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NEWSLETTER

Division of Biostatistics

Case-Cohort Studies vs Nested Case-Control Studies

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A cohort study is one of the observational study designs which is used to evaluate association between exposure and disease. In a cohort study, investigators follow a group of people over time and note each new occurrence of the disease. However, large epidemiologic cohort studies often need to follow several thousand subjects for a long time. Assembling detailed information for all cohort members may take a long time and result in an enormous cost. To reduce cost and achieve the same goal as a cohort study, several alternative study designs have been proposed. Some of them such as nested case-control and case-cohort study designs are particularly practical in studying rare diseases.

A nested case-control study design involves the selection of several healthy controls for each case, typically from those still under observation at the time when the case developed the disease [3]. However, nested case-control studies have some limitations:

1) Inefficiency due to the alignment of each selected control subject to its matched case.
2) When there are more than one disease outcomes considered, a strict implementation of the nested case-control design requires the selection of a new set of controls for each distinct disease outcome.

Case-cohort study designs were proposed as an alternative to the nested case-control study design. Case-cohort study requires only the selection of a random sample, named a subcohort, and all cases.

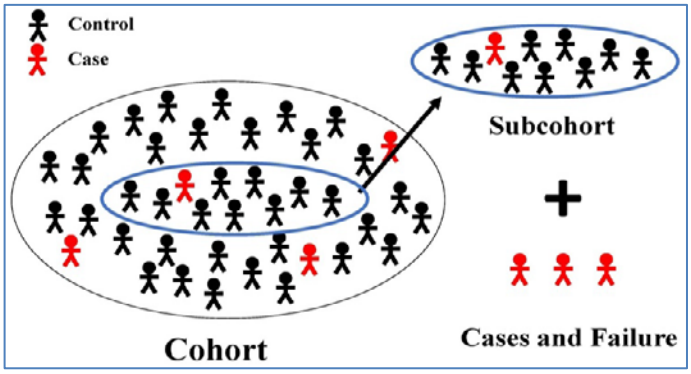

Figure 1 Case-cohort sample

Figure 1 illustrates the subject selection process of a case-cohort sample. The black color indicates the controls whereas the red indicates the cases. The case-cohort sample consists of the subcohort members as well as all the cases that are outside the subcohort [2]. It has been demonstrated that the case-cohort study design, for a single disease outcome, is more efficient than a nested case-control study design; however, the difference is very small [1]. Compared to the nested case-control studies, a major advantage of the case-cohort design is the ability to study several disease outcomes using the same subcohort. For example, suppose that researchers are interested in whether smoking is a risk factor for diabetes as well as lung cancer. Under this situation, two control groups need to be sampled under the nested case-control design while a case-cohort design only requires one subcohort which is used to evaluate the effect of smoking for both diabetes and lung cancer.

In summary, nested case-control and case-cohort designs are efficient in terms of cost and can be used to evaluate the relationship between the exposure and diseases. Compared to a nested case-control design, the case-cohort design is more efficient and allows an investigator to study several disease outcomes by using the same random sample.

Reference

[1]Langholz, B. and Thomas, D. (1990). Nested case-control and case-cohort methods of sampling from a cohort: A critical comparison. American Journal of Epidemiology , 131:169-76.

[2]Prentice, R. (1986). A case-cohort design for epidemiologic cohort studies and disease prevention trials. Biometrika, 73:1-11.

[3]Thomas, D. C. (1977). Addendum to methods of cohort analysis: Appraisal by application to asbestos mining. Journal of the Royal Statistical Society Series A, 140:483-485.