

# ACCESSING GOVERNMENT API DATA USING POWER BI

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RUSS LOSKI



# SQL Saturday Baton Rouge 2023



K U V A R E



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# INTRODUCTION

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- Russ Loski
- Data Engineer
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- Slides and Code: <https://bit.ly/43P3vxy>
  - [Presentations/Accessing Government API Data using Power BI at main · rloski-public/Presentations \(github.com\)](https://github.com/rloski-public/Presentations)



# Community Support

Name	Type	Frequency	Join
LA Data Platform	Virtual	Every 3 <sup>rd</sup> Wednesday monthly @ 7PM PDT	
Southland Data Professionals	Virtual	Every 3 <sup>rd</sup> Thursday each odd month @ 6.30PM PDT	
San Diego SQL Server User Group	Virtual	Every 3 <sup>rd</sup> Thursday monthly @ 6.30PM PDT	

[Find more Azure Data Tech Groups on Meetup](#)

# AGENDA

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- Introduction to government data
- APIs
- PUMS Metadata API
- PUMS API
- CMS Marketplace API
- Weather API



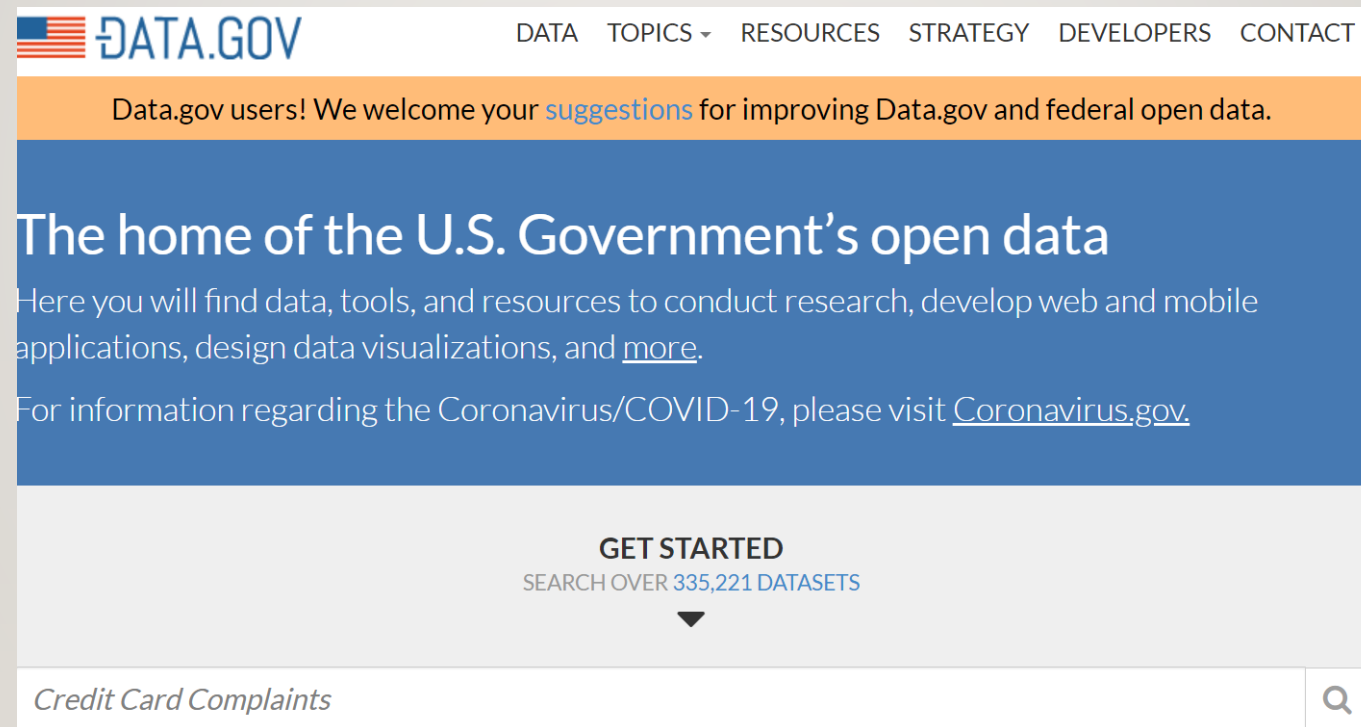
# AGENDA DETAILS

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- Government Data
  - Public Microdata PUMS
  - CMS
  - NOAA Weather
- Power Query Concepts
  - Connect to API
    - Web.Contents
    - POSTing data
    - Headers
- Parsing JSON
  - Json.Document
  - Table.FromList
  - Record.ToTable
  - Record.FromList
  - Table.ExpandRecordColumn

# GOVERNMENT DATA

- [Data.gov](https://data.gov)



# FINDING APIS

- [Census Data API Discovery Tool](#)

Title	Description	Vintage	Dataset Name	Dataset Type	Geography List	Variable List	Group List	SortList	Examples	Developer Document
1986 County Business Patterns: Business Patterns	County Business Patterns (CBP) is an annual series that provides economic data by industry at the U.S., State, County and Metropolitan Area levels. This series includes the number of establishments, employment during the week of March 12, first quarter payroll, and annual payroll. CBP provides statistics for businesses with paid employees for the U.S., Puerto Rico, and the Island Areas. Census Bureau staff identified a processing error that affects selected data from the 2014 County Business Patterns (CBP). As a result, we suppressed 2014 employment and payroll totals in the Health Care and Social Assistance sector (Sector 62) for the following geographies: U.S.; Michigan; Battle Creek, MI metro area; Calhoun County, MI; and the 3rd congressional district of Michigan. This processing error did not affect other sectors. While suppressed values can be derived by subtraction, we do not recommend using the derived values in any analyses. The Census Bureau plans to release revised statistics at a later date.	1986	cbp	Aggregate	<a href="#">geographies</a>	<a href="#">variables</a>	<a href="#">groups</a>	<a href="#">sorts</a>	<a href="#">examples</a>	<a href="#">documenta</a>



# DATA SOURCES: ACS

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- American Community Surveys (ACS)
  - [American Community Survey \(ACS\) \(census.gov\)](https://www.census.gov/programs-surveys/acs/index.html)
- Public Use Microdata Sample (PUMS)
  - [American Community Survey Microdata \(census.gov\)](https://www.census.gov/pums/)
- FTP Site
  - [Index of /programs-surveys/acs/data/pums \(census.gov\)](https://www.census.gov/pums/data/pums.html)

# DATA SOURCE: BLS CPS

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- US Bureau of Labor Statistics Current Population Survey
- [CPS Home : U.S. Bureau of Labor Statistics \(bls.gov\)](#)

# CPS TABLES

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- [CPS Tables : U.S. Bureau of Labor Statistics \(bls.gov\)](https://www.bls.gov/cps/cps-tables/)
- [Current Population Survey Datasets \(census.gov\)](https://www.census.gov/data/tables/5yr/cps.html)
- [Basic Monthly CPS \(census.gov\)](https://www.census.gov/data/tables/5yr/cps.html)

# WHY APIS?

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# WHY USE API?

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- More immediate data; closer to streaming
- Targeted import of data
- Frequently better structure



# ISSUES WITH API

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- Parsing the data returned
- Authentication
  - **GET THE KEY**
- Posting data
- Understanding the requirements
- Understanding the restrictions

# CENSUS MICRODATA API

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- Census Microdata API:
  - <https://www.census.gov/data/developers/data-sets/census-microdata-api.html>
- Available APIs (census.gov)
  - <https://www.census.gov/data/developers/data-sets.html>

# CENSUS MICRODATA API - DOCUMENTATION

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- Guidance for Developers (census.gov)
  - <https://www.census.gov/data/developers/guidance.html>
- Census Data API User Guide
  - <https://www.census.gov/data/developers/guidance/api-user-guide.html>
- Census Microdata API User Guide
  - <https://www.census.gov/data/developers/guidance/microdata-api-user-guide.html>

# CENSUS MICRODATA KEY REQUEST

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- Request a key: [Key Signup \(census.gov\): https://api.census.gov/data/key\\_signup.html](https://api.census.gov/data/key_signup.html)

I found that a key is not required when you are only doing a small number of calls to the API. However, once you hit a certain limit your IP address will be blocked for the day.

# RESOURCES FOR THE MICRODATA

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## 2021 ACS 1-Year Estimates - Public Use Microdata Sample

- **Example Call:** [api.census.gov/data/2021/acs/acs1/pums?get=SEX,PWGTP,MAR&SCHL=24&key=YOUR\\_KEY\\_GOES\\_HERE](https://api.census.gov/data/2021/acs/acs1/pums?get=SEX,PWGTP,MAR&SCHL=24&key=YOUR_KEY_GOES_HERE)
- 2021 ACS 1-Year Public Use Microdata Sample Variables [ [html](#) | [xml](#) | [json](#) ]
- [Examples](#)
- [Supported Geography](#)

## 2021 ACS 1-Year Estimates - Puerto Rico Public Use Microdata Sample



# PUMS URL

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- 'https://api.census.gov/data/2021/acs/acs1/pums?get=WGTP,FHICOV&HHLDRHISP=02:99&key=' + PUMSKey
  - Address: https://api.census.gov/
  - Path: data/2021/acs/acs1/pums
  - Query arguments: ?get=WGTP,FHICOV&HHLDRHISP=02:99&key=

# POWER QUERY

---

✕

✓

*fx*

1

2

3

4

List

List

List

List

List

= Json.Document(Web.Contents(URL))

# VIEWING DATA IN POWER QUERY

	List
1	WGTP
2	FHICOVP
3	HHLDRHI...
4	SEX
5	state

	List
1	0
2	0
3	0
4	1
5	06

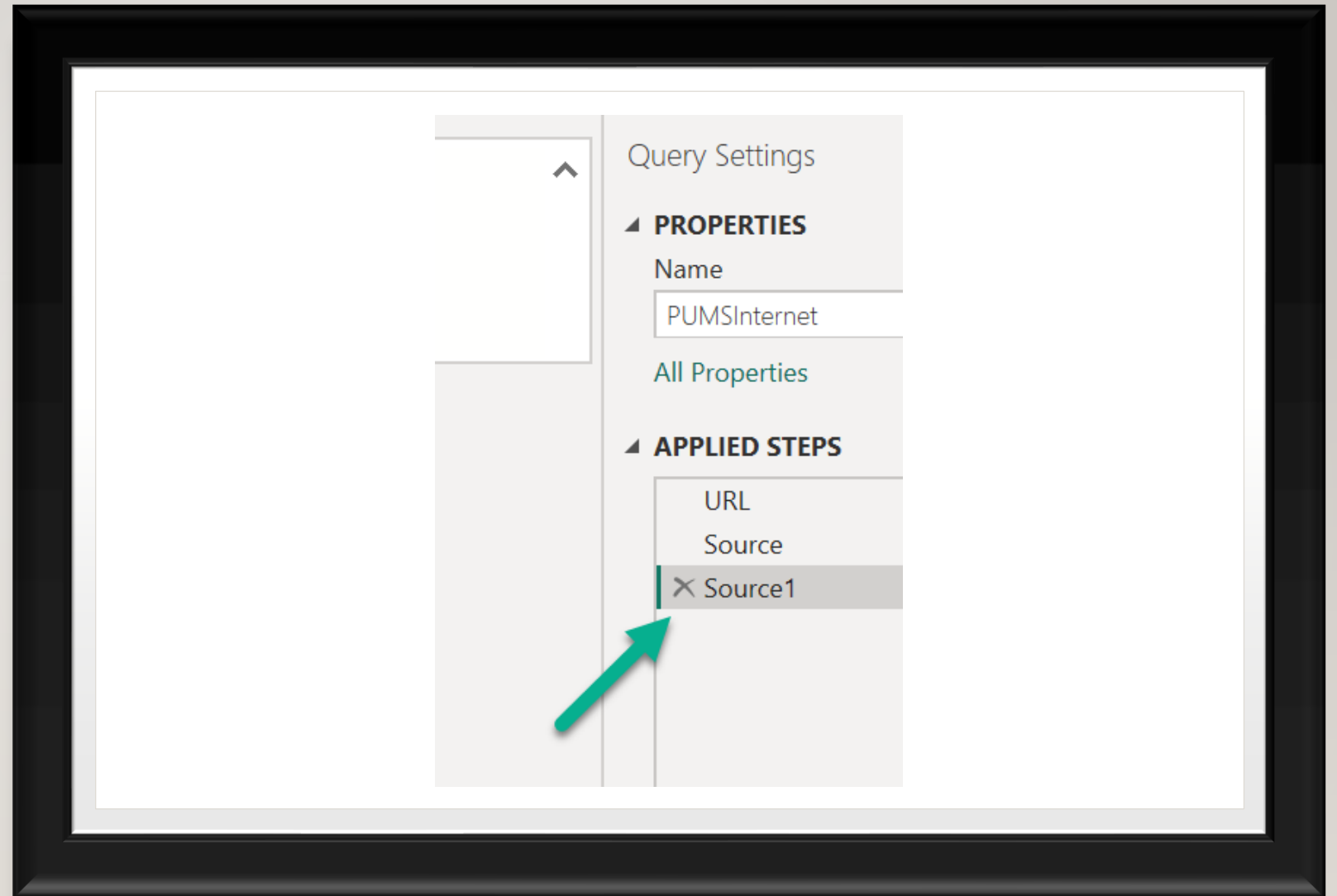
# PUMS RESULTS

---

```
✓
1 results
✓ - Command executed in 211 ms on 7:47:40 PM, 3/10/2016
5]
• [[ 'WGTP', 'FHICOVP', 'HHLDRHISP'],
  ['283', '0', '3'],
  ['31', '0', '2'],
  ['31', '0', '2'],
  ['31', '0', '2'],
  ['82', '0', '2'],
  ['82', '0', '2'],
  ['170', '0', '2'],
  ['170', '1', '2'],
  ['170', '1', '2'],
  ['170', '1', '2'],
  ['170', '1', '2'],
  ['170', '1', '2'],
  ['137', '0', '2'],
  ['137', '0', '2'],
  ['137', '0', '2'],
  ['137', '0', '2'],
```

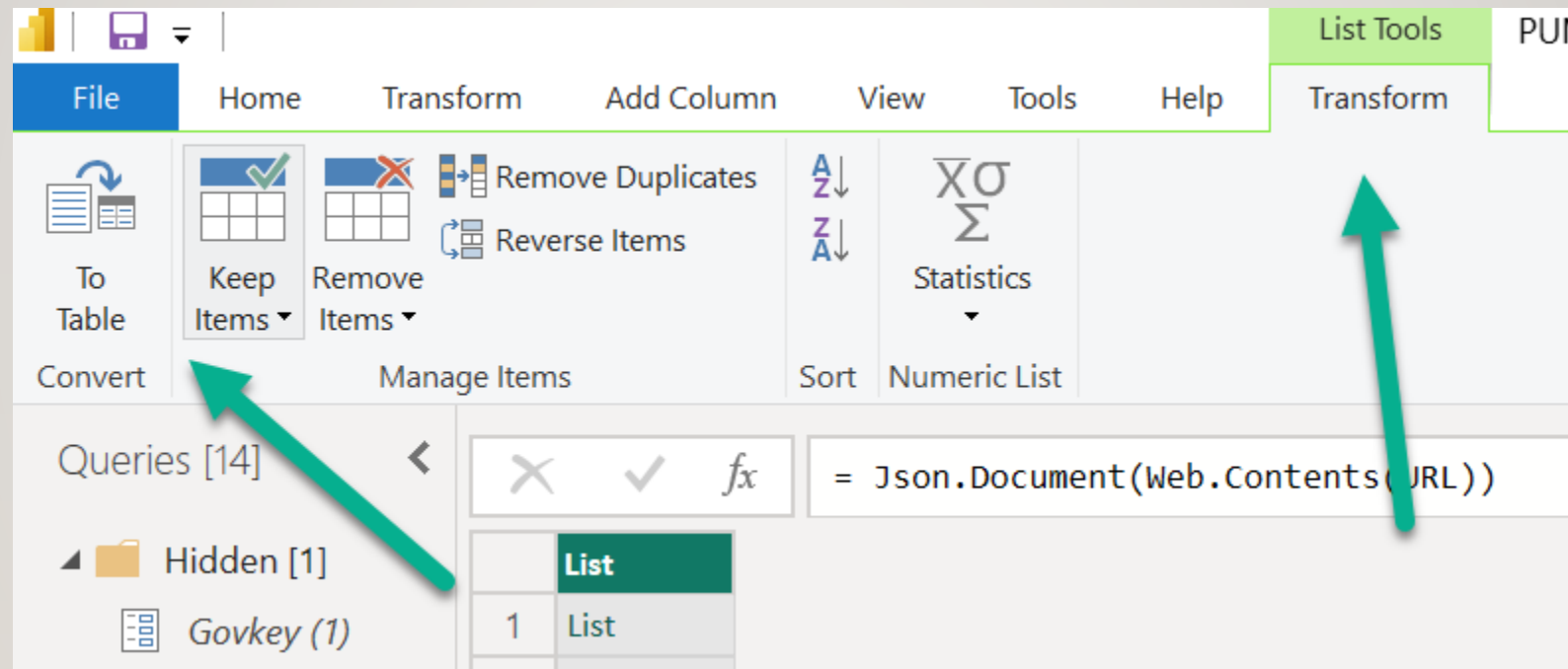
# REMOVE STEP

---





# CONVERT LIST TO TABLE

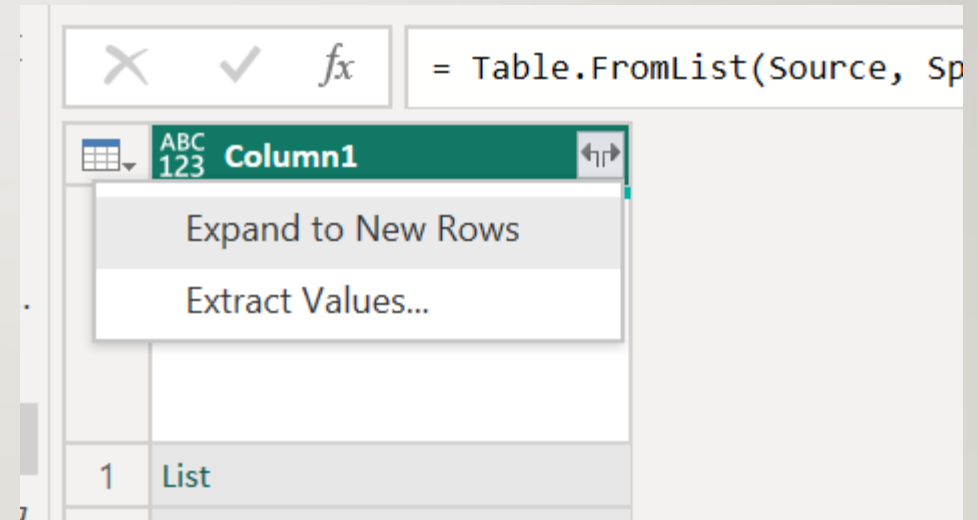
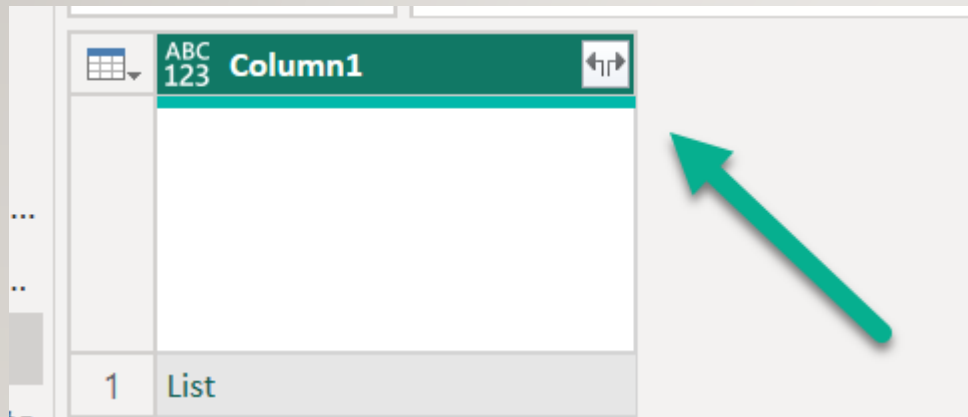


The screenshot shows the Power Query interface with the 'List Tools' ribbon selected. The ribbon contains several groups of options:

- Convert**: Includes the 'To Table' button, which is highlighted by a green arrow.
- Manage Items**: Includes 'Keep Items', 'Remove Items', 'Remove Duplicates', and 'Reverse Items'.
- Sort**: Includes 'Sort' and 'Numeric List'.
- Statistics**: Includes 'Statistics'.

The 'Transform' tab is also visible, highlighted by a green arrow. The bottom of the interface shows a list of queries, including 'Hidden [1]' and 'Govkey (1)', and a formula bar containing the expression: `= Json.Document(Web.Contents(URL))`.

# EXPAND COLUMNS

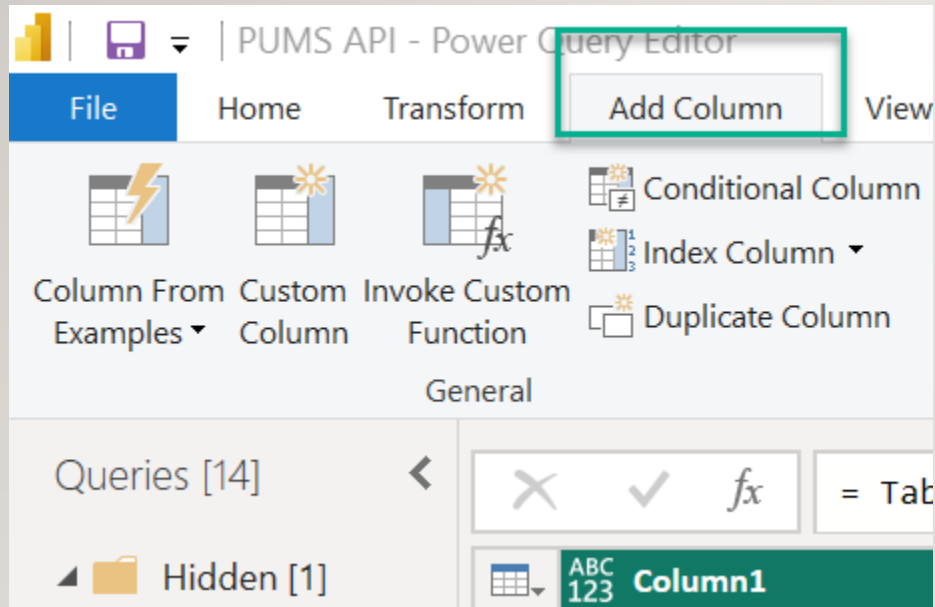


1	WGTP
2	FHICOVP
3	HHLDRHISP
4	SEX

1	WGTP:FHICOVP:HHLDRHISP:...
2	0:0:0:1:06
3	0:1:0:2:06

# ADD CUSTOM COLUMN – RECORD.FROMLIST

Record.FromList - PowerQuery M | Microsoft Learn: <https://learn.microsoft.com/en-us/powerquery-m/record-fromlist>



## Custom Column

Add a column that is computed from the other columns.

New column name

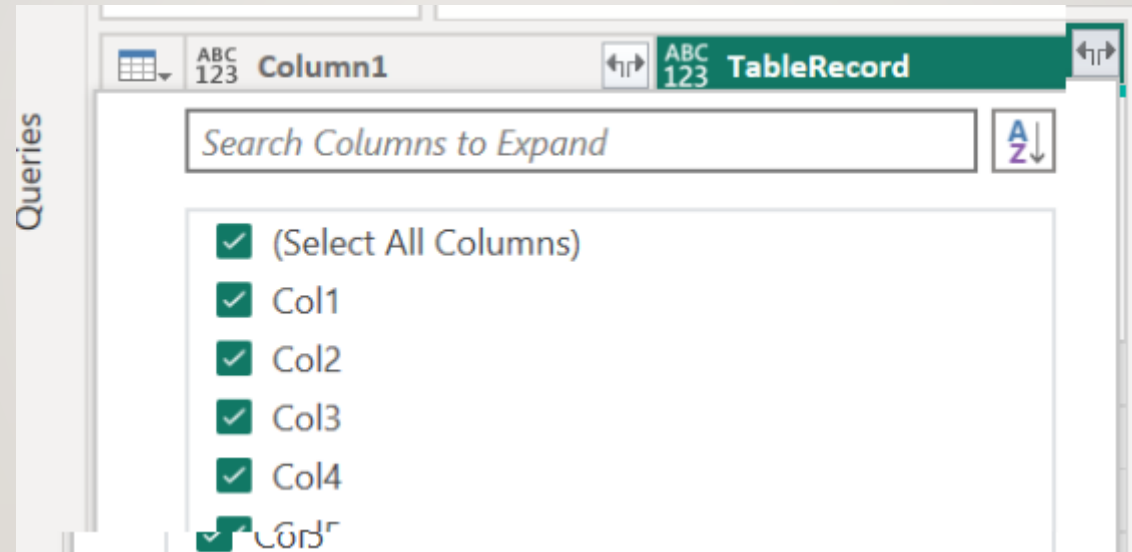
TableRecord

Custom column formula ⓘ

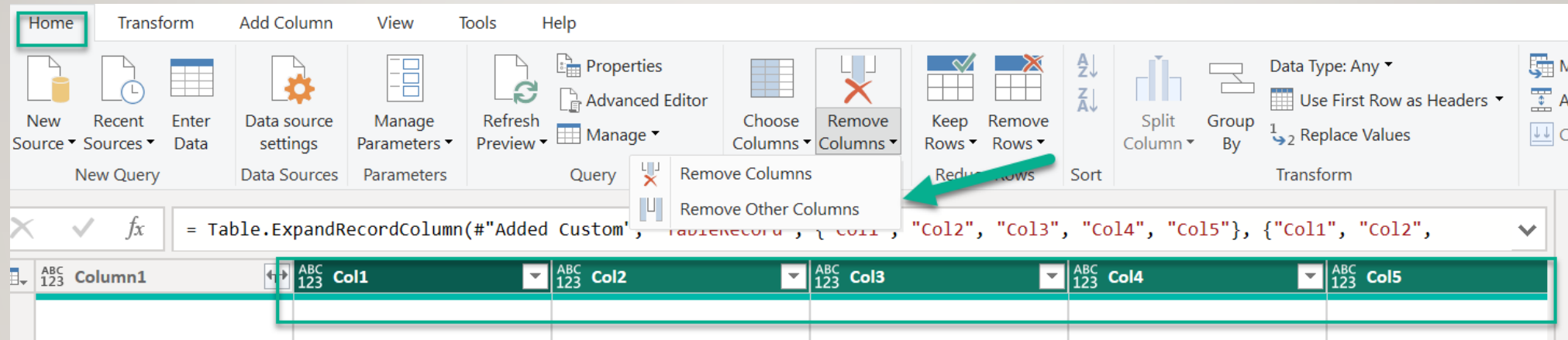
```
= Record.FromList([Column1], {"Col1","Col2","Col3","Col4",  
"Col5"})
```

# EXPAND THE RECORDS

---

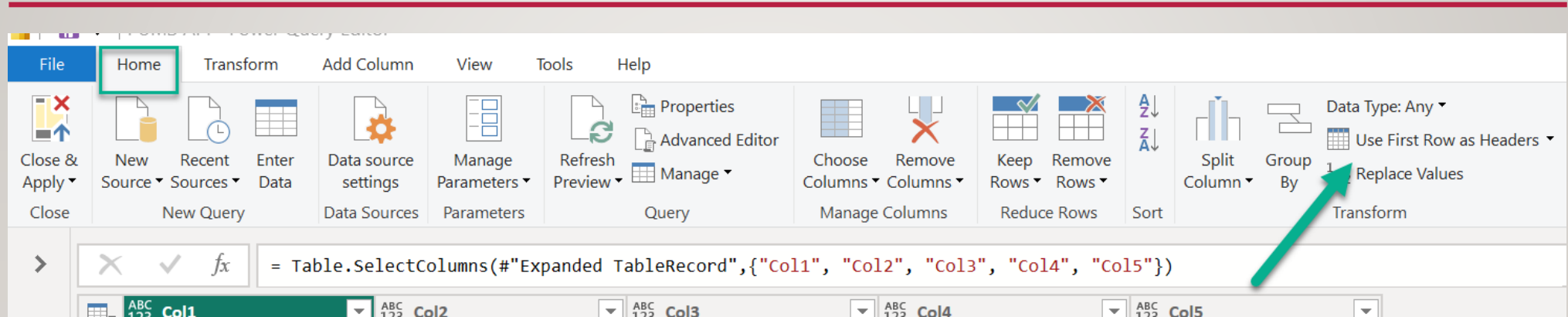


# REMOVE EXTRA COLUMN





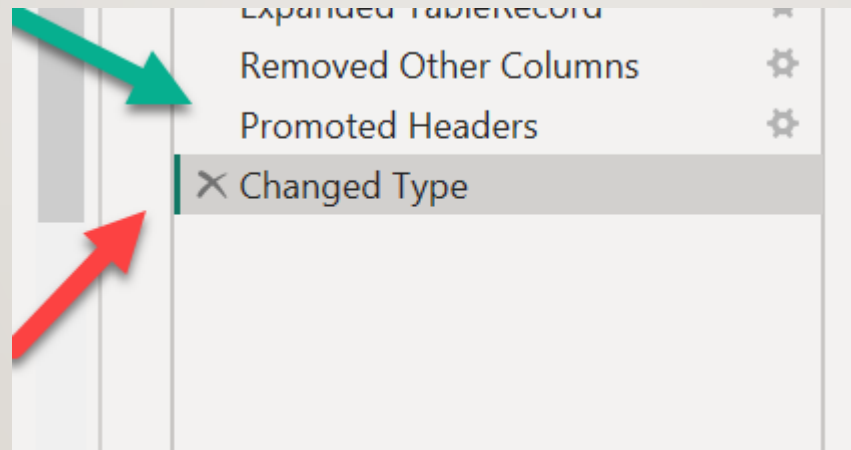
# PROMOTE HEADER



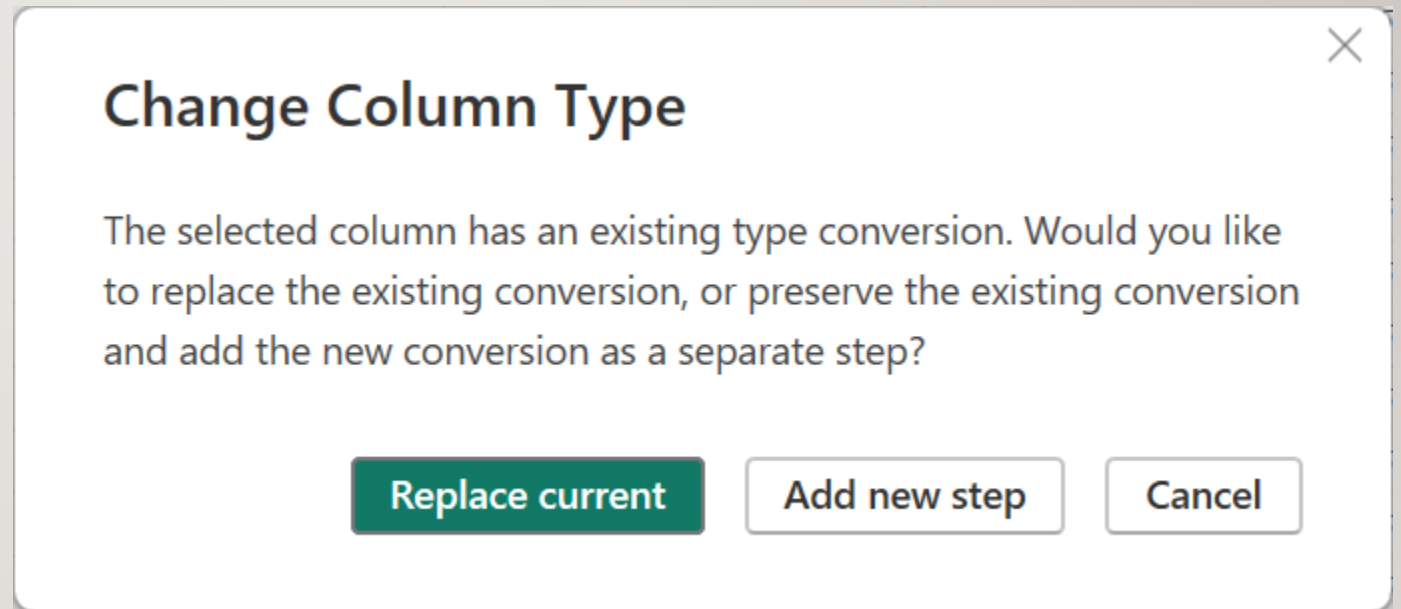
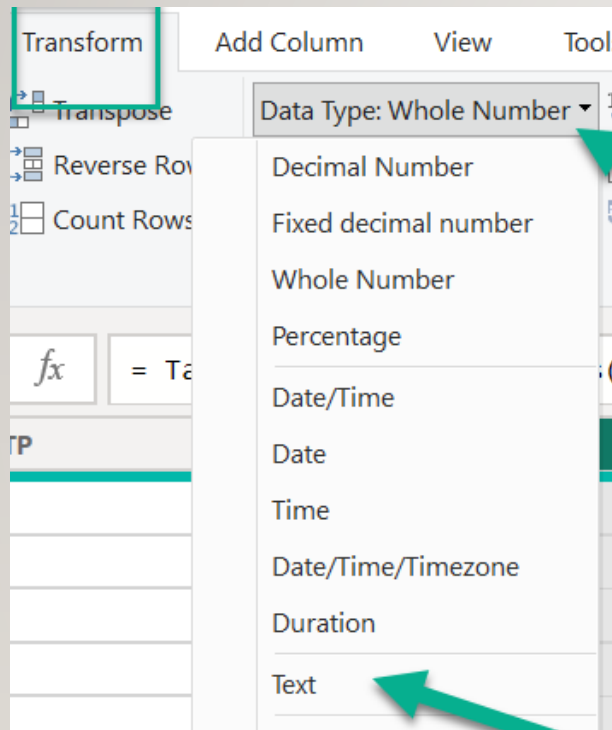
# WRONG DATA TYPES

---

1 <sup>2</sup> <sub>3</sub> WGTP	1 <sup>2</sup> <sub>3</sub> FHICOVP	1 <sup>2</sup> <sub>3</sub> HHLD RHISP
----------------------------------	-------------------------------------	--

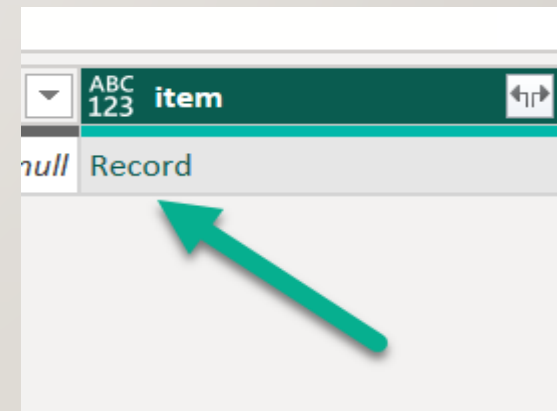
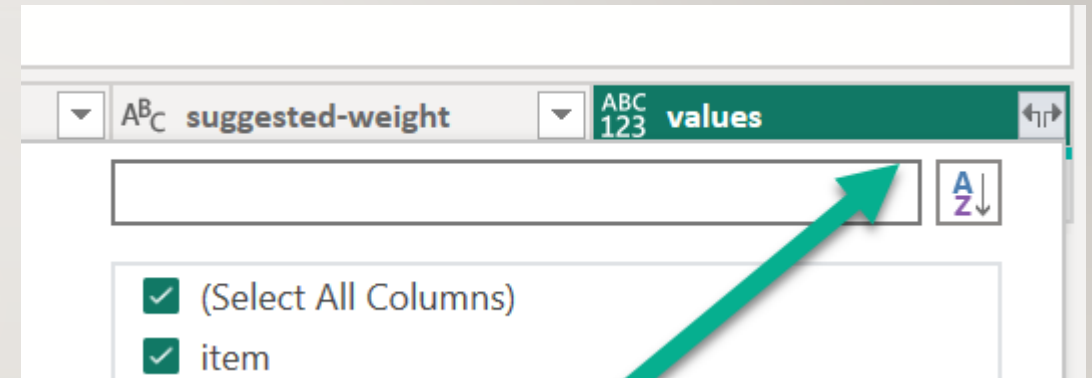


# FIX DATA TYPES – SELECT COLUMNS



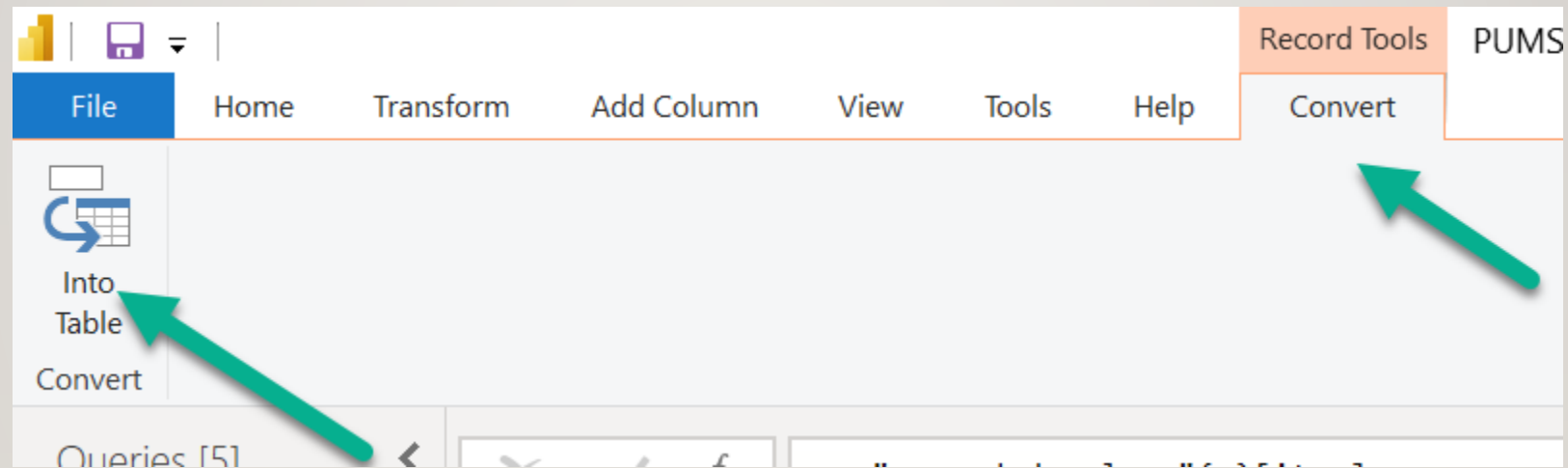
# EXPAND THE VALUES

- Click the icon in values column
- But click record in item



# CONVERT RECORD TO TABLE

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# PUMS FILTER AND SUMMARY

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# FILTERING

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- Use the column name as the parameter. The equals values are the filters
  - &HHLDRHISP=01:99
  - This is read “Where HHLDRHISP is between 01 and 99
- Geography filters are different
  - &for=state:06,48
  - This is read: where the state (ST) is in 06 and 48.

# SUMMARIZED DATA

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- To summarize you add tabulate query parameter
  - &tabulate=weight()

# PUMS METADATA API

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- `'https://api.census.gov/data/2021/acs/acs1/pums/variables.json'`

```
1 results
[10] ✓ - Command executed in 736 ms on 8:40:13 PM, 3/14/23
... {'variables': {'for': {'label': "Census API FIPS 'for' clause",
    'concept': 'Census API Geography Specification',
    'predicateType': 'fips-for',
    'group': 'N/A',
    'limit': 0,
    'predicateOnly': True},
    'in': {'label': "Census API FIPS 'in' clause",
    'concept': 'Census API Geography Specification',
    'predicateType': 'fips-in',
    'group': 'N/A',
    'limit': 0,
    'predicateOnly': True},
    'ucgid': {'label': 'Uniform Census Geography Identifier clause',
    'concept': 'Census API Geography Specification',
```

# PUMS METADATA POWER QUERY

---

let

```
Source = Json.Document(Web.Contents("https://api.census.gov/data/"  
    & "2021"  
    & "/acs/acs1/pums/variables.json")),
```

```
variables = Record.ToTable(Source[variables]),
```

```
#"Expanded Value" = Table.ExpandRecordColumn(variables, "Value", {"label", "concept", "predicateType",  
"group", "limit", "predicateOnly"}, {"label", "concept", "predicateType", "group", "limit", "predicateOnly"})
```

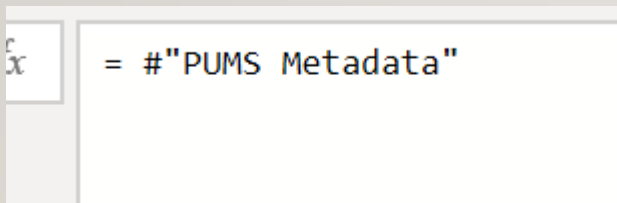
in

```
#"Expanded Value"
```

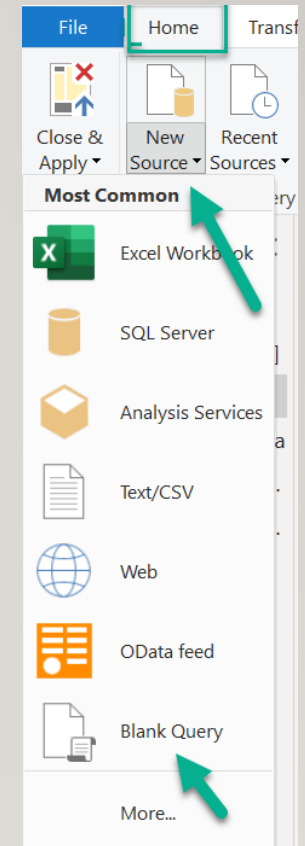


# BUILD NEW QUERIES FROM OLD

- Add blank query
- For the source, type in the name of the old query

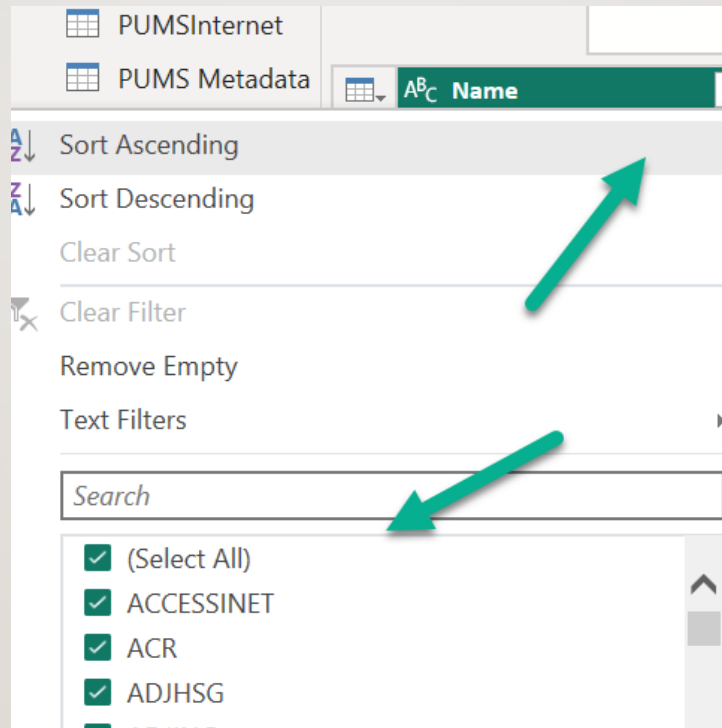


= #"PUMS Metadata"



# SELECT COLUMN NAME

---



# CMS MARKETPLACE

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- CMS Developer Tools
  - <https://developer.cms.gov/>
- Documentation: [API Specifications - Marketplace API \(cms.gov\)](#)

# CMS GET KEY

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- [Marketplace API Key Request \(cms.gov\)](#)
- <https://developer.cms.gov/marketplace-api/key-request.html>

# SAMPLES TO TRY

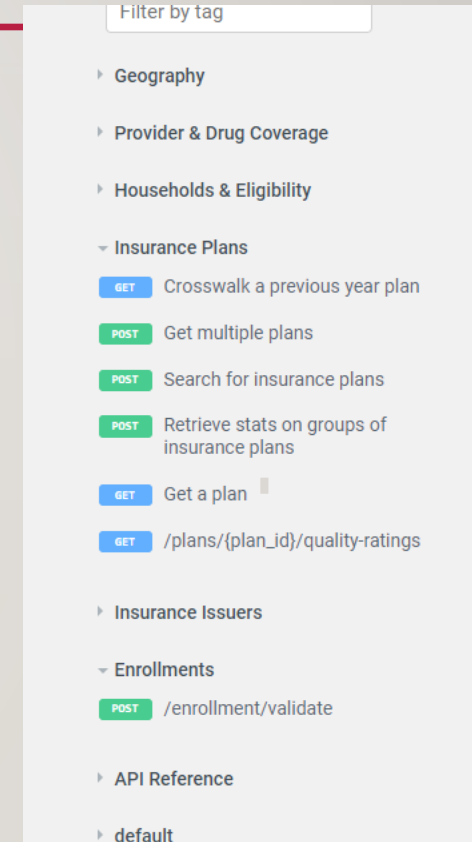
---

- [API Specifications - Marketplace API \(cms.gov\)](#)



# SAMPLE TO TRY

- [API Specifications - Marketplace API \(cms.gov\)](https://developer.cms.gov/marketplace-api/api-spec#/Insurance%20Plans/post_plans_search)
  - [https://developer.cms.gov/marketplace-api/api-spec#/Insurance%20Plans/post\\_plans\\_search](https://developer.cms.gov/marketplace-api/api-spec#/Insurance%20Plans/post_plans_search)



# REQUEST COMPONENTS

---

- https://
- marketplace.api.healthcare.gov/
- api/v1/plans/search?apikey=

```
{  
  "household": {  
    "income": 52000,  
    "people": [  
      {  
        "age": 27,  
        "aptc_eligible": True,  
        "gender": "Female",  
        "uses_tobacco": False}}, ...
```

# RESULTS

---

1 results

✓ - Command executed in 194 ms on 8:36:31 PM, 3/16/23

```
{'plans': [{ 'id': '19636LA0230006',  
  'name': 'Community Blue 70/50 $4500',  
  'premium': 263.91,  
  'premium_w_credit': 263.91,  
  'ehb_premium': 263.91,  
  'pediatric_ehb_premium': 0,  
  'aptc_eligible_premium': 263.91,  
  'metal_level': 'Bronze',  
  'type': 'POS',  
  'state': 'LA',  
  'benefits': [{ 'name': 'Primary Care Visit to Treat an Injury or Illness',  
    'covered': True,
```

# NOAA WEATHER

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# WEATHER API

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- [API Web Service \(weather.gov\)](https://www.weather.gov/documentation/services-web-api)
  - <https://www.weather.gov/documentation/services-web-api>
- Try it out: [API Web Service \(weather.gov\)](https://www.weather.gov/documentation/services-web-api)
- <https://www.weather.gov/documentation/services-web-api>
- [NOAA National Weather Service](https://www.weather.gov/documentation/services)
  - <https://www.weather.gov/documentation/services>



# WEATHER API KEY

---

- No key is required. However, you need to add User-Agent header.
- User-Agent: {your name}

# BASIC STRUCTURE

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- **@context**: This describes the structure of the rest of the document
- **features** is a list of the records.
- Right click the list and click **Drill Down**

✕	✓	<i>fx</i>	= Json.Document(WebContent)
<b>@context</b>	Record		
<b>type</b>	FeatureCollection		
<b>features</b>	List		

@context	Record
type	FeatureCollection
features	List

Copy

Into Table

Drill Down

Add as New Query

# OTHER GOVERNMENT DATA

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# CURRENT POPULATION SURVEY BASIC MONTHLY

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- [CPS Basic Monthly \(census.gov\)](https://www.census.gov/cps/cps.html)

# CPS API

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- [Getting Started : U.S. Bureau of Labor Statistics \(bls.gov\)](https://www.bls.gov)



# AMERICA TIME USE SURVEY

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- [ATUS home : U.S. Bureau of Labor Statistics \(bls.gov\)](#)
- [Obtaining ATUS Data : U.S. Bureau of Labor Statistics \(bls.gov\)](#)

# RESOURCES

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- Census Reporter: Making Census Data Easy to Use (<https://censusreporter.org/>)

# SQL Saturday Baton Rouge 2023



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# CONTACT

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- <https://www.linkedin.com/in/russloski>
- Slides and Code: <https://bit.ly/43P3vxy>
  - [Presentations/Accessing Government API Data using Power BI at main · rloski-public/Presentations \(github.com\)](https://github.com/rloski-public/Presentations)

