ELR Data Quality Report Cards

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Disease Reporting and ELR in Pennsylvania

- Home-grown electronic reporting system (PA-NEDSS)
  - Supports manual key entry and ELR (HL7, XML, and CSV)
  - 2,300 reports/day (~80% via ELR)

- ELR received from 55 facilities
  - 17 commercial labs
    - 74% of total volume
  - 29 hospital/health system labs
  - 9 other labs
    - PHLs, occupational health, POC lead, etc.

Post-Production ELR Problems

- Changes that impact data quality will occur after onboarding
  - Not possible to identify real-world problems in test messages
  - System updates/upgrades (can be bi-directional)
  - Reporting tests not approved to send
  - Staff turnover
- Post-production data quality monitoring needed to identify issues

Data Quality Impacts

- Feed drops/volume aberrations
- Missing data
- Invalid data
- Reduced timeliness of reporting

ELR Report Cards

- Quarterly feedback to labs re: production data quality
  - Began Fall 2018
- Summary of completeness, validity and timeliness
  - Feed drops are handled by a separate daily process
- Scores provided are arbitrary and not punitive
  - Based on requirements cited in state regulations
- Adapted from “Post-production ELR QA Toolkit”
  - Lina Saintus, North Carolina (Presented at CSTE 2017)

ELR Report Card Content

pennsylvania
DEPARTMENT OF HEALTH

PA-NEDSS PA-ELR Quarterly Post-Production Report Card

[redacted]

2019 Q3 (07/01/2019 - 09/30/2019)

Electronic laboratory reporting (ELR) plays a critical role in rapidly communicating reportable diseases to public health through Pennsylvania's National Electronic Disease Surveillance System (PA-NEDSS). The Pennsylvania Department of Health (PADOH) currently receives approximately 80% of total disease report volume in PA-NEDSS through PA-ELR submissions. For more information on how PADOH uses ELR data, see this link.

PA-ELR data quality problems can delay time-sensitive public health interventions. As a result, PADOH performs routine quality assurance monitoring of reportable disease data submitted to PA-NEDSS via PA-ELR in an effort to meet the following objectives:

1. Prevent deterioration of ELR baseline feed
2. Improve or maintain data quality
3. Share feedback and recommendations with reporters

Data sources used to generate this report include PA-NEDSS production and error queue data. Data quality issues impacting PA-ELR data may not be due to the reporting lab and could represent a problem PADOH needs to correct. Regardless, we are committed to the above objectives and appreciate your feedback and assistance in improving ELR data quality.

Please note: HIV- and AIDS-related data are not included in this report. Additionally, all references in this report to reportable conditions or diseases reflect laboratory results only and should not be interpreted as diagnoses or offically counted disease cases.

Links to PA-ELR HL7 Guidelines:
* PA-ELR HL7 2.3.1 Guidelines
* PA-ELR HL7 2.5.1 Guidelines

Links to Report Card Sections:

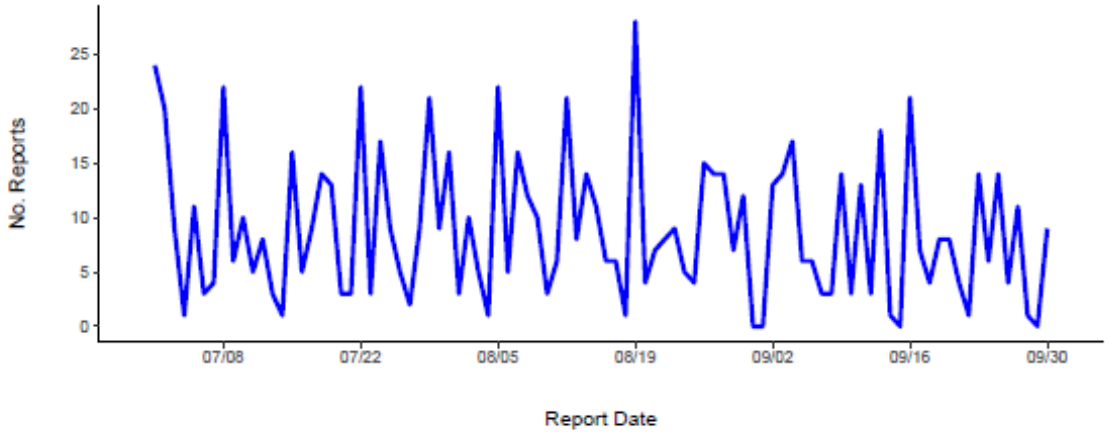
Questions about this report?
Contact Jonah Long at jonalong@pa.gov or 724-269-5942.

Section 1: Reporting Summary

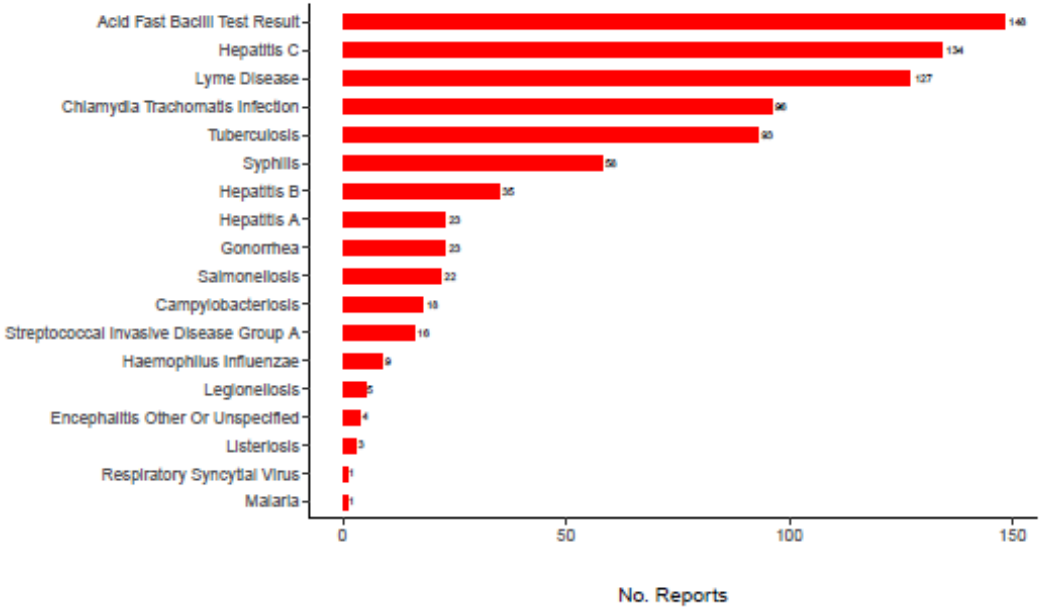
During the time period covered by this report:

- **816** reports were created in PA-NEDSS, containing **833** test results (duplicate report rate: **14.0%**)
- Successful messages were sent to PA-NEDSS on **88** days of **92** possible days **(95.7% of days in 2019 Q3)**
- Between **1** and **28** (median: **8**) reports were created in PA-NEDSS on days messages were sent

Number of PA-ELR Reports Loaded to PA-NEDSS, by Day



Number of PA-ELR Reports Loaded to PA-NEDSS, by Condition



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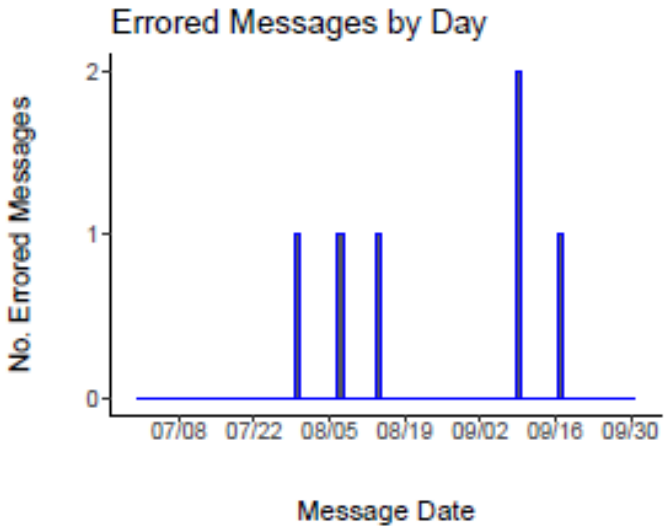
Section 2: Error Queue Summary

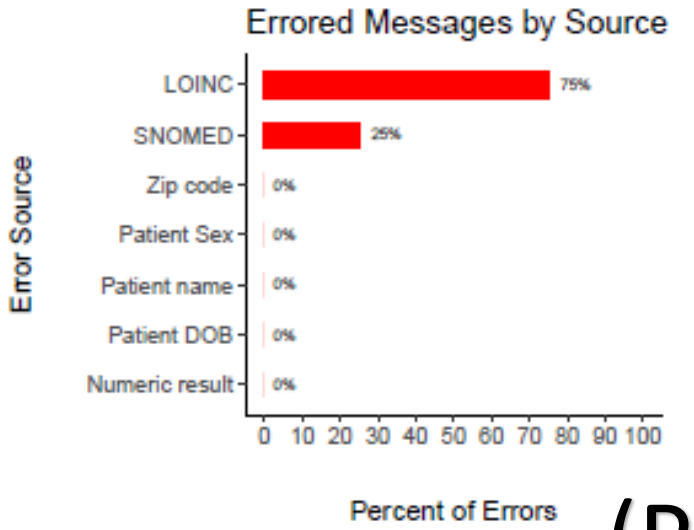
PA-ELR messages with missing or invalid key variables (e.g., date of birth, first/last name, sex, zip code, etc.), standard codes (i.e., LOINC and SNOMED), or numeric results will cause the message to go to the PA-ELR error queue. Multiple errors can occur within a single message.

During the report period, **6** messages with critical issues went to the error queue. The table and charts below summarize messages with critical errors sent to the PA-ELR error queue during the report period.

Table 1: Messages with Critical Errors

Message Date	Accession Number	Error Source Field(s) that are Missing or Invalid	Unmapped or Invalid Codes in OBX-3	Unmapped or Invalid Codes in OBX-5
07/30/2019	M7197220190729	LOINC	"610-6"	
08/07/2019	M7197220190729	LOINC	"610-6"	
08/14/2019	X7422620190811	LOINC	"610-6"	
08/14/2019	X7422620190811	LOINC	LOINC missing	
09/09/2019	F5595320190906	LOINC	LOINC missing	
09/09/2019	F5595320190906	LOINC	"610-6"	
09/09/2019	S8088220190907	SNOMED		"PSN"
09/17/2019	S8088220190907	SNOMED		"PSN"





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Section 3: Field Completion and Validation

Completeness

Pennsylvania disease reporting regulations (PA Code §27.22.c) detail the minimum information clinical laboratories are to include when reporting a laboratory finding pertaining to a reportable disease. Certain key fields sent with missing or invalid values will cause the message to be sent to the error queue (described in Section 2). The tables below reflect **only** data from reports that were successfully created from messages. The target completeness rates for the fields evaluated below should be **95% or greater.** For details regarding completeness issues identified, see Section 6.

Table 2: Summary of Field Completion Results

Field Evaluated[1]	Records Evaluated	Records Acceptable	Percent Acceptable
Patient phone number	816	781	95.7
Patient street address	816	814	99.8
Ordering provider name	833	831	99.8
Specimen source	833	833	100.0
Specimen collection date	833	833	100.0
Result date	833	763	91.6
Result value	833	732	87.9
Result units (quantitative only) [2]	136	9	6.6
Reference range or abnormal flag (quantitative only) [3]	139	127	91.4
LOINC (OBX-3)	833	833	100.0
SNOMED (OBX-5)	694	694	100.0

[1] Missing values are based on whether the fields are populated in PA-NEDSS, which may not mean the value was not sent in the message but could identify a message formatting or mapping issue.
[2] Units are not evaluated for titer results
[3] Reference ranges/abnormal flags are not evaluated for lead results

Validity

A subset of the above fields with non-missing values are checked for validity. The target validity rates for these fields should be **99% or greater.** For details regarding validity issues identified, see Section 6. Fields are evaluated as follows:

Table 3: Summary of Field Validation Results

Field(s) Evaluated	Records Evaluated (Non-missing)	Records Acceptable	Percent Acceptable (of Non-missing)
Patient phone [1]	781	781	100.0
Patient street address [2]	814	813	99.9
Specimen source [3]	833	801	96.2
Dates (collection/received/result) [4]	763	763	100.0
Result value type [5]	732	732	100.0
LOINC (OBX-3) [6]	833	833	100.0
SNOMED (OBX-5) [7]	694	595	85.7

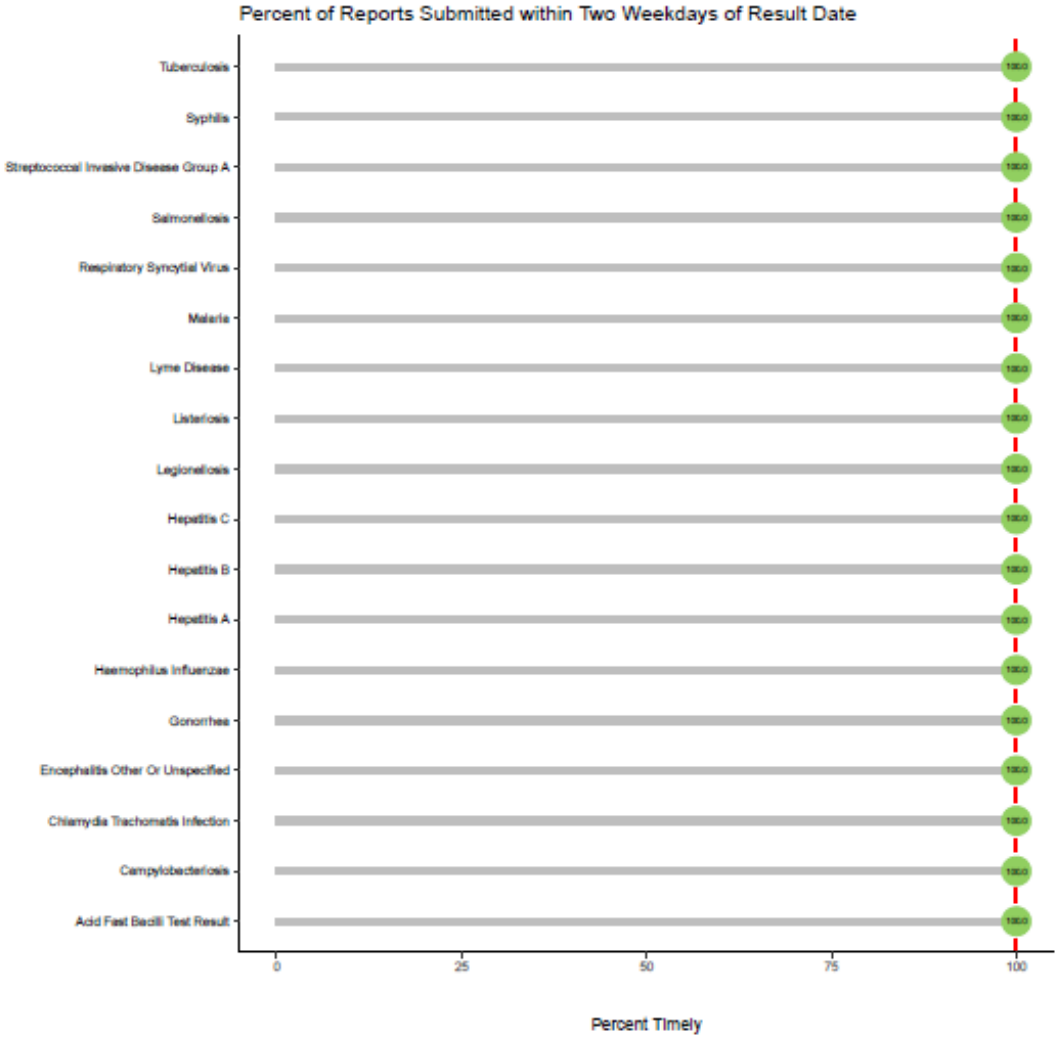
[1] Ten digits without atypical patterns
[2] At least one number and one alphabetic character
[3] Appropriately specific
[4] Non-missing fields are in the following expected order, from earliest to latest: specimen collection date>laboratory received date>result date>report date
[5] Result reported is the appropriate scale based on LOINC used in OBX-3
[6] Code is mapped
[7] Code is mapped (qualititative results only)

Section 4: Timeliness of Reporting

One of the major strengths of electronic laboratory reporting is improved timeliness of reporting to public health, as positive test results for reportable conditions can be messaged immediately.

Pennsylvania disease reporting regulations (PA Code §27.22.a) states clinical laboratories are to report laboratory findings pertaining to a reportable disease within one working day. In this report, timeliness is measured by comparing the difference (in week days) between test result date and report date for reports where a valid result date was included. Duplicate results are excluded from analysis. Reports submitted within **two weekdays or less** are considered timely.

A condition-level timeliness summary for your organization is below. Conditions with less than 100% timeliness are depicted in red. Overall, **100.0%** of reports received were considered timely. For more detail on timeliness issues identified, see Section 6.



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Section 5: Critical Data Quality Issues Summary

The table below summarizes critical data quality issues (below target standard) identified in this report, if any. Items listed below should be reviewed, and if possible, corrected. For more information or further assistance in identifying causes for data quality issues, please contact Jonah Long (jonalong@pa.gov). For additional detail on critical issues identified, see Section 6.

Table 4: Critical Data Quality Issue Summary

Evaluation	Item Needing Attention	Facility Score	Target	Below Target
Completeness	Result date	91.6	95.0	-3.4
Completeness	Result value	87.9	95.0	-7.1
Completeness	Result units (quantitative only)	6.6	95.0	-88.4
Completeness	Reference range or abnormal flag (quantitative only)	91.4	95.0	-3.6
Validity	Specimen source	96.2	99.0	-2.8
Validity	SNOMED (OBX-5)	85.7	99.0	-13.3

Thank you for your efforts in improving electronic laboratory reporting data quality in Pennsylvania!

Section 6: Critical Data Quality Issue Detail

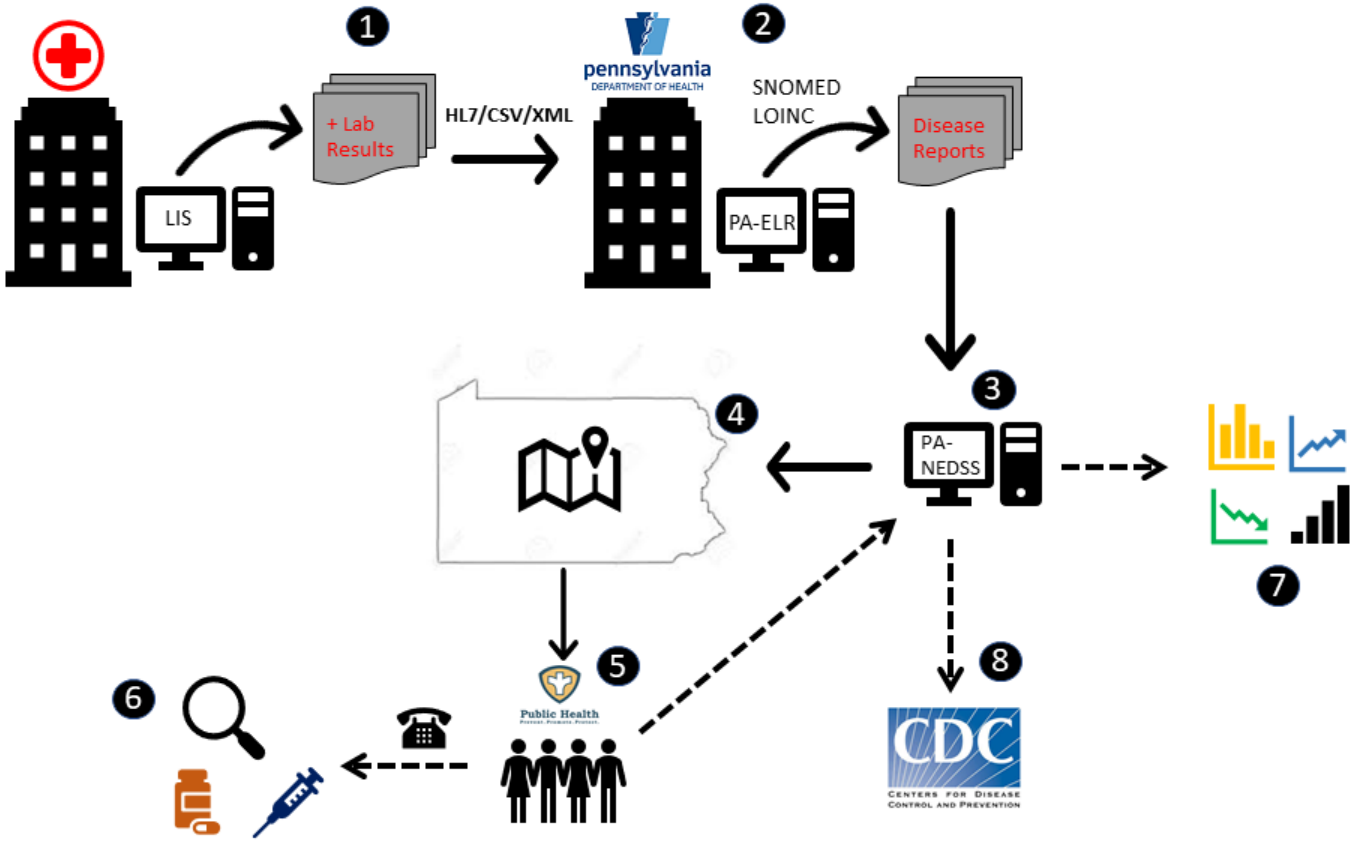
The table(s) below provide additional information regarding completeness, validity or timeliness issues listed in Section 5.

Note: the table below depicts only a 20% sample of errors (by issue) from the report period.

Table 5: Summary of Critical Data Quality Issues (with example accession numbers)

Issue	Condition	LOINC (OBX-3) (if applicable)	LOINC Description (if applicable)	No.Impacted Results	Percent Impacted	Example Accession
Result date missing	Tuberculosis	539-7	Mycobacterium sp identified in Sputum by Organism specific culture	66	71.0	F160520190621
Result value missing	Encephalitis Other Or Unspecified	16960-7	Herpes simplex virus 2 DNA [Presence] in Cerebral spinal fluid by NAA with probe detection	2	50.0	X6610620190721
SNOMED (OBX-5) invalid or not mapped	Hepatitis C	13955-0	Hepatitis C virus Ab [Presence] in Serum or Plasma by Immunoassay	1	0.7	S6330520190803
Specimen source invalid	Acid Fast Bacilli Test Result	542-1	Mycobacterium sp identified in Wound by Organism specific culture	1	0.6	H2441120190822
Specimen source invalid	Chlamydia Trachomatis Infection	43304-5	Chlamydia trachomatis rRNA [Presence] in Unspecified specimen by NAA with probe detection	18	18.8	F2044420190719

PA-ELR Overview: How PADOH Uses ELR Data



(1) Lab messages positive test result(s) to PADOH via PA-ELR. **(2)** Messages are checked for critical errors (if present, message goes to error queue). LOINC and SNOMED codes submitted with message are examined to determine which tests and results are being reported and for which disease. **(3)** Disease report(s) are created in PA-NEDSS. **(4)** Patient address data are geocoded to determine which public health jurisdiction receives the report. **(5)** Public health staff investigate disease reports in their jurisdiction. **(6)** Patients may be interviewed to identify and mitigate risk factors for disease; findings are entered into PA-NEDSS. **(7)** PA-NEDSS data are used to identify outbreaks and analyze statewide disease trends. **(8)** Disease cases meeting certain criteria are sent to CDC and contribute to national surveillance data.

Process Summary

1. Obtain source data
   - PA-NEDSS data reported via ELR (one row/OBX)
   - PA-NEDSS ELR code mapping tables
   - Official LOINC and SNOMED tables
   - Active PA-NEDSS ELR facilities w/CLIA #, contacts

SAS Enterprise Guide 7.1 (64-

2. Clean, code, and summarize PA-NEDSS ELR data by facility

3. Create facility-level report (PDF)

4. Email report to facility contact(s)

Challenges

- Analysis based on data populated in PA-NEDSS report
  - Missing values could be due to improper format
    - E.g., unit of measurement
  - Specimen source increasingly hard to evaluate
    - Some LOINCs hard-coded to specimen source (if specimen missing)
    - New logic to ignore non-specific SPM-4 and use specimen in LOINC
- Inconsistent program area standards
- No HIV/AIDS data access

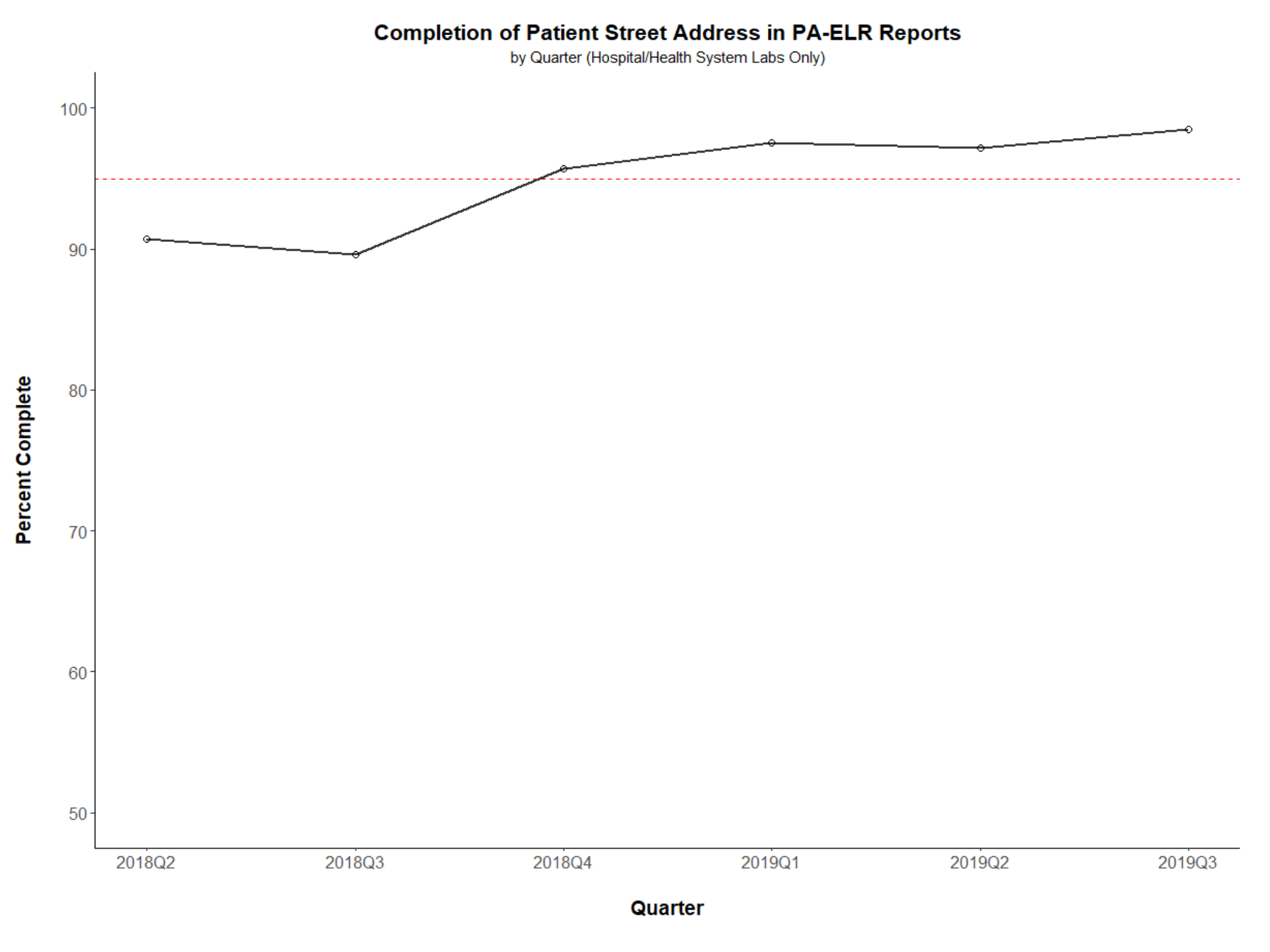
Lessons Learned

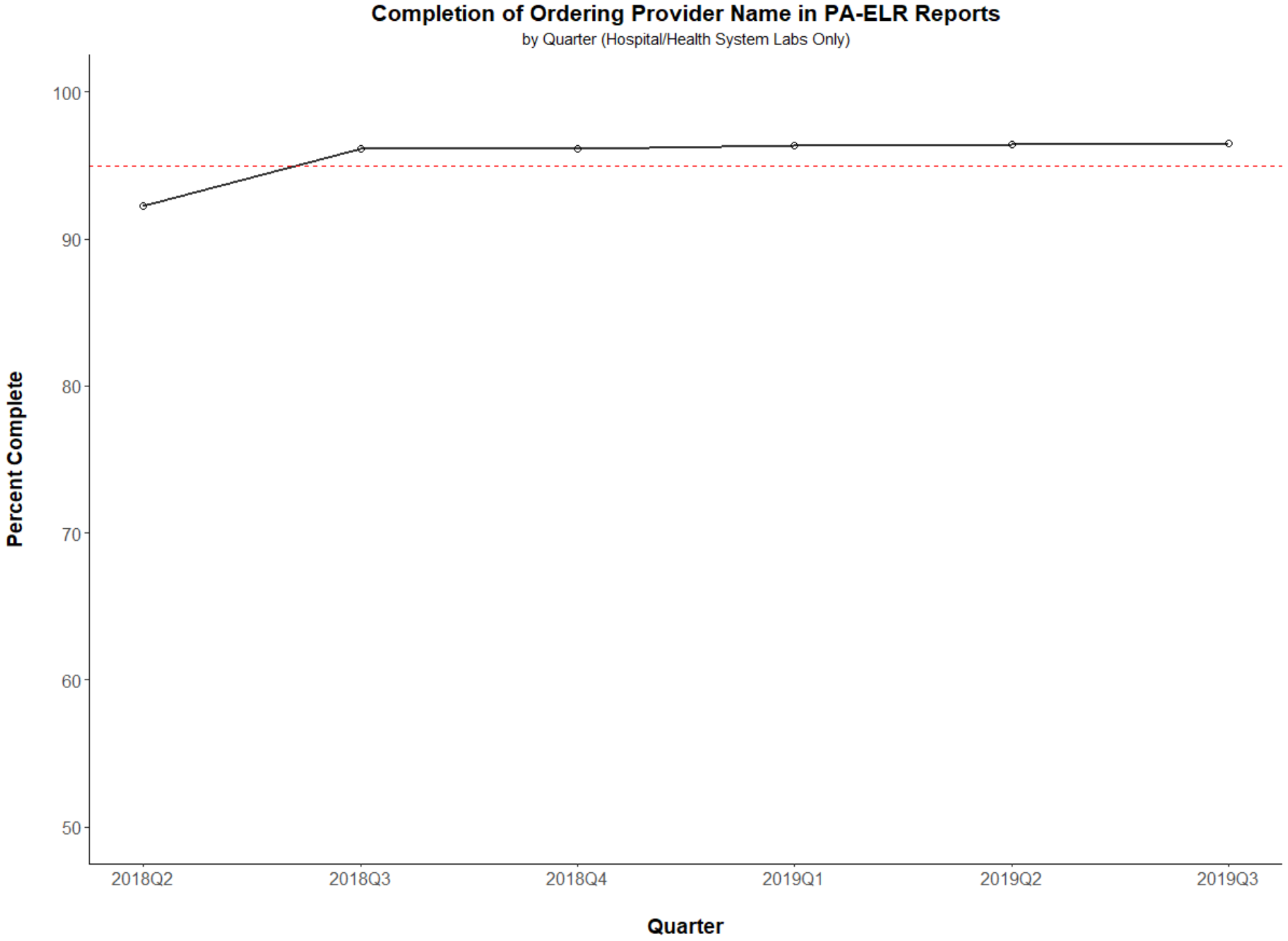
- Duplicate reports negatively impact timeliness
  - Identify and remove from timeliness assessment
    - E.g., AFB/TB reports with updated results
- System glitches on your end should be anticipated
  - Work with IT staff to identify solutions
    - E.g., telecommunication equipment type designation
  - Implement flexible coding where possible
    - E.g., system update to accommodate NPIs resulted in missing provider
- Change takes time
  - Process might be active, but change is passive

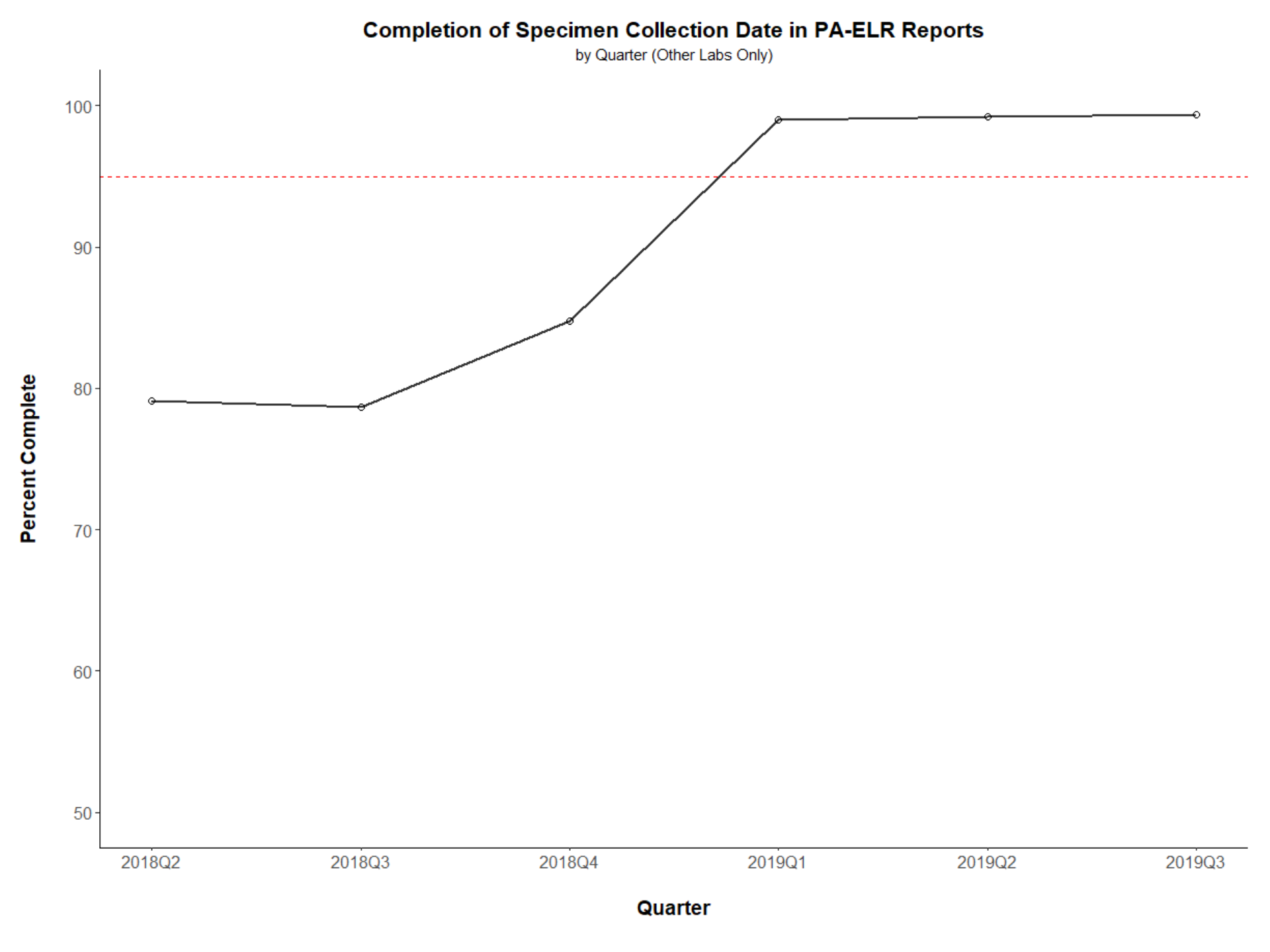
Outcomes

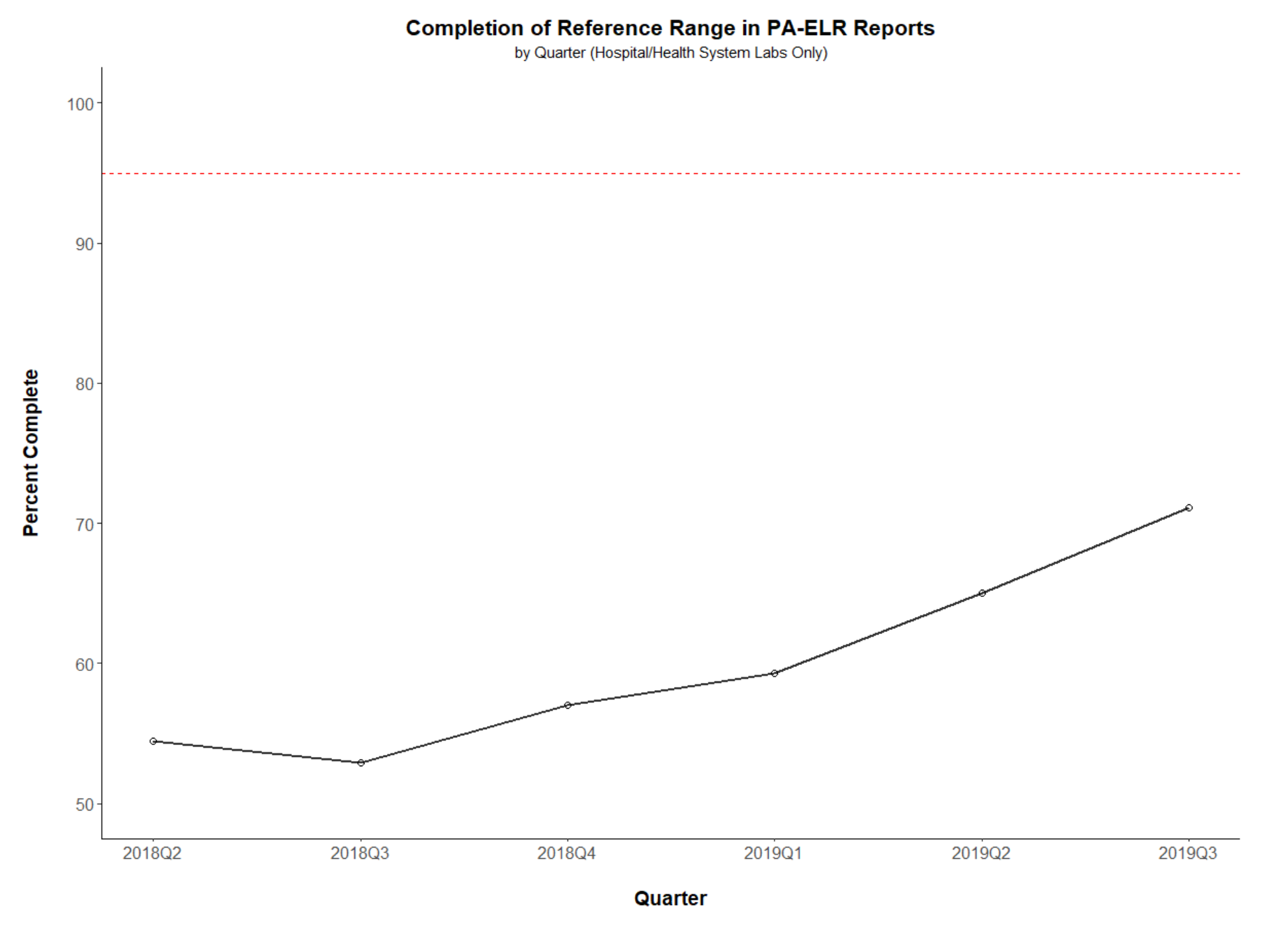
- Responses from ~10% of facilities per quarter
  - Primarily hospital/health system labs

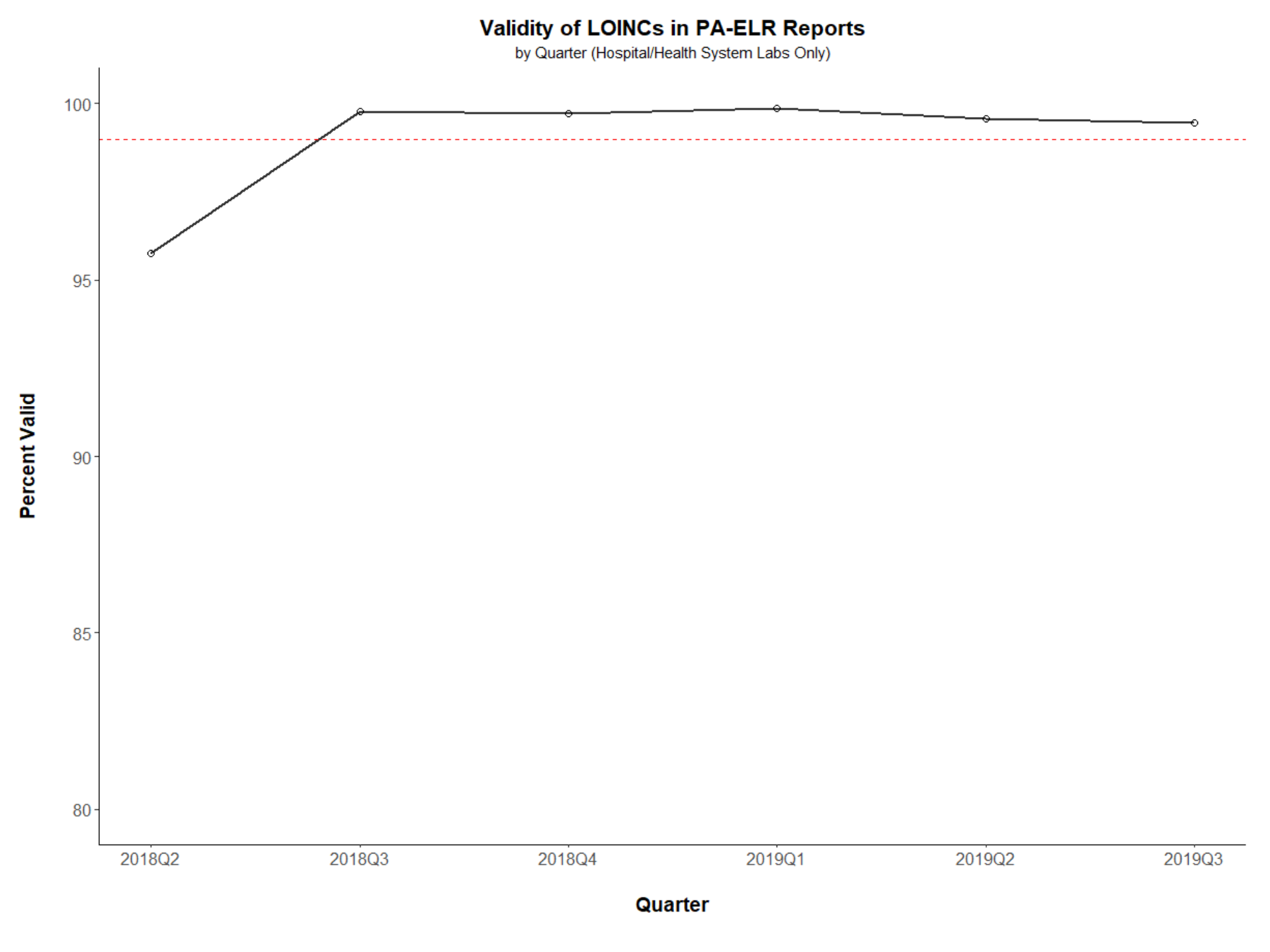
- Several data quality improvements observed since 2018 Q2
  - Primarily hospital/health system labs


Completion of Patient Street Address in PA-ELR Reports
by Quarter (Hospital/Health System Labs Only)
100
90
80
70
60
50
Percent Complete
2018Q2
2018Q3
2018Q4
2019Q1
2019Q2
2019Q3
Quarter


Completion of Ordering Provider Name in PA-ELR Reports
by Quarter (Hospital/Health System Labs Only)
Percent Complete
100
90
80
70
60
50
2018Q2
2018Q3
2018Q4
2019Q1
2019Q2
2019Q3
Quarter


Completion of Specimen Collection Date in PA-ELR Reports
by Quarter (Other Labs Only)
Percent Complete
100
90
80
70
60
50
2018Q2
2018Q3
2018Q4
2019Q1
2019Q2
2019Q3
Quarter


Completion of Reference Range in PA-ELR Reports
by Quarter (Hospital/Health System Labs Only)
100
90
80
70
60
50
Percent Complete
2018Q2
2018Q3
2018Q4
2019Q1
2019Q2
2019Q3
Quarter


Validity of LOINCs in PA-ELR Reports
by Quarter (Hospital/Health System Labs Only)
100
95
90
85
80
Percent Valid
2018Q2
2018Q3
2018Q4
2019Q1
2019Q2
2019Q3
Quarter

Questions?

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