**Prospective vs. Retrospective Studies**

Prospective

A prospective study watches for outcomes, such as the development of a disease, during the study period and relates this to other factors such as suspected risk or protection factor(s). The study usually involves taking a cohort of subjects and watching them over a long period. The outcome of interest should be common; otherwise, the number of outcomes observed will be too small to be statistically meaningful (indistinguishable from those that may have arisen by chance). All efforts should be made to avoid sources of bias such as the loss of individuals to follow up during the study. Prospective studies usually have fewer potential sources of bias and confounding than retrospective studies.

Retrospective

A retrospective study looks backwards and examines exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study. Many valuable case-control studies, such as Lane and Claypon's 1926 investigation of risk factors for breast cancer, were retrospective investigations. Most sources of error due to confounding and bias are more common in retrospective studies than in prospective studies. For this reason, retrospective investigations are often criticised. If the outcome of interest is uncommon, however, the size of prospective investigation required to estimate relative risk is often too large to be feasible. In retrospective studies the odds ratio provides an estimate of relative risk. You should take special care to avoid sources of [bias](https://www.statsdirect.com/help/basics/bias.htm) and [confounding](https://www.statsdirect.com/help/basics/confounding.htm) in retrospective studies.

Prospective investigation is required to make precise estimates of either the incidence of an outcome or the relative risk of an outcome based on exposure.

Case-Control studies

Case-Control studies are usually but not exclusively retrospective, the opposite is true for cohort studies. The following notes relate case-control to cohort studies:

* outcome is measured before exposure
* controls are selected on the basis of not having the outcome
* good for rare outcomes
* relatively inexpensive
* smaller numbers required
* quicker to complete
* prone to selection bias
* prone to recall/retrospective bias
* related methods are [risk (retrospective)](https://www.statsdirect.com/help/clinical_epidemiology/risk_retrospective.htm), [chi-square 2 by 2 test](https://www.statsdirect.com/help/chi_square_tests/22.htm), [Fisher's exact test](https://www.statsdirect.com/help/exact_tests_on_counts/fisher_exact.htm), [exact confidence interval for odds ratio](https://www.statsdirect.com/help/exact_tests_on_counts/odds_ratio_ci.htm), [odds ratio meta-analysis](https://www.statsdirect.com/help/meta_analysis/mh.htm) and [conditional logistic regression](https://www.statsdirect.com/help/regression_and_correlation/conditional_logistic.htm).

Cohort studies

Cohort studies are usually but not exclusively prospective, the opposite is true for case-control studies. The following notes relate cohort to case-control studies:

* outcome is measured after exposure
* yields true incidence rates and relative risks
* may uncover unanticipated associations with outcome
* best for common outcomes
* expensive
* requires large numbers
* takes a long time to complete
* prone to attrition bias (compensate by using [person-time](https://www.statsdirect.com/help/rates/compare_crude_incidence_rates.htm) methods)
* prone to the bias of change in methods over time
* related methods are [risk (prospective)](https://www.statsdirect.com/help/clinical_epidemiology/risk_prospective.htm), [relative risk meta-analysis](https://www.statsdirect.com/help/meta_analysis/relative_risk.htm), [risk difference meta-analysis](https://www.statsdirect.com/help/meta_analysis/risk_difference.htm) and [proportions](https://www.statsdirect.com/help/proportions/proportions.htm)