Capture-recapture to Estimate Completeness of Pulmonary Tuberculosis with Two Sources

Authors : Ratchadaporn Ungcharoen, Lily Ingsrisawang

Abstract : Capture-recapture methods are popular techniques for indirect estimation the size of wildlife populations and the completeness of cases in epidemiology and social sciences. The aim of this study was to estimate the completeness of pulmonary tuberculosis cases confirmed by two sources of hospital registrations and surveillance systems in 2013 in Nakhon Pathom province, Thailand. Several estimators of population size were considered: the Lincoln-Petersen estimator, the Chapman estimator, the Chao's lower bound estimator, the Zelterman's estimator, etc. We focus on the Chapman and Chao's lower bound estimators for estimating the completeness of pulmonary tuberculosis from two sources. The retrieved pulmonary tuberculosis data from two sources were analyzed and bootstrapped for 30 samples, with 241 observations from source 1 and 305 observations from source 2 per sample, for additional exploration of the completeness of pulmonary tuberculosis. The results from the original data show that the Chapman's estimator gave the estimation of a total 360 (95% CI: 349-371) pulmonary tuberculosis cases, resulting in 57% estimated completeness cases. But the Chao's lower bound estimator estimated the total of 365 (95% CI: 354-376) pulmonary tuberculosis cases and its estimated completeness cases was 55.9%. For the results from bootstrap samples, the Chapman and the Chao's lower bound estimators gave an estimated 347 (95% CI: 309-385) and 353 (95% CI: 315-390) pulmonary tuberculosis cases, respectively. If for two sources recoding systems are available, record-linkage and capture-recapture analysis can be useful for estimating the completeness of different registration system. Both Chapman and Chao's lower bound estimator approaches produce very close estimates.

Keywords : capture-recapture, Chao, Chapman, pulmonary tuberculosis