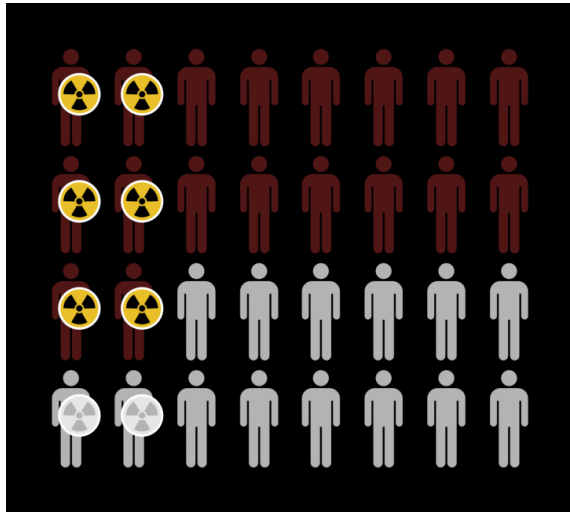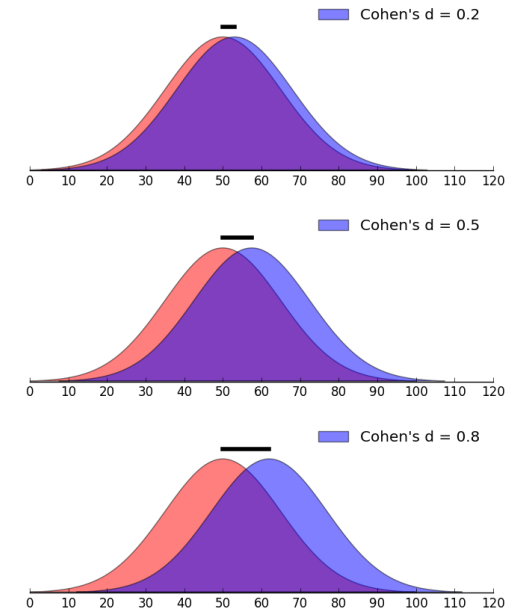# Effect Sizes

E0420

Week 13

Why do we report effect sizes?

- Statistical significance ≠ practical significance
- We need to know how large the obtained effect is
- Effect size = objective (and standardized) measure of the magnitude of the observed effect
- Standardized = comparable across studies
  - Meta-analyses
- **Population impact measures**
  - Measures used to describe the impact of health risks and benefits in a population (to inform health policy)
    - Odds Ratio (OR), Relative Risk (RR)
    - Number needed to treat (NNT), Population attributable fraction (PAF)

Effect sizes for common statistical tests

| Test	Effect Size
Chi-square – 2x2 table	Phi (ϕ), Odds Ratio (OR), Relative Risk (RR)
Chi-square – bigger table	Cramer's V
T-test	Cohen's d
ANOVA	$\eta2$, Cohen's f
Correlation	R
Regression – linear	β, R^2
Regression – logistic	OR, RR
Mediation	R^2, proportion mediated, standardized indirect effect
Moderation	R^2, f^2

Cohen's *d*

- Standardized mean difference

Cohen's d formula:

$$d = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\dfrac{s_1^3 + s_2^3}{2}}}$$

- d = Cohen's d effect size; X1 and X2 = means of the two groups; s1 and s2 = standard deviations of the two groups
- https://rpsychologist.com/cohend/

Relative risk

- The relative risk (=risk ratio [RR]) is the ratio of risk of an event in one group (e.g., exposed group) versus the risk of the event in the other group (e.g., nonexposed group).
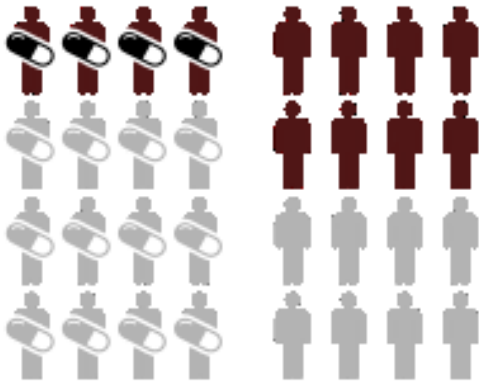
$$RR = \frac{IE/(IE+IN)}{CE/(CE+CN)}$$

RR = relative risk
IE = intervention events
IN = intervention non-events
CE = control events
CN = control non-events

- The group exposed to treatment (left) has half the risk (RR = 4/8 = 0.5) of an adverse outcome (black) compared to the unexposed group (right)
- Equivalent information to Odds Ratio (OR)

Relative Risk vs Odds Ratio

	Deaths	Survivors	Odds of death	OR	Risk of death	RR
(a)						
Intervention 1	10	90	10/90=0.11	0.11/0.11=1.0	10/100=0.10	0.10/0.10=1.0
Control	10	90	10/90=0.11		10/100=0.10	
(b)						
Intervention 2	1	99	1/99=0.01	0.01/0.11=0.09	1/100=0.01	0.01/0.1=0.10
Control	10	90	10/90=0.11		10/100=0.10	
(c)						
Intervention 3	3	97	3/97=0.0309	0.0309/0.0101=3.06	3/100=0.03	0.03/0.01=3.0
Control	1	99	1/99=0.0101		1/100=0.01	
(d)						
Intervention 4	30	70	30/70=0.43	0.43/0/11=3.9	30/100=0.30	0.30/0.10=3.0
Control	10	90	10/90=0.11		10/100=0.10	
(e)						
Intervention 5	45	55	45/55=0.82	0.82/0.11=7.45	45/100=0.45	0.45/0.1=4.5
Control	10	90	10/90=0.11		10/100=0.1	

OR=Odds ratio, RR=Relative risk

Population attributable fraction (PAF)

• PAF is the proportion of incidents in the population that are attributable to the risk factor
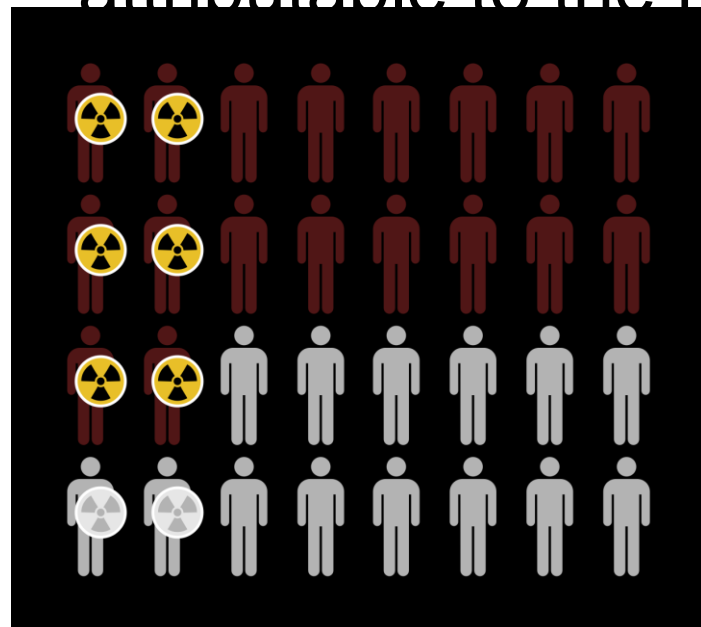
$$PAF = \frac{Incidence\ rate\ in\ total\ population - Incidence\ rate\ unexposed}{Incidence\ rate\ in\ total\ population}$$

• A quarter of the population is exposed to a risk factor (i.e., radiation) and has a higher risk of an adverse outcome (black). In the whole population, one ninth of the adverse outcomes can be attributed to the exposure (PAF = 1/9)

Real-life Example

The population attributable fractions to compare the contributions of different sources of alcohol supply are shown in Table 4. They suggest that due to high prevalence in this sample (~ 18%) as well as consistently increased risk for later alcohol use, parental supply of alcohol emerged as the major contributor to frequent use at age 15, with PAF 0.17 and 0.12 for less frequent use (adolescent and pediatrician report) and 0.23/0.23 for frequent use. Supply of alcohol from other family member was also considerable, with PAF between 0.10 and 0.13 for the adolescent report and between 0.05 and 0.11 for the pediatrician report.

Final Assignment (80 points)

- Topic and data selection (10 points)
  - Please, fill this spreadsheet **on 16/12 at the latest**: https://ucnmuni.sharepoint.com/:w:/t/ERAGroup-internal/ESaph_FXvC1IvKZLISPsjyEBnzdRc10xt8yV-RHBNzQK7g?e=5lMYRY
- Data analysis and write-up (70 points)
  - Submit SPSS syntax, output, and a word document to is.muni Homework Vaults ("Odevzdávárna") **on 11/2 at the latest.**
- Papers must be double-spaced, typed, and follow a specific reference/formatting style (e.g., APA, Chicago, CSE)
- Example is in is.muni -- Study Materials -- Course-related instructions