**PUBH 7485/8485**

**Homework 2**

The data for this assignment, as in the first assignment, come from the obstetrics and periodontal therapy (OPT) study which tested whether or not treatment of maternal periodontal disease could reduce pre-term birth and improve other birth outcomes.

1. Consider estimating the causal treatment effect using i) propensity score stratification and ii) inverse probability weighting (for the purposes of this assignment, please use the IPW2 estimator for the course notes). For each of these scenarios, please report the estimated average (causal) treatment effect, standard error, and 95% confidence interval in a table. Please have a separate table for each outcome and for each estimation approach (propensity score stratification and inverse probability weighting). Note that *Birth.outcome* and *GA.at.outcome* are additional outcome variables and *PID* is the patient identifier none of which should not be included in the regression models. Consider a logistic model for treatment assignment with just main effect terms for the covariates we considered in the outcome regression models.
2. Create a forest plot of the estimates and 95% confidence intervals of the ATEs for the two outcomes (i.e., a separate plot for each outcome) across homework #1 and #2. Comment on the sensitivity of your estimates for the ATE based the analytical technique.

PUBH 8485 students

1. Throughout, assume that all causal identifying assumptions are valid and that the propensity score is known. Consider the IPW2 estimator for , that is the value of which is given by the solution to the following estimating equation

Show that the approximate variance of is given by

1. Show that the approximate variance of the IPW2 estimator is greater than the variance of the sample average of (i.e., That is, there is more uncertainty in our estimator for due to missing data and we could have had a more precise estimator if we had observed for all individuals.