Amount of Time Being Served in PAC (Appointments)

2020

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Friday, 2 April 2021

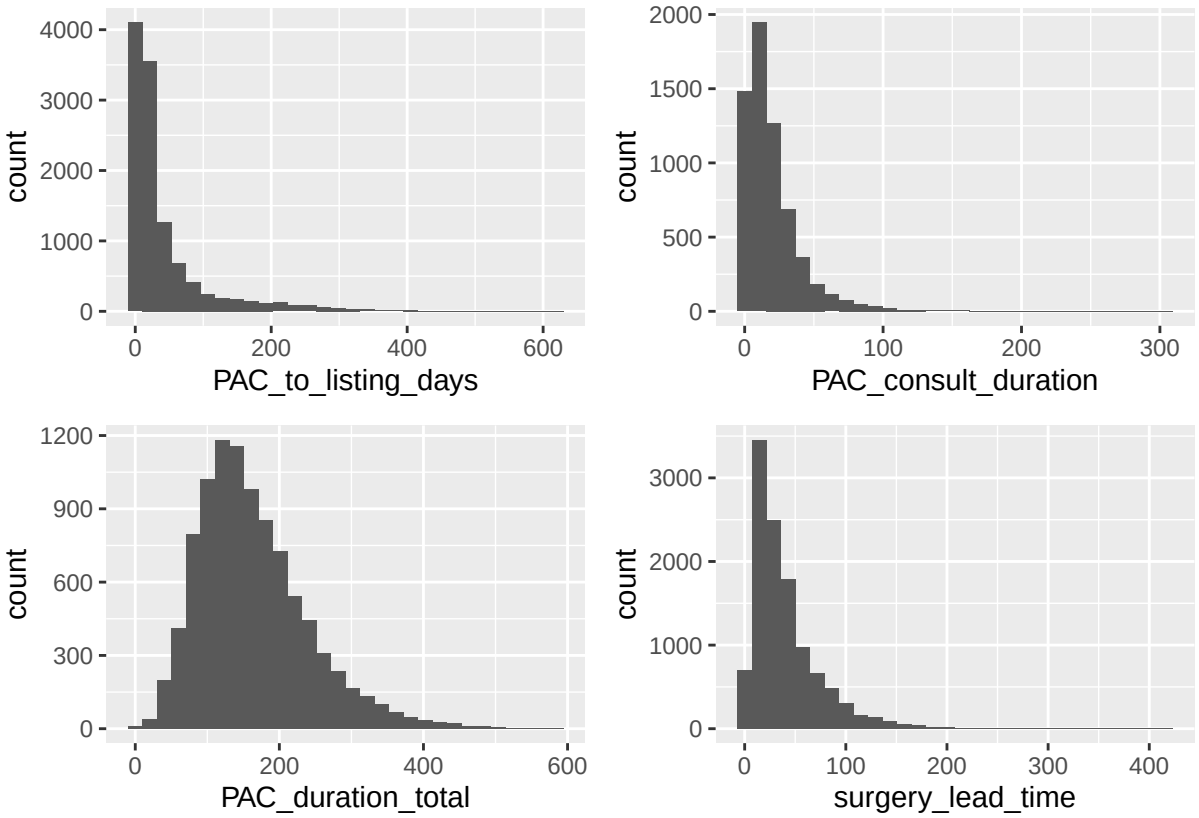
Some things to note:

- 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`.
- 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 CF and exponential. Gamma is not translated. Not sure if this is correct.
- We should decide on whether to split based on ASA, Department or both.

Some questions:

- Clarify that:
  - Visit time = time allocated
  - Listing date = when did they set the consult timing
  - Register time = when did they come
  - End time = when did they leave
  - Consult duration = how long to consult per se
- Department names:
  - e.g. DDR/HPB is it the same as HPB?
  - e.g. H&N ENT is it the same as ENT?
  - Maybe can have a brief explanation so that we can try to cluster things
- How was PAC registration/end time calculated?

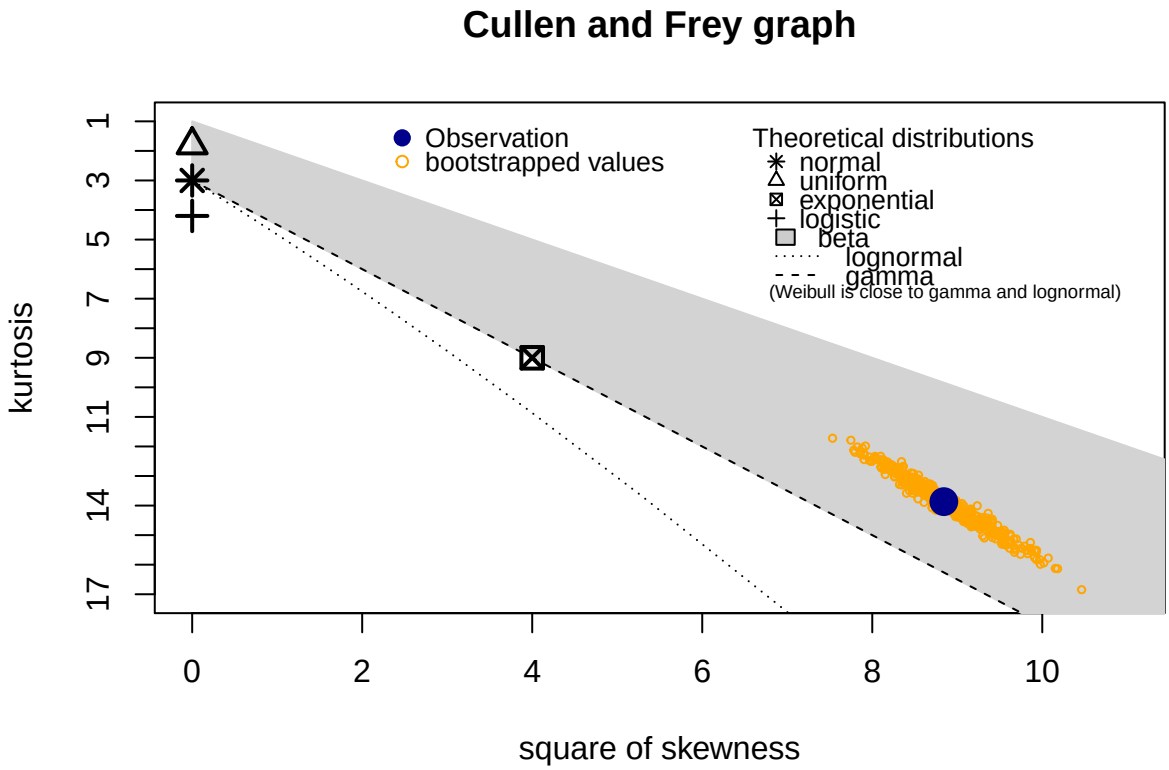
1 Histograms

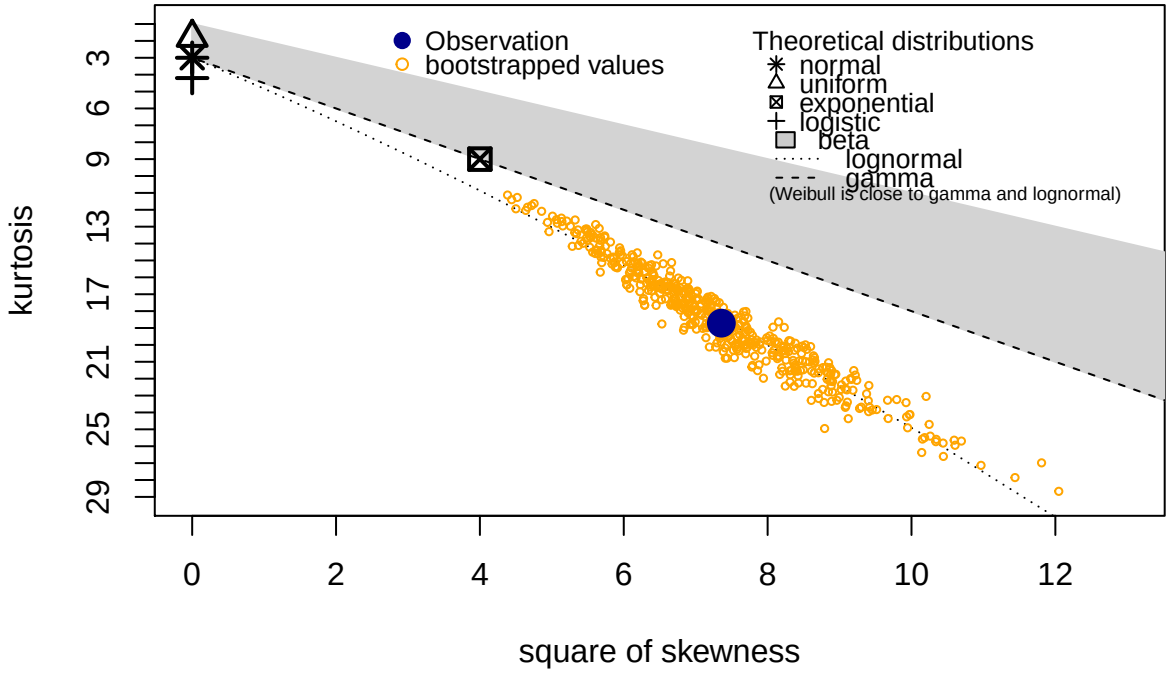


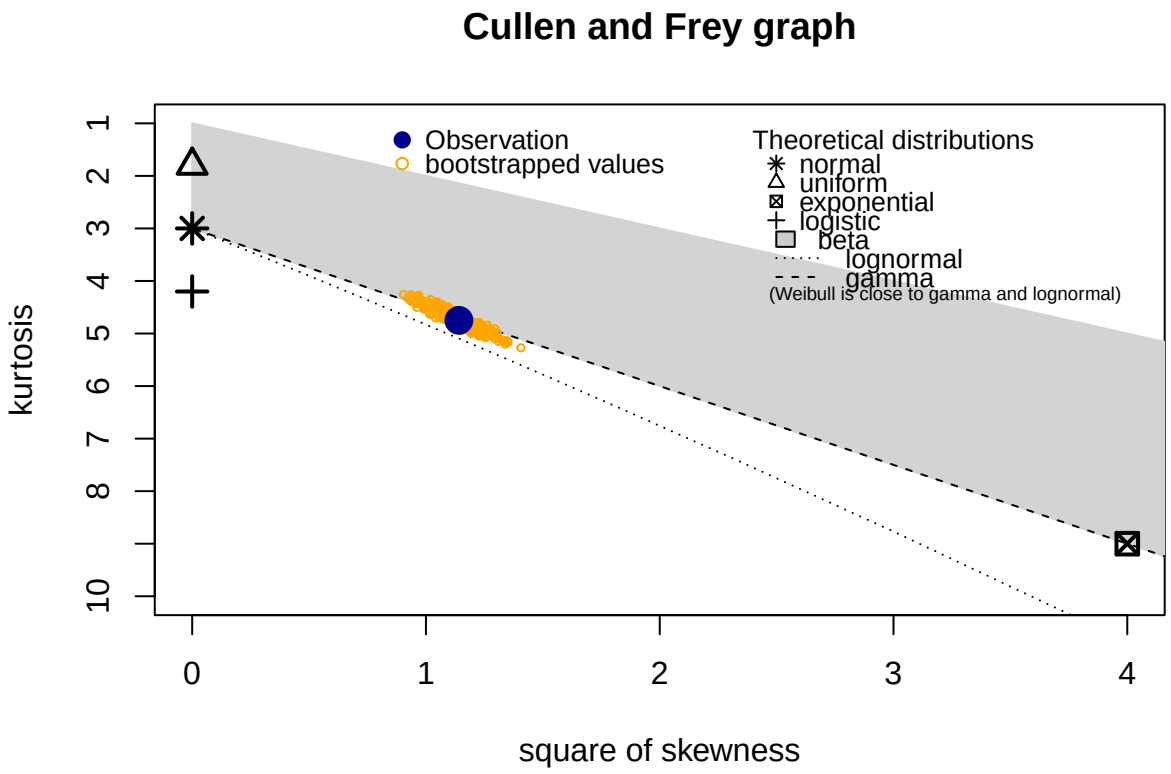
2 Cullen and Frey Graphs

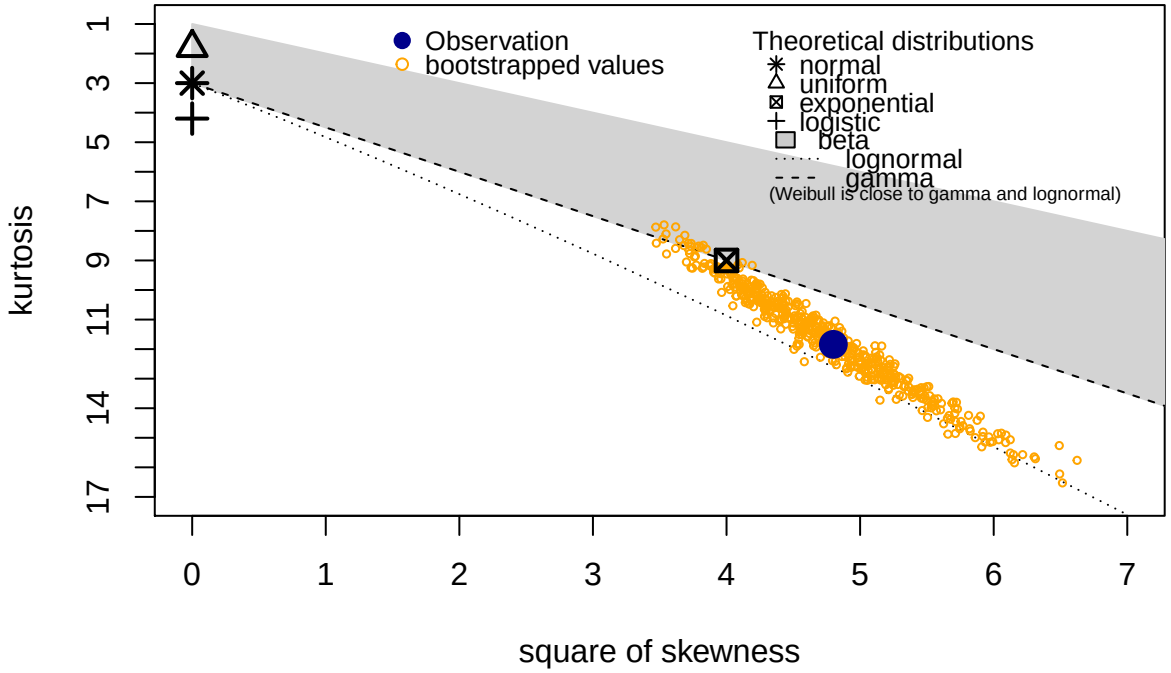
In order of:

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


Cullen and Frey graph
Observation
bootstrapped values
Theoretical distributions
normal
uniform
exponential
logistic
beta
lognormal
gamma
(Weibull is close to gamma and lognormal)
kurtosis
1
3
5
7
9
11
14
17
0
2
4
6
8
10
square of skewness


Cullen and Frey graph
Observation
bootstrapped values
Theoretical distributions
normal
uniform
exponential
logistic
beta
lognormal
gamma
(Weibull is close to gamma and lognormal)
kurtosis
3
6
9
13
17
21
25
29
0
2
4
6
8
10
12
square of skewness





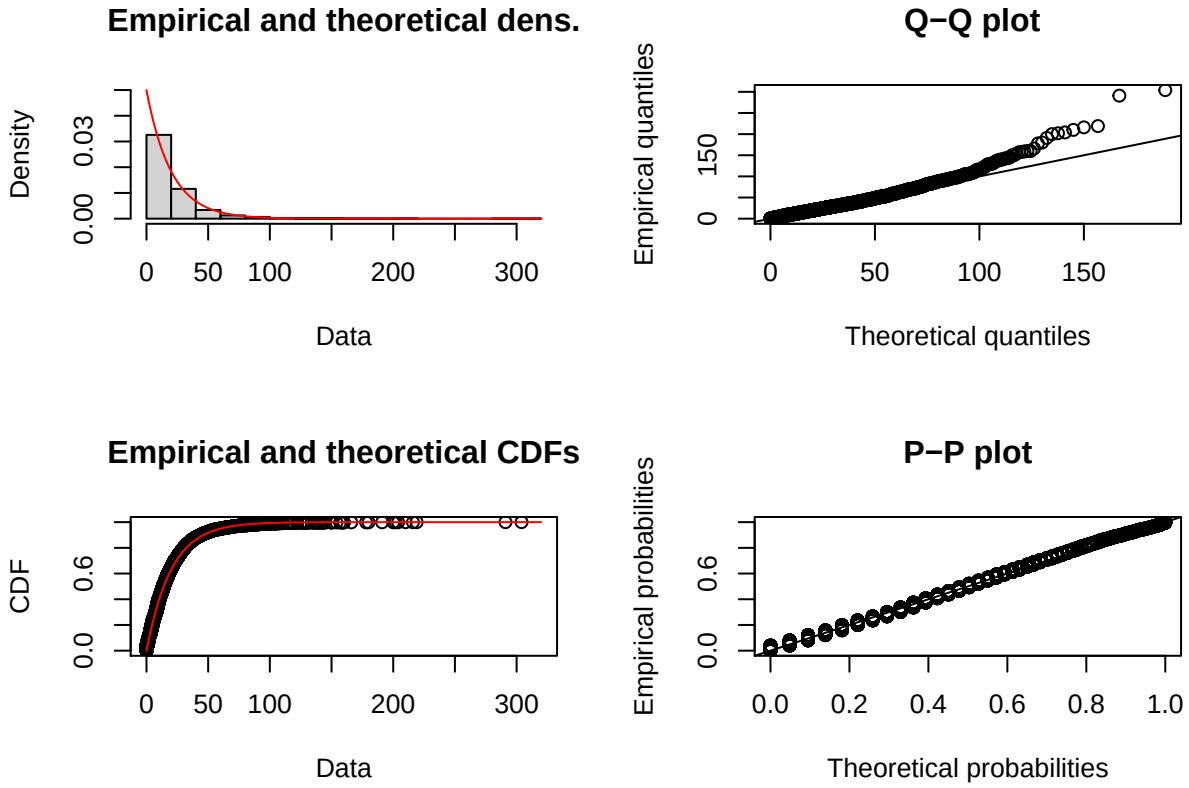

```
## $PAC_to_listing_days
## summary statistics
## ------
## min:  0   max:  619
## median:  16
```

```
## 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

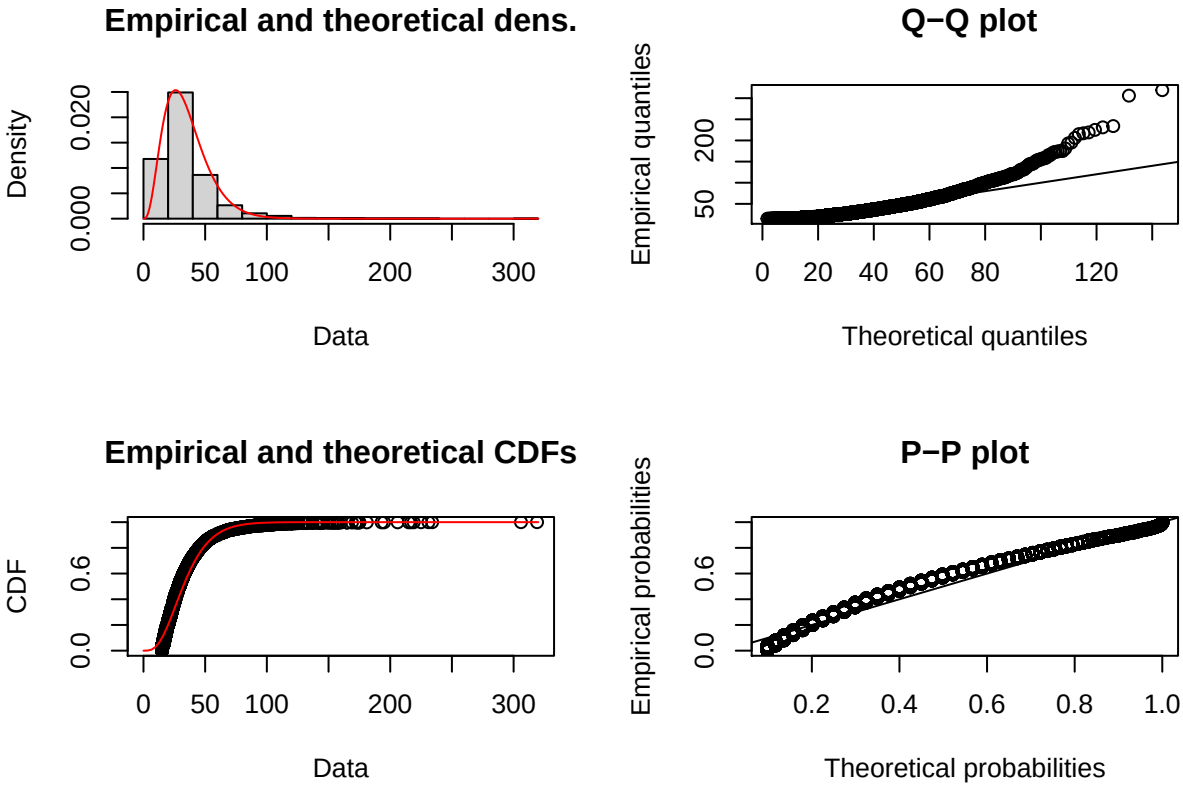
Disclaimer: distributions are not validated by chi-squared test yet but through other tests. Will need to ask James about these too. Will do the chi-squared tests soon.

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
```

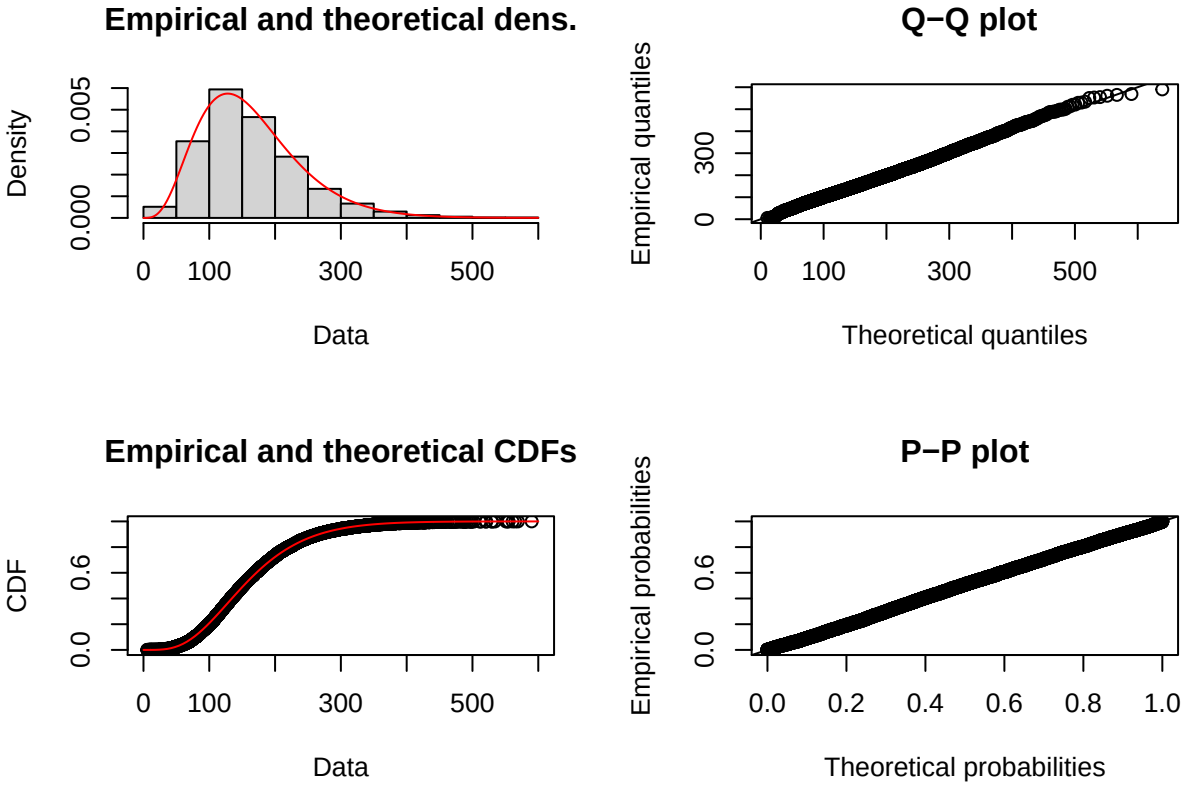
3.2 Gamma Distribution (Not Adjusted)




```
## [[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
```

4 Distribution for Total Duration

Disclaimer: distributions are not validated by chi-squared test yet but through other tests. Will need to ask James about these too. Will do the chi-squared tests soon.



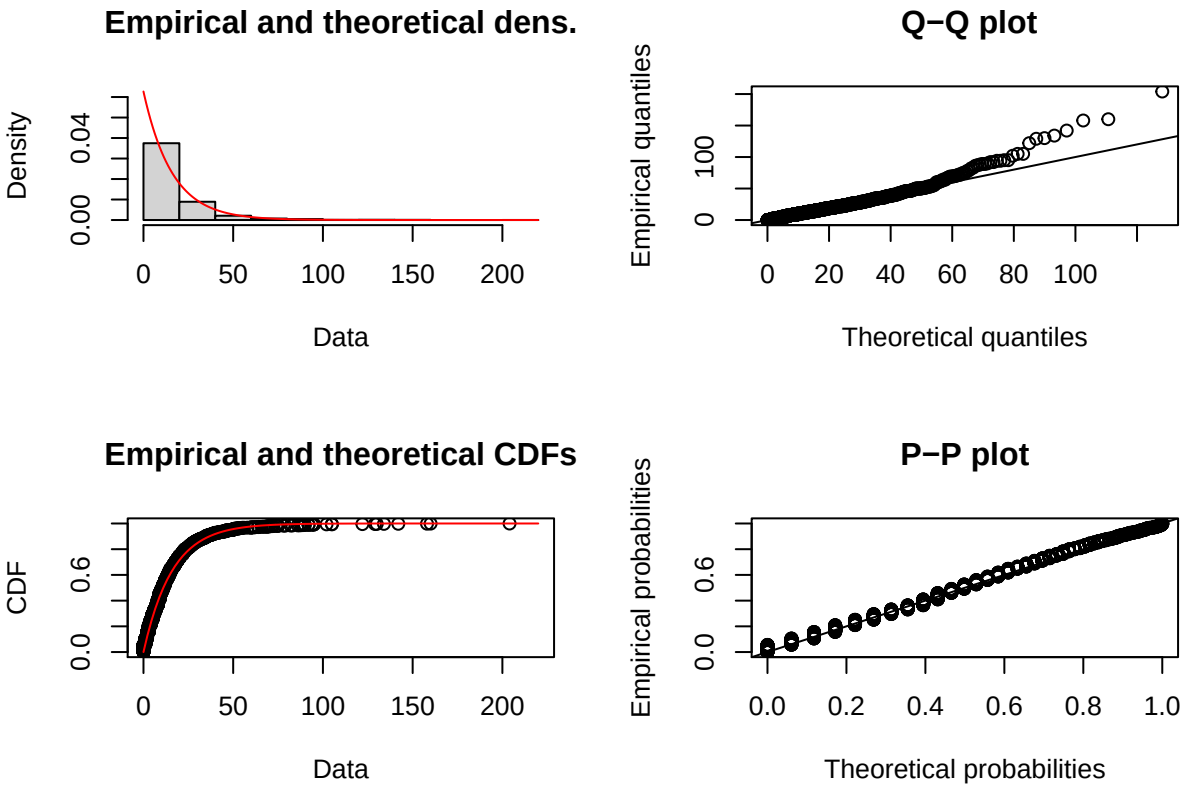

```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic  0.01234561
## Cramer-von Mises statistic    0.40957465
## Anderson-Darling statistic    2.80601438
##
## Goodness-of-fit criteria
##                                  1-mle-gamma
##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

5 Splitting by ASA

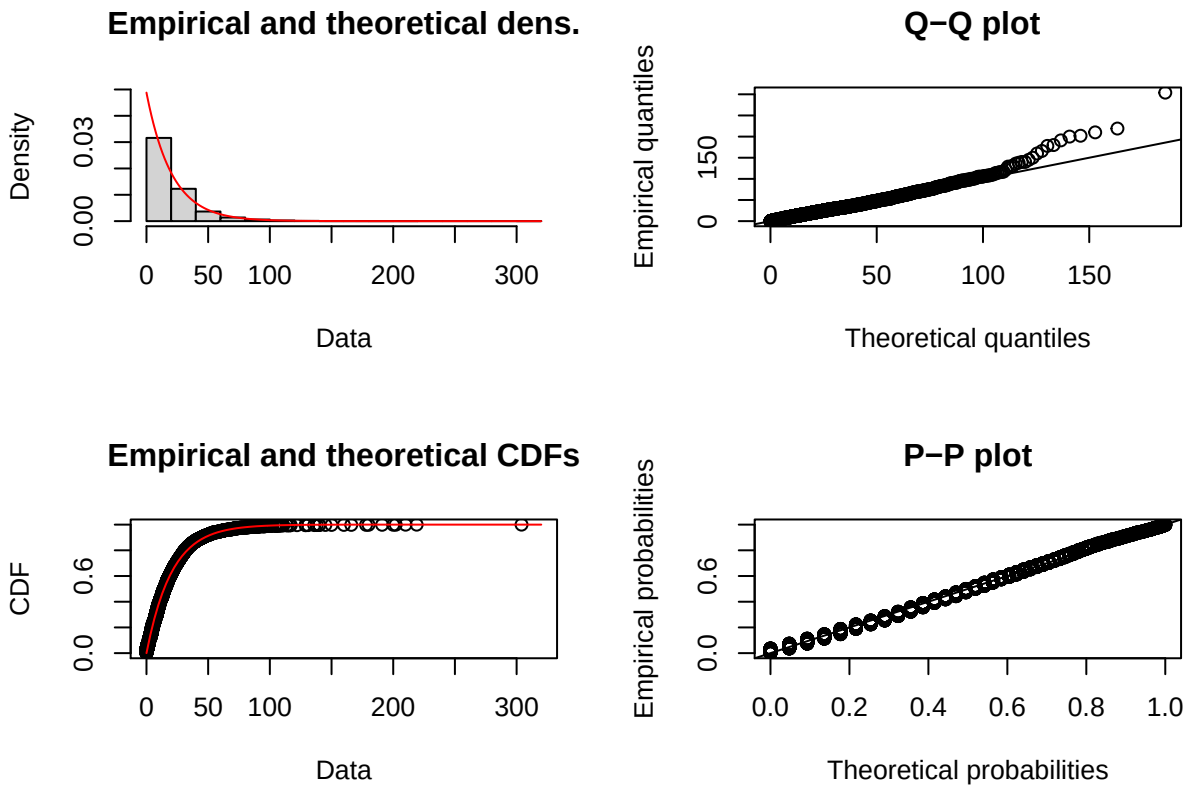
5.1 Consult Duration

5.1.1 Exponential

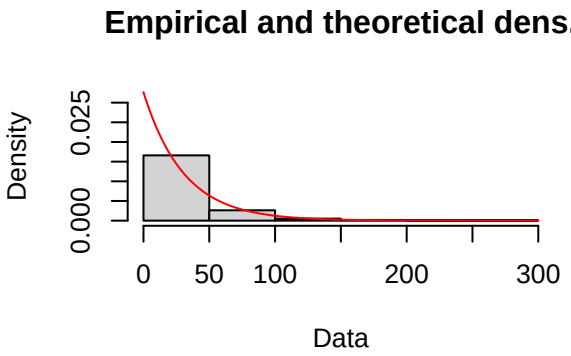


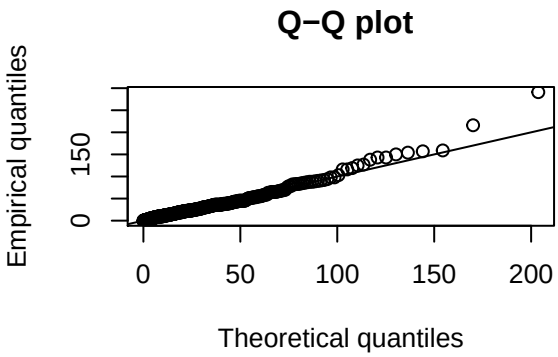

```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-exp
## Kolmogorov-Smirnov statistic 0.05620155
## Cramer-von Mises statistic   0.57557487
## Anderson-Darling statistic          Inf
##
## Goodness-of-fit criteria
##                                  1-mle-exp
## Akaike's 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
```

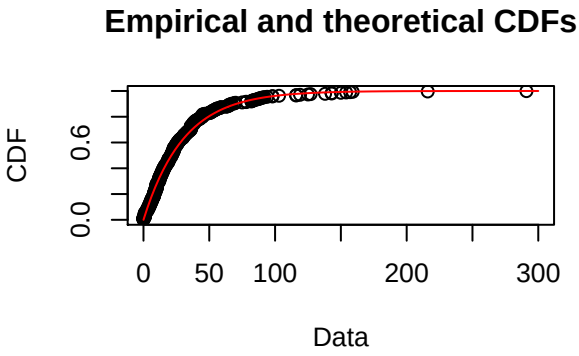
```
## Loglikelihood:  -5835.085   AIC:  11672.17   BIC:  11677.51
```

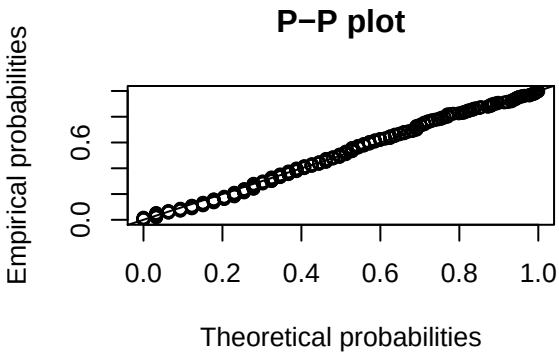



```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-exp
## Kolmogorov-Smirnov statistic 0.0362838
## Cramer-von Mises statistic   0.7793416
## Anderson-Darling statistic         Inf
##
## Goodness-of-fit criteria
##                                  1-mle-exp
## Akaike's 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
```



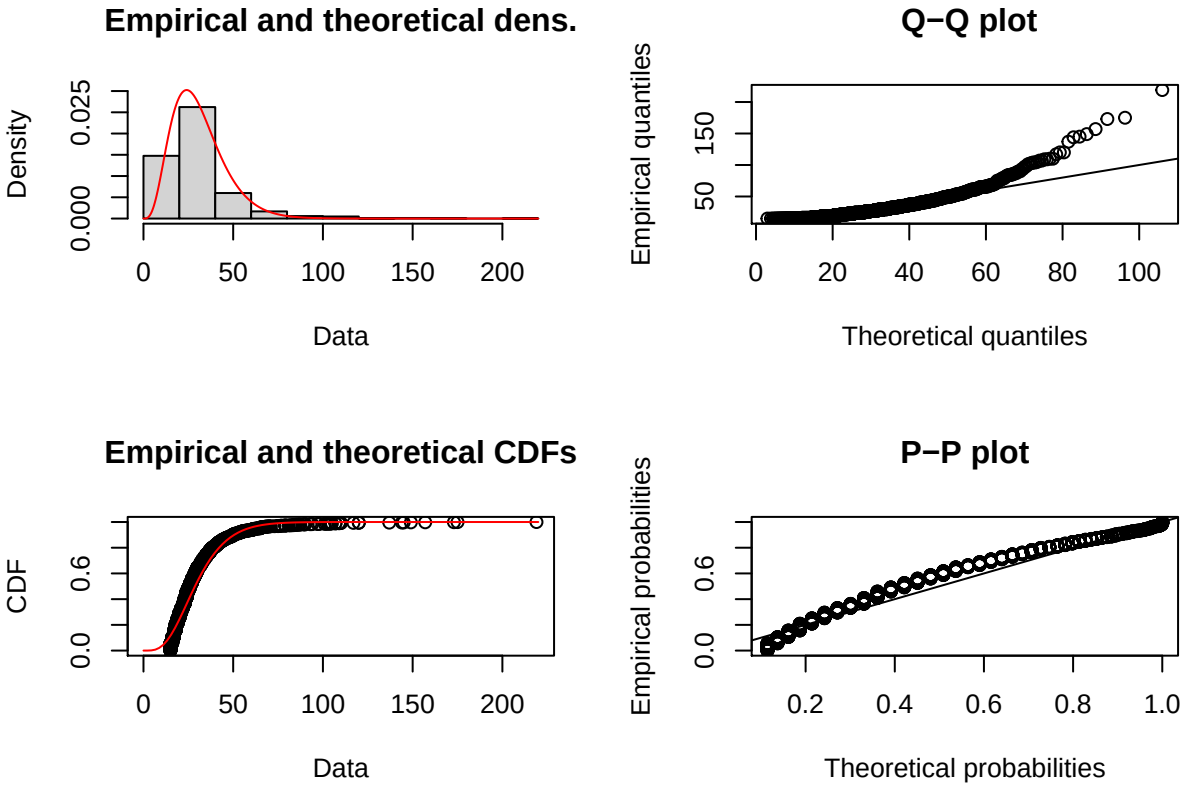




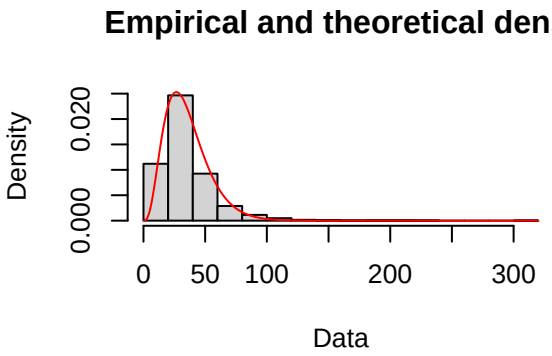


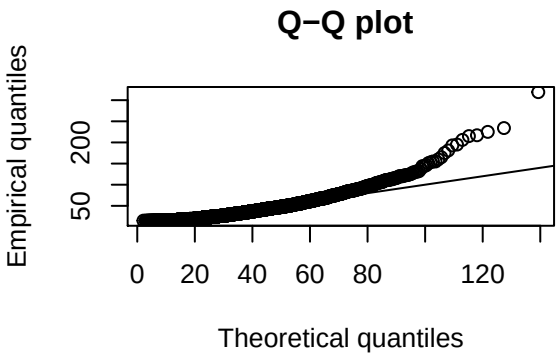

```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-exp
## Kolmogorov-Smirnov statistic 0.04957276
## Cramer-von Mises statistic   0.17788189
## Anderson-Darling statistic          Inf
##
## Goodness-of-fit criteria
##                                 1-mle-exp
## Akaike's 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
```

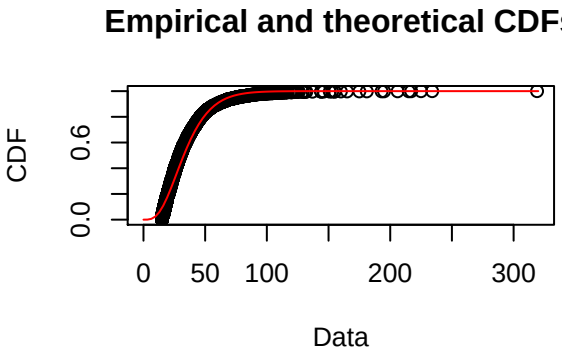
5.1.2 Gamma

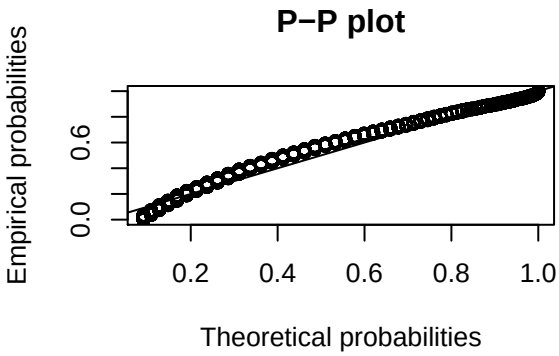



```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic    0.114437
## Cramer-von Mises statistic      6.134873
## Anderson-Darling statistic     38.225013
##
## Goodness-of-fit criteria
##                                  1-mle-gamma
## 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
```

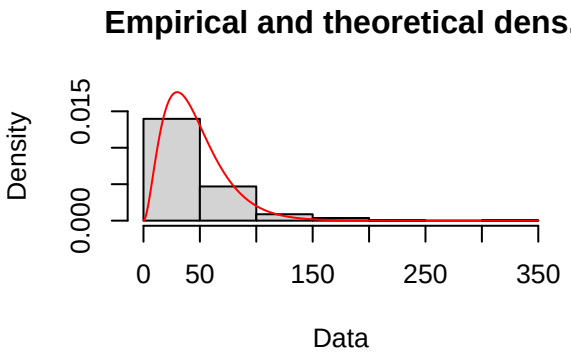


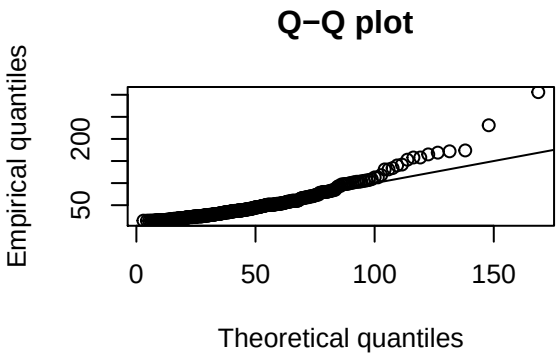


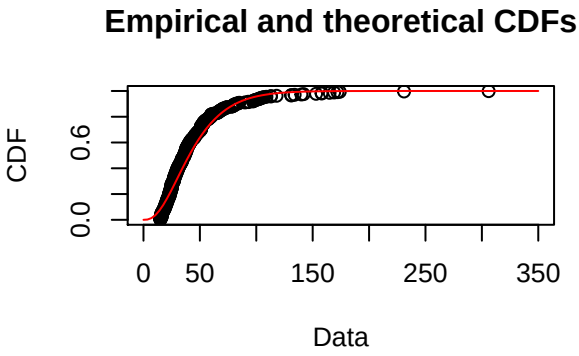


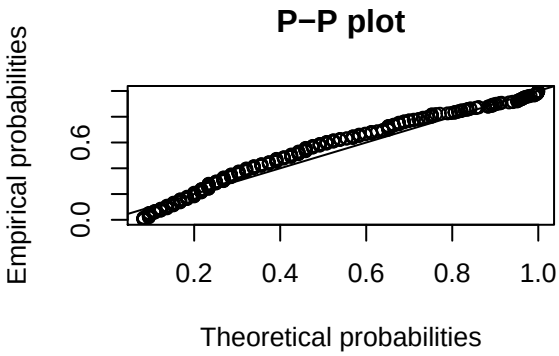



```
## [[1]]
## Goodness-of-fit statistics
##                                1-mle-gamma
## Kolmogorov-Smirnov statistic  0.09110847
## Cramer-von Mises statistic   10.81950492
## Anderson-Darling statistic   69.90641666
##
## Goodness-of-fit criteria
##                                  1-mle-gamma
## 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
```