AIRA
AMERICAN IMMUNIZATION REGISTRY ASSOCIATION

Query and Response Assessment

Aggregate Report

2025 – Quarter 4

M&I
MEASUREMENT & IMPROVEMENT

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Introduction

Overview: The measurement process for Query/Response uses the National Institute of Standards and Technology (NIST) Immunization Test Suite Validation Tool. This tool provides consistent conformance-based results for all measured IIS. In addition, the technical requirements for data query and response are documented in the HL7 Version 2.5.1: Implementation Guide for Immunization Messaging, Release 1.5 and addendum. This is referred to as the National IG.

The IIS community has used messaging standards for over twenty years, and they have become more important as Electronic Health Records (EHR)-IIS interoperability has grown in health care. To keep records complete and accurate, IIS must receive data from most immunizers in their area using standard reporting methods as proscribed in the National IG. One key message type is the query (QBP), which asks the IIS if it has information on a specific patient using basic demographic details. The IIS searches its records and replies with a response (RSP) message, which tells the sending system whether the patient was found and includes any available demographic or vaccination data.

Background: Query and Response moved into the Measurement and Improvement (M&I) stage of Assessment in 2016. This report contains the aggregate results of the IIS remeasurement completed in **Quarter 4 of 2025**. IIS can access their individual measurement reports in AART.

Measures: Measurement for Assessment and Certification Workgroup (MACAW), the advisory body for M&I, approved measures and tests for Query and Response in November 2016. The detailed measures and tests document is located on the AIRA repository. Measures and tests are based on the IIS Functional Standards v5.0. Query/Response measures and tests are specifically based off the following:

- **Functional Standard C5.0**: Manage interfaces for exchange and integration of data electronically between the IIS and other information systems in accordance with federal and jurisdictional standards.
- **Guidance Statement C5.1**: The IIS exchanges data in accordance with current interoperability standards endorsed by CDC for message content, format, and transport.
- **Functional Standard E7.0**: The IIS ensures authorized users have access to patient demographic and vaccination data based on user roles and permissions.

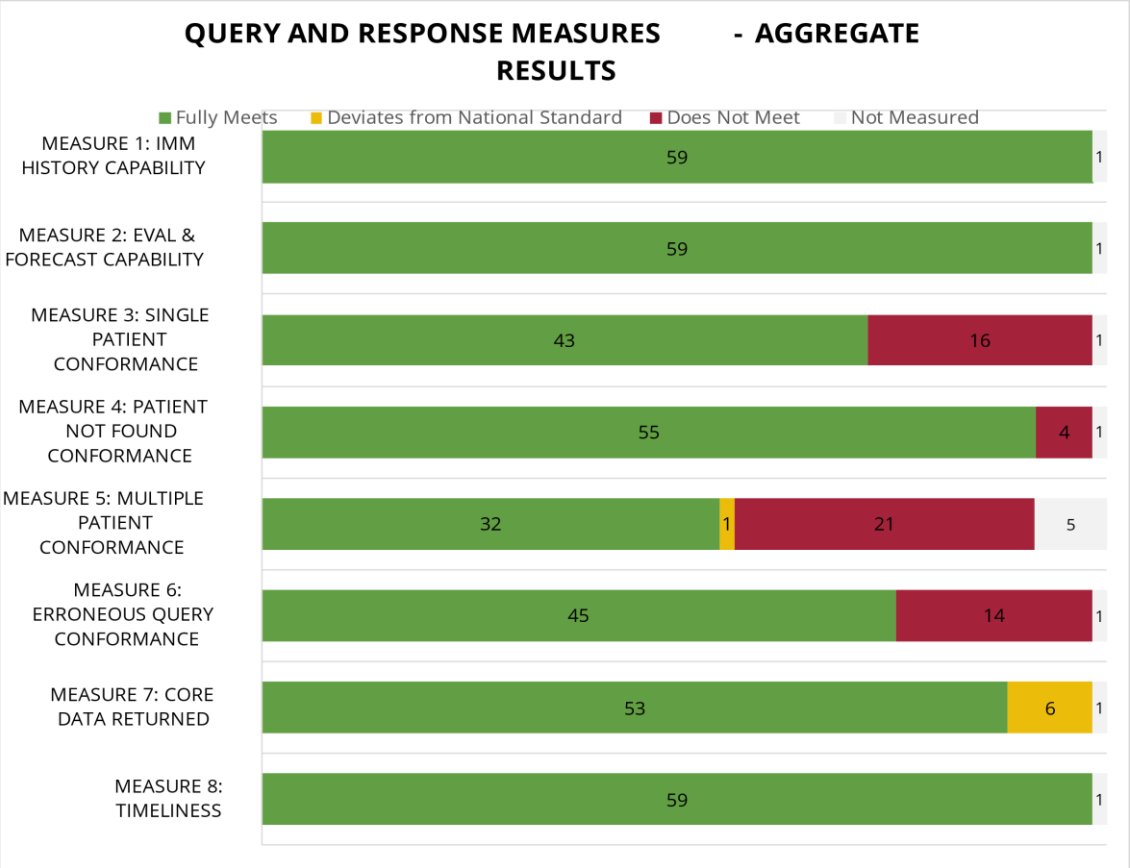
- **Guidance Statement E7.5**: The IIS supports authorized IIS partners' and providers' appropriate access to data in the IIS for public and population health purposes (e.g. childcare, schools, college, health plans, clinics).

Testing Method: To evaluate the ability of IIS to process and respond to queries, AIRA conducts a series of tests using conformant HL7 messages. Each test case is isolated to a single measure and simulates realistic scenarios such as one-to-one patient matches, no matches, and multiple potential matches. Test cases assess both structural conformance and appropriate handling of data across various profiles (e.g., Z32, Z42, Z33). Timing is also measured, with IIS expected to respond to 95% of queries within 5 seconds. Testing ensures the IIS can reliably return immunization records and forecasts in alignment with CDC-endorsed HL7 implementation guidance. Each measure has at least one test case but may have more as needed. In total, 13 test cases were developed, reviewed, and approved across the 8 measures. Test cases were developed to isolate the test case to the measure; expectations for a test case should be few, not many; and focus on proper behavior based on standards.

Possible Results: IIS can achieve one of three possible results in both test and measure outcomes – **meets, deviates from national standard, does not meet,** or **not measured**.

Summary Results

IIS participation: Sixty-one (61) IIS participated in M&I. **59 (97%)** could be measured and are included in this report.



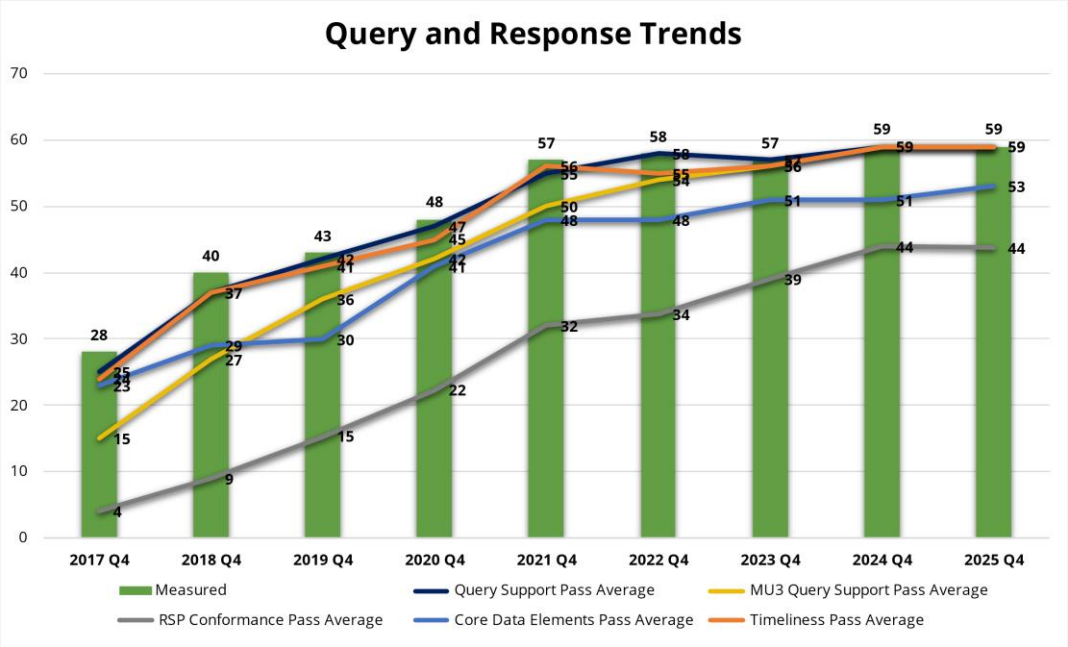
Of the 59 IIS assessed, the following high-level observations provide additional context for reading and interpreting the aggregate results graph:

- **Measures 1 and 2:** Measures 1 and 2 assess if an IIS has the capability to accept a query and return a response. Measure 1 is a query that has been around longer than Measure 2. Measure 2 is a new query as part of release 1.5 of the National IG and is included in the Centers for Medicare and Medicaid Services (CMS) Promoting Interoperability program.
- **Measures 3, 4, 5, and 6:** These measure the RSP from the IIS for the proper answer (e.g., did the IIS accept and process a query with the proper HL7 RSP profile) as well as RSP conformance. Of the IIS that did not meet these measures, all used the proper HL7 profile, but the RSP failed technical conformance. Conformance with a defined standard is an all-or-nothing measurement. Although some IIS were extremely close to passing while others were on the opposite end of the spectrum, both are classified as "does not meet." Due to the complicated testing method of Measure 5, there were 5 IIS that could not be measured due to the only returning a single patient in RSP.

- Please refer to Appendix A for additional details that contribute to IIS measure deviations and/or nonalignment.

Summary of Progress

This remeasurement demonstrated progress in the following areas:



- **Single patient found conformance:** Forty-three IIS have successfully passed the measure testing conformance when a single patient is found (Measure 3). No IIS passed this measure during the initial baseline. This measure is arguably the most technically complex measure, as it requires the IIS to create two different RSP profiles and both must meet all the conformance rules within an HL7 message.
- **Patient not found conformance:** Fifty-five IIS have successfully passed the measure testing conformance when no patients are found in the IIS (Measure 4). This is an increase of 52 IIS since the initial baseline.
- **Promoting interoperability query support (Measure 2):** Fifty-nine (100%) of IIS measured support the Z44 query profile. The profile is required for CMS's Promoting Interoperability program. Only 10 (42%) of 24 IIS measured supported this query at the initial baseline.

Questions and/or Comments

Please direct questions and/or comments via AIRA's Technical Assistance Request form.

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Appendix A: Outcome Reasons

The following appendix provides the specific details as to why IIS either deviated from or did not meet the Query and Response Assessment measures.

Query Measures

Measures 1 and 2 focus on submitting a specific query to an IIS and then measure the response based on whether it returned the correct profile.

Measure 1: Immunization History (Z34)

Measure 1 is a query for a patient's immunization record, but it does not necessarily contain the clinical decision support (e.g., evaluation and forecast). To meet this measure, an IIS must return a Z32 RSP. Technical HL7 conformance of the Z32 RSP is not required to pass this measure.

Deviates from Standard	**Does Not Meet**
No IIS deviated	No IIS resulted in does not meet

Measure 2: Evaluated History and Forecast (Z44)

Measure 2 is a query for the patient's evaluated immunization history and forecast. In this case, the evaluation and forecast must be included. To meet this measure, an IIS must return a Z42 RSP. Technical HL7 conformance of the Z42 RSP is not required to pass this measure.

Deviates from Standard	**Does Not Meet**
No IIS deviated	No IIS resulted in does not meet

Response Measures

Measures 3 through 6 measure the different types of responses that must be returned depending upon the condition (e.g., patient found, patient not found, etc.).

Measure 3: Single Patient Found Response

Measure 3 is the flip side of Measures 1 and 2. In Measure 3, the IIS must respond with the proper Z32 or Z42 RSP profile, and the RSP must be technically conformant. Conformance with a defined standard is an all-or-nothing measurement. Some IIS were extremely close to passing while others were quite far away, yet both are classified as "does not meet." This measure included two tests, so some IIS may overlap more than one category.

Deviates from Standard	Does Not Meet
No IIS deviated	**Correct profile but failed HL7 conformance:** The IIS had some level of conformance error in either the Z32 profile, the Z42 profile, or both profiles.

Measure 4: Patient Not Found

Measure 4 submitted a randomly generated patient not already in the IIS. The IIS was expected to return a Z33 RSP profile, and the RSP had to be technically conformant. Conformance with a defined standard is an all-or-nothing measurement. Some IIS were extremely close to passing while others were quite far away, yet both are classified as "does not meet."

Deviates from Standard	Does Not Meet
No IIS deviated	**Supplied correct answer but failed HL7 conformance:** The IIS had some level of conformance error when returning the expected Z33 response profile.

Measure 5: Multiple Patients Found

Measure 5 attempted to submit twins to the IIS to measure conditions where more than one patient is found from a query. In most cases, the IIS did detect these patients as twins and returned the correct profile, but failed HL7 conformance. If the IIS did not detect these patients are twins, they were unable to be measured. This measure was re-introduced as a formal part of Assessment in Q3 2025.

Deviates from Standard	Does Not Meet	Not Measured
Does not return Sex: The IIS does not return the sex of the patients that were initially submitted. This is a local policy decision by the IIS.	**Supplied correct answer but failed HL7 conformance:** The IIS had some level of conformance error when returning the expected Z33 response profile.	**Returned Single Patient:** The IIS returned only single patients when queried.

Measure 6: Erroneous Query

Measure 6 intentionally submitted a query with missing data elements to measure the IIS's response. The IIS was expected to return a Z33 profile, and the RSP had to be technically conformant. Conformance with a defined standard is an all-or-nothing measurement. Some IIS were extremely close to passing while others were quite far away, yet both are classified as "does not meet."

Deviates from Standard	Does Not Meet
No IIS deviated	**Supplied correct RSP profile but failed HL7 conformance:** The IIS had some level of conformance error when returning the expected Z33 response profile.
No IIS deviated	**Return Z23:** The IIS returned a Z23 profile rather than the expected Z33 profile.

CDC-endorsed data element measure

Measure 7 focused on detecting storage of CDC-endorsed data elements through a query to the IIS for a known patient. A subset of the CDC-endorsed data elements was chosen. Those elements are critical for informing vaccination decisions the clinician must make and support patient identification. To pass this measure, the IIS were required to return the following CDC-endorsed data elements:

- Patient ID (submitted medical record number (MRN) from VXU)
- Patient Name (first, middle, last)
- Patient DOB
- Patient Gender
- Vaccine Product Type Administered (CVX)
- Vaccination Administration Date

Deviates from Standard	Does Not Meet
Does not return MRN: The IIS does not return the MRN which was submitted to the IIS prior to query.	No IIS resulted in does not meet

Timeliness Measure

Measure 8 focused on the round-trip response time from message submission to receipt. To meet this measure, the IIS needed to respond within five seconds for 95% of the query by parameter (QBP) messages. The total number of QBPs submitted as part of the Assessment process was 25. This means the IIS was permitted to respond more slowly than five seconds on only one of those queries, which is quite tight. Future assessments may want to reconsider how to measure timeliness over a larger sample size. A second consideration is the use of preproduction environments for Assessment, which might not put as much emphasis on performance as production environments do or, conversely, may perform faster as a result of storing less data.

Deviates from Standard	**Does Not Meet**
No IIS deviated	No IIS resulted in does not meet

Appendix B: General Recommendations

General Recommendations

1. Continued education and direction
    a. Both are needed for ACK messaging to ensure IIS are implementing standards consistently across all systems. The ACK is becoming the face of the IIS and is the only way to determine in an automated and timely fashion if the submitted data were accepted by the IIS. Positive movement is being seen by select IIS, but more work is needed while moving closer to Promoting Interoperability, where certified electronic health records (EHRs) are required to consume ACK messages per the National IG.
2. Use the NIST conformance tool
    a. In general, IIS are using the correct HL7 profile when returning their RSP, but most of them contain technical conformance errors that make understanding the RSP more difficult. IIS should use the conformance tool provided by NIST when developing and/or improving implementation of the HL7 standards. The tool can aid the software development process. The tool is located at https://hl7v2-iz-r1-5-testing.nist.gov and is free to use without installation or registration.
3. Standard alignment among partners

a. Operationally, IIS should coordinate with their interface partners to jointly align with standards while, whenever possible, not disabling existing interfaces. It is important to communicate to partners that modifications may demand short-term work but yield long-term gains in faster and easier interoperability and interface development.