ReportStream

Programmer's Guide for Organizations and Testing Facilities

VERSION 2 .1 – MARCH 2022

Introduction

ReportStream is a free, open-source data platform that makes it easy for public health data to be transferred from testing facilities to public health departments.

This programmer's guide enables those who are writing automated systems and tools to send laboratory and other health-related data to local, state, and federal jurisdictions. It helps you, the technical user at the testing facility or sending location, learn how to send data using the ReportStream Restful (REST) API.

Examples in this guide use curl commands for simplicity with the assumption you'll be coding these calls into your sending system. You can also use a program like Postman to test submissions.

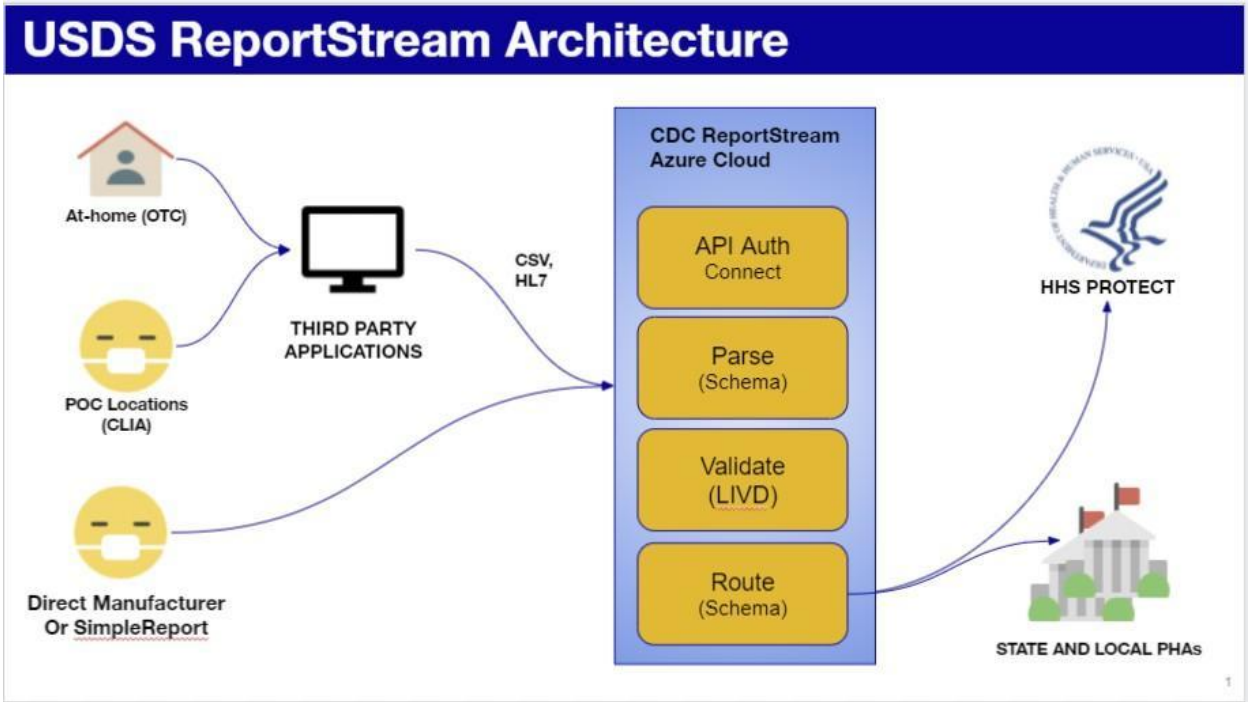
The **Waters API**—the primary secure entry point to ReportStream—is named in memory of Dr. Michael Stephan Waters (1973-2020) whose tireless work at the U.S. Food and Drug Administration championed diagnostic data interoperability efforts nationwide. ReportStream honors Dr. Waters through continuation and elevation of his work.

Release Notes

You can find ReportStream release notes here:

https://github.com/CDCgov/prime-reportstream/blob/master/prime-router/docs/release-notes.md

Onboarding Process Summary



The above diagram represents a high-level outline of the steps involved in a typical ReportStream interaction for organizations and testing facilities.

Onboarding Steps

Step 1: Sample Data

You'll share artificially created data ("fake data")/non-PII example data with the ReportStream team via email. Currently, ReportStream can accept either a CSV file or HL7 input data. We'll work together to help you use one of our existing standard data models or derive new data models as needed. We'll provide detailed documentation for expected data types and values in your data model, as well as fake data or synthetic data using that model, if needed.

Step 2: Onboard to Staging

After jointly agreeing on a stable draft or existing data model, the ReportStream team will onboard you to our staging environment. If using a shared secret key (described below), you'll need to set up an account in Keybase (more information in "Sending to ReportStream" section) so we can share the API Keys/tokens and the URL with you. We expect you'll keep all such private information secured both at rest and in transit.

You can use curl commands, Postman, or another method of your choosing to post test submissions to the staging environment. Using the Staging API, you can then test your automation code as well as your code that handles responses. **Do not send any PII or PHI to the Staging system—only fake/ dummy/ example/ synthetic data is acceptable.** Let us know when you send submissions to the Staging environment. We'll review that data and work with you to correct any issues. Feel free to send as many fake data submissions to staging as you like.

Step 3: Onboard to Production in Training Mode

Before the ReportStream team can onboard you to our production system in "Training" mode, we'll ask you to sign our Terms of Service (TOS) agreement and jointly agree on a stable final data model. If using a shared secret key, you'll receive API Keys/tokens and the URL via Keybase. ReportStream doesn't forward or transport data received in training mode; however, the response message provides detailed information on where your data would have flowed if production mode was active.

Step 4: Production

After jointly agreeing on a training end date, the ReportStream team will enable full production mode, with data automatically flowing to appropriate state, local, and federal jurisdictional systems.

Sending to ReportStream

There are two methods of authenticating to ReportStream's REST API token-based authentication with a public/private key pair and using a shared secret API key. Token-based authentication is recommended best practice.

The examples below assume a ReportStream client "healthy-labs" and submit the payload contained in the file ./healthy-labs-nonPII-data.csv (or .hl7). As part of the onboarding process, the ReportStream team will pre-configure ReportStream with your client information and give you a unique client-id. The client configuration tells ReportStream what type of data to expect for that client-id. ReportStream will look up the associated data model and format (CSV, HL7), and validate the attached payload.

In the examples, data are submitted via an HTTP POST to the ReportStream Staging (test) system "reports" endpoint. The data submitted are sent as the payload of the POST, as is, with no changes.

Example: Token-based authentication with public/private key pair

This method uses FHIR style authentication. Prior to connecting to the endpoint, you'll need a public/private keypair. The steps below show how to create a key pair using OpenSSL.

EC

```
openssl ecparam -genkey -name secp384r1 -noout -out my-es-keypair.pem
openssl ec -in my-es-keypair.pem -pubout -out  my-es-public-key.pem
```

RSA

```
openssl genrsa -out my-rsa-keypair.pem 2048
openssl rsa -in my-rsa-keypair.pem -outform PEM -pubout -out my-rsa-public-key.pem
```

Send the public key to the ReportStream team (they'll associate it with your configuration

within ReportStream). Once configured, continue with the steps below (they're typically automated and run from a server).

Generate a signed JWT:

```
issuer: healthy-labs.default
subject: healthy-labs.default
audience: staging.prime.cdc.gov
```

And POST to the token URL with the following parameters, replacing <token-signing-secret> with your JWT:

```
https://staging.prime.cdc.gov/api/token?scope=healthy-labs.default.report&grant_type=client_cred
entials&client_assertion_type=urn:ietf:params:oauth:client-assertion-type:jwt-bearer&client_asse
rtion=<token-signing-secret>
```

You should get something like this back, which will be valid for 5 minutes:

```
{"access_token":"<long-access-token>","token_type":"bearer","expires_in":300,"expires_at_seconds
":1625260982,"scope":"healthy-labs.default.report"}
```

Use the access token returned above as the bearer token for the submission:

```
curl -H "authorization:bearer <long-bearer-token>" -H "client:healthy-labs"  -H
"content-type:text/csv" --data-binary "@./healthy-labs-nonPII-data.csv"
"https://staging.prime.cdc.gov/api/waters"
```

HL7 example:

```
curl -H "authorization:bearer <long-bearer-token>" -H "client:healthy-labs"  -H
"content-type:application/hl7-v2" --data-binary "@./healthy-labs-nonPII-data.hl7"
"https://staging.prime.cdc.gov/api/waters"
```

Example: Shared secret key

Here's an example bash shell curl command submission to ReportStream using a shared secret API key. The command submits the contents of the file './healthy-labs-nonPII-data.csv' to the endpoint using the client name healthy-labs. You'll use your own client name and your own token (API key).

The ReportStream team will provide you with the token to use as the x-functions- key value for submissions to that client-id. We'll share secrets using Keybase, so you'll need to have a Keybase account (if you don't have a Keybase account, set one up at https://keybase.io).

```
curl -X POST -H "client:healthy-labs" -H "content-type:text/csv" –data-binary
"@./healthy-labs-nonPII- data.csv" -H "x-functions-key:<place-token-here>"
https://staging.prime.cdc.gov/api/reports
```

Here's an example HL7 submission:

```
curl -X POST -H "client:super-labs" -H "content-type:application/hl7-v2" –data-binary
"@./super-labs-nonPII- data.hl7" -H "x-functions-key:<place-token-here>"
https://staging.prime.cdc.gov/api/reports
```

(See "Appendix A: Fields List" for field definitions and sample values. See the "Appendix B: Sample Payloads and Output" for sample data and expected output.)

Notes

- There's a flag allowing partial submissions. With this flag, successful elements in a batch will succeed, and the unsuccessful ones won't. This flag requires extra code on your part to handle partial failures.
- Here's the complete end point input and response OpenAPI specification.

Responses from ReportStream

ReportStream responds to each API call with a response (JSON formatted) about the disposition of your data.

Errors and warnings

The ReportStream response may include warnings and/or errors based on validation of the submission against the expected schema (schemas are described in "Appendix C: ReportStream Data Models").

A successfully accepted submission returns a 201 "httpStatus" code. Submissions with *warnings* but no errors will still be accepted. However, one or more *errors* fail the entire submission (the entire batch).

Common errors

- Missing or mislabeled required columns/fields
- Missing or malformed data in required columns/fields
- CSV with "jagged" rows—differing number of columns within the payload
- Empty payload (an empty response is often a sign of a failed authorization, with a 401 response status). Make sure your token and the URL are correct.
- Incorrect client-id or other headers
- Incorrect data types (send a character string when a numeric value is expected)

Common validation warnings

- Missing optional columns/fields

- Missing or malformed data in optional columns/fields

Response Messages

Below is an example JSON response to a submission. This is a successful response to a 'synchronous' submission to ReportStream, typical of what lower volume users receive.


```
{
    "submissionId": 1588,
    "timestamp": "2022-02-09T16:59:33.789532Z",
    "sender": "simple_report",
    "reportItemCount": 2,
    "httpStatus": 201,
    "id": "e8880dcf-a201-4690-8e02-2871da739b61",
    "destinationCount": 2,
    "destinations": [
        {
            "organization_id": "de-dph",
            "service": "elr",
            "filteredReportRows": [],
            "sending_at": "2022-02-09T17:00:00.000000Z",
            "itemCount": 1,
            "sentReports": [ ],
            "organization": "Delaware Division of Public Health"
        },
        {
            "organization_id": "hi-phd",
            "service": "elr",
            "filteredReportRows": [],
            "sending_at": "2022-02-09T19:00:00.000000Z",
            "itemCount": 1,
            "sentReports": [ ],
    "errors": [],
    "warnings": [],
    "topic": "covid-19",
    "warningCount": 0,
    "errorCount": 0
}
```


Since the response is returned in real-time, the “destinations” section supplies information about where the submission is *expected* to be sent.

ReportStream features a History Details API that can be later queried to obtain the actual destinations and relevant detail. If you’d like to use this API, let the ReportStream team know and we’ll provide you with additional information about requirements for Okta authentication.

The request is made with the submissionId, above:

```
https://prime.cdc.gov/api/history/simple_report/submissions/1588
```

Response:

```
{
    "submissionId": 1588,
    "timestamp": "2022-02-09T16:59:33.789532Z",
    "sender": "simple_report",
    "reportItemCount": 2,
    "httpStatus": 201,
    "id": "e8880dcf-a201-4690-8e02-2871da739b61",
    "destinationCount": 2,
    "destinations": [
        {
            "organization_id": "de-dph",
            "service": "elr",
            "filteredReportRows": [],
            "sending_at": "2022-02-09T17:00:00.000000Z",
            "itemCount": 1,
            "sentReports": [
                {
                    "reportId": "38c84ec2-5741-4f2f-b234-25d774ec8caf",
                    "externalName":
"covid-19-43d64e18-ce56-482a-9134-f9f84a2c9d6f-20220209170000.hl7",
                    "createdAt": "2022-02-09T17:00:02.825148Z",
                    "itemCount": 1
                }
            ],
            "organization": "Delaware Division of Public Health"
        },
        {
            "organization_id": "hi-phd",
            "service": "elr",
            "filteredReportRows": [],
            "sending_at": "2022-02-09T17:00:00.000000Z",
            "itemCount": 1,
            "sentReports": [
                {
                    "reportId": "d9fae107-ef89-4fc0-b9b9-517219a4d2bb",
                    "externalName":
"covid-19-3560b0e8-c183-4132-ad0c-487a837f0e77-20220209170000.hl7",
                    "createdAt": "2022-02-09T17:00:02.822125Z",
                    "itemCount": 1
                }
            ],
            "organization": "Hawaii Public Health Department"
        }
    ],
    "errors": [],
    "warnings": [],
    "topic": "covid-19",
    "warningCount": 0,
    "errorCount": 0
}
```


The sentReports sections contain details about where and when the reports were transmitted.

Asynchronous Processing

In most cases, we'll ask high volume users to submit via ReportStream Async Processing. This

ReportStream configuration setting is automatically enabled for users. Upon submitting data via ReportStream Async Processing, the REST endpoint returns almost immediately; however, ReportStream doesn't return information about where the COVID-19 tests will be sent.

Here is an example ReportStream response to an Async submission:


```
{
   "submissionId":1604,
   "timestamp":"2022-02-10T13:50:19.162694Z",
   "sender":"simple_report.default",
   "httpStatus":201,
   "id":"3597ad7d-b92c-4bc0-a8fc-d909ed87bc90",
   "reportItemCount":2,
   "destinationCount":0,
   "destinations": [],
   "errors": [],
   "warnings": [],
   "topic":"covid-19",
   "warningCount":0,
   "errorCount":0
}
```


In exchange for speed, the async submission response provides less initial information in the JSON. The initial response will provide errors and warnings, but no destination or filter information. The History Details API can be queried later to get full information about expected and actual destinations.

Error Responses

In error cases, no report "id" UUID is returned, because no report was created based on the submission.

Example failure response (and identical HistoryAPI response). Note the "id" is null, and the “httpStatus” is not 201.


```
{
    "submissionId": 1594,
    "timestamp": "2022-02-09T20:44:55.055545Z",
    "sender": "simple_report",
    "destinationCount" : 0,
    "httpStatus": 400,
    "id": null,
    "destinations": [],
    "errors": [
        {
            "scope": "item",
```

```
            "index": 1,
            "trackingId": "abcde",
            "type": "error",
            "message": "Blank value for element 'Patient_last_name' ('patient_last_name')"
        }
    ],
    "warnings": [],
    "topic": null,
    "warningCount": 0,
    "errorCount": 1
}
```

An example of a report level error:

```
{
    "submissionId": 1599,
    "timestamp": "2022-02-09T20:56:16.82117Z",
    "sender": "strac",
    "httpStatus": 400,
    "id": null,
    "destinationCount" : 0,
    "destinations": [],
    "errors": [
        {
            "scope": "report",
            "index": null,
            "trackingId": null,
            "type": "error",
            "message": "CSV file has an inconsistent number of columns on row: 3"
        }
    ],
    "warnings": [],
    "topic": null,
    "warningCount": 0,
    "errorCount": 1
}
```

Fast Facts for ReportStream Users

- Data is sent in the HTTP payload, either in CSV or HL7 2.5.1 format.
- You can send a single record or up to 10,000 records in a single submission.
- You can send as often as you want.
- ReportStream will automatically filter, transform, batch, and forward data to local, state, and federal jurisdictions based on both geographical and data quality filters provided by those jurisdictions.
- ReportStream is not a permanent repository, EMR, or registry for health data. We only keep the data long enough to ensure it gets to the proper local, state, and federal jurisdictions.
- It's often easier to look at sample data than at a schema. The ReportStream team can send you fake data files. We can synthesize data in CSV based on any of our schemas. The fake data will always successfully validate against the schema used to generate it. We've made efforts to make many datatypes like names, addresses, and LOINC and SNOMED code value sets look somewhat real. Since it's computer-generated, the fake data may look strange.

Appendix A: Fields List for a Typical Covid-19 Submission

API CSV AND HL7 FIELD REQUIREMENTS

Legend:

- "Yes" means this is a required field for acceptance
- "Yes – Conditional" means this field is required, but only under certain circumstances. Review the field's Data Requirements and Additional Guidance for more information.
- "Requested" means that this field should be populated if available. In addition, some states may treat this as a required field.
- "No" means that this field is not a hard requirement. In the interest of providing complete information to public health agencies, please populate the field if data is available.

Special notes:

- Two of the most important and often overlooked pieces of required data are the deviceIdentifier (OBX-17.1) and testPerformed (OBX-3.1). These fields must match exactly to the appropriate row in the LOINC In Vitro Diagnostic (LIVD) test code mapping. The most updated mapping can be found here. Specifics about each field are detailed below.
- The preferred timestamp formatting for CSV and HL7 is yyyyMMddhhmmss+/-zzzz. If the UTC offset (+/-zzzz) is not present, results should be normalized to a single time zone, agreed to during the onboarding process.

Patient Data Elements

CSV Column Names	HL7 Field / Component	Fed Required?	State Required?	Data Requirements	Additional Guidance
patientUniqueId	PID-3.1	No	Requested	**Optional - Requested:** Enter unique patient identifier. This is typically the Medical Record Number. ***Do not send a Social Security Number.***	This value is optional and can be left blank if no information is provided. *Some jurisdictions may require this field, ReportStream will notify you if this is the case.*
patientNameLast	PID-5.1	No	Yes	Enter patient's last name.	File will fail if field left blank.
patientNameFirst	PID-5.2	No	Yes	Enter patient's first name.	File will fail if field left blank.
patientNameMiddle	PID-5.3	No	No	**Optional:** Enter patient's middle name, if known.	This value is optional and can be left blank if no information is provided.
patientHomeAddress	PID-11.1	No	Yes	Enter patient's home address.	File will fail if field left blank. If no address given or homeless, populate this field with ** Unknown / Not Given ** or ** Homeless **.
patientHomeAddress2	PID-11.2	No	No	**Optional:** Enter patient's additional address information, if applicable.	This value is optional and can be left blank if no information is provided.

patientCity	PID-11.3	No	Yes	Enter patient's city.	File will fail if field left blank. If no city given or homeless, populate this field with the ordering facility information.
patientState	PID-11.4	No	Yes	Enter patient's state using the two-character abbreviation.	File will fail if field left blank. If no state given or homeless, populate this field with the ordering facility information.
patientCounty	PID-11.9	Yes	Yes	Enter patient's county/parish name.	
patientZip	PID-11.5	Yes	Yes	Enter patient's zip code. **Accepted Format:** 12345 12345-6789	File will fail if value is not entered using acceptable format or field is left blank. If no zip code given or homeless, populate field with the ordering facility information.
patientEmail	PID-13.4	No	No	**Optional:** Enter patient's email address, if known. **Accepted Value:** Numeric or text	This value is optional and can be left blank if no information is provided.
patientPhone	PID-13.7	No	Yes - Conditional	Enter patient's phone number, if known. **Accepted Format:** 000-000-000	If no phone number given or homeless, populate field with the ordering facility information.
patientDob	PID-7.1	No	Yes	Enter patient's date of birth. **Accepted Format:** yyyyMMdd	File will fail if value is not entered using accepted format or field is left blank.
patientAge	N/A	Yes - Conditional	No	Enter patient's age (numeric value).	Required if patient DOB is blank.
patientAgeUnits	N/A	Yes - Conditional	No	Enter patient's age (units). **Example:** Years	Required if patient DOB is blank.
patientSex	PID-8.1	Yes	Yes	Enter patient's sex. **Accepted Values (HL70001):** ● M or Male ● F or Female ● O or Other ● U or Unknown ● A or Ambiguous ● N or Not applicable	File will fail if value not entered using accepted values or field is left blank. Accepted values come from values mapped to LOINC codes you can find in the PHIN VADS system.
patientRace	PID-10.1	Yes	Yes	Enter patient's race. **Accepted Values (HL70005):** ● 1002-5 or American Indian or Alaska Native ● 2028-9 or Asian ● 2054-5 or Black or African American ● 2076-8 or Native Hawaiian or Other Pacific Islander ● 2106-3 or White ● 2131-1 or Other	File will fail if numeric values or text values are not entered using acceptable values or field is left blank. Accepted values come from values mapped to LOINC codes you can find in the PHIN VADS system.

				• ASKU or Ask, but unknown • UNK or Unknown	
patientRaceText	PID-10.2	No	No	**Optional**	If not provided, field is populated based on the provided code for patient race.
patientEthnicity	PID-22.1	Yes	Yes	Enter patient's ethnicity. **Accepted Values:** • 2135-2 or Hispanic or Latino • 2186-5 or Not Hispanic or Latino • UNK or Unknown	File will fail if numeric values or text values are not entered using acceptable values or field is left blank. Accepted values come from values mapped to LOINC codes you can find in the PHIN VADS system.
patientEthnicity Text	PID-22.2	No	No	**Optional**	If not provided, field is populated based on the provided code for patient ethnicity.

Order and Result Data Elements

CSV Column Names	HL7 Field / Component	Fed Required?	State Required?	Data Requirements	Additional Guidance
testID	SPM-2.2	Requested	Requested	**Optional - Requested:** Enter unique identifier for this submitted test result.	Field is not required, but requested for thorough reporting.
specimenId	SPM-2.1 or OBX-18.1	Yes	Yes	Enter the unique and consistent identifier for the specimen.	This identifier is often a barcode number, serial number, or GUID.
correctedTestId	N/A	Requested	Requested	**Optional - Requested:** Enter the testId of the previous result, or if no testId was supplied previously, enter the specimenId	This field should be populated only when sending a corrected result for a previously submitted test.
deviceIdentifier	OBX-17.1	Yes	Yes	Enter device identifier from Department of Health and Human Services' (HHS) LOINC Mapping spreadsheet. **Examples:** 1) "00811877010616" 2) "BD Veritor System for Rapid Detection of SARS-CoV-2_Becton, Dickinson and Company (BD)" 3) "BD Veritor System for Rapid Detection of SARS-CoV-2 & Flu A+B_Becton, Dickinson and Company (BD)" 4) "RightSign COVID-19	File will fail if value not entered using accepted values or field is left blank. Go to https://www.cdc.gov/csels/dls/sars-cov-2-livd-codes.html. Click on the Mapping Tool labeled "LIVD SARS-CoV-2 Test Codes.xlsx" to download the file. Locate the saved file on your computer and open it. Click on the "LOINC Mapping" tab. Go to Column M, labeled "Testkit Name ID" to locate the corresponding value to enter.

				IgG/IgM Rapid Test Cassette_Hangzhou Biotest Biotech Co., Ltd.”	
deviceName	OBX-17.2	No	No	**Optional**: Enter device name from Department of Health and Human Services' (HHS) LOINC Mapping spreadsheet. **Examples:** 1) “ID NOW” 2) “BD Veritor System for Rapid Detection of SARS-CoV-2*” 3) “BD Veritor System for Rapid Detection of SARS-CoV-2 & Flu A+B*” 4) “RightSign COVID-19 IgG/IgM Rapid Test Cassette*”	May be used if deviceIdentifier/OBX-17.1 is not present. Go to https://www.cdc.gov/csels/dls/sars-cov-2-livd-codes.html. Click on the Mapping Tool labeled "LIVD SARS-CoV-2 Test Codes.xlsx" to download the file. Locate the saved file on your computer and open it. Click on the "LOINC Mapping" tab. Go to Column B, labeled "Model" to locate the corresponding value to enter.
testPerformed	OBX-3.1	Yes	Yes	Enter TestPerformed Code value from Department of Health and Human Services' (HHS) LOINC Mapping spreadsheet. **Examples:** 1) “94534-5” 2) “94558-4” 3) “97097-0” 4) “94507-1” “94508-9”	File will fail if value not entered using acceptable values or field is left blank. Go to https://www.cdc.gov/csels/dls/sars-cov-2-livd-codes.html. Click on the Mapping Tool labeled "LIVD SARS-CoV-2 Test Codes.xlsx" to download the file. Locate the saved file on your computer and open it. Click on the "LOINC Mapping" tab. Go to Column F, labeled "Test Performed LOINC Code". Locate the corresponding value to enter.
testResult	OBX-5.1	Yes	Yes	Enter a numeric SNOMED code from the common values listed. **Example:** “260373001”	File will fail if value is not entered using accepted text values or SNOMED codes, or if the field is left blank. Enter a value from the common values listed. Go to https://www.cdc.gov/csels/dls/sars-cov-2-livd-codes.html. Click on the Mapping Tool labeled "LIVD SARS-CoV-2 Test Codes.xlsx" to download the file. Locate the saved file on your computer and open it. Click on the "LOINC Mapping" tab. Go to Column E, labeled "Vendor Result Description". Locate SNOMED code value and

					enter into field (Example: Positive = 260373001).
testOrderedDate	ORC-15.1	Yes	Yes	Enter test ordered date. **Accepted Format:** yyyyMMddhhmmss+/-zzzz	File will fail if value is not entered using acceptable format or field is left blank.
specimenCollectedDate	SPM-17.1	Yes	Yes	Enter specimen collection date. **AcceptedFormat:** yyyyMMddhhmmss+/-zzzz	If unknown, populate field with the order_test_date value. In most cases, these are the same. Can be left blank if same as order_test_date.
testResultDate	OBX-14.1	Yes	Yes	Enter test result date. **Accepted Format:** yyyyMMddhhmmss+/-zzzz	File will fail if value is not entered using acceptable format or field is left blank.
testReportDate	OBX-19.1	Yes	Yes	Enter test report date. **Accepted Format:** yyyyMMddhhmmss+/-zzzz	File will fail if value is not entered using acceptable format or field is left blank.
testOrdered	OBR-4.1	No	No	**Optional**	If not provided, field is populated based on the provided test identifier or device and the test performed.
testName	OBR-4.2	No	No	**Optional**	If not provided, field is populated based on the provided test identifier or device and the test performed.
testCodingSystem	OBR-4.3	No	No	**Optional**	If not provided, field is populated based on the provided test identifier or device and the test performed.
testResultText	OBX-5.2	No	No	**Optional**	If not provided, field is populated based on the provided test identifier or device and the test performed.
testResultCodingSystem	OBX-5.3	No	No	**Optional**	If not provided, field is populated based on the provided test identifier or device and the test performed.

Ordering Provider Data Elements

CSV Column Names	HL7 Field / Component	Fed Required?	State Required?	Data Requirements	Additional Guidance
orderingProviderNpi	ORC-12.1	Yes	Yes	Enter National Provider Identifier (NPI). ReportStream prefers this value, however if NPI is unknown enter local coding. **Examples:** • NPI example:	File will fail if field left blank. *Some jurisdictions may not accept a local code, ReportStream will work with you if this is the case*. NPI is a 10-character all-numeric identification

				• 1013012657 • Local code example: muc1290	number to uniquely identify a health care provider. NPIs can be found at https://npiregistry.cms.hhs.gov/.
orderingProviderLname	ORC-12.2	No	Yes	Enter the last name of the ordering provider.	File will fail if field left blank.
orderingProviderFname	ORC-12.3	No	Yes	Enter the first name of the ordering provider.	File will fail if field left blank.
orderingProviderAddress	ORC-24.1	Requested	Yes	Enter the street address of the ordering provider.	File will fail if field left blank.
orderingProviderAddress2	ORC-24.2	No	No	**Optional:** Enter ordering provider's additional address information, if applicable.	This value is optional and can be left blank if no information is provided.
orderingProviderCity	ORC-24.3	Requested	Yes	Enter ordering provider's city.	File will fail if field left blank.
orderingProviderState	ORC-24.4	Requested	Yes	Enter ordering provider's state using the two-character abbreviation.	File will fail if field left blank.
orderingProviderZip	ORC-24.5	Requested	Yes	Enter ordering provider zip code. **Accepted Format:** 12345 12345-6789	File will fail if value is not entered using accepted format or field is left blank.
orderingProviderPhone	ORC-14.7	Requested	Yes - Conditional	Enter ordering provider's phone number. **Accepted Format:** 000-000-000	File will fail if value is not entered using accepted format or field is left blank.

Testing Facility Data Elements

CSV Column Names	HL7 Field / Component	Fed Required?	State Required?	Data Requirements	Additional Guidance
performingFacility	OBX-23.10	Yes	Yes	Enter testing facility's CLIA number.	File will fail if left blank. CLIA numbers can be found at https://www.cdc.gov/clia/LabSearch.html.
performingFacilityName	OBX-23.1	No	Yes	Enter testing facility's name.	File will fail if field left blank.
performingFacilityStreet	OBX-24.1	No	Yes	Enter the street address of the testing facility.	File will fail if field left blank.
performingFacilityStreet2	OBX-24.2	No	No	**Optional:** Enter testing facility's additional address information, if applicable.	This value is optional and can be left blank if no information is provided.
performingFacilityCity	OBX-24.3	No	Yes	Enter testing facility's city.	File will fail if field left blank.
performingFacilityState	OBX-24.4	Yes	Yes	Enter testing facility's state using the two-character abbreviation.	File will fail if field left blank.

performingFacilityZip	OBX-24.5	Yes	Yes	Enter testing facility's zip code. **Accepted Format:** 12345 12345-6789	File will fail if value is not entered using accepted format or field is left blank.
performingFacilityPhone	N/A	No	No	Enter testing lab's phone number, if known. **Accepted Format:** • 000-000-0000	File will fail if value is not entered using accepted format.

Ask-On-Entry (AOEs)

CSV Column Names	HL7 Field / Component	Fed Required?	State Required?	Data Requirements	Additional Guidance
firstTest	OBX-3.1 OBX-5.1	Requested	Requested	**Optional - Requested:** Enter patient's first test status. **OBX-3.1** 95417-2 **OBX-5.1** Y, N, UNK **CSV** YES, NO, UNK	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly as displayed.
pregnant	OBX-3.1 OBX-5.1	Requested	Requested	**Optional - Requested:** Enter patient's pregnancy status. **OBX-3.1** 82810-3 **OBX-5.1/CSV** 77386006 (Yes) 60001007 (No) 261665006 (Unknown)	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly as displayed.
healthcareEmployee	OBX-3.1 OBX-5.1	Requested	Requested	**Optional - Requested:** Enter patient's employment in healthcare status. **OBX-3.1** 95418-0 **OBX-5.1** Y, N, UNK **CSV** YES, NO, UNK	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly as displayed.
symptomatic	OBX-3.1 OBX-5.1	Requested	Requested	**Optional - Requested:** Enter patient's symptomatic for disease status. **OBX-3.1** 95419-8 **OBX-5.1**	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly as displayed.

				Y, N, UNK **CSV** YES, NO, UNK	
congregateResident	OBX-3.1 OBX-5.1	Requested	Requested	**Optional - Requested:** Enter patient's congregate housing status. **OBX-3.1** 95421-4 **OBX-5.1** Y, N, UNK **CSV** YES, NO, UNK	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly as displayed.
congregateResidentType	N/A	Requested	Requested	**Optional - Requested:** Enter the type of facility providing care for patient. **Accepted Values:** 22232009 (Hospital) 2081004 (Hospital ship) 32074000 (Long Term Care Hospital) 224929004 (Secure Hospital) 42665001 (Nursing Home) 30629002 (Retirement Home) 74056004 (Orphanage) 722173008 (Prison-based care site) 20078004 (Substance Abuse Treatment Center) 257573002 (Boarding House) 224683003 (Military Accommodation) 284546000 (Hospice) 257628001 (Hostel) 310207003 (Sheltered Housing) 57656006 (Penal Institution) 285113009 (Religious institutional residence) 285141008 (Work environment) 32911000 (Homeless) 261665006 (Unknown)	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly as displayed.
hospitalized	OBX-3.1 OBX-5.1	Requested	Requested	**Optional - Requested:** Enter patient's hospitalization status. **OBX-3.1** 77974-4 **OBX-5.1** Y, N, UNK **CSV** YES, NO, UNK	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly as displayed.
symptomsIcu	OBX-3.1 OBX-5.1	Requested	Requested	**Optional - Requested:** Enter patient's intensive care unit (ICU) status.	Field is not required, but requested for thorough reporting. Enter one of the acceptable values exactly

				OBX-3.1 77974-4 **OBX-5.1** Y, N, UNK **CSV** YES, NO, UNK	as displayed.

Ordering Facility Data Elements

All Ordering Facility Data Elements can be left blank if they are the same as the Testing Facility Data Elements

CSV Column Names	HL7 Field / Component	Fed Required?	State Required?	Data Requirements	Additional Guidance
orderingFacilityName	ORC-21.1	No	Yes – Conditional	Enter ordering facility name.	Can be left blank if same as testing_lab_name.
orderingFacilityStreet	ORC-22.1	No	Yes – Conditional	Enter the street address of the ordering facility.	Can be left blank if same as testing_lab_street.
orderingFacilityStreet2	ORC-22.2	No	No	**Optional:** Enter ordering facility's additional address information, if applicable.	This value is optional and can be left blank if no information is provided.
orderingFacilityCity	ORC-22.3	No	Yes – Conditional	Enter ordering facility's city.	Can be left blank if same as testing_lab_city.
orderingFacilityState	ORC-22.4	No	Yes – Conditional	Enter ordering facility's state using the two-character abbreviation.	Can be left blank if same as testing_lab_state.
orderingFacilityZip	ORC-22.5	No	Yes – Conditional	Enter ordering facility zip code. **Accepted Format:** • 12345 • 12345-6789	Can be left blank if same as testing_lab_zip_code.
orderingFacilityPhone	ORC-23	No	Yes – Conditional	Enter ordering facility phone number. **Accepted Format:** 000-000-0000	Can be left blank if same as testing_lab_phone_number.

Additional Data Elements

CSV Column Names	HL7 Field / Component	Fed Required?	State Required?	Data Requirements	Additional Guidance
previousTestType	OBX-3	No	No	**Optional:** Enter previous test type, if known. **Examples:** 94309-2 94558-4 94762-2	This value is optional and can be left blank if no information is provided.
previousTestDate	OBX-5	No	No	**Optional:** Enter previous test date, if known. **Preferred Format:**	This value is optional and can be left blank if no information is provided.

				yyyyMMddhhmmss+/-zzzz	
previousTestResult	OBX-5	No	No	**Optional:** Enter previous test result, if known. **Examples:** 260373001 (Detected) 260415000 (Not Detected) 261665006 (UNK - Unknown) 276727009 (Prior test type unknown)	This value is optional and can be left blank if no information is provided.
healthcareEmployeeType	N/A	No	No	**Optional:** Enter healthcare employee type, if known. **Example:** 223366009 (Heath care professional)	This value is optional and can be left blank if no information is provided. **Codes can be found at:** SNOMED CT Browser: https://browser.ihtsdotools.org/?perspective=full&conceptId1=223366009 Logica COVID-19 FHIR Profile Library IG: https://covid-19-ig.logicahealth.org/ValueSet-healthcare-occupation-value-set.html
symptomsList	OBX-5	No	No	**Optional:** Enter COVID-19 symptoms, if known. **SNOMED-CT Values:** 426000000 (Fever over 100.4F) 103001002 (Feeling feverish) 43724002 (Chills) 49727002 (Cough) 267036007 (Shortness of breath) 230145002 (Difficulty breathing) 84229001 (Fatigue) 68962001 (Muscle or body aches) 25064002 (Headache) 36955009 (New loss of taste) 44169009 (New loss of smell) 162397003 (Sore throat) 68235000 (Nasal congestion) 64531003 (Runny nose) 422587007 (Nausea) 422400008 (Vomiting) 62315008 (Diarrhea)	This value is optional and can be left blank if no information is provided. **CDC List of COVID-19 Symptoms can be found at:** https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fabout%2Fsymptoms.html
hospitalizedCode	N/A	No	No	**Optional:** Enter hospitalized code, if known. **Accepted Values:** 840544004 (Suspected disease caused by 2019 novel coronavirus (situation)) 840539006 (Disease caused by 2019 novel coronavirus (disorder))	This value is optional and can be left blank if no information is provided.

Appendix B: Sample Payloads and Output

Sample CSV Payload and Output

Input:

congregateResident,congregateResidentType,deviceIdentifier,deviceName,firstTest,healthcareEmployee,healthcare
EmployeeType,hospitalized,hospitalizedCode,orderingFacilityState,orderingProviderAddress,orderingProviderAddres
s2,orderingProviderCity,orderingProviderFname,orderingProviderLname,orderingProviderNpi,orderingProviderPhone
,
orderingProviderPhoneArea,orderingProviderState,orderingProviderZip,patientAge,patientAgeUnits,patientCity,patien
tCounty,patientDob,patientEmail,patientEthnicity,patientEthnicityText,patientHomeAddress,patientHomeAddress2,pat
ientNameFirst,patientNameLast,patientNameMiddle,patientPhone,patientPhoneArea,patientRace,patientRaceText,pa
tientSex,patientState,patientUniqueId,patientUniqueIdHash,patientZip,performingFacility,performingFacilityZip,pregna
nt,pregnantText,previousTestDate,previousTestResult,previousTestType,reportingFacility,serialNumber,specimenCol
lectedDate,specimenId,specimenSource,symptomatic,symptomsIcu,symptomsList,testCodingSystem,testName,test
O
rdered,testOrderedDate,testPerformed,testReportDate,testResult,testResultCodingSystem,testResultDate,testResult
Text
YES,74056004,"BinaxNOW COVID-19 Antigen Self Test_Abbott Diagnostics Scarborough, Inc.",BinaxNOW
COVID- 19 Antigen Self Test,YES,YES,3842006,YES,895231008,CA,11304 Lori
Drive,,Basile,Verla,Duff,4490193417,310-
742-0168,310,CA,70515,20,yr,Basile,Evangeline,20010218,charlene.meree@email.com,2135-2,Hispanic or
Latino,873 Tatum Crest,,Charlene,Meree,Emery,252-256-3219,252,2106-
3,White,F,LA,99000223440,98732498797494739877745A5,20195,10D2243349,34588,60001007,Not
Pregnant,20210214,260415000,94558-4,10D2243349,20210422-AAA,20210411,258500001-AAA-
BBB,697989009,YES,NO,44169009^20201219;426000000^20201220,SCT,SARS-CoV-2 nucleocapsid protein
antigen,94558-4,20210411,94558-4,20210414,455371000124106,SCT,20210413,Invalid result

Response:


```
{
  "id" :
  "6b0ecd05-4e2b-43f7-9d60-ca0b86c80c5f",
  "timestamp" : "2021-07-15T22:10:50.801291Z",
  "topic" : "covid-19",
  "reportItemCount" : 1,
  "destinations" : [ {
  "organization" : "HHSProtect",
    "organization_id" :
    "hhsprotect", "service" : "elr",
    "sending_at" : "2021-07-15T18:12-04:00",
    "itemCount" : 1
  }, {
    "organization" : "California Department of Public
    Health", "organization_id" : "ca-dph",
    "service" : "elr",
    "sending_at" : "2021-07-15T18:12-04:00",
    "itemCount" : 1
  }, {
    "organization" : "Louisiana Department of Health",
    "organization_id" : "la-doh",
    "service" : "elr",
    "sending_at" : "2021-07-15T17:12-05:00",
    "itemCount" : 1
  } ],
  "destinationCount" : 3,
```

```
  "warningCount" : 0,
  "errorCount" :
  0, "errors" : [ ],
  "warnings" : [ ]
}
```

Sample HL7 2.5.1 Payload and Output

Input:

FHS|^~\&|CDC PRIME - Atlanta,^2.16.840.1.114222.4.1.237821^ISO|CDC PRIME - Atlanta,^2.16.840.1.114222.4.1.237821^ISO|||202108031315+0000
BHS|^~\&|CDC PRIME - Atlanta,^2.16.840.1.114222.4.1.237821^ISO|CDC PRIME - Atlanta,^2.16.840.1.114222.4.1.237821^ISO|||202108031315+0000
MSH|^~\&|CDC PRIME - Atlanta,^2.16.840.1.114222.4.1.237821^ISO|Winchester House^05D2222542^ISO|CDPHCA
REDIE^2.16.840.1.114222.4.3.3.10.1.1^ISO|CDPH_CID^2.16.840.1.114222.4.1.214104^ISO|20210803131511.0147+0000||ORU^R01^ORU_R01|1234d1d1-95fe-462c-8ac6-46728dba581c|P|2.5.1|||NE|NE|USA|UNICODE UTF-8|||PHLabReport-NoAck^ELR_Receiver^2.16.840.1.113883.9.11^ISO
SFT|Centers for Disease Control and Prevention|0.1-SNAPSHOT|PRIME Data Hub|0.1-SNAPSHOT||20210726 PID|1||09d12345-0987-1234-1234-111b1ee0879f^^^Winchester House&05D2222542&ISO^PI^&05D2222542&ISO||Bunny^Bugs^C^^^^L||19000101|M||2106-3^White^HL70005^^^^2.5.1|12345 Main St^^San Jose^CA^95125^USA^^^06085||(123)456-7890^PRN^PH^^1^123^4567890|||||||N^Non Hispanic or Latino^HL70189^^^^2.9|||||||N
ORC|RE|1234d1d1-95fe-462c-8ac6-46728dba581c^Winchester House^05D2222542^ISO|1234d1d1-95fe-462c-8ac6-46728dba581c^Winchester House^05D2222542^ISO|||||||1679892871^Doolittle^Doctor^^^^^^CMS&2.16.840.1.113883.3.249&ISO^^^^NPI|||(123
)456-7890^WPN^PH^^1^123^4567890|20210802|||||Winchester House|6789 Main St^^San Jose^CA^95126^^^^06085|(123)456-7890^WPN^PH^^1^123^4567890|6789 Main St^^San Jose^CA^95126
OBR|1|1234d1d1-95fe-462c-8ac6-46728dba581c^Winchester House^05D2222542^ISO|1234d1d1-95fe-462c-8ac6- 46728dba581c^Winchester House^05D2222542^ISO|94558-4^SARS-CoV-2 (COVID-19) Ag [Presence] in Respiratory specimen by Rapid immunoassay^LN^^^^2.68|||202108020000-0500|202108020000-0500|||||||1679892871^Doolittle^Doctor^^^^^^CMS&2.16.840.1.113883.3.249&ISO^^^^NPI|(123)456-7890^WPN^PH^^1^123^4567890|||||202108020000-0500|||F
OBX|1|CWE|94558-4^SARS-CoV-2 (COVID-19) Ag [Presence] in Respiratory specimen by Rapid immunoassay^LN^^^^2.68||260415000^Not detected^SCT|||N^Normal (applies to non-numeric results)^HL70078^^^^2.7|||F|||202108020000-0500|05D2222542^ISO||10811877011290_DIT^^99ELR^^^^2.68^^10811877011290_DIT||202108020000-0500||||Winchester House^^^^^ISO&2.16.840.1.113883.19.4.6&ISO^XX^^^05D2222542|6789 Main St^^San Jose^CA^95126^^^^06085
OBX|2|CWE|95418-0^Whether patient is employed in a healthcare setting^LN^^^^2.69||N^No^HL70136|||||F|||202108020000-0500|05D2222542||||202108020000-0500||||Winchester House^^^^^ISO&2.16.840.1.113883.19.4.6&ISO^XX^^^05D2222542|6789 Main St^^San Jose^CA^95126-5285^^^^06085|||||QST
OBX|3|CWE|95417-2^First test for condition of interest^LN^^^^2.69||N^No^HL70136|||||F|||202108020000-0500|05D2222542||||202108020000-0500||||Winchester House^^^^^ISO&2.16.840.1.113883.19.4.6&ISO^XX^^^05D2222542|6789 Main St^^San Jose^CA^95126-5285^^^^06085|||||QST
OBX|4|CWE|95421-4^Resides in a congregate care setting^LN^^^^2.69||Y^Yes^HL70136|||||F|||202108020000-0500|05D2222542||||202108020000-0500||||Winchester House^^^^^ISO&2.16.840.1.113883.19.4.6&ISO^XX^^^05D2222542|6789 Main St^^San Jose^CA^95126-5285^^^^06085|||||QST
OBX|5|CWE|95419-8^Has symptoms related to condition of interest^LN^^^^2.69||N^No^HL70136|||||F|||202108020000-0500|05D2222542||||202108020000-0500||||Winchester House^^^^^ISO&2.16.840.1.113883.19.4.6&ISO^XX^^^05D2222542|6789 Main St^^San Jose^CA^95126-5285^^^^06085|||||QST
SPM|1|1234d1d1-95fe-462c-8ac6-46728dba581c&&05D2222542&ISO^1234d1d1-95fe-462c-8ac6-46728dba581c&&05D2222542&ISO||445297001^Swab of internal nose^SCT^^^^2.67||||53342003^Internal nose structure (body structure)^SCT^^^^2020-09-01|||||||||202108020000-0500|20210802000006.0000-0500

Response:


```
{
  "id" : "f08ccba0-c5ff-4ef5-924c-f72747603f02",
  "timestamp" : "2021-08-05T11:33:01.060209Z",
  "topic" : "covid-19",
  "reportItemCount" : 1,
  "destinations" : [ {
    "organization" : "California Department of Public Health",
    "organization_id" : "ca-dph",
    "service" : "elr",
    "sending_at" : "2021-08-05T07:34-04:00",
    "itemCount" : 1
  } ],
  "destinationCount" : 1,
  "warningCount" : 0,
  "errorCount" : 0,
  "errors" : [ ],
  "warnings" : [ ]
}
```

Appendix C: ReportStream Data Models

While ReportStream's initial uses have focused on COVID-19 test results, it's designed to accept a wide variety of healthcare data in CSV or HL7 2.5.1 format.

During the onboarding process, the ReportStream team configures a data model or schema associated with your client-id. When ReportStream receives a submission, its data gets validated against that schema prior to ingesting, transforming, and routing the data.

If you send us non-PII sample/example data, we can work with you to develop a schema meeting your needs. Or you can send data meeting one of our existing schemas.

Examples

COVID-19 data matching HHS Guidance:
https://github.com/CDCgov/prime-reportstream/blob/master/prime-router/docs/schema_documentation/direct-direct-covid-19.md

A simple schema meant for testing and demos:
https://github.com/CDCgov/prime-reportstream/blob/master/prime-router/docs/schema_documentation/sample-phd1-sample.md

A complex real-life schema used by our sister project, SimpleReport, for submitting COVID-19 data:
https://github.com/CDCgov/prime-reportstream/blob/master/prime-router/docs/schema_documentation/primedatainput-pdi-covid-19.md

Other examples of COVID-19 schemas:

https://github.com/CDCgov/prime-reportstream/tree/master/prime-router/docs/schema_documentation

Additional Resources

COVID-19 Diagnostic Data Standards: Frequently Asked Questions