# **Teacher Notes**

# **Intro to Statistics**

## **Motivation and Essential Understandings**

Businesses and other organizations often collect data on their users through apps. This data might include information about customer demographics, purchase habits and reviews. These same apps can also be used to track other types of data such as crime rates or census data. The goal of this lesson is to introduce students to Power BI, a business analytics tool. Students will utilize the tool to assess crime rates in the city of Baltimore and hypothesize reasons for the crime rates as it relates to different criminology theories.

* How are business analytical tools used to assess for crime rates or other socially relevant statistics?
* Which criminology theories provide insights on reasons behind crime rates?

## **Context and Dataset**

Power BI is a business analytics tool from Microsoft. This tool is designed to help organizations visualize their data in the form of charts, tables and other graphics. The interface is easy to use and allows organizations to develop their own reports and/or dashboards. The dataset used for this lesson is the crime rate data for the City of Baltimore. You will be guiding your students to understand and evaluate the use of Power BI to analyze crime statistics as well as the use of criminology theories to makes conclusions about the data.

## **Learning Objective**

## This lesson will introduce students to the application of business analytics tools to analyze crime statistics. Students will also be introduced to criminology theories and their application to criminal activity.

## **Learning Outcomes**

Students will be able to:

* Understand the use of business analytics tools to analyze a structured dataset
* Apply Power BI to a crime rate data.
* Evaluate the use of Power BI in a criminal/sociological context.
* Identify relationships between business analytics tools and the broader fields of AI / ML
* Create their own Power BI dashboard

## **Analytical Concepts and Skills**

1. Formulating hypotheses and Asking questions
2. Analyzing and interpreting data
3. Using computational thinking
4. Constructing explanations based on the analysis of data

## **Target Audience**

This lesson is geared towards undergraduate Students whose interest is in criminal justice. No prior knowledge is necessary for this lesson.

## **Lesson Outline/Narrative**

**Time allotment**: This lesson can be taught in one class period.

**Teacher Overview Materials**

Please review the following documents prior to delivering this lesson:

1. An Examination of the Impact of Criminological Theory on Community Corrections Practice: <https://www.uscourts.gov/sites/default/files/80_3_2_0.pdf>
2. Linear regression: Detailed View: <https://towardsdatascience.com/linear-regression-detailed-view-ea73175f6e86>
3. Correlation Coefficient: <https://towardsdatascience.com/getting-the-basics-of-correlation-covariance-c8fc110b90b4>
4. Tests of significance: <https://www.westga.edu/academics/research/vrc/assets/docs/tests_of_significance_notes.pdf>

**Technical Tools:** This lesson will be delivered via zoom.

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| **Part 1: Introduction to Power BI** | |
| **Narrative:**  Introduce Power BI. Have students access the link below and take some time to evaluate the dashboard.  **Questions to ask students:**   1. What are some other visualizations Power BI could be used for in your field?   **Assessments:**   * Pre-assessment * Poll Question: During what season is crime most common? | |
| **File/Material** | **Description/Notes** |
| https://app.powerbigov.us/view?r=eyJrIjoiNTM0NTQwMjctZmIwOC00M2JkLTkzNzAtNmExM2U2MzU2N  zRlIiwidCI6IjMxMmNiMTI2LWM2YWUtNGZjMi04MDBkLTMxOGU2NzljZTZjNyJ9 | Power BI Link to crime rate data for the City of Baltimore. |
| https://home.chicagopolice.org/statistics-data/data-dashboards/ | Crime dashboard for crime in Chicago (not referenced in the lesson, but incase students inquire about crime in other areas) |
| **Part 2: Criminology Theories** | |
| **Narrative:**  Introduce some key criminology theories. Students should compare the theories and hypothesize reasons for the crime rate in Baltimore based on the premises behind each theory.   * Social Learning Theory: People learn from each other * Strain Theory: Certain factors or stressors can lead people to commit criminal acts * Rodney Stark’s Deviant Places Theory   **Assessments:**   * Post Course Survey / Assessment * Poll Question: Which neighborhood in Baltimore would you feel safest living in? | |
| **File/Material** | **Description/Notes** |
| <https://statisticalatlas.com/neighborhood/Maryland/Baltimore/Downtown/Population#figure/neighborhood-in-baltimore/population-density> | Data concerning the population density and median income of different neighborhoods in Baltimore |
| https://datasmart.ash.harvard.edu/news/article/using-predictive-policing-to-reduce-crime-rate-189 | Article about how AI is being used for predictive policing |
| <https://datasmart.ash.harvard.edu/news/article/getting-big-data-to-the-good-guys-140> | Article about San Francisco’s “Shared Youth Database” |
| **Part 3: Statistical Modeling** | |
| **Narrative:**  Students should take their comparisons of the criminology theories above and use linear regression, correlation coefficient or significance testing to arrive at their conclusions. | |
| **File/Material** | **Description/Notes** |
| https://apps.dtic.mil/dtic/tr/fulltext/u2/a563653.pdf | A description of a robust regression model applied to crime data in Salinas, California |
| **Part 4: Identifying Good and Bad Visualizations** | |
| **Narrative:**  Students should find a ‘bad’ visualization or ‘bad’ use of data that ‘supports’ a false claim. Have the students write up a short paragraph about why the visualization is poor and what could be changed to present more accurate results. | |
| **File/Material** | **Description/Notes** |
| <https://medium.com/nightingale/bad-data-visualization-in-the-time-of-covid-19-5a9f8198ce3e> | An example of how bad visualizations had an impact on the public’s response to COVID-19 |

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| **Part 5: Creating Your Own Dashboard** | |
| **Narrative:**  Using the directions below, students should create their own dashboard using PowerBI. The sample data is provided in the tutorial. Students can then edit their dashboards and compare to the Baltimore Crime Dashboard. | |
| **File/Material** | **Description/Notes** |
| <https://www.ndsu.edu/fileadmin/oira/Data_Resources/GettingStartedWithPowerBIDesktop.pdf> | Instructions on how to begin using PowerBI |
| <https://www.youtube.com/watch?v=BsXliHbOFDM> | A YouTube tutorial on how to create a dashboard in PowerBI, with sample data |