

# The California Immunization Registry

*Data Analysis Considerations for Local Health Jurisdictions, Researchers and Policy Makers*

## BACKGROUND

The California Immunization Registry (CAIR) is the immunization information system (IIS) for the State of California. In 2017, seven of 10 regional or county IIS, representing 49 California counties in total, were consolidated into what is now known as CAIR2, which is operated and maintained by the Immunization Branch at the California Department of Public Health (CDPH). In 2018, the Imperial County Immunization Registry also joined CAIR2. In 2022, the San Diego Immunization Registry was fully integrated into CAIR2, and Healthy Futures Immunization Registry began exchanging data with CAIR2. CAIR2 now receives immunization data for California residents in all 58 counties. CAIR is the general term used to describe the entire statewide IIS.

CAIR is used by medical providers, local health jurisdictions (LHJs), schools and individual residents seeking vaccination records. CAIR data support clinical decision making for individual providers and their patients. CAIR data are also used by CDPH and LHJs to assess vaccination coverage among residents, monitor trends in vaccinations (e.g., at a geographic level or by vaccine antigen), and to identify gaps in vaccination coverage that can inform public health and policy efforts to improve immunization access for Californians.

## PROVIDER REPORTING AND DATA COMPLETENESS

All California vaccine providers are required to report immunization data to CAIR2 as of January 1, 2023, per Assembly Bill (AB) 1797. Prior to AB 1797, only pharmacists were

required to report vaccinations they administered starting in August 2016. Medi-Cal Managed Care Plans are required by the Department of Health Care Services to ensure that child and adult Medi-Cal Managed Care members' immunizations are reported to CAIR.<sup>1</sup> All providers enrolled in the California COVID-19 Vaccination Program were required to report vaccine administration data to an IIS and thus COVID-19 vaccination information in CAIR is robust. There are ongoing efforts to increase the number of providers enrolled in and reporting to CAIR2, and all providers are encouraged to load historical doses into CAIR2.

Most CAIR users submit data electronically. Electronic data exchange began in 2009, and CAIR2 began accepting electronic data in HL7 format in 2016. The ability for providers to report and receive (i.e., bidirectional data exchange) immunization data began in 2017. In addition to electronic reporting, some data are also manually entered. New patient records are also created in CAIR2 through weekly uploads of birth certificate data for infants born in California.

Although the quality of CAIR data continues to improve over time, vaccine administration data in CAIR are not a complete representation of all vaccine doses administered in California. The vaccination history represented in the registry for an individual may be incomplete if patients have moved or changed providers, or if historical vaccinations have not been imported into CAIR.

## ACCESSING AND REQUESTING DATA FROM CAIR

Aggregate COVID-19 vaccination data from CAIR can be found on the [California Open Data Portal](https://data.ca.gov/group) (<https://data.ca.gov/group>). LHJs can look up individual vaccination records directly in CAIR2 and access CAIR2 data for analysis purposes by connecting to [CDPH's cloud-based data repository](https://www.cdph.ca.gov/Programs/CID/DCDC/CAIR/Pages/CAIR-records-LHD-COVID.aspx) (<https://www.cdph.ca.gov/Programs/CID/DCDC/CAIR/Pages/CAIR-records-LHD-COVID.aspx>).

Non-LHJ data requestors can complete a data request form to receive aggregated CAIR data. Aggregate data requests require the Immunization Branch to follow [de-identification guidelines from the California Health and Human Services Agency](https://www.dhcs.ca.gov/dataandstats/Documents/DHCS-DDG-V2.1-010821%20(1).pdf) ([https://www.dhcs.ca.gov/dataandstats/Documents/DHCS-DDG-V2.1-010821%20\(1\).pdf](https://www.dhcs.ca.gov/dataandstats/Documents/DHCS-DDG-V2.1-010821%20(1).pdf)), which may result in data masking. Researchers can request non-aggregated data by submitting their project to [California's Institutional Review Board \(IRB\)](https://www.cdii.ca.gov/committees-and-advisory-groups/committee-for-the-protection-of-human-subjects-cphs/) (<https://www.cdii.ca.gov/committees-and-advisory-groups/committee-for-the-protection-of-human-subjects-cphs/>). Prior to requesting IRB approval, researchers need to discuss their project with Immunization Branch staff and will need a letter of support from the Immunization Branch to accompany their IRB application.

Please contact [vpdreport@cdph.ca.gov](mailto:vpdreport@cdph.ca.gov) for assistance to request data from CAIR or if you have any questions about CAIR data requests.

## ANALYSIS AND VACCINATION COVERAGE ESTIMATION

CAIR data can be used to estimate the proportion of individuals in a community that have been vaccinated against a specific

disease. Vaccination coverage is typically calculated by dividing a numerator value that describes the number of people vaccinated (or vaccine doses administered) by a denominator that includes an estimate of the eligible population. For example, influenza vaccination coverage among California adults during 2023 would include the number of adults vaccinated against influenza during 2023 divided by the number of eligible Californians aged 18 and older.

Data analysts should consider several factors before using CAIR data to estimate vaccine coverage. CAIR data completeness can vary by factors such as recipient age, provider reporting history, type of vaccination, region, population demographics and population migration. For example, a child born in California in 2018 may have a complete vaccination record in CAIR, whereas a child born in a different state in 2018 who later moved to California may have few or no immunization records in CAIR. For these reasons and others, calculating an unadjusted measure of vaccine coverage using a population denominator (e.g., from the California Department of Finance or US Census Bureau) can result in a biased estimate of vaccine coverage.

Depending on the study question and vaccination(s) being evaluated, analysts can employ several strategies to determine which doses are valid for inclusion in the numerator for vaccine coverage calculations, as well as several options for determining the most appropriate denominator. However, calculated vaccine coverage rates often differ substantively depending on the methods used, and can underestimate or overestimate actual coverage rates. For example, researchers

using data from the Michigan State Care Improvement Registry explored four different methods for calculating vaccine coverage and found estimates varied at the county and state level depending on the denominator used.<sup>2</sup> Coverage rates varied between 2%-21%. Example results from the study are included in the figure below.

The limitations of CAIR data are not unique to California, and data quality and utility are expected to improve over time. Many other state-level IIS face similar challenges in capturing and maintaining complete, population-level vaccination records. Public health agencies, including the Centers for Disease Control and Prevention (CDC), employ a variety of methods to track vaccination progress. For example, CDC relies on cross-sectional surveys, such as the National Immunization Survey, to estimate

vaccination coverage across different vaccine types and age groups.<sup>3</sup> Researchers from CDPH and the San Diego County Health and Human Services Agency have also employed population surveys to assess vaccine coverage at various geographic levels.<sup>4,5</sup> One researcher from the Oregon Health Authority published a technique for addressing inflated counts of vaccines in IIS data.<sup>6</sup> Two studies from Kirtland et al. and Rangunathan et al. have explored estimates of vaccine coverage derived from IIS data using hierarchical Bayesian statistical models to integrate covariate data from other sources to further reduce bias in the estimates.<sup>7,8</sup>

To discuss CAIR data or analysis methods in greater depth, please email the CAIR Registry and Preparedness Unit at: [vpdreport@cdph.ca.gov](mailto:vpdreport@cdph.ca.gov).

Figure. Variation in vaccine coverage results from Gowda et al. after using four different denominators

**Table 1. State and county examples of adolescent (11–18 years of age) vaccine coverage levels calculated using four different denominator calculation methodologies: Michigan, 2010**

Vaccine	Denominator calculation method			
	MCIR Inclusive <sup>a</sup> Percent	Exclude Flagged <sup>b</sup> Percent	Exclude Flagged and Inactive <sup>c</sup> Percent	U.S. Census <sup>d</sup> Percent
Michigan				
Tdap	45.3	46.0	55.9	50.9
MCV4	45.7	46.5	56.6	51.2
HPV	15.0	15.3	18.5	16.2
Influenza	8.1	8.3	10.1	9.1
Example county X				
Tdap	38.6	39.0	46.5	44.6
MCV4	36.1	36.7	43.7	41.8
HPV	18.1	18.4	21.8	20.2
Influenza	7.1	7.3	8.6	8.2

<sup>a</sup>MCIR Inclusive was defined as all adolescents with a record in the MCIR that had valid county information.  
<sup>b</sup>Exclude Flagged was defined as all adolescents with an MCIR record with valid county information after excluding those that may have out-migrated.  
<sup>c</sup>Exclude Flagged and Inactive was defined as all adolescents with an MCIR record with valid county information after excluding those that may have out-migrated or with records that were inactive for ≥10 years.  
<sup>d</sup>U.S. Census was defined as the total number of adolescents in each county using 2007 U.S. Census estimates.  
MCIR = Michigan Care Improvement Registry  
Tdap = tetanus-diphtheria-acellular pertussis  
MCV4 = meningococcal conjugate vaccine  
HPV = human papillomavirus

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