101

IIS 101: The Basics

IIS /i-i-s/ *Noun, plural*: Immunization Information Systems (IIS) are confidential, population-based, computerized databases that record all immunization doses administered by participating providers to persons residing within a given geopolitical area. The most powerful tool for managing immunization records and supporting healthier communities. The following are five ways an IIS makes the community stronger:

1 Connects People with Information

IIS are public health systems that maintain electronic vaccination records, managed by health departments in states, territories, counties, and cities. Each of the systems collects and shares data across multiple healthcare organizations, clinics, and pharmacies in a jurisdiction. IIS provide a consolidated record of administered vaccines, connecting participating providers with patients' complete vaccination history. Access to this data is critical for maintaining accurate patient records across multiple point-of-care providers.

2 Promotes Comprehensive Immunization Records

As confidential, electronic systems, IIS allows healthcare providers, pharmacies, health administrators, health insurance payers, school systems, and consumers varying levels of access to comprehensive vaccination histories. For example, IIS help public health implement

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federal vaccine program recommendations; likewise, IIS ensure the integrity of patient data across a wider network. Consolidation of vaccination records from multiple point-of-care providers through data exchange helps prevent individuals from receiving too many or too few vaccinations, saving time and money, and improving patient care.

3 Encourages Accuracy in Timing and Dosage

IIS simplify immunization record keeping and support best practices for vaccination, organizing patient data into one reliable source. As immunization schedules become more complex, IIS evaluation and forecasting tools assist point-of-care providers in determining which vaccinations their patients need. At the point of clinical care, participating providers can manage patients' immunizations through timely alerts when vaccines are due or missing based on the recommended immunization schedule. IIS streamline data collection and provide quality, meaningful information to guide both clinical and patient decision-making.

4 Increases Visibility into Areas of Need

As an IIS grows, the system benefits by network effect, becoming a clearer window into the overall health of a population. As vaccination providers continue to input patient data, aggregate data from IIS provides a more comprehensive view of the opportunities and pockets of need in a community. Health officials can leverage this data to guide public health initiatives and measure progress toward reducing vaccine-preventable diseases thus keeping communities healthy.

5 Facilitates Public Health Response in the Event of Outbreak

With expanded usage, an IIS becomes an invaluable tool in response to outbreaks of vaccine-preventable diseases. With the ability to retrieve data from a single, consolidated record, community health officials can determine needs and risk levels based on individuals' vaccination records to take quicker, more effective action.

Learn more ways IIS strengthen communities at immregistries.org.

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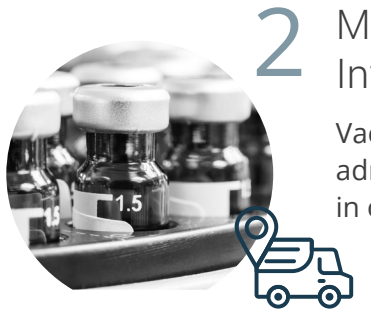
The Value of IIS

Immunization Information Systems (IIS) offer unmatched functionality through immunization record consolidation and management. Each of the following seven key features work together to keep our communities healthy.

1 Provides Consolidated Records

Comprehensive records containing immunizations administered at a previous provider office, hospital, pharmacy or school clinic give healthcare providers the full story, preventing patients from receiving too many or too few vaccines.



2 Manages Vaccine Inventory

Vaccine ordering, tracking, and administration are all managed in one tool.

3 Minimizes Waste

Ensures every vaccine is accounted for and prevents the administration of unnecessary doses of vaccines.

4 Forecasts Immunizations

Helpful alerts notify providers to assist with clinical decisions and management of the complex immunization schedule.

5 Reminds Patients of Due Dates

Automated reminders promote on-time vaccinations.

6 Spotlights Areas of Need

Population-level vaccine coverage data provides a clear view of communities at risk.

7 Expedites Response in an Outbreak

Insights into vaccination status set the stage for effective outbreak response.

Learn more ways IIS improve public health at immregistries.org.

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How IIS Support a Patient's Journey

Immunization Information Systems (IIS) gather and consolidate scattered immunization records to support a patient and their healthcare providers, through planned and unexpected events. Healthcare providers are able to reference and update a patient's immunization record in the IIS, to ensure the individual is fully immunized and to prevent the patient from becoming over- or under-vaccinated. IIS equip the whole care team with the information they need to confidently deliver the best care possible.

Take a look at a patient's journey to see the critical role that IIS play throughout a lifetime of care. The IIS is checked at each milestone below.

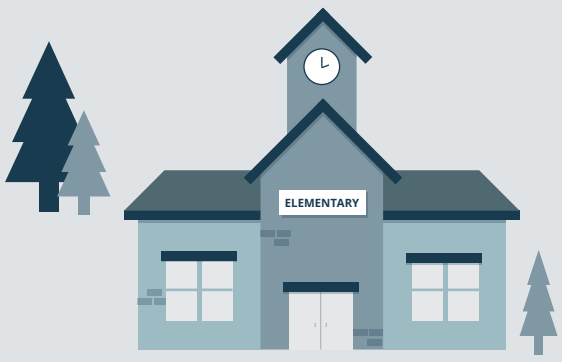
HELPING TO MAKE OUR
IIS
EDUCATION MATERIALS
COMMUNITIES STRONGER

Birth

Patient is born and receives the Hepatitis B vaccine in the hospital.

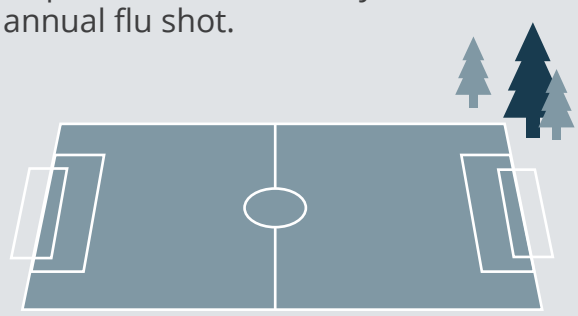
2 - 24 Months Old

During routine well-child visits at pediatrician's office, receives all recommended childhood vaccines.



5 Years Old

Receives immunizations required for school entry and annual flu shot.



11 Years Old

Receives necessary vaccines during a sports physical.

17 Years Old

Steps on a rusty nail and visits the Emergency Room. An IIS check shows the Tetanus vaccine is up to date.

18 Years Old

Moves into dorms at college and receives Meningitis vaccination and other recommended immunizations.

28 Years Old

Expecting first child and receives Tdap and flu shot.

50 Years Old

Receives shingles vaccine at pharmacy.

77 Years Old

Living at a long-term care facility and receives recommended vaccines.

Learn more ways IIS promote patient health at immregistries.org.

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EHR and IIS

Their Differences and How They Work Together

Only captures patient health information within the same medical organization

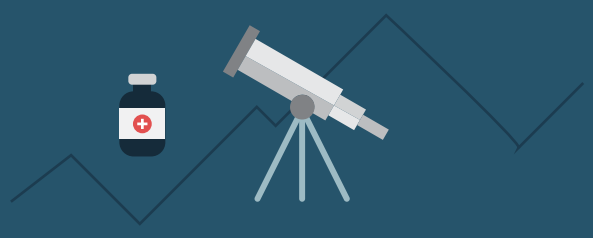
Captures immunization information for a broad population

Replaces written health records of medical encounters

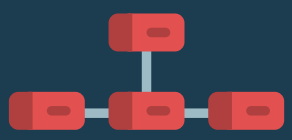
Consolidates immunization records by reaching across heath care providers and networks

Supports provider decisions about a patient's care

Provides clinical decision support and vaccine forecasting



Automates and streamlines provider workflow



Identifies areas of need, where lower immunization rates exist

Can communicate bidirectionally with IIS

Can communicate bidirectionally with other IIS and EHRs

Better Together

Connectivity
IIS connect providers with a patient's full immunization history, regardless of prior networks or providers visited. When IIS are integrated into the EHR, access to this information becomes seamless. This connectivity eliminates the burden of retrieving and compiling fragmented information from past providers and pharmacies.

Visibility
Connecting providers to broader population data allows them visibility into the history and needs of the population they serve, ensuring the best outcomes in daily, clinical decision-making. Providers also gain visibility into future needs through immunization forecasting, helping organizations more strategically plan and communicate with patients through timely vaccination reminders.

Collaboration
When IIS and EHR systems share data, patient immunization records become as complete and accurate as possible. A consolidated record that follows patients throughout their lifetime prevents the patient from receiving too many or too few vaccines in the future.

Learn more about the unique capabilities of IIS and EHR systems at immregistries.org.

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LANDSCAPE ANALYSIS

IIS ADULT VACCINATION DATA CAPTURE AND DATA UTILIZATION

MAY 2021

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EXECUTIVE SUMMARY

In September 2019, the American Immunization Registry Association (AIRA) was awarded a two-year cooperative agreement with the CDC Office of the Associate Director for Adult and Influenza Immunization to inform strategies for improving awareness and utilization of immunization information systems (IIS) among adult health care providers.

Historically, adult vaccination efforts have not received the same focus or funding levels as those dedicated to the federal Vaccines for Children (VFC) program. COVID-19 response efforts have put a spotlight on the national immunization infrastructure and the importance of capturing adult vaccination data in IIS as the centralized source of vaccination information.

By the end of 2020, all states and jurisdictions in the United States had a functional lifespan IIS with the capability and authority to collect and capture adult immunization data. Data from the 2019 IIS Annual Report (IISAR)[1] indicate that approximately 60% of adults aged 19 years and older are represented in an IIS with one or more recorded vaccinations compared to approximately 95% for children and 82% of adolescents respectively.[2] The IISAR also compares IIS coverage rates for adult influenza vaccination against the national Behavioral Risk Factor Surveillance System (BRFSS) standard measurement. The 2019 IISAR[3] data indicate that the IIS estimate trails BRFSS (2017–2018) by about 26 percentage points, demonstrating a considerable gap in IIS reporting activity. While findings from the AIRA adult IIS capture survey indicated that approximately 63% of IIS jurisdictions actively and routinely (e.g., real time, daily, weekly) capture adult vaccination data, there is still much work to be done.

[1] https://www.cdc.gov/vaccines/programs/iis/annual-report-iisar/rates-maps-table.html
[2] IISAR measures child participation as children aged 4 months through 5 years who have two or more vaccinations recorded in the IIS; adolescent participation includes individuals aged 11 through 17 years with two or more vaccinations recorded in the IIS.
[3] https://www.cdc.gov/vaccines/programs/iis/iisar-survey-data.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fprograms%2Fiis%2Fissar-survey-data.html

The cooperative agreement is composed of a series of deliverables including the *Landscape Analysis Report*. This landscape analysis has been developed to provide an overview of the policies, practices, challenges, and successes that exist within the current adult vaccination environment as they relate specifically to the reporting practices, capture, and utilization of adult vaccination data in an IIS. The *Landscape Analysis Report* will be used to inform the *Strategic Road Map*, which will provide a three- to five-year plan for addressing barriers and implementing strategies to advance adult vaccination data capture and utilization of IIS.

Information for the landscape analysis was collected through a variety of methods, including a literature review, a series of web-based surveys, subject matter expert interviews, and a virtual in-person meeting. Subject matter experts and stakeholders informing this document included representation from a variety of IIS programs, larger electronic health record (EHR) partner organizations, state and national professional organizations and policy advocates, as well as public health and clinical practitioners.

While stakeholder engagement illuminated numerous and varied factors that can either help or hinder efforts to advance adult vaccination data capture and utilization, four considerations emerged as overarching themes:

- Adult vaccination capture activities need to be prioritized at the national, state, and clinical levels along with appropriate resource allocations (staffing and funding) to make these efforts successful.
- Providers should be motivated to report. Motivation may come in many forms, such as reporting mandates, financial incentives, performance incentives, consumer or peer pressure, tools/features that facilitate or improve the clinical workflow, or even intrinsic/personal values.
- Barriers to reporting should be reduced or eliminated with a primary focus on implementing automated electronic data exchange between EHRs and the IIS and eliminating explicit (opt-in) consent requirements.
- Data confidence concerns about accuracy and quality should be addressed in order to increase the use of IIS data by the various stakeholders who use (or could use) this data to support clinical, programmatic, policy, and resource allocation decisions.

A number of immunization/IIS programs have chosen to prioritize adult vaccination activities and are successfully using their IIS to support and facilitate these efforts, whereas some jurisdictions have done very little. Large disparities in adult vaccination efforts between and across jurisdictions illustrate the need for a concerted effort to uniformly expand these efforts nationally. Some of the topics explored in this document include:

- Role of state-level vaccines for adults (VFA) programs and the reporting to IIS of doses administered
- Jurisdictional policies and mandates
- IIS and EHR systems and features for capturing and transmitting patient and vaccination data
- Identifying and recruiting adult providers to increase IIS participation
- Establishing electronic interfaces between IIS and EHRs or pharmacy systems (onboarding)
- Improving IIS data saturation, data quality, and data utilization
- Leveraging IIS to support emergency preparedness and response activities
- Addressing provider perception (or misconceptions), reducing the general "burden" of reporting doses administered, and increasing clinicians' familiarity and comfort level with the adult vaccination schedule

While IIS were initially developed to capture childhood immunizations, standards of practice for health care providers serving adults include assessing patient status for all recommended vaccines at each clinical encounter and documenting the receipt of vaccine by the patient in both electronic medical records and IIS.[4] Documenting receipt of vaccine has also been included as a Healthy People 2030 developmental objective to "increase the proportion of people with vaccination records in an information system."[5] This *Landscape Analysis Report* provides the insight needed to establish a *Strategic Road Map* for prioritizing and advancing adult data capture and utilization nationally across all jurisdictions.

[4] National Vaccine Advisory Committee, Orenstein WA, Gellin BG, Beigi RH, Despres S, LaRussa PS, et al. Recommendations from the National Vaccine Advisory Committee: Standards for Adult Immunization Practice. Public Health Rep. 2014 Mar;129(2):115–23.

[5] https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-people-vaccination-records-information-system-iid-d02 (IID-D02)

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APPENDICES

1

INTRODUCTION

SECTION 1 INTRODUCTION

BACKGROUND

Immunization information systems (IIS) were initially developed to capture childhood immunizations.

With the expansion of routine vaccine recommendations for adults and the emergence of the COVID-19 pandemic, there is increasing interest in expanding IIS capture of adult demographic and immunization data, increasing the use of IIS by adult care providers, and leveraging the IIS for population-level coverage analysis and public health response. However, there are unique challenges that limit the capacity of IIS to capture adult records, including the number and variety of immunizing adult providers, immunization program priorities, general resource challenges, and technical and policy concerns over data capture and data exchange. To date, there has not been an overarching evaluation and cataloguing of the unique challenges affecting the expansion of IIS or strategies to guide and unify efforts to improve awareness and use of IIS among adult care providers.

Recommendations from the National Vaccine Advisory Committee (NVAC) on the standards for adult immunization practice[6] suggest that all health care providers serving adults should (1) **assess patient status for all recommended vaccines at each clinical encounter**; (2) educate and counsel the patient on the recommended vaccines and strongly recommend needed vaccines; (3) vaccinate at the same visit or, for providers that do not stock recommended vaccines, refer the patient to a vaccinating provider; and (4) **document the receipt of vaccine by the patient**. Documenting the receipt of vaccine has been further characterized and clarified in subsequent publications to specify "documenting the receipt of vaccine in both electronic medical records and IIS."[7,8] Documenting receipt of vaccine has also been included as a Healthy People 2030 developmental objective to "**increase the proportion of people with vaccination records in an information system**."[9]

[6] National Vaccine Advisory Committee, Orenstein WA, Gellin BG, Beigi RH, Despres S, LaRussa PS, et al. Recommendations from the National Vaccine Advisory Committee: Standards for Adult Immunization Practice. Public Health Rep. 2014 Mar;129(2):115–23.
[7] https://www.sciencedirect.com/science/article/pii/S0264410X20307283?via%3Dihub
[8] https://www.sciencedirect.com/science/article/pii/S0264410X1831274X?via%3Dihub
[9] https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-people-vaccination-records-information-system-iid-d02 (IID-D02)

In September 2019, the American Immunization Registry Association (AIRA) was awarded a two-year cooperative agreement with the CDC Office of the Associate Director for Adult and Influenza Immunization to inform strategies for improving awareness and utilization of immunization information systems (IIS) among adult health care providers in routine and emergency settings. The cooperative agreement is composed of a series of deliverables:

- ***Literature Review*** (March 2020) – a review of literature and relevant resources on IIS use approaches, systems, and capabilities related to adult capture, mass vaccination of adults, and emergency preparedness
- ***Mass Vaccination Capabilities Summary*** (July 2020) – a catalogue and review of existing mass vaccination solutions designed for use by immunization programs and providers and identification of essential elements that should be included in a mass vaccination module
- ***Landscape Analysis Report*** (present document) – analysis of current approaches, systems, and capabilities used to capture adult immunization records in IIS in all settings where adults are vaccinated
- ***Strategic Road Map*** (July 2021) – a three- to five-year strategic road map that bridges the gaps identified in the landscape analysis, including strategies and recommendations to improve the use of IIS for adult immunizations

The landscape analysis presented in this document is intended to provide insight into the challenges and potential solutions to adult vaccination data capture and use. The *Landscape Analysis Report* will then be used to inform the *Strategic Road Map*, which will prioritize the various issues and provide guidance for the resolution and implementation of strategies to advance adult vaccination data capture and utilization using IIS. Information for the landscape analysis was collected through a variety of resources:

- Literature review
- A series of web-based surveys (June–August 2020)
  - IIS community survey (June/July 2020)
  - National Adult and Influenza Immunization Summit (NAIIS) survey (May/June 2020)
  - Electronic health record (EHR) vendor survey (August 2020)
- Subject matter expert (SME) interviews (conducted via teleconference in August 2020)
- Virtual in-person meeting (facilitated via Zoom, September 17–18, 2020)
- *Mass Vaccination Capabilities Summary*

Additional information about the surveys and stakeholder engagement is detailed in Appendix D. Methodology Overview. Subject matter experts and stakeholders informing this document included representation from a variety of IIS programs, larger EHR partner organizations, state and national professional organizations and policy advocates, as well as public health and clinical practitioners. Individual participants are listed in Appendix E. Acknowledgements. Due to the emerging COVID-19 pandemic, access to pharmacists and providers was restricted. Lack of engagement with the provider community is a notable limitation of the current assessment effort. Information approximating the provider perspective was primarily collected through the various professional organizations that represent the provider community and the EHR vendors who offer the tools that support clinical workflows and data flows. Direct input from the provider and pharmacist communities should be targeted for future engagement and research efforts.

This document is intended for broad distribution to the CDC, policy makers, immunization and IIS program staff, representatives of state and national professional organizations, and other stakeholders that comprise the adult vaccination landscape. This landscape analysis has been developed to provide an overview of the policies, practices, challenges, and successes that exist within the current adult vaccination environment as they relate specifically to the reporting practices, capture, and utilization of adult vaccination data in an IIS.

This landscape analysis examines a wide range of issues that contribute to the successes and challenges impacting adult vaccination capture activities across jurisdictions and across a variety of stakeholders who rely on the information in IIS to make clinical, programmatic, policy, and resource allocation decisions. Some of the topics explored in this document include:

- Role of state-level vaccines for adults (VFA) programs and the reporting of doses administered to IIS
- Jurisdictional policies and mandates
- IIS and EHR systems and features for capturing and transmitting patients and vaccinations
- Identifying and recruiting adult providers to increase IIS participation
- Establishing electronic interfaces between IIS and EHRs or pharmacy systems (onboarding)
- Improving IIS data saturation, data quality, and data utilization
- Leveraging IIS to support emergency preparedness and response activities
- Addressing provider perception (or misconceptions), reducing the general "burden" of reporting doses administered, and increasing clinicians' familiarity and comfort level with the adult vaccination schedule

Each topic section concludes with a list of possible actions or activities that could be undertaken by the immunization/IIS community, the CDC, policymakers, professional organizations, and other stakeholders to improve adult data capture and utilization. The full list of these action items has been compiled and presented in Appendix C: Community Action Summary. This list will be prioritized in the next phase of the project in order to establish the recommendations and strategies for the Strategic Road Map.

2 FINDINGS AND ANALYSIS

SECTION 2 FINDINGS AND ANALYSIS

By the end of 2020, all states and jurisdictions in the United States had a functional lifespan IIS with the capability and authority to collect and capture adult immunization data.

The AIRA adult IIS capture survey posed a question to examine the level of adult IIS capture activities taking place among IIS programs. Findings among those responding to this question (n=60), identified that **38 (63%) jurisdictions actively and routinely (e.g., real time, daily, weekly) capture adult vaccination data, with an additional 11 (18%) jurisdictions reporting that they have done some work in this arena and are actively working to expand these efforts.** The remaining jurisdictions have not established adult vaccination capture as a top program priority or face considerable barriers in expanding these activities.

Some of the primary activities driving successful adult data capture in IIS, as reported by AIRA survey respondents, included the following:

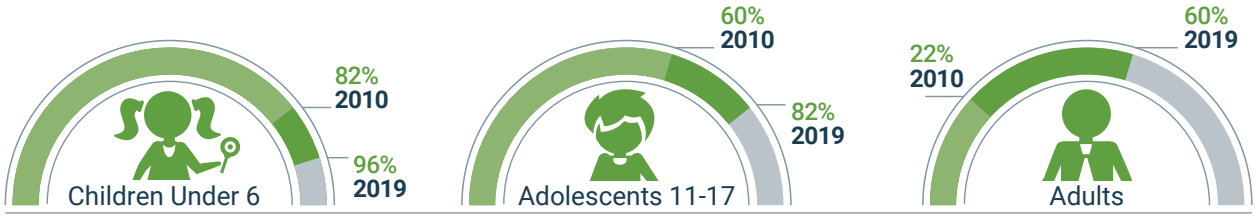
- State/jurisdictional mandates requiring all doses administered to be reported to the IIS
- Offering a publicly funded adult vaccination program (VFA—vaccines for adults) as a means to increase adult vaccination, engage with adult providers, and establish policies and practices for reporting doses administered to the IIS
- Leveraging electronic interfaces to collect all patient data (childhood and adult) and ensuring that all providers within an integrated health network are actively reporting through an established interface
- Strategic partnerships with licensing agencies to promote IIS reporting and/or incorporate IIS reporting into their licensing requirements (e.g., long-term care and boards of pharmacy)
- Leveraging recruitment opportunities such as annual influenza, “supplemental flu,” and COVID-19

AIRA SME interviews revealed similar trends:

- Mandatory reporting laws
- Offering vaccine to providers through the VFA program
- Establishing electronic interfaces
- Pursuing partner and legacy data loads
- Establishing partnerships with long-term care facilities
- Implementing provider recognition programs
- Aging up of pediatric records

Data from the 2019 *IIS Annual Report* (IISAR)[10] indicate that 60% of adults aged 19 years and older are represented in an IIS with one or more recorded vaccinations. This represents a 4% increase nationwide when compared to the 2018 IISAR. Adult representation compares to approximately 96% for children and 82% of adolescents respectively.[11]

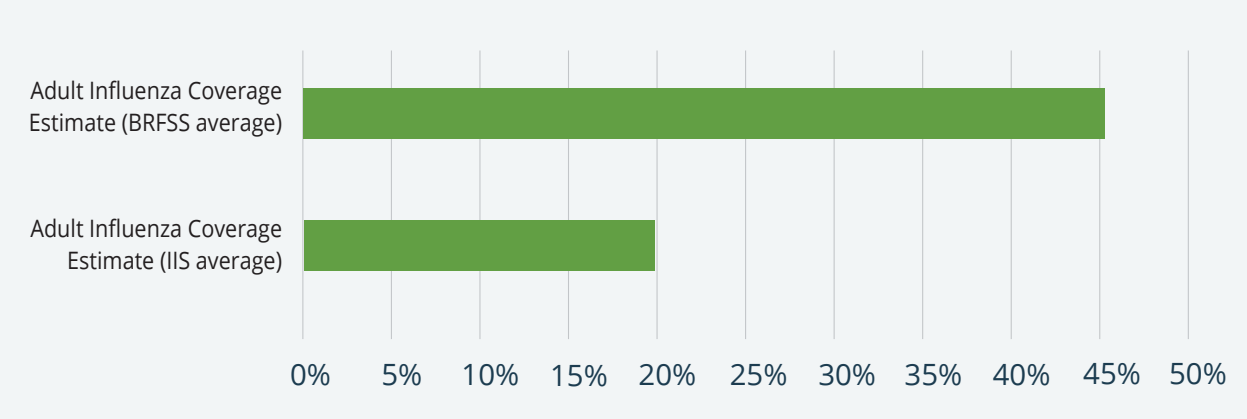
Figure 1 | *Percent of children, adolescents, adults represented in IIS, 2019*



[10] https://www.cdc.gov/vaccines/programs/iis/annual-report-iisar/rates-maps-table.html
[11] IISAR measures child participation as children aged 4 months through 5 years who have two or more vaccinations recorded in the IIS; adolescent participation includes individuals aged 11 through 17 years with two or more vaccinations recorded in the IIS.

The IISAR also compares IIS coverage rates for adult influenza vaccination against the national Behavioral Risk Factor Surveillance System (BRFSS) standard measurement. The 2019 IISAR[12] data indicate that the IIS estimate for adult influenza coverage trails BRFSS (2017–2018) by about 26 percentage points, demonstrating a considerable gap in IIS reporting activity.

Figure 2 | *Comparison of Adult IIS and BRFSS Influenza Coverage, 2019 IISAR*

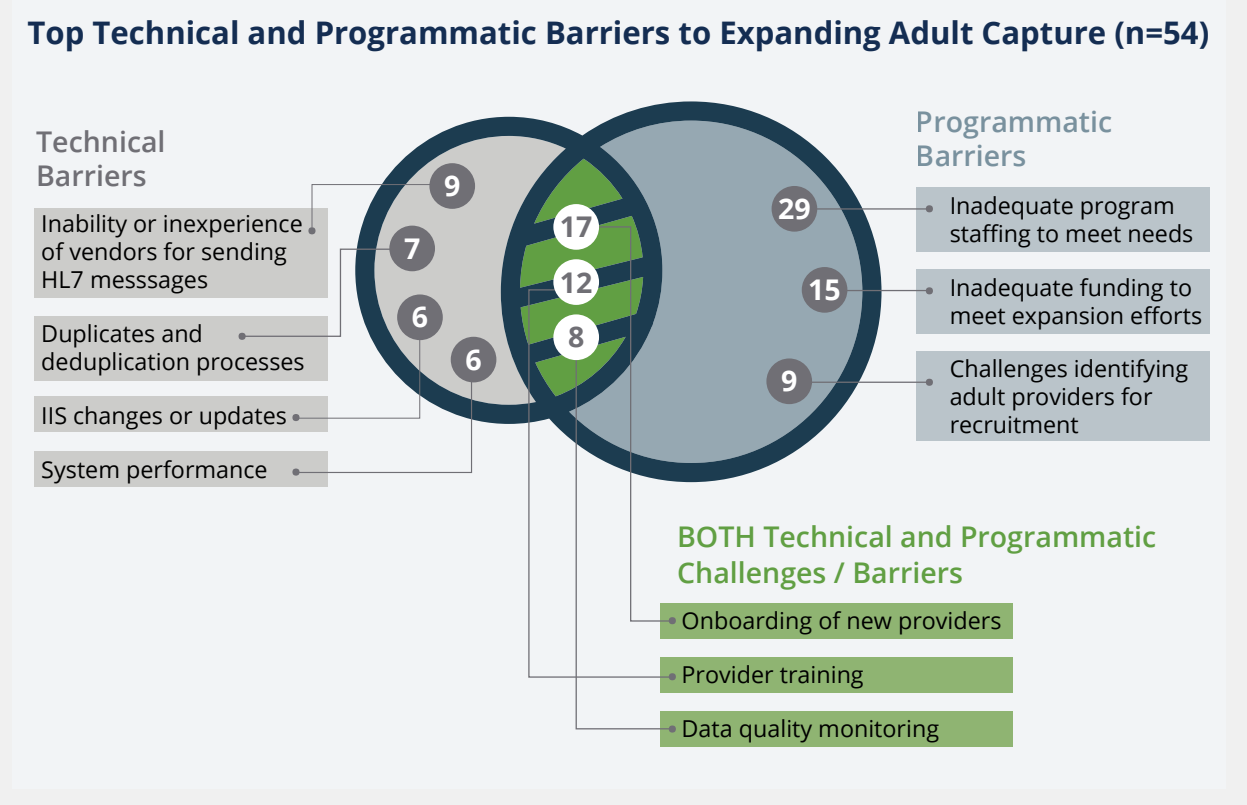


Note: IISAR adult participation rates vary widely across jurisdictions with six jurisdictions having achieved a rate of greater than 95%, while another six jurisdictions reported a rate of less than 25% or have no adult data to report. According to the 2019 IISAR, four of the jurisdictions reporting >95% adult participation were also participants in the CDC IIS Sentinel Sites Project.[13] In 2015/2016, CDC invested supplemental funding into the Sentinel Sites Project to expand efforts beyond children and adolescents to include adult provider recruitment and onboarding in conjunction with pandemic influenza preparedness and response.[14,15] In addition to having higher levels of adult participation in the IIS, these jurisdictions also had a higher percentage of influenza coverage in the IIS, trailing BRFSS by only 14 percentage points.

[12] https://www.cdc.gov/vaccines/programs/iis/iisar-survey-data.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fprograms%2Fiis%2Fissar-survey-data.html
[13] Centers for Disease Control and Prevention. About IIS Sentinel Sites. Available at: https://www.cdc.gov/vaccines/programs/iis/activities/sentinel-sites.html
[14] https://repository.immregistries.org/files/resources/5835ade18f56a/track_e__adult_immunizations___pharmacies_.pdf
[15] https://repository.immregistries.org/files/resources/5835add98615b/track_d__successful_partnerships_.pdf

AIRA survey respondents were also asked to identify the top three technical and programmatic barriers or challenges that an immunization/IIS program may face when expanding efforts to increase adult data capture. Top responses are depicted in **Figure 3** (n=54); however, it should be noted that **staffing limitations was overwhelmingly the most cited barrier across both technical and programmatic categories**.

Figure 3 | *Top Technical and Programmatic Barriers to Expanding Adult Capture*



The EHR vendor survey offered additional perspective on their top three technical and programmatic barriers to increased adult data capture. **Lack of provider incentives to participate (reporting mandates, financial incentives, performance requirements, consumer demand, etc.) topped the list**. This was followed by a lack of social and economic drivers for VFA when compared to the Vaccines for Children (VFC) program, differences in regional/IIS-specific onboarding processes and data requirements, and navigating explicit (opt-in) consent requirements for adults.

When participants of the AIRA virtual meeting were asked to identify what challenges and barriers exist within their organization or among the members/providers that their organization represents, the following concerns were raised:

- Perception and historical focus on childhood, leading to failure to promote the value of investments in IIS for adult and preparedness use
- Lack of vaccination requirements for adults (mandates)
- Lower volume of vaccinations administered by adult providers (versus children)
- Some providers offering only a subset of vaccinations that apply to their practice specifically (somewhat influenced by setting)
- Lack of reporting mandates for providers
- Variety and number of adult vaccinators (including local health engagement)
- Variety and number of providers that need to connect to the IIS (onboarding)
- Fewer adult records in system
- Adult data quality and duplicates
- IIS doesn't always capture risk-based indicators in order to properly forecast vaccinations due/overdue
- Difficulty supporting the increasing demand for consumer access, use of data, and application of data beyond the clinic environment (data use)

Survey responses received by NAIIS members and the EHR vendor community cited "no requirement/mandate to report doses administered to the IIS" as the primary driving factor when asked to identify the factors most likely to impact a provider's decision on whether to report vaccinations to the IIS. This was distantly followed by "requires too much time/effort for staff to enter doses administered into the IIS," "establishing an electronic interface is too expensive or time intensive," and "not a current priority or focus area for the practice/organization." Issues such as "not familiar with how to report doses administered to the IIS" and "too many legal issues to establish memorandums of understanding (MOUs) or user agreements" did not appear to have an impact on a provider's decision to report.

It is noteworthy that the primary drivers of success and the majority of barriers and challenges can be categorized as policy, programmatic, and/or operational in nature. **When examining factors that impact adult data capture and utilization in the IIS, the technical aspects of data capture, exchange, and use are less challenging than addressing policy considerations, resource needs, and overcoming competing priorities.**

Subsequent sections in this document will examine the various drivers and barriers reported through the surveys, interviews, and virtual meeting discussions. The narrative has been divided into the following core topic areas:

- ADULT VACCINATION PROGRAM ACTIVITIES
- POLICIES AND MANDATES
- TECHNICAL CONSIDERATIONS
- IDENTIFYING ADULT PROVIDERS
- RECRUITMENT
- ONBOARDING
- IMPROVING DATA SATURATION
- DATA MANAGEMENT AND DATA UTILIZATION
- COVID-19 OPPORTUNITY
- COMMUNITY IDENTIFIED NEEDS

ADULT VACCINATION PROGRAM ACTIVITIES (STATE VFA PROGRAMS)

The AIRA survey indicated that over 90% of jurisdictions offer at least one or more publicly supplied vaccines for the routine vaccination of patients 19 years of age and older through a state or federal vaccine program. Offering a publicly funded adult vaccination program was reported as an indicator of success for active reporting of adult vaccinations to an IIS. This success is driven by two main factors:

1. A publicly funded adult vaccination program promotes vaccination of adults in general and provides a cost-effective option for providers interested in offering vaccination services to their patients.
2. Jurisdictions increasingly require reporting of doses administered to the IIS as a condition of program participation.

The challenge for national and state policy makers is the lack of uniformity in VFA implementation from jurisdiction to jurisdiction. The AIRA survey and subject matter expert interviews identified wide-ranging differences in VFA program funding, vaccine offerings, eligible provider types, and recipient eligibility requirements across jurisdictions. For instance, on one extreme, a jurisdiction may offer universal adult vaccination—all providers are welcome to participate, the full range of vaccinations recommended by the Advisory Committee on Immunization Practices (ACIP) are available, and all patients can receive publicly funded vaccine regardless of eligibility. On the other extreme, a jurisdiction may not have a VFA program at all or may operate with restrictions—only public health clinics can participate, a limited set of vaccinations are available (e.g., influenza and Tdap), and/or only patients who are un/underinsured are eligible to receive publicly funded doses. In these cases, any vaccine not supplied through the state vaccine program must be purchased independently by providers on the private market. Most jurisdictions fall somewhere in the middle.

The primary factor determining how or if a jurisdiction implements a VFA program is the amount of federal Section 317 funding available to the jurisdiction and/or how the jurisdiction chooses to appropriate their available 317 funds. Section 317 funds are federal dollars typically authorized to support the purchase of vaccines for children, adolescents, and adults; supplement immunization program operations and critical infrastructure; and fill gaps to address priorities in vaccination programs. While Section 317 serves as an essential part of our nation's immunization delivery system, this program is chronically underfunded.[16] Federal 317 funding is discretionary funding and is appropriated annually. Guidance for how 317 funds can be used is defined and communicated to awardees annually based on current CDC priorities.

After the Affordable Care Act (ACA) was implemented, more individuals gained insurance coverage. This resulted in nearly all children being covered for vaccination services through either VFC or private insurance and allowed the focus for Section 317 funding to shift toward addressing gaps in uninsured adults. Given the record high coverage of children, in contrast to the persistently low coverage in adults, Section 317 funding enables jurisdictions to address the needs of adult vaccination programs by supporting uninsured or underinsured adults, fully insured individuals seeking vaccines during public health response activities (e.g., outbreak response, post-exposure prophylaxis), and individuals in correctional facilities and jails.

Across the board, adult vaccination efforts have not received the same funding levels as those dedicated to children through the federal Vaccines for Children (VFC) program and other federal and state funding. The VFC program purchases vaccines for all eligible VFC children across the nation. A similar program does not exist for the purchase of vaccines for uninsured or underinsured adults; therefore, all funds for adult immunization efforts must come from either Section 317 or state general funds. In addition to vaccine purchase, Section 317 funds are also needed to carry out other CDC priorities.

[16] https://a1c3b8ed-22cb-4bca-bf40-dc4df365ae4d.filesusr.com/ugd/cbc5b5_e4810de20cb54f178b16b92b7bac3a7b.pdf

SME interviews conducted by AIRA offered examples for how some jurisdictions have been able to supplement their available 317 dollars and expand VFA program offerings by leveraging supplemental funding (state general funds: New Mexico), forging strategic partnerships (health insurers: Vermont), or participating in special projects (Tdap cocooning project for pregnant mothers: Nevada). Other examples from Rhode Island, Chicago, and Texas are described in the Association of Immunization Managers (AIM) *Adult Immunization Resource Guide*.[17] These examples aside, funding for childhood and adolescent vaccination programs has continued to significantly outpace funding for adult vaccination programs.

Immunization stakeholder actions to improve adult data capture and utilization:

- Reduce variability in VFA program implementations across jurisdictions.
- Increase 317 funding and/or 317 funds earmarked specifically for vaccine purchase.
- Improve VFA program marketing and messaging to encourage provider participation and increase VFA vaccine uptake by adult recipients.
- Require all publicly funded dose administrations to be reported to the IIS regardless of patient age, provider type, or vaccination setting.

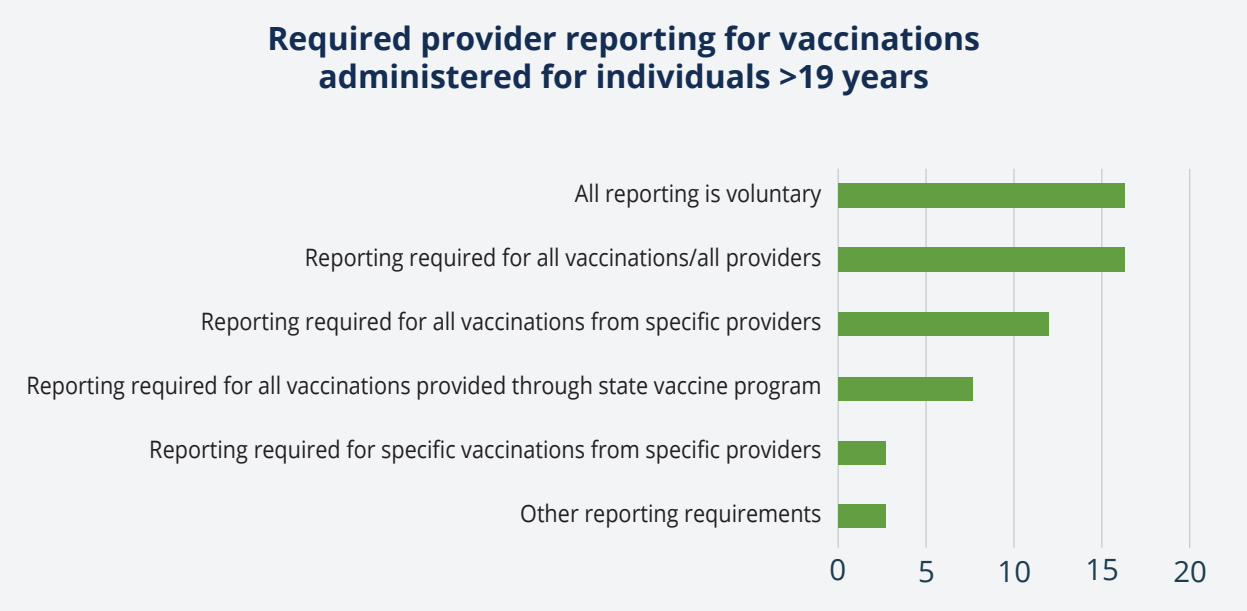
[17] https://www.immunizationmanagers.org/page/ARG_CHAPTER3

POLICIES AND MANDATES

MANDATORY REPORTING

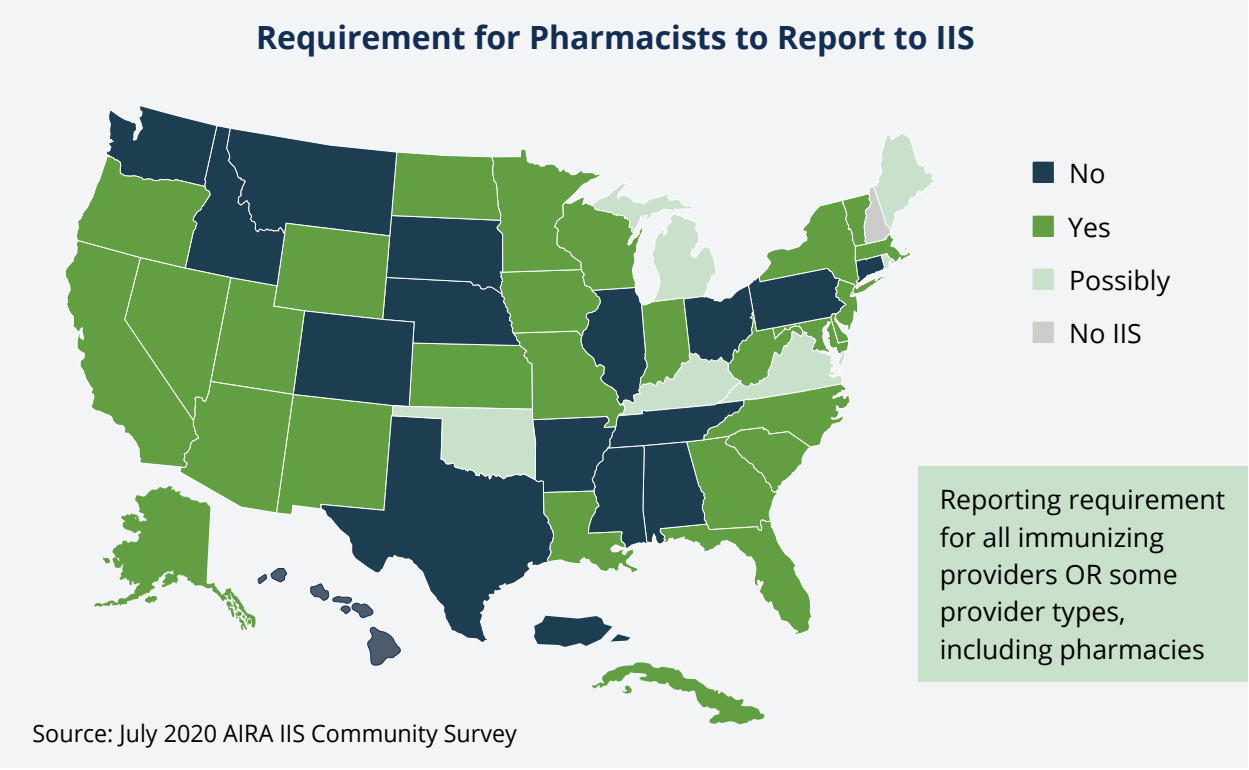
Mandatory reporting was noted as one of the primary indicators of success for active reporting of adult vaccinations to an IIS. **Seventy-two percent (72%) (n=41) of those responding to this question in the AIRA adult immunization survey (n=57) indicated that their jurisdiction has some sort of reporting mandate that requires a provider to report vaccine administrations to the IIS for individuals over the age of 19 years.** Of those, 39% (n=16) require reporting for all vaccinations from all providers/provider types. Of the remaining 61% (n=25), some require reporting for only state vaccine program participants, some require reporting of all vaccinations but only from specific providers/provider types (predominantly pharmacies), and some require reporting of specific vaccinations (e.g., influenza) from specific providers/provider types. **Figure 4** displays a visual depiction of this breakdown.

Figure 4 | *Required provider reporting for vaccines administered to individuals > 19 years*



It should also be noted that, in some jurisdictions, state boards of pharmacy may have IIS reporting mandates that are separate from, and/or in addition to, a general IIS reporting mandate (e.g., Louisiana, Nevada). In these cases, licensed pharmacies/pharmacists would be required to report all doses administered to the IIS regardless of whether a larger statewide mandate is in existence. As pharmacies continue to serve a more pronounced role in the vaccination of adults and patients in general, active reporting of doses administered in the pharmacy setting becomes increasingly important. In addition, some adult-only providers may not want the additional responsibilities of offering a full range of adult vaccination services, opting instead to refer patients out to pharmacy chains or independent pharmacies to manage these activities. **Figure 5** provides a national overview of states/jurisdictions that have implemented pharmacy reporting requirements for adult vaccinations through either a statewide general reporting mandate, a statewide mandate specific to pharmacy reporting, or a reporting mandate issued directly by the state board of pharmacy.

Figure 5 | *Requirements for Pharmacists to Report Vaccines Administered to the IIS*



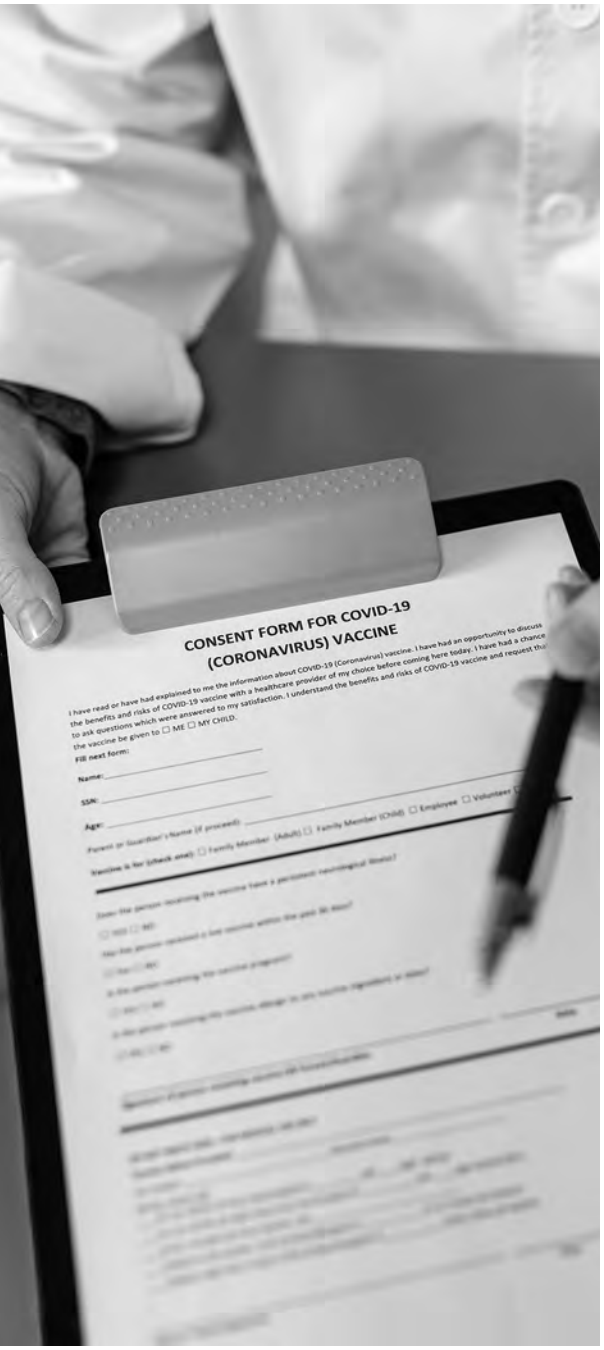
Source: July 2020 AIRA IIS Community Survey

From the AIRA SME interviews, states that have implemented mandatory reporting requirements for adults (e.g., Louisiana, Nevada, New Mexico) directly attribute an increased level of reporting to the IIS as a direct result of these mandates. Louisiana is one of the newest states to implement a reporting requirement for adult vaccinations (June 2019). When reporting was voluntary, there was no express motivation for providers to report. This resulted in a very low adult participation rate in the IIS. With the new law, most providers were ready to willingly comply, and Louisiana experienced little pushback from providers in implementing the new law. In Nevada, the immunization coalition helped to draft the language for the bill to expand the existing legislation to include adult reporting in 2010. The mandate was crafted with the backing of the provider community, immunization champions, and supportive legislators. Per Nevada, the expanded legislation has facilitated significant improvements to adult immunization capture. In New Mexico, immunization/IIS program staff appreciate having the ability to reference and leverage their state reporting mandate when needed to increase reporting of adult data versus relying on voluntary provider participation. While North Dakota does not have a statewide reporting mandate for adults, participants in the state VFA program are required to report doses administered to the IIS. North Dakota reports that mandatory reporting for VFA providers has resulted in improved immunization rates among this group of providers.

Some states report that a mandate is not necessary to encourage reporting (e.g., Washington, Idaho). Washington reported that a large volume of adult providers actively report to the IIS even without a mandate; however, Washington is somewhat unique. Washington is a universal vaccine purchase state for VFC,[18] and VFC providers are required to report doses administered to the IIS. Washington's current VFC participation rate in the IIS is 97.5%.[19] As a result, any provider who participates in the VFC program and also serves adult patients (e.g., family practitioners, hospital networks) is more likely to actively report adult vaccinations to the IIS, especially among providers with an electronic interface between the provider's EHR and the IIS. In Idaho, staff report that private providers, hospitals, and pharmacies report voluntarily without state intervention. Idaho has also benefited from connecting with pharmacy reporting hubs/data exchange networks like the STChealth ImmsLink effort. These hubs connect with large, retail pharmacies operating nationally. Any dose administered at a participating pharmacy chain is reported directly to the hub and is automatically routed to the correct jurisdiction regardless of whether a reporting mandate exists. Both Washington and Idaho have very active anti-vaccine communities, and there is a general concern that pursuing reporting mandates could result in adverse, unintended consequences.

[18] A universal vaccine purchase state uses additional funding sources (e.g., state general funds, 317, payor partnerships) to supplement VFC funds for the purchase of vaccine from the federal contract. This vaccine is then made available to all children receiving services within the jurisdiction regardless of federal VFC eligibility requirements. Some states, such as Vermont and Rhode Island, are universal for both children (VFC) and adults (VFA).

[19] 2019 IISAR data



By examining 2019 IISAR data for provider site participation, combined with AIRA survey results related to the presence of an IIS adult reporting mandate, **participation in jurisdictions with a general reporting mandate was 30% higher than in jurisdictions without a mandate. Jurisdictions with a partial reporting mandate (e.g., specific providers and/or specific vaccinations only), were 24% higher than jurisdictions with no mandate.** These data indicate that reporting mandates positively impact reporting activity and mandates could be successfully leveraged to increase and improve adult vaccination reporting efforts.

Compliance with reporting mandates can be challenging, however. Most reporting mandates are written without an enforcement clause, and if present, very few jurisdictions invoke the available enforcement actions (e.g., withholding vaccine orders, fines). Interviewed jurisdictions felt that leveraging these actions can serve as a *disincentive* to reporting and/or vaccinating in general. For instance, withholding vaccine ordering for a provider who is not routinely reporting to the IIS could potentially lead the provider to withdraw from the VFA program or not vaccinate patients who would have received the vaccine if the order had been fulfilled.

In addition, enforcement is difficult in general because of challenges in identifying vaccinating providers and knowing which providers *should* be reporting to the IIS (see Identifying adult providers). It is also difficult for IIS staff to track who is and is not reporting. It may not always be clear whether the provider is failing to report the doses they administer or whether they may not be vaccinating at all and therefore have no doses to report. In other cases, lack of compliance may simply be related to a lack of awareness that a reporting mandate exists or a misunderstanding of what the law/policy entails.

CONSENT POLICIES AND MANDATES

Mandates for express consent (opt-in) and/or changes in consent requirements as children age into adulthood were noted as a primary barrier in jurisdictions where adult reporting has been a challenge or has not been established as a program priority. Since 2000, the number of jurisdictions requiring explicit consent (opt-in) has declined as many jurisdictions have moved toward implied consent (opt-out or all-in).[20] Kansas is the most recent state to change its consent law from opt-in to opt-out. This law went into effect in July 2020. **Higher levels of participation in an IIS are seen in jurisdictions with implied consent, resulting in more complete patient and vaccination data in the IIS.[21] By examining 2019 IISAR data for adult enrollment and participation, combined with AIRA survey results related to the presence of an IIS adult opt-in consent mandate, average enrollment among adults was 24% higher in jurisdictions with implied consent (opt-out or all-in), and participation (presence of at least one recorded adult vaccination) was 25% higher.**

Figures 6 and 7 display the various consent requirements reported through the AIRA survey. The following definitions can be used to interpret the figures:

- **None/no consent required (all-in):** All individuals can be reported to the IIS without consent and without an option to be excluded from the IIS.
- **Opt-out:** All individuals can be reported to the IIS without consent, but individuals have an option to request that their records not be included or that their records be removed from the IIS. Consent is implied unless otherwise stated.
- **Opt-in:** individuals must expressly consent to having their records reported to the IIS before a record can be entered/transmitted to the IIS. Consent may be verbal or written depending on the specific mandate language.

[20] Martin DW, Lowery EN, Brand, B, et al. Immunization information systems: a decade of law and policy. *J Public Health Manag Pract.* 2015;21(3):296-303.
[21] Murthy, NC. Update on Adult Vaccinations and Immunization Information Systems, 2015. Presented at: American Immunization Registry Association National Meeting; April 11, 2017; Chicago, Illinois. Available at: https://repository.immregistries.org/files/resources/58f907be494e4/aira_2017__1c__update_on_adult_vaccinations_and_iis__cdc__n__murthy.pdf (accessed 05/03/2020)

Figure 6 | *Type of Consent Required for Adults*

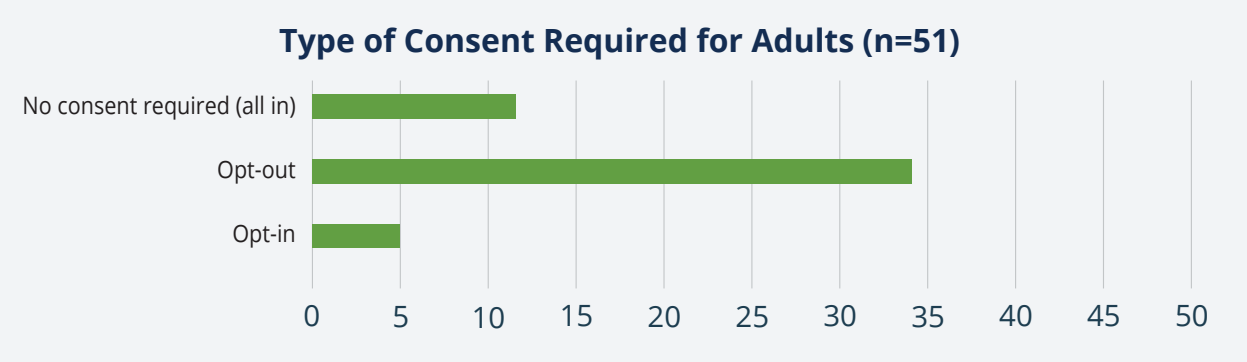
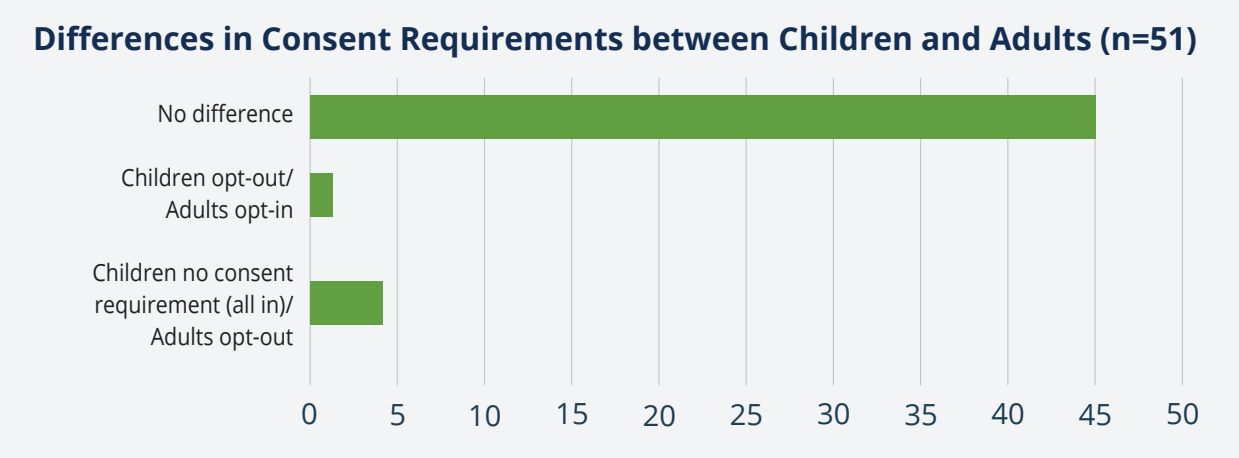
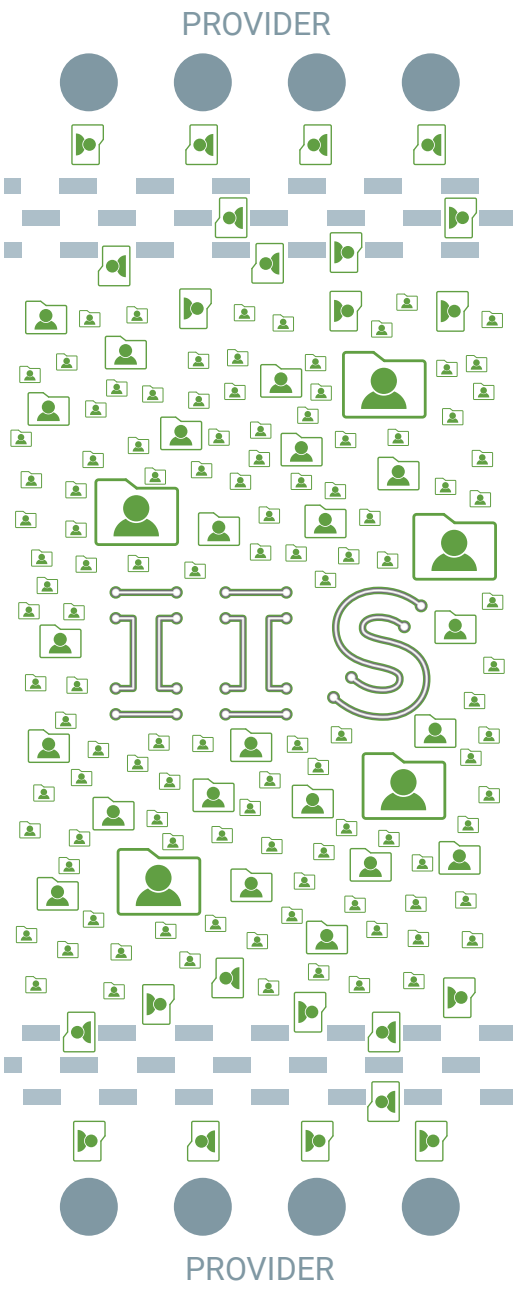


Figure 7 | *Difference in Consent Requirements between Children and Adults*



Note: Consent mandates in the states of Montana and California differ slightly from other jurisdictions. In Montana and California, consent is based on access to records not reporting of records to the IIS. In this case, all records can be reported, but individuals can choose not to have their records accessed by users of the IIS. Montana requires opt-in for record sharing; California is opt-out.

The AIRA survey also examined what happens to data in the IIS when consent is not given or when consent is withdrawn. In most jurisdictions data are retained in the IIS, but front-end user access to the records are prohibited or limited. In other jurisdictions, minimal identifying information (e.g., name and date of birth (DOB)) is retained to support patient deduplication and prevent future records for the patient from being reintroduced. In these cases, all other data associated with the record are removed. A small number of IIS perform a hard delete and fully eliminate the record from the IIS. The challenge with this approach is that, if/when a record is reintroduced to the IIS, there is no mechanism for the IIS to recognize that the patient had previously opted out of inclusion and the record is added back to the database.



DATA SHARING POLICIES AND MANDATES

In addition to policies and mandates related to immunization reporting and consent, some jurisdictions have policies or mandates that restrict the ability of IIS to share or exchange data. In some cases, these restrictions prevent IIS from participating in interstate data sharing. As a mobile society, interstate data sharing supports continuity of care for individuals and families who relocate on a temporary (e.g., snowbirds or military families) or permanent basis. In other cases, restrictions prevent IIS from expanding functionality to support consumer access (aka consumer access portals/vaccine passport services). Providing individuals with access to their personal immunization records, or records for dependents or other members of the household, supports the overall mission of an IIS as the ultimate source of official immunization records and indirectly encourages increased provider participation to meet patient needs/demands for access to their personal health records. **Interstate data exchange and consumer access policies were not explicitly examined as part of the current project effort but may have implications related to evolving COVID-19 pandemic response efforts and the need for individuals to provide proof of vaccination in order to work, travel, or attend public events.**

Immunization stakeholder actions to improve adult data capture and utilization:

- Encourage jurisdictions to implement mandatory reporting laws and policies to facilitate reporting of adult immunization records to the IIS.
- Encourage jurisdictions to address opt-in consent laws or policies that may prohibit or restrict the collection, sharing, and utilization of adult immunization records.
- Expand interstate data sharing/exchange and encourage jurisdictions to address laws that may prohibit or restrict these types of activities.
- Provide tools and support to guide state efforts for pursuing and implementing new laws or policies.
- Examine best practices for enforcing mandatory reporting laws and policies.
- Expand consumer access to IIS data via consumer access portals and/or vaccine passport services. Consumer demand for access to complete, personal immunization records helps drive expectations for active provider reporting.
- Implement a mechanism for tracking the various laws and policies for IIS reporting requirements, consent laws, and data sharing.

TECHNICAL CONSIDERATIONS

The CDC IIS Functional Standards (v4.1)[22] establish functional and operational guidance that all IIS should attain in order to achieve a **"level of uniformity and consistency in supporting common clinical, programmatic, and public health immunization goals for both public and private stakeholders." The guidance applies universally to the capture of all data in an IIS regardless of age (child, adolescent, and adult).** The following functional standards are most relevant to expanding adult data capture:

- The IIS contains complete and timely demographic and immunization data for children, adolescents, and adults residing or immunized within its jurisdiction.
- The IIS forecasts pediatric, adolescent, and adult immunizations in a manner consistent with ACIP recommendations.
- The IIS exchanges data with health information systems in accordance with current interoperability standards endorsed by CDC for message content, format, and transportation.

With 82% of IIS programs routinely capturing adult vaccination data or working to expand efforts in this arena,[23] the majority of IIS platforms are well positioned to facilitate adult data capture from a technical perspective. This means that these systems can effectively:

- Capture adult patient demographics
- Record all routinely recommended vaccines administered to adults (ACIP)
  - (Note: Most systems also support other vaccines administered in conjunction with travel, occupational requirements, pandemic response, and/or bioterrorism readiness.)
- Assess an immunization history and forecast/recommend vaccinations due
- Participate in unidirectional and bidirectional data exchange with EHR systems through HL7 messaging (see also Onboarding)
- Leverage adult vaccination data to facilitate other immunization program support operations such as reminder/recall, population-based assessment, and inventory management

For IIS programs that expressed "IIS changes/updates" as a challenge for expanding adult capture activities, these concerns fell into one of three categories: (1) updates to support COVID-19 vaccine distribution, which is not the focus of this current document, (2) updating demographic field requirements, and (3) adding or improving support for adult forecasting algorithms.

[22] https://www.cdc.gov/vaccines/programs/iis/functional-standards/func-stds-v4-1.html
[23] AIRA adult immunization survey results 2020

From a reporting perspective, differences in the field-level requirements for recording a child record and recording an adult record are minimal. The Core Data Elements for IIS Functional Standards (v4.0)[24] provides a list of required fields that should be captured in conjunction with patient demographics and vaccination events. From this list, mother's (guardian's) name (first, middle, and last) become irrelevant for patients over the age of 18 years. Many IIS have implemented business rules to ignore the requirement to capture this field for adult patients. Some IIS may also have alternative logic for adults regarding the capture of mother's maiden name (used for deduplication) and responsible party name/relationship (used for reminder/recall).

IIS programs expressed concerns about adding or improving support for adult forecasting algorithms. These concerns related to the challenges of properly accounting for differences in the ACIP adult[25] and childhood[26] immunization schedules and the various factors for determining immunizations that are due or overdue by applying age-based, product-based, and condition-based logic to assess a patient's vaccination record. **While the childhood immunization schedule is largely structured around the timing of pediatric well-child visits, the adult immunization schedule tends to be more nuanced with a greater focus on high-risk conditions.** IIS-based scheduling and forecasting features provide important clinical decision support to help providers make vaccination decisions. Forecasting features are available through direct user access to the IIS and through bidirectional HL7 interfaces established between a provider's EHR and the IIS. These algorithms are also used by IIS reminder/recall tools used to facilitate the administration of subsequent doses in a multi-dose vaccine series.

In general, the majority of IIS leverage the Clinical Decision Support for Immunizations (CDSi) Logic Specification and Supporting Data[27] to build and test their evaluation and forecasting algorithms. CDSi algorithms take many factors into consideration: immunization history, vaccine product/licensure, vaccine timing, invalid doses, changes in ACIP recommendations, and special patient conditions/contraindications. **The primary challenge for adult forecasting comes in the form of contraindications, precautions, and other high-risk factors that are more common in adult populations and how these conditions can affect the vaccine forecast.** These factors include acute and chronic medical conditions (e.g., pregnancy, cancer), occupation (e.g., health care workers, first responders), lifestyle indicators (e.g., drug use), and certain laboratory results (e.g., blood titers).

[24] https://www.cdc.gov/vaccines/programs/iis/core-data-elements/iis-func-stds.html
[25] https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html
[26] https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html
[27] https://www.cdc.gov/vaccines/programs/iis/cdsi.html

The challenge for the IIS community is balancing the collection of information needed to provide proper forecasting without evolving beyond what is reasonable and appropriate for an IIS to capture and store.

Another challenge drawing recent attention relates to the use of CDSi for ACIP shared clinical decision making (SCDM) recommendations,[28] such as the 2019 updated recommendation for pneumococcal conjugate vaccination (PCV13). Since SCDM recommendations are not intended to be discussed with every patient, it is difficult to program selective electronic prompts into an IIS. Without the ability to selectively prompt and provide custom clinical decision support, the default position may result in individuals not being vaccinated against diseases that fall within the SCDM type of recommendations.

Findings collected in conjunction with the *Mass Vaccination Capabilities Summary* demonstrated that most IIS support the ability to capture the common contraindications and precautions detailed in the *General Best Practice Guidelines for Immunization*[29] established by the ACIP, but few support the extended Coded Observations (SNOMED) detailed in the CDSi Supporting Data Version 4.3.[30] Most IIS also have the ability to capture general evidence of immunity for specific vaccine types (e.g., "laboratory evidence of immunity"[31] or "history of disease"[32]) but not the actual lab results or blood titers. When contraindications, precautions, and immunities are captured, capable IIS often leverage this information in forecasting vaccinations and generating reminder/recall notifications; however, there are three primary challenges to the collection of this information:

1. Most EHRs don't capture or record extended contraindications, precautions, or immunities in a way that it can be easily transmitted, and while transmission of this information is *technically* possible according to the HL7 Implementation Guide, very few interfaces are configured to transmit this information to the IIS.[33]
2. Some IIS have privacy/legal concerns regarding the capture of the more medically sensitive data elements, especially the extended Coded Observations that include the acute and chronic medical conditions, lifestyle indicators, laboratory results, and occupational hazards.
3. If captured, contraindications, precautions, and immunities are rarely maintained and can quickly become outdated, making the data inaccurate/unreliable, especially for temporary and acute conditions.

[28] https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html
[29] https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html
[30] https://www.cdc.gov/vaccines/programs/iis/cdsi.html
[31] Typically used for hepatitis A, hepatitis B, measles, mumps, rubella, and varicella
[32] Typically used only for varicella and herpes zoster
[33] EHR vendor survey responses indicate that acute medical conditions, chronic medical conditions, lifestyle indicators, laboratory results, and occupation are "rarely" to "never" transmitted to an IIS through an HL7 interface.

Besides the aforementioned differences regarding core data elements and support for adult record evaluation and forecasting, all IIS should be capable of capturing, evaluating, and exchanging adult vaccination data in the same manner used to capture, evaluate, and exchange data for pediatric and adolescent populations.

Some IIS programs had also expressed a concern about system performance if adult capture activities were to be expanded. While the large majority of AIRA survey responses (94%) reflected that systems are ready to go or would require only minor changes, others were concerned about a potential need to increase load capacity or storage requirements if the increased volume of records resulted in adverse impacts to system performance. Many systems have moved, or are in the process of moving, to a cloud-based hosting environment. Scaling of storage and load capacity are much easier in a virtual environment as compared to local hosting models that require the purchase, configuration, and maintenance of hardware.

Immunization stakeholder actions to improve adult data capture and utilization:

- Explore alternative methodologies and best practices for capturing, transmitting, and maintaining contraindications and precautions that may be helpful in the evaluation and forecasting of adult vaccination records (CDSi and SCDM)
- Encourage all jurisdictions to move toward cloud-based hosting for easier scaling when additional processing and storage capacity resources are needed
- Examine possible EHR limitations on data collection and data transmission of fields desired or required by an IIS

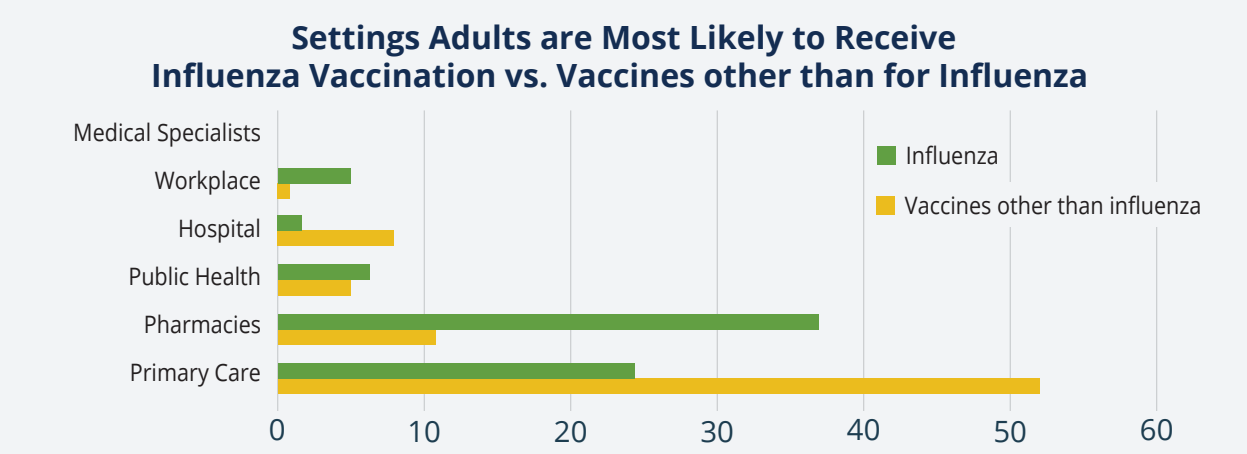
IDENTIFYING ADULT PROVIDERS

Many provider types offer health care services to adults, but not all health care services are performed in a traditional medical office. While not all providers who serve adults offer vaccinations, all are encouraged to assess a patient's general vaccination status and administer or refer out for vaccinations, if needed.[34] **The challenge for IIS programs revolves around how to identify all of the unique and varied entities that are administering vaccinations to adults, as well as those who may need access to a patient's vaccination history in order to provide more comprehensive patient care.**

When asked to identify where adults are most likely to receive routine vaccination services *other than influenza*, members of NAIIS and the EHR vendor community overwhelmingly identified private primary care providers as the principal location for vaccination receipt.[35] This was followed by pharmacies, hospitals, and public health. When asked to identify where adults are most likely to receive an influenza vaccine, the same respondents identified pharmacies as the predominant location for influenza vaccination. This was followed by private primary care providers, public health, workplace, and hospitals. **Figure 8** provides a graphic comparison of these trends.

[34] National Vaccine Advisory Committee, Orenstein WA, Gellin BG, Beigi RH, Despres S, LaRussa PS, et al. Recommendations from the National Vaccine Advisory Committee: Standards for Adult Immunization Practice. Public Health Rep. 2014 Mar;129(2):115–23.
[35] AIRA NAIIS survey and AIRA EHR vendor survey results 2020.

Figure 8 | *Settings Adults are Most Likely to Receive Influenza Vaccination vs. Vaccines other than for Influenza*



Note: Findings from the CDC Early-Season Flu Vaccination Coverage – United States, November 2018[36] varied slightly from those reported here. CDC results indicated that adults are most likely to receive influenza vaccinations in a doctor's office (34.3%). This was followed by pharmacy/store (32.2%), workplace (14.9%), clinic/health center (7.9%), and hospital/emergency department (5.4%).

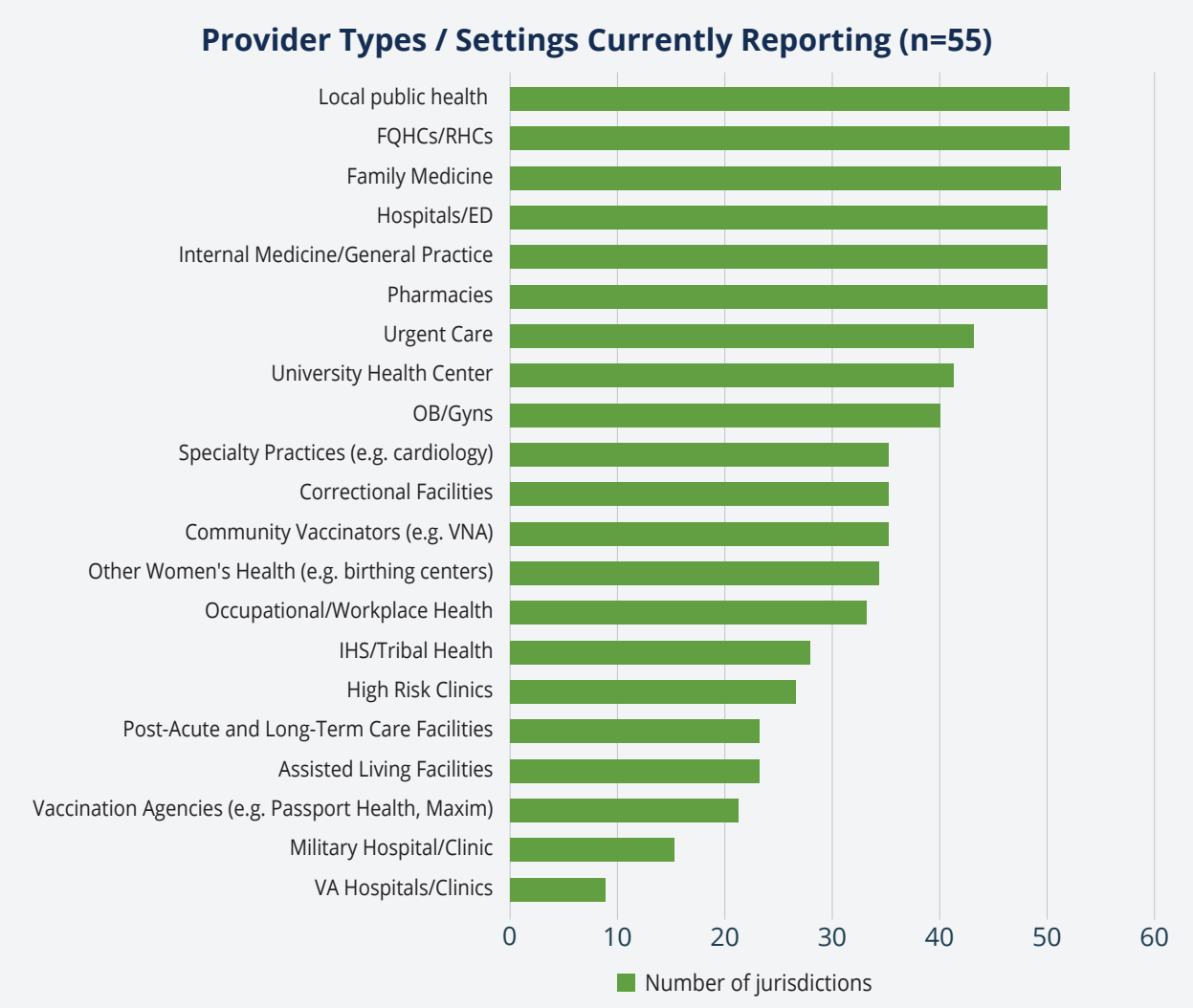
The AIRA survey of the IIS community found that local public health clinics, other public entities (Federally Qualified Health Centers (FQHCs) and rural health centers (RHCs)), family medicine, pharmacies, general practitioners, internal medicine, and hospitals/emergency departments are the entities most likely to administer vaccine and report vaccine administrations to their respective IIS. Conversely, military and Veterans Administration (VA) hospitals and clinics, as well as other federal facilities/agencies (Indian Health Services (IHS) and Tribal Health), have reportedly been a challenge for IIS programs to successfully interface with. Differences in state and federal participation requirements and establishing proper points of contact within these organizations have been challenging for some IIS programs to navigate. **The Immunization (IZ) Gateway project may help to alleviate some of these challenges by providing "centralized technical infrastructure that facilitates the flow of immunization data through an intelligent message router between IIS, large multi-jurisdictional provider organizations to IIS, and from IIS to consumers."**[37,38]

[36] https://www.cdc.gov/flu/fluvaxview/nifs-estimates-nov2018.htm
[37] https://www.cdc.gov/vaccines/covid-19/reporting/iz-gateway/information-sheet.html
[38] https://repository.immregistries.org/resource/the-immunization-gateway-portfolio/

Employee health programs have also proven difficult to navigate. These programs may contract out for vaccination services, and if vaccinating in-house, they might not use an EHR to capture vaccination activity or might use an entirely different EHR from the rest of their organization. IIS programs also noted that contracted vaccination services (e.g., traveling nurses) can be challenging because these organizations often operate at the national level and are typically not facility-based services.

Figure 9 depicts AIRA survey results based on current trends among adult vaccination provider types most likely to report doses administered to the IIS.

Figure 9 | *Provider Types and Settings Currently Reporting to IIS*



In order to identify and engage with providers offering vaccination services or needing access to vaccination histories and forecasting/clinical decision support tools, IIS programs need partners and resources to help facilitate this identification process. **There is no single resource that exists to identify all of the various providers/provider types who play a role in the vaccination of adults.**

In conjunction with the AIRA IIS community survey, SME interviews, and the AIRA virtual meeting, IIS programs noted the following resources and entities that have been helpful in the identification process:

- Providers participating in publicly funded vaccine programs (VFC/VFA)
- Larger provider networks/health systems—identify and connect with all associated clinics
- Adult immunization coalitions
- Intra-agency contacts (e.g., epidemiology programs, preparedness programs)
- Federal list of approved FQHCs and RHCs
- Meaningful use (MU) attestation data from Medicare and Medicaid
- Boards of medicine, boards of medical examiners, boards of pharmacy
- University schools of medicine, schools of pharmacy, and nursing programs
- Provider professional organizations/associations/groups
- Long-term care associations
- Employee health associations/contractors
- National Provider Identifier (NPI) Registry[39]
- Pharmaceutical companies (private vaccine purchases)
- Insurance providers/payers/health plans (All Payer Claims Database)

Even with strategic partnerships and resources, the IIS community still faces challenges with identifying vaccinating providers. Some entities may not be willing or able to share their provider lists. For partners that are able to share provider lists, some may list providers as individuals versus clinics/facilities. When listed as individuals, the lists may or may not provide the clinic/facility that the provider is associated with. In addition, depending on the organization or format of the list provided, it may not always be apparent which providers on the list actually offer vaccination services.

[39] https://www.cms.gov/Regulations-and-Guidance/Administrative-Simplification/NationalProvIdentStand/DataDissemination

From the AIRA virtual meeting, four key points emerged regarding defining and identifying adult providers:

1. Regardless of provider type or vaccination setting, all providers have a role in the vaccination process. Addressing knowledge gaps about IIS is important in motivating providers to participate in the IIS and share data.
2. Access to immunization records, via direct user interface or through bidirectional data exchange, is a priority for all providers. Providers should know who needs to receive a vaccination even if they don't administer the vaccination themselves (patient referral).
3. Contracted immunization service providers play an important role, especially with employee-based health programs. It is important that these doses get documented and reported regardless of who administers the vaccination.
4. There is no definitive list or source for identifying vaccinating providers or the proportion of participation by provider type.

Immunization stakeholder actions to improve adult data capture and utilization:

- Develop best practice guidance for sources and methodologies for provider identification (by provider type and provider setting).
- Provide funding for staff to execute adult vaccination program activities related to identification, outreach, and recruitment.
- Examine the vaccination and reporting practices of employee health programs and contracted vaccination services to develop guidance and best practices for engaging and interfacing with these entities.

RECRUITMENT

As adult vaccination providers are identified and made known to the IIS program, IIS staff are tasked with reaching out to **(1) promote the IIS and its supporting functionality, (2) facilitate access and reporting to the IIS, and (3) train users on the various IIS features.** During the AIRA virtual meeting, breakout groups were asked to identify the factors most likely to hinder adult reporting. The following items were notable:

- Lack of focus on adult vaccination in general at the national, state, and provider levels
- Lack of adult reporting mandates
- Perception that IIS are only for children/childhood records
- Lack of awareness about IIS in general
- Concerns about low adult data saturation and low data quality
- Limited time during patient encounters, immunizations aren't prioritized
- Challenges with the onboarding process or meeting onboarding criteria
- Convincing providers who are unwilling/unable to establish electronic interfaces to manually enter doses administered into the IIS
- Not always clear who is responsible for reporting patients and vaccinations (especially for providers who offer only a limited vaccine selection or refer patients out for vaccination services)
- Lack of value (or perceived value) to the provider

IIS programs should consider these issues when developing recruitment strategies. **The IIS must provide value to the provider community in order to solidify their ongoing use and support.** A major factor in perceived value is data saturation—the degree to which an IIS has collected all patient and vaccination records within the jurisdiction with the ultimate goal of achieving complete data saturation.[40] This topic is reviewed further in the section titled "Improving data saturation." **Active reporting by all vaccinating providers, whether mandated or voluntary, whether direct data entry or electronic interface, is imperative to ensuring that IIS can provide complete, consolidated vaccination records to all of the stakeholders who rely on them.**

[40] Importing Legacy Data to Improve IIS Saturation (AIRA, 2019): https://repository.immregistries.org/resource/importing-legacy-data-to-improve-iis-saturation/

When asked what strategies have been the most successful for recruiting adult vaccinators to participate in the IIS, SME interview and virtual meeting participants indicated the following:

- Instituting mandatory reporting policies and mandates
- Educating providers on adult vaccination schedules, IIS reporting requirements, and reporting options
- Offering a VFA program and encouraging provider participation
- Offering provider incentives to report, to participate in the VFA program, and/or to participate in immunization/IIS educational opportunities
- Reducing reporting barriers by establishing electronic interfaces between EHRs and the IIS
- Offering incentives or financial assistance to help providers establish EHR-IIS interfaces
- Promoting specific IIS tools/features of greatest interest to adult providers
- Establishing strategic partnerships with other entities (e.g., provider organizations and large health care systems) and immunization champions to promote awareness of the IIS and encourage provider participation through partner list serves, periodic member publications, presentations at membership meetings, etc.
- Implementing provider report cards to stimulate competition
- Implementing IIS-based consumer access portals and services such as a vaccine passport program—consumer demand for complete personal records helps drive provider participation

With the rise of EHRs, some IIS features have become less of a recruitment selling point, as EHRs have independently evolved support tools for similar features. What EHRs are unable to replicate, however, is access to consolidated immunization records across multiple sources. **The ability to establish an electronic interface between a provider's EHR and the IIS has become the primary focus for both providers and IIS programs nationwide. Providers are much more likely to participate in the IIS if access to records and reporting of dose administrations is seamlessly integrated within the EHR, thereby requiring little intervention by the providers themselves.** Expanding existing child-only interfaces to include adult records, expanding existing multi-facility or provider network interfaces to include more adult providers, and connecting to the IZ Gateway offer some easy ways for IIS programs to recruit providers and increase adult-capture activities. Pharmacy reporting hubs provide a similar solution for large, retail pharmacies by providing seamless, automated integration between pharmacy management systems and IIS. These topics are explored further in the section on Onboarding.

When asked to identify which IIS features provide the greatest benefit to the adult provider community, members of NAIIS and the EHR vendor community indicated that the IIS as a "source of consolidated vaccination records" was overwhelmingly the most beneficial feature of the IIS. This was followed by "clinical decision support and vaccine forecasting" and "Healthcare Effectiveness Data and Information Set (HEDIS)/other reporting requirements." **Data saturation and record completeness are the primary factors that attract providers and affect provider perception of the IIS.** This sentiment was echoed in the SME interviews. Other IIS features such as coverage assessment, outbreak management, fulfilling patient record requests, reminder/recall, quality improvement activities, and inventory management were rated considerably lower by NAIIS and EHR vendor respondents. In general, providers are more likely to leverage data and system features in their respective EHRs to fulfill these secondary functions.

Note: Features such as coverage assessment, outbreak management, and reminder/recall may have much higher value in the public health setting where staff rely on IIS data to evaluate population health indicators for the development and evaluation of targeted programs and interventions.

During the AIRA virtual meeting, participants were asked to use three words to describe the IIS to someone who may not be familiar with IIS. The following word cloud illustrates the collective responses. Key words and phrases such as "quick," "helpful," "immunization big data," "population-based," "service-oriented," and "convenient" may be useful for marketing and messaging during provider recruitment efforts.

SMEs also indicated that the strategies for identifying and recruiting providers who vaccinate adults is the same regardless of whether they vaccinate children, adults, or a combination of both. Primary messaging focuses on record reconciliation/consolidation, recommendation of doses due or past due, and preventing over-vaccination.

The AIRA survey asked participants to describe opportunities or strategies that were planned or previously implemented to increase adult immunization capture in the IIS. The following responses were notable:

- Capitalize on interest in administering COVID-19 and/or seasonal influenza vaccine
- Expand adult immunization program activities and vaccine offerings (VFA)
- Implement interstate data sharing/exchange
- Modify legislation to require reporting or remove consent barriers
- Expand efforts to engage with long-term care, skilled nursing facilities, nursing homes, and acute care facilities
- Target pharmacies and prioritize pharmacy interfaces
- Identify strategic partner candidates to help identify providers and promote the IIS to members

Immunization stakeholder actions to improve adult data capture and utilization:

- Maximize efforts to recruit "easy targets."
  - Expand existing HL7 interfaces to include the entire patient population for practices serving both children and adults (see also Onboarding).
  - Expand existing HL7 interfaces with health care networks that include numerous clinics, hospitals, and specialty providers to include all of the providers within the network who vaccinate or may need access to vaccination records (see also Onboarding).
  - Prioritize pharmacies and connect to existing pharmacy data exchange
  - Connect to the IZ Gateway for access to other jurisdictions and providers participating in that effort.
- Investigate and address challenges associated with the recruitment of and reporting from federal entities like the military, VA, and IHS/Tribal Health (see also Identifying adult providers).
- Examine and improve IIS and VFA marketing and messaging to best appeal to the business needs, operational needs, and general interests of the provider community.
- Improve data saturation of adult records in the IIS to improve value of the IIS for all stakeholders (see also Improving data saturation).
- Leverage COVID-19 planning and response to increase outreach with adult providers and promote IIS tools and features for support of a pandemic response (see also COVID-19 opportunity).
- Leverage other stakeholders and professional organizations interested in partnering and assisting with IIS awareness and recruitment efforts—resources, educational efforts, QI projects, immunization champions, etc.

ONBOARDING

The majority of providers increasingly leverage an EHR product to manage patients and clinical encounters. In 2018, 78.7% of office-based physicians had a certified EHR system.[41] Providers with EHRs predominantly use their EHR as the primary source for reviewing immunization records and forecasts. This may occur through either a local search of their EHR system or through an electronic query to the IIS if a bidirectional (query/response) interface has been established.

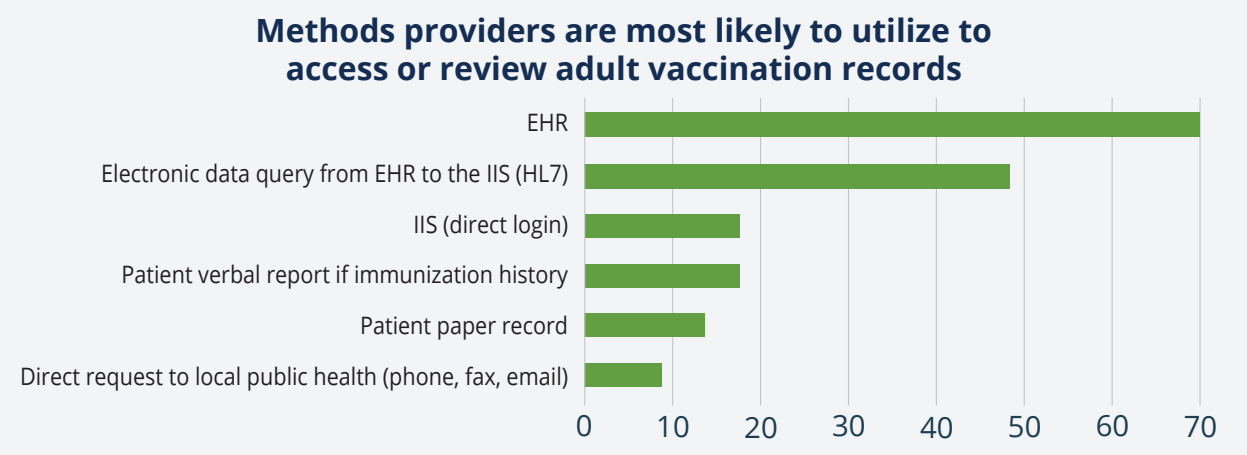
The interoperability between EHRs and IIS plays a central role in helping clinicians manage and administer vaccines. The Immunization Integration Program (IIP)[42] is a CDC National Center for Immunization and Respiratory Diseases (NCIRD)-sponsored initiative[43] focused on ensuring that clinicians and IIS have access to timely, complete, and accurate immunization data to improve clinical decision making and immunization management, with the goals of improving vaccination coverage and reducing vaccine-preventable disease. The IIP brings together expert stakeholders representing clinicians, IIS, EHR developers, public health, and others through the IIP Collaborative to improve interoperability, information sharing, and access to immunization information by clinicians and public health. The IIP Collaborative identified the following priorities as part of its 2020 objectives:

- Addressing variability in the handling of acknowledgement messages among EHRs, IIS, and clinicians to improve the quality of information used for decision making
- Helping to address challenges associated with multiple patients' being identified by IIS in response to queries from clinicians through their EHR systems
- Promoting standardization in transport methods across EHRs and IIS
- Improving patient identification and matching to support information sharing and management

In general, providers with an EHR are less likely to interact directly with the IIS to perform patient searches and review immunization records. Combined responses from the AIRA IIS community, NAIIS, and EHR vendor community surveys resulted in the following distribution of responses to a question about where adult vaccination providers are most likely to access and/or review adult immunization records (**Figure 10**).

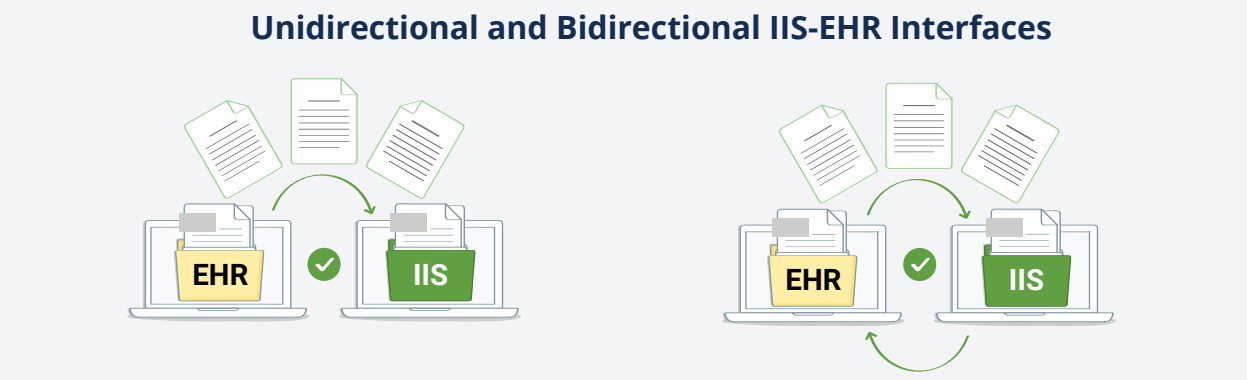
[41] https://www.cdc.gov/mmwr/volumes/69/wr/mm6938a8.htm?s_cid=mm6938a8_w
[42] https://www.himss.org/what-we-do-initiatives/himss-immunization-integration-program
[43] Key partners include AIRA, Healthcare Information and Management Systems Society (HIMMS), and Chickasaw Health Consulting.

Figure 10 | *Methods providers are most likely to utilize to access or review adult vaccination records*



If the EHR does not provide an option to query the IIS, the provider has access only to whatever portion of the patient's record is held locally in the EHR. For providers with a bidirectional interface, the EHR can query the IIS for an immunization record allowing the provider to verify and/or supplement whatever history the provider has recorded locally with vaccinations that may have been administered by other providers. When properly configured, the EHR can query the IIS to retrieve an immunization record, incorporate any new doses from the IIS into the EHR, and leverage the CDSi features offered through IIS forecasting. In both unidirectional and bidirectional interfaces, doses administered during the visit are reported back to the IIS to ensure that both the IIS and EHR contain an updated patient record. **Figure 11** illustrates the data flow for both scenarios.

Figure 11 | *Unidirectional and Bidirectional IIS-EHR Interfaces*



The various survey findings suggest that establishing electronic interfaces between EHRs and IIS is the best method for increasing adult immunization capture in IIS. This concept was also a recurring theme in the AIRA virtual meeting discussions, with a specific focus on the critical importance of prioritizing bidirectional data exchange. However, when asked to identify the top three technical and programmatic barriers or challenges that an immunization/IIS program may face when expanding efforts to increase adult data capture, AIRA survey respondents cited onboarding of new providers and inability/inexperience of EHR vendors with sending HL7 messages as some of their primary concerns.

Note: All certified EHR products must be able to produce an HL7 message in order to pass certification. The onus for understanding HL7 and producing a viable HL7 v2.5.1 message should be placed on the EHR vendor or technical provider staff. IIS staff should not be expected to provide HL7 education. Providers or EHR vendors needing more information on HL7 should be pointed to appropriate resources, such as the CDC HL7 Implementation Guide.

In April 2020, AIRA administered a mass vaccination quick survey to the IIS community in conjunction with a separate project deliverable to provide a summary of IIS and external mass vaccination solution capabilities. The quick survey timing coincided with the emergence of the COVID-19 pandemic. More than half of the respondents cited concerns about the ramp-up of onboarding activities that would be required to support a mass vaccination effort. Results from the adult survey and the mass vaccination survey demonstrate that **onboarding activities are a primary concern for IIS program staff during both routine and emergency response operations due to staffing resource requirements and timelines for bringing a new interface to production**.

In 2018, AIRA published the *Onboarding Consensus-Based Recommendations*[44] for IIS onboarding staff and other participants in the onboarding process. Guidance was developed with input from a group of carefully selected stakeholders[45] and a focus on process improvements, implementation considerations, and recommendations for reducing bottlenecks and increasing the number of production interfaces. The primary challenges addressed in the guidance include:

- Reducing the amount of time that providers/vendors spend waiting to begin the onboarding process and reducing the amount of time that providers/vendors spend in the development/testing phase once they begin actively onboarding
- Reducing the number of jurisdictions with local requirements or local interpretations of the HL7 standard that require EHR vendors to develop one-off solutions
- Reducing reliance on IIS staff to facilitate the onboarding process by identifying opportunities to implement automation or efficiencies
- Reducing the number of legacy interfaces using older interfacing standards and technologies for connection, transport, and messaging

The onboarding and monitoring process for adult interfaces is the same as that used for child-only and child-adult interfaces. The only meaningful difference in interface validation is seen between those providers who participate in the state-funded and federally funded vaccine programs (VFC/VFA) and those who do not because of the additional inventory monitoring and monthly reporting requirements associated with program participation; however, the onboarding and validation *process* is otherwise the same.

Historically, many IIS programs prioritized the onboarding of providers who participate in the jurisdiction's VFC program. Some jurisdictions even prohibited the submission of adult records. For instance, a family practice may have been asked to send records only for patients <19 years of age, and/or the IIS may have screened for and prevented records with a date of birth >19 years from entering the IIS. As state policies and mandates have evolved over time, IIS have increasingly welcomed, and even required, the submission of adult vaccination data.

Leveraging and expanding existing interfaces originally established for children among providers or provider organizations who see both children and adults was reported during IIS interviews as a significant source of adult vaccination data. Expanding existing interfaces within an integrated

[44] https://repository.immregistries.org/resource/onboarding-consensus-based-recommendations/
[45] IIS programs with model onboarding processes, larger EHR partner organizations, IIS vendors, and the American Academy of Pediatrics

health care network or large provider organization (e.g., Kaiser Permanente, Ochsner) to include all facilities/clinics within the network also provided a wealth of data by facilitating access to vaccine doses administered by any provider or specialist within the organization. Expanding existing interfaces to include adults or additional facilities within a network is reportedly an easy adaptation for IIS and EHR vendors to make.

The following comment, received by an EHR vendor representative in conjunction with the AIRA EHR vendor survey, reinforces the fact that child-only, child-adult, and adult-only interfaces are essentially the same when all factors are held constant:

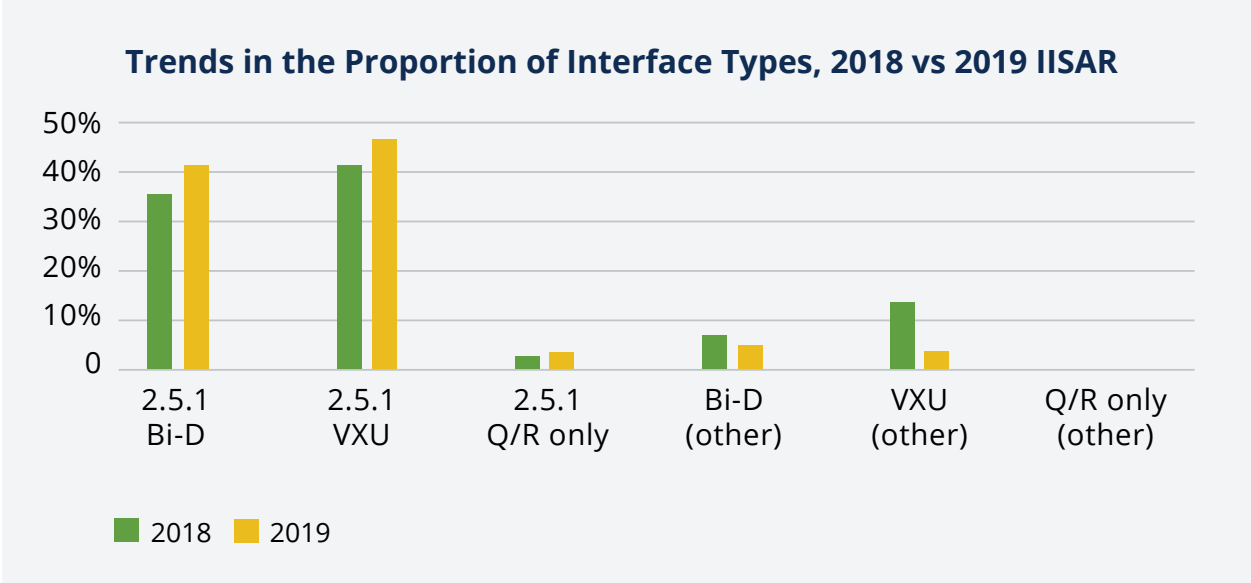
> **"There are no substantially greater hurdles for adult immunizations to be reported than for children. The federal EHR incentive programs are agnostic to whether immunizations are administered to adults vs. children, so adult-only practices are just as likely to implement electronic interfaces. And even for jurisdictions where there are laws mandating child immunizations be reported, I suspect the same providers would be just as likely to also report immunizations for their adult patients as well."**

Progress toward establishing electronic interfaces, and the proportion of unidirectional to bidirectional interfaces, is assessed annually in the CDC's IISAR. The question examines the total number of providers in the jurisdiction with production interfaces. **According to the IISAR, electronic interfaces are on the rise. In reviewing 2019 IISAR data, 59% of all providers enrolled in the IIS had established an electronic interface. At the end of 2019, approximately 46% of all IIS interfaces were categorized as bidirectional, and 51% were categorized as unidirectional**. The different types of interfaces can be defined as follows:

- **Unidirectional:** Electronic data exchange where the EHR reports doses administered to the IIS (VXU).
- **Bidirectional:** Electronic data exchange where the EHR can electronically request patient records and an evaluated forecast from the IIS using query (QBP) and response (RSP), and doses administered are reported to the IIS (VXU).
- **Query/response only:** Electronic data exchange where the EHR can request patient records and an evaluated forecast from the IIS using query/response (QBP/RSP) for viewing and consumption only. This option is reserved for providers who need the ability to review immunization records but do not offer vaccination services (e.g., specialists who refer patients out for vaccinations).

The following chart (**Figure 12**) demonstrates a year-to-year comparison of the proportion of interface types across the two years where this information has been collected in the IISAR.

Figure 12 | *Trends in the Proportion of Interface Types, 2018 vs 2019 IISAR*

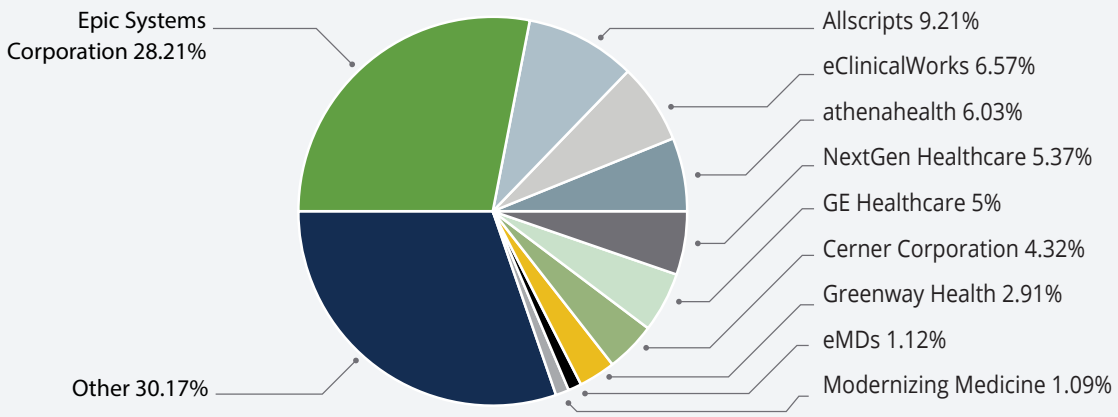


Note: Meaningful Use and MU financial incentives played a significant role in helping to establish provider interfaces with IIS. The Office of the National Coordinator for Health Information Technology (ONC) determined that, as a result of MU, the percentage of participating Medicare professionals who vaccinate and report to an IIS increased from 51% in 2011 to 72% in 2014.[46] Among the IIS community, it has been noted that these efforts disproportionately benefited high-volume providers and pediatricians/family practices who vaccinate children. Similar incentive programs may be needed to assist small and midsize providers with establishing EHR-IIS interfaces. Incentive programs may also be needed to facilitate upgrades to existing interfaces to support bidirectional data exchange.

[46] https://dashboard.healthit.gov/quickstats/pages/medicare-eps-immunization-registry-reporting-trend.php

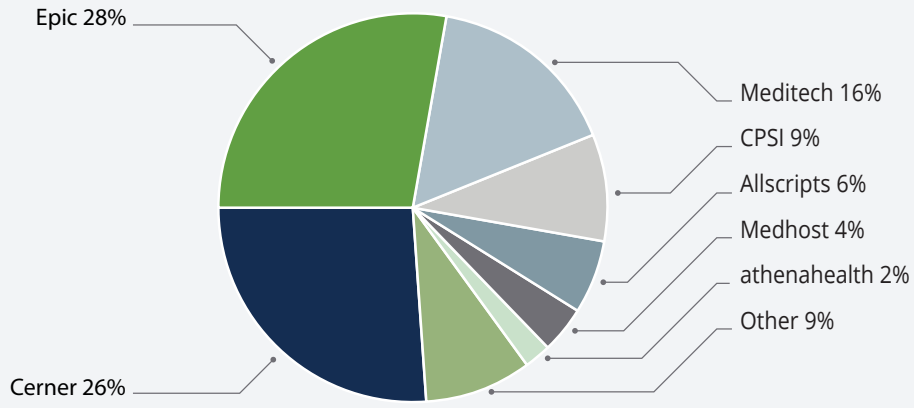
In the United States, there are several hundred EHR products on the market. Many have successfully interfaced with IIS in multiple jurisdictions. According to a 2018 report by KPMG,[47] the following EHR vendors make up the largest proportion of the market share for ambulatory EHRs:

EHR vendors with largest proportion of market share for ambulatory EHRs



The top acute care hospital EHR vendors, per a 2019 KLAS Research report,[48] included:

Top acute care hospital EHR vendors



[47] https://www.ehrinpractice.com/largest-ehr-vendors.html
[48] Idem.

Many IIS programs strategically target providers using these larger EHR products to take advantage of economies of scale when onboarding multiple providers who use the same EHR platform. Some of the larger EHR vendors and integrated health networks are also working toward connecting with the IZ Gateway to facilitate data-sharing interfaces across multiple jurisdictions more easily. A multi-state hub model is already in use for all Allscripts clients. For pharmacies, STChealth[49] has developed a data exchange network (ImmsLink) being leveraged to help IIS connect to more than 35,000 pharmacy locations, including CVS, Walgreens, Costco, and Walmart pharmacies.

On the provider side, a handful of general challenges have been reported both formally and anecdotally:

- Not all providers have an EHR.
- Not all EHR products on the market support HL7, and not all EHR products that support HL7 are capable of bidirectional data exchange.
- EHR vendors often charge a fee to establish and/or maintain an interface with the IIS; these fees vary widely and may be cost-prohibitive to some small and midsize providers.
- Establishing an interface with the IIS may not be a priority for the practice if reporting to the IIS is not otherwise mandated.

The impact of these barriers and challenges should be investigated further, along with possible solutions to facilitate the long-term vision for increasing adult vaccination capture in an IIS. Several of the key messages captured during the AIRA virtual meeting focused on the importance of establishing electronic interfacing to facilitate adult capture:

> **“Bidirectional access is a priority to all IIS users, independent of provider type. The first step to vaccination is knowing who needs to receive a vaccine and which dose in a series is needed.”**

> **“Automation of data reporting and adding provider reporting as part of standard of care.”**

> **“Bidirectional reporting can make or break a provider’s experience with IIS and can offer advantages that incentivize IIS use.”**

> **“Need for consistent, bidirectional IIS throughout the country.”**

[49] https://stchealth.com/

The IIP Testing and Recognition Program[50] facilitates the adoption of consensus-based, immunization-related capabilities within EHRs to improve interoperability with IIS, reduce burden on clinicians, and recognize EHR products with immunization-centric functionalities. This voluntary program serves as a platform for EHRs to demonstrate their products' inclusion of immunization data exchange capabilities to support clinicians in selecting an EHR product. Chickasaw Health Consulting has also published guidance, titled *Immunization Integration Program: Immunization-Related Capabilities and Guidance*[51] (September 2020), to provide EHR vendors and software developers with clinical workflow requirements and suggestions. While there are many competing priorities for clinicians when selecting an EHR product, there may be opportunities to improve awareness of the sorts of capabilities to consider for improving immunization management in the practice setting, especially as it relates to interoperability and data exchange with IIS.

Immunization stakeholder actions to improve adult data capture and utilization:

- Focus on increasing the number of electronic interfaces with providers serving adults—specifically bidirectional interfaces for those administering vaccinations and query for those who typically refer patients out for vaccination services.
- Prioritize interfaces that can produce higher results with less effort: expansion of existing interfaces, pharmacy data exchange networks, providers using the larger EHR vendor platforms, high-volume providers, and providers most likely to report (see also Identifying adult providers).
- Examine provider-side/EHR-side challenges and barriers with data capture and electronic interfacing to identify and implement possible solutions: EHRs not capable of data exchange, EHRs not capable of bidirectional data exchange, cost of establishing an interface, transitioning between EHR products, etc.
- Provide funding for staff to execute adult vaccination program activities related to onboarding and interface monitoring.
- Identify resources and promote incentive programs to help providers establish electronic interfaces between their EHRs and IIS.
- Improve data saturation of adult records in the IIS to increase and improve bidirectional and query returns (see also Improving data saturation).

[50] https://www.himss.org/what-we-do-initiatives/iip-testing-and-recognition-program
[51] https://www.himss.org/sites/hde/files/media/file/2020/10/07/iip-capabilities-guidance-requirements.pdf

IMPROVING DATA SATURATION

Data saturation and record completeness are the primary factors that drive IIS success and provider perception of the value and utility of the IIS. Users of the IIS who search or query the system should be able to find the patient of interest along with a record of vaccinations the individual has received. This information can then be used to drive clinical decisions about which vaccinations a patient is due to receive. Unfortunately, this may not always be the case. The following comment received in conjunction with the AIRA NAIIS survey reinforces the critical importance of record reporting and the risks of incomplete data:

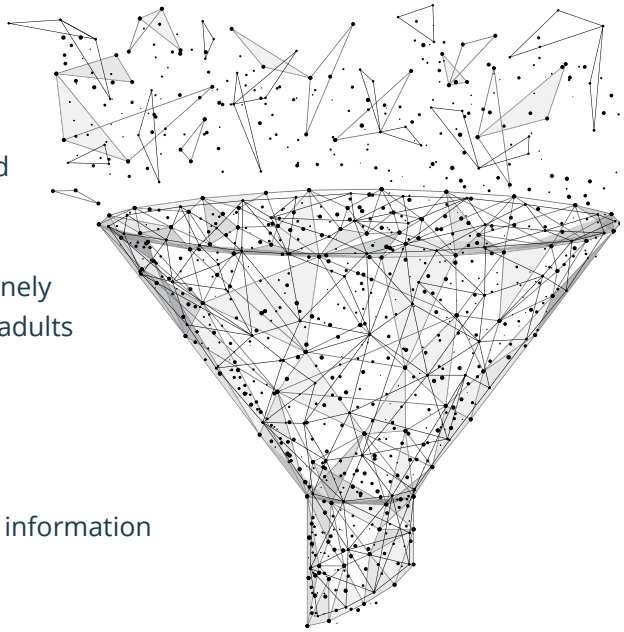
> **"We find the records [in the IIS] are often incomplete and making a decision to immunize based on the registry is unsafe."**

While this comment should not be interpreted as a reflection of IIS on the whole, this perception of even a single IIS interaction demonstrates room for improvement. Increased participation by adult providers will improve data in the IIS, and improved data will thereby increase provider participation.

In 2019, AIRA published a document titled *Importing Legacy Data to Improve IIS Saturation*[52] to establish best practices for the collection of legacy data, gap monitoring and resolution, and increasing data completeness in IIS. The document examines key strategies for increasing data saturation:

1. Encourage all vaccinating providers to report every dose administered to the IIS.
2. Encourage all vaccinating providers to document all historical doses presented on a patient's immunization record and report these historical doses to the IIS.
3. When establishing an electronic interface, IIS should secure an initial legacy data load to ensure that all documented patients and vaccinations in the provider's system are used to update the IIS.
4. Monitor existing production interfaces for gaps in reporting and, once resolved, pursue a gap data load for the affected time period or affected record.
5. Leverage strategic data partnerships with other entities that may house patient and vaccination data to supplement provider-reported data.

[52] https://repository.immregistries.org/resource/importing-legacy-data-to-improve-iis-saturation/



While full participation by vaccinating providers is imperative to ensuring that IIS can provide complete vaccination records to those who rely on them, other strategic data sources and partnerships can be leveraged to help improve adult population representation and record saturation. According to the AIRA survey and SME interviews, IIS programs have successfully and routinely collected supplemental patient and vaccination data for adults through the following data sources:

- Vital records
- Medicaid
- Health plan/payer claims
- Health information exchanges (HIE), regional health information organizations (RHIO), master patient index (MPI) initiatives

IIS partnerships with other entities such as Medicare, Department of Motor Vehicles (DMV), and Refugee Health Programs are also on the rise where state mandates or policies allow for data sharing across platforms.

Note: Some IIS have expressed concern about the reliability and accuracy of data received from other sources (specifically data from health/insurance plans). To alleviate some of these concerns, IIS programs may choose to import this data as non-owning/historical. IIS programs should always consider risk versus benefit when pursuing data partnerships.

Across the immunization community, there has historically been a greater focus on vaccinating children, due in part to the success of the VFC program and vaccination requirements for school and child care attendance. In turn, the focus on childhood vaccination has led to a higher saturation of child and adolescent records in IIS nationwide as well as a higher demand and expectation for these records to be complete and up to date in IIS. The lack of focus on adult vaccination has resulted in a lack of urgency regarding vaccination activities and accountability for reporting adult dose administrations to IIS.

Immunization stakeholder actions to improve adult data capture and utilization:

- Attempt to secure legacy data loads in conjunction with onboarding of all new provider interfaces.
- Pursue legacy data loads with existing provider interfaces if one was not secured at the time the interface was originally established.
- Encourage existing providers to always record and report all historical vaccinations documented on a patient's immunization record.
- Establish strategic data partnerships with other entities that may have adult demographic or vaccination records to supplement data reported by the provider community.
- Investigate reported data quality concerns that may result from legacy data loads or external partner data and develop best practice guidance for mitigating these concerns.

DATA MANAGEMENT AND DATA UTILIZATION

Establishing and maintaining a high level of confidence in IIS data is important for immunization/IIS program staff, providers, and external data partners. There are three activities that directly impact IIS perception and ultimately encourage increased provider and stakeholder participation:

1. Increasing data saturation
2. Improving data quality
3. Demonstrating how data captured in the IIS can be meaningfully leveraged by adult providers and other stakeholders

Improving data saturation was addressed in the previous section. The goal is to consistently work toward securing a complete immunization record for every individual residing in and/or receiving services within a jurisdiction. Data saturation is a key driver of IIS success and plays an important role in both data quality and data utilization. This concept was a recurring theme in the AIRA virtual meeting discussions.

Data quality management is an ongoing activity, and an ongoing challenge, for all IIS programs. **The concept of data quality is multifaceted and can be categorized based on accuracy, completeness, and timeliness.** Data quality issues may appear at various levels: field level, message level (HL7), record level, and registry (IIS) level. Some issues are the result of simple user data entry errors, while others are more complex or systemic.

IIS have various tools and features to identify, and in some cases resolve, data quality issues. For example, the IIS uses complex algorithms to identify duplicate patients and duplicate vaccination events. These are either resolved automatically when there is a high match confidence or queued for manual review when the system cannot confirm the match within the allowable parameters. Complex logic is also used to evaluate inbound HL7 messages. Depending on the severity of identified issues, the IIS may issue errors on problematic message segments or prevent the data from entering the IIS altogether.

On the issue of data quality, AIRA has already developed a variety of documents to guide the IIS community in improving general data quality for both incoming data (HL7) and data at rest.[53] These resources are readily available to the IIS community through the AIRA repository. Some of the more relevant resources include:

- *MIROW Data Quality Assurance in Immunization Information Systems: Incoming Data* (2008)[54]
- *MIROW Data Quality Assurance: Selected Aspects* (2013)[55]
- *IIS Data Quality Practices: Monitoring and Evaluating Data Submissions* (2017)[56]
- *IIS Data Quality Practices: To Monitor and Evaluate Data at Rest* (2018)[57]

[53] Data at rest refers to the entire repository of patient and vaccination records held in the IIS.
[54] https://repository.immregistries.org/files/resources/5835adc2dbbe4/data_quality_assurance_in_immunization_information_systems__incoming_data_.pdf
[55] http://repository.immregistries.org/resource/data-quality-assurance-in-immunization-information-systems-selected-aspects/
[56] http://repository.immregistries.org/files/resources/59cabe6404421/data_quality_phase_ii.pdf
[57] https://repository.immregistries.org/files/resources/5c002cbde216d/aira_dq_guide_data_at_rest_-_final.pdf

Concerns and reservations about data saturation and data quality adversely impact data utilization, while higher data confidence leads to more frequent, more complex, and more creative utilization of IIS data. The relationship between data confidence and data utilization was examined in an internal report prepared for AIRA leadership titled *Needs and Gap Assessment Report: IIS-Based Coverage Assessments* (2019). The report identified numerous uses for IIS data including:

- Identifying gaps and disparities through coverage assessment
- Program planning and targeted outreach to address identified needs
- Evaluating the impact of various programs/interventions
- Informing and supporting changes to programs and policies
- Justifying resource allocations

Per the Needs and Gap Assessment Report, data confidence tends to be considerably higher among the more mature IIS programs nationwide. These programs report that IIS data are held in high regard and are leveraged as a primary data resource to support numerous stakeholder activities and academic studies. At times these programs have trouble keeping up with data requests from internal and external stakeholders. **Mature IIS programs suggest that the more a program leverages its data, the more data it will receive and the better the data quality becomes.** These programs also encourage others to focus on what is good about the data and not focus on the imperfections.

Changing the perceptions and practices for IIS data utilization can be a challenge for IIS programs with less confidence in their data or lack of support from their provider community or external partners. These programs should acknowledge limitations by leveraging statements like, "using data available in the IIS" or "according to patient and vaccination data reported to the IIS" to help manage expectations. National messaging should focus on using data "as is" to motivate jurisdictions and their providers to increase the volume of reported vaccinations and advance data quality monitoring and improvement activities. All who rely on data from the IIS should understand:

- The inherent limitations of IIS data (if data don't get reported by those who administer doses, they will not magically appear in the IIS)
- The impact that reporting sources can have on IIS data quality (the IIS merely reflects what gets reported; if bad data are submitted by the sender, bad data are reflected in the IIS)
- The role of an IIS in the broader context of public health improvement and response (public health staff have to rely on whatever data are available at any given moment to inform important decisions)

From the adult project SME interviews, several other considerations emerged that impact both data quality and data utilization:

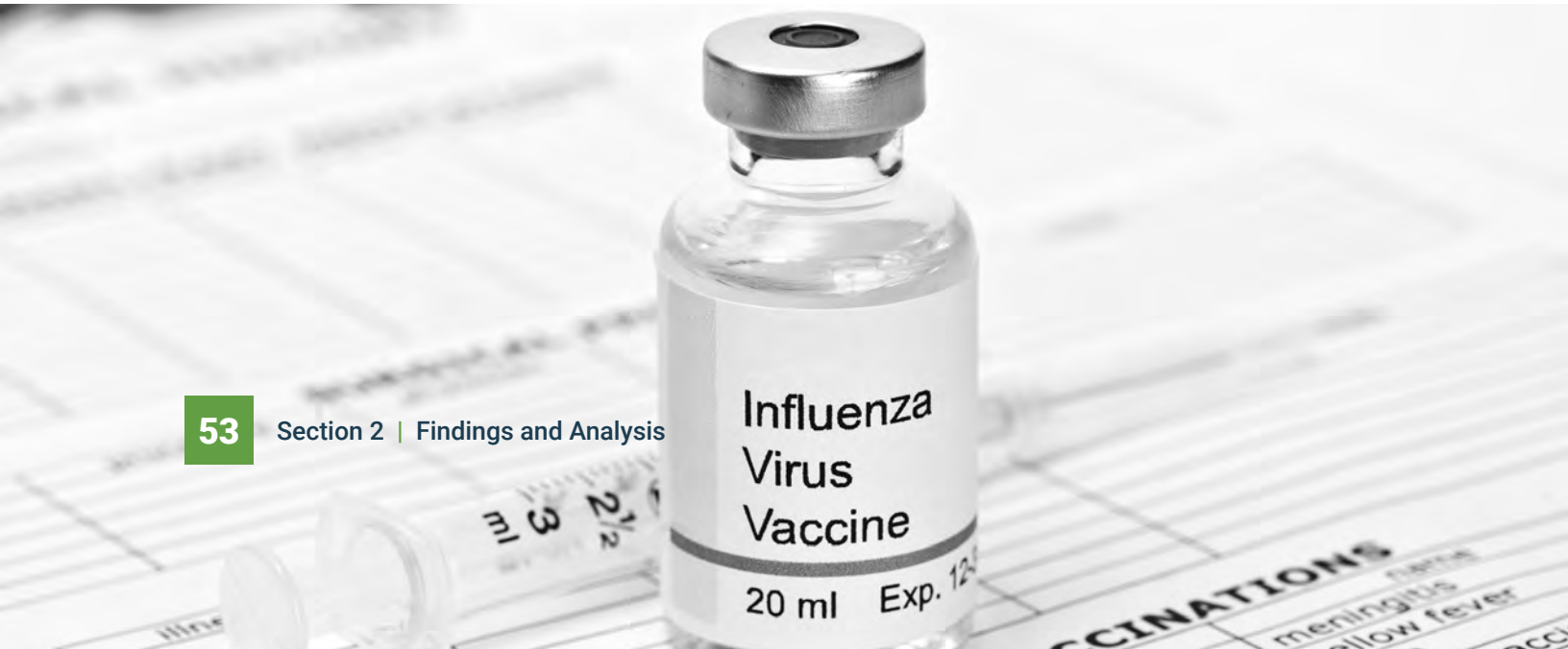
- **Ownership:** Ownership is a term used to determine which provider is responsible for a patient and reporting that person's immunization history to the IIS. The concept of a medical home is less common with adults than it is with children. As such, structuring data for adult data utilization can be more challenging. Each IIS platform handles ownership differently depending on whether the system allows a patient to be associated with a single provider or many providers (one-to-one versus one-to-many). There are pros and cons to each approach.
- **Patient management:** Managing adult patient records may be more complicated than managing records for children. Adults are more likely to have name changes that could impact patient matching and deduplication. Adults (especially young adults and seniors) may also be more transient, which complicates the tracking of patient movement and impacts patient matching and deduplication. Inactivation of adult patients who move out of the area or have passed away is an important element of managing population denominators.
- **Special factors:** Challenges and inconsistencies with the capture and management of contraindications, precautions, and other high-risk factors impact coverage assessment and multivariate analysis. For example, a program may have difficulty identifying the percentage of pregnant women who received an influenza vaccine. Consistent capture and reporting of race and ethnicity is also a factor when assessing coverage and disparities using multivariate analysis.

As immunization/IIS program staff and stakeholders become more comfortable with IIS data, they can expand their efforts and resources for data extraction, data analysis, and data visualization to better target program interventions and evaluation activities. Staff with proper technical knowledge and data access are needed to facilitate data requests and stakeholder-guided efforts. One such effort to assist IIS is the CDC's Vaccinate with Confidence initiative.[58] Through that project, AIRA provides jurisdictions with a variety of resources and technical assistance to improve data quality and confidence which is the goal of increasing coverage-level assessments and improving outbreak response.

Immunization stakeholder actions to improve adult data capture and utilization:

- Leverage existing AIRA guidance documents to inform efforts for improving data saturation, data quality management, and data utilization.
- Improve messaging on IIS data limitations and the actions stakeholders can take to help improve and resolve these issues.
- Commit to using IIS data "as is" while consistently working toward improving data saturation and data quality.
- Document best practices and lessons learned from more mature IIS programs with high data confidence and high data utilization.
- Provide funding for staff to execute adult vaccination program activities related to data management and data use.

[58] https://www.cdc.gov/vaccines/partners/vaccinate-with-confidence.html



COVID-19 OPPORTUNITY

COVID-19 has put a spotlight on the national immunization infrastructure and the importance of capturing adult vaccination data in IIS as the centralized source of vaccination information. The result of not historically prioritizing adult vaccination and reporting efforts has created additional challenges for the COVID-19 response, specifically as it relates to identifying adults in priority vaccination groups, managing available COVID-19 vaccine inventories, and tracking/reporting of vaccine receipt. **The COVID-19 pandemic has exposed areas for improvement while also presenting an opportunity to leverage the attention and investment in national infrastructure to support the longer-term efforts for improving adult vaccination data capture.** For instance, the IZ Gateway may provide a platform and mechanism for connecting a wider variety of immunization partners with the respective IIS in the jurisdictions that they serve. Another example includes leveraging vaccine passport projects to drive improvements in consumer access and facilitate proof of vaccination as needed in order to work, travel, or attend public events.

At the start of the COVID-19 pandemic, AIRA prepared a report for the CDC Office of the Associate Director for Adult and Influenza Immunization and the CDC IIS Support Branch titled *Mass Vaccination Capabilities Summary: A Summary of IIS and External Mass Vaccination Solutions* (July 2020). This report was developed as a point-in-time assessment of the tools available for the support of mass vaccination activities at the start of the COVID-19 pandemic. In conjunction with the drafting of the mass vaccination assessment, AIRA conducted a quick survey of the IIS community and observed a series of interviews conducted by the CDC IIS Support Branch (IISSB).

The April 2020 quick survey results found that, of the 49 jurisdictions that responded, 77% of jurisdictions planned to use their core IIS as a main component—*or the main component*—of their mass vaccination solution, and approximately half (53%) of the respondents indicated that they plan to use some sort of IIS-based mass vaccination module.[59]

Regardless of whether the mass vaccination support tool is integrated directly with the IIS or interfaces electronically with the IIS, it is imperative that all data collected during a mass vaccination event are reported into an IIS and/or the national repository for active monitoring of the overall campaign, accurate and timely reporting of available inventory and doses administered counts, consolidation of patient records, and the facilitation of post-event activities (e.g., reminder/recall for multi-dose series, coverage assessment, consumer proof of vaccination). After-action COVID-19 response analysis will likely inform the evolution of functionality for the next generation of IIS-based and free-standing mass vaccination support tools.

Quick survey results and CDC IISSB interviews also demonstrated that IIS program staff have similar concerns during emergency response planning as they do with expanding adult data capture during routine program operations. The following challenges were notable for both preparing for a mass vaccination response and the general expansion of IIS adult capture activities:

- Expanding access to new users or clinics
- Capturing vaccination data from non-traditional providers or points of service
- Increased onboarding activities and increased interface monitoring
- Decreased data quality
- Training new users
- Identifying high-risk/priority populations

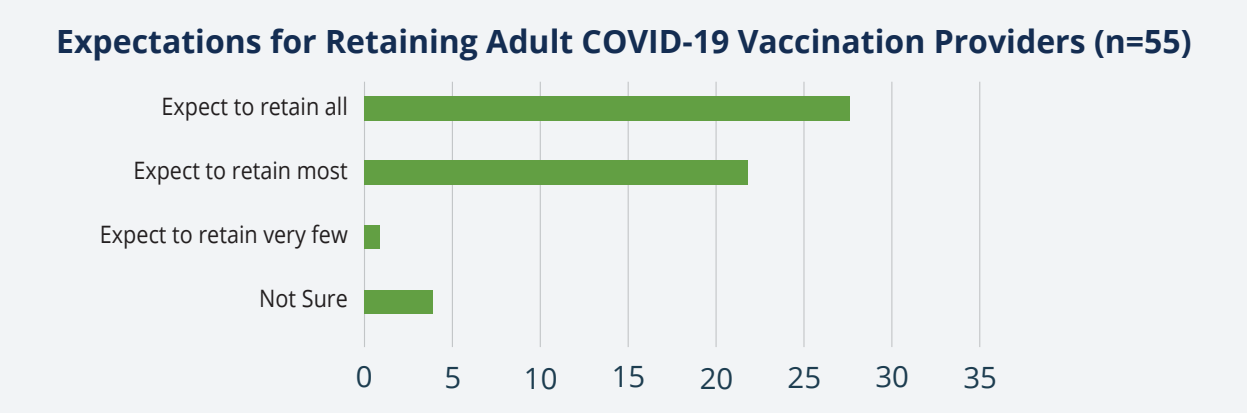
[59] Note: Survey questions were worded in the context of any mass vaccination campaign/event, not just COVID-19.

These types of concerns and challenges can predominantly be categorized as operational or resource-based considerations. The primary emphasis is placed on identification/recruitment, provider enrollment, and establishing/managing electronic interfaces. While IIS features and workflows can always be improved or enhanced, the majority of IIS have the technical ability to support mass vaccination and adult vaccination data collection as long as they align with the IIS Functional Standards.[60] See also "Technical considerations."

Many IIS programs view the current coronavirus pandemic as an opportunity to increase recruitment efforts and expand reporting within both traditional and non-traditional vaccination settings. **The COVID-19 response presents a unique opportunity to recruit and onboard adult vaccination providers, with the ultimate goal of retaining these providers as active, long-term IIS partners.** Even the most mature IIS programs expect to bring on at least a few new providers, while other IIS programs expect to enroll numerous providers in conjunction with the rollout of a COVID-19 vaccine.

In the AIRA adult survey, IIS programs were asked to respond to the following question: "If you are planning to ramp up reporting activities among adult vaccination providers in response to COVID-19, how do you foresee their ongoing involvement with the IIS at the conclusion of any mass vaccination efforts?" **Figure 13** shows the distribution of responses. The overwhelming majority of IIS programs (91%) expect to retain all or most of the providers who routinely offer vaccination services to adults with ongoing, active reporting of doses administered to the IIS.

Figure 13 | *Expectations for Retaining Adult COVID-19 Vaccination Providers*



[60] https://www.cdc.gov/vaccines/programs/iis/functional-standards/func-stds-v4-1.html

AIRA virtual meeting participants identified the following factors that are most likely to drive provider retention during routine vaccination and following emergency response efforts:

Factors supportive of provider retention following emergency response

- Ongoing use of the IIS must be integrated into the clinic workflow, and reporting must be easy, automatic, and sustainable.
- Reporting will continue if the provider sees the benefit of reporting and receives value from having access to consolidated records and IIS features.
- Providing feedback through metrics, coverage rates, and provider report cards to show that participation is having a positive impact.
- Improving data saturation and data quality for better patient matches and clinical decision support.

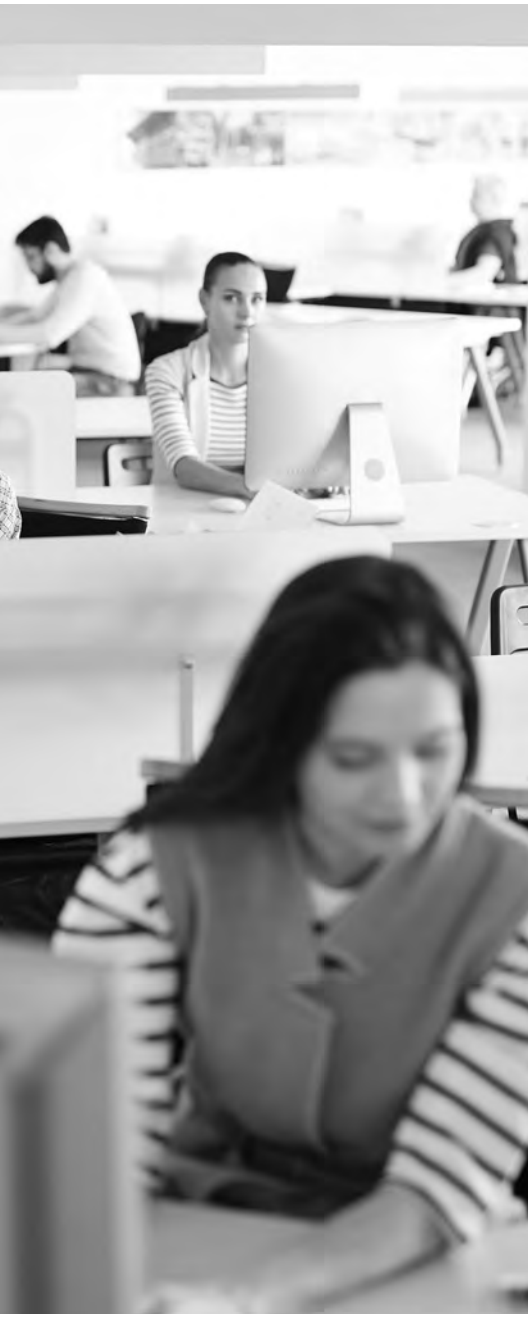
During the AIRA virtual meeting, one participant suggested that the COVID-19 response also presents an additional opportunity to offer incentives to smaller provider practices:

> “Utilize COVID-19 dollars where available to assist in IIS infrastructure and especially in small practice providers to connect to IIS and improve data acquisition and fidelity.”

While interest in improving the general capture of adult demographic and immunization data in an IIS has been on the rise, the COVID-19 pandemic has created an urgency around these efforts and identified critical gaps in current public health infrastructure for responding to these types of events. **The COVID-19 response presents a unique opportunity to recruit providers, establish electronic interfaces between EHRs and IIS, improve reporting policies/mandates for adult vaccinations, expand adult vaccination programming, and increase the funding and resources necessary to support and sustain these ongoing efforts.**

Immunization stakeholder actions to improve adult data capture and utilization:

- Leverage COVID-19 vaccination planning as an opportunity for IIS programs to engage with, recruit, and onboard new adult providers.
- Improve the policies and technology needed to meet increasing consumer access demand and emerging requirements for proof of vaccination (consumer access portals and vaccine passport services).
- Develop messaging and strategies to retain vaccinating providers as long-term IIS partners beyond COVID-19.
- Document and share lessons learned, best practices, and new strategies for public health emergency response that emerge from COVID-19.
- Ensure adequate resources to support the COVID-19 response and future emergency response efforts.



COMMUNITY IDENTIFIED NEEDS

During AIRA SME interviews, participants were asked what barriers or challenges they felt were the most difficult to overcome when leveraging the IIS to support adult vaccinators and encouraging adult providers to routinely report vaccinations to the IIS. Two primary issues were mentioned repeatedly:

- Inadequate staffing resources and general staffing constraints
- Capacity to onboard large numbers of new providers (subcategory of staffing)

Staffing issues are complex and multifaceted. In some cases, the issue is tied to a lack of funding for a dedicated position (or positions). In other cases, a state or jurisdictional hiring freeze may prevent programs from adding new positions or even filling open vacancies. This is particularly challenging in programs with high staff turnover.

Efforts to expand VFA offerings or the participating provider network, identifying and recruiting adult vaccination providers for IIS reporting, enforcing reporting mandates (where applicable), onboarding providers and monitoring provider interfaces, improving data saturation and data quality, expanding data monitoring and data utilization efforts, and educating/training adult providers require appropriate levels of staffing to effectively carry out these activities. **Lack of dedicated resources to operate an adult vaccination program prevents staff from being able to prioritize and focus on these efforts.** Lack of focus and prioritization also make it difficult for immunization/IIS programs to demonstrate the value of these activities and make the case for appropriating additional resources. IIS programs (and other stakeholders) often find themselves being asked to “do more with no additional funding.”

Other issues mentioned included:

- Competing priorities
- Training of new providers
- Provider staff turnover
- Lack of statewide reporting mandate
- Challenges with enforcing existing reporting mandates
- Ability to identify non-reporting providers
- Keeping up with data requests from internal and external stakeholders

There were also a couple of additional barriers and challenges that tend to be less tangible and may be outside the realm of what immunization program and IIS program staff can meaningfully address without the direct support of external partnerships. One key challenge is addressing general attitudes among adult providers. Many providers view reporting of vaccinations to the IIS as "lots of effort with little return." Promoting IIS reporting among providers without an HL7 interface is very difficult especially when reporting is not required. Providers are unwilling to accept the burden of dual data entry, and establishing an HL7 interface may be cost-prohibitive for some providers. It is also difficult to promote IIS reporting to providers who may not administer enough vaccinations to make IIS reporting a priority. IIS programs must also improve confidence in IIS data by overcoming stakeholder concerns about data quality (timeliness, completeness, accuracy, and cleanliness) and data saturation, which consequently is directly impacted by a lack of provider participation.

Another key challenge noted by SMEs is related to a general lack of immunization knowledge among specialty providers and those who primarily see adults. Childhood vaccinators tend to be very familiar with ACIP guidance and the recommended immunization schedule due to routine vaccination activities among the child and adolescent populations. These providers are also more likely to be familiar with the IIS and more likely to engage in active reporting. There is a perception that adult providers may view vaccination as an ancillary activity and may not have an in-depth understanding of the full ACIP vaccination recommendations for adults. Some specialty providers may also limit their focus to a subset of vaccinations specific to the nature of the specialty. It has also been reported that adult providers increasingly opt to refer vaccination services out to pharmacies and public health clinics. Some immunization/IIS programs have started actively engaging with university schools of medicine and schools of pharmacy to integrate routine vaccination and importance of IIS reporting into the school's educational and training curriculum.

SME interview participants were also asked how AIRA, CDC, and other partners such as Public Health Informatics Institute (PHII), professional organizations, and legislators can help to support the expansion of adult vaccination capture and reporting to IIS. Responses could be generally categorized as follows:

- **Advocacy:** Keep adult vaccination at the forefront and elevate it as a core national priority, develop materials that can be leveraged as conversation starters with key leadership and policy makers, testify or provide messaging for those actively pursuing rule/mandate changes, and unify messaging across national organizations/associations and their respective state chapters.
- **Increase funding:** More funding is needed to increase staff for adult program activities, and increase 317 funding to expand vaccine offerings and number of doses available for distribution.
- **Education and promotion:** Prepare tools that promote and reinforce the benefits of IIS; develop educational resources for adult providers on ACIP recommendations, the adult vaccination schedule, and the importance of reporting to the IIS.
- **Best practice guidance:** Establish forums for information sharing across IIS jurisdictions to examine how the more successful states are addressing common challenges, document lessons learned and best practices, and identify ways that adult providers can meaningfully use the data reported to the IIS.
- **Data sharing:** Facilitate interfaces with federal entities (military, VA, tribal, etc.), prioritize state-to-state data sharing, and incentivize the establishment of electronic interfaces between EHRs and IIS (similar to meaningful use).

Immunization stakeholder actions to improve adult data capture and utilization:

- **Establish adult vaccination reporting and adult data capture as a national priority, including the appropriation of consistent and sustainable funding and resources to make these efforts successful.**
- **Standardize adult vaccination program activities, expectations, and progress measurements across all states/jurisdictions.**
- **Evaluate national partnership opportunities to capitalize on tools, resources, and general support/advocacy for expanding adult vaccination and data capture activities.**
- **Assess and address factors that adversely impact provider attitudes and perception.**
- **Improve provider knowledge of the ACIP recommended schedule by investigating opportunities to improve provider education about adult vaccination and the importance of IIS.**

3 CONCLUSION AND NEXT STEPS

SECTION 3 CONCLUSION AND NEXT STEPS

Some immunization/IIS programs have chosen to prioritize adult vaccination activities and are successfully using their IIS to support and facilitate these efforts; however, there are large disparities across jurisdictions, and there is much more work to be done to uniformly expand these efforts nationally.

The more advanced immunization/IIS programs can serve as models for the larger immunization community and share lessons learned and best practices with those who have not yet prioritized these activities.

Throughout the information gathering process for this project, four key drivers emerged for increasing successful adult vaccination data capture and utilization:

- **Adult vaccination capture activities need to be prioritized at the national, state, and clinical levels** along with appropriate resource allocations to make these efforts successful.
- **Providers should be motivated to report.** Motivation may come in many forms, such as reporting mandates, financial incentives, performance incentives, consumer or peer pressure, tools/features that facilitate or improve the clinical workflow, or even intrinsic/personal values.
- **Barriers to reporting should be reduced or eliminated** with a primary focus on reducing provider burden by way of implementing automated electronic data exchange between EHRs and the IIS and eliminating explicit (opt-in) consent requirements.
- **Data confidence concerns should be addressed** to increase the use of IIS data by the various stakeholders who use (or could use) the data to support clinical, programmatic, policy, and resource allocation decisions.

A full list of the candidate stakeholder action items and activities presented at the end of each subsection in the Findings and Analysis chapter has been compiled and presented in Appendix C. Community Action Summary. In the next phase of this project, this list will be examined, prioritized, and further categorized through stakeholder engagement and will be used to establish the consensus-based recommendations and strategies that will be presented in the *Strategic Road Map*. The *Strategic Road Map* will then detail short-term and longer-range goals and activities to be completed by the various stakeholders in order to achieve the larger vision of increasing adult data capture and utilization.

APPENDICES

APPENDIX A ACRONYMS

ABBREVIATION	
ACA	Affordable Care Act
ACIP	Advisory Committee on Immunization Practices
AIM	Association of Immunization Managers
AIRA	American Immunization Registry Association
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CDSi	Clinical Decision Support for Immunizations
DMV	Department of Motor Vehicles
DOB	date of birth
EHR	electronic health record
FQHC	Federally Qualified Health Center
HEDIS	Healthcare Effectiveness Data and Information Set
HIE	health information exchange
HL7	Health Level Seven International
IHS	Indian Health Services
IIP	Immunization Integration Program
IIS	immunization information system(s)
IISAR	IIS Annual Report
IISSB	CDC IIS Support Branch
IZ	immunization
MIROW	Modeling of Immunization Registry Operations Workgroup

ABBREVIATION	
MOU	memorandum of understanding
MPI	master patient index
MU	Meaningful Use
NAIIS	National Adult and Influenza Immunization Summit
NCIRD	CDC National Center for Immunization and Respiratory Diseases
NPI	national provider identifier
NVAC	National Vaccine Advisory Committee
ONC	Office of the National Coordinator for Health Information Technology
PHII	Public Health Informatics Institute
QBP	HL7 query by parameter message (query for vaccination record)
RHC	rural health center
RHIO	regional health information organization
RSP	HL7 response to query message
SCDM	ACIP shared clinical decision making
SME	subject matter expert(s)
SNOMED	SNOMED International (common language for clinical terminology)
VA	Veterans Administration
VFA	Vaccines for Adults
VFC	Vaccines for Children Program
VXU	HL7 Unsolicited Vaccination Record Update Message

APPENDIX B REFERENCES AND RESOURCES

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APPENDIX C STAKEHOLDER ACTION SUMMARY

This appendix offers a compiled list of the "immunization stakeholder actions to improve adult data capture and utilization" that appear at the end of each subsection in the Findings and Analysis chapter.

Adult vaccination program activities (state VFA programs):

- Reduce variability in VFA program implementations across jurisdictions.
- Increase 317 funding and/or 317 funds earmarked specifically for vaccine purchase.
- Improve VFA program marketing and messaging to encourage provider participation and increase VFA vaccine uptake by adult recipients.
- Require all publicly funded dose administrations to be reported to the IIS regardless of patient age, provider type, or vaccination setting.

Policies and mandates:

- Encourage jurisdictions to implement mandatory reporting laws and policies to facilitate reporting of adult immunization records to the IIS.
- Encourage jurisdictions to address opt-in consent laws or policies that may prohibit or restrict the collection, sharing, and utilization of adult immunization records.
- Expand interstate data sharing/exchange and encourage jurisdictions to address laws that may prohibit or restrict these types of activities.
- Provide tools and support to guide state efforts for pursuing and implementing new laws or policies.
- Examine best practices for enforcing mandatory reporting laws and policies.
- Expand consumer access to IIS data via consumer access portals and/or vaccine passport services. Consumer demand for access to complete, personal immunization records helps drive expectations for active provider reporting.
- Implement a mechanism for tracking the various laws and policies for IIS reporting requirements, consent laws, and data sharing.

Technical considerations:

- Explore alternative methodologies and best practices for capturing, transmitting, and maintaining contraindications and precautions that may be helpful in the evaluation and forecast of adult vaccination records (CDSi and SCDM).
- Encourage all jurisdictions to move toward cloud-based hosting for easier scaling when additional processing and storage capacity resources are needed.
- Examine possible EHR limitations on data collection and data transmission of fields desired or required by an IIS.

Identifying adult providers:

- Develop best practice guidance for sources and methodologies for provider identification (by provider type and provider setting).
- Provide funding for staff to execute adult vaccination program activities related to identification, outreach, and recruitment.
- Examine the vaccination and reporting practices of employee health programs and contracted vaccination services to develop guidance and best practices for engaging and interfacing with these entities.

Recruitment:

- Maximize efforts to recruit "easy targets."
  - Expand existing HL7 interfaces to include the entire patient population for practices serving both children and adults (see also Onboarding).
  - Expand existing HL7 interfaces with health care networks that include numerous clinics, hospitals, and specialty providers to include all of the providers within the network who vaccinate or may need access to vaccination records (see also Onboarding).
  - Prioritize pharmacies and connect to existing pharmacy data exchange
  - Connect to the IZ Gateway for access to other jurisdictions and providers participating in that effort.
- Investigate and address challenges associated with the recruitment of and reporting from federal entities like the military, VA, and IHS/Tribal Health (see also Identifying adult providers).
- Examine and improve IIS and VFA marketing and messaging to best appeal to the business needs, operational needs, and general interests of the provider community.
- Improve data saturation of adult records in the IIS to improve value of the IIS for all stakeholders (see also Improving data saturation).
- Leverage COVID-19 planning and response to increase outreach with adult providers and promote IIS tools and features for support of a pandemic response (see also COVID-19 opportunity).
- Leverage other stakeholders and professional organizations interested in partnering and assisting with IIS awareness and recruitment efforts—resources, educational efforts, QI projects, immunization champions, etc.

Onboarding:

- Focus on increasing the number of electronic interfaces with providers serving adults—specifically bidirectional interfaces for those administering vaccinations and query for those who typically refer patients out for vaccination services.
- Prioritize interfaces that can produce higher results with less effort: expansion of existing interfaces, pharmacy data exchange networks, providers using the larger EHR vendor platforms, high-volume providers, and providers most likely to report (see also Identifying adult providers).
- Examine provider-side/EHR-side challenges and barriers with data capture and electronic interfacing to identify and implement possible solutions: EHRs not capable of data exchange, EHRs not capable of bidirectional data exchange, cost of establishing an interface, transitioning between EHR products, etc.
- Provide funding for staff to execute adult vaccination program activities related to onboarding and interface monitoring.
- Identify resources and promote incentive programs to help providers establish electronic interfaces between their EHRs and IIS.
- Improve data saturation of adult records in the IIS to increase and improve bidirectional and query returns (see also Improving data saturation).

Improving data saturation:

- Attempt to secure legacy data loads in conjunction with onboarding of all new provider interfaces.
- Pursue legacy data loads with existing provider interfaces if one was not secured at the time the interface was originally established.
- Encourage existing providers to always record and report all historical vaccinations documented on a patient's immunization record.
- Establish strategic data partnerships with other entities that may have adult demographic or vaccination records to supplement data reported by the provider community.
- Investigate reported data quality concerns that may result from legacy data loads or external partner data and develop best practice guidance for mitigating these concerns.

Data management and data utilization:

- Leverage existing AIRA guidance documents to inform efforts for improving data saturation, data quality management, and data utilization.
- Improve messaging on IIS data limitations and the actions stakeholders can take to help improve and resolve these issues.
- Commit to using IIS data "as is" while consistently working toward improving data saturation and data quality.
- Document best practices and lessons learned from more mature IIS programs with high data confidence and high data utilization.
- Provide funding for staff to execute adult vaccination program activities related to data management and data use.

COVID-19 opportunity:

- Leverage COVID-19 vaccination planning as an opportunity for IIS programs to engage with, recruit, and onboard new adult providers.
- Improve the policies and technology needed to meet increasing consumer access demand and emerging requirements for proof of vaccination (consumer access portals and vaccine passport services).
- Develop messaging and strategies to retain vaccinating providers as long-term IIS partners beyond COVID-19.
- Document and share lessons learned, best practices, and new strategies for public health emergency response that emerge from COVID-19.
- Ensure adequate resources to support the COVID-19 response and future emergency response efforts.

Community identified needs:

- Establish adult vaccination reporting and adult data capture as a national priority, including the appropriation of consistent and sustainable funding and resources to make these efforts successful.
- Standardize adult vaccination program activities, expectations, and progress measurements across all states/jurisdictions.
- Evaluate national partnership opportunities to capitalize on tools, resources, and general support/advocacy for expanding adult vaccination and data capture activities.
- Assess and address factors that adversely impact provider attitudes and perception.
- Improve provider knowledge of the ACIP recommended schedule by investigating opportunities to improve provider education about adult vaccination and the importance of IIS.

APPENDIX D METHODOLOGY OVERVIEW

This appendix provides an overview of the primary tools and resources used to inform this Landscape Analysis Report.

IIS community survey:
Survey was administered by AIRA to the immunization program managers and IIS program managers of the 64 jurisdictions that make up the CDC immunization program awardees plus the city of San Diego. Survey Monkey was used to collect responses. The survey was open from June 23, 2020, through July 15, 2020. A total of 61 unique responses were received (53 complete, 3 nearly complete, and 5 incomplete). All states/jurisdictions responded except Chicago (included in Illinois' survey response), Houston (included in Texas's survey response), San Antonio (included in Texas's survey response), and Puerto Rico.

NAIIS survey:
This survey was administered by NAIIS and AIRA to the participants of the 2020 National Adult and Influenza Immunization Summit (May 21, 2020). Survey Monkey was used to collect responses. The poll was open from May 21, 2020, through June 5, 2020. A total of 73 responses were received.

ANSWER CHOICES	RESPONSES	
State or local public health department (immunization program manager, IIS manager, etc)	47.95%	35
Provider (e.g. physician, nurse, PA, NP, etc)	9.95%	7
Pharmaceutical representative	5.48%	4
Federal governmental agency representative (e.g. CDC, HHS, etc)	5.48%	4
EHR vendor/IIS vendor	0.00%	0
Provider professional organization (e.g. AAP, APhA, AAFP, ACOG, AMA, etc.)	5.48%	4
National advocacy/public health organization (e.g. AIM, NFID, IAC, etc)	4.11%	3
Other	21.92%	16
TOTAL		**73**

EHR vendor survey:
This survey was administered by AIRA to 20 EHR vendors that actively participate on AIRA committees and standards development. Survey Monkey was used to collect responses. The poll was open from July 31, 2020, through August 10, 2020. A total of four responses were received. The following vendors responded:

- Epic
- Cerner
- Allscripts
- PCC Pediatric EHR Solutions

Subject matter expert interviews – IIS programs:
Interviews were conducted by AIRA with eight IIS programs. Programs were selected for interviews based on responses to the AIRA IIS community survey and 2018/2019 IISAR. Selected programs represented a wide range of policy/mandate models, VFA program implementation, adult data saturation in the IIS, number of electronic interfaces between provider EHRs and the IIS, strategic partnerships, geography, and IIS product/platform. Interviews were conducted between August 14, 2020, and August 31, 2020. The following jurisdictions were selected for interviews:

- Idaho
- Louisiana
- Nevada
- New Mexico
- North Dakota
- Rhode Island
- Vermont
- Washington

AIRA virtual meeting:

A virtual in-person meeting was conducted by AIRA. The meeting included 38 participants representing 20 professional organizations that guide immunization policies and practices in the United States. The virtual meeting was held September 17-18, 2020, via Zoom. The following organizations participated in the meeting and contributed to the discussions:

- Adult Vaccine Access Coalition (AVAC)
- American Academy of Family Physicians (AAFP)
- American College of OB/Gyns (ACOG)
- American College of Physicians (ACP)
- American Immunization Registry Association (AIRA)
- American Medical Association (AMA)
- American Medical Group Association (AMGA)
- American Pharmacists Association (APhA), APhA Foundation
- Association of Immunization Managers (AIM)
- Association of State and Territorial Health Officials (ASTHO)
- Centers for Disease Control and Prevention (CDC)
- Gerontological Society of America (GSA)
- Immunization Action Coalition (IAC)
- National Adult and Influenza Immunization Summit (NAIIS)
- National Adult Immunization Coordinators Partnership (NAICP)
- National Association of Community Health Centers (NACHC)
- National Association of County and City Health Officials (NACCHO)
- Office of the National Coordinator for Health Information Technology (ONC/HIT)
- Office of Infectious Disease and HIV/AIDS Policy (OIDP)
- Public Health Informatics Institute (PHII)

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