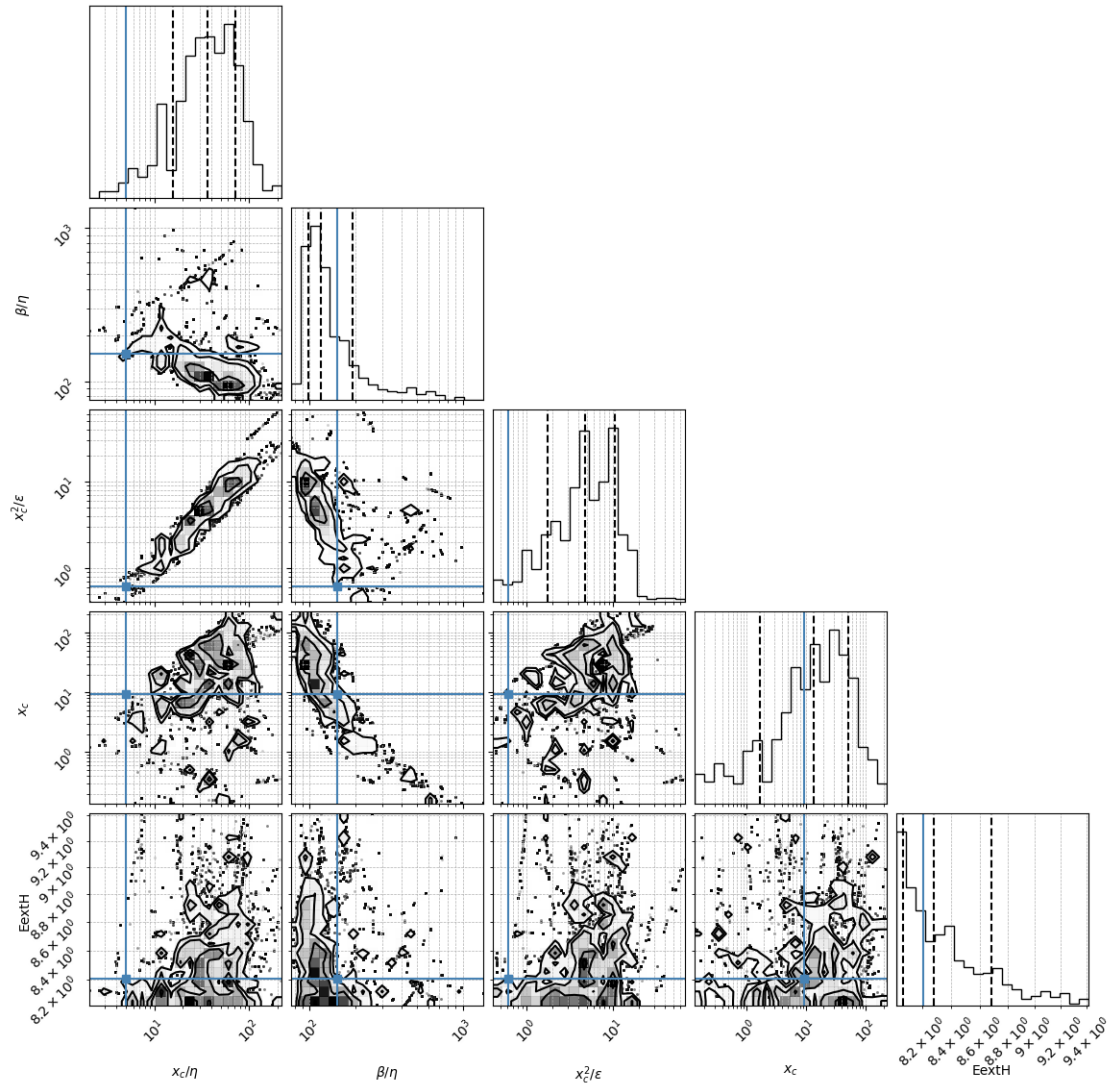
mcmc_analysis_Denmark_M_1900_homo_baysian

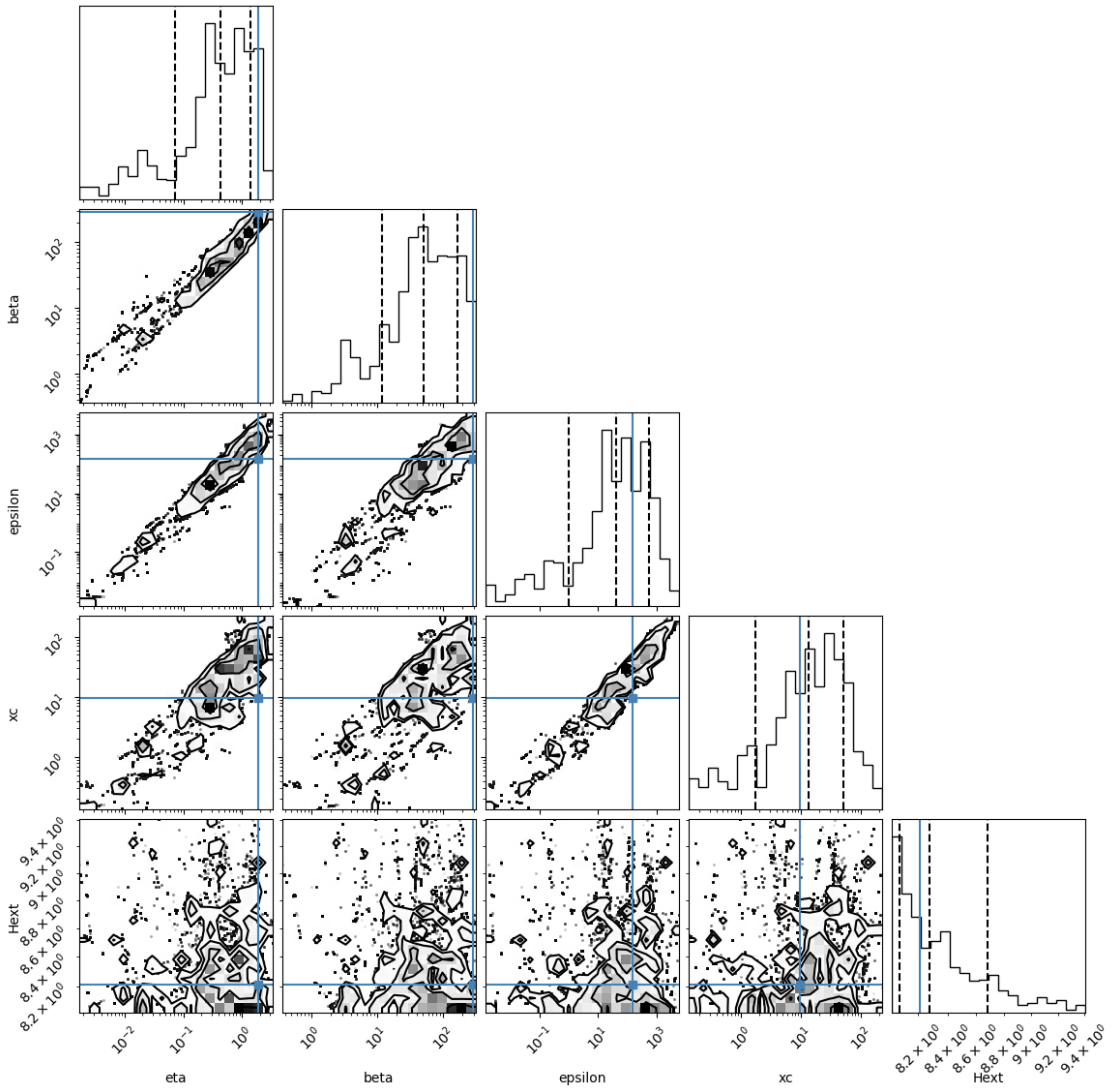
November 24, 2025

1 # 1. Density coner plot

A sample is 1 parameter set scanned. For the corner plot below, the quantiles (represented by the solid lines) are 0.16,0.5,0.84 of the samples. Dots represent individual samples (outside the line surrounding 0.84 of the samples) The parameter search is performed in the transformed space of x_c/η, β/η, x_c^2/ϵ, x_c but we also show the regular parameters

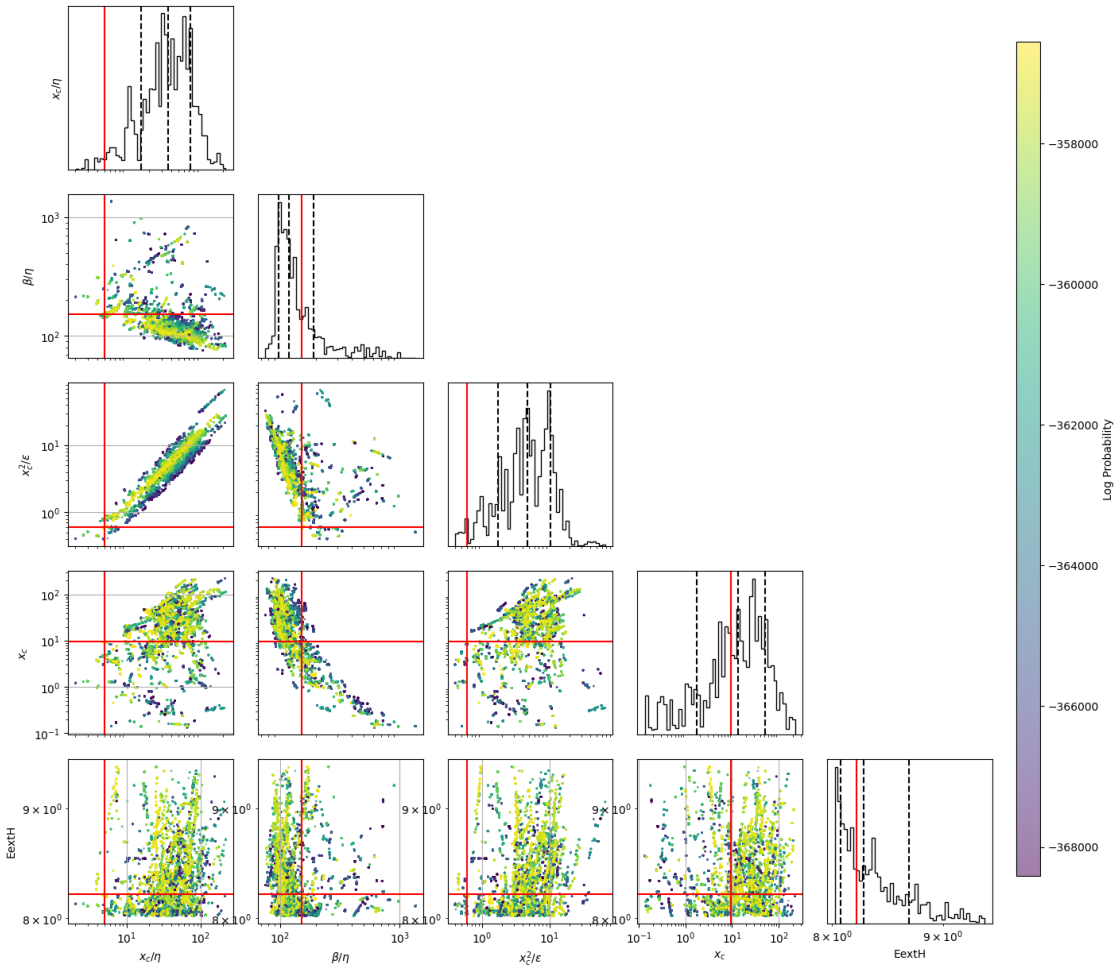
```
(25,)
```


β/η
x_c^2/ε
x_c
EextH
x_c/η
β/η
x_c^2/ε
x_c
EextH



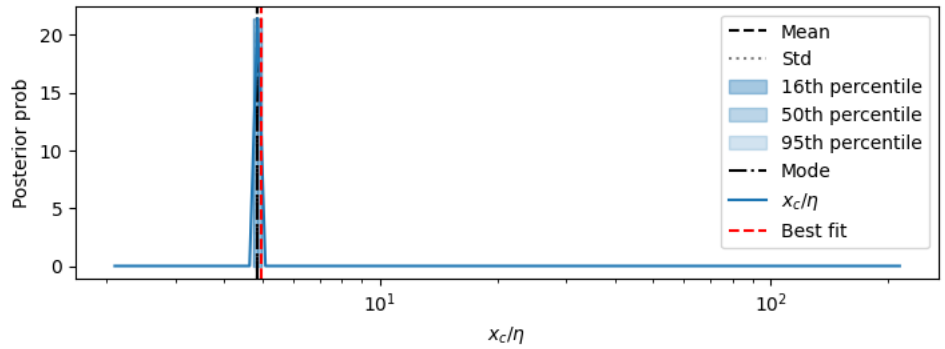
2 2. Heat map corner plot of raw samples

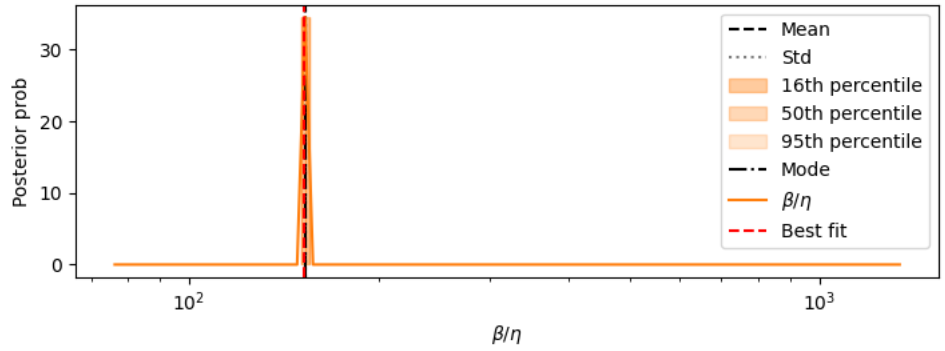
This plot shows all the raw sample points and their lnprobability

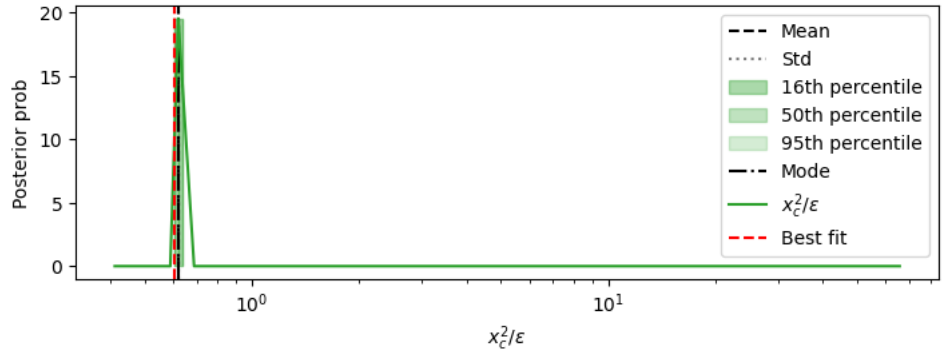


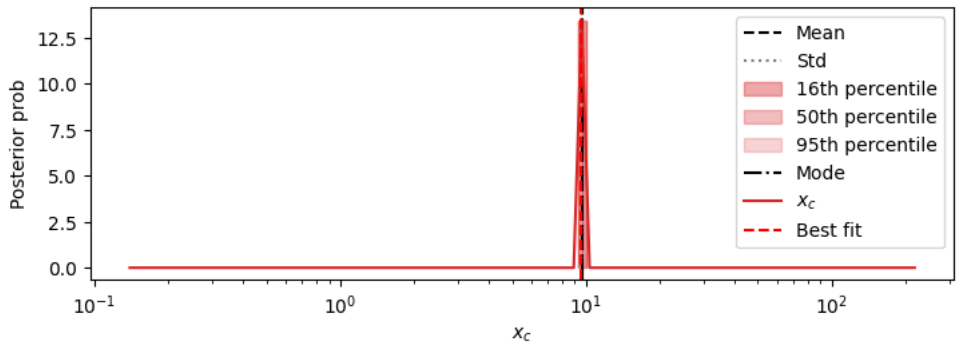
3 3. Posterior distributions of parameters

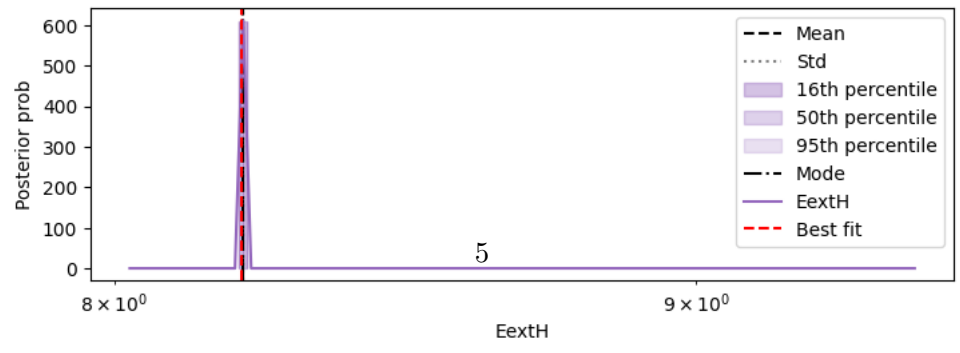
1d marginalizations of posterior distributions. we use a grid of size nbins=100-150


Posterior prob
x_c/η
Mean
Std
16th percentile
50th percentile
95th percentile
Mode
x_c/η
Best fit


Posterior prob
β/η
Mean
Std
16th percentile
50th percentile
95th percentile
Mode
β/η
Best fit

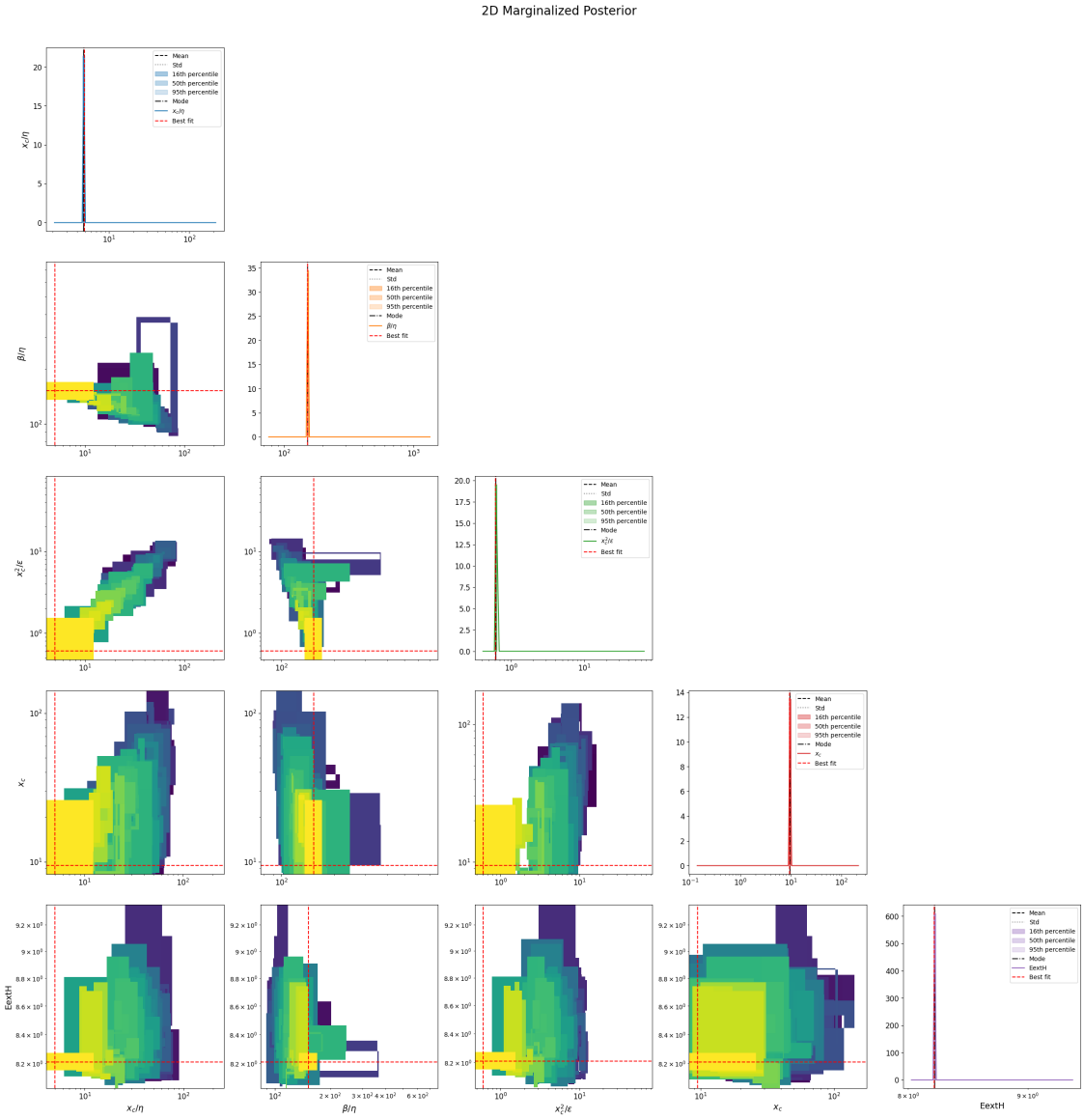

Posterior prob
x_c^2/ε
Mean
Std
16th percentile
50th percentile
95th percentile
Mode
x_c^2/ε
Best fit


Posterior prob
x_c
Mean
Std
16th percentile
50th percentile
95th percentile
Mode
x_c
Best fit


Posterior prob
EextH
Mean
Std
16th percentile
50th percentile
95th percentile
Mode
EextH
Best fit

2D marginalizations of posterior distributions

```
/Volumes/alon/navehr/SRtools/SRtools/samples_utils.py:474: UserWarning: The
input coordinates to pcolormesh are interpreted as cell centers, but are not
monotonically increasing or decreasing. This may lead to incorrectly calculated
cell edges, in which case, please supply explicit cell edges to pcolormesh.
  ax.pcolormesh(X, Y, Z, **kwargs)
```




```
Rescaling the samples TIME by 365
```

4 4. Table of results

mode is the marginalized mode, max_likwlihood is the sample with highest likelihood mode_overall is the 4D posterior mode

	mean	\
xc/eta	4.862	
beta/eta	152.864	
xc^2/epsilon	0.621	
xc	9.597	
ExtH	8.212	
eta	1.884	
beta	288.56	
epsilon	140.377	
sqrt(xc/eta)	2.205	
s= eta^0.5*xc^1.5/epsilon	0.271	
beta*xc/epsilon	18.431	
eta*xc/epsilon	0.122	
Fx=beta^2/eta*xc	4588.093	
Dx =beta*epsilon/eta*xc^2	250.745	
Pk=beta*k/epsilon	1.018	
Fk=beta^2/eta*k	90913.115	
Dk =beta*epsilon/eta*k^2	93420.731	
Fk^2/Dk=beta^3/eta*epsilon	84499.673	
epsilon/beta^2	0.00176	
k/beta	0.00173	
k^2/epsilon	0.00178	
eta/xc	0.206	
beta/xc	31.435	
epsilon/xc^2	1.61	
k/xc	0.0521	
best fit no ext hazard_MedianLifetime	73.38	
best fit no ext hazard_MaxLifetime	106.28	
best fit_MedianLifetime	73.03	
best fit_MaxLifetime	105.49	
data_MedianLifetime	69.0	
data_MaxLifetime	103.5	
ML_lnprob	-356549.779313	

std \		
xc/eta	[0.000861,	
0.000862]		
beta/eta	[0.00504,	
0.00504]		
xc^2/epsilon	[0.000109,	
0.000109]		
xc	[0.0018,	

```
0.0018]
ExtH                                                    [1.53e-05,
1.53e-05]
eta                                                     [3.62e-05,
3.62e-05]
beta                                                      [0.00494,
0.00494]
epsilon                                                       [0.027,
0.027]
sqrt(xc/eta)                                            [0.000195,
0.000195]
s= eta^0.5*xc^1.5/epsilon                               [2.59e-05,
2.59e-05]
beta*xc/epsilon                                         [0.000442,
0.000442]
eta*xc/epsilon                                          [1.18e-08,
1.18e-08]
Fx=beta^2/eta*xc                                              [0.01,
0.01]
Dx =beta*epsilon/eta*xc^2                               [0.000472,
0.000472]
Pk=beta*k/epsilon                                       [0.000219,
0.000219]
Fk=beta^2/eta*k                                             [5.355,
5.355]
Dk =beta*epsilon/eta*k^2                                  [15.247,
15.249]
Fk^2/Dk=beta^3/eta*epsilon                                 [22.29,
22.296]
epsilon/beta^2                                          [4.12e-07,
4.12e-07]
k/beta                                                  [2.97e-08,
2.97e-08]
k^2/epsilon                                             [3.42e-07,
3.42e-07]
eta/xc                                                  [3.64e-05,
3.65e-05]
beta/xc                                                   [0.00658,
0.00658]
epsilon/xc^2                                            [0.000282,
0.000282]
k/xc                                                    [9.78e-06,
9.78e-06]
best fit no ext hazard_MedianLifetime
0.51
best fit no ext hazard_MaxLifetime
0
```

```
best fit_MedianLifetime
0.51
best fit_MaxLifetime
0
data_MedianLifetime
0.5
data_MaxLifetime
0
ML_lnprob                                [-356549.77931334125,
-356549.77931334125]

                                                    mode  \
xc/eta                                             4.862
beta/eta                                         152.864
xc^2/epsilon                                       0.621
xc                                                 9.597
ExtH                                               8.212
eta                                                1.884
beta                                              288.56
epsilon                                          140.377
sqrt(xc/eta)                                       2.205
s= eta^0.5*xc^1.5/epsilon                          0.271
beta*xc/epsilon                                   18.431
eta*xc/epsilon                                     0.122
Fx=beta^2/eta*xc                                4588.093
Dx =beta*epsilon/eta*xc^2                        250.745
Pk=beta*k/epsilon                                  1.018
Fk=beta^2/eta*k                                90913.116
Dk =beta*epsilon/eta*k^2                       93420.729
Fk^2/Dk=beta^3/eta*epsilon                     84499.676
epsilon/beta^2                                   0.00176
k/beta                                           0.00173
k^2/epsilon                                      0.00178
eta/xc                                             0.206
beta/xc                                           31.435
epsilon/xc^2                                        1.61
k/xc                                             0.0521
best fit no ext hazard_MedianLifetime             73.38
best fit no ext hazard_MaxLifetime               106.28
best fit_MedianLifetime                           73.03
best fit_MaxLifetime                             105.49
data_MedianLifetime                               69.0
data_MaxLifetime                                 103.5
ML_lnprob                                -356549.779313

percentile_16  \
xc/eta                                                          [4.749,
```

4.976]
beta/eta [150.665,
155.094]
xc^2/epsilon [0.605,
0.637]
xc [9.247,
9.96]
ExtH [8.205,
8.218]
eta [1.814,
1.957]
beta [278.954,
298.498]
epsilon [130.097,
151.469]
sqrt(xc/eta) [2.179,
2.231]
s= eta^0.5*xc^1.5/epsilon [0.267,
0.276]
beta*xc/epsilon [18.183,
18.682]
eta*xc/epsilon [0.121,
0.123]
Fx=beta^2/eta*xc [4382.395,
4803.446]
Dx =beta*epsilon/eta*xc^2 [241.755,
260.07]
Pk=beta*k/epsilon [0.968,
1.07]
Fk=beta^2/eta*k [87938.461,
93988.392]
Dk =beta*epsilon/eta*k^2 [86957.043,
100364.873]
Fk^2/Dk=beta^3/eta*epsilon [79742.525,
89540.62]
epsilon/beta^2 [0.00168,
0.00184]
k/beta [0.00167,
0.00179]
k^2/epsilon [0.00165,
0.00192]
eta/xc [0.201,
0.211]
beta/xc [30.451,
32.452]
epsilon/xc^2 [1.569,
1.652]

```
k/xc                                                          [0.0502,
0.054]
best fit no ext hazard_MedianLifetime                          [72.89,
73.89]
best fit no ext hazard_MaxLifetime                            [106.28,
106.28]
best fit_MedianLifetime                                        [72.54,
73.54]
best fit_MaxLifetime                                          [105.49,
105.49]
data_MedianLifetime                                            [68.51,
69.5]
data_MaxLifetime                                               [103.5,
103.5]
ML_lnprob                          [-356549.77931334125,
-356549.77931334125]

percentile_50  \
xc/eta                                                         [4.749,
4.976]
beta/eta                                                     [150.665,
155.094]
xc^2/epsilon                                                   [0.605,
0.637]
xc                                                              [9.247,
9.96]
ExtH                                                           [8.205,
8.218]
eta                                                            [1.814,
1.957]
beta                                                         [278.954,
298.498]
epsilon                                                      [130.097,
151.469]
sqrt(xc/eta)                                                   [2.179,
2.231]
s= eta^0.5*xc^1.5/epsilon                                      [0.267,
0.276]
beta*xc/epsilon                                               [18.183,
18.682]
eta*xc/epsilon                                                 [0.121,
0.123]
Fx=beta^2/eta*xc                                           [4382.395,
4803.446]
Dx =beta*epsilon/eta*xc^2                                     [241.755,
260.07]
Pk=beta*k/epsilon                                              [0.968,
```

```
1.07]
Fk=beta^2/eta*k                                          [87938.461,
93988.392]
Dk =beta*epsilon/eta*k^2                                [86957.043,
100364.873]
Fk^2/Dk=beta^3/eta*epsilon                               [79742.525,
89540.62]
epsilon/beta^2                                              [0.00168,
0.00184]
k/beta                                                      [0.00167,
0.00179]
k^2/epsilon                                                 [0.00165,
0.00192]
eta/xc                                                          [0.201,
0.211]
beta/xc                                                       [30.451,
32.452]
epsilon/xc^2                                                  [1.569,
1.652]
k/xc                                                         [0.0502,
0.054]
best fit no ext hazard_MedianLifetime                         [72.89,
73.89]
best fit no ext hazard_MaxLifetime                          [106.28,
106.28]
best fit_MedianLifetime                                       [72.54,
73.54]
best fit_MaxLifetime                                        [105.49,
105.49]
data_MedianLifetime                                            [68.51,
69.5]
data_MaxLifetime                                              [103.5,
103.5]
ML_lnprob                          [-356549.77931334125,
-356549.77931334125]

percentile_95  \
xc/eta                                                        [4.749,
4.976]
beta/eta                                                   [150.665,
155.094]
xc^2/epsilon                                                  [0.605,
0.637]
xc                                                             [9.247,
9.96]
ExtH                                                          [8.205,
8.218]
```

```
eta                                                    [1.814,
1.957]
beta                                                 [278.954,
298.498]
epsilon                                              [130.097,
151.469]
sqrt(xc/eta)                                           [2.179,
2.231]
s= eta^0.5*xc^1.5/epsilon                              [0.267,
0.276]
beta*xc/epsilon                                       [18.183,
18.682]
eta*xc/epsilon                                         [0.121,
0.123]
Fx=beta^2/eta*xc                                     [4382.395,
4803.446]
Dx =beta*epsilon/eta*xc^2                             [241.755,
260.07]
Pk=beta*k/epsilon                                       [0.968,
1.07]
Fk=beta^2/eta*k                                     [87938.461,
93988.392]
Dk =beta*epsilon/eta*k^2                            [86957.043,
100364.873]
Fk^2/Dk=beta^3/eta*epsilon                           [79742.525,
89540.62]
epsilon/beta^2                                         [0.00168,
0.00184]
k/beta                                                 [0.00167,
0.00179]
k^2/epsilon                                            [0.00165,
0.00192]
eta/xc                                                   [0.201,
0.211]
beta/xc                                               [30.451,
32.452]
epsilon/xc^2                                           [1.569,
1.652]
k/xc                                                    [0.0502,
0.054]
best fit no ext hazard_MedianLifetime                    [72.89,
73.89]
best fit no ext hazard_MaxLifetime                    [106.28,
106.28]
best fit_MedianLifetime                                  [72.54,
73.54]
best fit_MaxLifetime                                   [105.49,
```

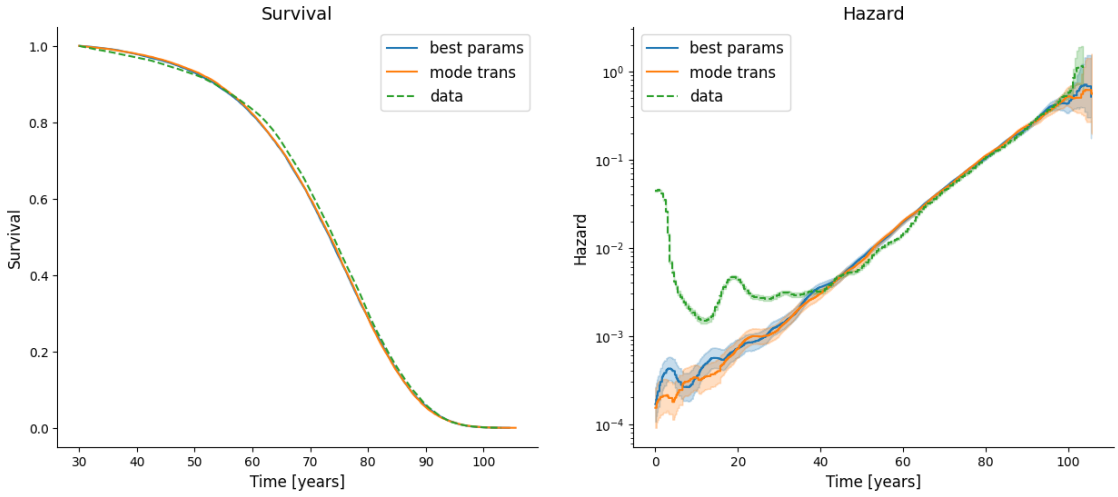
105.49]
data_MedianLifetime [68.51,
69.5]
data_MaxLifetime [103.5,
103.5]
ML_lnprob [-356549.77931334125,
-356549.77931334125]

	max_likelihood	mode_overall
xc/eta	4.975	4.975
beta/eta	152.598	152.598
xc^2/epsilon	0.607	0.607
xc	9.473	9.473
ExtH	8.208	8.208
eta	1.904	1.904
beta	290.54	290.54
epsilon	147.803	147.803
sqrt(xc/eta)	2.231	2.231
s= eta^0.5*xc^1.5/epsilon	0.272	0.272
beta*xc/epsilon	18.621	18.621
eta*xc/epsilon	0.122	0.122
Fx=beta^2/eta*xc	4680.275	4680.275
Dx =beta*epsilon/eta*xc^2	251.343	251.343
Pk=beta*k/epsilon	0.983	0.983
Fk=beta^2/eta*k	88671.272	88671.272
Dk =beta*epsilon/eta*k^2	90217.239	90217.239
Fk^2/Dk=beta^3/eta*epsilon	87151.796	87151.796
epsilon/beta^2	0.00175	0.00175
k/beta	0.00172	0.00172
k^2/epsilon	0.00169	0.00169
eta/xc	0.201	0.201
beta/xc	30.671	30.671
epsilon/xc^2	1.647	1.647
k/xc	0.0528	0.0528
best fit no ext hazard_MedianLifetime	73.38	NaN
best fit no ext hazard_MaxLifetime	106.28	NaN
best fit_MedianLifetime	73.03	NaN
best fit_MaxLifetime	105.49	NaN
data_MedianLifetime	69.0	NaN
data_MaxLifetime	103.5	NaN
ML_lnprob	-356549.779313	-356549.779313

5 5. Fits of simulations to data

best params is the sample with highest likelihood. mode trans is the 4D posterior mode in the transformed space of x_c/η, β/η, x_c^2/ϵ, x_c

```
Text(0, 0.5, 'Hazard')
```




```
Text(0, 0.5, 'Prob density')
```