ASSIGNMENT-4

Packages Used:

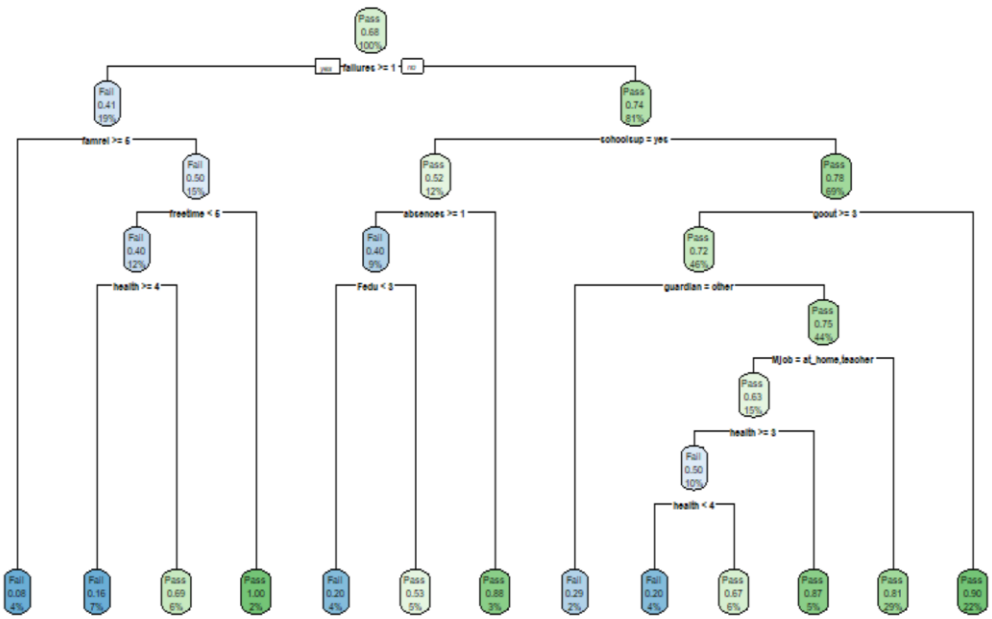
- Caret
- Rpart
- Rpart.plot
- Naïvebayes

Steps and Formula

- Using condition if G3<10; mark as Fail or else Pass and converted G3 column
  - **R Formula:** record$G3<-ifelse(record$G3<10,"Fail","Pass")
  - record$G3<-factor(record$G3)
- Set the random sample seed to 1234
- Divided the entire data with 70% of being the training data and remaining 30% being the testing data
  - **R Formula:** sample(2,nrow(record),replace=TRUE,prob = c(0.7,0.3))->partition
  - record[partition==1,]->training_dataset
  - record[partition==2,]->validation_dataset

DECISION TREE

- The following tree is plot using all variables.
  - **R Formula:** rpart(G3~ .,training_dataset,method = "class")->tree
  - rpart.plot(tree)



- On the basis of the above plot, we have predicted the 30% Test Data Set
    - **R Formula:** predict(tree,validation_dataset,type='class')->test
- Following is the Matrix of the test data based on the Decision Tree Algorithm
    - **R Formula:** (table(validation_dataset$G3,test1)->table_DT)

	Fail	Pass
Fail	15	25
Pass	11	64

- Following are the criteria to validate the model
    - Accuracy: It is the proportion of true positive and true negative over the sum of the matrix. This model has 68.7% accuracy
        - **R Formula:** sum(diag(table_DT))/sum(table1)->accuracy_DT
    - Recall: Recall measures how many truly relevant results are returned. This model has 57.7% recall rate
        - **R Formula:** (table_DT[1,1])/(sum(table_DT[,1]))->recall_DT
    - Precision: This is a measure of result relevancy. This model has 37.5% precision
        - **R Formula:** (table_DT[1,1])/(sum(table_DT[1,]))->precision_DT

NAÏVE BAYES ALGORITHM

- Run Naïve Bayes Algorithm on the Training Data and Plot it
    - **R Formula:** naive_bayes(G3~ .,data=training_dataset)->naive
    - plot(naive)
    - Please note the plots are below
- Following is the Matrix of the test data based on the Naïve Bayes Algorithm
    - **R Formula:** predict(naive,validation_dataset,type='class')->test2
    - (table(validation_dataset$G3,test2)->table_NB)

	Fail	Pass
Fail	20	20
Pass	8	67

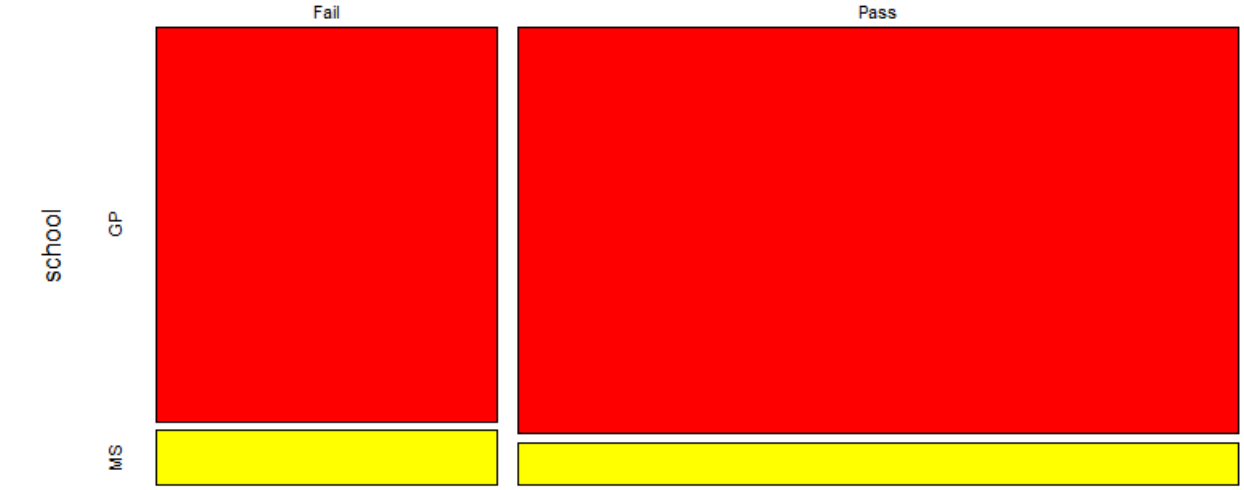
- Following are the criteria to validate the model
    - Accuracy: 75.65%
        - R Formula: sum(diag(table_NB))/sum(table_NB)->accuracy_NB
    - Recall: 71.42%
        - R Formula: (table_NB[1,1])/(sum(table_NB[,1]))->recall_NB
    - Precision: 50%
        - R Formula: (table_NB[1,1])/(sum(table_NB[1,]))->precision_NB

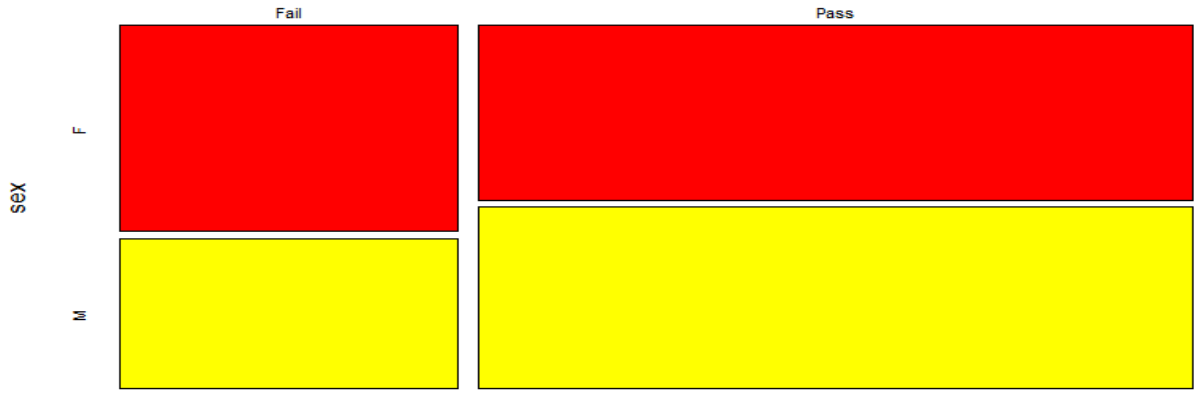
ANALYSIS

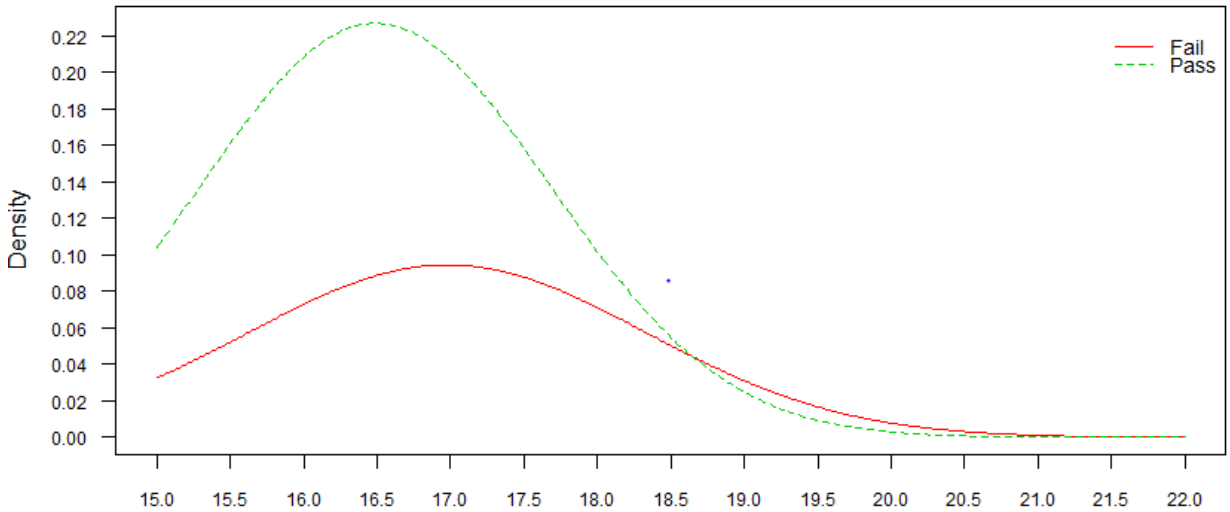
According to Accuracy of both the models , Naïve Bayes algorithm has better accuracy than Decision tree for this particular data(Avoiding Correlation and Feature selection)

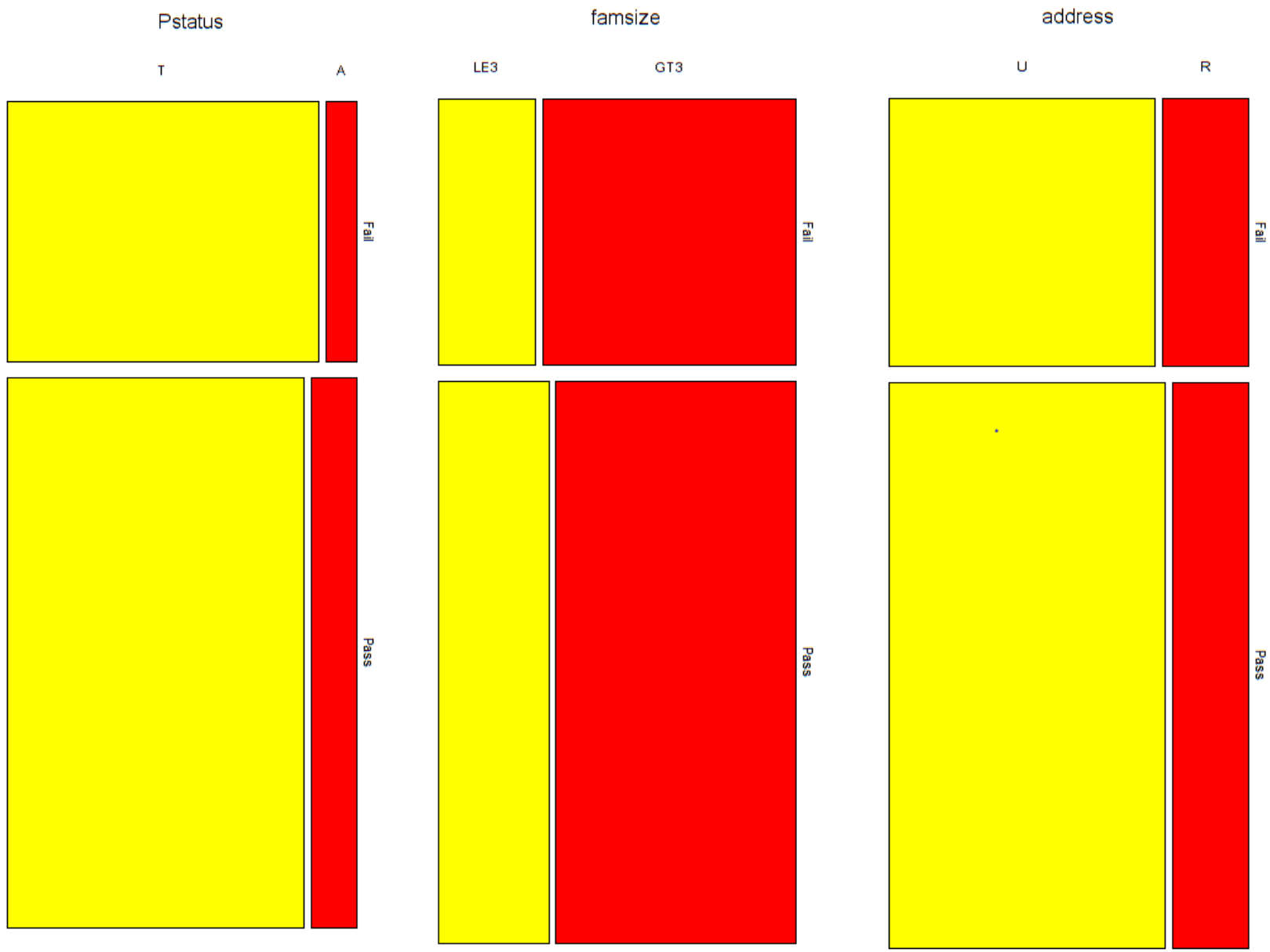
Note:- The Accuracy of data may be change if uses correlation or feature selection.

PLOTS OF NAÏVE BAYES





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Fail
Pass
famsize
LE3
GT3
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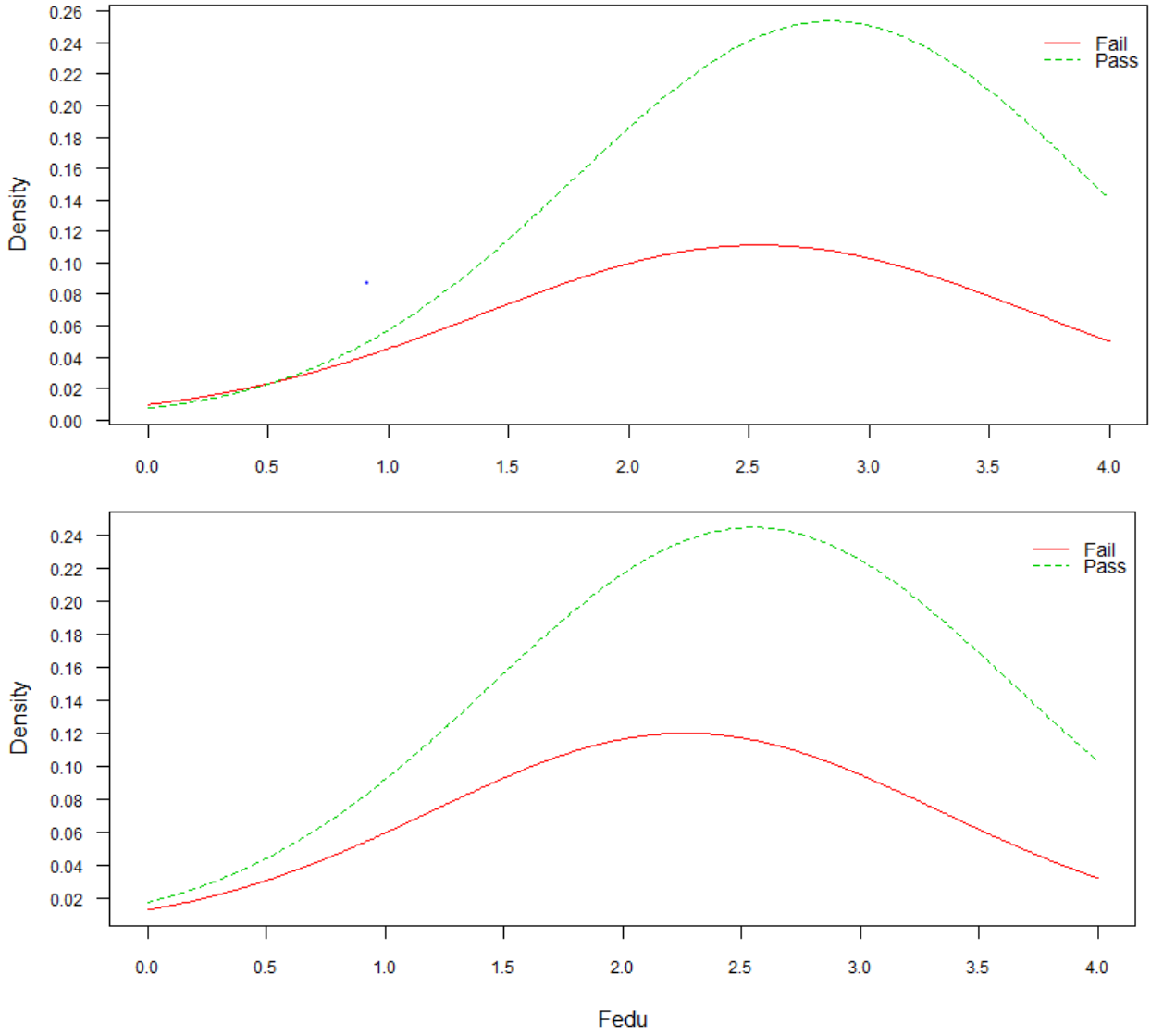
address
U
R
Fail
Pass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Pass
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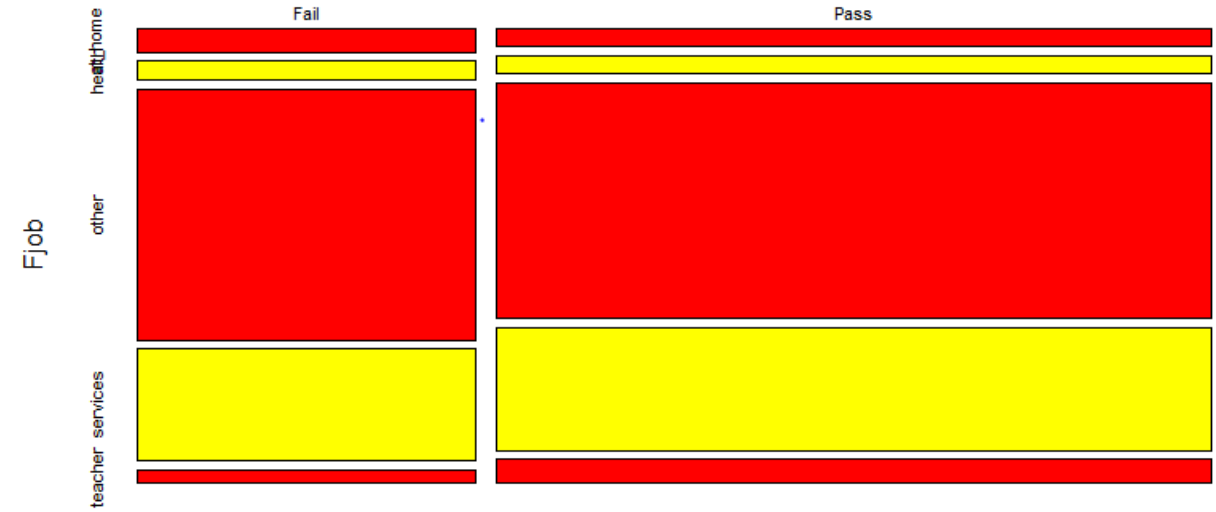
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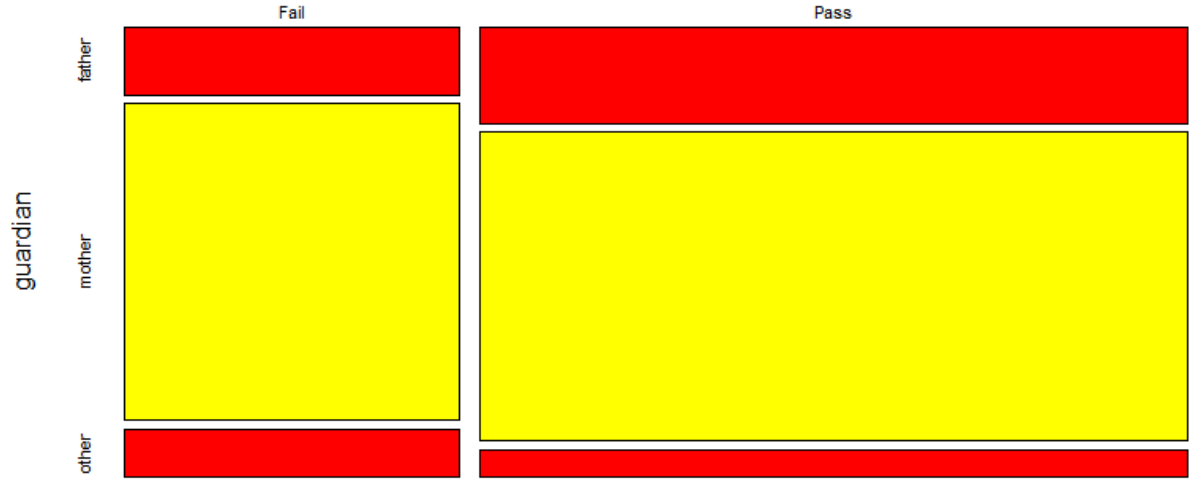
other
services
teacher


Fail
Pass
reason
course
home
other
reputation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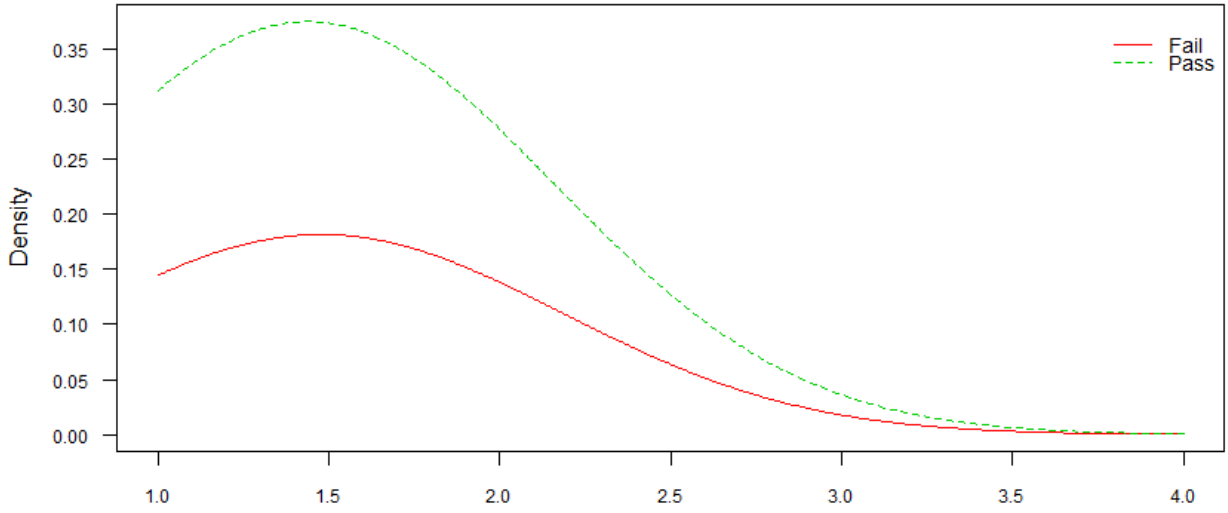
mother
other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Fail
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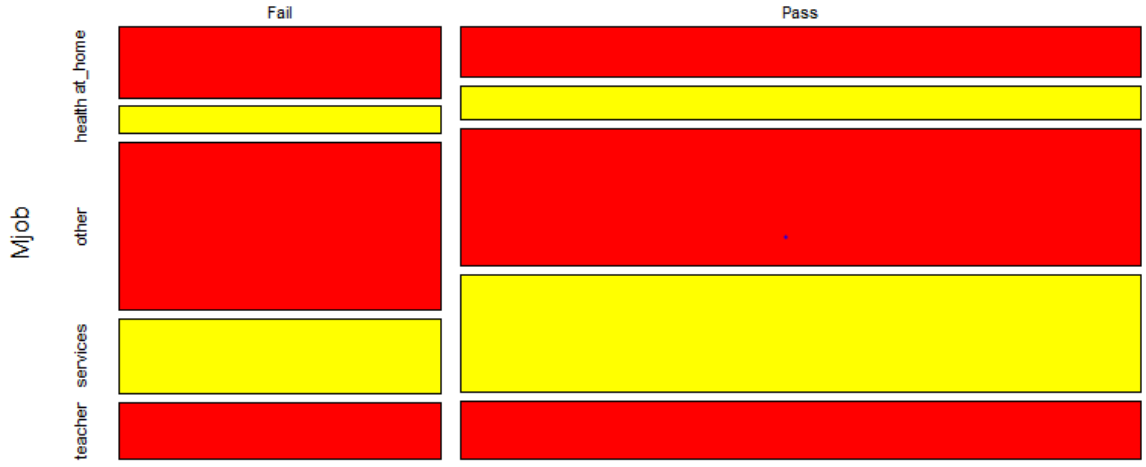
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Pass
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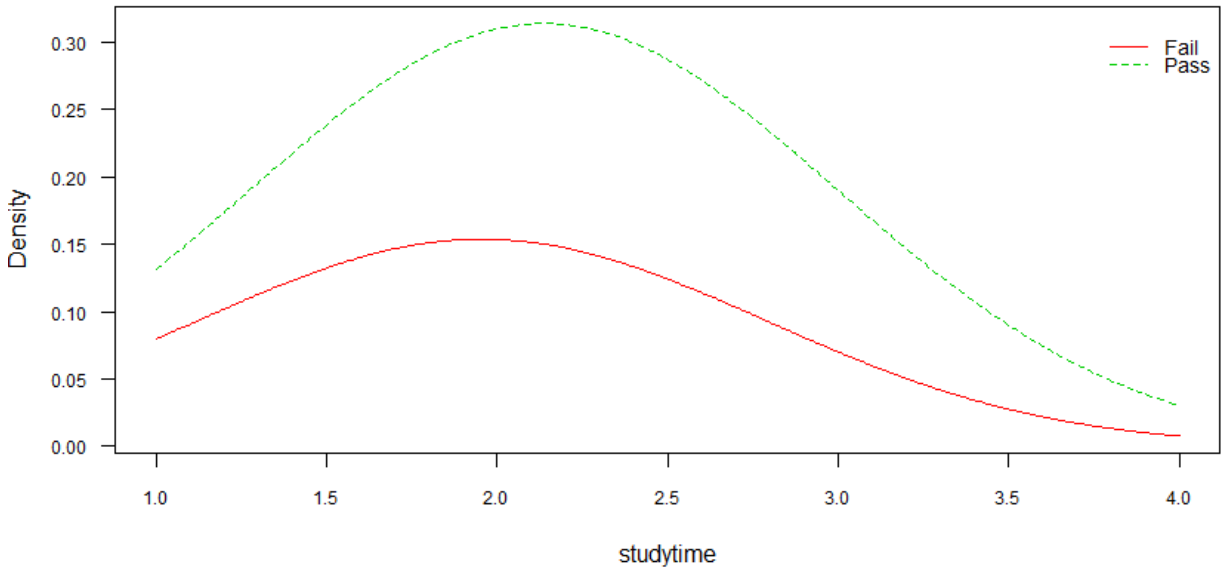
at_home
other
services
teacher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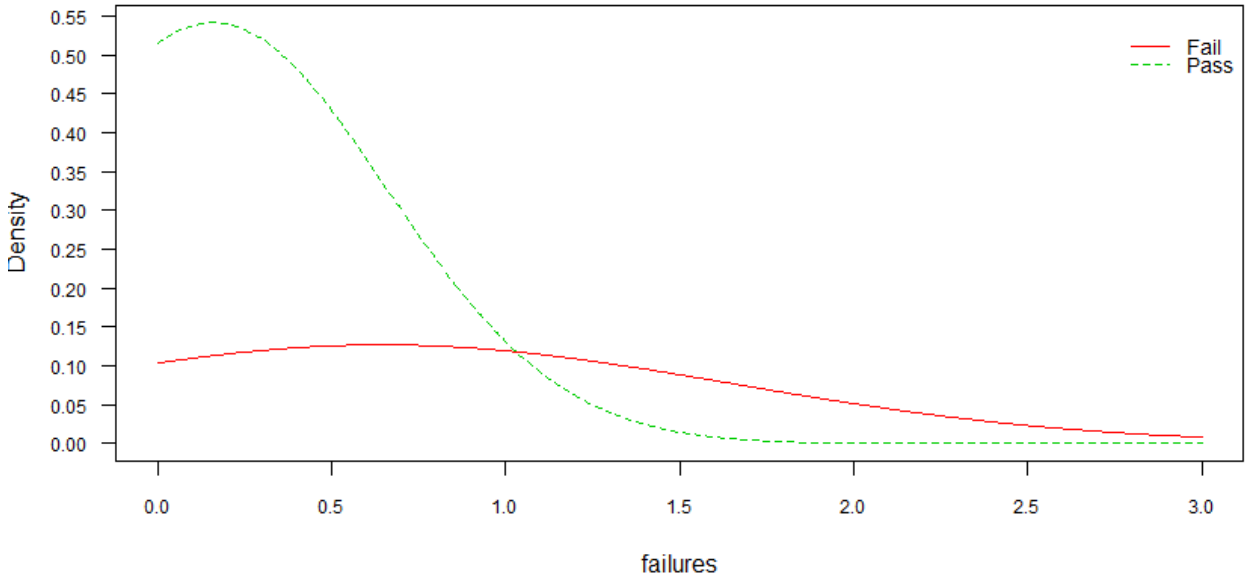
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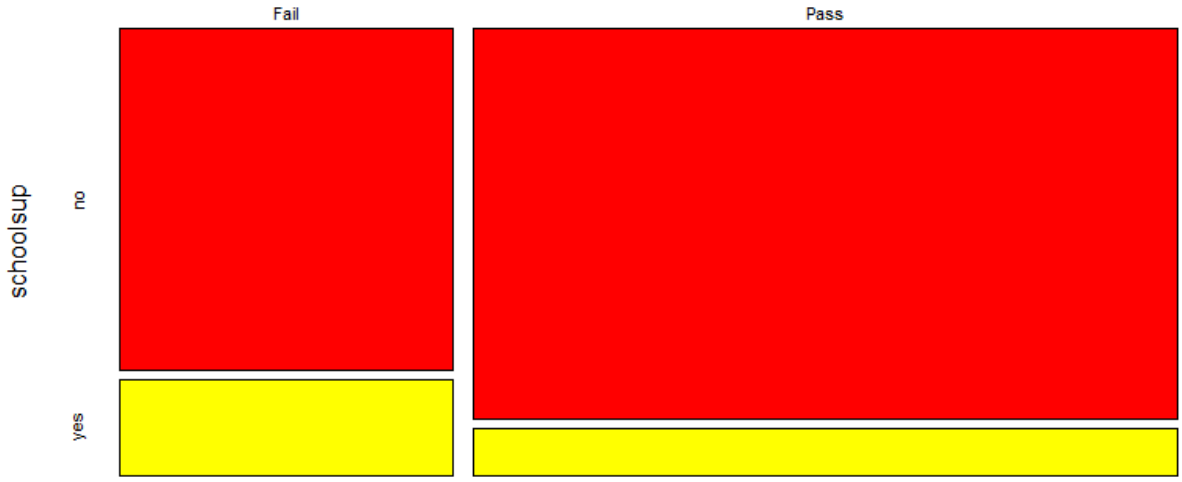
Fail
Pass
schoolsup
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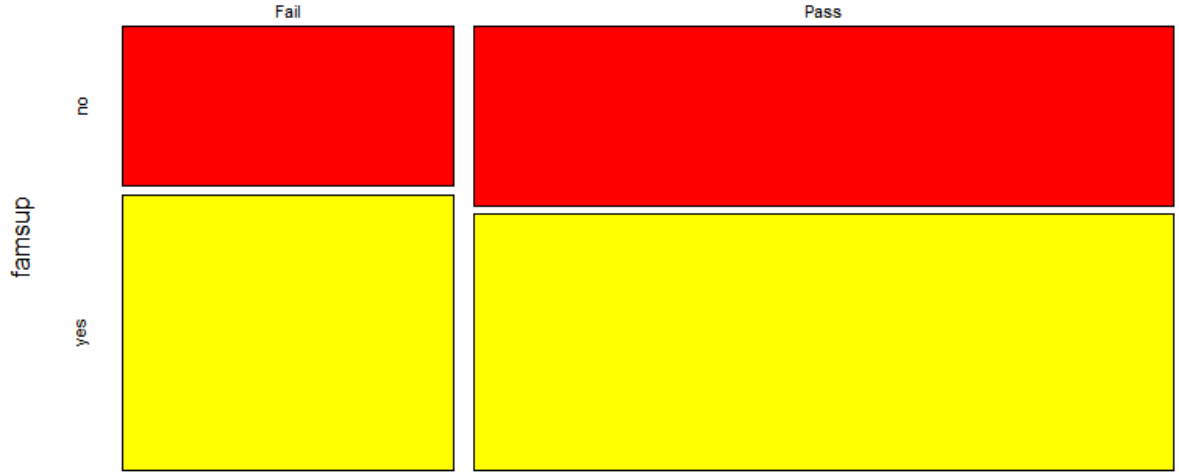
Fail
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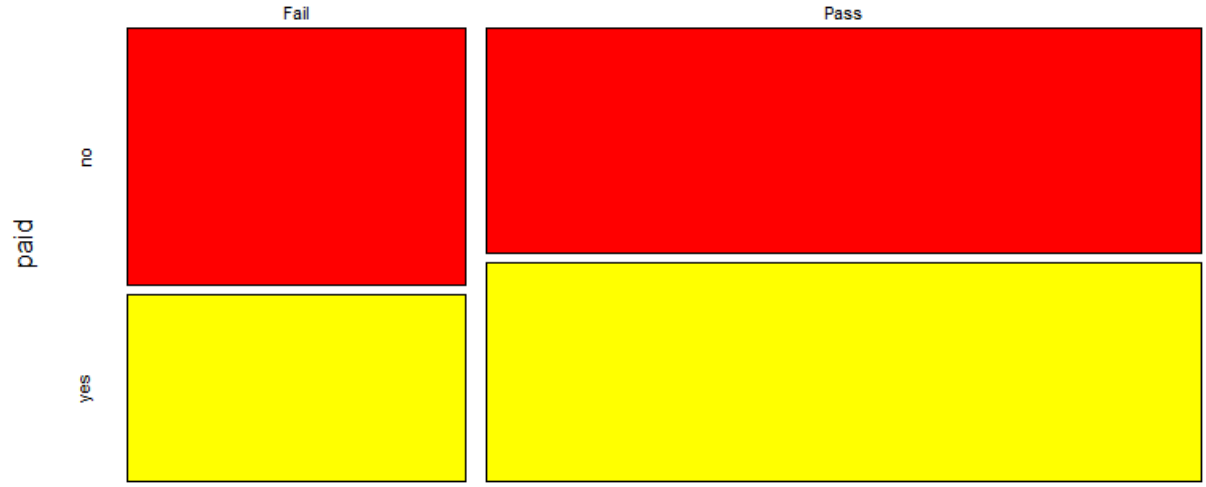
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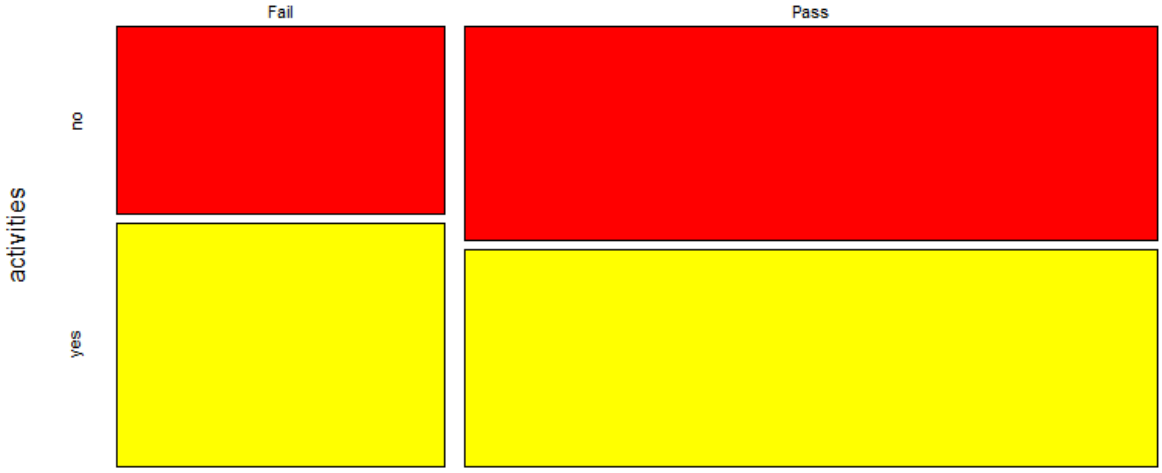
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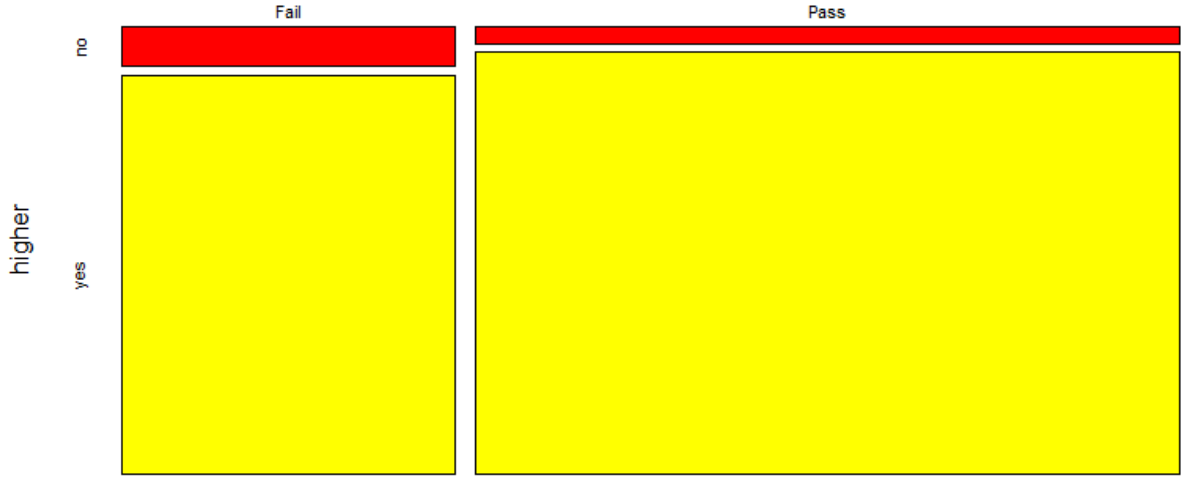
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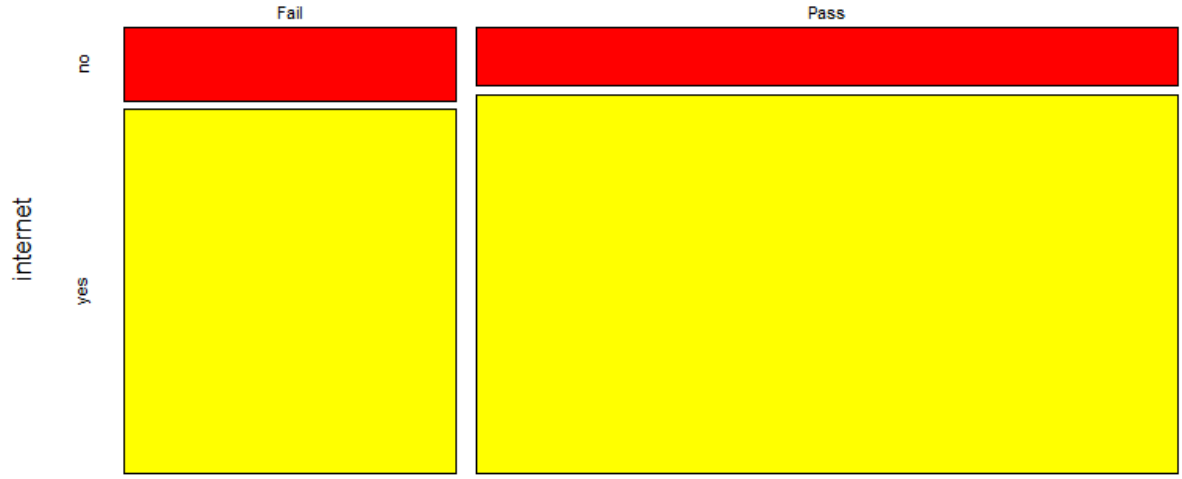
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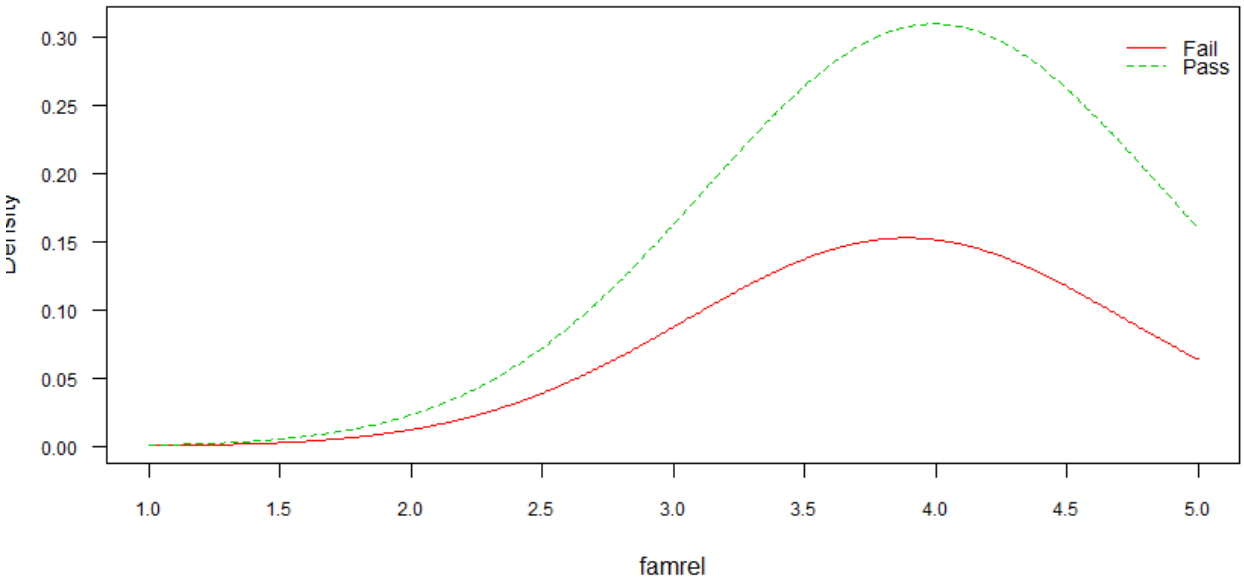
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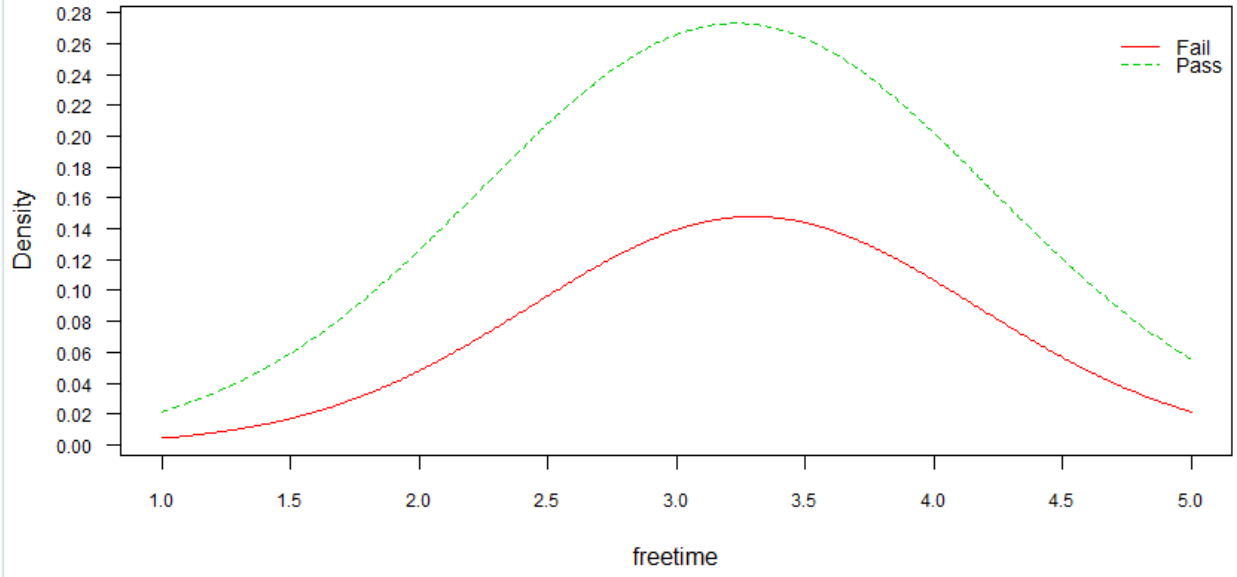
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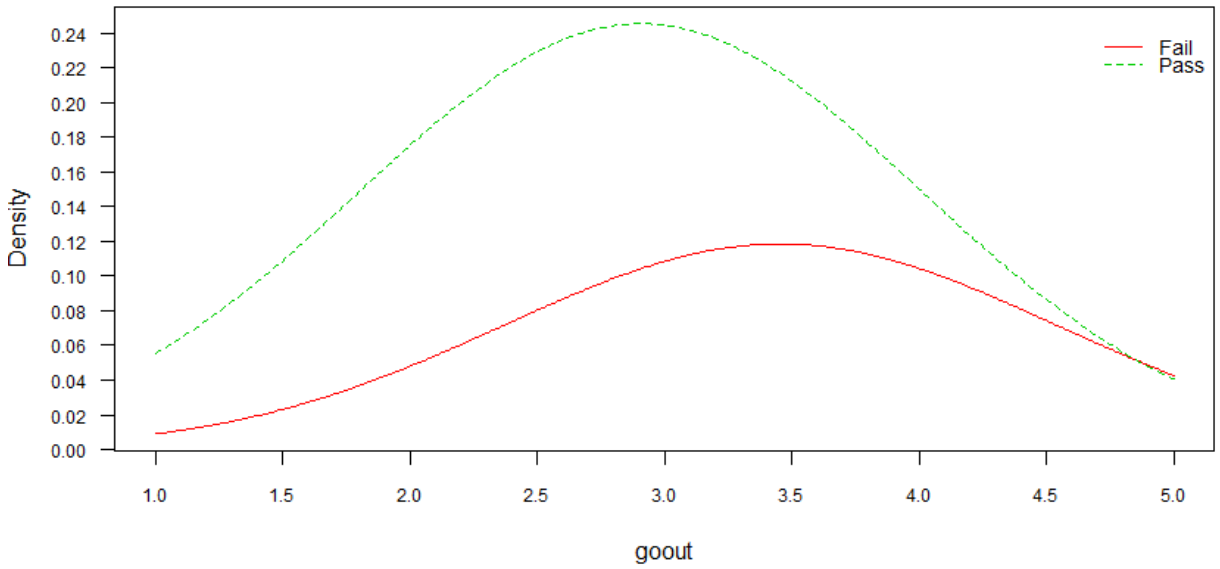
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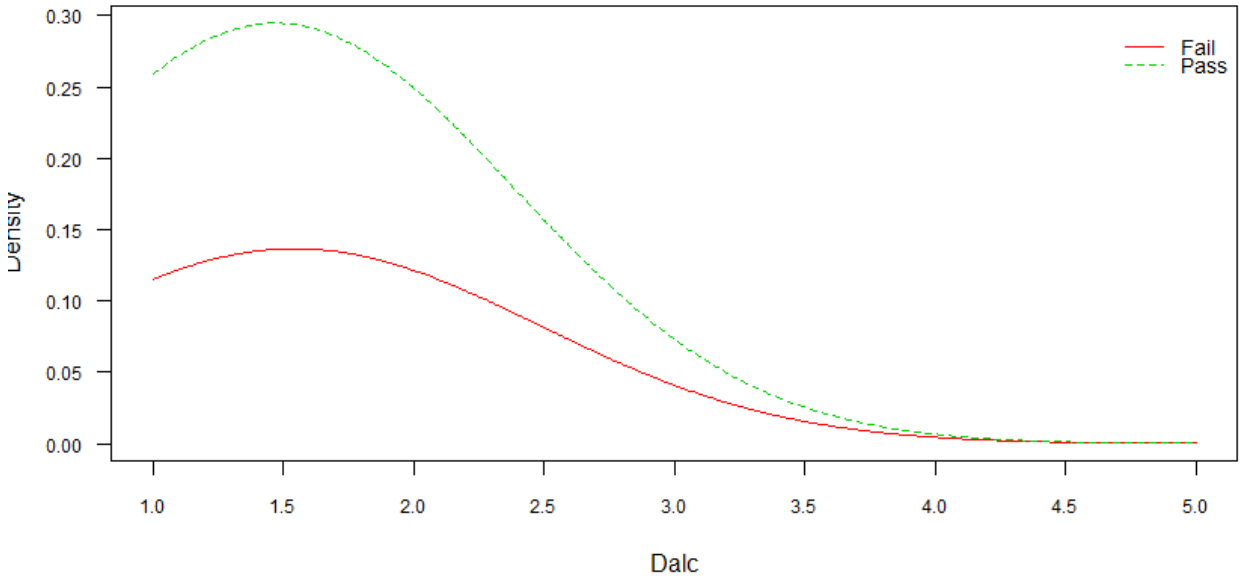
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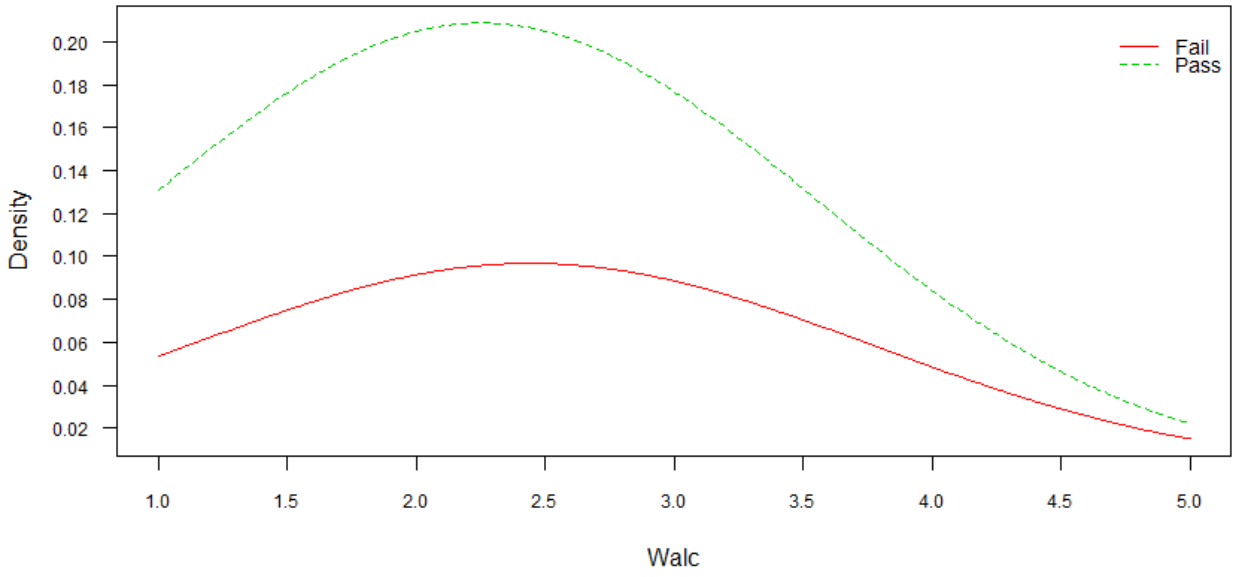
Fail
Pass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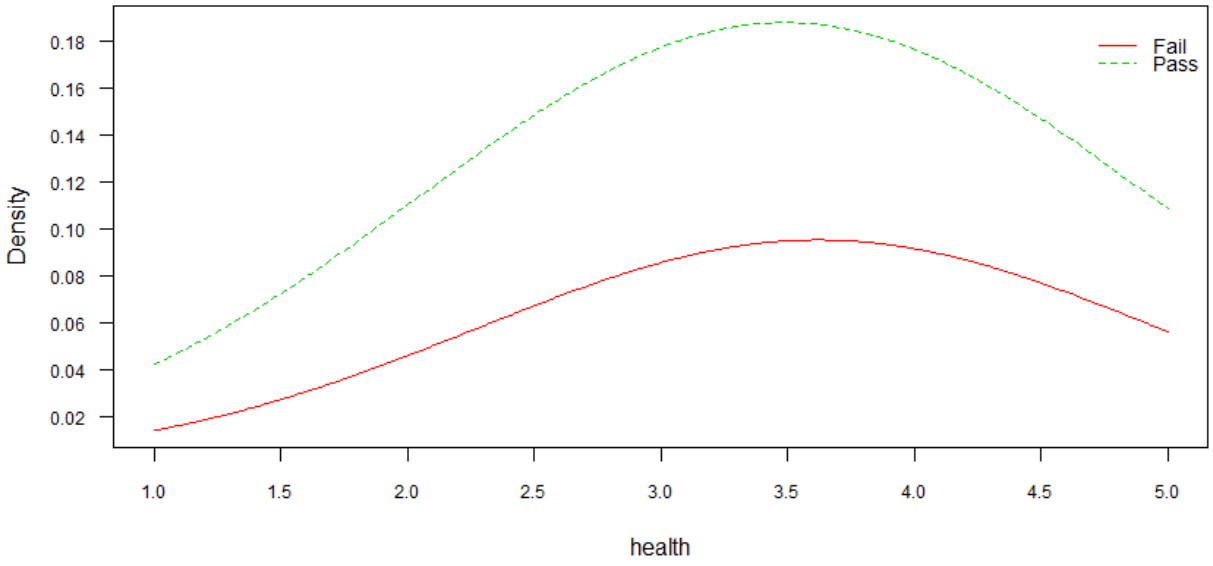
Walc
Fail
Pass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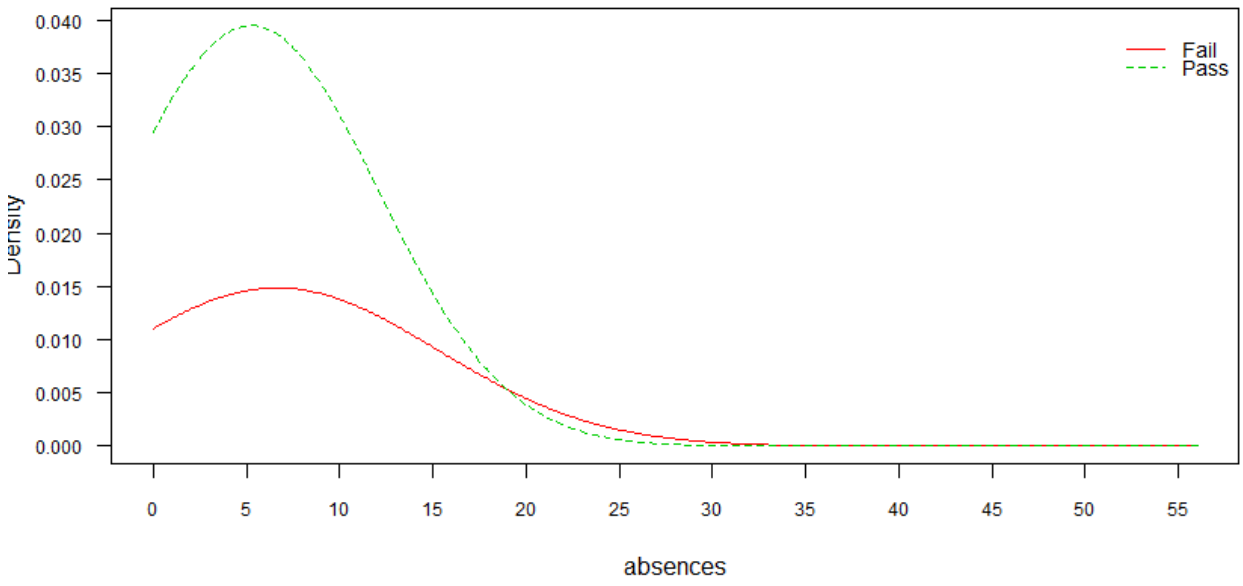
health
Fail
Pass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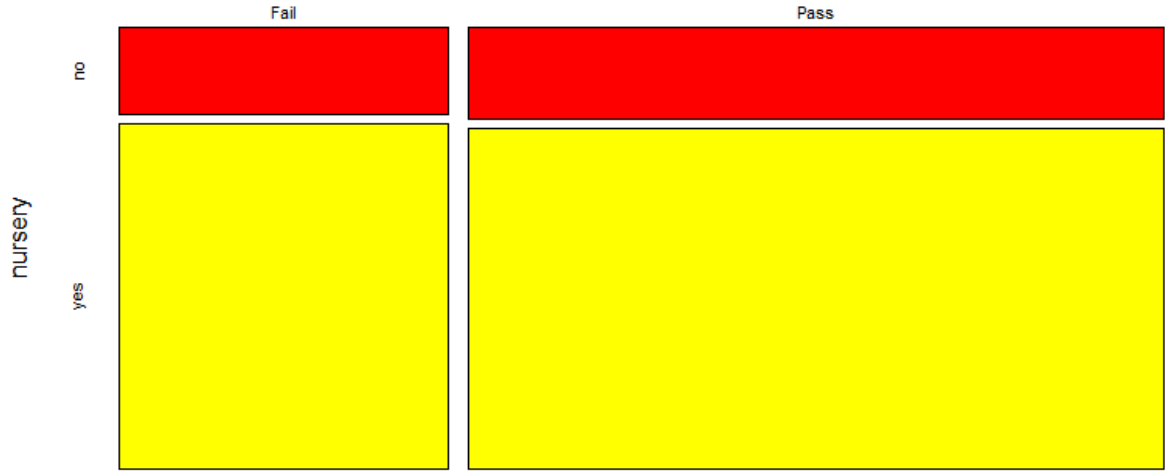
absences


Fail
Pass
nursery
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