

Stat 402- HW 3

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Problem # 1.1

```
liver <- read.csv("~/Downloads/liver23.csv")

liver <- liver[(liver$hist_hypertens_don.x != "U") & (liver$coronary_angio_don.x != "U"), ]

# Create a contingency table for hypertension
table_contingency <- table(liver$tx_fail, liver$hist_hypertens_don.x)
print(table_contingency)
```

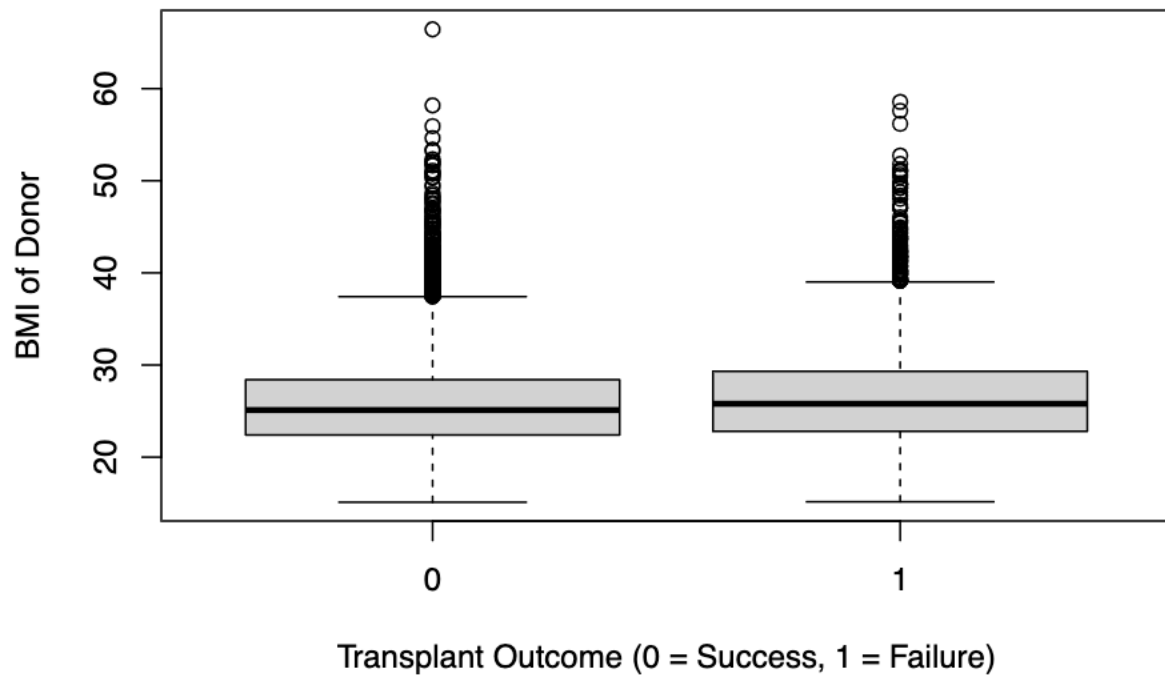
```
##
##           N      Y
##    0 8579 1421
##    1 1509   944
```

```
# Proportions of contingency table
prop_table <- prop.table(table_contingency, margin = 2)
# Proportions by column
print(round(prop_table, 2)) # Round to 2 decimal places
```

```
##
##           N      Y
##    0 0.85 0.60
##    1 0.15 0.40
```

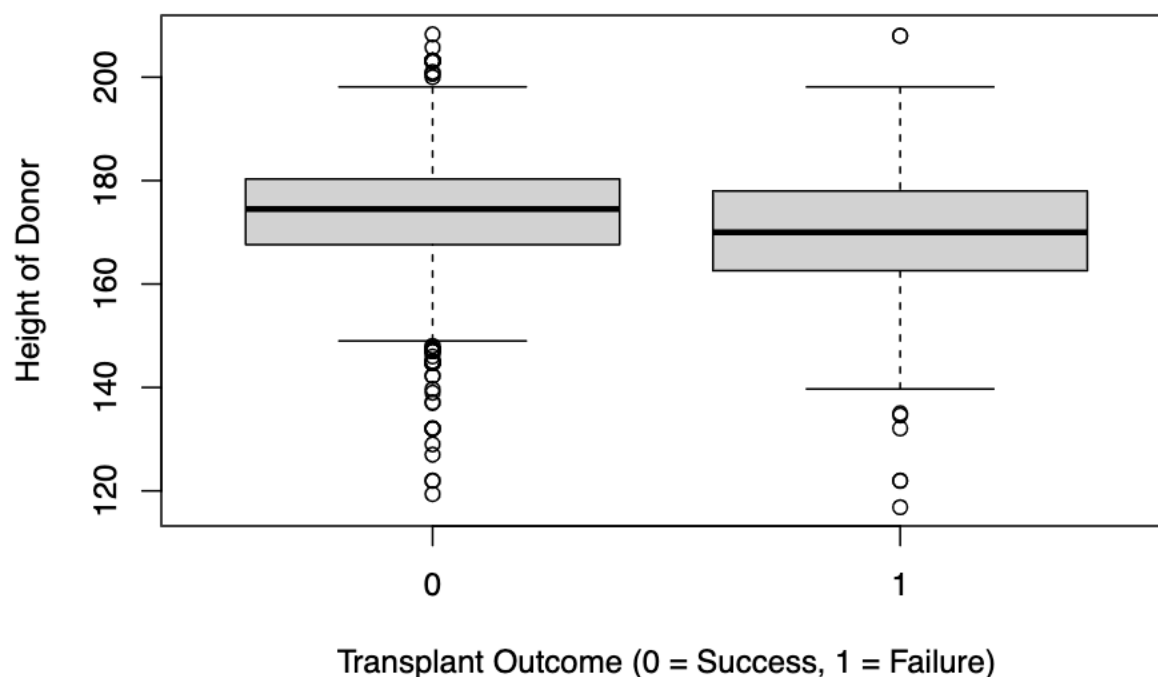
```
# Create a boxplot for BMI
boxplot(
  bmi_don_calc.x ~ tx_fail,
  data = liver,
  main = "BMI by Transplant Outcome",
  xlab = "Transplant Outcome (0 = Success, 1 = Failure)",
  ylab = "BMI of Donor")
```

BMI by Transplant Outcome



```
# Create a boxplot for Height of Donor
boxplot(
  hgt_cm_don_calc.x ~ tx_fail,
  data = liver,
  main = "Height by Transplant Outcome",
  xlab = "Transplant Outcome (0 = Success, 1 = Failure)",
  ylab = "Height of Donor"
)
```

Height by Transplant Outcome



Problem #1.2

```
logistic_model <- glm( tx_fail ~ hgt_cm_don_calc.x + bmi_don_calc.x +
  coronary_angio_don.x + hist_hypertens_don.x,
  data=liver, family=binomial)
summary(logistic_model)
```

```
##
## Call:
## glm(formula = tx_fail ~ hgt_cm_don_calc.x + bmi_don_calc.x +
##     coronary_angio_don.x + hist_hypertens_don.x, family = binomial,
##     data = liver)
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    2.671619   0.422976   6.316 2.68e-10 ***
## hgt_cm_don_calc.x -0.026568   0.002343 -11.340 < 2e-16 ***
## bmi_don_calc.x    0.010079   0.004400   2.291  0.022 *
## coronary_angio_don.xY -0.714100   0.072138  -9.899 < 2e-16 ***
## hist_hypertens_don.xY  1.320632   0.053513  24.679 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
## Null deviance: 12358  on 12452  degrees of freedom
```

```
## Residual deviance: 11452  on 12448  degrees of freedom
## AIC: 11462
##
## Number of Fisher Scoring iterations: 4
```

Problem #1.3

```
exp_coef <- exp(coef(logistic_model))
exp_coef
```

```
##           (Intercept)      hgt_cm_don_calc.x      bmi_don_calc.x
##           14.4633598           0.9737820           1.0101302
## coronary_angio_don.xY hist_hypertens_don.xY
##           0.4896328           3.7457864
```

Interpretations: Intercept does not make sense to interpret as donors will not have height or BMI of 0. As the height of the donor increases by 1 cm, the risk of graft failure decreases by about 2.6%. As the bmi of the donor increase by 1 unit, the risk of graft failure increases by about 1%. If the donor died as a function of coronary heart disease, the risk of graft failure decreases by about 51%. If the donor had a history of hypertension, the risk of graft failure is 3.74 times as likely.

```
exp_conf <- exp(confint(logistic_model))
```

```
## Waiting for profiling to be done...
```

```
exp_conf
```

```
##           2.5 %      97.5 %
## (Intercept)      6.3143519 33.1504128
## hgt_cm_don_calc.x 0.9693146 0.9782585
## bmi_don_calc.x    1.0014306 1.0188554
## coronary_angio_don.xY 0.4243889 0.5631298
## hist_hypertens_don.xY 3.3728072 4.1600834
```

```
#ignore CI for Intercept
```

We can see that all predictors are statistically significant, as none of the confidence intervals contain the value 1. Increase in height and having died on coronary heart disease is associated with as decrease in the risk of graft failure, as the values of their Confidence Intervals are all below 1. While increase in bmi and history of hypertension is associated with an increase in the risk of graft failure, as these values are all above 1.

Table one: The odds, 95% confidence interval for the odds, and p-value of kidney transplant failure for different predictors in the model

		Confidence interval for the odds		p-value
Predictor	odds	2.5%	97.5%	
height	0.9738	0.9693	0.9783	< 2e-16 ***
BMI	1.0101	1.001	1.0189	0.022 *
Coronary angio	0.4896	0.4244	0.5613	< 2e-16 ***
hypertension	3.7458	3.3728	4.1601	< 2e-16 ***