

**EPIDEMIOLOGIC SUMMARY OF
COCCIDIOIDOMYCOSIS IN CALIFORNIA, 2016**

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Epidemiologic Summary of Coccidioidomycosis in California, 2016

Key Findings and Public Health Messages

The California Department of Public Health (CDPH) received reports of 5,372 incident cases of coccidioidomycosis as of May 9, 2017, with estimated illness onset dates in 2016.

The annual incidence rate of coccidioidomycosis in 2016 was 13.7 per 100,000 population, an increase of 71 percent compared to the 2015 incidence rate of 8.0 per 100,000 population (3,140 case-patients) and very close to the 2011 incidence rate of 13.8 per 100,000 population (5,213 case-patients).

The highest annual incidence rates occurred among males (17.3 per 100,000; 3,382 case-patients) as compared to females and among persons in age group 45 to 54 years of age (19.8 per 100,000; 1,040 case-patients) as compared to persons from other age groups.

The counties with the highest annual incidence rates statewide in 2016 included Kern (251.7 per 100,000; 2,238 case-patients), Kings (157.3 per 100,000; 235 case-patients), San Luis Obispo (82.8 per 100,000; 231 case-patients), Fresno (60.8 per 100,000; 601 case-patients), Tulare (45.3 per 100,000; 212 case-patients), Madera (31.5 per 100,000; 49 case-patients), and San Joaquin (25.3 per 100,000; 187 case-patients).

The highest number of reported incident cases was in the month of October (925 case-patients), with 64.0 percent of cases occurring from August through December.

To decrease the risk of infection, persons living, working, or traveling in coccidioidomycosis endemic areas, especially those at increased risk for disseminated disease, should limit their

exposure to outdoor dust as much as possible, including staying inside and keeping windows and doors closed when it is windy and the air is dusty.

It is important that healthcare providers be alert for coccidioidomycosis among patients who live in or have traveled to endemic areas, especially those who work or participated in activities where soil is disturbed.

Background

Coccidioidomycosis (also known as Valley Fever) results from directly inhaling spores of the dimorphic fungus *Coccidioides spp.* (*Coccidioides immitis* and *Coccidioides posadasii*) from soil or airborne dust. Coccidioidomycosis is not transmitted directly from person to person. Although *Coccidioides* grows in localized areas of the southwest United States (US), the southern San Joaquin or Central Valley and Central Coast are the major endemic regions in California.

Of those infected with coccidioidomycosis, approximately 60 percent may be asymptomatic. Following an incubation period of 1 to 3 weeks, clinical manifestations occur in 40 percent of infected persons and range from influenza-like illness, such as cough, fever, or difficulty breathing, to severe pneumonia, and rarely, disseminated disease.

Disseminated infection, which can be fatal, most commonly involves skin and soft tissues, bones, and the central nervous system. Persons at increased risk for severe disease include African Americans, Filipinos, Hispanics, pregnant women, adults of older age groups, and people with weakened immune systems¹.

We describe the epidemiology of reported coccidioidomycosis in California in 2016 and present time trend data for years 2001 through 2016 and demographic trend data for years 2011 through 2016 to provide historical perspective. Because coccidioidomycosis may occur as a chronic condition and be reported more than once, we included only the first report of coccidioidomycosis per person using a probabilistic de-duplication method spanning multiple surveillance reporting years. For a complete discussion of the definitions, methods, and limitations associated with this report, please refer to Technical Notes at the end of this report.

California reporting requirements and surveillance case definition

California Code of Regulations (CCR), Title 17, requires health care providers to report suspected cases of coccidioidomycosis to their local health department within 7 days or immediately by telephone if an outbreak is suspected. Since 2010, CCR, Title 17, Section 2505 has also mandated laboratories to report to the local health jurisdiction².

California regulations require local health officers to report cases of coccidioidomycosis to CDPH. CDC defines a confirmed case as one with clinically compatible illness and at least one of the following: culture, histopathologic, or molecular evidence of *Coccidioides* species, or positive serologic test for *coccidioidal* antibodies in serum, cerebrospinal fluid, or other body fluids by: detection of *coccidioidal* immunoglobulin M (IgM) by immunodiffusion, enzyme immunoassay (EIA), latex agglutination, or tube precipitin; or detection of *coccidioidal* immunoglobulin G (IgG) by immunodiffusion, EIA, or complement fixation; or *coccidioidal* skin-test conversion from negative to positive after onset of clinical signs and symptoms. Clinical illness includes one or more of the following: influenza-like signs and symptoms, pneumonia or other pulmonary lesion,

erythema nodosum or multiforme rash, involvement of the bones, joints, or skin by dissemination, meningitis, or involvement of viscera or lymph nodes³.

Epidemiology of coccidioidomycosis in California

CDPH received reports of 5,372 incident cases of coccidioidomycosis with estimated illness onset date in 2016.

The annual incidence rate of coccidioidomycosis in 2016 was 13.7 per 100,000 population, an increase of 71 percent compared to the 2015 incidence rate of 8.0 per 100,000 population (3,140 case-patients) and very close to the 2011 incidence rate of 13.8 per 100,000 population (5,213 case-patients). (Figures 1 and 5).

In 2016, the incidence rate among males was 17.3 per 100,000 population (3,382 case-patients) as compared to 10.0 per 100,000 in females (1,985 case-patients). As compared to other age groups, the highest annual incidence rate occurred among persons 45 to 54 years of age (19.8 per 100,000; 1,040 case-patients) (Figure 3). Incidence rates by race/ethnicity were not calculated due to the substantial missing data (32.7 percent). However, cases with complete data reported Hispanic ethnicity and Black (non-Hispanic) races more frequently than would be expected based on the overall demo-graphic profile of California (Figures 4 and 6).

The highest 2016 annual incidence rate was in Kern County (251.7 per 100,000; 2,238 case-patients). The other counties with high 2016 annual incidence rates included Kings (157.3 per 100,000; 235 case-patients), San Luis Obispo (82.8 per 100,000; 231 case-patients), Fresno

(60.8 per 100,000; 601 case-patients), Tulare (45.3 per 100,000; 212 case-patients), Madera (31.5 per 100,000; 49 case-patients), and San Joaquin (25.3 per 100,000; 187 case-patients) (Figure 7). These counties are in *Coccidioides*-endemic areas and approximately 70.0 percent of case-patients resided in these counties at the time of illness onset.

Comments

The 5,372 incident cases of coccidioidomycosis in 2016 was the highest annual number of reported cases since 1995, when individual cases became reportable in California. The coccidioidomycosis incidence rate in 2016 was comparable to the incidence rate peak California had observed in 2011 when the annual number of reported cases also surpassed 5,000.

Age group, race/ethnicity, gender, and county epidemiologic profiles of incident cases with estimated illness onset dates in 2016 are similar with those reported in coccidioidomycosis epidemiologic summaries from earlier years as described previously⁴.

The causes of the increase in 2016 are not well understood but climatic and environmental factors favorable to *Coccidioides* proliferation and airborne release, and increases in non-immune populations in endemic areas might have been contributing factors. Following the initiation of mandated laboratory reporting in 2010, there might have been an increase in laboratory reporting which could have contributed to the increase in reported cases. However, some highly endemic counties were using laboratory-based reporting, even prior to the mandate. Coccidioidomycosis is highly endemic in the Central Valley and Central Coast of California and remains an important public health problem in the State. There is currently no vaccine.

To decrease the risk of infection, persons living, working, or traveling in coccidioidomycosis endemic areas, especially those at increased risk for disseminated disease, should limit their exposure to outdoor dust as much as possible, including staying inside and keeping windows and doors closed when it is windy and the air is dusty.

It is important that healthcare providers be alert for coccidioidomycosis among patients who live in or have traveled to endemic areas, especially those who work or participated in activities where soil is disturbed^{1,5}.

For more information on coccidioidomycosis, including education materials and data from previous years, please visit the CDPH Coccidioidomycosis webpage at:

<https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioidomycosis.aspx>

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Last updated 06/06/2014

Figure 1. Coccidioidomycosis, Cases and Rates by Health Jurisdiction, California, 2011–2016

	YEAR OF ESTIMATED ILLNESS ONSET											
	2011		2012		2013		2014		2015		2016	
JURISDICTION	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE
CALIFORNIA TOTAL	5,213	13.8	4,117	10.8	3,307	8.6	2,306	6.0	3,140	8.0	5,372	13.7
ALAMEDA COUNTY TOTAL	25	1.6	22	1.4	28	1.8	27	1.7	41	2.5	43	2.6
ALAMEDA	23	1.6	20	1.4	27	1.9	27	1.8	40	2.7	43	2.8
BERKELEY	2	1.7*	2	1.7*	1	0.9*	0	-	1	0.8*	0	-
ALPINE	0	-	0	-	0	-	0	-	0	-	0	-
AMADOR	3	7.9*	1	2.6*	0	-	0	-	4	10.7*	0	-
BUTTE	4	1.8*	4	1.8*	4	1.8*	1	0.4*	0	-	3	1.3*
CALAVERAS	1	2.2*	2	4.4*	3	6.6*	1	2.2*	0	-	1	2.2*
COLUSA	1	4.6*	0	-	0	-	0	-	1	4.5*	1	4.5*
CONTRA COSTA	31	2.9	29	2.7	37	3.4	29	2.6	49	4.4	61	5.4
DEL NORTE	0	-	0	-	0	-	0	-	0	-	0	-
EL DORADO	0	-	1	0.6*	1	0.5*	1	0.5*	1	0.5*	2	1.1*
FRESNO	724	76.9	479	50.4	309	32.2	156	16.1	267	27.3	601	60.8
GLENN	0	-	0	-	0	-	0	-	0	-	0	-
HUMBOLDT	1	0.7*	0	-	0	-	0	-	1	0.7*	0	-
IMPERIAL	5	2.8*	12	6.7*	5	2.8*	0	-	2	1.1*	9	4.8*
INYO	0	-	0	-	0	-	1	5.4*	0	-	0	-
KERN	2,564	301.7	1,860	216.7	1,659	191.0	928	105.9	1,081	122.4	2,238	251.7
KINGS	374	247.1	239	159.4	103	68.5	78	52.2	102	68.1	235	157.3
LAKE	0	-	0	-	0	-	0	-	0	-	0	-
LASSEN	0	-	0	-	0	-	0	-	9	29.1*	5	16.3*
LOS ANGELES COUNTY TOTAL	316	3.2	335	3.4	344	3.4	403	4.0	558	5.5	731	7.1
LOS ANGELES	302	3.3	312	3.3	335	3.6	383	4.0	521	5.5	714	7.5
LONG BEACH	13	2.8*	21	4.5	8	1.7*	19	4.0	36	7.5	15	3.1*
PASADENA	1	0.7*	2	1.4*	1	0.7*	1	0.7*	1	0.7*	2	1.4*
MADERA	44	29.0	24	15.9	46	30.2	35	22.7	55	35.5	49	31.5
MARIN	3	1.2*	1	0.4*	6	2.3*	1	0.4*	0	-	2	0.8*
MARIPOSA	0	-	0	-	0	-	0	-	2	11.1*	3	16.6*
MENDOCINO	1	1.1*	0	-	1	1.1*	0	-	1	1.1*	0	-
MERCED	52	20.0	60	22.8	54	20.4	48	17.9	76	28.2	41	15.0
MODOC	0	-	0	-	0	-	0	-	0	-	0	-
MONO	0	-	0	-	0	-	0	-	0	-	0	-
MONTEREY	68	16.2	75	17.7	69	16.2	23	5.4	37	8.5	77	17.5
NAPA	1	0.7*	3	2.2*	0	-	0	-	0	-	2	1.4*
NEVADA	1	1.0*	2	2.0*	0	-	0	-	0	-	0	-
ORANGE	83	2.7	115	3.7	72	2.3	77	2.5	172	5.4	106	3.3
PLACER	2	0.6*	7	1.9*	3	0.8*	0	-	5	1.3*	2	0.5*
PLUMAS	1	5.0*	0	-	2	10.1*	1	5.1*	0	-	0	-

	2011		2012		2013		2014		2015		2016	
JURISDICTION	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE
RIVERSIDE	72	3.2	56	2.5	34	1.5	38	1.6	59	2.5	63	2.7
SACRAMENTO	38	2.7	5	0.3*	9	0.6*	18	1.2*	22	1.5	21	1.4
SAN BENITO	2	3.6*	0	-	1	1.8*	1	1.7*	0	-	3	5.2*
SAN BERNARDINO	50	2.4	57	2.7	49	2.3	33	1.6	28	1.3	39	1.8
SAN DIEGO	148	4.7	139	4.4	93	2.9	88	2.7	112	3.4	123	3.7
SAN FRANCISCO	9	1.1*	3	0.4*	17	2.0*	4	0.5*	13	1.5*	7	0.8*
SAN JOAQUIN	111	16.0	74	10.6	52	7.4	60	8.4	97	13.3	187	25.3
SAN LUIS OBISPO	170	62.9	107	39.3	49	17.9	22	8.0	62	22.4	231	82.8
SAN MATEO	8	1.1*	16	2.2*	9	1.2*	3	0.4*	3	0.4*	4	0.5*
SANTA BARBARA	19	4.5	26	6.0	23	5.3	15	3.4*	25	5.6	59	13.2
SANTA CLARA	29	1.6	26	1.4	17	0.9*	12	0.6*	17	0.9*	38	2.0
SANTA CRUZ	3	1.1*	9	3.4*	5	1.8*	3	1.1*	1	0.4*	8	2.9*
SHASTA	2	1.1*	0	-	0	-	1	0.6*	0	-	2	1.1*
SIERRA	0	-	0	-	0	-	0	-	0	-	0	-
SISKIYOU	0	-	0	-	1	2.2*	0	-	0	-	2	4.5*
SOLANO	15	3.6*	8	1.9*	6	1.4*	4	0.9*	19	4.4	11	2.5*
SONOMA	4	0.8*	4	0.8*	1	0.2*	5	1.0*	1	0.2*	2	0.4*
STANISLAUS	58	11.2	62	11.8	39	7.4	36	6.8	50	9.3	72	13.2
SUTTER	1	1.0*	1	1.0*	1	1.0*	0	-	0	-	1	1.0*
TEHAMA	0	-	1	1.6*	1	1.6*	1	1.6*	0	-	1	1.6*
TRINITY	0	-	0	-	0	-	0	-	0	-	0	-
TULARE	127	28.4	154	34.1	114	25.0	107	23.3	114	24.6	212	45.3
TUOLUMNE	3	5.4*	6	10.9*	0	-	0	-	1	1.8*	5	9.2*
VENTURA	34	4.1	90	10.8	39	4.6	42	5.0	48	5.6	64	7.5
YOLO	4	2.0*	2	1.0*	0	-	3	1.4*	4	1.9*	5	2.3*
YUBA	1	1.4*	0	-	1	1.3*	0	-	0	-	0	-

Rates are expressed as cases per 100,000 population.

*Potentially unreliable rate, relative standard error 23 percent or more

For resolution and process status inclusion criteria, please refer to Technical Notes (pages 13-15)

Figure 2. Coccidioidomycosis, Cases by Month of Estimated Illness Onset, California, 2011–2016

MONTH OF ESTIMATED ONSET	YEAR OF ESTIMATED ILLNESS ONSET					
	2011	2012	2013	2014	2015	2016
TOTAL	5,213	4,117	3,307	2,306	3,140	5,372
JANUARY	414	515	265	251	215	283
FEBRUARY	251	510	234	225	179	267
MARCH	283	385	215	158	197	233
APRIL	293	335	267	179	227	271
MAY	306	318	365	191	172	200
JUNE	348	313	283	165	210	299
JULY	441	297	285	200	292	376
AUGUST	553	322	282	167	258	601
SEPTEMBER	629	301	231	193	323	716
OCTOBER	632	268	292	189	402	925
NOVEMBER	554	299	321	184	348	693
DECEMBER	509	254	267	204	317	508

Figure 3. Coccidioidomycosis, Cases and Rates by Age Group, California, 2011–2016

AGE GROUP	YEAR OF ESTIMATED ILLNESS ONSET											
	2011		2012		2013		2014		2015		2016	
	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE
TOTAL	5,213	13.8	4,117	10.8	3,307	8.6	2,306	6.0	3,140	8.0	5,372	13.7
0	11	2.2*	10	2.0*	1	0.2*	2	0.4*	3	0.6*	4	0.8*
1-4	45	2.2	40	2.0	21	1.0	7	0.3*	14	0.7*	29	1.4
5-9	112	4.4	76	3.0	68	2.6	33	1.3	46	1.8	106	4.1
10-14	192	7.5	110	4.3	57	2.2	52	2.0	57	2.2	188	7.3
15-24	673	11.9	524	9.2	372	6.5	200	3.5	312	5.4	598	10.2
25-34	909	17.0	664	12.4	531	9.9	343	6.4	441	8.3	796	15.1
35-44	923	17.9	702	13.6	573	11.1	369	7.2	529	10.3	911	17.7
45-54	1,003	19.1	811	15.5	653	12.5	422	8.0	563	10.7	1,040	19.8
55-64	685	16.2	582	13.4	534	12.0	450	9.9	553	11.9	857	18.0
65+	638	14.4	581	12.6	477	9.9	417	8.3	609	11.6	834	15.3
UNKNOWN	22	-	17	-	20	-	11	-	13	-	9	-

Rates are expressed as cases per 100,000 population.

*Potentially unreliable rate, relative standard error 23 percent or more

Figure 4. Coccidioidomycosis, Cases by Race/Ethnicity, California, 2011–2016

RACE/ETHNICITY	YEAR OF ESTIMATED ILLNESS ONSET					
	2011	2012	2013	2014	2015	2016
TOTAL	5,213	4,117	3,307	2,306	3,140	5,372
ASIAN/PACIFIC ISLANDER	167	165	131	110	160	263
BLACK, NOT HISPANIC	359	257	174	121	199	267
HISPANIC	1,291	1,212	987	740	845	1,684
AMERICAN INDIAN/ALASKAN NATIVE	13	15	19	13	12	17
WHITE, NOT HISPANIC	903	850	723	567	797	1,203
OTHER OR MULTI-RACE	58	61	48	38	109	179
UNKNOWN	2,422	1,557	1,225	717	1,018	1,759

32.7% of reported incidences of coccidioidomycosis did not identify race/ethnicity. Incidence rates by race/ethnicity were not calculated due to the substantial missing data.

Figure 5. Coccidioidomycosis, Cases and Incidence Rates by Year of Estimated Illness Onset, California, 2001-2016

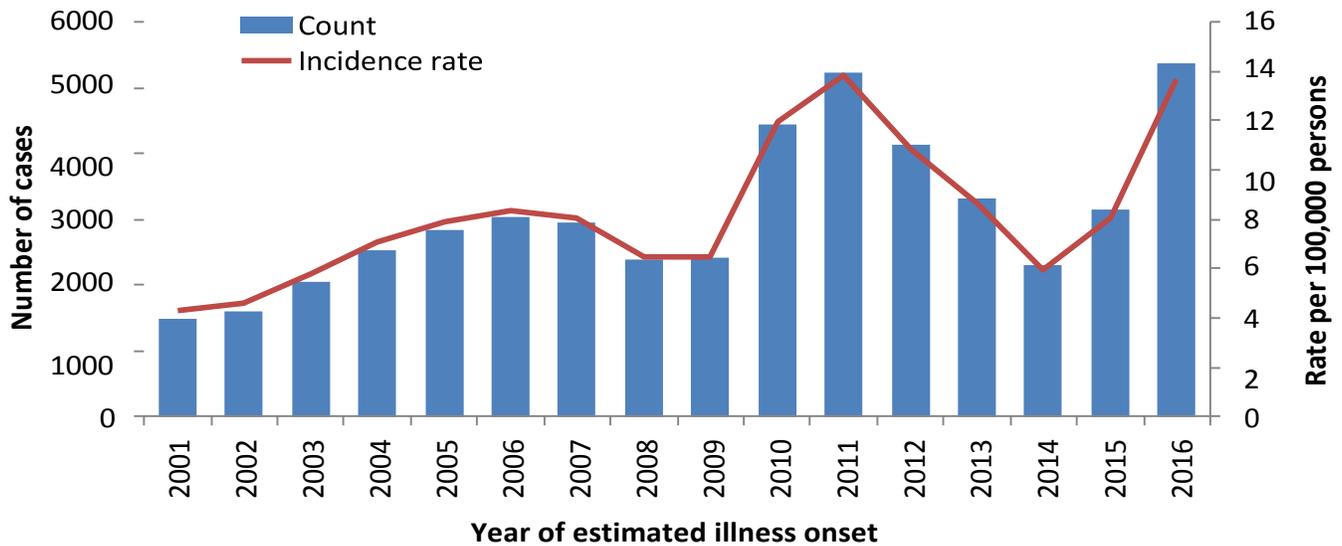
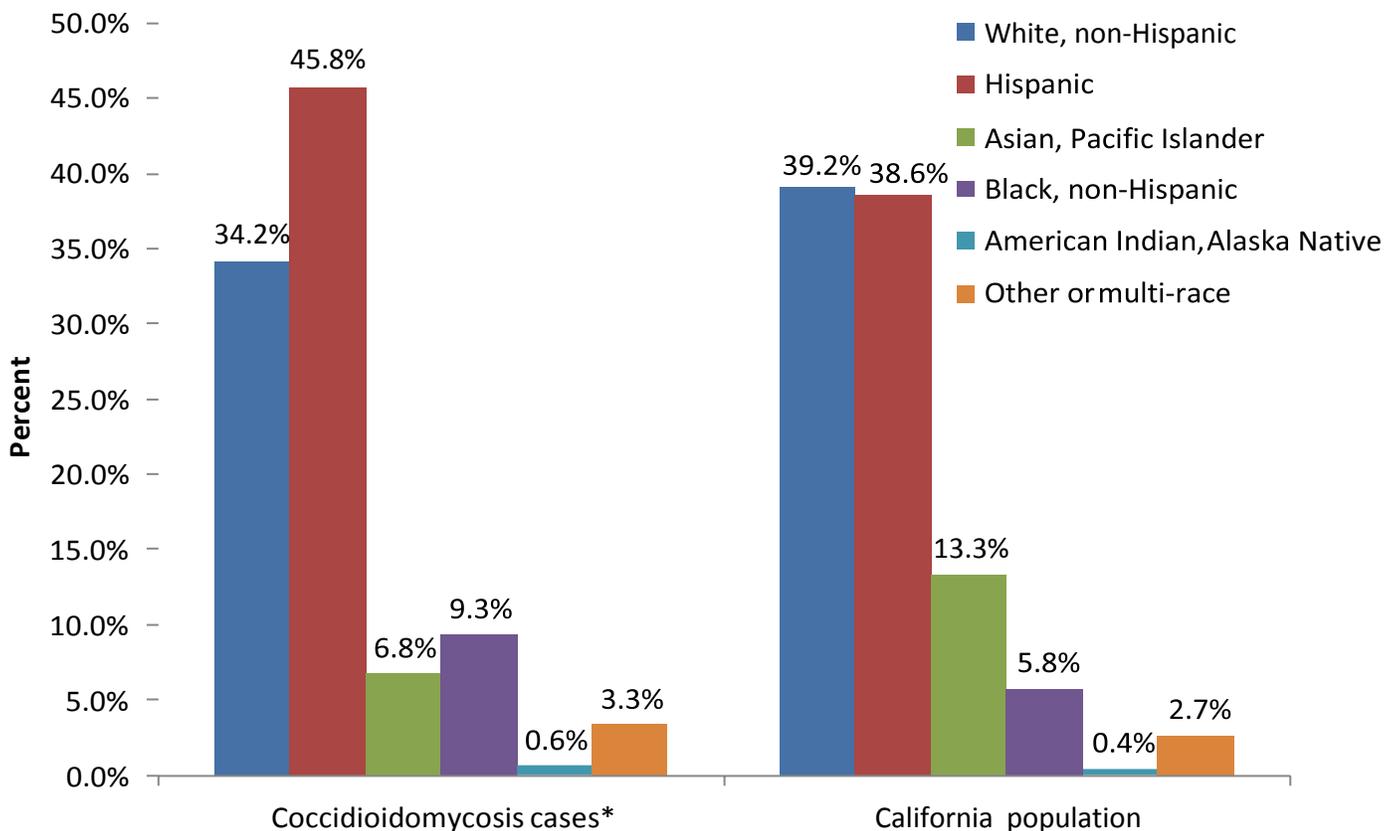


Figure 6. Coccidioidomycosis, Cases and Population by Race/Ethnicity, California, 2011-2016



Cases with unknown or missing race/ethnicity were excluded.

32.7% of reported incidences of coccidioidomycosis did not identify race/ethnicity.

Information presented with a large percentage of missing data should be interpreted with caution.

Background

The California Department of Public Health (CDPH) maintains a mandatory, passive reporting system for a list ² of communicable disease cases and outbreaks, including coccidioidomycosis. Health care providers and laboratories are mandated to report cases or suspected cases of these diseases to their local health department (LHD). LHDs are also mandated to report these cases to CDPH. The distribution of information on the health of the community is a core function and essential service of public health. The data in this epidemiologic summary provide important health information on the magnitude and burden of coccidioidomycosis in California. Bearing in mind their limitations, these data can contribute toward identifying populations at high risk needing preventive actions and tracking the effectiveness of control and prevention measures.

Materials and methods

Case data sources and inclusion criteria

For the 2016 Epidemiologic Summary of Coccidioidomycosis in California, we extracted data on coccidioidomycosis incident cases with an estimated illness onset dates from 2001 through 2016 from California Confidential Morbidity Reports that LHDs submitted to CDPH by May 9, 2017. LHDs followed the Centers for Disease Control and Prevention (CDC) surveillance case definition to close and report cases ³. Due to inherent delays in case reporting and depending on the length of follow-up clinical, laboratory and epidemiologic investigation, LHDs may add or rescind cases with eligible illness onset dates after the date of this report. Data used in this report were quality checked and duplicate

records were removed based on a data matching process. Because coccidioidomycosis may occur as a chronic condition and be reported more than once, we included only the first report of coccidioidomycosis per person using a probabilistic de-duplication method spanning multiple surveillance reporting years.

Coccidioidomycosis cases included in the report were assessed as confirmed and closed by the LHDs.

Population data source

For the 2016 epidemiologic summary of coccidioidomycosis, we used State of California, Department of Finance (DOF) projections and estimations data.⁽⁶⁻⁷⁾ For the 2001–2010 trend comparisons, we used State of California, DOF population data ⁸.

Definitions

A case was defined as a person who had laboratory and/or clinical evidence of infection or disease that satisfied the most recent communicable disease surveillance case definition published by the United States Centers for Disease Control and Prevention (CDC) or by the Council of State and Territorial Epidemiologists.

We defined the estimated illness onset date for each case as the date closest to the time when symptoms first appeared. Because date of illness onset may not be recorded, the estimated date of illness onset can range from the first appearance of symptoms to the date the report was made to CDPH. Since illness onset of coccidioidomycosis is often insidious,

estimated illness onset was frequently drawn from the diagnosis date.

We defined single race/ethnicity categories as follows: Hispanic (of any, including unknown, race); White, non-Hispanic; Black, non-Hispanic; Asian/Pacific Islander; and American Indian/Alaska Native. Cases with other and unknown race and ethnicity were listed as other/unknown.

We defined a rate as unreliable if the relative standard error was 23 percent or more (a threshold recommended by the National Center for Health Statistics). The formulas used to calculate the relative standard error were:

- Incidence rate (IR) = Number of cases/population x 100,000
- Standard error (SE) = $IR/\sqrt{\text{number of cases}}$
- Relative standard error = $SE/IR \times 100$

Data analyses

We reported case totals and rates per 100,000 population stratified by estimated year of illness onset, age group, and LHD.

A substantial portion of race/ethnicity data were missing, thus rates by race/ethnicity were not calculated. However, for comparison we depicted case totals and California population totals by race/ethnicity.

Tables and figures

The following tables and figures are included in this report; please note that the tables and figures may have been suppressed to minimize depiction of unreliable rates:

Tables:

Cases and Rates by Health Jurisdiction

Cases by Month of Estimated Illness Onset

Cases and Rates by Age Group

Cases by Race/Ethnicity

Figures:

Counts and Incidence Rates by Year of Estimated Illness Onset

Cases and Population by Race/Ethnicity

County-Specific Incidence Rates

Limitations

Completeness of reporting

The numbers of disease cases in this report are likely to underestimate the true magnitude of the disease. Among factors that may contribute to under-reporting are: delays in notification, limited collection or appropriate testing of specimens, health care seeking behavior among ill persons, limited resources and competing priorities in LHDs, and lack of reporting by clinicians and laboratories. Among factors that may contribute to increased reporting are disease severity, the availability of new or less expensive diagnostic tests, changes in the case definition by CDC, recent media or public attention, and active surveillance activities.

From 2011–2016, the proportion of coccidioidomycosis cases with incomplete race/ethnicity data varied from 31 to 46 percent. Race/ethnicity information based on a high percentage of missing data should be interpreted with caution.

Small numbers and rate variability

All rates, even those based on full population counts, are subject to random error. Random error may be substantial when the number of cases is small (e.g., less than 20) and can make it impossible to distinguish random fluctuations from true changes in the underlying risk of disease. Rates and proportions based on small numbers should be interpreted with caution.

Rate comparisons

Incidence rate comparisons between geographic entities and over time should be done with caution. Additionally, the limitations previously listed (especially the completeness of reporting and random variability of rates) should be considered when interpreting and comparing incidence rates.

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7- State of California, Department of Finance,
E-4 Population Estimates for Cities, Counties, and the State, 2011–2017, with 2010 Benchmark. Sacramento, California, May 2017.

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Erratum (9/1/2017)

Text beneath Figures 4 (page 10) and 6 (page 11) should indicate that information on race/ethnicity was unavailable for 37.1 percent of reported cases.



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