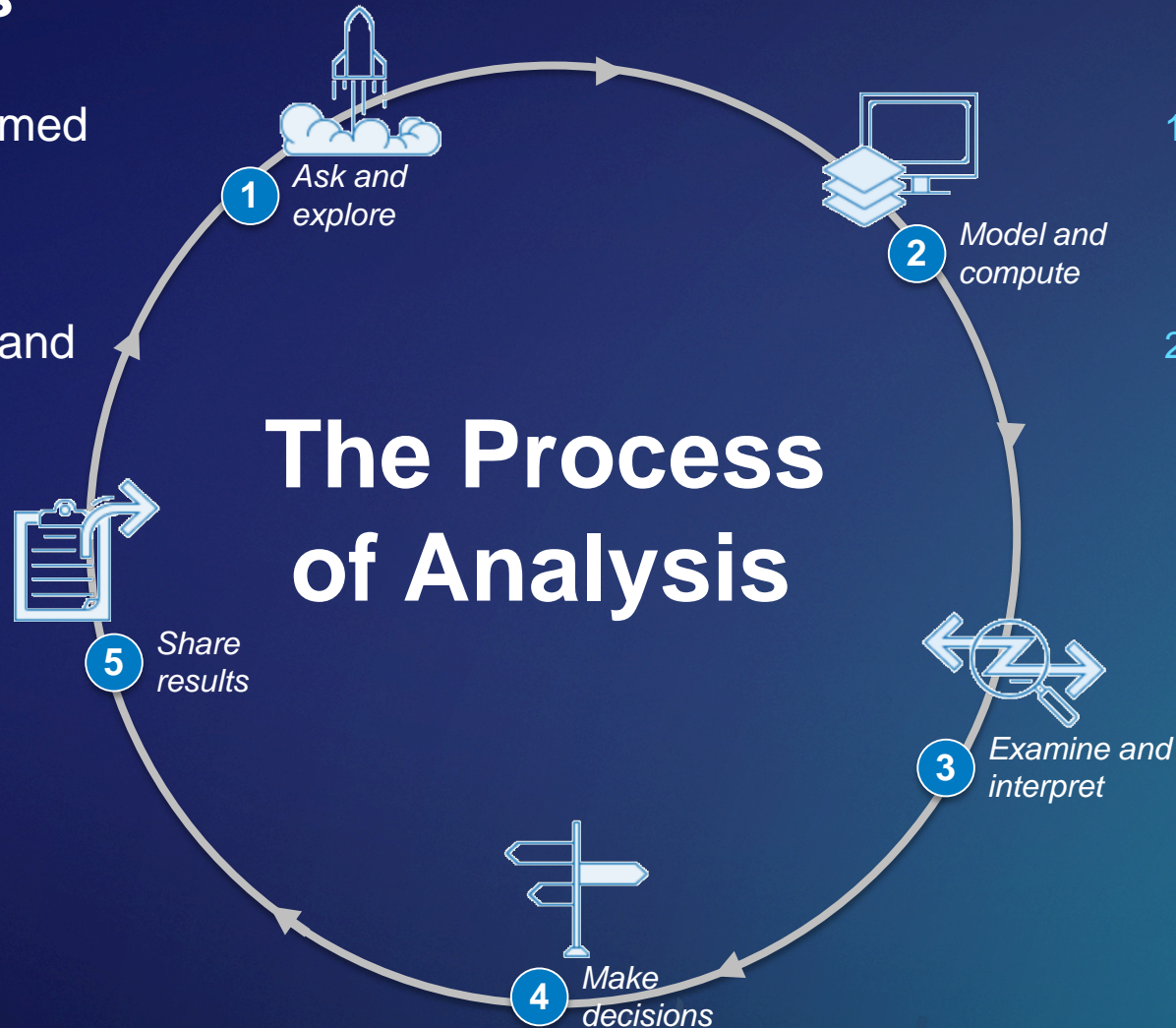# Gaining Insights from Your National Security Data

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Technical Demonstration

Steps of Analysis

1. Begins with a well-framed question

2. Manipulate, quantify, and manage your data

The Process of Analysis

1. **Ask and explore**

2. **Model and compute**

3. **Examine and interpret**

4. **Make decisions**

5. **Share results**

1. Increasingly data is being automatically collected

2. The analyst must find the value in the collected data

An analyst must understand the data, analysis and the intersection between the two

Why?

Spatial is Special

Available with Online or Enterprise

OR

ArcGIS Online

**Your infrastructure
(physical, virtual, or cloud)**

ArcGIS Enterprise

Insights for ArcGIS®

Data type: — Qualitative — Quantitative — Temporal

Measure: ascertain the size, amount, or degree of (something)

A bar graph uses either horizontal or vertical bars to show comparisons among categories. They are valuable to identify broad differences between categories at a glance.

A treemap shows both the hierarchical data as a proportion of a whole and, the structure of data. The proportion of categories can easily be compared by their size.

Bubble charts represent numerical values of variables by area. With two variables (category and numeric), the circles placed so they are packed together.

A heat chart shows total frequency in a matrix. Values in each cell of the rectangular grid are symbolized into classes.

Relationship: a connection or similarity between two or more things or, the state of being related to something else

A choropleth map allows quantitative values to be mapped by area. They should show normalized values not counts collected over unequal areas or populations.

A chord diagram visualizes the inter-relationships between categories and allows comparison of similarities within a dataset or, between different groups of data.

Scatterplots allow you to look at relationships between two numeric variables with both scales showing quantitative variables. The level of correlation can also be quantified.

Link analysis is used to investigate relationships between entities where and an entity is an object, person, place or event. Links connect two or more entities.

Spider lines , also termed desire lines, show paths between origins and destinations. They show connections between places.

Change: process through which something becomes different, often over time

A bar graph uses either horizontal or vertical bars to show comparisons among categories. They are valuable to identify broad differences between categories at a glance.

A heat chart shows total frequency in a matrix. Using a temporal axis values, each cell of the rectangular grid are symbolized into classes over time.

Bubble charts with three numeric variables are multivariate charts that show the relationship between two values while a third value is shown by the circle area.

Graduated symbol maps show a quantitative difference between mapped features by varying symbol size. Data are classified with a symbol assigned to each range.

A Density/heat map calculates spatial concentrations of events or values enabling the distribution to be visualized as a continuous surface.

A Data clock creates a circular chart of temporal data, commonly used to see the number of events at different periods of time.

Line graphs visualize a sequence of continuous numeric values and are used primarily for trends over time. They show overall trends and changes from one value to the next.

A combo chart combines two graphs where they share common information on the x-axis. They allow relationships between two datasets to be shown.

Interaction: flow of information, products or goods between places

A chord diagram visualizes the inter-relationships between categories and allows comparison of similarities within a dataset or, between different groups of data.

Spider lines, also termed desire lines, show paths between origins and destinations. Flow maps show directional connections and flow between places.

Distribution: the arrangement of phenomena, could be numerically or spatially

Histograms show the distribution of a numeric variable. The bar represents the range of the class bin with the height showing the number of data points in the class bin.

A box plot displays data distribution showing the median, upper and lower quartiles, min and max values and, outliers. Distributions between many groups can be compared.

A choropleth map allows quantitative values to be mapped by area. They should show normalized values not counts collected over unequal areas or populations.

Graduated symbol maps show a quantitative difference between mapped features by varying symbol size. Data are classified with a symbol assigned to each range.

A Density/heat map calculates spatial concentrations of events or values enabling the distribution to be visualized as a continuous surface.

A unique symbol map (areas or points) allows descriptive (qualitative) information to be shown by location. Areas have different fills and points can be geometric or pictorial.

Part-to-whole: relative proportions or percentages of categories, showing the relationship between parts and whole

Donut charts are used to show the proportions of categorical data, with the size of each piece representing the proportion of each category.
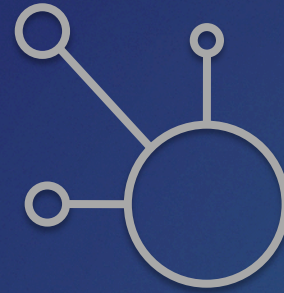
A treemap shows both the hierarchical data as a proportion of a whole and, the structure of data. The proportion of categories can easily be compared by their size.

esri

Linda Beale PhD, 2017

Link Analysis

Applicability of link analysis

- **Which nodes are critical sections of a network?**
  - Lines of communication in business or crime networks
  - Electrical transmission or water towers, distribution transformers or water mains etc.
  - Road intersections or bridges
  - Servers that are likely to get the most load
  - Key distribution centers, finding catchment and service areas
  - Spread of epidemic diseases
  - Critical transport routes by affected people
  - Flow of information of goods between people or places

Degree
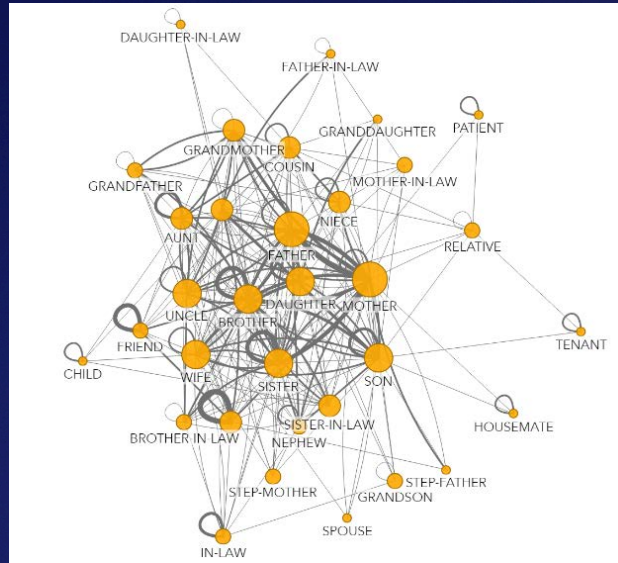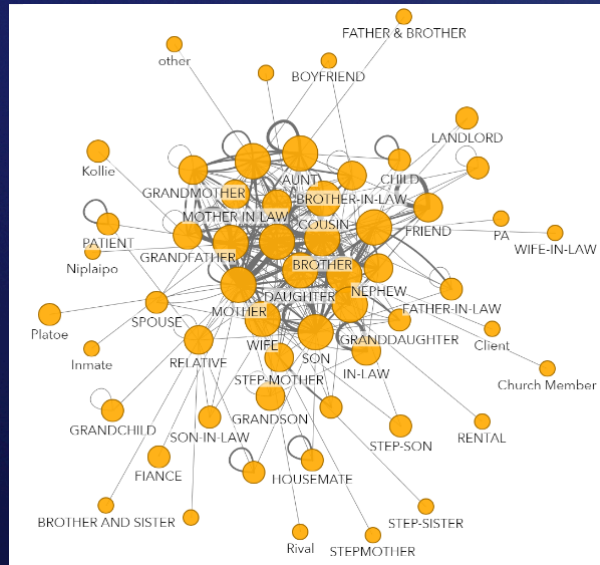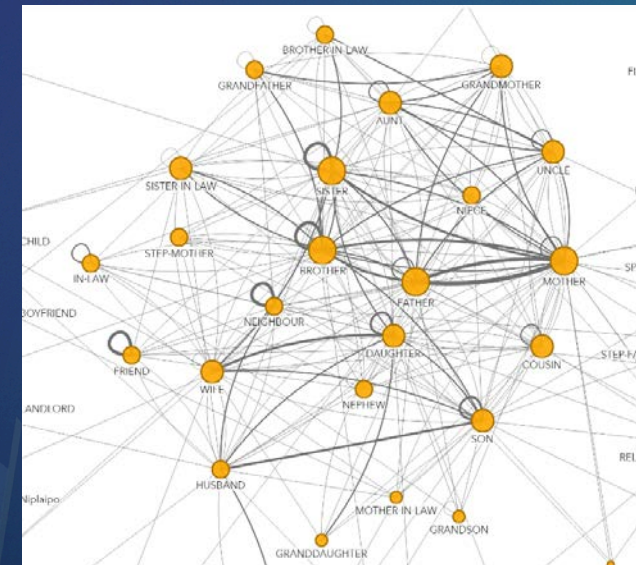

Betweeness
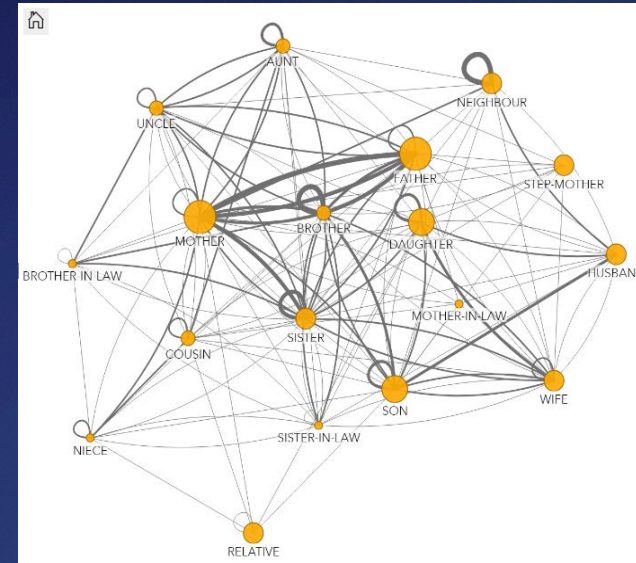
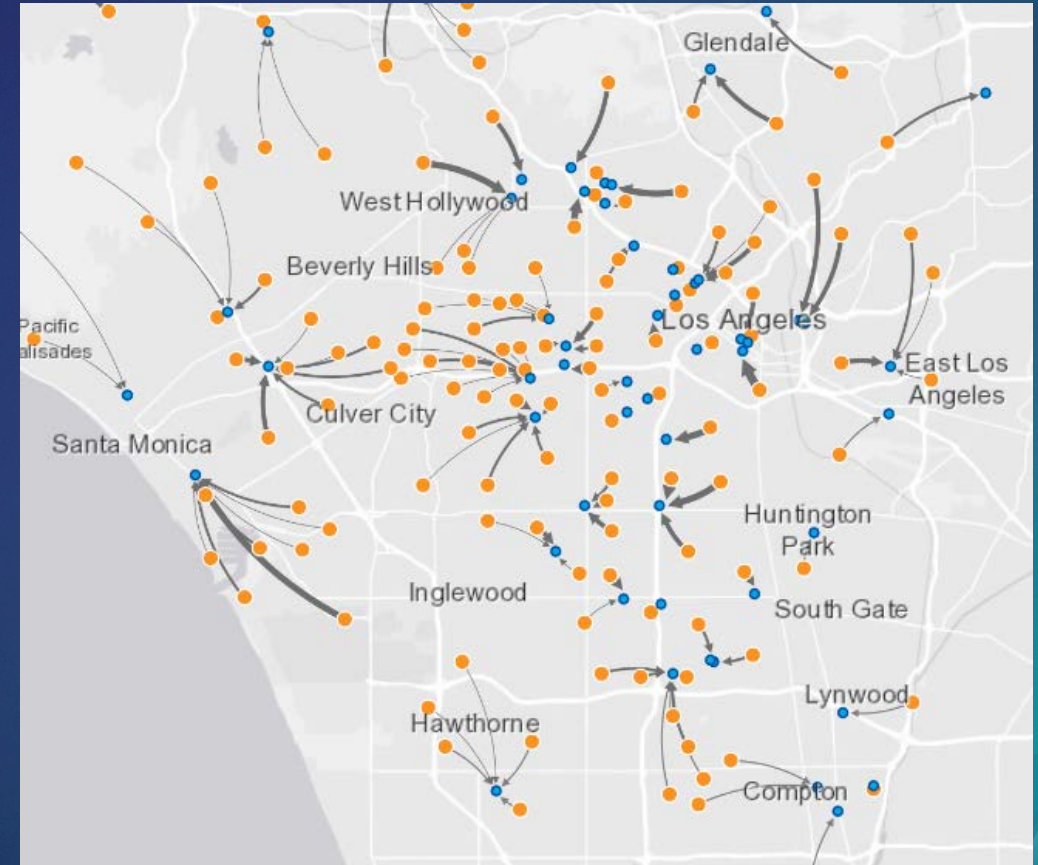**Closeness**

Eigenvector

Link maps

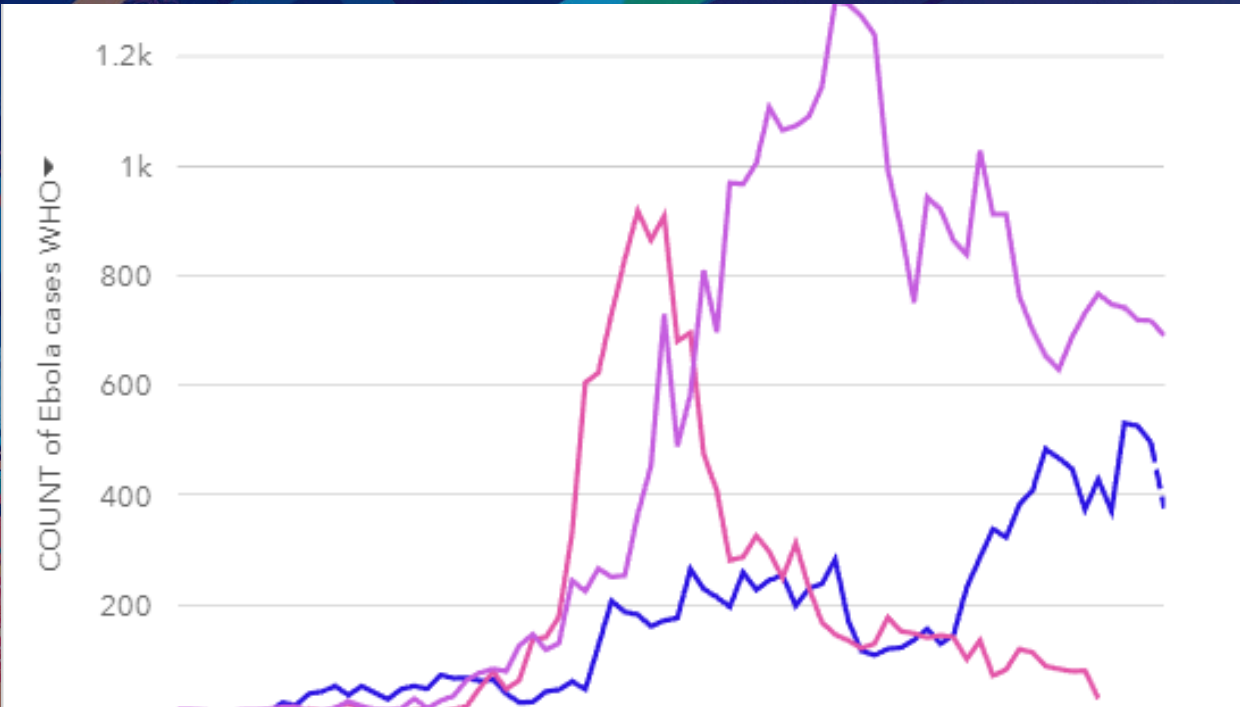- **Spider lines/Desire lines**
  - A desire line map shows straight lines connecting the origins and the destinations
  - Shows the shortest line between origin and destination

- **Flow maps**
  - Shows movement of people, goods, transport etc.
  - Displays direction of movement and can also show volume

- The same centrality analysis is available

Financial Crime Analysis

Linda Beale