**Appendix**

**Appendix A**

**Computation of the additive measure in logistic model based on new reference category**

Considered both factors A and B jointly, then there are four categories: A0B0 , A1B0, A0B1 and A1B1. To simplify the description, using over-parameterized dummy coding scheme, the coefficients are,,  and  in logistic regression respectively. When using A0B0 as the reference category ( in dummy coding scheme), The ORs can be rewritten as , ,  and  respectively. The three measures of interaction can be equivalently written as follows

,

,

.

when choosing the category with the lowest risk when both factors are considered jointly as the reference category, for example the group A1B0 , the coefficients s of the four categories can be expressed as , ,  and . Then the ORs can be expressed as , ,  and  respectively. The three measures of interaction can be computed by rearranging the ORs, which have the form of

,

,

.

So does the reference category set as group A0B1or A1B1. When the reference category is A0B1, the three measures of interaction have the form of

,

,

.

When the reference category is A1B1, the three measures of interaction have the form of

,

,

.

**Appendix B**

***RR* can be expressed as a function of both *OR* and the intercept *b*0.**

If there are independent variable *X* and dependent variable *Y* in logistic regression, then we have:

;

The probability of an event occurring in the control group (*X*=0) is:

;

The probability of an event occurring in the treatment group (*X*=1) is:

;

The *OR* value can be expressed as:

;

The *RR* value can be expressed as:

.

**Appendix C**

**R function for computing new coefficients based on the lowest risk category as reference category**

newCoefficents <- function(coefficients){ # coefficients: the original coefficients

if(length(coefficients)!=4) stop("the length of coefficients must be equate to 4")

minloc <- which.min(coefficients)

loc <- 1:4

if(minloc==2) loc<-c(2,1,4,3)

if(minloc==3) loc<-c(3,4,1,2)

if(minloc==4) loc<-c(4,3,2,1)

new.coef<- coefficients[loc]

new.coef<- new.coef – new.coef[1]

return(new.coef)

}