The Data Journalist Chapter 7 Tutorial Making Choropleth Maps in Qgis Desktop

Prepared by: David McKie Contact:

Summary: As we learned in Chapters 6 and 7, choropleth maps apply colours to polygons in order to demonstrate variations in the values that we want to convey in our stories. A range of colours could indicate municipal wards or police districts with highest break-and-enter rates, the electoral boundaries that receive the highest per capita spending on social programs or, in the case of this tutorial, the areas in Winnipeg with the highest average household incomes. So, we will simply pick up where we left off in the "7_4_JoiningMapstoOtherDatasetsQgis" tutorial, which used that city's shapefile census tracts.

Skills you will learn:

- 1. How to create a choropleth maps using Qgis.
- 2. How to add a base map.
- 3. How to create a map layout that can be exported as a PDF.

If you are unsure about how to use the Qgis user interface, you should read the tutorial "A Quick Tour of Qgis Desktop" before using this tutorial.

Task 1: How to create a choropleth map using Qgis

Before creating a choropleth map, we must join the shape file to the table that contains the values we want to display. In the last step of the joining maps tutorial, we completed this task. This tutorial will pick up where we left off by returning to the project.



In the joining maps tutorial, we joined Winnipeg's census tracts...

...to the shape file that we created from the non-geographic household income table.

2 t	i 😜 🗮 🔊 🗣	🛎 🏘 👂 🖻 🖺 i					
CUED	Total_Private_households	Median_2005_household_income	Median_2005_aftertax_household_income	Average_2005_household_income	Standard_error_of_average_household_income	Average 2005 after-tax household income	Standard_error_of_average_aftertax_household_income
001.00	1850	53436	45133	63800	2098	52357	1580
002.00	2400	41184	36694	49562	2438	41537	1538
003.00	2630	39250	34345	45973	1417	38835	1068
004.01	2305	45270	39247	52837	1530	44227	1157
004.02	1700	36937	33134	41922	1313	36099	1025
005.00	2335	75475	60342	90117	3634	70.788	2386
005.00	2630	43616	37830	51066	1496	42711	1114
007.00	1595	52045	43546	61740	2291	50829	1719
008.00	1140	91369	70850	122958	8591	90696	5103
009.00	1225	90350	71015	106568	5024	81378	2966
010.00	2410	62693	51968	98276	5363	74343	3530
011.00	4025	47899	39792	62896	2944	49839	1754
012.00	2975	28865	25643	34264	1025	29543	775
013.00	915	19108	17393	26686	1598	23288	1266
14.00	3855	30029	27163	36575	1043	31176	797
015.00	3395	20486	18965	28371	1001	25096	784
016.00	1070	32861	27868	47162	3436	39182	2428
017.00	1450	52400	44765	62636	2551	51178	1908
018.00	1260	46977	41392	57152	2622	47689	1911
019.00	1265	47457	40948	52776	1808	44766	1405
020.00	1020	41881	37465	49440	1895	42561	1499
021.00	2350	32446	29331	39619	1315	35140	1119
022.00	1845	20374	19670	26888	1122	24745	953
023.00	2665	21520	19748	27351	858	24463	702
024.00	200	53509	51461	74120	11129	58100	7854
025.00	1115	19086	18577	29812	2211	26679	1626
26.00	725	18760	18251	28753	2103	26293	1805
027.00	501	30011	36147	47256	2356	37644	1086

We used the average household income column.

Average_2005_household_income
63800
49562
45973
52837
41922
90117
51066
61740
122958
106568
98276
106568 98276

We used the join option in the properties dialogue box by right-clicking on the census tract layer to obtain the shortcut menu, the "Layer Properties" dialogue box, and then the "Joins" option.

Now we have a new layer that is ready to be colour-coded.

Ҳ General	Single Symbol 🔻		
Style Labels Fields Rendering Display Actions Joins Diagrams Metadata	Fill Simple fill	Unit Millimeter Transparency 0% Color Symbols in group Corners diagon: dotted green land w	vater N
	Save		A
	Save		A
	 Eave Layer rendering Layer transparency 		A
	 Save Layer rendering Layer transparency Layer blending mode Normal 	Feature blending mode Normal	A

Select the "Style" icon.



The arrow to the right of "Single Symbol" produces a drop-down menu.

🤾 General	Graduated V	
🥳 Style	Column 👻 E	
abc Labels	Symbol Change Classes 5	-
Fields	Color ramp Blues Invert Mode Equal Int	erval 🔹
🖌 Rendering	Legend Format %1 - %2 Precision 4	Trim
🔎 Display	Symbol 🗸 Values Legend	
Actions		
┥ Joins		
🗾 Diagrams		
👔 Metadata		
	Charife Add data Databa Databa all Y tick data baundarian	
	Classify Add class Delete Delete all	Advanced
	Layer transparency	
		- U -
	Laver blending mode Normal Teature blending mode Normal	
	Layer blending mode Normal Feature blending mode Normal	•

Select the "Graduated" option.

Now we have to decide which value to display. Click on the arrow to the far right of the space next to the "Column" label to obtain the drop-down menu.

🔏 Layer Properties -	WinnipegCensus	sTracts06 Style
🔀 General	崔 Graduated	▼
😻 Style	Column	3 -
(abc) Labels	Symbol	householdincome2006wpgForQGIS_Total_Private_households householdincome2006wpgForian_2005_household_income
Fields	Color ramp	householdincome2006wpgForQaftertax_household_income householdincome2006wpgForage_2005_household_income Mode Equal Interval
🧹 Rendering	Legend Format	householdincome2006wpgForaverage_household_income householdincome2006wpgForQafter-tax household income
🧭 Display	Symbol 🗸	householdincome2006wpgForQaftertax_household_income values Legena
Actions		
• Joins		
Diagrams		
🥡 Metadata		
	Classify	Add class Delete Delete all 🗙 Link class boundaries Advanced 🗸
	 Layer render 	ing
	Layer transpar	
	Layer blending	mode Normal Feature blending mode Normal
	Style 👻	OK Cancel Apply Help

🌠 Layer Properties - N	WinnipegCensu	Tracts06 Style	1.00 - 5 - 5	11.2	24 Y
🔀 General	Craduated	•			
😻 Style	Column	vpgForQGIS_Standard_error_of_aver	age_household_income	• 8	
(abc) Labels	Symbol	Change		Classes	5
Fields	Color ramp	Blues - Inv	vert	Mode	Equal Interval
🎸 Rendering	Legend Format	%1 - %2		Precision	4 🔶 🗌 Trim
🧭 Display	Symbol 🗸	Values Legend			
S Actions					
• Joins					
Diagrams					
🥡 Metadata					
	Classify	Add class Delete	Delete all	in <mark>k cla</mark> ss b	oundaries Advanced 🕶
	▼ Layer rende	ing			
	Layer transpa	ency 🖓			0 🔹
	Layer blendin	mode Normal	Feature blending r	node	Normal 🔻
	Style 🔻		OK Cancel		Apply Help

Select "average household income.".

You'll notice that Qgis defaults to 5 "Classes", which divide the values into five equal parts. Like ArcMap, Qgis defaults to classifying the data in five groupings.

If you want to alter the classes, select the "Advanced" tab to exercise the different options.

For our demonstration map, we will use the five equal classes.

Click Classify.

Depending on the values in your dataset, this categorization may make little sense. If it doesn't, you make changes by selecting different options from the short-cut menu obtained by clicking the arrow to the right of the "Mode" tab.

REF & C. Dans	100 B	-	a complement of the	Automatic of	A total +
Plugins Vector Raster	Database Web M	MMQGIS Pro	ocessing Help		9 ×
General	Graduated		style		
💐 Style	Column	vpgForQGIS_	Standard_error_of_average_household_	income • E	
(abc Labels	Symbol		Change	Classes	5
Fields	Color ramp	Blu	es 🔹 Invert	Mode	Equal Interval
候 Rendering	Legend Format	%1 - %2		Precision	Equal Interval Quantile (Equal Count)
🤎 Display	Symbol 🗸	Values	Legend		Natural Breaks (Jenks) Standard Deviation
S Actions					Pretty Breaks
• Joins					
🕅 Diagrams					
C Motadata					

For the purposes of this exercise, let's stick with the five equal intervals. To make the intervals appear, select the "Classify" tab, which produces your values.

To find out more about the modes Qgis uses to break data into classes, check out the "Modes" section of the <u>"Tutorial: Qgis Basics for Journalists"</u>.

And for more general information about classification systems, please consult <u>GIS</u> <u>Data Classifications in Cartographica</u>.

Zayer Properties - 1	WinnipegC <mark>e</mark> nsu	sTracts06 Style	¥ 44
🔀 General	Craduated	▼	
😻 Style	Column	vpgForQGIS_Standard_error_of_average_household_income 👻 🗵	
(abc) Labels	Symbol	Change Classes 5	•
Fields	Color ramp	Blues Invert Mode Equal Inter	val 🔻
🞸 Rendering	Legend Format	%1 - %2 Precision 4	Trim
🧭 Display	Symbol	Values Legend	
Sctions			
• ┥ Joins			
🕅 Diagrams			
🥡 Metadata			
	Classify	Add class Delete Delete all 🗙 Link class boundaries	Advanced 💌
	 Layer rende 	ring	
	Layer transpa	rency O	0 🗘
	Layer blendin	mode Normal Feature blending mode Normal	•
	Style •	OK Cancel Apply	Help

General	Craduated	-				
🖌 Style	Column	vpgForQGIS_Standa	ard_error_of_average_house	ehold_income 💌 😢		
Labels	Symbol		Change	Classes	5	\$
Fields	Color ramp	[source]	▼ Invert	Mode	Equal Interva	
Rendering	Legend Format	%1 - %2		Precision	0	Trim
Display	Symbol 🔽	Values	Legend			
Actions	XXX	0.00 - 2261.00 2261.00 - 4522.00 4522.00 - 6783.00	0.0000 - 2261.0000 2261.0000 - 4522.0000 4522.0000 - 6783.0000			
🗧 Joins	×	6783.00 - 9044.00 9044.00 - 11305.00	6783.0000 - 9044.0000			
		3011.00 11303.00	9044.0000 - 11303.0000			
. Diagrams		5011.00 11505.00	9044.0000 - 11303.0000			
Diagrams			9044.0000 - 11303.0000			
Diagrams	Classify	Add class	Delete Delete	e all X Link class b	poundaries	Advanced
Diagrams Metadata	Classify Layer render	Add class	Delete Delete	e all 🔀 Link class b	poundaries	Advanced
Diagrams	Classify Layer render Layer transpar 	Add class ring rency	Delete Delete	e all X Link class b	ooundaries	Advanced

You can get rid of the decimal places by double-clicking on the values to produce a small dialogue box. However, let's just stick with these numbers. Select the

"Apply" and then "OK" tabs.



Our legend appears on the menu to the left, and our map is colour coded with the darker colours representing areas with the higher incomes. If these tracts had names that make sense, say federal ridings, or municipal boundaries, then we could activate the labels on the map.

Task 2: How to add a base map.

We should also import a map in order to give the boundaries a better sense of place.



Select the first option, "Manage and Install Plugins" and then the "OpenLayers Plugin".



Once installed, the "OpenLayers plugin" will appear in the "Web" section of your menu.





Choose OpenStreetMap.



Selec the first option from the drop-down menu, "OpenStreetMap".

It takes a few seconds for Qgis to retrieve the map, which it will place at the top of your layer menu to the left, thereby hiding the census tracts. To make them appear, drag the "OpenStreetMap" layer to the bottom of the menu. Right click on your census tract menu and select the "zoom to layer" option to see the census tracts on the map.



This gives us a better sense of place.

In order to see the streets underneath the census tracts, we can return to the properties menu.

General	붙 Graduated	-				
Style	Column	vpgForQGIS_Standa	ard_error_of_average_household_	income • E		
Labels	Symbol		Change	Classes	5	\$
Fields	Color ramp	[source]	▼ Invert	Mode	Equal Interva	· ·
Rendering	Legend Format	%1 - %2		Precision	0	Trim
Display	Symbol 🗸	Values	Legend			
	×	4522.00 - 6783.00	4522.0000 - 6783.0000			
loins Diagrams Metadata	×	6783.00 - 9044.00 9044.00 - 11305.0	0 6783.0000 - 9044.0000 00 9044.0000 - 11305.0000			
loins Diagrams Metadata	Classify Layer render	6783.00 - 9044.00 9044.00 - 11305.0 Add class	D 6783.0000 - 9044.0000 0 9044.0000 - 11305.0000 Delete Delete all	X Link class b	oundaries	Advanced 👻
loins Diagrams Metadata	Classify Classify Clayer render Layer transpar	6783.00 - 9044.00 9044.00 - 11305.0 Add class ing ency	0 6783.0000 - 9044.0000 00 9044.0000 - 11305.0000 Delete Delete all	X Link class b	oundaries	Advanced V

General	崔 Graduated	•				
🎸 Style	Column	vpgForQGIS_Standard_	error_of_average_household_in	come • E		
Labels	Symbol		Change	Classes	5	
Fields	Color ramp	[source]	▼ Invert	Mode	Equal Interval	•
Rendering	Legend Format	%1 - %2		Precision	0	Trim
Display	Symbol 🗸	Values	Legend			
Actions	XXX	0.00 - 2261.00 2261.00 - 4522.00 4522.00 - 6783.00	0.0000 - 2261.0000 2261.0000 - 4522.0000 4522.0000 - 6783.0000			
🧳 Joins	××	6783.00 - 9044.00 9044.00 - 11305.00	6783.0000 - 9044.0000 9044.0000 - 11305.0000			
🗏 Diagrams						
Motodata	8					
metadata						
Metadata	Classify	Add class	Delete all	X Link class b	oundaries	Advanced
metadata	Classify Layer render	Add class	Delete all	X Link class b	oundaries	Advanced

At the bottom, you'll notice a "Layer transparency" option.



Move the setting to the halfway mark, select "Apply" and then "OK".

The streets are now easier to see, allowing us to better locate some of the city's more well-to-do areas so we know where to send our cameras, or what neighborhoods to visit.

Save your Qgis file, something that you should always be doing at regular intervals.

Task 3: How to create a map layout that can be exported as a PDF.

We have the map we want. One option would be to save the layer and export it to Google Fusion Tables, or ArcGIS Online, as we learned in the Chapter 6 tutorials. Another option is creating a map layout in Qgis, complete with a legend scale bar and title.

Right-click the layer for which you want to create the layer and select the "Zoom to layer" option from the drop-down menu.

Go to the "Project" section on the menu up top, and select "New Print Composer".





In the composer dialogue box, give the composition a name, and then click OK.

A new composer window will appear. To add your map of Winnipeg, click "Layout", "Add Map, and then draw a box just inside the perimeter of the page.



Under Extents, click the "Set to map canvas extent" button to centre the layer.

 	Items Command history Items Tem Map 0	××××× 🗡
	Composition Item properties Atlas generation Item properties	×
	map 0	
	▼ Main properties	
Cettonia	Cache Update preview	w
Lac du Bonnet	Scale 1105732	3
	Map rotation 0.00 °	.
Pinawa	X Draw map canvas items	
Seven Sisters	Lock layers for map item	.
	Lock layer styles for map item	.
Whitemouth	▼ Extents	
	X min -10968047.849	Ļ
Lewis	Y min 6361163.763	.
	X max -10661760.057	₽
	Y max 6575675.791	_
Reynolds	Set to map canvas extent	
	View extent in map canvas	
	Controlled by atlas	
	▶ Grids	
	Overviews	
	Position and size	_
	Rotation	•

If the map is too large or too small, you can adjust the "Scale" option under "Item properties" on the right.



A larger number will make the map smaller. A smaller number will make the map larger.

Now we can add additional elements such as a legend.



In the menu, select "Layout", and "Add Legend."



Draw a box where you want the legend to appear.

By default, all layers on the map will appear as legend items.

To remove a legend item, uncheck the "Auto update" checkbox to the right, and then select and manually remove the layers you don't want in your legend using the minus button.

Auto update Update all
householdincome2006wpgForQGIS
WinnipegCensusTracts06 0.00000 - 2261.00000 2261.00000 - 4522.00000 4522.00000 - 6783.00000 6783.00000 - 9044.00000 9044.00000 - 11305.00000 OpenStreetMap
✓ ▲ ▲ ⊕ = ▲ ∑ Ţ €, ▼ Only show items inside current atlas feature

Note: If, for whatever reason the legend dialogue box disappears on the right, click inside the legen on the map to make it re-appear.

In addition to removing the income level csv file name from the legend, do the same the "OpenStreetMap" title.



To change the name of a legend item as it shows up in the legend, click the legend item itself, and then the "Edit" button -- that resembles a pencil – to change its title in the legend.

Fale Uccessed Uccessed UnnipegCensusTracts06 0.00000 - 2261.000 2261.00000 - 4522 4522.00000 - 6783 6783.00000 - 9044.00000 9044.00000 - 11305.00000	 ✓ Legend items ↓ Auto update ↓ WinnipegCensusTracts06 ↓ 0.00000 - 2261.00000 ↓ 2261.00000 - 4522.00000 ↓ 4522.00000 - 6783.00000 ↓ 6783.00000 - 9044.00000 ↓ 9044.00000 - 11305.00000
	 ✓ ▲ ④ ⊕ ■ ▲ ∑ ▼ €₁▼ Only show items inside current atlas feature Fonts





To change the "Legend" title, or prefer that it doesn't have a title at all, change it in the "Title" textbox under "Main properties" on your right.



Reflicience Bronis Lezionis Lezionis Lezionis Lezionis Lezionis Faits Seessijour Faits	Item properties
Legend Winnipeg Household Income 0.00000 - 2261.00000 2261.00000 - 4522.00000 4522.00000 - 6783.00000	Legend

	Legend
Britkur Lationia Lationia Lationia Lationia Lationia Lationia Lationia Pravia Series Plania Vinternante Outomoutin Vinternante Vintern	▼ Main properties Title Title alignment Left Map Map Wrap text on ▼ Resize to fit contents ▲ uto update Update all ♥ Legend items ● 0.00000 - 2261.00000 2261.00000 - 4522.00000 4522.00000 - 6783.00000 6783.00000 - 9044.00000 9044.00000 - 11305.00000

Let's add two more items that will help people viewing the map.

To obtain a North Arrow, go to the menu and select "Layout, and then "Add Image."





Draw the box where you want the north arrow to go.

This produces an "Item properties" panel to the right.

Click the "Search Directories" submenu, and under the Image searth paths, find the one ending in "/arrows."



	Composition Item properties Atlas generation
	Picture
BriRver	▼ Main properties Image source
	Resize mode
1 . T	Zoom
	Placement
-	Top left
	Search directories Image search paths C:/PROGRA~2/QGIS22~1.0/apps/qgis-ltr/svg
00	Remove Add



Select an arrow that meets your needs.



Now let's add a Scale Bar.

In the menu, select "Layout", and then "Add Scalebar."





Draw a box where you would like to see the scale bar.

You can also adjust the size of the scale bar box by clicking and draging on one of the squares at the edge of the box.

In the "Item properties" tab.....

m properties

.....select one of six styles under the "Style" dropdown.

Scalebar Main properties Map Map 0 Style Single Box Unit Double Box	Compos	sition Item	properties	Atlas ger	neration			
Scalebar Main properties Map Map 0 Style Single Box Unit Double Box			internet Ite	m propertie	s ^{recencerce}	 		· 🗙
 ▼ Main properties Map Map 0 Style Single Box ▼ Unit Double Box 	Scalebar	•						
Map Map 0 Style Single Box ✓ Single Box ✓ Unit Double Box	▼ Mai	n properties						
Style Single Box ✓ Single Box ✓ Unit Double Box	Мар	Map 0					-	
▼ Unit Double Box	Style	Single Box					•	
Line Ticks Middle	▼ Unit	Single Box Double Box Line Ticks Mid	dle				ĥ	
Scalel Line Ticks Down Line Ticks Up	Scale	Line Ticks Dov Line Ticks Up	vn					
Label Numeric	Label	Numeric						
Label for units km	Label	for units	km					

item properties			Atlas generation		_
		interest Ite	m properties		
leba	r				
Mai	n properties				
Мар	Map 0				-
Style	Single Box				•
Unit	ts				
Scale	bar units	Meters			•
Label	unit multiplier	Map units			
		Feet			
Label	for units	Nautical Mile	es		
Seg	ments				
Segm	ients		left 2	\propto	•
Segm	ients		left 2 right 4	⊗	• • •
Segm	ixed width		left 2 right 4 10000.000000 units	⊗	4 • • •
Segm	ixed width it segment wid	th	left 2 right 4 10000.000000 units min 50 mm	8	
Segm	ixed width it segment wid	th	left 2 right 4 10000.000000 units min 50 mm max 150 mm	8	

Choose the units for the scale bar under "Units".

You can also adjust the segments in the Segments area.

For instance, left 0 and right 4 produces a result you can see in the screen grab below.



Finally, we will add a title to the map.

In the menu, select "Layout", just like we've done in previous steps, and "Add Label."

Draw the box where you'd like the title to go, knowing that can always move it later on.

A menu will appear to your right.



 Outlet
 Outlet
 Visualisan

 Visualisan
 Outlet
 Outlet

 Visualisan
 Outlet
 Outlet</t

Type the title in the "Main properties" textbox to the right.

You can also adjust the font size and colour by selecting the "Font" under "Appearance.

And	X clegend> X Map 0
Select Font Font style Size Normal 10	Composition Item properties Atlas generation Item properties
MS Sans Serif MS Serif MS Serif MS Shell Dig 2 MS LIL Gothir Effects Sample	Render as HTML
Strikeout Underline Writing System Any OK	Font color Font c
22261.00000 - 4522.0000 4522.00000 - 6783.0000 6783.00000 - 9044.00000 9044.00000 - 11305.00000 9044.00000 - 11305.00000 9044.00000 - 11305.00000	Left Center Right Vertical alignment Top Middle Bottom Position and size Page 1 X 68.048 mm Y 18.257 mm



Align the title by selecting the radio button to the right of Center" on the righ tunder "Horizontal alignment".

10 20 30 40 km

4522.00000 - 6783.00000

6783.00000 - 9044.00000 9044.00000 - 11305.00000 a :





Adjust the font to your liking and, if necessary, move the title to a more desired location on the map.

If you're happy with the result, export your map layout as a PDF by going to "Composer" on the main menu at the top, and selecting the "Export as PDF" option.

🥂 Average	e Hou	sehold	Income	s in Wi	nnip	eg
Composer	Edit	View	Layout	Atlas	Sett	ings
🔚 Save P	roject		C	trl+S		
Rew Co	mpos	er	C	trl+N		
🕞 Duplica	te Con	nposer				0 40
🔍 Compo	ser Ma	nager				
Print Co	ompos	ers			•	
늗 Add Ite	ms fro	m Tem	olate			
🐻 Save a	s Temp	late				100 C
Export	as Ima	ge				
湷 Export	as PDF					
🍓 Export	as SV0	i				
Page S	etup		C	trl+Shift	+P	
🖶 Print			C	trl+P		
🚺 Quit			C	trl+Q		
60						



Browse to where you want to save the file and give it a name.

Choropleths are effective ways of communicating important information.