

Report of the Australian Malaria Register for 1992 and 1993

Joan Bryan, Elekana Fa'afai & Simon Forsyth,
Australian Centre for International & Tropical Health & Nutrition, The University of Queensland,
Mayne Medical School, Herston Road, Herston Qld 4006

Abstract

Australia is free from endemic malaria but several hundred imported cases occur each year. Notification and screening data on malaria cases are collected by State and Territory health authorities and laboratories and forwarded to the Australian Malaria Register (AMR) for national collation and analysis. This report provides information on 758 malaria cases with 5 deaths reported in Australia in 1992 and 712 cases with 1 death in 1993. In both years, just over 70% of cases were male and the modal age group was 20 to 29 years. Cases were reported from all States and Territories, with Queensland reporting the greatest number of cases in both years. The predominant species was *Plasmodium vivax*, although *P. falciparum* accounted for just over a quarter of the cases each year. Papua New Guinea (PNG) was the most common source of cases in both years, reflecting the number of people who move between Australia and PNG and the high endemicity of malaria in PNG. The incidence of malaria was also high in travellers from the Solomon Islands in both years and from Ghana in 1992 and Nigeria in 1993. The six deaths over two years highlight the need for medical practitioners to consider malaria as a diagnosis in patients with a history of travel to malarious countries and to provide appropriate advice on malaria prophylaxis to intending travellers. *Commun Dis Intell* 1998;22:237-244

Introduction

Malaria is still a major health problem in tropical areas of the world. Although free from endemic malaria, Australia imports several hundred cases of malaria from these countries each year. The Australian Malaria Register collates case data nationally and has previously published reports for the years 1990 and 1991.^{1,2,3,4} This paper

reports on malaria cases in Australia in 1992 and 1993.

Materials and Methods

This report is based on information supplied by the State and Territory health authority malaria registers, screening programs and laboratories to the Australian Malaria Register which is managed by the Tropical Health Program of the Australian

ISSN 0725-3141
Volume 22
Number 11
29 October 1998

Contents

Report of the Australian Malaria Register for 1992 and 1993	237
Joan Bryan, Elekana Fa'afai & Simon Forsyth	
Editorial Comment	245
Bronwen Harvey	
Trends in Malaria in Australia, 1991-1997	247
Bronwen Harvey	
VRE; a public health context	248
Alexandra Geue	
Emergence and Epidemiology of Vancomycin-Resistant Enterococci in Australia	249
Jan Bell, John Turnidge, Geoffrey Coombs, Frances O'Brien	
Measles Control Campaign Update	253
CDI Instructions for authors	254

Cont'd next page

Contents, *continued*

Notice to authors	254
Communicable Diseases Surveillance	255
Bulletin Board	263
Overseas briefs	264

Centre for International and Tropical Health and Nutrition.

The data were entered and managed using EpiInfo Version 6, in accordance with the coding and editing rules described in Appendix 1 of Sleigh et al.³ Duplicate entries, which occurred due to errors of entry or to the same episode being reported through both a private practitioner and a hospital, were identified and eliminated where possible.

Cases with clinical onset or, in the absence of clinical data, with a first laboratory report in 1992 and 1993 were included in the analysis. The definition and classification of cases as new or relapsed and imported or introduced were the same as those used previously.^{1,2,3,4} Relapse was defined as occurring when the same species of parasite was identified from a patient more than 28 days from the onset of a primary attack. Reports of episodes involving the same parasite and occurring within 28 days in the one individual were counted as a single episode. Cases were classified as imported when infection was acquired outside Australia.

In many cases occupation was not recorded, but the person was stated to have entered Australia for education. Such persons were classified as students and those under 15 years of age as minors. For many people no reason was given for their being in the country in which they acquired malaria; however, each year more than 100 of these people acquired malaria in the country in which they were born and the new category 'birth country' was made for such cases.

The incidence of malaria in arrivals from various countries was calculated using all arrivals from the relevant country as the denominator. The unpublished arrivals data was provided by the Australian Bureau of Statistics.

Results

Sex and age distribution

In 1992, 758 cases of malaria were reported, of which 554 (73.1%) occurred in males. In 1993, the total number of cases was 715. Sex was not recorded for 5 of these (2 in the 0-9 age group, 1 in the 10-19 year age group and 2 whose ages were not recorded). Of the remaining cases, 510 (71.8%) were male. (Figures 1 and 2).

Age was not recorded for 18 cases (5 female and 13 male) in 1992 and 22 cases (7 female, 13 male and 2 unknown sex) in 1993. For those cases in which age was recorded, the modal age group was 20 to 29 years in both years (Figures 1 and 2).

Geographic and seasonal distribution

In both years, the greatest number of cases was recorded in Queensland; 338 (44.6%) in 1992 and 294 (41.1%) in 1993. New South Wales accounted for 163 (21.5%) of cases in 1992 and 206 (28.8%) in 1993. Victoria had 130 cases (17.2%) in 1992 and 90 (12.6%) in 1993 (Tables 1 and 2).

Cases for which a date of onset of symptoms is recorded occurred fairly evenly throughout the year with the highest number of cases in February in both years and the lowest in August in 1992 and December in 1993 (Figure 3).

Figure 1. Malaria notifications, Australia, 1992, by age and sex.

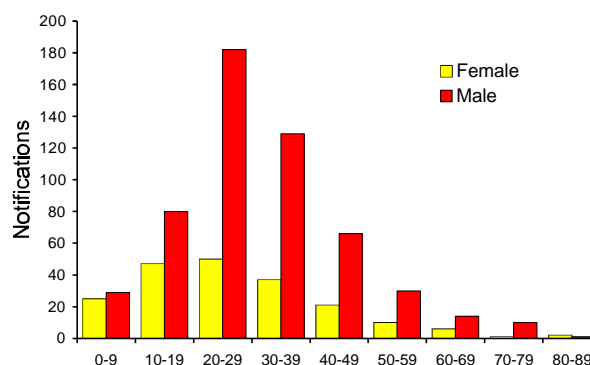


Figure 2. Malaria notifications, Australia, 1993, by age and sex.

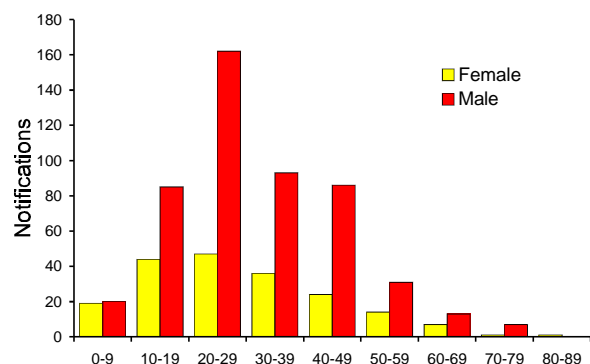
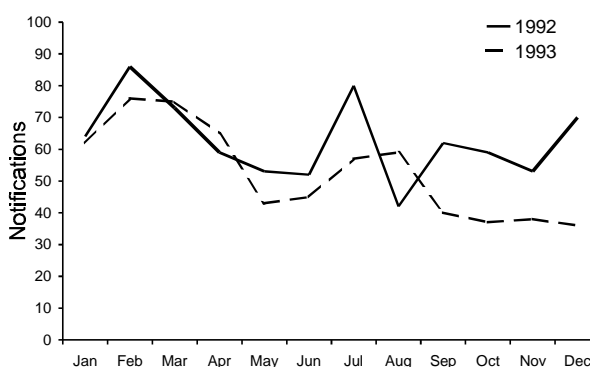


Figure 3. Malaria notifications, Australia, 1992 and 1993, by month of onset.



Species of malaria parasite

In 1992, the species was unknown for 7 of the cases. Of the remaining 751 cases, 214 (28.5%) were *Plasmodium falciparum* only, 512 (68.2%) were *P. vivax* and 10 (1.3%) were mixed infections of both species. *P. malariae* and *P.*

Table 1. Malaria notifications, Australia, 1992, by State or Territory of residence and species of *Plasmodium*.

State / Territory	<i>Plasmodium</i> species						Total	Percent
	<i>falciparum</i>	<i>vivax</i>	<i>falciparum/vivax</i>	<i>malariae</i>	<i>ovale</i>	Unknown		
ACT	6	20	0	0	0	0	26	3.4
NSW	29	124	0	3	5	2	163	21.5
NT	8	14	0	0	0	0	22	2.9
Qld	111	219	4	3	0	1	338	44.6
SA	10	21	0	0	0	1	32	4.2
Tas	0	3	0	0	0	0	3	0.4
Vic	40	80	5	1	1	3	130	17.2
WA	10	31	1	0	2	0	44	5.8
Total	214	512	10	7	8	7	758	100.0

ovale were both relatively rare, together accounting for less than 2% of cases (Table 1).

In 1993, species was unknown for 2 cases. Of the remaining 713, there were 184 cases (25.8%) of *P. falciparum* alone, 497 cases (70.0%) of *P. vivax* alone and 9 (1.3%) cases were infected with both species. Again, *P. ovale* and *P. malariae* were rare (Table 2).

became ill in Australia, 113 (17.4%) became ill overseas and no data were given for 19 (2.9%) cases.

In 1993, the country of acquisition of all 18 cases diagnosed on screening was PNG. The proportion who became ill in Australia and overseas was very similar to the previous year with an Australian onset for 482 of the 605 clinical cases (79.7%), an overseas onset for 114

Table 2. Malaria notifications, Australia, 1993, by State or Territory of residence and species of *Plasmodium*.

State / Territory	<i>Plasmodium</i> species							Total	Percent
	<i>falciparum</i>	<i>vivax</i>	<i>falciparum/vivax</i>	<i>malariae</i>	<i>ovale</i>	<i>ovale/falciparum</i>	Unknown		
ACT	8	13	0	1	1	0	0	23	3.2
NSW	36	159	1	4	6	0	0	206	28.8
NT	11	22	0	0	0	0	0	33	4.6
Qld	101	185	3	3	2	0	0	294	41.2
SA	5	18	2	0	0	0	0	25	3.5
Tas	3	3	0	0	0	0	0	6	0.8
Vic	18	65	0	1	2	1	2	90	12.6
WA	2	32	3	0	0	1	0	38	5.3
Total	184	497	9	9	11	2	2	715	100.0

Accuracy of diagnosis

P. falciparum is the only species with a high case fatality rate. Because of differing patterns of resistance to drugs between the malaria species, case management is dependent on correct species identification. In 1992, 643 slides were re-read at a reference laboratory and parasite identification differed in 63 cases, including 22 cases in which the parasite species was originally recorded as unknown. Fifteen cases of *P. falciparum* were incorrectly classified as *P. vivax* and one as *P. malariae*. In the 640 slides examined at a reference laboratory in 1993, 46 differences occurred, including seven slides of *P. falciparum* which were initially diagnosed as *P. vivax*. No fatal cases were amongst those misdiagnosed.

Onset of illness

In 1992, 18 cases of parasitaemia were recorded as a result of screening people without symptoms. The infection of one of these was acquired in India, and Papua New Guinea (PNG) was the origin of the infection of all other symptomless cases. Of the 650 clinical cases, 518 (79.7%)

(18.8%) and no data for 9 (14.9%) cases.

Delay in diagnosis

Data on onset date and date of diagnosis were available for 679 cases (89.6%) in 1992 and 630 cases (88.5%) in 1993. The number of cases diagnosed on the day of symptom onset was 97 in 1992 and 129 in 1993, respectively 14.3% and 25.7% of the cases for which this data were available.

In 1992, over 50% of cases were diagnosed within 3 days of the onset of symptoms. Diagnosis was on average slightly quicker if symptoms began in Australia. In cases with an Australian onset, 56.6% of cases being diagnosed by day 3, whereas 50% of cases in which symptoms started overseas were not diagnosed until the fifth day of illness. In 1993, overall 54.6% were diagnosed by day 3 after onset of symptoms. This included 55.3% of cases with an Australian onset and 51.4% of cases in which the person became ill overseas. The numbers of undiagnosed cases remaining each day after the onset of symptoms are shown in Figures 4 and 5.

Figure 4. Malaria notifications, Australia, 1992, number of cases remaining undiagnosed each day after onset of symptoms.

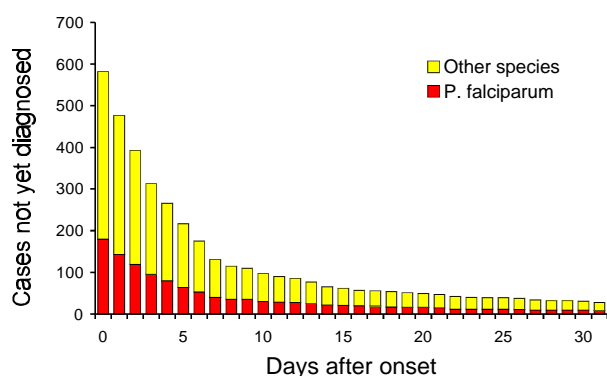
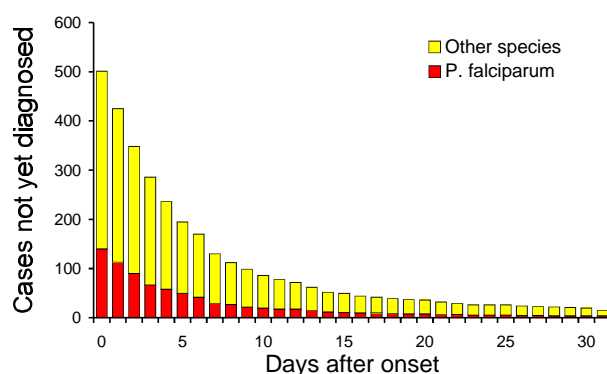


Figure 5. Malaria notifications, Australia, 1993, number of cases remaining undiagnosed each day after onset of symptoms.



Deaths

Five deaths were recorded in 1992, all in Australian residents. Two cases were acquired in PNG, one in the Solomon Islands and one in Nigeria. One case was acquired in Australia, as a result of a blood transfusion. *P. falciparum* was the parasite in all fatal cases. All cases became ill in Australia and the delay between onset of symptoms and diagnosis was 3 days, 5 days, 6 days (2 cases) and 7 days respectively.

The one death recorded in 1993 occurred in a 46 year old male who had a *P. vivax* infection acquired in Indonesia. The species was confirmed in a central reference laboratory. There was a two week diagnostic delay in this case, but even with such delays *P. vivax* infections do not normally cause fatalities. It is possible that this was an infection with both *P. falciparum* and *P. vivax* but with few *P. falciparum* infected red blood cells in the peripheral blood stream. No information was available on whether the patient had any underlying medical condition.

Case classification and origin of cases

In 1992, two cases were acquired in Australia. One was from a blood transfusion and the other was in a Torres

Strait Island resident who was diagnosed on Thursday Island. In 1993, no cases were acquired in Australia. In 1992, 26 cases were classified as relapsing and in 1993, there were 39. Origin was unknown in 45 cases in 1992 and 51 cases in 1993. All other cases (90.6% in 1992 and 87.4% in 1993) were classified as imported (Table 3).

Table 3. Case classifications for malaria notifications, Australia, 1992 and 1993.

Case classification	1992		1993	
	Frequency	Percent	Frequency	Percent
Imported	686	90.5	625	87.4
Acquired in Australia	2	0.3	0	0.0
Relapsing	26	3.4	39	5.5
Unknown	44	5.8	51	7.1
Total	758	100.0	715	100.0

PNG was the most common source of cases in both years, 361 cases in 1992 and 323 cases in 1993. Other important source countries were: the Solomon Islands (86 cases in 1992 and 74 cases in 1993), Vanuatu (18 in 1992 and 30 in 1993), Indonesia (86 cases in 1992 and 67 in 1993), Thailand (11 cases in 1992 and 17 in 1993), India (50 cases in 1992 and 58 in 1993). Vietnam was the source of 17 cases in 1992 but only 2 in 1993. Ghana, Nigeria, Kenya and Pakistan also contributed 5 to 11 cases annually. Fiji, a malaria-free country without malaria vectors was reported as the country of acquisition for one case of malaria in 1992. This case was not followed up. The countries in which malaria was acquired, and the species involved, are shown in Tables 4 and 5.

The incidence of malaria in arrivals from selected countries is presented in Table 6. As in previous years, the incidence was high for the Solomon Islands (11.4/1000 and 11.1/1000). However, this figure was exceeded by Ghana in 1992 (14.0/1000) and Nigeria in both 1992 (11.6/1000) and 1993 (12.7/1000). As fewer than a thousand travellers entered Australia annually from either of these countries, the absolute numbers of malaria cases acquired there were small. The incidence in travellers from PNG was lower than in 1991, and this was responsible for the reduction in the total number of cases in both 1992 and 1993 compared to 1991 when 939 cases were reported.^{3,4}

The species of malaria differed according to region in which the parasites were acquired (Tables 7 and 8). In 1992, 72.7% of cases from Africa were due to *P. falciparum* but this percentage dropped to 52.4% in 1993. The proportion of cases due to *P. falciparum* was lower and relatively stable in other regions being about 28% for the SW Pacific 13% to 18% in SE Asia and less than 10% in South Asia.

Occupation and reason for travel

The occupation of almost half of the cases was not provided (Table 9). Amongst the rest, about 40% were students. The most common reason for presence in the malarious country in which infection occurred was 'holiday', accounting for 237 cases in 1992 and 190 cases in 1993 (Table 9).

Table 4. Malaria notifications, Australia, 1992, by country in which malaria was acquired and species of *Plasmodium*.

Country	<i>Plasmodium</i> species						Total
	<i>falciparum</i>	<i>vivax</i>	<i>falciparum/vivax</i>	<i>malariae</i>	<i>ovale</i>	Unknown	
Angola	0	0	0	0	1	0	1
Australia	1	1	0	0	0	0	2
Benin	1	0	0	0	0	0	1
Brazil	1	0	0	0	0	0	1
Cameroon	1	0	0	0	0	0	1
China	1	0	0	0	0	0	1
East Timor	0	1	0	0	0	0	1
Egypt	1	0	0	0	0	0	1
Fiji ¹	0	1	0	0	0	0	1
Ghana	6	2	0	0	1	0	9
India	5	44	1	0	0	0	50
Indonesia	17	67	0	1	0	1	86
Kenya	8	1	0	0	2	0	11
Malawi	2	0	0	0	0	0	2
Mexico	1	0	0	0	0	0	1
Myanmar	0	4	0	0	0	0	4
Nepal	0	1	0	0	0	0	1
Nigeria	5	0	0	1	1	0	7
Pakistan	0	4	0	0	0	1	5
Philippines	0	1	0	0	0	0	1
Papua New Guinea	108	239	6	5	0	3	361
Solomon Islands	21	61	3	0	0	1	86
Sri Lanka	0	3	0	0	0	0	3
Sudan	1	0	0	0	0	0	1
Thailand	4	7	0	0	0	0	11
Uganda	1	0	0	0	0	0	1
Vanuatu	5	13	0	0	0	0	18
Vietnam	0	17	0	0	0	0	17
Zaire	0	1	0	0	0	0	1
Zambia	3	0	0	0	0	0	3
Zimbabwe	2	0	0	0	0	0	2
Other	9	6	0	0	3	0	18
Unknown	0	0	0	0	0	49	49
Total	204	474	10	7	8	55	758

1. Reported source of infection. However, Fiji is a malaria free country with no malaria vectors.

Of the cases for whom a reason for visit was recorded, between 20 and 30% each year acquired their infection in their country of birth. The source of infection was the birth country in 203 cases in 1992 and 123 cases in 1993 (Table 10). In 1992, 50 people who acquired their infection in their country of birth entered Australia for education, as did 43 in 1993.

Malaria in the receptive zone

In Australia, areas north of 19°S are considered receptive to malaria.⁵ The number of cases reported by doctors within the receptive zone was 139 in 1992 and 135 in 1993. *P. falciparum* accounted for 47.5% of these cases in 1992 and for 47.5% in 1993. In 1992, 75% of *P. falciparum* cases in the receptive zone had been diagnosed by day 5, whereas seven days elapsed before 75% of *P. falciparum*

cases were diagnosed in the non-receptive zones.

Diagnosis of *P. falciparum* in the receptive zone was quicker in 1993 with 75% of cases diagnosed by day 4, compared to day 6 in other areas.

Discussion

The six deaths from malaria in two years highlight the need for general practitioners to be aware of the possibility of malaria in travellers from tropical countries and regions, particularly PNG, the Solomon Islands and Africa, and to arrange for the appropriate diagnostic tests immediately symptoms develop. Misdiagnosis was not implicated in any of the deaths, but the demonstration that 21 cases of the potentially fatal *P. falciparum* were originally diagnosed as the usually nonfatal *P. vivax* indicates that misidentification can occur. When treating patients with malaria, medical

Table 5. Malaria notifications, Australia, 1993, by country in which malaria was acquired and species of *Plasmodium*.

Country	<i>Plasmodium</i> species							Total
	<i>falciparum</i>	<i>vivax</i>	<i>falciparum/vivax</i>	<i>malariae</i>	<i>ovale</i>	<i>ovale/falciparum</i>	Unknown	
Belize	0	1	0	0	0	0	0	1
Burma	0	3	0	0	0	0	0	3
Cambodia	0	3	0	0	0	0	0	3
Central African Republic	0	0	0	0	1	0	0	1
Ecuador	0	1	0	0	0	0	0	1
Ethiopia	0	0	1	0	0	0	0	1
Ghana	3	0	0	2	0	1	0	6
India	4	53	1	0	0	0	0	58
Indonesia	10	57	0	0	0	0	0	67
Ivory Coast	0	0	0	0	1	0	0	1
Kenya	3	0	0	0	2	0	0	5
Laos	0	1	0	0	0	0	0	1
Malawi	1	1	0	0	0	0	0	2
Malaysia	0	0	1	0	0	0	0	1
Nigeria	5	0	0	0	0	0	0	5
Pakistan	0	8	0	0	0	0	0	8
Philippines	0	1	0	0	0	0	0	1
Papua New Guinea	104	210	4	3	1	0	1	323
Singapore	0	1	0	0	0	0	0	1
Solomon Islands	14	59	1	0	0	0	0	74
Somalia	1	3	0	0	0	0	0	4
South Africa	0	1	0	0	1	0	0	2
Sri Lanka	0	1	0	0	0	0	0	1
Sudan	1	0	0	0	0	0	0	1
Tanzania	5	0	0	0	0	0	0	5
Thailand	1	16	0	0	0	0	0	17
Timor	1	0	0	0	0	0	0	1
Uganda	2	0	0	0	1	0	0	3
Vanuatu	3	25	1	1	0	0	0	30
Vietnam	0	2	0	0	0	0	0	2
Zaire	0	0	0	1	2	0	0	3
Zambia	2	1	0	0	0	0	1	4
Zimbabwe	3	2	0	0	0	1	0	6
Other	8	6	0	1	2	0	0	17
Unknown	0	0	0	0	0	0	56	56
Total	171	456	9	8	11	2	58	715

practitioners should consider the possibility of misdiagnosis, especially when the blood slide has been examined in laboratories which would seldom see malaria cases. New diagnostic tests which are highly sensitive and specific for *P. falciparum* now enable doctors to establish more accurately whether or not their patient is infected with this species.

Delay in diagnosis has implications both for the individual patient and for public health in the malaria receptive zone. Diagnostic delay of more than three days occurred in five of the six patients who died (83.3%), but for fewer than 50% of malaria cases overall.

Delays in diagnosis and treatment allow time for gametocytes to develop. The gametocytes of *P. falciparum*

require about 10-12 days to mature before they can infect mosquitoes whereas those of *P. Vivax* take 2-4 days.⁶ The presence of gametocytes in a patient in the malaria receptive zone provides a risk of transmission of malaria within Australia. No secondary cases arose as a result of the 274 cases reported in the receptive zone during 1992 and 1993, however continuing vigilance is needed to ensure that any outbreak can be quickly detected and remedial action taken.

The continuing occurrence of imported malaria cases in Australia is a reminder to doctors of the need to provide patients who are intending to travel to malarious countries with accurate and up to date advice on the risks of malaria in the countries they intend to visit and on the measures

Table 6. Malaria notifications, Australia, 1992 and 1993, incidence of malaria in arrivals from selected countries.

Country of exposure	Arrivals		Cases		Rate/1000	
	1992	1993	1992	1993	1992	1993
Papua New Guinea	76545	77640	361	323	4.7	4.2
Solomon Islands	7545	6641	86	74	11.4	11.1
Vanuatu	25856	24236	18	30	0.7	1.2
Indonesia	230392	270172	86	67	0.4	0.2
Thailand	106361	123262	11	17	0.1	0.1
Vietnam	26479	31475	17	2	0.6	0.1
India	34120	36145	50	58	1.5	1.6
Ghana	645	984	9	6	14.0	6.1
Nigeria	605	393	7	5	11.6	12.7
Kenya	2526	2801	11	5	4.4	1.8
Pakistan	5019	4487	5	8	1.0	1.8

Table 7. Malaria notifications, Australia, 1992, by region of exposure and species of *Plasmodium*.

Region of exposure	<i>Plasmodium</i> species						Unknown	Total
	<i>falciparum</i>	<i>vivax</i>	<i>falciparum/vivax</i>	<i>malariae</i>	<i>ovale</i>			
Africa	40	6	0	1	8	0	55	
Australia	1	1	0	0	0	0	2	
Central America	1	0	0	0	0	0	1	
Southeast Asia	22	101	0	1	0	1	125	
Southwest Pacific	134	314	9	5	0	4	466	
South America	1	0	0	0	0	0	1	
South Asia	5	52	1	0	0	1	59	
Unknown	0	0	0	0	0	49	49	
Total	204	474	10	7	8	55	758	

Table 8. Malaria notifications, Australia, 1993, by region of exposure and species of *Plasmodium*.

Region of exposure	<i>Plasmodium</i> species							Unknown	Total
	<i>falciparum</i>	<i>vivax</i>	<i>falciparum/vivax</i>	<i>malariae</i>	<i>ovale</i>	<i>ovale/falciparum</i>	<i>vivax/ovale</i>		
Africa	31	9	1	4	9	2	1	1	63
Central America	0	1	0	0	0	0	0	0	1
Southeast Asia	6	68	1	0	0	0	0	0	100
SW Pacific	60	226	5	4	1	0	0	1	427
South America	0	1	0	0	0	0	0	0	1
South Asia	3	58	1	0	0	0	0	0	67
Unknown	0	0	0	0	0	0	0	56	56
Total	100	363	8	8	10	2	1	58	715

they can take to protect themselves against this potentially fatal disease.

References

1. Forsyth S, Loeskow K, Pearce M, Riley I, Sleight A and Srinivasa M. Final report of the Australian Malaria Register for 1990. Tropical Health Program, The University of Queensland. Herston (Brisbane):1991.
2. Forsyth S, Loeskow K, Pearce M, Riley I, Sleight A and Srinivasa M. Report of the Australian Malaria Register for 1990. *Commun Dis Intell* 1991;15:400-408
3. Sleight A, Srinivasa M, Cooper A, Forsyth S, and Riley I. Report of the Australian Malaria Register for 1991. Tropical Health Program, The University of Queensland. Herston (Brisbane):1992.
4. Sleight A, Srinivasa M, Cooper A, Forsyth S, and Riley I. Report of the Australian Malaria Register for 1991. *Commun Dis Intell* 1993;17:134-142

5. Black RH. Malaria in Australia. Commonwealth Department of Health School of Public Health and Tropical Medicine, The University of Sydney, Service Publication No.9. Australian Government Printing Service. Canberra 1972

6. Carter R and Graves PM. Gametocytes in malaria. In Wernsdorfer WH and McGregor I (Eds) Principles and practice of malariology. Churchill Livingstone. Edinburgh 1988

Table 9. Malaria notifications, Australia, 1992 and 1993, by occupation.

Occupation	1992		1993	
	Number of cases	Percent	Number of cases	Percent
Clerk	3	0.4	9	1.3
Labourer and related worker	29	3.8	20	2.8
Machine operator, driver	15	2.0	7	1.0
Manager, administrative	15	2.0	18	2.5
Minor (years old)	53	7.0	49	6.9
Para-professional	23	3.0	22	3.1
Professional	72	9.5	36	5.0
Salesperson, personal service worker	20	2.6	17	2.4
Student	160	21.1	149	20.8
Tradesperson	30	4.0	31	4.3
Unknown	348	45.9	357	49.9
Total	758	100	715	100.0

Table 10. Malaria notifications, Australia, 1992 and 1993, by reason for presence in country in which malaria exposure occurred.

Reason	1992		1993	
	Number of cases	Percent	Number of cases	Percent
Business	57	8.3	56	10.0
Business companion	2	0.3	2	0.4
Education	7	1.0	3	0.5
Employment	90	13.1	104	18.5
Holiday	237	34.4	190	33.9
Other	51	7.4	27	4.8
Birth country	203	29.5	123	21.9
Student vacation	5	0.7	9	1.6
Visiting relatives	36	5.2	47	8.4
Total¹	688	100.0	561	100.0

1. Excludes 70 cases in 1992 and 154 cases in 1993 for whom no data were recorded.