Causal Inference Assignment #1: 3.1

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Translating this data generating process for PU;X into simulations, generating counterfactual outcomes and evaluating the target causal parameter.

1. First set the seed to 252.

```
set.seed(252)
```

2. Set n=5000 as the number of i.i.d. draws from the data generating process.

```
n = 5000
```

3. Simulate the background factors U.

```
U.W1 = runif(n, 0, 1)
U.W2 = runif(n, 0, 1)
U.A = runif(n, 0, 1)
U.Y = rnorm(n, mean=0, sd=0.3)
```

4. Evaluate the structural equations F to deterministically generate the endogenous nodes X.

```
W1 = as.numeric(U.W1 < 0.2)
W2 = as.numeric(U.W2 < (plogis(W1*0.5)))
A = as.numeric(U.A < (plogis((W1*W2))))
Y = (4*A) + (0.7*W1) - (2*A*W2) + U.Y
```

5. Intervene to set the supplement to RUTF (A = 1) and generate counterfactual outcomes Y1 for n units. Then intervene to set the supplement to the standard (A = 0) and generate counterfactual outcomes Y0 for n units.

```
Y.1 <- (4*1) + (0.7*W1) - (2*1*W2) + U.Y
Y.0 <- (4*0) + (0.7*W1) - (2*0*W2) + U.Y
```

6. Create a data frame X to hold the values of the endogenous factors (W1;W2; A; Y) and the counterfactual outcomes Y1 and Y0. The rows are the n children and the columns are their characteristics. Use the head and summary to examine the resulting data.

```
X<- data.frame(W1, W2, A, Y, Y.1, Y.0)
head(X)
```

```
##   W1 W2 A           Y      Y.1         Y.0
## 1  0  0 0 -0.39069139 3.609309 -0.39069139
## 2  0  1 0  0.27579209 2.275792  0.27579209
## 3  0  1 0  0.13800411 2.138004  0.13800411
## 4  0  0 0 -0.03862696 3.961373 -0.03862696
## 5  0  1 1  2.08010486 2.080105  0.08010486
## 6  0  0 0 -0.02693322 3.973067 -0.02693322
```

```
summary(X)
```

```
##        W1               W2               A               Y
##  Min.   :0.0000   Min.   :0.0000   Min.   :0.0000   Min.   :-0.91451
##  1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.: 0.08653
##  Median :0.0000   Median :1.0000   Median :1.0000   Median : 1.66352
##  Mean   :0.1854   Mean   :0.5184   Mean   :0.5258   Mean   : 1.66258
##  3rd Qu.:0.0000   3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.: 3.05952
##  Max.   :1.0000   Max.   :1.0000   Max.   :1.0000   Max.   : 5.32635
##       Y.1              Y.0
##  Min.   :1.025   Min.   :-0.9749
##  1st Qu.:2.090   1st Qu.:-0.1505
##  Median :3.032   Median : 0.0816
##  Mean   :3.098   Mean   : 0.1346
##  3rd Qu.:4.044   3rd Qu.: 0.3800
##  Max.   :5.361   Max.   : 1.6252
```

7. Evaluate the causal parameter.

```
Psi.F<- mean(Y.1 - Y.0)
Psi.F
```

```
## [1] 2.9632
```