What Big SIZE you have!

Using Effect Sizes to Measure Impact of Public Health Nursing Interventions

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Illustration by Carl Offterdinger, end of the 19th century.
Source: Published by Wilhelm Effenberger (F. Loewes Verlag), Stuttgart, end of the 19th century.

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Background

- Evaluating client/patient progress
  - Electronic Health Records
  - BIG data = large n's
    - → sample size affects statistical tests
- Data from the Omaha System
    - low-income parents discharged from Midwest PHN agency in 2009

The Omaha System

Problem Classification Scheme

(42 problems)

Intervention Scheme

Problem Ratings for Outcomes

range: 1-5 for Knowledge, Behavior, Status [KBS]

13 documented in current study, range: 6 to 906 times

Examples:

- **Abuse**
- **Caretaking/parenting**
- **Health care supervision**
- **Mental health**
- **Pregnancy**
- **Substance use**

<u>Differences</u> in KBS scores at admission vs. scores at discharge

Problem

- How to measure treatment effectiveness?
  - statistical tests: $p < 0.05$
    - → tell whether differences occurred by chance
    - → do not tell much about size of differences

statistical significance ≠ practical/clinical significance

Solution: Calculate Effect Sizes

Cohen's D (speculative)	
Small effect	0.20
Medium effect	0.50
Large effect	0.80

Cohen, Jacob (1988) *Statistical Power Analysis for the Behavioral Sciences* 2nd edition (Hillsdale, NJ: Lawrence Erlbaum).

Lipsey (empirical)	
Small effect	0.15
Medium effect	0.45
Large effect	0.90

Lipsey, Mark W. (1990) *Design Sensitivity: Statistical Power for Experimental Research* (Newbury Park, CA: Sage Publications).

How to Calculate?

One group pretest-posttest design (RM)

1. $$d_{RM} = \frac{\bar{x}_2 - \bar{x}_1}{s_d}$$

2. **Calculate se of d_{RM}** $$se_{dRM} = \sqrt{\frac{2(1-r_{12})}{n} + \frac{d^2_{RM}}{2(n-1)}}$$

3. **Calculate 95% CI**

$$CI_{dRM} = d_{RM} +/- (1.96 * se_{dRM})$$

Or…Let the Computer Do It!

Kadel RP & Kip KE. (2012). A SAS macro to compute effect size (Cohen's d) and its confidence interval from raw survey data. Proceedings of the Annual Southeastern SAS Users Group Conference

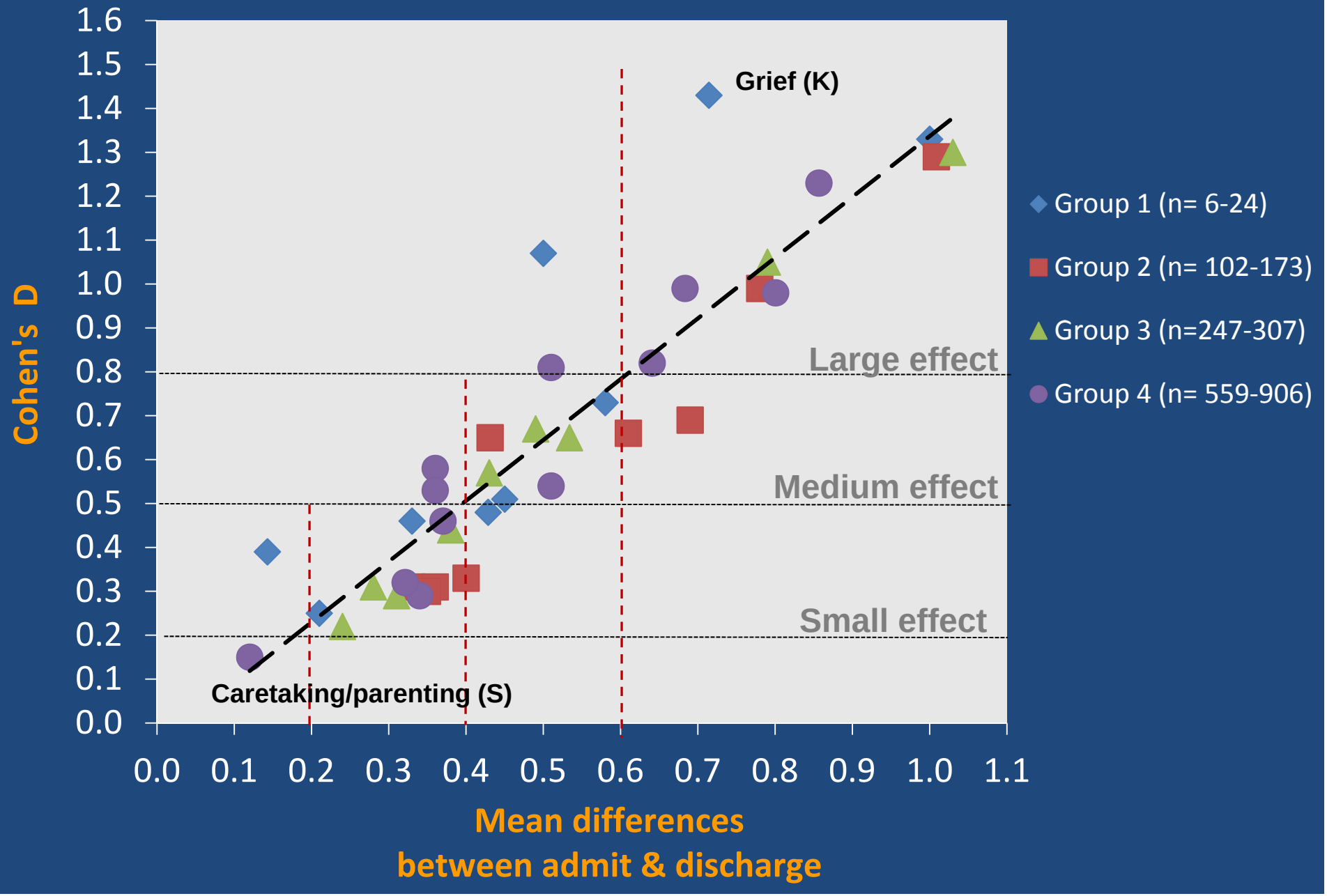
http://analytics.ncsu.edu/sesug/2012/SD-06.pdf

Midwest PHN 2009 Sample Characteristics (N = 1,016)	
% Female	98
Age (mean)[a] Range 13-66 years	23
Race/ethnicity (%)	
White	32
Black	32
Asian/Pacific Islander	23
Other	13
Hispanic	20
Problems per client (mean) Range 1-13 problems	4.2
Ave length of services (median) Range 2-2954 days	223

Paired T-Test Results for KBS Mean Difference Scores

Problem	Scale	N	Mean diff	p-value	Cohen's d (95% CI)
Cognition	B	24	0.45	0.024	0.51 (0.07, 0.94)
Communication with Community Resources	K	116	0.78	<0.0001	0.99 (0.75, 1.24)
Mental Health	B	247	0.28	<0.0001	0.31 (0.19, 0.44)
Caretaking/ Parenting	S	906	0.12	<0.0001	0.15 (0.10, 0.21)

Scatter Plot: Effect Sizes by Mean Differences



Implications

- Large effect size = KBS change score of 0.60
- Look beyond p-values
- Effect sizes = standardized metric
  - "easy" to calculate

- Omaha System users should report effect sizes

  → empirically establish what is practical and clinically meaningful

Thank You!

What Big SIZE you have!

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