DGR's Healthcare Providers and Facilities Gravity Model
ArcGIS - Python Script Tool Development
Preliminary Testing and Documentation

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Background:

The healthcare gravity model was originally developed during 1998 for the New Mexico Health Policy Commission (NM HPC) by the Division of Government Research (DGR, UNM) at the University of New Mexico (UNM) as part of several contract funded research projects. The primary goal of this work was to develop and illustrate a reliable measurement method that considered that patients traveled beyond the boundaries of arbitrary data collection units (counties, ZIP codes and census tracts) to obtain healthcare services. Also, to incorporate traditional federal and state service capacity standards (usually county based) and guidelines as part of this proposed method.

There was never an academic publication describing this work as funding to do so was not provided by the NM HPC as part of existing contracts. However, a limited distribution report (Quick Facts 2002) was published by the NM HPC and DGR prepared a PowerPoint presentation for an internal HPC audience. The gravity model poster received an award for best analytical content at the 2002 ESRI Southwest User Group Conference (SWUG) held in Taos New Mexico.

This discussion will document recent developments to build upon and expand this original work. It is currently being conducted as an unfunded research project using student versions of ArcGIS and SAS along with open source versions of Python. Currently only older already publicly available data used during these previous projects has been tested. It is hoped that future versions will have access to more recent data.

As this work progresses, some conference presentations will be prepared and hopefully more recent results will be published with the collaboration of both interested UNM faculty and state employees. See a recent geography class presentation that illustrates current developments and some problems that have been encountered.

Instructions for Use:

1. Prepare a ZIP Code (or other data collection unit*) feature class with populations and provider (or facility) data. Note: this is a point based feature class.
2. Also prepare a polygon based ZIP Code (or other data collection unit*) feature class for resulting data display and create a symbology layer file (.lyr) with desires data class breaks.
3. Create an ArcMap (.mxd) with additional desired basemap layers suck as cities and towns, county boundaries, and the polygon ZIP Code (or other data collection unit*) feature class from step 2.
4. Open and run the Healthcare Gravity Model Python Tool dialog box from the Gravity Model Tool Box.

5. Review the Initial ArcMap results including the tool dialog and resulting attribute table.
6. Modify the initial class breaks (natural breaks) as necessary.
7. Create a map composition and a PDF if desired (not yet in the Python Script Tool).

ZIP Code Feature Class Example (1):

Item Description - dgrzip_pop_prov_test1

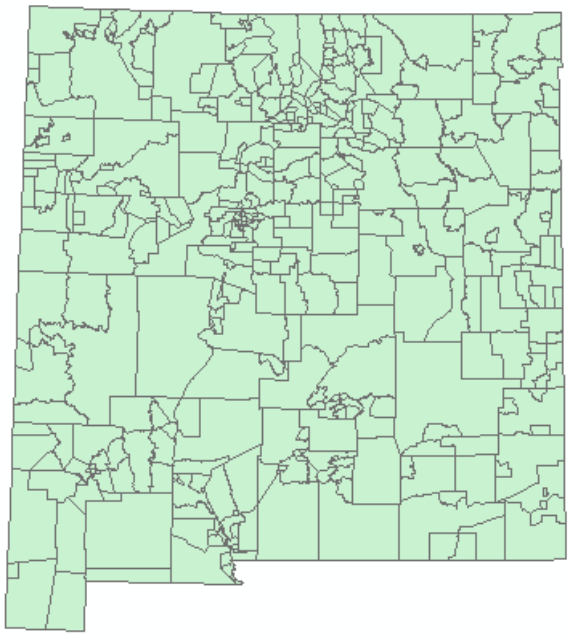
Description | Preview

Preview: Table

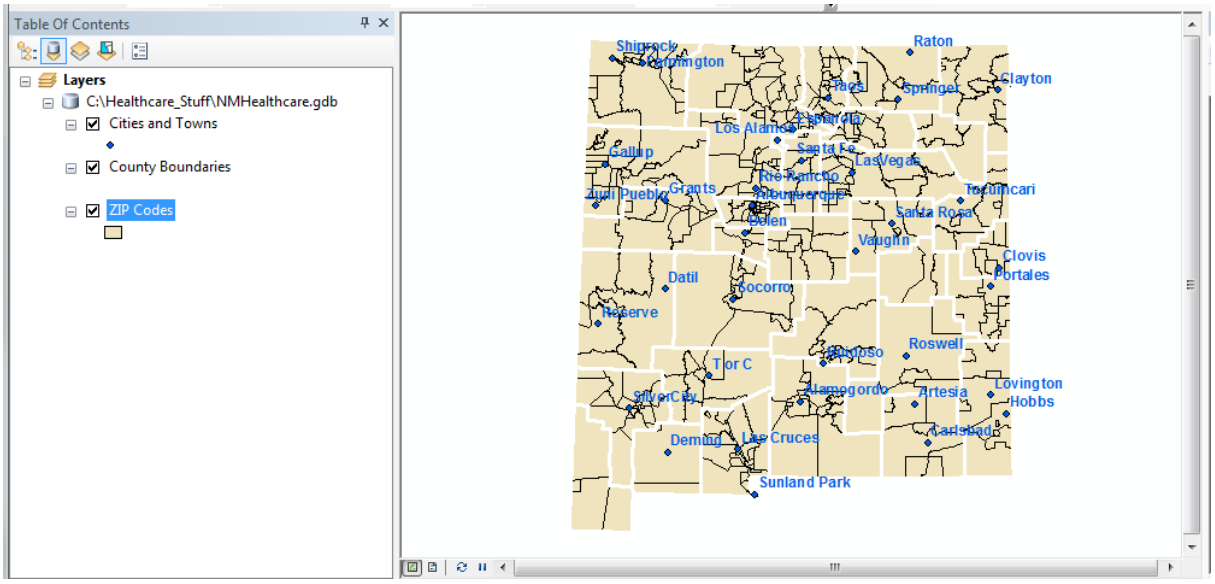
OBJECTID_1 *	Shape *	OBJECTID	ZIPCODE	ORIG_FID	ZIPCODE_1	ANL	ESTPOP01	PCSUM
1	Point	1	87001	2	87001	1	2052	1
2	Point	2	87002	3	87002	1	20623	9
3	Point	3	87004	4	87004	1	8322	3
4	Point	4	87005	5	87005	1	885	0
5	Point	5	87006	6	87006	1	1354	0
6	Point	6	87007	7	87007	1	583	0
7	Point	7	87008	8	87008	1	3302	2
8	Point	8	87009	9	87009	1	3	0
9	Point	9	87010	10	87010	1	1220	0
10	Point	10	87011	11	87011	1	34	0
11	Point	11	87012	12	87012	1	298	0
12	Point	12	87013	13	87013	1	3767	1
13	Point	13	87014	14	87014	1	611	0
14	Point	14	87015	15	87015	1	12890	5
15	Point	15	87016	16	87016	1	2802	1
16	Point	16	87017	17	87017	1	443	0
17	Point	17	87018	18	87018	1	389	0
18	Point	18	87020	19	87020	1	11509	11
19	Point	19	87021	20	87021	1	3104	0
20	Point	20	87022	21	87022	1	1818	2
21	Point	21	87023	22	87023	1	910	0
22	Point	22	87024	23	87024	1	1818	1
23	Point	23	87025	24	87025	1	1621	1
24	Point	24	87026	25	87026	1	3175	0
25	Point	25	87027	26	87027	1	258	0

1 (of 400)

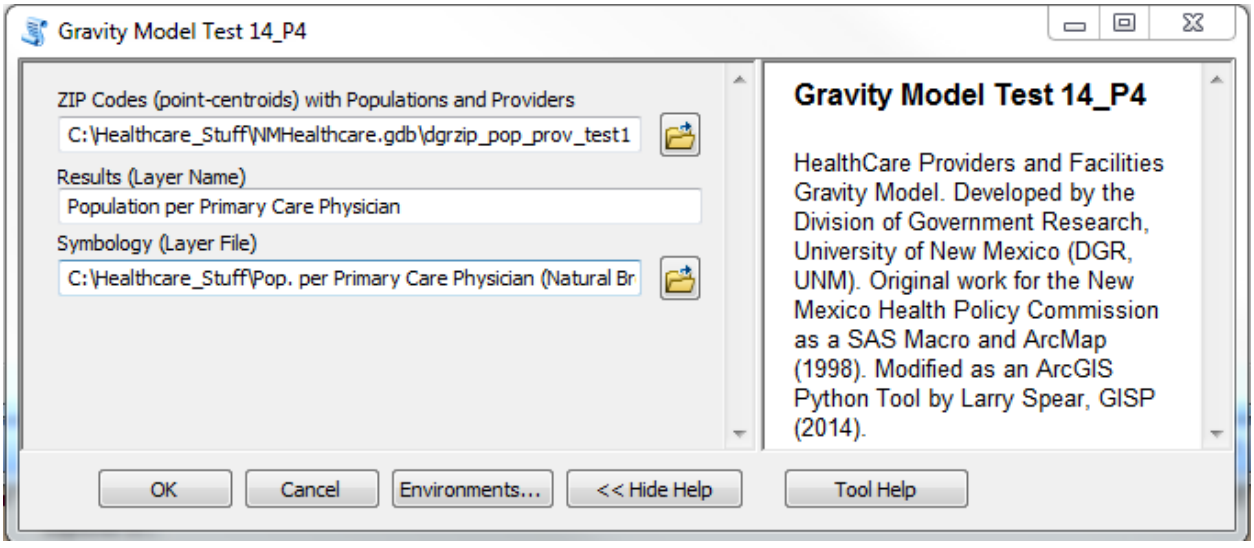
Polygon based Feature Class for Data Display (2):



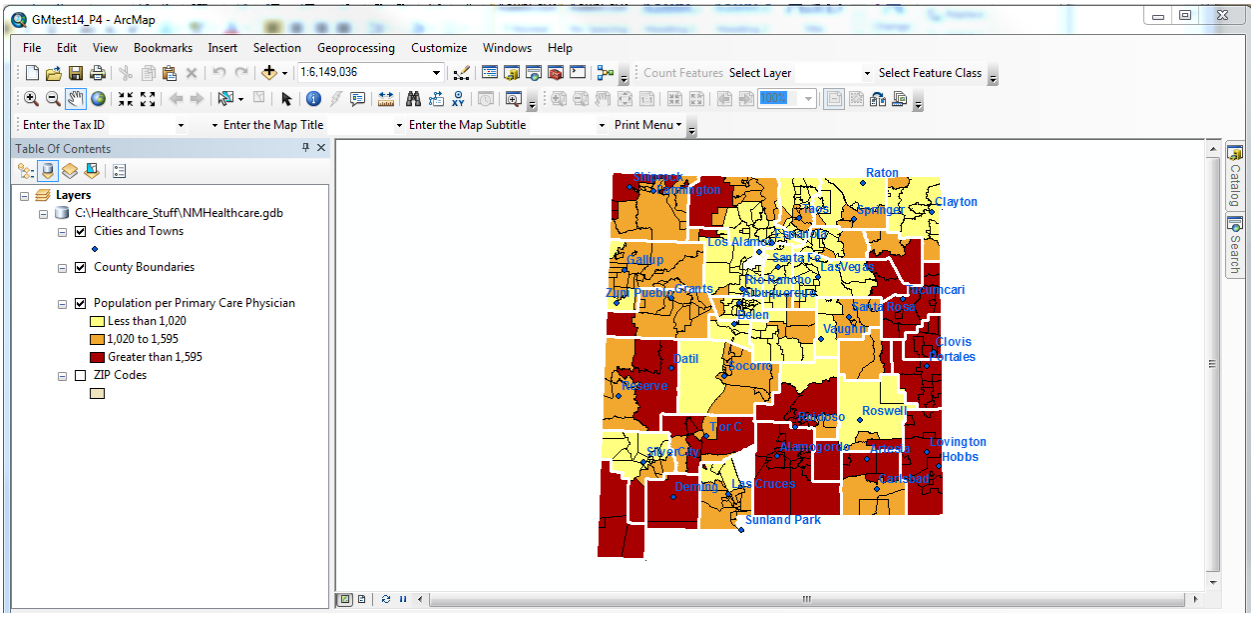
ArcMap Basemap (3):



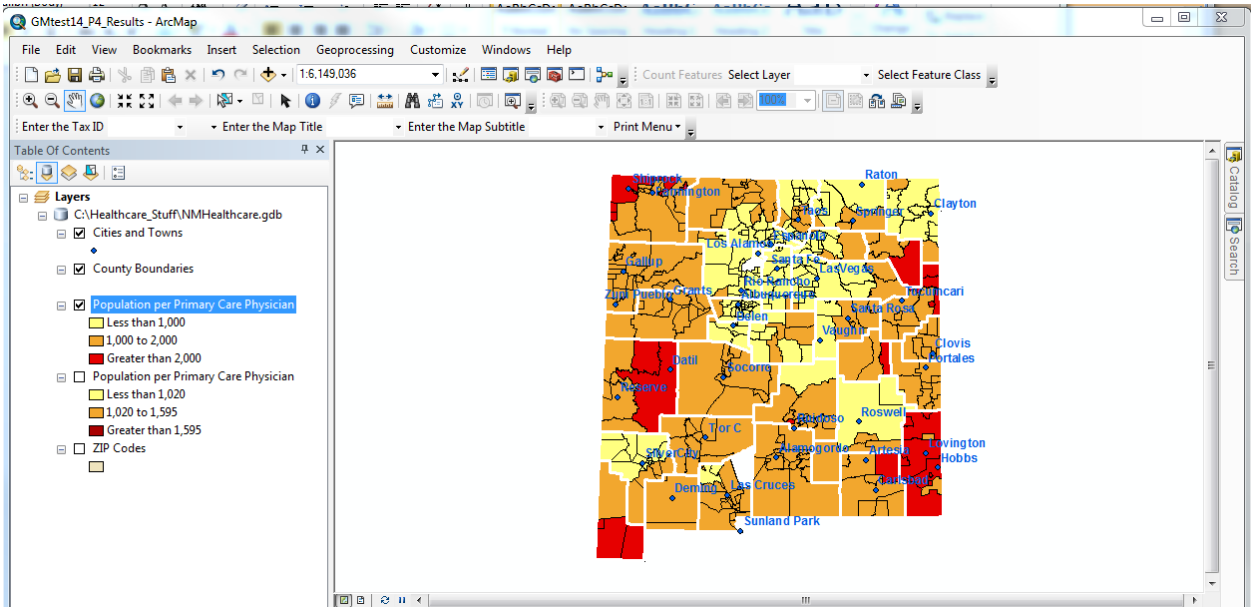
Script Tool Dialog Box (4):



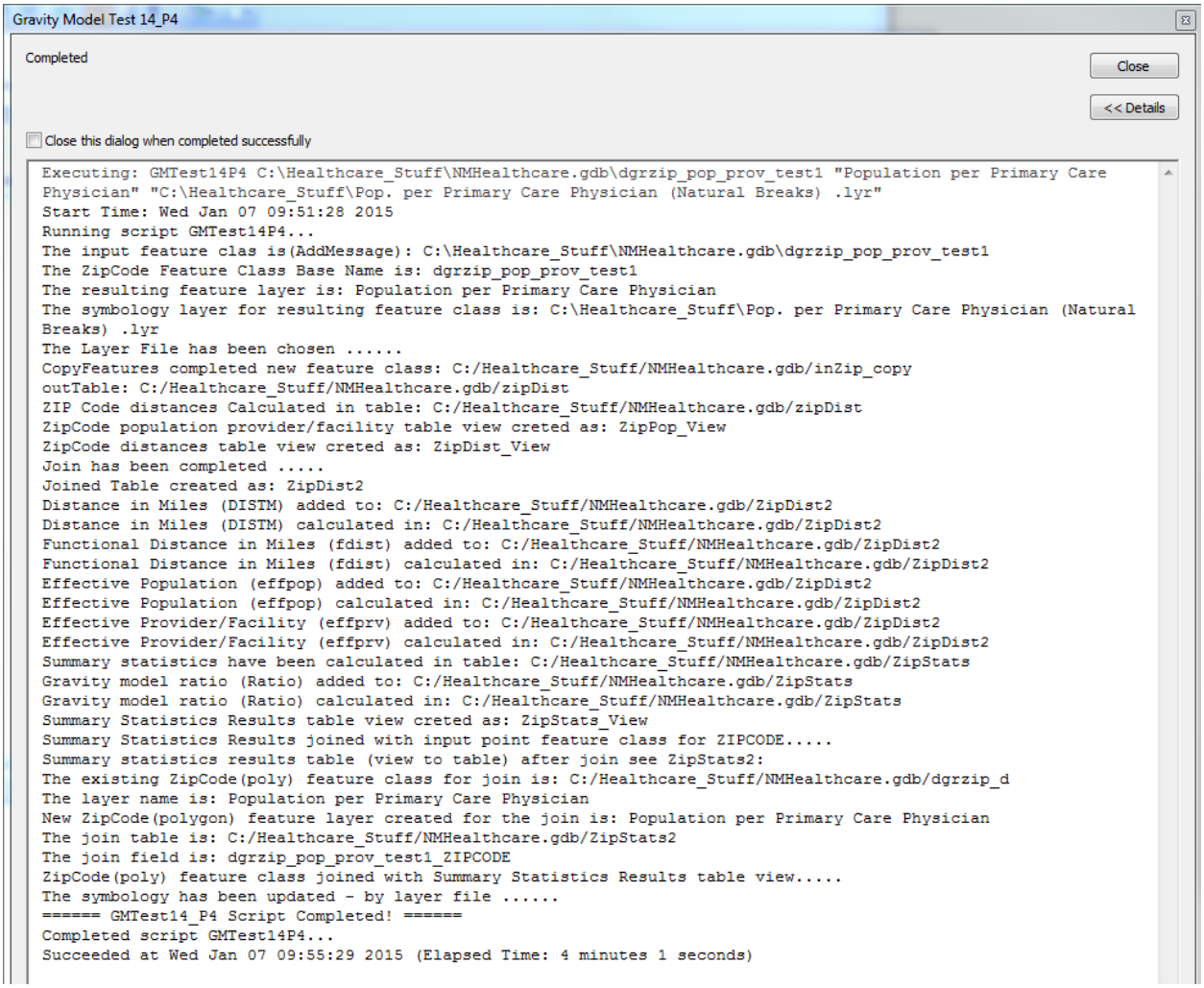
ArcMap Initial Results Display (5):



Modify Class Breaks (6):



Results Dialog (5):



Current Problems:

- Both ModelBuilder and Python Script Tool could be considered slow (about 5 minutes to complete).
- Many ArcGIS tools requiring conversions from feature class to layers and tables and back and forth.
- Joined files do not work with some tools especially layer symbology.
- Layer symbology must not be updated with layer based on manual classification.
  Note: Initial natural breaks or other classifications can't be updated automatically with a manual classification. This problem needs to be resolved with ESRI and subsequent versions will hopefully allow for automated symbology.

- Data cursors (including new da – data access) seem to work as a stand-alone script but not as a python script tools when accessing a simple geodatabase file of statistics needed for automating symbology. This problem also needs to be resolved with ESRI.

Credits:

The original idea for DGR's healthcare gravity model was developed by James W. "Jim" Davis the principal investigator for these projects. Several students at DGR assisted with the development; John "Jack" Ruggerio researched ZIP Code boundaries and developed the ZIP Code base map, and Judith Van der Elst prepared some maps and the poster presentation. I was the GIS project manager at the time and worked with Jim Davis to prepare the SAS Macro and performed the data analyses in both SAS and ArcGIS.

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