Point Proximity Analysis

Valuable, but Simple Techniques for "Bigger Box" Thinking

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Discussion Points

☐ Health Care Case Study

- Distance matrix

☐ Insurance Case Study

- Desire lines analysis

☐ Retail Case Study

- Spatial statistics tools

XLHealth

Inform. Empower. Excel.

- Since 2001, XLHealth has consistently been named one of the "Ten Best Disease Management Companies in America" by the Health Industries Research Companies.

- In 2005, XLHealth was recognized by the Disease Management International Purchasing Consortium with its "Best Disease Management Ideas" award.

- XLHealth has been awarded the Disease Management Association of America's Recognizing Excellence Award for "Best Disease Management Program: Medicare".

XL Health's Need for GIS Analysis

- A shift in government policy
  - Higher payments from Medicare

- Medicare encourages "special needs" plans.

- Requires reports and maps that document that access to services.

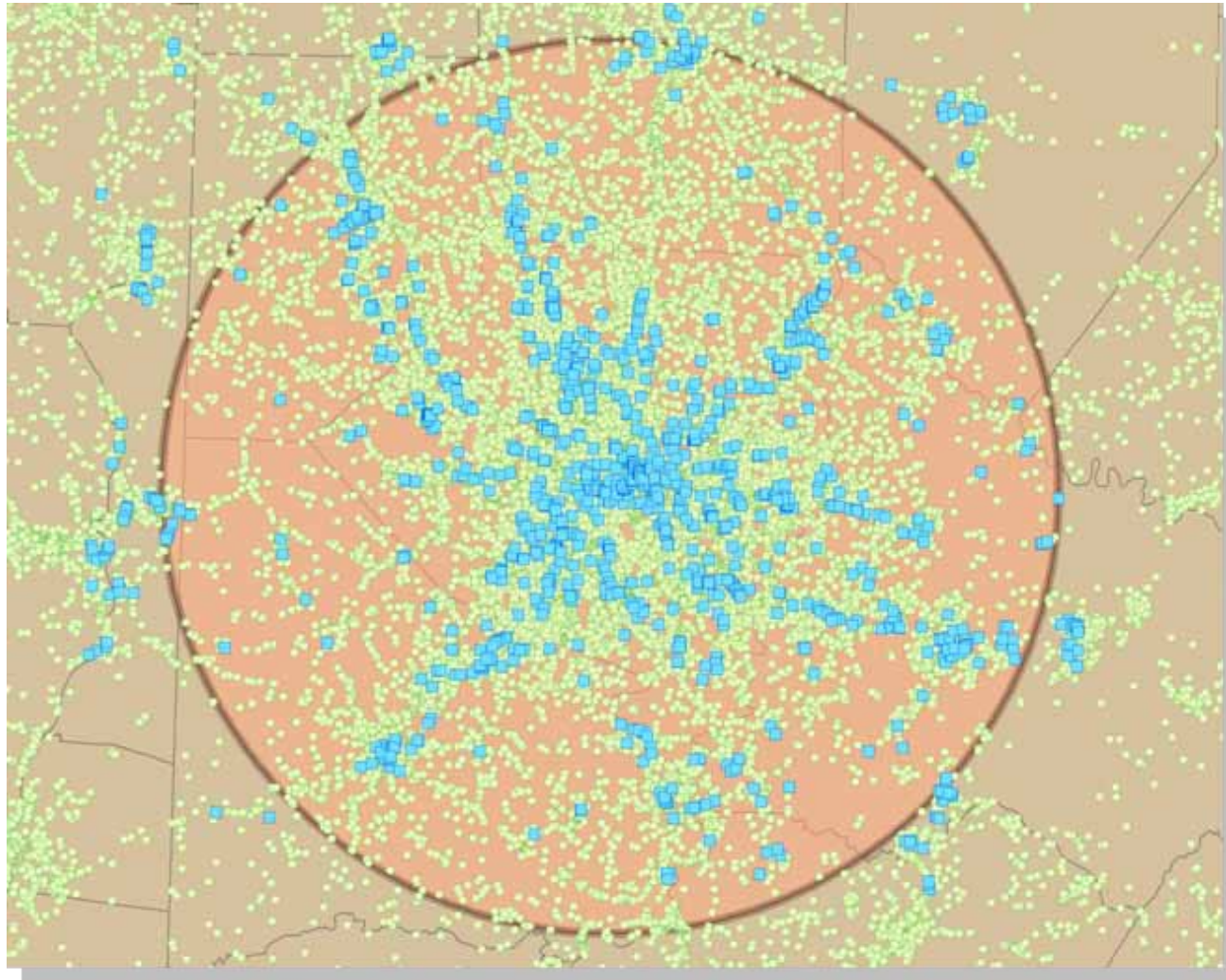# Reporting Requirements (One Example)

☐ Access to contracted Primary Care Providers

- ■ % of beneficiaries in Urban Areas with access to 2 or more PCPs within 30 minutes/30 miles.

- ■ % of beneficiaries in Rural Areas with access to 1 or more PCPs within 45 min/45 mi.

Example: Pittsburgh PCP's

30-mile ring

30-minute drive time
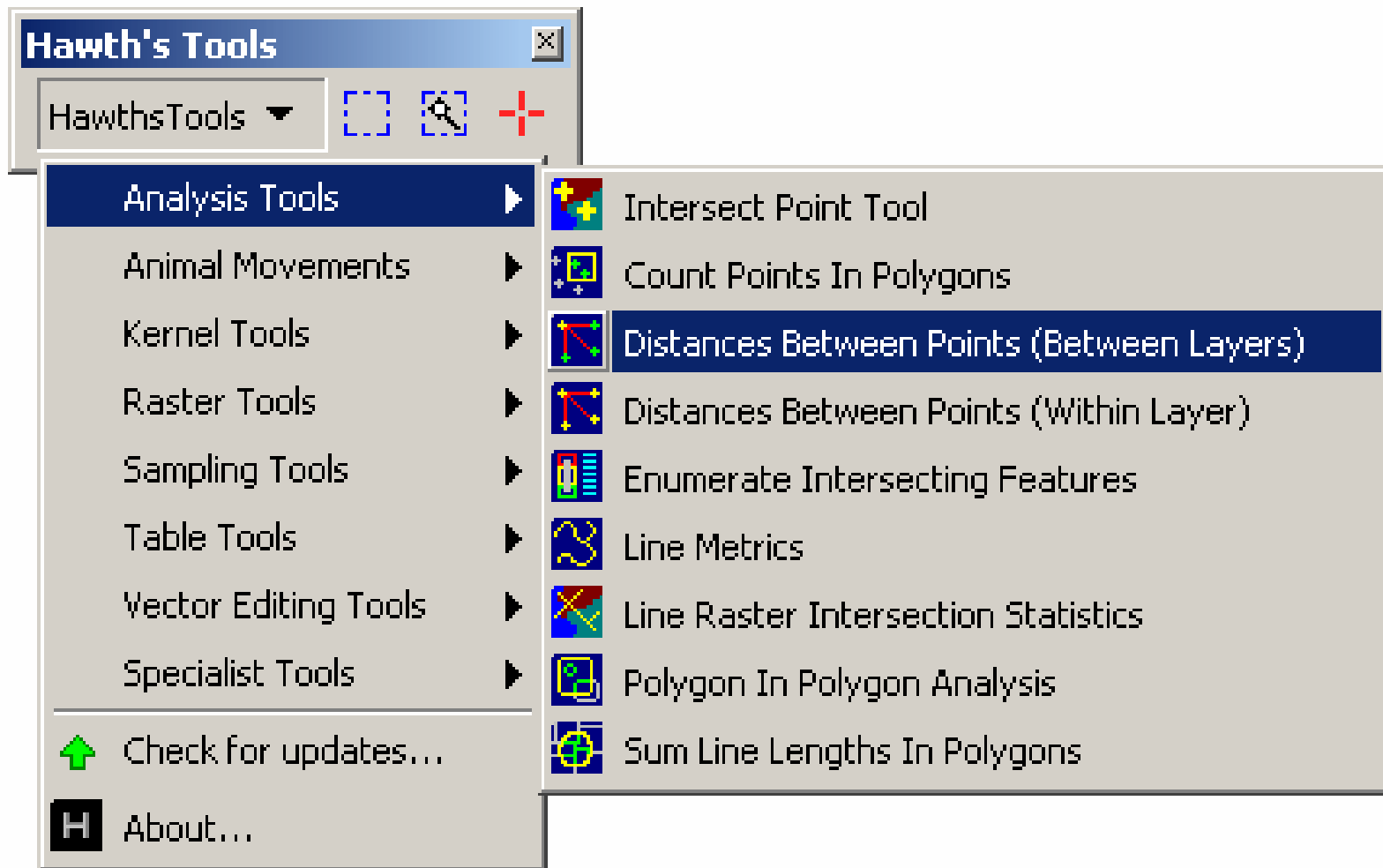
Example: Pittsburgh Beneficiaries & PCP's
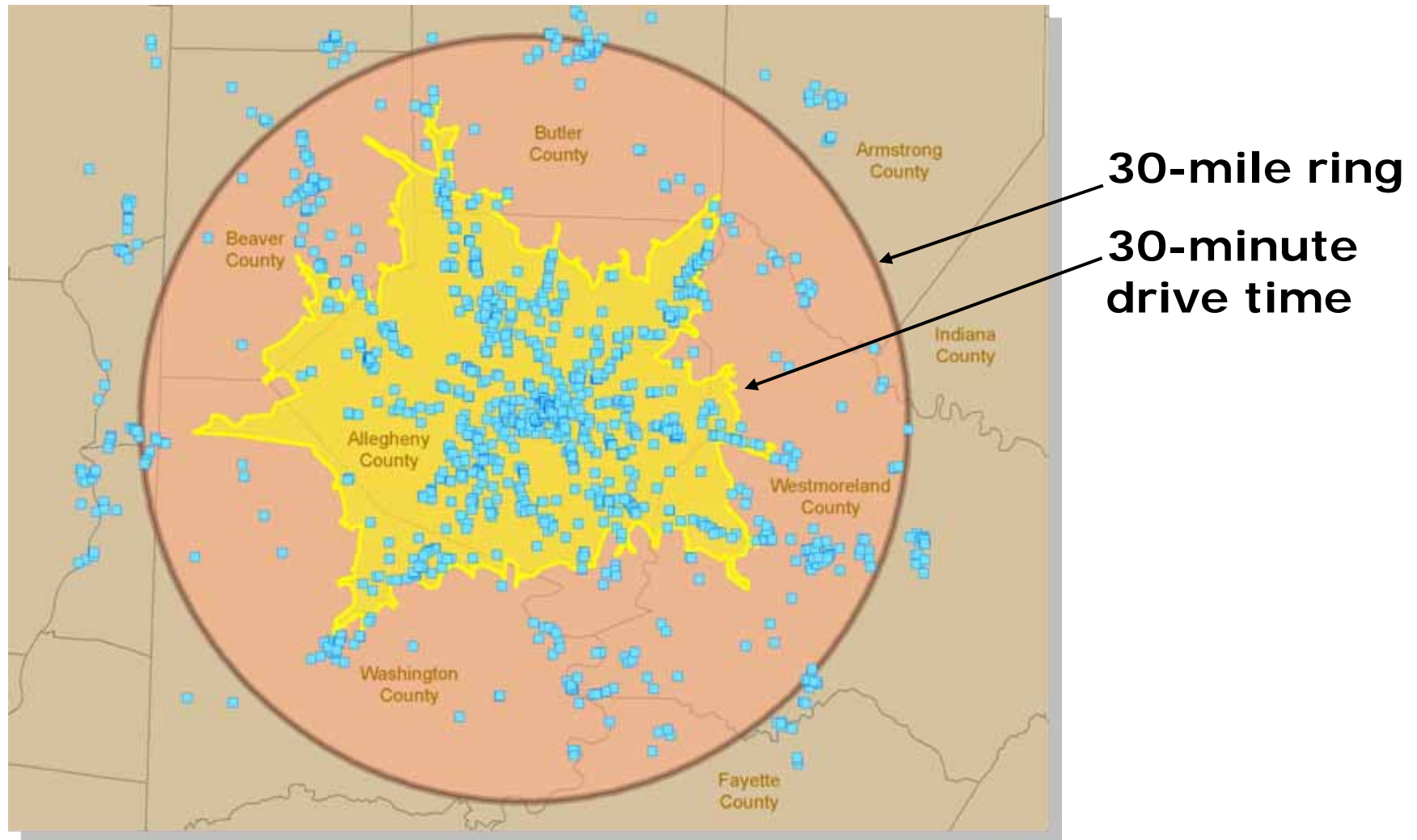
This example uses infoUSA data and not actual XL Health data.

Hawth's Extension is provided "AS-IS".

Distance Between Points (Between Layers)

Distance Between Points (Between Layers)

Distance Between Points (Between Layers)

Input

Source point layer: `Beneficiaries`

☐ Use selected features only

Unique source ID field: `ObjectID`

Target point layer: `Primary Care Physicians`

☐ Use selected features only

Unique target ID field: `FID`

Analysis Option

○ Create a linear distance matrix file

○ Create an NxN distance matrix file (small samples only)

○ Output summary distance statistics only (minimum, maximum, mean, standard deviation)

● Nearest neighbours: for each source point, find the closest target points to it and record the distance and ID in the attribute table.

Find the top `5` closest points (max: 100).

Output
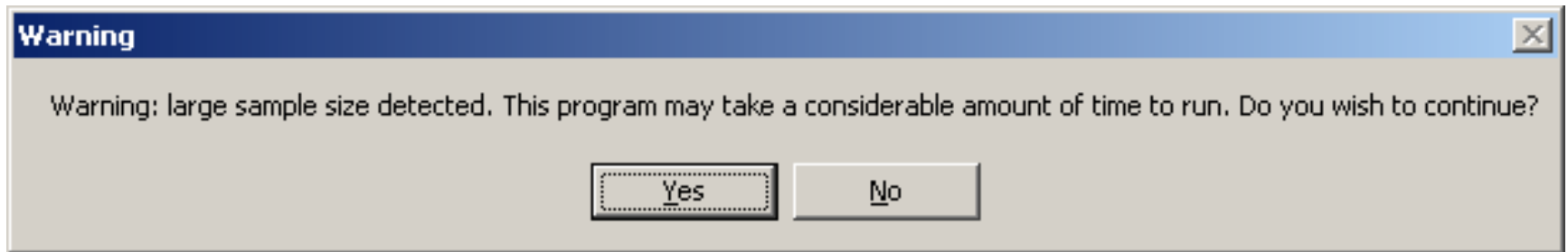
Output table to create (delimited textfile):

`C:\MapDocuments\GeoInfo\PCP_dist5.csv`

Delimiting character (default: comma): `,`

Web Help   OK   Exit

Using Hawth's Analysis Tools

☐ The warning message was helpful, but the application was quite fast—about 125,000 records in 15 minutes.

Warning	✕
Warning: large sample size detected. This program may take a considerable amount of time to run. Do you wish to continue?	

[Yes]   [No]

Using Hawth's Analysis Tools

☐ Shapefiles.

☐ An assigned projected coordinate system.
  ◼ Same projection for both layers.
  ◼ Distances calculated from map units.

☐ A custom projection with map units in miles saves a calculation step.

Using the Results
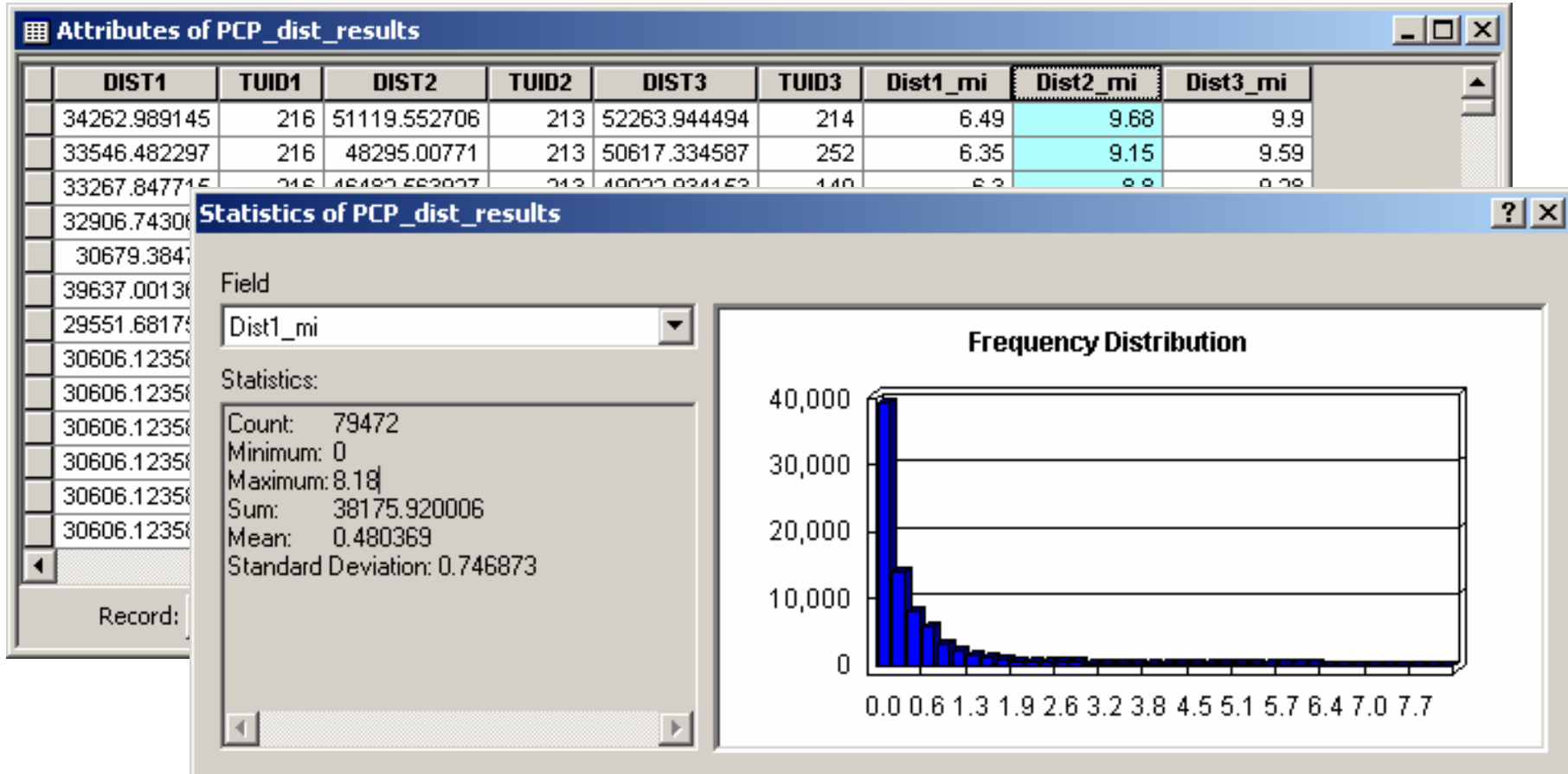
Using the Results

79,472 Beneficiaries	Distance to the Closest PCP	Distance to the 2nd Closest PCP	Distance to the 3rd Closest PCP
Maximum Distance (in Miles):	8.18	9.68	9.9
Average Distance (in Miles):	0.48	0.68	0.85

99.99% of Beneficiaries:
Access to at least 5 providers within 30 miles
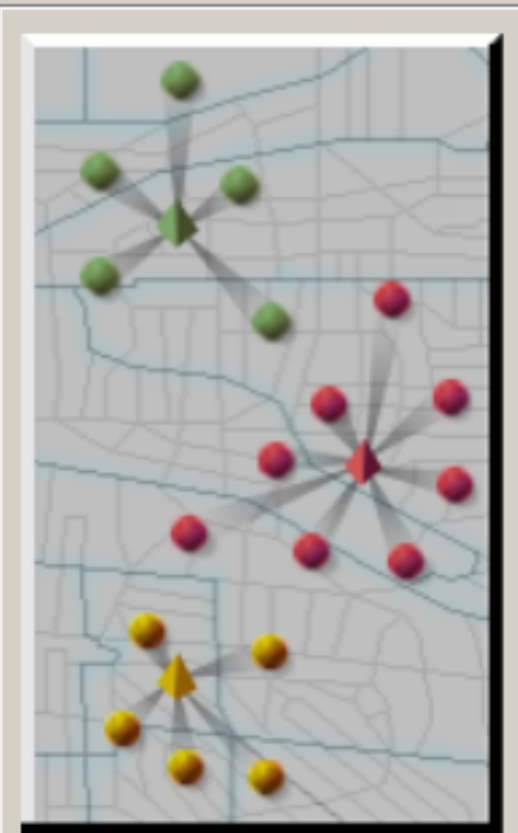
Attributes of PCP_dist5

OID	SOURCEUID	DIST1	TUID1	DIST2	TUID2	DIST3	TUID3	DIST4	TUID4	DIST5	TUID5
17783	6622706	29.111253	126	31.77677	125	32.14765	55	32.599262	54	33.163867	2863
17781	6622704	29.052158	126	31.72228	125	32.070402	55	32.522318	54	33.087256	2863
17780	6622703	28.297793	126	31.026324	125	31.083058	55	31.538779	54	32.107882	2863
99051	7014831	31.549404	2297	31.549404	2296	31.666094	2295	31.666094	2294	31.93763	2461
17711	6622543	28.585649	126	30.398643	55	30.877864	54	31.471671	2863	31.47332	125
99050	7014824	31.010034	2297	31.010034	2296	31.128492	2294	31.128492	2295	31.389223	2461
99054	7014907	31.000232	2297	31.000232	2296	31.119459	2294	31.119459	2295	31.375363	2461
17779	6622702	26.114867	126	28.683147	125	30.00824	55	30.429242	54	30.961646	2863
17784	6622707	26.079697	126	28.648626	125	29.974389	55	30.395244	54	30.927499	2863
17785	6622708	26.079697	126	28.648626	125	29.974389	55	30.395244	54	30.927499	2863
17802	6622725	26.030714	126	28.60077	125	29.926153	55	30.346834	54	30.878912	2863
17803	6622726	26.030714	126	28.60077	125	29.926153	55	30.346834	54	30.878912	2863
99053	7014878	30.493133	2296	30.493133	2297	30.614684	2294	30.614684	2295	30.855967	2461
17721	6622644	27.799241	126	29.310362	55	29.794211	54	30.392961	2863	30.659616	2864

Record: 0   Show: All / Selected   Records (123443 out of 123451)   Options ▾

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A Business Analyst Solution

A Business Analyst Solution

Report Wizard

Select the type of ranking or point report you would like to create:

☑ Locator Report

○ Market Ranking

○ Wind Rose

○ Geographic Customer Summary

With the Locator or proximity report you can list all of the locations that are closest to your facilities and examine the geographic patterns and distribution of your customers. For example, you can list the 10 closest customers or competitors to each store location.

Help   << Back   Next >>   Cancel

A Business Analyst Solution

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A Business Analyst Solution

A Business Analyst Solution

☐ The exported report has the data you need.

☐ You will find the DBF file in your output folder under the Reports directory.

  ■ **E.g.** **C:\My Output Data\Projects\Default Project\Reports\[report name]**

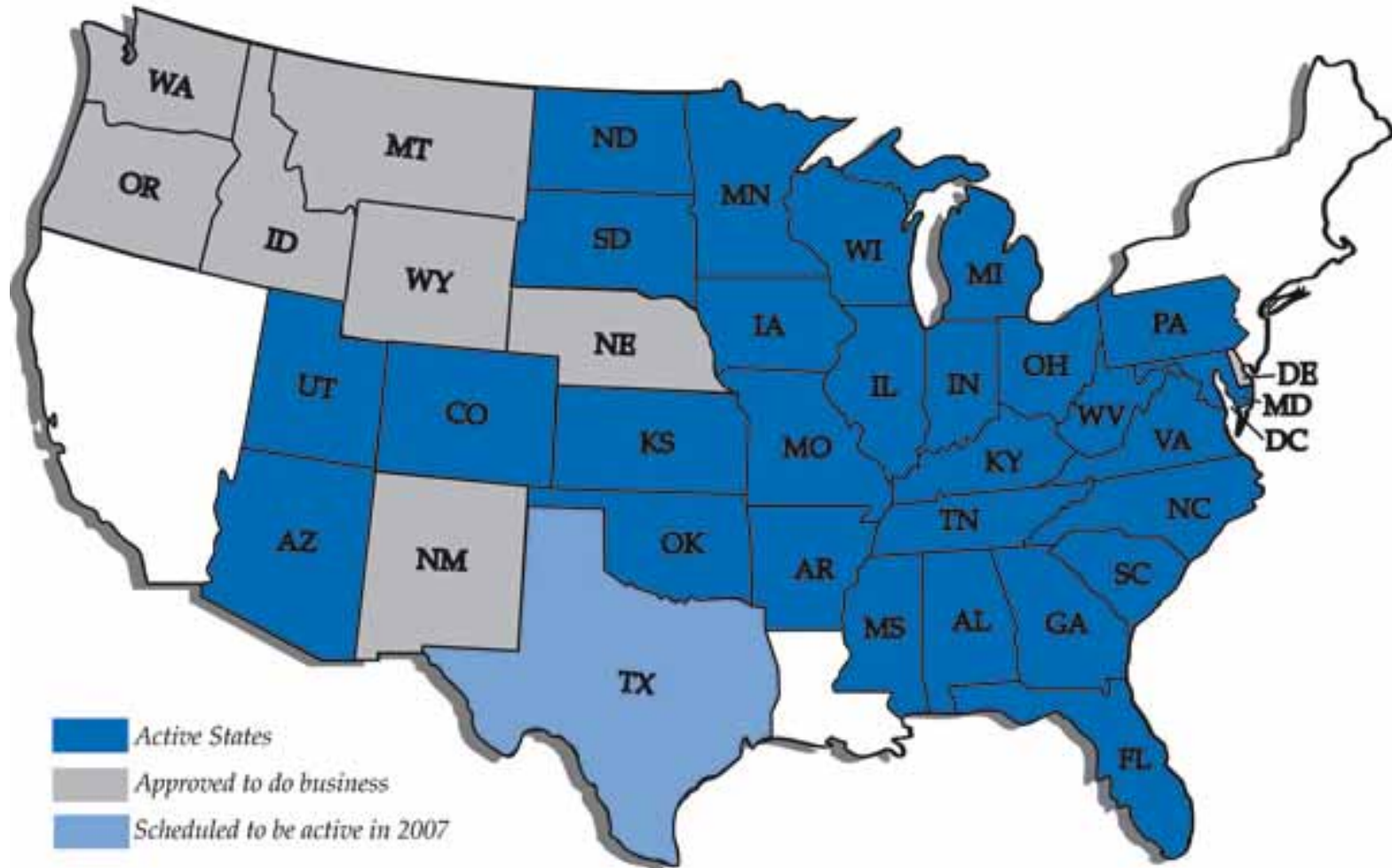| ID	NAME	LOCATOR1	DISTANCE	DIRECTION
Member 0	Member 0	PCP 0	1.54	SW
Member 0	Member 0	PCP 3	1.75	SW
Member 0	Member 0	PCP 4	1.75	SW
Member 0	Member 0	PCP 5	1.75	SW
Member 0	Member 0	PCP 6	1.75	SW
Member 1	Member 1	PCP 0	0.31	SW
Member 1	Member 1	PCP 3	0.53	NW
Member 1	Member 1	PCP 4	0.53	NW

A Starting Point

☐ Identify gaps: improve their services

☐ Opportunity: provide new services in new geographies

State Auto Insurance Companies

☐ Based in Columbus, OH

☐ Products:

- Personal auto

- Nonstandard auto

- Homeowners

- Business coverages, including workers' compensation

- Fidelity and surety bonds

- Farmowners

Image used with permission.

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State Auto Insurance Companies

Active States
Approved to do business
Scheduled to be active in 2007

Image used with permission.

State Auto: Committed to Excellence

- ☐ Forbes magazine's Best Managed Company-Insurance, (2006)

- ☐ Member of Forbes' Platinum 400 companies (2005, 2006)

- ☐ ACORD Upload Company of the Year – (1997, 2002, 2003, 2004) (2005 ACORD Certification award)

  - ■ Demonstrating commitment to efficiency through automation

State Auto: Committed to Excellence

☐ Every year since 1954, State Auto Mutual has earned a rating of A+, or better, from the A.M. Best Company, the premier evaluator of insurance company financial strength and stability.

☐ State Auto is one of only 14 US companies that have earned that distinction.

Excellence: Seeing possibilities

"People who live in the present often wind up exploiting the present to an extent that it starts removing the possibility of having a future."

-Alan Kay in *CIO Insight*

February 1, 2007, "Expert Voices: Beyond The Box"
By Allan E. Alter

http://www.cioinsight.com/article2/0,1540,2089567,00.asp?kc=CMCIOEMNL020607EP18

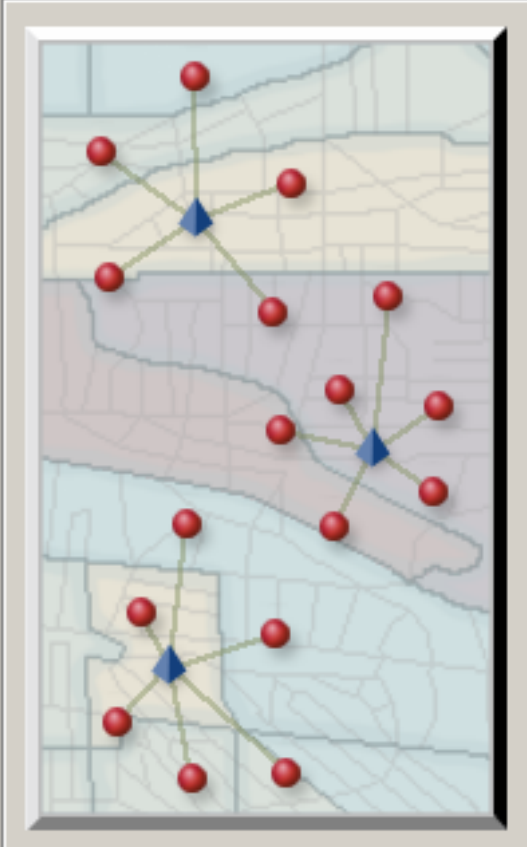# GIS Analysis: Looking for possibilities

❑ To find answers to questions about how to do business in a better way.

■ Lower Cost

■ Better Service

■ Higher Productivity

GIS Analysis

☐ State Auto studied the distance between their offices and agency accounts using the Business Analyst Desire Line Wizard.

■ Offices are mapped using the Store Setup option and agencies using the Customer Setup option.

■ Business Analyst Menu→Analysis→Desire Lines.

Using Desire Lines

Desire Lines

Image used with permission.
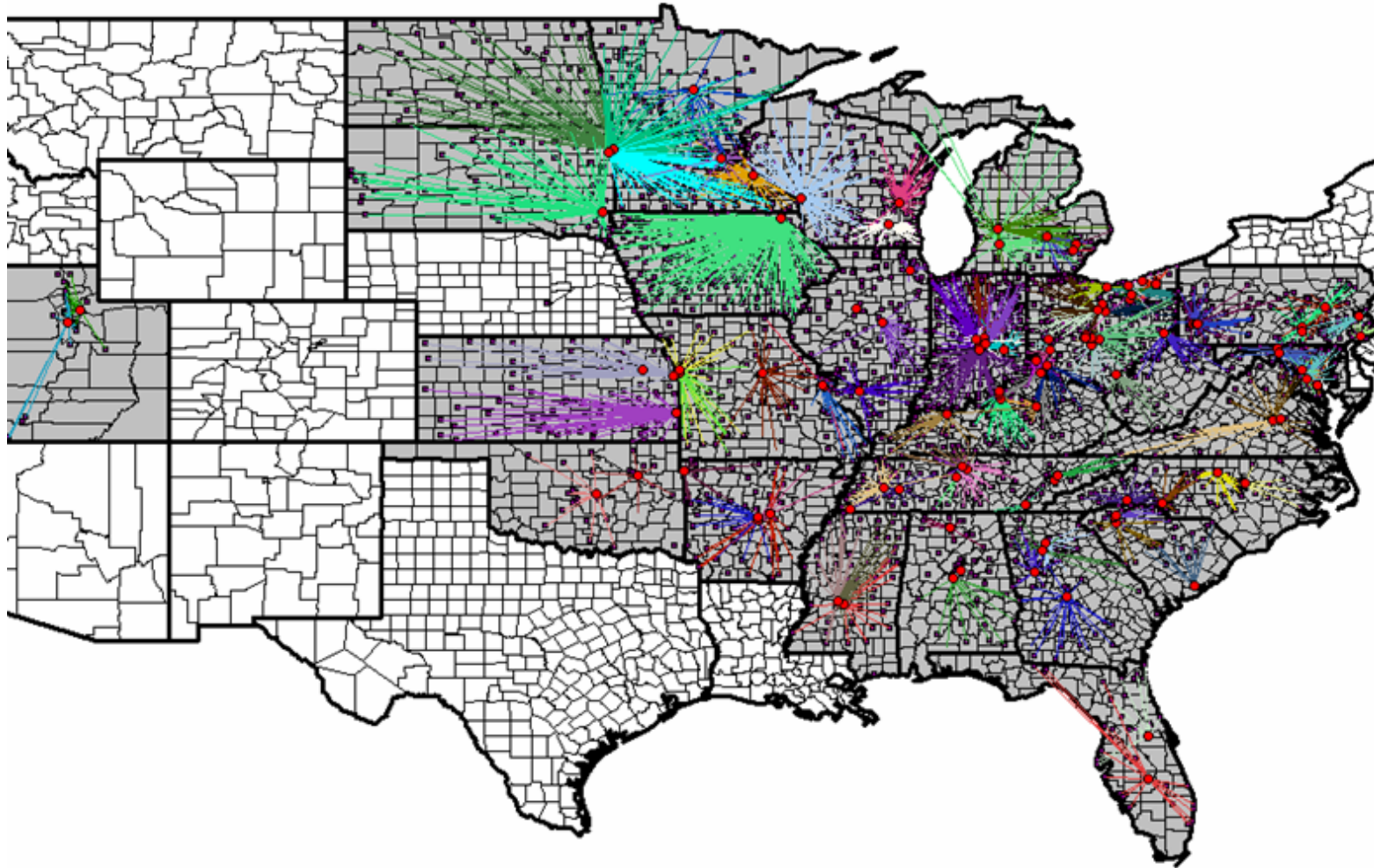
What's the max and average distance?

□ Right click the field that identifies your stores and select "Summarize".

What's the max and average distance?

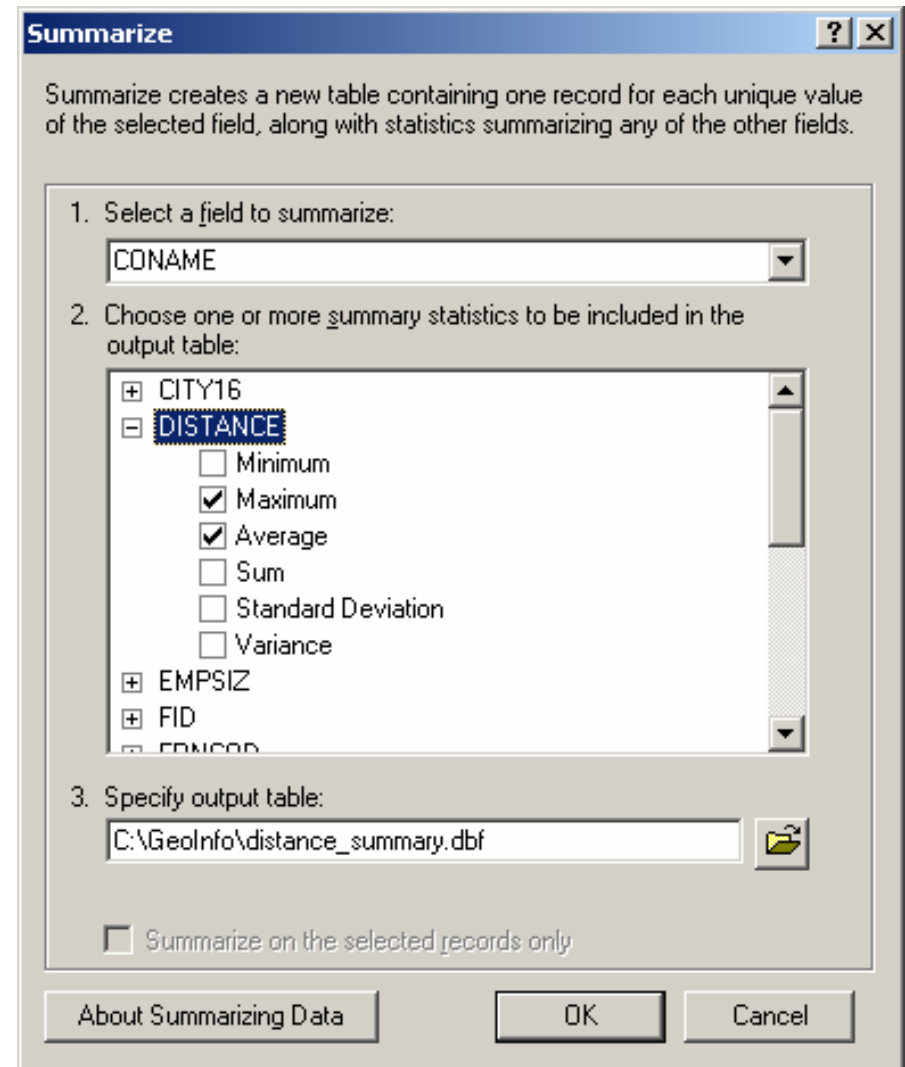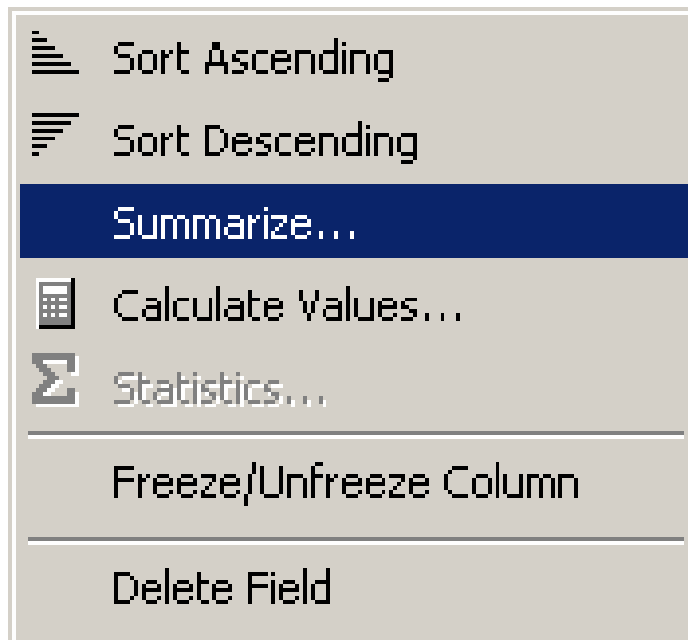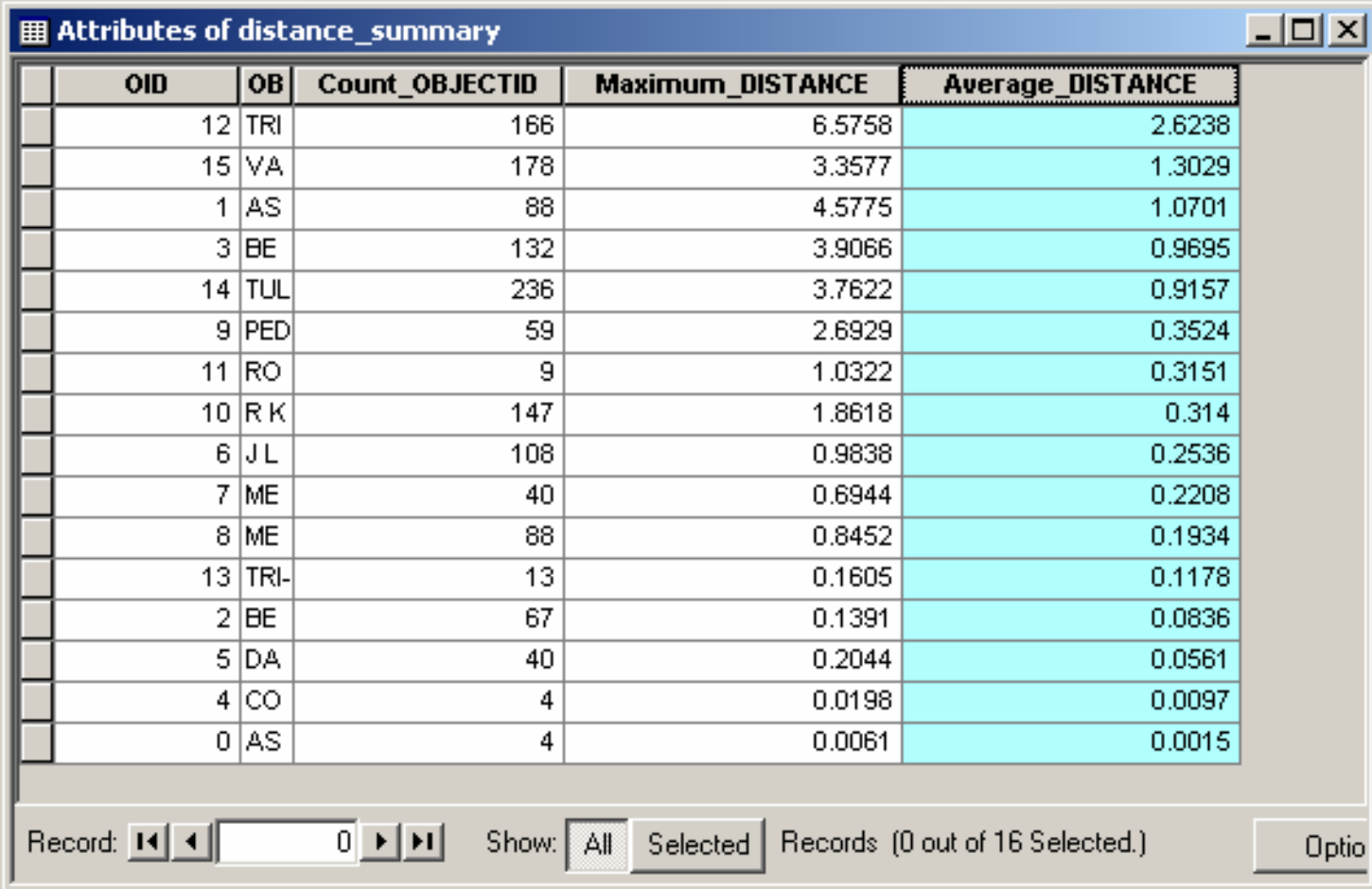□ The table lets you sort the data to compare each office's distance values—and then compare that to sales, number of accounts and other business data.

	OID	OB	Count_OBJECTID	Maximum_DISTANCE	Average_DISTANCE
	12	TRI	166	6.5758	2.6238
	15	VA	178	3.3577	1.3029
	1	AS	88	4.5775	1.0701
	3	BE	132	3.9066	0.9695
	14	TUL	236	3.7622	0.9157
	9	PED	59	2.6929	0.3524
	11	RO	9	1.0322	0.3151
	10	R K	147	1.8618	0.314
	6	J L	108	0.9838	0.2536
	7	ME	40	0.6944	0.2208
	8	ME	88	0.8452	0.1934
	13	TRI-	13	0.1605	0.1178
	2	BE	67	0.1391	0.0836
	5	DA	40	0.2044	0.0561
	4	CO	4	0.0198	0.0097
	0	AS	4	0.0061	0.0015

Attributes of distance_summary

Record: 0   Show: All Selected   Records (0 out of 16 Selected.)   Optio

Is the organizational structure equally distributed? Is this efficient and cost effective?

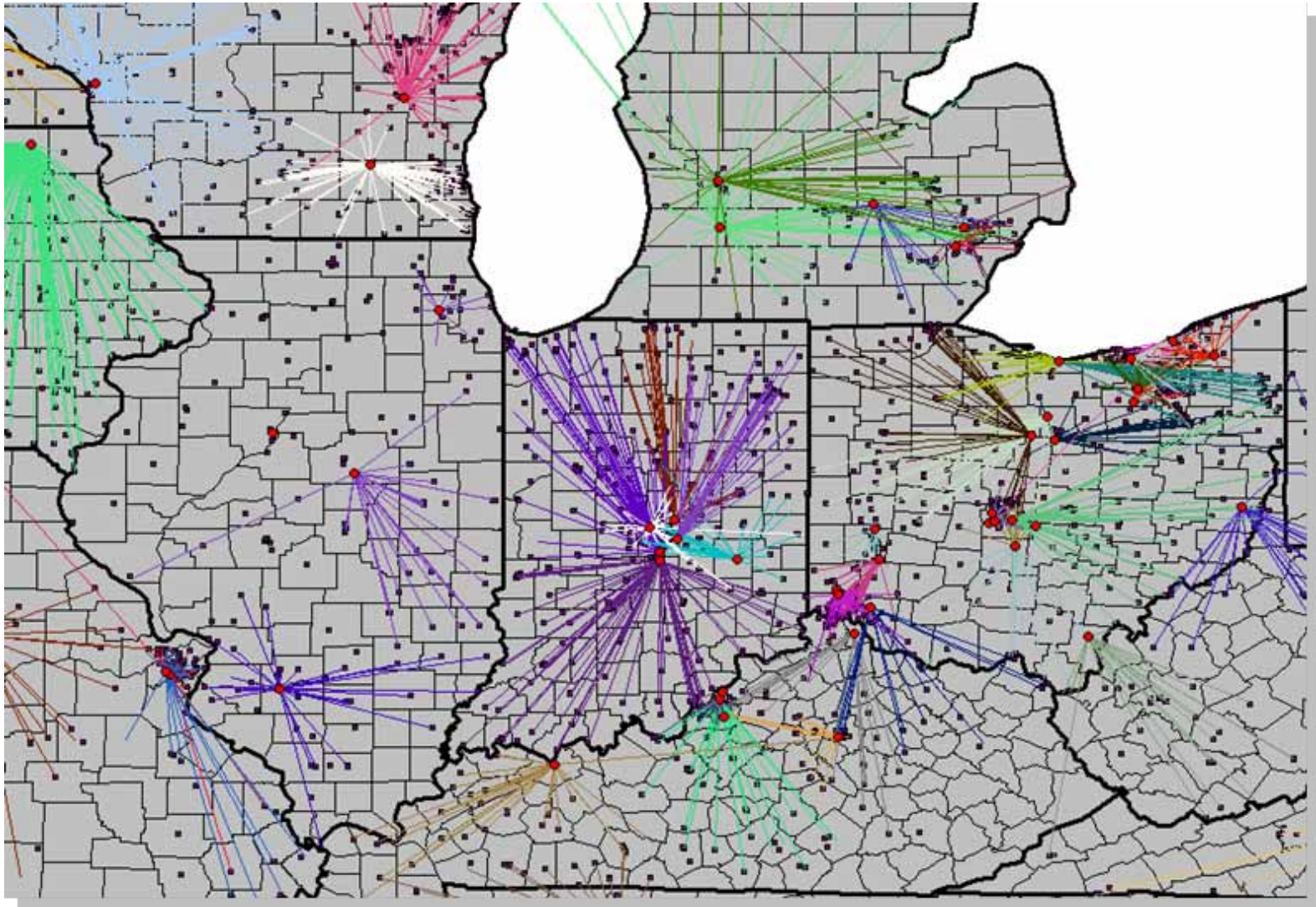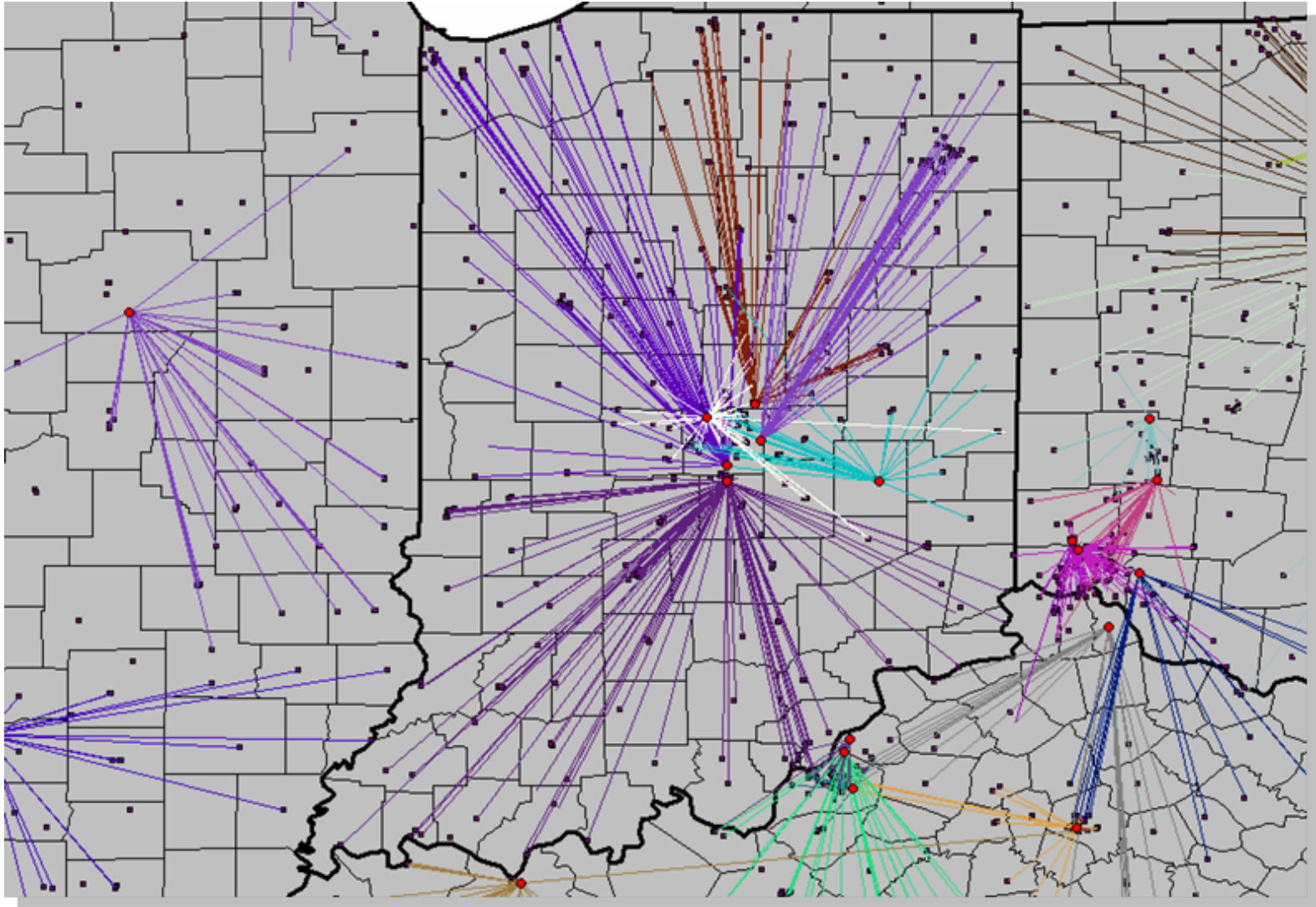
Image used with permission.

Why are some accounts assigned to very distant locations when another office is closer?

Image used with permission.

Should the structure be revised?
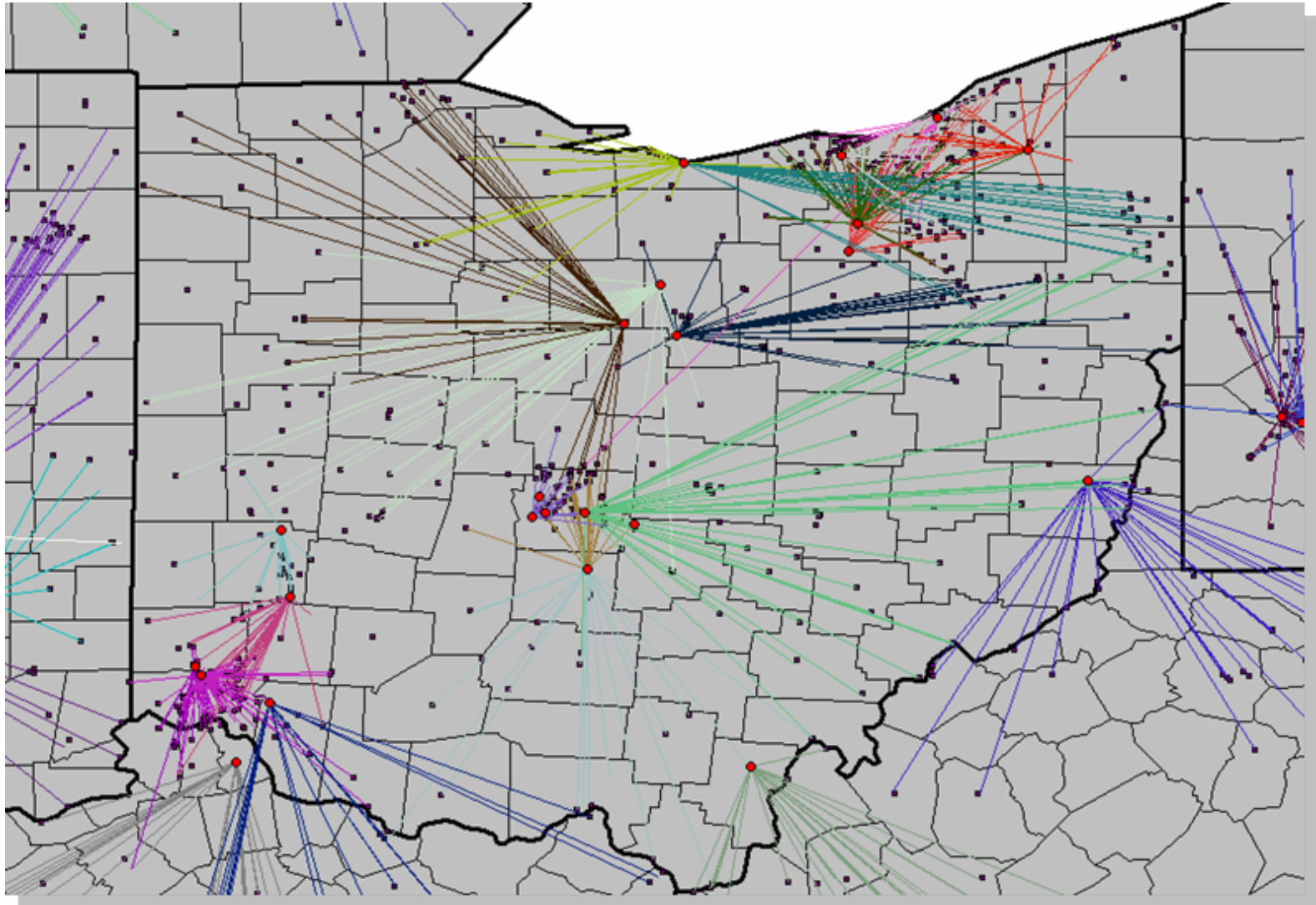

Image used with permission.

6 + 2 = 8 vs. 8 = 6 + 2

"Having the right answer means you do not have to listen to other answers because they can never be

'more than right'.

The result is a severe limitation on thinking."

-Dr. Edward DeBono

http://www.edwarddebono.com/WeeklyMessage.php?PHPSESSID=666a4387cc52495aaf8db2443982231b

Point Proximity for Retail Market Study

- ☐ We don't have "right" answers.

- ☐ There are limitations in market analysis.

- ☐ But GIS gives us a way to look at the market in a different way.

Defining the Market Area

☐ How do we define the market area? How large should the market area be?

☐ Can our competitors help us understand the market?

■ How do competitors cover the market?

■ What is the average proximity of the competitors within the market area?

Step 1: Select your Business Locations

- ☐ Show population density for the market area. (Indianapolis)
- ☐ Load the competition business locations. (Quick Lubes)
- ☐ The points are clearly clustered, but how big should the market area be?
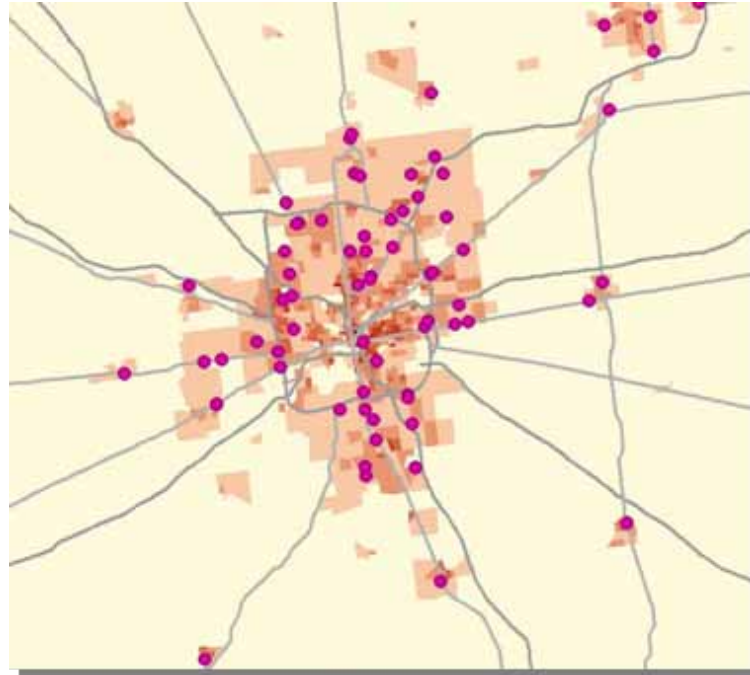
Step 2: Spatial Statistics Tools

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- Spatial Statistics Tools
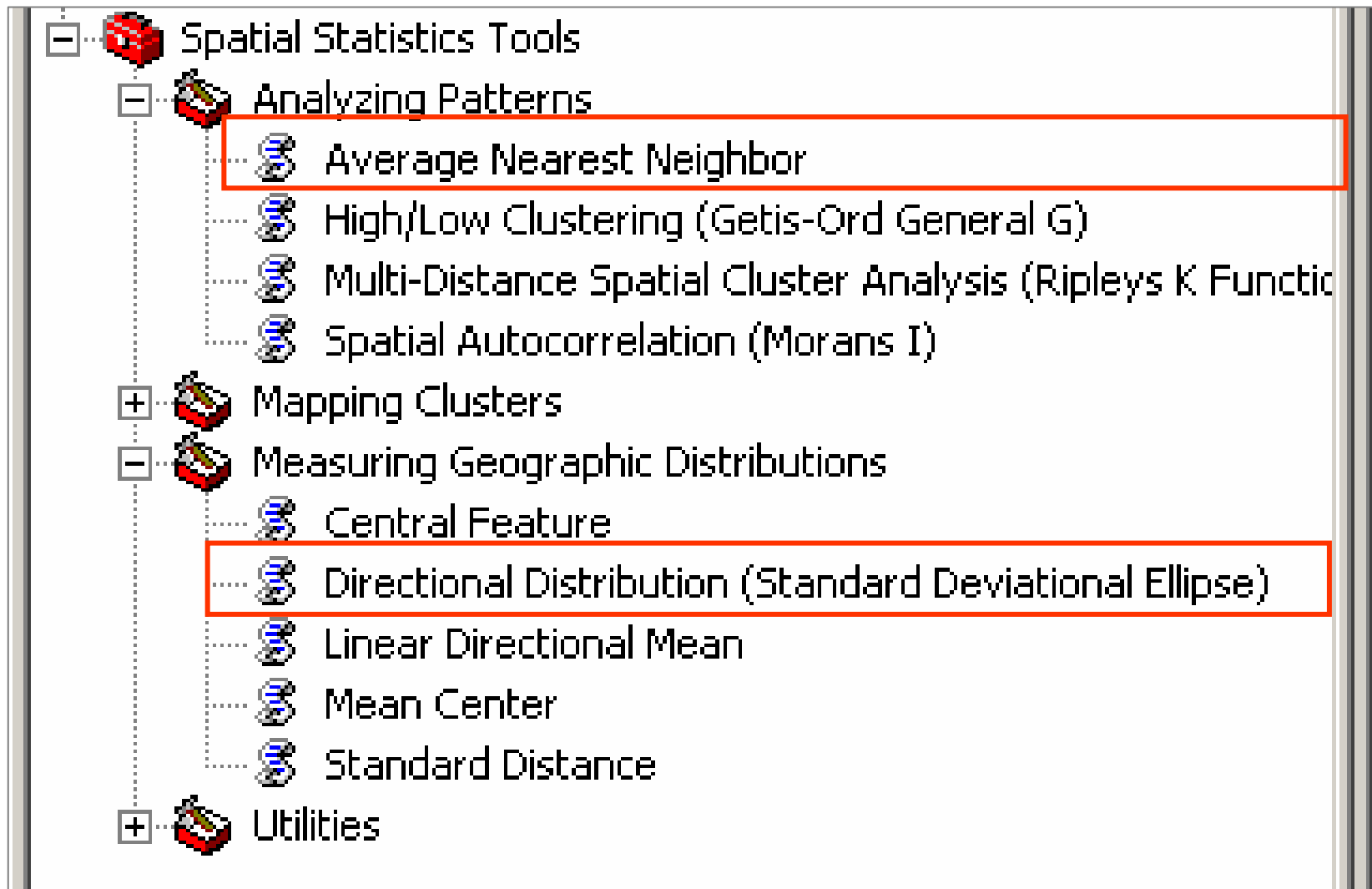 - Analyzing Patterns
    - Average Nearest Neighbor
    - High/Low Clustering (Getis-Ord General G)
    - Multi-Distance Spatial Cluster Analysis (Ripleys K Functic
    - Spatial Autocorrelation (Morans I)
  - Mapping Clusters
  - Measuring Geographic Distributions
    - Central Feature
    - Directional Distribution (Standard Deviational Ellipse)
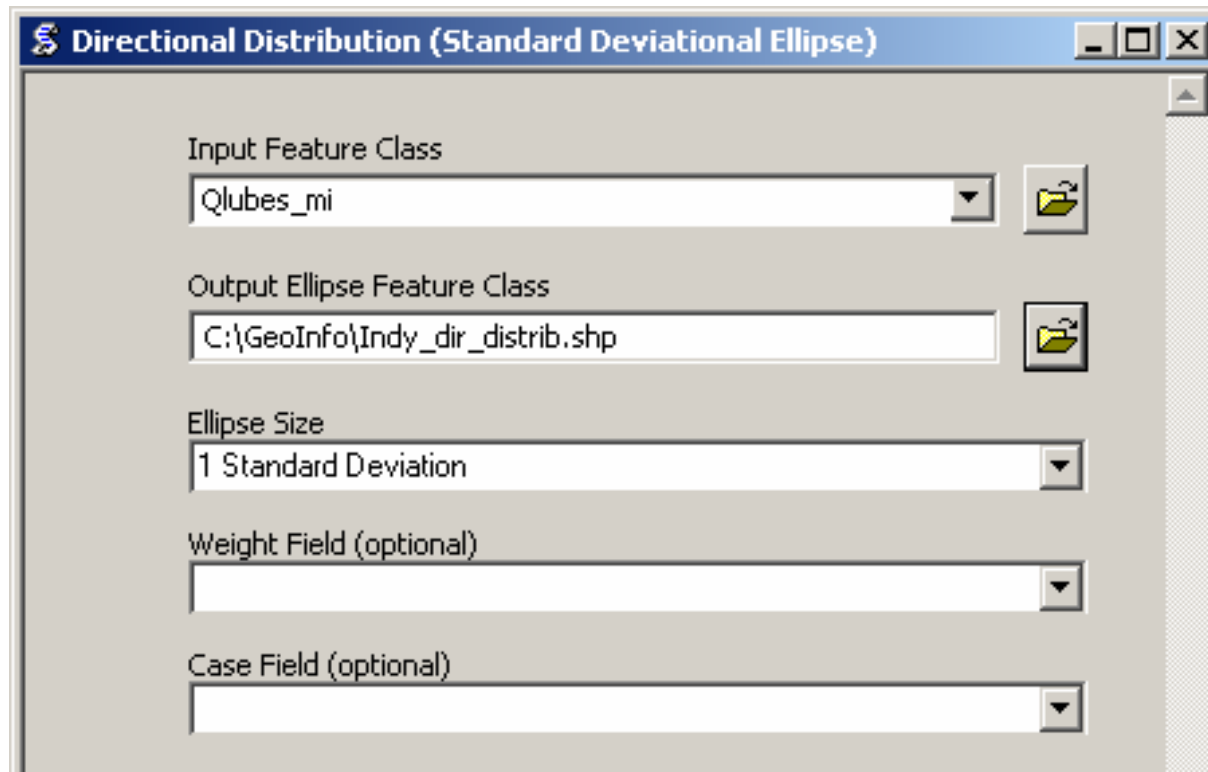   - Linear Directional Mean
    - Mean Center
    - Standard Distance
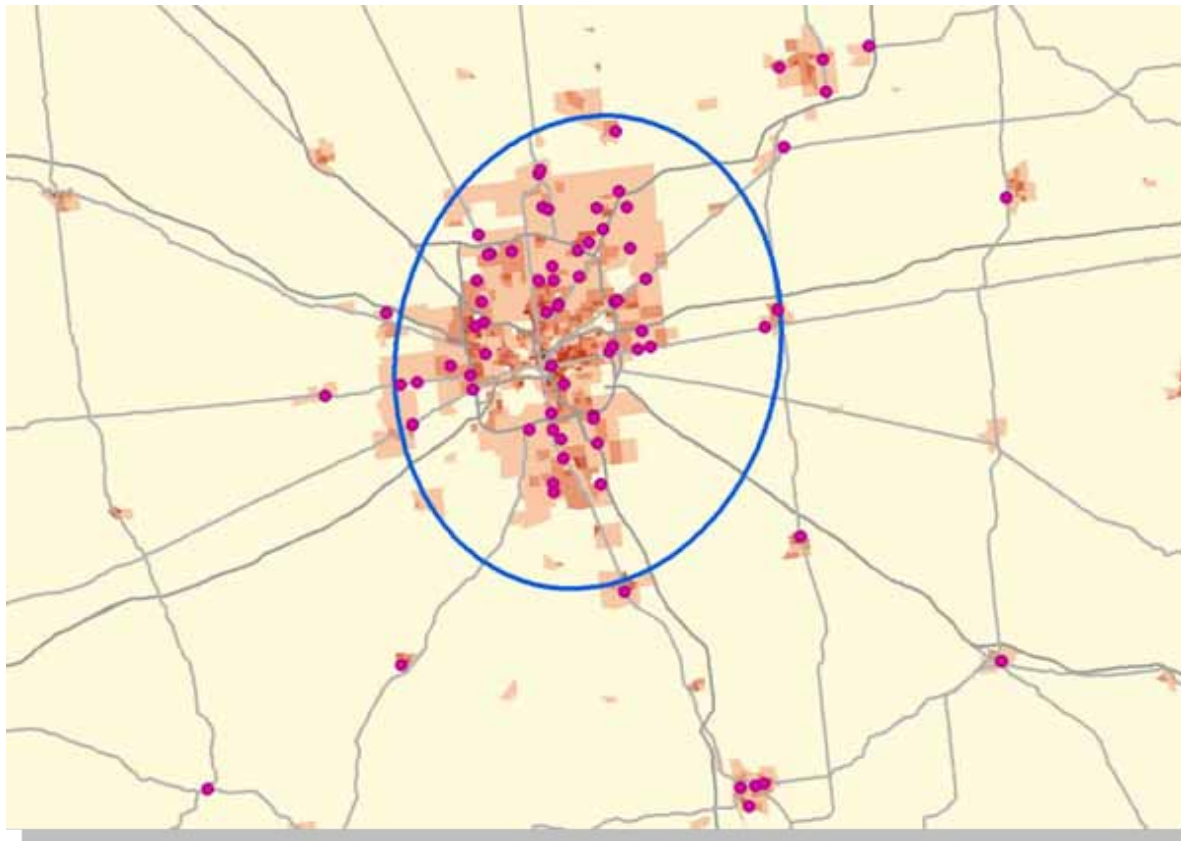 - Utilities

Step 2: Calculate Directional Distribution

☐ Calculate the Standard Deviational Ellipse
  ■ Requires a projected map layer.

Step 2: Calculate Directional Distribution

☐ The ellipse helps to define the market area.

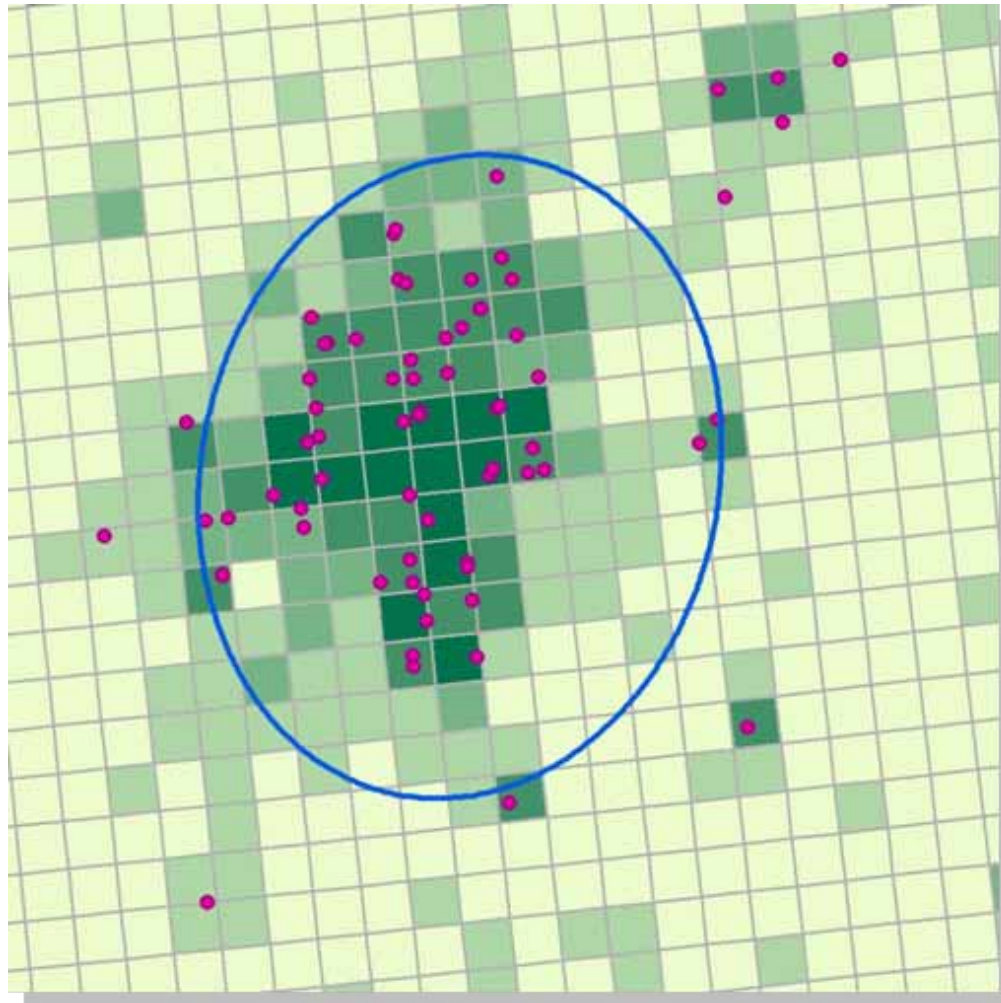# Step 3: Calculate Proximity

☐ Calculate the average proximity using the Average Nearest Neighbor tool: 3.3 miles

■ Requires a projected map layer.
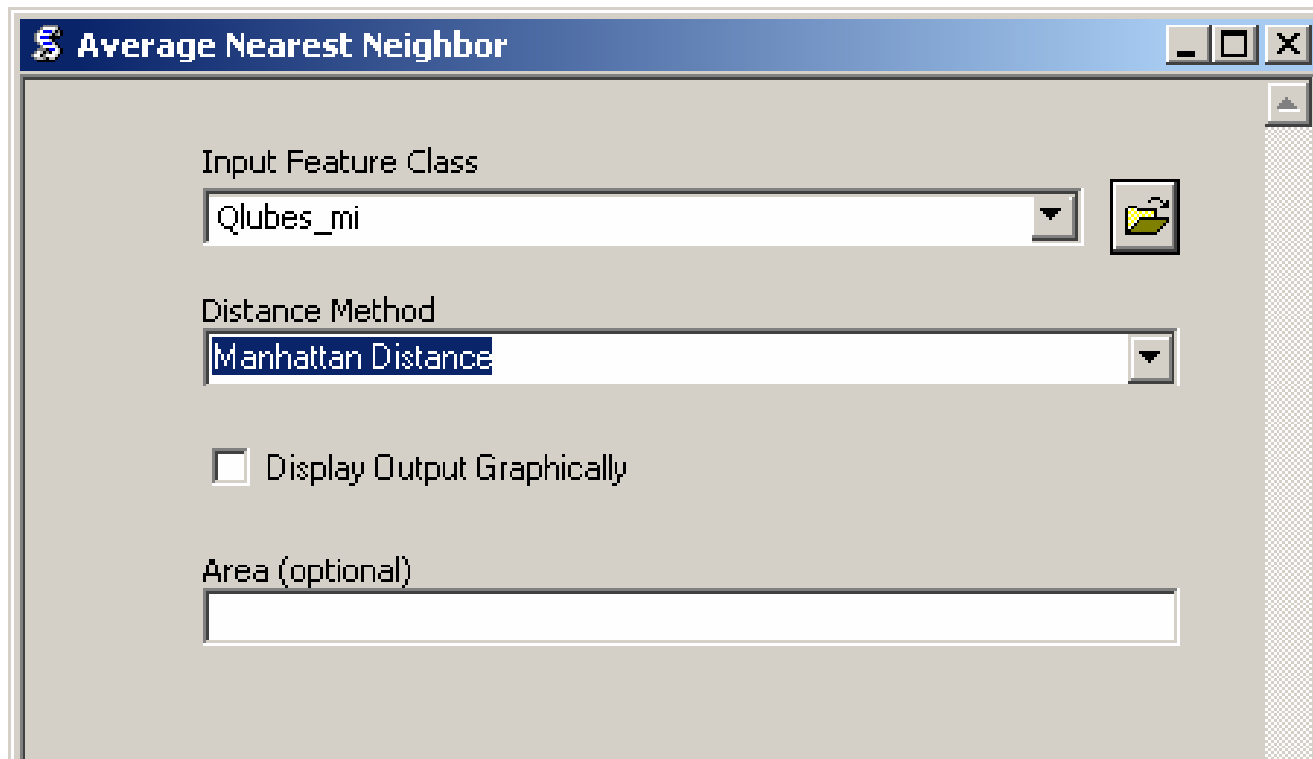
3-Mile Grid with Population 18+

3-Mile Grid

2006 Total Pop 18+

	0 - 1,000
	1,001 - 5,000
	5,001 - 10,000
	10,010 - 20,000
	20,010 - 33,280
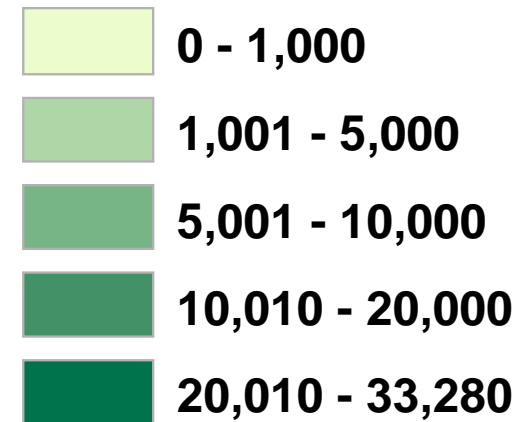
Small Sample:
Avg. Nearest Neighbor Distances in Indianapolis

Restaurants	0.13
Grocery Stores	0.69
Department Stores	0.70
Kmart, Target, and Wal-mart	0.95
McDonald's	2.40
Starbucks	3.00
KFC	5.70
Target	6.40
Wal-mart	7.30
Kmart	11.00

More Work Is Needed

- More industries
- More markets
- Comparison of similar market areas
  - E.g. Using a "Threshold Ring" for CBSA centroids to generate rings of equal population and then use "Find Similar" to find those that have the same population density.

Point Proximity Analysis–
A Tool for "Bigger Box" Thinking

"Innovation is not just about
connecting dots in a new way.
It's also about picking the right dots and,
as Steve Jobs has pointed out,
having a lot of dots to connect."
-Anders Hemre

http://thoughtblender.blogspot.com/2006/09/connecting-dots-and-thinking-inside.html
http://www.wired.com/wired/archive/4.02/jobs.html?pg=8&topic=

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Questions?

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