



Building Provider-Level Data Quality Dashboards

David Juen, IIS Manager

Joseph King, HL7 Project Coordinator

Abstract Co-Authors from AIRA:

Alexandra Hayes, Senior Project Manager

Jennifer Jubert, Business Analyst



Agenda

- What is I-CARE?
- Previously with AIRA...
- Background and description of technical assistance project
- Data quality report card background & methodology
 - Report card version 1 & pilot 1
- Data quality report cards current version & rollout
- Data quality report card learnings
- Next steps



★ What is I-CARE?



- I-CARE is the Illinois IIS, built in-house at IDPH and launched in 2007
- I-CARE is managed by both the Illinois Department of Public Health and the Chicago Department of Public Health
 - Providers within city limits are managed by CDPH
- There are currently 771 providers in Chicago connected to I-CARE, and 42% (320) of them are enrolled in the Vaccines for Children (VFC) program



Previously with AIRA...

- In 2024, I-CARE conducted two TA projects with AIRA:
 1. HL7 Onboarding: Create a standardized HL7 onboarding process
 2. HL7 Warnings and Errors Report: Improve ACK & ERR messaging and create a report that has a log of all HL7 warnings and errors

*CDPH presented about these TA projects at the 2025 National Conference





Background

- **CDPH wanted to create a report card summarizing important data quality metrics to share with providers, promoting visibility into the IIS as well as encouraging providers to take ownership of the data they sent to I-CARE.**

Site Reports

[Invalid Address](#) – Generate a list of active patients with an invalid primary address.

[Invalid Doses](#) – Generate a list of patients with invalid doses. ★ UPDATED

[Missed Opportunities Detail](#) – Generate a report of missed opportunities for a site. A missed opportunity for a patient is calculated by finding the most recent shot date for a patient, and then listing all forecasted shots where the forecasted date is before the most recent shot date.

[Missed Opportunities Summary](#) – Generate a summary report of missed opportunities for a site.

[Missing Lots](#) – Generate a list of patients with missing lot numbers on immunizations.

[Monthly Statistics](#) – Generate a monthly statistics report for patients aged 24 - 35 months or for patients aged 9 - 26 years. This report will always run as a background process.

[Patient List Export](#) – Generate a comma-delimited text file of patients that match the search criteria.

[Shot Refusals](#) – Generate a list of shots refusals reported by a site within a given time period.

[HL7 Errors](#) – Generate a HL7 Errors Report. View all HL7 upload errors and warnings.





Data Quality Technical Assistance Project

What was the purpose of this project?

- To design a report that enables providers and clinical staff to receive meaningful, easy to understand feedback that can be used to strengthen data quality by identifying actionable HL7 metrics.
- CDPH was completing advanced Tableau training at the same time as the TA, so that knowledge could be used when building provider report cards.





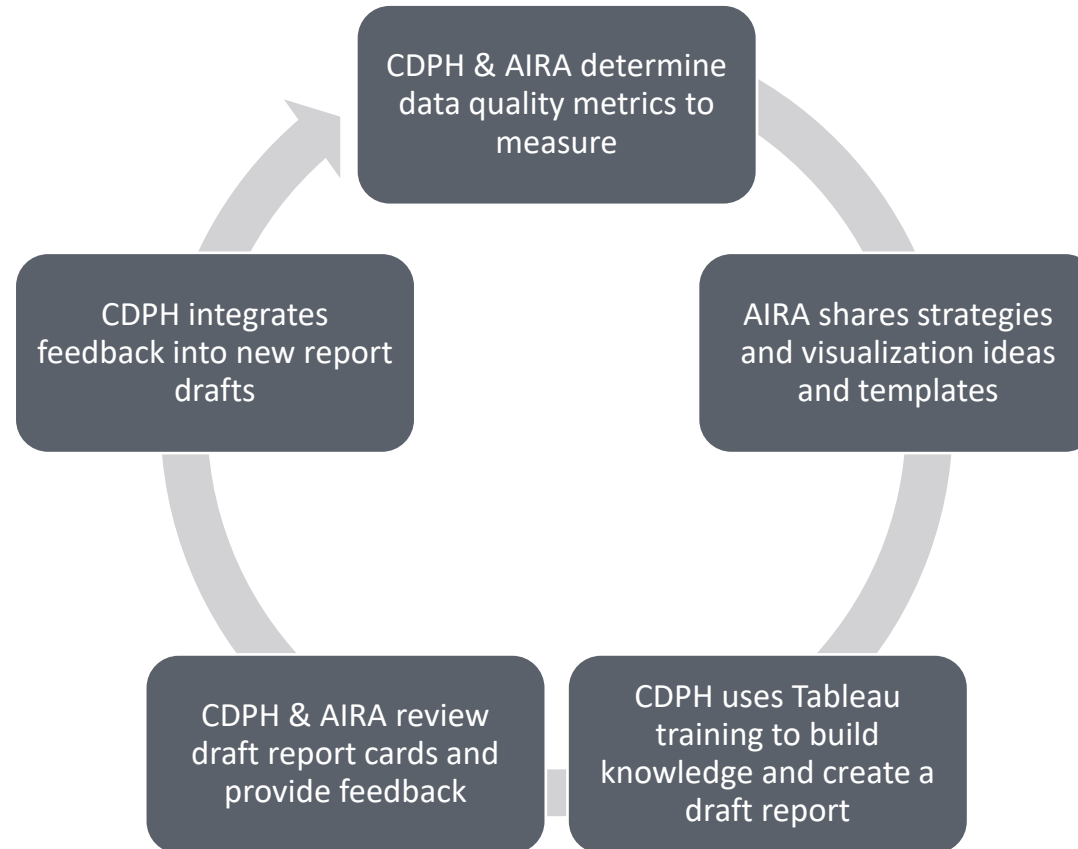
Data Quality Technical Assistance Project

- The TA took place in June 2025, and was completed over the course of two weeks. In that time, AIRA and CDPH:
 - Identified key HL7 data quality metrics that reflect provider-level data quality performance and align with national standards.
 - Reviewed report cards made by other jurisdictions to identify successful and adaptable strategies.
 - Mapped key HL7 metrics to data within I-CARE to confirm feasibility for reporting and visualization.
 - Utilized visual design approaches to ensure the report provides clear, actionable insights.
 - Planned a pilot with a small group of providers.





Data Quality Technical Assistance Project





HL7 Data Quality Report Card Methodology

- How was the report card built?
 - While CDPH was completing the TA with AIRA, we also took an advanced Tableau training. Report cards were built using Tableau Prep Builder and Tableau Desktop
 1. Monthly reports were identified and pulled from I-CARE
 - HL7 Stats
 - Shot timeliness
 - Invalid doses
 - HL7 warnings & errors
 2. Reports were combined using Tableau Prep Builder to combine all reports into one flow to generate one large Tableau extract file
 3. Report card drafts were created using Tableau Desktop



Admin Query and DQ Reports



View: Reports

Site: IMMUNIZATION PROGRAM AT WSCDC

Reports

Background Report Results

Admin

Select View:

Reports

Queries

Admin Queries may be added dynamically by the Dev Team. Generally these would be dedicated queries intended to be run by specific users.

▲ Query Name	⚡ Description	Access
Data Quality - HL7 stats	Data Quality - Show HL7 stats by Chicago 'C', Downstate 'D', Region 'R', County 'O', or All 'A'; for Date Period From/To (:date_from, :date_to). Default - 01/01/1900 and Today's Date	Admin

Site Reports

[Invalid Address](#) – Generate a list of active patients with an invalid primary address.

[Invalid Doses](#) – Generate a list of patients with invalid doses. ★ UPDATED

[Missed Opportunities Detail](#) – Generate a report of missed opportunities for a site. A missed opportunity for a patient is calculated by finding the most recent shot date for a patient, and then listing all forecasted shots where the forecasted date is before the most recent shot date.

[Missed Opportunities Summary](#) – Generate a summary report of missed opportunities for a site.

[Missing Lots](#) – Generate a list of patients with missing lot numbers on immunizations.

[Monthly Statistics](#) – Generate a monthly statistics report for patients aged 24 - 35 months or for patients aged 9 - 26 years. This report will always run as a background process.

[Patient List Export](#) – Generate a comma-delimited text file of patients that match the search criteria.

[Shot Refusals](#) – Generate a list of shots refusals reported by a site within a given time period.

[HL7 Errors](#) – Generate a HL7 Errors Report. View all HL7 upload errors and warnings.

Tableau Flow

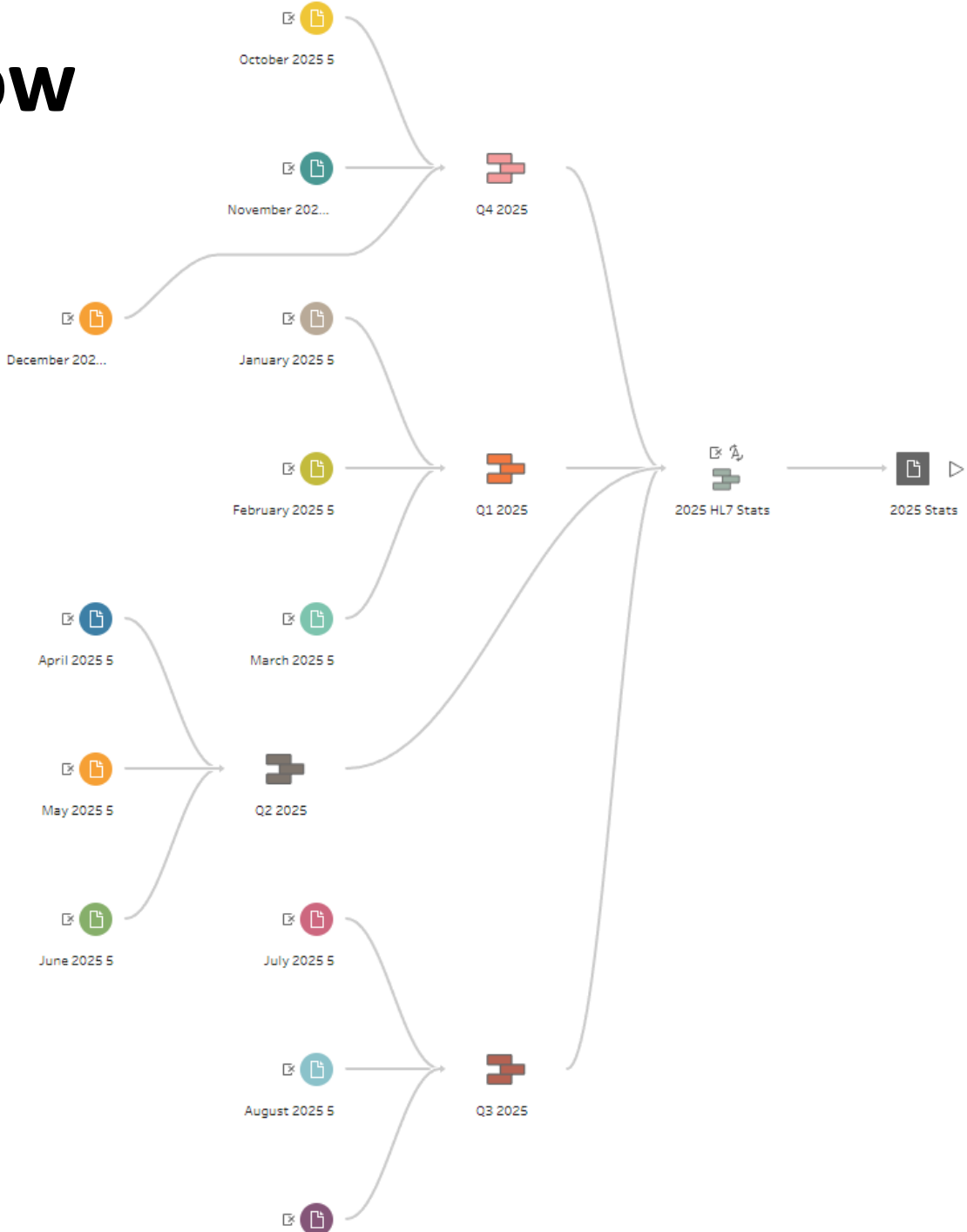
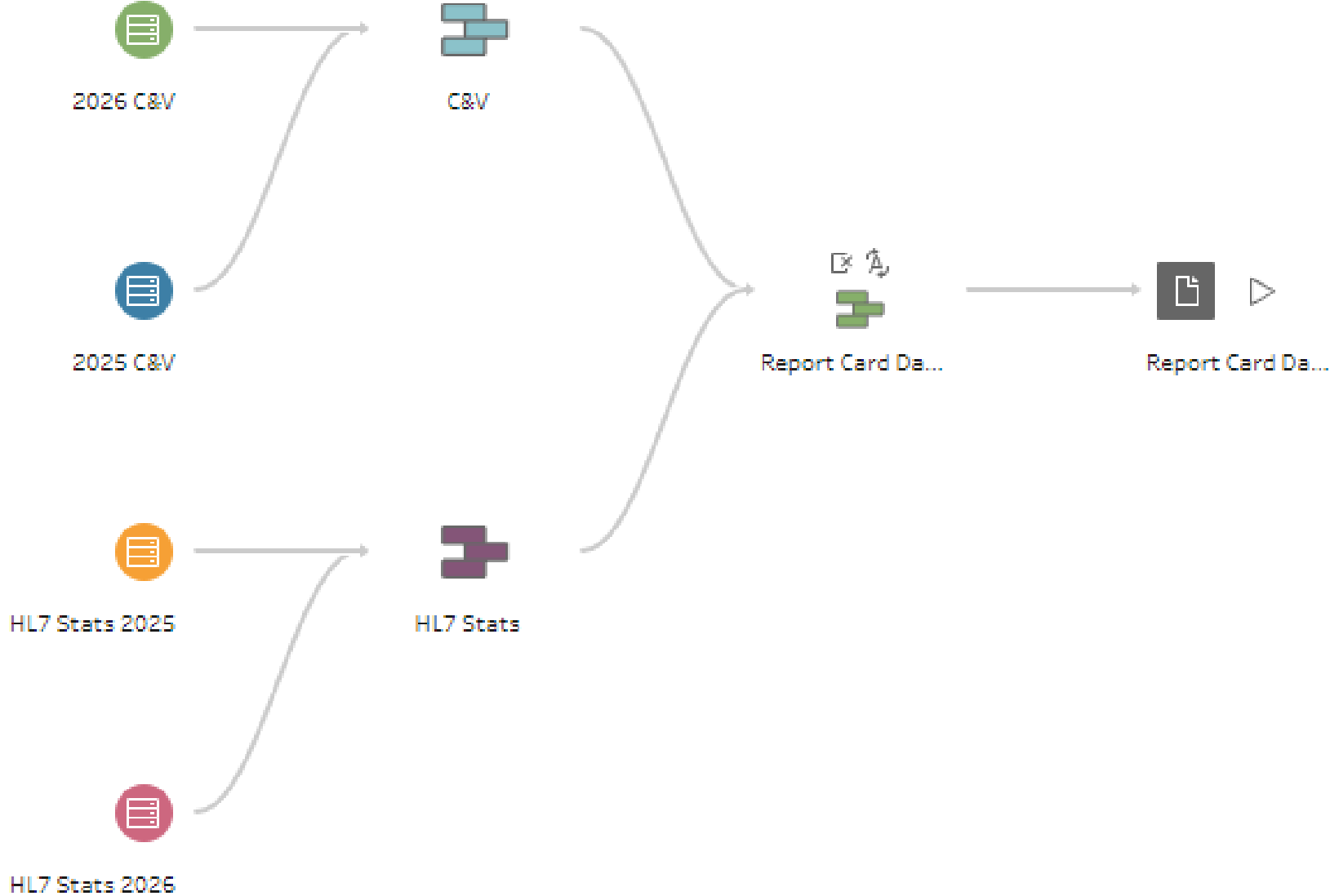


Tableau Flow





HL7 Data Quality Report Card Data

- How were values calculated?
 - Shot timeliness:
 - Percentage of shots sent to I-CARE within one day of administration (# of shots sent within 24 hours/total shots sent to I-CARE)
 - Doses administered at an improbable age
 - Number of invalid doses for age-related reasons
 - Completeness & Validity
 - (# of HL7 warnings for corresponding metric/total shots)
- Were there any special considerations?
 - Sites with a container setup using RXA-11 values cannot receive a complete report card, as we cannot calculate the number of shots sent to I-CARE
 - Some sites receive multiple of the same HL7 warning for one message, leading to confusing results
 - Report cards do not measure data at rest, only data actively being sent to I-CARE



Report Card

Report Date	Provider	Date Range Captured	Shots (VXU) Received
March 25, 2026	[REDACTED]	January 2025 to December 2025	0

Completeness What percentage of shots were sent to I-CARE where the indicated fields IS PRESENT?

Measures	Shots Where Field is Empty	Total Shots	Target	Result
Vaccine amount is present for administered vaccine	2	0	99%	
Patient ethnicity is present	5	0	95%	
Administering vaccinator is present for administered vaccine	30	0	99%	
Lot number is present for administered vaccine	30	0	99%	
Ordering provider is present for administered vaccine	30	0	99%	
Vaccine units are present for administered vaccine	32	0	99%	
Vaccine manufacturer code (MVX) is present	4,568	0	99%	

Validity What percentage of shots were sent to I-CARE where the indicated field IS VALID?

Measures	Shots Where Field is Invalid	Total Shots	Target	Result
MRN re-use for two different patients	1	0	99%	
Shot route is missing or invalid	30	0	99%	
Shot site is missing or invalid	42	0	99%	
Vaccine ID code (CVX/MVX/NDC) mismatch	4,657	0	99%	



CDPH Data Quality Report Card Version 1

Report Cards contained metrics on HL7 message volume and activity, shot timeliness, shots administered at an improbable age, and HL7 warnings and errors.

- 7 fields were selected to measure shot completeness:
 - Race
 - Ethnicity
 - Lot number
 - MVX
 - Administering Vaccinator
 - Ordering Provider
 - Funding Source
- 6 fields were selected to measure shot validity:
 - Shot ID codes
 - Vaccine viability (expired vaccine)
 - Shot date prior to patient DOB
 - Historical dose date accuracy
 - Shot route validity
 - Shot site validity



Report Card



Files Received: **10,988** HL7 Messages Received: **10,988** Shots Received: **11,025**

Month & Year
All

Date of Last HL7 Import

Shot Timeliness

7/22/2025

Shots Received by I-CARE within One Day of Administration
90.80%

Doses Administered at Improbable Age

23

Completeness by Site

Race	95%	99.97%
Ethnicity	95%	100.00%
Lot Number	95%	99.70%
MVX	95%	100.00%
Administering Vaccinator	95%	0.48%
Ordering Provider	95%	0.00%
Funding Source	95%	0.00%

Completeness by Group

Race	95%	99.97%
Ethnicity	95%	100.00%
Lot Number	95%	99.70%
MVX	95%	100.00%
Administering Vaccinator	95%	0.47%
Ordering Provider	95%	0.00%
Funding Source	95%	0.00%

Completeness Chicago

Race	95%	95.07%
Ethnicity	95%	94.90%
Lot Number	95%	99.36%
MVX	95%	71.22%
Administering Vaccinator	95%	96.30%
Ordering Provider	95%	97.53%
Funding Source	95%	68.26%

Validity by Site

Shot ID Code Validity	99%	98.54%
Vaccine Viability	99%	99.45%
Shot Date after Patient DOB	99%	100.00%
Historical Dose Date Accuracy	99%	100.00%
Shot Route Validity	99%	99.65%
Shot Site Validity	99%	99.10%

Validity by Group

Shot ID Code Validity	99%	98.56%
Vaccine Viability	99%	99.45%
Shot Date after Patient DOB	99%	100.00%
Historical Dose Date Accuracy	99%	100.00%
Shot Route Validity	99%	99.65%
Shot Site Validity	99%	99.11%

Validity Chicago

Shot ID Code Validity	99%	95.12%
Vaccine Viability	99%	99.95%
Shot Date after Patient DOB	99%	99.98%
Historical Dose Date Accuracy	99%	99.16%
Shot Route Validity	99%	99.17%
Shot Site Validity	99%	92.62%

★ CDPH Data Quality Report Card Pilot

July 2, 2025

- CDPH emailed ~20 high-VFC volume providers with a form to gauge their interest in participating in the report card pilot.

July 23, 2025

- Report cards were sent to providers who responded positively to the interest survey.

July 30, 2025

- CDPH hosted 2 review sessions for providers to ask questions and give feedback on the report cards.



Pilot Results & Takeaways

- **What was the outcome?**

- While providers did find the report cards easy to understand and potentially useful, the providers we selected already had very strong data quality and did not have much feedback regarding the report cards.
- The providers we selected did not require any immediate intervention in order to address their data quality.

- **What did we learn?**

- It will be more useful to roll out report cards to as many providers as possible so that we can address any data quality needs or concerns.
- Report cards should be simplified in order to make them easier to build and maintain
 - Continue to enhance the report card over time as well



HL7 Data Quality Report Cards Current State

Following the pilot, CDPH redesigned the report cards to simplify what data needed to be pulled and stitched together from I-CARE as well as ensure providers receive the most actionable insights from their report cards. As a result, CDPH:

- Removed shot timeliness from the report card
- Removed date of last HL7 activity from the report card
- Removed doses administered at an improbable age
- Added more metrics to HL7 completeness and validity tables
- Clarified the language on the report
 - Improved descriptions of data quality metrics
 - Details on what the report card is actually measuring and how values are calculated

Report Card



Data Quality Report Card



Report Date	Provider	Date Range Captured	Shots (VXU) Received
March 25, 2026	All	January 2025 to December 2025	4,766,173

Completeness What percentage of shots were sent to I-CARE where the indicated fields IS PRESENT?

Measures	Shots Where Field is Empty	Total Shots	Target	Result
Patient sex is present	17,617	4,766,173	99%	99.63%
Vaccine amount is present for administered vaccine	28,120	4,766,173	99%	99.41%
Lot number is present for administered vaccine	46,415	4,766,173	99%	99.03%
Vaccine units are present for administered vaccine	80,477	4,766,173	99%	98.31%
Ordering provider is present for administered vaccine	148,649	4,766,173	99%	96.88%
Administering vaccinator is present for administered vaccine	188,473	4,766,173	99%	96.05%
Patient race is present	270,674	4,766,173	95%	94.32%
Patient ethnicity is present	285,186	4,766,173	95%	94.02%
Vaccine manufacturer code (MVX) is present	725,397	4,766,173	99%	84.78%

Validity What percentage of shots were sent to I-CARE where the indicated field IS VALID?

Measures	Shots Where Field is Invalid	Total Shots	Target	Result
Shot record is invalid	4	4,766,173	99%	100.00%
Shot record has invalid expiration date	137	4,766,173	99%	100.00%
Shot date before patient birth date	732	4,766,173	99%	99.98%
Shot record is a duplicate	837	4,766,173	99%	99.98%
MRN re-use for two different patients	861	4,766,173	99%	99.98%
Non-viable (expired) vaccine was administered	4,065	4,766,173	99%	99.91%
Shot record has invalid funding source	7,252	4,766,173	99%	99.85%
Vaccine ID code (CVX/MVX/NDC) is invalid	17,968	4,766,173	99%	99.62%
Shot route is missing or invalid	39,053	4,766,173	99%	99.18%
Historical dose is being reported for the current date	39,385	4,766,173	99%	99.17%
Administered flag is invalid	250,593	4,766,173	99%	94.74%
Vaccine ID code (CVX/MVX/NDC) mismatch	268,325	4,766,173	99%	94.37%
Shot site is missing or invalid	350,278	4,766,173	99%	92.65%



HL7 Data Quality Report Card Launch

- Based on the results of the first pilot, CDPH decided to launch provider report cards at our VFC regional trainings.
 - This allows us to have face-to-face interaction with providers and eases the burden of communication and scheduling.
 - This also allows CDPH to reach a large number of providers in one day with 15-minute report card review sessions.
 - Providers pick a time to meet with CDPH, receive a copy and explanation of their report card, and receive information on any next steps they may need to take to address data quality
- VFC trainings occurred on 2/25/2026, 3/11/2026, 4/8/2026, and 5/21/2026.



  **VFC Regionals**

Provider Report Cards



**SIGN UP
TODAY**



Thank you



★ Report Card Distribution at VFC Regionals



★ Report Card Distribution at VFC Regionals





HL7 Data Quality Report Card Takeaways

- Providers have been very engaged with report cards so far and value having a report they can take back to show the rest of their team.
- Using the VFC regionals to share report cards has led to very high interest and involvement from providers.
- High-priority providers should be identified and contacted outside of the VFC regional.
- The most common data quality concerns are regarding demographic completeness and shot ID code validity.





Next Steps

- What are we doing next?
 - New TA session with AIRA where we hope to continue to enhance the report cards: visual improvements, incorporating coverage level data, incorporating data quality metrics, and enhanced outreach capabilities
 - Completing follow-up with priority providers who need assistance improving their data quality
 - Monitoring report cards over time to check for improvements or deterioration in data quality
 - Using the report card as a starting point, develop internal HL7 dashboard with data quality and other key metrics such as shot timeliness, validity, and more.





Questions?

- CDPH.HL7@cityofchicago.org



Thank You!



[Chicago.gov/Health](https://chicago.gov/Health)



HealthyChicago@cityofchicago.org



[@ChicagoPublicHealth](https://www.facebook.com/ChicagoPublicHealth)



[@ChiPublicHealth](https://twitter.com/ChiPublicHealth)