California Emerging Infections Program

2019-2021 Data Highlights

California Emerging Infections Program (CEIP) core projects:

Active Bacterial Core surveillance (ABCs)

Foodborne Diseases Active Surveillance Network (FoodNet)

Healthcare-Associated Infections Community Interface (HAIC)

Human Papillomavirus Vaccine Impact Monitoring Surveillance Effort (HPV-Impact)

Respiratory Virus Hospitalization Surveillance Network (RESP-Net)

Mpox Vaccine Effectiveness (MPX)

Creutzfeldt-Jakob Disease (CJD)

Released:

Contact Information:
ABCs - abcs@ceip.us
FoodNet - foodnet@ceip.us
HAIC - hai@ceip.us
RESP-Net - respnet@ceip.us
Mpox - mpox@ceip.us

www.ceip.us https://www.cdc.gov/ncezid/dpei/eip/index.html info@ceip.us @California_EIP

Pathogen Incidence per 100,000 Persons by County, 2019-2021

		Alameda			Contra Costa			San Francisco		
		2019	2020	2021	2019	2020	2021	2019	2020	2021
FoodNet	*Campylobacter*	28.5	15.6	19.2	27.7	15.4	17.9	50.8	26.4	30.4
	Cyclospora	£	£	£	£	£	£	£	£	£
	Shiga-toxin producing E. coli (STEC)	9.8	4.5	6.1	9.9	4.1	6.2	9.3	4.0	7.0
	Listeria	£	£	£	£	£	£	£	£	£
	Salmonella	18.4	10.0	10.7	19.0	13.8	13.4	22.5	12.8	10.3
	Shigella	8.7	4.6	6.3	7.3	3.1	5.2	28.7	15.2	25.9
	Vibrio	£	0.6	£	£	£	0.9	1.6	£	1.8
	Yersinia	£	£	0.6	£	£	1.0	£	£	1.2
ABCs	Group A *Streptococcus*	6.5	4.5	4.8	6.7	3.3	3.1	14.6	10.2	7.8
	Group B *Streptococcus*	8.4	7.4	7.4	8.2	8.3	8.4	10.7	7.7	7.9
	Neisseria meningitidis	£	£	£	£	£	£	£	£	£
	Haemophilus influenzae	1.8	1.2	£	1.5	1.1	£	3.0	1.1	1.2
	Streptococcus pneumoniae	7.1	4.9	3.3	4.8	3.7	2.3	10.8	6.3	2.4
HAIC	*Candida spp.* [a]	5.8	6.1	5.7	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
	Carbapanem-resistant *Enterobacterales*	6.2	4.9	9.3	3.6	5.0	10.3	1.9	2.0	1.2
	Clostridioides difficile [b]	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	80.7	74.2	91.0
	Methicillin-resistant *Staphylococcus aureus* (MRSA)	14.5	14.7	11.6	14.2	12.5	11.3	16.6	11.0	10.5
	Methicillin-sensitive *Staphylococcus aureus* (MSSA)	29.9	28.5	27.3	34.4	30.4	33.6	37.6	29.2	33.3
Resp-Net [#, ^]		2019-20	2020-21	2021-22	2019-20	2020-21	2021-22	2019-20	2020-21	2021-22
	Influenza	53.1	0.8	2.1	67.6	£	1.8	51.0	£	1.6
	Respiratory Syncytial virus	2.0	£	13.1	2.2	£	18.4	1.4	£	9.4
	SARS-CoV-2[1]	121.4	346.3	368.3	120.5	440.5	433	128.1	270.9	420.9

Population denominators retrieved from the California Department of Finance's P3 annual county population estimates

* "£" denotes rate not reported due to low case counts.

a. Surveillance of *Candida* spp. causing candidemia is conducted only in Alameda County,

b. *Clostridioides difficile* surveillance is conducted only in the City and County of San Francisco.

#. RESP-NET Case Incidences are for hospitalized cases.

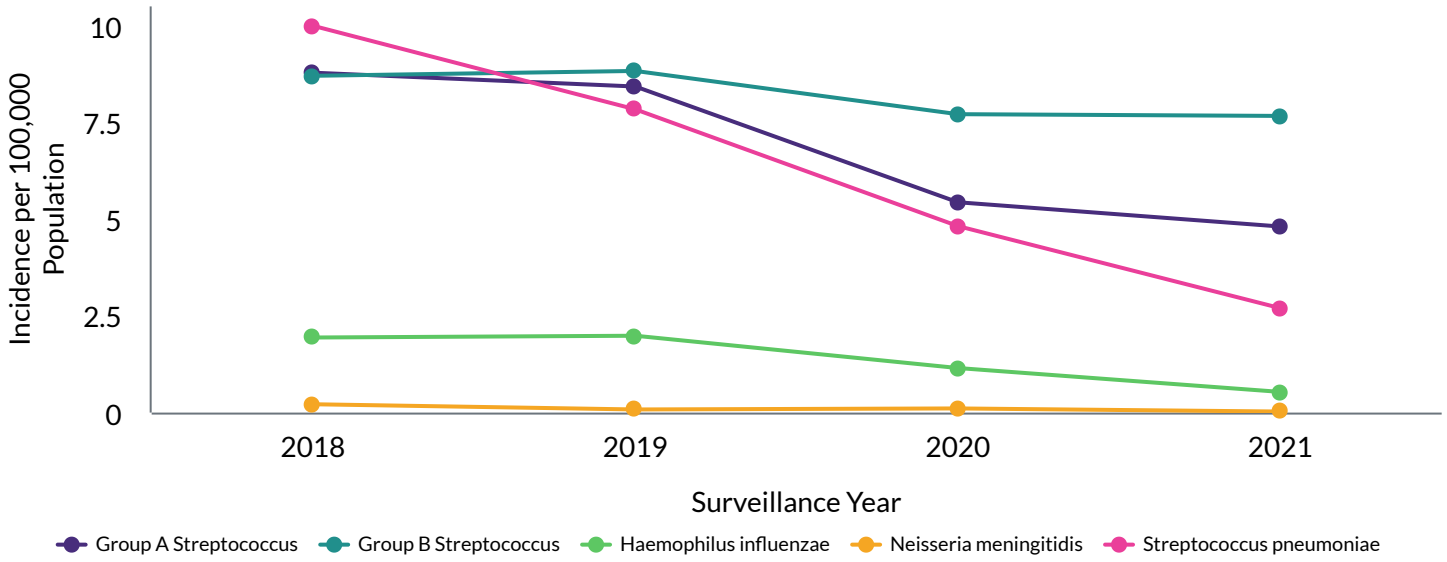
^. A RESP-NET season is classified as hospitalized cases identified from October 1st through April 30th for influenza and RSV. SARS-CoV-2 rates are year-round

1. CEIP began conducting surveillance for SARS-CoV-2 in 2020 (counted as the 2019-2020 season), alongside the other EIP sites, with influenza and RSV surveillance under the same program.

Active Bacterial Core surveillance (ABCs)

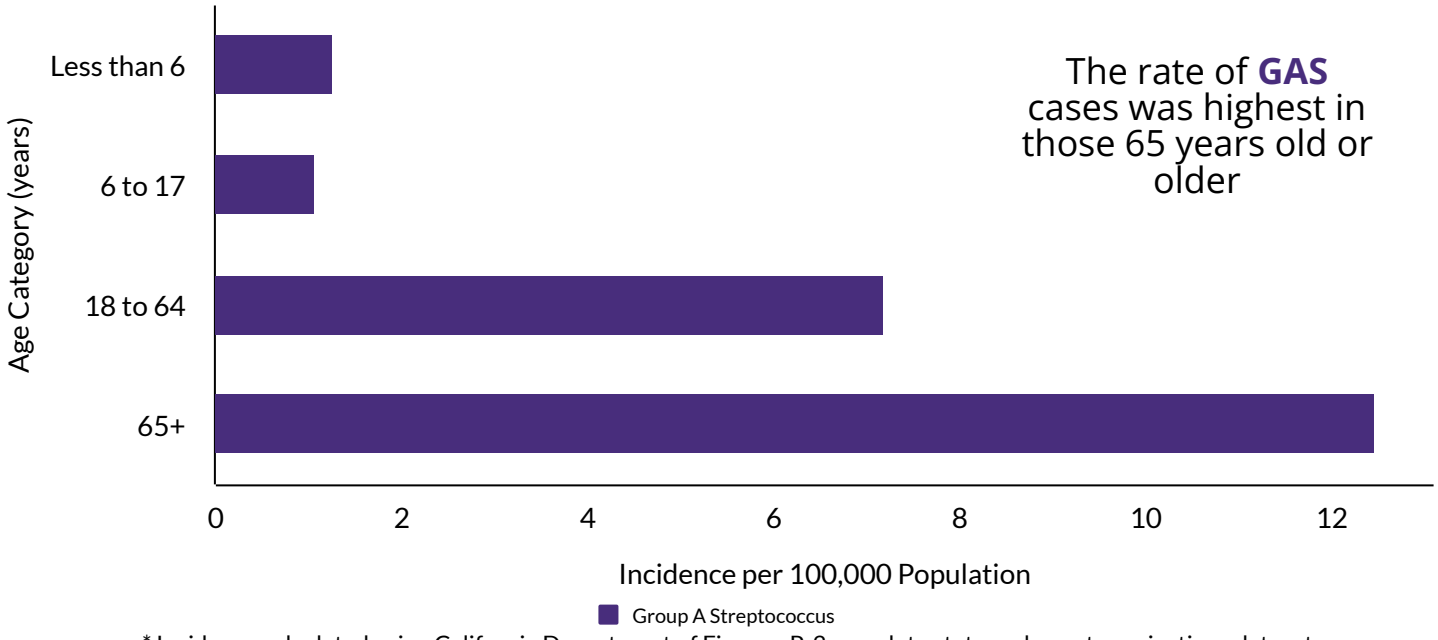
ABCs is an active, population-based surveillance effort in Alameda, Contra Costa, and San Francisco counties. ABCs monitors the incidence and epidemiologic characteristics of invasive disease due to Group A *Streptococcus* (GAS), Group B *Streptococcus* (GBS), *Haemophilus influenzae*, *Neisseria meningitidis*, and *Streptococcus pneumoniae*.

Streptococcus pneumoniae had the highest ABCs case incidence in 2018, but was exceeded by **GBS** from 2019-2021



* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset

GAS 2018-2021 Average Annual Case Incidence by Age Category



The rate of **GAS** cases was highest in those 65 years old or older

* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset

BACT FACTS INTERACTIVE

View data from all ABCs sites using CDC's interactive data tool https://www.cdc.gov/abcs/bact-facts-interactive-dashboard.html

abcs@ceip.us

COVID-19 in Healthcare Personnel (HCP) and COVID-19 Vaccine Effectiveness

This study has **two main components:**

In the first component, CEIP utilized population-based surveillance during the emergence of COVID-19 to contact and perform phone interviews of HCP who tested positive for COVID-19 from May 1, 2020 – December 31, 2021 within Alameda, Contra Costa, and San Francisco counties. A total of 9,237 cases were detected and 2,043 interviews completed.

HCP COVID-19 Cases

Year	Cases
2020	4,671
2021	4,566
Total	9,237

2,043
Interviews Completed

The study found that varying risk factors exist depending on the healthcare setting where HCP work.

Chea, N., Eure, T., Penna, A.R., et al. (2022). Practices and activities among healthcare personnel with severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection working in different healthcare settings - ten Emerging Infections Program sites, April-November 2020. Infection Control and Hospital Epidemiology, 43, 1058-1062. doi:10,1017/ice.2021.262

The second component includes a facility-based case-control study that examines the effectiveness of the SARS-CoV-2 vaccine by age groups, comorbid conditions, job categories, vaccine product, and number of doses. All participants are interviewed by phone to obtain information on demographic variables, illness, exposures to SARS-CoV-2, and medical and vaccination history. Data are verified through medical records and the California Immunization registry (CAIR).

Enrollment ongoing since February 1, 2021

HCP Vaccine Effectiveness Case-Control Summary

Year	Cases Enrolled	Controls Enrolled
2021	49	84
2022	22	22

The study found initial doses of the vaccine were effective in preventing symptomatic COVID-19 in HCP. Subsequent booster doses offer substantial protection against COVID-19, but protection wanes over time.

Pilishvili, T., Gierke, R., Fleming-Dutra, K. E., Farrar, J. L., Mohr, N. M., Talan, D. A., Krishnadasan, A., Harland, K. K., Smithline, H. A., Hou, P. C., Lee, L. C., Lim, S. C., Moran, G. J., Krebs, E., Steele, M. T., Beiser, D. G., Faine, B., Haran, J. P., Nandi, U., ... Schrag, S. J. (2021). Effectiveness of mRNA Covid-19 Vaccine among U.S. Health Care Personnel. New England Journal of Medicine, 385(25), e90. https://doi.org/10.1056/NEJMoa2106599

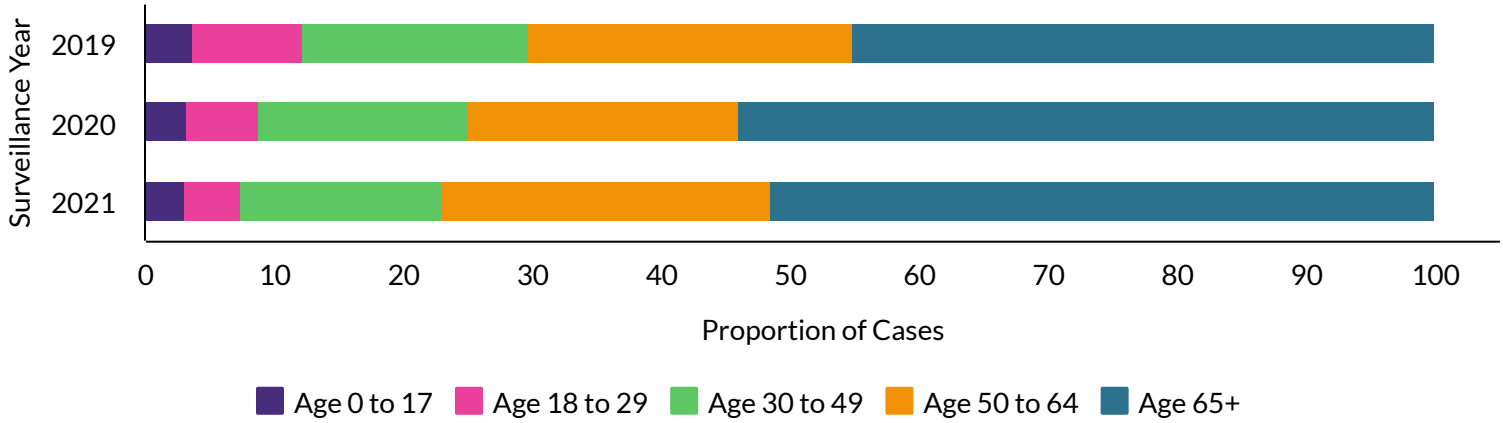
Healthcare-Associated Infections-Community Interface (HAIC)

HAIC conducts active, population-based surveillance for *Clostridioides difficile*, invasive methicillin-resistant *Staphylococcus aureus* (iMRSA) and methicillin-sensitive *Staphylococcus aureus* (iMSSA), candidemia (*Candida* spp. isolated from blood), and carbapenem-resistant *Enterobacterales* (CRE).

View national HAIC data collected by the Emerging Infections Program at https://www.cdc.gov/hai/eip/haicviz.html

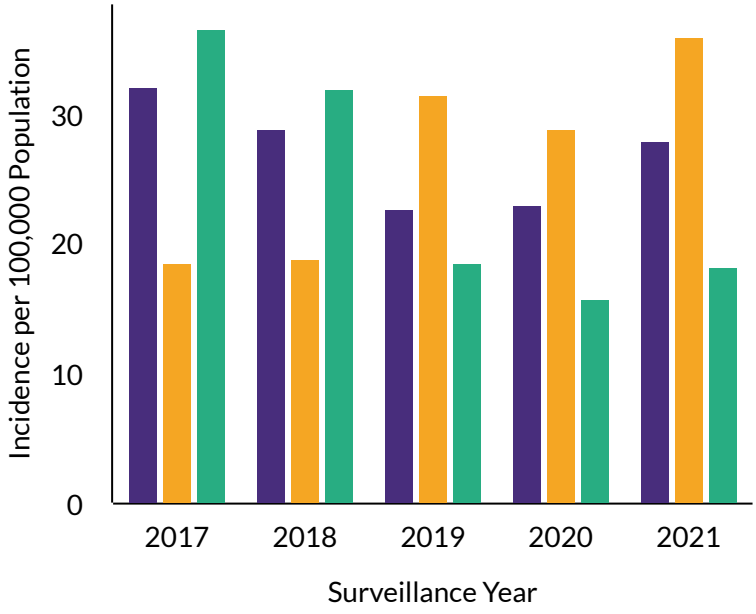
Clostridioides difficile Infections (CDI)

Those 65 Years of Age or Older Accounted for **50.1%** of All CDI Cases from 2019-2021



* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset
- Age is in years

Incidence of **Community-Associated CDI Increased** from 2017 to 2021



Healthcare Facility-Onset:
(+) Specimen collected more than 3 days after admission OR admitted from, or stool collected at, a long-term care facility.

Community-Associated:
(+) Specimen collected within 3 days of admission without healthcare exposures in prior 12 weeks.

Community-Onset - Healthcare Facility-Associated: (+) specimen collected within 3 days of admission with healthcare exposure(s) 12 weeks prior to admission.

* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset

Clostridioides difficile Infections (CDI) Continued

Treatment Given to CDI cases in San Francisco County 2018-2021, All Treatment Courses:

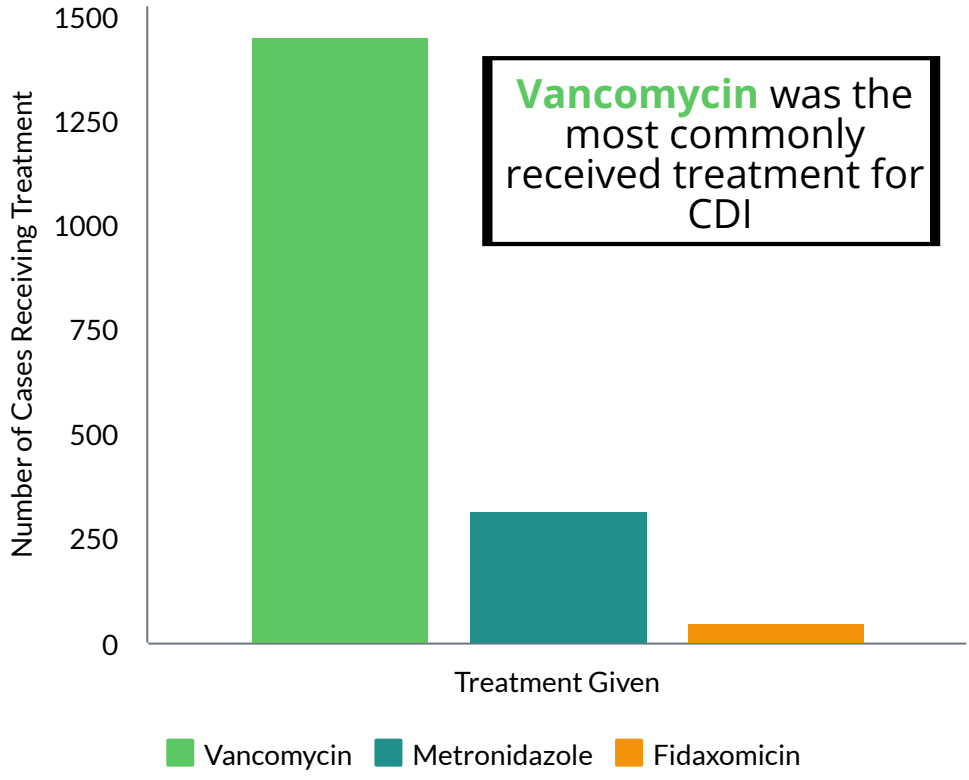
Treatment & Route of Administration	n (%)
Vancomycin - Oral	1440 (78.9%)
Vancomycin - Rectal	15 (0.8%)
Metronidazole - Oral	183 (10.0%)
Metronidazole - IV	135 (7.4%)
Fidaxomicin - All	49 (2.7%)
Other - All	4 (0.2%)
Total*	1826

* Excludes all unknown and no treatment
Cases may have received more than one treatment

221 (14.1%) received >1 treatment course

From 2018-2021, **78.7%** of cases in San Francisco County received treatment for CDI

Treatment Given to CDI Cases, 2018-2021



Vancomycin was the most commonly received treatment for CDI

Between 2018-2021, **230 (9%)** CDI cases had more than one incident episode of CDI

Recurring CDI episode is one positive stool specimen or more collected more than 8 weeks after initial incident CDI episode

981 total CDI stool specimens were collected from 2011-2022

From 2011-2018, strain typing was performed using **capillary-based PCR-ribotyping** and results were analyzed against a library of standard profiles using **BioNumerics**

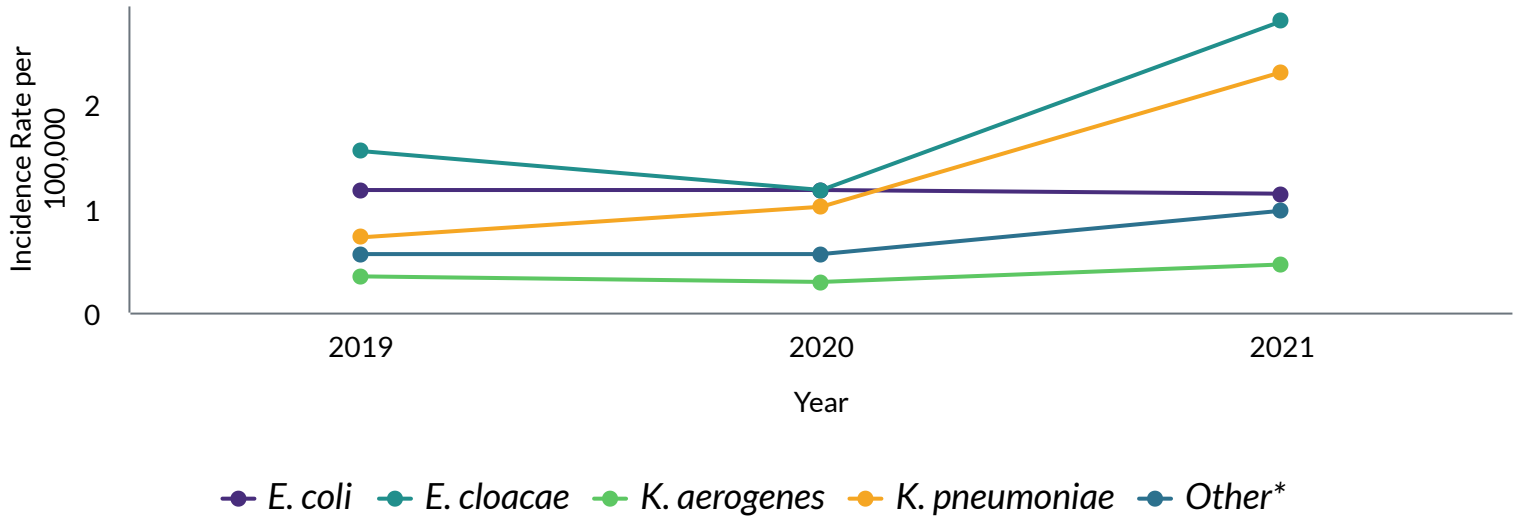
Whole genome sequencing (WGS) for molecular typing and virulence marker detection was performed on **all isolates** beginning with the **2019** collection year

These data are used to **describe the molecular and microbiologic characteristics** of *C. difficile* strains causing disease in the population under surveillance and is used to **describe changes in strain prevalence over time**

Carbapenem-resistant *Enterobacterales* (CRE)

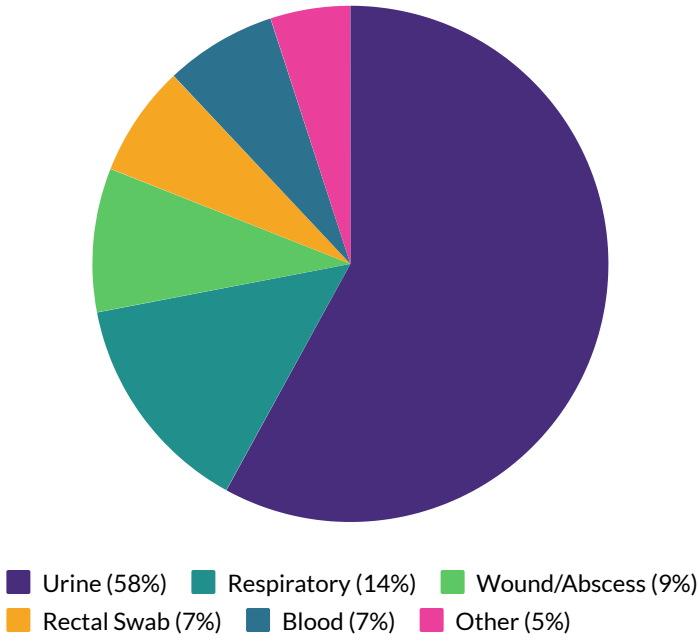
CEIP initiated surveillance for carbapenem-resistant *Enterobacterales* species (isolated from sterile and non-sterile sources) on **January 1, 2017**, in Alameda, Contra Costa, and San Francisco counties.

CRE Species Incidence By Year (2019-2021)

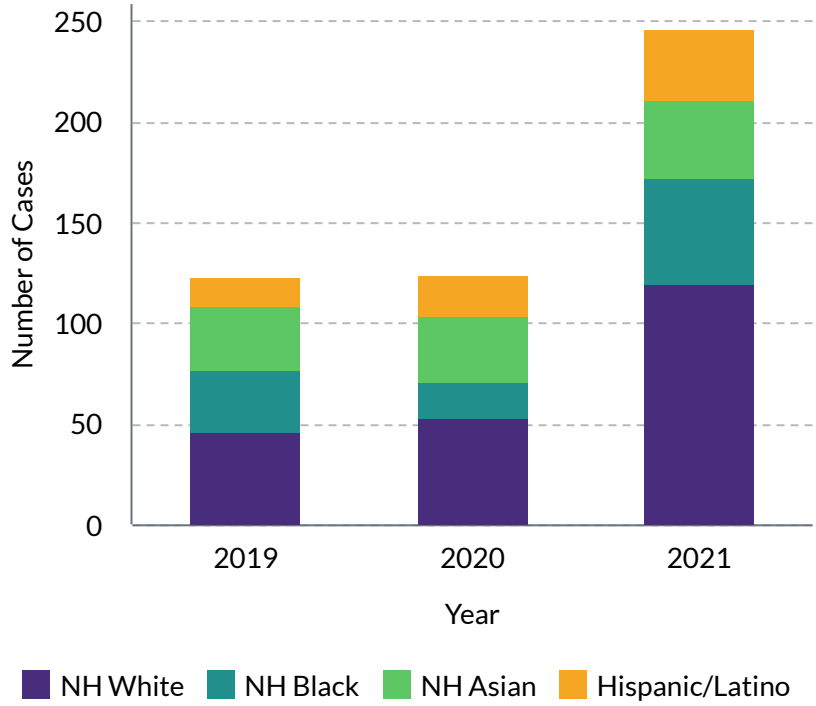


* Other Carbapenem-resistant *Enterobacterales* include *Klebsiella oxytoca*, *Serratia* spp., *Proteus* spp., *Citrobacter* spp., *Providencia* spp., *Hafnia alvei*, and *Morganella* spp.

More than half of CRE isolates are identified from **urine specimens (58%)**, followed by **Respiratory (14%)**, **and Wounds or Abscesses (9%)**.



CRE Diagnosis by Race and Ethnicity

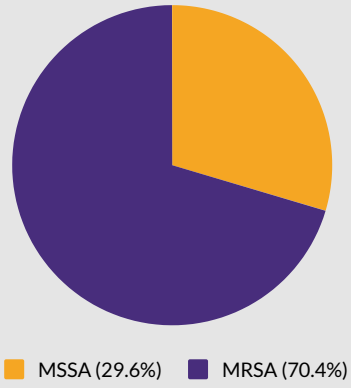


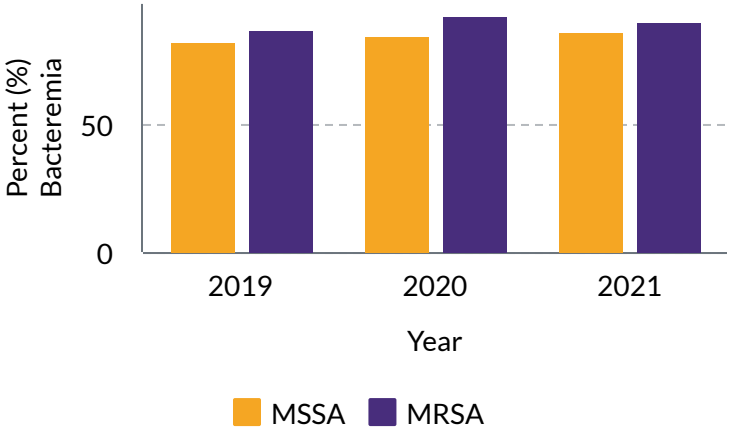
In **2021** there was an increase in cases among **Non-Hispanic White, Non-Hispanic Black,** and **Hispanic/Latino** Individuals

Invasive *Staphylococcus aureus* (iSA)

Surveillance for **Invasive *Staphylococcus aureus* (iSA)** includes **Methicillin-Sensitive (MSSA)** and **Methicillin-Resistant (MRSA)** *Staphylococcus aureus*

MRSA made up between **27% and 31%** of iSA cases annually between 2019 and 2021, and **29.6% of all cases.**





Bacteremia is the leading type of iSA infection for **both MSSA** and **MRSA**, making up **over 80%** of cases annually between **2019 and 2021.**

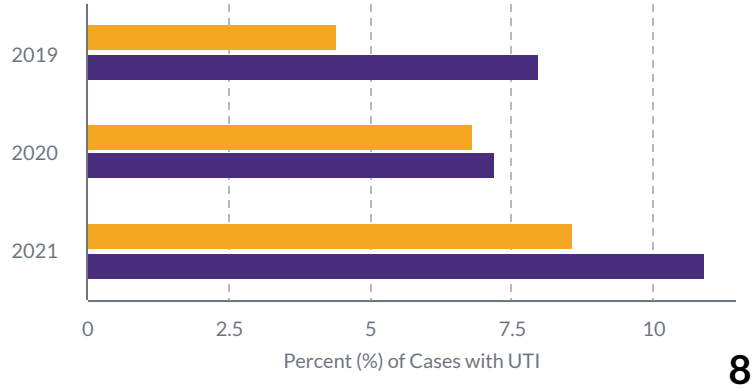
Top 5 **iSA** Infection Types (2019 - 2021)

MSSA	Percent (%) of Cases
1. Bacteremia	84.5%
2. Septic Arthritis	12.0%
3. Cellulitis	11.7%
4. Septic Shock	11.6%
5. Osteomyelitis	11.4%
MRSA	**Percent (%) of Cases**
1. Bacteremia	89.7%
2. Septic Shock	15.7%
3. Cellulitis	15.1%
4. Pneumonia	13.9%
5. Osteomyelitis	12.7%

* Multiple infection types can be present in a single case

Septic Shock increased annually for both **types of iSA** between 2019 and 2021, rising from **12.8% to 18.7% for MRSA** and from **9.2% to 14.6% for MSSA,** making it one of the 4 most prevalent iSA infection types.

Proportion of **MSSA** cases with **Urinary Tract Infection (UTI)** increased from **4.4% in 2019** to **8.6% in 2021.** Among **MRSA** cases, this share increased from **8% in 2019** to **10.9% in 2021**.

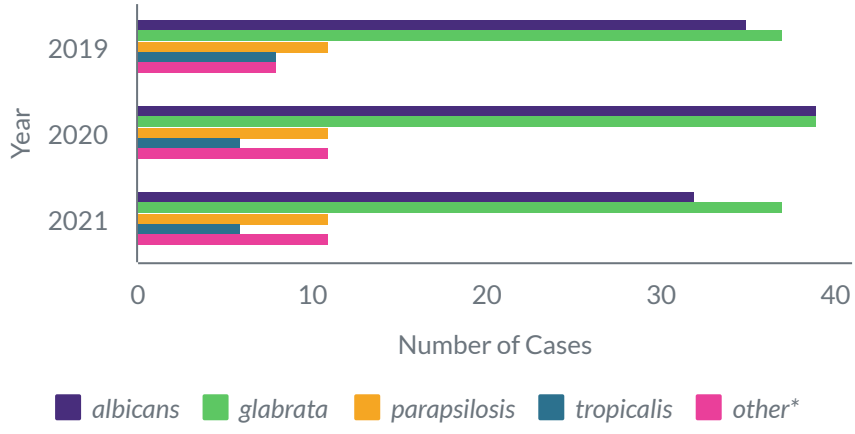


Candidemia

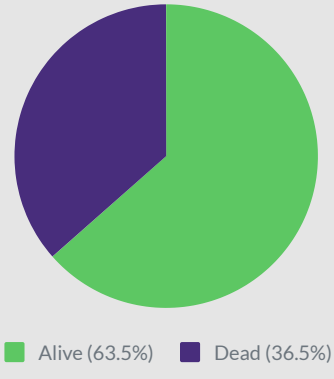
Between 2019 and 2021, CEIP collected information on **294 cases of Candidemia** (*Candida* spp. bloodstream infections) in Alameda County.

From 2019 to 2021, most **Candidemia** isolates were ***C. albicans*** or ***C. glabrata***

Each year, **11 cases** of ***C. parapsilosis*** were identified.



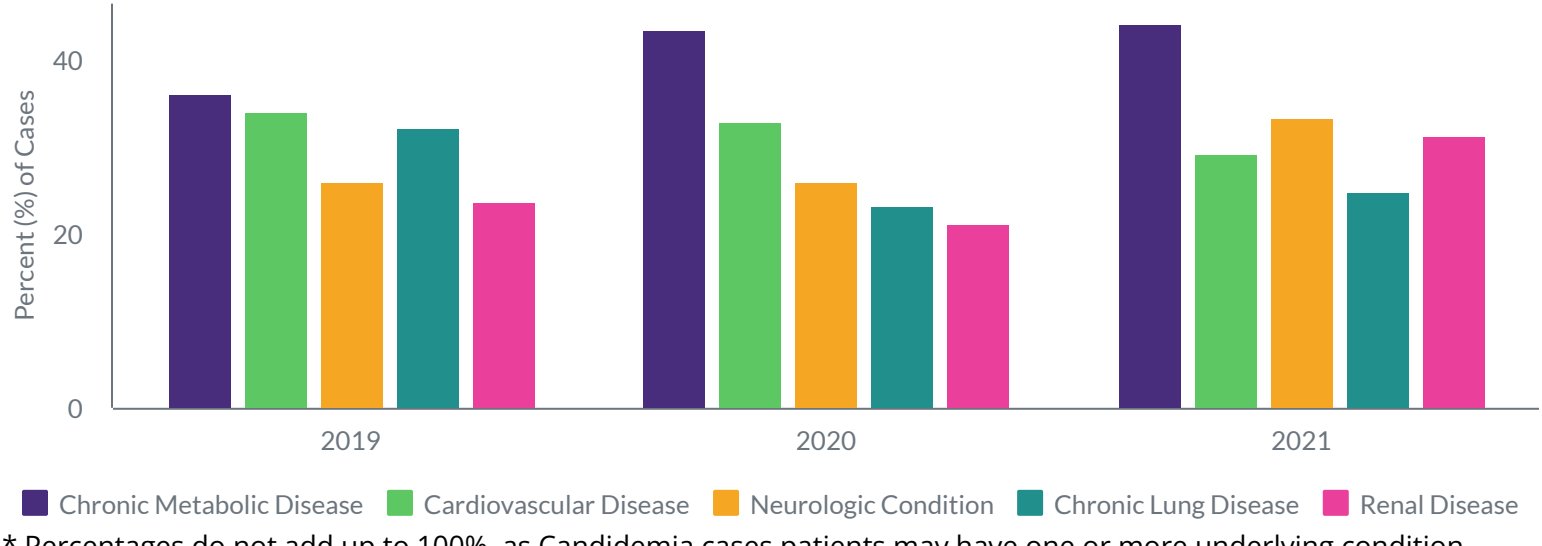
* Other *Candida* species include *C. dubliniensis*, *lusitaniae*, *krusei*, *guilliermondii*, germ tube negative/non *albicans*, *rugosa*, *kefyr*, *utilis*, *bracarensis*, *orthopsilosis*, and *haemulonii*



Between 2019 and 2021, **36.5%** of patients with **Candidemia died.**

Mortality among candidemia cases was highest in 2021, occurring in **38%** of cases.

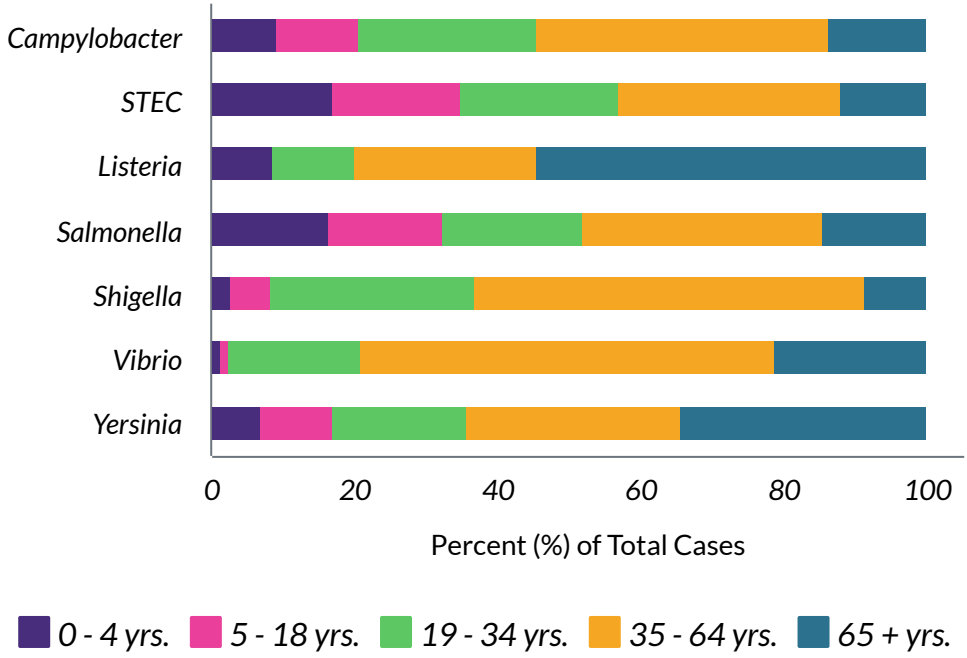
From 2019 to 2021, the **5 Most Common Underlying Conditions** found among **Candidemia** patients **were Chronic Metabolic Disease**, **Cardiovascular Disease**, **Neurologic Condition**, **Chronic Lung Disease**, and **Renal Disease**.



* Percentages do not add up to 100%, as Candidemia cases patients may have one or more underlying condition.

Foodborne Diseases Active Surveillance Network (FoodNet)

FoodNet conducts active, population-based surveillance in Alameda, Contra Costa, and San Francisco counties for illness due to pathogens commonly transmitted through food, including *Salmonella*, *Shigella*, *Campylobacter*, Shiga toxin-producing *Escherichia coli* (STEC) O157 and non-O157, *Listeria monocytogenes*, *Yersinia*, *Vibrio*, and *Cyclospora*.

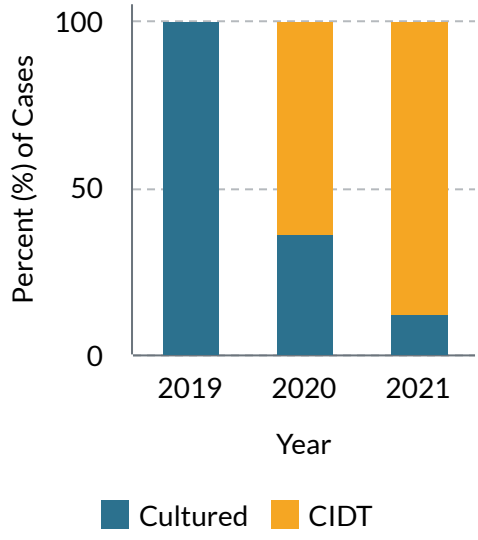


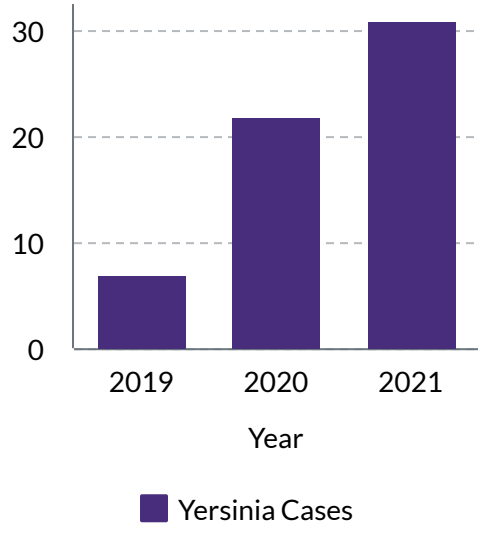
* Cyclospora cases not included due to low case counts;

The proportion of cases **younger than 18 years old** was higher for **STEC (34.9%)** and ***Salmonella* (32.4%)**

54% of ***Listeria*** cases and **34.3%** of ***Yersinia*** cases were in individuals aged **65 years or older**

Use of **Culture-Independent Diagnostic Testing (CIDT)** has potentially led to increased diagnosis of ***Yersinia*.** The proportion of cases diagnosed using **CIDT** increased from **0% to 85%** from **2019 to 2021**. The number of cases diagnosed increased from **7 to 31 cases**.





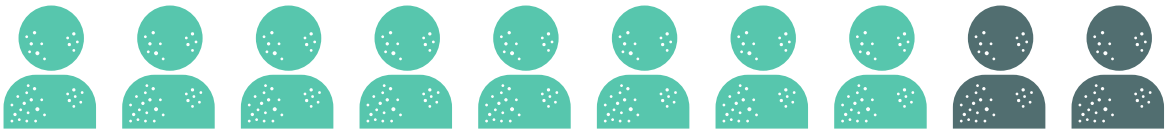
View data from all ten FoodNet sites using CDC's interactive data tool www.cdc.gov/FoodNetFast

foodnet@ceip.us

Human Papillomavirus Vaccine Impact Monitoring (HPV-Impact)

Surveillance of cervical pre-cancer and cervical cancer in Alameda County to monitor the impact of the HPV vaccines.

Most cervical pre-cancers can be prevented through HPV vaccination



Of women with cervical pre-cancer in Alameda County

8 in 10 had cervical pre-cancer with HPV types that would have been **prevented** by on time HPV 9-valent vaccination.

GARDASIL® 9

Only HPV vaccine available in the US since 2016

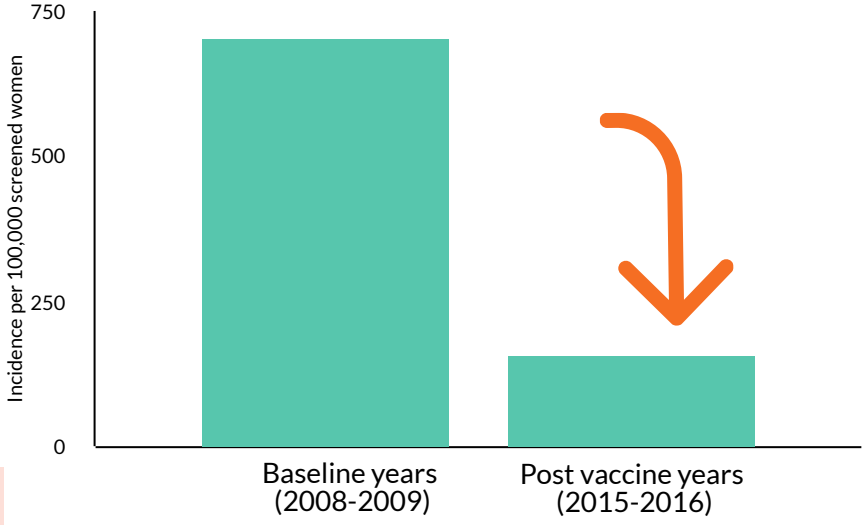
Prevents infection with HPV type 6, 11, 16, 18, 31, 33, 45, 52, and 58

Protects against 90% of cervical cancers

The American Cancer Society recommends the HPV vaccine for boys and girls between ages 9 and 12 years

HPV types 16/18, cause the majority of cervical cancers, have declined substantially

In the U.S., cervical pre-cancer attributed to vaccine-preventable HPV 16/18 declined 77% in women 20-24 years old



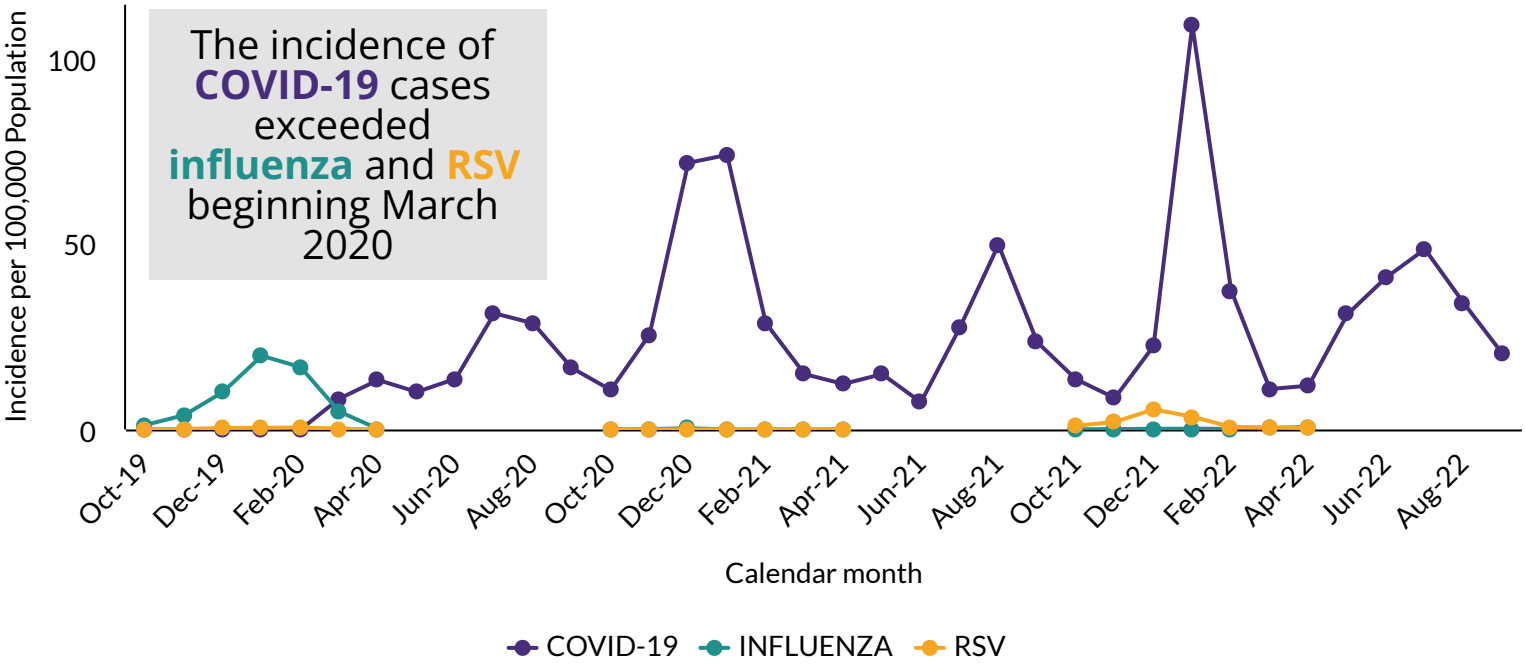
View entire publication here: https://pubmed.ncbi.nlm.nih.gov/35904861/

Gargano JW, McClung N, Lewis RM, et al. HPV type-specific trends in cervical precancers in the United States, 2008 to 2016. *International Journal of Cancer*. 2022;152(2):137-150. doi:10.1002/ijc.34231

Respiratory Virus Hospitalization Surveillance Network (RESP-NET)

Respiratory Virus Hospitalization Surveillance Network (RESP-NET) comprises three platforms that conduct population-based surveillance for hospitalizations associated with laboratory-confirmed COVID-19, Influenza, and Respiratory Syncytial Virus (RSV) among children and adults. Surveillance is conducted in Alameda, Contra Costa and San Francisco counties.

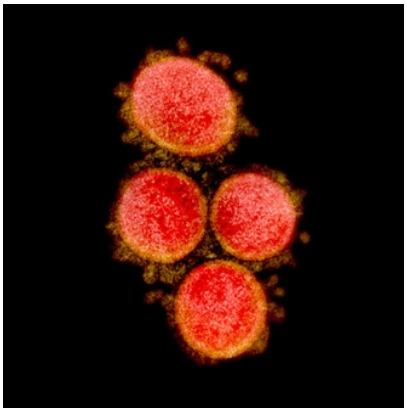
RESP-Net Project Hospitalization Incidence from 2019-2022



* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset - COVID-19 Surveillance is conducted year round. RSV and influenza surveillance season is defined as October 1st through April 30th

During 2021 and 2022, clinical laboratories submitted over **2,400** SARS-CoV-2 positive specimens from hospitalized patients to public health laboratories for variant identification.

CEIP would like to extend a **big** thank you to our laboratory partners!



Transmission electron micrograph of SARS-CoV-2 virus particles, isolated from a patient. Image captured and color-enhanced at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland.

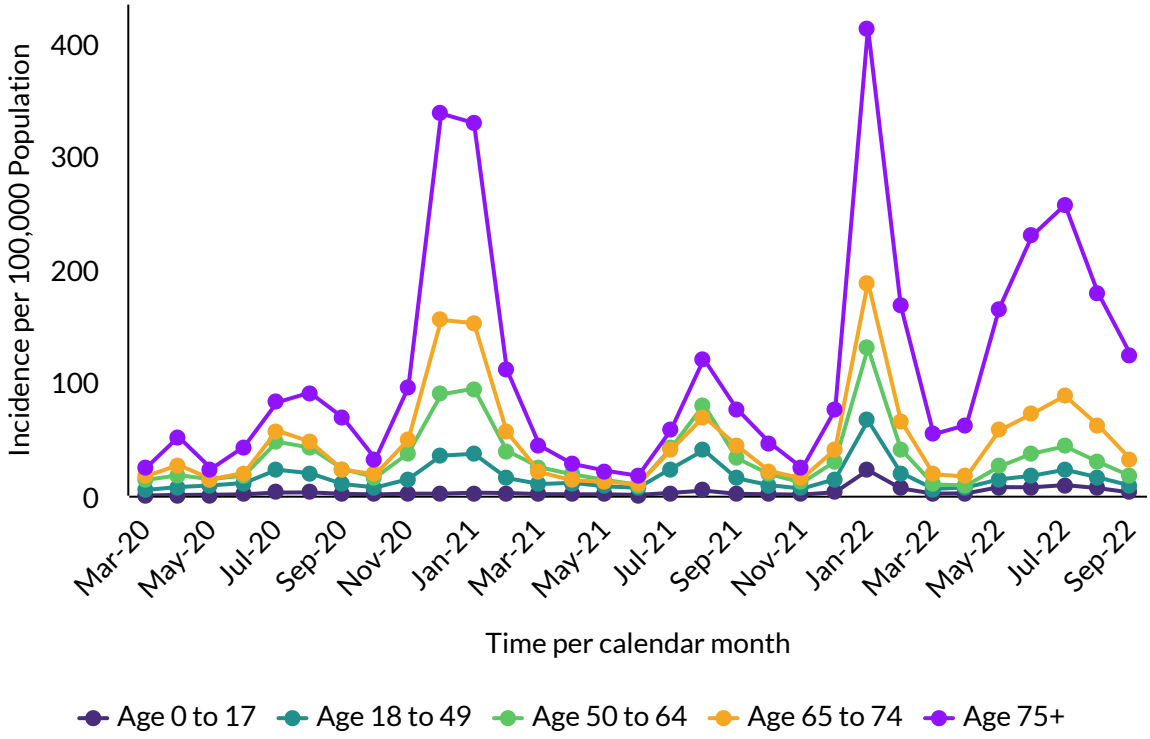
RESP-NET
Respiratory Virus Hospitalization Surveillance Network

View data from all RESP-NET sites by visiting:

https://www.cdc.gov/surveillance/resp-net/dashboard.html

Respiratory Virus Hospitalization Surveillance Network (RESP-Net)

Incidence of COVID-19 Hospitalization by Age Group



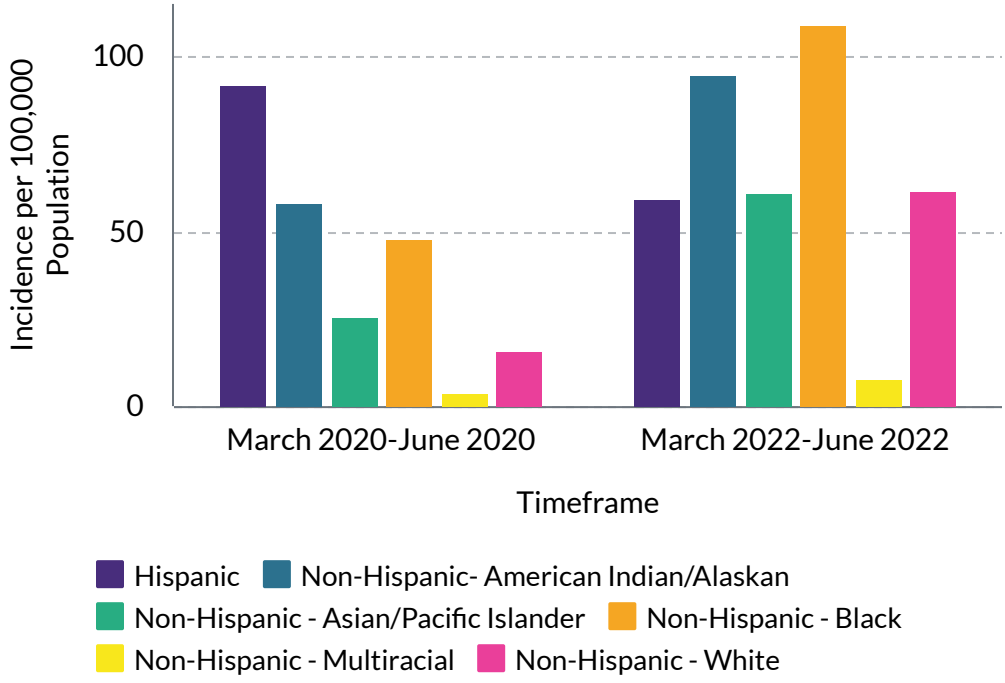
* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset
Age categories are in years

Incidence of COVID-19 hospitalizations was highest among those aged **75+** from **March 2020** through **September 2022**

The incidence of COVID-19 hospitalizations among **Hispanics** was higher than other race & ethnicity categories from **March 2020** through **June 2020**.

From **March 2022** through **June 2022, Non-Hispanic Black** cases had the highest incidence of COVID-19 hospitalizations

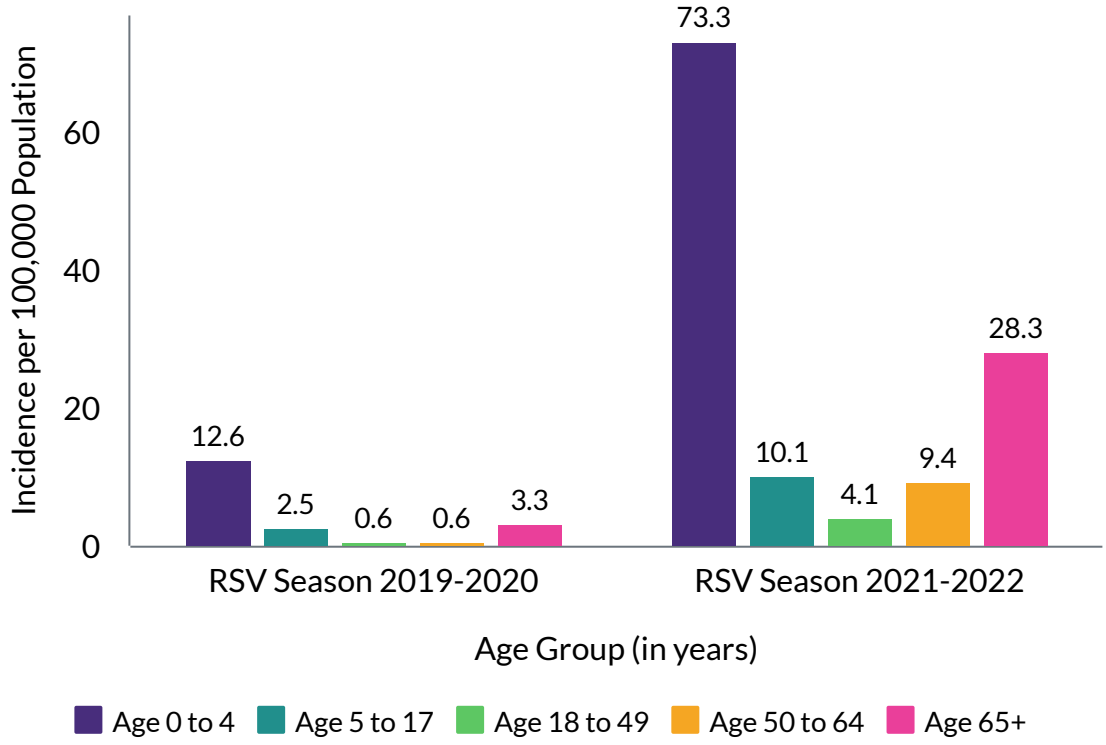
Incidence of COVID-19 Hospitalizations By Race and Ethnicity



* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset
Unknown race and ethnicity proportion of total cases for each time group are 17.0% and 33.4% respectively.

Respiratory Virus Hospitalization Surveillance Network (RESP-Net)

RSV Hospitalization Incidence by Age Group

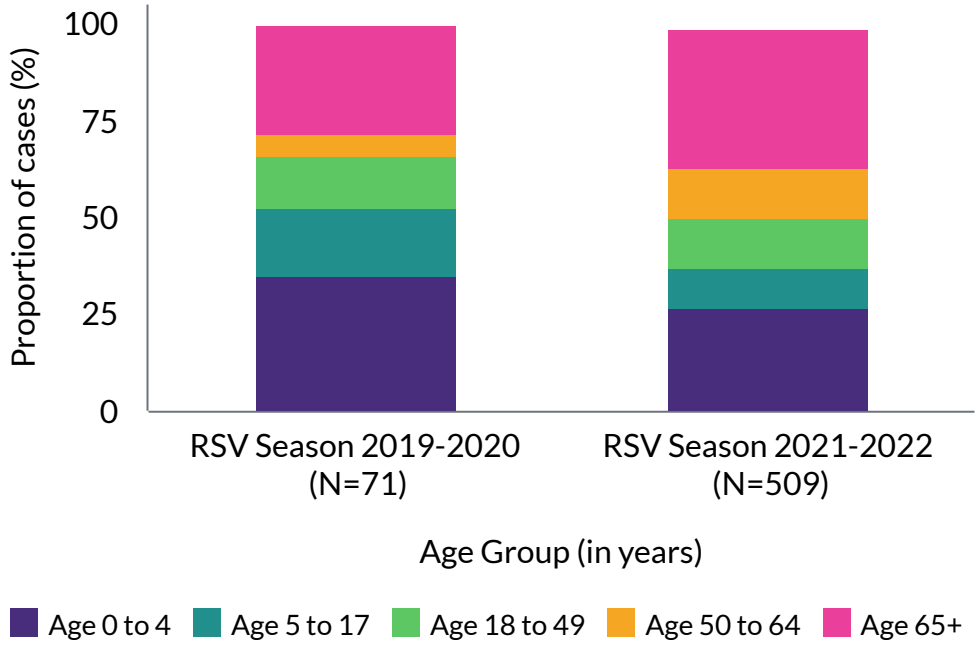


Incidence of RSV hospitalizations for the 2021-2022 season among those age 0 to 4 years was more than **5x higher** compared to the 2019-2020 season. Cases in those age 65 years or older increased **8x**.

* Incidence calculated using California Department of Finance P-3 complete state and county projections dataset
- RSV season is from October to April. 2020-2021 RSV season excluded due to low case count

The proportion of RSV hospitalizations among those age **65 years or older** surpassed those age **0 to 4 years** within the 2021-2022 season compared to the 2019-2020 season.

Proportion of RSV Hospitalizations by Age Group

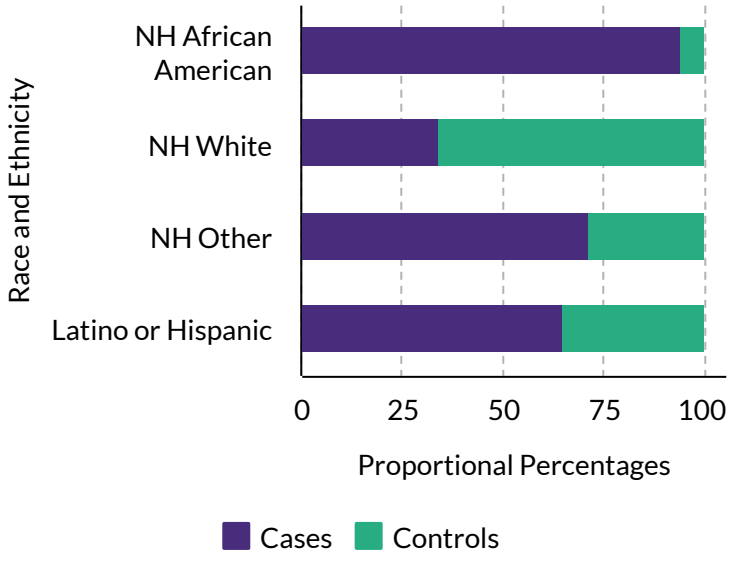


RSV season is from October to April. 2020-2021 RSV season excluded due to low case count

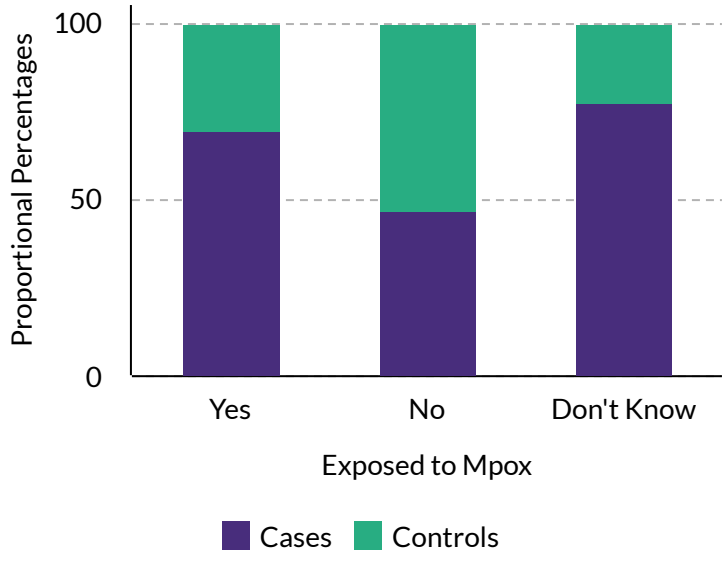
Mpox Vaccine Effectiveness (MPX)

The goal of the Mpox Vaccine Effectiveness (MPX) Study is to assess how well the Mpox vaccine works in adult (18-49 years) gay, bisexual, other men who have sex with men and transgender populations. The study is conducted in collaboration with the Centers for Disease Control and Prevention (CDC), California Department of Public Health (CDPH), and local health departments (Alameda, Contra Costa, and San Francisco counties, and the city of Berkeley).

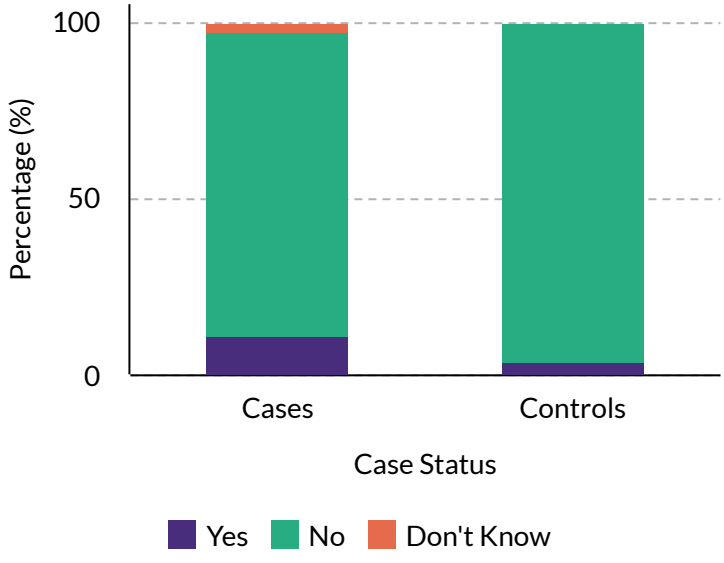
Race and Ethnicity of Study Population



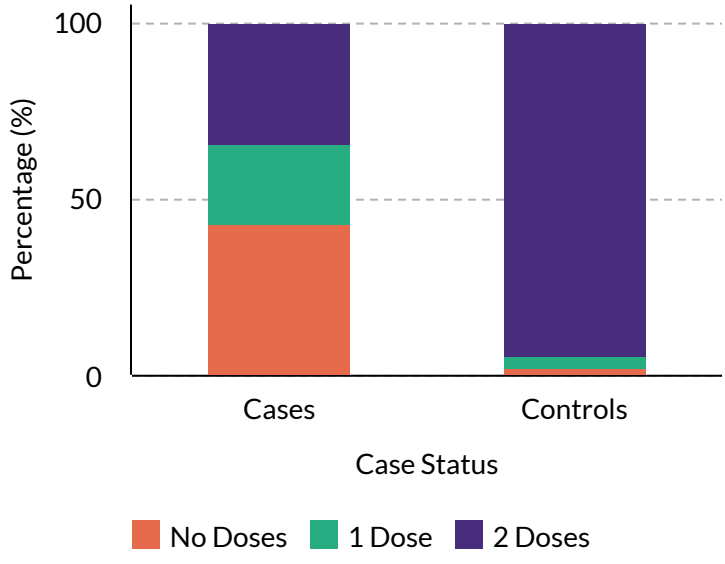
Exposure History - Confirmed & Suspected



Self-Reported Immunocompromised Status of Study Population



Vaccination Status of Study Population



Mpox Vaccine Effectiveness (MPX)

We are working with local healthcare facilities and clinics in order to recruit more study participants; our current collaborations include 6 clinics, 2 LGBTQ centers, 1 non-profit, and 1 bath house. Enrollment of cases and controls for the Mpox Vaccine Effectiveness study are ongoing.