

SIMPLE STATISTICAL TOOLS FOR PERFORMANCE AUDITING

January 12, 2016

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Denver Police Department

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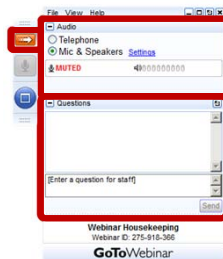
Opening Remarks



Moderator
R. Kinney Poynter
Executive Director
NASACT



Speaker
Kelsey Yamasaki
Associate Statistical Researcher
Denver Police Department (CO)



Your Participation

Open and close your control panel

Join audio:

- Choose **Mic & Speakers** to use VoIP
- Choose **Telephone** and dial using the information provided

Submit questions and comments via the Questions panel

Agenda and Learning Objective

- Importance of Data and Statistical Analysis
- When To Use Statistical Tests
- How to Use Statistical Tests and Interpret Results
 - Downloads
 - Pearson and Spearman Correlations
 - T-Tests
 - Chi-Square Tests
- How to Present Results of Statistical Tests
- Questions and Resources

Importance of Data Analysis

- Age of Big Data
 - Evidence Based v. Data Based
- Promised Transformation
 - Retrospective v. Prospective
- Need for New Methodologies
 - Traditional Auditing v. Social Science Research
- Need for Skilled Workers
 - 140,000 – 190,000 deep analysts needed.
 - 1.5 million managers and analysts w/know-how.

Importance of Statistical Tests

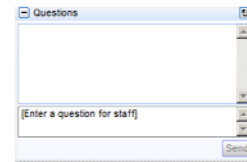
- Better Understanding of Data
- Finding Patterns and Trends
- Determining Differences Between Groups Is Meaningful
- Finding Correlations
- Finding Causation
- Predicting Future Outcomes

When to Use Statistical Tests

- Pearson v. Spearman Correlation
 - Correlation – Test for Relationship Between Two Variables
 - Normal Distribution v. Non-Normal Distribution
 - Linear Relationship v. Non-Linear Relationship
- T-Tests
 - Statistical Difference – Test for Difference Between 2 Groups
- Chi-Square Tests
 - Statistical Difference – Test for Difference Between 2+ Groups.

Polling Question 1 of 2

- **For individuals:** Please be sure to answer the polling questions as they are also your attendance checks for today's webinar.
- **For groups:** Please answer in a way that reflects the consensus of the group.
 - Attendance for groups is still monitored via the sign-in sheet.



Don't forget to send in your questions!

Downloads

- Excel Data Analysis ToolPak: 2007-2010
 1. Click "File" button and select "Options".
 2. Click "Add-Ins" and select "Excel Add-Ins" in the "Manage" box.
 3. Click "Go", then select "Analysis ToolPak" box.
 4. Click "Ok".
- Excel Real Statistics Resource Pack
 - www.real-statistics.com/free-download/real-statistics-resource-pack/
 - Download and Install.

Correlations: Relationships Between Two Variables

- Check Distribution of Data
 - Check Minimum, Maximum, and Median of Data
 - Create Labels
 - Select “Data” tab and “Data Analysis” button.
 - In “Data Analysis” box select “Histogram” and click “OK”
 - Which correlation test do I use?

Pearson	Spearman
Normal Distribution	Non-Normal Distribution
Linear Relationship	Non-Linear Relationship

- [Switch to Excel to Demonstrate]

Pearson Correlation

- Setting Up Your Data
- =PEARSON(array1,array2)
- Interpreting Results: Correlation Coefficient
 - 0.0000 to 0.1XXX = No Correlation
 - 0.2000 to 0.3XXX = Weak Correlation
 - 0.4000 to 0.6XXX = Moderate Correlation
 - 0.7000 to 1.0000 = Strong Correlation
- Graphing Results

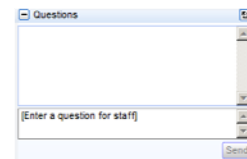
[Switch to Excel to Demonstrate]

Spearman Correlation

- Setting Up Your Data
- =SCORREL(array1,array2)
- Interpreting Results: Correlation Coefficient
 - 0.0000 to 0.1XXX = No Correlation
 - 0.2000 to 0.3XXX = Weak Correlation
 - 0.4000 to 0.6XXX = Moderate Correlation
 - 0.7000 to 1.0000 = Strong Correlation
- Graphing Results
- [Switch to Excel to Demonstrate]

Polling Question 2 of 2

- **For individuals:** Please be sure to answer the polling questions as they are also your attendance checks for today's webinar.
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A screenshot of a web-based 'Questions' window. The window has a title bar that says 'Questions' and a close button. Below the title bar is a large empty text area. At the bottom of the window, there is a smaller text input field containing the placeholder text '[Enter a question for staff]'. To the right of this input field is a 'Send' button.

Don't forget to send in your questions!

T-Test: Difference Between Two Groups

- Setting Up Your Data
- =TTEST(array1,array2, tails (1,2), type(1,2,3))
- Interpreting Results: P-Values
 - 0.0000 to 0.0500 = Statistically Significant
 - 0.05XX to 0.1000 = Possible Statistical Significance
 - 0.1XXX to 1.0000 = No Statistical Significance.
- Graphing Results
- [Switch to Excel to Demonstrate]

Chi-Square: Difference Between More Than Two Groups

- Setting Up Your Data
- Create Pivot Table
- Create Expected Values Table
- =CHITEST(actual values, expected values)
- Interpreting Results: P-Values
 - 0.0000 to 0.0500 = Statistically Significant
 - 0.05XX to 0.1000 = Possible Statistical Significance
 - 0.1XXX to 1.0000 = No Statistical Significance.
- Graphing Results
- [Switch to Excel to Demonstrate]

Review

- Pearson v. Spearman Correlation
 - Correlation – Test for Relationship Between Two Variables
 - Normal Distribution v. Non-Normal Distribution
 - Linear Relationship v. Non-Linear Relationship
- T-Tests
 - Statistical Difference – Test for Difference Between 2 Groups
- Chi-Square Tests
 - Statistical Difference – Test for Difference Between 2+ Groups.
- Interpreting Results: P-Values
 - 0.0000 to 0.0500 = Statistically Significant
 - 0.05XX to 0.1000 = Possible Statistical Significance
 - 0.1XXX to 1.0000 = No Statistical Significance.

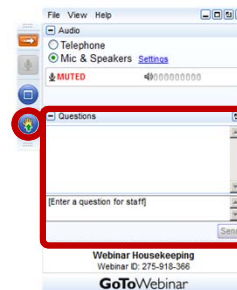
Question and Answer Session



Moderator
R. Kinney Poynter
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Your Participation

- Please continue to submit your text questions and comments using the Questions panel
- Please raise your hand to be unmuted for verbal questions.

Questions?

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Resources:

www.statisticshowto.com

www.real-statistics.com

www.statswithcats.wordpress.com

www.researchgate.net

Attendance Check – FOR INDIVIDUALS ONLY

- Please type “**I have completed the webinar.**” in your Question toolbar.
- Be sure to hit the send button after typing your response.