The University of Hong Kong
School of Public Health

Master of Public Health
Advanced Statistical Methods I

Instrumental variable analysis

Assignment 3
(submit to Moodle by 23:55pm, Apr 9, 2021)

Mar 30, 2021

Impact of peer BMI on adolescents

An observation study recruited 500 adolescents and investigated the peer impact on their BMI. The study also included information on the mean income level in the community where their schools are located. The dataset 'bmi_peer.csv' stored the following variables related to the timing of treatment and mortality:

- *bmi.adol* indicates the BMI of the recruited adolescents in the study
- *bmi.friend* indicates the BMI of close friends of the adolescents in the same school
- *bmi.parent* indicates the BMI of the friends' parents
- *income* indicates the mean income level (1: low, 10: high) of the district where the school locates

It was recognized by the investigators that the relationship between BMI in adolescents and their close friends is likely to be confounded by multiple factors. Hence an instrumental variable analysis, using the BMI of friend's parents as an instrumental variable, will be carried out.

a) Produce the scatterplot between the BMI of the adolescents, their close friend and close friends' parent. Describe the pattern. [3 marks]

b) From the data, assess empirically if *income* is a confounding factor. You may regard *income* as a continuous variable. [3 marks]

c) Estimate the impact of close friends' BMI accounting for observed confounding factors. [3 mark]

d) Carry out an instrumental variable analysis to estimate the same effect as in c). [4 marks]

e) Test the relevance of the instrument. [4 marks]

f) Carry out a test for endogeneity. [4 marks]

g) Based on the above results, draw a conclusion for the analysis. [4 marks]