Stat 021 Homework 5

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Due: Friday, Nov. 1, 12:00pm

Instructions: A **pdf** version of your homework must be submitted to Gradescope by **noon** on the due date. The course passcode is **MPKJ4Z**. If you are having trouble getting your *.Rmd* file to compile, you need to get help with this **before** the due date.

You are allowed to hand in **only one** late homework assignment throughout the semester. If you need to hand in this particular assignment late, you must let me know via email by noon on the due date.

You are encouraged to study with your peers to help complete the homework assignments but no copying is allowed. If I see that two or more homework assignments are copied, all students involved will receive a grade of 0 on that assignment and will forfeit (perhaps retroactively) the opportunity to hand in a late homework.

Q1) Sketch (by hand) residual plots (with $\hat{y}_i$, predicted response values, on the horizantal axis) that show each of the following: (5 points) 1. constant variance and linearity; 1. non-constant variance and linearity; 1. constant variance and non-linearity; 1. non-constant variance and non-linearity.

Q2) Suppose we have two random variables X and Y. What are the differences among the following assumptions regarding X and Y:

- X and Y are uncorrelated,

- X and Y are independent,

- X and Y have the same variance, and

- X and Y have the same distribution? (5 points)

Q3) Read the Wikipedia page for Simpson's Paradox: https://en.wikipedia.org/wiki/Simpson%27s_ paradox. Then, import the "Stand your ground" data set uploaded on Moodle. This data (from 2015) is related to the Stand Your Ground law in Florida. Each observational unit consists of a case where the Stand Your Ground law was a part of the defense strategy, the defendent's race (white or non-white), the victim's race (white or non-white), and a binary variable indicating whether or not the defendent was convicted. With this categorical data we are not going to fit a regression model but we are going to examine this data and look out for Simpson's paradox. (10 points)

a) Create and print the following tables to summarize the data:

   1. Defendant's race vs convicted for all observational units;
   2. Defendant's race vs convicted for cases with minority victims only;
   3. Defendant's race vs convicted for cases with white victims only;
   4. The table created by adding Tables 2 and 3 together.

b) What are the overall conviction rates for minority and white defendants, respectively? What are the conviction rates for minority and white defendants among the cases with minority victims? What are the conviction rates for minority and white defendants among the cases with white victims?

c) Explain what is going on here in terms of Simpson's paradox and interpret what this means with respect to racial bias in the criminal justice system.

```
standyourground1 <- read.csv("stand_your_ground.csv")
standyourground1
```

```
##      Convicted  Accused WhiteVictim MinVictim
## 1         Yes    White           1         0
## 2         Yes    White           1         0
## 3         Yes    White           1         0
## 4         Yes    White           1         0
## 5         Yes    White           1         0
## 6         Yes    White           1         0
## 7         Yes    White           1         0
## 8         Yes    White           1         0
## 9         Yes    White           1         0
## 10        Yes    White           1         0
## 11        Yes    White           1         0
## 12        Yes    White           1         0
## 13        Yes    White           1         0
## 14        Yes    White           1         0
## 15        Yes    White           1         0
## 16        Yes    White           1         0
## 17        Yes    White           1         0
## 18        Yes    White           1         0
## 19        Yes    White           1         0
## 20        Yes    White           1         0
## 21        Yes    White           1         0
## 22        Yes    White           1         0
## 23        Yes    White           1         0
## 24        Yes    White           1         0
## 25        Yes    White           1         0
## 26        Yes    White           1         0
## 27        Yes    White           1         0
## 28        Yes    White           1         0
## 29        Yes    White           1         0
## 30        Yes    White           1         0
## 31        Yes    White           1         0
## 32        Yes    White           1         0
## 33        Yes    White           1         0
## 34        Yes    White           1         0
## 35        Yes    White           1         0
## 36         No    White           1         0
## 37         No    White           1         0
## 38         No    White           1         0
## 39         No    White           1         0
## 40         No    White           1         0
## 41         No    White           1         0
## 42         No    White           1         0
## 43         No    White           1         0
## 44         No    White           1         0
## 45         No    White           1         0
## 46         No    White           1         0
## 47         No    White           1         0
```

2

```
## 48          No      White            1          0
## 49          No      White            1          0
## 50          No      White            1          0
## 51          No      White            1          0
## 52          No      White            1          0
## 53          No      White            1          0
## 54          No      White            1          0
## 55          No      White            1          0
## 56          No      White            1          0
## 57          No      White            1          0
## 58          No      White            1          0
## 59          No      White            1          0
## 60          No      White            1          0
## 61          No      White            1          0
## 62          No      White            1          0
## 63          No      White            1          0
## 64          No      White            1          0
## 65          No      White            1          0
## 66          No      White            1          0
## 67          No      White            1          0
## 68          No      White            1          0
## 69          No      White            1          0
## 70          No      White            1          0
## 71          No      White            1          0
## 72          No      White            1          0
## 73          No      White            1          0
## 74          No      White            1          0
## 75          No      White            1          0
## 76          No      White            1          0
## 77          No      White            1          0
## 78          No      White            1          0
## 79          No      White            1          0
## 80          No      White            1          0
## 81          No      White            1          0
## 82          No      White            1          0
## 83          No      White            1          0
## 84          No      White            1          0
## 85          No      White            1          0
## 86          No      White            1          0
## 87          No      White            1          0
## 88          No      White            1          0
## 89          No      White            1          0
## 90          No      White            1          0
## 91          No      White            1          0
## 92          No      White            1          0
## 93          No      White            1          0
## 94          No      White            1          0
## 95          No      White            1          0
## 96          No      White            1          0
## 97          No      White            1          0
## 98          Yes     White            0          1
## 99          Yes     White            0          1
## 100         Yes     White            0          1
## 101         Yes     White            0          1
```

```
## 102          Yes     White           0           1
## 103          No      White           0           1
## 104          No      White           0           1
## 105          No      White           0           1
## 106          No      White           0           1
## 107          No      White           0           1
## 108          No      White           0           1
## 109          No      White           0           1
## 110          No      White           0           1
## 111          No      White           0           1
## 112          No      White           0           1
## 113          No      White           0           1
## 114          No      White           0           1
## 115          No      White           0           1
## 116          No      White           0           1
## 117          No      White           0           1
## 118          No      White           0           1
## 119          Yes Minority           1           0
## 120          Yes Minority           1           0
## 121          Yes Minority           1           0
## 122          Yes Minority           1           0
## 123          Yes Minority           1           0
## 124          Yes Minority           1           0
## 125          Yes Minority           1           0
## 126          Yes Minority           1           0
## 127          No Minority            1           0
## 128          No Minority            1           0
## 129          No Minority            1           0
## 130          No Minority            1           0
## 131          No Minority            1           0
## 132          No Minority            1           0
## 133          No Minority            1           0
## 134          No Minority            1           0
## 135          No Minority            1           0
## 136          No Minority            1           0
## 137          No Minority            1           0
## 138          No Minority            1           0
## 139          No Minority            1           0
## 140          No Minority            1           0
## 141          Yes Minority           0           1
## 142          Yes Minority           0           1
## 143          Yes Minority           0           1
## 144          Yes Minority           0           1
## 145          Yes Minority           0           1
## 146          Yes Minority           0           1
## 147          Yes Minority           0           1
## 148          Yes Minority           0           1
## 149          Yes Minority           0           1
## 150          Yes Minority           0           1
## 151          Yes Minority           0           1
## 152          No Minority            0           1
## 153          No Minority            0           1
## 154          No Minority            0           1
## 155          No Minority            0           1
```

```
## 156       No Minority           0           1
## 157       No Minority           0           1
## 158       No Minority           0           1
## 159       No Minority           0           1
## 160       No Minority           0           1
## 161       No Minority           0           1
## 162       No Minority           0           1
## 163       No Minority           0           1
## 164       No Minority           0           1
## 165       No Minority           0           1
## 166       No Minority           0           1
## 167       No Minority           0           1
## 168       No Minority           0           1
## 169       No Minority           0           1
## 170       No Minority           0           1
## 171       No Minority           0           1
## 172       No Minority           0           1
## 173       No Minority           0           1
## 174       No Minority           0           1
## 175       No Minority           0           1
## 176       No Minority           0           1
## 177       No Minority           0           1
## 178       No Minority           0           1
## 179       No Minority           0           1
## 180       No Minority           0           1
## 181       No Minority           0           1
## 182       No Minority           0           1
## 183       No Minority           0           1
## 184       No Minority           0           1
## 185       No Minority           0           1
## 186      Yes Minority           0           1
## 187      Yes Minority           0           1
## 188      Yes Minority           0           1
## 189      Yes Minority           0           1
## 190      Yes Minority           0           1
## 191      Yes Minority           0           1
## 192      Yes Minority           0           1
## 193       No Minority           0           1
## 194       No Minority           0           1
## 195       No Minority           0           1
## 196       No Minority           0           1
## 197       No Minority           0           1
## 198      Yes    White           1           0
## 199      Yes    White           1           0
## 200      Yes    White           1           0
## 201      Yes    White           1           0
## 202      Yes    White           1           0
## 203       No    White           1           0
## 204       No    White           1           0
## 205       No    White           1           0
## 206       No    White           1           0
## 207       No    White           1           0
## 208       No    White           0           1
## 209       No    White           0           1
```

```
## 210      No   White            0           1
## 211     Yes Minority           1           0
## 212     Yes Minority           1           0
## 213      No Minority           1           0
## 214     Yes Minority           0           1
## 215      No Minority           0           1
## 216      No Minority           0           1
## 217      No Minority           0           1
## 218      No Minority           0           1
## 219      No Minority           0           1
## 220      No Minority           0           1
```

```r
def2 <- standyourground1 %>% select(Convicted:Accused)
def2
```

```
##      Convicted  Accused
## 1          Yes    White
## 2          Yes    White
## 3          Yes    White
## 4          Yes    White
## 5          Yes    White
## 6          Yes    White
## 7          Yes    White
## 8          Yes    White
## 9          Yes    White
## 10         Yes    White
## 11         Yes    White
## 12         Yes    White
## 13         Yes    White
## 14         Yes    White
## 15         Yes    White
## 16         Yes    White
## 17         Yes    White
## 18         Yes    White
## 19         Yes    White
## 20         Yes    White
## 21         Yes    White
## 22         Yes    White
## 23         Yes    White
## 24         Yes    White
## 25         Yes    White
## 26         Yes    White
## 27         Yes    White
## 28         Yes    White
## 29         Yes    White
## 30         Yes    White
## 31         Yes    White
## 32         Yes    White
## 33         Yes    White
## 34         Yes    White
## 35         Yes    White
## 36          No    White
## 37          No    White
## 38          No    White
```

```
## 39          No      White
## 40          No      White
## 41          No      White
## 42          No      White
## 43          No      White
## 44          No      White
## 45          No      White
## 46          No      White
## 47          No      White
## 48          No      White
## 49          No      White
## 50          No      White
## 51          No      White
## 52          No      White
## 53          No      White
## 54          No      White
## 55          No      White
## 56          No      White
## 57          No      White
## 58          No      White
## 59          No      White
## 60          No      White
## 61          No      White
## 62          No      White
## 63          No      White
## 64          No      White
## 65          No      White
## 66          No      White
## 67          No      White
## 68          No      White
## 69          No      White
## 70          No      White
## 71          No      White
## 72          No      White
## 73          No      White
## 74          No      White
## 75          No      White
## 76          No      White
## 77          No      White
## 78          No      White
## 79          No      White
## 80          No      White
## 81          No      White
## 82          No      White
## 83          No      White
## 84          No      White
## 85          No      White
## 86          No      White
## 87          No      White
## 88          No      White
## 89          No      White
## 90          No      White
## 91          No      White
## 92          No      White
```

```
## 93           No     White
## 94           No     White
## 95           No     White
## 96           No     White
## 97           No     White
## 98          Yes     White
## 99          Yes     White
## 100         Yes     White
## 101         Yes     White
## 102         Yes     White
## 103          No     White
## 104          No     White
## 105          No     White
## 106          No     White
## 107          No     White
## 108          No     White
## 109          No     White
## 110          No     White
## 111          No     White
## 112          No     White
## 113          No     White
## 114          No     White
## 115          No     White
## 116          No     White
## 117          No     White
## 118          No     White
## 119         Yes Minority
## 120         Yes Minority
## 121         Yes Minority
## 122         Yes Minority
## 123         Yes Minority
## 124         Yes Minority
## 125         Yes Minority
## 126         Yes Minority
## 127          No Minority
## 128          No Minority
## 129          No Minority
## 130          No Minority
## 131          No Minority
## 132          No Minority
## 133          No Minority
## 134          No Minority
## 135          No Minority
## 136          No Minority
## 137          No Minority
## 138          No Minority
## 139          No Minority
## 140          No Minority
## 141         Yes Minority
## 142         Yes Minority
## 143         Yes Minority
## 144         Yes Minority
## 145         Yes Minority
## 146         Yes Minority
```

```
## 147      Yes Minority
## 148      Yes Minority
## 149      Yes Minority
## 150      Yes Minority
## 151      Yes Minority
## 152       No Minority
## 153       No Minority
## 154       No Minority
## 155       No Minority
## 156       No Minority
## 157       No Minority
## 158       No Minority
## 159       No Minority
## 160       No Minority
## 161       No Minority
## 162       No Minority
## 163       No Minority
## 164       No Minority
## 165       No Minority
## 166       No Minority
## 167       No Minority
## 168       No Minority
## 169       No Minority
## 170       No Minority
## 171       No Minority
## 172       No Minority
## 173       No Minority
## 174       No Minority
## 175       No Minority
## 176       No Minority
## 177       No Minority
## 178       No Minority
## 179       No Minority
## 180       No Minority
## 181       No Minority
## 182       No Minority
## 183       No Minority
## 184       No Minority
## 185       No Minority
## 186      Yes Minority
## 187      Yes Minority
## 188      Yes Minority
## 189      Yes Minority
## 190      Yes Minority
## 191      Yes Minority
## 192      Yes Minority
## 193       No Minority
## 194       No Minority
## 195       No Minority
## 196       No Minority
## 197       No Minority
## 198      Yes    White
## 199      Yes    White
## 200      Yes    White
```

```
## 201        Yes     White
## 202        Yes     White
## 203         No     White
## 204         No     White
## 205         No     White
## 206         No     White
## 207         No     White
## 208         No     White
## 209         No     White
## 210         No     White
## 211        Yes Minority
## 212        Yes Minority
## 213         No Minority
## 214        Yes Minority
## 215         No Minority
## 216         No Minority
## 217         No Minority
## 218         No Minority
## 219         No Minority
## 220         No Minority
```

```
mindef <- def2 %>% filter(Accused == "Minority")
mindef
```

```
##     Convicted  Accused
## 1         Yes Minority
## 2         Yes Minority
## 3         Yes Minority
## 4         Yes Minority
## 5         Yes Minority
## 6         Yes Minority
## 7         Yes Minority
## 8         Yes Minority
## 9          No Minority
## 10         No Minority
## 11         No Minority
## 12         No Minority
## 13         No Minority
## 14         No Minority
## 15         No Minority
## 16         No Minority
## 17         No Minority
## 18         No Minority
## 19         No Minority
## 20         No Minority
## 21         No Minority
## 22         No Minority
## 23        Yes Minority
## 24        Yes Minority
## 25        Yes Minority
## 26        Yes Minority
## 27        Yes Minority
## 28        Yes Minority
## 29        Yes Minority
```

```
## 30       Yes Minority
## 31       Yes Minority
## 32       Yes Minority
## 33       Yes Minority
## 34        No Minority
## 35        No Minority
## 36        No Minority
## 37        No Minority
## 38        No Minority
## 39        No Minority
## 40        No Minority
## 41        No Minority
## 42        No Minority
## 43        No Minority
## 44        No Minority
## 45        No Minority
## 46        No Minority
## 47        No Minority
## 48        No Minority
## 49        No Minority
## 50        No Minority
## 51        No Minority
## 52        No Minority
## 53        No Minority
## 54        No Minority
## 55        No Minority
## 56        No Minority
## 57        No Minority
## 58        No Minority
## 59        No Minority
## 60        No Minority
## 61        No Minority
## 62        No Minority
## 63        No Minority
## 64        No Minority
## 65        No Minority
## 66        No Minority
## 67        No Minority
## 68       Yes Minority
## 69       Yes Minority
## 70       Yes Minority
## 71       Yes Minority
## 72       Yes Minority
## 73       Yes Minority
## 74       Yes Minority
## 75        No Minority
## 76        No Minority
## 77        No Minority
## 78        No Minority
## 79        No Minority
## 80       Yes Minority
## 81       Yes Minority
## 82        No Minority
## 83       Yes Minority
```

```
## 84          No Minority
## 85          No Minority
## 86          No Minority
## 87          No Minority
## 88          No Minority
## 89          No Minority
```

```
whitedef <- def2 %>% filter(Accused == "White")
whitedef
```

```
##      Convicted Accused
## 1          Yes   White
## 2          Yes   White
## 3          Yes   White
## 4          Yes   White
## 5          Yes   White
## 6          Yes   White
## 7          Yes   White
## 8          Yes   White
## 9          Yes   White
## 10         Yes   White
## 11         Yes   White
## 12         Yes   White
## 13         Yes   White
## 14         Yes   White
## 15         Yes   White
## 16         Yes   White
## 17         Yes   White
## 18         Yes   White
## 19         Yes   White
## 20         Yes   White
## 21         Yes   White
## 22         Yes   White
## 23         Yes   White
## 24         Yes   White
## 25         Yes   White
## 26         Yes   White
## 27         Yes   White
## 28         Yes   White
## 29         Yes   White
## 30         Yes   White
## 31         Yes   White
## 32         Yes   White
## 33         Yes   White
## 34         Yes   White
## 35         Yes   White
## 36          No   White
## 37          No   White
## 38          No   White
## 39          No   White
## 40          No   White
## 41          No   White
## 42          No   White
## 43          No   White
```

```
## 44          No    White
## 45          No    White
## 46          No    White
## 47          No    White
## 48          No    White
## 49          No    White
## 50          No    White
## 51          No    White
## 52          No    White
## 53          No    White
## 54          No    White
## 55          No    White
## 56          No    White
## 57          No    White
## 58          No    White
## 59          No    White
## 60          No    White
## 61          No    White
## 62          No    White
## 63          No    White
## 64          No    White
## 65          No    White
## 66          No    White
## 67          No    White
## 68          No    White
## 69          No    White
## 70          No    White
## 71          No    White
## 72          No    White
## 73          No    White
## 74          No    White
## 75          No    White
## 76          No    White
## 77          No    White
## 78          No    White
## 79          No    White
## 80          No    White
## 81          No    White
## 82          No    White
## 83          No    White
## 84          No    White
## 85          No    White
## 86          No    White
## 87          No    White
## 88          No    White
## 89          No    White
## 90          No    White
## 91          No    White
## 92          No    White
## 93          No    White
## 94          No    White
## 95          No    White
## 96          No    White
## 97          No    White
```

```
## 98         Yes    White
## 99         Yes    White
## 100        Yes    White
## 101        Yes    White
## 102        Yes    White
## 103         No    White
## 104         No    White
## 105         No    White
## 106         No    White
## 107         No    White
## 108         No    White
## 109         No    White
## 110         No    White
## 111         No    White
## 112         No    White
## 113         No    White
## 114         No    White
## 115         No    White
## 116         No    White
## 117         No    White
## 118         No    White
## 119        Yes    White
## 120        Yes    White
## 121        Yes    White
## 122        Yes    White
## 123        Yes    White
## 124         No    White
## 125         No    White
## 126         No    White
## 127         No    White
## 128         No    White
## 129         No    White
## 130         No    White
## 131         No    White
```

```
minwhitedef <- rbind(mindef, whitedef)
minwhitedef
```

```
##      Convicted  Accused
## 1          Yes Minority
## 2          Yes Minority
## 3          Yes Minority
## 4          Yes Minority
## 5          Yes Minority
## 6          Yes Minority
## 7          Yes Minority
## 8          Yes Minority
## 9           No Minority
## 10          No Minority
## 11          No Minority
## 12          No Minority
## 13          No Minority
## 14          No Minority
## 15          No Minority
```

```
## 16          No Minority
## 17          No Minority
## 18          No Minority
## 19          No Minority
## 20          No Minority
## 21          No Minority
## 22          No Minority
## 23         Yes Minority
## 24         Yes Minority
## 25         Yes Minority
## 26         Yes Minority
## 27         Yes Minority
## 28         Yes Minority
## 29         Yes Minority
## 30         Yes Minority
## 31         Yes Minority
## 32         Yes Minority
## 33         Yes Minority
## 34          No Minority
## 35          No Minority
## 36          No Minority
## 37          No Minority
## 38          No Minority
## 39          No Minority
## 40          No Minority
## 41          No Minority
## 42          No Minority
## 43          No Minority
## 44          No Minority
## 45          No Minority
## 46          No Minority
## 47          No Minority
## 48          No Minority
## 49          No Minority
## 50          No Minority
## 51          No Minority
## 52          No Minority
## 53          No Minority
## 54          No Minority
## 55          No Minority
## 56          No Minority
## 57          No Minority
## 58          No Minority
## 59          No Minority
## 60          No Minority
## 61          No Minority
## 62          No Minority
## 63          No Minority
## 64          No Minority
## 65          No Minority
## 66          No Minority
## 67          No Minority
## 68         Yes Minority
## 69         Yes Minority
```

```
## 70       Yes Minority
## 71       Yes Minority
## 72       Yes Minority
## 73       Yes Minority
## 74       Yes Minority
## 75        No Minority
## 76        No Minority
## 77        No Minority
## 78        No Minority
## 79        No Minority
## 80       Yes Minority
## 81       Yes Minority
## 82        No Minority
## 83       Yes Minority
## 84        No Minority
## 85        No Minority
## 86        No Minority
## 87        No Minority
## 88        No Minority
## 89        No Minority
## 90       Yes    White
## 91       Yes    White
## 92       Yes    White
## 93       Yes    White
## 94       Yes    White
## 95       Yes    White
## 96       Yes    White
## 97       Yes    White
## 98       Yes    White
## 99       Yes    White
## 100      Yes    White
## 101      Yes    White
## 102      Yes    White
## 103      Yes    White
## 104      Yes    White
## 105      Yes    White
## 106      Yes    White
## 107      Yes    White
## 108      Yes    White
## 109      Yes    White
## 110      Yes    White
## 111      Yes    White
## 112      Yes    White
## 113      Yes    White
## 114      Yes    White
## 115      Yes    White
## 116      Yes    White
## 117      Yes    White
## 118      Yes    White
## 119      Yes    White
## 120      Yes    White
## 121      Yes    White
## 122      Yes    White
## 123      Yes    White
```

```
## 124      Yes     White
## 125       No     White
## 126       No     White
## 127       No     White
## 128       No     White
## 129       No     White
## 130       No     White
## 131       No     White
## 132       No     White
## 133       No     White
## 134       No     White
## 135       No     White
## 136       No     White
## 137       No     White
## 138       No     White
## 139       No     White
## 140       No     White
## 141       No     White
## 142       No     White
## 143       No     White
## 144       No     White
## 145       No     White
## 146       No     White
## 147       No     White
## 148       No     White
## 149       No     White
## 150       No     White
## 151       No     White
## 152       No     White
## 153       No     White
## 154       No     White
## 155       No     White
## 156       No     White
## 157       No     White
## 158       No     White
## 159       No     White
## 160       No     White
## 161       No     White
## 162       No     White
## 163       No     White
## 164       No     White
## 165       No     White
## 166       No     White
## 167       No     White
## 168       No     White
## 169       No     White
## 170       No     White
## 171       No     White
## 172       No     White
## 173       No     White
## 174       No     White
## 175       No     White
## 176       No     White
## 177       No     White
```

```
## 178        No    White
## 179        No    White
## 180        No    White
## 181        No    White
## 182        No    White
## 183        No    White
## 184        No    White
## 185        No    White
## 186        No    White
## 187        Yes   White
## 188        Yes   White
## 189        Yes   White
## 190        Yes   White
## 191        Yes   White
## 192        No    White
## 193        No    White
## 194        No    White
## 195        No    White
## 196        No    White
## 197        No    White
## 198        No    White
## 199        No    White
## 200        No    White
## 201        No    White
## 202        No    White
## 203        No    White
## 204        No    White
## 205        No    White
## 206        No    White
## 207        No    White
## 208        Yes   White
## 209        Yes   White
## 210        Yes   White
## 211        Yes   White
## 212        Yes   White
## 213        No    White
## 214        No    White
## 215        No    White
## 216        No    White
## 217        No    White
## 218        No    White
## 219        No    White
## 220        No    White
```

```r
countwhitedef <- count(whitedef, Convicted == "Yes")
countwhitedef
```

```
## # A tibble: 2 x 2
##   `Convicted == "Yes"`     n
##   <lgl>                <int>
## 1 FALSE                   86
## 2 TRUE                    45
```

```
## [1] 0.3435115
```

```
#White defendants are convicted 34.351% of the time
```

```
countmindef <- count(mindef, Convicted == "Yes")
countmindef
```

```
## # A tibble: 2 x 2
##   `Convicted == "Yes"`     n
##   <lgl>                <int>
## 1 FALSE                   60
## 2 TRUE                    29
```

```
## [1] 0.3258427
```

```
#Minority defendants are convicted 32.584% of the time
```

```
minvicwhite <- standyourground1 %>% select(Convicted:Accused, MinVictim) %>% filter(Accused == "White")
minvicwhite
```

```
##    Convicted Accused MinVictim
## 1        Yes   White         1
## 2        Yes   White         1
## 3        Yes   White         1
## 4        Yes   White         1
## 5        Yes   White         1
## 6         No   White         1
## 7         No   White         1
## 8         No   White         1
## 9         No   White         1
## 10        No   White         1
## 11        No   White         1
## 12        No   White         1
## 13        No   White         1
## 14        No   White         1
## 15        No   White         1
## 16        No   White         1
## 17        No   White         1
## 18        No   White         1
## 19        No   White         1
## 20        No   White         1
## 21        No   White         1
## 22        No   White         1
## 23        No   White         1
## 24        No   White         1
```

```
countminvic <- count(minvicwhite, Convicted == "Yes")
countminvic
```

```
## # A tibble: 2 x 2
##   `Convicted == "Yes"`     n
##   <lgl>                <int>
## 1 FALSE                   19
## 2 TRUE                     5
```

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```
## [1] 0.2631579
```

```
minvicmin <- standyourground1 %>% select(Convicted:Accused, MinVictim) %>% filter(Accused == "Minority")
minvicmin
```

```
##    Convicted  Accused MinVictim
## 1        Yes Minority         1
## 2        Yes Minority         1
## 3        Yes Minority         1
## 4        Yes Minority         1
## 5        Yes Minority         1
## 6        Yes Minority         1
## 7        Yes Minority         1
## 8        Yes Minority         1
## 9        Yes Minority         1
## 10       Yes Minority         1
## 11       Yes Minority         1
## 12        No Minority         1
## 13        No Minority         1
## 14        No Minority         1
## 15        No Minority         1
## 16        No Minority         1
## 17        No Minority         1
## 18        No Minority         1
## 19        No Minority         1
## 20        No Minority         1
## 21        No Minority         1
## 22        No Minority         1
## 23        No Minority         1
## 24        No Minority         1
## 25        No Minority         1
## 26        No Minority         1
## 27        No Minority         1
## 28        No Minority         1
## 29        No Minority         1
## 30        No Minority         1
## 31        No Minority         1
## 32        No Minority         1
## 33        No Minority         1
## 34        No Minority         1
## 35        No Minority         1
```

```
## 36        No Minority        1
## 37        No Minority        1
## 38        No Minority        1
## 39        No Minority        1
## 40        No Minority        1
## 41        No Minority        1
## 42        No Minority        1
## 43        No Minority        1
## 44        No Minority        1
## 45        No Minority        1
## 46       Yes Minority        1
## 47       Yes Minority        1
## 48       Yes Minority        1
## 49       Yes Minority        1
## 50       Yes Minority        1
## 51       Yes Minority        1
## 52       Yes Minority        1
## 53        No Minority        1
## 54        No Minority        1
## 55        No Minority        1
## 56        No Minority        1
## 57        No Minority        1
## 58       Yes Minority        1
## 59        No Minority        1
## 60        No Minority        1
## 61        No Minority        1
## 62        No Minority        1
## 63        No Minority        1
## 64        No Minority        1
```

```r
countminvicmin <- count(minvicmin, Convicted == "Yes")
countminvicmin
```

```
## # A tibble: 2 x 2
##   `Convicted == "Yes"`     n
##   <lgl>                <int>
## 1 FALSE                   45
## 2 TRUE                    19
```

```r
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```

```
## [1] 0.4222222
```

```r
#When there is a minority victim, white defendants are convicted 26.316% of the time.
#However, minority defendants are convicted 42.222% of the time.
```

```r
whitevicwhite <- standyourground1 %>% select(Convicted:Accused, WhiteVictim) %>% filter(Accused == "Whi-
whitevicwhite
```

```
##     Convicted Accused WhiteVictim
## 1         Yes   White           1
## 2         Yes   White           1
```

```
## 3            Yes     White           1
## 4            Yes     White           1
## 5            Yes     White           1
## 6            Yes     White           1
## 7            Yes     White           1
## 8            Yes     White           1
## 9            Yes     White           1
## 10           Yes     White           1
## 11           Yes     White           1
## 12           Yes     White           1
## 13           Yes     White           1
## 14           Yes     White           1
## 15           Yes     White           1
## 16           Yes     White           1
## 17           Yes     White           1
## 18           Yes     White           1
## 19           Yes     White           1
## 20           Yes     White           1
## 21           Yes     White           1
## 22           Yes     White           1
## 23           Yes     White           1
## 24           Yes     White           1
## 25           Yes     White           1
## 26           Yes     White           1
## 27           Yes     White           1
## 28           Yes     White           1
## 29           Yes     White           1
## 30           Yes     White           1
## 31           Yes     White           1
## 32           Yes     White           1
## 33           Yes     White           1
## 34           Yes     White           1
## 35           Yes     White           1
## 36           No      White           1
## 37           No      White           1
## 38           No      White           1
## 39           No      White           1
## 40           No      White           1
## 41           No      White           1
## 42           No      White           1
## 43           No      White           1
## 44           No      White           1
## 45           No      White           1
## 46           No      White           1
## 47           No      White           1
## 48           No      White           1
## 49           No      White           1
## 50           No      White           1
## 51           No      White           1
## 52           No      White           1
## 53           No      White           1
## 54           No      White           1
## 55           No      White           1
## 56           No      White           1
```

```
## 57          No    White             1
## 58          No    White             1
## 59          No    White             1
## 60          No    White             1
## 61          No    White             1
## 62          No    White             1
## 63          No    White             1
## 64          No    White             1
## 65          No    White             1
## 66          No    White             1
## 67          No    White             1
## 68          No    White             1
## 69          No    White             1
## 70          No    White             1
## 71          No    White             1
## 72          No    White             1
## 73          No    White             1
## 74          No    White             1
## 75          No    White             1
## 76          No    White             1
## 77          No    White             1
## 78          No    White             1
## 79          No    White             1
## 80          No    White             1
## 81          No    White             1
## 82          No    White             1
## 83          No    White             1
## 84          No    White             1
## 85          No    White             1
## 86          No    White             1
## 87          No    White             1
## 88          No    White             1
## 89          No    White             1
## 90          No    White             1
## 91          No    White             1
## 92          No    White             1
## 93          No    White             1
## 94          No    White             1
## 95          No    White             1
## 96          No    White             1
## 97          No    White             1
## 98         Yes    White             1
## 99         Yes    White             1
## 100        Yes    White             1
## 101        Yes    White             1
## 102        Yes    White             1
## 103         No    White             1
## 104         No    White             1
## 105         No    White             1
## 106         No    White             1
## 107         No    White             1
```

```r
count(whitevicwhite, Convicted == "Yes")
```

```
## # A tibble: 2 x 2
##   `Convicted == "Yes"`     n
##   <lgl>               <int>
## 1 FALSE                  67
## 2 TRUE                   40
```
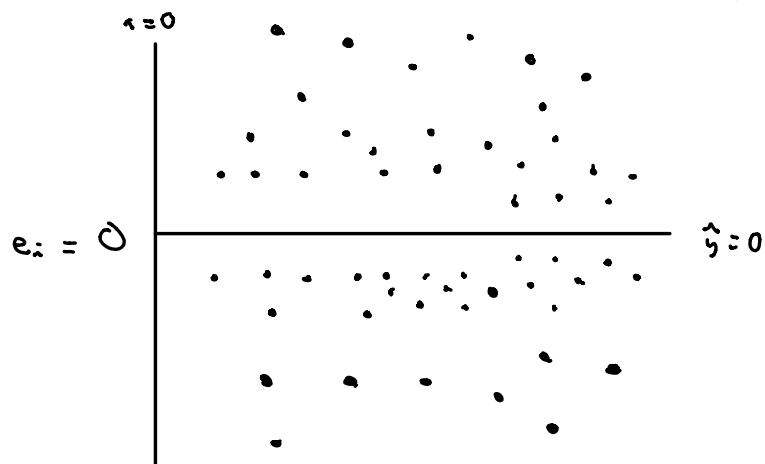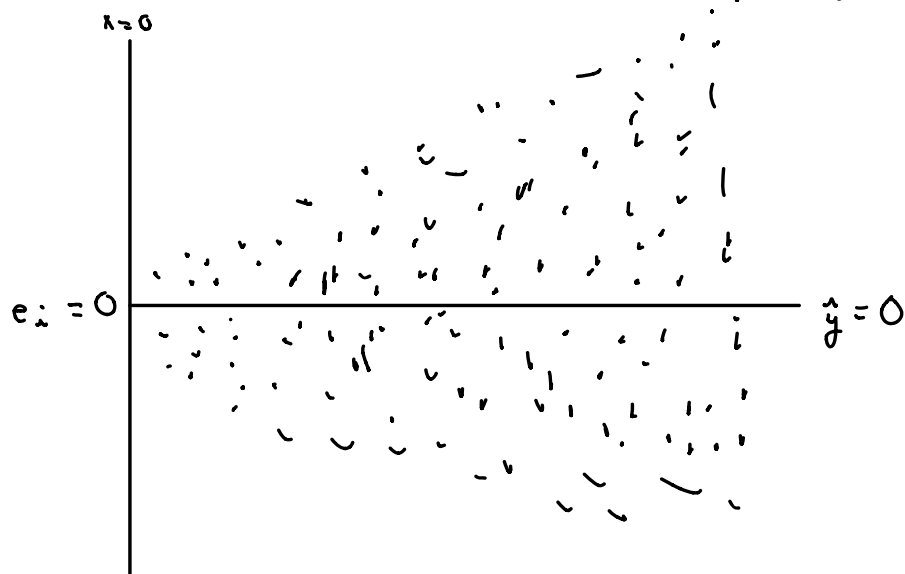
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```
## [1] 0.3738318
```

```
whitevicmin <- standyourground1 %>% select(Convicted:Accused, WhiteVictim) %>% filter(Accused == "Minori
whitevicmin
```

```
##    Convicted  Accused WhiteVictim
## 1        Yes Minority           1
## 2        Yes Minority           1
## 3        Yes Minority           1
## 4        Yes Minority           1
## 5        Yes Minority           1
## 6        Yes Minority           1
## 7        Yes Minority           1
## 8        Yes Minority           1
## 9         No Minority           1
## 10        No Minority           1
## 11        No Minority           1
## 12        No Minority           1
## 13        No Minority           1
## 14        No Minority           1
## 15        No Minority           1
## 16        No Minority           1
## 17        No Minority           1
## 18        No Minority           1
## 19        No Minority           1
## 20        No Minority           1
## 21        No Minority           1
## 22        No Minority           1
## 23       Yes Minority           1
## 24       Yes Minority           1
## 25        No Minority           1
```

```
count(whitevicmin, Convicted == "Yes")
```

```
## # A tibble: 2 x 2
##   `Convicted == "Yes"`     n
##   <lgl>               <int>
## 1 FALSE                  15
## 2 TRUE                   10
```

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```
## [1] 0.4
```

```
#When there is a white victim, white defendants are convicted 37.383% of the time.
#When there is a white victim, minority defendants are convicted 40% of the time.
```

c. This case is an example of Simpson's Paradox. The overall conviction rates would lead one to believe that white defendants are convicted at a higher rate than their minority counterparts (34.351% compared to 32.584%). However, this fact is mislaeading. When the victim of a crime is a minority, minorities are convicted at 42.222% of the time, compared to 26.316% of the time for whites. When the victim is white, minorities are convicted 40% of the time, as compared to the 37.383% of the time white defendants are convicted. There is just a large proportion of the data set that is represented by white-on-white cases, which white defendants have the highest conviciton rates in. With these facts in hand, questions can be raised about racial bias in the criminal justice system. The fact that minority and white defendants have similar conviction rates in regard to white victims, despite the fact that white defendants are convicted at a much lower rate than minorities in regard to minority victims can point to possible inequalities in the criminal justice system.
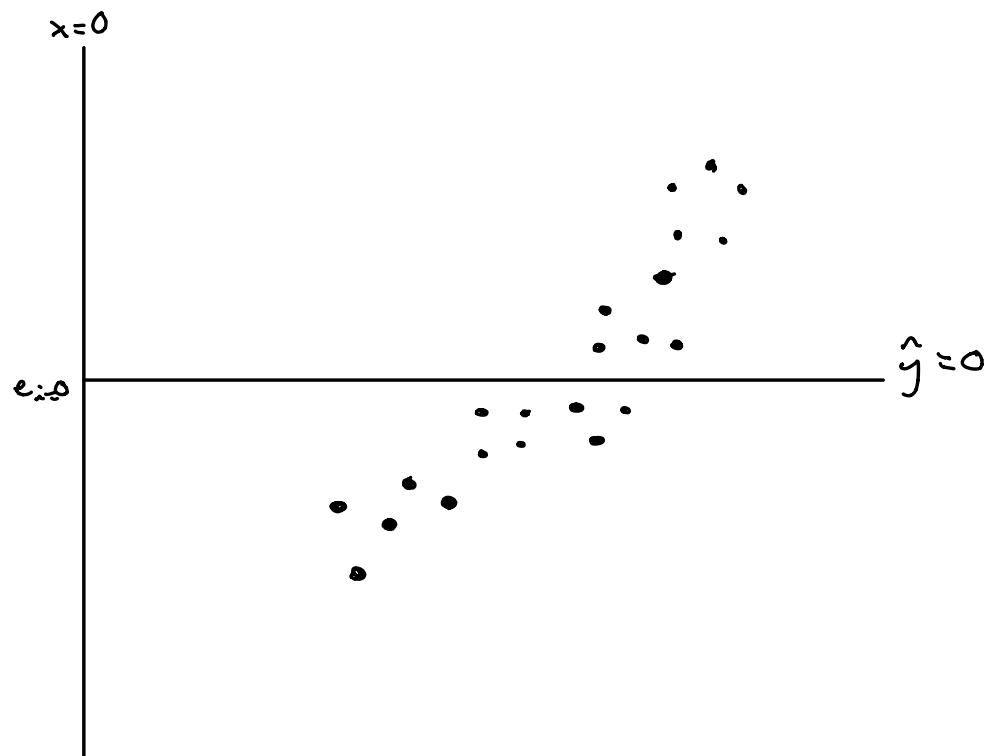
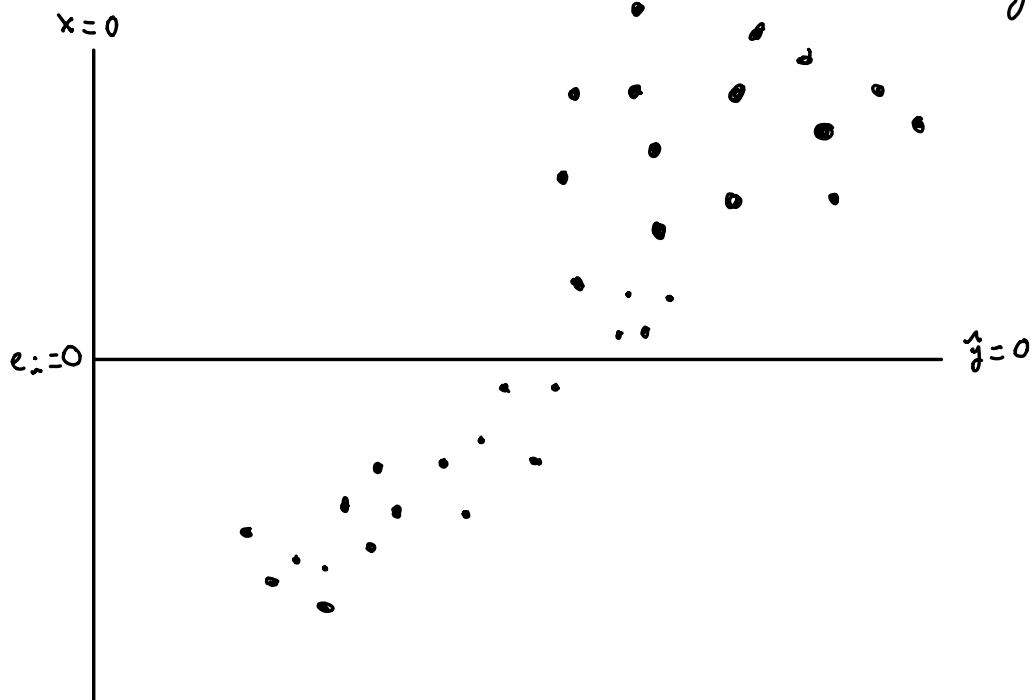1.   Constant Variance and Linearity

2. Non-constant variance and linearity

3. Constant variance and non-linearity

4. Non-constant variance and non-linearity

Q2.   1. If X and Y are uncorrelated,
they're expected to have no relationship/effect
on another.

2. If X and Y are independent, it is assumed
$r=0$ and the $P(x|y) = P(x)$.

3. If X and Y have the same
variance, they'll have similar spreads
in their residual plots and distributions,
given that variance is constant.

4. If X & Y have the
same distribution, their shape will be
similar, despite variance.