Amount of Time Being Served in PAC (Appointments)

2020

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05 April, 2021

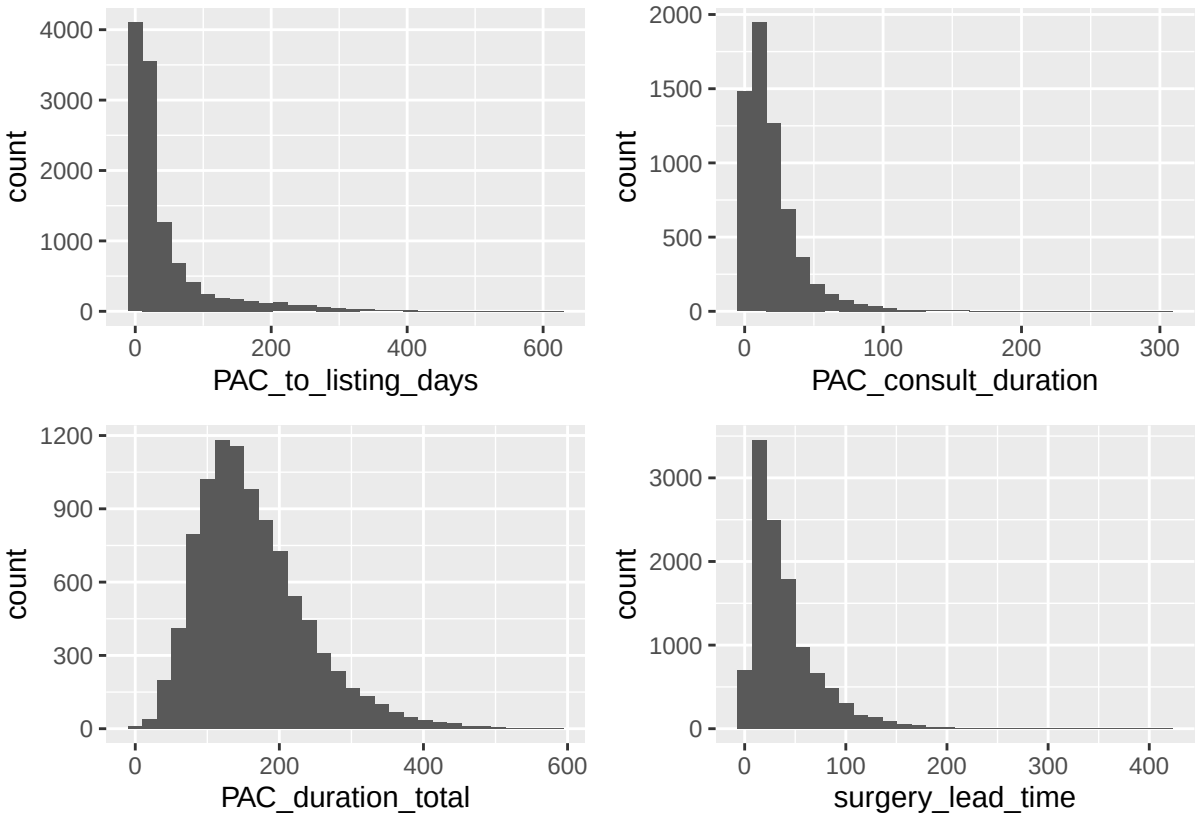
Some things to note:

- Not sure if total duration as denoted by the difference between `PAC Registration Time` and `PAC End Time` is a better fit than the `PAC Consult Duration`. Question for SGH.
- Hence, both distributions are included.
- We are also looking preliminarily into other histograms, though we are not sure what to use it for yet.
- `PAC Consult Duration` is for ≥ 15 minutes, then translated to start at 0 instead for initial histogram, CF and exponential parameter approximation. Gamma is not translated. **Not sure if this is correct.**
- We should decide on whether to split based on ASA, Department or both.

Disclaimer: Some distributions are not validated by chi-squared test yet but through other tests. Will do the chi-squared tests soon.

Chi-squared tests at $\alpha = 0.05$.

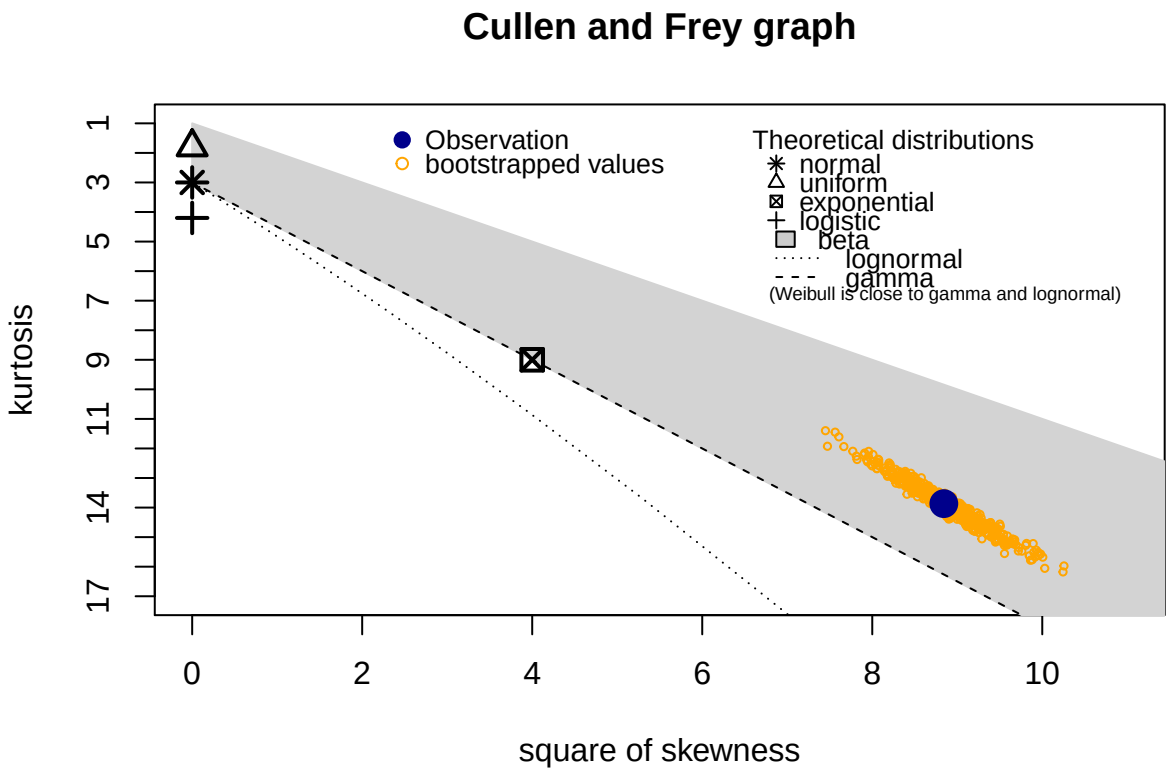
1 Histograms

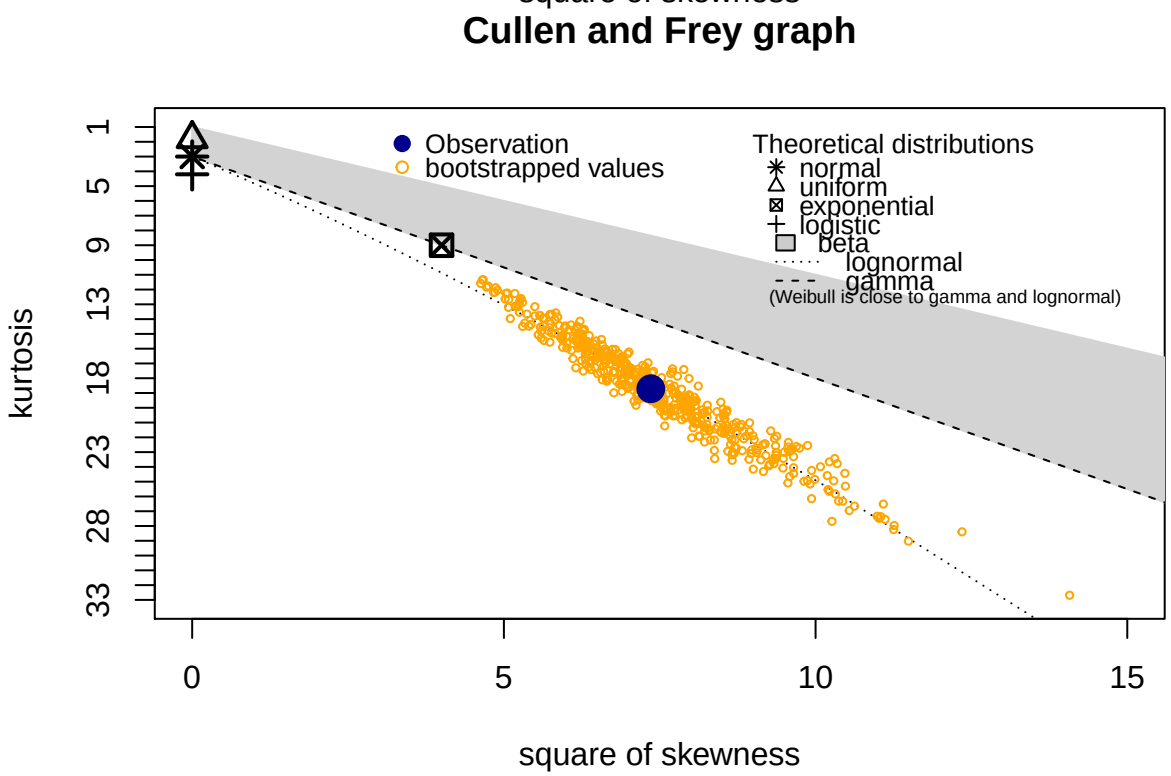


2 Cullen and Frey Graphs

In order of:

1. `PAC_to_listing_days`
2. `PAC_consult_duration`
3. `PAC_duration_total`
4. `surgery_lead_time`


Cullen and Frey graph
kurtosis
square of skewness
Observation
bootstrapped values
Theoretical distributions
normal
uniform
exponential
logistic
beta
lognormal
gamma
(Weibull is close to gamma and lognormal)


Cullen and Frey graph
kurtosis
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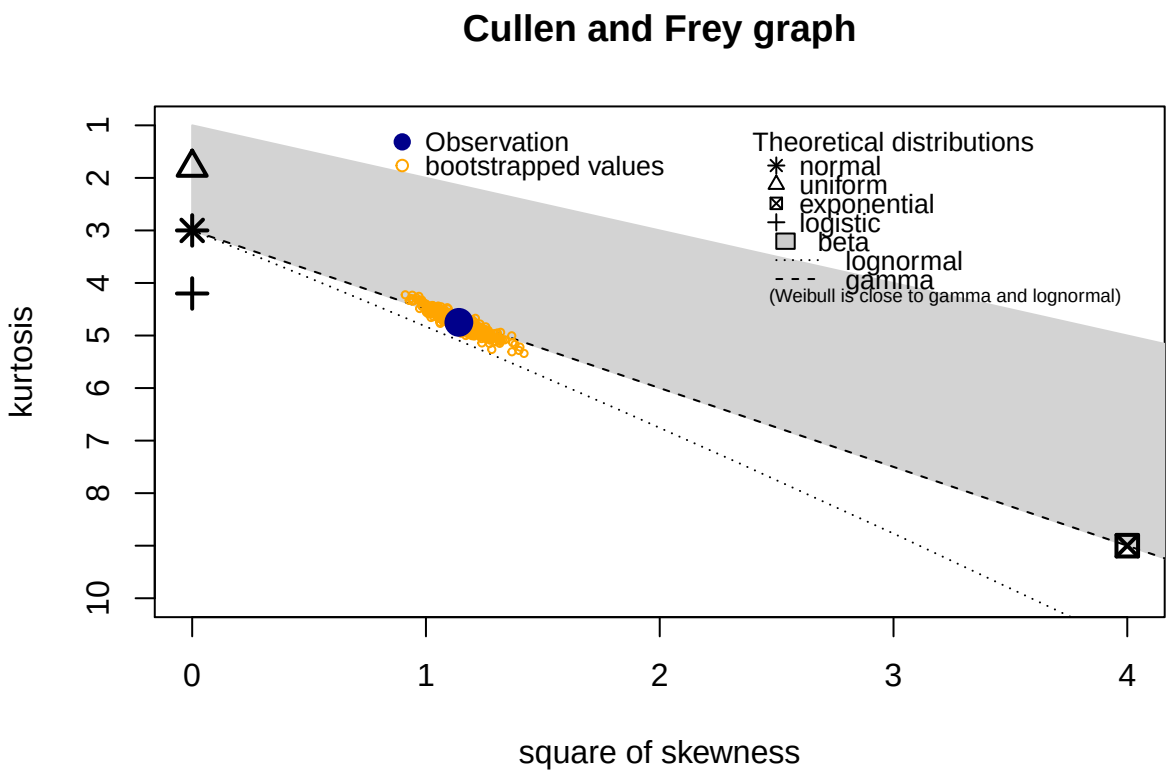
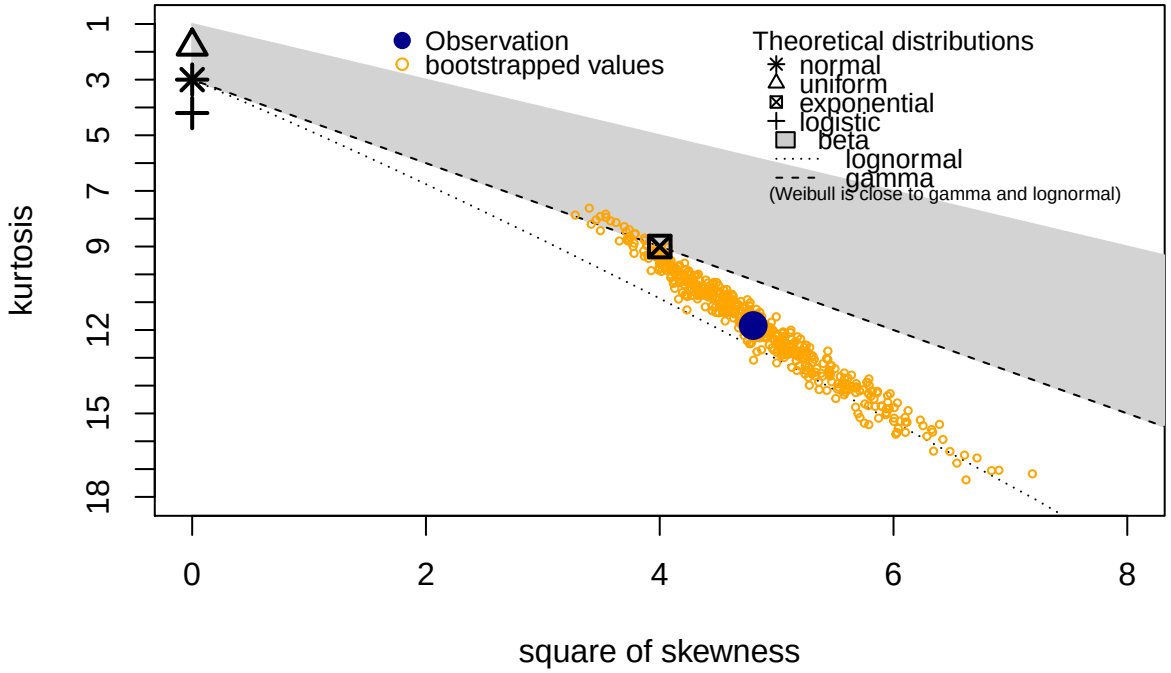
lognormal
gamma
(Weibull is close to gamma and lognormal)



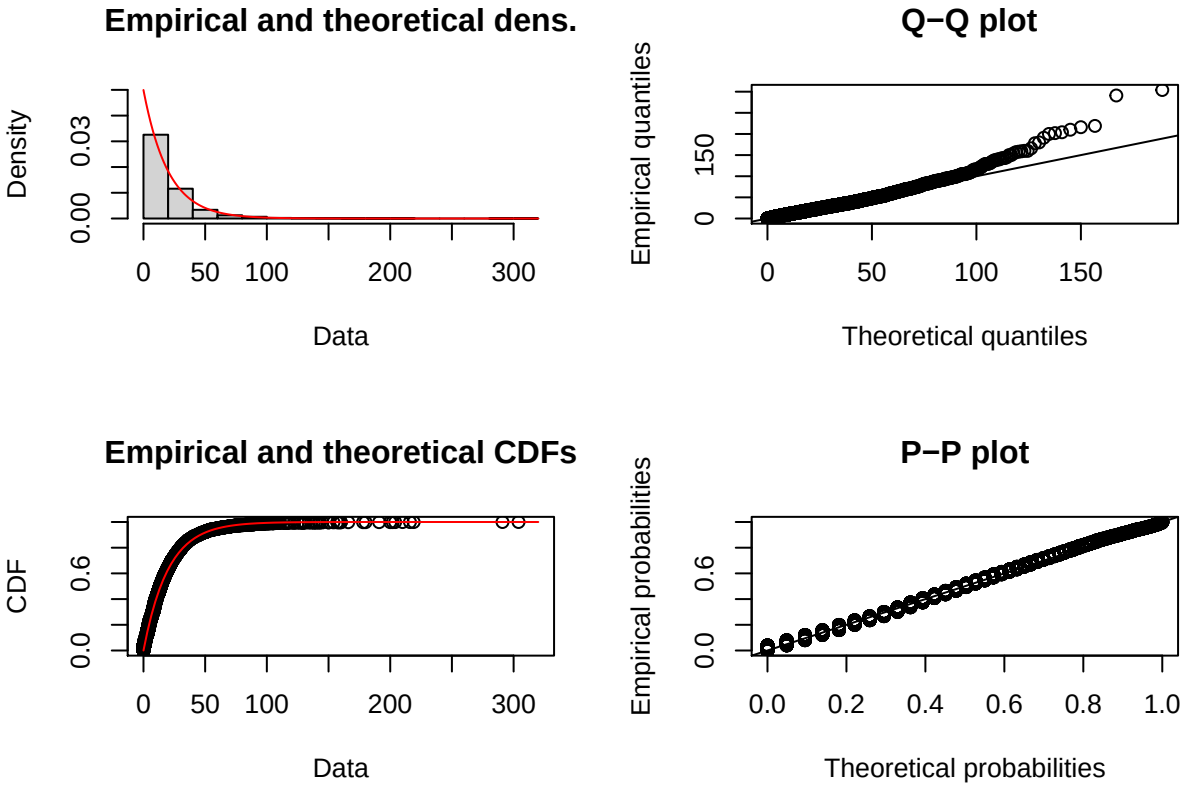



```
## $PAC_to_listing_days
## summary statistics
## ------
## min:  0   max:  619
## median:  16
```

```
## mean:  42.79963
## estimated sd:  65.62039
## estimated skewness:  2.973575
## estimated kurtosis:  13.86638
##
## $PAC_consult_duration
## summary statistics
## ------
## min:  0   max:  319
## median:  23
## mean:  27.85219
## estimated sd:  22.5321
## estimated skewness:  2.712354
## estimated kurtosis:  18.71308
##
## $PAC_duration_total
## summary statistics
## ------
## min:  6   max:  590
## median:  151
## mean:  164.0044
## estimated sd:  77.51667
## estimated skewness:  1.068126
## estimated kurtosis:  4.749302
##
## $surgery_lead_time
## summary statistics
## ------
## min:  0   max:  416
## median:  29
## mean:  39.42632
## estimated sd:  34.15108
## estimated skewness:  2.19082
## estimated kurtosis:  11.83965
```

3 Distribution for Consult Duration

3.1 Exponential Fit (PAC Consult Duration Adjusted)

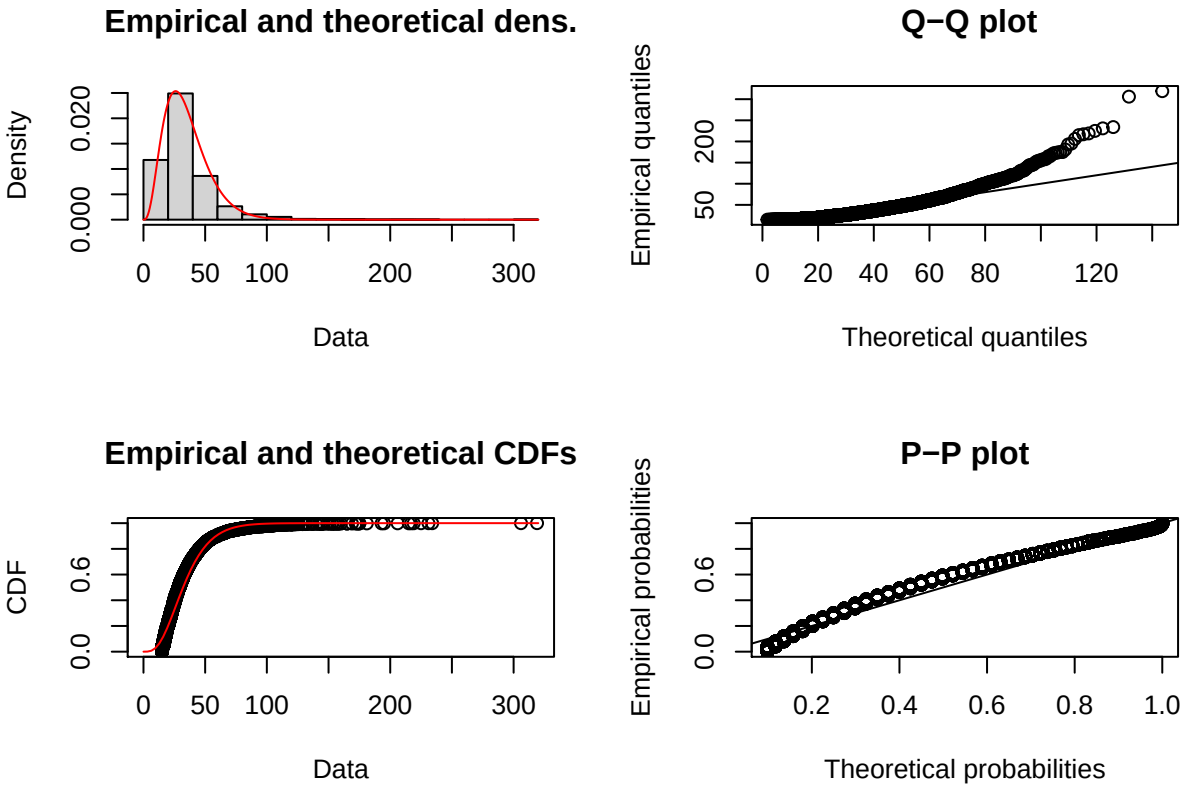



```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-exp
## Kolmogorov-Smirnov statistic 0.03996815
## Cramer-von Mises statistic   1.03945996
## Anderson-Darling statistic          Inf
##
## Goodness-of-fit criteria
##                                 1-mle-exp
## Akaike's Information Criterion  50200.39
## Bayesian Information Criterion  50207.14
##
## [[2]]
## Fitting of the distribution ' exp ' by maximum likelihood
## Parameters :
##        estimate   Std. Error
## rate 0.04995227 0.0006300881
## Loglikelihood:  -25099.2   AIC:  50200.39   BIC:  50207.14
```

Table 1: Chi-Squared Test for Exponential Distribution

Pass	Error	Critical Value
Rejected	249.0955	15.50731

3.2 Gamma Distribution (Not Adjusted)



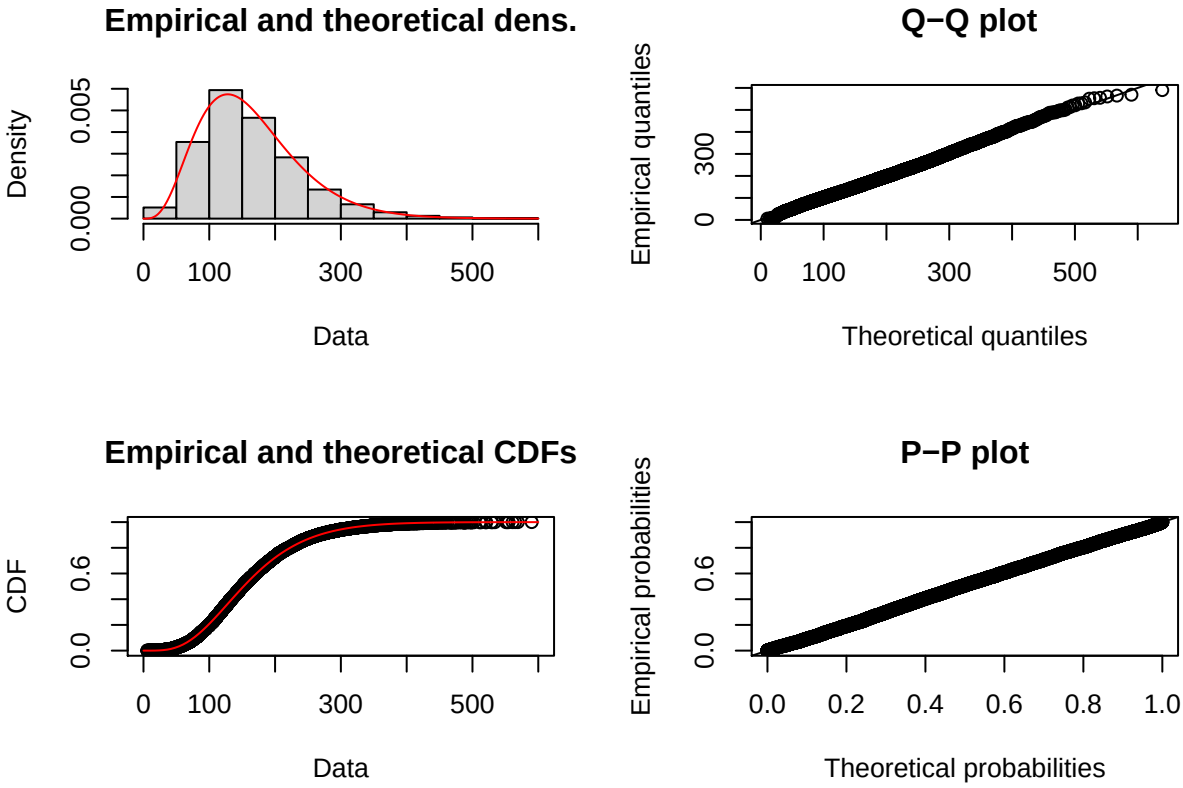

```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic   0.09869939
## Cramer-von Mises statistic    19.06314095
## Anderson-Darling statistic   120.45321262
##
## Goodness-of-fit criteria
##                                 1-mle-gamma
## Akaike's Information Criterion     52794.4
## Bayesian Information Criterion     52807.9
##
## [[2]]
## Fitting of the distribution ' gamma ' by maximum likelihood
## Parameters :
##       estimate  Std. Error
## shape 3.9019472 0.066844114
```

```
## rate  0.1114137 0.002036751
## Loglikelihood:  -26395.2   AIC:  52794.4   BIC:  52807.9
## Correlation matrix:
##           shape      rate
## shape 1.0000000 0.9369669
## rate  0.9369669 1.0000000
```

Table 2: Chi-Squared Test for Gamma Distribution

Pass	Error	Critical Value
Rejected	136017.6	14.06714

4 Distribution for Total Duration




```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic  0.01234561
## Cramer-von Mises statistic    0.40957465
## Anderson-Darling statistic    2.80601438
##
## Goodness-of-fit criteria
##                                  1-mle-gamma
## Akaike's Information Criterion    108483.4
```

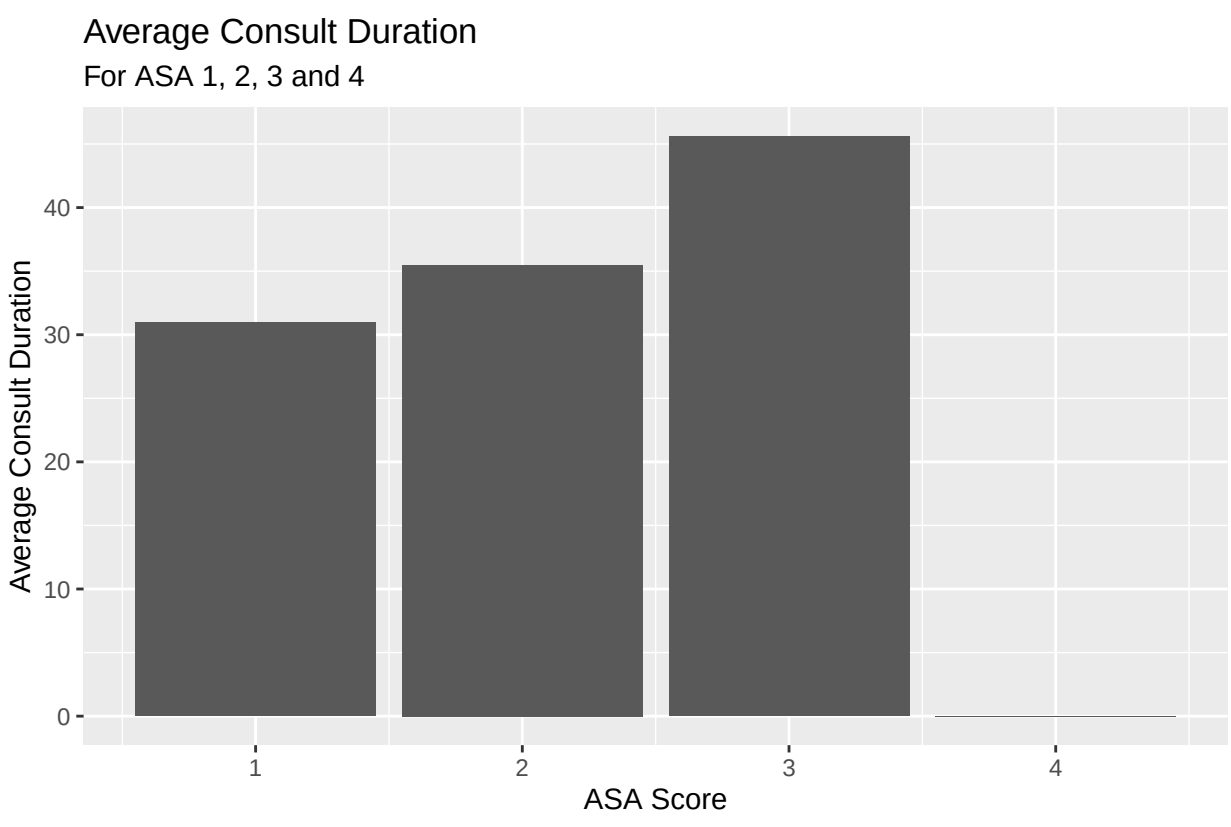
```
## Bayesian Information Criterion    108497.8
##
## [[2]]
## Fitting of the distribution ' gamma ' by maximum likelihood
## Parameters :
##         estimate   Std. Error
## shape 4.56048704 0.0632867725
## rate  0.02781078 0.0004074654
## Loglikelihood:  -54239.72   AIC:  108483.4   BIC:  108497.8
## Correlation matrix:
##           shape      rate
## shape 1.0000000 0.9451178
## rate  0.9451178 1.0000000
```

Table 3: Chi-Squared Test for Gamma Distribution

Pass	Error	Critical Value
Rejected	71.68093	36.41503

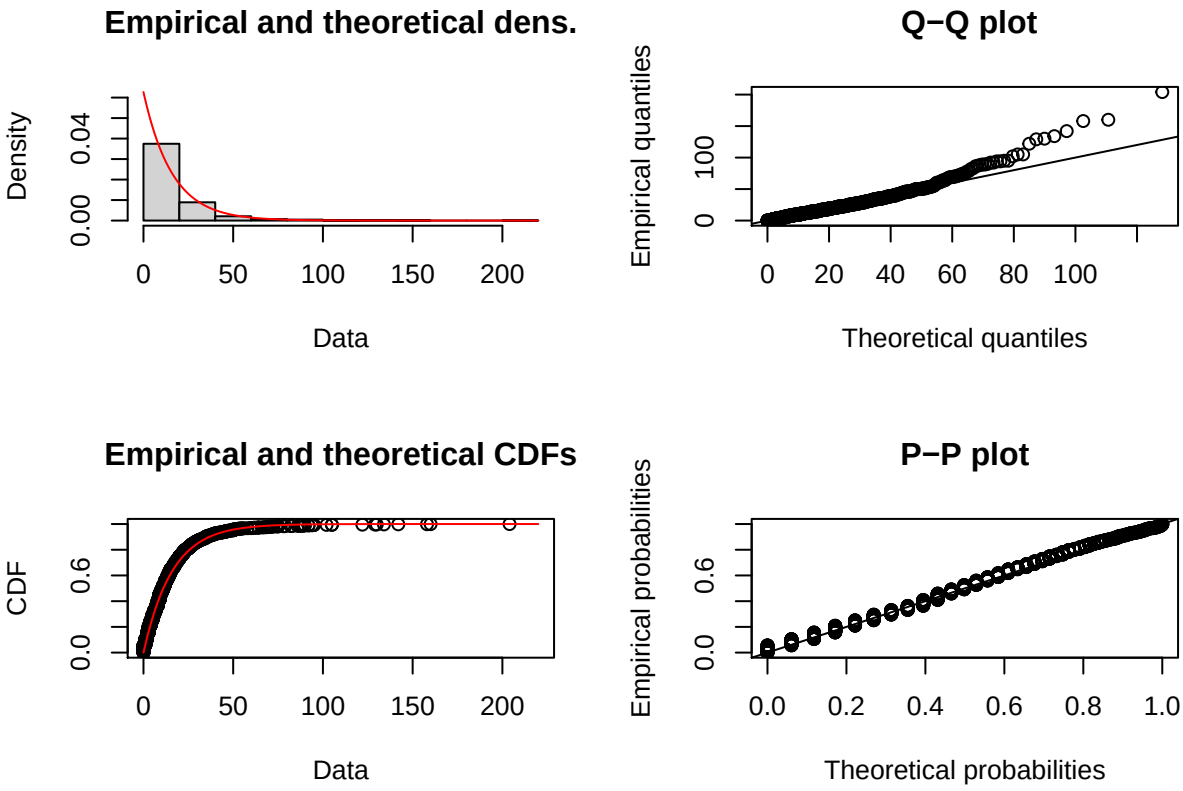
5 Splitting by ASA

5.1 Consult Duration

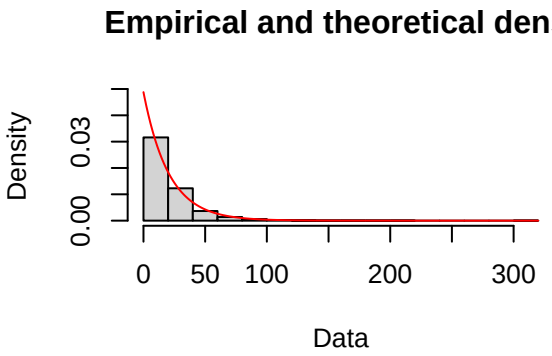


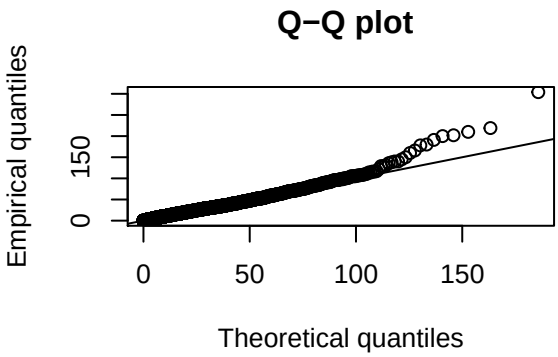
For ASA 4, the value is zero

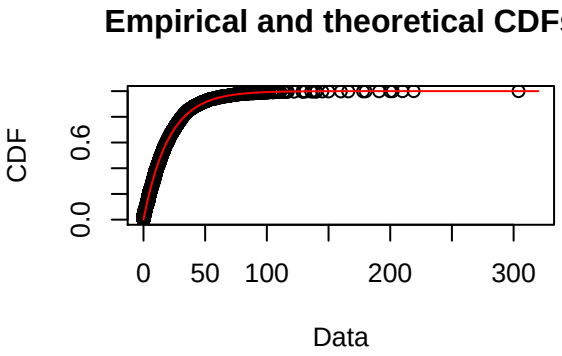
5.1.1 Exponential

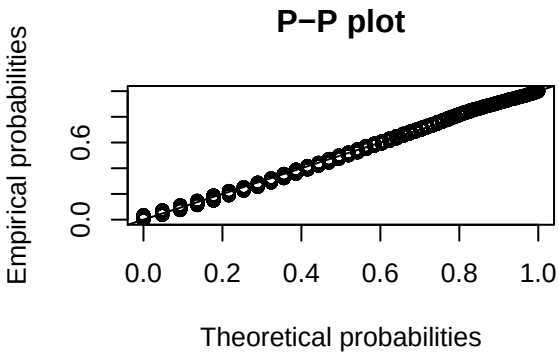



```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-exp
## Kolmogorov-Smirnov statistic 0.05620155
## Cramer-von Mises statistic   0.57557487
## Anderson-Darling statistic          Inf
##
## Goodness-of-fit criteria
##                                 1-mle-exp
## Akaike's Information Criterion  11672.17
## Bayesian Information Criterion  11677.51
##
## [[2]]
## Fitting of the distribution ' exp ' by maximum likelihood
## Parameters :
##        estimate Std. Error
## rate 0.06269745 0.00159314
## Loglikelihood:  -5835.085   AIC:  11672.17   BIC:  11677.51
```

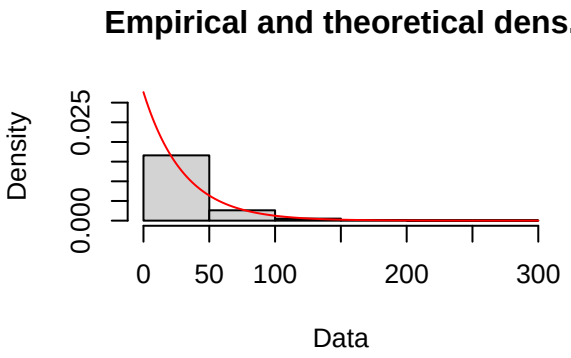


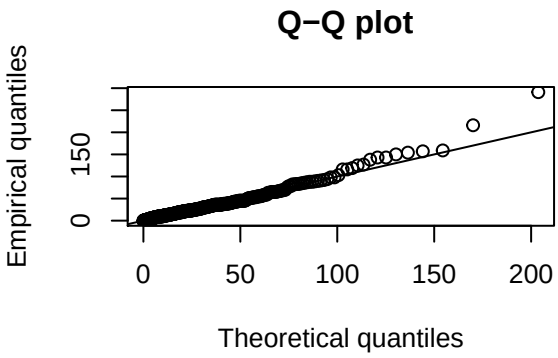


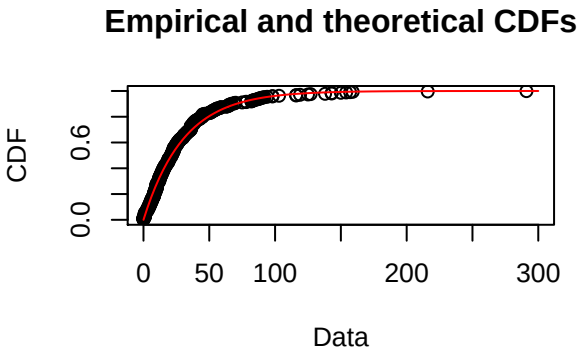


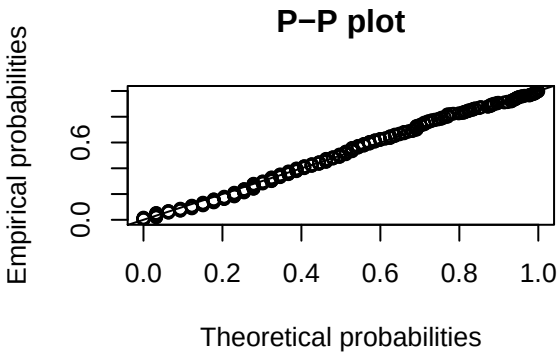



```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-exp
## Kolmogorov-Smirnov statistic 0.0362838
## Cramer-von Mises statistic   0.7793416
## Anderson-Darling statistic         Inf
##
## Goodness-of-fit criteria
##                                  1-mle-exp
## Akaike's Information Criterion  34791.29
## Bayesian Information Criterion  34797.67
##
## [[2]]
## Fitting of the distribution ' exp ' by maximum likelihood
## Parameters :
##       estimate   Std. Error
## rate 0.04880002 0.0007415562
## Loglikelihood:  -17394.65   AIC:  34791.29   BIC:  34797.67
```



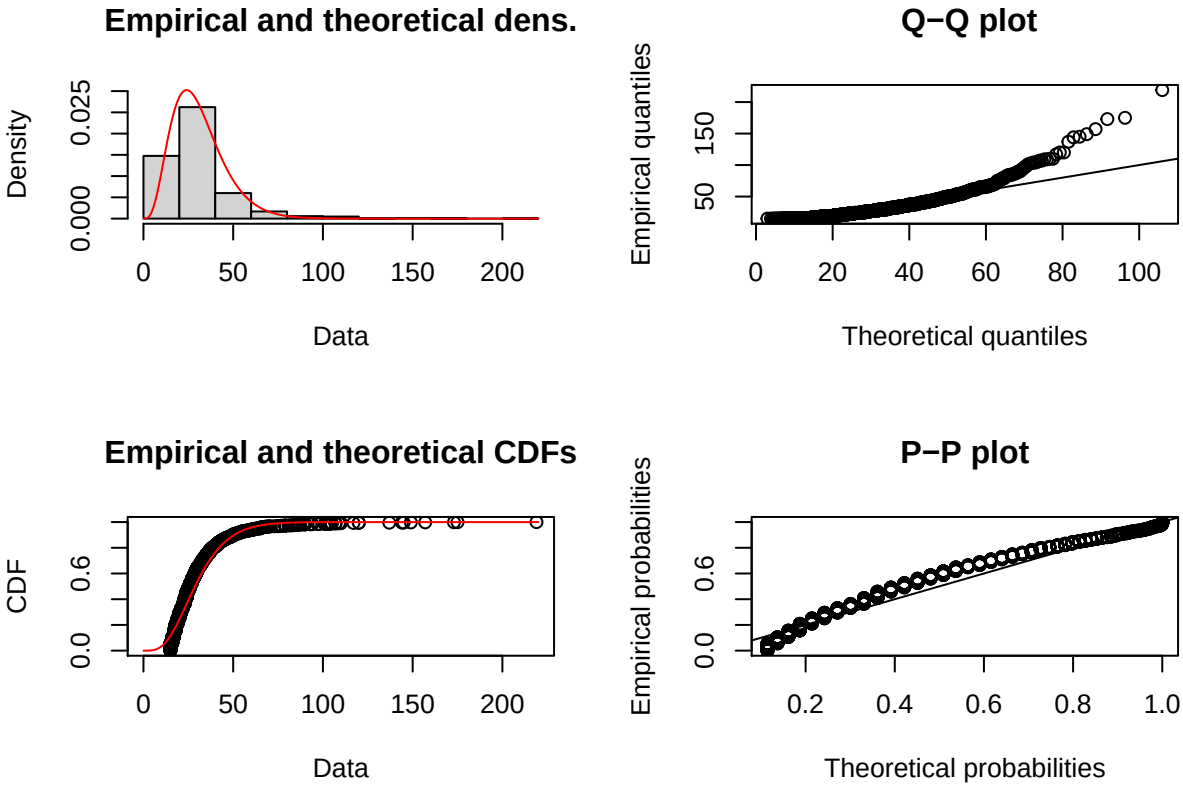




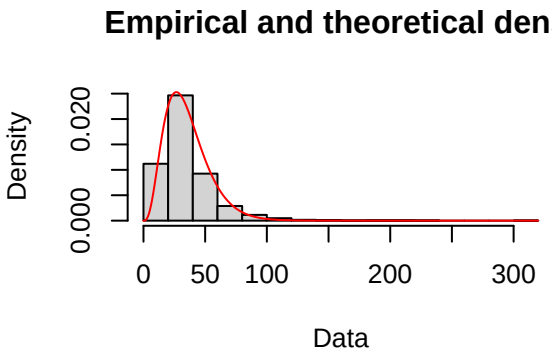


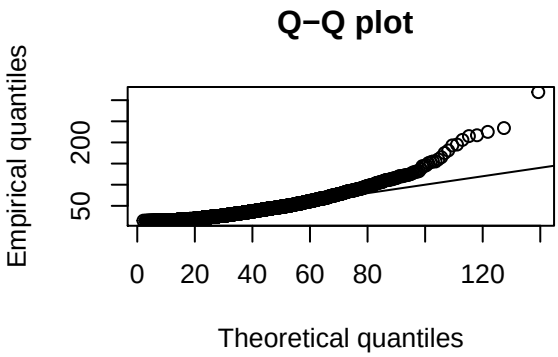

```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-exp
## Kolmogorov-Smirnov statistic 0.04957276
## Cramer-von Mises statistic   0.17788189
## Anderson-Darling statistic          Inf
##
## Goodness-of-fit criteria
##                                 1-mle-exp
## Akaike's Information Criterion  3432.970
## Bayesian Information Criterion  3436.931
##
## [[2]]
## Fitting of the distribution ' exp ' by maximum likelihood
## Parameters :
##       estimate Std. Error
## rate 0.03266818 0.00165692
## Loglikelihood:  -1715.485   AIC:  3432.97   BIC:  3436.931
```

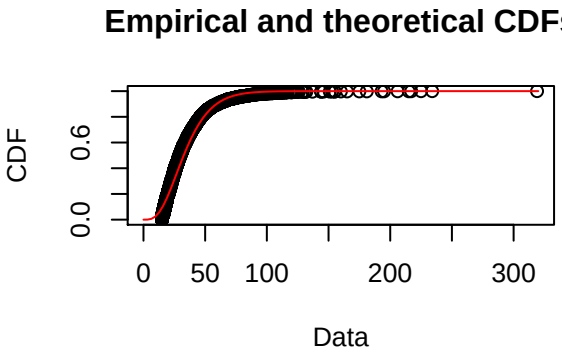
5.1.2 Gamma

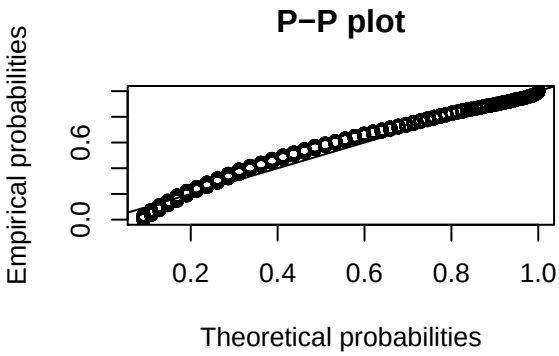



```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic    0.114437
## Cramer-von Mises statistic      6.134873
## Anderson-Darling statistic     38.225013
##
## Goodness-of-fit criteria
##                                  1-mle-gamma
## Akaike's Information Criterion    12457.58
## Bayesian Information Criterion    12468.27
##
## [[2]]
## Fitting of the distribution ' gamma ' by maximum likelihood
## Parameters :
##        estimate  Std. Error
## shape 4.4853867 0.155558107
## rate  0.1449135 0.005317745
## Loglikelihood:  -6226.79   AIC:  12457.58   BIC:  12468.27
## Correlation matrix:
##           shape      rate
## shape 1.0000000 0.9450172
## rate  0.9450172 1.0000000
```

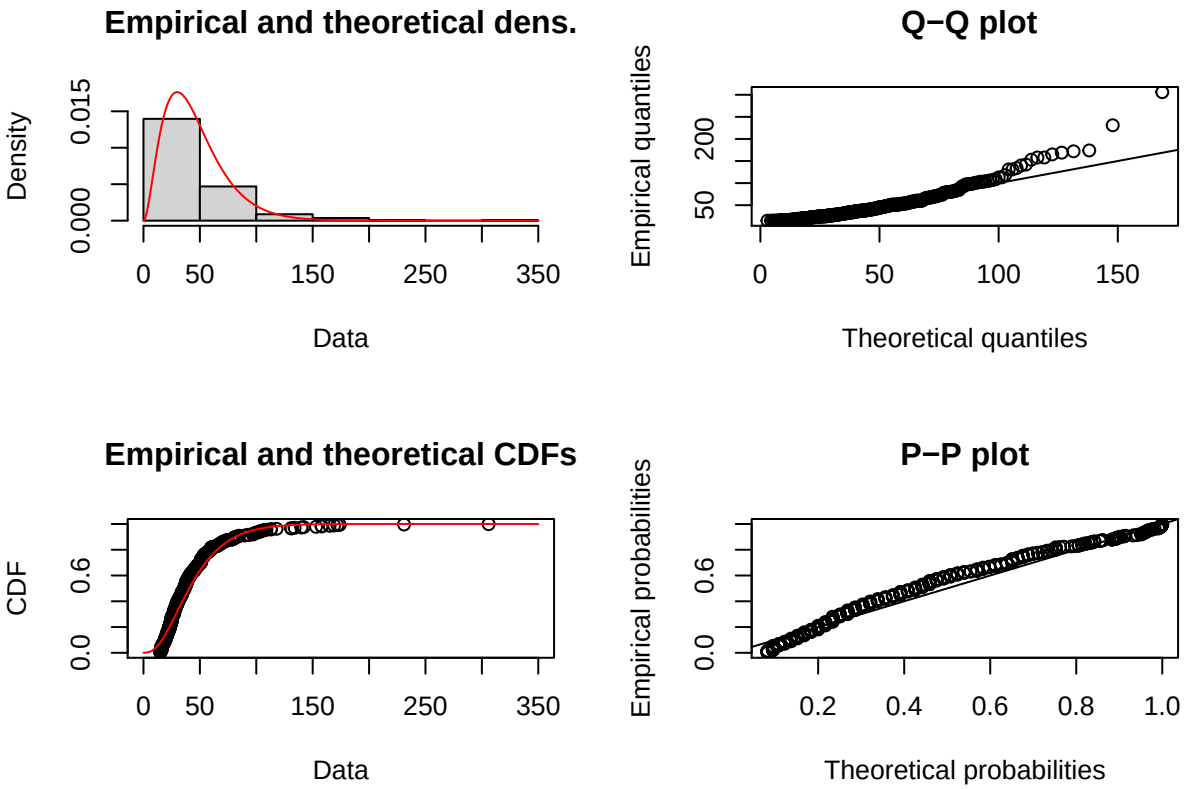









```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic  0.09110847
## Cramer-von Mises statistic   10.81950492
## Anderson-Darling statistic   69.90641666
##
## Goodness-of-fit criteria
##                                  1-mle-gamma
## Akaike's Information Criterion    36388.82
## Bayesian Information Criterion    36401.57
##
## [[2]]
## Fitting of the distribution ' gamma ' by maximum likelihood
## Parameters :
##       estimate  Std. Error
## shape 4.0192113 0.083040693
## rate  0.1132407 0.002491953
## Loglikelihood:  -18192.41   AIC:  36388.82   BIC:  36401.57
## Correlation matrix:
##           shape      rate
## shape 1.0000000 0.9387642
## rate  0.9387642 1.0000000
```




```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic   0.1001559
## Cramer-von Mises statistic     1.2112114
## Anderson-Darling statistic     7.4902588
##
## Goodness-of-fit criteria
##                                  1-mle-gamma
## Akaike's Information Criterion    3558.613
## Bayesian Information Criterion    3566.535
##
## [[2]]
## Fitting of the distribution ' gamma ' by maximum likelihood
## Parameters :
##         estimate  Std. Error
## shape 2.90693484 0.197733132
## rate  0.06372697 0.004730094
## Loglikelihood:  -1777.306   AIC:  3558.613   BIC:  3566.535
## Correlation matrix:
##           shape      rate
## shape 1.0000000 0.9160503
## rate  0.9160503 1.0000000
```