

Case-Control Studies

- Identify all cases in the source population
- Select sample of non-cases from source population
- Ascertain exposure status in case and controls
- Calculate odds ratio as measure of association

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Case-Control Odds Ratio

- Cross-tabulate exposure and disease status
- Calculate odds ratio (OR)
- Case-control OR stochastically equivalent cohort RR

	D+	D-
E+	A ₁	B ₁
E-	A ₀	B ₀
	M ₁	M ₂

$$\text{Odds Ratio} = \frac{A_1 B_0}{B_1 A_0}$$

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Historical Example: Levin

- [Mort Levin \(1904 -1995\)](#) 1950 case-control studies
- Population: Roswell Park Cancer Institute (Buffalo, NY)
- 236 lung cancer cases
- 481 non-cases (nonmalignant lung conditions)
- OR estimate of 2.29 suggests smokers had 2.29x the risk of non-smokers

	Heavy smoker	Lung CA+	Lung CA-
Exposed+		156	221
Exposed-		80	260
Total		236	481

$$\hat{OR} = \frac{A_1 \cdot B_0}{B_1 \cdot A_0} = \frac{156 \cdot 260}{221 \cdot 80} = 2.29$$

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Tampon Use and Toxic Shock, Wisconsin, 1980

	TSS+	TSS -
Tampon +	30	71
Tampon -	1	22
Total	31	93

$$OR = \frac{A_1 B_0}{B_1 A_0} = \frac{(30)(22)}{(71)(1)} = 9.3$$

Interpretation: Exposure \Rightarrow 9.3x the risk

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Multiple Levels of Exposure

Historical Example: (Wynder & Graham, 1950, p. 212)

Exposure may be measured at various levels. In this historical example, smoking is classified into 6 levels. To analyze the table, break-up it up into five separate 2-by-2 tables with each table referencing the nonexposed group as follows:

Smoking status	Cases	Controls
Chain	123	64
Excessive	186	98
Heavy	213	274
Moderate	61	147
Light	14	82
Non-smoker	8	115
Total	605	115

Table 1

Case	Cntl
Light smoke	14 82
Non-smoker	8 115

OR₁ = (14)(115)/(82)(8) = 2.5

Table 2

Case	Cntl
Moderate	61 147
Non-smoker	8 115

OR₂ = (61)(115)/(147)(8) = 6.0

Table 3

Case	Cntl
Heavy	213 274
Non-sm.	8 115

OR₃ = (213)(115)/(274)(8) = 11.2

Table 4

Case	Cntl
Excessive	186 98
Non-smoker	8 115

OR₄ = (186)(115)/(98)(8) = 27.3

Table 5

Case	Cntl
Chain	123 64
Non-smoker	8 115

OR₅ = (123)(115)/(64)(8) = 27.6

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Longitudinal Designs

- Experimental Studies**
 - Assign Treatments to Study Subjects
 - Treatment Group 1 \rightarrow Incidence 1
 - Treatment Group 0 \rightarrow Incidence 0
- Cohort Studies**
 - Select Study Subjects Based on a Common Characteristic
 - Exposure Group 1 \rightarrow Incidence 1
 - Exposure Group 0 \rightarrow Incidence 0
- Case-Control Studies**
 - Select Study Subjects Based on a Disease Status
 - Diseased Group \rightarrow Odds of Exposure 1
 - Control Group \rightarrow Odds of Exposure 0

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Longitudinal Designs

Trial	Cohort	Case-Control
Experimental	Observational	Observational
Assign exposure	Classify exposure	Select cases and non-cases
Calculate RD and/or RR	Calculate RD and/or RR	Calculate OR
Study multiple outcomes	Study multiple outcomes	Study multiple exposures
Prospective	Prospective or retrospective	Retrospective

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