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Abstract. In this paper we discuss disease mapping construction when the number of observation is under reported. This case caused the maximum likelihood estimator of relative risk parameter can't be obtained, different with the case when the observations are complete. The case of under reported in this paper is concerned with health case where because of some reasons there are a number of diseased people who are not counted or not reported. We suggest a Bayesian method of constructing that considered under reportedness in the data.

Keywords: Disease mapping; underreported; prior; posterior; Gibbs sampling.
PACS: 02.50.-r

INTRODUCTION

The distribution of relative risk (θ) of a disease in an area can be expressed in a map. The map is very useful for the Government in allocating health care budget in order to tackle the spread of the disease, high risk area can be spotted, in addition a useful aetyologi hypothesis about a disease can be suggested. Therefore, in order for decisions made based on this map can be accountable, then the data that formed the basis of its compilation must be accurate; reflecting the actual circumstances.

It might happen that the data which are reported to the health service is not complete, because there are some people who suffer from the disease are not choosing a medical treatment such as go to a doctor, clinic, or hospital, and therefore do not counted in the report. Other thing that might explain this situation is that the system of reporting does not work as it should be. Therefore data from the health services, in particular regarding the number of sufferers, contained an error (damaged), referred to as damaged or underreported variable. That is the value being reported has a missing value.

A number of methods of analysis for the data that gets damaged a lot of flourish [see 1, 2 and 3]. To the author's knowledge there has not been a case in the preparation of maps covered under reported illness. Therefore this situation is certainly needs to get attention in drawing up a map of the spread of the disease. Because using a complete case method is not suitable and can lead to wrong decision.

The main issue that gets attention in the preparation of a map of disease is the estimation of relative risks (θ), in an area that will be mapped. In disease mapping, the observe number of cases (O) is assumed to have a Poisson distribution with parameter $E\theta$, E is the many cases that are expected; obtained from a reference population. So in an area i we have:

$$P(O_i = o) = \frac{(E_i\theta_i)^o \exp(-E_i\theta_i)}{o!}, \quad o = 0,1, \ldots$$

And thus the *maximum likelihood estimator* (MLE) of parameter θ_i, i,e the estimator of relative risk, is a ratio between the number of observed cases (O_i) to the expected number (E_i):

$$\widehat{\theta_i} = \frac{O_i}{E_i} \tag{1}$$

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