

A large, light gray watermark of the University of South Asia logo is centered in the background. The logo is circular with the text "SEEK KNOWLEDGE" at the top and "UNIVERSITY OF SOUTH ASIA" at the bottom. In the center of the logo is an open book. The left page of the book contains the Bengali characters 'অ', 'আ', 'ক', and 'খ'. The right page contains the letters 'a', 'b', 'c' and the numbers '1', '2', '3'.

Case Control Study

Course Title: Research Methodology

Faculty: Professor Azaz Bin Sharif

Submitted by: Group One

August 1, 2025

Here we are:

- Md. Abdul Mannan (2517624080)
- Nafis Safwat (2517437080)
- Mirza Jannatul Ferdous (2517436080)
- Syeda Tanzim Tashfia (2517675080)
- Masuka Akther (2517512680)
- Md. Yeasir Arafat (2517101680)
- Md. Tarek Hasan (2517605080)

Overview of Case-Control Study

- **Definition:**

- An observational study comparing individuals with a condition (cases) to those without (controls).
- Purpose: To identify whether past exposures potentially linked to the condition.

- **Key Features:**

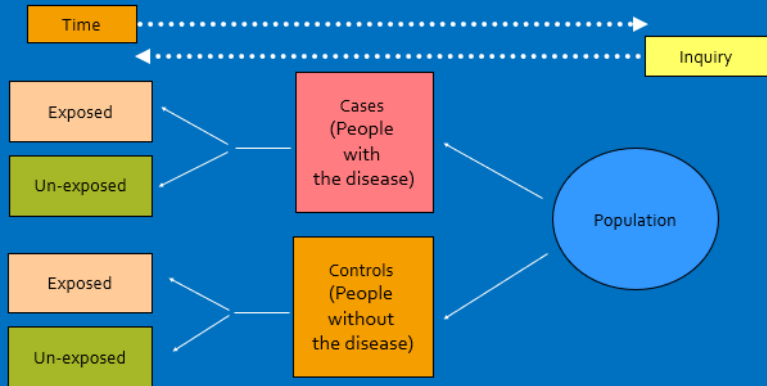
- Retrospective design (looks backward in time)
- Compares exposure history between cases and controls.
- Commonly used for rare diseases or outbreak investigations

- **Example:**

- Studying Association of Lung Cancer and Cigarette Smoking

Case-Control Study Schema

Borrowed from Prof. Azaz Bin Sharif



- **Case and Control Selection:**

- Cases: Clearly defined, confirmed diagnosis
- Controls: Similar in age, sex, geography, etc., but without disease
- Matching helps control confounding

- **Exposure Assessment:**

- Use standardized, reliable methods (e.g., interviews, records)
- Apply blinding where possible to reduce interviewer bias

- **Bias and Confounding:**

- Recall bias: Inaccurate memory of past exposures
- Selection bias: Non-comparable case/control groups
- Confounding: Unmeasured variables influencing exposure and outcome

Sample Size Calculation

Key Inputs:

- Expected odds ratio (OR) for exposure
- Prevalence of exposure in controls
- Desired power (typically 80–90%)
- Significance level (α), usually 0.05
- Case-to-control ratio (e.g., 1:1, 1:2, 1:4)

Tools:

- *Epi Info*, *OpenEpi*, *G*Power*

Retrospective Case-Control Study

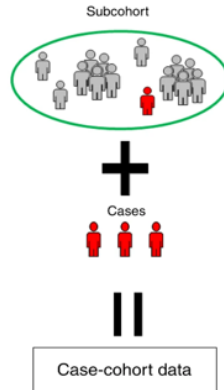
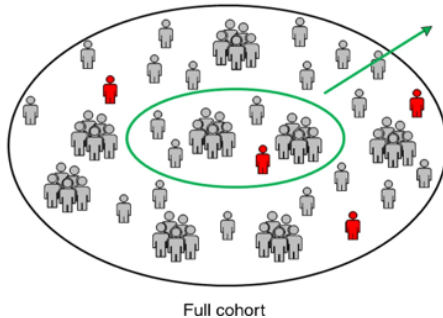
Retrospective case-control studies rely on existing records (medical records, databases) for data collection.

- **Data Collection:** Existing data sources like medical records, databases, etc.
- **Retrospective Element:** Data collected based on past events and records
- **Examples:**
 - Analyzing existing medical records to compare patients with a specific disease to those without, based on past risk factors identified in the records.

Study: H. pylori and Stomach Cancer (Uemura et al. 2001)

- **Design:** Retrospective case-control
- **Cases:** Patients with gastric cancer
- **Controls:** Patients without gastric cancer, undergoing endoscopy
- **Exposure:** H. pylori infection
- **Result:** Strong correlation between H. pylori infection and gastric cancer

Case-Cohort Study



Study: Occupational Risk Factors for Bladder Cancer in Men – A Dutch Case-Cohort Study (Zeegers et al. 2001)

- **Design:** Hospital-based matched case-control study
- **Cases:** 532 men from the total cohort who developed bladder cancer
- **Controls:** 1,630 men from the original cohort of 58,279 men
- **Exposure:** Paint components; Polycyclic aromatic hydrocarbons (PAHs); Diesel exhaust
- **Result:**
 - High exposure to paint, PAHs, diesel, and aromatic amines showed slightly increased bladder cancer risk, but not statistically significant.
 - The interaction with cigarette smoking was more consistent than the effect of occupational exposures alone.

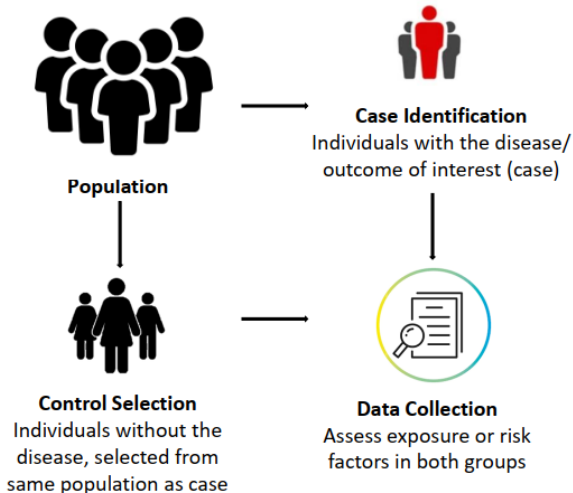
Advantages:

- Efficiency
- Cost-effectiveness
- Flexibility
- Reduced bias

Disadvantages:

- Statistical complexity
- Potential for reduced efficiency

Population Based Case-Control Study



Population Based Case-Control Study

Strengths:

- Controls from same population as cases
- Suitable for rare diseases
- Helps identify exposure-disease associations

Weaknesses:

- Recall bias
- Selection bias (non-representative controls)
- Cannot directly calculate incidence/prevalence

Matched Case-Control Study

We compare matched and unmatched case-control design using targeted maximum likelihood estimation to assess which provides more information on the marginal causal effect.

Advantages:

- Helpful when confounding factors are strong
- May increase power of small studies
- Works well for studies focusing on one factor
- Case make finding controls easier

Disadvantages:

- Difficulty in analyzing matched data
- Increased study complexity
- Difficulty in assessing does-response relationship

Study: Assessing Risk Factors Associated with Multiple Sclerosis in Kuwait (El Muzaini et al. 2020)

- **Data Collection:** Structured, pre-tested questionnaire via face-to-face interviews
- **Cases:** 110 confirmed MS patients
- **Controls:** 110 matched controls (matched on age ± 5 years, gender, and nationality)
- **Analysis:** Conditional logistic regression to identify significant associations
- **Result:**
 - A family history of MS significantly increased risk (adjusted matched odds ratio)
 - Vaccination against influenza A and B was associated with reduced MS risk

Hospital Based Case-Control Study

This study compares the exposure history of individuals with a specific disease (cases) to individuals without that disease (controls), all recruited from a hospital setting.

Strengths:

- Efficient for studying rare diseases
- Allow for a more focused investigation of risk factors within a specific healthcare setting

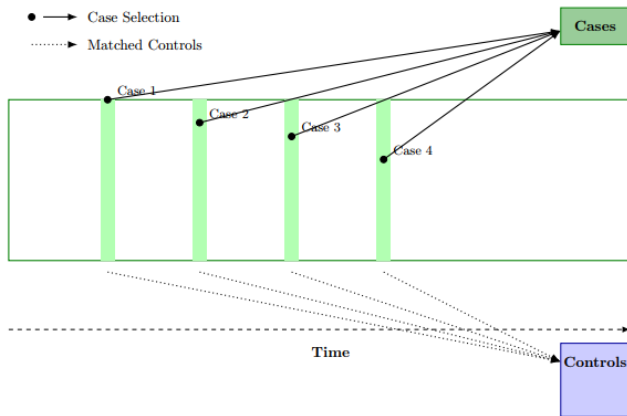
Weaknesses:

- Findings may not be generalizable to the broader population
- Selection bias (non-representative controls)
- Recall Bias

Study: Case–Control Study of HPV & Oropharyngeal Cancer
(D'Souza et al., 2007)

- **Design:** Hospital-based matched case-control study
- **Cases:** 100 patients
- **Controls:** 200 cancer-free patients (matched by sex and age group)
- **Exposure:**
 - Oral HPV infection (including HPV-16 DNA via oral rinse cytology)
 - Seropositivity for HPV-16 capsid protein L1 and oncoproteins E6/E7
- **Result:**
 - Oral HPV-16 infection associated with oropharyngeal cancer (OR 14.6; 95% CI 6.3–36.6)
 - Seropositivity for HPV-16 L1: OR 32.2 (95% CI 14.6–71.3)

Nested Case-Control Study



(Idea from Prof. Javier Nieto and Prof. Moyses Szklo)

Study: Serum Sex Hormone Levels and Breast Cancer (Drogan et al., 1997)

- **Actual Time Frame** From 1977 to 1987
- **Source Population** 3375 postmenopausal women
- **Cases:** 72 women with breast cancer
- **Controls:** 144 without breast cancer
- **Exposure:** Serum estrogen and androgen levels
- **Result:** Risk of breast cancer was positively and significantly associated with serum levels of estrogens and androgens.
Relative Risk = 5.2 (estrogens); 6.2 (androgens)

Thank You!

Questions or Comments?

We appreciate your attention.