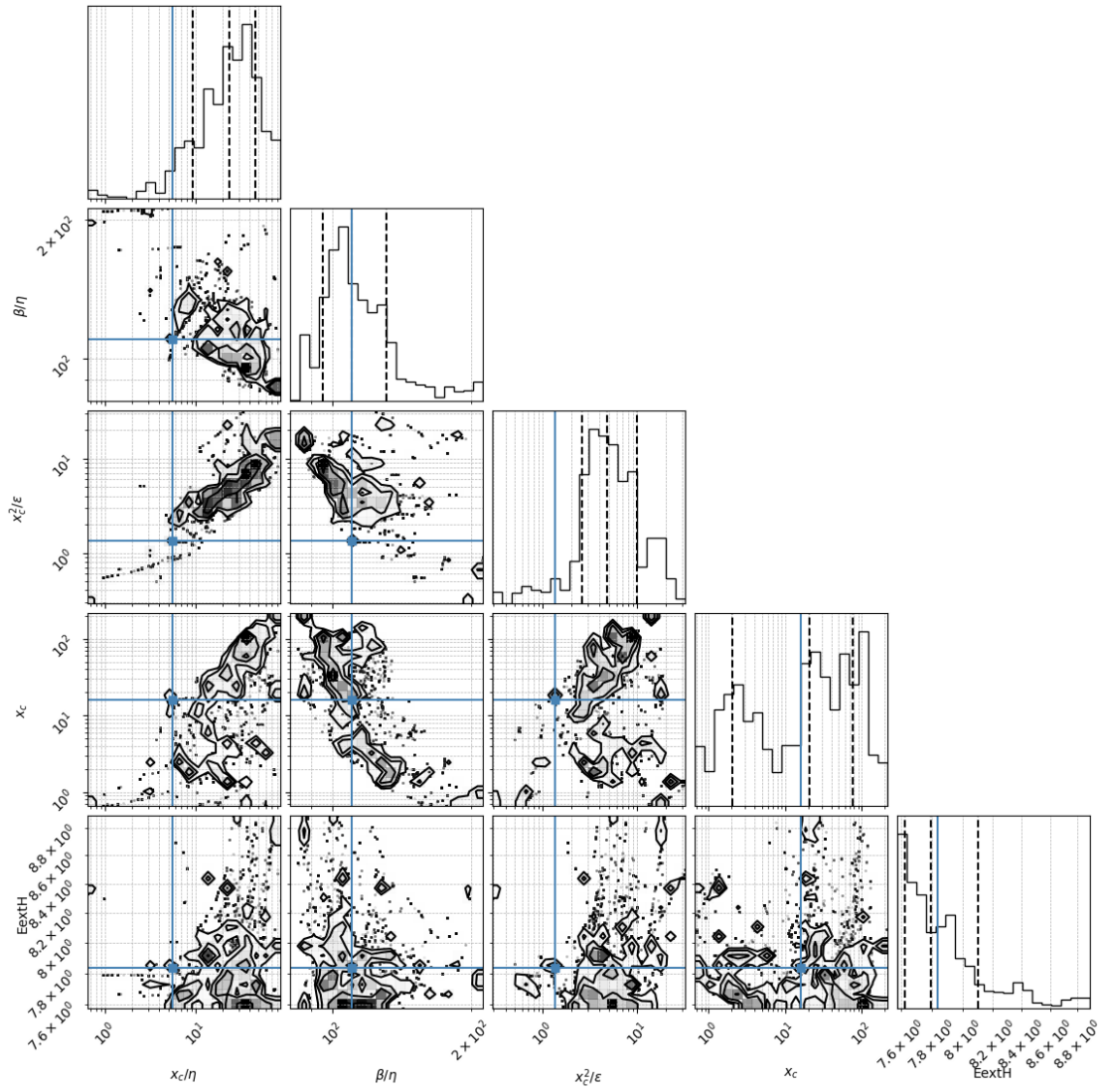
mcmc_analysis_Denmark_F_1900_hetro_baysian

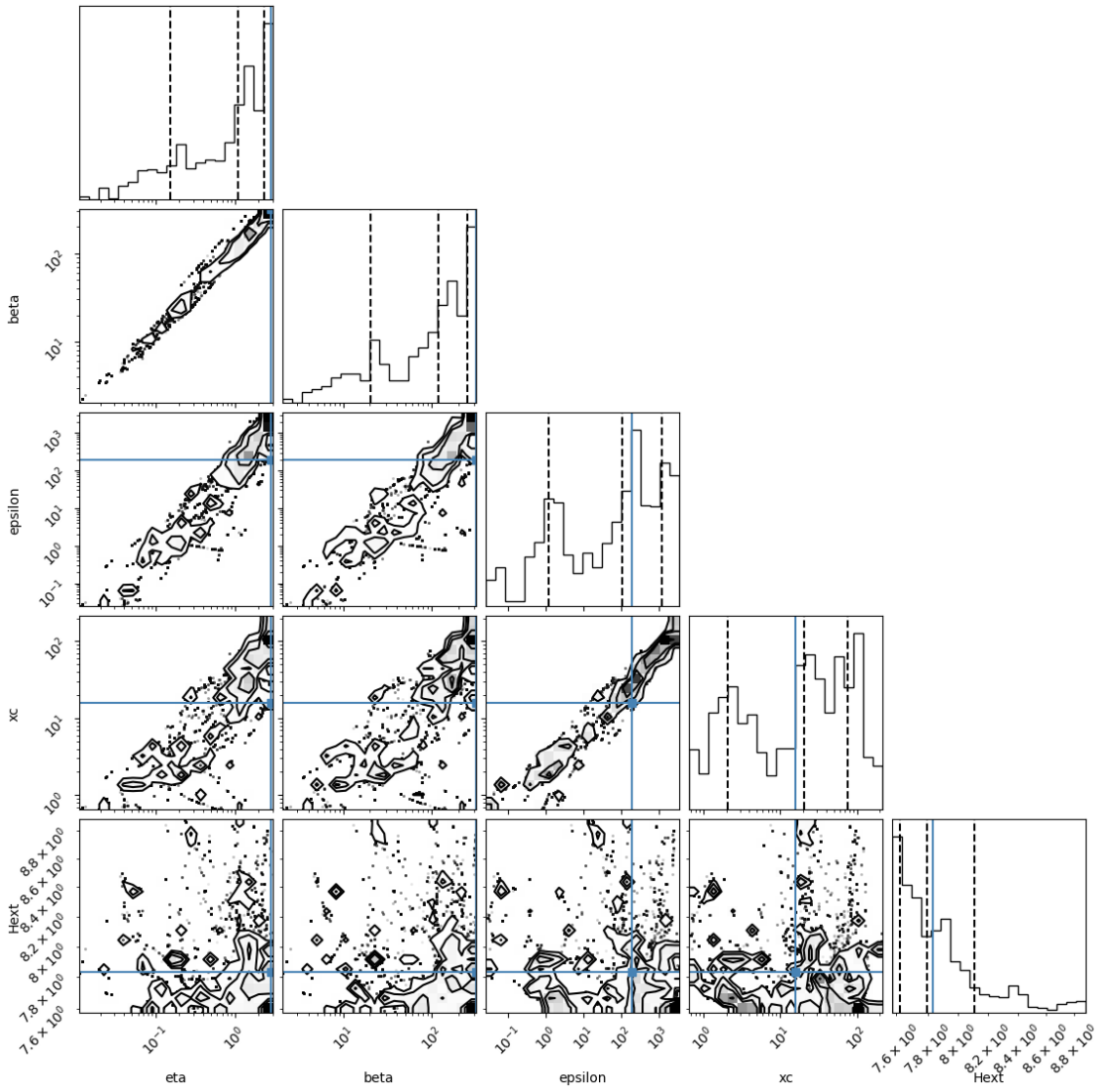
November 24, 2025

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

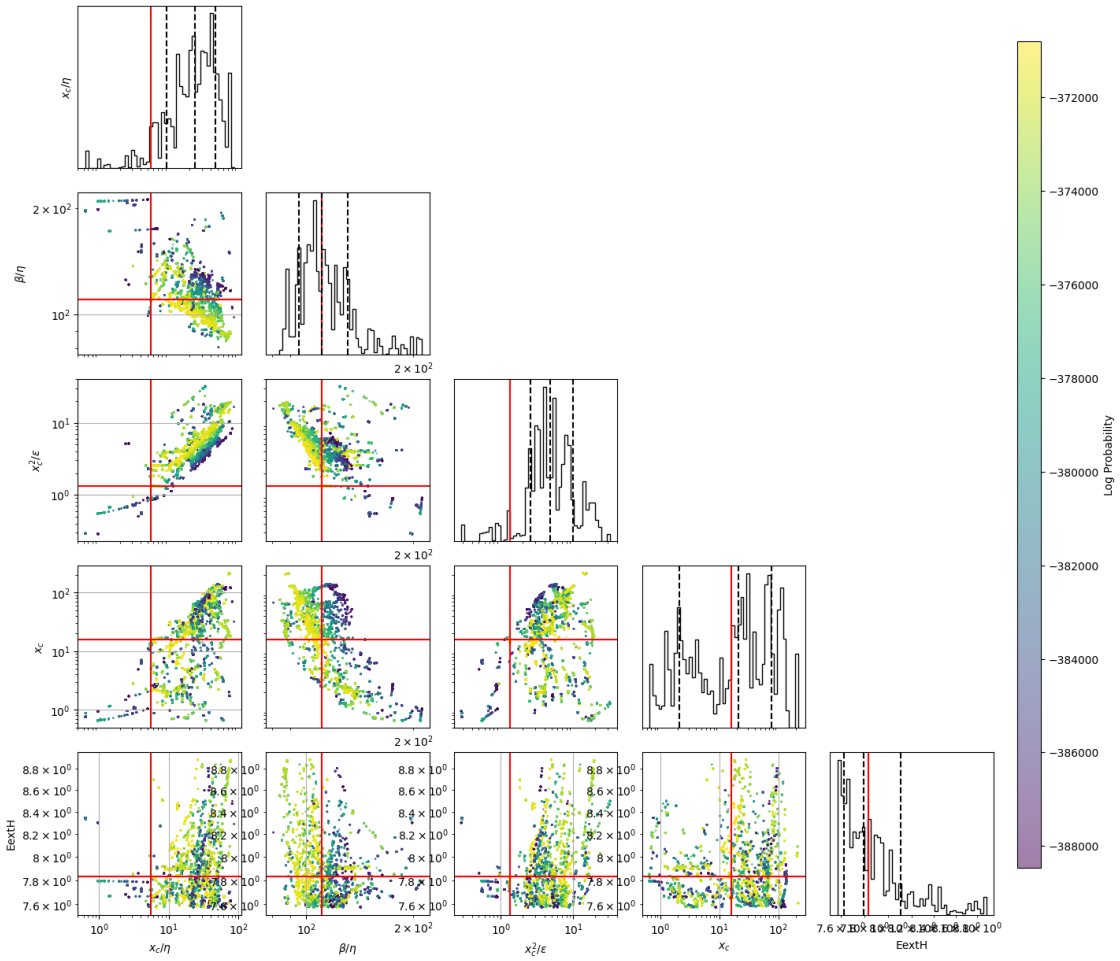
```
(25,)
```


x_c/η
β/η
x_c^2/ε
x_c
EextH



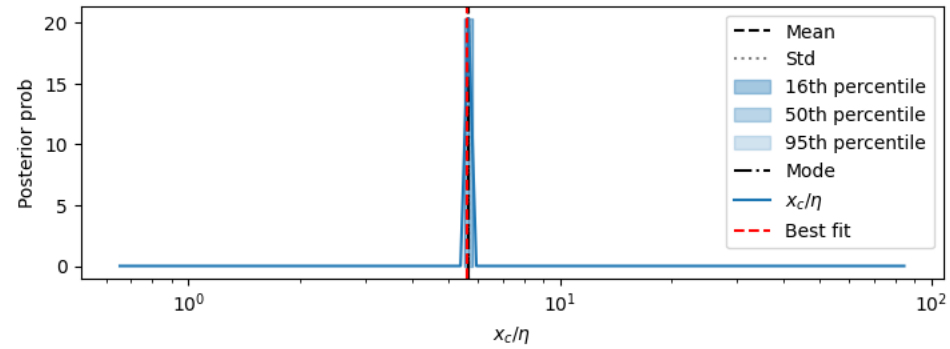
2 2. Heat map corner plot of raw samples

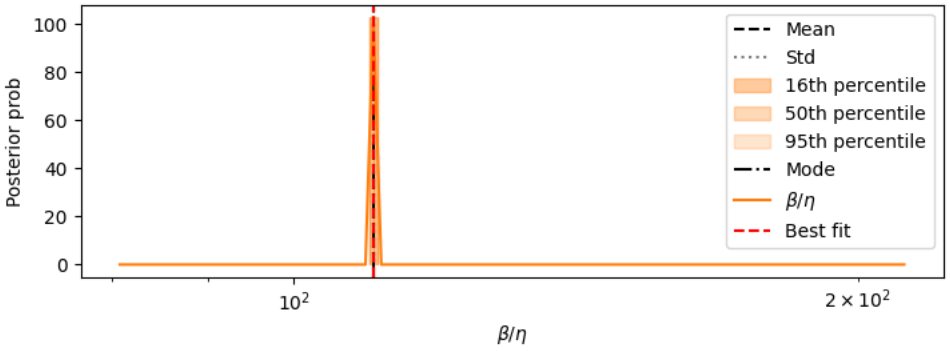
This plot shows all the raw sample points and their lnprobability

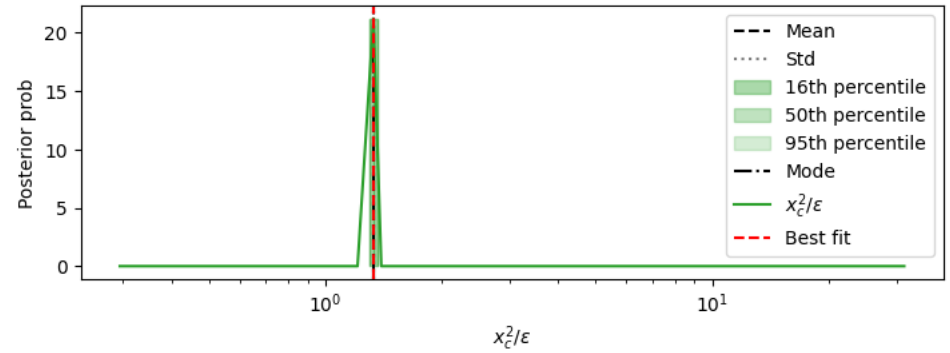


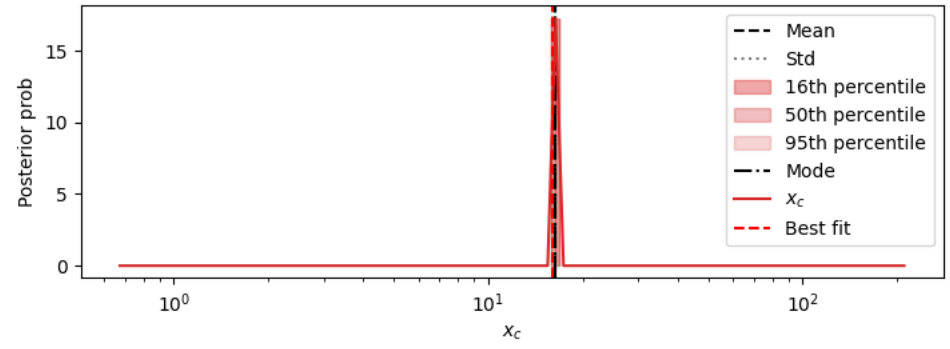
3 3. Posterior distributions of parameters

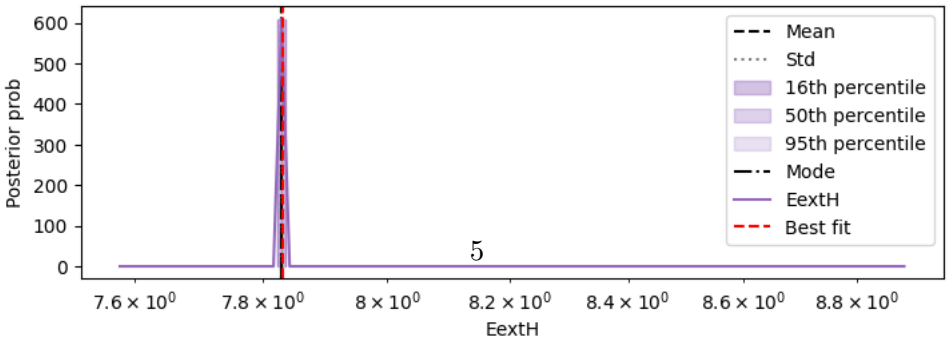
1d marginalizations of posterior distributions. we use a grid of size nbins=100-150


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

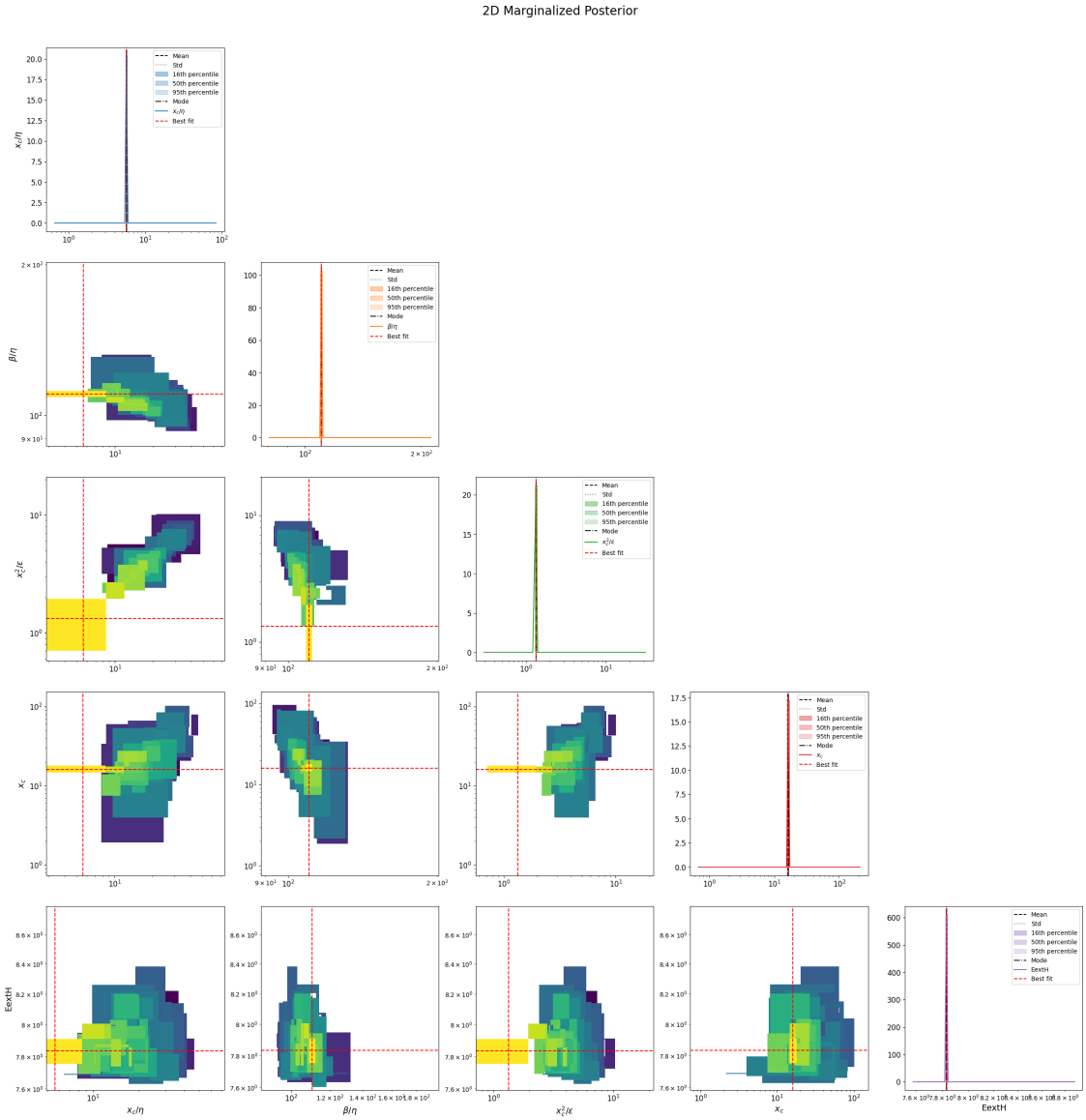

Posterior prob
x_c^2/ε
Mean
Std
16th percentile
50th percentile
95th percentile
Mode
x_c^2/ε
Best fit


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	5.671	
beta/eta	110.317	
xc^2/epsilon	1.331	
xc	16.37	
ExtH	7.83	
eta	2.797	
beta	311.254	
epsilon	195.386	
sqrt(xc/eta)	2.381	
s= eta^0.5*xc^1.5/epsilon	0.555	
beta*xc/epsilon	25.773	
eta*xc/epsilon	0.239	
Fx=beta^2/eta*xc	2119.235	
Dx =beta*epsilon/eta*xc^2	84.921	
Pk=beta*k/epsilon	0.84	
Fk=beta^2/eta*k	70007.511	
Dk =beta*epsilon/eta*k^2	80951.947	
Fk^2/Dk=beta^3/eta*epsilon	55615.457	
epsilon/beta^2	0.00197	
k/beta	0.00161	
k^2/epsilon	0.00128	
eta/xc	0.176	
beta/xc	19.3	
epsilon/xc^2	0.752	
k/xc	0.0305	
best fit no ext hazard_MedianLifetime	78.49	
best fit no ext hazard_MaxLifetime	105.97	
best fit_MedianLifetime	78.2	
best fit_MaxLifetime	106.81	
data_MedianLifetime	74.5	
data_MaxLifetime	106.5	
ML_lnprob	-370794.764814	

std \		
xc/eta		[7.46e-14,
7.46e-14]		
beta/eta		[8.53e-14,
9.95e-14]		
xc^2/epsilon		[1.69e-14,
1.67e-14]		
xc		[7.46e-14,

7.11e-14]
ExtH [3.55e-15,
2.66e-15]
eta [4.84e-14,
4.84e-14]
beta [5.57e-12,
5.51e-12]
epsilon [4.52e-12,
4.49e-12]
sqrt(xc/eta) [1.55e-14,
1.55e-14]
s= eta^0.5*xc^1.5/epsilon [3.55e-15,
3.55e-15]
beta*xc/epsilon [1.07e-14,
1.42e-14]
eta*xc/epsilon [1.67e-16,
1.39e-16]
Fx=beta^2/eta*xc [2.82e-11,
2.82e-11]
Dx =beta*epsilon/eta*xc^2 [1.21e-12,
1.21e-12]
Pk=beta*k/epsilon [2.66e-15,
2.55e-15]
Fk=beta^2/eta*k [1.37e-09,
1.37e-09]
Dk =beta*epsilon/eta*k^2 [1.57e-09,
1.59e-09]
Fk^2/Dk=beta^3/eta*epsilon [7.93e-10,
7.93e-10]
epsilon/beta^2 [2.82e-17,
2.78e-17]
k/beta [2.84e-17,
2.86e-17]
k^2/epsilon [2.95e-17,
2.95e-17]
eta/xc [2.3e-15,
2.3e-15]
beta/xc [2.49e-13,
2.49e-13]
epsilon/xc^2 [9.44e-15,
9.44e-15]
k/xc [1.35e-16,
1.35e-16]
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                                [-370794.76481385506,
-370794.76481385506]

                                                    mode  \
xc/eta                                             5.671
beta/eta                                         110.317
xc^2/epsilon                                       1.331
xc                                                 16.37
ExtH                                                7.83
eta                                                2.797
beta                                             311.254
epsilon                                          195.386
sqrt(xc/eta)                                       2.381
s= eta^0.5*xc^1.5/epsilon                          0.555
beta*xc/epsilon                                   25.773
eta*xc/epsilon                                     0.239
Fx=beta^2/eta*xc                                2119.235
Dx =beta*epsilon/eta*xc^2                         84.921
Pk=beta*k/epsilon                                   0.84
Fk=beta^2/eta*k                                70007.511
Dk =beta*epsilon/eta*k^2                       80951.947
Fk^2/Dk=beta^3/eta*epsilon                     55615.457
epsilon/beta^2                                   0.00197
k/beta                                           0.00161
k^2/epsilon                                      0.00128
eta/xc                                             0.176
beta/xc                                             19.3
epsilon/xc^2                                       0.752
k/xc                                              0.0305
best fit no ext hazard_MedianLifetime              78.49
best fit no ext hazard_MaxLifetime                105.97
best fit_MedianLifetime                            78.2
best fit_MaxLifetime                              106.81
data_MedianLifetime                                74.5
data_MaxLifetime                                   106.5
ML_lnprob                                -370794.764814

percentile_16  \
xc/eta                                                                [5.534,
```

5.812]
beta/eta [109.782,
110.855]
xc^2/epsilon [1.3,
1.362]
xc [15.902,
16.852]
ExtH [7.824,
7.837]
eta [2.719,
2.877]
beta [303.485,
319.221]
epsilon [184.116,
207.345]
sqrt(xc/eta) [2.352,
2.411]
s= eta^0.5*xc^1.5/epsilon [0.546,
0.563]
beta*xc/epsilon [25.362,
26.191]
eta*xc/epsilon [0.236,
0.243]
Fx=beta^2/eta*xc [2052.51,
2188.129]
Dx =beta*epsilon/eta*xc^2 [82.747,
87.152]
Pk=beta*k/epsilon [0.807,
0.875]
Fk=beta^2/eta*k [68297.283,
71760.566]
Dk =beta*epsilon/eta*k^2 [76386.217,
85790.579]
Fk^2/Dk=beta^3/eta*epsilon [53360.687,
57965.504]
epsilon/beta^2 [0.0019,
0.00205]
k/beta [0.00157,
0.00165]
k^2/epsilon [0.0012,
0.00136]
eta/xc [0.172,
0.181]
beta/xc [18.767,
19.849]
epsilon/xc^2 [0.734,
0.769]

```
k/xc                                                    [0.0297,
0.0314]
best fit no ext hazard_MedianLifetime                       [78.0,
79.0]
best fit no ext hazard_MaxLifetime                      [105.97,
105.97]
best fit_MedianLifetime          [77.71000000000001,
78.71000000000001]
best fit_MaxLifetime                                    [106.81,
106.81]
data_MedianLifetime                                        [74.0,
75.0]
data_MaxLifetime                                          [106.5,
106.5]
ML_lnprob                      [-370794.76481385506,
-370794.76481385506]

percentile_50  \
xc/eta                                                    [5.534,
5.812]
beta/eta                                                [109.782,
110.855]
xc^2/epsilon                                                [1.3,
1.362]
xc                                                      [15.902,
16.852]
ExtH                                                      [7.824,
7.837]
eta                                                       [2.719,
2.877]
beta                                                    [303.485,
319.221]
epsilon                                                 [184.116,
207.345]
sqrt(xc/eta)                                              [2.352,
2.411]
s= eta^0.5*xc^1.5/epsilon                                 [0.546,
0.563]
beta*xc/epsilon                                         [25.362,
26.191]
eta*xc/epsilon                                            [0.236,
0.243]
Fx=beta^2/eta*xc                                      [2052.51,
2188.129]
Dx =beta*epsilon/eta*xc^2                               [82.747,
87.152]
Pk=beta*k/epsilon                                         [0.807,
```

```
0.875]
Fk=beta^2/eta*k                                          [68297.283,
71760.566]
Dk =beta*epsilon/eta*k^2                                 [76386.217,
85790.579]
Fk^2/Dk=beta^3/eta*epsilon                               [53360.687,
57965.504]
epsilon/beta^2                                               [0.0019,
0.00205]
k/beta                                                     [0.00157,
0.00165]
k^2/epsilon                                                  [0.0012,
0.00136]
eta/xc                                                          [0.172,
0.181]
beta/xc                                                      [18.767,
19.849]
epsilon/xc^2                                                    [0.734,
0.769]
k/xc                                                         [0.0297,
0.0314]
best fit no ext hazard_MedianLifetime                              [78.0,
79.0]
best fit no ext hazard_MaxLifetime                           [105.97,
105.97]
best fit_MedianLifetime                  [77.71000000000001,
78.71000000000001]
best fit_MaxLifetime                                         [106.81,
106.81]
data_MedianLifetime                                             [74.0,
75.0]
data_MaxLifetime                                                [106.5,
106.5]
ML_lnprob                            [-370794.76481385506,
-370794.76481385506]

percentile_95  \
xc/eta                                                          [5.534,
5.812]
beta/eta                                                   [109.782,
110.855]
xc^2/epsilon                                                     [1.3,
1.362]
xc                                                           [15.902,
16.852]
ExtH                                                            [7.824,
7.837]
```

```
eta                                                    [2.719,
2.877]
beta                                                 [303.485,
319.221]
epsilon                                              [184.116,
207.345]
sqrt(xc/eta)                                           [2.352,
2.411]
s= eta^0.5*xc^1.5/epsilon                              [0.546,
0.563]
beta*xc/epsilon                                      [25.362,
26.191]
eta*xc/epsilon                                         [0.236,
0.243]
Fx=beta^2/eta*xc                                   [2052.51,
2188.129]
Dx =beta*epsilon/eta*xc^2                            [82.747,
87.152]
Pk=beta*k/epsilon                                      [0.807,
0.875]
Fk=beta^2/eta*k                                    [68297.283,
71760.566]
Dk =beta*epsilon/eta*k^2                           [76386.217,
85790.579]
Fk^2/Dk=beta^3/eta*epsilon                         [53360.687,
57965.504]
epsilon/beta^2                                       [0.0019,
0.00205]
k/beta                                               [0.00157,
0.00165]
k^2/epsilon                                          [0.0012,
0.00136]
eta/xc                                                 [0.172,
0.181]
beta/xc                                              [18.767,
19.849]
epsilon/xc^2                                           [0.734,
0.769]
k/xc                                                 [0.0297,
0.0314]
best fit no ext hazard_MedianLifetime                     [78.0,
79.0]
best fit no ext hazard_MaxLifetime                   [105.97,
105.97]
best fit_MedianLifetime                  [77.71000000000001,
78.71000000000001]
best fit_MaxLifetime                                 [106.81,
```

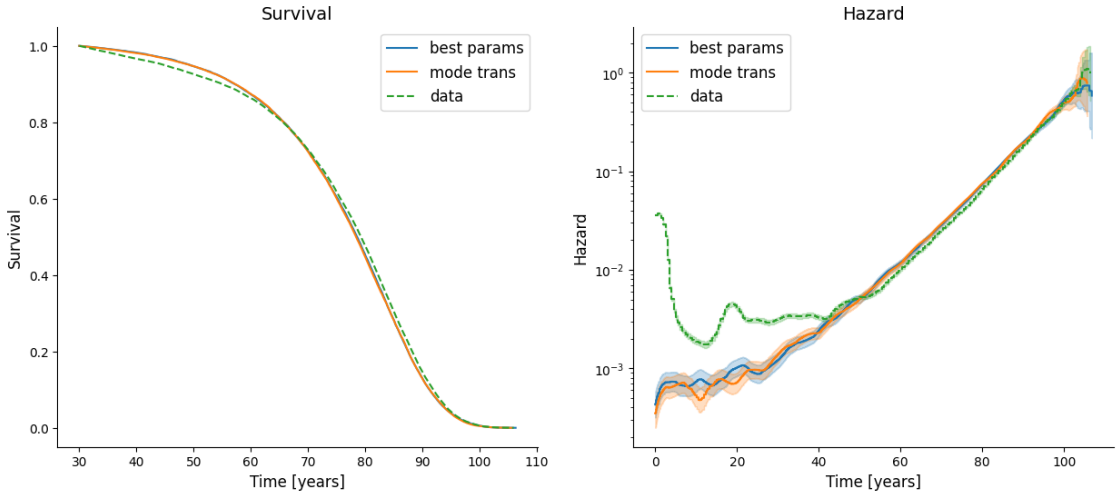
106.81]
data_MedianLifetime [74.0,
75.0]
data_MaxLifetime [106.5,
106.5]
ML_lnprob [-370794.76481385506,
-370794.76481385506]

	max_likelihood	mode_overall
xc/eta	5.607	5.607
beta/eta	110.326	110.326
xc^2/epsilon	1.33	1.33
xc	15.961	15.961
ExtH	7.833	7.833
eta	2.847	2.847
beta	314.073	314.073
epsilon	191.604	191.604
sqrt(xc/eta)	2.368	2.368
s= eta^0.5*xc^1.5/epsilon	0.562	0.562
beta*xc/epsilon	26.163	26.163
eta*xc/epsilon	0.237	0.237
Fx=beta^2/eta*xc	2170.9	2170.9
Dx =beta*epsilon/eta*xc^2	82.975	82.975
Pk=beta*k/epsilon	0.82	0.82
Fk=beta^2/eta*k	69300.572	69300.572
Dk =beta*epsilon/eta*k^2	84555.179	84555.179
Fk^2/Dk=beta^3/eta*epsilon	56798.05	56798.05
epsilon/beta^2	0.00194	0.00194
k/beta	0.00159	0.00159
k^2/epsilon	0.0013	0.0013
eta/xc	0.178	0.178
beta/xc	19.677	19.677
epsilon/xc^2	0.752	0.752
k/xc	0.0313	0.0313
best fit no ext hazard_MedianLifetime	78.49	NaN
best fit no ext hazard_MaxLifetime	105.97	NaN
best fit_MedianLifetime	78.2	NaN
best fit_MaxLifetime	106.81	NaN
data_MedianLifetime	74.5	NaN
data_MaxLifetime	106.5	NaN
ML_lnprob	-370794.764814	-370794.764814

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')
```