1. Spatial Analysis of Enrollment Data

1.1: Kansas Community College Service Areas Defined using Thiessen Polygons

Thiessen polygons (the lines which define them are referred to as Voronoi lines) delimit for us on a map a very unique area. In examining Figure 1 below you will note that each community college shown sits in its own area as defined by a polygon. The uniqueness of each polygon is that for any point selected within it, the distance is closer to the central point (the community college as marked) than to any other central point on the map. For example, if one were to randomly choose a location within *Cloud CCC's* polygon, the *lineal* distance to the CCCC campus would be shorter from the point chosen than to, let's say, Barton CCC. The utility of Thiessen polygons lies in a result that defines the mathematically optimal placement of borders around a given point in relation to other points of the same type, thus defining a service area in which a customer can travel the minimum (lineal) distance to receive the services of a given business (actual distance to travel over a network, i.e., roads, may be different).
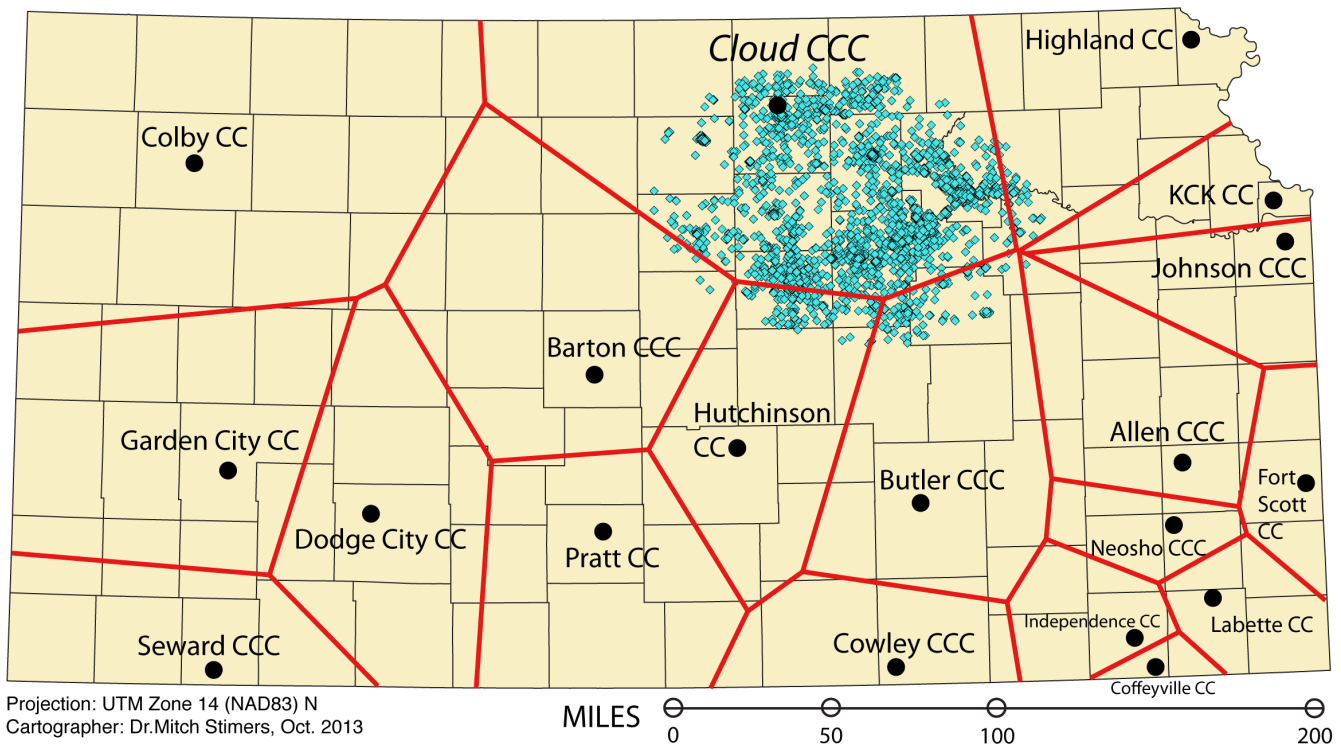

Figure 1: Thiessen Polygons.

1.2: Spatial Clustering of Enrolled Students by Home Address using Standard Deviational Ellipses

Student home addresses (2008-2012, N=15,869) in the United States were geocoded within a Geographic Information System (GIS) to produce a point file with a geographic coordinate attached to each address. That file was reduced to students in Kansas and southern Nebraska, a geographic area that accounted for 89.3% of students (N=14,172) over the study period. A standard deviational ellipse (SDE) was applied at one and two standard deviations from the mean geographic center based on the point cluster in the area shown. Results show that within one standard deviation from the mean center, CCCC captured 74% of its total student body, and 94% of the student body's home address falls within two standard deviations (this is to be expected in a normally distributed population); just 6% of the total student body falls outside of the second SDE. What is important to note here is not necessarily the percent of students in each SDE, but the percent *and* spatial extent of those ellipses (Figure 2).

(Figure 2, following page)

Home Addresses of Enrolled Students, 2008-2012
located in...

◆ *...the 1st Standard Deviational Ellipse* (n=10,413)
◆ *...the 2nd Standard Deviational Ellipse* (n=13,362)

✻ 0.8% total in Johnson and Wyandotte Counties combined (n=235)   ✶✶ 1.7% total in Sedgwick County (n=127)

*The SDEs were based the mean geographic center of all student home addresses in **Kansas and Southern Nebraska (N=14,172)** as mapped below.*
Percent figures listed indicate percent of enrolled students, 2008-2012, based on that area only, and contained with each ellipse, as well as outside of those ellipses.
Student addresses in the study area shown below represent 89.3% of all enrolled student addresses (15,869) from 2008-2012.

CCCC
74%

6% total fall outside both ellipses

94%

✶✶
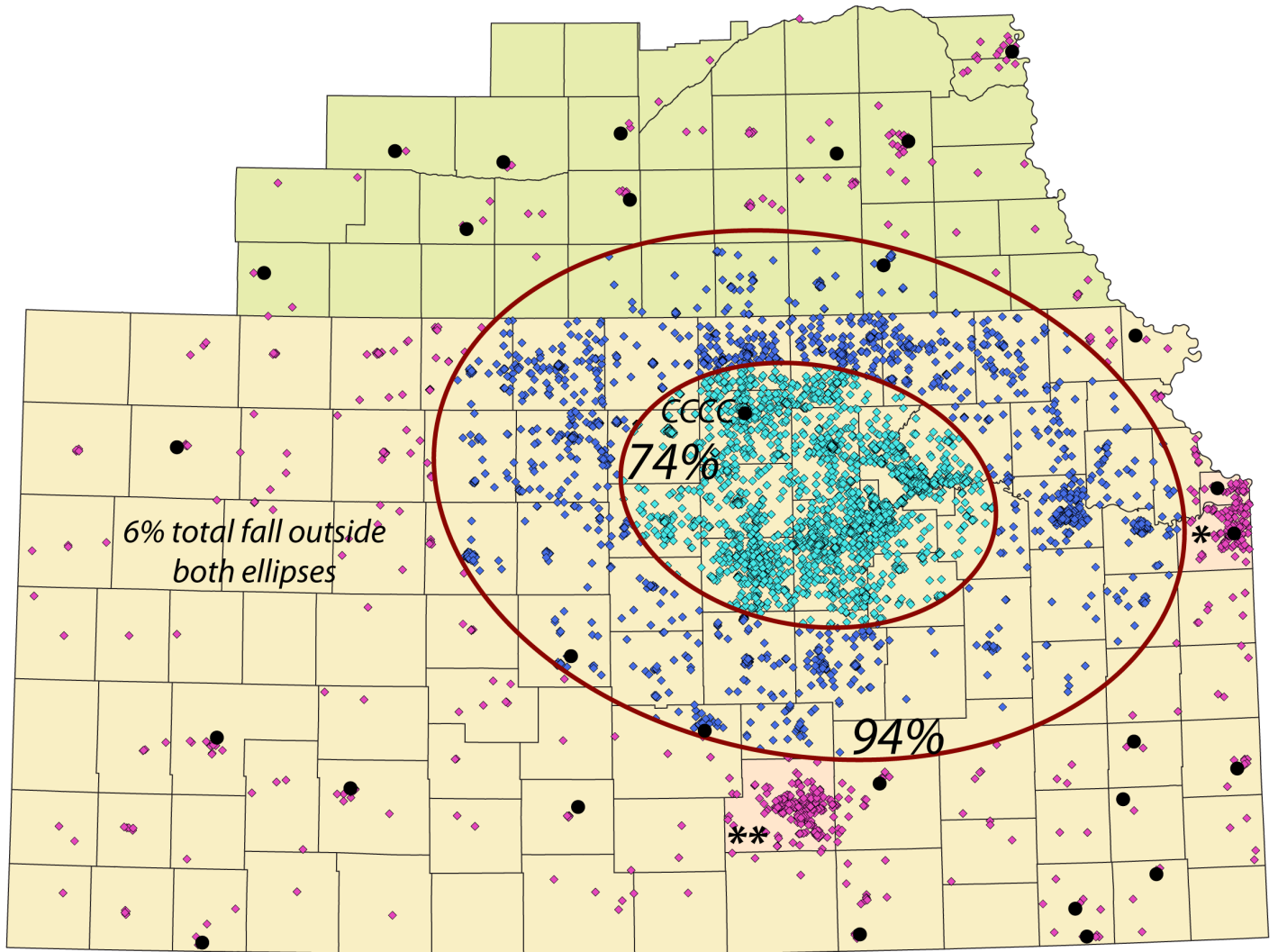
Projection: UTM Zone 14 (NAD83) N
Cartographer: Dr. Mitch Stimers, Oct. 2013

MILES
0   50   100   200

Nebraska   ● Community College Locations
Kansas   ◆ Home Addresses, Enrolled Students, 2008-2012, Outside Both Ellipses (n=810)

N

Figure 2: Standard deviational ellipses.

The final map in this series is relatively straightforward; it displays the location of all high schools in Kansas who contributed 1 percent or more to the total CCCC student body over the study period (Figure 3 - these data are also listed in Section 2 in table form). These data apply to a subset of the population over the study period, those of 24 years of age and younger (*n*=7,520). Similar data were not mapped for the age 25 and older cohort (*n*=6,837).

High Schools that Contributed 1% or More to the Total CCCC Student Body, 2008-2012

● 9.4%	● 5.6%	● 5.4%	● 4.3%	● 3.8%	○ Other 23 shown, 3.2-1.1%

Total of these 28: 67.7%
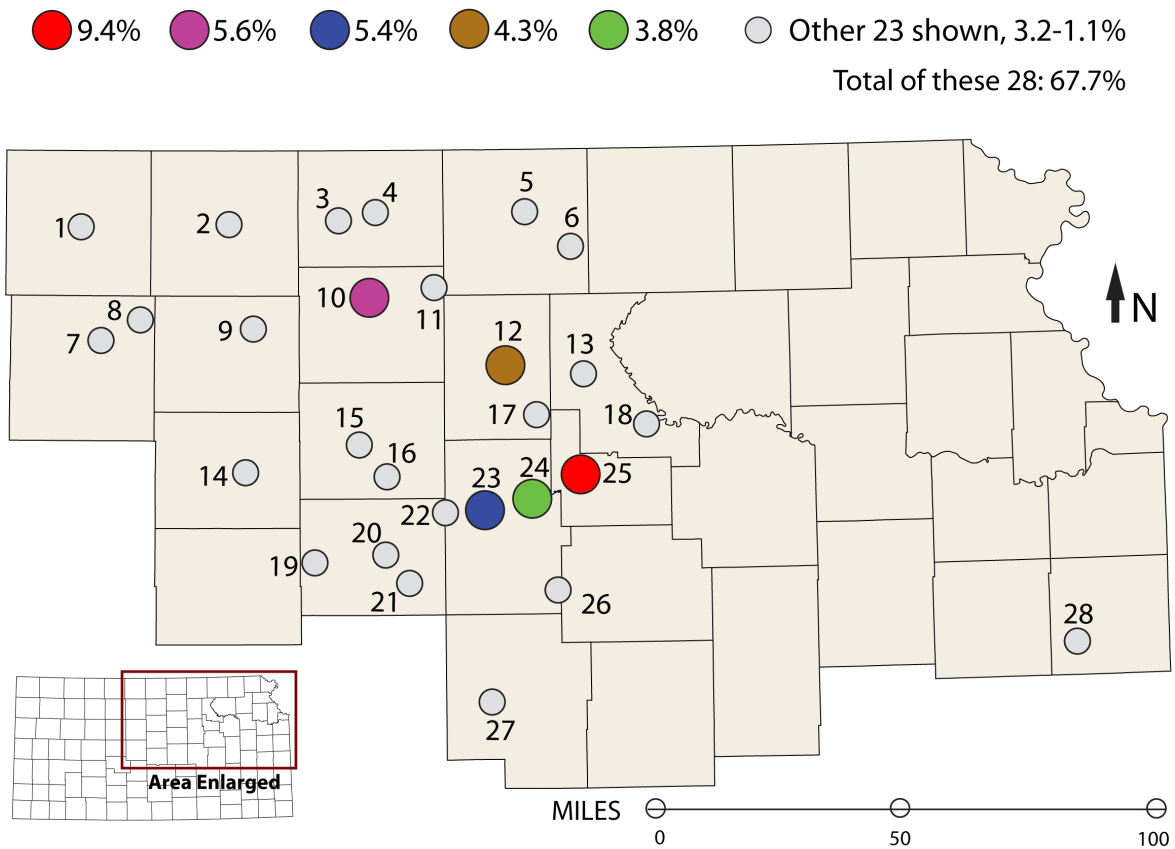
1. Smith Center Jr.–Sr.	11. Clifton–Clyde	21. Southeast Saline Senior
2. Rock Hills	12. Clay Center	22. Solomon Jr.–Sr.
3. Pike Valley	13. Riley County	23. Abilene
4. Republic County	14. Lincoln	24. Chapman
5. Washington County	15. Minneapolis	25. Junction City
6. Hanover	16. Bennington	26. Herington
7. Osborne	17. Wakefield	27. Hillsboro
8. Lakeside High School At Downs	18. Manhattan	28. Linn
9. Beloit	19. Eli–Saline	
10. Concordia	20. Salina High	

Projection: UTM Zone 14 (NAD83) N
Cartographer: Dr. Mitch Stimers, Oct. 2013

Figure 3: Kansas high school contributions, students age 24 and younger.