Assignment 1

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Q1.

	Unconfounded	Confounding 1	Confounding 2
a__u,1	0.50	0.50	0.50
a__u,2	-2.00	-2.00	-2.00
a__x,1	0.50	0.50	0.50
a__x,2	0.10	0.10	0.10
a__x,3	-0.30	-0.30	-0.30
B1	-4.61	-4.61	-4.61
B2	0.41	0.41	0.41
B3	0.00	-0.70	-0.70
B4	0.00	0.00	0.50

Q2

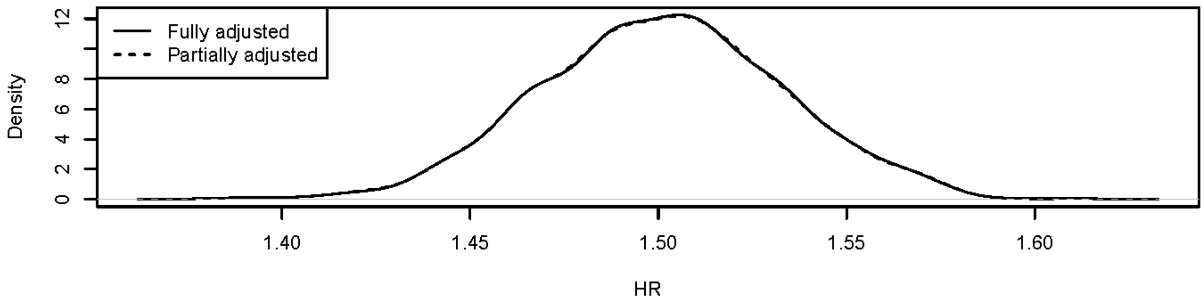
Confounding Scenario 2 since the DGP of the outcome in this scenario involves a non-zero (non-null) value for B4.

Q3

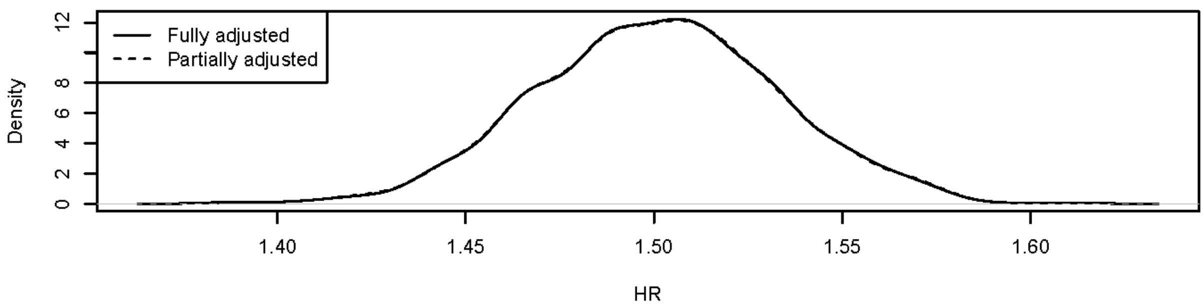
	Fully adjusted	Partially adjusted
Unconfounded	1.5	1.50
Confounding 1	1.5	1.50
Confounding 2	1.5	1.43

Q4

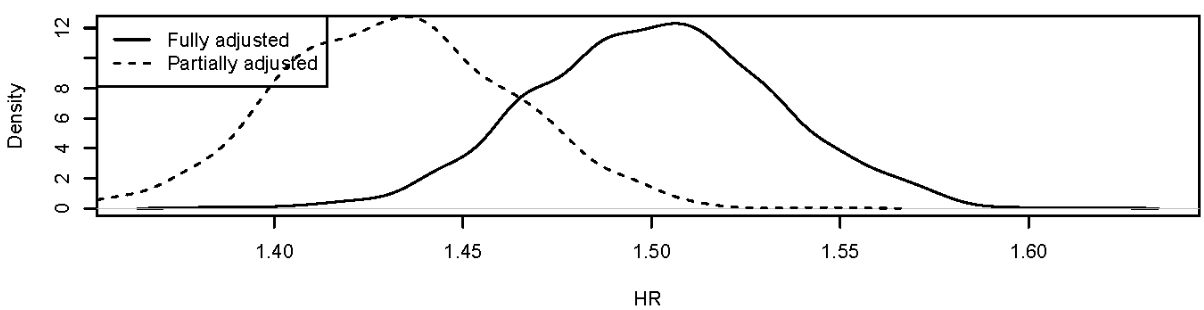
Unconfounded



Confounding scenario 1



Confounding scenario 2



Q5

The partially adjusted model is only biased under confounding scenario 2. The underlying code is correct since we expect the simulated X HRs to be about 1.5, the true X HR, for both the partially and fully adjusted models under the unconfounded and the first confounding scenario, which both the plots and the data show. This is because the unconfounded and first scenarios are parameterized with null relationships between Y and U, thus omitting U in the model won't affect Y. In scenario 2 the introduction of a non null relationship between Y and U in the DGP resulted in a biased estimate for the HR of X in the partially adjusted model with the HR biased towards the null. If we wanted to simulate different strengths of the confounding we could vary the U beta coefficient resulting in different parameterizations of the underlying exponential distribution for Y, thus altering the affect of U on Y. Additionally, we can change the $\alpha_{x,3}$ parameter altering U's affect on X changing the nature of the underlying binomial distribution of X and thus altering the affect of U as a confounder.