

## MALARIA

### Background

This case definition was developed by the Armed Forces Health Surveillance Branch (AFHSB) for the purpose of epidemiological surveillance of malaria. The case definition is intended to be sensitive in an effort to capture as many true cases of malaria as possible. Malaria is recognized as a disease of military operational significance. U.S. service members are at risk of malaria when they are permanently assigned to endemic areas, when they participate in operations in endemic areas, and when they visit malaria endemic areas during personal travel.<sup>1</sup>

### Clinical Description

Malaria is a disease caused by protozoan parasites of the genus *Plasmodium*. The most serious forms of the disease are caused by *Plasmodium falciparum* and *Plasmodium vivax*, but other related species (*Plasmodium ovale*, *Plasmodium malariae*, and *Plasmodium knowlesi*) also infect humans. Malaria parasites are transmitted by female Anopheles mosquitoes. The parasites multiply within red blood cells, causing symptoms that include fever, anemia, chills, flu-like illness and, in severe cases, coma, and death.<sup>2</sup>

#### Case Definition and Incidence Rules

For surveillance purposes, a case of malaria is defined as:

- One record of a reportable medical event (RME) of a *confirmed* case of malaria; or
- *One hospitalization* with a case defining diagnosis of malaria (see ICD9 and ICD10 code lists below) in the *primary* diagnostic position; or

*If diagnosis is in the non-primary position:*

- *One hospitalization* with a case defining diagnoses of malaria (see ICD9 and ICD10 code lists below) in a *non-primary* diagnostic position due to a specific *Plasmodium* species (ICD9 084.0-084.3 / ICD 10 B50x - B53.x); or
- *One hospitalization* with a case defining diagnosis of malaria (see ICD9 and ICD10 code lists below) in a *non-primary* diagnostic position **plus** a diagnosis of anemia, thrombocytopenia and related conditions, or malaria complicating pregnancy in *any other* diagnostic position; or
- *One hospitalization* with a case defining diagnosis of malaria (see ICD9 and ICD10 code lists below) in a *non-primary diagnostic position*, **plus** a diagnosis of signs or symptoms<sup>3</sup> consistent with malaria (see ICD9 and ICD10 code lists below) in *each* diagnostic position antecedent to the malaria diagnosis.

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<sup>1</sup> Armed Forces Health Surveillance Branch. Update: Malaria, U.S. Armed Forces, 2018. *Medical Surveillance Monthly Report (MSMR)*. 2019 Feb; Vol 26(2): 2-7.

<sup>2</sup> Mandell, G. L., Bennett, J. E., Dolin, R. 2010. *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Disease*. 7<sup>th</sup> ed. Philadelphia: Churchill Livingstone.



### Case Definition and Incidence Rules *(continued)*

#### Laboratory case finding criteria:

- One DoD laboratory report of a positive malaria antigen test **plus one outpatient medical encounter** with a case defining diagnosis of malaria (see ICD9 and ICD10 code lists below) in *any* diagnostic position *within 30 days* of the specimen collection date.

#### Incidence rules:

For individuals who meet the case definition:

- The incidence date is considered the date of the first record of a reportable medical event, hospitalization, or outpatient medical encounter that includes a diagnosis of malaria.
- An individual is considered an incident case only *once per 365 days*.

#### Exclusions:

- None

### Codes

The following ICD9 and ICD10 codes are included in the case definition:

Condition	ICD-10-CM Codes	ICD-9-CM Codes
Malaria	B50 <i>Plasmodium falciparum</i> malaria...	--
	- B50.0 ( <i>with cerebral complications</i> )	- 084.9 ( <i>other pernicious complications of malaria</i> )
	- B50.8 ( <i>other severe and complicated Plasmodium falciparum malaria</i> )	- 084.0 ( <i>Falciparum malaria; malignant tertian</i> ) - 084.8 ( <i>Blackwater fever</i> )
	- B50.9 ( <i>unspecified</i> )	- 084.0 ( <i>above</i> ) - 084.5 ( <i>mixed malaria</i> )
	B51 <i>Plasmodium vivax</i> malaria ...	- 084.9 ( <i>above</i> )
	- B51.0 ( <i>with rupture of spleen</i> )	
	- B51.8 ( <i>with other complications</i> )	
	- B51.9 ( <i>without complication</i> )	- 084.1 ( <i>Vivax malaria; benign tertian</i> ) - 084.5 ( <i>above</i> )
	B52 <i>Plasmodium malariae</i> malaria ...	- 084.9 ( <i>above</i> )
	- B52.0 ( <i>with nephropathy</i> )	
	- B52.8 ( <i>with other complications</i> )	

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	- B52.9 ( <i>without complication</i> )	- 084.2 ( <i>Quartan malaria</i> ) - 084.5 ( <i>above</i> )
	B53 ( <i>other specified malaria</i> )	--
	- B53.0 ( <i>Plasmodium ovale malaria</i> )	- 084.3 ( <i>Ovale malaria</i> )
	- B53.1 ( <i>malaria due to simian plasmodia</i> )	- 084.4 ( <i>other malaria</i> )
	- B53.8 ( <i>other malaria, not elsewhere classified</i> )	
	B54 ( <i>unspecified malaria</i> )	- 084.6 ( <i>malaria, unspecified</i> )

Condition	ICD-10-CM Codes	ICD-9-CM Codes
Anemia	<i>D50 (iron deficiency anemia)</i>	<i>280 (iron deficiency anemias)</i>
	- D50.0 (iron deficiency anemia secondary to blood loss; chronic)	280.0 (iron deficiency anemia secondary to blood loss; chronic)
	- D50.1 (sideropenic dysphagia) - D50.8 (other iron deficiency anemias)	280.8 (other specified iron deficiency anemias) 280.1 (iron deficiency anemia secondary to inadequate dietary iron intake)
	- D50.9 (iron deficiency anemia, unspecified)	280.9 (iron deficiency anemia, unspecified)
	<i>D51 (vitamin B12 deficiency anemia)</i>	<i>281 (other deficiency anemias)</i>
	- D51.0 (vitamin B12 deficiency anemia due to intrinsic factor deficiency)	281.0 (pernicious anemia)
	- D51.1 (vitamin B12 deficiency anemia due to selective vitamin B12 malabsorption with proteinuria) - D51.2 (transcobalamin II deficiency) - D51.3 (other dietary vitamin B12 deficiency anemia) - D51.8 (other vitamin B12 deficiency anemias) - D51.9 (vitamin B12 deficiency anemia, unspecified)	281.1 (other vitamin B12 deficiency anemia)
	<i>D52 (folate deficiency anemia)</i>	281.2 (folate-deficiency anemia)
	- D52.0 (dietary folate deficiency anemia) - D52.1 (drug-induced folate deficiency anemia) - D52.8 (other folate deficiency anemias) - D52.9 (folate deficiency anemia, unspecified)	
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<i>D53 (other nutritional anemias)</i>	--
- D53.0 (protein deficiency anemias)	281.4 (protein-deficiency anemia)
- D53.1 (other megaloblastic anemias, not elsewhere classified)	281.3 (other specified megaloblastic anemias)
- D53.2 (scorbutic anemia) - D53.8 (other specified nutritional anemias)	281.8 (anemia associated with other specified nutritional deficiency)
- D53.9 (nutritional anemia, unspecified)	281.9 (unspecified deficiency anemia)
<i>D55 (anemia due to enzyme disorders)</i>	282.2 (anemias due to disorders of glutathione)
- D55.0 (anemia due to glucose-6-phosphate dehydrogenase [G6PD] deficiency) - D55.1 (anemia due to other disorders of glutathione metabolism)	
- D55.2 (anemia due to disorders of glycolytic enzymes) - D55.3 (anemia due to disorders of nucleotide metabolism) - D55.8 (other anemias due to enzyme disorders) - D55.9 (anemia due to enzyme disorder)	282.3 (other hemolytic anemias due to enzyme deficiency)
<i>D56 (thalassemia)</i>	282.4 (thalassemias)
- D56.0 (alpha thalassemia)	282.43 (alpha thalassemia)
- D56.1 (beta thalassemia)	282.44 (beta thalassemia)
- D56.2 (delta-beta thalassemia)	282.45 (delta-beta thalassemia)
- D56.3 (thalassemia minor)	282.46 (thalassemia minor)
- D56.4 (hereditary persistence of fetal hemoglobin [HPFH])	282.7 (other hemoglobinopathies)
- D56.5 (hemoglobin E-beta thalassemia)	282.47 (hemoglobin E-beta thalassemia)
- D56.8 (other thalassemia)	282.49 (other thalassemia)
- D56.9 (thalassemia, unspecified)	282.40 (thalassemia, unspecified)
<i>D57 (sickle-cell disorders)</i>	282.6 (sickle-cell disease)
D57.0 (Hb-SS disease with crisis)	282.62 (Hb-SS disease with crisis)
- D57.00 (Hb-SS disease with crisis, unspecified) - D57.01 (Hb-SS disease with acute chest syndrome) - D57.02 (Hb-SS disease with splenic sequestration)	

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D57.1 (sickle-cell disease without crisis)	282.60 (sickle-cell disease, unspecified) 282.61 (Hb-SS disease without crisis)
D57.2 (sickle cell/Hb-C disease)	--
- D57.20 (sickle cell/Hb-C disease without crisis)	282.63 (sickle cell/Hb-C disease without crisis)
- D57.21 (sickle-cell/Hb-C disease with crisis)	282.64 (sickle cell/Hb-C disease with crisis)
- D57.211 Sickle-cell/Hb-C disease with acute chest syndrome	
- D57.212 Sickle-cell/Hb-C disease with splenic sequestration	
- D57.219 sickle cell/Hb-C disease with crisis, unspecified)	
D57.3 (sickle-cell trait)	282.5 (sickle-cell trait)
D57.4 (sickle-cell thalassemia)	282.41 (sickle-cell thalassemia without crisis)
- D57.40 (sickle-cell thalassemia without crisis)	
- D57.41 (sickle-cell thalassemia with crisis)	282.42 (sickle-cell thalassemia with crisis)
- D57.411 Sickle-cell thalassemia with acute chest syndrome	
- D57.412 Sickle-cell thalassemia with splenic sequestration	
- D57.419 (sickle-cell thalassemia with crisis, unspecified)	
D57.8 (other sickle-cell disorders)	282.68 (other sickle-cell disease without crisis)
- D57.80 (other sickle-cell disorders without crisis)	
- D57.81 (other sickle-cell disorders with crisis)	282.69 (other sickle-cell disease with crisis)
- D57.811 Other sickle-cell disorders with acute chest syndrome	
- D57.812 Other sickle-cell disorders with splenic sequestration	
- D57.819 (other sickle-cell disorders with crisis, unspecified)	
<i>D58 (other hereditary hemolytic anemias)</i>	<i>282 (hereditary hemolytic anemias)</i>
- D58.0 (hereditary spherocytosis)	- 282.0 (hereditary spherocytosis)
- D58.1 (hereditary elliptocytosis)	- 282.1 (hereditary elliptocytosis)
- D58.2 (other hemoglobinopathies)	- 282.7 (other hemoglobinopathies)

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- D58.8 (other specified hereditary hemolytic anemias)	- 282.8 (other specified hereditary hemolytic anemias)
- D58.9 (hereditary hemolytic anemia, unspecified)	- 282.9 (hereditary hemolytic anemia, unspecified)
<i>D59 (acquired hemolytic anemia)</i>	<i>283 (acquired hemolytic anemias)</i>
- D59.0 (drug-incuded autoimmune hemolytic anemia)	283.0 (autoimmune hemolytic anemias)
- D59.1 (other autoimmune hemolytic anemias)	
- D59.2 (drug-incuded nonautoimmune hemolytic anemia)	283.19 (other non-autoimmune hemolytic anemias)
- D59.3 (hemolytic-uremic syndrome)	283.11 (hemolytic-uremic syndrome)
- D59.4 (other nonautoimmune hemolytic anemias)	283.1 (non-autoimmune hemolytic anemias) 283.10 (non-autoimmune hemolytic anemia, unspecified)
- D59.5 (paroxysmal nocturnal hemoglobinuria [Marchiafava-Micheli]) - D59.6 (hemoglobinuria due to hemolysis from other external causes) - D59.8 (other acquired hemolytic anemias)	283.2 (hemoglobinuria due to hemolysis from external causes)
- D59.9 (acquired hemolytic anemia, unspecified)	283.9 (acquired hemolytic anemia, unspecified)
<i>D60 (acquired pure red cell aplasia [erythroblastopenia])</i>	284.81 (red cell aplasia, acquired, adult with thymoma)
- D60.0 (chronic acquired pure red cell aplasia)	
- D60.1 (transient acquired pure red cell aplasia)	
- D60.8 (other acquired pure red cell aplasia)	
- D60.9 (acquired pure red cell aplasia, unspecified)	
<i>D61 (other aplastic anemias and other bone marrow failure syndromes)</i>	<i>284 (aplastic anemia and other bone marrow failure syndromes)</i>
- D61.0 (constitutional aplastic anemia)	284.0 (constitutional aplastic anemia)
- D61.01 (constitutional, pure, red blood cell aplasia)	- 284.01 (constitutional red blood cell aplasia)
- D61.09 (other constitutional aplastic anemia)	- 284.09 (other constitutional aplastic anemia)
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- D61.1 (drug-induced aplastic anemia)	284.89 (other specified aplastic anemias)
- D61.2 (aplastic anemia due to other external agents)	
- D61.3 (idiopathic aplastic anemia)	
- D61.8 (other specified aplastic anemias and other bone marrow failure syndromes)	284.8 (other specified aplastic anemias)
- D61.81 (pancytopenia)	284.1 (pancytopenia)
- D61.810 (antineoplastic chemotherapy induced pancytopenia)	284.11 (antineoplastic chemotherapy induced pancytopenia)
- D61.811 (other drug-induced pancytopenia)	284.12 (other drug-induced pancytopenia)
- D61.818 (other pancytopenia)	284.19 (other pancytopenia)
- D61.82 (myelophthisis)	284.2 (myelophthisis)
- D61.89 (other specified aplastic anemias and other bone marrow failure syndromes)	284.89 (above)
- D61.9 (aplastic anemia, unspecified)	284.9 (aplastic anemia, unspecified)
D62 (acute posthemorrhagic anemia)	285.1 (acute posthemorrhagic anemia)
D63 (anemia in chronic diseases classified elsewhere)	285.2 (anemia of chronic illness)
- D63.0 (anemia in neoplastic disease)	285.22 (anemia in neoplastic disease)
- D63.1 (anemia in chronic kidney disease)	285.21 (anemia in chronic kidney disease)
- D63.8 (anemia of other chronic diseases classified elsewhere)	285.29 (anemia of other chronic disease)
<i>D64 (other anemias)</i>	<i>285 (other and unspecified anemias)</i>
- D64.0 (hereditary sideroblastic anemia)	285.0 (sideroblastic anemia)
- D64.1 (secondary sideroblastic anemia due to disease)	
- D64.2 (secondary sideroblastic anemia due to drugs and toxins)	
- D64.3 (other sideroblastic anemias)	
- D64.4 (congenital dyserythropoietic anemia)	285.8 (other specified anemias)
D64.8 (other specified anemias)	
- D64.81 (anemia due to antineoplastic chemotherapy)	285.3 (antineoplastic chemotherapy induced anemia)
- D64.89 (other specified anemias)	285.8 (above)
- D64.9 (anemia, unspecified)	285.9 (anemia, unspecified)

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Conditions	ICD-10-CM Codes	ICD-9-CM Codes
Thrombocyto- penia and related conditions	D69 (purpura and other hemorrhagic conditions)	287 (purpura and other hemorrhagic conditions)
	D69.0 (allergic purpura)	287.0 (allergic purpura)
	D69.1 (qualitative platelet defects)	287.1 (qualitative platelet defects)
	D69.2 (other nonthrombocytopenic purpuras)	287.2 (other nonthrombocytopenic purpuras)
	D69.3 (immune thrombocytopenic purpura)	287.31 (immune thrombocytopenic purpura)
	D69.4 (other primary thrombocytopenia)	287.3 (primary thrombocytopenia)
	- D69.41 (Evan's syndrome)	287.32 (Evan's syndrome)
	- D69.42 (congenital and hereditary thrombocytopenic purpura)	287.33 (congenital and hereditary thrombocytopenic purpura)
	- D69.49 (other primary thrombocytopenia)	287.30 (primary thrombocytopenia, unspecified)
	D69.5 (secondary thrombocytopenia)	287.4 (secondary thrombocytopenia)
	- D69.51 (posttransfusion purpura)	287.41 (posttransfusion purpura)
	- D69.59 (other secondary thrombocytopenia)	287.49 (other secondary thrombocytopenia)
	D69.6 (thrombocytopenia, unspecified)	287.5 (thrombocytopenia, unspecified)
	D69.8 (other specified hemorrhagic conditions)	287.8 (other specified hemorrhagic conditions)
D69.9 (hemorrhagic condition, unspecified)	287.9 (unspecified hemorrhagic conditions)	

Condition	ICD-10-CM Codes	ICD-9-CM Codes
Malaria complicating pregnancy	O98.6 (protozoal diseases complicating pregnancy, childbirth and the puerperium)	647.4 (malaria complicating pregnancy, childbirth or the puerperium)
	O98.61 (protozoal diseases complicating pregnancy)	--
	- O98.611 (protozoal diseases complicating pregnancy, first trimester)	- 647.41 (malaria in the mother, delivered, with or without mention of antepartum condition)
	- O98.612 (protozoal diseases complicating pregnancy, second trimester)	- 647.43 (malaria in the mother, antepartum condition or complication)
	- O98.613 (protozoal diseases complicating pregnancy, third trimester)	
- O98.619 (protozoal diseases complicating pregnancy, unspecified trimester)	- 647.40 (malaria in the mother, unspecified as to episode of care or not applicable)	
O98.62 (protozoal diseases complicating childbirth)	- 647.41 (above)	

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	O98.63 (protozoal diseases complicating the puerperium)	<ul style="list-style-type: none"> <li>- 647.42 (malaria in the mother, delivered, with mention of postpartum complication)</li> <li>- 647.44 (malaria in the mother, postpartum condition or complication)</li> </ul>
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Condition	ICD-10-CM Codes	ICD-9-CM Codes
Signs and symptoms consistent with malaria <sup>3</sup>	E87.2 (acidosis)	276.2 (acidosis)
	J80 (acute respiratory distress syndrome)	518.82 (other pulmonary insufficiency, not elsewhere classified)
	M54.2 (cervicalgia)	723.1 (cervicalgia)
	M54.5 (low back pain)	724.2 (lumbago)
	N17.9 (acute kidney failure, unspecified)	584.9 (acute renal failure, unspecified)
	R05 (cough)	786.2 (cough)
	R06.0 (dyspnea)	786.09 (dyspnea and respiratory abnormalities; other) 786.05 (shortness of breath)
	- R06.00 (dyspnea, unspecified)	
	- R06.02 (shortness of breath)	
	- R06.09 (other forms of dyspnea)	
	- R06.89 (other abnormalities of breathing)	
	R07.1 (chest pain on breathing)	786.52 (painful respiration)
	R07.81 (pleurodynia)	
	R07.82 (intercostal pain)	
	R07.89 (other chest pain)	
	R11 (nausea and vomiting)	787.0 (nausea and vomiting)
	- R11.0 (nausea)	787.02 (nausea alone)
	- R11.1 (vomiting)	787.03 (vomiting alone)
	- R11.10 (vomiting, unspecified)	
	- R11.11 (vomiting without nausea)	
	- R11.12 (projectile vomiting)	
	- R11.14 (bilious vomiting)	787.04 (bilious emesis)
	- R11.2 (nausea and vomiting, unspecified)	787.01 (nausea with vomiting)
R16.1 (splenomegaly, not elsewhere classified)	789.2 (splenomegaly)	

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<sup>3</sup> Heymann, D. L. 2016. *Control of Communicable Diseases Manual*, 20<sup>th</sup> ed. Washington, DC: American Public Health Association.



R17 (unspecified jaundice)	782.4 (jaundice, unspecified, not of newborn)
R40 (somnolence, stupor, coma)	780.09 (other alteration of consciousness)
- R40.0 (somnolence)	
- R40.1 (stupor)	
- R40.2 (coma)	780.01 (coma)
- R40.20 (unspecified coma)	
- R40.21 (coma scale, eyes open)	
- R40.211^ - R40.224^	
- R40.3 (persistent vegetative state)	780.03 (persistent vegetative state)
- R40.4 (transient alteration of awareness)	780.0 (alteration of consciousness) 780.02 (transient alteration of awareness) 780.3 (convulsions)
R41.0 (disorientation, unspecified)	780.97 (altered mental status)
R41.82 (altered mental status, unspecified)	780.97 (above)
R44 (other symptoms and signs involving general sensations and perceptions)	780.1 (hallucinations)
- R44.0 (auditory hallucinations)	
- R44.1 (visual hallucinations)	
- R44.2 (other hallucinations)	
- R44.3 (hallucinations, unspecified)	
- R44.8 (other symptoms and signs involving general sensations and perceptions)	
- R44.9 (unspecified symptoms and signs involving general sensations and perceptions)	
R50 (fever of other and unknown origin) - Consider	780.6 (fever and other physiologic disturbances of temperature regulation)
- R50.2 (drug induced fever)	780.60 (fever, unspecified)
- R50.8 (other specified fever)	780.61 (fever presenting with conditions classified elsewhere)
- R50.81 (fever presenting with conditions classified elsewhere)	
- R50.9 (fever, unspecified)	
R51 (headache)	784.0 (headache)
G44.1 (vascular headache, not elsewhere classified)	

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R53 (malaise and fatigue)	780.7 (malaise and fatigue)
- R53.1 (weakness)	780.79 (other malaise and fatigue)
- R53.2 (functional quadriplegia)	780.72 (functional quadriplegia)
- R53.8 (other malaise and fatigue)	--
- R53.81 (other malaise)	780.79 (above)
- R53.82 (chronic fatigue, unspecified)	780.71 (chronic fatigue syndrome)
- R53.83 (other fatigue)	780.79 (above)
R56 (convulsions, not elsewhere classified)	--
- R56.0 (febrile convulsions)	780.31 (febrile convulsions, simple, unspecified)
- R56.00 (simple febrile convulsions)	780.32 (complex febrile convulsions)
- R56.01 (complex febrile convulsions)	
- R56.1 (post traumatic seizures)	780.33 (post traumatic seizures)
- R56.9 (unspecified convulsions)	780.39 (other convulsions)
R68.0 (hypothermia, not associated with low environmental temperature)	780.65 (hypothermia not associated with low environmental temperature)
- R68.83 (chills, without fever)	- 780.64 (chills, without fever)
R74.0 (nonspecific elevation of levels of transaminase and lactic acid dehydrogenase [LDH])	790.4 (nonspecific elevation levels of transaminase or lactic acid dehydrogenase [LDH])

## Development and Revisions

- In February of 2019 the case definition was updated to add as cases individuals who had a positive laboratory test for malaria antigen and an outpatient diagnosis of malaria within 30 days of one another. This addition was based upon a 2019 analysis of possible malaria cases during the years 2015–2017. The analysis included a validation study that linked positive laboratory tests to outpatient encounters and examined the detailed clinical records of individuals who met both criteria to identify likely cases of malaria.<sup>4</sup>
- In December of 2014 the case definition was updated to include ICD10 codes. Minor modifications were made to the code set (see *Code Set Determination and Rational* below).
- In January 2011, the case definition was updated for the annual malaria report. To improve sensitivity, additional case finding criteria were added. The original definition used criteria 1 and 2 only to identify a case of malaria. The revised definition added case finding criteria 3 through 5.
- The case definition was developed in January 2010 by the AFHSC Medical Surveillance Monthly Report (MSMR) staff for a MSMR article on malaria.<sup>1</sup> The definition was developed based on reviews of the ICD9 codes, the scientific literature, and previous AFHSC analyses.

<sup>4</sup> O'Donnell FL, Mancuso JD, Stahlman S. Reevaluation of the MSMR case definition for incident cases of malaria. *MSMR*. 2019; 26(2):8–14.



### *Case Definition and Incidence Rule Rationale*

- The case definition does not include outpatient encounters. An analysis of outpatient encounters with recorded diagnoses of malaria during 2002-2009 revealed the following: Approximately 93% of such outpatient encounters were associated with a subsequent report of malaria to the Reportable Medical Events System (RMES) within 30 days. When outpatient encounters are included, there also appears to be a significant number of false positives.
- In January 2011 malaria complicating pregnancy (ICD9 codes 647.4x) was added to the case finding criteria for this definition. Analysis of the codes found that during the past nine years, every individual diagnosed with this code was also diagnosed with “malaria” during the same inpatient medical encounter. Therefore, it was decided that if the two codes appear in the same inpatient medical encounter, neither code is required to appear in the *primary* diagnostic position.
- In January of 2011 the malaria-related conditions of anemia and thrombocytopenia and the associated “signs, symptoms, or other clinical abnormalities consistent with malaria” were added to the case finding criteria. These criteria are used to confirm the validity of documented malaria cases in a non-primary diagnostic position.

### *Code Set Determination and Rationale*

- In December of 2014 the code set was reviewed. ICD9 codes 780.62 (postprocedural fever), 780.63 (postvaccination fever) and 780.66 (nonhemolytic transfusion reaction) were removed from the code set. They were originally included because they fall under malaise, fatigue and fever, but are likely not related to malaria. ICD9 code 780.72 (functional quadriplegia) was reviewed and retained as the code, in some instances, refers to immobility due to frailty versus neurologic quadriplegia. ICD9 786.05 (shortness of breath) was added to the code set for consistency with ICD10.
- In June 2011, ICD9 code 518.5 (pulmonary insufficiency following trauma and surgery) was removed from the code set following routine AFHSC review. Reviewers felt the specification of trauma and surgery was not relevant to malaria and that the 518.82 code for pulmonary insufficiency was better applicable.
- In June 2011, ICD9 code 790.6 (other abnormal blood chemistry) was removed from the code set following routine AFHSC review. This code applies to blood levels of cobalt, copper, iron, lead, lithium, magnesium, mineral, and zinc which are not related to malaria.
- ICD9 code 084.7 (therapeutically induced malaria) is *not* included in the code set. This code converts to ICD 10 code B53.8 (other malaria, not elsewhere classified) which is included in the ICD10 code set.

## **Reports**

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AFHSC reports on malaria in the following reports:

- Armed Forces Communicable Disease Weekly Report. Summary of Communicable Reportable Events by Service; Available on the DHA website at: <https://health.mil/Military-Health-Topics/Combat-Support/Armed-Forces-Health-Surveillance-Branch/Reports-and-Publications>
- Monthly Malaria Case-Finding Report. Assists Services in identifying additional cases of malaria by leveraging AFHSB’s various data sources that may not be available to the individual Public Health hubs. This case finding report pulls data from the following sources: reportable medical events (RME), hospitalizations and outpatient encounter data, Theater Medical Data Store (TMDS), and TRAC<sup>2</sup>ES (TRANSCOM Regulating Command and Control Evacuation System). Report uses different case finding criteria and a different code set (i.e., ICD9 084.x / ICD10 B50.x-B54.x [excludes ICD9 084.7], ICD9 647 and ICD9 647.4x / ICD10 098.6x).



- Annual MSMR update; published in February. Report uses the standard AFHSB case definition and code set documented here.

### Review

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Feb 2019	Case definition reviewed and updated by the AFHSB Surveillance Methods and Standards (SMS) working group.
Dec 2014	Case definition reviewed and updated by the AFHSC Surveillance Methods and Standards (SMS) working group.
Jun 2011	Case definition reviewed and updated by the AFHSC Surveillance Methods and Standards (SMS) working group.
Dec 2010	Case definition reviewed and adopted by the AFHSC Surveillance Methods and Standards (SMS) working group; recommended review and update.
Jan 2010	Case definition developed and reviewed by AFHSC MSMR staff.

### Comments

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- *Algorithm for Presumed Malaria Acquisition:* The locations of malaria acquisition are estimated using a hierarchical algorithm:
  - 1) Cases hospitalized in a malarious country were considered acquired in that country.
  - 2) Reportable medical events that listed exposures to malaria endemic locations were considered acquired in those locations
  - 3) Cases diagnosed among service members during or within 30 days of deployment to a malarious country were considered acquired in that country.
  - 4) Cases diagnosed among service members who had been deployed to Afghanistan or Korea within 2 years prior to diagnosis were considered acquired in those respective countries.
  - 5) The remaining cases with unknown locations are matched within a 14-day window to malaria case data from the Disease Reporting System Internet (DRSi).
  - 6) Cases with a malarious country of origin listed in the case report are considered acquired in that country.
  - 7) All remaining cases are considered acquired in unknown locations.

