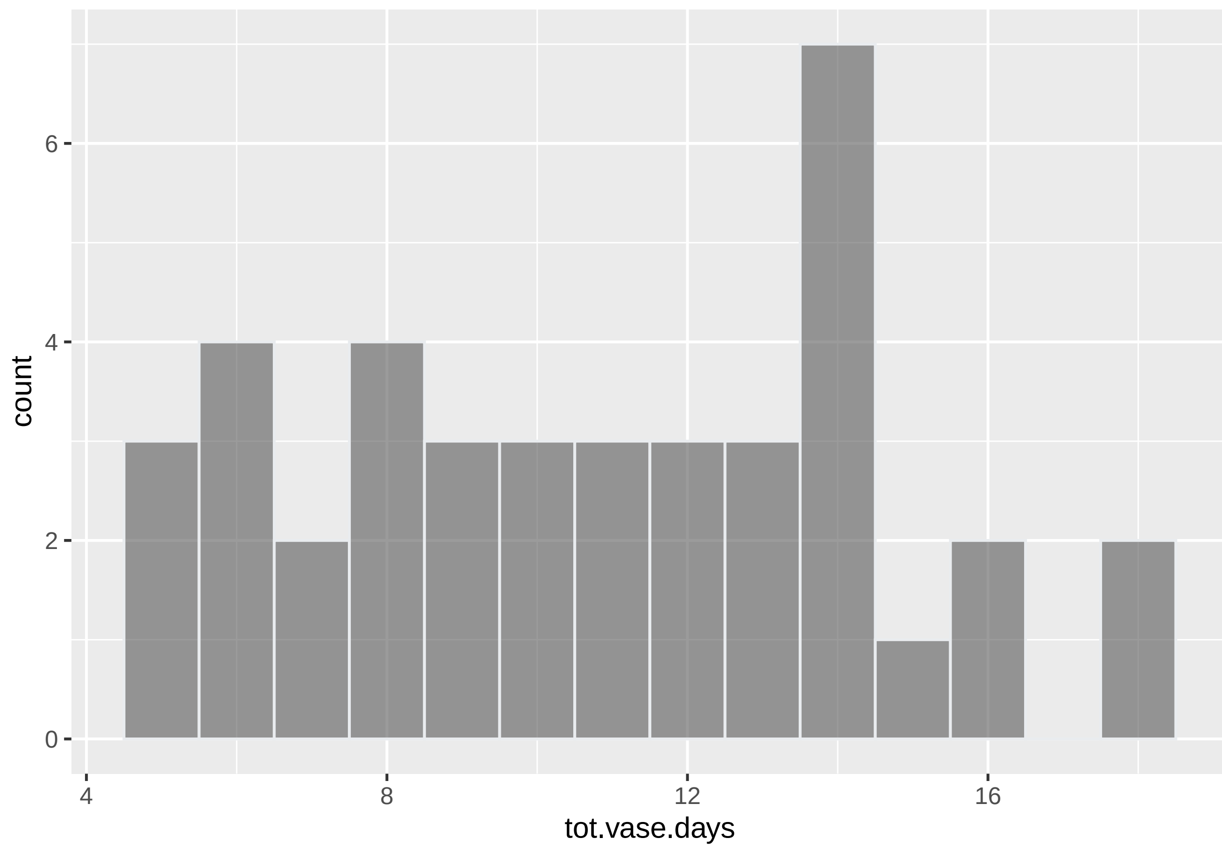
Analysis of the pilot data - PMHD - Group 6

The data

The data is loaded and visualized with a histogram.

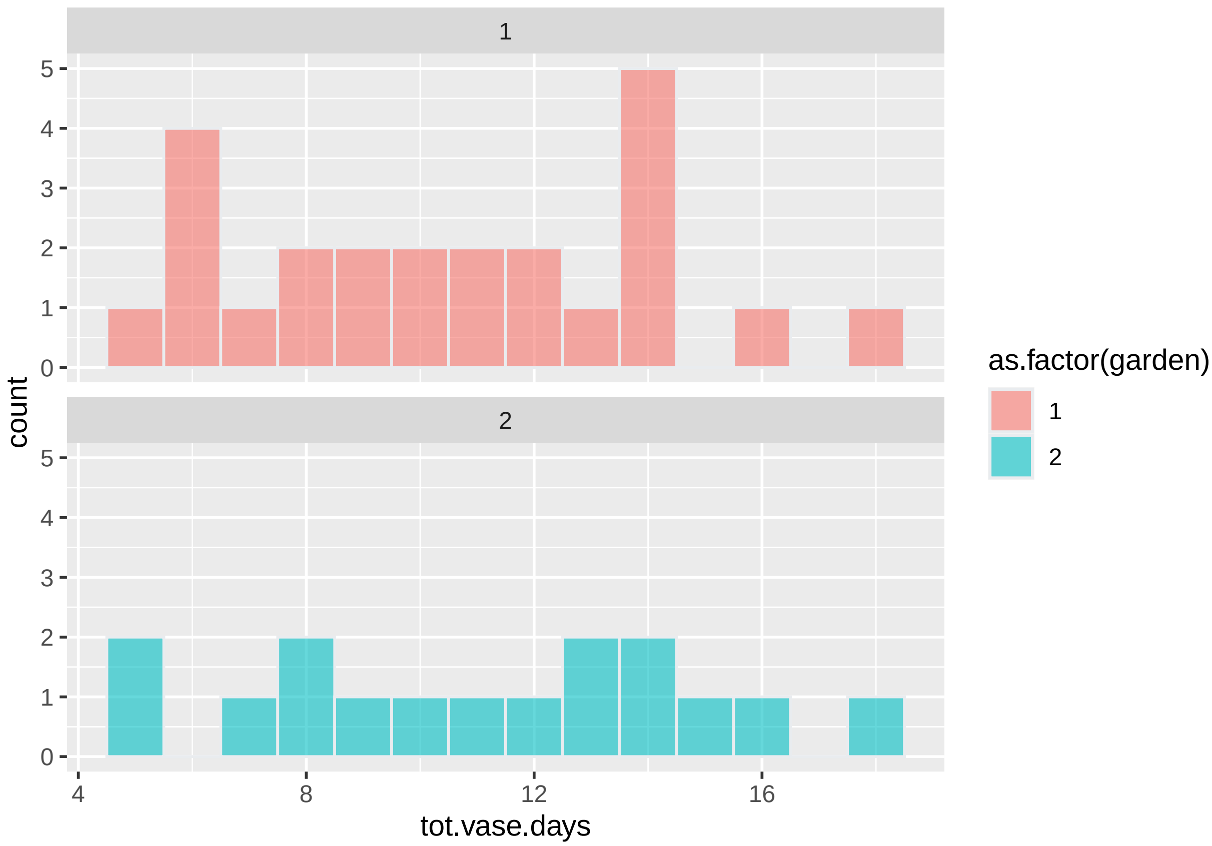
```
pilot.data <- read.csv("G6.pilot.data.csv")
ggplot(data=pilot.data, aes(x=tot.vase.days)) +
  geom_histogram(color="#e9ecef", alpha=0.6, position = 'identity', binwidth = 1)
```



Plotting the histograms based on the different possible sources of variability

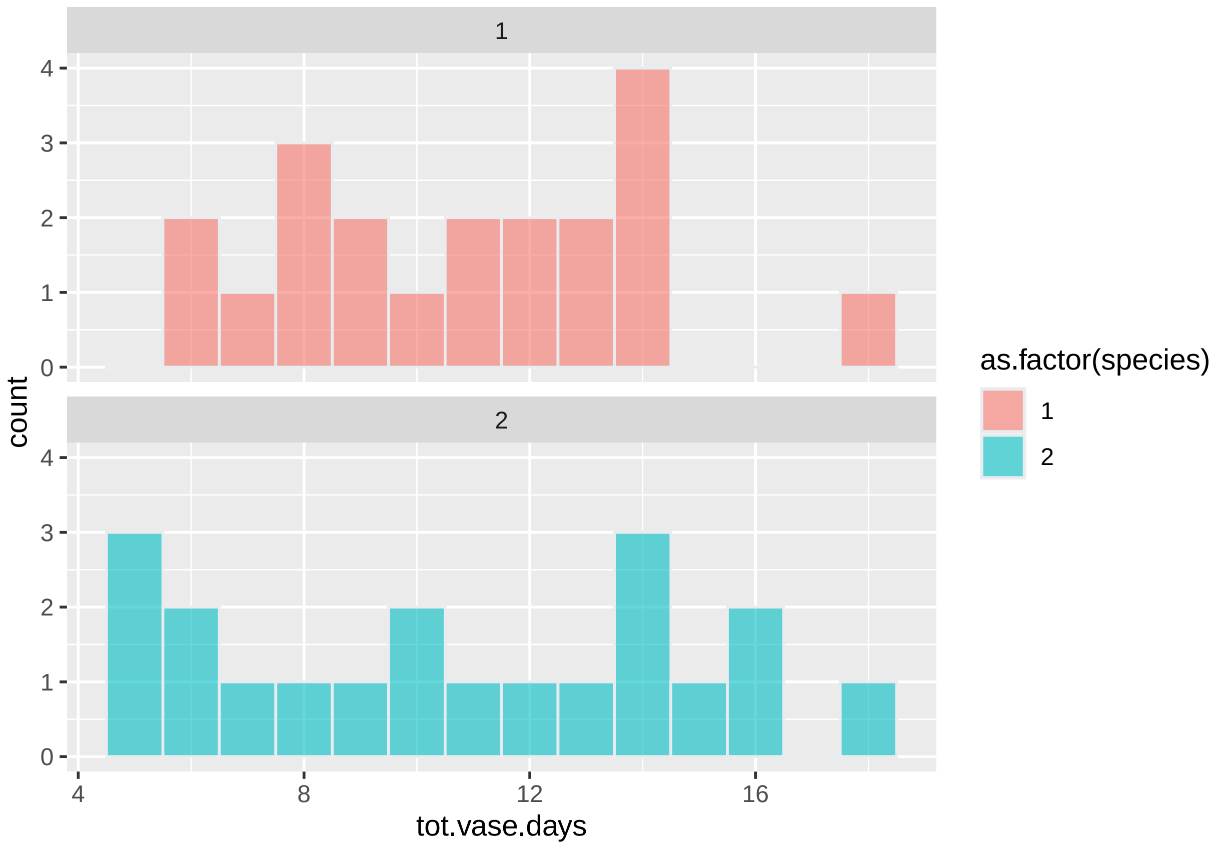
Garden

```
ggplot(data=pilot.data, aes(x=tot.vase.days, fill=as.factor(garden))) +
  geom_histogram( color="#e9ecef", alpha=0.6, position = 'identity', binwidth = 1) +
  facet_wrap(~as.factor(garden),ncol=1)
```



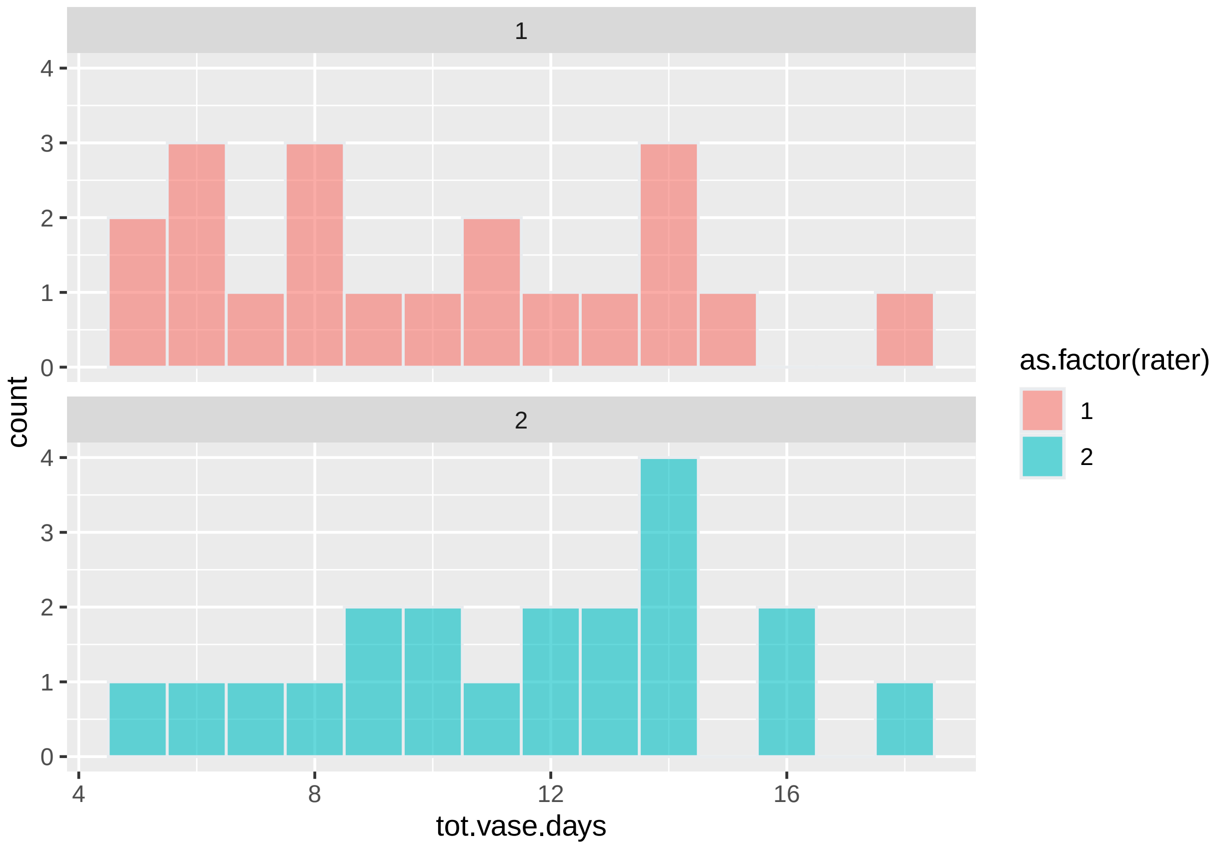
Species

```
ggplot(data=pilot.data, aes(x=tot.vase.days, fill=as.factor(species))) +
  geom_histogram( color="#e9ecef", alpha=0.6, position = 'identity', binwidth = 1) +
  facet_wrap(~as.factor(species),ncol=1)
```



Rater

```
ggplot(data=pilot.data, aes(x=tot.vase.days, fill=as.factor(rater))) +
  geom_histogram( color="#e9ecef", alpha=0.6, position = 'identity', binwidth = 1) +
  facet_wrap(~as.factor(rater),ncol=1)
```



Estimation of the lambda parameter and confidence interval

The lambda parameter is estimated by fitting the pilot data to a poisson distribution.

```
parms <- fitdistr(pilot.data$tot.vase.days, "poisson")
lambda.pilot <- parms$estimate
sd_x     <- parms$sd
confidence.interval.95 <- c(lambda.pilot + c(-1,1) * 1.96 * sd_x)
lambda.pilot
```

```
## lambda
## 10.775
```

```
confidence.interval.95
```

```
## [1]  9.757734 11.792266
```

Simulation to calculate the sample size

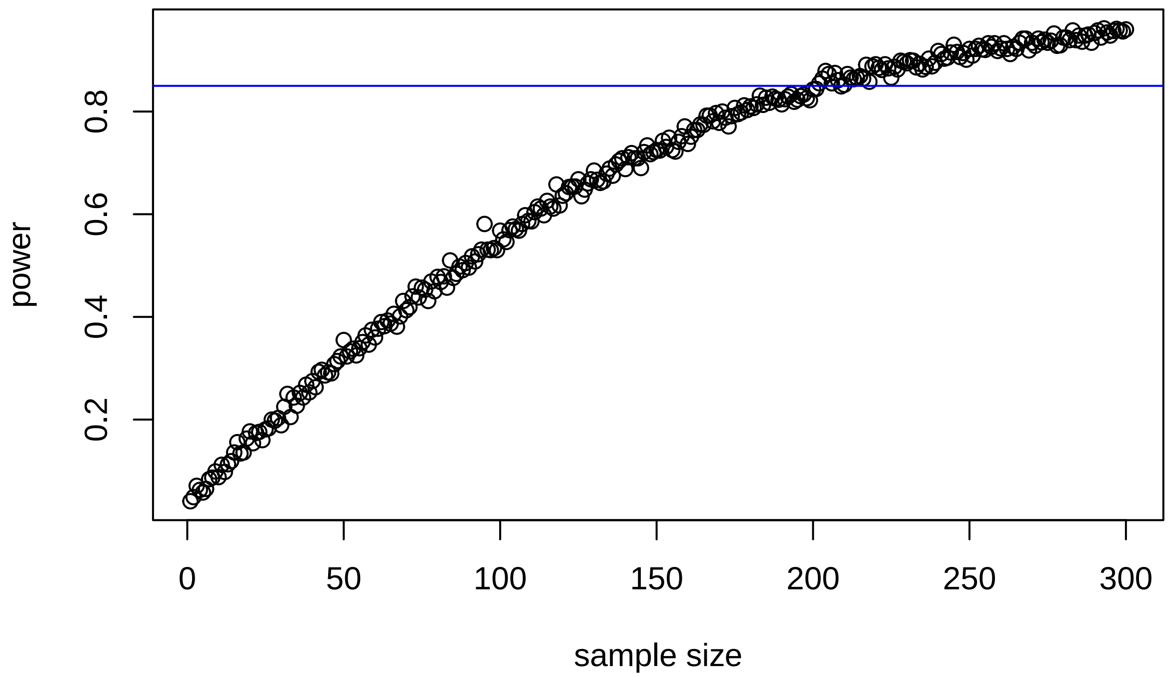
Simulation based on the code provided by the professor in the lecture of sample size calculation.

```
max.Sample.Size <- 300 # we evaluate all possible sample sizes up to 300
power <- rep(0,max.Sample.Size) # initialization of the variable
for (N in 1:max.Sample.Size){
    # setting the lambda parameters of the two populations
    lambda.control = lambda.pilot   # this value may come from pilot study
    lambda.treated = lambda.pilot+1 # value of the control group plus the effect size
    alpha = 0.05  # significance level

    # simulation of a high number of experiments and test
    numberSimulation <- 1000
    pval <- numeric(numberSimulation) # initialization of the variable

    set.seed(1234) # set the seed for reproducible results
    for (i in 1:numberSimulation){
      # we simulate from Poisson distribution
      controlGroup <- rpois(N, lambda = lambda.control)
      treatedGroup <- rpois(N, lambda = lambda.treated)
      simData <- data.frame(response = c(controlGroup, treatedGroup), treatment = rep(c(0, 1), each = N)
      # we use a GLM model for Poisson regression to test effect of treatment
      pval[i] <- summary(glm(response ~ treatment, data = simData, family=poisson()))$coeff["treatment"
    }

    # Estimation of the power
    power[N]<-sum(pval < alpha)/numberSimulation
}
# plotting the results
sample.size <- 1:max.Sample.Size
plot(sample.size, power,xlab = "sample size")
abline(h=0.85, col="blue")
```




```
results <- data.frame(sample.size,power)
results
```

```
##     sample.size power
## 1             1 0.041
## 2             2 0.049
## 3             3 0.071
## 4             4 0.063
## 5             5 0.058
## 6             6 0.065
## 7             7 0.084
## 8             8 0.087
## 9             9 0.099
## 10           10 0.088
## 11           11 0.112
## 12           12 0.098
## 13           13 0.113
## 14           14 0.119
## 15           15 0.136
## 16           16 0.156
## 17           17 0.134
## 18           18 0.136
## 19           19 0.163
## 20           20 0.177
## 21           21 0.154
## 22           22 0.174
```

```
## 23            23 0.176
## 24            24 0.160
## 25            25 0.181
## 26            26 0.183
## 27            27 0.200
## 28            28 0.198
## 29            29 0.203
## 30            30 0.189
## 31            31 0.225
## 32            32 0.250
## 33            33 0.205
## 34            34 0.243
## 35            35 0.227
## 36            36 0.252
## 37            37 0.243
## 38            38 0.268
## 39            39 0.253
## 40            40 0.275
## 41            41 0.263
## 42            42 0.293
## 43            43 0.297
## 44            44 0.286
## 45            45 0.292
## 46            46 0.290
## 47            47 0.308
## 48            48 0.314
## 49            49 0.323
## 50            50 0.355
## 51            51 0.323
## 52            52 0.333
## 53            53 0.338
## 54            54 0.325
## 55            55 0.339
## 56            56 0.351
## 57            57 0.364
## 58            58 0.346
## 59            59 0.375
## 60            60 0.360
## 61            61 0.377
## 62            62 0.390
## 63            63 0.382
## 64            64 0.393
## 65            65 0.387
## 66            66 0.406
## 67            67 0.381
## 68            68 0.401
## 69            69 0.431
## 70            70 0.413
## 71            71 0.419
## 72            72 0.440
## 73            73 0.459
## 74            74 0.438
## 75            75 0.457
## 76            76 0.453
```

```
## 77             77 0.431
## 78             78 0.469
## 79             79 0.450
## 80             80 0.478
## 81             81 0.468
## 82             82 0.479
## 83             83 0.457
## 84             84 0.510
## 85             85 0.476
## 86             86 0.484
## 87             87 0.498
## 88             88 0.491
## 89             89 0.505
## 90             90 0.496
## 91             91 0.518
## 92             92 0.508
## 93             93 0.522
## 94             94 0.531
## 95             95 0.581
## 96             96 0.531
## 97             97 0.530
## 98             98 0.534
## 99             99 0.530
## 100           100 0.568
## 101           101 0.551
## 102           102 0.546
## 103           103 0.569
## 104           104 0.576
## 105           105 0.571
## 106           106 0.568
## 107           107 0.581
## 108           108 0.598
## 109           109 0.587
## 110           110 0.586
## 111           111 0.604
## 112           112 0.615
## 113           113 0.611
## 114           114 0.598
## 115           115 0.626
## 116           116 0.615
## 117           117 0.611
## 118           118 0.658
## 119           119 0.617
## 120           120 0.636
## 121           121 0.641
## 122           122 0.653
## 123           123 0.654
## 124           124 0.654
## 125           125 0.668
## 126           126 0.635
## 127           127 0.648
## 128           128 0.660
## 129           129 0.668
## 130           130 0.685
```

```
## 131          131 0.667
## 132          132 0.661
## 133          133 0.664
## 134          134 0.679
## 135          135 0.689
## 136          136 0.675
## 137          137 0.697
## 138          138 0.704
## 139          139 0.709
## 140          140 0.688
## 141          141 0.711
## 142          142 0.719
## 143          143 0.709
## 144          144 0.709
## 145          145 0.690
## 146          146 0.721
## 147          147 0.734
## 148          148 0.717
## 149          149 0.721
## 150          150 0.725
## 151          151 0.724
## 152          152 0.743
## 153          153 0.731
## 154          154 0.749
## 155          155 0.725
## 156          156 0.722
## 157          157 0.741
## 158          158 0.752
## 159          159 0.771
## 160          160 0.737
## 161          161 0.751
## 162          162 0.764
## 163          163 0.764
## 164          164 0.775
## 165          165 0.774
## 166          166 0.792
## 167          167 0.792
## 168          168 0.781
## 169          169 0.797
## 170          170 0.778
## 171          171 0.800
## 172          172 0.788
## 173          173 0.771
## 174          174 0.791
## 175          175 0.807
## 176          176 0.795
## 177          177 0.798
## 178          178 0.812
## 179          179 0.803
## 180          180 0.810
## 181          181 0.807
## 182          182 0.814
## 183          183 0.831
## 184          184 0.813
```

```
## 185           185 0.827
## 186           186 0.817
## 187           187 0.829
## 188           188 0.825
## 189           189 0.823
## 190           190 0.814
## 191           191 0.824
## 192           192 0.829
## 193           193 0.834
## 194           194 0.819
## 195           195 0.823
## 196           196 0.830
## 197           197 0.833
## 198           198 0.826
## 199           199 0.822
## 200           200 0.843
## 201           201 0.844
## 202           202 0.855
## 203           203 0.864
## 204           204 0.879
## 205           205 0.873
## 206           206 0.855
## 207           207 0.875
## 208           208 0.861
## 209           209 0.849
## 210           210 0.852
## 211           211 0.873
## 212           212 0.866
## 213           213 0.863
## 214           214 0.866
## 215           215 0.869
## 216           216 0.864
## 217           217 0.891
## 218           218 0.858
## 219           219 0.888
## 220           220 0.892
## 221           221 0.885
## 222           222 0.881
## 223           223 0.892
## 224           224 0.884
## 225           225 0.866
## 226           226 0.887
## 227           227 0.882
## 228           228 0.899
## 229           229 0.897
## 230           230 0.894
## 231           231 0.900
## 232           232 0.899
## 233           233 0.886
## 234           234 0.893
## 235           235 0.882
## 236           236 0.887
## 237           237 0.903
## 238           238 0.888
```

```
## 239          239 0.895
## 240          240 0.918
## 241          241 0.912
## 242          242 0.903
## 243          243 0.905
## 244          244 0.915
## 245          245 0.930
## 246          246 0.916
## 247          247 0.906
## 248          248 0.914
## 249          249 0.901
## 250          250 0.922
## 251          251 0.909
## 252          252 0.922
## 253          253 0.928
## 254          254 0.921
## 255          255 0.920
## 256          256 0.933
## 257          257 0.926
## 258          258 0.933
## 259          259 0.918
## 260          260 0.923
## 261          261 0.933
## 262          262 0.922
## 263          263 0.912
## 264          264 0.926
## 265          265 0.922
## 266          266 0.934
## 267          267 0.942
## 268          268 0.942
## 269          269 0.919
## 270          270 0.934
## 271          271 0.928
## 272          272 0.942
## 273          273 0.935
## 274          274 0.940
## 275          275 0.934
## 276          276 0.938
## 277          277 0.952
## 278          278 0.928
## 279          279 0.929
## 280          280 0.944
## 281          281 0.944
## 282          282 0.939
## 283          283 0.958
## 284          284 0.939
## 285          285 0.948
## 286          286 0.936
## 287          287 0.948
## 288          288 0.950
## 289          289 0.934
## 290          290 0.953
## 291          291 0.958
## 292          292 0.944
```

```
## 293          293 0.962
## 294          294 0.954
## 295          295 0.948
## 296          296 0.957
## 297          297 0.961
## 298          298 0.958
## 299          299 0.956
## 300          300 0.960
```