

Power to Excel

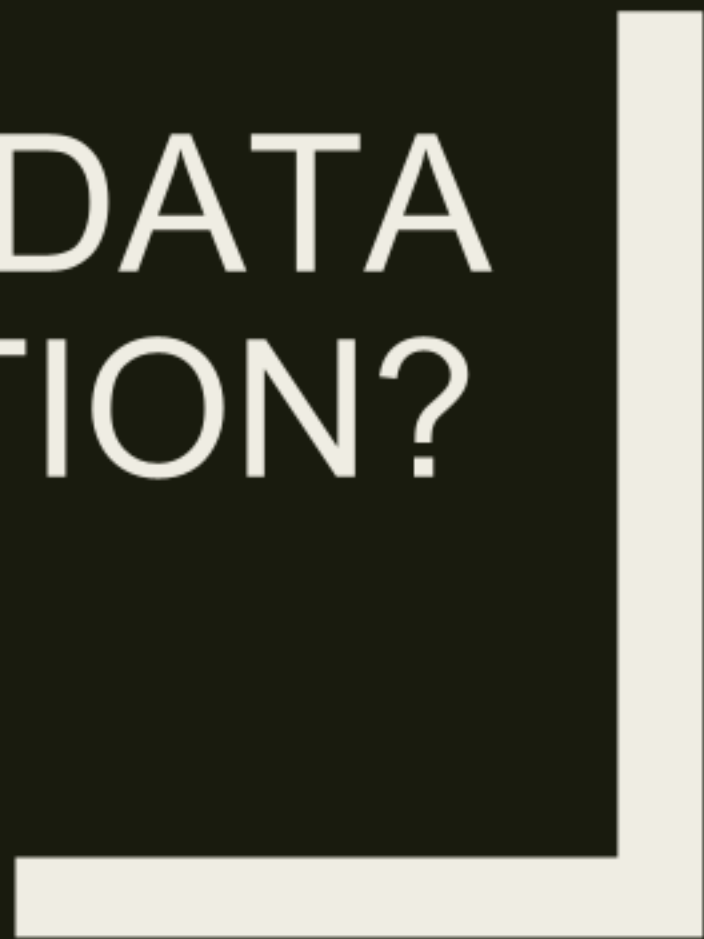
Using Excel to Analyze Data and Communicate Effectively

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Colorado Office of the State Auditor

Action	Shortcut	Type	Action	Shortcut	Type	Action	Shortcut	Type
Copy	Ctrl + c		Cell Format	Ctrl + 1		Calculate worksheets	F9	
Paste	Ctrl + v	Copy & Paste	Format as %	Ctrl + %	Cell Format	Calculate active worksheet	Shift + F9	Calculate
Paste Special	Ctrl + Alt + v		Format as Number	Ctrl + #		Force recalculate all	Ctrl + Alt + F9	
Select Row	Shift + Space		Add Autofilter	Ctrl + Shift + L (L)		Go To Special	F5 → Alt + s	
Select Column	Ctrl + Space	Select & Navigate	Clear Filter	Alt → a → c	Filter	Find	Ctrl + F	Search
Jump to End	Ctrl + Arrow		Show Dropdown List	Alt = Arrow down		Replace	Ctrl + h	
Mark + Jump to End	Shift + Ctrl + Arrow		Hide Sheet	Alt → o → h → h		Delete/insert Row/Column	Ctrl + - / Ctrl + +	
Group	Alt + Shift + Arrow right	Group & Ungroup	Unhide Sheet	Alt → o → h → u		Open Data Validation	Alt + d + I (L)	Others
Ungroup	Alt + Shift + Arrow left		Rename Sheet	Alt → o → h → r	Worksheet functions	Create Pivot Table	Alt → n → v	
Add \$ in Formula	F4 (in Cell)	In Cell	Insert new Worksheet	Alt + Shift + F1		Repeat last Action	F4 (not in Cell)	
Line break within Cell	Alt + Enter (in Cell)		Go to next/previous Sheet	Ctrl + Page up/ Page down		Enter Cell	F2	

→ = press keys after each other + = press keys at the same time o = additional key Note: Some shortcuts such as "F5" or "F9" may require additional keys such as "Shift".

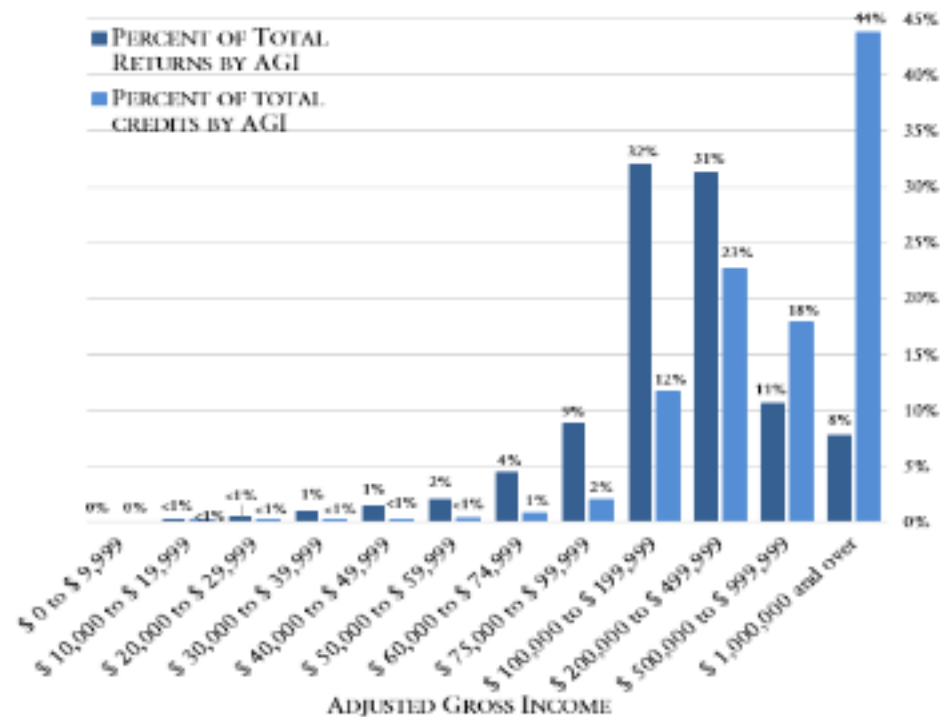
WHY USE DATA
VISUALIZATION?



Easier to identify patterns, trends, and outliers when analyzing data sets

Total Number of Returns by AGI		Total Credits by AGI	
Negative Income	NR	Negative Income	NR
\$ 0 to \$ 9,999	NR	\$ 0 to \$ 9,999	NR
\$ 10,000 to \$ 19,999	30	\$ 10,000 to \$ 19,999	\$3,645
\$ 20,000 to \$ 29,999	78	\$ 20,000 to \$ 29,999	\$12,721
\$ 30,000 to \$ 39,999	161	\$ 30,000 to \$ 39,999	\$35,184
\$ 40,000 to \$ 49,999	259	\$ 40,000 to \$ 49,999	\$63,640
\$ 50,000 to \$ 59,999	361	\$ 50,000 to \$ 59,999	\$107,975
\$ 60,000 to \$ 74,999	774	\$ 60,000 to \$ 74,999	\$243,534
\$ 75,000 to \$ 99,999	1,544	\$ 75,000 to \$ 99,999	\$581,769
\$ 100,000 to \$ 199,999	5,641	\$ 100,000 to \$ 199,999	\$3,244,942
\$ 200,000 to \$ 499,999	5,502	\$ 200,000 to \$ 499,999	\$6,333,357
\$ 500,000 to \$ 999,999	1,868	\$ 500,000 to \$ 999,999	\$4,984,419
\$ 1,000,000 and over	1,378	\$ 1,000,000 and over	\$12,207,204
Total	17,613	Total	\$27,852,111

EXHIBIT 2. PERCENT OF RETURNS¹ CLAIMING THE CHILD CARE CONTRIBUTION TAX CREDIT BY AGI, AND PERCENT OF THE CREDIT CLAIMED BY AGI, TAX YEAR 2017



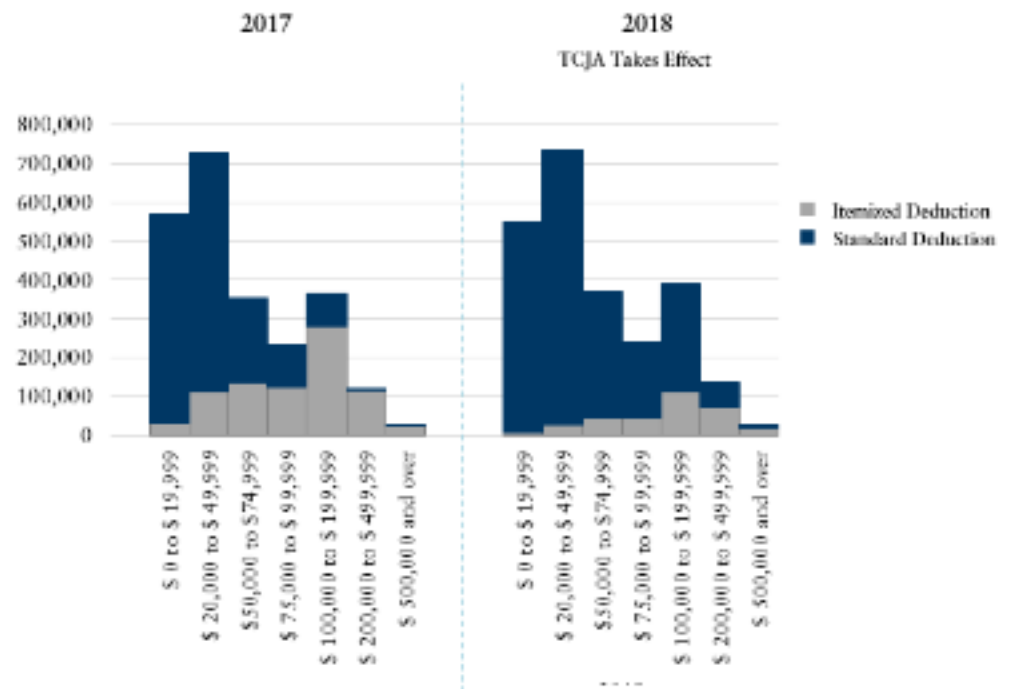
SOURCE: Office of the State Auditor analysis of Department of Revenue 2020 Tax Profile and Expenditures Report for the 2017 Statistics of Income.
¹Full year Colorado resident returns only.

Faster and more engaging way to communicate information

Specifically, the standard deduction had only been annually adjusted for inflation since the 1970s through Tax Year 2017, until the TCJA roughly doubled the standard deduction for Tax Years 2018 through 2025, from \$6,500 to \$12,000 for single filers and from \$13,000 to \$24,000 for married couples filing jointly. This change significantly increased the number of Coloradans claiming the federal standard deduction, and who could therefore claim the State's Charitable Contribution Deduction, at all income levels. Specifically, for Tax Years 2015 through 2017, about 66 percent of Colorado taxpayers' returns claimed the standard deduction on their federal returns. Then in Tax Year 2018, the first year of the temporary increase in the standard deduction under the TCJA, the proportion of Colorado returns claiming the standard deduction increased to 86 percent. Further, the change in the proportion of taxpayers who claimed the standard deduction was the most significant among taxpayers with AGIs over \$75,000. For example, prior to the TCJA about 27 percent of taxpayers with AGIs between \$75,000 and \$499,000 claimed the standard deduction; whereas, in Tax Year 2018, after the passage of the TCJA, 70 percent of these taxpayers claimed it.

EXHIBIT 2. INCREASE IN RETURNS CLAIMING THE STANDARD DEDUCTION, BY AGI

Due to temporary increases in the federal standard deduction under the TCJA there was a large shift of returns claiming the standard deduction instead of itemizing between Tax Years 2017 and 2018.



SOURCE: Office of the State Auditor analysis of Department of Revenue Statistics of Income for Tax Years 2017 through 2018.

Training Objectives



DATA ANALYSIS



PRACTICE



DATA
VISUALIZATIONS

DATA ANALYSIS

What type of data do you have?
What key questions can you answer?

Four Types of Data Measurement

Qualitative

- Nominal – Categorical data with no ordering
 - *Project Type*
 - *Location*
- Ordinal – Categorical data with ordering but no measurement between values
 - *Survey data (Satisfaction level or Likelihood)*

Quantitative

- Interval – Ordered data with measurement between values.
 - *Date of project start*
 - *Temperature (C or F)*

Zero point doesn't indicate an absence of the variable

- Ratio – Ordered data with measurement between values
 - *Amount of project spending*
 - *Days between project start and end date*

Zero point indicates an absence of the variable

Practice

Economic Development

Project Data: Projects

Includes the Type of Project, Start and End Dates for the Project, Amount Spent, Tax Credit Amounts, and Property Values

Zip Codes & Tax Rates:

Includes CO Zip Codes, Counties, and Applicable Property Tax Rates

Survey Data:

Project Contact and their responses to whether the tax credit incentivized the project (ranked on a scale of 1-5)

Nominal	ID Key (Nominal)	Nominal	Nominal	Interval	Interval	Ratio
Company	project_id	project_contact	Project Type	start_date	end_date	project_spend
Jatri	1	Tirrell Sheivels	Business Incubator	5/20/2017	9/4/2021	\$639,691.70
Meejo	2	Kendricks Bangley	Outdoor Recreation	4/30/2017	8/31/2022	\$249,713.30
Brainsphere	3	Greer Danbury	Outdoor Recreation	10/11/2023	N/A	N/A
Shuffletag	4	Quintana Montier	Medical	11/30/2023	N/A	N/A
Gabtype	5	Stuart Acarson	Business Incubator	6/13/2016	6/3/2021	\$191,719.63
DabZ	6	Bernelle Swate	Education	10/6/2016	11/4/2021	\$1,077,384.78

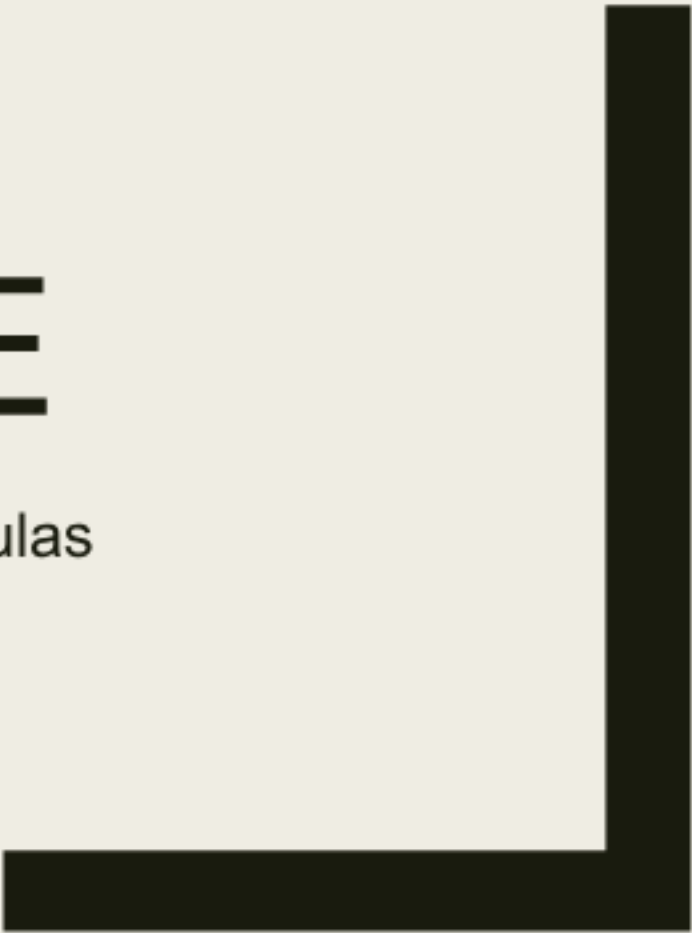
	A	B	C	D
1	Nominal	Nominal	Nominal	Ratio
2	ZIP Code	City	County	Property Tax Rate
3	80001	Arvada	Jefferson	2.95%
4	80002	Arvada	Jefferson	2.95%

ID Key (Nominal)	Nominal	Ordinal
		To what extent did the credit influence the decision to invest in the project? (1-5 scale with 1 being not at all and 5 being completely)
project_id	project_contact	
	1 Tirrell Sheivels	5
	2 Kendricks Bangley	4
	3 Greer Danbury	2
	4 Quintana Montier	2
	5 Stuart Acarson	3



PRACTICE

Orienting to Excel and Basic Formulas



File Home Insert Page Layout Formulas Data Review View Developer Kofax PDF Format Tell me what you want to do...

Clipboard Font Alignment Number Styles

Calibri (Body) 11 A A Wrap Text General Normal Bad Good Neutral Calculation Check Cell Explanatory... Input Linked Cell Note

	A	B	C	D	E	F	G	H	I	J	K	L	M
	Nominal	ID Key (Nominal)	Nominal	Nominal	Interval	Interval	Ratio	Ratio	Ratio	Ratio	Nominal	Nominal	Nominal
	Company	project_id	project_contact	Project Type	start_date	end_date	project_spend	Tax Credit	Original Property Value	2022 Property Value	state	Project Location	project_status
1													
2													
3													
4													
5	Jato	1	Tromb Stalovits	Business Incubator	5/20/2017	9/4/2021	\$639,691.70	\$177,958.34	\$200,551.44	\$690,867.04	Colorado	7711 Bowman Lane, 80262	completed
6	Meejo	2	Kendricks Bangley	Outdoor Recreation	4/30/2017	8/31/2022	\$249,713.90	\$24,971.88	\$127,353.78	\$254,707.57	Colorado	955 McBride Lane, 81010	completed
7	Brainsphere	3	Greer Danbury	Outdoor Recreation	10/11/2023	N/A	N/A	N/A	\$59,840.33	N/A	Colorado	7 Thackeray Avenue, 80045	pending
8	Shuffletag	4	Quintana Montier	Medical	11/30/2023	N/A	N/A	N/A	\$354,044.12	N/A	Colorado	21047 Stang Junction, 80044	pending
9	Gobtype	5	Stuart Acarson	Business Incubator	6/18/2016	6/3/2021	\$191,719.68	\$19,171.96	\$144,040.04	\$207,057.20	Colorado	1090 McCormick Center, 80249	completed
10	DobZ	6	Bernelle Swate	Education	10/6/2016	11/4/2021	\$1,077,384.78	\$215,476.96	\$581,787.78	\$1,163,575.56	Colorado	5 Bluejay Alley, 80638	completed
11	Kamba	7	Ronni Debill	Business Incubator	10/17/2018	N/A	N/A	N/A	\$1,319,654.42	N/A	Colorado	423 Fordem Way, 80279	ongoing
12	Flashset	8	Karlyn Clarke-Williams	Arts	3/19/2015	5/10/2021	\$969,860.02	\$199,972.00	\$692,480.05	\$989,257.22	Colorado	6 Becker Plaza, 80955	completed
13	Meezzy	9	Delilla Lankester	Education	1/28/2018	5/27/2022	\$1,816,356.92	\$363,271.38	\$1,373,165.83	\$1,961,665.47	Colorado	623 Tennessee Way, 80150	completed
14	Rhyzo	10	Eveleen Yeatman	Business Incubator	3/28/2016	4/14/2021	\$962,687.89	\$192,537.58	\$727,792.04	\$1,039,702.92	Colorado	048 Blue Hill Park Alley, 80305	completed
15	Viva	11	Nanette Fogg	Medical	3/19/2020	4/16/2023	\$199,673.95	\$19,967.40	\$62,537.88	\$215,647.87	Colorado	3548 Londonderry Circle, 80279	completed
16	Trunyx	12	Denny Dignam	Business Incubator	1/28/2018	N/A	N/A	N/A	\$103,951.96	N/A	Colorado	13264 Norway Maple Way, 80045	ongoing
17	Tagtrone	13	Artemas Seale	Housing	9/25/2015	3/2/2022	\$316,490.71	\$31,649.07	\$247,394.37	\$353,420.52	Colorado	6 Karstens Place, 80243	completed
18	Yousopia	14	Charlean Pendock	Business Incubator	7/10/2018	1/6/2023	\$1,245,510.97	\$249,062.19	\$941,455.09	\$1,844,955.85	Colorado	8348 Annamark Pass, 80204	completed
19	Eidel	15	Eugenie Boffin	Medical	5/9/2020	9/26/2021	\$1,617,635.47	\$323,527.09	\$930,140.40	\$1,860,280.79	Colorado	56 Schmedeman Road, 80045	completed
20	Devcast	16	Kristopher Terrill	Outdoor Recreation	3/21/2020	11/21/2022	\$379,083.01	\$37,908.30	\$204,704.83	\$409,409.05	Colorado	61824 Lakeland Plaza, 80045	completed
21	Twimbo	17	Teddy Hartas	Education	9/4/2018	N/A	N/A	N/A	\$1,395,750.55	N/A	Colorado	15405 Stone Corner Center, 80291	ongoing
22	Feedfire	18	Yvor Gordon-Giles	Education	11/7/2018	N/A	N/A	N/A	\$685,650.90	N/A	Colorado	0 Schliming Crossing, 80945	ongoing
23	Vimbo	19	Glori Oglesbee	Education	3/21/2015	6/1/2022	\$1,062,211.63	\$212,442.33	\$314,202.20	\$1,083,455.86	Colorado	56114 Cody Street, 80045	completed
24	Camido	20	Addi Hyam	Outdoor Recreation	3/18/2024	N/A	N/A	N/A	\$1,324,289.34	N/A	Colorado	2 Harbart Place, 80279	pending
25	Aivee	21	Ford Crossingham	Arts	1/11/2016	5/3/2021	\$1,598,742.27	\$318,748.45	\$860,620.83	\$1,721,241.65	Colorado	62 Hoffeman Circle, 81505	completed
26	Twimm	22	Geri Woolger	Arts	4/30/2017	2/23/2023	\$1,063,727.37	\$212,545.47	\$803,421.89	\$1,147,745.56	Colorado	58684 Heath Park, 81505	completed
27	Ailane	23	Dorie Gaskins	Business Incubator	4/22/2019	5/22/2022	\$65,562.81	\$6,556.28	\$19,534.32	\$66,670.07	Colorado	1377 Porter Park, 80945	completed
28	Bubblomix	24	Valida Uccelli	Outdoor Recreation	8/12/2016	4/18/2023	\$524,257.55	\$104,847.51	\$396,323.50	\$566,176.55	Colorado	7752 Monomonic Street, 80217	completed
29	Fiveclub	25	Orv Munden	Business Incubator	5/3/2015	N/A	N/A	N/A	\$135,060.81	N/A	Colorado	4175 Milwaukee Pass, 80945	ongoing
30	Shuffledrive	26	Cinda Stoner	Business Incubator	4/21/2015	3/27/2022	\$1,373,059.60	\$274,613.92	\$980,571.69	\$1,400,530.99	Colorado	6723 Tennessee Alley, 80945	completed
31	Browsecat	27	Curcio Eatherton	Outdoor Recreation	3/14/2019	10/31/2022	\$220,958.62	\$22,095.86	\$139,514.95	\$288,629.91	Colorado	51 Lakeland Place, 80638	completed
32	Oozz	28	Wash Colbert	Arts	10/11/2018	7/19/2023	\$1,212,821.93	\$242,564.39	\$865,954.86	\$1,237,078.37	Colorado	141 Fairfield Way, 80930	completed
33	Yotz	29	Oren Bohlin	Education	1/20/2024	N/A	N/A	N/A	\$1,046,781.24	N/A	Colorado	71 Onsgard Street, 80930	pending
34	Oyoyo	30	Linsy Godbehene	Business Incubator	8/26/2019	8/7/2021	\$125,706.57	\$12,570.64	\$95,054.02	\$155,762.88	Colorado	96 Sutherland Court, 80658	completed
35	Flashset	31	Derwin Glasby	Medical	1/21/2017	7/12/2021	\$16,833.25	\$1,683.33	\$12,018.94	\$17,169.92	Colorado	32 Walton Center, 80150	completed
36	Skinix	32	Hunfredo Symcock	Outdoor Recreation	10/23/2019	7/16/2021	\$1,305,403.37	\$261,080.67	\$704,917.82	\$1,409,835.04	Colorado	316 Blaine Street, 80126	completed
37	Wikizz	33	Neron Heartfield	Medical	12/25/2018	N/A	N/A	N/A	\$647,587.59	N/A	Colorado	8854 Lakewood Parkway, 80538	ongoing
38	Topiclab	34	Jeanette Blakeley	Housing	2/2/2017	N/A	N/A	N/A	\$791,190.13	N/A	Colorado	42819 Shoshone Crossing, 80305	ongoing
39	Babbleset	35	Tristan Hilschke	Housing	6/27/2018	7/1/2023	\$1,364,398.44	\$272,879.69	\$1,031,485.22	\$1,473,550.32	Colorado	3451 Comanche Junction, 80291	completed
40	Meeveo	36	Titas Bulluck	Arts	4/2/2020	2/8/2023	\$1,252,024.55	\$250,404.91	\$638,532.52	\$1,277,065.04	Colorado	0 Old Gate Park, 80291	completed
41	Roombo	37	Tanney Dawidman	Housing	7/29/2016	8/4/2022	\$991,573.26	\$198,314.65	\$707,983.91	\$1,011,404.79	Colorado	326 Bluejay Junction, 80915	completed
42	Gabvine	38	Coraline Grinaway	Business Incubator	9/20/2016	9/23/2021	\$338,957.26	\$33,895.73	\$242,015.48	\$345,736.41	Colorado	57217 Acker Hill, 81010	completed
43	Fivechat	39	Nonie Sergeant	Medical	7/25/2024	N/A	N/A	N/A	\$147,270.55	N/A	Colorado	39415 Old Gate Terrace, 80279	pending
44	Quamba	40	Billy Fishleigh	Medical	1/18/2019	9/22/2022	\$418,907.15	\$41,890.72	\$123,912.73	\$427,285.29	Colorado	22186 Kim Drive, 80291	completed
45	Dablist	41	Averil Sked	Outdoor Recreation	7/14/2019	N/A	N/A	N/A	\$597,271.89	N/A	Colorado	102 Esker Parkway, 80126	ongoing
46	Realmix	42	Norris McKennan	Business Incubator	9/5/2017	1/26/2023	\$745,970.40	\$149,194.08	\$563,953.62	\$805,648.03	Colorado	035 Debb Crossing, 80150	completed
47	Eidel	43	Nicol Pittet	Business Incubator	8/15/2018	7/11/2022	\$121,502.85	\$12,150.24	\$38,054.54	\$131,222.54	Colorado	98004 Old Shore Street, 80279	completed
48	Alkhu	44									Colorado	3 Padua Sales, 80045	completed

What is the property tax rate for each project?

Task: Splitting apart data in a cell and connecting two data sets to create an additional data point.

Isolate the Zip Code from the Address so we can match it to the Zip Code & Tax Rate Data

- 1) Right click and insert a new column next to the Project Location (label as 'Zip Code')
- 2) Ctrl+Shift+down to select the Project Location data
- 3) On your top ribbon, select 'Data', and then the 'Text to Columns' --> Wizard will open, you can do 'delimited' and then 'comma' since the Zip Code is after the comma --> Select 'General' for formatting.

Use a VLOOKUP function to pull the tax rate into the Project Data table

Vlookup uses the unique identifier to search the second set of data and return the data that is in the corresponding row/column

=Vlookup(lookup_value,table_array,col_index_num,[range_lookup])

In this case we want to use the Zip Code from the Project Data table, find that in the Zip Code & Tax Rate data, and return the appropriate tax rate

=Vlookup(Zip Code, Zip Codes & Tax Rates \$A\$2:\$D\$646,4,False)

*the '\$' in the cell reference locks your formula to those cells. If you don't include it as you go down each row the reference will move down a row as well, resulting in an 'N/A' error because the formula will be looking in blank cells

How have the property taxes changed for finished projects?

Task: Add calculations to your table and nest functions to deal with errors

Add Columns to the Table

Add Columns to your table to calculate

1) the original property tax amount
*=(Original Property Value * Tax Rate)*

2) the 2022 property tax amount
*=(2022 Property Value * Tax Rate)*

3) the difference in property taxes since the project was completed (label as 'Change in Revenue').

=(2022 Property Tax – Original Property Tax)

Add an IFERROR function to resolve the #N/A for unfinished projects

Nested functions allow you to perform more than one calculation. In this case we want to figure out the property tax due, but need to account for projects that don't have a 2022 property value and therefore would result in a mathematical error (no value * rate = #N/A)

=IFERROR([@[2022 Property Value]][@[Tax Rate]],@[Original Property Tax])*

How did the Tax Credit impact the decision to do the project?


Task: Connecting two data sets to understand the effectiveness of the tax credit policy

```
=Vlookup(Project_ID, Survey Data  
$A$2:$C$210, 3, False)
```



PRACTICE



Pivot Tables




What was the total change in property tax revenue for finished projects?

Creating a pivot table to summarize the data

PivotTable Fields

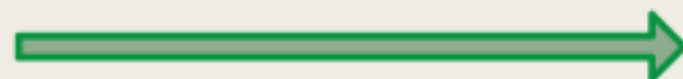
Choose fields to add to report:  

Search 

- Company
- project_id
- project_contact
- Project Type
- start_date
- end_date
- project_expend
- Tax Credit
- Original Property Value
- 2022 Property Value
- state
- Project_Location
- Zip Code
- project_status
- Tax Rate

Drag fields between areas below:

FILTERS	COLUMNS
ROWS	VALUES



- Zip Code
- project_status
- Tax Rate
- Original Property Tax
- 2022 Property Tax
- Change in Revenue
- Survey Results

MORE TABLES...

Drag fields between areas below:

FILTERS	COLUMNS
project_status	
ROWS	VALUES
	Sum of Change in Revenue

What was the total change in property tax revenue for finished projects, by zip code and by project type?

PivotTable Fields

Choose fields to add to report:

Search

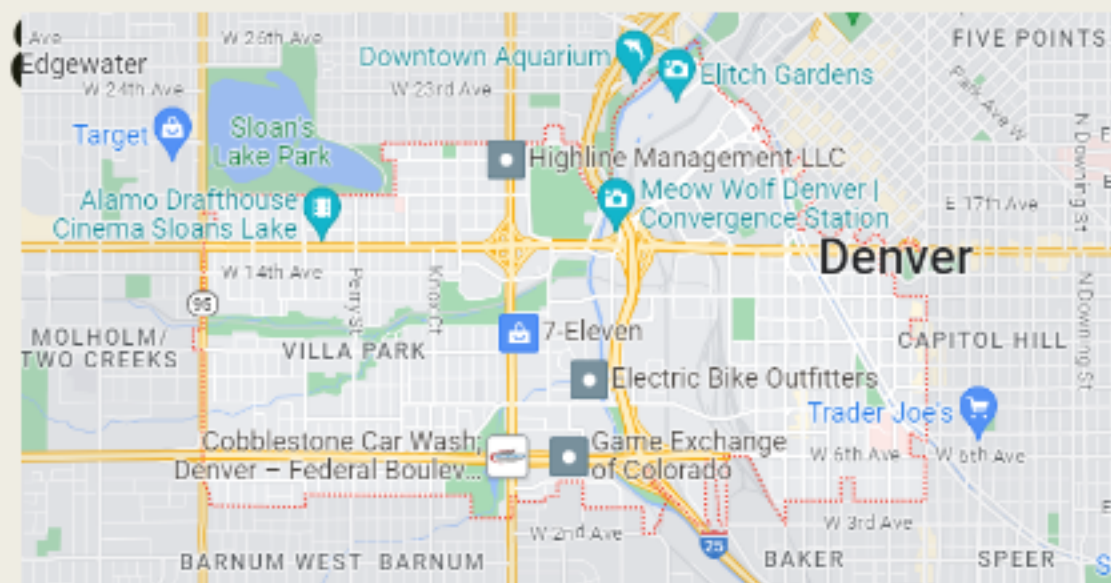
- project_contact
- Project Type
- start_date
- end_date
- project_spend
- Tax Credit
- Original Property Value
- 2022 Property Value
- state
- Project_Location
- Zip Code
- project_status
- Tax Rate
- Original Property Tax
- 2022 Property Tax

Drag fields between areas below:

FILTERS	COLUMNS
project_status	

ROWS	VALUES
Zip Code	Sum of Change in Revenue
Project Type	

What was the average change in property tax revenue for finished projects, in zip code



Search

- Company
- project_id
- project_contact
- Project Type
- start_date
- end_date
- project_spread
- Tax Credit
- Original Property Value
- 2022 Property Value
- state
- Project_Location
- Zip Code
- project_status
- Tax Rate

Drag fields between areas below

FILTERS
project_status

COLUMNS
Σ Values

ROWS
Zip Code
Project Type

Σ VALUES
Count of project_id
Average of Change in Revenue

project_status	completed			
Zip Code	Project Type	Count of project_id	Average of Change in Revenue	
80204	Arts	1	\$	8,476.91
	Business Incubator	2	\$	14,443.35
	Education	1	\$	10,413.20
	Housing	2	\$	22,064.43
	Medical	2	\$	10,644.67
	Outdoor Recreation	3	\$	15,145.87
80204 Total		11	\$	14,421.14
Grand Total		11	\$	14,421.14

What was the cost of the tax credit and the revenue change for projects influenced by the tax credit?

Drag fields between areas below:

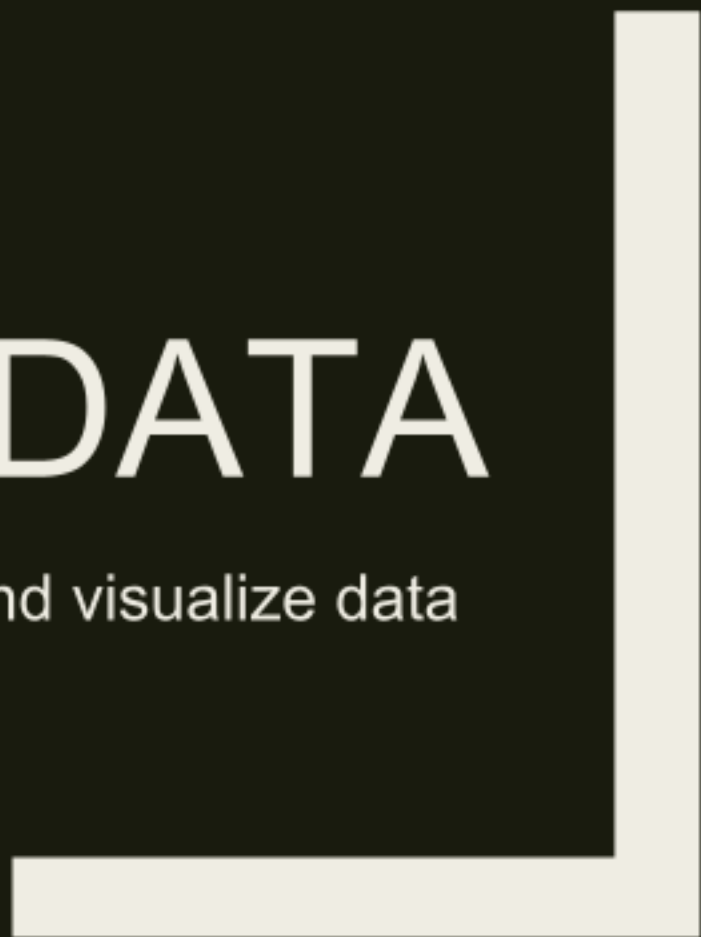
FILTERS	COLUMNS
project_status ▼	Σ Values ▼
Survey Results ▼	

ROWS	VALUES
Project Type ▼	Sum of Tax Credit ▼
	Sum of Change in Revenue ▼

D. project_status	completed	Σ	
Survey Results	(Multiple Items)	Σ	
Project Type ▼	Sum of Tax Credit	Sum of Change in Revenue	
Arts	\$ 2,820,083.71	\$ 288,550.83	
Business Incubator	\$ 3,473,186.89	\$ 409,979.61	
Education	\$ 2,235,552.73	\$ 254,932.28	
Housing	\$ 3,230,229.61	\$ 265,814.19	
Medical	\$ 2,194,758.02	\$ 230,866.67	
Outdoor Recreation	\$ 2,891,376.27	\$ 287,601.06	
Grand Total	\$ 16,845,187.23	\$ 1,737,744.64	

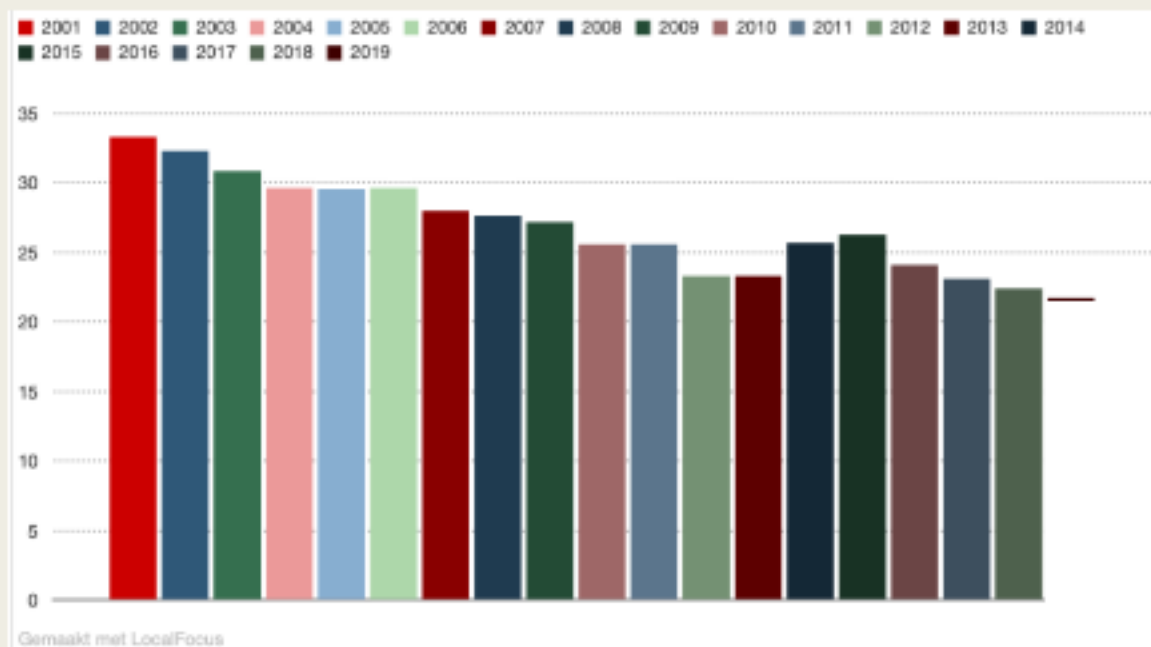
VISUALIZING DATA

Key ways to summarize and visualize data



Basic Tips

Keep it simple



Percentage rokers in Nederland volgens het CBS

Let's give every year a color of it's own ...

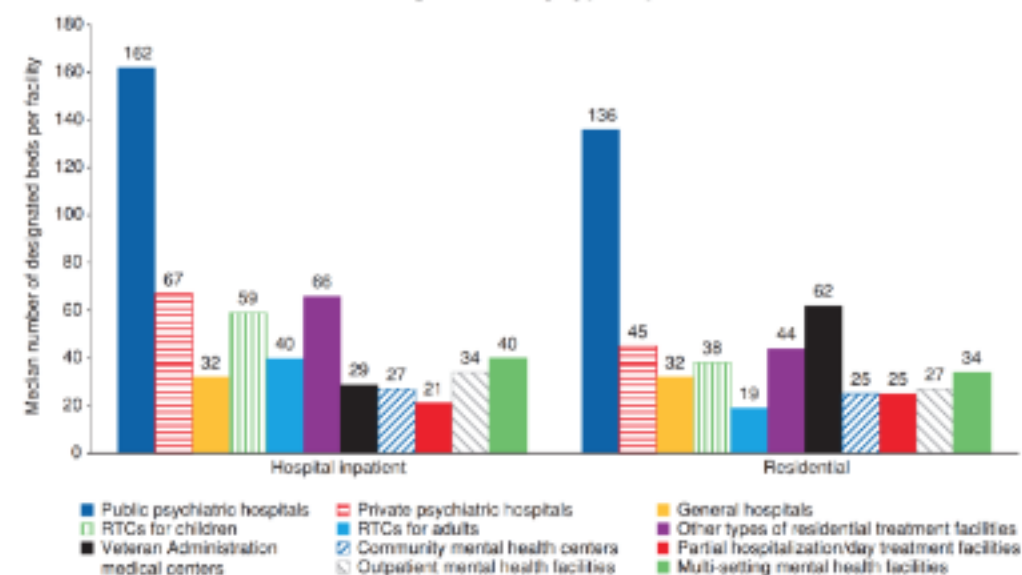
A new federal report finds that pregnancy-related deaths are rising in the U.S., especially among black women.

RACE / ETHNICITY	DEATHS	RATE PER 100,000 LIVE BIRTHS
White	1,385	13.0
Black	1,252	42.8
American Indian, Alaskan	62	32.5
Asian, Pacific Isl.	182	14.2
Hispanic	519	11.4
AGE		
Less than 20	158	11.3
20 - 24	543	12.1
25 - 29	751	13.2
30 - 34	799	15.3
35 - 39	706	28.7
greater than 40	452	76.5

SOURCE: Centers for Disease Control and Prevention, 2011-2015 data

A bad chart that could be fixed by

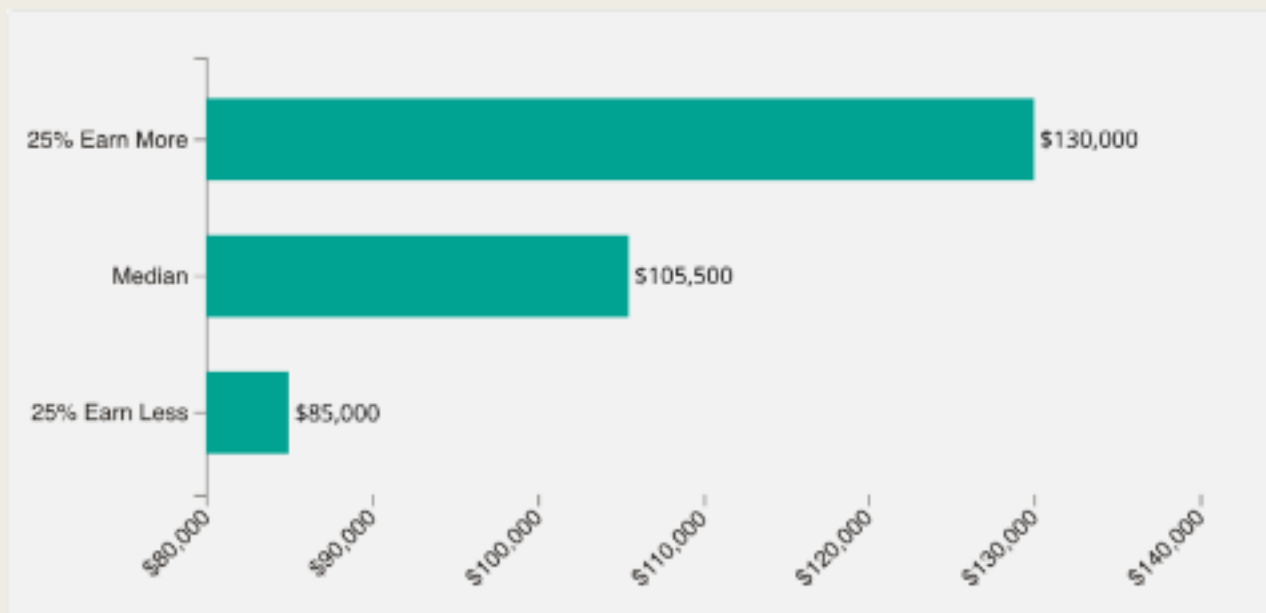
Figure 2.6. Median number of designated beds for mental health treatment per facility, by service setting and facility type: April 29, 2016



SOURCE: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, National Mental Health Services Survey (N-MHSS), 2016.

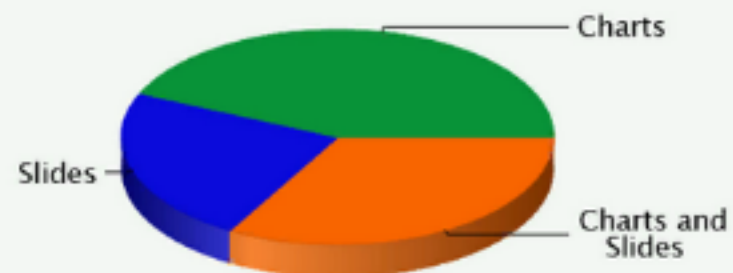
Basic Tips

Use the right chart for your data



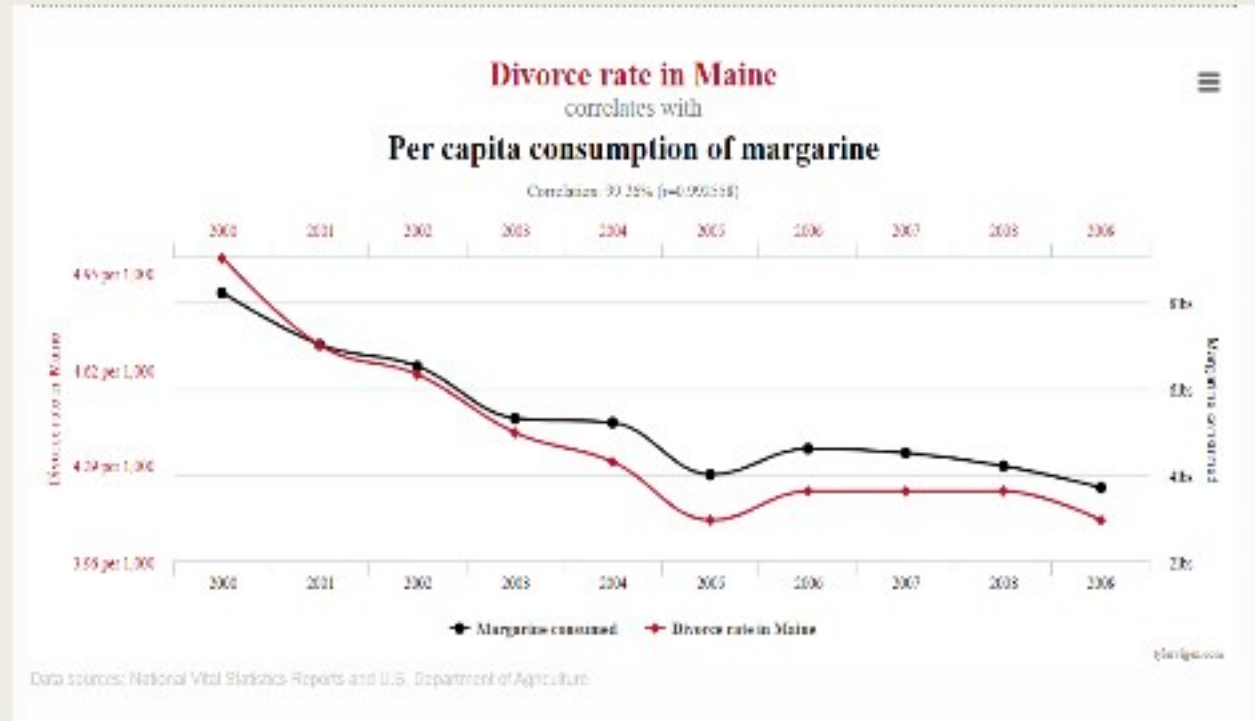
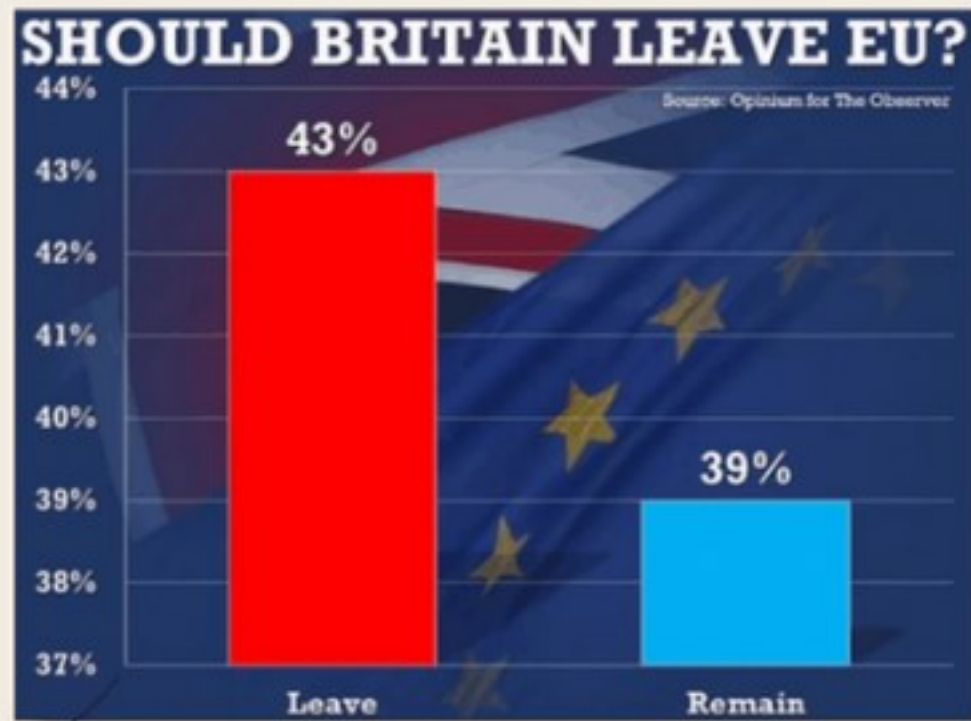
trying to understand the salary range for my profession, why is this a bar chart?

Number of slides
on this slide:



Basic Tips


Use the correct scaling for your axis and avoid visually pairing data that isn't related.





PRACTICE

Keeping Data Simple
Bar Charts



Visualizing the cost and benefits of a tax incentive

- Project Type (nominal)
 - Tax Credit (ratio)
 - Change in Revenue (ratio)
 - Influence of the credit on the project, Survey data from 1-5 (Ordinal)
-
- Display the data by category (project type) with each category showing the total tax credit amount awarded and the change in revenue

Creating a Chart

Project Type	Sum of Tax Credit	Sum of Change in Revenue
Arts	2820083.708	288550.8321
Business Incubator	3473186.888	409979.6079
Education	2235552.732	254932.2837
Housing	3230229.607	265814.1911
Medical	2194758.022	230866.6688
Outdoor Recreation	2891376.268	287601.0556
Grand Total	16845187.23	1737744.639

Developer Kater PDF Tell me what you want to do...

Visual Data Visualizer People Graph Recommended Charts PivotChart 3D Map Line Column Win/Loss Slicer Table

Insert Chart

Recommended Charts All Charts

Clustered Column

Chart Title

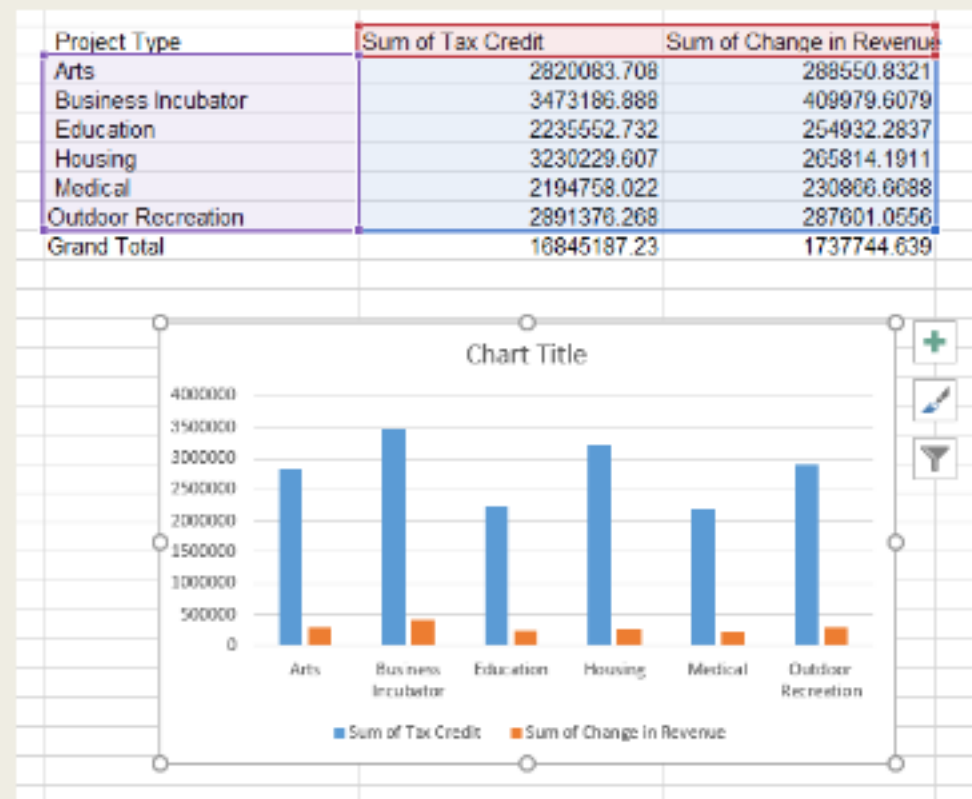
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0

Arts Business Incubator Education Housing Medical Outdoor Recreation

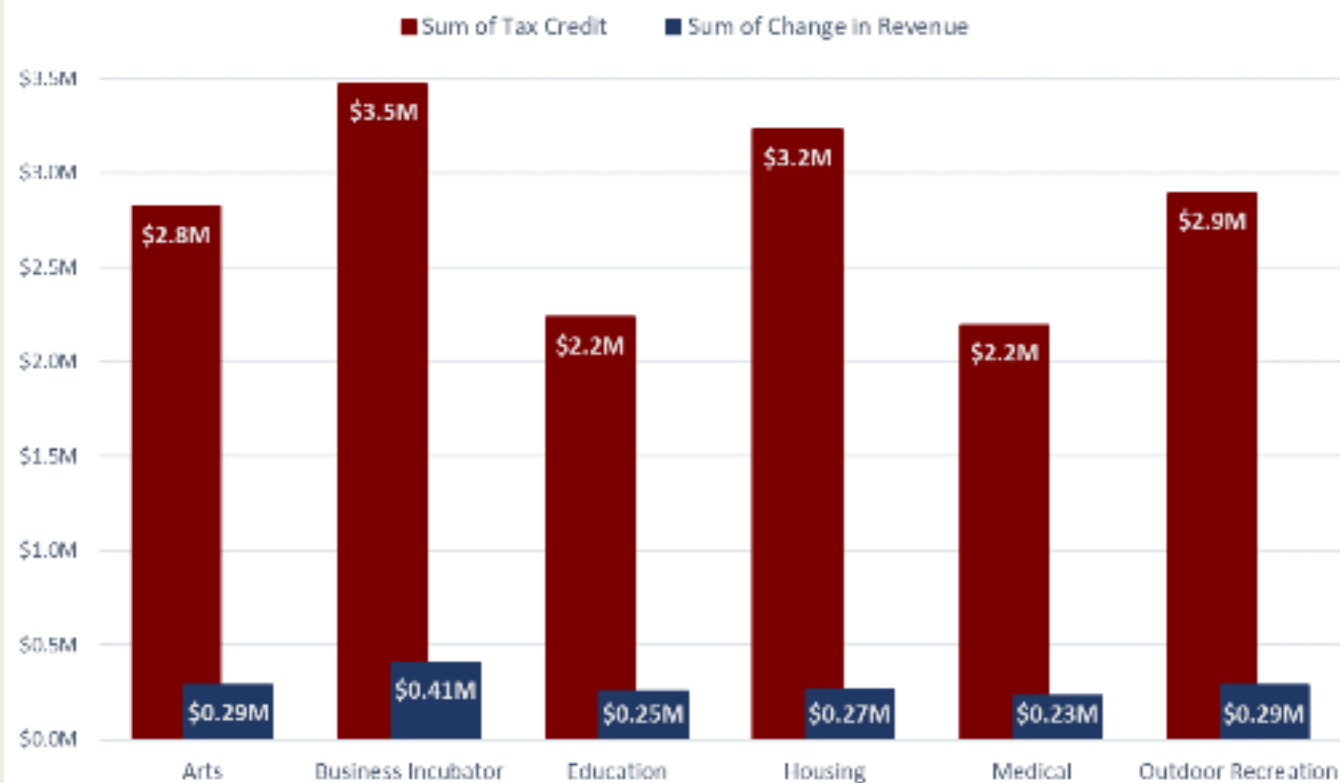
■ Sum of Tax Credit ■ Sum of Change in Revenue

A clustered column chart is used to compare values across a few categories. Use it when the order of categories is not important.

OK Cancel



2022 Property Tax Revenue Increases Made Up a Small Portion of the Cost of the Tax Incentive to Spur Economic Development Projects



RESOURCES






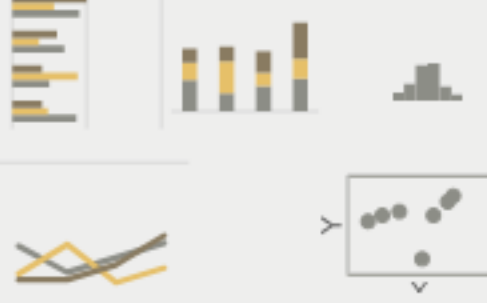





Measurement Type	Definition	Examples	Mathematical Operations	Measures	Type of Visual
Nominal	Categorized data with no ordering	City of birth Gender Ethnicity Marital status	Equality ($=$, \neq)	Mode Count/Proportion	
Ordinal	Categorized data with ordering	Language ability (beginner, intermediate, fluent) Ranking ('Satisfaction or Likelihood' on a survey)	Equality ($=$, \neq) Comparison ($>$, $<$)	Mode Median Range Count/Proportion	
Interval	Categorized data with ordering that has equal intervals No true zero	Personality inventories Temperature Time of day	Equality ($=$, \neq) Comparison ($>$, $<$) Addition, subtraction ($+$, $-$)	Mode Median Range Standard deviation Variance Frequency	
Ratio	Categorized data with ordering that has equal intervals and true zero	Age Height Population Time Passing Money	Equality ($=$, \neq) Comparison ($>$, $<$) Addition, subtraction ($+$, $-$) Multiplication, division (\times, \div)	Mode Median Standard deviation Variance Frequency Correlation	

Chart Type	Data Type	Example	Best Practices	Visual
Bar/Column (Stacked, Clustered)	Category Data	Grants per project type Proportion of total grant funding awarded and spent to each project type	Data should be scaled to accurately represent the analysis	
Pie	Single measurement Proportions	Grants per project type Proportion of total grant funding to each project type	5 or fewer categories. Ordering doesn't matter (nominal data)	
Line Graph	Time Series	Amounts awarded and spent over time	Trends over time Use when changes are small (easier to show the scale than bar charts)	
Combo Chart	Mixed data related to a common point	Number of grants awarded each year and total amounts spent over time	Use primary and secondary axis to scale the data appropriately	
Histogram	Frequency grouped by category	Number of programs awarded grant funds, by \$10k increments of funding	Develop groupings that accurately represent data and are easy to digest	



From the grassy plains to the Rocky Mountains and beyond—
an earthy, rich collection of Colorado colors for the OSA.

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[TOP 10 MOST IMPORTANT EXCEL FORMULAS - MADE EASY!](#)

[EXCEL BASICS 10: DATE & TIME NUMBER FORMATTING, FORMULAS, FUNCTIONS & CALCULATIONS](#) (HAS A WORKBOOK OF DATA TO USE THAT YOU CAN FOLLOW ALONG WITH)

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[CREATE A CHART FROM START TO FINISH](#)

[EXCEL CHARTS & GRAPHS: LEARN THE BASICS FOR A QUICK START](#)

LEARNIT TRAINING:

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=REZ2XUDYPA8](https://www.youtube.com/watch?v=REZ2XUDYPA8)

(MORE COMPLEX DATA VISUALIZATION USING EXCEL DEVELOPER FOR DYNAMIC CHART UPDATES)

MICROSOFT EXCEL HELP PAGES

[HTTPS://SUPPORT.MICROSOFT.COM/EN-US/OFFICE/HOW-TO-CORRECT-A-N-A-ERROR-IN-THE-VLOOKUP-FUNCTION-E037D763-FFC3-4FAE-A909-89C482D389B2](https://support.microsoft.com/en-us/office/how-to-correct-a-n-a-error-in-the-vlookup-function-e037d763-ffc3-4fae-a909-89c482d389b2)

KHAN ACADEMY DATA ANALYSIS:

[HTTPS://WWW.KHANACADEMY.ORG/COMPUTING/AP-COMPUTER-SCIENCE-PRINCIPLES/DATA-ANALYSIS-101#DATA-TOOLS](https://www.khanacademy.org/computing/ap-computer-science-principles/data-analysis-101#data-tools)

BEAUTY OF DATA VISUALIZATION – DAVID MCCANDLESS

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=5ZG-C8AAIGG](https://www.youtube.com/watch?v=5ZG-C8AAIGG)

LEVELS OF MEASUREMENT (DATA TYPES): DR NIC STATS [HTTPS://WWW.YOUTUBE.COM/WATCH?V=HZXNZFNT5V8](https://www.youtube.com/watch?v=HZXNZFNT5V8)

*THIS CHANNEL ALSO HAS HELPFUL VIDEOS ON EXCEL

DATA DRIVE STORYTELLING BLOG

[HTTPS://EVOLYTICS.COM/BLOG/PAGE/2/?BLOG-SEARCH=DATA%20DRIVEN%20STORYTELLING](https://evolytics.com/blog/page/2/?blog-search=data%20driven%20storytelling)

GOOD AND BAD VISUALIZATION TIPS

[HTTPS://WWW.OLDSTREETSOLUTIONS.COM/GOOD-AND-BAD-DATA-VISUALIZATION](https://www.oldstreetsolutions.com/good-and-bad-data-visualization)