Determining an Appropriate Statistical Model when Assessing the Association between Obesity and Mortality

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Objectives: To determine a statistical model appropriate to assess the association between Obesity and mortality using epidemiological data. We hypothesized that the model with the lowest AIC, BIC, and lowest Sobol's Indices is the appropriate model, compared to the others, to assess the association between obesity and mortality.

Methods: The datasets used were the National Child Development Study, the Health Retirement Study, the National Health Interview Survey, and the National Health and Nutrition Examination Survey. The statistical models compared were the Cox PH Model and the AFT Model. For the AFT Model, we used the Weibull Distribution, Lognormal Distribution, and Exponential Distribution. Body mass index (BMI) was used as a proxy for obesity, the exposure of interest. Mortality, the event of interest, was calculated using age and a death indicator of the participants. Covariates were sex, socioeconomic status (SES), education, smoking status, drinking status. The interactions were between BMI and SES, BMI and Sex, BMI and Smoking Status.

Results: The results of the NCDS dataset indicated that the Cox PH Model has an AIC of 11528.81, BIC of 11611.81 without interactions, an AIC of 11502.04, and BIC of 11640.36 with interaction. The Cox PH model has the highest AIC and BIC regardless of the inclusion of interactions compared to the AFT Models. The AFT model with a Weibull distribution had the lowest AIC and BIC (without interaction: 8367.61 and 8521.30, respectively and with interaction: 8346.29 and 8592.19, respectively). The Sobol's Indices for the models, without interaction, were close to zero for all covariates except education, where all models were close to one. However, with interactions, the Sobol's Indices of the education covariate decreases for all AFT Models though the Cox PH Model remains the highest and without change.

Conclusions: Given our sample and specified model, the AFT model with a Weibull distribution appeared to fit the data better relative to the Cox PH Model or the other AFT Models. The Cox PH model is more sensitive to interactions than the AFT Models.