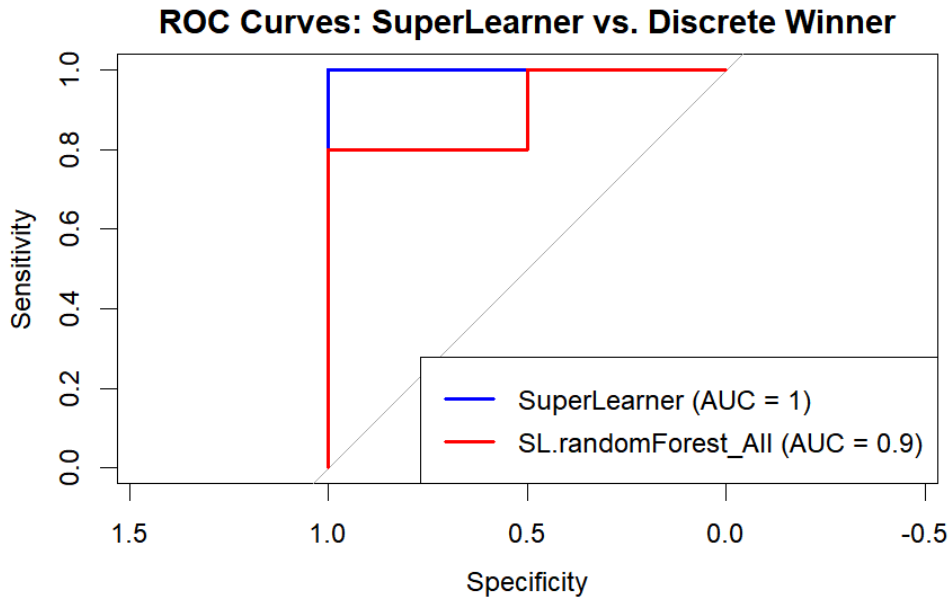
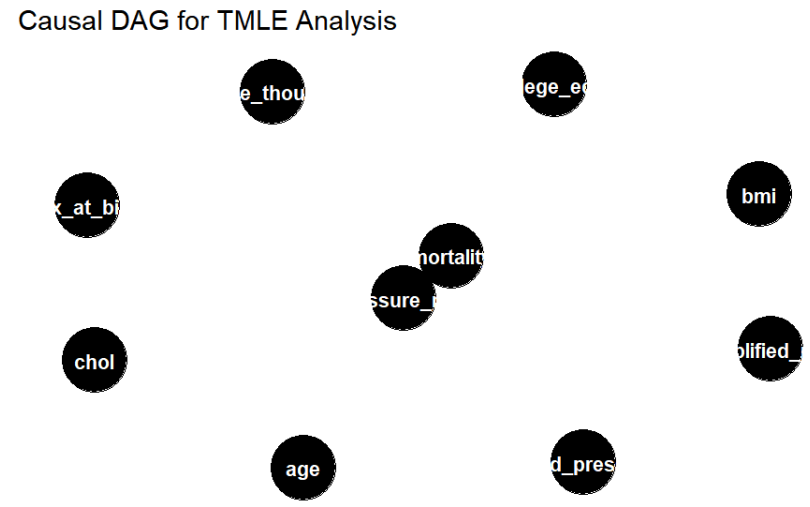
```
Call:
SuperLearner(Y = Y_train_numeric, X = X_train, family = binomial(),
    SL.library = sl_library, verbose = TRUE)


                          Risk       Coef
SL.glm_All           0.2352661 0.00000000
SL.randomForest_All  0.2312056 0.62303850
SL.xgboost_All              NA 0.00000000
SL.glmnet_All        0.2350656 0.36154508
SL.ranger_All               NA 0.00000000
SL.nnet_All          0.2473484 0.01541642



 SL.glm_All            SL.randomForest_All      SL.xgboost_All
         0.00000000           0.62303850          0.00000000
      SL.glmnet_All        SL.ranger_All          SL.nnet_All
         0.36154508           0.00000000          0.01541642



                     Risk                 Algorithm
SL.glm_All           "0.235266124850258" "SL.glm_All"
SL.randomForest_All  "0.231205621911156" "SL.randomForest_All"
SL.xgboost_All       NA                  "SL.xgboost_All"
SL.glmnet_All        "0.235065552882723" "SL.glmnet_All"
SL.ranger_All        NA                  "SL.ranger_All"
SL.nnet_All          "0.247348428272246" "SL.nnet_All"


Call:
SuperLearner(Y = Y_train_numeric, X = X_train_clean, family = binomial(),
    SL.library = c("SL.glm", "SL.randomForest"))


                          Risk       Coef
SL.glm_All           0.5227273 0.02474887
SL.randomForest_All  0.2743400 0.97525113
```

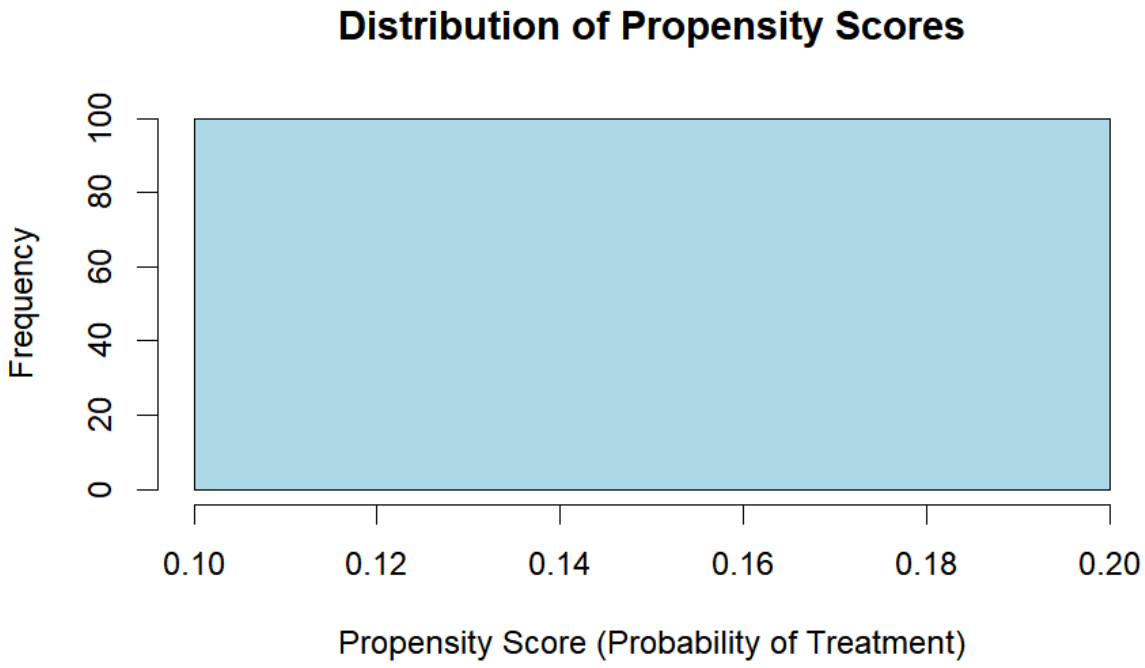


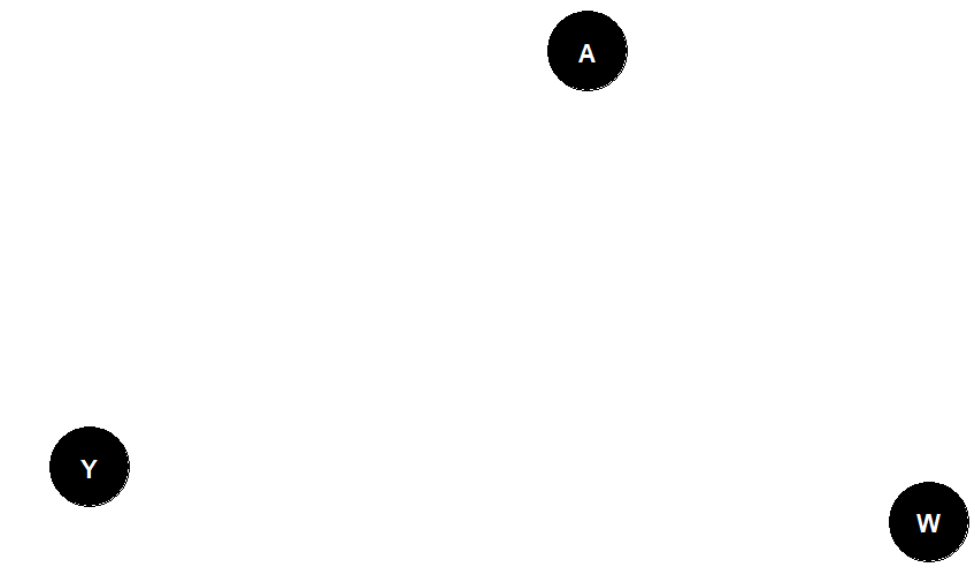

```
          Actual
Predicted 0 1
        0 0 2
        1 2 3
SuperLearner Precision: 0.6
SuperLearner Recall: 0.6
SuperLearner F1 Score: 0.6
```




```
Marginal mean under treatment (EY1)
   Parameter Estimate:  2.4279e-09
```

```
  Estimated Variance:  3.7274e-19
             p-value:  6.985e-05
   95% Conf Interval:  (1.2313e-09, 3.6245e-09)

 Marginal mean under comparator (EY0)
  Parameter Estimate:  0.61113
  Estimated Variance:  0.002816
             p-value:  <2e-16
   95% Conf Interval:  (0.50712, 0.71514)

 Additive Effect
  Parameter Estimate:  -0.61113
  Estimated Variance:  0.002816
             p-value:  <2e-16
   95% Conf Interval:  (-0.71514, -0.50712)

 Additive Effect among the Treated
  Parameter Estimate:  -0.59085
  Estimated Variance:  0.0045941
             p-value:  <2e-16
   95% Conf Interval:  (-0.72369, -0.458)

 Additive Effect among the Controls
  Parameter Estimate:  -0.61656
  Estimated Variance:  0.0028762
             p-value:  <2e-16
   95% Conf Interval:  (-0.72167, -0.51144)

 Relative Risk
  Parameter  Estimate: 3.9729e-09
  Variance(log scale): 0.070106
              p-value: <2e-16
    95% Conf Interval: (2.3644e-09, 6.6754e-09)

 Odds Ratio
  Parameter  Estimate: 1.5449e-09
  Variance(log scale): 0.11138
              p-value: <2e-16
    95% Conf Interval: (8.0321e-10, 2.9715e-09)

Average Treatment Effect (ATE): -0.6111
95% Confidence Interval: [ -0.7151 ,  -0.5071 ]
p-value: < 2.22e-16

Interpretation:
Blood pressure medication is associated with a 61.11 percentage point
decrease in mortality risk.
This effect is statistically significant at the 0.05 level.

Propensity Score Range: [ 0.14 ,  0.14 ]
```


Distribution of Propensity Scores
Frequency
0
20
40
60
80
100
0.10
0.12
0.14
0.16
0.18
0.20
Propensity Score (Probability of Treatment)


Causal DAG for LTMLE Analysis
A
Y
W

```
Call:
glm(formula = naive_formula, family = binomial(), data = data_ltmle)

Coefficients:
                             Estimate Std. Error z value Pr(>|z|)
(Intercept)                -2.4979641  0.3727946  -6.701 2.08e-11 ***
blood_pressure_medication  -1.4365835  0.0643753 -22.316  < 2e-16 ***
blood_pressure_medication_2 -0.0438309  0.0606669  -0.722 0.469996
age                         0.0026763  0.0015323   1.747 0.080704 .
sex_at_birth               -0.0017996  0.0412669  -0.044 0.965215
simplified_race            -0.0040465  0.0149928  -0.270 0.787242
income_thousands           -0.0003455  0.0009165  -0.377 0.706172
college_educ               -0.0065826  0.0438767  -0.150 0.880745
bmi                         0.0249958  0.0072320   3.456 0.000548 ***
chol                        0.0075552  0.0013862   5.450 5.02e-08 ***
blood_pressure              0.0037614  0.0021242   1.771 0.076599 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 13852  on 9999  degrees of freedom
Residual deviance: 13246  on 9989  degrees of freedom
AIC: 13268

Number of Fisher Scoring iterations: 4

Naive estimate for blood_pressure_medication: -1.436584
Naive estimate for blood_pressure_medication_2: -0.04383089
```

```
Estimator:  tmle
Call:
ltmle(data = data_ltmle, Anodes = Anodes, Lnodes = Lnodes, Ynodes = Ynodes,
    abar = list(regimen1, regimen2), SL.library = sl_library)

Treatment Estimate:
   Parameter Estimate:  0.56689
    Estimated Std Err:  0.0068726
              p-value:  <2e-16
    95% Conf Interval: (0.55342, 0.58036)

Control Estimate:
   Parameter Estimate:  0.2277
    Estimated Std Err:  0.20976
              p-value:  0.27768
    95% Conf Interval: (0, 0.63881)

Additive Treatment Effect:
   Parameter Estimate:  0.33919
    Estimated Std Err:  0.20987
              p-value:  0.10605
    95% Conf Interval: (-0.072148, 0.75052)

Relative Risk:
   Parameter Estimate:  2.4896
  Est Std Err log(RR):  0.92127
              p-value:  0.32214
    95% Conf Interval: (0.40921, 15.147)

Odds Ratio:
   Parameter Estimate:  4.4393
  Est Std Err log(OR):  1.1931
              p-value:  0.21158
    95% Conf Interval: (0.42828, 46.015)

LTMLE estimated treatment effect:
Comparison:
Naive model coefficients - A0: -1.436584 , A1: -0.04383089
LTMLE estimate (difference between treatment regimens):
coef1: -1.436584
coef2: -0.04383089
treatment_effect:
There is a notable difference between the naive and LTMLE estimates,
suggesting time-dependent confounding is important.
```