



SAMHSA-HRSA CENTER for INTEGRATED HEALTH SOLUTIONS

Program Evaluator's Roundtable Community of Practice (CoP) Session #2

Tuesday, July 12, 2016

Min Qi (Mitch) Wang, Ph.D., Faculty

Suzanne M. Randolph, Ph.D., Faculty

Jamie Weinstein, MPH, Facilitator

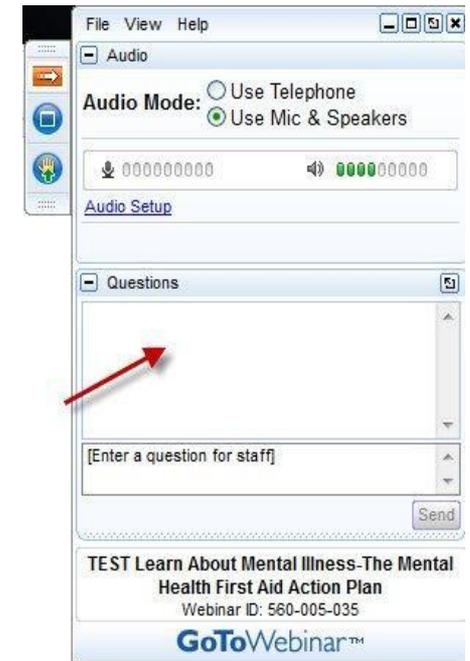
The MayaTech Corporation

How to ask a question during the webinar



If you dialed in to this webinar on your phone please use the “raise your hand” button and we will open up your lines for you to ask your question to the group. **(left)**

If you are listening to this webinar from your computer speakers, please type your questions into the question box and we will address your questions. **(right)**



**SESSION IS
BEING RECORDED**

Today's Agenda

Welcome and Faculty Introductions

Brief Poll

Presentation and Discussion (Q&A) on Topic:

“Small-sample Data Analysis Strategies”

- Analyses with small samples
- Data issues: handling analysis with
 - ongoing drop-out and re-enrollment issues
 - using discharge vs. 6 month reassessment data to look at longer-term outcomes
- Utilizing small-sample data (if time)

Wrap Up

I am confident that I know how to select the appropriate statistical test(s) to analyze my small-sample, longitudinal data.

- Yes, definitely
- Somewhat
- No, not at all

I have sufficient resources/tools to conduct my small-sample data analyses.

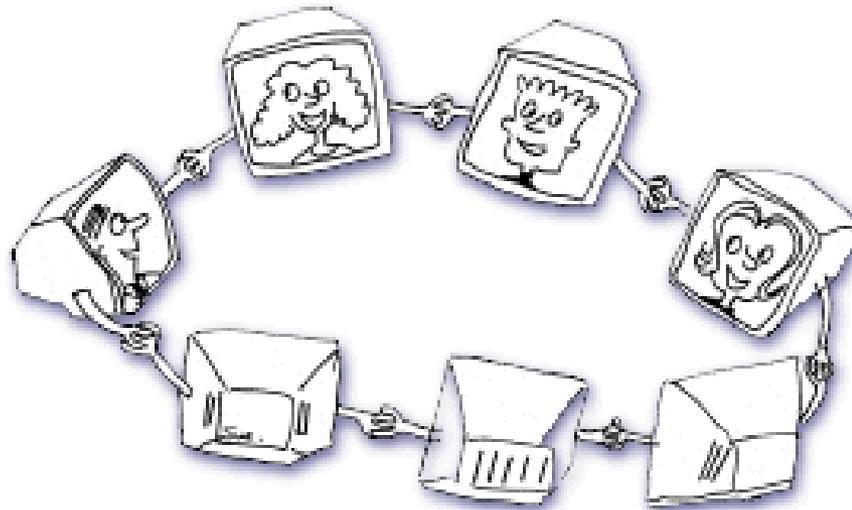
- Yes
- Not sure
- No

I have sufficient resources/tools to utilize my small-sample data in a way that makes sense to others.

- Yes
- Not sure
- No

I know the challenges I face in analyzing my small-sample, longitudinal data when data at some time points are missing.

- Yes, definitely
- Somewhat
- No, not at all

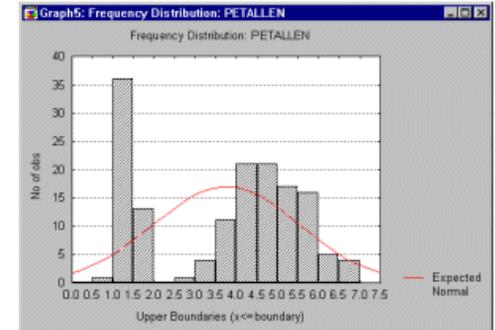


MAI-CoC Evaluation Roundtable CoP

GRANTEE SITES INTRODUCTION & EXPECTATIONS FOR THE SESSION

Factors influencing the Selection of Statistical Tests for Small-sample Data*

- Is there a normal (“bell-shaped curve”) distribution of the variable in the population at large? In the sample?
- What is the nature of the variable of interest?



Application for MAI CoC: “The incidence rates [small sample sizes] of rare diseases are not normally distributed in the population.” Therefore, “traditional” (parametric) statistics might not be appropriate for studies tracking improved health outcomes in small samples for such conditions as hepatitis, HIV, and/or their co-occurrence.

Source: The quoted material and figure in this section are taken from a website “Nonparametric Statistics,” retrieved July 7, 2016 at <https://documents.software.dell.com/statistics/textbook/nonparametric-statistics>.

Factors limiting the applicability of tests that assume normal distribution

- **Sample Size**

- “We can assume that the sampling distribution is normal (even if we are not sure that the distribution of the variable in the population is normal), as long as our sample is large enough (e.g., 100 or more observations). However, if our sample is very small, then those tests can be used only if we are sure that the variable is normally distributed, and there is no way to test this assumption if the sample is small.”

- **Lack of precision in measurement**

- “The underlying assumption for most statistical tests like *t*-tests and analysis of variance is that our data type is at least *interval*; but in many cases we have, at best, *ordinal* data (e.g., excellent, very good, good, fair, or poor health). Many times we also have *categorical* data (yes/no, agree/disagree). These latter two types of data are not precise measurements.”

Factors limiting the applicability of tests that assume normal distribution--continued

- **Problem in measurement--EXAMPLE:**

“Let’s consider grade point averages (GPA):

- Is an A average twice as good as a C average?
- Is the difference between a B and an A average comparable to the difference between a D and a C average?

Thus, the GPA letter-grade measure only allows us to establish a rank ordering of students from "good" students to "poor" students.”

If on the other hand, we measured GPA with a point system with 4.0 as highest, a 4.0 could be interpreted as twice as high as a 2.0, and we could calculate other measures such as a mean with these data when the sample size is large enough.

The solution to the problem of measurement: Non-parametric tests

“Most common statistical techniques such as analysis of variance (and *t*- tests), regression, etc., assume that the underlying measurements are at least of interval, meaning that equally spaced intervals on the scale can be compared in a meaningful manner (e.g., *B* minus *A* is equal to *D* minus *C*).”

“However, as in our example, this assumption is very often not tenable, and the data represent a *rank* ordering of observations (ordinal) rather than precise measurements.”

The solution to the problem of measurement: Non-parametric tests--*continued*

“Thus, the need is evident for statistical procedures that enable us to process data of ‘low quality,’ from small samples, on variables about which nothing is known (concerning their distribution).”

“Specifically, nonparametric methods were developed to be used in cases when the researcher knows nothing about the parameters (i.e., whether there is a normal distribution) of the variable of interest in the population (hence the name *nonparametric*).”

Selecting Statistical Tests for Small-sample Data

Examples of issues to consider before selection:

- What is the unit of analysis? (Site, individuals, etc.)
- How many units are there (# sites, participants, cases, etc.)?
- What types of data are there for the independent and dependent variables—e.g., continuous or interval (where I can calculate means); categorical (e.g., Yes/No, Agree/Disagree); rank ordered (1st, 2nd, 3rd); etc.?
- Do we have more than one data collection time point? Will these be used for comparisons?
- How many data points do we have?
- Are there missing data? How much? At what time points?

Brief Overview of Nonparametric Methods

“Basically, there is at least one nonparametric equivalent for each parametric general type of test. In general, these tests fall into the following categories:

1. Tests of differences between groups (independent samples such as intervention vs. controls)
2. Tests of differences between variables (dependent samples such as test/retest or pre-/posttest)
3. Tests of relationships between variables.”

Differences between independent groups.

“Usually, when we have two samples that we want to compare concerning their mean value for some variable of interest, we would use the *t*-test for independent samples; or for multiple groups, the analysis of variance (ANOVA) or multiple ANOVA (MANOVA).” Some nonparametric alternatives follow:

If two independent groups, instead of <i>t</i>-tests, use:	If multiple groups, instead of ANOVA/MANOVA, use:
Mann-Whitney U test	Kruskal-Wallis analysis of ranks
Kolmogorov-Smirnov two-sample test	Median test
Wald-Wolfowitz runs test	

Differences between dependent groups.

“If we want to compare two variables measured in the same sample, we would customarily use the [t-test for dependent samples](#) (e.g., when we want to compare the difference for a group of patients’ using their CD4 count at first visit as compared to their CD4 count at 12 months). Some nonparametric alternatives are:

Type/Level of Measurement	Two Variables (instead of matched-sample <i>t</i> -test), use:	Three or more Variables (instead of ANOVA), use:
Continuous or interval level (actual viral load or CD4 count)	<i>Sign</i> test	<i>Friedman's</i> two-way analysis of variance
	<i>Wilcoxon's</i> matched pairs test	
Dichotomous or categorical (virally suppressed/not suppressed)	<i>McNemar's Chi-square</i> test	<i>Cochran Q</i> test

Nonparametric Correlations

“The following are three types of commonly used nonparametric correlation coefficients (Spearman R, Kendall Tau, and Gamma coefficients).”

“Note that the *chi-square* statistic computed for two-way frequency tables, also provides a careful measure of a relation between two or more (tabulated) variables, and unlike the correlation measures listed above, it can be used for variables that are measured on a simple nominal/categorical scale.” Also, for categorical variables, use the *Phi* coefficient, and the *Fisher exact test*.”

Best Practices and Precautions

- “Nonparametric and Distribution statistics can be used to compute a wide variety of measures of location (mean, median, mode, etc.) and dispersion (variance, average deviation, quartile range, etc.) to provide the ‘complete picture’ of one's data.”
- “It is always advisable to run different nonparametric tests”; and when there are differences, try to uncover why the results differ.
- “Please refer to [online textbook] descriptions of the specific tests to learn more about their power and efficiency.”

Small Sample Data Analysis Additional Considerations and Alternatives

What is considered small sample size?

Small sample sizes refer to studies that have typically between 5 and 30 cases/participants total.

Small sample size analysis strategies

Rather than focus on a p value that is sensitive to the sample size, we can focus on other parameters and results – such as effect size.

Effect Size (ES)

Effect size is a simple way of quantifying the difference between two groups that has many advantages over the use of tests of statistical significance alone.

Effect size emphasizes the **size** of the difference between groups/times of assessment.

How is Effect Size (ES) calculated?

$$\text{Effect Size} = \frac{[\text{Mean of experimental group}] - [\text{Mean of control group}]}{\text{Standard Deviation}}$$

How can Effect Size be interpreted?

An effect size is exactly equivalent to a 'Z-score' of a standard Normal distribution.

For example, an effect size of 1.0 means that the score of the average person in the experimental group is 1.0 standard deviations above the average person in the control group; and, hence, exceeds the scores of 84% of the control group.

How can ES be interpreted? -continued

An effect size of 0.5 means that the score of the average person in the experimental group exceeds the scores of 69% of the control group.

An effect size of 2.0 means that the score of the average person in the experimental group exceeds the scores of 98% of the control group.

Alternative measures of ES

Proportion of variance accounted for

In ANOVA, this is eta-squared, η^2

In regression, this is R^2

The relationship between the sample size and the significance

Group	Disease			Total
	Yes	No		
Control	Count	5	5	10
	% within Group	50.0%	50.0%	100.0%
Treatment	Count	2	8	10
	% within Group	20.0%	80.0%	100.0%

$p=.16$

The relationship between the sample size and the significance

Group			Disease		
			Yes	No	
Control	Count	50	50	100	
	% within Group	50.0%	50.0%	100.0%	
Treatment	Count	20	80	100	
	% within Group	20.0%	80.0%	100.0%	

$p=.001$

Summary - Resources to Share

- The quoted material in several sections is taken from a website “Nonparametric Statistics,” retrieved July 7, 2016 at <https://documents.software.dell.com/statistics/textbook/nonparametric-statistics>.

Grantees' Questions/Issues...

Resources Recap - 2015 Evaluator's CoP

INTEGRATION MEASURES

INTEGRATED PRACTICE ASSESSMENT TOOL (IPAT)

- http://www.integration.samhsa.gov/operations-administration/IPAT_v_2.0_FINAL.pdf

Vermont Integration Profile (VIP)

- *Viewing only Link to VIP 4.0:*
<https://redcap.uvm.edu/redcap/surveys/?s=7H3k7DN6sD>
- *The Live Link to VIP 4.0:*
<https://redcap.uvm.edu/redcap/surveys/?s=vEpGbwyFE6>

AHRQ Atlas for Integrated Behavioral Healthcare Measures (IBHC)

- http://integrationacademy.ahrq.gov/sites/default/files/Final_Atlas_Users_Guide_0.pdf

CONSUMER EXPERIENCE MEASURES

Consumer Assessment of Healthcare Providers and Systems (CAHPS)

- <http://www.ahrq.gov/cahps/surveys-guidance/index.html>

Resources - 2016 Evaluator's CoP

Hepatitis Challenge

- <http://www.epidemic.org/theTest/hepcChallenge/>

A Guide to GPRA Data Collection Using Trauma-informed Interviewing Skills

- <http://www.integration.samhsa.gov/about-us/Trauma-InformedInterviewingManual-508.pdf>

Session #3

Tuesday, August 2nd 2:00 -3:00 PM ET

Session 3 topics:

- Utilizing data (if carryover is needed, due to lack of time in session #2)
- Analyzing hepatitis and HIV data
- Evaluating services integration

Additional Questions

Gretchen Vaughn

gvaughn@mayatech.com

Jamie Weinstein

jweinstein@mayatech.com



Additional Comments?

Contact the SAMHSA-HRSA Center for Integrated Health Solutions
integration@thenationalcouncil.org or MAI-COC-TA@mayatech.com

**Slides for today's CoP are available on
the CIHS website at:**

<http://www.integration.samhsa.gov/mai-coc-grantees-online-community/communities-of-practice>

For More Information & Resources

Visit www.integration.samhsa.gov or
e-mail integration@thenationalcouncil.org





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Thank you for joining us today.

Please take a moment to provide your feedback by completing the survey at the end of today's webinar.