Introduction to the Census Bureau's Application Programming Interface (API)

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Application Programming Interface (API)

Outline

- **Application Programming Interface (API) basics**
- Run through of an API call
- API Resources

Application Programming Interface (API)

The Census API

- The Census Bureau Application Programming Interface (API)
  - Data Service which enables **Census Bureau programs** to provide data in a standardized way and hosted from a Central location
  - Gives **software and web developers** the ability to create and easily update custom applications
  - Allows **data scientists** to have more direct access to data in order to conduct analyses

Application Programming Interface (API)

Advantages

- Uses of the Census Bureau API include
  - Supporting mobile and web applications
  - Drives interactive data visualizations
  - Connects to statistical analysis software like R

Application Programming Interface (API)

Using the API

- Why use the API?
  - Need specific variables within a table in data.census.gov
  - Uniform geographies within a larger geography?
  - Need data for many geographies
  - Need easy way to update data year after year
  - “Live” connection to data (think: dashboard, online tool)
- **Before using API, consider data.census.gov**

Application Programming Interface (API)

Beginning your API journey

API Dataset	Table ID Begins with	API Call Begins with
Detailed Tables	B or C	api.census.gov/data/2021/acs/acs1
Data Profiles	DP	api.census.gov/data/2021/acs/acs1/**profile**
Comparison Profiles	CP	api.census.gov/data/2021/acs/acs1/**cprofile**
Selected Population Profiles	S0201	api.census.gov/data/2021/acs/acs1/**spp**
Subject Tables	S	api.census.gov/data/2021/acs/acs1/**subject**

API Dataset	Table ID Begins with	API Call Begins with
Detailed Tables	B or C	api.census.gov/data/2021/acs/acs5
Data Profiles	DP	api.census.gov/data/2021/acs/acs5/**profile**
Comparison Profiles	CP	api.census.gov/data/2021/acs/acs5/**cprofile**
Subject Tables	S	api.census.gov/data/2021/acs/acs5/**subject**

https://www.census.gov/programs-surveys/acs/data/data-tables.html

Application Programming Interface (API)

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- **Run through of an API call**
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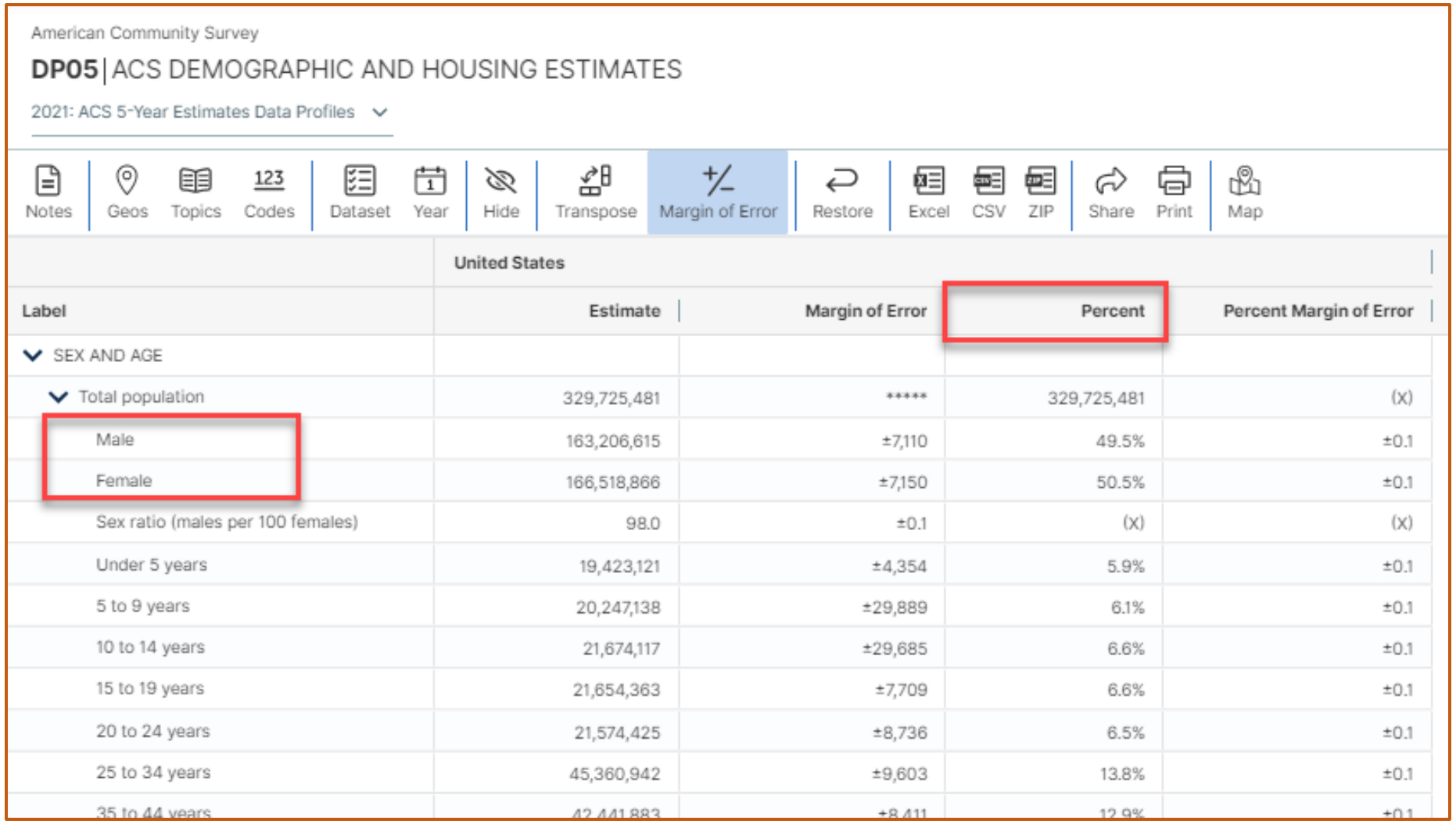
Finding the Data Points

- We are looking for two data points from table **DP05** (**ACS Demographic and Housing Estimates**):
  - **Percent of males**
  - **Percent of females**

- This data is needed for **Fairfax County, Virginia** and all the **census tracts in Fairfax County**. Because data is needed for the tracts, we will use the 2021 5-year ACS estimates (tract-level data is only available with 5-year estimates) for both geographies.



American Community Survey

DP05 | ACS DEMOGRAPHIC AND HOUSING ESTIMATES

2021: ACS 5-Year Estimates Data Profiles

Notes | Geos | Topics | Codes | Dataset | Year | Hide | Transpose | Margin of Error | Restore | Excel | CSV | ZIP | Share | Print | Map

	United States			
Label	Estimate	Margin of Error	Percent	Percent Margin of Error
SEX AND AGE				
Total population	329,725,481	*****	329,725,481	(X)
Male	163,206,615	±7,110	49.5%	±0.1
Female	166,518,866	±7,150	50.5%	±0.1
Sex ratio (males per 100 females)	98.0	±0.1	(X)	(X)
Under 5 years	19,423,121	±4,354	5.9%	±0.1
5 to 9 years	20,247,138	±29,889	6.1%	±0.1
10 to 14 years	21,674,117	±29,685	6.6%	±0.1
15 to 19 years	21,654,363	±7,709	6.6%	±0.1
20 to 24 years	21,574,425	±8,736	6.5%	±0.1
25 to 34 years	45,360,942	±9,603	13.8%	±0.1
35 to 44 years	42,441,883	±8,411	12.9%	±0.1

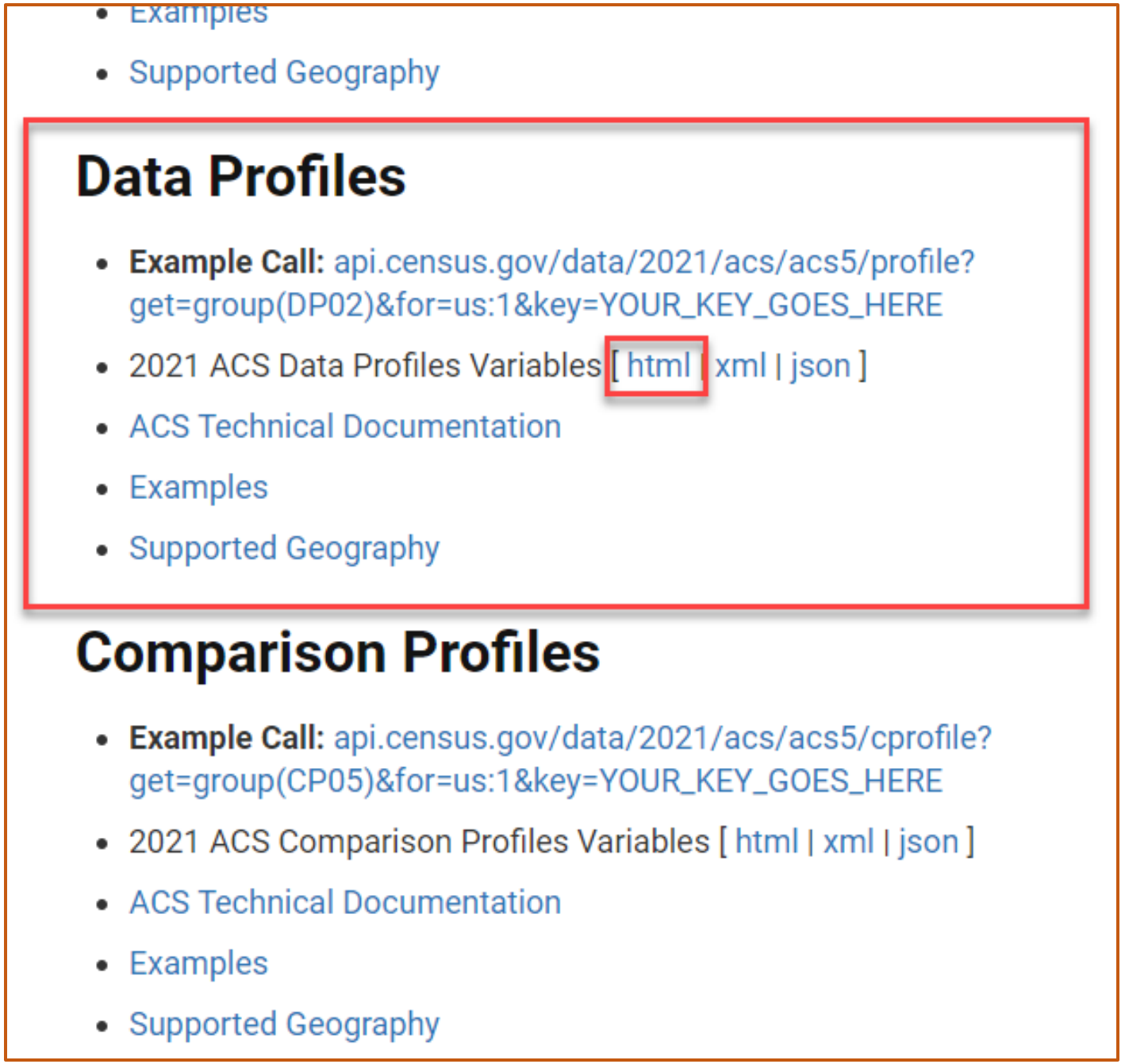
Finding the Dataset

- Go to the **Developers page** at https://www.census.gov/data/developers.html
- Click on the **Available APIs** link on the left
- Click on **American Community Survey (ACS)**
- Click on **American Community Survey 5-Year Data (2009-2021)**

Finding the Dataset and Variables

- We want data for the 2021 5-year estimates, and we want data points from table DP05, which is a Data Profile Table. Scroll down the page until you get to the **Data Profiles** section.

- Click on the **html** link next to **Variables**



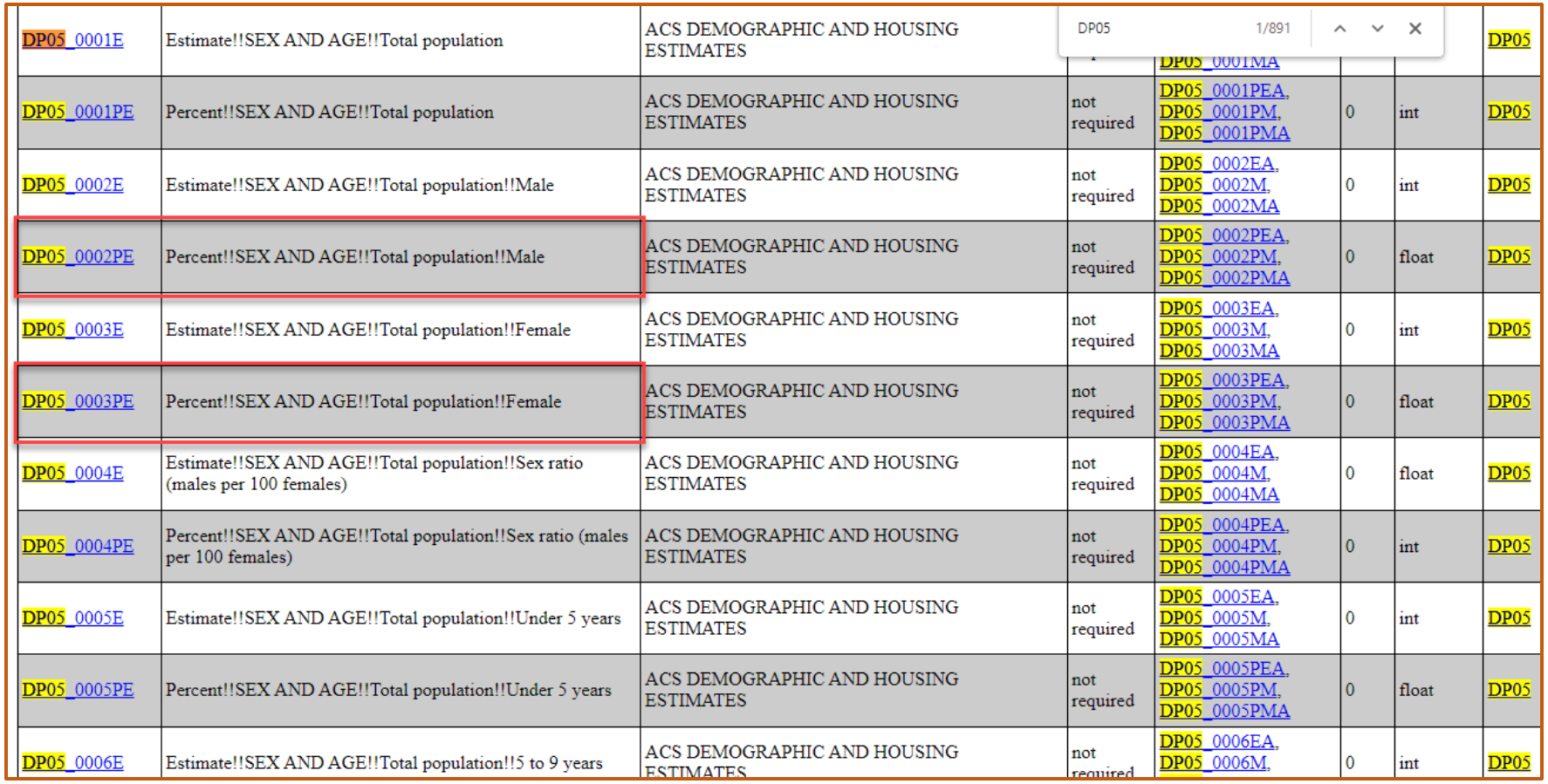
Finding Variables

- The page that opens gives every variable found in the 2021 5-year ACS Data Profiles. It helps quite a bit that we know we want data from table DP05. Click on Ctrl + F and type 'DP05' into the search bar. The matches should take you to a list of variables, starting with DP05_0001E. The variables are named according to their placement in the table, so DP05_0001E is the first line of the table, DP05_0002E is the second line of the table, and so on.

- Scroll down the list until you see the variable labeled "Percent – Sex and Age – Total population -- Male." The name of this variable is DP05_0002PE.

- Then locate the variable labeled "Percent – Sex and Age – Total population -- Female." The name of this variable is DP05_0003PE.

- Make note of the names of these two variables-- DP05_0002PE and DP05_0003PE.

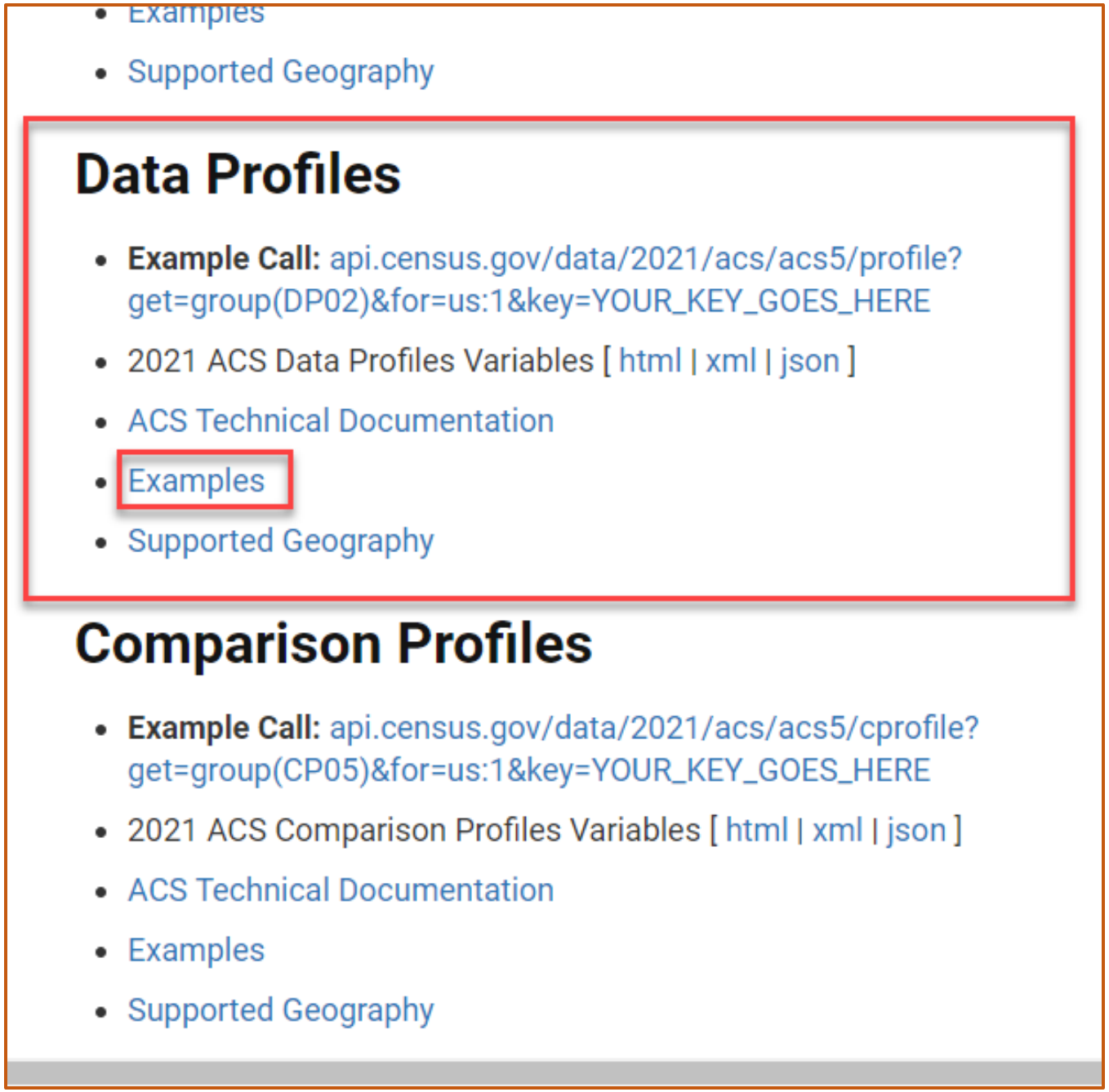


DP05 1/891

DP05_0001E	Estimate!!SEX AND AGE!!Total population	ACS DEMOGRAPHIC AND HOUSING ESTIMATES		DP05_0001MA			DP05
DP05_0001PE	Percent!!SEX AND AGE!!Total population	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0001PEA, DP05_0001PM, DP05_0001PMA	0	int	DP05
DP05_0002E	Estimate!!SEX AND AGE!!Total population!!Male	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0002EA, DP05_0002M, DP05_0002MA	0	int	DP05
DP05_0002PE	Percent!!SEX AND AGE!!Total population!!Male	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0002PEA, DP05_0002PM, DP05_0002PMA	0	float	DP05
DP05_0003E	Estimate!!SEX AND AGE!!Total population!!Female	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0003EA, DP05_0003M, DP05_0003MA	0	int	DP05
DP05_0003PE	Percent!!SEX AND AGE!!Total population!!Female	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0003PEA, DP05_0003PM, DP05_0003PMA	0	float	DP05
DP05_0004E	Estimate!!SEX AND AGE!!Total population!!Sex ratio (males per 100 females)	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0004EA, DP05_0004M, DP05_0004MA	0	float	DP05
DP05_0004PE	Percent!!SEX AND AGE!!Total population!!Sex ratio (males per 100 females)	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0004PEA, DP05_0004PM, DP05_0004PMA	0	int	DP05
DP05_0005E	Estimate!!SEX AND AGE!!Total population!!Under 5 years	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0005EA, DP05_0005M, DP05_0005MA	0	int	DP05
DP05_0005PE	Percent!!SEX AND AGE!!Total population!!Under 5 years	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0005PEA, DP05_0005PM, DP05_0005PMA	0	float	DP05
DP05_0006E	Estimate!!SEX AND AGE!!Total population!!5 to 9 years	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	not required	DP05_0006EA, DP05_0006M,	0	int	DP05

Finding Example Queries

- Now we can look at the example queries. Return to the page where you selected the html version of the variables.
- Click on **Examples.**



Finding Example Queries

- Here you can find example queries for all the geographies that are available with the 2021 5-year ACS Data Profiles.

Census API: Examples for /data/2021/acs/acs5/profile

Geography Hierarchy	Geography Level	Example URL
us	010	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=us:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=us:1&key=YOUR_KEY_GOES_HERE
region	020	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=region:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=region:3&key=YOUR_KEY_GOES_HERE
division	030	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=division:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=division:5&key=YOUR_KEY_GOES_HERE
state	040	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=state:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=state:06&key=YOUR_KEY_GOES_HERE
state› county	050	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&in=state:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:037&in=state:06&key=YOUR_KEY_GOES_HERE
state› county› county subdivision	060	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county%20subdivision:*&in=state:48&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county%20subdivision:*&in=state:48&in=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county%20subdivision:91835&in=state:48%20county:201&key=YOUR_KEY_GOES_HERE
state› county› county subdivision› subminor civil division	067	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=subminor%20civil%20division:*&in=state:72%20county:127%20county%20subdivision:57247&key=
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=subminor%20civil%20division:76644&in=state:72%20county:127%20county%20subdivision:57247&
state› county› tract	140	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&in=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:018700&in=state:06%20county:073&key=YOUR_KEY_GOES_HERE
state› place	160	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=place:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=place:*&in=state:*&key=YOUR_KEY_GOES_HERE

Finding the County Queries

- First we need data for these variables for Fairfax County, so we want to focus on the queries for Geography Level, or Summary Level, 050.

state› county	050	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&in=state:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:037&in=state:06&key=YOUR_KEY_GOES_HERE

- The **&for** portion of the query dictates the geography. The first query is going to give you data for all counties in the US. You can tell that it is going to give data for all counties because it uses the wildcard (represented by an asterisk).

state› county	050	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&in=state:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:037&in=state:06&key=YOUR_KEY_GOES_HERE

- The second one is also going to give you data for all the counties in the US, but it will also give you the state that the county is in.

state› county	050	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&in=state:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:037&in=state:06&key=YOUR_KEY_GOES_HERE

- The third one allows you to look at data for a single county within a given state. The 2-digit code used in this example query, '06', is the Federal Information Processing System (FIPS) code for California. Each state has its own unique FIPS code. The 3-digit code used in this example query, '037', is the county code for Los Angeles County. Each county has its own county code that is unique within the state.

state› county	050	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:*&in=state:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=county:037&in=state:06&key=YOUR_KEY_GOES_HERE

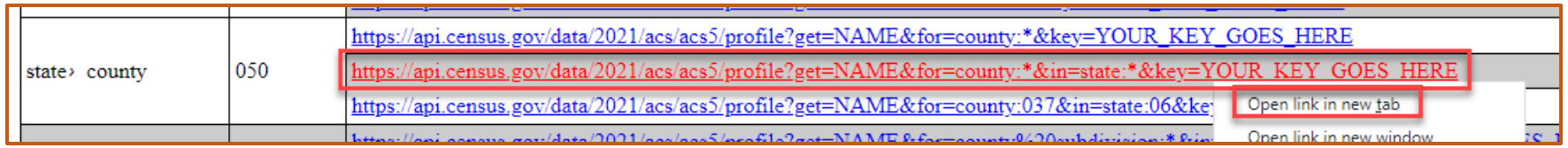
Finding the County Queries

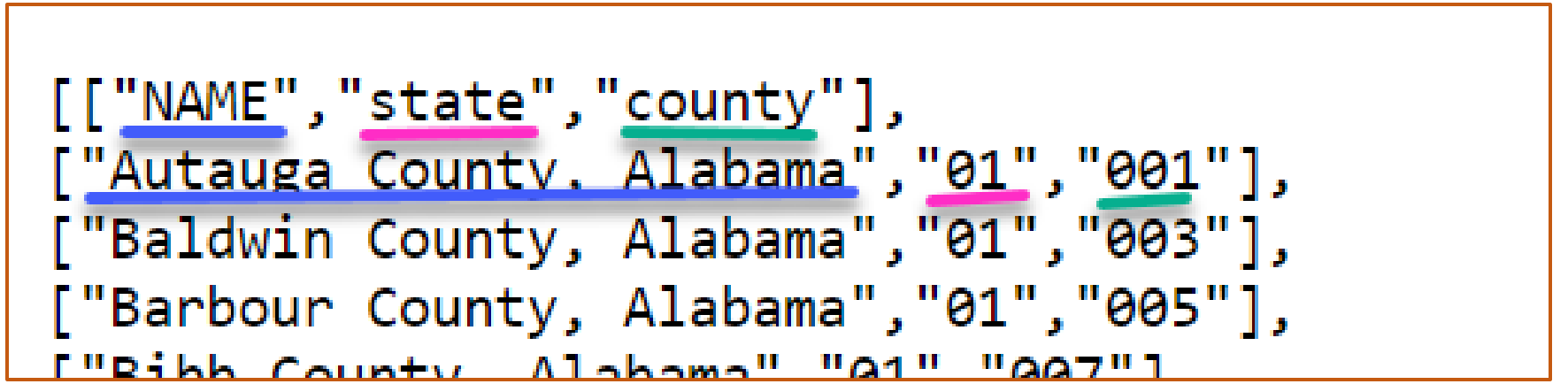
- Since we just need this table for Fairfax County, it would be most efficient to use the third query so we can just get the data we need, and not data for every other county in the US. However, you may not know the codes needed for Virginia and Fairfax County.

- You can use the second query to find this information. Right-click on the second query and choose 'Open link in a new tab.'

- This query gives you:
  - the name of each county and state (NAME),
  - the 2-digit state code (state), and
  - the 3-digit county code (county).

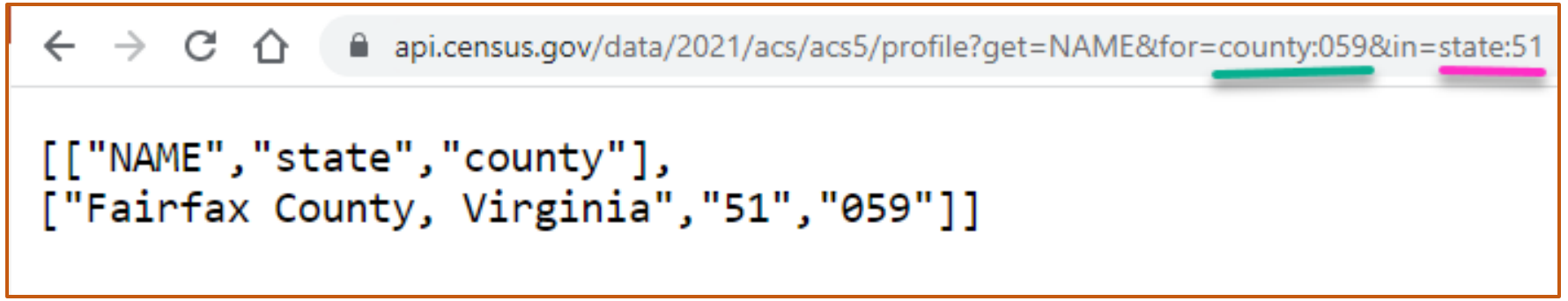
- Click on Ctrl + F and type in "Fairfax County, Virginia." From the match, we can see that the FIPS code for Virginia is '51' and the county code for Fairfax County is '059.'





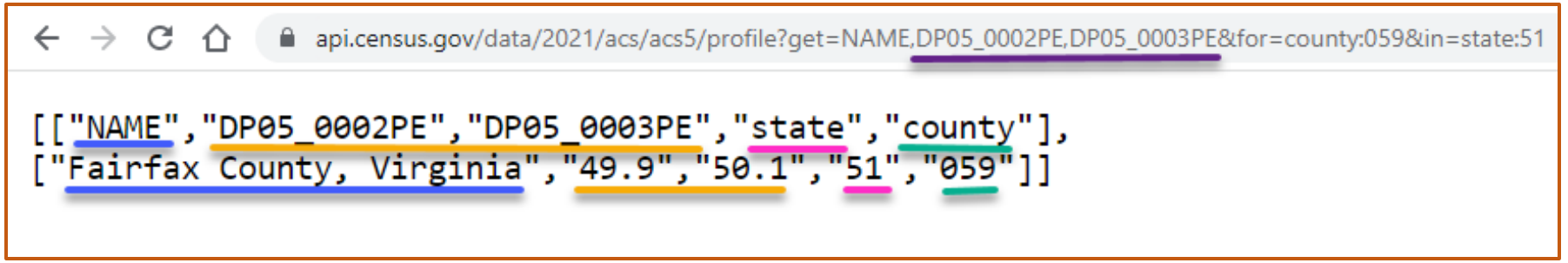
Changing the Geographies in the Query and Adding the Individual Data Points

- There is no need to return to the list of Example queries to switch to a different query. Just navigate to the query and replace the asterisk after **county:** with **059** and the asterisk after **state:** with **51**. Then hit Enter. Now you only have a line for Fairfax County.



- Now you can add in the variables for the estimates that you want: DP05_0002PE and DP05_0003PE.

- Navigate to the query, position the cursor after **NAME**, and type **,DP05_0002PE,DP05_0003PE**. Make sure to separate the variables with commas, but do not include any spaces. Then hit Enter.



- Now this query gives you:
  - the name of the county and state,
  - the estimate for DP05_0002PE,
  - the estimate for DP05_0003PE,
  - the 2-digit state code, and
  - the 3-digit county code.

Finding the Census Tract Queries

- Return to the list of example queries. Now that we have data for Fairfax County, we now need this data for all the census tracts in Fairfax County, so we want to focus on the queries for Geography Level, or Summary Level, 140.

state› county› tract	140	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&in=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:018700&in=state:06%20county:073&key=YOUR_KEY_GOES_HERE

- The first query is going to give you data for all census tracts in a state. You can tell that it is going to give data for all census tracts because it uses the wildcard for the tract portion. This example query is giving data for the tracts in California (FIPS is 06).

state› county› tract	140	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&in=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:018700&in=state:06%20county:073&key=YOUR_KEY_GOES_HERE

- The second one is also going to give you data for all the census tracts in a state. This query will also give you the county that the tract is found in. This example query is giving data for the tracts in California (FIPS is 06).

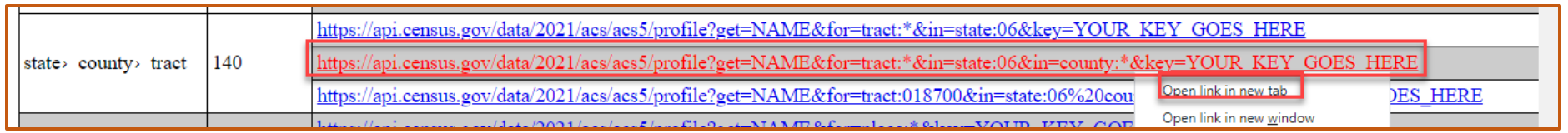
state› county› tract	140	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&in=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:018700&in=state:06%20county:073&key=YOUR_KEY_GOES_HERE

- The third one allows you to look at data for a single census tract within a given county and state. The 2-digit FIPS code used in this example query, '06', is for California. The 3-digit county code used in this example query, '073', is the code for San Diego County. And the 6-digit tract number, '018700', is for census tract 187.

state› county› tract	140	https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:*&in=state:06&in=county:*&key=YOUR_KEY_GOES_HERE
		https://api.census.gov/data/2021/acs/acs5/profile?get=NAME&for=tract:018700&in=state:06%20county:073&key=YOUR_KEY_GOES_HERE

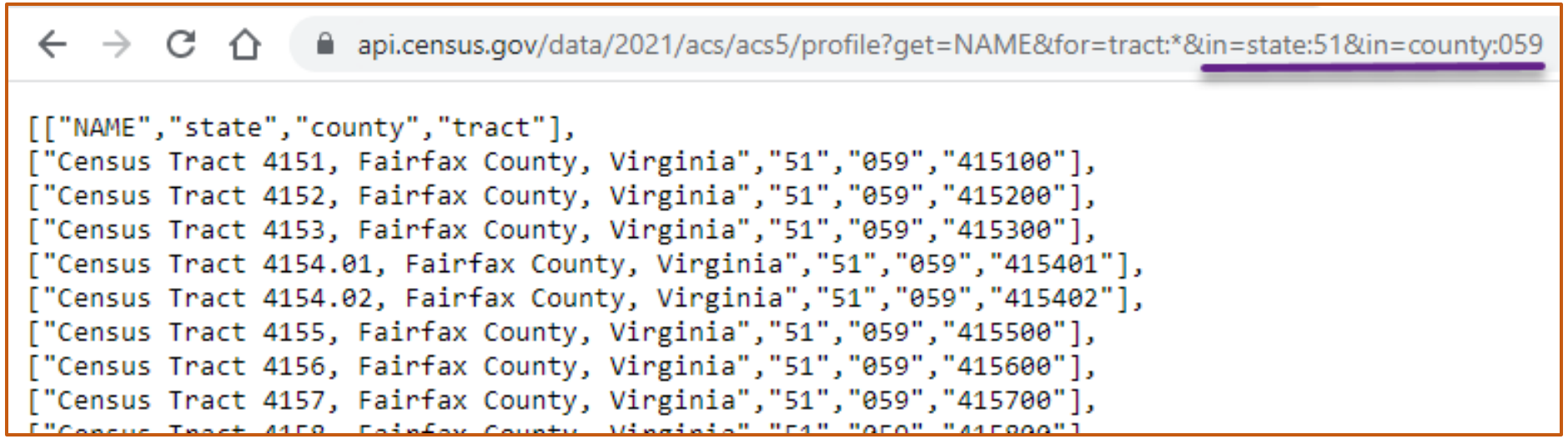
Finding the Census Tract Queries

- Since we just need this table for the census tracts in Fairfax County, it would be best to use the second query. The added benefit of using this query is that we can not only specify the state, but also the county by replacing the asterisk with a county code. Right-click on the second query and choose 'Open link in a new tab.'



- From our earlier query, we know that the county code for Fairfax County is '059' and the FIPS code for Virginia is '51'. Replace the **06** after **state:** with **51** and the asterisk after **county:** with **059**. Then hit Enter.

- Now you will have a line for every census tract in Fairfax County, Virginia.



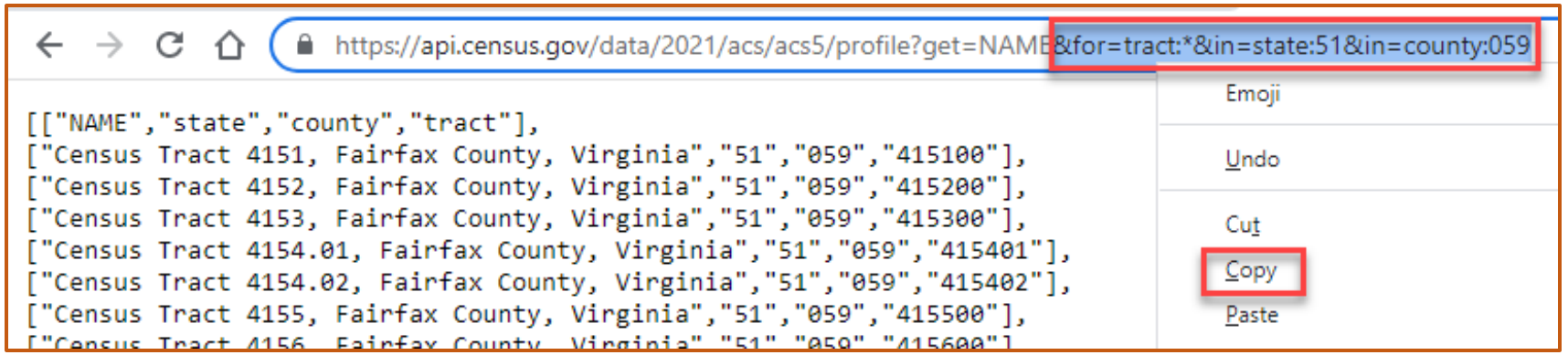
Changing Geography in Query

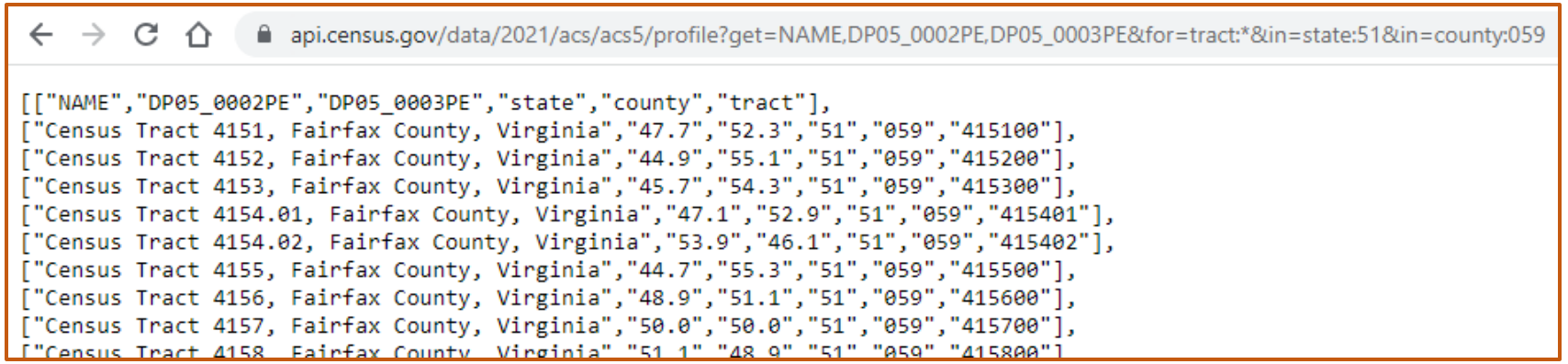
- To get data for the two variables from table DP05, all you have to do is copy the geography portion of this query and paste it over the geography portion of the query that we used earlier for Fairfax County.

- Highlight the entire geography portion, **&for=tract:*&in=state:51&in=county:059**, right click on it, and click on Copy.

- Then return to the tab with the Fairfax County query, highlight the geography portion (**&for=county:059&in=state:51**), right-click on it, and hit Paste. Then hit Enter.

- Once the query runs, you'll have data for both data points for each census tract in Fairfax County.





Confirming Table is Available for Group Call

- Now let's say that you want to get data for all of table DP03, Selected Economic Characteristics. You first want to confirm that you will be able to pull data from the table in its entirety. When you pull data for an entire table, it is referred to as "making a group call."

- To confirm that the table needed, DP03, is available for group calls, return to the ACS API page and click on the html version for the variables. Then delete the **/variables** portion from the query and hit Enter. This will give you access to all the API information for the 2021 5-year ACS Data Profiles.

Data Profiles

- **Example Call:** api.census.gov/data/2021/acs/acs5/profile?get=group(DP02)&for=us:1&key=YOUR_KEY_GOES_HERE
- 2021 ACS Data Profiles Variables [html | xml | json]
- ACS Technical Documentation
- Examples

api.census.gov/data/2021/acs/acs5/profile.html

Census API: Datasets in /data/2021/acs/acs5/profile and its descendants

Title	Description	Vintage	Dataset Name	Dataset Type	Geography List	Variable List	Group List	SortList	Examples	Developer Documentation	API Base URL
American Community Survey: 5-Year Estimates: Data Profiles 5-Year	The American Community Survey (ACS) is an ongoing survey that provides data every year -- giving communities the current information they need to plan investments and services. The ACS covers a broad range of topics about social, economic, housing, and demographic characteristics of the U.S. population. The ACS 5-year data profiles include the following geographies: nation, all states (including DC and Puerto Rico), all metropolitan areas, all congressional districts, all counties, all places and all tracts. The Data profiles contain broad social, economic, housing, and demographic information. The data are presented as both counts and percentages. There are over 2,400 variables in this dataset.	2021	acs› acs5› profile	Aggregate	geographies	variables	groups	sorts	examples	documentation	http://api.census.gov/data/2021/acs/acs5/profile
1 dataset											

Confirming Table is Available for Group Call

- To confirm that you can run a group call using DP03, right-click on the **Groups** link and choose 'Open link in new tab.'
- This gives you a list of the Data Profiles that are available for group calls. Once you have confirmed that table DP03 is available for group calls, close the tab, as it's no longer necessary to keep it open.

Census API: Datasets in /data/2021/acs/acs5/profile and its descendants

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Open link in new tab
Open link in new window
Open link in incognito window

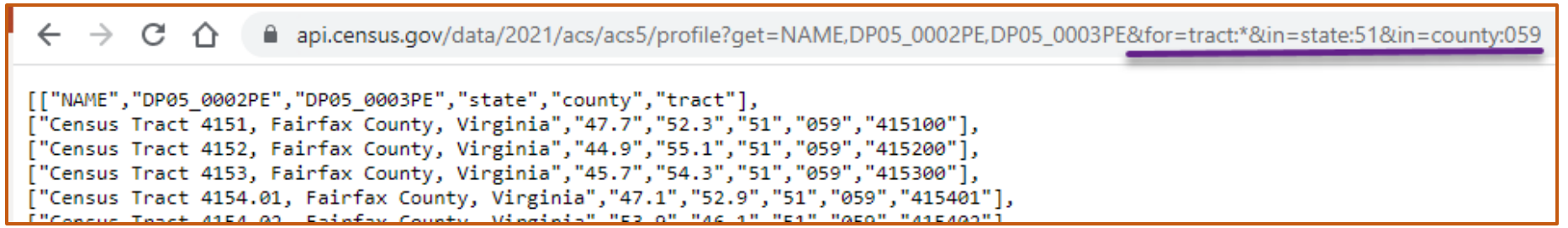
Census API: groups in /data/2021/acs/acs5/profile/groups

Name	Description	Variable List
DP02	SELECTED SOCIAL CHARACTERISTICS IN THE UNITED STATES	selected variables
DP02PR	SELECTED SOCIAL CHARACTERISTICS IN PUERTO RICO	selected variables
DP03	SELECTED ECONOMIC CHARACTERISTICS	selected variables
DP04	SELECTED HOUSING CHARACTERISTICS	selected variables
DP05	ACS DEMOGRAPHIC AND HOUSING ESTIMATES	selected variables

5 groups

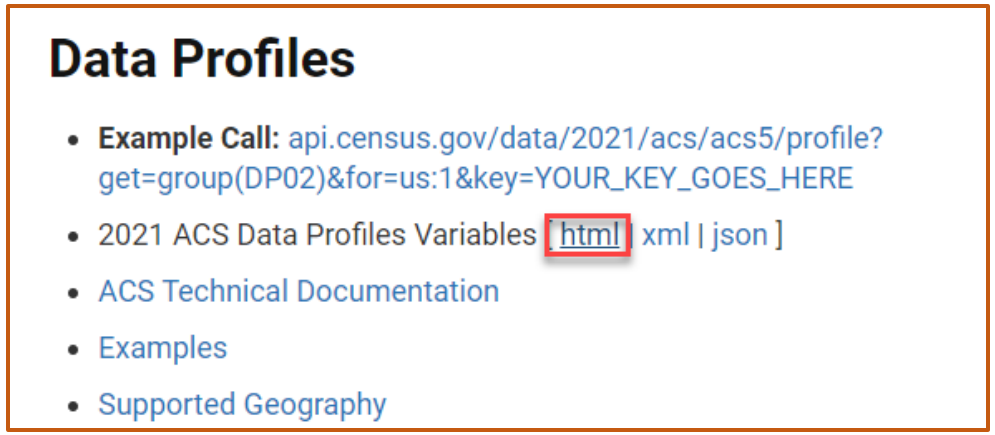
Changing the Geographies in the Query and Adding the Table

- Return to the last query you did for the census tracts in Fairfax County. To switch from getting data for just the two data points to getting data for all of DP03, you can alter the existing query.



- You will just need to delete the two variables for the estimates and the NAME variable and add the table. Delete **NAME,DP05_0002PE,DP05_0003PE** and replace it with **group(DP03)**. Then hit Enter.

- Now you have data for all of table DP03 for all the census tracts in Fairfax County. To determine what each variable represents, visit the Variables page found at https://api.census.gov/data/2021/acs/acs5/profile/variables.html.



- Application Programming Interface (API) basics
- Run through of an API call
- **API Resources**

Application Programming Interface (API)

What if you need help?

https://api.census.gov/data/key_signup.html

Application Programming Interface (API)
Additional resources

Recorded videos/webinars:

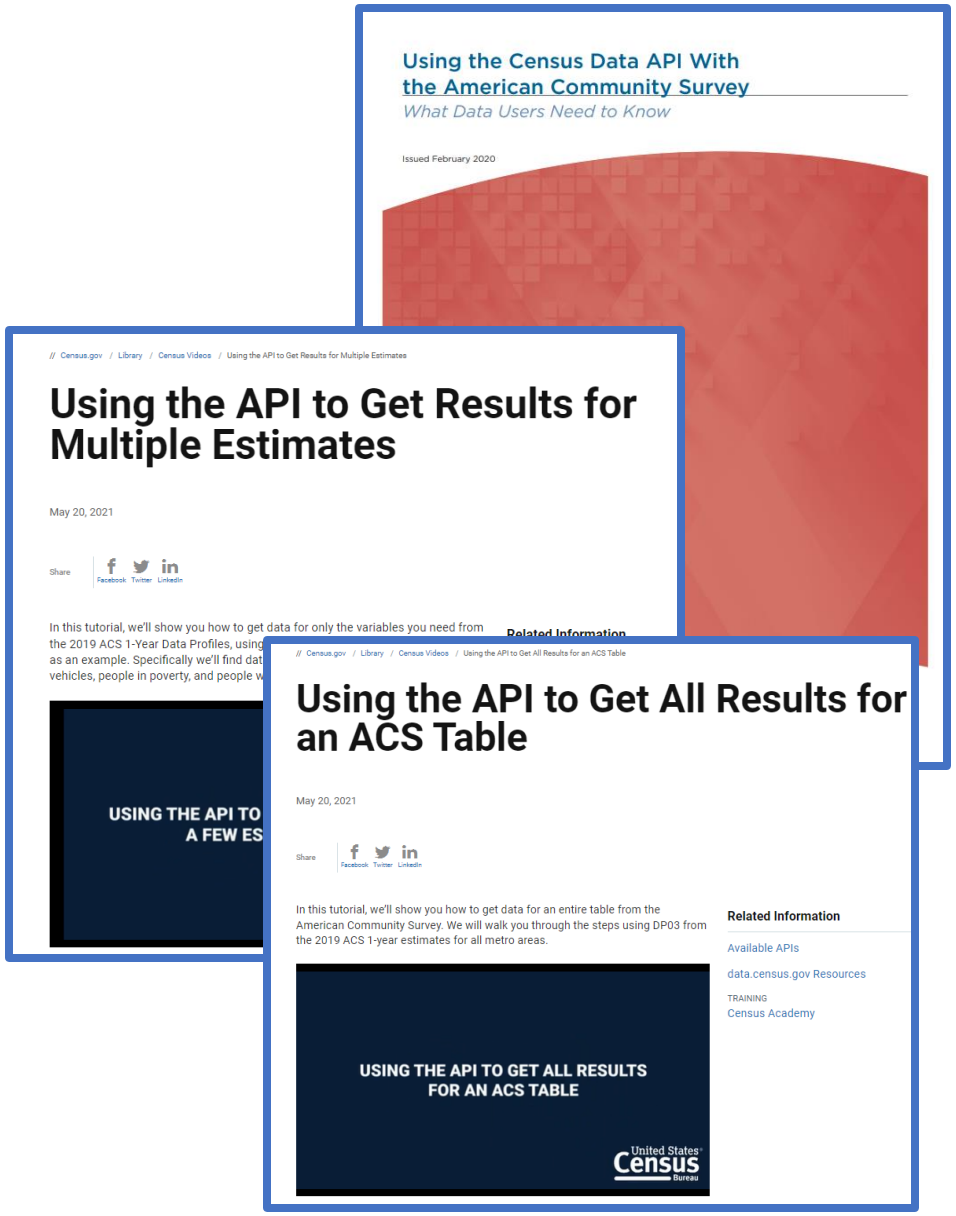
- Webinar: Demystifying the Census API
- Webinar: Using the Census API with the ACS
- Webinar: Getting Started with ACS Data in R and Python
- Webinar: Using API to Get All Results for an ACS Table
- Webinar: Using API top Get Results for Multiple Estimates

API webpages and documentation

- Webpage: ACS Data via API
- Webpage: Using ACS Data with Open-Source Software
- Webpage: How-to Materials for Using the Census API
- Document: ACS API Data Users Handbook
- Document: Census Data API User Guide
- Document: Removing ACS Annotation Columbus from API Group Call in Excel

Live Workshops

- Basics of Using the Census API



Application Programming Interface (API)

Additional support

U.S. Census Bureau Slack Channel

- Developer's forum to help improve access to public datasets from the U.S. Census Bureau
- Join U.S. Census Bureau Slack Channel

ACS User Support

- acso.users.support@census.gov

API support

- census.data@census.gov

TidyCensus

- U.S. Census Bureau does not maintain or provide support
- Documentation and support: https://walker-data.com/tidycensus/

GitHub

- All programming languages are welcome!
- If you are interested in submitting code to the ACS GitHub, please submit an email to acso.users.support@census.gov.