Appendix G: Mapping 101 - Joining Census data for beginning GIS users

Mapping 101: Joining Census Data for Beginning GIS Users

In order to create an effective extreme heat plan for a community, it is critical to understand the local demographic and social make-up, and identify the more vulnerable or at-risk populations. In 2012, the Minnesota Department of Health (MDH) developed statewide maps of five demographic characteristics provided by the U.S. Census Bureau, including: percentage of population less than five years old, percentage of population 65 years old or older, percentage of elderly (65 year old and older) living alone, percentage of population with a high school degree or less, and percentage of population living below the poverty level. The data was mapped for all of the county subdivisions in the state (i.e., cities, townships, and unorganized territories).

For some communities with larger populations, it may be beneficial to create their own maps at smaller geographic detail, such as census tracts. Additionally, some communities may want to create their own maps using other variables besides the five characteristics mapped by MDH. The following tutorial will walk GIS users through the process of downloading Census data and joining the data to corresponding shapefiles. The tutorial walks through the process using census tracks, but the same method would be applied for any other geographic unit. This tutorial is recommended for persons with some existing familiarity with how ArcGIS software works; it is not intended to teach a person how to use ArcGIS.

1 Go to http://factfinder2.census.gov/

2 Select the Geographies sidebar button in the left column. A new selection box will open over the main webpage on your screen.

U.S. Census	s Bureau				FactFit	nder			
-	HINAT HE PHONES			frede	fundings. FADs. General Se				
Search - Use the op	ptions on the left (search, topics, ge	ographies,) to find the data y	ou're looking	g for					
Your Salactions	Search Results: 1.25 of 4.54	5							
"Your Selectors' is enjrig	Selected Diver 1	Downed % Company 12 O	141 M						
Search within Results for									
	0 1 1de			3 Delayert		Abrest			
	F Di-1 Parts of Care	a Papalater per manag Characteration 2016		2010 Demogra	you, hy he 17	0			
Tapes Q	And Company and And	and the second s				0			
Colorada a	Astess 5	inte internet in the second							
States Charles (more). 1	Enter a goography name or use the	Geography Filter Options below:	-						
	The second								
Population Groups	Coner a pergraphy name production	Reading County	0						
Population Groups (Inclusionally,)	Viar Geography Hors	Select prographies to add to Your	Selections						
Population Groups (Inclusion Groups) Industry Codes.	Enter a periority name invaluence Your Geography Henris Your Geography Henris a entry	Select prographies to add to Your Concepts Research 120 or 610	Selectores		per pe	or 🖬			
Population Groups (sectionetry,) Industry Codes (sect)	Enter a georgraphy states (replaces) Vian Georgraphy Fibers Vian Georgraphy Fibers Georgraphy Fiber to entyl	Select geographies to all to Your Company Results: 1 21 of 670 Selected & Add () () Ch	Selections US Inck All C	Seer Ad E	1 1 1 1	4 1			
Population Groups (Incl. encentry,) Industry Codes (INC3,)	Elimit a georgraphy many hosteria. Viar Geography Pitters Viar Geography Pitters Geography Pitter Systems Geography Type	Select programme to add to Your Compress Research 1 and 40 Your Selected a data of the Compress Research 1 and 1 and 1	Salactions Lite All I I I I I I I I Geographic Typ	Deer Ad	4 🕅 1 2	4 5			
Population Groups (rest, streetly,) Industry Codes (IMCS,)	Elimit a georgraphy many hostama. Viar Georgraphy Filters 'Viar Georgraphy Filters's entry Georgraphy Filter Stylenee Homory (5)	Select programming to add to Your Compression to add to Your Compression and to Your Compression and the Your Compression Selection Compression Selection	Selections Selections Selections Selections Geographic Type Justice	mer Ad Di	- 10 Ja 4 <u>₹</u> 1 J	4 5			
Population Groups (rest, elinesity,) Industry Codes (RACS,)	Elimit a programme rearry location Vision Georgraphy Filters Georgraphy Filters Georgraphy Filters Georgraphy Filters Georgraphy Filters Georgraphy States (1) Tomes (1) Tomes (1) Tomes (1)	Select geographics to add to Your Select geographics to add to Your Selected in Add in Selected Geography Second In Selected Comparestry Second In Second Comparestry Second In Second Comparestry Second In Second Comparestry Second In Second In Second In Second In Second Comparestry Second In Second In Second In Second In Second Comparestry Second In Second In Second In Second In Second Comparestry Second In Secon	Selectores	Sever Add	- 10 10 4 <u>¥</u> 1 3	or 📰			
Population Groups (real, strength, -) Industry Codes (NACS, -)	Elimit a greepagety many leaders. Vear Geography Filters Vear Geography Filters Geography Filters Geography Filters Geography Filters Geography Filters Geography Filters Geography Geogr	Select geographies to add to Your Geographic transmit i court of the Selected in Add in the Geographic transmit i court of the Geographic transmit i court of the Geographic transmit i court of the Court of the Selected The Add Series within Joint The International The Add Series within Joint The Court of the Selected The Add Series within Joint The Selected The Selec	Selections Construct	See Add	- per pa 4 (≝ 2 3	or 📰			
Population Groups (real, elinestry,) Industry Codes, (plaCS,)	Ether a group gale runne (version) Voor Geography Filters Voor Geography Filters Congregaty Filters Geography Filter Colores Geography Filter Colores Goography Filter Colores	Select geographies to add to Your Charge garg Streams 1 220 of 410 Selected a data a a Congregate Sense 2 Congregate Sense	Selections The selections The selection of the selectio	See At Dealer	4 <u>F</u> 1 2	or 🖽 1.4.5			
Pepdetice Groups reserves	Extent a georgraphy matrix (values) Visar Georgraphy Filters Visar Georgraphy Filters except Georgraphy Filter Cyclines (c) Georgraphy	Attendence Chartier, 1	Solections Solect	Seer At 3	9479 4 🖹 2 3	0 2			
Population Groups statutionary,	Ether a group calls years years years Vacial Congregative Filters Vacial Congregative Filters Vacial Congregative Filters Con	Select geographies to add to Your Select geographies to add to Your Selected with 4.51 (a) of (a) (b) (b) (b) (b) (b) (b) (b) (b) (b) (b)	Solections Solections Solections Sole	cent At Cent Advant Cen	- per pa 4 📱 2 3	ue 💷			
Population Groups statutions(s,) industry Codes stat(S,)	Ether a group apply many logitums. Viair Europeaply Filters Viair Europeaply Filters Companying Filter 4 engls Group apply Filter 2006 Engls apply Filter 200	Select geographies to add to Your Select geographies to add to Your Selected & Add & C Congraph Seman 3 Congraph Sema 3	Selections Selections CENT Comprised Type Date Date Date Date Date Date	Deer At Book	. jed ja ≮ ∦ 2 3	94 E			
Pepdation (in ragin rain examp) Industry Codes (IntCS)	Elimit a groupidity matrix (variation) Viair Canography Filters Viair Canography Filters Viair Canography Filters Viair Canography Filters Companying Filter	Select geographies to add to Your Select geographies to add to Your Selected & Add & Do of Compression Selection Compression Selection Compression Selection Compression	Selections Selections CENT Comprised Type Comprised Type Date Date Date Date Date Date Date	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. juri ja ≮ <u>₹</u> 2–3	4 5			

3 Use the Filter Options or Search function to search for the desired geographies.

- a. First filter for the smallest desired geography (i.e. Census Tracts)
- b. Use Filter options again to filter further and narrow selected geographies (i.e. Census Tracts within Place).
- c. Once geographies have been found, select and click Add at the top of Geographic Results and close the Selecting Geographies window by clicking the "X" in the top right corner.

Next narrow down variables by searching through Topics sidebar button on the left column. Select the desired variables by checking the box next to the variables you want to download in the main selection screen. Once all variables have been selected click Download from the Search Results menu. If the file is small enough it will give you the option of opening it as a Microsoft Excel file. If the file is large it will automatically download as a zip file. Select Open from the File Download prompt window.

Total Solucions	Meech Results: 1.25 of 2013 per page: 19 to									
Churty Interests Churty, Mereaula O	540	n.int	🖟 Vere 🖸 Deserved 🦌 Constant 🖄 Over All 🛛 🚱	4 1 2 3	4.5					
cover all exercising	1 com	ø :	tas 1	Detaeet 2	Aber					
Search within Results Inc.	Г	384	Portic at Severa Psycamic and musing Characteristics 2015	2010 Deregraphic Public SF	0					
	E	107-01	Server Hump Devictments, 2019	2010 SP1 10P5 Date	0					
	F	101.HZ	Tenure, Household Scie, and Age of HouseHolder, 2010	2010 3P1 109% Date	0					
Taxes D -	10	101-00	Investmit Payceller and Household Type by Tanune 2010	2010 SP1 1075 Date	0					
C Renau	I.C.	11.91	Age linups and Sec. 2010	2010.5P1 100% Date	0					
A Baron Count Estimate	C	117. F18	Presence Caller by Tate 2010	2010 DP1 102% Dete	0					
H. Age Group E. Diseksky	r.	97. PT1	Prosting and Families 2018	2010 SF1 100% Dela	0					
8. Educations 2. Englisylverid	r	107. 912	Musered Redenity and Dray Garley Republic 201	2010 SP1 100% Dels	0					
it besite & farmings it Langeage	r.	107 P13	Drog Guehen Republic to See, Apr. and Type of Drog Quehen. 2013	2010 SP1 100% Date	0					
# Dright-	T	0140	Timple Track of mar and Sec 2018	2010 SF1 10(% Dele	0					
8 Population Change	Г	127.8%	Name and Trapano or Lates Dript, 2010	2010 SP1 100% Date	0					
it Race & Stheinty	1	121.04	Revel, Contributions of Two Rades, and Roll Repairs of Laters 2010	2010 SP1 10/% Date	0					
± Relationship	E	11.25	Reparkanse ty in Contemptor: 2018	2010 SP1 100% Date	0					
2 Percent	10	17.04	Rana Asire or in Contendent and Pagante of Laten. 2018	2010 SF1 120% Date	0					
8 Business and Industry 8 Tear	r.	41.01	Next Assuring for the Analyza' totax and Alasta Satis Reputation by Senited Trilling 2010	2010 SP1 100% Date	0					
# Product Type	1	17.09	Name Property for the Autor Propagator by Sampling Categories 2011	2010 SF1 128% Date	0					
IR Detenet	E.	11.09	Race Reporting for the frame has well and Other Parcels Internet Reputation by Selected Composed 2010	2010 371 100% Date	0					
P' foliale estives produite 🔘	r	ITA.	Name, Manageria or Labor, Age. and Manada December 2018	2010 Secletrating Data SF (PL 94-171)	0					
Geographies	Π.	-	OCERANCY STATUS	2010 Redentising Data SF (70, 94-171)	0					
	100	12210	and the last	Includence of the local division of the loca						

5 Open the Excel file (unzip the zipped file first if necessary). The goal now is to condense all column headers down to <u>one</u> row. Rename the columns of data you want to keep with a maximum of 8 characters (e.g. "Total Population" would become "TOTALPOP"). Then delete any remaining column header rows.

1.1						-	ar a pr	DeDel Con	hered cost	i - Martin	Die Collec					
	100		un Pap	Lapsus	Company of	Cars .	Apropus .	TOTAL CO.								
	1	Califeri	- 34	· A .			1200	the first	Seven			N 8	8 H	2-1-14	· .	97 6
140	Aprile		t - 1111 - 1	A . A		10.000	· Dilate	and in the start			1.00	itural fo	mat Cas	Pa Dete	··· ·	Tert & to
53	1	1.0									Further	ating + pr1	104 - 3544	T BITOM	a. G.	Film - Se
eted ju	Part of the local division of the local divi	-							· · ·				•		_	191/18
11		1	• 0	A												
-	4 A		. C	. D.		1	- 6	×	1	1	- C.	- L.'.	M	N	0	P
14		-		5001	9001	5002	5062	5003	5001	5004	5004	5005	3005	3004	1006	3007
- 8	2			SEX AND	LIEK WAD	THEX AND	FIER AND	I SEX AND	ISEX AND	FIER AND	SEX AND	TEX AND	THEN AND	ISEX AND	FIER AND	FIER AND
- H				Total pep	Total pep	Tatal pop	Total pop	Tetal pep	Tintal pop	Tetal pep	Total pop	Total pop	Tetal pop	a Tortal prop	Tonal pop	a Tetal: pog
- B						Turget 2.5	conder 5 y	+210.9 yes	12 20 9 Yes	1010 14 p	131 TO 34 Y	(12 in tak	12 10 19 1	4 20 10 28 Y	CAD TO DA N	122 20 128)
- 6																
. 8	a sen is	680.40	Dirt.due	(within	when:	HODI	where	when	HODE	when .	HINES	within .	when a	1000	+0002	where a
		102	610	Number	Percent	feurniter.	Parcent	Rumber	Partant	Number	Percent	Number	Parcent	Number	Pancent	Number
- 6	10000	B.F 27066	A Blooming		100	4505	5.4	4394	8.1	401	5.4		3.4	4047	1.1	4. 427
	1 140000	0.0 J70794	a areek/un	80104	100	2874	4.1	1294	21	2054		2540	1 21	219	11	248
	180000	out 17076	il Brocklyn	1 75.765	100	4011	1.3	6181	1 8.3	5688	2.5	5523	7.1	3254	6. 6.9	5.60
- 6	1 100000	0.2 171084	4 Changlin	21081	100	1401	6.4	1.1548	6.1	1000	8.2	1912	8.1	1429	5.0	1 544
5	4 240000	0.0 17100	8 Charthage	21952	100	1310	5.7	1 2346	8.5	2234	9.9	100	8.1	1 194	1. 14	100
- 8	18 140000	007 371314	B Coroiran	1 1079	100	. 352	- 43	141	6.3	- 433	8,1	412		200	1 54	1 33
	180000	0.0 17141	& Crystal at	2715	100	3483	4.7	1296	5.0	3254	5.7	1208	- M	1214	14	1 183
1	17 140000	0,7 17190	2 Dayton ci	4673	3.00	254	54	294	6.1	347	1.1	334	1. 74	210	1 34	6 22
12	18 140000	0.0 271514	II Deephav	< <u>384</u> 2	300	396	54	20		334	8.6		(N	, 304	()	
1	19 140000	0.8 27181	8 Eden Prai	NO757	300	8990	4.6	4104	- 21	4560	2,3	4223	. 6.5	2825	44	454
	20 240000	0.7 171818	II Sdina (P)	67943	100	2584		3406		3454		2943	3.5	1462		214
12	1 190000	0.0 27200	B Excelsion	21.04	100	304	4.1	10	- 61	309	- 43	304		34		
and its	12 190000	0.2 17348	8 Golden V	20971	100	1097		1110	3.3	1137	- 54		4.1	10	M	1 123
	28 280000	0.7 17256	2 Greenfiel	- 2777	100	110		- 390		- 211					- 44	
-14	190000	0.7 27294	a Greenwo		100		1.1		- 41	40	- 14			- 21		
Proj.		0.0 17000	to reprint of a	2910	100	1.00	- 11.3	100							-	
	190000	We take	e mport :	\$1990	100	1479		1008						1101		208

4

Next insert a column before Column A and name it TRACT or BLKGRP or BLOCK (if you downloaded Census Tracts, Block Groups, or Blocks, respectively). In the first cell below the title, insert the function "=RIGHT(B2,6)" and hit the Enter key. [If you downloaded block groups, use "=RIGHT(B2,7); if you downloaded blocks, use "=RIGHT(B2,10]

1	0.18				0	C. 10, 591.	Piline (Re	ead-Only -	Mosset	Local .					-0.0	100
100	and Bear		land. Fr	renated 1	-	nitesi bis										20
ITL A	-		1000				Tauk .			. 184			- Print	χ.	37 40	
44.			0 A A			10000	· · · · ·	1000			1.104	1.00	2ª Drivis	10	XI un	
The of	8.7.11	1 11 11	g.A.		1. 18 18	- In storps	A Center +	3.15	+ (31.5	Campbo	and Provide	C 200	- El romat	- a -	Set 2 Find	8
Internet 1		Fart			Altera	and .		- there	-		Styles		Cam		Latting	
50	<i>.</i> -	- × -	. J. 10000	7(82,6)												_
4		с.	D			6	10		1.1	K	4. 1.	54	N	0	P	0
I TRACT	iid.		660 1	OTALPOIN	UALE P	ULESSS A	4.5109 8	M_10to14 M	15to17.M	181019 M	20 M	21	M_22ho36.2	5 to 29 ye	10 to 34 yr 3	15 to
2 HRIGHT	2,6)	2.2 16+20	Census Tri	3031	1519	116	129	118	85	45	19	20	79	116	119	
2	0800000	1.718+20	Census Tri	4569	2225	154	179	155	109	65	25	-40	.86	171	215	
4	G800000U1	2.716+20	Census Tri	3173	1548	129	109	88	50	35	54	12	45	110	265	
1	0800000U!	2.718+20	Census Tri	4641	2325	207	125	104	54	47	25	23	83	223	264	
6 ()	0800000UT	2.718+20	Census Tr.	2749	1375	94	72	59	45	23	12	- 4	37	122	349	
7	0800000U1	2.715+20	Census Tri	2027	970	74	56	41	29	16	4	13	44	133	136	
6 ()	0800000U1	2.718+20	Census Tr.	2335	1185	113	107	76	35	10	34	20	70	127	111	
K)	0800000011	2.718+20	Census Tri	1427	605	36	92	74	45	26	. 9	5	27	52	30	
D	0800000./1	2.715+20	Census Tri	2250	1109	79	67	38	15	27	- 14	17	88	181	131	
T	0800000Ut	2.716+20	Census Tri	2583	1229	132	117	119	87	50	29	23	66		101	
12	0800000U!	2.718+20	Census Tri	1812	889	78	86	- 11	-41	30	12	34	26	83	51	
CR (0800000U1	2.71E+20	Census Tr.	2138	1025	118	135	.97	73	61	28	16	44		54	
14	0800000U!	2.710+20	Census Tr.	4768	2503	26	20	13	10	160	308	337	731	395	162	
15	0800000Ut	2,71E+20	Census Tr.	3166	2685	83	.65	35	26	24	30	23	109	180	121	
16	0800000.11	2.718+20	Centus Tri	3198	1881	149	107	81	-40	44	25	43	140	223	177	
17	0800000U1	2.718+20	Census Tr.	3828	2057	66	40	23	13	25	20	46	271	528	294	
18	0800000U!	2,718+20	Census Tri	2618	3418	77	49	40	19	38	21	25	163	390	221	
7	0800000U1	2.718+20	Census Tr:	1093	886	80	66	39	33	24	17	26	72	102	110	
9	0800000U!	2.716+20	Census Tr.	3394	1728	61	33	29	3.8	. 9	10	24	215	446	219	
4	000000Uf	2.716+20	Census Tri	4534	2379	183	112	67	33	45	22	43	189	385	301	
12	0800000U1	2.71E+20	Census Tri	2221	1195	119	101	84	40	43	29	23	82	178	344	
13	0900000U!	2.716+20	Census Tr.	2720	1494	147	109	81	#2	51	30	19	132	292	165	
18	0800000UT	2.718+20	Census Tr.	4396	2220	233	200	128	70	51	32	15	138	306	258	
25	0800000U1	2.715+20	Census Tri	3083	1559	\$72	125	108	- 54	38	24	22	113	172	163	
26	0800000U1	2.718+20	Census Tr.	3436	2586	154	116	112	71	28	17		60	173	199	
	NC 10 SF1	P12 / 23	America for	1964	+ 1 11	144		101	104	10.00	- * j					1.1
Contract													(11 12 12 · ·	100.0		-

Appendix G

6

- 7 Drag the formula all the way down the column (or double click in the lower right corner of the cell for the same effect). Next select the entire column by clicking on column header "A". Right click on "A" and select Copy. Right click on "A" again and select Paste as Special. Select Values as your Paste as Special option. Then save and close the Excel spreadsheet or CSV file as an Excel spreadsheet.
- 8 Download the Census TigerLine shapefiles. Use 2000 shapefiles for Census 2000 and American Community Survey estimates through 2009. American Community Survey estimates from 2010 and later and for Decennial 2010 Census, use 2010 TigerLine shapefiles.
 - a. Download files here: http://www.census.gov/geo/www/tiger/index.html
 - b. Click 2010 Tigerline shapefiles main page
 - c. Under Download select FTP site like under Download by State.
 - d. Select Minnesota
 - e. Select Directory 27
 - f. Select tl_2010_27_tract10.zip
 - g. In File Download select Save and save the zip file in the same folder as Excel data.
 - h. Unzip the folder.

A Tip: After unzipping the data, open the file in Microsoft Excel. Ensure that field names have no spaces (use an "_" or "-" instead). Also, remove any extraneous rows of field names; ArcMap can only read ONE row of field names.

9 Open ArcMap and click "Add Data". Add both the TigerLine shapefile and the spreadsheet you modified with Census Data.



10 Right-click the shapefile and select "Joins & Relates" and then "Join . . ." You should get a window that looks like this:



- 11 In dropdown "1." select "TRACTCE10"; in dropdown "2." make sure your worksheet is selected; in dropdown "3." select "TRACT". Keep all records should be selected. Then click 'OK'.
- 12 Now if you right-click on the shapefile and select "Open Attribute Table" you should see the Census data joined to the shapefile. The shapefile may contain more attributes than your Census worksheet, in which case you will have some fields that say "NULL".

13 Make the Join permanent: right-click the shapefile again and select "Data" and then "Export Data". Save the new shapefile with the joined Census data.



14 Finally you are ready to make the map. To show your variables, double-click the newly created shapefile. This will open the Layer Properties window. Select the tab called Symbology. Within Symbology, select the option on the right for Quantities, and then select Graduated Colors.



15 Now choose the variable you want to display in the Value dropdown (e.g. [Male]). You can normalize the data (create a ratio or percentage) by adding another variable to the Normalization dropdown. For example, you could show number of males less than 5 years old as a true count or you could normalize it by adding the total number of males in the Normalization dropdown to get a ratio of the percent of males that are less than 5 years old. Then select the Color Ramp of your choice and click OK. Next select the Classify button. Choose Natural Breaks or Quantile, then click OK. Select the number of Classes (or groups) of data you want to display ("Classes"> 4). Your map might look something like this:



16 In the View dropdown, select Layout View. Uncheck any shapefiles you do not want to show in the final map. Finally, go to the Insert dropdown and add a legend, north arrow and scale bar.