mcmc_analysis_Sweden_F_1910_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,)
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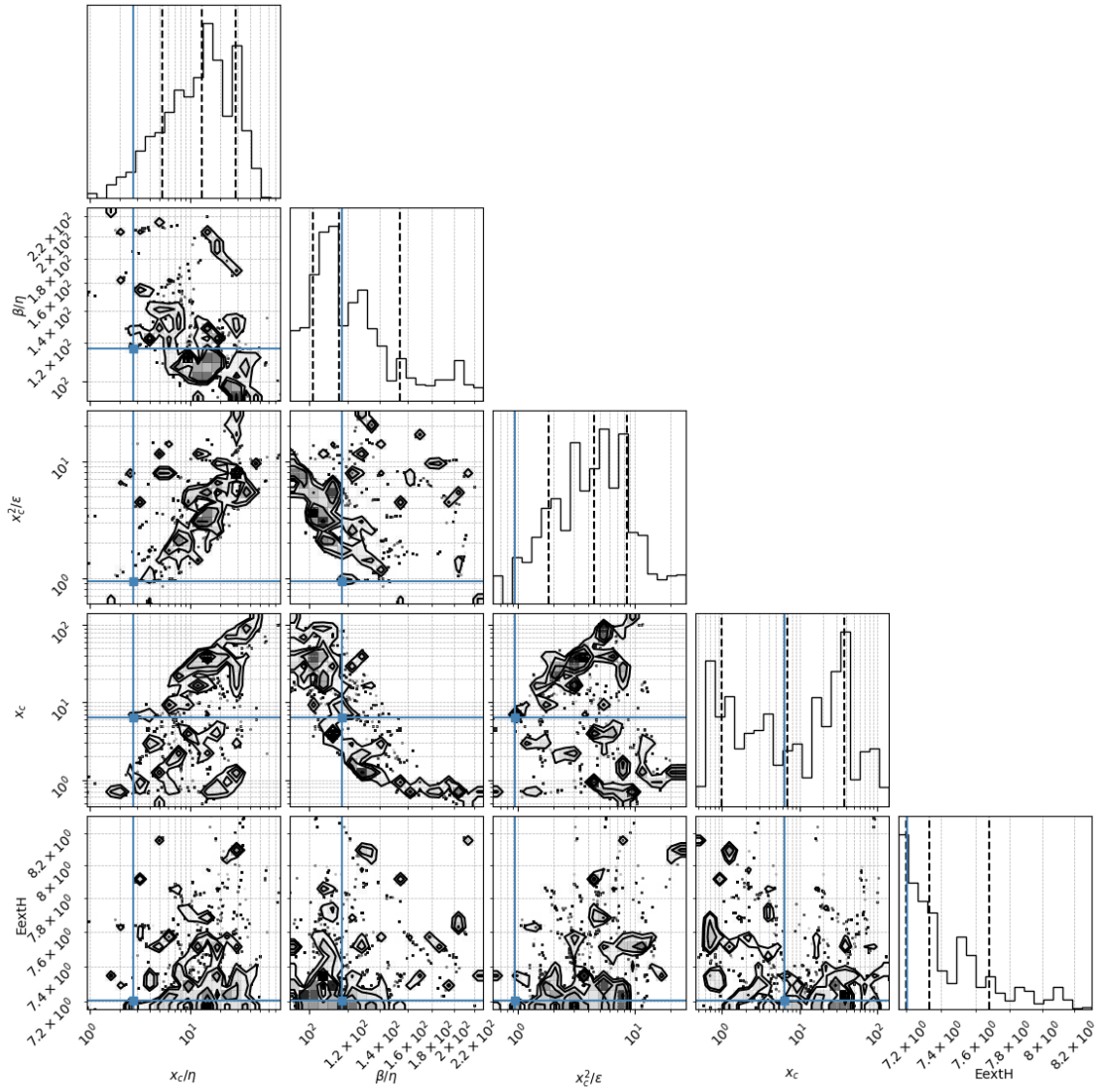
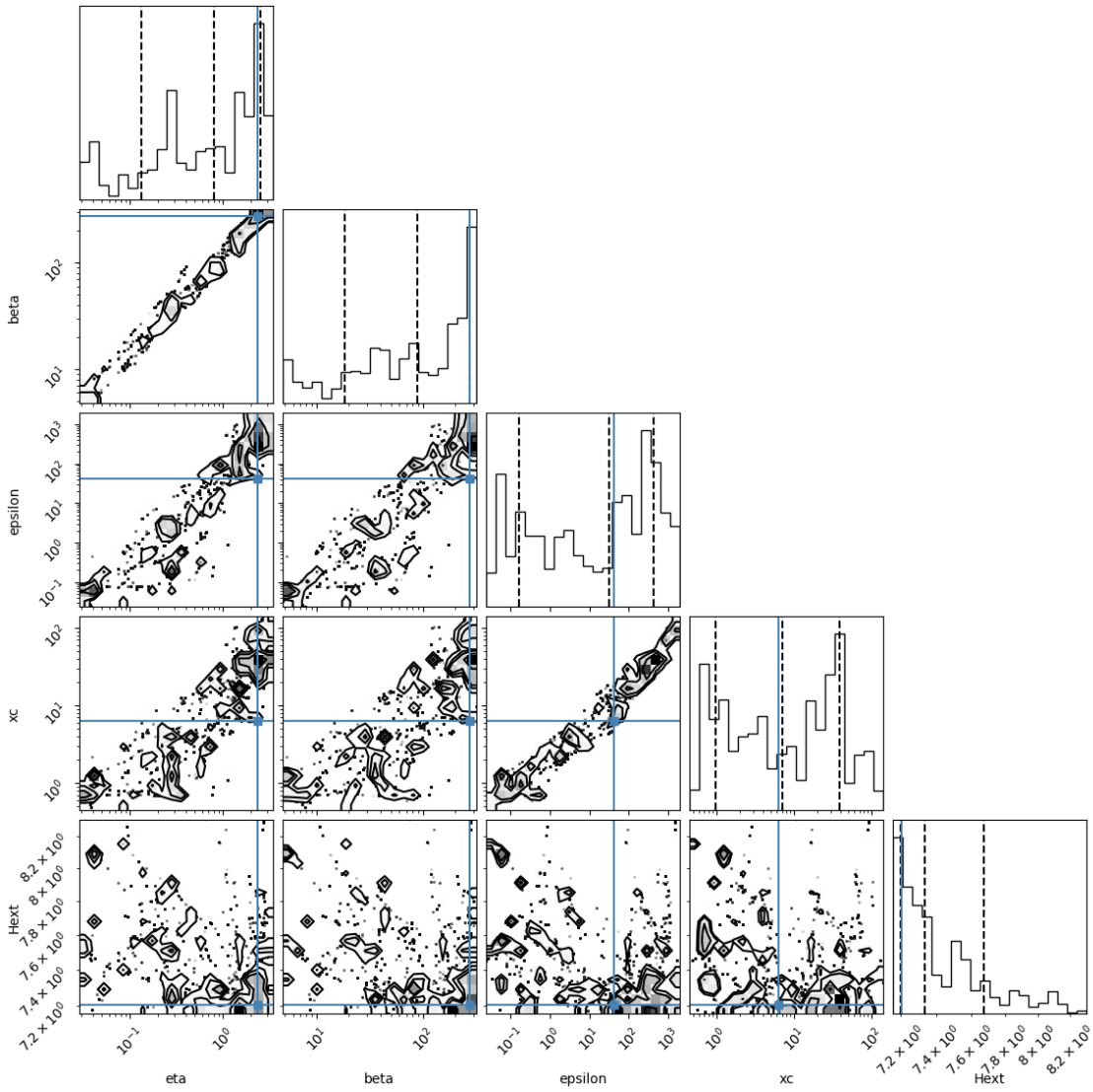
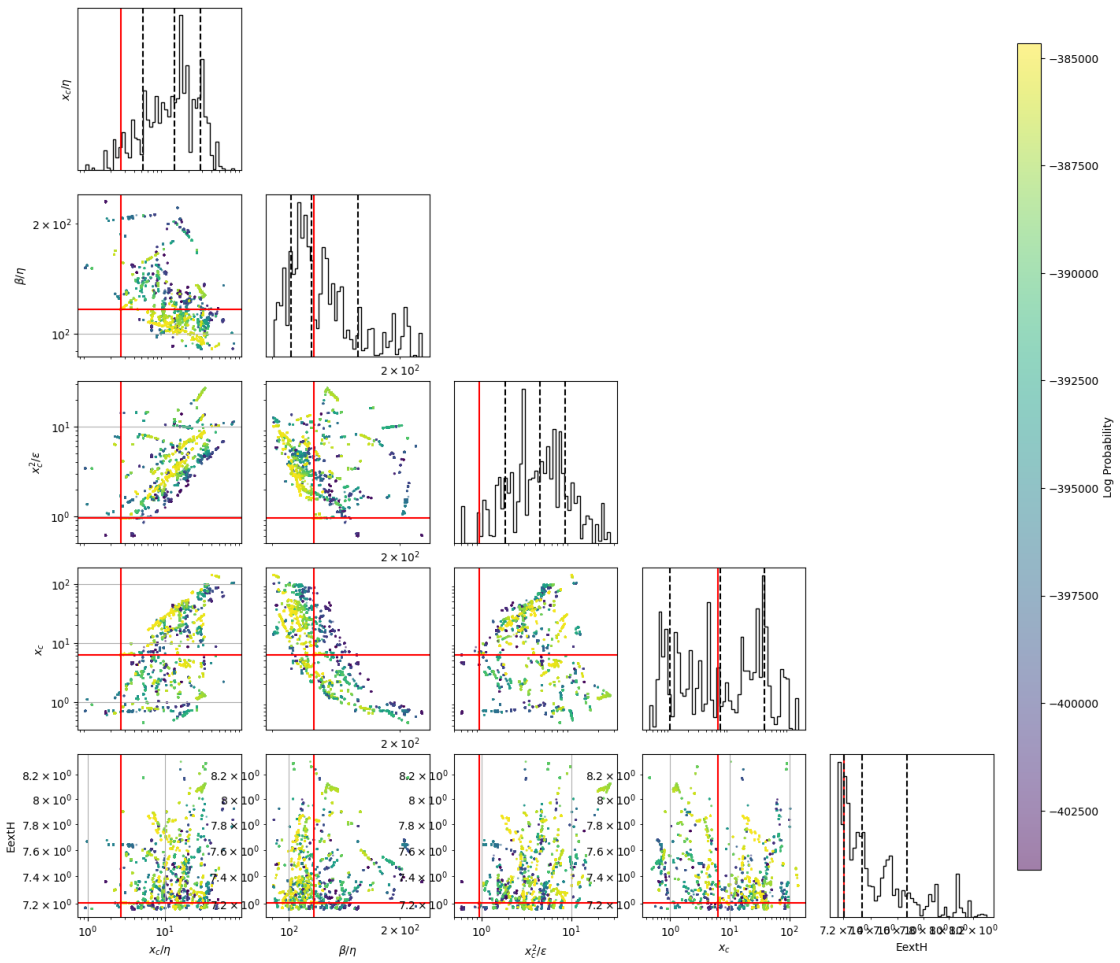

x_c/η
β/η
x_c^2/ε
x_c
EextH



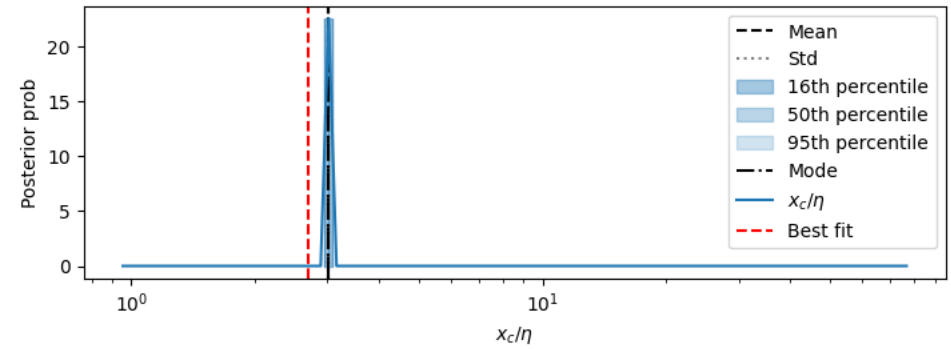
2 2. Heat map corner plot of raw samples

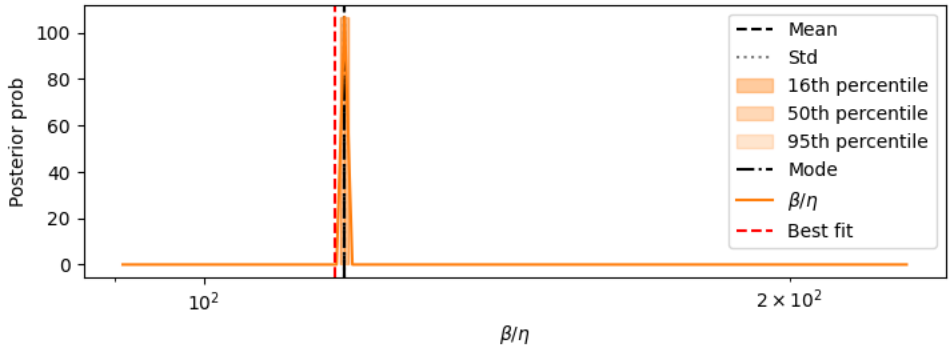
This plot shows all the raw sample points and their lnprobability

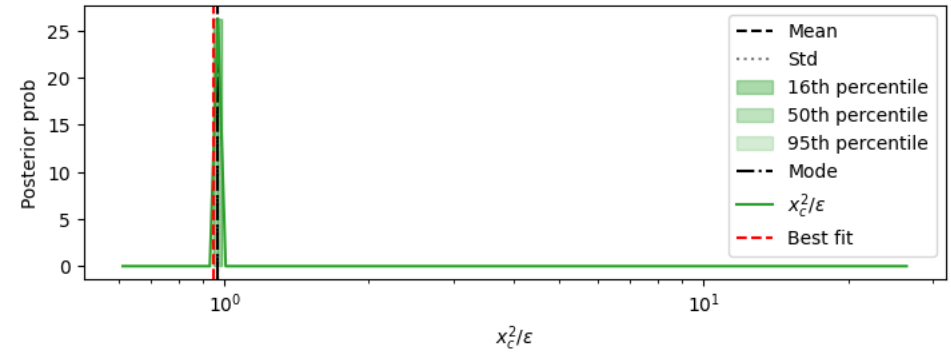


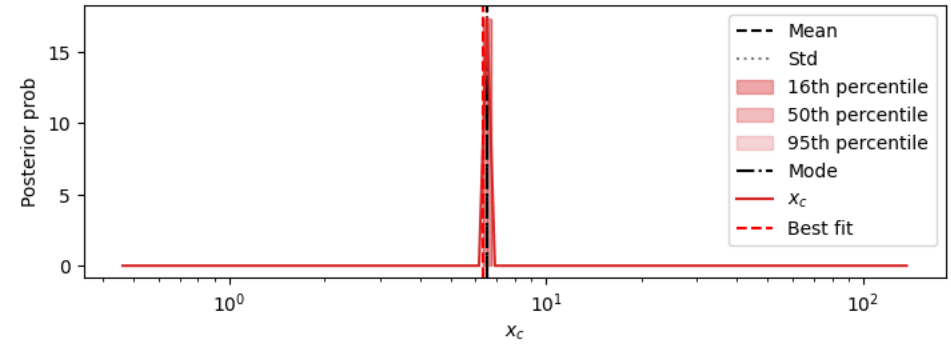
3 3. Posterior distributions of parameters

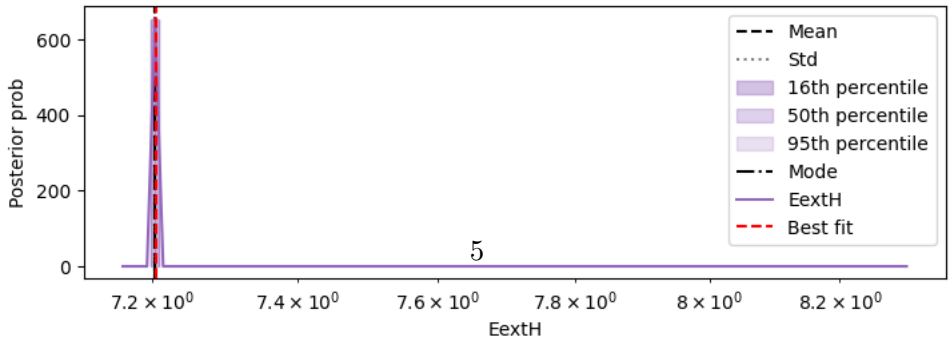
1d marginalizations of posterior distributions. we use a grid of size nbins=100-150


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


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

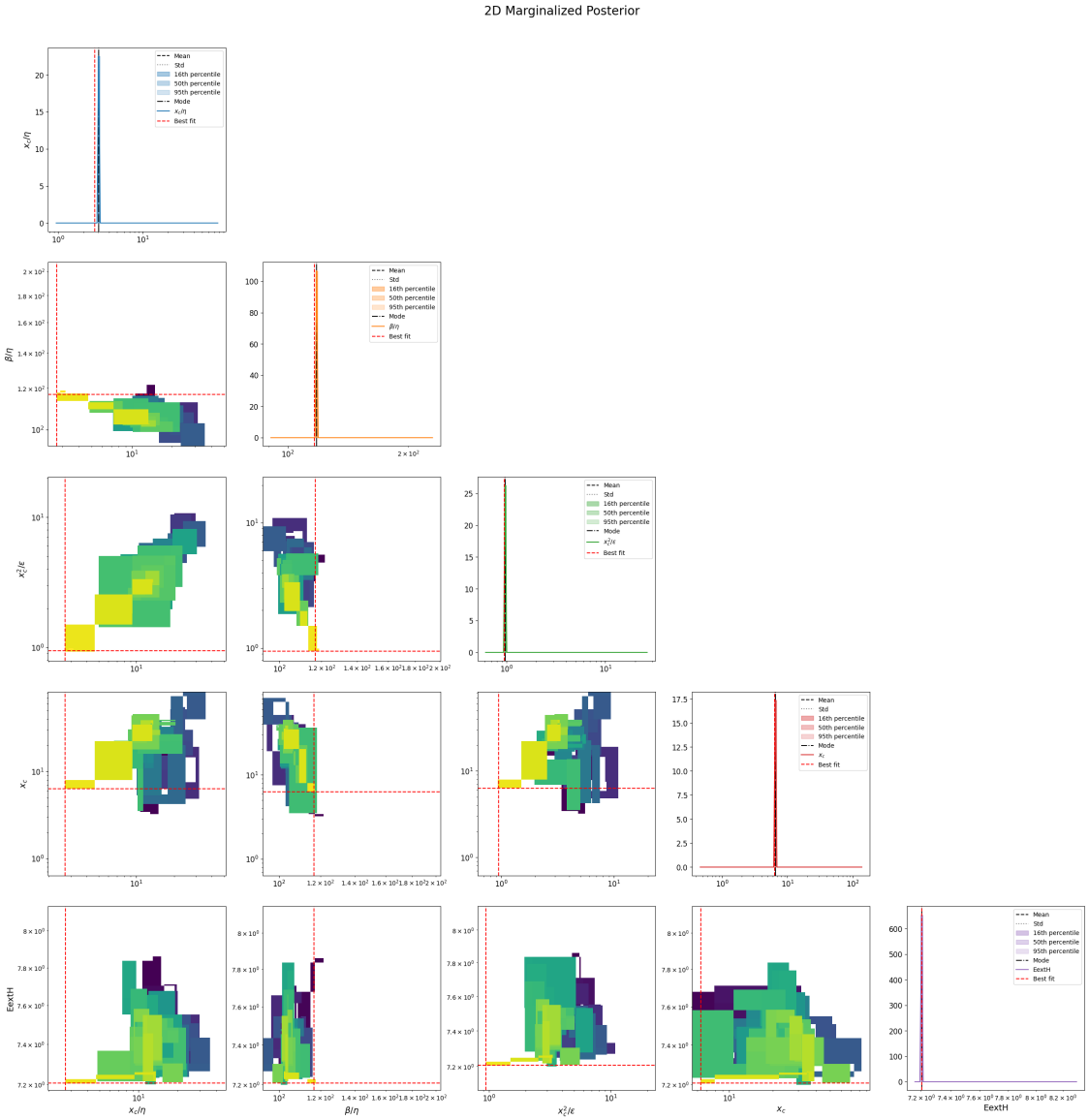

Mean
Std
16th percentile
50th percentile
95th percentile
Mode
x_c^2/ε
Best fit
Posterior prob
x_c^2/ε


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


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

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	3.019	
beta/eta	118.128	
xc^2/epsilon	0.967	
xc	6.523	
ExtH	7.204	
eta	2.315	
beta	275.803	
epsilon	44.486	
sqrt(xc/eta)	1.676	
s= eta^0.5*xc^1.5/epsilon	0.559	
beta*xc/epsilon	39.313	
eta*xc/epsilon	0.336	
Fx=beta^2/eta*xc	4916.645	
Dx =beta*epsilon/eta*xc^2	124.173	
Pk=beta*k/epsilon	3.163	
Fk=beta^2/eta*k	65167.097	
Dk =beta*epsilon/eta*k^2	18780.419	
Fk^2/Dk=beta^3/eta*epsilon	197542.77	
epsilon/beta^2	0.000555	
k/beta	0.00181	
k^2/epsilon	0.00561	
eta/xc	0.378	
beta/xc	42.296	
epsilon/xc^2	1.074	
k/xc	0.0811	
best fit no ext hazard_MedianLifetime	82.23	
best fit no ext hazard_MaxLifetime	106.9	
best fit_MedianLifetime	81.31	
best fit_MaxLifetime	106.24	
data_MedianLifetime	79.5	
data_MaxLifetime	110.0	
ML_lnprob	-384645.751982	

	std	\
xc/eta	[2.68e-05, 2.68e-05]	
beta/eta	[0.00011, 0.00011]	
xc^2/epsilon	[3.65e-06, 3.65e-06]	
xc	[4.85e-06, 4.85e-06]	
ExtH	[3.34e-11, 3.34e-11]	
eta	[8.22e-14, 8.22e-14]	

beta	[8.53e-12, 8.58e-12]
epsilon	[0.0, 0.0]
sqrt(xc/eta)	[0.0284, 0.0289]
s= eta^0.5*xc^1.5/epsilon	[0.00722, 0.00731]
beta*xc/epsilon	[0.6, 0.61]
eta*xc/epsilon	[0.00524, 0.00533]
Fx=beta^2/eta*xc	[105.357, 107.664]
Dx =beta*epsilon/eta*xc^2	[0.000218, 0.000218]
Pk=beta*k/epsilon	[2.03e-13, 2.03e-13]
Fk=beta^2/eta*k	[1.96e-09, 1.97e-09]
Dk =beta*epsilon/eta*k^2	[0.0, 0.0]
Fk^2/Dk=beta^3/eta*epsilon	[0.0, 0.0]
epsilon/beta^2	[7.06e-17, 7.06e-17]
k/beta	[5.62e-17, 5.64e-17]
k^2/epsilon	[0.0, 0.0]
eta/xc	[3.71e-14, 3.71e-14]
beta/xc	[1.54e-12, 1.54e-12]
epsilon/xc^2	[3e-14, 3.02e-14]
k/xc	[3.41e-15, 3.43e-15]
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	[-384645.7519822385, -384645.7519822385]

	mode \
xc/eta	3.019
beta/eta	118.128
xc^2/epsilon	0.967
xc	6.523
ExtH	7.204
eta	2.315
beta	275.803
epsilon	44.486
sqrt(xc/eta)	1.662
s= eta^0.5*xc^1.5/epsilon	0.563
beta*xc/epsilon	39.598
eta*xc/epsilon	0.338
Fx=beta^2/eta*xc	4966.616
Dx =beta*epsilon/eta*xc^2	124.173
Pk=beta*k/epsilon	3.163
Fk=beta^2/eta*k	65167.097
Dk =beta*epsilon/eta*k^2	18780.419
Fk^2/Dk=beta^3/eta*epsilon	197542.77
epsilon/beta^2	0.000555

k/beta	0.00181
k^2/epsilon	0.00561
eta/xc	0.378
beta/xc	42.296
epsilon/xc^2	1.074
k/xc	0.0811
best fit no ext hazard_MedianLifetime	82.23
best fit no ext hazard_MaxLifetime	106.9
best fit_MedianLifetime	81.31
best fit_MaxLifetime	106.24
data_MedianLifetime	79.5
data_MaxLifetime	110.0
ML_lnprob	-384645.751982

	percentile_16 \
xc/eta	[2.953, 3.086]
beta/eta	[117.576, 118.682]
xc^2/epsilon	[0.949, 0.986]
xc	[6.338, 6.714]
ExtH	[7.198, 7.209]
eta	[2.26, 2.371]
beta	[270.076, 281.652]
epsilon	[42.036, 47.079]
sqrt(xc/eta)	[1.644, 1.681]
s= eta^0.5*xc^1.5/epsilon	[0.553, 0.572]
beta*xc/epsilon	[38.816, 40.396]
eta*xc/epsilon	[0.331, 0.344]
Fx=beta^2/eta*xc	[4828.24, 5108.957]
Dx =beta*epsilon/eta*xc^2	[121.478, 126.928]
Pk=beta*k/epsilon	[3.028, 3.303]
Fk=beta^2/eta*k	[63819.92, 66542.712]
Dk =beta*epsilon/eta*k^2	[17804.712, 19809.594]
Fk^2/Dk=beta^3/eta*epsilon	[188712.904, 206785.786]
epsilon/beta^2	[0.000532, 0.00058]
k/beta	[0.00177, 0.00185]
k^2/epsilon	[0.0053, 0.00594]
eta/xc	[0.37, 0.387]
beta/xc	[41.27, 43.347]
epsilon/xc^2	[1.053, 1.094]
k/xc	[0.0788, 0.0835]
best fit no ext hazard_MedianLifetime	[81.74000000000001, 82.74000000000001]
best fit no ext hazard_MaxLifetime	[106.9, 106.9]
best fit_MedianLifetime	[80.82000000000001, 81.82000000000001]
best fit_MaxLifetime	[106.24, 106.24]
data_MedianLifetime	[79.0, 80.0]
data_MaxLifetime	[110.0, 110.0]

```
ML_lnprob                                [-384645.7519822385, -384645.7519822385]

                                                                      percentile_50
\
xc/eta                                                                   [2.953, 3.086]
beta/eta                                                               [117.576, 118.682]
xc^2/epsilon                                                             [0.949, 0.986]
xc                                                                       [6.338, 6.714]
ExtH                                                                     [7.198, 7.209]
eta                                                                       [2.26, 2.371]
beta                                                                   [270.076, 281.652]
epsilon                                                                  [42.036, 47.079]
sqrt(xc/eta)                                                             [1.644, 1.681]
s= eta^0.5*xc^1.5/epsilon                                                [0.553, 0.572]
beta*xc/epsilon                                                          [38.816, 40.396]
eta*xc/epsilon                                                           [0.331, 0.344]
Fx=beta^2/eta*xc                                                       [4828.24, 5108.957]
Dx =beta*epsilon/eta*xc^2                                               [121.478, 126.928]
Pk=beta*k/epsilon                                                        [3.028, 3.303]
Fk=beta^2/eta*k                                                      [63819.92, 66542.712]
Dk =beta*epsilon/eta*k^2                                             [17804.712, 19809.594]
Fk^2/Dk=beta^3/eta*epsilon                                         [188712.904, 206785.786]
epsilon/beta^2                                                         [0.000532, 0.00058]
k/beta                                                                 [0.00177, 0.00185]
k^2/epsilon                                                             [0.0053, 0.00594]
eta/xc                                                                   [0.37, 0.387]
beta/xc                                                                 [41.27, 43.347]
epsilon/xc^2                                                             [1.053, 1.094]
k/xc                                                                    [0.0788, 0.0835]
best fit no ext hazard_MedianLifetime    [81.74000000000001, 82.74000000000001]
best fit no ext hazard_MaxLifetime                                       [106.9, 106.9]
best fit_MedianLifetime                  [80.82000000000001, 81.82000000000001]
best fit_MaxLifetime                                                    [106.24, 106.24]
data_MedianLifetime                                                        [79.0, 80.0]
data_MaxLifetime                                                        [110.0, 110.0]
ML_lnprob                                [-384645.7519822385, -384645.7519822385]

                                                                      percentile_95
\
xc/eta                                                                   [2.953, 3.086]
beta/eta                                                               [117.576, 118.682]
xc^2/epsilon                                                             [0.949, 0.986]
xc                                                                       [6.338, 6.714]
ExtH                                                                     [7.198, 7.209]
eta                                                                       [2.26, 2.371]
beta                                                                   [270.076, 281.652]
epsilon                                                                  [42.036, 47.079]
```

sqrt(xc/eta)	[1.608, 1.757]
s= eta^0.5*xc^1.5/epsilon	[0.535, 0.572]
beta*xc/epsilon	[37.299, 40.396]
eta*xc/epsilon	[0.319, 0.344]
Fx=beta^2/eta*xc	[4562.946, 5108.957]
Dx =beta*epsilon/eta*xc^2	[121.478, 126.928]
Pk=beta*k/epsilon	[3.028, 3.303]
Fk=beta^2/eta*k	[63819.92, 66542.712]
Dk =beta*epsilon/eta*k^2	[17804.712, 19809.594]
Fk^2/Dk=beta^3/eta*epsilon	[188712.904, 206785.786]
epsilon/beta^2	[0.000532, 0.00058]
k/beta	[0.00177, 0.00185]
k^2/epsilon	[0.0053, 0.00594]
eta/xc	[0.37, 0.387]
beta/xc	[41.27, 43.347]
epsilon/xc^2	[1.053, 1.094]
k/xc	[0.0788, 0.0835]
best fit no ext hazard_MedianLifetime	[81.74000000000001, 82.74000000000001]
best fit no ext hazard_MaxLifetime	[106.9, 106.9]
best fit_MedianLifetime	[80.82000000000001, 81.82000000000001]
best fit_MaxLifetime	[106.24, 106.24]
data_MedianLifetime	[79.0, 80.0]
data_MaxLifetime	[110.0, 110.0]
ML_lnprob	[-384645.7519822385, -384645.7519822385]

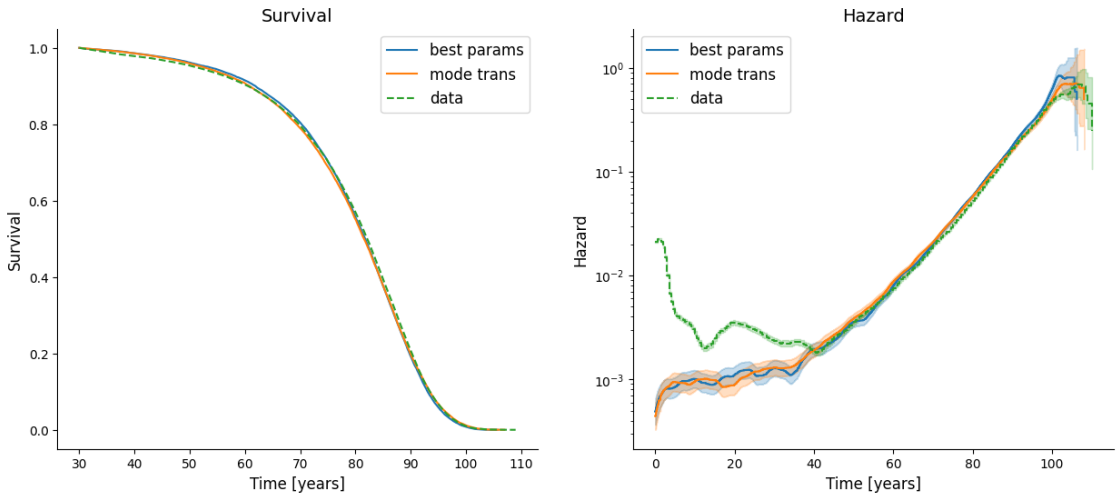
	max_likelihood	mode_overall
xc/eta	2.701	2.98
beta/eta	116.724	118.134
xc^2/epsilon	0.945	0.955
xc	6.326	6.598
ExtH	7.206	7.201
eta	2.342	2.342
beta	273.406	273.406
epsilon	42.33	42.33
sqrt(xc/eta)	1.643	1.675
s= eta^0.5*xc^1.5/epsilon	0.575	0.566
beta*xc/epsilon	40.86	39.648
eta*xc/epsilon	0.35	0.338
Fx=beta^2/eta*xc	5044.572	4899.297
Dx =beta*epsilon/eta*xc^2	123.46	123.569
Pk=beta*k/epsilon	3.229	3.229
Fk=beta^2/eta*k	63826.067	63826.067
Dk =beta*epsilon/eta*k^2	19763.934	19763.934
Fk^2/Dk=beta^3/eta*epsilon	206121.251	206121.251
epsilon/beta^2	0.000566	0.000566
k/beta	0.00183	0.00183
k^2/epsilon	0.00591	0.00591

eta/xc	0.37	0.37
beta/xc	43.218	43.218
epsilon/xc^2	1.058	1.058
k/xc	0.079	0.079
best fit no ext hazard_MedianLifetime	82.23	NaN
best fit no ext hazard_MaxLifetime	106.9	NaN
best fit_MedianLifetime	81.31	NaN
best fit_MaxLifetime	106.24	NaN
data_MedianLifetime	79.5	NaN
data_MaxLifetime	110.0	NaN
ML_lnprob	-384645.751982	-384645.751982

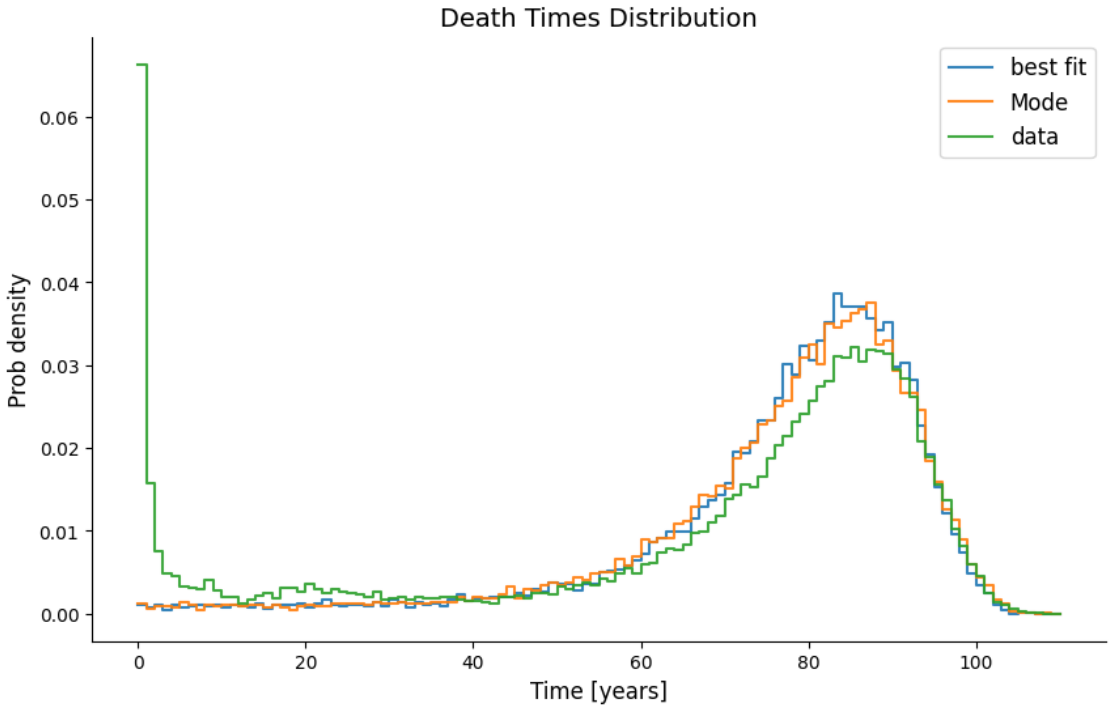
5 5. Fits of simulations to data

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')
```


Death Times Distribution
best fit
Mode
data
Prob density
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0
20
40
60
80
100
Time [years]