



NEVADA DIVISION of PUBLIC
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Nevada State Immunization Program Immunization Data: Technical Notes

Nevada Division of Public and Behavioral Health

Nevada State Immunization Program

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Nevada State Immunization Program (NSIP) uses a variety of data sources to publish immunization rates. This document highlights two important data sources and serves as the technical guide for how these immunization rates are produced. This guide is intended for those who wish to understand the technical considerations that need to be made when examining immunization public health data. If you have additional questions, please contact us at 775-684-5900 or izit@health.nv.gov.

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NV WebIZ

Background:

NV WebIZ is Nevada's Statewide Immunization Information System (IIS). The American Immunization Registry Association (AIRA) defines IIS as "confidential, population-based, computerized databases that record all immunization doses administered by participating providers to persons residing within a given geopolitical area. At the point of clinical care, an IIS can provide consolidated immunization histories for use by a vaccination provider in determining appropriate client vaccinations. At the population level, an IIS provides aggregate data on vaccinations for use in surveillance and program operations, and in guiding public health action with the goals of improving vaccination rates and reducing vaccine-preventable disease"¹. IIS are important assets to immunization efforts, as they gather immunization records from multiple healthcare providers and consolidate them in one location for use by patients, providers, parents/guardians, schools, and public health practitioners.

The Center for Disease Control and Prevention's (CDC) National Center for Immunization and Respiratory Diseases (NCIRD) houses the Immunization Services Division (ISD), grants federal funding to all 50 states, Washington D.C., and eight territories to manage an Immunization Program and an IIS. In 2003, NV WebIZ was publicly introduced as the official immunization registration system for Nevada. The NV WebIZ software platform is a proprietary system developed and maintained by Envision Technology Partners, Inc., which has worked closely with NSIP over the years to support and enhance Nevada's IIS.

In 2007, legislation passed in Nevada that requires all childhood immunizations administered in the state to be reported to NV WebIZ beginning in 2009 unless a parent or guardian elects to opt out by signing a [form](#) issued by NSIP. Regulations adopted in 2010 expanded the requirement to include all adult immunizations, also allowing adults the option to opt-out. As of June 10, 2022, there are approximately 52 million vaccination records stored in NV WebIZ.

As of 2022, over 3000 organizations use the IIS, including hospitals, primary care providers, pharmacies, schools, Women, Infants, and Children (WIC) clinics, and tribal and Indian Health Services (IHS) clinics. Notably, NV WebIZ recently began exchanging data with all Veterans Health Administration (VHA) providers in the state. Providers that receive and administer publicly funded vaccines, such as those enrolled in the Vaccines for Children (VFC) Program, must meet additional inventory management and other accountability requirements in NV WebIZ. All providers participating in the VFC program share data with NV WebIZ. Consistent reporting by providers not enrolled in publicly funded vaccine programs can be more difficult to ensure, as NSIP has limited insight into the volume or type of vaccines purchased and administered in such practices. There is also a long-standing challenge of establishing consistent reporting by long-term care facilities (LTCFs).

Methodology:

Healthcare providers can manually enter data into the IIS or send and receive data via real-time Health Level 7 (HL7) electronic interface connections to the system. An HL7 interface allows immunization data to flow between an electronic health record (EHR) system and NV WebIZ.

Coverage in NV WebIZ is calculated using active patients and valid vaccinations. Active patients are those believed to be alive and living within Nevada. Patient records are marked inactive if there is an indication the patient has died or has moved out of state. Not all patients who die or move are marked inactive in the system. Valid vaccinations are those doses given at the appropriate age and interval; NV WebIZ leverages the recommendation algorithms issued by the [Clinical Decision Support for Immunization \(CDSi\)](#) group²,

which automatically determines whether a dose is valid based on age and interval, and marks it as such. Doses can also be manually marked as invalid when necessary, such as when storage temperature excursions are discovered after administration or if an expired dose is inadvertently administered.

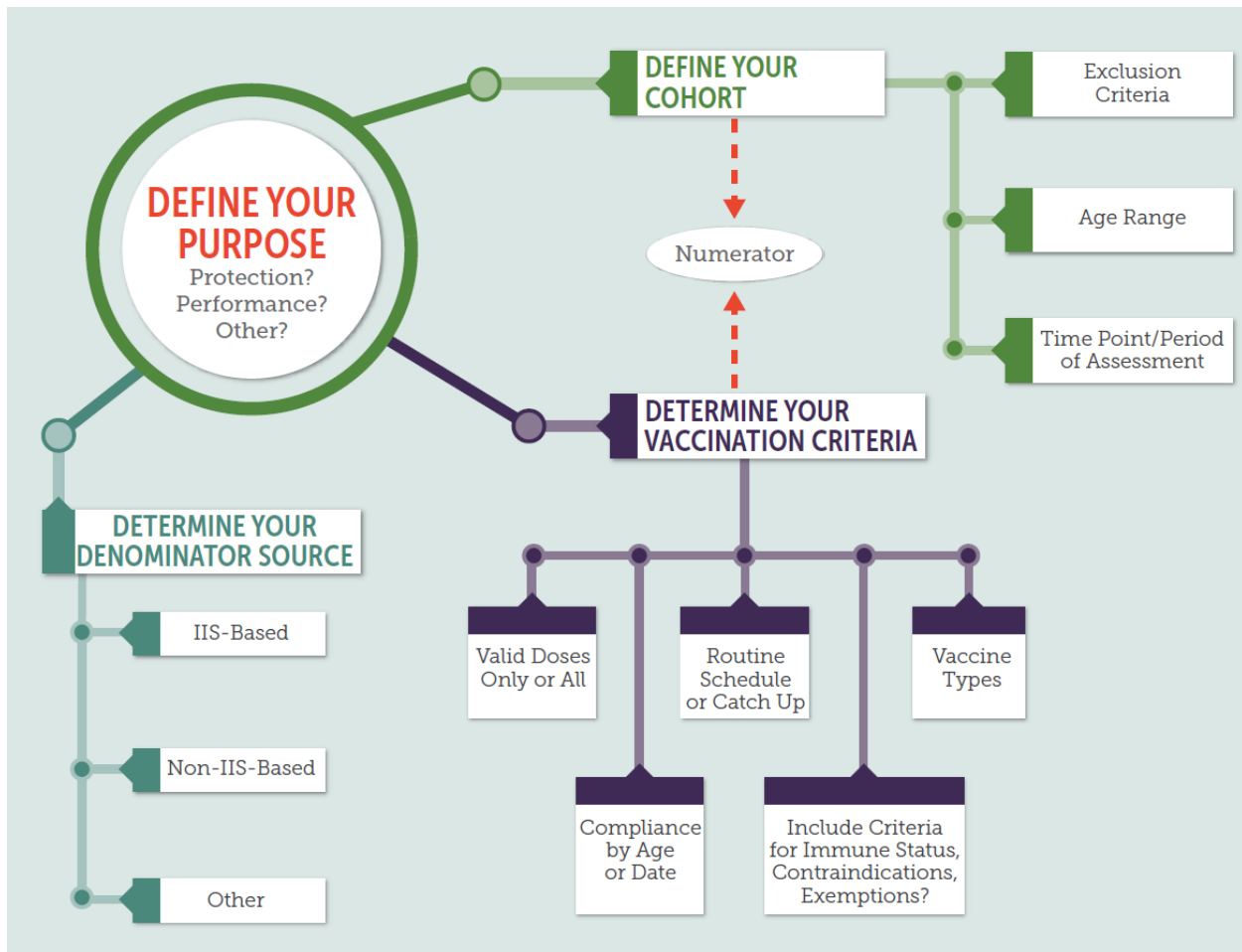
An important tool for anyone looking to assess coverage rates is AIRA's [Analytic Guide for Assessing Vaccination Coverage Using an IIS](#). "Its purpose is to assist IIS staff and other interested parties in using IIS data to do population-based coverage assessments. The guide describes practical considerations and key decision points in designing a population-based assessment using an IIS"³. Below is relevant information that has been pulled from this document.

The main components of a vaccination rate are the numerator and denominator, as well as the specified period being examined for when these vaccinations occurred. The numerator is derived from counting the number of members of a cohort that met a set of pre-determined criteria, such as age, vaccination doses, and period of interest in NV WebIZ. It is also important to understand the question that the data aims to answer. Additional considerations when deriving a numerator include whether only the routine schedule is being examined or both the routine and catch-up, what vaccine types should be included in the analysis, and whether exemptions are captured in the IIS (Note: Few providers record exemption status in NV WebIZ). A detailed routine and catch-up schedule for pediatric and adolescent immunizations can be found [here](#)⁴.

The denominator aims to be a capture of the total number of members that could be part of that cohort for the age, geographical area, and period that is being examined. In some cases, NV WebIZ is the best source of that denominator; in others, an external denominator is used, such as census or state demographer data. There are pros and cons to using each of these data sources, and it is important to understand what the purpose of the assessment is before a determination on best methods can be made. These pros and cons are listed in more detail in AIRA's guide. Still, issues such as activation/deactivation of patients in an IIS, geographic unit of assessment, maturity of the IIS, and the mobility of a population are all major factors that need to be considered.

There are typically two main types of immunization assessments: a protection-based assessment and a performance-based assessment. In a protection-based assessment, members of a cohort who have a history of disease or laboratory evidence of immunity should be included, in addition to vaccinated members, to assess protection from or immunity to a certain disease. In a performance-based assessment, only vaccinated members are considered, in order to assess the performance of a specific provider, program, or region (Note: Few providers record history of disease or laboratory evidence of immunity in NV WebIZ).

Below is a visual that broadly walks through what key decisions need to be made before an assessment is started. This visual, along with additional information on all these terms can be found in AIRA's referenced guide³:



(Source: *Analytic Guide for assessing vaccination coverage using an IIS.*)

Data Quality Considerations:

Although IIS are seen as the primary data source and tool for generating immunization coverage rates, data quality considerations exist. Understanding these considerations is important context when generating reports from or interpreting immunization data.

The dynamic and ever-evolving nature of IIS data allows Nevada to leverage a near real-time data source for immunizations, which has been crucial during the COVID-19 pandemic; however, it introduces unique considerations when compared to many other public health data collection systems that collect and store data but are not updated daily. Foremost among these considerations is maintaining high levels of data quality.

There are specific data quality dimensions and indicators that need to be considered when thinking about the data quality of an IIS: completeness, accuracy, validity, consistency, timeliness, and uniqueness⁵.

- **Completeness:** The degree to which full information about a data set, record, or individual data element is captured in the IIS.
- **Accuracy:** The degree to which data correctly describes the event being described.
- **Validity:** The degree to which the data conforms to the syntax (format, type, range) of its definitions, i.e., to the rules of what is accepted or expected by the IIS.

- **Consistency:** The absence of difference when comparing two or more representations of a thing against a definition.
- **Timeliness:** The amount of time between the occurrence of the real-world event and its documentation in the IIS.
- **Uniqueness:** An event, person, or data element is only recorded once.

More information on these dimensions can be found in AIRA's IIS [Data Quality Practices](#) and [Data Quality Practices- To Monitor and Evaluate Data at Rest](#).

These dimensions and indicators need constant monitoring for an IIS to be the best possible source of immunization data. One challenge that NSIP has faced is the lack of dedicated, permanent data quality and analysis staff positions. Since 2020 NSIP has gradually been working to address this limitation by hiring contracted staff to assist with these projects and receiving and utilizing funds for data modernization to increase automation in NV WebIZ. Partners at all levels (e.g., health clinics, hospitals, pharmacies, state, local, and federal public health) are also working diligently to adhere to reporting best practices to improve data quality and enhance data exchange between programs and systems.

One consideration that most data sources struggle with is missing data. Not all reporting fields are well populated in NV WebIZ; this is especially true of demographic data. Approximately 36% of all records in NV WebIZ are missing race data, and 42% are missing ethnicity data. Around 16% of all records are missing county of residence data. Children under the age of 18 years have lower rates of missing data than adults over 18. In the interest of reporting important demographic data to stakeholders, NSIP still reports demographic data with complete transparency of missing demographic data in an analysis.

The population of patients captured in the IIS may not reflect the true population of Nevada. A common challenge among IIS is the timely management of patient status. NV WebIZ assigns two (2) types of patient status: provider-level status, which indicates an association with a specific vaccinating provider for the purpose of vaccination services, and jurisdiction-level status, which indicates whether a person resides within the state. For example, a patient who lives in a rural/frontier county or border town may receive medical services in Nevada while residing in another state. In this case, the patient's provider-level status should be "Active," while their jurisdictional-level status should be "Inactive."

Nevada's population is very dynamic, with the frequent flux of people moving both within the state as well as to and from the state. Barriers exist to the routine management of patient status, including limitations in the EHR systems used by vaccinating providers, lack of awareness that a patient has moved, lack of provisions for data sharing between government agencies, and the sheer volume of data. The IIS community continuously seeks innovative methods to support and improve patient status management. Possible methods include a partnership with offices of Vital Records (to account for deceased patients) or the Department of Motor Vehicles (DMV) and/or the U.S. Postal Service (to aid in determining state residency).

Proper management of jurisdictional-level patient status and, more importantly, deceased status is key to improving the accuracy of immunization coverage rate estimates. NV WebIZ typically overestimates the infant and adolescent population because not all infants and adolescents who have moved out of the state have been marked inactive by their healthcare providers.

Adult data tends to be less reliable than pediatric data for several reasons⁶:

- (i) Lack of vaccine requirements/mandates and vaccine prioritization for adults.
- (ii) Children are more likely to have a primary care provider and/or more physician visits.

- (iii) There is an increased emphasis on children being up to date on their immunizations to support childcare & school enrollment immunization verification needs.
- (iv) Adult data quality and duplicates

Strengths:

Although data quality will always be a concern that needs to be considered, NV WebIZ is the best source of Nevada childhood immunization data. NV WebIZ is not subject to the same limitations as the National Immunization Surveys (NIS) or the Behavioral Risk Factor Surveillance Surveys (BRFSS) because it is a population-based registry and captures all Nevadans—an advantage that surveys cannot offer. NV WebIZ can also supply near real-time data, which the NIS cannot. Coverage rates can be calculated for small geographic areas and/or specialized populations, which is generally difficult to do with surveys. For example, publicly available NIS data only shows state-level data for Nevada, while NV WebIZ contains county and zip code-level information. IIS data is also useful in identifying populations of unimmunized and under-immunized individuals, or “pockets of need,” which can help distribute resources to address health disparities and improve health equity⁷. All administered immunizations in NV WebIZ have also been entered by a healthcare provider or other authorized entity, a marked benefit over-reliance on self-reporting.

NIS

Background:

Another source for vaccination coverage by the state is NIS. The NIS are a group of telephone surveys sponsored and conducted by CDC’s NCIRD that are used to monitor vaccination coverage among children 19–35 months and teens 13–17 years, flu vaccinations for children six months–17 years, and COVID-19 vaccination for children and teens in eligible age groups and for adults 18 years and older⁸.

Methodology:

The NIS provide current, population-based, state and local area estimates of vaccination coverage among children and teens using a standard survey methodology. The surveys collect data through telephone interviews with parents or guardians in all 50 states, Washington D.C., and some U.S. territories. Cell phone numbers are randomly selected and called to enroll one or more age-eligible child or teen from the household. The parents and guardians of eligible children are asked during the interview for the names of their children’s vaccination providers and permission to contact them. With this permission, a questionnaire is mailed to each child’s vaccination provider(s) to collect information on the types of vaccinations, number of doses, dates of administration, and other administrative data about the healthcare facility. Estimates of vaccination coverage are determined for child and teen vaccinations recommended by the Advisory Committee on Immunization Practices (ACIP), and children and teens are classified as being up to date based on the ACIP-recommended numbers of doses for each vaccine⁸.

There are five (5) surveys that are currently being conducted by the CDC NCIRD. The first three (3) surveys assess routine immunizations in children: NIS-Child for children between 19 to 35 months, NIS-Teen for adolescents 13 to 17 years, and NIS-CIM (NIS-Child Influenza Module) for children 6 to 18 months and 3 to 12 years who were not included in the NIS-Child or NIS-Teen⁸.

The NIS-Adult COVID Module (NIS-ACM) was added in April 2021 in response to the COVID-19 pandemic to assess COVID-19 vaccination coverage in adults 18 years and older⁸.

The NIS-Child COVID Module (NIS-CCM) was added in July 2021 in response to the COVID-19 pandemic to assess COVID-19 vaccination coverage among children and teens in eligible age groups for the COVID-19 vaccine⁸.

Vaccinations measured in the NIS-Child survey include⁸:

- Diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP/DT/DTP)
- Poliovirus vaccine (Polio/IPV)
- Measles or Measles-Mumps-Rubella vaccine (MMR)
- Haemophilus influenzae type b vaccine (Hib)
- Hepatitis B vaccine (HepB)
- Varicella zoster (chickenpox) vaccine (VAR)
- Pneumococcal conjugate vaccine (PCV)
- Rotavirus vaccine (ROT)
- Hepatitis A vaccine (HepA)
- Influenza vaccine (Flu)

Vaccinations measured in the NIS-Teen survey include⁸:

- Tetanus, diphtheria, acellular pertussis (Tdap)
- Meningococcal conjugate (MenACWY)
- Human papillomavirus (HPV)
- Influenza vaccine (Flu)

Vaccinations measured in the NIS-CIM survey include⁸:

- Influenza vaccine (Flu)

Vaccinations measured in the NIS-ACM and NIS-CCM surveys include⁸:

- COVID-19 vaccine(s)

Considerations:

Since the NIS collect the same data each year in the same ways, it has long been considered the gold standard for comparing immunization rates between jurisdictions and over time within a jurisdiction. The NIS data are not subject to changes in data quality or methodology.

There are several limitations to NIS data. The NIS are subject to the same errors that all surveys are subject to, sampling and non-sampling errors⁹. NIS data are based on small samples that are meant to be representative of the entire population, but selection bias, such as under coverage and nonresponse bias, could lead to a sample that is not representative of the population. Coverage variations by county or ZIP code are not captured in this data, which limits the ability to analyze smaller populations.

The NIS data also does not consider whether vaccine doses were given at the appropriate ages and intervals, which could lead to the overrepresentation of true vaccination coverage in a population. NIS data are based on self-reported answers, which is less reliable than having a healthcare provider enter immunization information; however, parents and guardians of eligible children are asked during the interview for the

name(s) of their child(ren)'s vaccination provider(s) and permission to contact them. With this permission, a questionnaire is mailed to each child's vaccination provider(s) to collect information on the types of vaccinations, number of doses, dates of administration, and other administrative data about the healthcare facility⁸.

The NIS relies on phone interviews, so households who do not have telephones are not included in the NIS. NIS data has a lag time between when it is collected to when it is published to allow for cleaning and analysis of the data by CDC.

Methodological Differences between NIS and IIS

	IIS	NIS
Data Collection	Reported by healthcare provider directly into the IIS or into an EHR	Telephone survey of representative sample; providers may also be contacted
Data Quality	Standard coverage calculated using doses given at correct age and interval between doses	More lenient, does not account for interval between doses or child's age
Data Consistency	Subject to changes as data quality and completeness improve over time	Generally consistent methodology over time; can compare year to year without caveats

CDC IIS-NIS Integration Project

CDC is working towards a future in which vaccination coverage assessment is based primarily on IIS data, with NIS processes being used to collect information not available across the IIS¹⁰.

CDC developed a four-phase plan to integrate IIS and NIS¹⁰:

Phase 1: Phone numbers from IIS augment the NIS cell phone random digit dialing (RDD) sampling frame; vaccination data still collected via the NIS Provider Record-Check (PRC).

Phase 2: IIS serves as the sole sampling frame (RDD frame dropped); vaccination data still collected via the NIS PRC.

Phase 3: IIS serves as the sole sampling frame (RDD frame dropped); vaccination data collected from both PRC and IIS.

Phase 4: IIS serves as the sole sampling frame (RDD frame dropped); vaccination data collected from IIS only.

NV WebIZ is an active participant in CDC's IIS-NIS Integration Project, which explores the feasibility of leveraging IIS data for improved NIS results. With the implementation of this project, which is currently in Phase 1, Nevada looks to keep improving on reporting accurate and timely immunization data for its residents.

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Appendix.

Acronym Table

Acronym	Description
AIRA	American Immunization Registry Association
BRFSS	Behavioral Risk Factor Surveillance Survey
CDC	Centers for Disease Control and Prevention
CDSi	Clinical Decision Support for Immunization
DMV	Department of Motor Vehicles
EHR	Electronic Health Record
HL7	Health Level 7
IHS	Indian Health Services
IIS	Immunization information system
ISD	Immunization Services Decision
LTCF	Long-Term Care Facilities
NCIRD	National Center for Immunization and Respiratory Diseases
NIS	National Immunization Surveys
NIS-ACM	National Immunization Surveys- Adult COVID Module
NIS-CCM	National Immunization Surveys- Child COVID Module
NIS-CIM	National Immunization Surveys- Child Influenza Module
NSIP	Nevada State Immunization Program
PRC	Provider Record-Check
RDD	Random Digit Dialing
VA	Veteran's Affairs
VFC	Vaccines for Children
WIC	Women, Infants, and Children