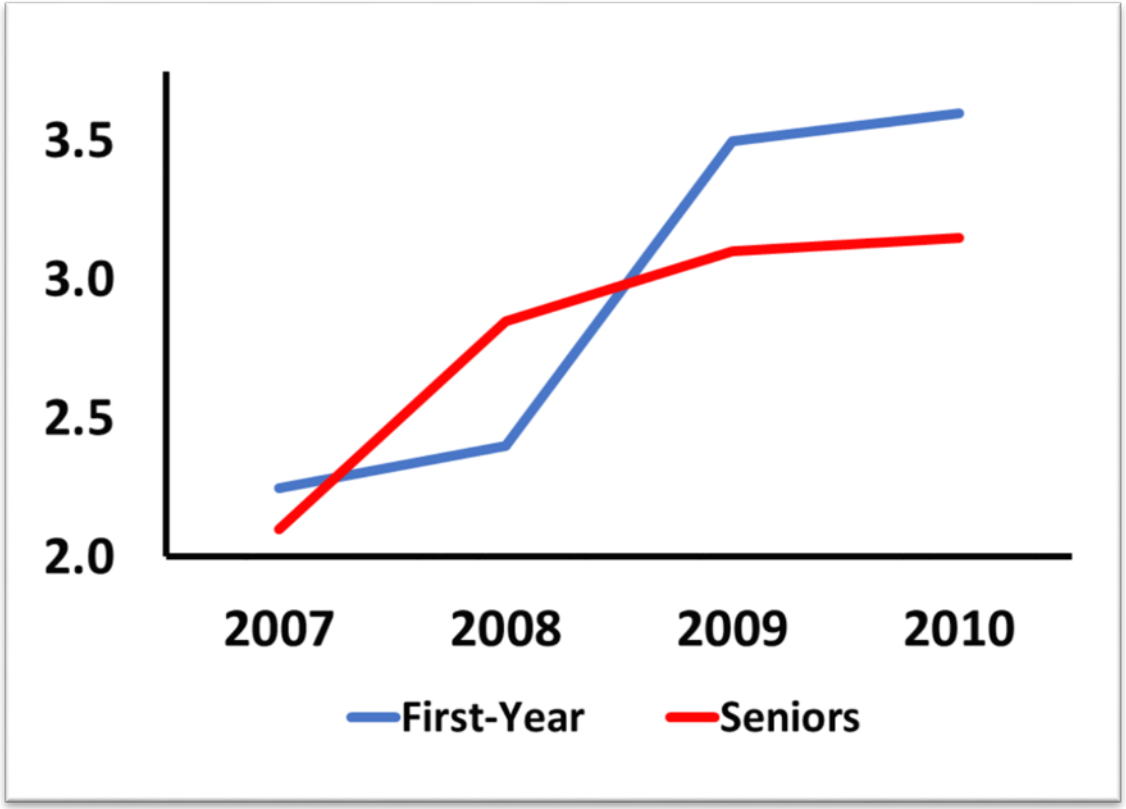
A Multi-Year Analysis (of NSSE Data) Using ANOVA



John Stanley, Institutional Analyst
Yang Zhang, Director of Institutional Research
University of Hawaii at Mānoa
miro@hawaii.edu

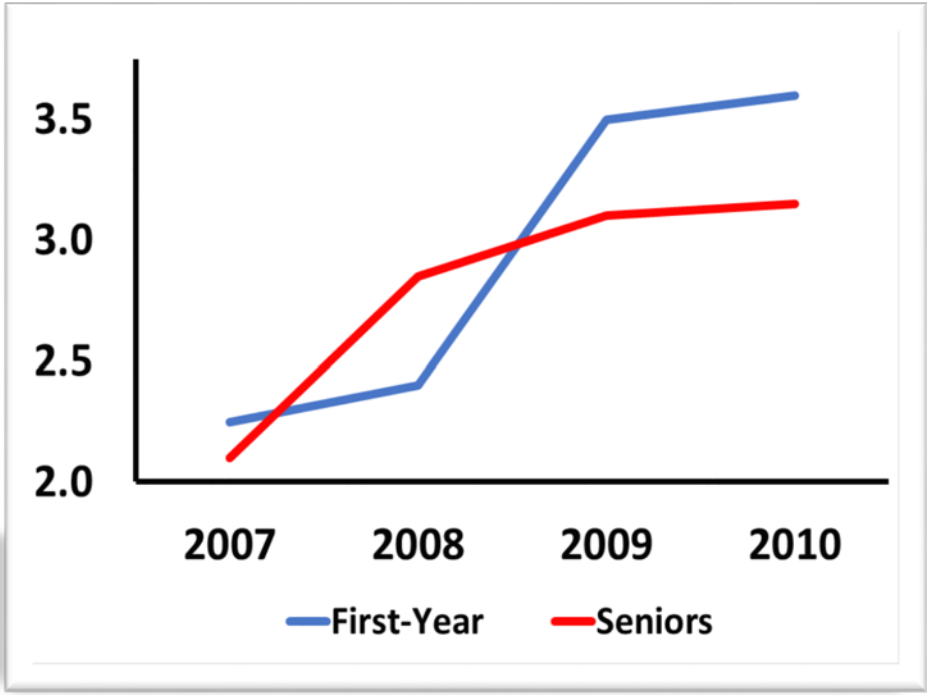
CAIR Conference Napa, CA, Nov. 20-22, 2013

Presentation Outline

- What is a multi-year data analysis and why is it useful?
- UH Mānoa example using NSSE data
  - Brief background on NSSE
  - Research question
  - Methodology
  - Step-by-Step data analysis
  - Results
- Limitations and future studies

What is a Multi-Year Data Analysis?

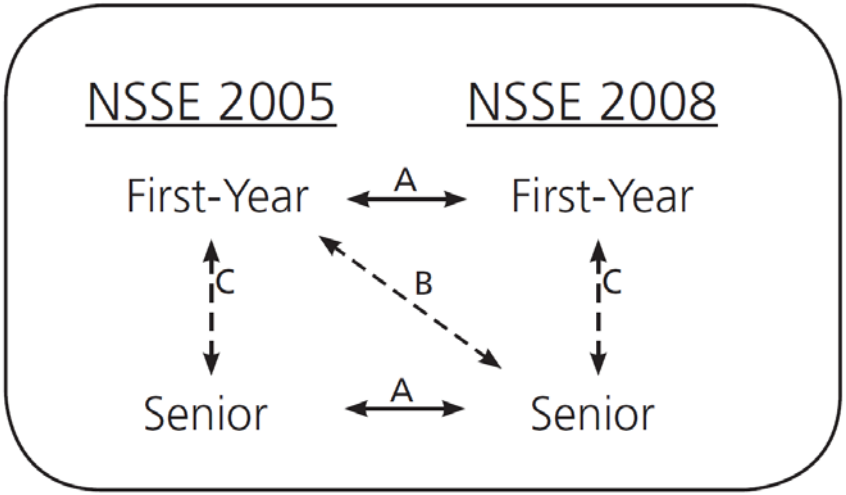
In multi-year designs, we are interested in measuring whether there has been a meaningful change in outcomes over time.



Research Questions that can be Addressed by 'Multi-Year' Analysis

- *Cross-Sectional (A): "Are 2005 and 2008 first year students' experiences about advising significantly different?"*
- *Longitudinal (B): "Did 2005 first year students' experiences change in 2008 when they became seniors?"*
- *(C): "Are 2005 first year students' perceptions of a supportive campus environment significantly different from 2005 seniors?"*

Multi-Year analyses can be longitudinal or cross-sectional



From NSSE Multi-Year Data Analysis Guide 2012

From NSSE Multi-Year Data Analysis Guide 2012

Why NSSE?

- NSSE is popular. As of 11/18/2013, 721 institutions will participate in 2014. Two million students have participated NSSE since 2000.
- NSSE Schedule: Administered in spring, reports is available in summer, and student responses are available in early fall.
- NSSE focuses on student engagement. It indirectly measures the extent to which first-year and senior students participate in educational practices that contribute to their academic and personal growth.
- Survey questions and benchmarks
  - 5 benchmarks: level of academic challenge; active and collaborative learning; student-faculty interaction; supportive campus environment, enriching educational experiences.
- Who will be interested in findings: leadership, faculty, committees (retention and graduation, strategic planning, initiatives, etc.)

UH Manoa Example

- Context: UH Mānoa's Strategic Plan for 2002-2010 called for increasing support for academic advising.

- Approximately 40 new academic advising positions were created:
  - Faculty involvement in advising and mentoring increased considerably between 2002 and 2010.
  - Manoa Advising Center (MAC) formed in January 2007.

- Can NSSE data be used to indirectly measure the effectiveness of these strategic planning decisions?

  i.e. Given the implementation of additional advising services in 2006-07, how much did student perceptions of the quality of academic advising increase from 2005 to 2009?

Research Question

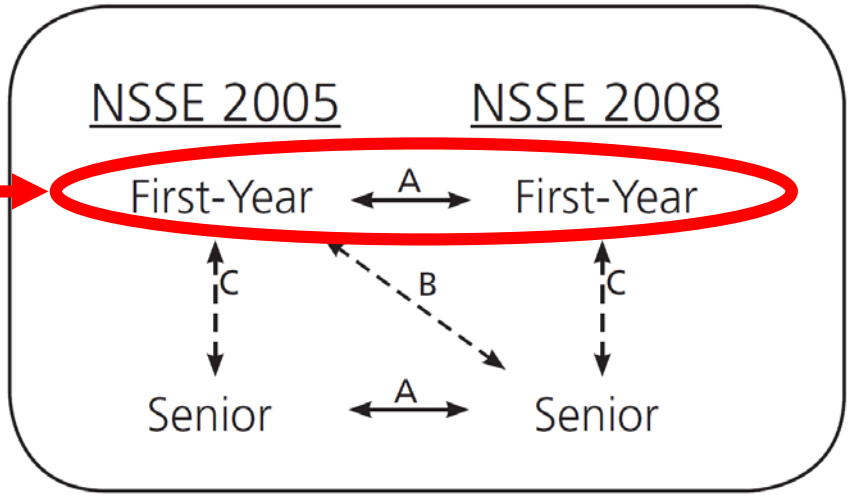
- Given the implementation of additional advising services at UHM in 2006-07, how much did student perceptions in the quality of academic advising increase from **2005 to 2009**?

12 **Overall, how would you evaluate the quality of academic advising you have received at your institution?**

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

From NSSE Survey PDF, 2008

Today's Example is designed like this

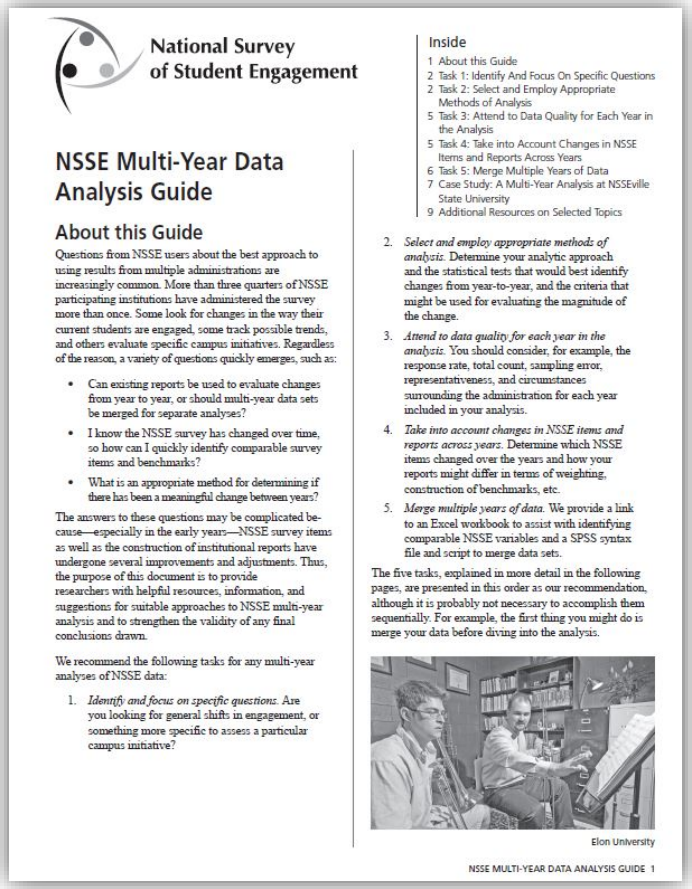


From NSSE Multi-Year Data Analysis Guide 2012

Useful documentation provided by NSSE to get you started

- NSSE Multi-Year Data Analysis Guide
- Contextualizing NSSE effect sizes
- SPSS syntax for merging multiple years of data
- Excel codeset for tracking year-to-year variable changes
- Working with NSSE Data: A Facilitator's Guide

Link to NSSE Data Analysis Resources:
http://nsse.iub.edu/html/analysis_resources.cfm



National Survey of Student Engagement

NSSE Multi-Year Data Analysis Guide

Inside

About this Guide

Questions from NSSE users about the best approach to using results from multiple administrations are increasingly common. More than three quarters of NSSE participating institutions have administered the survey more than once. Some look for changes in the way their current students are engaged, some track possible trends, and others evaluate specific campus initiatives. Regardless of the reason, a variety of questions quickly emerges, such as:

- Can existing reports be used to evaluate changes from year to year, or should multi-year data sets be merged for separate analyses?
- I know the NSSE survey has changed over time, so how can I quickly identify comparable survey items and benchmarks?
- What is an appropriate method for determining if there has been a meaningful change between years?

The answers to these questions may be complicated because—especially in the early years—NSSE survey items as well as the construction of institutional reports have undergone several improvements and adjustments. Thus, the purpose of this document is to provide researchers with helpful resources, information, and suggestions for suitable approaches to NSSE multi-year analysis and to strengthen the validity of any final conclusions drawn.

We recommend the following tasks for any multi-year analyses of NSSE data:

1. *Identify and focus on specific questions.* Are you looking for general shifts in engagement, or something more specific to assess a particular campus initiative?
2. *Select and employ appropriate methods of analysis.* Determine your analytic approach and the statistical tests that would best identify changes from year-to-year, and the criteria that might be used for evaluating the magnitude of the change.
3. *Attend to data quality for each year in the analysis.* You should consider, for example, the response rate, total count, sampling error, representativeness, and circumstances surrounding the administration for each year included in your analysis.
4. *Take into account changes in NSSE items and reports across years.* Determine which NSSE items changed over the years and how your reports might differ in terms of weighting, construction of benchmarks, etc.
5. *Merge multiple years of data.* We provide a link to an Excel workbook to assist with identifying comparable NSSE variables and a SPSS syntax file and script to merge data sets.

The five tasks, explained in more detail in the following pages, are presented in this order as our recommendation, although it is probably not necessary to accomplish them sequentially. For example, the first thing you might do is merge your data before diving into the analysis.

Elon University

NSSE MULTI-YEAR DATA ANALYSIS GUIDE 1

NSSE Multi-Year Data Analysis Guide

Relevant Literature

Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco: Jossey-Bass.

Herzog, S., and Bowman, N. A. (Eds.). (2011). *Special issue: validity and limitations of college student self-report data*. *New Directions for Institutional Research*. *2011*(150). 1–120.

Kuh, G. D. (2000). Understanding campus environments. In Barr, M. J., and Desler, M. (Eds.), *Handbook on student affairs administration* (2nd ed.). San Francisco: Jossey-Bass.

Kuh, G. D., et al. (2010). *Student success in college: creating conditions that matter*. San Francisco: Jossey-Bass.

Pascarella, E., and Terenzini, P. (2005). *How college affects student: volume 2, a third decade of research*. San Francisco: Jossey-Bass.

Porter, S. R. (2013). *Self-reported learning gains: a theory and test of college student survey response*. *Research in Higher Education*. *54*(2). 201–226.

Data Analysis

Four Steps:

1. Merge Multiple Years of NSSE Data

2. Perform Data Management Tasks

    a) Check Data Quality (sampling error, changes over time)
    b) Random Sampling
    c) Weighting

3. Choose Statistical Method

4. Data Analysis

    a) One-way ANOVA
    b) Post-hoc tests (Tukey Test)
    c) Cohen's d

Step 1: Merge Multiple Years of NSSE Data

```
Sub CombineDataFiles (strPath As String, strFilemask As String)

Dim strFname As String
Dim strCmd As String
Dim intFileNb

    If InStr(strPath, "\") = 0 Then     'no path given, use current folder
        strPath = objSpssApp.GetSPSSPath
    End If
    If Len(strFilemask) = 0 Then        'no file Mask given, combine all files
        strFilemask = "*.sav"
    End If

    'Get the first file name and load file
    strFname = Dir$(strPath & strFilemask)
    strCmd = "GET FILE='" & strPath & strFname & "'." & vbCr
    strCmd = strCmd & "COMPUTE source=1." & vbCr
    strCmd = strCmd & "VALUE LABEL source 1 " & "'" & strFname & "'." & vbCr
    strCmd = strCmd & "VARIABLE LABEL source 'path=" & strPath & "'." & vbCr
    strCmd = strCmd & "EXECUTE."
    objSpssApp.ExecuteCommands strCmd , True

    'Combine the other files
    intFileNb = 2
    While strFname <> ""
        strFname = Dir$()
        If strFname <> "" Then
            strCmd = "ADD FILES /FILE=* /FILE='" & strPath & strFname & "'." & vbCr
            strCmd = strCmd & "IF MISSING(source) source=" & intFileNb & "." & vbCr
            strCmd = strCmd & "ADD VALUE LABEL source " & intFileNb & " '" & strFname & "'." & vbCr
            strCmd = strCmd & "EXECUTE."
            Debug.Print strCmd
            objSpssApp.ExecuteCommands strCmd , True
            intFileNb = intFileNb + 1
        End If
    Wend

    ' Save the combined file
    strCmd = "SAVE OUTFILE='" & strPath & "combined file.sav'." & vbCr
    strCmd = strCmd & "EXECUTE."
    objSpssApp.ExecuteCommands strCmd , True

End Sub
```

NSSE provides a SPSS script that can merge multiple years of data in to one combined file called “combinedfile.sav”.

http://nsse.iub.edu/html/analysesSyntax_original.cfm

Step 2: Review Respondent Characteristics

Respondent Characteristics

The adjacent table displays your number of respondents, response rate, and sampling error by class. Sampling error is an estimate of the margin by which the true percentage of your students may differ from the reported percentage on a given item (because not all of your students completed surveys).

	N	Resp. Rate	Sampling Error
First-Year Students	613	26%	+/-3.4%
Seniors	685	26%	+/-3.3%

From NSSE Executive Snapshot 2008 (University of Hawaii at Mānoa)

Step 2: Randomization and Weighting

Tips on Developing Comparable NSSE Statistics

Tip #1: Use All Randomly Selected Cases

- For 2004 and earlier, use values of '1' and '2' for "smpl01"
- For 2005 to the present, use values of '1', '2', and '3' for "smpl05"

Tip #2: Use Weights

- "stuwt2" for 2001 to 2003 administrations
- "weight1" for 2004 to current administration

Tip #3: Exclude Ineligibles

- For 2005 to the present, use values of '1' for "inelig" to ensure only eligible respondents are included.

From NSSE Multi-Year Data Analysis Guide 2012

Step 3: Choosing a Method

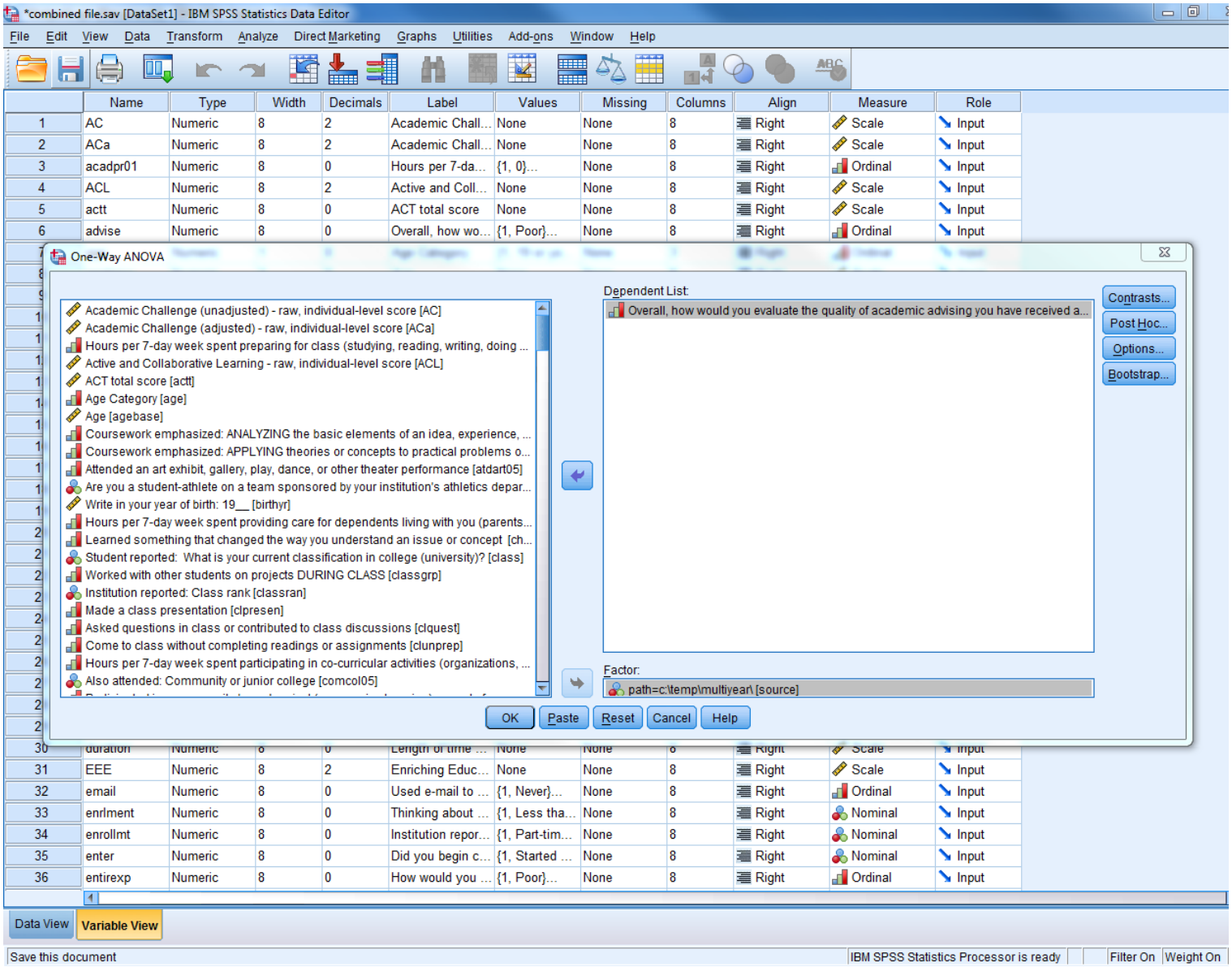
Table 1
Considerations for Multi-Year Analytical Methods

	t-test	ANOVA	Regression	Effect Size	Percentage Change
How many years of data required?	2	3 or more	2 or more	2	2
Determines statistical significant difference?	Yes	Yes	Yes	No	No
Determines magnitude of difference?	No*	No*	No*	Yes	Yes
Are statistical controls possible?	No	Yes	Yes	No	No

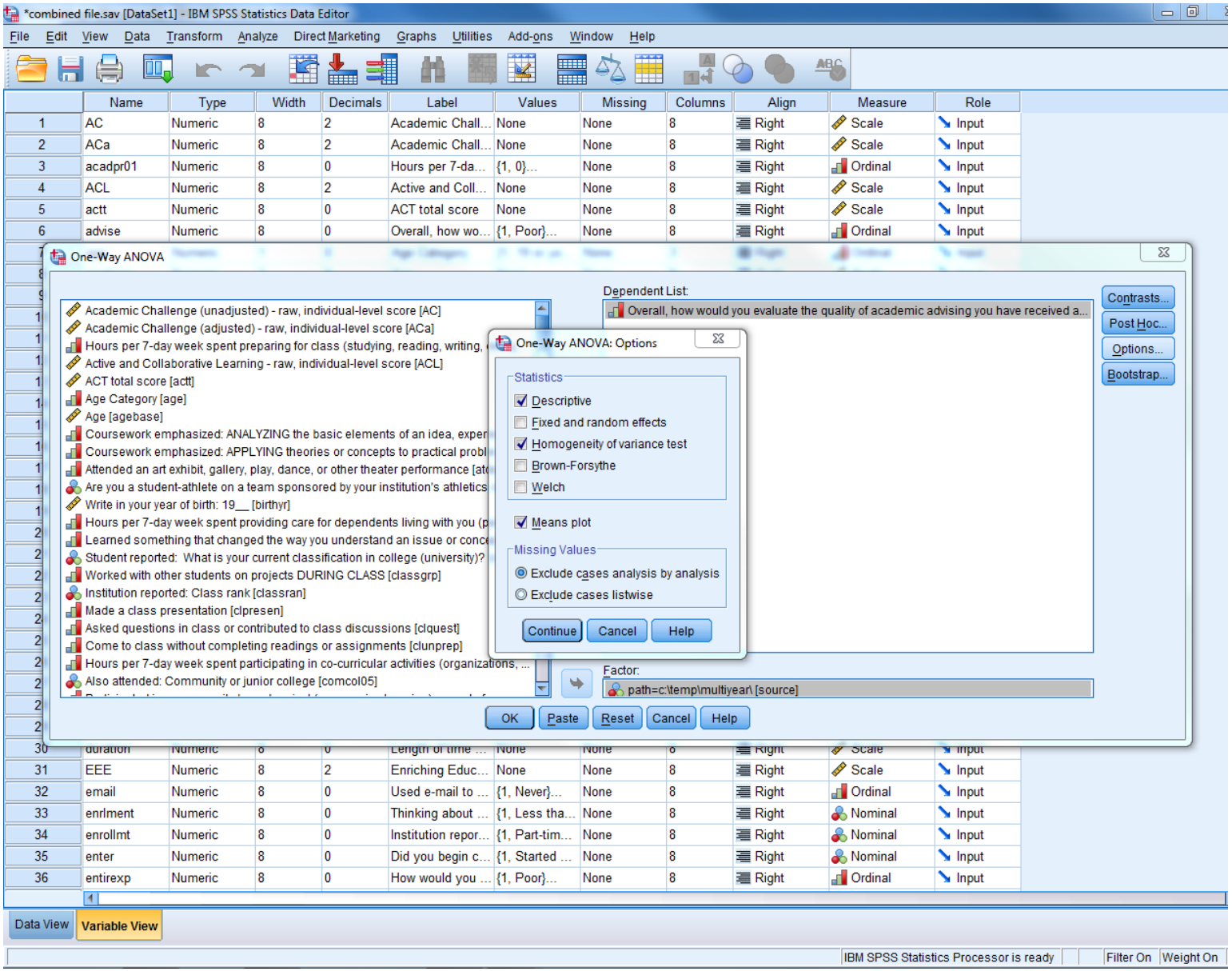
* Determining the magnitude of the difference is possible but requires additional manipulations to variables of interest, inclusion of ad hoc software commands, or additional calculations.

From NSSE Multi-Year Data Analysis Guide 2012

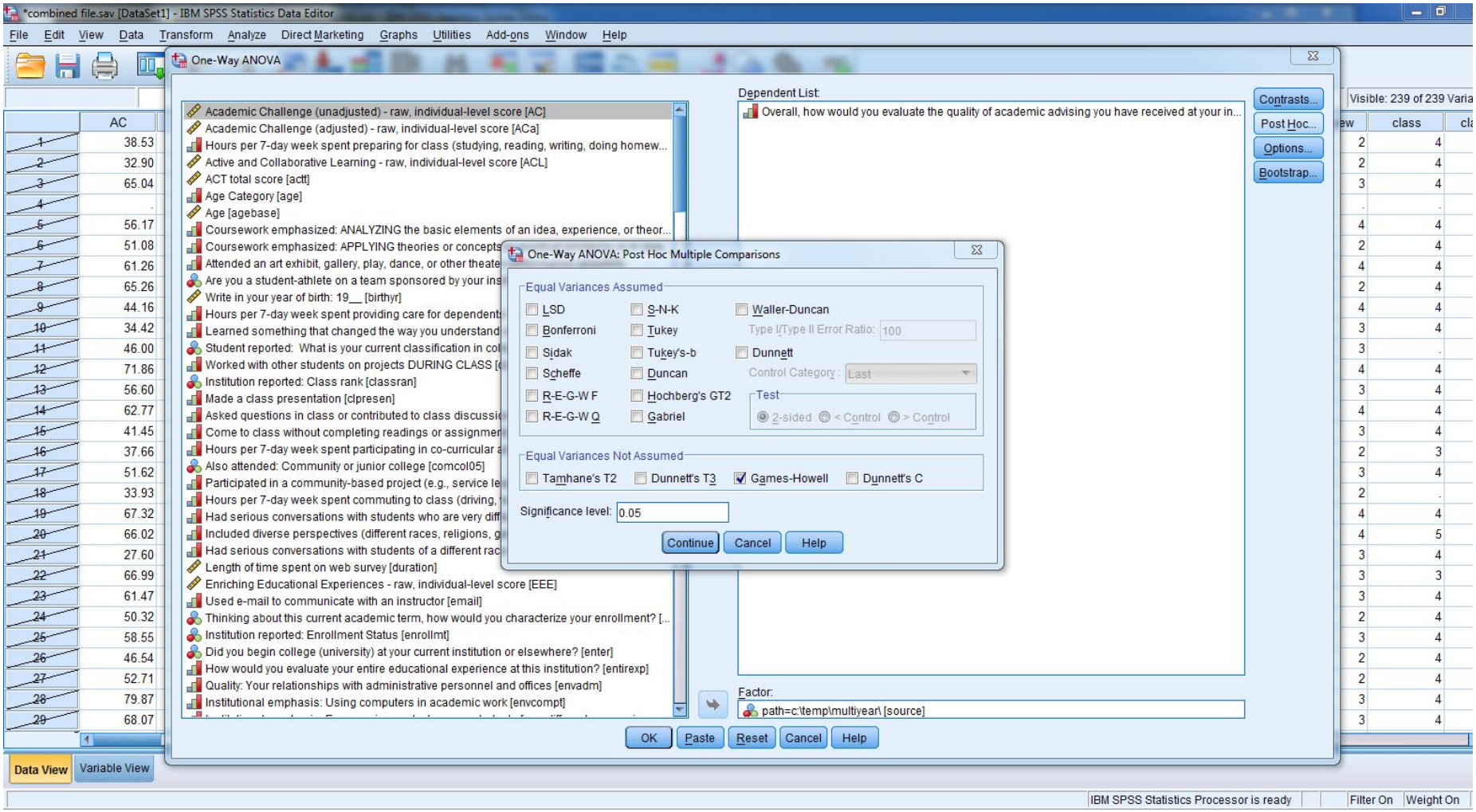
Step 4: One-way ANOVA in SPSS



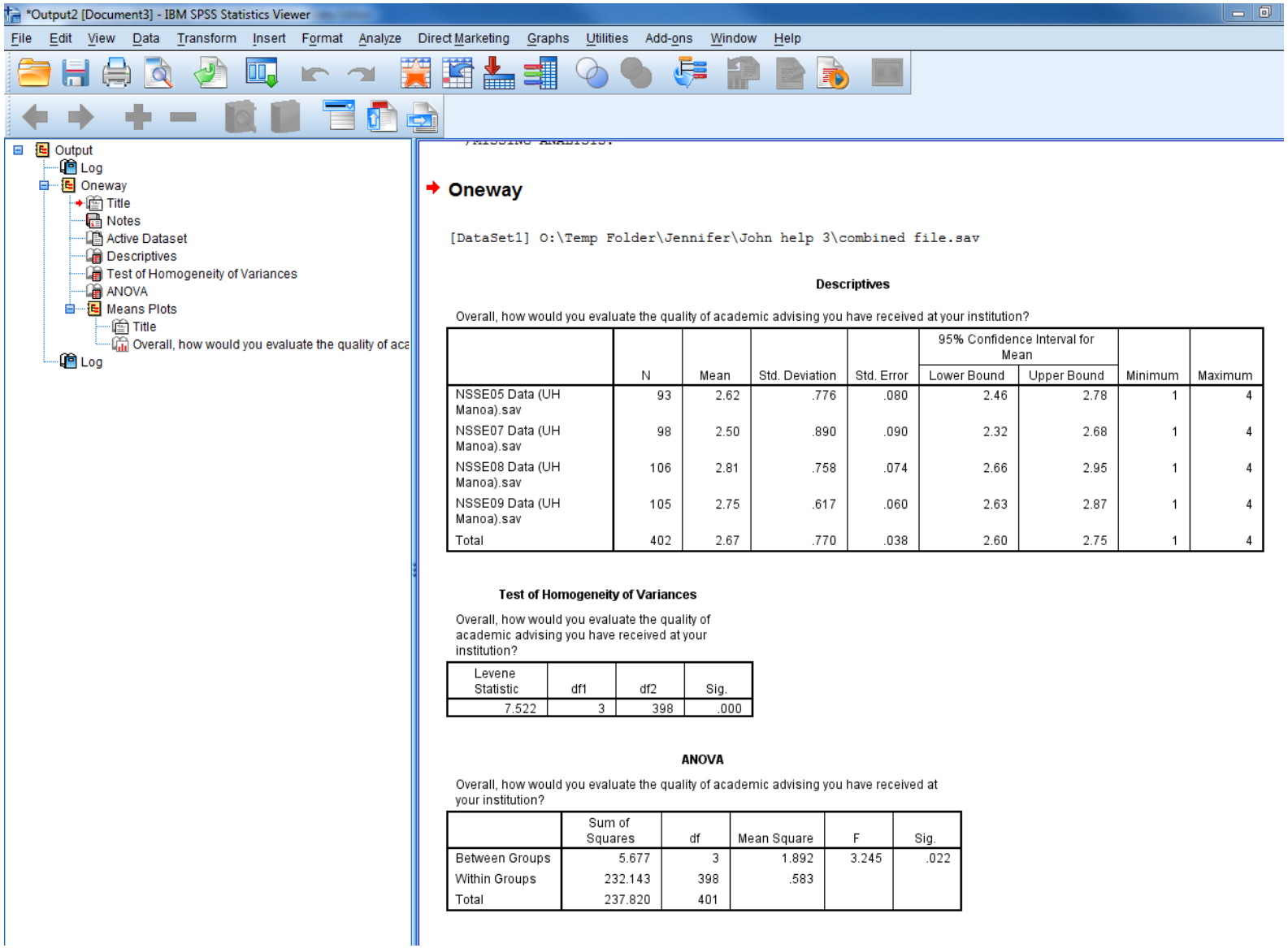
One-way ANOVA: Options



One-way ANOVA: Post Hoc Test



One-way ANOVA: Descriptive Statistics



Descriptives

Overall, how would you evaluate the quality of academic advising you have received at your institution?

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
NSSE05 Data (UH Manoa).sav	93	2.62	.776	.080	2.46	2.78	1	4
NSSE07 Data (UH Manoa).sav	98	2.50	.890	.090	2.32	2.68	1	4
NSSE08 Data (UH Manoa).sav	106	2.81	.758	.074	2.66	2.95	1	4
NSSE09 Data (UH Manoa).sav	105	2.75	.617	.060	2.63	2.87	1	4
Total	402	2.67	.770	.038	2.60	2.75	1	4

Test of Homogeneity of Variances

Overall, how would you evaluate the quality of academic advising you have received at your institution?

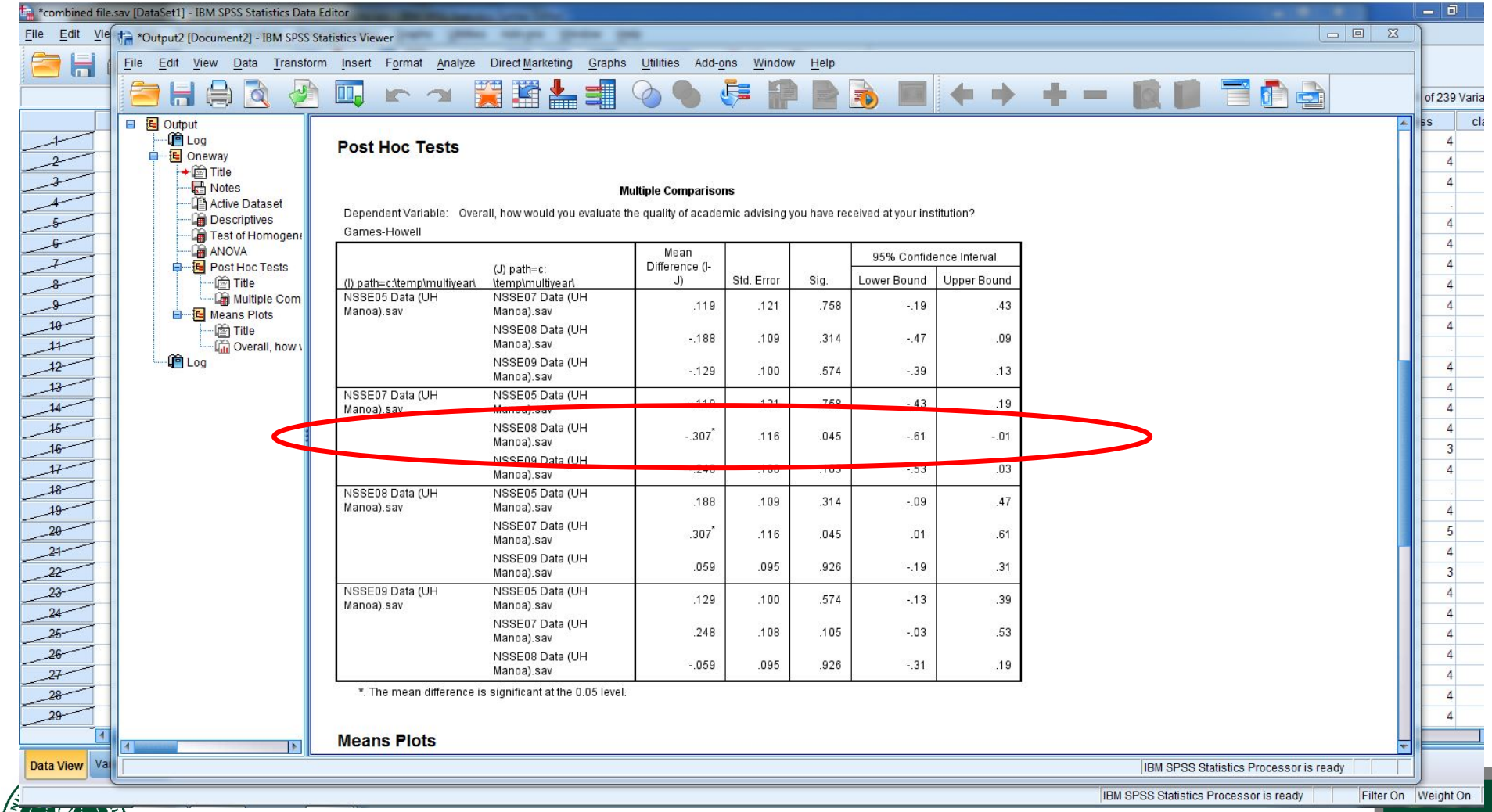
Levene Statistic	df1	df2	Sig.
7.522	3	398	.000

ANOVA

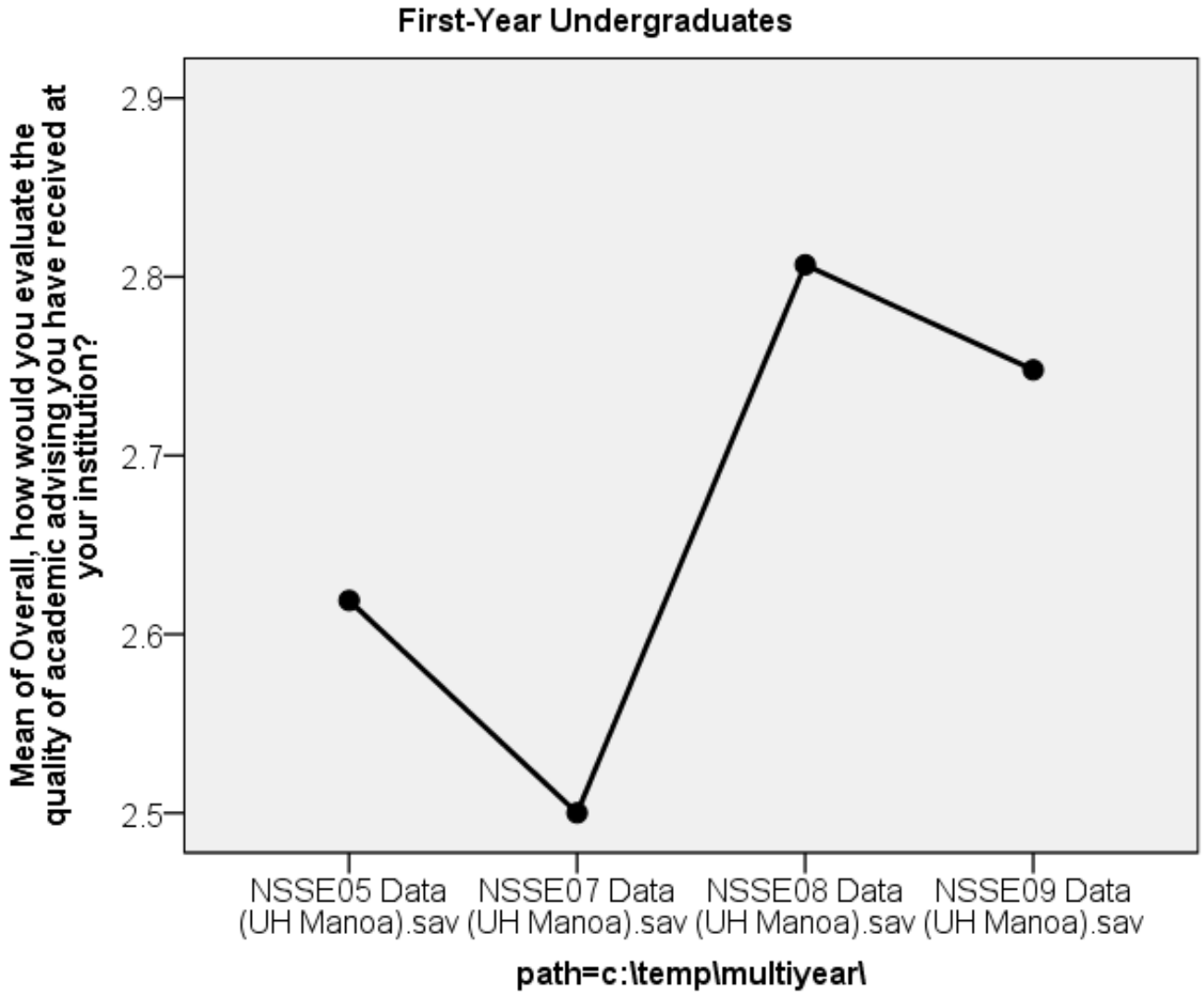
Overall, how would you evaluate the quality of academic advising you have received at your institution?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.677	3	1.892	3.245	.022
Within Groups	232.143	398	.583		
Total	237.820	401			

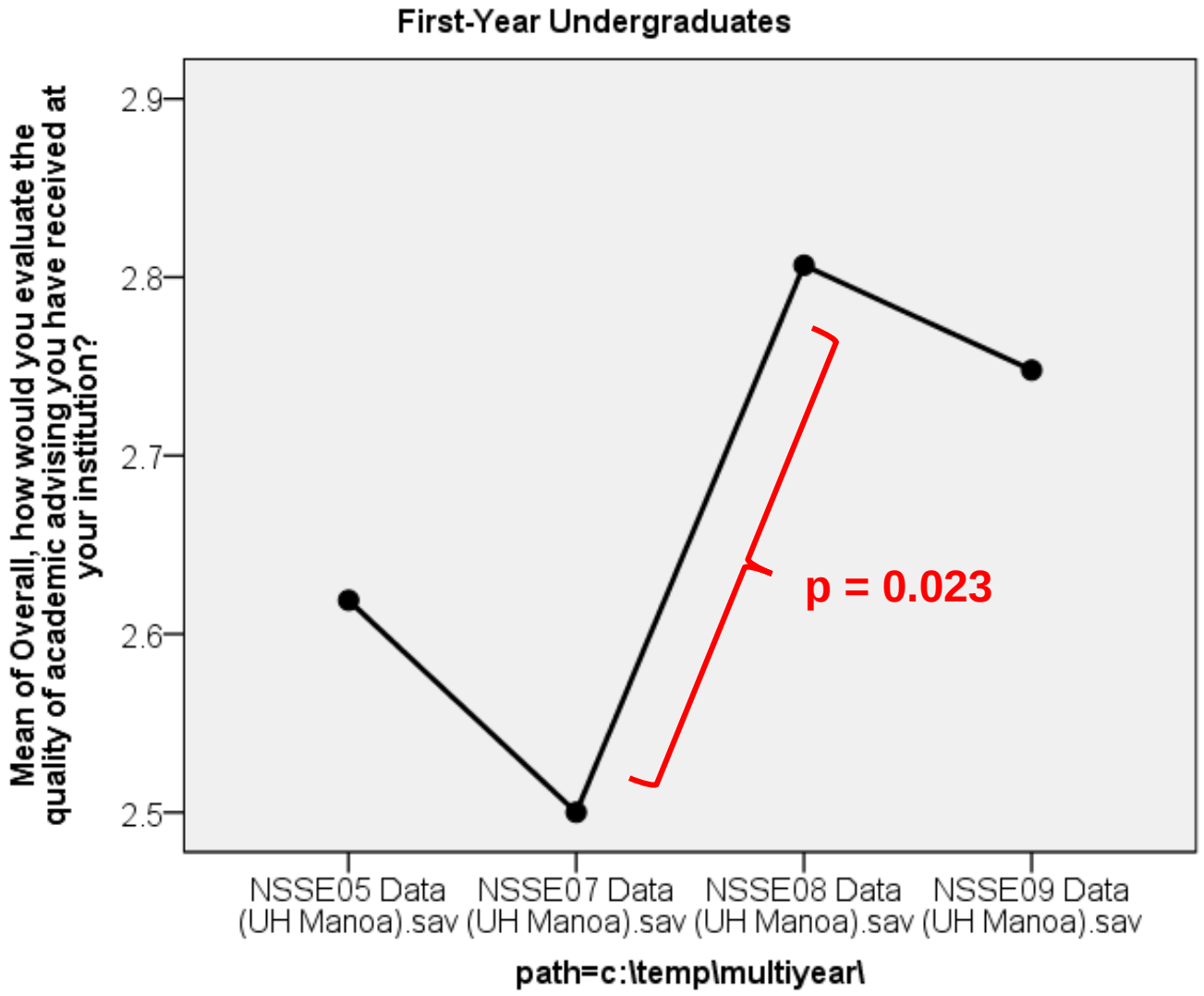
One-way ANOVA: Post Hoc Results



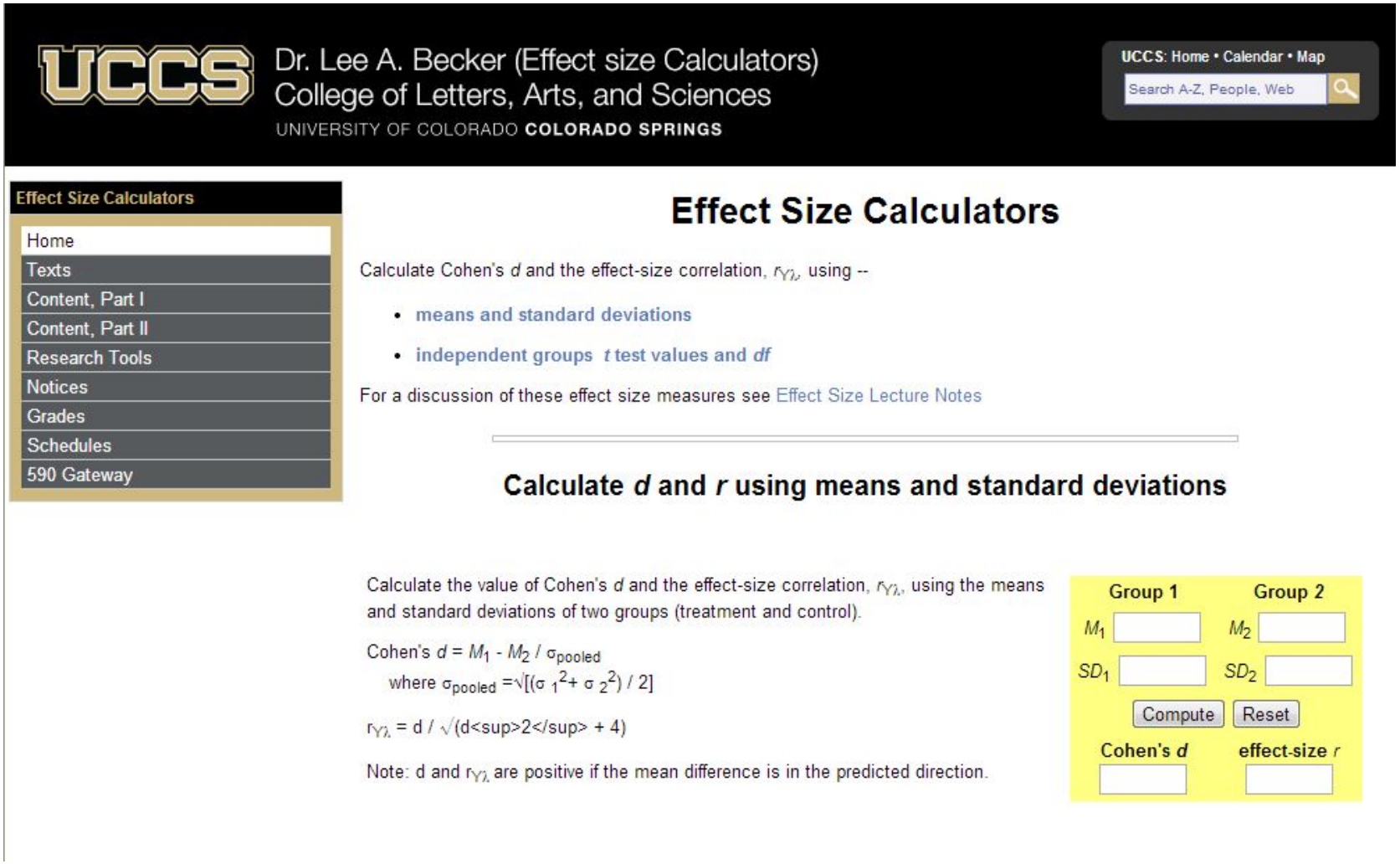
One-way ANOVA: Means Plot



One-way ANOVA: Means Plot

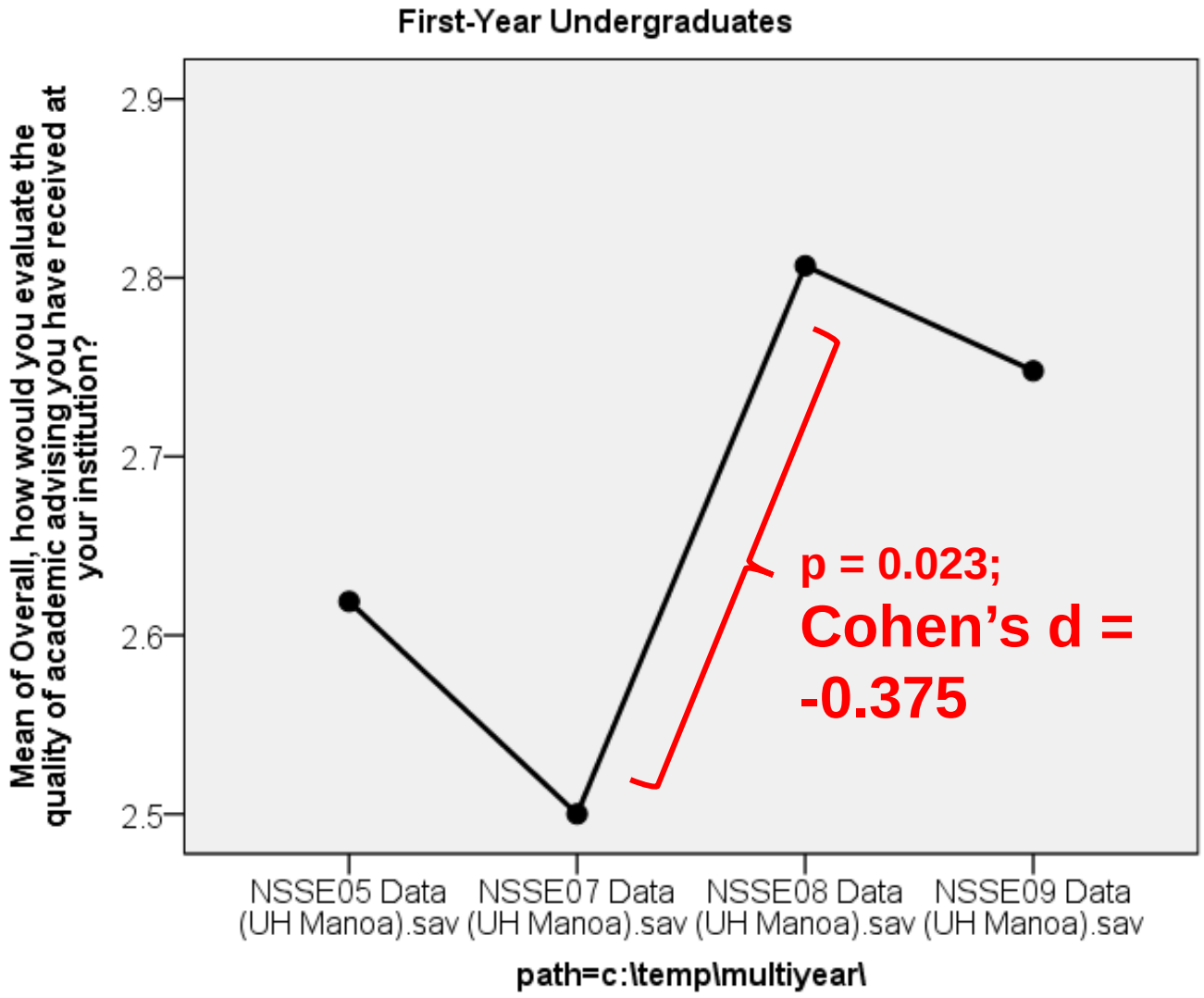


Cohen's d



Available at: http://www.uccs.edu/~lbecker/

One-way ANOVA: Means Plot



Proposed Reference Values for Effect Size Interpretation

(NSSE Benchmark Comparisons)

	Effect Size
Small	0.1
Medium	0.3
Large	0.5
Very Large	0.7

Summary

- Choose criteria to measure based on strategic planning priorities.
  - *Identify and focus on specific questions.* Are you looking for general shifts in engagement, or something more specific to assess a particular campus initiative?
- Follow steps to ensure data quality, randomization, and weighting.
- Post-hoc tests to see where the differences lies
- Check effect sizes

Limitations and Future Studies

Limitations/ Challenges:

-- Sample size difference in different years

-- Limited knowledge about college initiatives and strategies

-- Change of NSSE instruments over years, especially in 2013 (Benchmarks to Engagement Indicators)

Future studies employing a multi-year analysis

-- analyzing other NSSE questions & benchmarks

-- using other external or home grown surveys results. Such as graduating seniors survey, first year experience survey, alumni survey, etc.

Questions and Suggestions?

Mahalo

John Stanley, Institutional Analyst
Yang Zhang, Director

University of Hawaii at Manoa
Manoa Institutional Research Office

Questions: miro@hawaii.edu

Link to this presentation:
http://manoa.hawaii.edu/ovcaa/mir/pdf/cair2013.pdf