Cross-sectional studies

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What are cross-sectional studies?

- Cross-sectional studies measure simultaneously the exposure and health outcome in a given population and in a given geographical area at a certain time.
- A cross-sectional study is an observational study.
- Often described as a “snapshot” of a population in a certain point in time because exposure and outcome are determined simultaneously for each subject.
- Cross-sectional is also called prevalence study.
- The temporal relationship between exposure and disease cannot be determined.
- Cross-sectional studies can be helpful in determining how many people are affected by a condition and whether the frequency of the occurrence varies across groups or population characteristics.
- Cross-sectional studies are mostly carried out for public health planning. For example “Knowledge, attitude and practice (KAP) of family planning methods among women attending antenatal clinic in area “x” is a cross-sectional study.

Cross-sectional study design

1. Define the population for study.
2. Determine the presence or absence of exposure and the presence or absence of disease for each individual enrolled in the study.

For example we survey a population and for each study participant, we determine at the same time the serum cholesterol (exposure) and evidence of cardiovascular diseases (outcome). Each study participant will be in one of the following possible subgroups (a, b, c and d):

a. Persons who have been exposed and have the disease.

b. Persons who have been exposed but do not have the disease.

c. Persons who have the disease but have not been exposed.

d. Persons who have neither been exposed nor have the disease.

Cross-sectional Studies

In a cross-sectional study we can calculate the prevalence of disease and the prevalence of exposure, using the 2 X 2 table.

	Disease	No disease
Exposed	a	**b**
Not exposed	**c**	d

Prevalence of disease in exposed compared to non-exposed:

a/a+b vs c/c+d

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In a cross-sectional study we can calculate the prevalence of disease and the prevalence of exposure, using the 2 X 2 table.

	Disease	No disease
Exposed	**a**	**b**
Not exposed	c	d

Prevalence of exposure in diseased compared to non-diseased:

a/a+c vs b/b+d

Sampling Plans

Simple random sampling

- A sample is taken in such a way that each combination of individuals in the population has an equal chance of being selected.

Systematic random sampling

- Designed to be an easy alternative to the simple random sampling.
- Done by deciding on what fraction of the population is to be sampled.

Stratified random sample

- Used when gathering information about a diverse population.
- Care must be taken to ensure that the relevant subgroups are adequately represented in the study sample.

Applications of cross-sectional studies

- They are usually conducted to estimate the prevalence of the outcome of interest for a given population, commonly for the purposes of public health planning.

- Appropriate for screening hypotheses because they require relatively shorter time and fewer resources.

- Cross-sectional studies are widely used in palliative care research.

- Also used to understand the prevalence of various conditions, treatments, services or other outcomes and the factors associated with such outcomes.

Advantages of cross-sectional studies

- Relatively inexpensive and takes little time to conduct.
- Can estimate prevalence of outcome of interest because sample is usually taken from the whole population.
- Many outcomes and risk factors can be assessed.
- Useful for public health planning, understanding disease etiology and for the generation of hypotheses.
- There is no loss to follow-up.

Disadvantages of cross-sectional studies

- Cannot tell us about causal relationships (only correlation).
- Generalizability limited by sampled population and population definition.
- Sample size requirements may be very large (especially when looking at rare outcomes or exposures).
- Potential for selection bias.
- It evaluates prevalence rather than incidence.

Conclusion

- Cross-sectional studies are relatively cheap observational studies and can be conducted in a short time.
- They can be used for public health planning, understanding disease etiology and for the formulation of hypotheses.
- They cannot be used to establish causal relationship between exposure and outcomes.

Examples

The links below provide access to examples of cross-sectional study:

Nguyen PH, Budiharsana MP. Receiving voluntary family planning services has no relationship with the paradoxical situation of high use of contraceptives and abortion in Vietnam: a cross-sectional study. BMC Women's Health. 2012 May 28;12(1):14. https://dx.doi.org/10.1186/1472-6874-12-14

Yang G, Ma J, Chen A, Zhang Y, Samet JM, Taylor CE, Becker K. Smoking cessation in China: findings from the 1996 national prevalence survey. Tob Control. 2001 Jan 6;10(2):170-4. https://dx.doi.org/10.1136/tc.10.2.170

References

- Carlson MDA, Morrison RS. Study Design, Precision, and Validity in Observational Studies. J Palliat Med. 2009 Jan;12(1):77-82. https://dx.doi.org/10.1089/jpm.2008.9690
- Gordis L. Epidemiology. 4th ed. Philadelphia: Saunders Elsevier; 2008.
- Levin KA. Study design III: Cross-sectional studies. Evid Based Dent. 2006;7(1):24-5. https://dx.doi.org/10.1038/sj.ebd.6400375