most recent trip, she purchased an artemisinin-based treatment, but then decided not to take it, but to purchase SP. The following extract illustrates the conflicting factors which affected her decision making, namely the low parasitaemia associated with the infection, the gradual development of more serious symptoms and her concerns about the side effect of drugs. The latter appeared to be the decisive factor for her:

I always do the blood test to see whether it's malaria or not. And then I'll buy the tablet. And then (laughs) but I don't think, I was, you know, I wasn't that ill for me to start, this one plus malaria, I don't, I was actually... if you, I was actually, actually feeling very very ill when I came back, and they said, "Oh, go to the GP, what if it's malaria, and "I know". And why I didn't take the Fansidar is because the people started saying, "Oh, it's very nice, but it gives such a headache, you can... the side effects is headache, even from where I bought it. I said, "So what is the point now. I don't.. what type of headache?" He said, "Oh, it's a very bad headache, but it's very good". That is, it will cure this, but it gives headache, I said ok, I'm not taking it
So you haven't taken anything other than paracetamol?
No. Ok. Paracetamol and ibuprofen, and paracetamol and ibuprofen
Do you think you'd better get it checked out?
No, no no. I'm well now (VFR18)

Eight of the 10 GPs said that patients had tried some form of self-treatment for malaria before visiting their surgery but were unaware where these would have been purchased. Some GPs noted requests were sometimes made by VFRs for confirmatory tests to check if their self-treatment of malaria had been successful. Others told their GPs that

they had treated themselves for malaria whilst abroad and it was left to the GP's judgement to decide whether to have the patient tested again.

Two of the three consultants reported that patients would have typically tried some self-treatment purchased in Nigeria or Ghana before presenting, typically SP or quinine. Proguanil was a drug often mentioned to the paediatric consultant as a drug they had used to treat their children, though it was not known if this was for attempted prevention or treatment. None believed that their patients would be aware that chloroquine may no longer be effective.

9.2 Diagnosis and treatment of malaria in the UK

The actions of VFR18, who found she was infected with malaria before her return to the UK, have already been described above. For the patients interviewed, symptoms of uncomplicated malaria were initially attributed by one as being caused by influenza, and another by stress or post travel fatigue. The others speculated that they might have contracted malaria.

All initially tried some form of symptom relief, including paracetamol, aspirin, and Ibuprofen. Two also took SP as advised by friends, before seeking medical advice. One patient also drank two bottles of Schweppes tonic water, as recommended by his wife. He did this on the understanding that it contained quinine and had been used previously by his wife's family in Ghana as a malaria treatment.

Upon arrival in hospital, all expected to be admitted, except for one who had not alerted friends and relatives that he might not be available to them.

The events between the onset of symptoms and being admitted to hospital for each patient was as follows and show the range of actions that may be taken:

- Pt 1: began to feel ill three days after returning to the UK, considered that the symptoms he was feeling might be caused by malaria, and went that day to A&E where he was admitted. This was the second time he had returned with malaria, the first time was after visiting Sierra Leone, his country of birth.

- Pt 2: was ill for three days on return to the UK and thought he had influenza. He contacted the local out of hours GP service, described the symptoms, mentioned recent travel to Ghana and was prescribed an analgesic. His daughter called an ambulance later that day as his symptoms worsened. The ambulance paramedics realised that he may have malaria, and took him to hospital where he was admitted.

- Pt 3: presented at his GP after he felt ill for five days. He himself did not suspect malaria. He worked in a hospital and had in the meantime reported his illness to his manager, was diagnosed with "the fever" and given an analgesic. The GP suspected malaria. He was sent to A&E for blood tests, and was admitted.

- Pt 4: bought chloroquine and proguanil from a pharmacy upon returning to the UK and started taking it. This was not because he felt ill, but because he had failed to take these, the tablets he took as a matter of course when visiting Nigeria. He started to feel ill about eight days after returning to the UK. He went to his GP three days later. He was sent to the hospital for a blood test as the doctor suspected malaria, and was waiting to return to his GP the next day for the results when he became so unwell that he went to A&E. He thought he had had malaria before as a VFR after returning to Nigeria from Japan. He did not suspect malaria on this most recent occasion, because he believed in the effectiveness of the chloroquine and proguanil he had purchased.

- Pt 5: went to his GP the day following the onset of symptoms which started five days after his arrival in the UK. He suspected he had malaria. He was given various tests, including one for malaria. The result was negative. He was given SP by a friend. This did not work, and two weeks later he returned to his GP when he felt very ill. A second test also proved negative. His GP then referred him for an appointment at HTD the following morning, where he was diagnosed with malaria and admitted.

- Pt 6: decided to go to HTD the second day after arriving back in the UK. He had begun to feel ill during the return flight from Lagos, suspected malaria, and was

given SP by a friend when he arrived in the UK. He made his decision to visit HTD as he had been referred there previously. This was the fourth time he had acquired malaria when visiting as a VFR.

9.2.1 The diagnosis of malaria by GPs

GPs would consider malaria when a patient presented with an unexplained fever or influenza-type symptoms and/or reported that they had recently travelled to a malarious country. Although GPs reported that some VFRs volunteered information about recent travel to them, this was not routine and eight of the ten said that they asked about this as a matter of course. Another GP said that he had a heightened awareness of malaria during the month of September, the time of year when most suspected cases were seen, and the tenth would consider malaria as a possible diagnosis if patients told him they had been abroad. The number of patients seen by the GPs who were subsequently diagnosed with malaria varied, with an annual range of 0-10 patients.

GPs explained that they had a low threshold for testing, explaining that it is better to "over-test" than to "under-test". None appeared to be particularly concerned by the possibility of legal action if they made a mistake, instead, pride in their own clinical practice, together with an awareness of the possible consequences for the patient of a mis-diagnosis, appeared to account for the overriding concern amongst GPs not to miss a case of malaria. It should be noted that several of the GPs had been employed in this role for a number of years, and as such, may have had considerable experience in considering malaria as part of a differential diagnosis. In addition, two were trainers of other GPs, suggesting they had high levels of expertise.

Although very few had personally treated cases of severe malaria, the details of cases seen by other GPs in the UK where undiagnosed malaria had resulted in severe illness or death were described by a few, and provided a forceful reminder to them to always consider malaria. As an example, one GP described a case of severe malaria that had occurred when he had been called to see a young boy who had previously visited his GP surgery and whose parents had subsequently requested a home visit:

> ***And why have they left it so long then, or had it just deteriorated very rapidly?***
> *Yes, I didn't get the impression of people leaving it too long, um, but I got the impression that my visit was crucial, and also that slight free-floating anxiety that so many of us GPs have. The, if I missed this, what might have happened tomorrow,*

thank goodness I thought malaria was a possibility, arranged the blood test, got that person into hospital today, thank goodness I did that home visit, and didn't just say, not that I would, take another aspirin and call me in the morning if you're not better, and of course I wouldn't do that, but it's a constant reminder why, the importance of not taking that glib approach. And one person I remember vividly was a very atypical presentation. A two, three year old boy who just had diarrhoea and vomiting. So many people have diarrhoea and vomiting aged two to three, and well, it's just joining nursery isn't it? What is it? And luckily I asked about fever, once he'd got a fever, "oh, dear, it's bad diarrhoea and vomiting then". I couldn't give a figure, but a large proportion of diarrhoea and vomiting also have a fever but suddenly I pricked up my ears at that point, and mum wasn't bothered at all about the fever, she was just worried about, she just felt for her little boy, who was vomiting all over the place, and I homed in on the fever, and said, "So he's got a fever, have you been abroad recently, still thinking not necessarily malaria, it could be another tropical illness, and she said about the trip, and, actually, the boy hadn't had malaria syrup and I sent that boy straight in and it was falciparum malaria, and I remember feeling lucky, feeling they were lucky, that I was lucky, that that was a close shave (GP3)

Upon suspicion of malaria all GPs said that they would either take a blood sample, and send it urgently to the local hospital to be tested, or would ask the patient to attend the hospital phlebotomy service immediately. They would request laboratory results to be communicated to them the same day. However, some GPs acknowledged that this service is very busy and the waiting time for a patient to get a blood test can be prolonged.

One hospital used for referrals by three of the GPs interviewed had a policy of outpatient care for malaria patients who were diagnosed with uncomplicated falciparum malaria, whilst in other geographical areas, such patients were admitted. Thus, if diagnosed, patients would either be asked to come to the surgery for a prescription, or be referred to hospital for admission, depending on the protocols followed by the local hospital.

One GP said that they would start treating patients with chloroquine before the result was known and then discuss his decision with hospital microbiologists upon confirmation of the diagnosis. The practice of commencing treatment before a diagnosis was known had been carried out by another GP when he previously worked under the supervision of an African doctor, but he now considered this to be "cavalier".

Consultants estimated that only between 10-20% of the patients who presented at A&E would have initially sought care from their GP, and one expressed satisfaction that patients attended his Department so that their treatment could be started promptly if necessary. One hospital consultant cited occasions when delays in a correct diagnosis had occurred as a result of GPs not considering it as a possible cause of their patient's illness. However, the more frequently mentioned concern of consultants was of problems for patients in gaining access to GP services and they explained that patients might wait up to a week for a GP appointment. Even those who could access GP services after only 24 hours, hospital consultants indicated, might be unwilling to do so.

Although not common, community pharmacists stated that VFRs might attempt to purchase malaria treatments from them. The drug most typically sought was SP. One pharmacist explained that some patients become irate on learning that they could not issue this. All referred potential cases of malaria to their GP or to hospital.

9.2.2 Consultants' perceptions of VFRs attending A&E

Two of the hospital consultants estimated that they saw about 200 patients with suspected malaria each year. The one who treated children stated that when he previously worked in a secondary, rather than tertiary care setting, there would be one or two possible cases a week seen during the peak season of August to September. Approximately 80% to 95% of patients they saw who had suspected malaria were of African origin. The majority were thought to be of Nigerian descent, although the precise number was difficult for hospital consultants to quantify.

Two believed that there were more cases in the summer and winter months, though the third did not notice any increase in cases at these times. All three suspected that although many patients visited both urban and rural areas, most cases were acquired when visiting the latter. However, one, himself of Nigerian origin, observed that detailed information on the exact location of areas visited could be difficult to obtain from patients.

The paediatric consultant estimated that a common duration of travel was two to three months, whilst the other two believed that patients had travelled for between three or four weeks. Those VFRs who worked in the UK were thought to travel less frequently

than those with business interests in Nigeria or Ghana. The latter might travel four or five times each year. Less frequent travel was associated with being employed in the UK, or because of financial constraints.

9.2.3 Diagnosis and treatment of patients in the A&E setting

For those adult patients who presented to A&E, the waiting time to see a doctor, either for those who were referred by their GP or who self-referred, depended on the severity of the patient's symptoms. As many patients had what were judged to be mild symptoms at presentation, the typical waiting time could be between two and four hours. As was reported by GPs, not all patients volunteered the information that they had been to Nigeria or Ghana. However, the majority of patients did share with the consultant their thought that their illness, or that in a child, might be due to malaria. In the paediatric setting, patients would be seen more quickly, with a diagnosis made, and treatment started within four to five hours.

No patient had mentioned sickle-cell disorder or G6PD to consultants.

It was rare for two of the consultants who treated adults to see patients with severe malaria, though the paediatric consultant did more regularly see such cases, as they would be referred to his tertiary referral unit.

Estimates were given of between 20% of 40% of patients tested who were confirmed to have malaria. SC1 reported that approximately 30% may discharge themselves once their diagnosis was known, and also observed that others were only eager for a diagnosis of typhoid fever, which they considered to be a more serious illness, to be discounted before choosing to leave. Those who did would be given quinine and contacted a few weeks later to confirm that they had recovered. He wondered if this method of care might become a policy adopted by his hospital in the future.

The paediatric consultant noted that self-discharge was rare, although a few families did not recognise the need for their child to be admitted. However, child protection laws were in place to prevent children being discharged without treatment. The third consultant worked in a hospital where a policy of treating most malaria as outpatients was in place, and so this issue did not arise.

9.3 "Fever" and malaria

To find out the extent to which the term "fever" was used synonymously with "malaria", respondents were asked if these words might be used interchangeably. Some VFRs appeared to wonder why the question was being asked. For them, fever was simply a rise in temperature and was one symptom of malaria. However, one immediately explained that these words were previously used interchangeably in Nigeria or Ghana as there was no specific word to describe malaria in African languages. Another described that for the "lay mind" , the words would still be used interchangeably in this way. Symptoms experienced, she explained, might be described as fever until or if, a laboratory diagnosis was made, and only if parasites found, identified as malaria.

GPs and community pharmacists were also asked this question, and many replied in a similar way to the majority of VFRs in describing fever as a symptom of malaria. However, a few, for example a Ghanaian-born community pharmacist, also described an interchanging of these words.

9.4 The attribution of convulsions to malaria

There was a certain apprehension amongst a few VFRs and patients when the question of what might cause convulsions was raised in the interview, and in these cases the topic was not pursued. The attribution of convulsions to physical causes including malaria was recognised by many VFRs. At the same time, some acknowledged a difference between their own understanding and that held by some in Nigeria and Ghana about the aetiology of convulsions. Amongst their friends and relatives who lived in rural areas of these countries, or who were less well educated, VFRs and patients explained, convulsions might be attributed to supernatural causes.

A few VFRs and patients also suggested reasons other than malaria why people might convulse. A hot climate was one alternative reason given, justified for one by the experience of seeing many children suffer convulsions in the much hotter climate of Ghana, but never in the UK. Although she herself believed that convulsions were caused by malaria, another VFR said that she would follow the custom in Ghana that a child with convulsions should only be carried by a man. Another VFR described with

pride the ability of his mother to cure children with convulsions with ointments throughout his childhood in Nigeria.

One patient, a pastor, felt that convulsions had a spiritual cause and explained that he would pray for a person who began to convulse. His rationale was based on his childhood experiences, when his brother was the only member of the family who experienced convulsions as a child. This stopped when he became older and the implication was that he had been cured by the power of prayer. Another patient, also a pastor, described the differences in beliefs about convulsions between Nigeria and the UK as follows:

> ***And if someone had convulsions, what would you attribute that to? Would you have any ideas about that? Like a kid***
> *Convulsions in my society, is more spiritual.*
> ***Is it?***
> *That's how we regard it. You know, because they think a child is innocent. Um, for a child to be in that position, uh, I would say, you know, most of them attribute it to spiritual, you know, these things. But I think, because they are not aware of the medical side, they've come to embrace it, and they live with it. So I remember during my childhood, when anything comes, it is, you know, you, you, you solve it the traditional way, and not the medical way, you see?*
> ***Here, amongst your community here, would they see it the same way?***
> *I don't think so. I don't think so, you see, because, to me, this country is an open society. And if anything happens, now, children, who go to play class, to school, and so on and so forth, so if for a matter of, let's say days, they are not found*
> ***For a matter of?***
> *They are not found, you know, in these places, people become suspicious, and they can easily report you, you know. Even those of us, to me, I would say who are enlightened, if I happened to see anything of the sort, there's no way I would condone any other way than hospital, see your*
> *GP, or quickly, take, you know, the child to these things. But I can assure you, some of us, I can't give you exact... still think it's more spiritual than...* " (Pt2)

This suggestion that these beliefs may be current amongst some Nigerian and Ghanaian residents in the UK was reinforced by another patient who, after the interview had concluded, explained that his wife was upset until he was diagnosed with malaria, as she believed that he may have been jinxed in Nigeria, when he first developed symptoms. He observed that there were many aspects of life in the UK-based Nigerian community that I could not understand.

9.5 Perceptions of VFRs and patients to treatment in the UK setting

In contrast to the reported care taken to diagnose and refer patients promptly, described by the GPs and hospital consultants interviewed, some VFRs made unfavourable comparisons of the way diagnosis and treatment is managed in the UK compared to Nigeria and Ghana. For example one VFR was concerned that doctors in the UK may assume any illness in a returning traveller to be malaria, and so not consider other causes, whilst another felt that it may be difficult for GPs in the UK to recognise the symptoms of malaria. The concerns of the latter were also voiced by another four VFRs who had either been treated for malaria themselves or how had witnessed hospital care for friends and relatives in the UK. They cited delays in diagnosis, on occasion necessitating transfer to another hospital where clinicians had more expertise, as well as inappropriate treatment being given. The most extreme example of mistrust of UK-based doctors was expressed by one VFR who had been begged by a friend to smuggle SP to him in hospital, as he feared he would die if he continued to take the treatment prescribed. According to this respondent, if malaria patients were transferred from Nigeria to the UK, several deaths would result. Similarly a VFR from Ghana claimed that patients could die from malaria in the UK, but not in Ghana.

No GP or consultant was aware that patients had these concerns, or at least did not raise these issues in the interviews. In fact by contrast to the VFRs, for their part, all three consultants suggested that some Nigerian and Ghanaian patients felt that the care given in the UK to malaria patients was disproportionate to the threat. However, one also felt that some people were becoming more aware of the reasons for this:

> *I don't think they, the sort of anxiety we have as clinicians about falciparum in particular, patients don't get it. You're going on about it, they're just laughing at you, basically*
> ***And have there been any changes over time, or has it always been the case that people don't see it as being a serious disease?***
> *I suspect that some of our campaigns, you know, the posters and things are beginning to get people to think a bit, some of them have sort of come to terms with the fact that they are not quite as immune as they used to be when they lived their other life out there. I've heard that from one or two people in the last year.*
> ***So it's beginning to get through?***
> *The message is beginning to get through, but it will take a while before the majority get the message* (SC1)

The second factor which led to feelings of mistrust of the UK-health system and claims of incompetence was the fear of being placed in isolation in hospital when diagnosed

with malaria. This was not a subject for inclusion in the initial topic guide, but was raised by some study participants. One VFR said this had happened to a relative, whilst another had worked in a hospital where she described this as having been the policy. Two others said that they had heard of its occurrence. One of these, who had previously experienced malaria symptoms when on holiday in the UK described how, until her condition necessitated hospital care, her family had tried to treat her themselves because of concerns that her illness would be treated like some "scary disease".

The perceived policy of isolation of malaria patients was described by these VFRs as having been implemented because indigenous UK-based clinicians did not understand that malaria was not directly transmissible. The reaction of the VFRs was incredulity and bewilderment that what is an easily managed illness in Nigeria or Ghana is dealt with in the UK in this unnecessary way.

Three of the six patients also had concerns about being isolated. One thought that it was only because his parasitaemia level was low that he was kept with other patients when he was admitted. In common with the VFR described above, one described how he was encouraged by a friend to treat himself in order to avoid being isolated upon admission to hospital in the UK:

> ***Yeah, so how do your friends and relatives over here feel about that?***
> *Uh, they think it's a joke. Because when I phone my friend in that, in the flight, my friend is telling me to come down the aircraft and get treatment over there before I fly back. I said I'd rather get back here and treat myself. He said but they're gonna quarantine you for about a week, I said, I don't care, as long as I get well, yeah.*
> ***So it's commonly accepted that people think you're gonna get treated like that?***
> *Yeah.*
> ***So do your friends normally take tablets before they travel?***
> *A lot of them do*
> ***They do?***
> *Yeah, a lot of them do* (Pt6)

The other VFR said that as a result of his treatment he would be happy to assure friends that the rumours prevalent in the community about being isolated when presenting with malaria were incorrect.

None of the hospital consultants had a policy in place of isolating malaria patients, and one had a policy of outpatient treatment for the majority of malaria cases. He believed

that patients were aware of this when they attended. Of the two others, one understood the fear amongst patients of being isolated:

> ***And so with their children, would they bring themselves in more quickly if they suspect something or would it be pretty much...?***
> *I think in my view, not quickly enough. Maybe in their judgement they think they bring them in quickly, but, the attitude generally is ok, I, you know, I took precautions, whether they are the right precaution or not, um, this kid took their medicine, whether that be the right medicine or not, and they're fine, we're fine, they're probably fine, um, without any kind of thoughts around how semi-immune they might be, relative to their children, and they kind of sit on them a little bit, in my view. Sit on them a little bit. They still bring them relatively quickly, but not until the symptoms have persisted for a good couple of days in the typical scenario*
> ***Why do you think that is?***
> *Difficult to tell, but you can't help but think it's due, it's linked to their own view about how malaria might be treated, or is treated. Many of them express concern or anxiety about being um, isolated if they were shown to...*
> ***That came up in the conference*** (a conference which we had both attended) ***didn't it? And they're worried on behalf of their children as well?***
> *They're worried on behalf of their children. And that anxiety sort of plays on their mind and about their children, which is probably why occasionally when the kids present they tend to be slightly sicker* (SC1).

The paediatric consultant did not think a fear of their children being isolated was a concern of parents. However, he described some embarrassment on the part of families when their children's diagnosis of malaria was discussed in earshot of other patients, and believed that there was a certain stigma felt by some African families around malaria. Whilst he described this as minimal when compared to that which may be associated with a diagnosis of HIV or TB in some African families, he wondered if it was because of parents' knowledge of a high mortality associated with malaria in African countries, as he was unable to think of other reasons for this.

9.6 Discussion

There has been little previous research carried out to investigate how Nigerian and Ghanaian VFRs view malaria treatment in non-malaria-endemic countries. In the literature review described in chapter two, this was only investigated in any detail in the study by Leonard and VanLandingham (Leonard and VanLandingham, 2001). Thus, there was little opportunity to compare the findings from this thesis with other research. On the other hand, comparisons could be made with research carried out in Nigeria and Ghana about malaria treatment, and here there were similarities with respect to the common use of self-treatment using drugs purchased in a local pharmacy (Ahorlu et al.,

1997, Onwujekwe et al., 2005b, Buabeng et al., 2007). The answers given to the questions about planned action if malaria symptoms were acquired in Nigeria or Ghana did however reveal a recognition by some VFRs of the limitations surrounding self-treatment of malaria in these countries. Many VFRs appeared to adopt a pragmatic approach to this, taking advantage of any local expertise as well as the fast and easy access to drugs purchased from pharmacists in Nigeria or Ghana, whilst being prepared to seek more formal medical treatment in these countries if it became necessary.

The depiction by VFRs in particular of malaria treatment in Nigeria and Ghana as being quick and easy to obtain, despite its limitations, contrasted with the perceptions that some had with respect to malaria treatment in the UK. The perceived incompetence of non-African clinicians, possibly leading to mis-diagnosis and hence delayed treatment voiced by some respondents was also a finding made by Leonard and VanLandingham (Leonard and VanLandingham, 2001). Whilst many of the clinicians interviewed for this thesis appeared to be competent in their patient care, there was some indication that clinical guidelines might not always be followed.

In section 7.2, it was noted that some VFRs were keen to stress during the interview that malaria is not directly transmissible and it was surmised that this was emphasised in case my own knowledge might not be correct. A lack of understanding about why patients might be isolated was another example of misunderstanding about the skills of non-African clinicians, and reported previously by Leonard and VanLandingham (Leonard and VanLandingham, 2001).

Although many VFRs had asserted that they were able to recognise the symptoms of malaria, two of the patients interviewed did not, when infected, attribute their symptoms to this disease. On the other hand, those patients who did recognise that they might have malaria sought treatment promptly and this was in line with the opinion voiced by many VFRs that prompt treatment of malaria was recognised as being of fundamental importance to avoid a serious outcome.

None of the patients described their symptoms as mild, and although only discussed briefly in the research carried out by Morgan and Figueroa-Muñoz and Leonard and VanLandingham, in these studies, of the few who mentioned this, their experiences

were of malaria being a debilitating illness (Leonard and VanLandingham, 2001, Morgan and Figueroa-Muñoz, 2005).

In section 3.8.1a, the use of the word fever to equate with a clinical diagnosis of malaria was described as common in Nigeria and Ghana. The results in this thesis found that for some Nigerians and Ghanaians living in London, fever was also considered to be synonymous with malaria. This was a similar finding to that reported by Morgan and Figueroa-Muñoz, (Morgan and Figueroa-Muñoz, 2005) where UK participants of African ethnicity asked if there was a difference between the words fever and malaria. The extent to which this perception is held and whether it may cause confusion when patients of Nigerian and Ghanaian ethnicity seek medical advice for presumed malaria when in the UK is unclear.

No previous studies carried out in European countries or the USA have investigated whether, in the malaria context, convulsions may be attributed to malaria by VFRs, or alternatively are perceived to have a supernatural cause. Beliefs in spiritual causes of malaria were described by VFR respondents as originating from Nigeria and Ghana rather than from the UK, and as reported in chapter two, the linking of convulsions to spiritual influences was also a finding from some studies carried out in these countries (McCombie, 2002, Williams and Jones, 2004, Onwujekwe et al., 2005a, Adongo et al., 2005). The finding that supernatural causes may be thought to be responsible for convulsions illustrates how parallel aetiologies may be considered by some VFRs when understanding this phenomenon. However, some VFRs differentiated between beliefs about malaria commonly held by their friends and relatives in Nigeria and Ghana, many who lived in urban areas and who believed that convulsions could be caused by physical illnesses including malaria, and those views held by others who were judged to be less well educated.

In the experience of the participants of this study, there were few structural barriers to prompt treatment seeking from the NHS in the UK. Unlike the finding from the study by Leonard and VanLandingham (Leonard and VanLandingham, 2001), which was conducted among VFRs in America, the participants in this study did not express any concerns about the cost of treatment, presumably because treatment is free for those who attend NHS hospitals. GPs described waiting times for blood tests to be long. Few

of the VFRs had personal experience of using NHS services for the treatment of malaria, but of those who did, neither they nor any of the patients mentioned that they were delayed in getting treated, nor complained of long waits in phlebotomy clinics. In addition, while hospital consultants considered that access to GPs was a problem for VFRs suffering from malaria and could cause delays in receiving adequate treatment, for the patients and VFRs interviewed for this thesis, there was no evidence that this was a particular problem. The data also suggest that alternative sources of treatment were rarely sought, as the community pharmacists reported that very few customers attempted to purchase malaria treatments from them. However, taking a larger sample of interviews with community pharmacists may have identified more examples of this.

The results presented in this chapter build on the results from the previous two chapters showing that as the VFRs move from the UK to Nigeria or Ghana and back, they are moving between contrasting cultural and social systems of which the health systems are an integral part. In the UK, health professionals are perceived to have access to expert knowledge, to be the guardians of public health and in practice they control access to drugs and other treatments. As a consequence, if a VFR becomes ill on their return to the UK their treatment choices are limited, but their access to appropriate biomedical treatment is not constrained by structural factors. By contrast, in Nigeria and Ghana health professionals may be perceived to possess expert knowledge, but they are not the only source of drugs or other treatments and structural factors.

Chapter ten: conclusions

The aim of this research was to explore the reasons for the burden of imported malaria in the Nigerian and Ghanaian communities living in London. It was driven by the concern that despite it being preventable, imported malaria is a common travel-related illness that primarily affects one particular group: those visiting friends and relatives in West African countries. Little previous work had been undertaken to understand why this might be so.

The epidemiological analysis described in chapter five updated previous analyses which had covered the period 1987 to 2006 (Smith et al., 2008), by providing data for 2007 and 2008. The calculation of ethnicity rates using two epidemiological methods (cumulative incidence and incidence rates) confirmed that those most at risk of reported malaria remain those categorised by the MRL as being "of African ethnicity", and showed the large difference in incidence rates in this group compared to those in two other ethnic groups. The thesis also provided for the first time an epidemiological analysis of the group most at risk of imported malaria in the UK: namely Africans living in London who had acquired falciparum malaria whilst visiting friends and relatives abroad. This was carried out for the period 2004-2008. There were two findings which were of particular interest. One concerned the higher number of reports of those who did not take chemoprophylaxis in areas where malaria was subisdised compared to other areas, and this, in combination with the results of the qualitative research, provide new information which should be taken into consideration in future efforts to reduce the incidence of malaria in the Nigerian and Ghanaian communities. This is discussed in section 10.1. The second concerned the heterogeneity within the sample. The diversity of beliefs and experiences amongst these communities was also a finding from the qualitative analysis, and had not been previously identified in previous research. The implications of this are discussed in section 10.2.

Some of the findings from the qualitative study included in this thesis have been described previously by other researchers. Examples include a perception amongst some VFRs of a continuing immunity to malaria, and the extent to which they are aware of how malaria is transmitted. As very little primary research has been carried out into the issue of imported malaria in African VFRs, the replication of these results is valuable in itself. However, this is the first time that the perspective of health care providers and

community pharmacists has also been included in research carried out in a UK setting, and this provided useful evidence to show that in many respects, individuals from these groups were aware of why VFRs believed themselves to be at risk. It also provided an opportunity for them to identify operational barriers to the provision of effective malaria prevention and treatment.

The thesis also provided new insights to explain the reasons for the burden of imported malaria in the Nigerian and Ghanaian communities in London and introduced a novel conceptual framework to explain the reasons for the burden of imported malaria in the UK. In this chapter, more detail is provided about this framework, incorporating the new insights gained from the qualitative findings. These were:

- introducing new information about the social, structural and physical environment in the UK; namely an understanding of the challenges facing the providers of pre-travel health services in London and the operational barriers to effective malaria diagnosis and treatment in a UK setting.
- identifying and exploring more fully than has been previously described those factors that may be relevant to the individual VFR. One of these, the adequacy of mosquito avoidance advice, has been not previously described in detail by other researchers. Two others have not been previously identified. One is the importance given by VFRs to the beliefs of other family members about malaria, and the second is information about attitudes of VFRs towards the diagnosis and treatment in a UK setting.

These issues are discussed between sections 10.2.1 and 10.2.2a of this chapter. Four examples are then provided of how the conceptual framework can be used to explain the burden of imported malaria in Nigerian and Ghanaian VFRs.

The next section of this chapter discusses three of the theoretical issues that arose during the writing of the thesis are described, and the conceptual framework is used to explore these. These issues are: whether malaria could be prevented within non-endemic countries by the removal of structural barriers, or whether this is unlikely, given the broad range of factors which impact on the burden of disease; what constitutes an

appropriate definition of "VFR" and in particular, whether ethnicity should be included in this definition; whether risk could be considered as a social construct, as proposed by Douglas and Wildavsky (Douglas and Wildavsky, 1982). The chapter concludes by describing the limitations of the thesis, and offering some final thoughts.

Before beginning the discussion of these issues, it should be emphasised that that the qualitative methodology used in this research means that these results cannot be extrapolated to a wider population. Instead, as described in section 4.2, the choice of this methodology was to allow an in-depth exploration of the reasons that explain the incidence of imported malaria in the Nigerian and Ghanaian communities in London who visit friends and relatives abroad. These findings need to be tested using quantitative methodology to assess their validity, and the following sections should be read with this caveat in mind.

10.1 Cost of malaria chemoprophylaxis.

As stated in section 2.5.4, the decision made in LSL areas not to implement a Government policy making travellers responsible for the full cost of malaria chemoprophylaxis was taken because of fears that the already high incidence of imported malaria in LSL areas would increase. Furthermore, after the policy was implemented, concerns were raised by medical professionals in other parts of the UK that the number of cases would rise (Badrinath et al., 1998, Evans, 1996, Hollyoak, 1995, Hossain, 2008). The cost of chemoprophylaxis has been previously identified as a barrier to it use in three previous research studies (Leonard and VanLandingham, 2001, Morgan and Figueroa-Muñoz, 2005, Schilthuis et al., 2007). Results of the qualitative analysis shown in section 7.2 suggested that the cost of malaria chemoprophylaxis does prohibit its use for some VFRs, and some healthcare professionals believed it presented a major barrier. Therefore the epidemiological analysis described in section 5.2.7, which showed that there were more reports of VFRs who did not take chemoprophylaxis in LSL areas compared to other areas of London is surprising. However, the thesis provided other insights which might explain this finding.

10.1.1 Non-adherence

Firstly, non-adherence to chemoprophylaxis by some travellers, whether it is subsidised or not, should be considered. If this is found to be a significant issue, then subsidising chemoprophylaxis will not have the intended impact on reducing the incidence of imported malaria. Previous research has indicated that some VFRs might leave unused chemoprophylaxis for host friends and family in malarious countries, rather than completing the course themselves, or that alternatively, practical reasons such as a dislike of its taste, or forgetfulness might lead people not finishing the course (Morgan and Figueroa-Muñoz, 2005, Pistone et al., 2007). The poor quality of information recorded by clinicians on the MRL report forms, in particular the finding by Phillps-Howard that 24% of those who had recorded on this form had not actually done so (Phillips-Howard et al., 1990b), must also be considered when interpreting data from this source.

Findings from the qualitative analysis showed that adherence was good amongst the small number of VFR participants (n=8) who started chemoprophylaxis. There was no unanimity of opinion between healthcare professionals about whether adherence to chemoprophylaxis was a significant issue amongst VFRs more widely. Further research is justified to explore the extent to which adherence to chemoprophylaxis impacts on the incidence of malaria. This would also provide the opportunity to explore the most suitable regimens for different travellers. One new insight from the interviews with practice nurses was that it was particularly difficult for some travellers to adhere to specific regimens. For example some preferred drugs they could take weekly, whilst others preferred chemoprophylaxis which could be started just before travel and finished shortly afterwards. Nurses suggested that once VFRs were comfortable with a particular regimen, they would be more likely to ask for the same prescription for future visits, suggesting that they found adherence manageable. This new research would be particularly timely as the policy of subsidising malaria chemoprophylaxis in LSL areas has recently changed, with AP only being prescribed if all other anti-malarials are contraindicated (Health Protection Agency, 2012). If a majority of those who take mefloquine are found to be more likely not to complete the prescribed course for example, this may not lessen the burden of imported malaria. Thus, any financial savings that could be anticipated from this policy change would be limited.

10.1.2 Lack of awareness of the LSL policy

A lack of awareness amongst some residents of LSL that malaria chemoprophylaxis is subsidised should also be considered. Of the three clinicians interviewed, one, who worked in an LSL hospital, and so was in a position to impart this information to more than one hundred patients each year, was not aware that the policy existed. The decision to implement the policy was in part a political decision, taken with the backing of a local MP, Simon Hughes (Liz Hunt, 1996). From my experience of working for the Health Protection Agency, I can confirm that at until at least February 2011, no campaigns were undertaken to inform the population of LSL that malaria chemoprophylaxis is subsidised, and this may be for fear of it being revoked by the UK's Department of Health. Whatever the reasons may be for not communicating this message, one possible consequence may be that some travellers in LSL might not consider purchasing malaria chemoprophylaxis as they mistakenly believe the cost to be prohibitive, or not to represent good value for money, given the alternatives available to them. An unawareness of the policy, considered in the context of the relatively large Nigerian and Ghanaian communities in at least two boroughs in the LSL area (see section 49.2) could mean that the volume of individuals travelling without prophylaxis (as indicated by the quantitative analysis) from these areas is higher than in many other London boroughs.

10.1.3 Volume of travellers from LSL areas

Another possible explanation for the higher incidence of imported malaria in African VFRS travelling without chemoprophylaxis in LSL areas is that the volume of individuals seeking pre-travel health advice may put a strain on the services that provide these. This, in combination with other pressures on primary care services, as described by many GPs may mean that travel health services are given a lower priority. This may result in more travellers in LSL areas compared to other boroughs being unable to access chemoprophylaxis. Practice nurses from all areas described their services as being over-stretched, but more research would be valuable to determine if pre-travel health services in areas with relatively high proportions of people travelling to falciparum malaria-endemic countries are adequate.

10.1.4 The relative importance of the cost of chemoprophylaxis compared to other factors

The qualitative analysis provided evidence that the cost of chemoprophylaxis was not considered by some when making decisions about whether to use it. For others, it was not the sole factor determining its use, or was only one of a number of other factors that were taken into consideration. Thus, another reason to explain why the incidence of malaria was higher in LSL areas than others, despite the policy of subsidising chemoprophylaxis, was that the cost of these drugs is not a key determinant of its use. Instead, the decision an individual makes may be influenced by a complex interaction of factors. Therefore, implementing a policy that only seeks to impact on one of these is unlikely to be successful.

This introduces the second new contribution of this thesis; that is the development of a conceptual framework which explains the factors VFRs take into account when making decisions about malaria control.

10.2 Conceptual framework

An outline of a conceptual framework was introduced in chapter four. This is re-introduced in figure 10.2.1, with data gathered from the interviews providing more details.

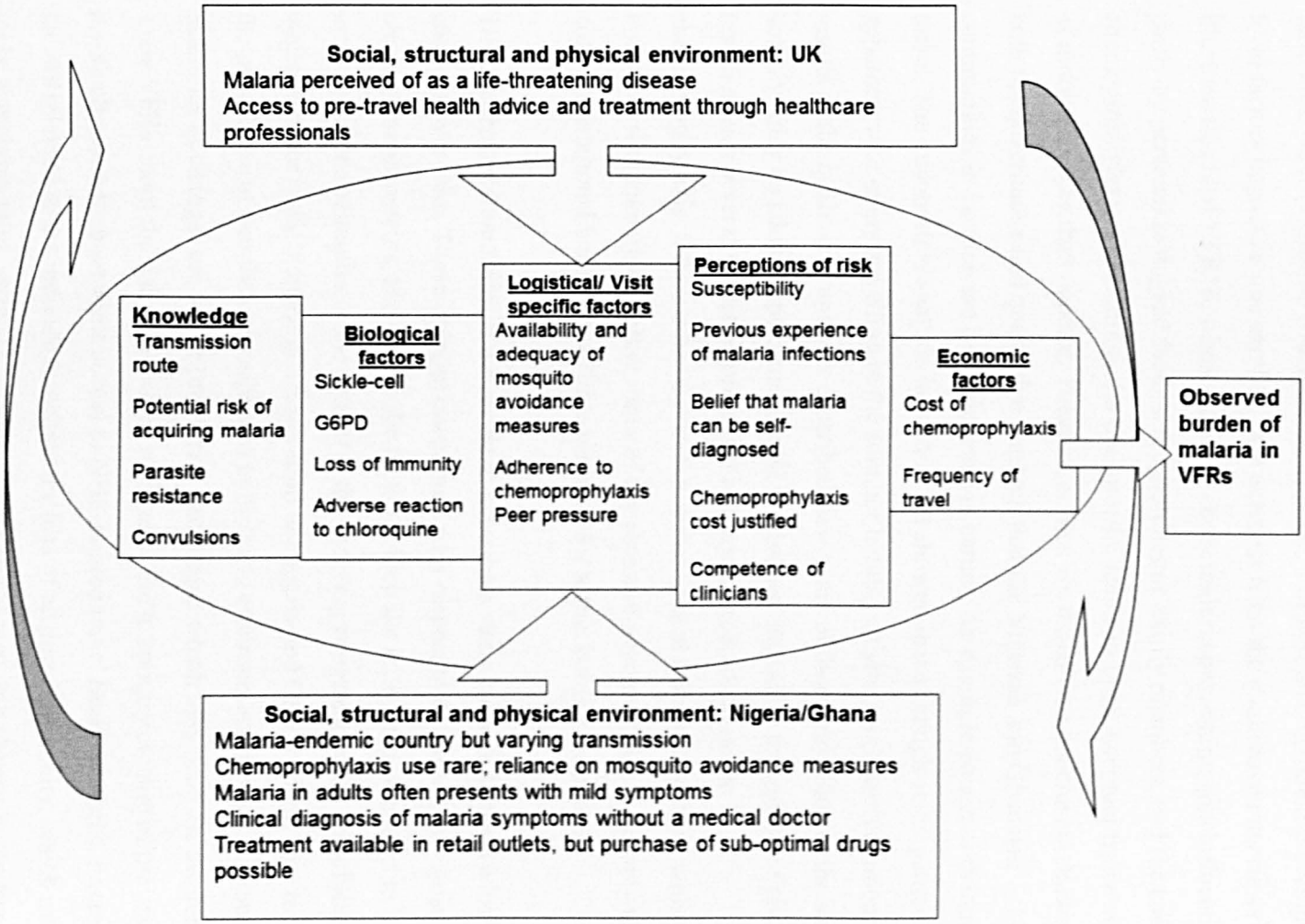

Figure 10.2.1 Conceptual framework revisited

It is important to note that not all factors shown in the oval shape in the framework are taken into consideration by each VFR in decision making about imported malaria. Instead, the particular combination of knowledge, circumstances and perceptions of the individual VFR determine which are considered. Furthermore, different individual-level factors impact on one another. One example from the qualitative interviews to illustrate this is of VFR16, whose decision about malaria prevention was influenced partly by personal biological factors, the attitudes of family members, and the cost of chemoprophylaxis. Furthermore, no one specific factor in the conceptual framework is of more relevance than another. These assertions are based on a conclusion drawn from both the quantitative and qualitative research that the Nigerian and Ghanaian communities in London are heterogeneous in nature. An example concerns the month of travel. The quantitative analysis in section 5.3 showed that although some patterns were apparent, with many travelling in the summer holidays, there was some variation. The results of the qualitative analysis described how some of those travelling in the summer holidays may be taking trips planned well in advance, including the uptake of pre-travel health advice several weeks before travel and uptake and adherence to chemoprophylaxis. Others who take well-planned trips at these times travel without this. For those who take trips at other times of the year and who may plan these only at short notice, operational barriers may be significant for some, but not for others.

The conceptual framework is not meant to describe a static context, but one which changes over time. These changes occur both with respect to the structural, social and physical environments, and also in the factors which the individual considers to be important. One examples of the former is the evolving resistance to SP and chloroquine, whilst another is the increasing urbanisation in Nigeria and Ghana which may reduce the prevalence of anopheles mosquitoes in the local environment. In the UK context, examples of changes are health promotion campaigns which may raise the awareness of some VFRs about the risk of imported malaria or the temporary closure of pre-travel health clinics, which prevents access to NHS-funded travel health services. Examples of factors relevant to the individual include the loss of acquired immunity, which may make symptoms more serious than previously experienced or a change in the frequency of travel. Repeated infection-free trips may lower the perception of the risk of acquiring imported malaria in future visits.

The social, structural and physical environment relevant to malaria control in Nigeria and Ghana was described in chapters one and two. The new findings of the qualitative part of this thesis focus on issues related to the social structural and physical environment in the UK with respect to malaria prevention and treatment, and to individual level factors. These are discussed in the following sections, with recommendations made about further work or interventions that could be undertaken. Some of the recommendations focus on providing up-dated advice to VFRs about effective prevention and diagnosis and treatment of malaria which are relevant to them in their unique situation, as members of a Diaspora. This is not an endorsement of psychological models of service uptake, discussed in section 4.1. Rather, it is in response to evidence from the thesis which suggests that tensions exist about who holds expert knowledge about malaria (VFRs, many of whom claim to have personal experience of managing the disease, or clinicians, who may have less personal experience but more up-to-date theoretical knowledge). However, although I believe that the provision of correct information is important, I do not assert that this is the only intervention undertaken. Indeed, given the complexity and interaction of the factors shown in the conceptual framework and the heterogeneity within the Nigerian and Ghanaian communities, it is worth emphasising that one of the main conclusions that can be drawn from this thesis is that it is not likely that implementing one intervention will be successful. Instead, multi-level interventions would need to be put in place. The related question of whether interventions carried out in one country alone are sufficient to prevent imported malaria is discussed in section 10.3.

10.2.1 The social, structural and physical environment in the UK

10.2.1a The operation of pre-travel health clinics

The thesis results revealed some difficulties experienced by health care professionals in operating travel health clinics. One issue was related to the pressure under which these services were operating, given the other priorities under QOF arrangements, and the non-inclusion of pre-travel health advice in these. One solution adopted by a GP practice was to direct travellers to privately-funded travel health clinics during times they were not able to offer services. Evidence from the thesis suggests that many VFRs

consider the financial costs involved in their healthcare. To persuade them to opt for the UK system, the easy and free accessibility of pre-travel health advice should be ensured. Without this, I argue, some may choose to continue to follow the established method of malaria control in Nigeria or Ghana, with a focus on treatment for an illness presumed to be malaria. Instead, an evaluation of the operation of local pre-travel health services is called for, to ensure that travellers are able to access free travel health advice at a surgery close to their area of residence. Local, rather than national policies are justified, as geographical areas with large migrant communities may need to offer a different range of services to other areas.

Another issue relating to the operation of pre-travel health clinics was concerned with timely attendance by travellers. Malaria is only one of several diseases that may be discussed in consultations. There may be a need to vaccinate travellers against other diseases such as typhoid and hepatitis A, and these vaccines do not offer immediate protection after being administered. Therefore, one priority for travel health services must be to encourage attendance well before travel wherever possible. There is however a need for consistency about the time before travel in which pre-travel health advice is sought, and clear communication made with patients about this. An assessment of the time before travel that health advice is sought could be made by a small working group of nurses, who could disseminate recommendations to colleagues.

Although information giving the time before travel that appointments should be made was available in some GP practices visited for this research, it was not always advertised. Furthermore, such advice is only read by those who attend GP practices. Other sites where such information may be provided include community pharmacists, libraries and in local newspapers. One possible implication of promoting the use of pre-travel health advice may be to increase the volume of travellers who access these. Given the difficulties already experienced by some practices in providing these services, a means of addressing this issue would need to be in place before advertising them widely.

10.2.1b Accessibility of travel health advice when travelling at short notice

The evidence from practice nurses was that travel at short notice may be more common amongst VFRs than in other groups of travellers, particularly given the need to attend

family-related events such as funerals. It has only been previously mentioned as an issue affecting the accessibility of travel health services for VFRs in one published study in the UK (Morgan and Figueroa-Muñoz, 2005). This thesis identified the provision of pre-travel health advice at short notice to be one of the main difficulties experienced by the majority of practice nurses, and was also raised as an issue by community pharmacists. Two of the six patients interviewed also described their inability to access chemoprophylaxis at short notice as being the reason they travelled without it, although one acknowledged that he had not prioritised the need to visit a travel clinic. As noted in section 8.5, more research would be useful to gain an accurate estimate of the proportion of malaria cases in the UK which can be attributed to difficulties in accessing pre-travel health advice shortly before travel.

Given the acknowledged constraints on the operation of travel health clinics described above, if further research identifies access to pre-travel health advice at short notice to be a barrier to its use, providing sufficient appointment times for individuals who seek health advice shortly before travelling is likely to be difficult. One option may be to set up in PCTs with large migrant populations one or two well-advertised and resourced travel health clinics, with extended opening hours to provide this service. Providing two or three trained community pharmacists who are able to prescribe and administer chemoprophylaxis in each borough may be another or additional option. Whilst this solution would only prevent malaria, and not travel-related vaccine-preventable diseases, it may be a pragmatic means of helping to reduce the incidence of imported malaria in areas of high incidence. This would also be a means by which the providers of local healthcare services in these areas could demonstrate an understanding of the needs experienced by some members of their local migrant communities who may need to travel at short notice. Of course, the cost of chemoprophylaxis may be a disincentive for some VFRS, even if they are able to access it at short notice. The recent policy change in LSL areas described in section 10.1.1 would have to be re-considered for these travellers, as the only drug which can be started shortly before travel should not now be prescribed unless other drugs are contraindicated. Amending this policy to provide this drug on a subsidised basis for one particular group of travellers (those travelling at short notice) may have the unintended consequence of encouraging more travellers to only access pre-travel health advice shortly before travel. This highlights

the complex nature of the issue of imported malaria and the interventions that can be taken to reduce the incidence.

10.2.2 Factors relevant to malaria control at the individual level

10.2.2a Adequacy of mosquito avoidance advice

Although the avoidance of mosquito bites is one of the four WHO recommendations for the prevention of imported malaria, only two studies have previously investigated this. One used a standardised questionnaire (Pistone et al., 2007), a study method that does not allow for in-depth discussions with respondents. The other only commented briefly on this issue (Leonard and VanLandingham, 2001). This thesis explored for the first time the factors which VFRs consider when deciding how to protect themselves against mosquito bites when in Nigeria or Ghana, the constraints associated with these and the operational difficulties associated with providing this aspect of pre-travel health advice.

The results revealed concerns by both VFRs and practice nurses about the provision of advice about protection against malaria bites. Together, these uncertainties may result in this issue being given little attention. Difficulties mentioned by nurses included the occasional awkwardness caused by ethnic differences between the individual nurse and the traveller, the need felt by some nurses to "tick all the boxes" to prove they had communicated the risk, thus precluding the opportunities for a relaxed discussion, and the time constraints that may prevent comprehensive pre-travel health advice being given. The unwillingness of many VFRs to listen to the advice of travel clinic nurses about the risk of being bitten by mosquitoes is perhaps an example of the general lack of confidence of some VFRs in British healthcare professionals vis a vis malaria control, compared to their own familiarity, gained from the experience of living in a malaria-endemic area. Indeed, in the questions asked about mosquito control in the interviews, many VFRs and patients displayed knowledge about the local environment in which they would be staying, and may justifiably feel that travel health nurses do not have this. None of the VFRs stated they would seek pre-travel health advice in order to learn about effective methods of mosquito control. Instead, the intention of seeking pre-travel health advice, amongst those who chose to do so, was to obtain a prescription for chemoprophylaxis. The skills of the practice nurse, as appeared to be perceived by many VFRs, were in prescribing this appropriately.

Although seeming not to pay heed to the advice given by travel clinic nurses, many VFRS however acknowledged that they did face difficulties in protecting themselves against mosquito bites, as described in section 7.5.3. Personal bednets, which would help to overcome at least some of these problems were however almost universally unpopular for VFRs and patients. This thesis produced new evidence to show the extent of this dislike, and the reasons underlying this.

Nevertheless, mosquito avoidance is important. As noted in section 2.3.1, the efficacy of malaria chemoprophylaxis is estimated to be is 90%. Thus it cannot be fully relied upon to prevent malaria. Aside from the lack of adherence to chemoprophylaxis by those who do choose to take it, it appears (from the epidemiological analysis in section 5.2.7), that many VFRs who contract falciparum malaria whilst visiting friends and relatives in Sub-Saharan African countries travel without it. This means for some there is almost a total reliance on protection against mosquito bites to prevent malaria. Given the constraints on GP practice-led travel health services, and that this method of imparting pre-travel health advice only reaches one section of the community (those who access pre-travel health services), other ways to communicate these messages about effective ways of preventing mosquito bites should be considered by UK-based imported malaria strategists. The findings from this thesis suggest that this information needs to be tailored in a way which acknowledges the expertise and experience of VFRs. Without this, suggestions about the most effective method for providing this information are unlikely to be successful. This is because from the evidence from those interviewed for this research, many VFRs do not consider such information to be targeted at them. This was particularly noticeable with respect to the discussions with travellers about the usefulness of pre-travel health advice issued on travel tickets. One option might be for practice nurses with an interest in travel health to work together with African community groups to determine the type of information that would be useful to them, and how it should be presented. For example, this might include sharing information about successful measures taken by other VFRs to protect themselves from being bitten by mosquitoes, and promoting the use of skin creams when sitting outside in the evening, a practice that appeared to be used by few VFRs. The best methods for disseminating this information to target communities could also be discussed in such

collaborations. A start to such work has already been undertaken (Health Protection Agency, 2009), and the opportunity to work together with healthcare professionals was received positively by the African community groups involved.

10.2.2b The influence of family and friends on VFRs

That some VFR respondents reported pressure by their family or friends not to use chemoprophylaxis was another significant new finding from this research. There were two different ways in which this could potentially impact on the decision to use it: one by dissuading VFRs from purchasing it in the UK before travel, the other by discouraging them from adherence to planned malaria prevention measures in Nigeria or Ghana. Only a few VFRs mentioned that the views of friends and relatives affected their decision making, and its importance would need to be evaluated in future research studies. The VFR (VFR12) who appeared to be the most influenced by peer pressure in the UK and in Nigeria was amongst the youngest of respondents, and it may be that those who are older, and/or travelling with children to whom they have a responsibility, may be less likely to be influenced by friends and family. The connection made by some younger African migrants living in London between cultural identity and the use of chemoprophylaxis, as described by this VFR, was interesting as it suggests a wish by some migrants to maintain established ways of managing this disease. The results also indicate an unawareness by some friends and relatives in Nigeria and Ghana of the changing risk for VFRs once they leave a malarious country, and/or an unwillingness to accept these. It should be remembered however, that although made fun of by her father for taking chemoprophylaxis, VFR12 *was* persuaded to take it by her mother; showing how even within one family, pressures to use chemoprophylaxis can be contradictory.

More details of the specific factors which may influence host family's attitudes were also described by some VFRs in comments made about other aspects of malaria prevention. For example, with respect to the use of mosquito control measures, VFR1 described how hosts' wealth and personal travel experiences may make them more likely to encourage protection against mosquito bites by their guests, compared to those who are less well educated and/or those living in rural areas. The interview with VFR18 meanwhile showed how the personal perceptions of individual VFRs (which for this respondent included a vehement dislike of chemoprophylaxis, an unawareness of

her possible loss of immunity and confidence in self-treatment) may make them resistant to the encouragement of friends and family. Others, such as VFR16, who believed his host family would "snigger" at their guests for taking chemoprophylaxis, was himself ambivalent about their use (see section 7.7.2). Much of the previous research about VFR's knowledge, attitudes and beliefs towards malaria has focused on exploring their own perceptions. These new findings suggest that the attitudes of family and friends and the interplay between them and the traveller may also be significant to some extent. If this is the case, then it presents an added complexity for travel health nurses in the discussions that are held with VFRs about travel health risks. It also provides more evidence for the assertion that imported malaria cannot be controlled solely by reducing barriers that are present in the UK (see section 1.4), such as improving access to pre-travel health advice.

10.2.2c Diagnosis and treatment of malaria

The only study to have previously investigated these issues was conducted in the USA, and only included Nigerian migrants. Whilst there were some similarities in the findings between the two studies (distrust of non-African clinicians and a fear of being isolated upon admission to hospital), there were also some new insights about the diagnosis and treatment of malaria that were explored in this thesis.

In some ways, the discussions with VFR and patient respondents about the diagnosis and treatment of malaria revealed similar findings to those described in section 10.2.2a which considered mosquito control methods: a belief held by some that previous experiences of the disease provides expertise to manage future situations. With respect to mosquito prevention measures, this sometimes failed VFRs and patients for reasons over which many felt they had little control, such as local environmental factors. With respect to the diagnosis of malaria on the other hand, many of the VFRs and patients perceived themselves as confident in their own ability to diagnose malaria from clinical symptoms (a skill some believed to have been acquired from previous experience and which some believed they had in contrast to non-African clinicians). This thesis provided examples of how in practice, these failed. Similarly, although many believed they were knowledgeable about the appropriate treatment for malaria, and confident in their ability to treat themselves, in the interviews carried out, few were aware of parasite

resistance to chloroquine and SP. The consequences of not being up to date with current effective malaria treatments were clear from the experiences of some VFRs described in the interviews.

Clinicians are thus faced with the challenge of providing new information to VFRs about the diagnosis and treatment of malaria in a way which acknowledges the expertise and previous experience that many VFRs have. For example, this might consist of summarising research about parasite resistance to SP and chloroquine in a way which can be easily communicated by VFRs. With respect to malaria diagnosis, clinicians could share their experiences of where self-diagnosis was not successful. Collaboration between clinicians and VFRs who are willing to engage with them may be one valuable method of circulating this to the wider African community. All of the patients interviewed were grateful for their care, and one, a pastor, was keen to disseminate the message that the fear of isolation was unfounded. Taking advantage of the goodwill of such individuals would be useful to overcome the mistrust and suspicion that appears to be held by some VFRs.

The thesis also provided evidence of a changing perspective among some VFRs with respect to diagnosis. Some *were* keen to take advantage of the facilities that are freely available in the UK, even if it entailed a wait of four hours or more, to exclude malaria as a possible diagnosis. According to one clinician, a growing number of VFRs are becoming aware of their gradual loss of immunity and that as a consequence of this, the symptoms experienced in future episodes of malaria may be more severe than previously. This gradual adaptation to the changing reality for some VFRS provides another opportunity for clinicians to engage with VFRs, and this could be done either opportunistically, and/or by engagement in local workshops or conferences.

However, these messages, whether disseminated by clinicians and/or community members are unlikely to be successful if mis-diagnoses and delayed treatment by UK-clinicians continue to be experienced by VFRs, as the evidence from this thesis suggests that anecdotes of these experiences are likely to be shared within the local Nigerian and Ghanaian communities. Thus, these problems must be dealt with effectively in order to increase the confidence of VFRs in non-African clinicians, and this presents another

challenge for clinicians. As with other issues discussed in this chapter, it also exemplifies the multi-faceted approach which must be taken to reduce the incidence of imported malaria in London, if it is to be successful.

10.2.2d Examples of VFR decision making about malaria using the conceptual framework

Four examples are provided in this section to show how the conceptual framework can be used to explain how VFRs may become infected with malaria.

The first is of a student, travelling back to Nigeria to visit his parents. He had no intention of seeking pre-travel health advice in the UK, because he believed he could recognise the symptoms of malaria, as he had previously successfully treated himself for an illness which he had presumed to be malaria. Although encouraged to take chemoprophylaxis by some of his UK-based Nigerian friends, he feared they would contain chloroquine, against which he had had a severe reaction in the past. A friends persuaded him to do visit his GP practice, and he did so a week before he left. He was told that AP, the only drug that could be taken shortly before travel was no longer available for the price of a NHS prescription, but he could purchase it at a British Airways travel clinic. He thought the cost of this service to be unjust and did not purchase it.

He planned to stay in his parent's house in Lagos throughout his visit. He was aware of the mosquito control measures in their home, and intended to protect himself from mosquito bites by covering his body in the evenings when he was outside. However, he had to make an unexpected trip to a rural area of Nigeria to visit his grandmother. Just before leaving Nigeria, he developed symptoms suggestive of malaria and purchased SP from a community pharmacist. This was the usual method he used to treat himself. It was ineffective and he attended A&E two days after arrival in the UK, where he was confirmed to have malaria.

A female VFR was travelling to Nigeria with her children. She made this trip every two years, and planned it carefully. She visited her local GP practice in Lambeth for pre-travel health advice and obtained subisdised malaria chemoprophylaxis. She took care

to protect herself and her children from mosquito bites for the first two weeks of her trip. Her parents criticised her for what seemed to them to be an over-reaction to the risk of malaria when she applied creams to her children's skin, and made them cover their arms and legs in the evening. The children themselves were also reluctant to do this. They also disliked taking the weekly dose of mefloquine. Despite this, she enforced these measures. After she arrived back in the UK, she did not insist on them finishing the course because they had no symptoms of malaria. One child developed malaria-type symptoms, which were initially mis-diagnosed by her GP. The child received a laboratory-diagnosis of malaria upon admittance to hospital.

A VFR travelled with his wife and children to Ghana for the first time in several years. They sought pre-travel health advice, but were unable to afford the cost of the chemoprophylaxis they were prescribed. Instead, they decided to purchase it for the children only. The husband had sickle-cell trait, and felt as such, he was not susceptible to malaria. The wife felt she had some immunity to malaria. Although she remembered experiencing severe symptoms in her childhood, as an adult, the symptoms she had acquired, and which she had assumed to be malaria were mild and easily treated. Ghanaian-born friends living in the UK advised them to purchase malaria treatment for themselves before returning to the UK. Despite attempting to protect themselves from malaria bites, they were unprepared for the number of mosquitoes in the area in which they stayed. As they did not have malaria symptoms before they left Ghana, and had little spare time, they did not purchase the treatment they intended. The wife contracted malaria.

A VFR had travelled annually for the last five years without taking chemoprophylaxis before leaving the UK on any of these visits. The nature of his employment meant that he always had to travel at short notice. He had become aware through cases publicised in the UK media that he was more at risk of malaria than he had previously thought, and for the first time decided to seek pre-travel health advice. He tried to make an appointment at his GP travel clinic, but was told none were available at short notice. His attempt to purchase chemoprophylaxis from a community pharmacist was unsuccessful. His Accra-based hosts had recently moved, and were in the process of renovating their new property, but had not yet replaced the old window and door screens which had

holes in. He acquired malaria shortly before leaving Accra. He was reluctant to attend hospital in London, because he had heard rumours that he would be isolated. However, after his health deteriorated, he was admitted.

10.2.2e Summary of the conceptual framework

The conceptual framework presented in this thesis is the first time that such a framework has been constructed for imported malaria. This needs to be tested in other contexts to examine its validity. One example might be New Zealand residents of Pacific Island ethnicities visiting the Solomon Islands, Vanuatu or Papua New Guinea as VFRs. Another example where it could be tested is for second generation migrants. A third example is its validity with respect to other common travel-related diseases, such as typhoid. The relevance of the framework with respect to how VFRs manage new and emerging infections, which may perhaps become more prevalent as a result of climate change, is also deserving of further research.

10.3 Other theoretical issues discussed in the thesis

The next section deals with the three theoretical questions raised in this thesis, and uses the conceptual framework shown in figure 10.2.1 to answer these.

The first question was whether diseases such as imported malaria could be prevented within non-endemic countries by the removal of structural barriers, or whether this is unlikely, given the broad range of factors which impact on the burden of disease. As shown in the conceptual framework, it is clear that there *were* structural barriers which may have contributed to the decision not to seek prevention against malaria. However, as has been demonstrated throughout the thesis, there is considerable heterogeneity within the Nigerian and Ghanaian communities. Thus, no single structural barrier is likely to be a problem for all respondents. For example, for some, the cost of chemoprophylaxis may not be a deterrent, but problems with accessing travel health advice at short notice may prevent them from taking chemoprophylaxis. For others, none of the structural barriers revealed in this thesis may be relevant to their decision making. Therefore, it is unlikely that even where a particular structural factor was a deterrent, would its removal result in a significant decrease in the incidence of imported malaria. Nonetheless, I argue that it is worthwhile making interventions in countries

where imported malaria occurs to reduce the Public Health burden of this disease and the impact of infection on the individual. .

The remaining question is whether interventions carried out in the UK alone could prevent imported malaria. The evidence from this thesis was that some VFRs were content to follow the established way of managing malaria in Nigeria or Ghana. Furthermore, the finding that the attitudes of friends and relatives influence the behaviours of UK-based VFRs suggests that imported malaria cannot be eliminated solely by focusing on reducing barriers in the UK. On the other hand, as asserted in section 10.2, the contexts in which VFRs make decisions are not static, but change over time. Thus, the importance given to the beliefs of family friends and members for example, may become less relevant. However, I believe that this question cannot be answered until all new interventions undertaken in the UK as suggested in this chapter are implemented and evaluated. Further research could then take place to determine the reasons why individuals did not adopt a policy of prevention rather than treatment of malaria and the extent to which these were influenced by factors not directly in the control of UK-based health professionals.

The second issue raised in the thesis was concerned with what constitutes an appropriate definition of "VFR" and in particular, whether ethnicity should be included in this definition. As shown in the conceptual framework, one factor which impacted on decisions made about malaria control was related to the importance of following societal and cultural norms in Nigeria and Ghana. Nearly all VFRs and patients' decision making was influenced to some extent by these factors. Health care providers and community pharmacists also voiced these issues as being a contributory factor to decision making by their patients and customers respectively. Clearly, there were individual differences in the *extent* to which ethnicity was a contributory factor, and the importance of understanding these individual differences were cited by Matteelli and colleagues (Matteelli et al., 2010). However, it could justifiably be argued on the evidence presented and shown in the conceptual framework that ethnicity is an important component associated with the term "VFR". Of course, this work is restricted to one disease area, and it would be useful to discover to what extent ethnicity is

important with respect to decision making about other travel-related infectious diseases, such as typhoid.

The third issue, how risk is assessed by individuals, was an important theme which arose throughout the research. It was identified initially in the literature review in chapter two, with respect to the perceived potential and personal risks associated with contracting malaria, and in each of the three qualitative results chapters there were many examples of risk assessment being made by VFRs. In section 3.9, the issue was raised of whether risk could be considered as a social construct, as proposed by Douglas and Wildavsky (Douglas and Wildavsky, 1982). Again, the conceptual framework shown in figure 9.2.1 helps to address this issue.

Of the three inter-related components with respect to risk put forward in this theory, the first was "private, subjective perception". As shown in the conceptual framework, subjective perceptions influenced some decisions that individuals made about the risk of malaria. One example was how previous experiences of malaria contributed to the decision to use chemoprophylaxis on future trips. Another was the dislike of taking tablets, which was a relevant issue for some.

The second component was the importance of accurate knowledge in order to be able to assess risk. The patient and VFR respondents demonstrated clearly the benefits of holding correct knowledge, as they understood why avoiding mosquito bites is necessary to reduce the risk of acquiring malaria when visiting a malarious country. The information presented in chapter two also showed how insufficient knowledge can lead to difficulties in assessing risk. This was with respect to the time required for immunity to malaria to be lost, which was unclear for VFRs but also for malaria experts.

The third component of Douglas and Wildavsky's theory was that following societal norms enables individuals to deal with the otherwise unmanageable amount of information they are faced with when assessing risk. Although no respondent specifically indicated that their decision making was a result of their inability to process or manage large amounts of, or conflicting information, there was evidence in the responses given by respondents of the following of social norms by some VFRs.

Examples include the choice of those mosquito avoidance measures which were common amongst friends and relatives in Nigeria and Ghana, and the use of community pharmacists in Nigeria and Ghana to purchase treatment for malaria.

Douglas and Wildavsky claim further that the prevailing social environment puts constraints on the individual with respect to the choices they make about risk. This was overtly expressed by some respondents, with respect to their perception that they were at a greater risk of malaria than their host families in Nigeria and Ghana. This was seen to lead to some instances of peer pressure when they visited their families in these countries and adopted practices with respect to protection against malaria that would not be followed in these countries. In the UK context also, the social environment imposed risks, for example some did not understand that the common view held in the UK that malaria is potentially a fatal disease. The unique situation of VFRs, as shown in the conceptual framework is that they are at the interface of two social environments, each of which is taken into consideration when making decisions about managing malaria. The results of the research carried out for this thesis and presented in the conceptual framework show that not only the social environment, but also the structural and physical environment are valid, and the failure by Douglas and Wildavsky to include these is perhaps a limitation of their theory.

10.4 Limitations

The limitations associated with each research methods (epidemiological analysis and qualitative research) have been described within the thesis. To summarise, with respect to the epidemiological analysis, these were broadly related to issues of data quality of both numerator and denominator, for example, the MRL reporting form may be not fully completed, or there may be inaccuracies in the information provided by clinicians completing the forms.

The MRL dataset includes reports of laboratory-confirmed malaria. The findings from the study carried out by Ladhani and colleagues showed that there may be individuals with mild symptoms of malaria who are never tested (Ladhani et al., 2003). Thus, the MRL data may only reflect a sub-set of the true number of those infected, and risk factors for those with more mild symptoms may differ. Without the availability of a

dedicated plasmodia screening programme for those who return to the UK after visiting malarious endemic countries, including the collection of risk factors for these individuals, there is little that could be done to overcome this, but the results of the epidemiological analysis should be borne with this limitation in mind.

The use of mid-year population estimates to measure incidence rates is not an accurate measure, as not all members of the community may travel, and some may travel more than once in any given year. The use of an alternative denominator, IPS data from the ONS, provided a useful alternative, but more detailed categorisation, relating to age, and sex, which would have enabled a more thorough analysis to be undertaken.

One of the main limitations of the qualitative study was its small-scale nature, which comprised only 56 respondents. Only a limited number of individuals were invited to attend, and others may have provided different perspectives. In addition, those individuals who were invited to participate but declined to do so may have provided different information to those who did agree to be interviewed. Having said this, similar themes were raised by participants in each respondent group, and it appeared that saturation point was reached for VFRs, GPs, practice nurses and community pharmacists by the end of data collection. Difficulties with recruitment of hospital consultants and patients precluded more being interviewed, but it is accepted that it would have been useful to increase recruitment to these groups. It was acknowledged throughout the thesis that the results of the qualitative study need to be tested using quantitative research methods to examine the extent to which they can be extrapolated to a wider population.

Given the small scale of the qualitative study, in the analysis, the findings from both Nigerians and Ghanaian respondents were included together. Although the epidemiological analysis showed that both groups are disproportionately affected by imported malaria, many factors, such as the structural, social and physical environment between these countries may differ considerably. More detailed research would be needed to explore this.

In the qualitative research, one patient explained that there were some factors which, as a non-Nigerian I could not understand. Thus, the difference in ethnicity between myself and the respondents may have introduced a certain reticence or bias in the responses that they gave. The result of this would be a failure to include all relevant factors in the analysis. This is accepted as a being a limitation. However, as noted in section 6.6.1, many African respondents took on the role of experts in the interviews, and some of the information provided to me, may not have been imparted to someone they judged to be already familiar with the issues discussed.

One of the most significant limitations of the qualitative research was that with the exception of one respondent, all VFRs and patients were born in either Nigeria or Ghana. Thus, the views of second generation migrants were not included. The results of the qualitative analysis should be considered in the light of this limitation.

10.5 Final thoughts

The reasons for the burden of imported malaria in the UK amongst the Nigerian and Ghanaian community are complex. Attempting to forecast future incidence trends will require consideration of a variety of factors and their interactions. It is worth repeating Bradley's 1989 comment, first quoted in the introduction to this thesis, that unexpected and relatively unpredictable events may determine the course of imported malaria, and making predictions about its future incidence is fraught with danger (Bradley, 1989).

One issue that will affect future trends is the extent to which structural factors in the UK continue to present a barrier to accessing chemoprophylaxis in particular, and this in turn reflects the level of commitment of the UK Government to a policy of health prevention rather than to treatment for common travel-related diseases. Without a concerted policy to ensure that measures are put in place to help VFRs protect themselves against malaria, some may continue to follow the established method of malaria control in Nigeria and Ghana, with a focus on treatment for an illness presumed to be malaria. In addition, the distrust held amongst some VFRs about the skills of non-African clinicians must be overcome in order that their recommendations are accepted.

However, the use of these established methods will also be affected by the extent to which VFRs recognise that the risk to themselves is not the same as when they were resident in Nigeria or Ghana, that a focus on prevention rather than treatment is preferable, and that there are limitations to the ways in which malaria is diagnosed and treated in Nigeria and Ghana. It has been shown in this thesis that there is some evidence of this changing perspective, and focused, appropriate health promotion campaigns could help to ensure this continues.

Environmental changes within Nigeria and Ghana, for example caused by increasing urbanisation, may also affect future trends in malaria incidence. Whilst this may decrease incidence, paradoxically, a level of complacency amongst VFRs with respect to the perceived risk of contracting malaria when in a malarious country may result. This would mean that fewer efforts at protection are made, and that cases continue, or even perhaps increase.

Another issue influencing future trends in imported malaria will be the success or failure of the current efforts to eliminate malaria in Nigeria and Ghana. The acceptance and affordability of one change in policy, namely that introduced by the WHO in 2010 that all cases should be parasitiologically-diagnosed and treated with ACTs (World Health Organisation, 2010) may be an indicator of the extent to which elimination efforts are practical. It will be interesting to evaluate whether this policy change is recognised by VFRs, and in particular to determine if they are aware of and follow these recommendations themselves when they are visiting Nigeria and Ghana.

In writing this thesis, it has been difficult at times to envisage that imported malaria could be controlled, given the wide-ranging factors which contribute to the burden of this disease. Nevertheless, it is worth remembering that malaria is preventable, and that it has already been eliminated in a number of malaria-endemic countries (Tatem et al., 2010). Thus, whatever health policies are considered and implemented should be undertaken with confidence that a reduction in the incidence of imported malaria in the Nigerian and Ghanaian communities living in London can be achieved.

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Appendix 1 – MRL Report Form

Your Reference No.

MRL No. _ _ /_ _ _ _

HEALTH PROTECTION AGENCY
MALARIA REFERENCE LABORATORY
PATIENT REPORT FORM

In Confidence

Date --------/--------/--------

Family name: _____

All other names: _____

Home post code: _____ Primary Care Trust: _____

Address in U.K: _____

_____

_____

Date of birth: ____/____ /____ Age _____ Sex : M / F

Country of birth: _____ Country of usual residence: _____

Ethnicity:(mark one)	Reason for travel:(mark one)	Malaria prophylaxis taken:(mark as relevant)
☐ White British	☐ New Entrant to UK	☐ NONE
☐ Other White background	☐ Visiting family in country of origin	☐ Mefloquine (Lariam)
☐ Black African	☐ UK citizen living abroad	☐ Malarone
☐ Black Caribbean	☐ Civilian sea/air crew	☐ Doxycycline
☐ Other Black background	☐ British armed forces	☐ Chloroquine (Nivaquine/Avloclor)
☐ Indian Sub-Continent	☐ Business/Professional travel	☐ Proguanil (Paludrine)
☐ South-East Asian	☐ Foreign student studying in UK	☐ Unknown
☐ Other Asian background	☐ Holiday travel to malarious country	☐ Other _____
☐ Mixed ethnicity	☐ Foreign visitor ill while in UK	
☐ Other (please specify)	☐ Children visiting parents living abroad	Prophylaxis taken regularly? Y / N
	☐ Other (please specify)_____	Continued on return for _____ weeks

Date of onset of illness:____/____/____ Date of starting treatment: ____/____/____

Date of arrival in U.K. from malarious country: ____/____/____

Duration of stay abroad :_____

For India, please specify areas visited

Country (ies) where infection acquired :_____

G.P. Name & Address:	Name & Contact Details of person completing this form if not the G.P.
Tel.No.	

MRL patient report form VS June 2008

Please complete other side →

Laboratory/Hospital where diagnosis made: _____

_____

Date of diagnosis: _____/_____/_____ Date of sample: _____/_____/_____

Method of diagnosis: ☐ Blood film ☐ Antigen test ☐ Clinical

please specify _____

Species of malarial parasite:

☐ P.falciparum ☐ P.ovale

☐ P.vivax ☐ Species unknown

☐ P.malariae ☐ No malaria parasites found

Was patient treated as an ☐ outpatient ☐ inpatient Was this patient admitted to ITU/HDU? Y / N

Duration of stay in hospital _____ days.

Pregnant? Y / N ----------/40

Outcome of illness: Recovery ☐ Death ☐ Unknown ☐

Any other information relevant to this case: _____

_____

_____

_____

_____

MALARIA IS A NOTIFIABLE DISEASE- PLEASE FILL IN A STATUTORY NOTIFICATION FORM AND FORWARD TO THE CCDC.

Please return this form to:

HPA Malaria Reference Laboratory
London School of Hygiene & Tropical Medicine
Keppel Street (Gower Street)
London WC1E 7HT

Tel. no: surveillance 020 7927 2435
laboratory 020 7927 2427
fax 020 7637 0248

If sending slides, please indicate where and to whom results should be sent.

MALARIA LAB. USE ONLY

Appendix 2 – Topic Guides

VFRs

Country and area being visited/area just visited
Length of time spent planning the trip
Where ticket purchased and whether any health advice was noticed
Health concerns when travelling
Potential risk of acquiring malaria in the country being visited
Planned/actual use of mosquito avoidance measures
Perceptions of malaria as a serious disease
Personal susceptibility to malaria including sickle-cell and G6PD
Previous experience of malaria
Potential fatal consequences of contracting malaria (for VFRs 16-20)
Beliefs about immunity to malaria
Perceived differences between Nigerians/Ghanaians and friends and family in the UK with respect to the seriousness of malaria
Use of chemoprophylaxis
Choice of chemoprophylaxis
Cost of chemoprophylaxis
Access to pre-travel healthcare
Plans for dealing with any symptoms in Nigeria or Ghana, and on return to the UK
Perceived reasons why malaria was contracted, description of symptoms, actions after initiation of symptoms (if relevant)
Fever and malaria
Convulsions and malaria
Perceptions of UK health services for the treatment of malaria
Knowledge about malaria transmission
Date of birth
PCT of residence
Country of birth and subsequent migration
Number of years resident in the UK
Areas within Nigeria or Ghana visited, frequency of travel, duration of visits
Number of people travelling on most recent trip
Borough of residence
Occupation

Patients

When became ill
Symptoms
Initial actions
How malaria was diagnosed
Where treated
Perceptions of where malaria may have been acquired
Country and area just visited
Length of time spent planning the trip
Where ticket purchased and whether any health advice was noticed
Health concerns when travelling
Potential risk of acquiring malaria in the country being visited
Use of mosquito avoidance measures
Perceptions of malaria as a serious disease
Personal susceptibility to malaria including sickle-cell and G6PD
Previous experience of malaria
Beliefs about immunity to malaria
Perceived differences between Nigerians/Ghanaians and friends and family in the UK with respect to the seriousness of malaria
Use of chemoprophylaxis
Choice of chemoprophylaxis
Cost of chemoprophylaxis
Access to pre-travel healthcare
Plans for dealing with any symptoms in Nigeria or Ghana, and on return to the UK
Fever and malaria
Convulsions and malaria
Perceptions of UK health services for the treatment of malaria
Knowledge about malaria transmission
Date of birth
PCT of residence
Country of birth and subsequent migration
Number of years resident in the UK
Areas within Nigeria or Ghana visited, frequency of travel, duration of visits
Number of people travelling on most recent trip
Borough of residence
Occupation

GPs

Length of time employed as a GP
Seasonality of VFR presentation with symptoms
Symptoms which would make malaria be considered as part of a differential diagnosis
Estimate of number of patients seen with suspected malaria
Self-treatment of VFRs before seeing GP
Recent travel asked/volunteered by patients with malaria-type symptoms
Actions upon presentation of malaria symptoms
Estimate of number suspected subsequently found to be infected with malaria
Fever and malaria
Experience of cases of severe malaria
Cost of chemoprophylaxis
Exploration and evaluation of:
VFR perceptions of a potential risk of acquiring malaria
VFR perceptions of a personal risk of acquiring malaria
VFR perceptions of their susceptibility to malaria
VFR perceptions of malaria as a serious disease
VFR perceptions of their immunity to malaria

VFR knowledge of how malaria is transmitted
Operation of travel health clinics

Practice nurses

Length of time employed as a practice nurse
Sex
Duration of travel
Seasonality
Urban or rural areas visited
First time or regular VFR travellers
Length of time before travel pre-travel health advice sought
Health concerns of travellers
Initiation of discussion about health advice
Sickle cell/ G6PD
Chloroquine resistance
Choice of chemoprophylaxis
Plans for bite avoidance measures including bed nets
Cost of chemoprophylaxis
Adherence to chemoprophylaxis
Sources and sufficiency of information to issue VFRs pre-travel health advice
Operation of travel health clinics
Exploration and evaluation of:
VFR perceptions of a potential risk of acquiring malaria
VFR perceptions of a personal risk of acquiring malaria
VFR perceptions of their susceptibility to malaria
VFR perceptions of malaria as a serious disease
VFR perceptions of their immunity to malaria

VFR knowledge of how malaria is transmitted

Community pharmacists

Length of time employed as a pharmacist
Number of customers seeking pre-travel health advice
Sex
Duration of travel
Seasonality
Urban or rural areas visited
First time or regular VFR travellers
Length of time before travel pre-travel health advice sought
Health concerns of travellers
Purchase of chloroquine by VFRs
Purchase of mosquito avoidance measures, including bednets
Cost of chemoprophylaxis
Appropriateness of the prescription for the area being visited and dosage
Subsidising of chemoprophylaxis
Sources and sufficiency of information to check appropriateness of prescriptions
How often updated
Perceptions of why VFRs might use community pharmacists to seek per-travel health advice
Requests for malaria treatment
Actions upon presentation of a customer with suspected malaria
Fever and malaria
Exploration and evaluation of:
VFR perceptions of a potential risk of acquiring malaria
VFR perceptions of a personal risk of acquiring malaria
VFR perceptions of their susceptibility to malaria
VFR perceptions of malaria as a serious disease
VFR perceptions of their immunity to malaria

VFR knowledge of how malaria is transmitted

Hospital consultants

Length of time working as a hospital consultant
Duration of travel
Seasonality of VFRs presenting with malaria symptoms
Urban or rural areas visited
First time or regular VFR travellers
Presentation at GP surgery before attending A&E
Estimate of number of patients seen
Waiting times in A&E
Presenting symptoms
Sickle-cell/G6PD
Self-treatment before presentation
VFR knowledge of chloroquine resistance
Number of patients confirmed with malaria
Number of patients presenting with severe malaria
Isolation of patients with suspected malaria
Cost of chemoprophylaxis
Use of mosquito bite avoidance measures including bednets
Exploration and evaluation of:
VFR perceptions of a potential risk of acquiring malaria
VFR perceptions of a personal risk of acquiring malaria
VFR perceptions of their susceptibility to malaria
VFR perceptions of malaria as a serious disease
VFR perceptions of their immunity to malaria

VFR knowledge of how malaria is transmitted

Appendix 3 – Ethical Approval

3a - **The following is the transcript of email correspondence between me and NRES, asking if ethical approval is required for interviewing staff employed by the NHS**

Thank you.
The following reply has been provided by Hilary Tulloch, Business Support Coordinator.

Your study does not fall within our remit because it does not involves the categories listed in 3.1 of GAfREC.

I hope this helps.

Regards

Queries Line
National Research Ethics Service (NRES)
National Patient Safety Agency
2nd Floor, Block A
50 Eastbourne Terrace
London W2 6LG

-----Original Message-----
From: Penny Neave [mailto:Penny.Neave@lshtm.ac.uk]
Sent: 31 August 2007 11:10
To: Queries
Subject: RE: Ethical approval for my PhD research

in reply to your request, please find below my research proposal.
NB: this has already been granted ethical approval by the London School of Hygiene's ethic's committee

The aim of the project is to explore the 'perceptions of illness risk associated with visiting friends and relatives in Africa among the African population living in London and their malaria prevention and treatment behaviours.'

Both quantitative and qualitative methods will be used

Quantitative analysis includes secondary analysis of Malaria Reference Laboratory data including cases of malaria from 2001 to 2006. Analysis of more recent yearly data will be undertaken when available.

All qualitative work will be undertaken in the areas of London with high numbers of African residents.

It will take the form of case studies, including

1. Semi-structured interviews with Africans aged over 16 about to travel to Africa and their families, (separate interviews with each) both before and after travel

Recruitment will take place through:

a) written requests for participation through contacts with members of churches with large African congregations, with a subsequent use of a "snowball effect" whereby those recruited would be asked for other potential participants

b) requests through primary, secondary schools, and technical colleges This would include a letter to the Headteacher /Principal explaining the reasons for the study and requesting a short interview to further discuss the issues. A letter would then be written to parents of African children within the school explaining the project and asking for potential participants to contact the Principal Investigator.

The preparation of a lesson plan on malaria at an appropriate level that can be used by teachers would be offered by the Principal Investigator to all schools contacted to ensure that some educational benefit was included.

2. semi-structured interviews with GPs, practice nurses, community pharmacists and A&E consultants in areas of London with high African population

These will be identified through information obtained through Primary Care Trusts and the Royal Pharmaceutical Society. Letters will be written to potential participants describing the study, with follow-up telephone conversations to arrange interviews if agreed

About 20 interviews with families are planned, together with 15 interviews in total with GPs, practice nurses, community pharmacists and A&E consultants

>>> "Queries" <Queries@nationalres.org.uk> 08/30/07 4:58 PM >>>
Thank you.
The following reply has been provided by Jo Downing, Information Officer

Thank you for your query. So that we might further consider your query, please email an A4 summary (one side only) outlining your proposal to Queries Line. For ease of reference please include your request in the covering email.

I look forward to hearing from you.
Regards

Queries Line
National Research Ethics Service (NRES)
National Patient Safety Agency
Website: www.nres.npsa.nhs.uk

Ref: 021/00

Sent: 30 August 2007 14:52
To: Queries
Subject: Ethical approval for my PhD research

I wonder if you could advise please.

I have got ethical approval from the London School of Hygiene and Tropical Medicine for my PhD research. I will be carrying this out with various groups including 1) members of the public, not patients 2) community pharmacists 3) GPs/practice nurses/A&E consultants. It will involve interviews with individuals and families.

Can you advise me whether I also need ethical approval from you please?

Hope you can help, and look forward to hearing from you

Best wishes
Penny Neave

3b: NRES approval (their reference H0706/6) for interviewing patients at King's College Hospital

NHS
Health Research Authority

Riverside Research Ethics Committee
Room 4W/12, 4th Floor West
Charing Cross Hospital
Fulham Palace Road
London W6 8RF
Telephone: 020 8846 7282
Facsimile: 020 8846 7280

Ms P Neave
PhD student
London School of Hygiene and Tropical Medicine
c/o Malaria Reference Laboratory
London School of Hygiene and Tropical Medicine
Keppel Street, WC1E 7HT

06 March 2009

Dear Ms Neave

Full title of study:	**Perceptions of illness risk associated with visiting friends and relatives in Africa among the African population living in London and their malaria prevention and treatment behaviours**
REC reference number:	**09/H0706/6**

Thank you for your letter of 23 February 2009, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

The Committee has designated this study as exempt from site-specific assessment (SSA). The favourable opinion for the study applies to all sites involved in the research. There is no requirement for other Local Research Ethics Committees to be informed or SSA to be carried out at each site.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission at NHS sites ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Clarification of sponsor's e-mail		
Application	AB/144286/2	12 December 2008
Key Collaborator	1	01 November 2008
Supervisor's CV	1	01 November 2008
Participant Consent Form	1	01 November 2008
Protocol		28 November 2008
Investigator CV		
Participant Information Sheet	3	01 February 2009

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document "After ethical review –guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nres.npsa.nhs.uk.

09/H0706/6	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project

A Research Ethics Committee established by the Health Research Authority

Yours sincerely

[redacted]

Sabita Uthaya
Chair

Email: atul.patel@imperial.nhs.uk

Enclosures: "After ethical review – guidance for researchers"

Copy to: *Dr Ron Behrens*

3c – NRES approval for interviewing patients at HTD (amendment to application number H0706/6).

Riverside Research Ethics Committee
Room 4W/12, 4th Floor West
Charing Cross Hospital
Fulham Palace Road
London W6 8RF
Tel: 020 3311 7262
Fax: 020 3311 7280

Ms P Neave
PhD student
London School of Hygiene and Tropical Medicine
c/o Malaria Reference Laboratory
London School of Hygiene and Tropical Medicine
Keppel Street
WC1E 7HT

08 December 2009

Dear Ms Neave

Study title:	**Perceptions of illness risk associated with visiting friends and relatives in Africa among the African population living in London and their malaria prevention and treatment behaviours**
REC reference:	**09/H0706/6**
Amendment number:	**1**
Amendment date:	**12 November 2009**

The above amendment was reviewed by the Sub-Committee in correspondence.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Participant Information Sheet	4	01 November 2009
Protocol	6 (Excluding Appendix 1)	01 November 2009
Notice of Substantial Amendment (non-CTIMPs)	1	12 November 2009

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

09/H0706/6:	**Please quote this number on all correspondence**

Yours sincerely

Atul Patel
Committee Co-ordinator

E-mail: atul.patel@imperial.nhs.uk

Enclosures: *List of names and professions of members who took part in the review*

Copy to: *Dr Ron Behrens*

3d: Permission from King's College Hospital R&D Department to carry out interviews with patients

Directorate of
RESEARCH & DEVELOPMENT

Ms Penny Neave
Research Student
London School of Hygiene and Tropical Medicine
London
WC1E 7HT

9 July 2009

KH/WF

Full Research & Development Approval

R&D: KCH632
Title: Perceptions of illness risk associated with visiting friends and relatives in Africa among the African population living in London and their malaria prevention and treatment behaviours
REC: 09/H0706/6

Dear Ms Neave

Thank you for submitting your research project to the R&D Department. The project has now been approved by the Trust. Please quote the R&D registration number noted above in any communications with the R&D Department regarding your project.

Conditions of Approval:

- The Principal Investigator must notify R&D of the actual start and end date of the project.
- The Principal Investigator is responsible for ensuring that Data Protection Principles are observed throughout the course of the project and adhere to relevant Trust policies.
- The agreed protocol must be followed. R&D must be notified of any changes to the protocol prior to implementation.
- The Principal Investigator and research team must have appropriate substantive or honorary contracts with the Trust. The Principal Investigator is responsible for ensuring that the team is covered, including new staff recruited to the study.
- If your study is a medicinal clinical trial all members of the research team must have completed GCP, Pharmacovigilance and Trial Master File training - please contact scott.vezina@kcl.ac.uk if training or annual updates are required.
- Please submit a copy of the progress report on the anniversary of the Ethics favourable opinion (sent via the CI)

Trust approval for the research is subject to the research being undertaken in line with the Department of Health's Research Governance Framework, and Trust policies relating to Research Governance.

The Research Governance Framework and details of you and your researchers responsibilities within this framework can be found on the Department of Health's website at:
http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4108962

If appropriate it is recommended that you register with the Current Controlled Trials website: http://isrctn.org/

In line with the Research Governance Framework, your project may be randomly selected for monitoring for compliance against the standards set out in the Framework. For information, the Trust's process for the monitoring of projects and the associated guidance is available from the Trust's intranet or on request from the R&D Department. You will be notified by the R&D Department if and when your project has been selected as part of the monitoring process. No action is needed until that time.

Many thanks for registering your research project

Yours sincerely

Wendy Fisher
Research and Development Manager (non-commercial)
Research and Development Department
Kings College Hospital NHS Trust
First Floor Jennie Lee House, 34 Love Walk
London SE5 8AD

R&DRegistration@kch.nhs.uk

CC: Tunye Lasoye, Consultant and Clinical Lead, Emergency Department.,, First Floor, Denmark Wing, KCH

3e –permission from Joint UCLH/UCL/Royal free Biomedical Research Unit to carry out interviews with patients at HTDl

University College London Hospitals NHS
NHS Foundation Trust

Joint UCLH/UCL/RoyalFree Biomedical Research (R&D) Unit

Office Location:
1st Floor Maple House
149 Tottenham Court Road
London W1T 7DN

Postal Address:
Rosenheim Wing, Ground Floor
25 Grafton Way
London WC1E 6DB

22/12/2010

Ms Penny Neave
HTD

Dear Ms Neave,

Project ID: 10/0194 (Please quote in all correspondence)
REC Ref: 09/H0706/6
Title: Perceptions of illness risk associated with visiting friends and relatives in Africa among the African population living in London and their malaria prevention and treatment behaviours

Thank you for registering the above study (non-IMP) with the UCL/UCLH/RF Joint Biomedical Research Unit (UCLH Site). I am pleased to inform you that your study (non-IMP) now has local R&D approval to proceed and recruit participants at University College London Hospitals NHS Foundation Trust.

As Chief/Principal Investigator you are required to ensure that your study/clinical trial (non-IMP) is conducted in accordance with the Department of Health's Research Governance Framework for Health and Social Care (2nd edition 2005) and that all members of the research team are aware of their responsibilities under the Framework.

Please note that you are also required:

- To comply with the Data Protection Act, Caldicott Principles and Trust Information Governance Policy.
- To ensure all researchers taking part in this study have up-to-date and appropriate honorary contracts.
- To ensure that a signed and dated copy of the consent form is kept in the study/trial file and a copy also given to the participant.
- To maintain an investigator file to store all study/trial documentation to be made available for audit.
- Where applicable to acknowledge NIHR/CBRC funding and support and collaboration with the BioStatistics Group.

If applicable to the methodology and conduct of the proposed study:

- There is a legal obligation to abide by the Medicines for Human Use (Clinical Trials) Regulations 2004 and subsequent amendments as well as any other applicable regulations.
- Medical Devices research regulated by the MHRA should be conducted in accordance to the Device Regulations.
- Tissue research must be conducted in accordance to the Human Tissue Act 2004 and the Codes of Practice issued by the Human Tissue Authority, with special relevance to Code 9

UCL Hospitals is an NHS Foundation Trust comprising: The Eastman Dental Hospital, The Heart Hospital, Hospital for Tropical Diseases, National Hospital for Neurology and Neurosurgery, The Royal London Hospital for Integrated Medicine and University College Hospital (incorporating the former Middlesex and Elizabeth Garrett Anderson Hospitals).

Research. Where tissue is used for human application please ensure that you abide by the Human Tissue (Quality and Safety for Human Application) Regulations 2007.

This R&D approval is conditional upon you complying with all requirements of the Research Ethics Committee notice of favourable opinion (dated) and notifying the UCL/UCLH/RF Biomedical Research Unit of the following as they arise:

- Serious Adverse Events & untoward research incidents
- Amendments (including a request to extend the study/clinical trial (non-IMP))
- Annual Progress Reports
- Any change in staff, their duties and their time on the study/trial
- End of or suspension of study/trial notification
- Planned audits by the Sponsor
- Publications

Please do not hesitate to contact a member of the team with regards to assistance and guidance for your research.

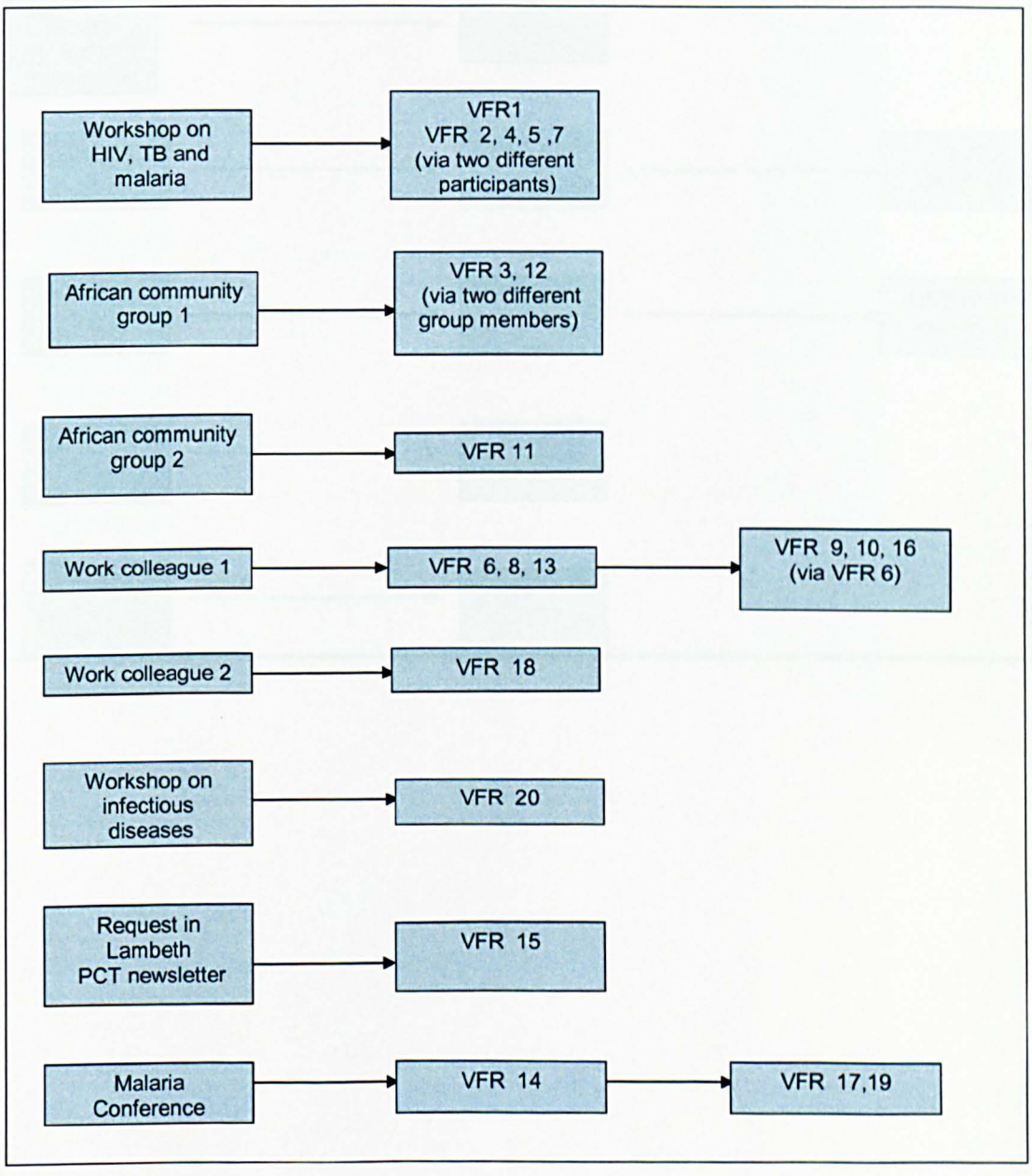
Yours sincerely

[redacted]

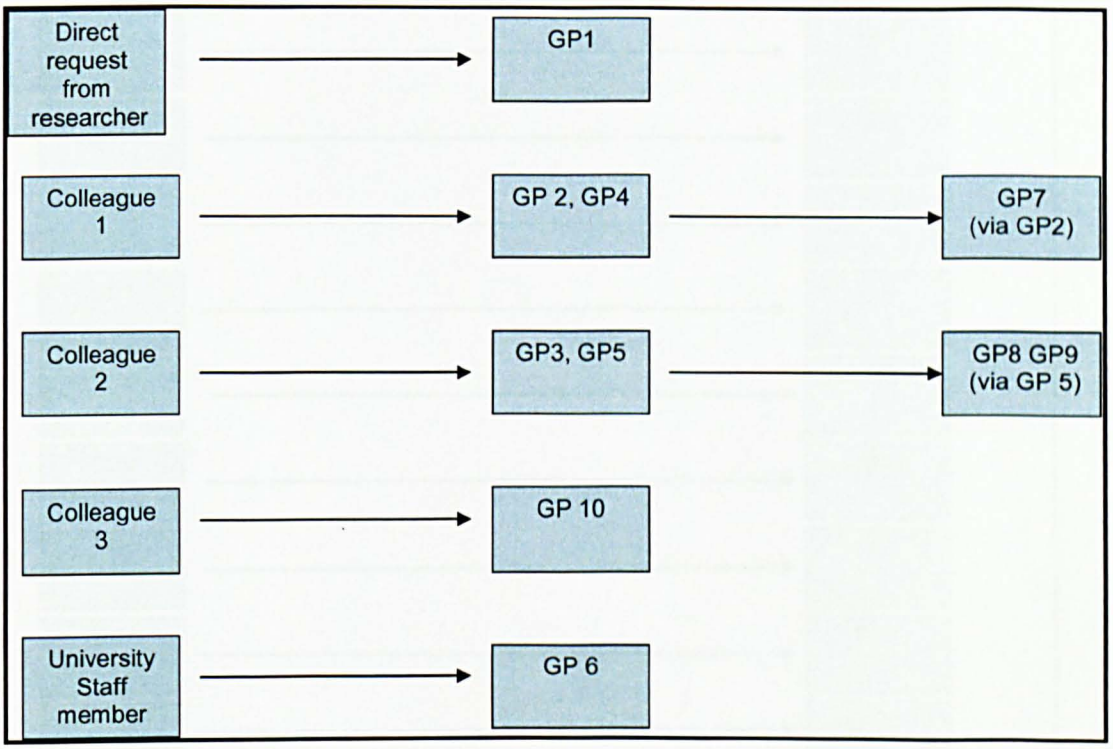
Professor Monty Mythen
Director of Research and Development
UCL/UCLH/Royal Free Biomedical Research Unit

Appendix 4 – Recruitment of VFRs, GPs and practice nurses

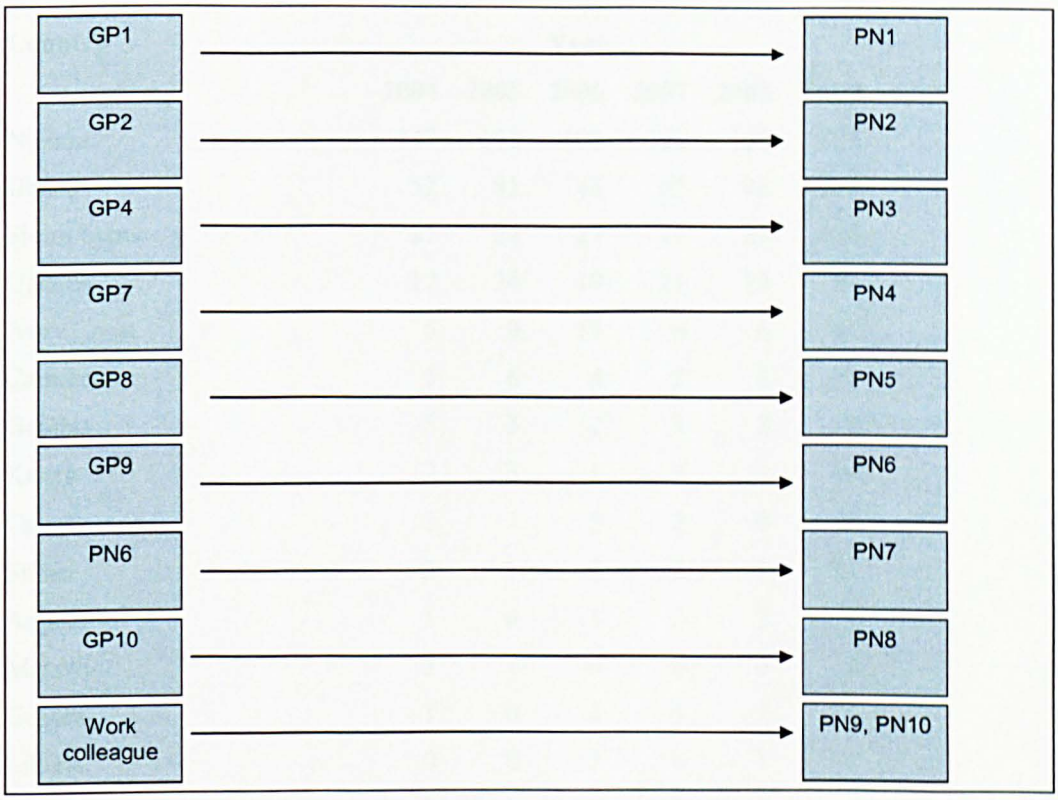
4a - VFRs



4b - GPs


Direct request from researcher
GP1
Colleague 1
GP 2, GP4
GP7 (via GP2)
Colleague 2
GP3, GP5
GP8 GP9 (via GP 5)
Colleague 3
GP 10
University Staff member
GP 6

4c – Practice Nurses



Appendix 5: Country where *P. falciparum* was acquired (2004-2008)

Country	Year					
	2004	**2005**	**2006**	**2007**	**2008**	**Total**
Nigeria	147	162	186	162	166	823
Ghana	52	81	43	63	46	285
Sierra Leone	27	24	27	11	29	118
Uganda	17	24	19	21	13	94
Ivory Coast	5	9	11	9	6	40
Cameroon	5	6	4	3	3	21
Gambia	5	3	2	1	3	14
Kenya	2	3	1	5	2	13
Congo	5	1	3	2	0	11
Sudan	2	1	2	3	3	11
Angola	1	0	1	2	2	6
Malawi	3	2	0	0	0	5
Guinea	1	0	2	1	1	5
Liberia	0	0	3	0	1	4
Togo	0	0	2	0	2	4
Burkina Faso	0	2	0	1	0	3
Zambia	0	0	3	0	0	3
Benin	0	1	0	0	1	2
Guinea Bissau	1	0	0	0	1	2
Rwanda	0	1	0	1	0	2
Somalia	0	0	1	0	1	2
Tanzania	1	1	0	0	0	2
Central African Republic	0	0	0	0	1	1
Democratic Republic of Congo	1	0	0	0	0	1
Equatorial Guinea	0	1	0	0	0	1
Ethiopia	1	0	0	0	0	1
Gabon	0	1	0	0	0	1
Mozambique	0	1	0	0	0	1

Appendix 6: Period of qualitative data collection

	2007	2008				2009				2010				2011
	Q 4	Q1	Q2	Q3	Q4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q3	Q4	Q1
VFR1	x													
VFR2		x												
VFR3			x											
VFR4			x											
VFR5			x											
VFR6			x											
VFR7			x											
VFR8				x										
VFR9				x										
VFR10				x										
VFR11				x										
VFR12					x									
VFR13					x									
VFR14					x									
VFR15					x									
VFR16						x								
VFR17								x						
VFR18								x						
VFR19								x						
VFR20											x			
CP1				x										
CP2				x										
CP3				x										
CP4				x										
CP5					x									
CP6					x									
CP7					x									
GP1					x									
GP2						x								
GP3						x								
GP4						x								
GP5						x								
GP6						x								
GP7						x								
GP8						x								
GP9						x								
GP10								x						
PN1						x								
PN2						x								
PN3						x								
PN4						x								
PN5							x							
PN6								x						
PN7								x						
PN8								x						
PN9								x						
PN10								x						
HC1						x								
HC2						x								
HC3								x						
P1								x						
P2								x						
P3													x	
P4													x	
P5													x	
P6														x

Appendix 7: Location of VFR interview (before or after travel) and method by which second interview carried out (where appropriate), and location of patient interviews.

	Before travel	After travel	Location of first interview	Method of 2nd interview
VFR1	Y	Y	Work office of participant	In person
VFR2*	Y	N	Participant's home	n/a
VFR3	Y	Y	Private club suggested by participant	Phone call
VFR4	Y	Y	Participant's home	Phone call
VFR5	Y	Y	Participant's home	Phone call
VFR6	Y	Y	Participant's home	Email
VFR7	Y	Y	Participant's home	Phone call
VFR8*	Y	N	Work office of participant	n/a
VFR9	Y	Y	Participant's home	Phone call
VFR10	Y	Y	Café	Phone call
VFR11	Y	Y	Participant's home	Phone call
VFR12	N	Y	Private room in PCT offices	n/a
VFR13*	Y	N	Bar	n/a
VFR14	Y	Y	Work office of participant	Email
VFR15	Y	Y	Private room in PCT offices	Email
VFR16	N	Y	Bar	n/a
VFR17	N	Y	Café	n/a
VFR18	N	Y	Work office of participant	n/a
VFR19	N	Y	Café	n/a
VFR20	N	Y	Café	n/a

*lost to follow up

Patient number	Location of interview
P1	Café
P2	Participant's home
P3	Participant's home
P4	Participant's home
P5	Participant's parked car
P6	Bar

Appendix 8: VFRs demographic details; sex; occupation; country born and countries of residence before immigration to UK

VFR	Age range	Sex	Occupation	Country born	Countries of residence before immigration to UK
1	40-50	M	Policy officer in Government Organisation	France	Mauritania at age of five, also Senegal and Cote d'Ivoire as student, United States, France, Nigeria
2	50-60	M	Cleaner	Ghana	Ghana
3	30-40	M	Lawyer/motivational speaker	UK	Nigeria at age seven for nine years
4	40-50	M	Cleaner	Ghana	Ghana
5	50-60	F	Healthcare assistant	Ghana	Ghana
6	30-40	M	MSc student in health-related subject	UK	Nigeria at three years of age for 22 years
7	40-50	F	Cleaner	Ghana	Ghana
8	50-60	M	Computer Executive	UK	Nigeria at two years of age for 22 years
9	40-50	M	Events organiser	Nigeria	Nigeria Italy at 24 years of age, for 17 years
10	20-30	M	MSc student in non health-related subject	Nigeria	Nigeria
11	60-70	F	Nurse	Nigeria	Nigeria
12	20-30	F	Student (non-health related subject)	Ghana	Ghana
13	30-40	M	Student (non-health related subject)	Nigeria	Nigeria
14	40-50	F	Nurse specialising in infectious diseases	Ghana	Ghana
15	40-50	F	Commissioner of NHS services not including malaria	UK	UK
16	30-40	M	Management consultant	UK	Nigeria at five years of age for 16 years USA and Ghana
17	40-50	F	Hairdresser (part-time student)	Ghana	Ghana
18	40-50	F	Nurse (specialising in an infectious disease other than malaria)	Nigeria	Nigeria
19	30-40	F	Housewife (part-time student)	Ghana	Ghana
20	20-30	F	Volunteer in charity and graduate student (non-health related subject)	Nigeria	Nigeria

Appendix 9: VFRs: years of residence in UK; travel details and use of chemoprophylaxis

VFR	Number of years resident in UK at time of interview	Current frequency of travel to Nigeria/Ghana	Country (area) being/just visited	Duration of travel (weeks)	Number of travellers (relationship to interviewee)	Use of chemoprophylaxis
1	10	Once or twice a year	Nigeria (Lagos) Ghana (Accra)	2	1	No
2	22	Once every year	Ghana Kumasi)	3	3 (wife and son)	Intended to, but lost to follow-up
3	14	Once previously	Ghana (Accra, Kibi, Swedru, Scintrex, Cape Coast)	3	1	Intended to, but did not use it on his most recent trip. Had used it on one previous trip to a malarious country
4	22	Twice. First time six years ago and once since then.	Ghana (Kumasi)	4	2 (wife)	Intermittent previously, taken for this trip
5	30	Every two years	Ghana (Accra, Kumasi)	6	1	Yes
6	4	Every year	Nigeria (Enugu, Jos, Bauchi, Kano, Lagos, Port Harcourt, Wari)	4	2 (a friend)	No
7	19	Every two years	Ghana (Kumasi, Accra)	7	3 (wife and daughter)	Yes
8	25	Once or twice a year	Nigeria (Ikeja-near Lagos)	3 ½	6 (wife, children and other relatives)	Provided contradictory information, and lost to follow-up
9	2	Four years since last visit, but previously once or twice a year (for business)	Nigeria (Lagos, Inugu, Port Harcourt)	4	1	Yes

VFR	Number of years resident in UK at time of interview	Current frequency of travel to Nigeria/Ghana	Country (area) being/just visited	Duration of travel (weeks)	Number of travellers (relationship to interviewee)	Use of chemoprophylaxis
10	8 months	1st time visiting since coming to UK	Nigeria (Lagos, Enugu, Port Harcourt, Abuja)	2	1	No
11	35	Every year	Nigeria (Lagos, Ogwashi-Uku)	4	1	Yes
12	9	Every year	Ghana (Accra, Takoradi)	4	1	Intermittent
13	30	Twice or three times a year	Nigeria (Lagos)	1	1	Intermittent previously and lost to follow-up
14	19	Every year	Ghana (Prestea)	2 ½	1	Yes
15	Since birth	Visited twice with gaps of 10 years between	Accra	2	6 (siblings, nephews and nieces	Yes
16	16	Initially "infrequent travel", now "virtually every year"	Abuja, Enugu	2	3 (wife and child	Intermittent on previous trips, used on this trip
17	20	Once every two years	Ghana (Accra, Kwuhu Abetisi	5	4 (three children	Yes
18	16	Once every year	Nigeria (Wari	3	1	No
19	13	Once every two years	Ghana (Elmina	5	3 (two children	Yes
20	1 ½	1st time visiting since coming to UK	Nigeria (Lagos	2	1	No

Appendix 10: Patients: demographic details; occupation; residency; travel-related details and use of chemoprophylaxis

ID	Age	Sex	PCT of residence	Occupation	Country born	No of years resident in UK	Country visited	Frequency of travel	Number of travellers	Use of chemoprophylaxis
1	40-50	M	Southwark and Bromley	Teacher of autistic children	Sierra Leone	22	Nigeria	First time since 2003	One	No
2	60-70	M	Lambeth	Maths teacher and part-time pastor	Ghana	24	Ghana	Once every two years	One (but joined by two family members later in the trip)	No
3	50-60	M	Southwark	Hospital technician and part-time pastor	Nigeria	32 (also Germany for two years, Norway five years)	Nigeria	Once or twice a year	One	No
4	40-50	M	Southwark	Nurse in mental healthcare	Nigeria	20 (also lived in Japan for 18 months after leaving Nigeria)	Nigeria	Last year six times and "frequently" before then since finishing studies	One	Intended to use pharmacist-purchased drugs bought in the UK which he stockpiles in Nigeria, but they were not there when he got there. Usually uses this
5	40-50	M	Newham	Caretaker	Nigeria	2 (but resident 17 years in Germany after leaving Nigeria).	Nigeria	First time since 2002	One	No
6	40-50	M	Croydon	Businessman (auto-trade)	Nigeria	26	Nigeria	Several times a year currently, Upon arrival to UK yearly visits then gaps of three to four years	One	Intermittent, not on current trip

Appendix 11: GPs: sex, ethnicity, practice details and number of years employed as a GP

GP	Sex	Ethnicity	No. GPs in practice*	No of PNS in practice*	Number of patients registered with practice*	% of patients of "Black African" ethnicity**	PCT	Number of years working as a GP
1	M	Caucasian	1-4	1-4	5000-9999	15-19	Lambeth	20-24
2	M	Caucasian	10-14	5-9	15000-19999	15-19	Greenwich	20-24
3	M	Caucasian	10-14	1-4	10000-14999	15-19	Lambeth	20-24
4	M	Caucasian	5-9	1-4	5000-9999	10-19	Greenwich	20-24
5	M	Caucasian	5-9	1-4	10000-14999	5-9	Lambeth	20-24
6	F	Afro-Caribbean	1-4	1-4	5000-9999	15-19	Southwark	10-14
7	F	Caucasian	5-9	1-4	5000-9999	5-9	Greenwich	10-14
8	M	Caucasian	1-4	1-4	5000-9999	20-24	Lambeth	25-29
9	M	Caucasian	10-14	1-4	5000-9999	10-14	Lambeth	20-24
10	F	Indian Sub-Continent	5-9	1-4	15000-19999	15-19	Greenwich	1-4

*information taken from Practice profile on internet

**information taken from LHO website

Appendix 12: practice nurses: sex, ethnicity, practice details and number of years working as a practice nurse

Practice nurse	Sex	Ethnicity	No of GPs in practice*	No of PNs in practice*	Number of patients registered with practice**	% of patients of "Black African" ethnicity**	PCT	Number of years working As a practice nurse
1	F	Afro-Caribbean	1-4	1-4	5000-9999	15-19	Lambeth	5-9
2	F	Caucasian	10-14	5-9	15000-19999	15-19	Greenwich	5-9
3	F	Caucasian	5-9	1-4	5000-9999	15-19	Greenwich	15-19
4	F	Caucasian	5-9	1-4	5000-9999	10-14	Greenwich	25-29
5	F	Caucasian	1-4	1-4	5000-9999	5-9	Lambeth	5-9
6	F	Black-Caribbean	10-14	1-4	5000-9999	15-19	Lambeth	1-4
7	F	Black-Caribbean	10-14	1-4	10000-14999	5-9	Lambeth	10-14
8	F	Caucasian	5-9	1-4	15000-19999	20-24	Greenwich	10-14
9	F	ISC	5-9	1-4	5000-9999	10-14	Lambeth	10-14
10	F	Black African	1-4	1-4	<5000	5-9	Greenwich	5-9

*information taken from Practice profile on internet

**information taken from LHO website

Appendix 13: Community pharmacists: sex, ethnicity, location of employment and number of years working as a community pharmacist

Pharmacist	Sex	Ethnicity	PCT	Number of years working as a pharmacist
1	F	Caucasian	Lambeth	5-9
2	F	African	Lambeth	5-9
3	M	Asian	Lambeth	15-19
4	M	Afro-Caribbean	Newham	25-29
5	M	Asian	Lambeth	10-14
6	M	Asian	Newham	1-4
7	M	Asian	Newham	10-14