



MALARIA

CRUDE DATA	
Number of Cases	24
Annual Incidence ^a	
LA County	0.25
California ^b	0.34
United States ^b	0.42
Age at Diagnosis	
Mean	40.8 years
Median	48 years
Range	1-69 years

^aCases per 100,000 population.

^bCalculated from Final 2008 Reports of Nationally Notifiable Infectious Disease. MMWR 58(31);856-857;859-869.

DESCRIPTION

Human malaria is a febrile illness caused by infection with one or more species of the protozoan parasite, *Plasmodium* (usually *P. vivax*, *P. falciparum*, *P. malariae*, *P. ovale*, and occasionally other *Plasmodium* sp.). Transmission occurs by the bite of an infected *Anopheles* mosquito and mainly in tropical and subtropical areas of the world. The disease is characterized by episodes of chills and fever every 2 to 3 days. *P. falciparum* poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant. The more severe symptoms of *P. falciparum* include jaundice, shock, renal failure, and coma. *P. knowlesi*, a parasite of Asian macaques, has been documented as a cause of human infections, including some deaths, in Southeast Asia. The first case in a US traveler was identified in 2008. An additional species similar to *P. ovale*, but has yet to be named, has also been recently discovered as a human pathogen.

For the purpose of surveillance, confirmation of malaria requires the demonstration of parasites in thick or thin blood smears, regardless of whether the person experienced previous episodes of malaria.

Before the 1950s malaria was endemic in the southeastern US. Now, it is usually acquired outside the continental US through travel and immigration. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito, *A.*

hermsi, exists in southern California in rare numbers, and is capable of transmitting the parasite.

Prevention methods for malaria include avoiding mosquito bites or, once already infected, preventing the development of disease by using antimalarial drugs as prophylaxis. Travelers to countries where malaria is endemic should take precautions by taking the appropriate antimalarial prophylaxis as prescribed; using mosquito repellants, utilizing bednets, and wearing protective clothing as well as avoiding outdoor activities between dusk and dawn when mosquito activity is at its peak.

2009 TRENDS AND HIGHLIGHTS

- The number of reported cases (N=24) continues to decrease since 2003.
- Almost half of all cases (n=11) were caused by *P. falciparum*. One case, who reported travel to Colombia, was co-infected with both *P. malariae* and *P. ovale*.
- All cases reported a travel history to a country with endemic malaria. This year, travelers to Africa represented 54% of all cases and 91% of *P. falciparum* cases.
- Only five of eighteen US resident cases (28%) used prophylaxis during their travels, two of whom reported completing their regimen. A greater proportion of cases who traveled for work purposes reported using prophylaxis than those traveling for leisure (i.e., visiting friends and relatives).



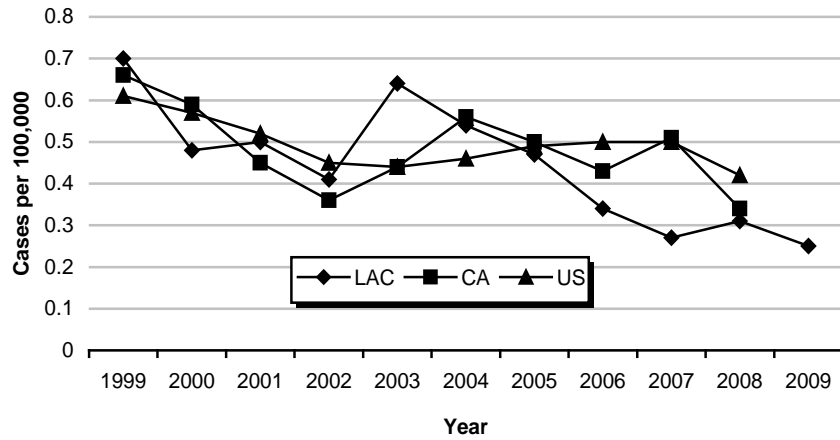
**Reported Malaria Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2005-2009**

	2005 (N=45)			2006 (N=33)			2007 (N=26)			2008 (N=30)			2009 (N=24)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0	0
1-4	0	0.0	0.0	2	6.1	0.3	0	0.0	0.0	0	0.0	0.0	3	12.5	0.5
5-14	3	6.7	0.2	2	6.1	0.1	2	7.7	0.1	1	3.3	0.1	0	0	0
15-34	21	46.7	0.7	8	24.2	0.3	11	42.3	0.4	12	40.0	0.4	6	25.0	0.2
35-44	8	17.8	0.5	7	21.2	0.5	3	11.5	0.2	6	20.0	0.4	2	8.3	0.1
45-54	10	22.2	0.8	11	33.3	0.8	5	19.2	0.4	7	23.3	0.5	5	20.8	0.4
55-64	2	4.4	0.2	1	3.0	0.1	5	19.2	0.6	4	13.3	0.4	7	29.2	0.7
65+	1	2.2	0.1	2	6.1	0.2	0	0.0	0.0	0	0.0	0.0	1	4.2	0.1
Unknown	0	0.0		0	0.0		0	0.0		0	0.0		0		
Race/Ethnicity															
Asian	7	15.6	0.6	5	15.2	0.4	7	26.9	0.5	4	13.3	0.3	3	12.5	0.2
Black	22	48.9	2.6	22	66.7	2.6	11	42.3	1.3	16	53.3	1.9	8	33.3	0.9
Hispanic	7	15.6	0.2	1	3.0	0.0	4	15.4	0.1	1	3.3	0.0	9	37.5	0.2
White	6	13.3	0.2	5	15.2	0.2	1	3.8	0.0	4	13.3	0.1	2	8.3	0.1
Other	1	2.2	3.5	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0	0
Unknown	2	4.4		0	0.0		3	11.5		5	16.7		2	8.3	
SPA															
1	2	4.4	0.6	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	1	4.2	0.3
2	11	24.4	0.5	5	15.2	0.2	10	38.5	0.5	8	26.7	0.4	6	25.0	0.3
3	5	11.1	0.3	4	12.1	0.2	2	7.7	0.1	3	10.0	0.2	1	4.2	0.1
4	8	17.8	0.6	5	15.2	0.4	4	15.4	0.3	2	6.7	0.2	0	0	0
5	3	6.7	0.5	3	9.1	0.5	2	7.7	0.3	3	10.0	0.5	4	16.7	0.6
6	7	15.6	0.7	8	24.2	0.8	3	11.5	0.3	5	16.7	0.5	4	16.7	0.4
7	3	6.7	0.2	2	6.1	0.1	1	3.8	0.1	1	3.3	0.1	1	4.2	0.1
8	6	13.3	0.5	6	18.2	0.5	2	7.7	0.2	6	20.0	0.5	7	29.2	0.6
Unknown	0	0.0		0	0.0		2	7.7		2	6.7		0	0	

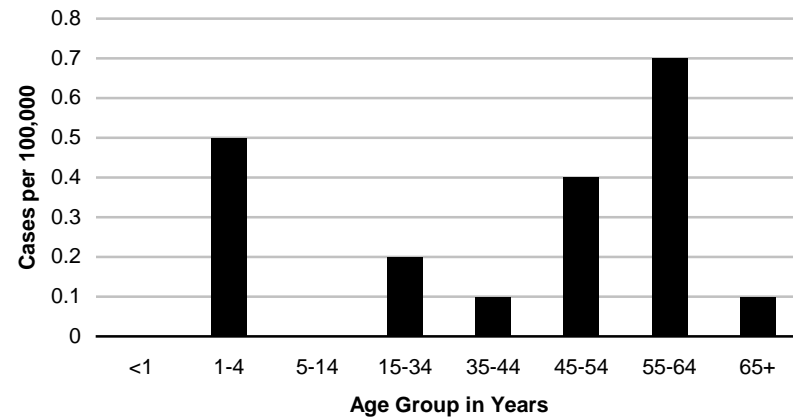
*Rates calculated based on less than 19 cases or events are considered unreliable.



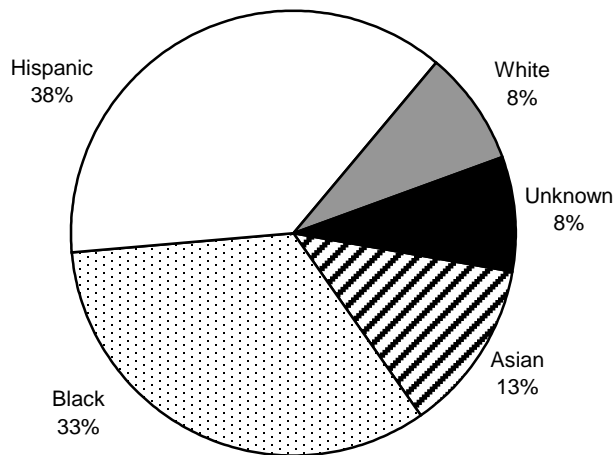
**Figure 1. Incidence Rates of Malaria
LAC, CA and US, 1999-2009**



**Figure 2. Incidence Rates of Malaria by Age Group
LAC, 2009 (N=24)**



**Figure 3. Percent Cases of Malaria by Race/Ethnicity
LAC, 2009 (N=24)**



**Figure 4. Number of Reported Malaria Cases by Race/Ethnicity
LAC, 2004-2009**

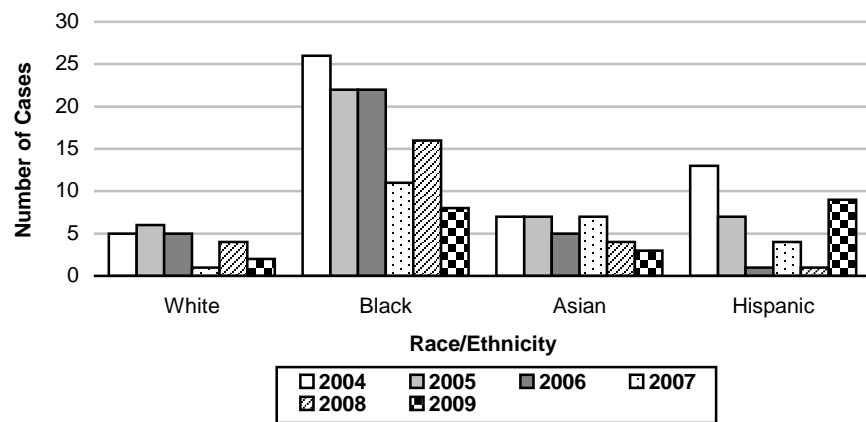




Figure 5. Percent Cases of Malaria by Species LAC, 2009

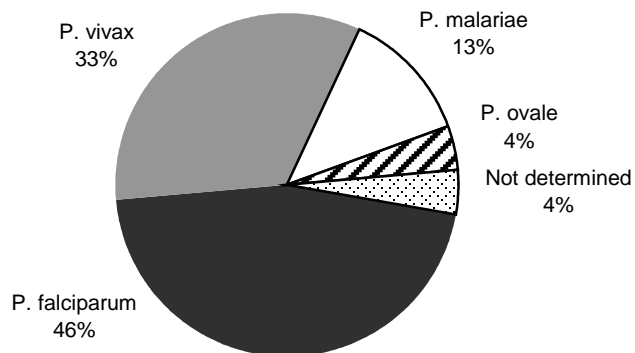


Table 1. Malaria Cases by Country of Acquisition and *Plasmodium* species, 2009

Country of Acquisition	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. malariae</i>	<i>P. ovale</i>	Not Determined	Total
Africa	10	0	2	1	0	13
- Ghana	1	0	1*	0	0	2
- Ivory Coast	1*	0	0	0	0	1
- Kenya	1*	0	0	0	0	1
- Liberia	0	0	1	0	0	1
- Nigeria	4	0	0	1	0	5
- Senegal	1*	0	0	0	0	1
- Sierra Leone	1	0	0	0	0	1
- Uganda	1	0	0	0	0	1
Asia/Oceania	1	2	0	0	1	4
- India	0	2	0	0	0	2
- Indonesia	1	0	0	0	0	1
- Pakistan	0	0	0	0	1	1
Latin America	0	6	1	0	0	7
- Colombia	0	3*	1	0	0	4
- Guatemala	0	2	0	0	0	2
- Honduras	0	1	0	0	0	1
Overall Total	11	8	3	1	1	24

*Case traveled to additional endemic countries.

Table 2. Prophylaxis Use Among US Residents with Malaria, 2009

Reason for Travel	Total Cases (n)	Prophylaxis Use (n)	Prophylaxis Use (%)
Pleasure	9	1	11
Work	6	3	33
Other/Unknown	3	1	33
Total	18	5	28



MALARIA

CRUDE DATA	
Number of Cases	30
Annual Incidence ^a	
LA County	0.31
California ^b	0.34
United States ^b	0.42
Age at Diagnosis	
Mean	37.4
Median	35
Range	9-59

^aCases per 100,000 population.

^bCalculated from Final 2008 Reports of Nationally Notifiable Infectious Disease. MMWR 58(31):856-857;859-869.

DESCRIPTION

Human malaria is a febrile illness caused by the protozoan parasites *Plasmodium vivax*, *P. falciparum*, *P. malariae*, and *P. ovale*. The disease is transmitted by the bite of an infected *Anopheles* mosquito and is characterized by episodes of chills and fever every 2 to 3 days. *P. falciparum* is found primarily in tropical regions and poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant. The more severe symptoms of *P. falciparum* include jaundice, shock, renal failure, and coma. For the purpose of surveillance, confirmation of malaria requires the demonstration of parasites in thick or thin blood smears, regardless of whether the person experienced previous episodes of malaria.

Before the 1950's malaria was endemic in the southeastern US. Now, it is usually acquired outside the continental US through travel and immigration. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito, *A. hermsi*, exists in southern California in rare numbers, and is capable of transmitting the parasite.

Prevention methods for malaria include avoiding mosquito bites or, once already infected, preventing the development of disease by using antimalarial drugs as prophylaxis. Travelers to countries where malaria is endemic should take precautions by taking the appropriate antimalarial prophylaxis as prescribed; using mosquito repellants, utilizing bednets, and wearing protective clothing as well as avoiding

outdoor activities between dusk and dawn when mosquito activity is at its peak.

2008 TRENDS AND HIGHLIGHTS

- The number of reported cases (N=30) continues to decrease since 2003.
- Almost half of all cases (n=14) were caused by *P. falciparum*. The remainder of cases with identified species were caused by *P. vivax* (n=12).
- All cases reported a travel history to a country with endemic malaria. This year, travelers to Africa represented 60% of all cases and 100% of *P. falciparum* cases.
- Among cases with a known reason for travel (n=21), there was a higher proportion of cases among refugees and immigrants (38%) compared to those traveling to visit friends and relatives (33%). This is a higher proportion than among previous years when refugees/immigrants made up less than 20% of cases annually.
- Only four of twelve US residents (33%) used prophylaxis during their travels, two of whom reported completing their regimen. A greater proportion of cases who traveled for work purposes reported using prophylaxis more commonly than those traveling for leisure (i.e., visiting friends and relatives).



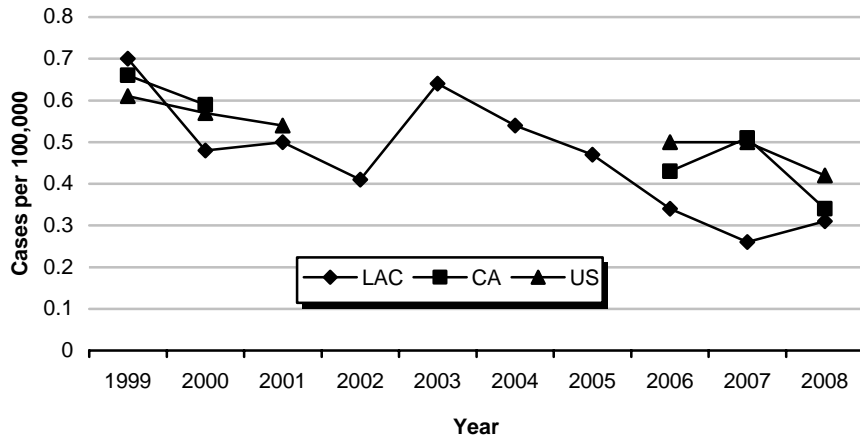
**Reported Malaria Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2004-2008**

	2004 (N=51)			2005 (N=45)			2006 (N=33)			2007 (N=26)			2008 (N=30)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
1-4	1	2.0	0.2	0	0.0	0.0	2	6.1	0.3	0	0.0	0.0	0	0.0	0.0
5-14	6	11.8	0.4	3	6.7	0.2	2	6.1	0.1	2	7.7	0.1	1	3.3	0.1
15-34	20	39.2	0.7	21	46.7	0.7	8	24.2	0.3	11	42.3	0.4	12	40.0	0.4
35-44	10	19.6	0.7	8	17.8	0.5	7	21.2	0.5	3	11.5	0.2	6	20.0	0.4
45-54	9	17.6	0.7	10	22.2	0.8	11	33.3	0.8	5	19.2	0.4	7	23.3	0.5
55-64	4	7.8	0.5	2	4.4	0.2	1	3.0	0.1	5	19.2	0.6	4	13.3	0.4
65+	1	2.0	0.1	1	2.2	0.1	2	6.1	0.2	0	0.0	0.0	0	0.0	0.0
Unknown	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Race/Ethnicity															
Asian	7	13.7	0.6	7	15.6	0.6	5	15.2	0.4	7	26.9	0.5	4	13.3	0.3
Black	26	51.0	3.0	22	48.9	2.6	22	66.7	2.6	11	42.3	1.3	16	53.3	1.9
Hispanic	13	25.5	0.3	7	15.6	0.2	1	3.0	0.0	4	15.4	0.1	1	3.3	0.0
White	5	9.8	0.2	6	13.3	0.2	5	15.2	0.2	1	3.8	0.0	4	13.3	0.1
Other	0	0.0	0.0	1	2.2	3.5	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Unknown	0	0.0		2	4.4		0	0.0		3	11.5		5	16.7	
SPA															
1	2	3.9	0.6	2	4.4	0.6	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
2	12	23.5	0.6	11	24.4	0.5	5	15.2	0.2	10	38.5	0.5	8	26.7	0.4
3	9	17.6	0.5	5	11.1	0.3	4	12.1	0.2	2	7.7	0.1	3	10.0	0.2
4	7	13.7	0.6	8	17.8	0.6	5	15.2	0.4	4	15.4	0.3	2	6.7	0.2
5	7	13.7	1.1	3	6.7	0.5	3	9.1	0.5	2	7.7	0.3	3	10.0	0.5
6	5	9.8	0.5	7	15.6	0.7	8	24.2	0.8	3	11.5	0.3	5	16.7	0.5
7	2	3.9	0.1	3	6.7	0.2	2	6.1	0.1	1	3.8	0.1	1	3.3	0.1
8	6	11.8	0.5	6	13.3	0.5	6	18.2	0.5	2	7.7	0.2	6	20.0	0.5
Unknown	1	2.0		0	0.0		0	0.0		2	7.7		2	6.7	

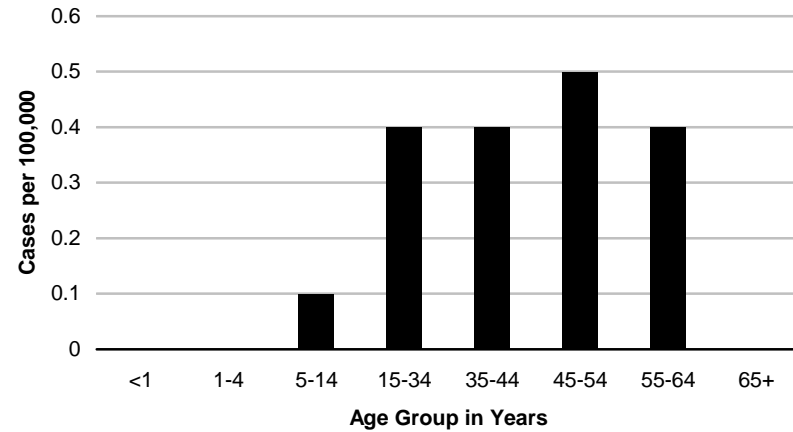
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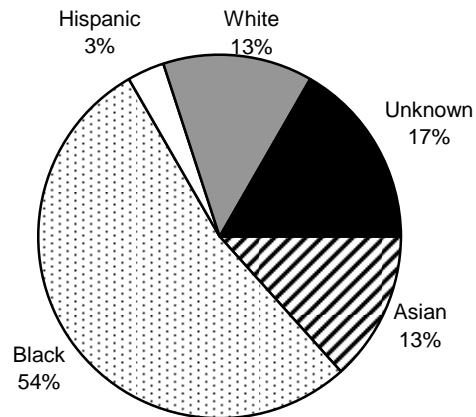
**Figure 1. Incidence Rates of Malaria
LAC, CA and US, 1999-2008**



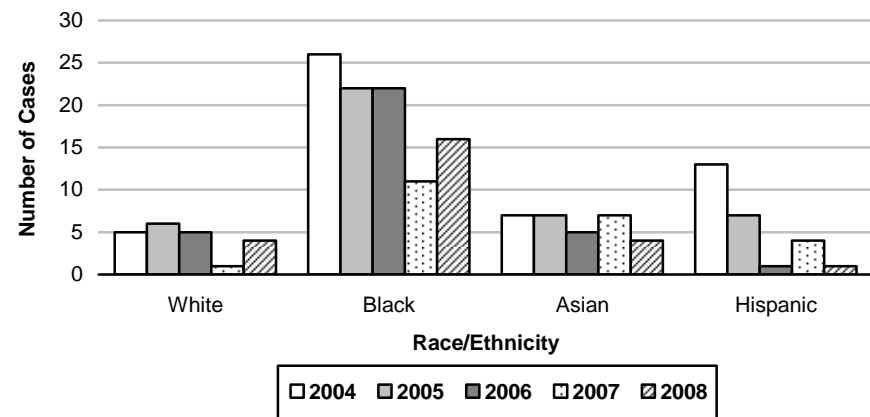
**Figure 2. Incidence Rates of Malaria by Age Group
LAC, 2008**



**Figure 3. Percent Cases of Malaria by Race/Ethnicity
LAC, 2008**

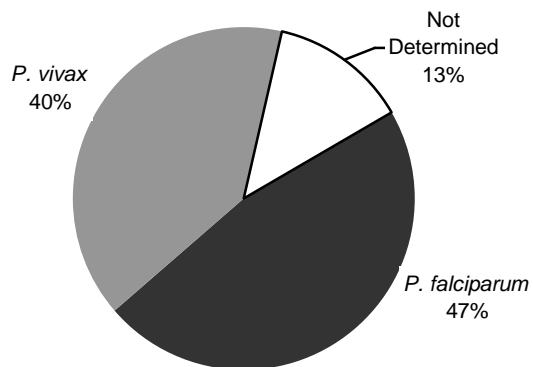


**Figure 4. Number of Reported Malaria Cases by Race/Ethnicity
LAC, 2004-2008**





**Figure 5. Percent Cases of Malaria by Species
LAC, 2008**



**Table 2. Prophylaxis Use Among US Residents with
Malaria, 2008**

Reason for Travel	Total Cases (n)	Prophylaxis Use (n)	(%)
Pleasure	6	2	33
Work	4	2	50
Other/Unknown	2	0	0
Total	12	4	33

**Table 1. Malaria Cases by Country of Acquisition and
Plasmodium species, 2008**

Country of Acquisition	<i>P. falciparum</i>	<i>P. vivax</i>	Not Determined	Total
Africa	12	3	3	18
- Cameroon	1	0	1	2
- Central African Republic	1	0	0	1
- Congo	0	1	0	1
- Ethiopia	1	1	0	2
- Ghana	1	0	1	2
- Liberia*	1	0	0	1
- Nigeria	7	0	1	8
Asia/Oceania	0	5	0	5
- India	0	4	0	4
- Pakistan	0	1	0	1
Latin America	0	3	0	3
- Guatemala	0	1	0	1
- Honduras	0	1	0	1
- Nicaragua	0	1	0	1
Unknown	2	1	1	4
Overall Total	14	12	4	30

*Case also traveled to Togo

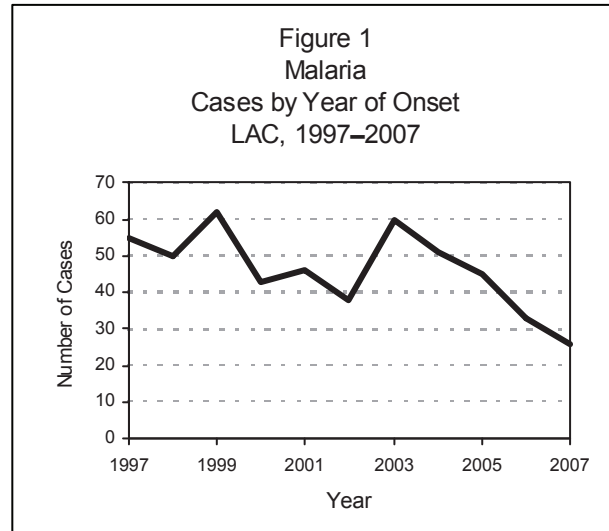


MALARIA

CRUDE DATA	
Number of Cases	26
Annual Incidence	
LA County	0.27
California	0.51 ^a
United States	0.50 ^b
Age at Onset	
Mean	37
Median	31
Age Range	14–63 years

^a Calculated based on the number of cases reported in Malaria Surveillance - United States, 2006 issue of MMWR (57(SS05);24-39), and the state population estimate from the 2006 American Community Survey (www.census.gov).

^b Malaria Surveillance - United States, 2006 issue of MMWR (57(SS05); 24-39).



DESCRIPTION

Human malaria is an acute or subacute febrile illness caused by one or more protozoan parasites that infect humans: *Plasmodium vivax*, *P. falciparum*, *P. malariae*, and *P. ovale*. The disease is transmitted by the bite of an infected *Anopheles sp.* mosquito and is characterized by episodes of chills and fever every 2–3 days. *P. falciparum* is found primarily in tropical regions and poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant. The more severe symptoms of *P. falciparum* include jaundice, shock, renal failure, and coma. For the purpose of surveillance, confirmation of malaria requires the demonstration of parasites in thick or thin blood smears, regardless of whether the person experienced previous episodes of malaria.

Before the 1950's malaria was endemic in the southeastern US. Now, it is usually acquired outside the continental US through travel and immigration and is rarely transmitted within the US. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito, *A. hermsi*, exists here and is capable of transmitting the parasite. Malaria surveillance is maintained to detect locally acquired cases that could indicate the reintroduction of transmission and to monitor patterns of resistance to antimalarial drugs. The last occurrence of locally acquired malaria in California (CA) was in 1988–89, when thirty migrant workers were reported in San Diego with *P. vivax* infection. Since then, local transmission has not occurred in southern CA due to the inadequate number of people infected with the malaria parasite required to sustain disease transmission. Additionally, the mosquito capable of transmitting malaria is very rare.

DISEASE ABSTRACT

- The number of malaria cases in LAC has continued to decrease since its peak in 2003.
- The percentage of US residents who took some form of antimalarial chemoprophylaxis during travel to a malaria-endemic region has dropped to a low of 6%.



STRATIFIED DATA

Trends: In 2007, there were 26 reported cases compared to 33 reported the previous year — a 21% decrease. Over half of the cases (n=14, 54%) were infected with *P. falciparum* in 2007 (Figure 2), less than the proportion affected in 2006 (n=21, 64%).

Age: The median age of infection has decreased markedly from 40 years in 2006 to 31 years in 2007. The mean age was 37 years (range: 14–63 years). The largest number of cases (n=11, 42%) occurred in the 15–34 year age group (Figure 3). In 2006 the largest number occurred in the 45–54 year age group.

Sex: The ratio of male-to-female cases was three to one (2.25:1).

Race/Ethnicity: The majority of reported malaria cases occurred among blacks, which included African-Americans and African immigrants (n=11, 48%). Seven cases (30%) were reported among Asians and four (17%) among Hispanics. Only one case occurred in a white person. Three cases had unknown race and ethnicity. Since the early 1990s, blacks have had the highest proportion of reported malaria cases, with the exception of year 2003, where whites outnumbered blacks.

Disease Severity: There were no deaths from malarial infection in 2007. However, most (n=18, 75%) required hospitalization and several experienced severe complications, mainly with falciparum malaria, including two with renal failure and one with cerebral malaria. Two cases had unknown hospitalization status. The mean length of hospitalization for sixteen cases with known admission and discharge dates was 5.3 days and ranged from 1 to 28 days.

Transmission and Risk Factors: All twenty-three cases with known travel status reported recent travel to a foreign country. Africa remains the most common region visited (n=11, 48%). Reports of travel to Nigeria, usually the most frequently reported country by far, decreased from 16 in 2006 to 4 in 2007, the same number who travelled to India (Table 1). Among cases with a known reason for travel (n=16), the most commonly reported reason was visiting friends and relatives (n=9, 56%). Refugees and immigrants made up 13% (n=2) of cases with known travel reasons. Purpose of travel was reported for only 62% of cases.

Among the 18 cases with reported US residence and known prophylaxis usage, only one individual (6%) took prophylaxis (Table 2). This is the lowest rate of usage recorded in recent years. Information on antimalarial prophylaxis usage was available for 21 cases (81%), of which a total of three cases (14%) took some form of prophylaxis. None of those who took prophylaxis reported taking their medication correctly as prescribed (one unknown).

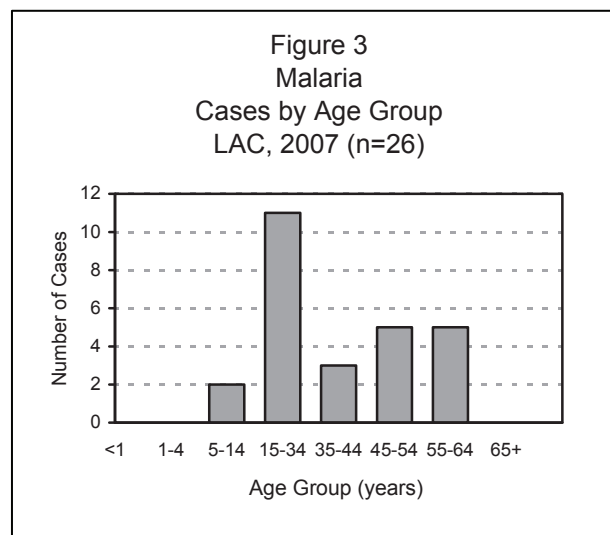
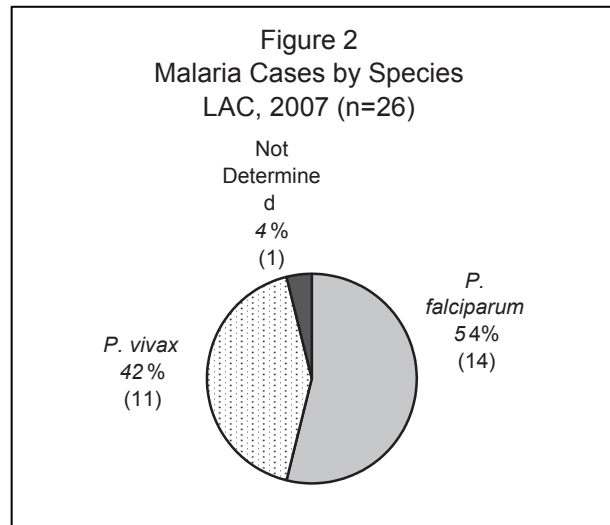




Table 1. Malaria Cases by Country of Acquisition and *Plasmodium* Species, 2007

Country of Acquisition	<i>P. falciparum</i>	<i>P. vivax</i>	Not Determined	Total
Africa	10	0	1	11
Congo	1	0	0	1
Ghana	0	0	1*	1
Liberia	1**	0	0	1
Nigeria	4	0	0	4
Sierra Leone	3	0	0	3
Uganda	1	0	0	1
Asia/Oceania	1	6	0	7
India	1	3	0	4
Pakistan	0	2	0	2
Papua New Guinea	0	1	0	1
Latin America	1	4	0	5
Dominican Republic	1	0	0	1
Guatemala	0	3	0	3
Peru	0	1	0	1
Unknown	2	1	0	3
Overall Total	14	11	1	26

* Case also traveled to Benin and Togo
** Case also traveled to Ghana

Table 2. Prophylaxis Use Among US Residents with Malaria, 2007

Reason for Travel	Total Cases (n)	Prophylaxis Use (n)	Prophylaxis Use (%)
Pleasure	11	1	6
Work	2	0	0
Other/Unknown	5	0	0
Total	18	1	6

No cases reported a history of prior malaria infection within the past twelve months. No cases were reported as being acquired through blood transfusion or transplantation.

COMMENTS

The number of cases reported in recent years is far below the number of cases seen throughout the late 1970s through 1986 (an average of 133 malaria cases reported annually from 1979-1986). The reasons for the overall decrease in malaria cases are unknown but it can be partially attributed to a decrease of incoming refugees from malaria endemic countries. Prior to the 1990s, refugees and immigrants from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. In contrast in 2007, refugees and immigrants made up only 13%.

Information on travel and prophylaxis is obtained by interviewing patients. The data are limited by the patients' ability to recall this information. It is also limited by the small size of the case population, particularly when stratified by multiple variables.



PREVENTION

Prevention methods for malaria include avoiding mosquito bites or, once already infected, preventing the development of disease by using antimalarial drugs as prophylaxis. Travelers to countries where malaria is endemic should take precautions by taking the appropriate antimalarial prophylaxis as prescribed; using mosquito repellants, utilizing bednets, and wearing protective clothing as well as avoiding outdoor activities between dusk and dawn when mosquito activity is at its peak.

ADDITIONAL RESOURCES

Centers for Disease Control and Prevention. Available at: <http://www.cdc.gov/malaria>

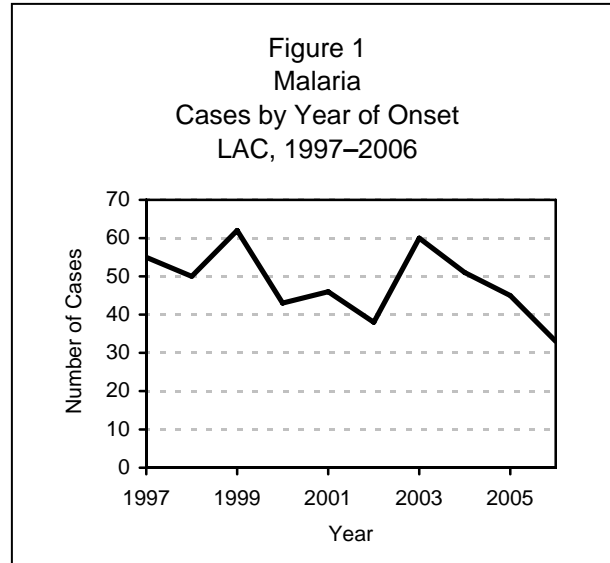
Centers for Disease Control and Prevention (1990). Transmission of *Plasmodium vivax* malaria—San Diego County, California, 1988 and 1989. *Morbidity and Mortality Weekly Report*, 39(6), 91-94. Retrieved October 15, 2008, from the CDC Web site:
<http://www.cdc.gov/mmwr/preview/mmwrhtml/00001559.htm>

Centers for Disease Control and Prevention (2006). Malaria surveillance—United States, 2004. *Morbidity and Mortality Weekly Report*, 55(SS04), 23-37. Retrieved October 15, 2008, from the CDC Web site: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5504a2.htm?s_cid=ss5504a2_e

MALARIA

CRUDE DATA	
Number of Cases	33
Age at Onset	
Mean	38
Median	40
Age Range	3–69 years
Annual Incidence	
LA County	0.34
California	0.43 ^a
United States	0.50 ^a

^a Calculated from 2007 Summary of notifiable diseases issue of MMWR (56:853-863).



DESCRIPTION

Human malaria is an acute or subacute febrile illness caused by one or more protozoan parasites that infect humans: *Plasmodium vivax*, *P. falciparum*, *P. malariae*, and *P. ovale*. The disease is transmitted by the bite of an infected *Anopheles sp.* mosquito and is characterized by episodes of chills and fever every 2–3 days. *P. falciparum* is found primarily in tropical regions and poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant. The more severe symptoms of *P. falciparum* include jaundice, shock, renal failure, and coma. Each case of malaria requires the demonstration of parasites in thick or thin blood smears, regardless of whether the person experienced previous episodes of malaria while outside the country.

Malaria is usually acquired outside the continental United States (US) through travel and immigration and is rarely transmitted within the US. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito, *A. hermsi*, exists here and is capable of transmitting the parasite. In 1988–89, the last autochthonous cases in California (CA) occurred in San Diego among thirty migrant workers infected with *P. vivax*. Since then, local transmission has not occurred in southern CA due to the inadequate number of people infected with the malaria parasite necessary to sustain disease transmission. Additionally, the mosquito capable of transmitting malaria is very rare.

DISEASE ABSTRACT

- The number of malaria cases in LAC has continued to decrease since its peak in 2003.
- The percentage of US travelers who took some form of antimalarial chemoprophylaxis during travel to a malaria-endemic region has increased since the previous year to 52%. Almost all who took prophylaxis reported complete compliance with the regimen.

STRATIFIED DATA

Trends: In 2006, there were 33 reported cases compared to 45 reported the previous year: a 27% decrease. This continued a decline in cases that began in 2003 when 60 cases were reported (Figure 1). Most cases (n=21, 64%) were infected with *P. falciparum* in 2006 (Figure 2), similar to the proportion affected in 2005 (n=29, 65%).

Seasonality: Seasonality for malaria was not determined. Malaria is acquired abroad and is independent of LAC weather or seasonal patterns.

Age: The mean age of infection has increased in 2006 to 38 (range: 3–69 years); the median age was 40. The largest number of cases (n=11, 33%) occurred in an older age group than previous years (45–54 years). In 2005 the largest number occurred in the 15–24 year age group (Figure 3).

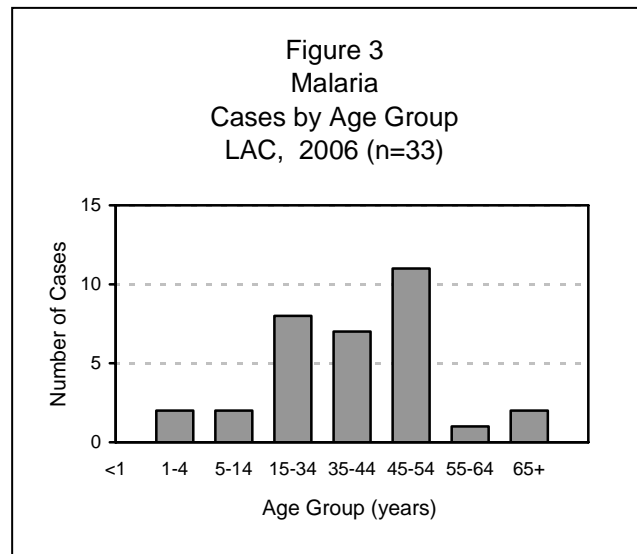
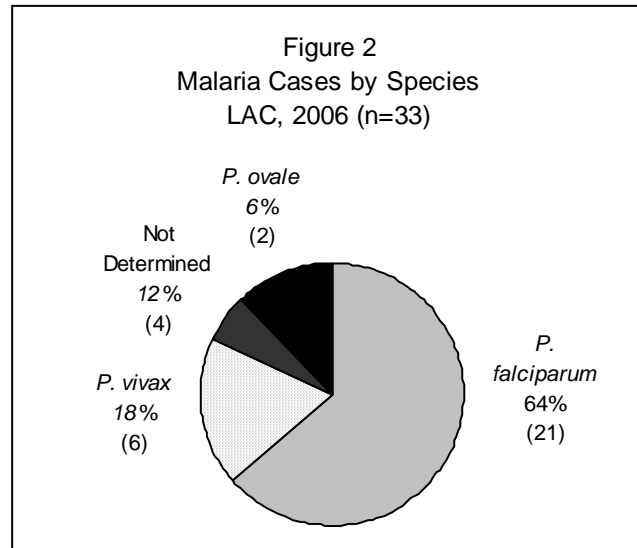
Sex: The ratio of male-to-female cases was three to one (3:1).

Race/Ethnicity: The majority of reported malaria cases occurred among blacks, which included African-Americans and African immigrants (n=22, 67%). Five cases each (15%) were reported among Asians and whites. Only one case (3%) of Latino ethnicity was reported. Since the early 1990s, blacks have had the highest proportion of reported malaria cases, with the exception of year 2003, where whites outnumbered blacks. Race and ethnicity were known for all cases.

Disease Severity: There were no deaths or severe complications associated with malarial infection in 2006, however, most (n=24, 73%) required hospitalization. The mean length of hospitalization was 2.7 days and ranged from 1 to 7 days.

Transmission and Risk Factors: All cases reported recent travel to a foreign country, with Africa continuing to be the most common region visited. Twenty-three (70%) reported malaria cases were from individuals who were traveling to or coming from African countries. Reports of travel to Nigeria, the most frequently reported country, increased from 9 in 2005 to 16 in 2006 (n=16) (Table 1). The most commonly reported reason for travel was visiting friends and relatives (n=19, 71%). Refugees and immigrants made up only 7% (n=2) of cases with known travel reasons. Purpose of travel was reported for 82% of cases.

Among the 21 cases that reported US residency prior to their most recent travel, 11 individuals (52%) took prophylaxis, which was at least twice as high a rate of usage compared to the previous two years. Information on antimalarial prophylaxis usage was available for 20 (95%). Almost all (n=10) took their medication correctly as prescribed. When stratified by purpose of travel, the proportion of prophylaxis usage among cases was higher in those who traveled for work than for pleasure (67% vs. 53%) (Table 2). Traveling for work in 2006 included individuals who traveled as part of volunteer service or for a scientific conference. Tourism and visiting friends and family were classified as traveling for pleasure. Prophylaxis



usage among travelers for work (67%) has remained similar to that found in 2005 (60%). Usage among travelers for pleasure has increased markedly from 12% in 2005 to 53% in 2006.

Table 1. Malaria Cases by Country of Acquisition and *Plasmodium* Species— LAC, 2006

Country of Acquisition	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. ovale</i>	Not Determined	Total
Africa	19	1	2	1	23
- Cameroon	2	0	0	0	2
- Ghana	1	0	0	0	1
- Nigeria	12	1	2	1	16
- Sierra Leone	2	0	0	0	2
- Uganda	2	0	0	0	2
Asia/Oceania	1	3	0	2	6
- India	0	1	0	1	2
- Indonesia	1	0	0	0	1
- Papua New Guinea*	0	2	0	0	2
- Vanuatu	0	0	0	1	1
Latin America	0	2	0	1	3
- Guatemala	0	1	0	0	1
- Honduras	0	1	0	0	1
- Mexico	0	0	0	1	1
Unknown	1	0	0	0	1
Overall Total	21	6	2	4	33

*One case also traveled to Indonesia and Guatemala in addition to Papua New Guinea.

Table 2. Prophylaxis Use Among US Travelers with Malaria, 2006

Reason for Travel	Total Cases (N)	Prophylaxis Use	
		(N)	(%)
Pleasure	17	9	53
Work	3	2	67
Other/Unknown	1	0	0
Total	21	11	52

Seven of 27 cases (26%) reported a history of infection with malaria in the twelve months prior to their most recent episode. The species of the prior infections were not identified for any cases. No cases were acquired through blood transfusion or transplantation.

PREVENTION

Prevention method of malaria includes avoiding mosquito bites or, once already infected, preventing the development of disease by using antimalarial drugs as prophylaxis. Travelers to countries where malaria is endemic should take precautions by taking the appropriate antimalarial prophylaxis as prescribed; using mosquito repellants, utilizing bednets, and wearing protective clothing; as well as avoiding outdoor activities between dusk and dawn when mosquito activity is at its peak.

COMMENTS

The reason for the overall decrease in malaria cases is most likely due to a decrease in overseas travel and incoming refugees from malaria endemic countries. The number of malaria cases overall is far below the number of cases seen throughout the late 1970s through 1986 (an average of 133 malaria cases reported annually from 1979-1986). Prior to the 1990s, refugees and immigrants from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. In contrast in 2006, refugees and immigrants made up only 7%.

Information on travel and prophylaxis is obtained by interviewing patients. The data is limited by the patients' ability to recall this information. It is also limited by the small size of the case population, particularly when stratified by multiple variables.

ADDITIONAL RESOURCES

Additional information about malaria is available from the CDC at: www.cdc.gov/malaria/

CDC. Malaria surveillance--United States, 2004. MMWR 2006; 55(SS04):23-37. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/ss5504a2.htm?s_cid=ss5504a2_e

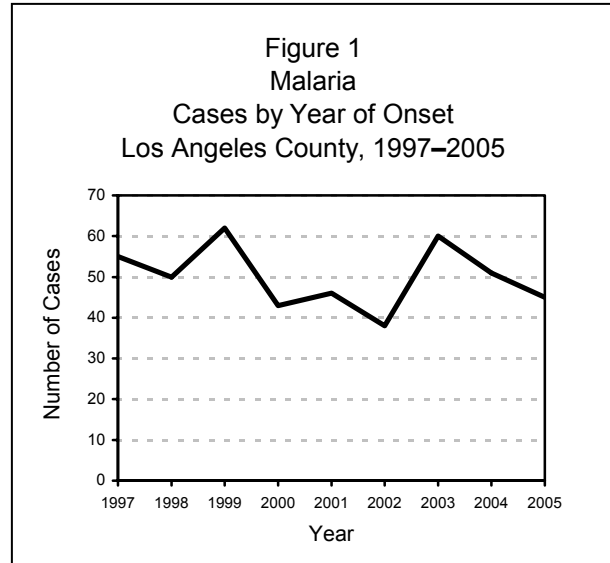
CDC. Transmission of *Plasmodium vivax* malaria--San Diego County, California, 1988 and 1989. MMWR 1990; 39(6):91-94. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/00000814.htm



MALARIA

CRUDE DATA	
Number of Cases	45
Age at Onset	
Mean	34
Median	32
Age Range	5–93 years
Case Fatality	
LA County	2.2%
United States	<1% ^a

^a Calculated from 2004 US malaria surveillance in the 2006 Surveillance Summary issue of MMWR (SS-4:23-37).



DESCRIPTION

Human malaria is an acute or subacute febrile illness caused by one or more protozoan parasites that infect humans: *P. vivax*, *P. falciparum*, *P. malariae*, and *P. ovale*. The disease is transmitted by the bite of an infected *Anopheles sp.* mosquito and is characterized by episodes of chills and fever every 2–3 days. *P. falciparum* is found primarily in tropical regions and poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant. The more severe symptoms of *P. falciparum* include jaundice, shock, renal failure, and coma. Each case of malaria requires the demonstration of parasites in thick or thin blood smears, regardless of whether the person experienced previous episodes of malaria while outside the country.

Malaria is a disease usually acquired outside the continental US through travel and immigration and is rarely transmitted within the US. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito, *A. hermsi*, exists here and is capable of transmitting the parasite. In 1988–89, the last autochthonous cases occurred in San Diego, California, among 30 migrant workers infected with *P. vivax*. Since then, local transmission has not occurred in Southern California due to an inadequate number of people infected with the malaria parasite to sustain disease transmission. Additionally, the mosquito capable of transmitting malaria is very rare.

DISEASE ABSTRACT

- A cluster of three malaria cases occurred in late 2005 among members of a missionary group that traveled to Africa. The cases, two from LAC and one from outside the county were not infected by the same *Plasmodium sp.*
- The number of malaria cases in LAC has continued to decrease since its peak in 2003.
- One fatality occurred in a non-resident of LAC with *P. falciparum* infection who traveled to the US from the Philippines.
- The percentage of US travelers who took some form of antimalarial chemoprophylaxis during travel to a malaria-endemic region remains similar to 2004 (21%). Only one case reported compliance with the prophylactic regimen.



STRATIFIED DATA

Trends: There was a 25% decline in cases in 2005 with 45 reported cases compared to peak year 2003, 60 cases (Figure 1). A larger proportion of cases were infected with *P. falciparum* (n=29, 65%) in 2005 compared to 2004 (n=29, 46%) (Figure 2).

Seasonality: Seasonality for malaria was not determined. Malaria is acquired abroad and is independent of LAC weather or seasonal patterns.

Age: The mean age of infection has decreased in 2005 to 34 (range: 5–93 years); the median age was 32. The largest number of cases (n=12, 27%) occurred in a younger age group (15–24 years), whereas, in 2004 the largest number occurred in the 25–34 year age group (Figure 3).

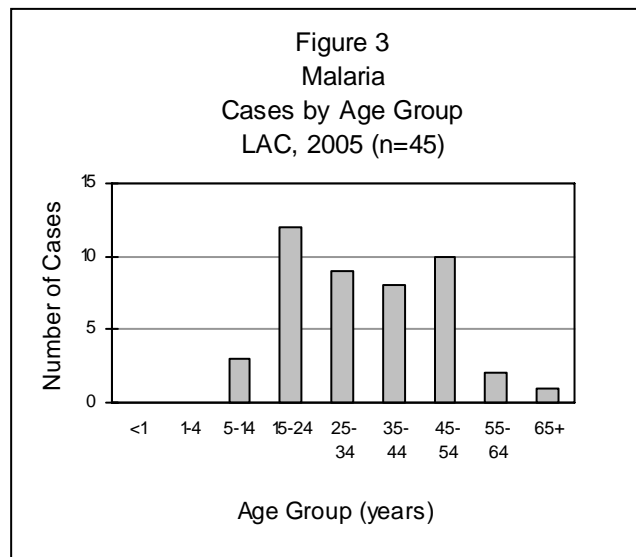
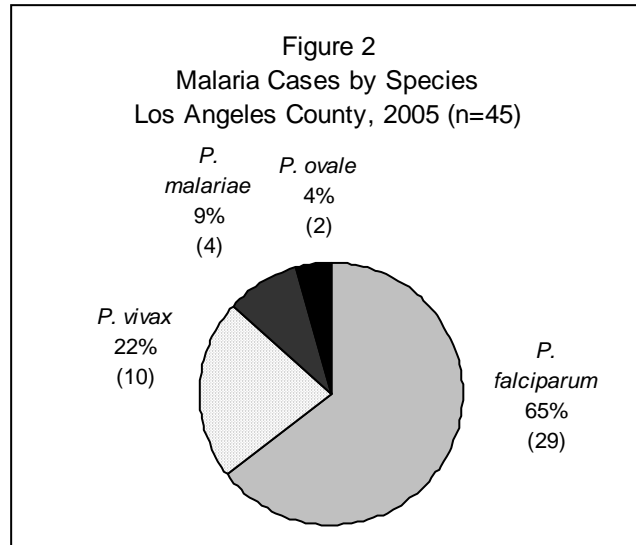
Sex: The ratio of male-to-female cases was three to one (3:1).

Race/Ethnicity: Over half of the reported malaria cases occurred among Blacks, which included African-Americans and African immigrants (n=22, 51%), followed by Latinos (n=7, 16%) and Asian/Pacific Islanders (n=7, 16%). Since the early 1990s, Blacks have had the highest proportion of reported malaria cases, with the exception of year 2003, where Whites outnumbered Blacks. Race and ethnicity were known for 96% of the cases.

Disease Severity: There was one death due to malaria. A 32-year old non-resident male acquired *P. falciparum* malaria while in a rural area of the Philippines and continued to experience symptoms during his visit to the US. He suffered multiple complications including cerebral malaria, renal failure, and acute respiratory distress syndrome (ARDS). His onset of symptoms began before his arrival into the US; the interval between onset and death was 22 days. One additional case was known to have severe complications, a 44-year old male visiting Senegal who also acquired *P. falciparum* malaria. His onset occurred before arrival to the US; he experienced renal failure during the course of hospitalization. He did not take any chemoprophylaxis.

Transmission and Risk Factors: All cases reported recent travel to a foreign country, with Africa continuing to be the most common region visited. Most of the reported malaria cases (n=30, 67%) were among individuals who were traveling to or coming from African countries. The most frequently reported country of travel was Nigeria (n=9) (Table 1).

Traveling for work included individuals that traveled as part of the military or a missionary group among others. Tourism and visiting friends and family were classified as traveling for pleasure. Among the 35 cases that claimed to be a resident of the US prior to their most recent travel, information on anti-malarial prophylaxis usage was available for 28 (80%). Six individuals (21%) took prophylaxis, which was the same rate of usage as in 2004. Of the six who took prophylaxis, four did not take the medication correctly





as prescribed; dosage information was known for five of the six cases. When stratified by purpose of travel, the proportion of prophylaxis usage among cases was much higher in those who traveled for work than for pleasure (60% vs. 12%) (Table 2). A single case that took the appropriate prophylaxis, acquired *P. falciparum* malaria while traveling to Uganda for work purposes.

Table 1. Malaria Cases by Country of Acquisition and *Plasmodium* Species— LAC, 2005

Country of Acquisition	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. malariae</i>	<i>P. ovale</i>	Total
Africa	25	2	2	1	30
- Benin	1	0	0	0	1
- Cameroon	2	0	0	0	2
- Ethiopia	0	1	0	0	1
- Ghana	3	0	0	0	3
- Kenya	2	0	0	0	2
- Liberia	0	1	0	0	1
- Nigeria	9	0	0	0	9
- Senegal	2	0	0	0	2
- Sierra Leone	1	0	0	0	1
- South Africa	1	0	0	0	1
- Togo	1	0	0	0	1
- Uganda	2	0	2	1	5
- Africa, unspecified	1	0	0	0	1
Latin America	1	5	2	0	8
- El Salvador	0	3	1	0	4
- Haiti	1	0	0	0	1
- Mexico	0	2	0	0	2
- Peru	0	0	1	0	1
Asia/Oceania	1	2	0	0	3
- India	0	1	0	0	1
- Philippines	1	0	0	0	1
- Thailand	0	1	0	0	1
Unknown	2	1	0	1	4
Overall Total	29	10	4	2	45

Table 2. Prophylaxis Use Among US Travelers with Malaria, 2005

Reason for Travel	Total Cases	Prophylaxis Use	
	(N)	(N)	(%)
Pleasure	21	2	12
Work	6	3	60
Other/Unknown	8	1	17
Total	35	6	21

Prior to the 1990s, refugees and immigrants from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. In contrast in 2005, refugees and immigrants made up only 19% (n=8) of cases with known travel reasons and arrived from various regions of the world. The most commonly reported reason for travel was visiting friends and relatives (n=23, 53%). Purpose of travel was reported for 96% of cases.



Only 3 of 36 cases (8%) reported a history of infection with malaria in the 12 months prior to their most recent episode. The species of the prior infections was known for only one of the three cases. The case had a previous infection with *P. falciparum* while most recently infected with *P. vivax*. No cases were acquired through blood transfusion or transplantation.

PREVENTION

Prevention of malaria is aimed at preventing infection by avoiding mosquito bites or, once already infected, preventing the development of disease by using antimalarial drugs as prophylaxis. Travelers to countries where malaria is endemic should take precautions by taking the appropriate antimalarial drugs as prescribed; using mosquito repellants, utilizing bednets, and wearing protective clothing; as well as avoiding outdoor activities between dusk and dawn when mosquito activity is at its peak.

COMMENTS

A cluster of cases involving out of county residents occurred in late 2005 among members of a missionary group. The group of 18 members traveled to Ghana during the summer and two began developing symptoms three to four months after their return to the US. One was confirmed with *P. ovale* and the other with *P. malariae*. Both cases took at least half of the prescribed prophylaxis during their travel. A third case, from outside LAC, did not develop symptoms until mid-2006 and was confirmed with an unidentified species of malaria.

The reason for the overall decrease in malaria cases is most likely due to a decrease in overseas travel and incoming refugees from malaria endemic countries. The number of malaria cases overall is far below the number of cases seen throughout the late 1970s through 1986 (an average of 133 malaria cases reported annually from 1979–1986). Cases can be further prevented by the correct usage of prescribed prophylaxis as almost all reported cases either did not take prophylaxis or did not take the complete regimen.

Information on travel and prophylaxis is obtained by interviewing patients. The data is limited by the patients' ability to recall this information. It is also limited by the small size of the case population, particularly when stratified by multiple variables.

ADDITIONAL RESOURCES

Additional information about malaria is available from the CDC at:
www.cdc.gov/ncidod/dpd/parasites/malaria/default.htm

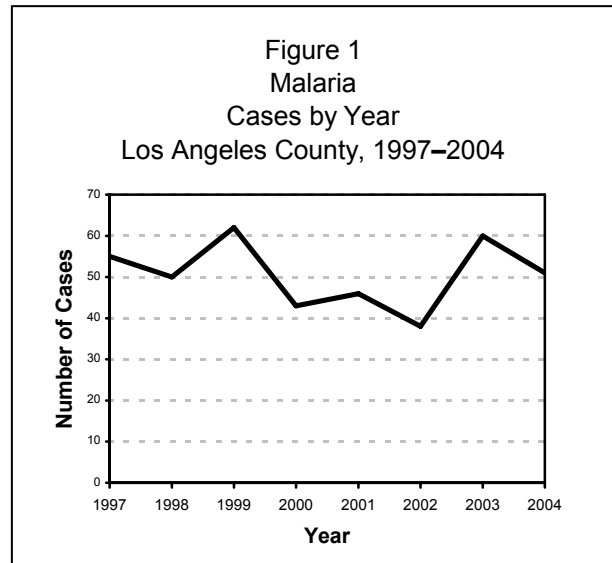
CDC. Malaria Surveillance—United States, 2004. MMWR 2006. SS-4:23-37. Available at:
www.cdc.gov/mmwr/preview/mmwrhtml/ss5504a2.htm?s_cid=ss5504a2_e

CDC. Transmission of *Plasmodium vivax* Malaria—San Diego County, California, 1988 and 1989. MMWR 1990. 39:91-94. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/00001559.htm.



MALARIA

CRUDE DATA	
Number of Cases	51
Age at Onset	
Mean	35
Median	34
Age Range	1–71 years
Case Fatality	
LA County	0.0%
United States	N/A



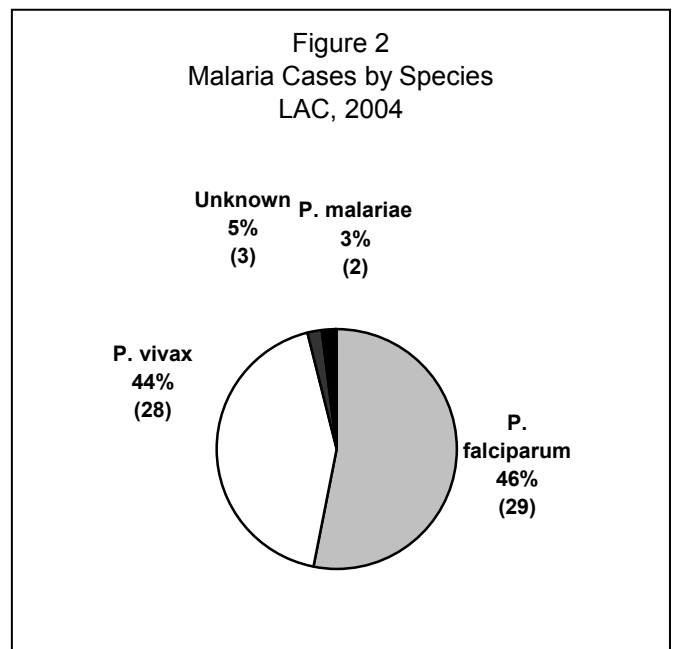
DESCRIPTION

Human malaria is an illness caused by one or more plasmodia that infect humans: *P. vivax*, *P. falciparum*, *P. malariae*, and *P. ovale*. *P. falciparum* is found primarily in tropical regions and poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant.

Malaria is a disease acquired outside the continental US through travel and immigration and is rarely transmitted within the US. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito, *Anopheles hermsi*, exists here and is capable of transmitting the parasite. In 1988–89, the last autochthonous cases occurred in San Diego, CA among thirty migrant workers infected with *Plasmodium vivax* (*P. vivax*). Since then, local transmission has not occurred in southern CA due to an adequate number of people infected with the malaria parasite to sustain disease transmission. Additionally, the mosquito capable of transmitting malaria is very rare.

DISEASE ABSTRACT

- The number of malaria cases in LAC decreased from 60 to 51 cases in 2003 and 2004, respectively (Figure 1).
- LAC residents comprised 66% (34/51) of the malaria cases. Fourteen percent (7/51) of the reported cases were refugees/immigrants and 6% (3/51) were foreign visitors in LAC. One non-resident case remains unknown for reasoned traveled to the US. Residency status could not be determined in 6 cases.
- Only 20% (7/34) of LAC residents took some form of antimalarial chemoprophylaxis during travel to a malaria-endemic region (Table 2). Of the remaining LAC residents, seventy-one percent (24/34) denied using any prophylaxis, six percent (2/34) could not recall prophylaxis usage, and in one case no information was available.





STRATIFIED DATA

Species Frequency: The infecting malarial species was identified for 48 cases (94%); 26 cases were infected with *P. falciparum*, 21 with *P. vivax*, and 1 with *P. malariae* (Table 1).

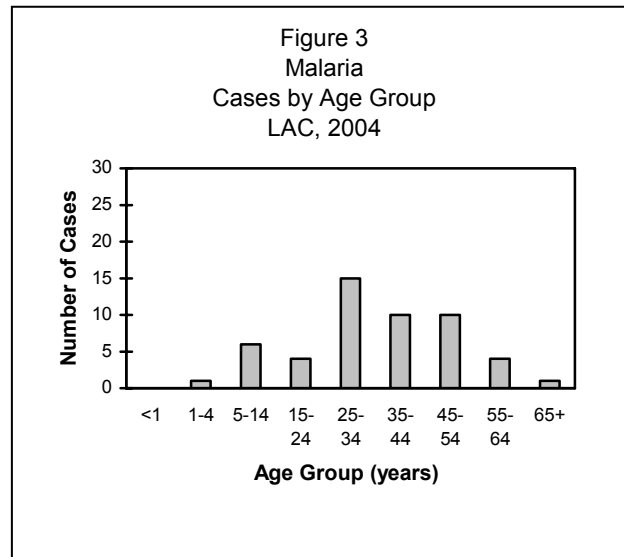
Seasonality: Seasonality for malaria was not determined. Malaria is acquired abroad and is independent of LAC weather or seasonal patterns.

Age: Most cases occurred in individuals aged 25-34, (15 cases or 29%) followed by those between 35 to 44 years (10 cases or 20%). Mean age of infection was 35 years, median age was 34, and the age range was 1-71 years old.

Sex: The rate ratio of male-to-female cases is two to one (2:1).

Race/Ethnicity: Over fifty percent of the reported malaria cases occurred among Blacks which included African-Americans and African nationals (27/51 or 53%), followed by Hispanics (13/51 or 25%), Asian/Pacific Islanders (7/51 or 14%), and Whites which comprised of only 8 percent (4/51) of the total cases.

Fatalities: There were no deaths due to malaria.



COMMENTS

LAC residency status included individuals who were residents for any length of time. Five of the 34 cases (15%) were LA county residents for less than 12 months. The majority of malaria cases (n=34, 76%) were LAC residents who traveled abroad either for work or pleasure. Traveling for work included individuals that traveled for business or as a student/teacher. Tourism and visiting friends/family were classified as traveling for pleasure. The reason for the overall decrease in malaria cases is most likely due to a decrease in overseas travel and incoming refugees from malaria endemic countries. The number of malaria cases overall is still far below the number of cases seen throughout the late 1970s through 1986 (an average of 133 malaria cases reported annually from 1979-1986).

In LAC, malaria is a disease related to travel and immigration. Among US travelers who returned with malaria infection, Africa remains the most common region visited. Twenty-nine (57%, 29/51) of reported malaria cases were from individuals who were LAC residents and non-residents traveling to or coming from African countries (Table 1). Since the early 1990s, Blacks, including African nationals and African Americans, have been the ethnic group with the highest incidence of malaria in LAC, with the exception of year 2003, where Caucasians outnumbered Blacks in malaria cases.

Prior to the 1990s, immigrants/refugees from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. In contrast in 2004, refugees/immigrants made up only 14% (7/51) of cases; most cases were Hispanic (3) and African (3). The leading countries of acquisition for refugees/immigrants were Guatemala and Nigeria, respectively.

Anti-malarial prophylaxis use was available for all of the 34 LAC residents. Only, seven individuals (21%, 7/34) took prophylaxis (Table 2). However, six of the seven cases taking prophylaxis reported not completing their medication; in one case information was unknown.

Seven cases of the 51 overall malaria cases reported had a previous malaria history twelve months prior to onset and none of these cases reported taking any form of prophylaxis. Twenty-seven of the malaria cases had no previous malaria history. Malaria history could not be determined for 17 cases. *P. vivax* was



the leading species in the cases that had a previous malaria history (4/7) with *P. falciparum* following (3/7). No cases were acquired through blood transfusion.

Table 1. Malaria Cases by Country of Acquisition and Plasmodium Species—LAC, 2004

Country of Acquisition	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. malariae</i>	<i>P. ovale</i>	Unknown	Total
Africa						
- Cameroon	1	0	0	0	0	1
- Ghana	0	0	1	0	0	1
- Kenya	3	1	0	0	0	4
- Liberia	1	0	0	0	0	1
- Nigeria	16	1	0	0	0	17
- South Africa	0	1	0	0	0	1
- Uganda	1	0	0	0	0	1
- Zimbabwe	1	0	0	0	0	1
- West Africa, unspecified	1	0	0	0	0	1
- Africa, unspecified	0	0	0	0	1	1
Total	24	3	1	0	1	29
Latin America						
- Guadalajara	0	1	0	0	0	1
- Guatemala	2	5	0	0	0	7
- Honduras	0	1	0	0	0	1
- Mexico	0	3	0	0	0	3
Total	2	10	0	0	0	12
Asia/Oceania						
- India	0	5	0	0	0	5
- Pakistan	0	1	0	0	0	1
Total	0	6	0	0	0	6
South Pacific						
- Vanuatu	0	1	0	0	0	1
Total	0	1	0	0	0	1
Unknown						
Total	0	1	0	0	2	3
Overall Total	26	21	1	0	3	51

Table 2. Malaria Prophylaxis Use Among US Residents, 2004

Reason for Travel	Malaria Cases (N)	Cases That Used Prophylaxis (N)	Prophylaxis Use (%)
Pleasure	25	7	28%
Work	6	0	0%
Other/Unknown	3	--	--
Total	34	7	21%



ADDITIONAL RESOURCES

Additional information about malaria is available from the CDC at:
CDC website: www.cdc.gov/ncidod/dpd/parasites/malaria/default.htm

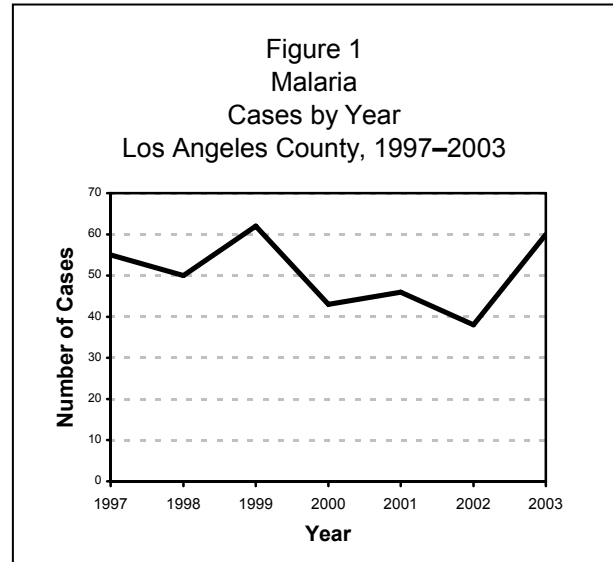
CDC. Malaria Surveillance—United States, 2002. MMWR 2004. SS-1:21-33. Available at:
<http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5301a2.htm>

CDC. Transmission of Plasmodium vivax Malaria—San Diego County, California, 1988 and 1989. MMWR 1990. 39:91-94. Available at:
<http://www.cdc.gov/mmwr/preview/mmwrhtml/00001559.htm>



MALARIA

CRUDE DATA	
Number of Cases	60
Age at Onset	
Mean	34
Median	32
Age Range	8–74 years
Case Fatality	
LA County	0.0%
United States	N/A



DESCRIPTION

Malaria is a disease acquired outside the continental US through travel and immigration and is rarely transmitted within the US. The last autochthonous cases occurred in San Diego, California in 1988-1989 among migrant workers. A total of thirty workers became infected with *Plasmodium vivax* (*P. vivax*).

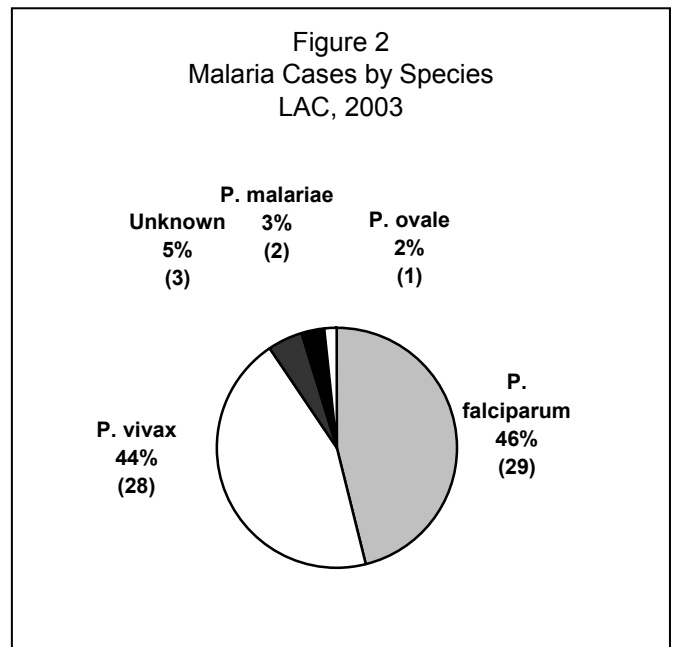
Human malaria is an illness caused by one or more plasmodia that infect humans: *P. vivax*, *P. falciparum*, *P. malariae*, and *P. ovale*. *P. falciparum* is found primarily in tropical regions and poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant. Malaria is acquired from the bite of an infective female *Anopheles* mosquito. Malaria is not transmitted locally in LAC, although a particular mosquito, *Anopheles hermsi*, exists here and is capable of transmitting the parasite.

DISEASE ABSTRACT

- The number of malaria cases in LAC increased from 38 cases in 2002 to 60 in 2003 (Figure 1).
- The percent of malaria cases who were US residents decreased slightly from 58% (22/38) in 2002 to 56% (33/59) in 2003.
- The percent of malaria cases who were recent immigrants, visitors to the US, or whose residency status was unknown increased slightly from 42% (16/38) in 2002 to 45% (27/60) in 2003.
- Of the 41 US resident cases, only 21, or approximately 50%, had taken some form of prophylaxis during travel to a malaria-endemic region (Table 2).

STRATIFIED DATA

Species Frequency: The infecting malarial species was identified for 57 cases (95%, Figure 2); 29 cases were infected with *P. falciparum*, 28 with *P. vivax*, 2 with *P. malariae* and 1 *P. ovale*. Three cases were unspecified (Figure 2).



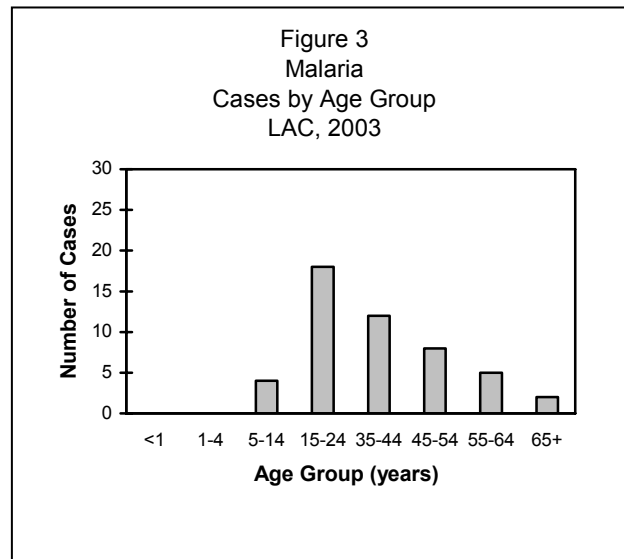


Seasonality: Seasonality for malaria was not determined, as malaria is a disease that is acquired abroad and is independent of LAC weather or seasonal patterns.

Age: Most cases occurred in individuals aged 15-24, (18 cases or 30%) followed by those between 35 to 44 years (12 cases or 20%). Mean age of infection was 33.6 years, median age was 32, and the age range was 8-74 years old.

Sex: The rate ratio of male-to-female cases was nearly two to one (1.9:1).

Race/Ethnicity: Whites or Caucasians comprised the most number of cases, 29/58 or 50%, followed by African Americans/Blacks (including African Nationals) (21/58 or 36%), and Asian/Pacific Islanders with 8 cases out of 58, or 14%. The race of two cases was unknown. The non-Hispanic/nonLatino ethnic group had the highest number of cases, 43/60 or 72%.



Fatalities: There were no deaths due to malaria in 2003.

COMMENTS

In LAC, malaria is a disease related to travel and immigration. More than half of all malaria cases among LAC residents were acquired in Africa. There is no recent documentation of malaria being transmitted locally, but a mosquito does exist in LAC that is capable of transmitting the parasite. Local transmission has not occurred here due to an inadequate number of people infected with the malaria parasite to sustain disease transmission. Additionally, the mosquito capable of transmitting malaria is very rare.

The majority of malaria cases (n=34, 57%) were LAC residents who traveled abroad either for work or vacation. Sixteen cases (42%) were recent immigrants, individuals visiting the US, or those whose residency status was unknown. Residency was defined as those who lived in the US for twelve months or longer. The reason for the overall increase in malaria cases is most likely due to an increase in travel and immigration. The number of malaria cases overall is still far below the number of cases seen throughout the late 1970s through 1986 (an average of 133 malaria cases reported annually from 1979-1986).

Among US travelers who returned with malaria infection, Africa remains the most common region visited. Thirty-three (55%) of all reported malaria cases were from individuals who were US residents and non-residents traveling to or coming from African countries (Table 1). Since the early 1990s, Blacks, including African nationals and African Americans, have been the ethnic group with the highest incidence of malaria in LAC. In 2003, however, Caucasians outnumbered Blacks in malaria cases.

Prior to the 1990s, immigrants/refugees from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. Of the reported cases in 2003 from non-US residents, the majority of cases were Caucasian with Hispanic ethnicity (10/19). All were either visiting the US or immigrating. Seven cases of the nineteen were African American or Black.

Anti-malarial prophylaxis use was available for all of the 41 US residents, which includes 40 civilians and one military personnel. Twenty individuals took prophylaxis (49%), compared to only 7 of 22 from the previous year (Table 2). However, eleven cases (55%) reported not completing their medication. While four (20%) cases did finish their medication, 2 cases were unsure what type of medication they were prescribed, one case was given inappropriate prophylaxis, and one case had a previous history of plasmodia infection. Out of those cases who did take prophylaxis, three malaria cases had a previous malaria history within twelve months prior to onset of current infection. One case acquired malaria in



India, one in Afghanistan or Iraq (case traveled to both countries), and one in India. There was one case attributed to Malaria relapse (malaria and history of travel to Cambodia and Thailand) No cases were acquired through blood transfusion.

Table 1. Malaria Cases by Country of Acquisition and Plasmodium Species—LAC, 2003

Country of Acquisition	<i>P. falciparum</i>	<i>P. vivax</i>	<i>P. malariae</i>	<i>P. ovale</i>	Unknown	Total
Africa						
- Cameroon	1	0	0	0	0	1
- Ethiopia	0	1	0	0	0	1
- Gambia	1	0	0	0	0	1
- Ghana	5	2	0	0	1	8
- Kenya	3 ^a	0	0	0	1	4
- Nigeria	12	1	0	0	1	14
- Sierra Leone	1	0	0	0	0	1
- South Africa	1 ^b	0	0	0	0	1
- Uganda	0	1	0	1	0	2
Total	24	5	0	1	3	33
Latin America						
- El Salvador	1	1	0	0	0	1
- Guatemala	1	2 ^c	0	0	0	3
- Honduras	1	2	0	0	0	3
- Mexico	0	2	0	0	0	2
- Nicaragua	0	0	1	0	0	1
Total	3	7	1	0	0	11
Asia/Oceania						
- India	4	1	1	0	0	6
- Indonesia	0	1	0	0	0	1
- Papua New Guinea	0	1	0	0	0	1
- Pakistan	1	1	0	0	0	2
- Philippines	0	0	0	0	1 ^e	1
- Solomon Island	0	1	0	0	0	1
- Thailand	0	1	0	0	0	1
- Vietnam	0	1	0	0	0	1
Total	5	7	1	0	1	14
Middle East						
- Iraq	0	2	0	0	0	2
Total	0	2	0	0	0	2
Overall Total	40	19	2	1	4	59

^a One case also traveled to Uganda.

^b Case also traveled to Mauritius and Zambia.

^c Two cases also traveled to Mexico.



Table 2. Malaria Prophylaxis Use Among US Residents, 2003

Reason for Travel	Malaria Cases (N)	Cases That Used Prophylaxis (N)	Prophylaxis Use (%)
Pleasure	27	10	37%
Work	11	8	72%
Other/Unknown	3	2	67%
Total	41	20	49%

ADDITIONAL RESOURCES

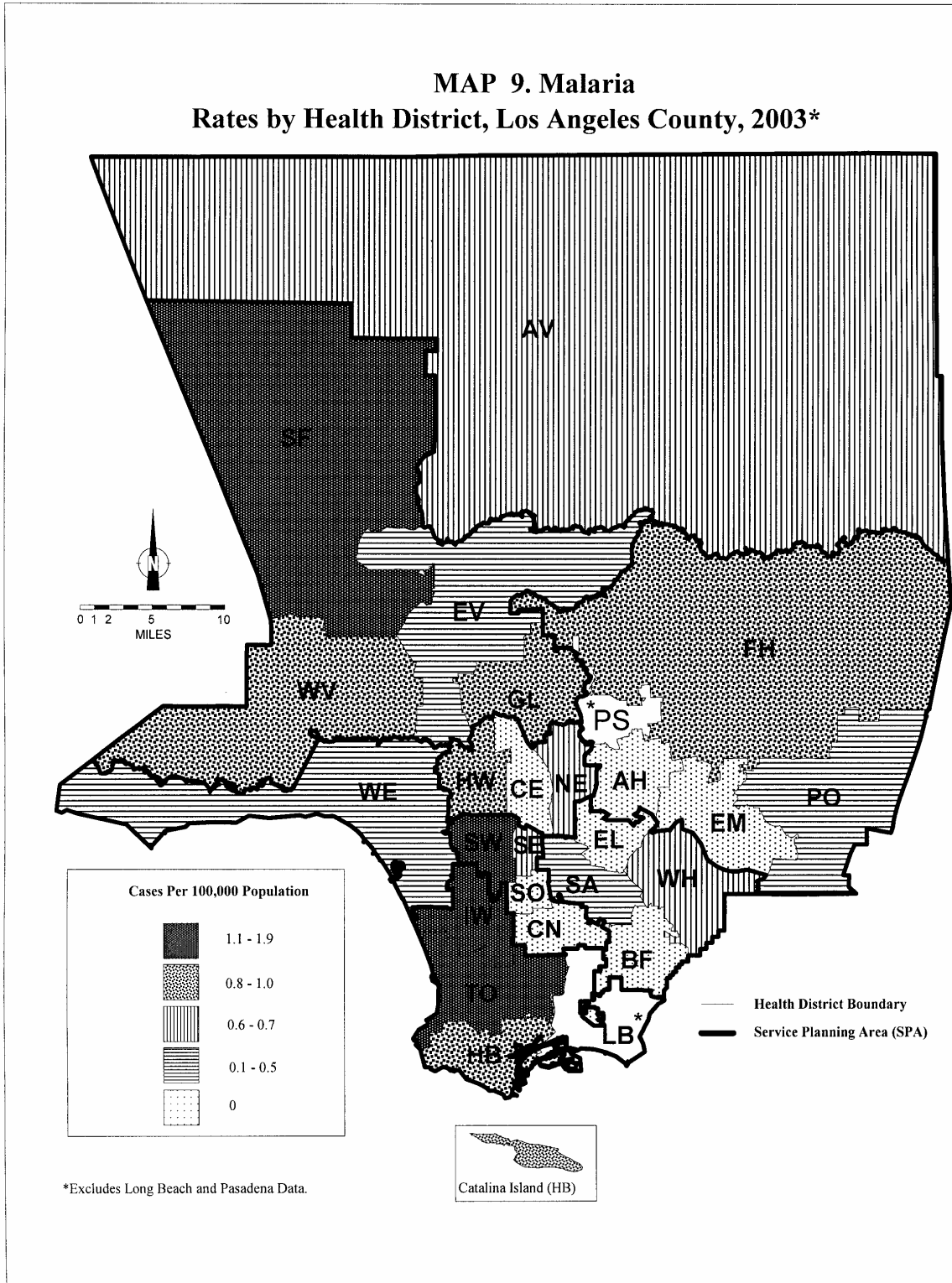
Additional information about malaria is available from the CDC at:
CDC website: www.cdc.gov/ncidod/dpd/parasites/malaria/default.htm

CDC. Malaria Surveillance—United States, 2002. MMWR 2004. SS-1: 21-33. Available at:
www.cdc.gov/mmwr/preview/mmwrhtml/ss5301a2.htm

CDC. Transmission of Plasmodium vivax Malaria—San Diego County, California, 1988 and 1989. MMWR 1990. 39: 91-94. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/00001559.htm.



MAP 9. Malaria
Rates by Health District, Los Angeles County, 2003*





MALARIA

CRUDE DATA	
Number of Cases	38
Age at Onset	
Mean	37
Median	39
Range	<1–77 years
Case Fatality	
LA County	0.0%
United States	N/A

^a Cases per 100,000 population.

DESCRIPTION

Human malaria is an illness caused by one or more plasmodia that infect humans: *P. vivax* (PV); *P. falciparum* (PF); *P. malariae* (PM); and *P. ovale* (PO). PF is found primarily in tropical regions and poses the greatest risk of death for non-immune persons because it invades red blood cells of all ages and is often drug-resistant. Malaria is acquired from the bite of an infective female *Anopheles* mosquito. Malaria is not transmitted locally in LAC, although a vector, *Anopheles hermsi*, exists here.

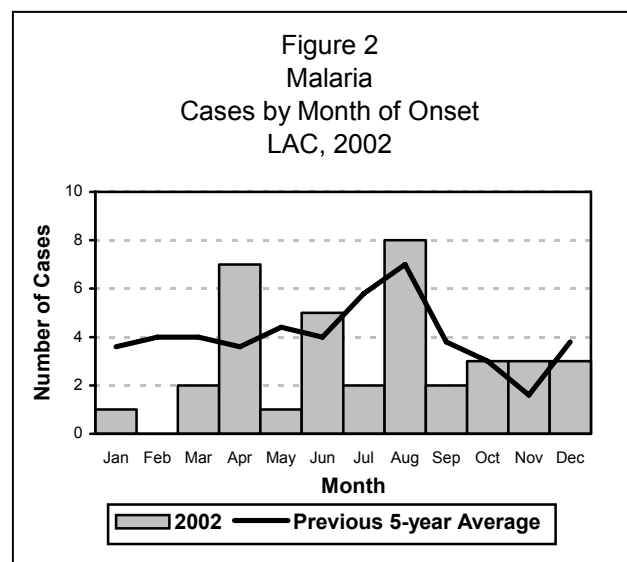
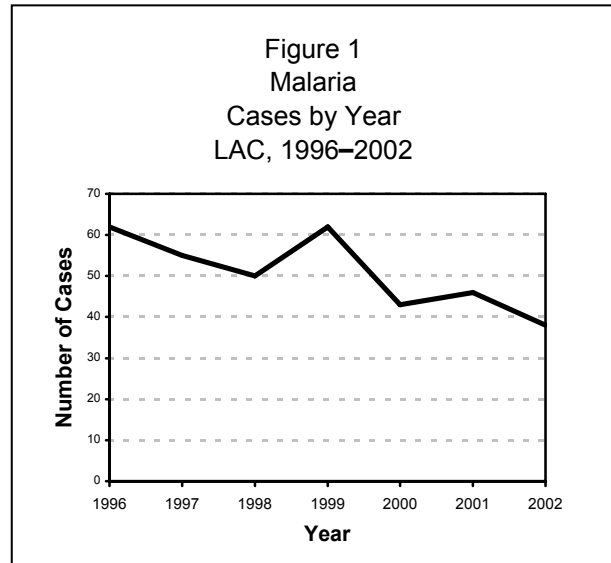
DISEASE ABSTRACT

- The number of malaria cases in LAC decreased from 46 cases in 2001 to 38 in 2002 (Figure 1).
- The percent of malaria cases who were US residents decreased from 63% (29/46) in 2001, to 58% (22/38) in 2002.
- The percent of malaria cases who were recent immigrants, visitors to the US, or whose residency status was unknown increased from 37% (17/46) in 2001 to 42% (16/38) in 2002.
- Of US resident cases, only 32% (7/22) had taken some form of prophylaxis during travel to a malaria-endemic region (Table 2).

STRATIFIED DATA

Species Frequency: The infecting malarial species was identified for 36 cases (95%, Figure 4); most cases (n=21, 55%) with PF, 15 (39%) with PV, and 2 (5%) were unspecified.

Seasonality: In 2002, April and August had the most cases of malaria. The fall and winter months had fewer cases compared to spring and summer months (Figure 2). These fluctuations in malaria cases by month are probably due to travel.





Age: The most cases occurred in individuals aged 15-34, followed by those between 35 to 44 years.

Sex: The rate ratio of male-to-female cases was 2.4:1.

Race/Ethnicity: Total cases were highest among person of reporting their race as Black. This included both African-Americans and African nationals (19/38).

Location: SPA 2 had the most malaria cases, eight cases, followed by SPA 8 with 7 cases.

COMMENTS

In LAC, malaria is a disease related to travel and immigration. There is no recent documentation of malaria being transmitted locally, but a competent mosquito vector exists in LAC. Local transmission has not occurred here due to a lack of a concentrated group of people circulating with the malaria parasite.

Residency and/or reason for travel were available for 36 (95%) of 38 reported malaria cases (Table 1). The majority of malaria cases (n=22, 58%) were LAC residents who traveled abroad either for work or vacation and 16 (42%) cases were recent immigrants, individuals visiting the US, or those whose residency status was unknown. The reason for overall drop in malaria cases is probably fewer people emigrating from malarial regions. The number of malaria cases overall is still far below the numbers of cases seen throughout the late 1970s through 1986 (an average of 133 malaria cases reported annually from 1979-1986).

Among malaria cases in US residents traveling abroad, Africa remains the most common region visited with Nigeria the most frequent destination. Twenty-two (58%) of all reported malaria cases were from individuals who were US residents and non-residents traveling to or coming from African countries (Table 1). Since the early 1990s, Blacks, including African nationals and African Americans, have been the ethnic group with the highest incidence of malaria in LAC.

Prior to the 1990s, immigrants/refugees from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. Of the 16 reported cases from non-US residents, recent African immigrants had the largest number of reported malaria (6 cases), followed equally by Central America and Southeast Asia with 5 reported cases respectively.

Antimalarial prophylaxis use history was available for all of the 22 US resident cases. Only 7 (32%) individuals took prophylaxis, up 12% from the previous year (Table 2). A lower percentage of work-related travel cases (20%) took prophylaxis compared to tourist cases. However, appropriateness of prophylaxis and adherence to regime was unknown. Twelve months prior to onset, three (8%) of all reported malaria cases had a previous malaria history.

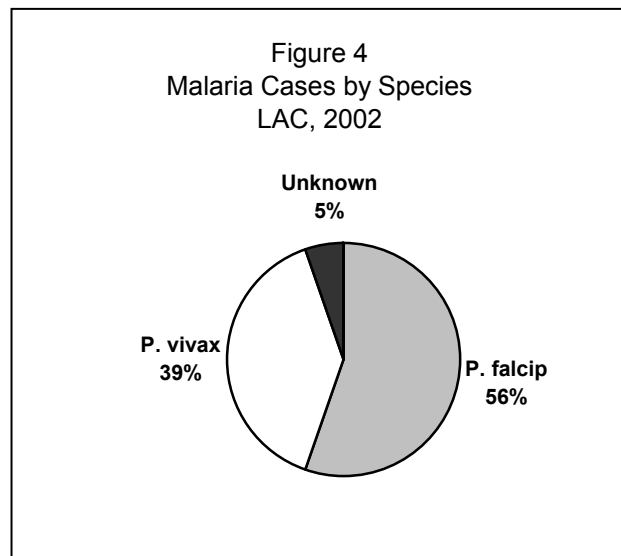
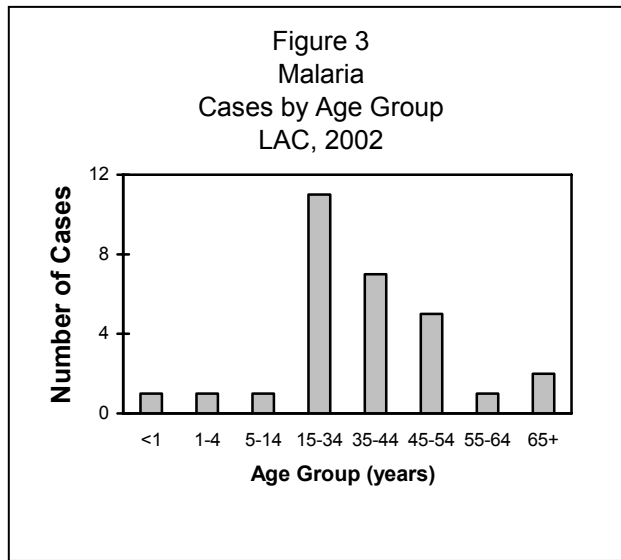




Table 1. Malaria Cases by Species, Residency Status and Travel History—LAC, 2002

Location	Foreign Travel by US Residents		Non-US Resident ^a	
	No. of cases	(species) ^b	No. of cases	(species) ^b
Africa				
- Cameroon	2	(2 PF)	0	--
- Ghana	3	(3 PF)	1	(1 PF)
- Ivory Coast	0	--	1	(1 PF)
- Kenya	1	(1 PF)	1	(1 N)
- Liberia	1	(1 PV)	0	--
- Nigeria	8	(7 PF, 1 N)	2	(2 PF)
- Sierra Leone	2	(2 PF)		
Latin America				
- Honduras	1	(1 PV)	0	--
- El Salvador	0	--	2	(2 PV) ^c
- Guatemala	0	--	2	(2 PV)
Asia/Oceania				
- India	3	(3 PV)	2	(2 PV, 1 PF)
- New Guinea	1	(1 PV)	0	--
- Pakistan	1	(1 PV)	1	(1 PV)
- Thailand	0	--	1	(1 PF)
Unknown	0	--	2	(2 PV)
Total	22		16	

^a Case recently immigrated, residency status is unknown, or case identified while visiting the US.

^b PF = *P. falciparum*; N = not determined; PV = *P. vivax*.

^c One case also traveled through Mexico.

Table 2. Malaria Prophylaxis Use in US Residents, 2002

Reason for Travel	Malaria Cases (N)	US Residents	
		Cases That Used Prophylaxis (N)	Prophylaxis Use (%)
Pleasure	17	6	35%
Work	5	1	20%
Total	22	7	32%

ADDITIONAL RESOURCES

Additional information about malaria is available from the CDC at:
CDC website: www.cdc.gov/ncidod/dpd/parasites/malaria/default.htm

MALARIA

CRUDE DATA	
Number of Cases	46
Annual Incidence ^a	
LA County	0.53
United States	0.54
Age at Diagnosis	
Mean	40
Median	43
Range	<1-75 years
Case Fatality	
LA County	0.0%
United States	N/A

^a Cases per 100,000 population.

DESCRIPTION

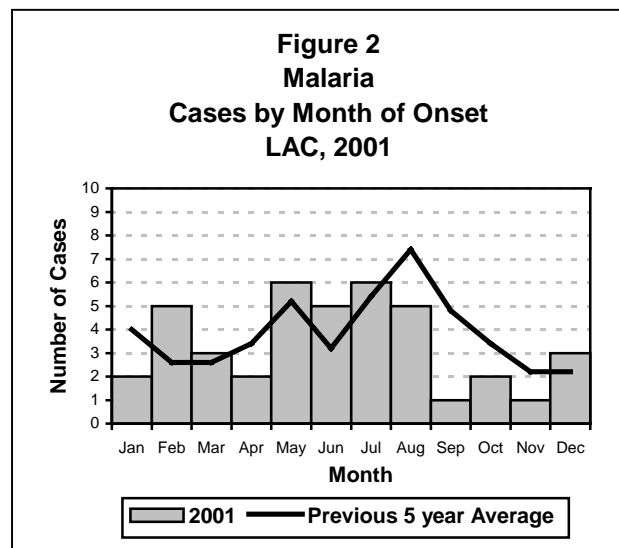
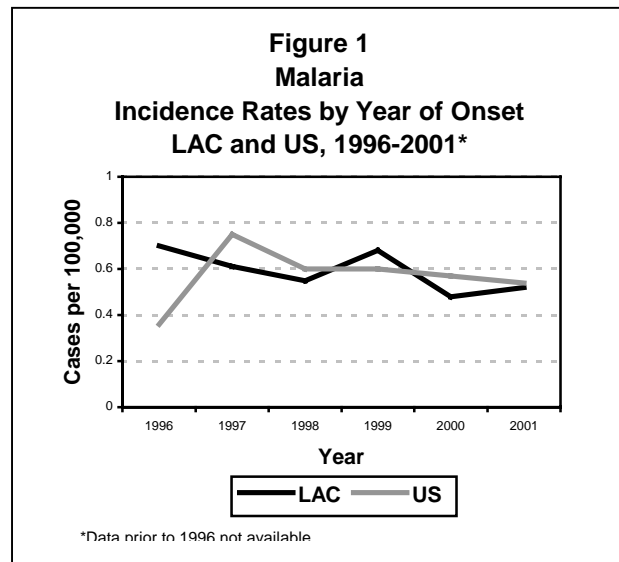
Malaria is caused by four species of the genus *Plasmodium*: *P. vivax* (PV); *P. falciparum* (PF); *P. malariae* (PM); and *P. ovale* (PO). PF can cause cerebral malaria and sometimes death. Malaria is acquired from the bite of an infective female *Anopheles* mosquito. Malaria is not transmitted locally in LAC, although a vector, *Anopheles hermsi*, exists here.

DISEASE ABSTRACT

- The incidence of malaria in LAC remained stable at 43 cases in 2000 to 46 in 2001.
- The percent of malaria cases who were US residents increased from 56% in 2000 to 63% in 2001.
- The percent of malaria cases who were recent immigrants or visitors to the US decreased from 44% in 2000 to 26% in 2001.
- Of US resident cases, 24.1% had taken some form of prophylaxis.

STRATIFIED DATA

Species Frequency: The infecting malarial species was identified for 45 cases (98%) (Figure 4). Most cases were infected with PF (53%) or PV (41%). There was one unspecified case (2%) and one case of mixed PF and PM infection (2%).



Seasonality: In 2001 May and July had the most cases of malaria. As is typical, the fall and winter months had fewer cases compared to spring and summer months (Figure 2). These fluctuations in malaria cases by month are probably due to travel.

Age: Most cases of malaria were in persons aged 15 to 24 years. This was due to more travel in this age group.

Sex: The rate ratio of male-to-female cases was 1.3:1.

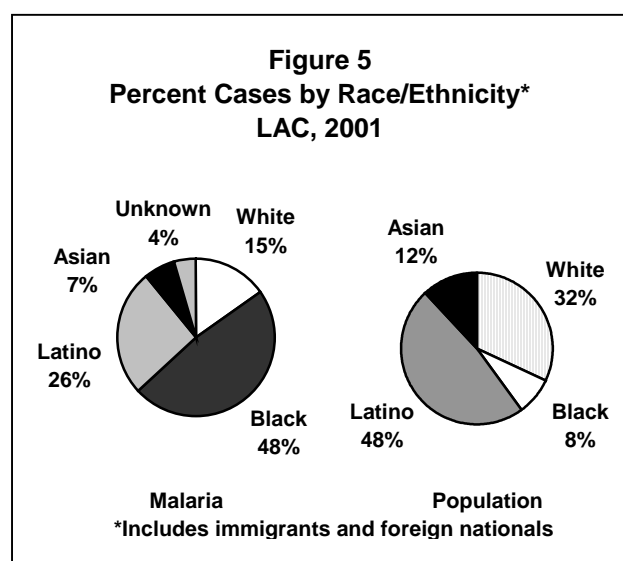
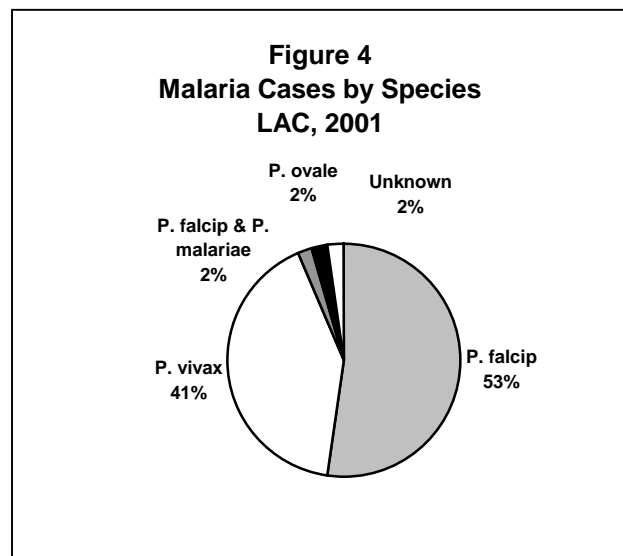
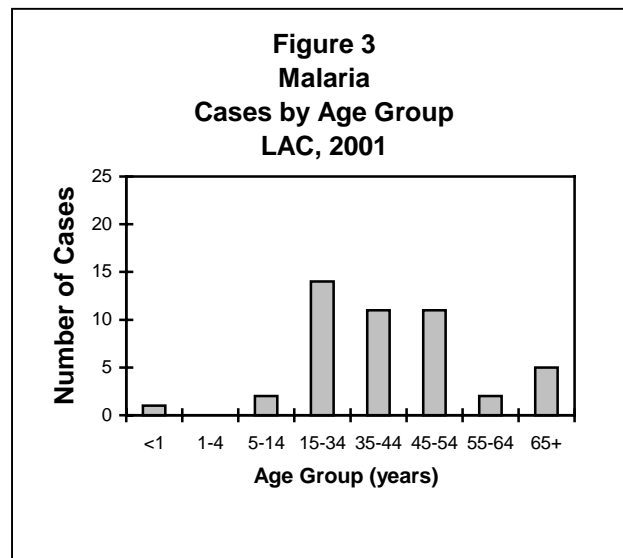
Race/Ethnicity: Cases were highest among African nationals/Black Americans (Figure 5). Most Latino cases were immigrants, individuals visiting the US, or persons whose residency status was unknown.

Location: West District had the most cases (8). Inglewood had 5 cases and West Valley had 4.

COMMENTS

In LAC, malaria is a disease that is related to travel and immigration. There is no documentation of malaria being transmitted locally, but a competent vector is found in LAC. Local transmission has not occurred here perhaps due to the dry weather and lack of a concentrated group of people circulating the parasite.

Malaria cases among immigrants and foreign nationals overestimate the risk to local residents. Residency and/or reason for travel were available for 41 of 46 cases of malaria (Table 1). Sixty-three percent (29/46) of 0malaria cases were LAC residents who traveled abroad either for work or vacation. Thirty-seven percent (17/46) were recent immigrants, individuals visiting the US, or those whose residency status was unknown. The reason for this drop in malaria cases overall is probably due to fewer people emigrating from malarial regions. There were fewer immigrants this year (percentage-wise) that contributed to malaria cases. The number of malaria cases overall is still far below the



numbers of cases seen throughout the late 1970s through mid- 1980s (yearly average from 1979-1986 = 133 reported cases/year).

Among malaria cases in US residents traveling abroad, Africa remains the most common region visited and Nigeria the most frequent destination. This is mostly due to naturalized Nigerians visiting relatives still living in Nigeria. Thirty-nine percent (18/46) of all reported malaria cases were from individuals who had traveled to or were coming from African countries. Since the early 1990s Blacks/African nationals have been the ethnic group with the highest incidence of malaria in LAC. Figure 62 shows that Blacks make up only 8% of the population of LAC but account for 48% of cases of malaria. Before the 1990s, immigrants/refugees from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. Forty-one percent of cases (7/17) who were recent immigrants, visitors to the US, or whose residency status was unknown were from Central America and Mexico. Thirty-five percent (6/17) were from African countries.

Antimalarial prophylaxis history was available for 27 of the 29 US resident cases (Table 1). Only seven individuals (24%) took prophylaxis. A higher percentage of work-related cases took prophylaxis compared to tourist cases (50 vs. 22%). However, appropriateness of prophylaxis and adherence to regime was unknown, and group size was small.

A low percentage of US residents and recent immigrants had a previous history of malaria this year compared to previous years (Table 2), most likely due to a change in reporting format on the epidemiologic form. For 2001, a history of malaria was only documented if it was within the previous 12 months, rather than at any time in the past. Under the new definition, 4% (2/46) of cases had a previous malaria history.

ADDITIONAL RESOURCES

CDC website: www.cdc.gov/ncidod/diseases/submenus/sub_malaria.htm

Table 1. Malaria Cases by Species, Residency Status, and Travel Exposure B LAC, 2001

Foreign Travel by US Residents		Recent Immigration, Residency Status Unknown, or Visit to US by Non-US Residents	
Region/Country	Number of Cases (Species) ^a	Country	Number of Cases (Species) ^a
Africa			
Cameroon	1(1PF)	Congo	1(1PV)
Central African Republic ^b	1(1PF)	Ethiopia	1(1PV)
Gabon	1(1PO)	Guinea	1(1PF)
Ghana	3(1PF,2PV)	Nigeria	2(2PF)
Ivory Coast	1(1PF)	Uganda	1(1PF)
Kenya	1(1PF)		
Mozambique	1(1PF)		
Nigeria	11(11PF)		
Uganda ^c	2(1PF,1PF&PM)		
Latin America			
Belize	1(1PV)	Central America	1(1PV)
Ecuador	1(1PV)	El Salvador	4(4PV)
Guatemala	1(1PV)	Guatemala ^d	2(2PV)
Honduras	2(2PV)		
Asia/Oceania			
India	1(1PF)	India	1(PV)
Indonesia	1(1PV)	Indonesia	1(1N)
Unknown	0	Unknown	2(2PV)
Total	29		17

^a PF = N = not determined, *P. falciparum*, PM = *P. malariae*, PO = *P. ovale*, and PV = *P. vivax*.

^b Case also traveled through India and Cambodia.

^c Case also traveled through Sudan.

^d Case also traveled through Mexico.

Table 2. Malaria Cases by Residency Status, Reason for Travel, Malaria Prophylaxis and Previous Malaria History B LAC, 2001

	US Residents			Non-US Residents
	Total US Residents	Travel for Work	Travel for Pleasure	Recent Immigrant or Foreign Visitor to US
Prophylaxis (%)	7/29 (24)	1/2 (50)	6/27 (22)	0 *
Previous malaria within last year (%)	1/29 (3)	0/3 (0)	1/24 (4)	1/17 (6)

* Natives of malaria-endemic countries generally do not take pre-exposure prophylaxis.