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





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

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?"



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

- <u>Context</u>: 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?

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





Elon University

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
```

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/an alysesSyntax_original.cfm

```
End If
Wend
```

End Sub

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

objSpssApp.ExecuteCommands strCmd , True

intFileNb = intFileNb + 1



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).

	Ν	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.



Step 3: Choosing a Method

Table 1 Considerations for Multi-Year Analytical Methods

	<i>t</i> -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

ta *combined	file.sav [DataSet	1] - IBM SPSS St	atistics Data	Editor									٥
<u>F</u> ile <u>E</u> dit	File <u>E</u> dit <u>V</u> iew <u>D</u> ata <u>T</u> ransform <u>A</u> nalyze Direct <u>M</u> arketing <u>G</u> raphs <u>U</u> tilities Add- <u>o</u> ns <u>W</u> indow <u>H</u> elp												
🔁 🔓			¥ 🎬	: 📥 🗐			-			M			
	Name	Туре	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role		
1	AC	Numeric	8	2	Academic Chall	. None	None	8	■ Right	🛷 Scale	🦒 Input		
2	ACa	Numeric	8	2	Academic Chall	. None	None	8	■ Right	🛷 Scale	🦒 Input		
3	acadpr01	Numeric	8	0	Hours per 7-da	{1, 0}	None	8	를 Right	📲 Ordinal	🔪 Input		
4	ACL	Numeric	8	2	Active and Coll	None	None	8	를 Right	I Scale	🔪 Input		
5	actt	Numeric	8	0	ACT total score	None	None	8	I Right	Scale	🦒 Input		
6	advise	Numeric	8	0	Overall, how wo	. {1, Poor}	None	8	I Right	Ordinal	🔪 Input		~
(🖬 o	ne-Way ANOVA	-			of the second		-		8.44	A	A 144	22	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 30 31 32 33 34 35 36	Academic Chall Academic Chall Hours per 7-da Active and Colla Age (agebase) Coursework en Coursework en Coursework en Age (agebase) Coursework en Astended an art Are you a stude Write in your yet Hours per 7-da Learned somet Worked with oft Institution report Worked with oft Institution report Made a class p Asked question Come to class : Hours per 7-da Also attended: C Come to class : Hours per 7-da Also attended: C	lenge (unadjust lenge (adjusted y week spent pr aborative Learnii [actt] ige] nphasized: APAI exhibit, gallery, nt-athlete on a t ar of birth: 19 y week spent pr hing that chang d: What is your ter students on ted: Class rank resentation [clp: is in class or coi without complet y week spent pa Community or ju week spent pa Community or ju	ed) - raw, indivi pearing for c ng - raw, indivi pearing for c ng - raw, indivi Play, dance, earn sponso (birthyr) oviding care ed the way yu current class projects DUI (classran) resen) ntributed to c ing readings in nior college o 8 8 8 8 8 8 8 8 8	dividual-level dual-level sc lass (studyin vidual-level s soasic elemen es or concep or other theal red by your ir for depender bu understan sification in c assignm co-curricular (comcol05) 0 0 0 0 0 0 0	score [AC] ore [ACa] g, reading, writing, o score [ACL] ts of an idea, experi ts to practical probli- ter performance [ato stitution's athletics institution's athletics ats living with you (p d an issue or conce ollege (university)?] [classgrp] sions [clquest] ents [clunprep] activities (organiza Enriching Educ Used e-mail to Thinking about Institution repor Did you begin c How would you	doing ernce, tart05] depar arents ppt [ch ppt [ch pt] tions, CK Past vorre None {1, Never} {1, Less tha {1, Part-tim {1, Started {1, Poor}	Factor: Fac	List how would how would neel Hell o 8 8 8 8 8 8 8 8 8 8	you evaluate the	e quality of academic a	advising you have	e received a Post <u>Hoc</u> Options Bootstrap	
Data View	Variable View												



One-way ANOVA: Options

a *combined	file.sav [DataSet	1] - IBM SPSS S	tatistics Data	a Editor								
<u>F</u> ile <u>E</u> dit	<u>V</u> iew <u>D</u> ata	<u>T</u> ransform <u>A</u>	nalyze Dir	ect <u>M</u> arketing	<u>G</u> raphs <u>U</u> tilities	Add- <u>o</u> ns <u>V</u>	/indow <u>H</u> elp					
😂 🗄			-	• 📥 🖃			- 🐴 🎹	A 14	ð 🌗 🔺			
	Name	Туре	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role	
1	AC	Numeric	8	2	Academic Chall	None	None	8	🗏 Right	🛷 Scale	🔪 Input	
2	ACa	Numeric	8	2	Academic Chall	None	None	8	端 Right	🛷 Scale	🔪 Input	
3	acadpr01	Numeric	8	0	Hours per 7-da	{1, 0}	None	8	端 Right	Ordinal	🔪 Input	
4	ACL	Numeric	8	2	Active and Coll	None	None	8	疆 Right	I Scale	🔪 Input	
5	actt	Numeric	8	0	ACT total score	None	None	8	I Right	🛷 Scale	💊 Input	
6	advise	Numeric	8	0	Overall, how wo	{1, Poor}	None	8	I Right	🚮 Ordinal	ゝ Input	
(🖬 o	ne-Way ANOVA	Theorem 1.			Apr Category	1.94.9	The second se		8.44	A new	N 1987	23
							Dependent	l ist			-	
	Academic Chal	lenge (unadjus	ted) - raw, ir	ndividual-level	score [AC]	-	Overall	how would	you evaluate the o	quality of academic a	advising you have	e received a
	Academic Chal	lenge (adjuste	d) - raw, indi	vidual-level sc	ore [ACa]			57				Post <u>H</u> oc
	Hours per 7-da	y week spent p	reparing for	class (studyin	g, reading, writing, (One-Way A	NOVA: Options	_ 25				Options
	Active and Colla	aborative Learn	ing - raw, ind	dividual-level s	core [ACL]	-Statistics-						Bootstrap
	Age Category [a	acij adel				Descript	ive					
	Age [agebase]					Eixed an	d random effects					
	Coursework en	nphasized: AN/	LYZING the	basic element	ts of an idea, exper	Homoge	neity of variance	test				
	Coursework en	nphasized: APF	PLYING theor	ries or concept	ts to practical probl	Brown-E	orsythe					
	Allended an an	nt-athlete on a	, play, dance team spons	, or other theat ored by your in	er performance (all istitution's athletics	Welch	orojuro					
	Write in your year	ar of birth: 19_	[birthyr]	oroa oy your m								
	Hours per 7-da	y week spent p	roviding care	e for depender	its living with you (p	📝 <u>M</u> eans p	lot					
	Learned somet	thing that chang	ged the way	you understan	d an issue or conce	-Missing Val	ues					
	Student reporte	d: What is you	r current clas	IRING CLASS	(university)?	Exclude	cases analysis b	v analysis				
2	Institution repor	ted: Class ran	k (classran)	INING CEAGO	[ciassyip]	© Exclude	cases listwise	, analyere				
	Made a class p	resentation [clp	presen]			C Excitato						
	Asked question	is in class or co	ontributed to	class discuss	ions [clquest]	Continue	Cancel	Help				
2	Come to class	without comple	eting reading	is or assignme	ents [clunprep]							
2	Also attended:	Community or i	unior college	e [comcol05]	activities (organiza		Factor:					
2	B 0 1 1 1						path=c:	\temp\multiy	/ear\[source]			
2					(OK Paste	<u>R</u> eset Ca	ncel Hel	p			
30	ouration	Numeric	0	U	Length of time	Ivone	None	0	= Kigni	Scale	s input	
31	EEE	Numeric	8	2	Enriching Educ	None	None	8	≣ Right	Scale Scale	S Input	
32	email	Numeric	8	0	Used e-mail to	{1, Never}	None	8	≡ Right	d Ordinal	S Input	
33	enrlment	Numeric	8	0	Thinking about	{1, Less tha	None	8	I Right	💦 Nominal	🔪 Input	
34	enrollmt	Numeric	8	0	Institution repor	{1, Part-tim	None	8	I Right	💦 Nominal	🔪 Input	
35	enter	Numeric	8	0	Did you begin c	{1, Started	None	8	I Right	💦 Nominal	🔪 Input	
36	entirexp	Numeric	8	0	How would you	{1, Poor}	None	8	I Right	I Ordinal	🔪 Input	
	4			-		-						



Data View Variable View

One-way ANOVA: Post Hoc Test

🖙 *combined file.sav [DataSet1] - IBM SPSS Statistics Data Editor	10401000	- 0
<u>File Edit View D</u> ata <u>T</u> ransform <u>A</u> nalyze Direct <u>Marketing G</u> raphs <u>Utilities</u> Add- <u>o</u> ns <u>W</u> indow <u>H</u> elp		
	23	Л
Dependent List	Contrasts	Visible: 239 of 239 Varia
AC Academic Challenge (unaquisted) - raw, individual-evel score [AC]	Post Hoc	ew class cla
38.53 Hours per 7-day week spent preparing for class (studying, reading, writing, doing homew	Ontions	2 4
2 32.90 Active and Collaborative Learning - raw, individual-level score [ACL]		2 4
-3 65.04 ACT total score [actt]	Bootstrap	3 4
Ape Category [age]		
Age lagebase		4 4
5 108 - Coursework emphasized. Avok 12 invoire basic elements of an index, experience, or aneon		2 4
7 6126 Attended an art exhibit, gallery, play, dance, or other theate		4 4
8 65.26 Are you a student-athlete on a team sponsored by your ins		2 4
9 44.16 Write in your year of birth: 19 [Dirthyr]		4 4
10 34 42 Hours per /-aay week spent providing care to redependente		3 4
11 46.00 Student reported: What is your current classification in coll		3
12 71 86 Worked with other students on projects DURING CLASS (Output Charter Control		4 4
13 56 60 Solution reported: Class rank [classran]		3 4
14 62 77 Made a class presentation [clpresen]		4 4
Asked questions in class of contributed to class so iscussing Come to class without completing crassing and the class of control of the completing crassing of the class of control of the class of		3 4
14 37.66 J Hours ber 7-day week specification in co-curricular a		2 3
12 51 62 Show a stended. Community or junior college [comcol05]		3 1
19-03 23 24 Participated in a community-based project (e.g., service le		2
19- 67.33 Hours per 7-day week spent commuting to class (driving,		4 4
The off of the second s		4 4
21 97 columnation with students of a different rac		4 5
21.00 Je Length of time spent on web survey [duration]		2 2
22 6117 PERCENTIAL STATE OF CONTRACT OF CO		2 4
60 01.41 Julie de-mail to communicate with an instructor [email]		3 4
50.52 So ininising about mis current academic term, now would you characterize your enroiment? [2 4
20 50.55 0 Did you begin college (university) at your current institution or elsewhere? [enter]		3 4
40.54 40.54 A How would you evaluate your entire educational experience at this institution? [entirexp]		2 4
52.11 a Quality: Your relationships with administrative personnel and offices [envadm] Factor.		2 4
287 (9.87) in stitutional emphasis: Using computers in academic work [envcompt]		3 4
b8.0/		3 4
Data View Variable View		2
	rio modu	Filter On Weight On



One-way ANOVA: Descriptive Statistics



	IN	wearr	Std. Deviation	Stu. Entor	Lower bound	Opper Doulld	WIIIIIII	Waxinnunn
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

*combined file	e.sav [DataSet1] - IBM SPSS Statistics Data I	Editor	and the second second										- 0
<u>File Edit V</u> ie	🖌 🔚 *Output2 [Document2] - IBM SPSS St	tatistics Viewer	and the second second	•									
	🚔 듺 🛛 File Edit View Data Transform Insert Format Analyze Direct Marketing Graphs Utilities Add-ons Window Help												
	😑 🗄 🖨 🔕 🤌	🛄 🖛 🛥 🚦			F 1			+ +	+ -		T 🗗 🎝		of 239
1 2 3 4	Image: Second secon	Post Hoc Tests	M all, how would you evaluate t	lultiple Compariso	ns mic advising	you have red	ceived at your ins	titution?				<u> </u>	4 4 4 4
	Test of Homogene	Games-Howell		Mean									4
	Post Hoc Tests		(J) path=c:	Difference (I-	Std Error	Sig	95% Contide	Unner Bound					4
8	Multiple Com	NSSE05 Data (UH Manoa).sav	NSSE07 Data (UH Manoa).sav	.119	.121	.758	19	.43					4
	Title	520	NSSE08 Data (UH Manoa).sav	188	.109	.314	47	.09					4
12	Log		NSSE09 Data (UH Manoa).sav	129	.100	.574	39	.13					4
	-	NSSE07 Data (UH Manoa).sav	NSSE05 Data (UH	110	121	759	- 43	.19					4
			NSSE08 Data (UH Manoa).sav	307	.116	.045	61	01		>			4
17			NSSE09 Data (UH Manoa) say	.240	.100	.105	53	.03					4
	-	NSSE08 Data (UH Manoa).sav	NSSE05 Data (UH Manoa).sav	.188	.109	.314	09	.47					
20			NSSE07 Data (UH Manoa).sav	.307*	.116	.045	.01	.61					5
	-		NSSE09 Data (UH Manoa).sav	.059	.095	.926	19	.31					3
23	-	NSSE09 Data (UH Manoa).sav	NSSE05 Data (UH Manoa).sav	.129	.100	.574	13	.39					4
_25	-		NSSE07 Data (UH Manoa).sav	.248	.108	.105	03	.53					4
27	-		NSSE08 Data (UH Manoa).sav	059	.095	.926	31	.19					4
28	-	*. The mean difference is	s significant at the 0.05 level.										4
1		Means Plots										-	4
Data View Va										IBM SPSS S	tatistics Processor is read	y T	
	(<u> </u>								IBM	SPSS Statistics	Processor is ready	Filter On V	Veiaht
	3												

One-way ANOVA: Means Plot





One-way ANOVA: Means Plot





Cohen's d



Dr. Lee A. Becker (Effect size Calculators) College of Letters, Arts, and Sciences UNIVERSITY OF COLORADO COLORADO SPRINGS

UCCS: Home • Calendar • Map

Search A-Z, People, Web

Effect Size Calculators

Home	
Texts	
Content, Part I	
Content, Part II	
Research Tools	
Notices	
Grades	
Schedules	
590 Gateway	

Effect Size Calculators

Calculate Cohen's d and the effect-size correlation, ry, using --

- · means and standard deviations
- · independent groups t test values and df

For a discussion of these effect size measures see Effect Size Lecture Notes

Calculate d and r using means and standard deviations

Calculate the value of Cohen's d and the effect-size correlation, $r_{Y\lambda}$, using the means and standard deviations of two groups (treatment and control).

```
Cohen's d = M_1 - M_2 / \sigma_{\text{pooled}}
where \sigma_{\text{pooled}} = \sqrt{[(\sigma_1^2 + \sigma_2^2) / 2]}
```

 $r_{Y\lambda} = d / \sqrt{(d < sup > 2 < /sup > + 4)}$

Group 1Group 2M1M2SD1SD2ComputeResetCohen's deffect-size r

Note: d and $r_{Y\lambda}$ are positive if the mean difference is in the predicted direction.

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?



John Stanley, Institutional Analyst Yang Zhang, Director

University of Hawaii at Manoa Manoa Institutional Research Office

Questions: miro@hawaii.edu

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

