

FHIR Analytics with Power BI

Michael Hansen (mihansen@microsoft.com)
Principal Program Manager, Microsoft Health Cloud and Data

1. Microsoft Azure API for FHIR: Applications and Data Ingest

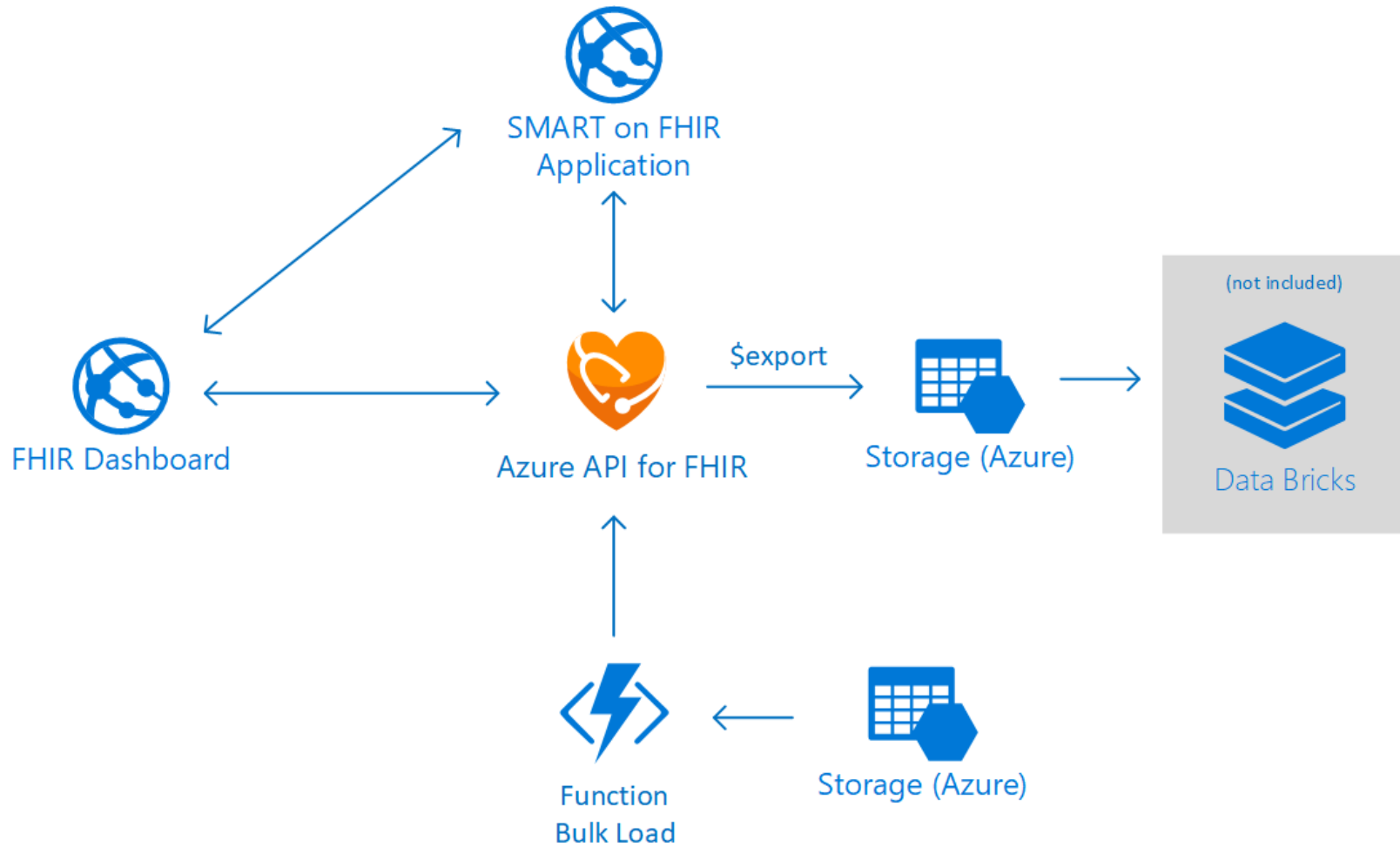
Jun 17, 2020 - 03:30PM - 04:10PM

2. **FHIR Analytics with Power BI**

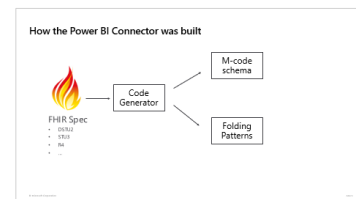
Jun 18, 2020 - 03:30PM - 04:10PM

<https://aka.ms/michael-devdays>

LARGE SANDBOX



<https://github.com/Microsoft/fhir-server-samples>



About me Patients

< >

	Family Name	Given Name	Age		
1	Gallegos952	Anita473	62	i	🔥
2	Kohler843	Alexis664	15	i	🔥
3	Arriaga291	Anita473	63	i	🔥
4	Fajardo595	Alfredo17	40	i	🔥
5	Saucedo620	Anita473	66	i	🔥
6	Hilll811	Bao544	78	i	🔥
7	Lynch190	Azalee124	57	i	🔥
8	Amador986	Antonia30	54	i	🔥
9	Romaguera67	Basil991	16	i	🔥
10	Waelchi213	Billy698	1	i	🔥

Information about the signed in user

FHIR Server URL: <https://mihandd2020.azurehealthcareapis.com>

Access Token:

eyJ0eXAiOiJKV1QiLCJhbGciOiJSUzI1NiIsIng1dCI6In0vHV0tUptRDVNN0RMZHpEMnYyeDNRS1NSWSlSImtpZC16In0vHV0tUptRDVNN0RMZHpEMnYyeDNRS1NSWSJ9.eyJhdWQoiOiiodHRwcovL21paGFuZGQyMDIwMmF6dXJlaGVhbHRoR2Y2fYzFWfaXMuyY29tiiaiwXNzljjoiaHR0cHM6Ly9zdHMud2luZG93cy5uZXQvYWlmZGU3YjltZGYwZi00N2U2LWFhYmYtMjQ2MmlwNzUwOGRjLyIsImhhbmhCdCMTU5MDE5MTIzNiwiImJlbjoxNTkwTWMtKxMjM2LCJleHAiOiE1OTAxOTUxMzMzYslmFjcil6ijEILChaw8iOi0MmRnWU1oeGJOZmgOWmt1eDg2bDhkcm85MUxJwaVzhvOVhpemFsZmxwcz1YzcTI0WGVGNm9BliwiWV1yljpbWlnB3JCjdlScHBPZC16ijY4MzZlN2ZlZW0zjtNdC4Y05NGUOLiyY2U1ZWM0ZWE2OSlsfmFcGlkYWNhbnJ0Zi0SLmhlcWYWRkcil6ij01JiF4LiqdLI9fSl5liwhmfEtZSl6im1naGfuZUG0VMdJwlWefkbWuliwb2klcioiNWIMtK57AtMtzxNC00YzdhlW

Postman

File Edit View Help

New Import Runner

My Workspace Invite

Refresh

Search

Upgrade

Filter

History Collections APIs

New Collection Trash

FHIR DevDays 2020

5 requests

GET {{fhirserverurl}}/metadata

GET {{fhirserverurl}}/Patient

POST {{fhirserverurl}}/Patient

DEL {{fhirserverurl}}/Patient

GET https://mihandd2020.azureh...

FHIR Training

30 requests

FHIR Training Example Q...

30 requests

rbac-demo

2 requests

GET {{fhirserverurl}}/meta...

GET {{fhirserverurl}}/Patient

DEL {{fhirserverurl}}/Patient

POST {{fhirserverurl}}/Pati...

GET http://52.250.88.95/fhir...

GET https://mihandd2020.a...

GET https://mihandd2020.a...

+

...

FHIR DevDays 2020

Comments 0

Examples 0

GET https://mihandd2020.azurehealthcareapis.com/\$export

Send

Save

Params

Authorization

Headers (10)

Body

Pre-request Script

Tests

Settings

Cookies

Code

Headers

8 hidden

KEY	VALUE	DESCRIPTION	...	Bulk Edit	Presets
<input checked="" type="checkbox"/> Accept	application/fhir+json				
<input checked="" type="checkbox"/> Prefer	respond-async				
Key	Value	Description			

Body

Cookies

Headers (10)

Test Results

Status: 202 Accepted

Time: 781 ms

Size: 490 B

Save Response

KEY	VALUE
Date	Fri, 22 May 2020 22:40:05 GMT
Server	Kestrel
Content-Length	0
Content-Location	https://mihandd2020.azurehealthcareapis.com/_operations/export/8433a4f3-af6b-4195-ad5d-0635fb96490e
Request-Context	appId=cid-v1:5de0b58a-3602-4f39-a0b3-835136311823
X-Request-ID	cdd3e7863a3a3f4a9cca226c06e26a68
x-ms-session-token	0:-1#58043
x-ms-request-charge	11.62
Strict-Transport-Security	max-age=31536000; includeSubDomains
X-Content-Type-Options	nosniff

Bootcamp

Build

Browse

?

Postman

File Edit View Help

New Import Runner

My Workspace Invite

Refresh

Search

Notifications

Upgrade

Filter

History Collections APIs

New Collection Trash

FHIR DevDays 20205 requests

GET {{fhirserverurl}}/metadata

GET {{fhirserverurl}}/Patient

POST {{fhirserverurl}}/Patient

DEL {{fhirserverurl}}/Patient

GET https://mihandd2020.azureh...

FHIR Training30 requests

FHIR Training Example Q...30 requests

rbac-demo2 requests

GET {{fhirserverurl}}/meta...

GET {{fhirserverurl}}/Patient

DEL {{fhirserverurl}}/Patient

POST {{fhirserverurl}}/Pati...

GET http://52.250.88.95/fhir...

GET https://mihandd2020.a...

GET https://mihandd2020.a...

+

...

FHIR DevDays 2020

Comments 0

Untitled Request

GET https://mihandd2020.azurehealthcareapis.com/_operations/export/8433a4f3-af6b-4195-ad5d-0635fb96490e

Send Save

Params Authorization Headers (8) Body Pre-request Script Tests Settings

Bearer Token

The authorization header will be automatically generated when you send the request. Learn more about authorization

Token

eyJ0eXAiOiJKV1QiLCJhbGciOiJSUzI1NiIsIng1dCI6IkN0VHV0TUptRDVNN0RMZHpEMnYyeDNRS1NSWSIsImtpZCI6IkN0VHV0TUptRDVNN0f...

Heads up! These parameters hold sensitive data. To keep this data secure while working in a collaborative environment, we recommend using variables. Learn more about variables

Body Cookies Headers (10) Test Results

Status: 200 OK Time: 229 ms Size: 3.22 KB Save Response

Pretty Raw Preview Visualize JSON

```
1 {
2   "transactionTime": "2020-05-22T22:40:05.6199562+00:00",
3   "request": "https://mihandd2020.azurehealthcareapis.com/$export",
4   "requiresAccessToken": false,
5   "output": [
6     {
7       "type": "AllergyIntolerance",
8       "url": "https://mihandd2020export.blob.core.windows.net:443/8433a4f3-af6b-4195-ad5d-0635fb96490e/AllergyIntolerance.ndjson",
9       "count": 19
10    },
11    {
12      "type": "CarePlan",
13      "url": "https://mihandd2020export.blob.core.windows.net:443/8433a4f3-af6b-4195-ad5d-0635fb96490e/CarePlan.ndjson",
14      "count": 344
15    },
16    {
17      "type": "CareTeam",
18      "url": "https://mihandd2020export.blob.core.windows.net:443/8433a4f3-af6b-4195-ad5d-0635fb96490e/CareTeam.ndjson",
19      "count": 343
20    },
21    {
22      "type": "Claim",
23      "url": "https://mihandd2020export.blob.core.windows.net:443/8433a4f3-af6b-4195-ad5d-0635fb96490e/Claim.ndjson",
24      "count": 7526
25    },
26    {
27      "type": "Condition",
28      "url": "https://mihandd2020export.blob.core.windows.net:443/8433a4f3-af6b-4195-ad5d-0635fb96490e/Condition.ndjson",
29      "count": 899
30    },
31    {
32      "type": "Device",
33      "url": "https://mihandd2020export.blob.core.windows.net:443/8433a4f3-af6b-4195-ad5d-0635fb96490e/Device.ndjson",
34      "count": 8
35    },
36    {
37      "type": "DiagnosticReport",
38      "url": "https://mihandd2020export.blob.core.windows.net:443/8433a4f3-af6b-4195-ad5d-0635fb96490e/DiagnosticReport.ndjson",
```

Bootcamp Build Browse

?

mihandd2020

[Schedule](#) [Comments](#) [Runs](#) [Revision history](#)

Command took 0.06 seconds -- by mihansen@microsoft.com at 5/22/2020, 4:13:00 PM on mihandd2020-1

Command took 27.56 seconds -- by mihansen@microsoft.com at 5/22/2020, 4:13:54 PM on mihandd2020-1

Command took 4.34 seconds -- by mihansen@microsoft.com at 5/22/2020, 4:15:06 PM on mihandd2020-1

Command took 1.03 seconds -- by mihansen@microsoft.com at 5/22/2020, 4:15:31 PM on mihandd2020-1

Command took 0.22 seconds -- by mihansen@microsoft.com at 5/22/2020, 4:15:50 PM on mihandd2020-1

- Azure Databricks
- Home
- Workspace
- Recents
- Data
- Clusters
- Jobs
- Models
- Search

mihansendevdays2020 (Python)

mihandd2020-1 File Edit View: Code Permissions Run All Clear Schedule Comments Runs Revision history

```
1 %sql
2 CREATE OR REPLACE TEMPORARY VIEW temp_latitude AS
3   SELECT id, coord.valueDecimal AS latitude FROM
4     (SELECT id, explode(address[0].extension[0].extension) as coord FROM patientTable)
5   WHERE coord.url = 'latitude';
6
7 CREATE OR REPLACE TEMPORARY VIEW temp_longitude AS
8   SELECT id, coord.valueDecimal AS longitude FROM
9     (SELECT id, explode(address[0].extension[0].extension) as coord FROM patientTable)
10  WHERE coord.url = 'longitude'
```

OK
Command took 0.11 seconds -- by mihansen@microsoft.com at 5/22/2020, 4:16:14 PM on mihandd2020-1

Cmd 8

```
1 %sql
2 SELECT
3   patientTable.id,
4   patientTable.name[0].family AS lastName,
5   temp_longitude.longitude AS longitude,
6   temp_latitude.latitude AS latitude,
7   temp_weights.weightValue, temp_heights.heightValue
8 FROM patientTable
9 INNER JOIN temp_weights ON temp_weights.patient = patientTable.id
10 INNER JOIN temp_heights ON temp_heights.patient = patientTable.id
11 INNER JOIN temp_latitude ON temp_latitude.id = patientTable.id
12 INNER JOIN temp_longitude ON temp_longitude.id = patientTable.id
13 LIMIT 10
```

(3) Spark Jobs

id	lastName	longitude	latitude	weightValue	heightValue
594d4283-3acb-4f46-a97e-3e845b5b7b1e	Cassin499	-70.99855518177093	41.9768387721285	90.7	178.3
e7a85ddd-af43-4955-9167-1f0418b37997	Walter473	-70.90101002669104	42.48264956980514	108.2	188.5
a32c525e-5af4-4dc2-a6d9-846b68da7cec	Murray856	-71.20926478303276	42.3904493291209	91.1	173.3
2d4a9f5a-d85f-4cf3-be3f-c7acc6ff7b81	Rath779	-70.06193778174459	41.772652063512545	18.7	107.7
e3c52f43-744e-4500-897c-7b7fd82fb87	Vega377	-70.9834912732618	42.468078587899306	86.7	169.7
c13d3170-7abd-4bdd-83eb-611adb9c54fd	Koepp521	-70.64738046500526	41.73272841490259	85.2	174.8
b09d027b-24a6-41e7-9773-d2ea0eb37be2	Upton904	-71.19959372945458	42.6974579230271	88.2	170.8
79704b8c-86b3-404b-972d-2d35d84edb8c	Carter549	-71.17372282029753	42.66658230787945	24.2	105.9
4d47a510-a0ef-4a2a-8088-0a8ac7250527	Deadman524	-70.87087421410524	42.085224802528084	88.6	175.2

Command took 5.35 seconds -- by mihansen@microsoft.com at 5/22/2020, 4:16:32 PM on mihandd2020-1

Paste

Cut

Copy

Format painter

Get data

Excel

Power BI datasets

SQL Server

Enter data

Recent sources

Transform data

Refresh

New visual

Text box

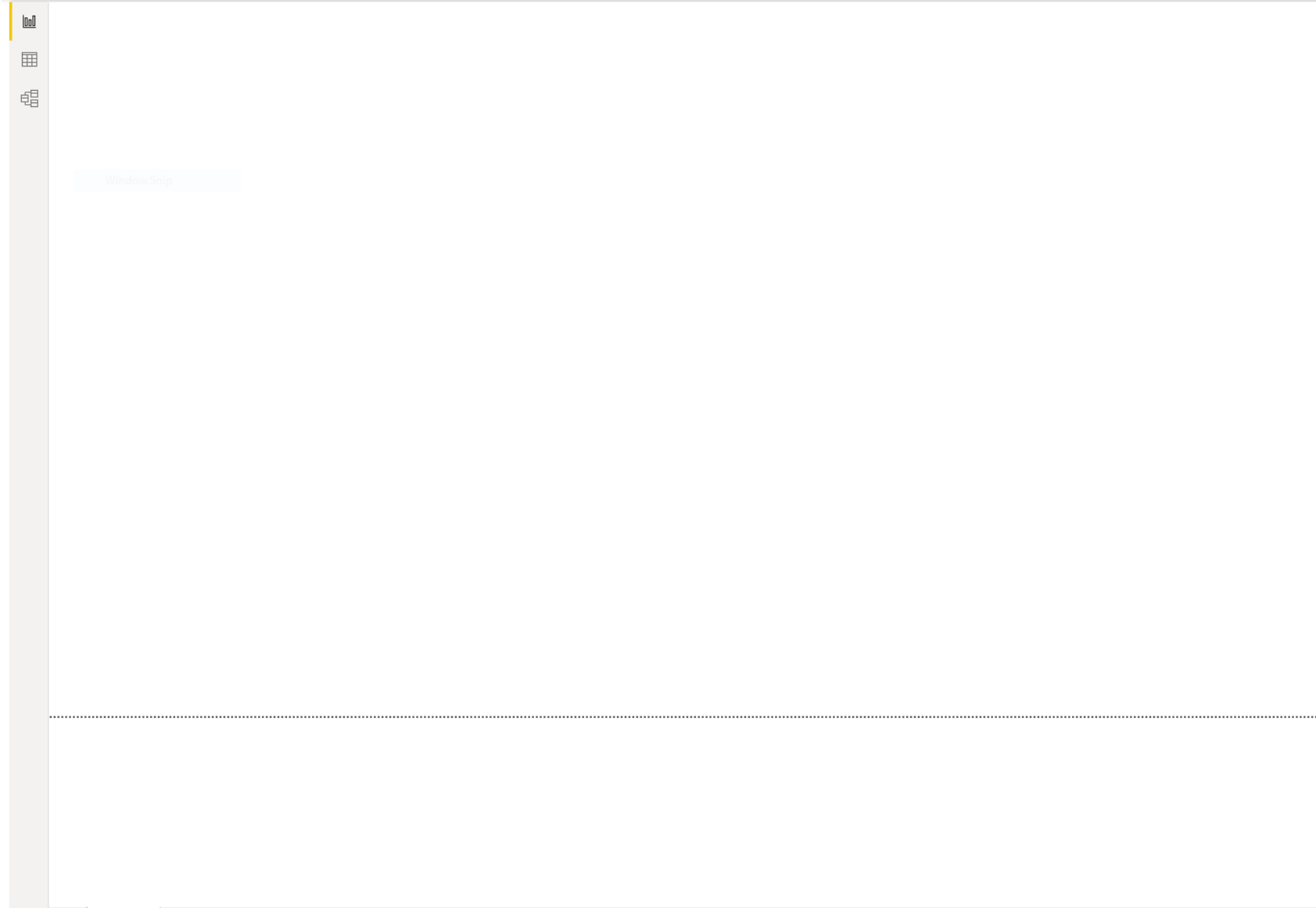
More visuals

New measure

Quick measure

Publish

ClipboardDataQueriesInsertCalculationsShare



Filters

Search

Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations

Search

Visuals

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Fields

Search

Paste

Cut

Copy

Format painter

Clipboard

Get data

Excel

Power BI datasets

SQL Server

Enter data

Recent sources

Data

Transform data

Refresh

Queries

New visual

Text box

More visuals

Insert

New measure

Quick measure

Calculations

Publish

Share

Get Data

fhir

All

Other

All

FHIR

Certified Connectors

Connect

Cancel

Filters

Search

Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations

Search

Add data fields here

Values

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Fields

Search

File Home Insert Modeling View Help

Clipboard

Paste

Cut

Copy

Format painter

Data

Get data

Excel

Power BI datasets

SQL Server

Enter data

Recent sources

Queries

Transform data

Refresh data

Insert

New visual

Text box

More visuals

Calculations

New measure

Quick measure

Share

Publish

From Fhir.Contents

URL

<https://mihandd2020.azurehealthcareapis.com>

Query (optional)

Example: Patient?address-postalcode=98052

OK

Cancel

Filters

Search

Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations

Search

Visualizations

Bar chart

Line chart

Area chart

Stacked bar chart

Waterfall chart

Map

Table

Matrix

Card

Image

Video

Power BI logo

R

Py

Values

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Fields

Search

FileHomeInsertModelingViewHelp

PasteCutCopyFormat painterClipboard

Get dataExcelPower BI datasetsSQL ServerEnter dataRecent sourcesData

Transform dataRefreshQueries

New visualText boxMore visualsInsert

New Quick measure measureCalculations

PublishShare

Visuals

Visualizations

Fields

Filters

Visualizations

Fields

Search

on this page

Add data fields here

on all pages

Add data fields here

Values

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Search

No items selected for preview

LoadTransform DataCancel

Navigator

Display Options

https://mihandd2020.azurehealthcareapis.c...

Account

ActivityDefinition

AdverseEvent

AllergyIntolerance

Appointment

AppointmentResponse

AuditEvent

Basic

Binary

BiologicallyDerivedProduct

BodyStructure

Bundle

CapabilityStatement

CarePlan

CareTeam





















CatalogEntry

ChargeItem

ChargeItemDefinition

Claim

Page 1

- ☐  OperationDefinition
- ☐  OperationOutcome
- ☐  Organization
- ☐  OrganizationAffiliation
- ☒  Patient
- ☐  PaymentNotice
- ☐  PaymentReconciliation
- ☐  Person
- ☐  PlanDefinition
- ☐  Practitioner
- ☐  PractitionerRole
- ☐  Procedure
- ☐  Provenance
- ☐  Questionnaire
- ☐  QuestionnaireResponse
- ☐  RelatedPerson
- ☐  RequestGroup
- ☐  ResearchDefinition
- ☐  ResearchElementDefinition
- ☐  ResearchStudy

id	meta	implicitRules	language	<re
6b3491cd-dc7a-4ed3-836d-b8fee43d174c	Record	null	null	Pat
96af6c43-2f07-42d1-a6df-5524cd9254b1	Record	null	null	Pat
853625c5-2f25-4026-bb7a-05f7111357c6	Record	null	null	Pat
fa88054d-d008-4a1a-ad87-f49008103308	Record	null	null	Pat
87715980-83a5-4426-9398-6bf2f9955bb4	Record	null	null	Pat
a529fcc9-b885-4143-84e6-5c9bae8c5bf0	Record	null	null	Pat
a7731012-1e08-44b7-8013-27f3294fbf78	Record	null	null	Pat
92936405-e774-41cd-bcaa-e992dced9c1c	Record	null	null	Pat
ac2267d2-8b4d-4885-8cbl-ae629f640e64	Record	null	null	Pat
558c6ca2-ed24-4bfb-b3d0-761328423128	Record	null	null	Pat
26bd11b2-b6e3-446b-9992-3dac1e57ee6a	Record	null	null	Pat
b117a556-ba3d-41d9-8442-48a2444b7eee	Record	null	null	Pat
a9d17f2d-f1e4-4ced-a34c-3d2dea82f2f	Record	null	null	Pat
93de8a25-fdac-4a5b-90e2-78fa3b3c8bdf	Record	null	null	Pat
aecfec44-3964-4a34-b1d8-a6573868ee4a	Record	null	null	Pat
feef1391-b197-46c0-84c1-b822e1a430eb	Record	null	null	Pat
afbaacb5-0683-4ae9-992c-359c8517d109	Record	null	null	Pat
bffc2a63-eebf-4c2c-a1f5-438e8123a0a5	Record	null	null	Pat
2619d444-13b2-446f-84dc-62313269c1ad	Record	null	null	Pat
c68fa327-9924-459e-aa4f-918439775a35	Record	null	null	Pat

 The data in the preview has been truncated due to size limits.

Cancel

Search

Add data fields here

Add data fields here



Values

Add data fields here

Cross-report

Off

Keep all filters

On ☒

Add drill-through fields here

<

 Patient

25 COLUMNS, 119 ROWS Column profiling based on top 1000 rows

>

[All Properties](#)

- Source
- Navigation

Category	Percentage
1. General Information	10%
2. Personal History	15%
3. Medical History	20%
4. Social History	10%
5. Family History	10%
6. Review of Systems	15%
7. Physical Examination	20%
8. Laboratory and Diagnostic Tests	10%
9. Treatment and Management	10%
10. Prognosis and Follow-up	10%

 f_x = Source{[Name="Patient"]}[Data]

 Patient

	gender	birthDate	deceased	address	maritalStatus	multipleBirth	photo	contact	comments
1	female	1/8			Record	Record		null	null Table
2	male	7/7			Record	Record		null	null Table
3	female	3/24			Record	Record		null	null Table
4	male	6/27			Record	Record		null	null Table
5	female	4/21			Record	Record		null	null Table
6	female	2/22			Record	Record		null	null Table
7	female	1/3			Record	Record		null	null Table
8	female	1/24			Record	Record		null	null Table
9	male	12/31			Record	Record		null	null Table
10	male	5/24			Record	Record		null	null Table
11	female	2/7			Record	Record		null	null Table
12	male	8/30			Record	Record		null	null Table
13	female	3/1			Record	Record		null	null Table
14	female	10/18			Record	Record		null	null Table
15	male	1/7			Record	Record		null	null Table
16	male	1/7			Record	Record		null	null Table
17	male	10/2			Record	Record		null	null Table
18	male	8/30			Record	Record		null	null Table
19	male	7/13			Record	Record		null	null Table
20	female	3/9			Record	Record		null	null Table
21	male	3/5/1941	null	Table	Record	Record		null	null Table
22	female	8/7/1978	null	Table	Record	Record		null	null Table
23	male	8/15/1998	null	Table	Record	Record		null	null Table
24	male	10/4/1959	null	Table	Record	Record		null	null Table
25	female	2/12/2019	null	Table	Record	Record		null	null Table
26	female	2/7/1954	null	Table	Record	Record		null	null Table
27	male	6/10/1939	null	Table	Record	Record		null	null Table
28	female	9/7/1984	null	Table	Record	Record		null	null Table
29	male	9/23/1957	null	Table	Record	Record		null	null Table
30	male	12/30/1963	null	Table	Record	Record		null	null Table
31	male	7/29/1998	null	Table	Record	Record		null	null Table
32	female	9/25/2002	null	Table	Record	Record		null	null Table
33	male	4/9/1982	null	Table	Record	Record		null	null Table
34	male	8/19/2007	null	Table	Record	Record		null	null Table
35	male	5/11/1999	null	Table	Record	Record		null	null Table
36	female	9/7/1968	null	Table	Record	Record		null	null Table
37	male	10/2/1942	null	Table	Record	Record		null	null Table
38	male	12/30/2015	null	Table	Record	Record		null	null Table
39	male	10/20/1990	null	Table	Record	Record		null	null Table
40	female	10/7/1967	null	Table	Record	Record		null	null Table
41	female	5/1/2015	null	Table	Record	Record		null	null Table
42	male	1/12/1975	null	Table	Record	Record		null	null Table
43	male	4/12/1998	null	Table	Record	Record		null	null Table
44	male	6/11/1983	null	Table	Record	Record		null	null Table

PREVIEW DOWNLOADED AT 11:35 AM

Queries [2]AllergyIntolerancePatient

fx= Table.ExpandRecordColumn(AllergyIntolerance1, "code", {"text"}, {"code.text"})

	clinicalStatus	verificationStatus	type	category	criticality	code.text	patient	encounter	onset
1	Record	Record	allergy	List	low			null	null
2	Record	Record	allergy	List	low			null	null
3	Record	Record	allergy	List	low			null	null
4	Record	Record	allergy	List	low			null	null
5	Record	Record	allergy	List	low			null	null
6	Record	Record	allergy	List	low			null	null
7	Record	Record	allergy	List	low			null	null
8	Record	Record	allergy	List	low			null	null
9	Record	Record	allergy	List	low			null	null
10	Record	Record	allergy	List	low			null	null
11	Record	Record	allergy	List	low			null	null
12	Record	Record	allergy	List	low			null	null
13	Record	Record	allergy	List	low			null	null
14	Record	Record	allergy	List	low	House dust mite allergy	Record	null	null
15	Record	Record	allergy	List	low	Allergy to nut	Record	null	null
16	Record	Record	allergy	List	low	Dander (animal) allergy	Record	null	null
17	Record	Record	allergy	List	low	House dust mite allergy	Record	null	null
18	Record	Record	allergy	List	low	Allergy to mould	Record	null	null
19	Record	Record	allergy	List	low	Allergy to tree pollen	Record	null	null
						Allergy to fish	Record	null	null

Search Columns to Expand

(Select All Columns)

☐ id

☐ extension

☒ reference

☐ type

☐ identifier

☐ display

☒ Use original column name as prefix

OKCancel

Query Settings

PROPERTIES

NameAllergyIntolerance

All Properties

APPLIED STEPS

Source

Navigation

Expanded code

FileHomeHelp

PasteCutCopy

Get dataExcelPower BIdatasetsSQL ServerEnter dataRecent sources

Transform dataRefresh

Manage relationshipsManage rolesView as

Q&A setupLanguageLinguistic schema

Publish

ClipboardDataQueriesRelationshipsSecurityQ&ALinguistic schemaShare

Settings and more (Alt+F)

AllergyIntolerance

<referenceId>

code.text

criticality

id

implicitRules

language

lastOccurrence

patient.reference

recordedDate

type

Patient

<referenceId>

active

address.country

address.postalCode

address.state

birthDate

gender

id

implicitRules

language

All tables

Properties

Select one or more model objects to set their properties.

Fields

Search

AllergyIntolerance

Patient

FileHomeHelp

PasteCutCopy

Get dataExcelPower BI datasetsSQL ServerEnter dataRecent sources

Transform dataRefresh data

Manage relationshipsManage rolesView as

Q&A setupLanguage setupLinguistic schema

Publish

ClipboardDataQueriesRelationshipsSecurityQ&ALanguageLinguistic schemaShare

Settings and more (Alt+F)



Properties >

Select one or more model objects to set their properties.

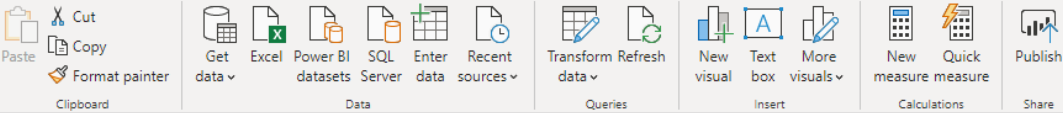
Fields >

Search

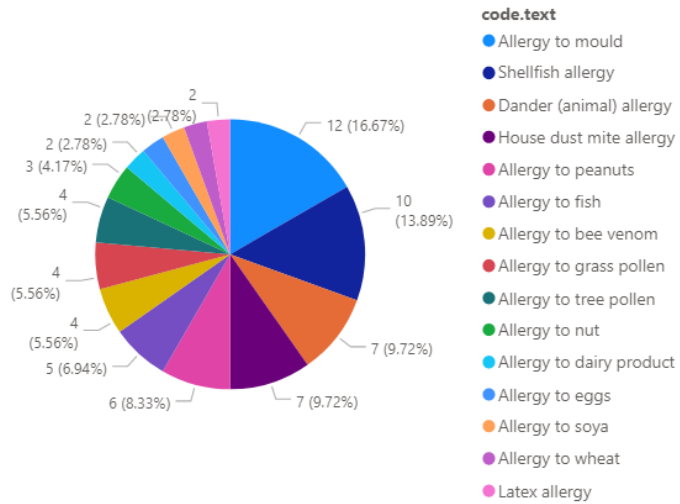
▶ AllergyIntolerance

▶ Patient

UPDATE AVAILABLE (CLICK TO DOWNLOAD)



Count of code.text by code.text



Filters

Search

Filters on this visual

code.text
is (All)

Count of code.text
is (All)

Add data fields here

Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations

Search

Visualizations

code.text

code.text

Add data fields here

Add data fields here

Add data fields here

Add data fields here

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Fields

Search

AllergyIntolerance

<reference...

code.text

criticality

id

implicitRules

language

lastOccurre...

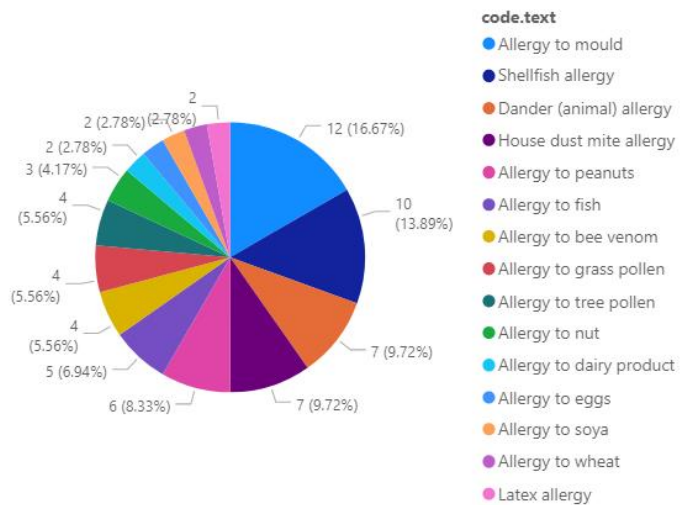
patient.refe...

recordedDa...

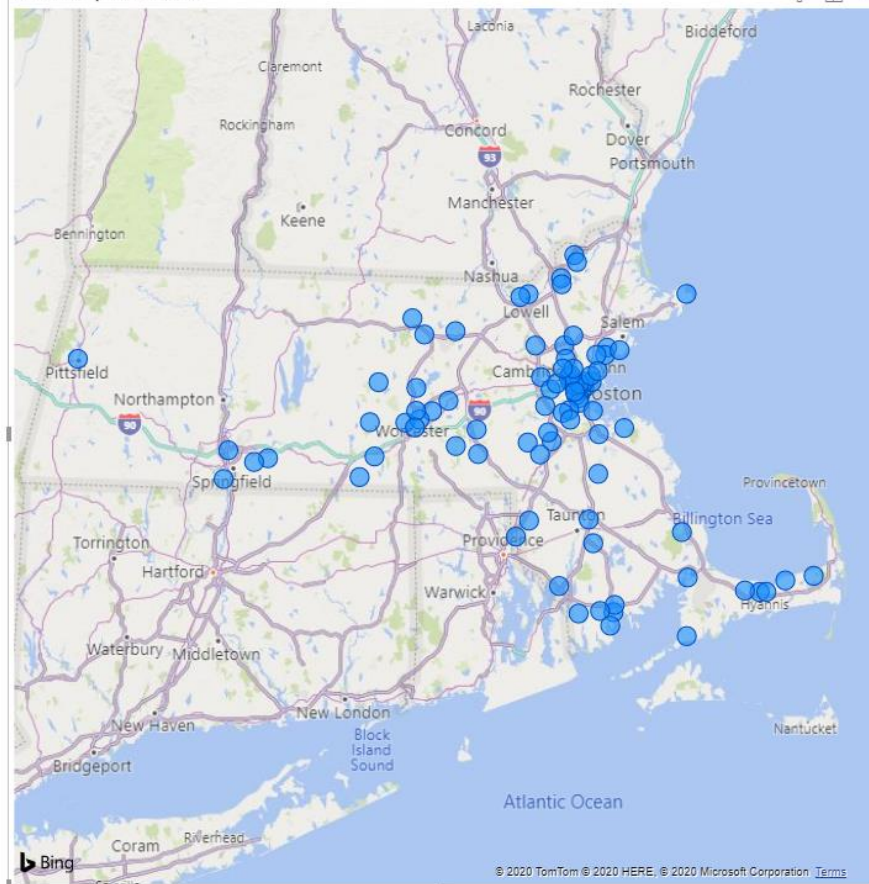
type

Patient

Count of code.text by code.text



address.postalCode



Filters

Search

Filters on this visual

address.postalCode is (All)

Add data fields here

Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations

Search

Location

address.postalCode

Legend

Add data fields here

Latitude

Add data fields here

Longitude

Add data fields here

Size

Add data fields here

Tooltips

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Fields

Search

AllergyIntolerance

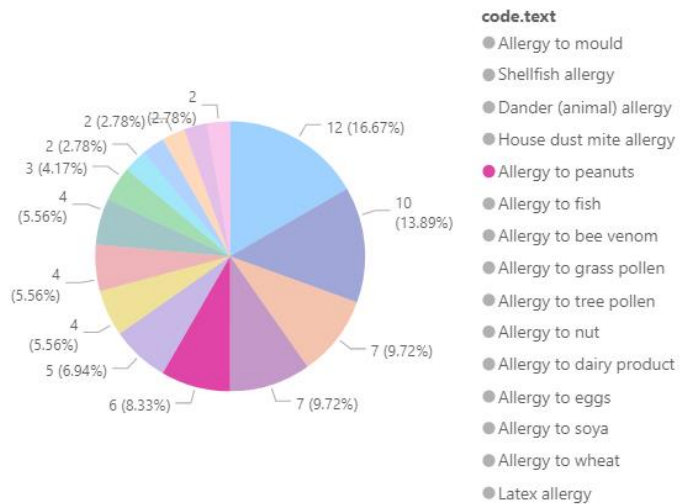
- <referenc...
- code.text
- criticality
- id
- implicitRules
- language
- lastOccurre...
- patient.refe...
- recordedDa...
- type

Patient

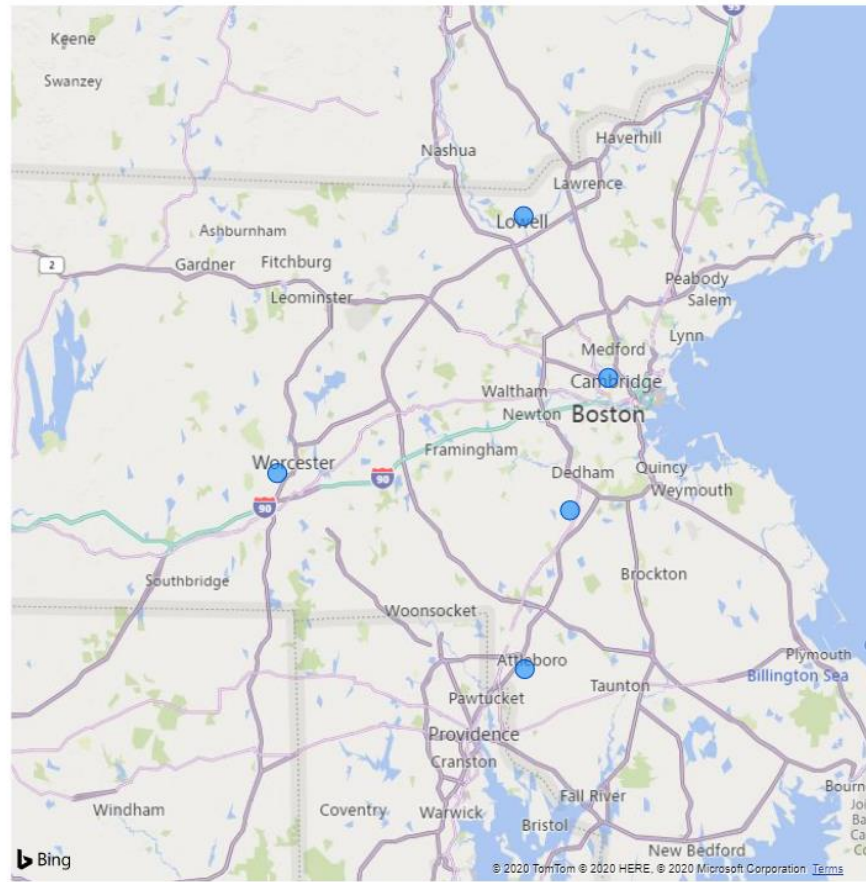
- <referenc...
- active
- address.cou...
- address.pos...
- address.state
- birthDate
- gender
- id
- implicitRules
- language



Count of code.text by code.text



address.postalCode



Filters

Search

Filters on this visual

code.text
is (All)

Count of code.text
is (All)

Add data fields here

Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations

Search

code.text

Count of code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

code.text

Fields

Search

AllergyIntolerance

<referencel...

code.text

criticality

id

implicitRules

language

lastOccurre...

patient.refe...

recordedDa...

type

Patient

<referencel...

active

address.cou...

address.pos...

address.state

birthDate

gender

id

implicitRules

language

File Home Insert Modeling View Help

Clipboard

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Data

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New visual

Text box

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Calculations

New measure

Quick measure

Share

Publish

Settings and more (Alt+F)



From Fhir.Contents

URL ⓘ

http://test.fhir.org/r2

Query (optional)

Example: Patient?address-postalcode=98052

OK

Cancel

Filters

Search

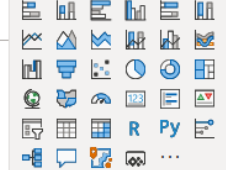
Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations



Values

Add data fields here

Drill through

Cross-report

Off

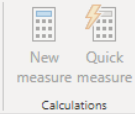
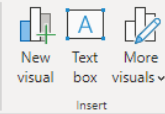
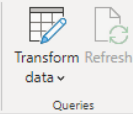
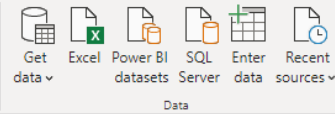
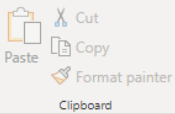
Keep all filters

On

Add drill-through fields here

Fields

Search



Navigator

Display Options

- ☐ MedicationStatement
- ☐ NamingSystem
- ☐ NutritionOrder
- ☐ Observation
- ☐ OperationDefinition
- ☐ OperationOutcome
- ☐ Order
- ☐ OrderResponse
- ☐ Organization
- ☒ Patient
- ☐ PaymentNotice
- ☐ PaymentReconciliation
- ☐ Person
- ☐ Practitioner
- ☐ Procedure
- ☐ ProcedureRequest
- ☐ ProcessRequest
- ☐ ProcessResponse
- ☐ Provenance
- ☐ Questionnaire

Patient

id	meta	implicitRules	language	<re
02de5332-97c5-4de7-a293-f8e718a947bb	Record	null	null	Pat
04260299-ab23-4661-9eb6-0eaeafade00	Record	null	null	Pat
0832c13b-3803-4229-b9e0-8112c3e0b383	Record	null	null	Pat
0af51e6f-be53-433a-996d-a8d2d56e5f	Record	null	null	Pat
0ff53974-6310-4397-9797-96548dea88	Record	null	null	Pat
1	Record	null	null	Pat
12724065	Record	null	null	Pat
12724066	Record	null	null	Pat
12724067	Record	null	null	Pat
12724070	Record	null	null	Pat
1c94cbe9-3fa3-4762-a29f-0b05d0b2fa50	Record	null	null	Pat
1efd74f3-10f0-4256-a8e4-eddce4f987	Record	null	null	Pat
2	Record	null	null	Pat
23636be2-c1f2-4702-83c2-a0d68847650f	Record	null	null	Pat
259	Record	null	null	Pat
260	Record	null	null	Pat
261	Record	null	null	Pat
262	Record	null	null	Pat
263	Record	null	null	Pat

The data in the preview has been truncated due to size limits.

Load

Transform Data

Cancel

Filters

Search

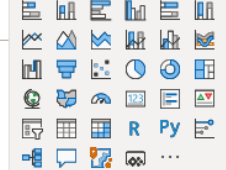
on this page

Add data fields here

on all pages

Add data fields here

Visualizations



Values

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Fields

Search

Queries [1] Patient

= Source[{Name="Patient"}][Data]

	telecom	gender	birthDate	deceased	address	maritalStatus	multipleBirth	photo	contact
1	Table	male	10/9			Record	Record		null
2		null	male	8/9			null		null
3	Table	male	2/3			Record	Record		null
4	null	male	12/25				null		null
5		null	male				null		null
6		null	male				null		null
7	Table	female	3/16			Record		null	null
8	Table	female	8/11			Record		null	Table
9	Table	male	4/29			Record		null	null
10	Table	male	8/22			Record		null	null
11	Table	female	11/10			Record	Record		null
12		null	male				null		null
13		null	male				null		null
14	Table	male	12/26			Record	Record		null
15		null	male	1/1			null		null
16	null	null					null		null
17		null					null		null
18		null					null		null
19	null	null					null		null
20	null	null	male				null		null
21	null	null	male		null		null		null
22	null	null	male		null		null		null
23	Table	male	1/1/1990	Record	Table	Record	Record		null
24		null	male		null		null		null
25		null	female		null	Table	Record		null
26		null	female		null	Table	Record		null
27	Table	female	6/14/1966		null	Table	Record	Record	null
28	Table	male	2/13/1952		null	Table	Record	Record	null
29	Table	female	8/29/2017		null	Table	Record	Record	null
30	null	null	male	12/25/1974		null		null	null
31	Table	female	7/31/1960		null	Table	Record	Record	null
32		null	male		null		null		null
33	Table	male	12/25/1974	Record	Table		null		null
34	Table	male	11/11/1999		null	Table		null	null
35	null	null			null		null		null
36	Table	male	5/11/1948		null	Table		null	null
37	null	null			null		null		null
38	Table	female	10/24/2002		null	Table	Record	Record	null
39	Table	male	5/14/2011		null	Table	Record	Record	null
40	Table	male	12/26/1969		null	Table	Record	Record	null
41	Table	female	11/4/1965		null	Table	Record	Record	null
42	Table	male	10/26/2014		null	Table	Record	Record	null
43	Table	male	12/25/1974	Record	Table		null		null
44	Table	male	3/6/1953		null	Table		null	null

Search Columns to Expand

Expand Aggregate

(Select All Columns)

- ☐ id
- ☐ extension
- ☐ use
- ☐ type
- ☐ text
- ☐ line
- ☐ city
- ☐ district
- ☒ state
- ☒ postalCode
- ☒ country
- ☐ period

Use original column name as prefix

OK Cancel

Query Settings

PROPERTIES

Name

Patient

All Properties

APPLIED STEPS

Source

Navigation

FileHomeInsertModelingViewHelp

Cut

Paste

Format painter

Copy

Get data

Excel

Power BI datasets

SQL Server

Enter data

Recent sources

Transform data

Refresh data

New visual

Text box

More visuals

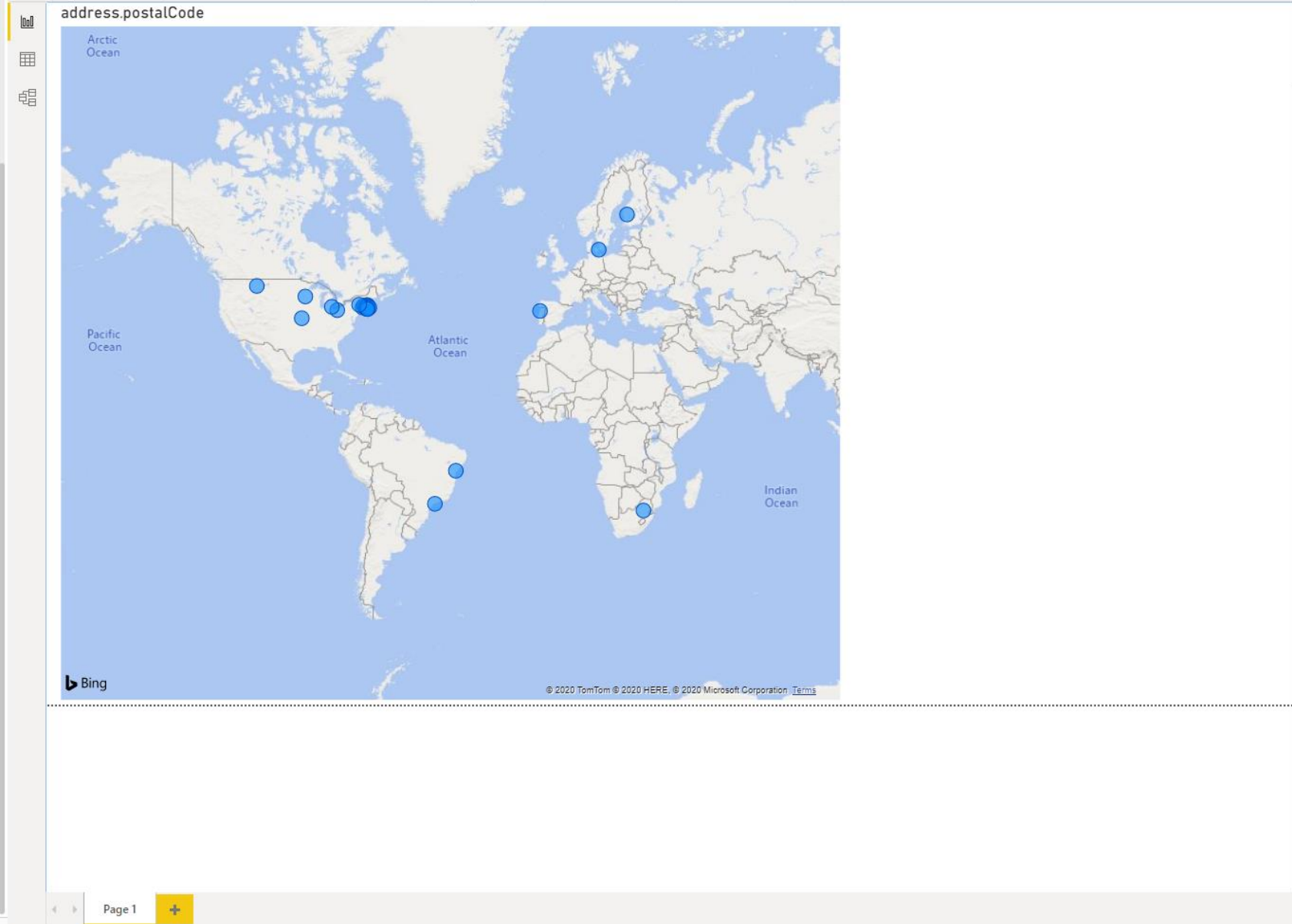
New measure

Quick measure

Publish

ClipboardDataQueriesInsertCalculationsShare

Settings and more (Alt+F)



Filters

Search

Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Visualizations

Search

Visuals

Add data fields here

Drill through

Cross-report

Off

Keep all filters

On

Add drill-through fields here

Fields

Search

Patient

☐ <reference...

☐ active

☐ address.cou...

☐ address.pos...

☐ address.state

☒ birthDate

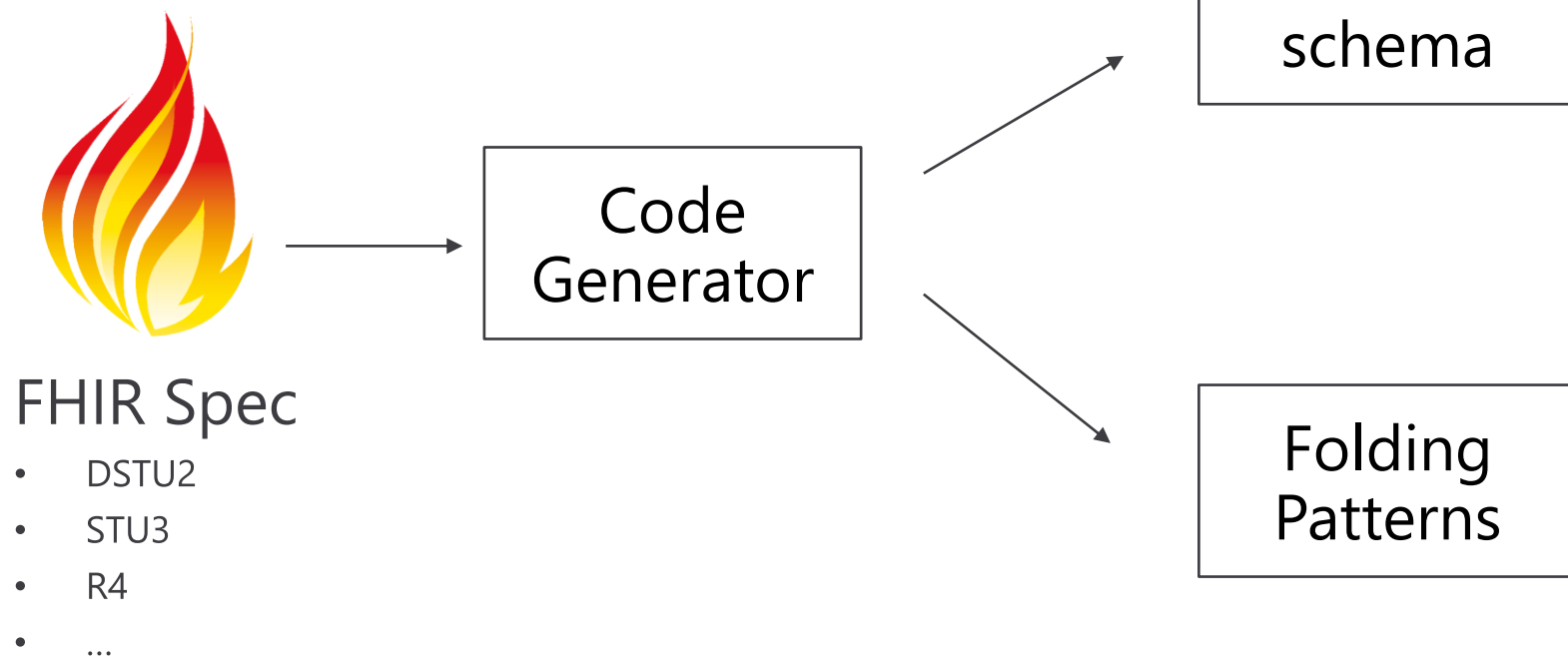
☐ gender

☐ id

☐ implicitRules

☐ language

How the Power BI Connector was built



Power Query (M) – A short introduction

Lists

```
{123, true, "A"}    // list containing a number, a logical, and a text  
{1, 2, 3}          // list of three numbers
```

Records

```
[  
    A = 1,  
    B = 2,  
    C = 3  
]
```

Tables

```
#table( {"A", "B"}, { {1, 2}, {3, 4} } )
```

Functions

```
AddFunction = (x, y) => x + y
```

Power Query (M) – A short introduction

Let expressions and lazy evaluation

```
let
    Sales2007 =
        [
            FirstHalf = 1000,
            SecondHalf = 1100,
            Total = FirstHalf + SecondHalf // 2100
        ],
    Sales2008 =
        [
            FirstHalf = 1200,
            SecondHalf = 1300,
            Total = FirstHalf + SecondHalf // 2500
        ]
in
    Sales2007[Total] + Sales2008[Total] // 4600
```

Data sources and data shaping

```
let
    Source = Fhir.Contents("https://mihandd2020.azurehealthcareapis.com", null),
    AllergyIntolerance1 = Source{[Name="AllergyIntolerance"]}[Data],
    #"Expanded code" = Table.ExpandRecordColumn(AllergyIntolerance1, "code", {"text"}, {"code.text"}),
    #"Expanded patient" = Table.ExpandRecordColumn(#"Expanded code", "patient", {"reference"}, {"patient.reference"})
in
    #"Expanded patient"
```

Power Query Folding - Basics

Filter expression

```
let
    Source = Fhir.Contents("https://myfhirserver.azurehealthcareapis.com", null),
    Patient1 = Source{[Name="Patient"]}[Data],
    #"Filtered Rows" = Table.SelectRows(Patient1, each [birthDate] < #date(1980, 1, 1))
in
    #"Filtered Rows"
```

FHIR query

```
GET https://myfhirserver.azurehealthcareapis.com/Patient?birthdate=lt1980-01-01
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "ActivityDefinition",  
  Expression = each [description] = "xyz" // string equality  
]
```

output.txt

```
description:exact=xyz
```


input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "ActivityDefinition",
  Expression = each [description] = "xyz" // string equality
]
```

output.txt

```
description:exact=xyz
```

≡ input.pq

```
[  
  ResourceType = "ActivityDefinition",  
  Expression = each Text.Contains([description], "xyz")  
]
```

≡ output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

```
| description:contains=xyz
```

≡ input.pq

```
[  
  ResourceType = "ChargeItem",  
  Expression = each [factorOverride] = 2.1 // number  
]
```

≡ output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

| factor-override=2.1|

≡ input.pq

```
[  
  ResourceType = "ChargeItem",  
  Expression = each [factorOverride] > 2.1 // greater than  
]
```

≡ output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

| factor-override=gt2.1|

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "ChargeItem",  
  Expression = each 2.1 < [factorOverride] // in Yoda form  
]
```

output.txt

```
factor-override=gt2.1
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "ChargeItem",  
  Expression = each [factorOverride] > 2.1 and [factorOverride] < 3  
]
```

output.txt

```
factor-override=gt2.1&factor-override=lt3
```

≡ input.pq

```
▼ [
  ResourceType = "ChargeItem",
  Expression = each [factorOverride] < 5 or [factorOverride] > 10
]
```

≡ output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

```
| factor-override=lt5,gt10|
```

🔗 🔍 📄 ...

Presentation last saved: Just now

input.pq

```
[  
  ResourceType = "Patient",  
  Expression = each [gender] = "male"  
]
```

output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

gender=male

input.pq

```
[  
  ResourceType = "Patient",  
  Expression = each [gender] <> "male"  
]
```

output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

gender: not= male

≡ input.pq

```
✓ [
  ResourceType = "Patient",
  Expression = each [active] = true
]
```

≡ output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

```
| active=true
```

🔗 🗒 📄 ...

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  Expression = each [active] = false  
]
```

output.txt

```
active=false
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  Expression = each [active]  
]
```

output.txt

```
active=true
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Encounter",  
  Expression = each [class][code] = "mycode" // Coding field, token search parameter  
]
```

output.txt

```
class=mycode
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "Encounter",
  Expression = each [class][system] = "mySystem" and [class][code] = "myCode"
]
```

output.txt

```
class=mySystem|myCode
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Encounter",  
  Expression = each [class][system] = null and [class][code] = "myCode"  
]
```

output.txt

```
class=myCode
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq

🔗 📄 ...

```
[
  ResourceType = "Encounter",
  Expression = each not ([class][system] = "mySystem" and [class][code] = "myCode")
]
```

output.txt

```
class: not= mySystem | myCode
```


input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Encounter",  
  Expression = each [class][system] <> "mySystem" or [class][code] <> "myCode"  
]
```

output.txt

```
class: not= mySystem | myCode
```

≡ input.pq

```
[  
  ResourceType = "Encounter",  
  // can't fold both, take most selective  
  Expression = each [class][system] <> "mySystem" and [class][code] <> "myCode"  
]
```

≡ output.txt c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\output.txt

class: not= mySystem |

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "ChargeItem",  
  
  // Quantity  
  Expression = each [quantity][value] = 1  
]
```

output.txt

```
quantity=1
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "ChargeItem",  
  
  // Quantity  
  Expression = each [quantity][value] > 5 and [quantity][system] = "mySystem" and [quantity][code] = "myCode"  
]
```

output.txt

```
quantity=gt5|mySystem|myCode
```

```
[
  ResourceType = "Observation",

  // Choice types. [value] can be either a string, dateTime, Period, Quantity, among others.
  // FhirPath for value-date is (Observation.value as dateTime) | (Observation.value as Period)
  Expression = each [value][dateTime] = #datetimezone(2010, 12, 31, 11, 56, 2, 0, 0)
]
```

```
value-date=2010-12-31T11:56:02.000+00:00
```

```
[
  ResourceType = "Observation",

  // Choice types. [value] can be either a string, dateTime, Period, Quantity, among others.
  // FhirPath for value-date is (Observation.value as dateTime) | (Observation.value as Period)
  Expression = each [value][Period][start] > #datetimezone(2010, 12, 31, 11, 56, 2, 0, 0)
```

```
value-date=sa2010-12-31T11:56:02.000+00:00
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Observation",  
  
  // Choice types. [value] can be either a string, dateTime, Period, Quantity, among others.  
  Expression = each [value][string] = "large"  
]
```

output.txt

```
value-string:exact=large
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceTypeNames = "Encounter",

  // Array properties of complex types
  Expression = each Table.MatchesAnyRows([meta][security], each [system] = "s" and [code] = "c")
]
```

output.txt

_security=s|c

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "Patient",

  // Array properties of simple type
  Expression = each List.MatchesAny([meta][profile], each _ = "https://myprofile.com")
]
```

output.txt

```
| _profile=https://myprofile.com
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  
  // :below  
  Expression = each List.MatchesAny([meta][profile], each Text.StartsWith(_, "https://myprofile.com"))  
]
```

output.txt

_profile:below=https://myprofile.com

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "Patient",

  // :above
  Expression = each List.MatchesAny([meta][profile], each Text.StartsWith("https://myprofile.com/a/b", _))
]
```

output.txt

_profile:above=https://myprofile.com/a/b

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  
  // missing  
  Expression = each [gender] = null  
]
```

output.txt

```
gender:missing=true
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  
  // not missing  
  Expression = each [gender] <> null  
]
```

output.txt

```
gender:missing=false
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  
  // missing  
  Expression = each [meta][profile] = null  
]
```

output.txt

```
_profile:missing=true
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "Patient",

  // not missing
  Expression = each Table.MatchesAnyRows([meta][security], each true)
]
```

output.txt

```
| _security:missing=false
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  
  // missing  
  Expression = each not Table.MatchesAnyRows([meta][security], each true)  
]
```

output.txt

```
_security:missing=true
```


input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Patient",  
  
  // missing  
  Expression = each Table.MatchesAllRows([meta][security], each false)  
]
```

output.txt

```
_security:missing=true
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Observation",  
  
  // CodeableConcept  
  Expression = each Table.MatchesAnyRows([code][coding], each [system] = "s" and [code] = "c")  
]
```

output.txt

```
code=s|c
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Observation",  
  
  // :text modifier  
  Expression = each Table.MatchesAnyRows([code][coding], each [display] = "Body mass index")  
]
```

output.txt

```
code:text=Body mass index
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[  
  ResourceType = "Observation",  
  
  // :text modifier  
  Expression = each [code][text] = "BMI"  
]
```

output.txt

```
code:text=BMI
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "Observation",

  // :text modifier, ORed together
  Expression = each
    [code][text] = "BMI" or
    Table.MatchesAnyRows([code][coding], each [display] = "Body mass index")
]
```

output.txt

```
code:text=BMI,Body mass index
```

```
[
  ResourceTypeNames = "Observation",

  // Observation components, but not quite what we want (systolic < 90)
  Expression = each
    Table.MatchesAnyRows([component], each Table.MatchesAnyRows([code][coding], each [code] = "8480-6")) and
    Table.MatchesAnyRows([component], each [value][Quantity][value] < 90)
]
```

```
component-code=8480-6&component-value-quantity=lt90
```

```
ResourceTypeName = "Observation",
```

```
// There's a composite search parameter for that!
```

```
// component-code-value-quantity:
```

```
// On Observation.component:
```

```
// 1 (token): code
```

```
// 2 (quantity): value.as(Quantity)
```

```
Expression = each
```

```
  Table.MatchesAnyRows(
```

```
    [component],
```

```
    each
```

```
      Table.MatchesAnyRows([code][coding], each [code] = "8480-6") and
```

```
      [value][Quantity][value] < 90)
```

```
component-code-value-quantity=8480-6<90
```

```
ResourceTypeName = "Observation",

// ORing composite values (systolic < 90 OR diastolic < 60)
Expression = each
  Table.MatchesAnyRows(
    [component],
    each
      Table.MatchesAnyRows([code][coding], each [code] = "8480-6") and // systolic
      [value][Quantity][value] < 90) or
    Table.MatchesAnyRows(
      [component],
      each
        Table.MatchesAnyRows([code][coding], each [code] = "8462-4") and // diastolic
        [value][Quantity][value] < 60)
```

```
component-code-value-quantity=8480-6<90,8462-4<60
```


input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "Observation",

  // Height measurement defined at the root of an observation
  Expression = each
    Table.MatchesAnyRows([code][coding], each [code] = "8302-2") and [value][Quantity][value] > 150
]
```

output.txt

```
code-value-quantity=8302-2$gt150
```

input.pq c:\Users\mihansen\Source\Repos\fhir-power-query\src\TestHelperWebApp\input.pq



```
[
  ResourceType = "Observation",

  // Height measurement defined as a component of an observation
  Expression = each
    Table.MatchesAnyRows([component], each Table.MatchesAnyRows([code][coding], each [code] = "8302-2") and [value][Quantity][value] > 150)
]
```

output.txt

```
component-code-value-quantity=8302-2$gt150
```

```
ResourceTypeName = "Observation",
```

```
// what if you don't know if it will be in the root or a component?
```

```
// write and OR, and we choose a common search parameter between the two:
```

```
// combo-code-value-quantity
```

```
// On Observation | Observation.component:
```

```
//     1 (token): code
```

```
//     2 (quantity): value.as(Quantity)
```

```
Expression = each
```

```
(Table.MatchesAnyRows([code][coding], each [code] = "8302-2") and [value][Quantity][value] > 150) or
```

```
(Table.MatchesAnyRows([component], each Table.MatchesAnyRows([code][coding], each [code] = "8302-2") and [value][Quantity][value] > 150))
```

```
combo-code-value-quantity=8302-2$gt150
```

<https://aka.ms/michael-devdays>

<https://github.com/Microsoft/fhir-server-samples>
<https://docs.microsoft.com/power-query/>

<https://azure.microsoft.com/free/>

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