FAQs

Business Analyst 9.1: How data is aggregated for a trade area

Business Analyst

1. **How is data calculated for a trade area?**
    ESRI uses a sophisticated Weighted Block Centroid geographic retrieval methodology to calculate data for rings and other trade areas. This method provides the most accurate information for rings and polygons.

    The basic principle - A geographic retrieval methodology determines how data is gathered and then summarized or aggregated for each ring. For standard geographic units, such as counties or ZIP Codes, the link between a designated area — called a trade area — and its attribute data is a simple one-to-one relationship; if a trade area contains a selection of ZIP Codes, the data retrieval is a simple process of gathering the data for those ZIP Codes.

    The geographic retrieval process for rings and other trade areas (eg drive time polygon) is more complicated because a ring may transect a geographic unit such as a county or ZIP Code. How much of a geographic unit must fall inside the ring for it to be included in the data? Can the aggregation include only data for that portion of the geographic unit that falls inside the ring? There are several approaches to solving this dilemma.

    The simple approach - To produce a report of data for these areas, underlying geographic areas must be collected. The most basic method for aggregating data for trade areas is to use a point-in-polygon approach to gather the Census Block Groups within the trade area and aggregate the data for the Block Groups.

    The first map illustrates a store location within a ring with a one-mile radius. The highlighted polygons within the ring represent all the Block Groups within the trade area selected by the point-in-polygon procedure. By using a simple Block Group retrieval methodology, the population of each selected Block Group would be aggregated to create a trade area total.
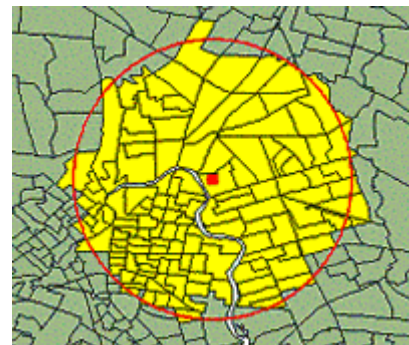
    Why simple Block Group retrieval is inaccurate - The second map zooms in on two specific Block Groups in the map above. The highlighted Block Group (340030473003) on the map illustrates the fundamental weakness of using Block Groups exclusively in a point-in-polygon approach. Because the centroid of the polygon is within the one-mile radius ring, the entire Block Group is included in the aggregation. For example, if a user calculates population for the one-mile radius trade area, the entire population of the

highlighted polygon would be included in the total even though approximately half of the Block Group is outside the trade area. This assignment weakness can severely skew the results of a trade area aggregation because many Block Groups contain a large population.
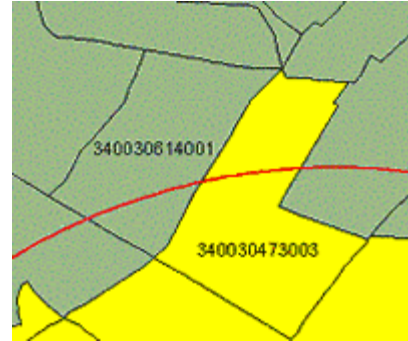
The inverse of this apportionment problem also contributes to the inaccuracy of this geographic retrieval approach. In the same example above, a substantial portion of Block Group 340030614001 is contained within the trade area, but none of the Block Group's attributes will be utilized during the aggregation process. This problem can have a significant effect on the aggregation process and contributes to inaccurate information on demographic reports.

Why Weighted Block Centroid retrieval is better - Because of these weaknesses, a more sophisticated geographic retrieval methodology is employed by ESRI to aggregate data for rings and other polygons. The Weighted Block Centroid retrieval approach uses Census Block data to better apportion Block Groups that are not exclusively contained within a trade area.

Census Blocks are the smallest unit of census geography. They are used to create all other levels of census geography. For example, one or many blocks are aggregated to create a Block Group. In the third map, the blue dots represent the geographic centroids for the 13 blocks that make up the highlighted (yellow) Block Group. Unfortunately, only a small subset of data (households, population, housing units, and number of businesses) is available at the Census Block level and, therefore, cannot be used to aggregate most data for a trade area.

Block centroids within a trade area are used to calculate a weight for the highlighted Block Group. These weights are then used to more accurately gather and aggregate demographic data for rings and other polygons.