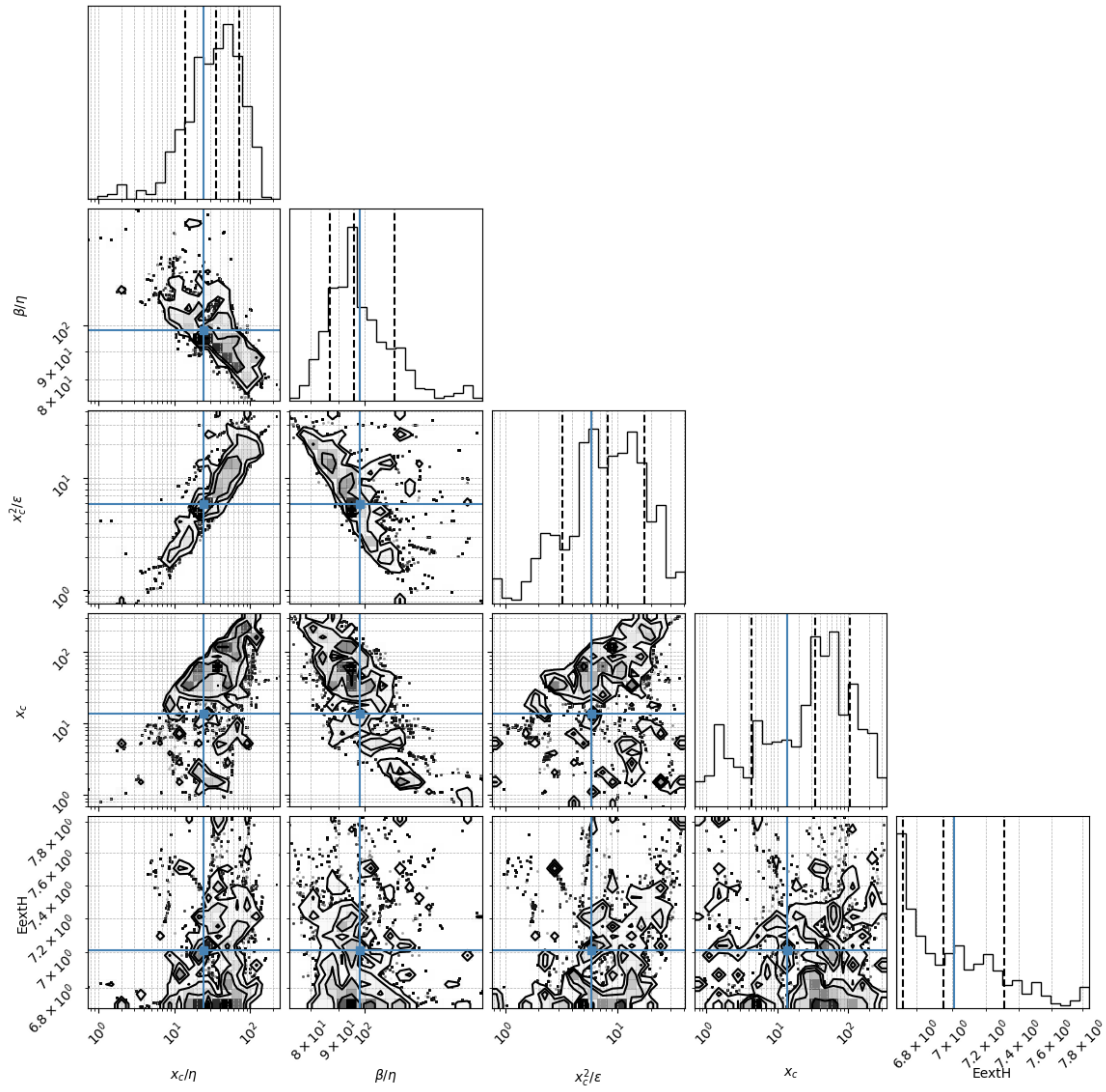
mcmc_analysis_Sweden_M_1910_hetro_baysian

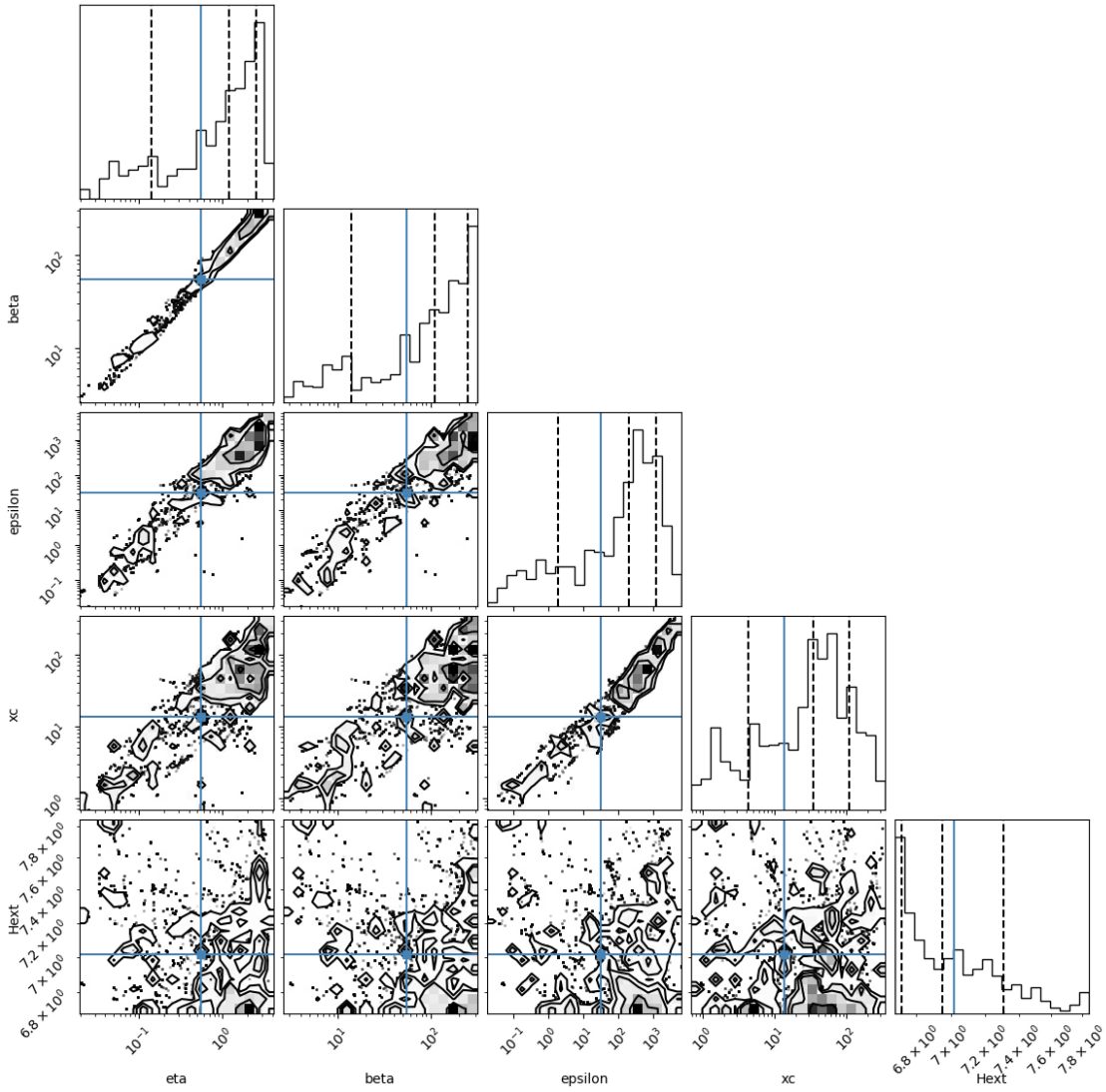
November 24, 2025

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

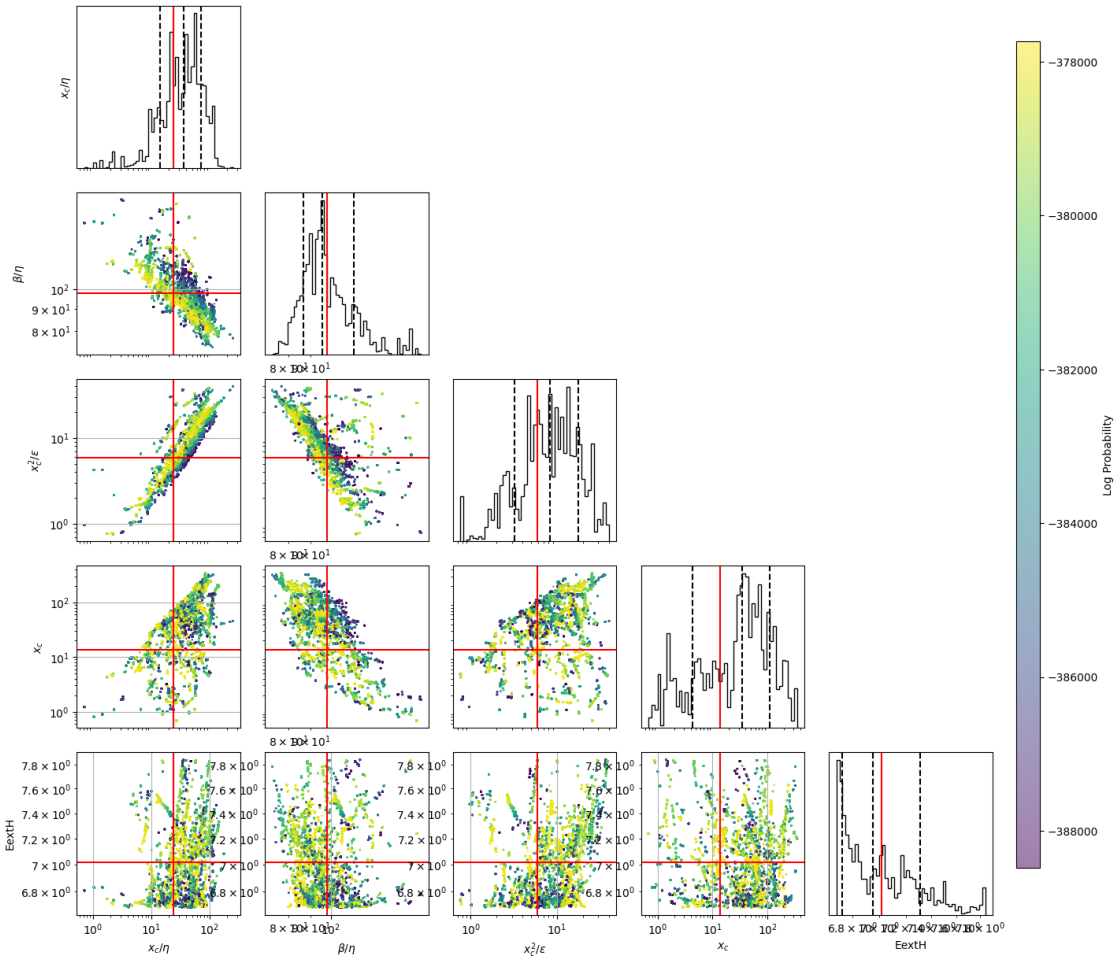
```
(25,)
```


x_c/η
β/η
x_c^2/ε
x_c
EextH



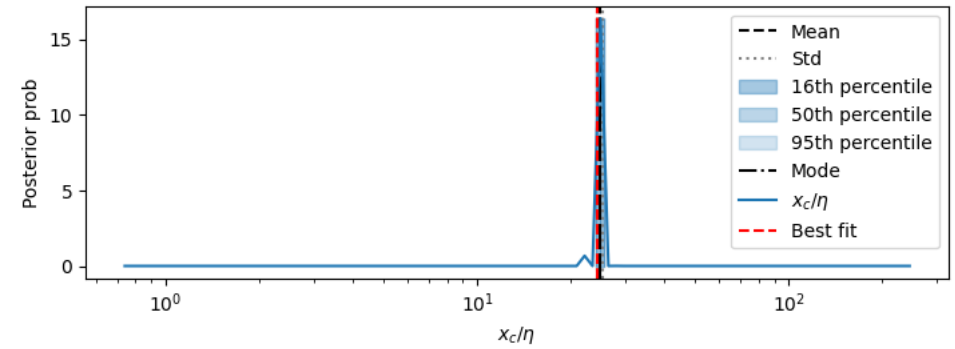
2 2. Heat map corner plot of raw samples

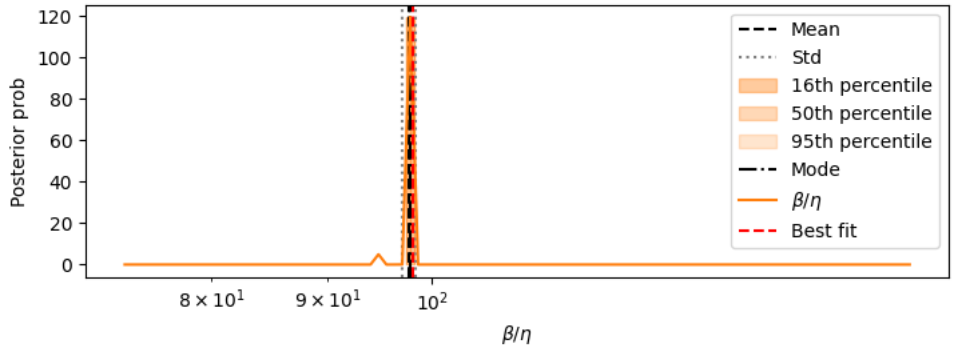
This plot shows all the raw sample points and their lnprobability

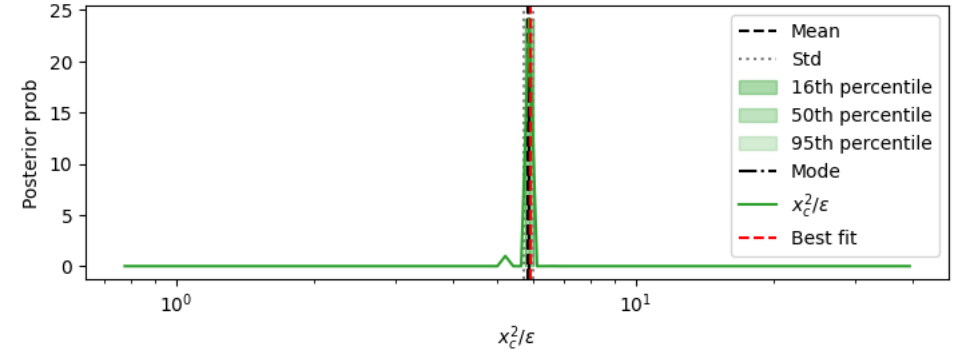


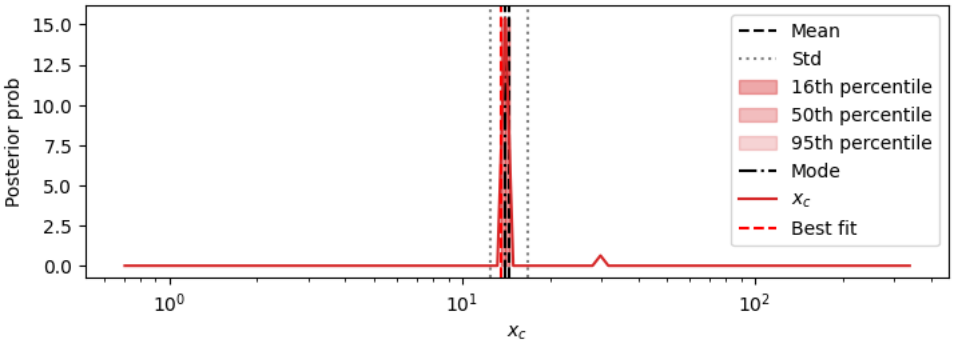
3 3. Posterior distributions of parameters

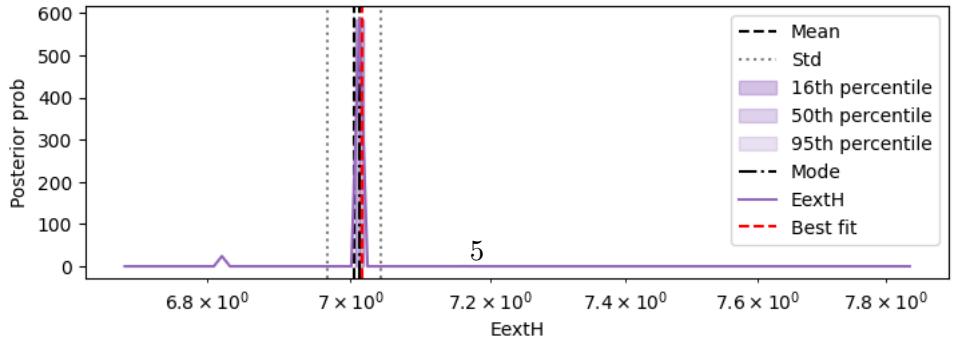
1d marginalizations of posterior distributions. we use a grid of size nbins=100-150


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

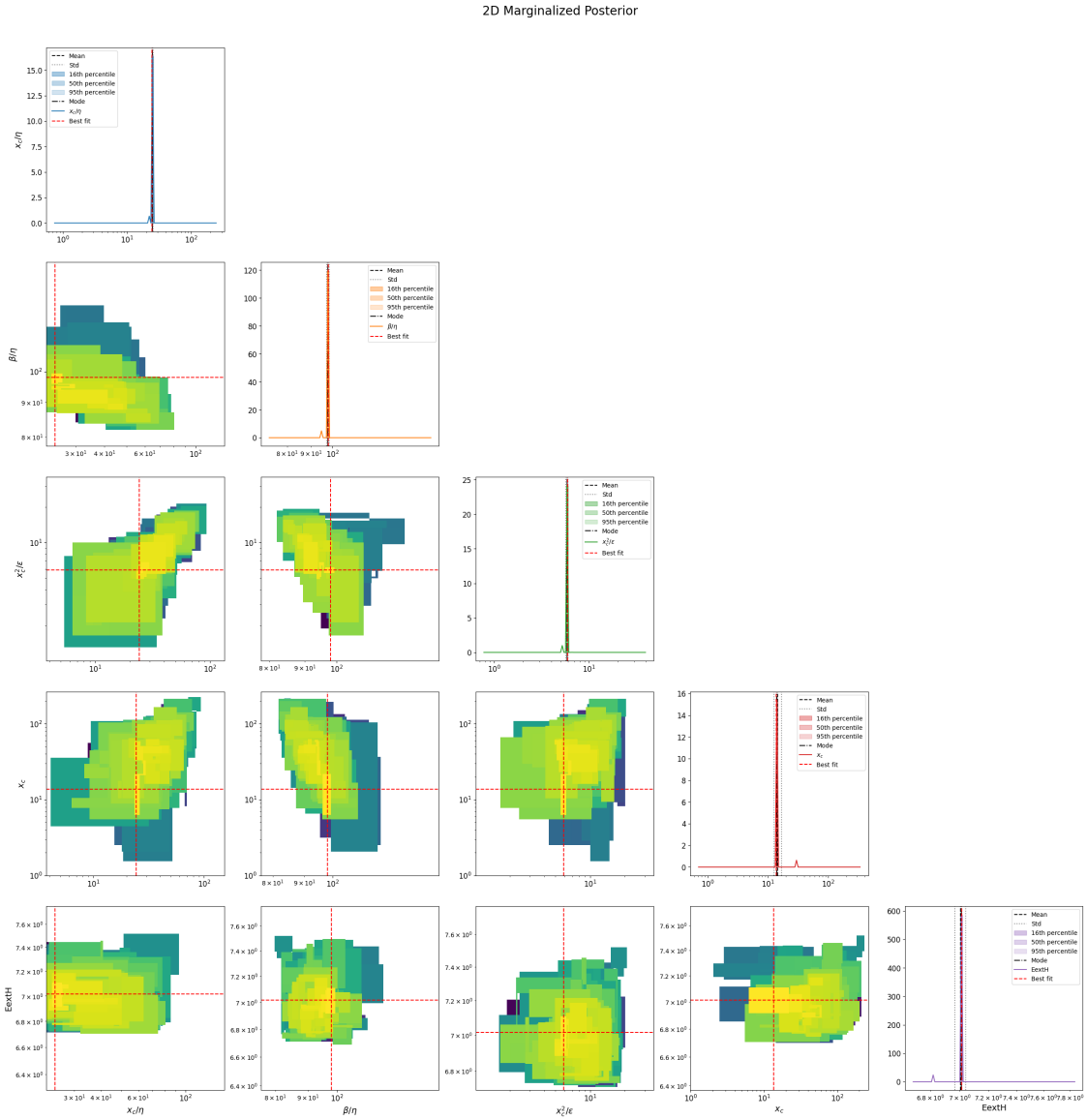

Posterior prob
x_c^2/ε
Mean
Std
16th percentile
50th percentile
95th percentile
Mode
x_c^2/ε
Best fit


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	24.776	
beta/eta	97.703	
xc^2/epsilon	5.839	
xc	14.511	
ExtH	7.005	
eta	0.576	
beta	57.115	
epsilon	33.873	
sqrt(xc/eta)	4.978	
s= eta^0.5*xc^1.5/epsilon	1.195	
beta*xc/epsilon	24.063	
eta*xc/epsilon	0.243	
Fx=beta^2/eta*xc	390.062	
Dx =beta*epsilon/eta*xc^2	16.976	
Pk=beta*k/epsilon	0.84	
Fk=beta^2/eta*k	10959.393	
Dk =beta*epsilon/eta*k^2	13700.654	
Fk^2/Dk=beta^3/eta*epsilon	9055.037	
epsilon/beta^2	0.0104	
k/beta	0.00875	
k^2/epsilon	0.00737	
eta/xc	0.0404	
beta/xc	3.976	
epsilon/xc^2	0.171	
k/xc	0.0344	
best fit no ext hazard_MedianLifetime	76.95	
best fit no ext hazard_MaxLifetime	108.53	
best fit_MedianLifetime	75.83	
best fit_MaxLifetime	107.45	
data_MedianLifetime	72.5	
data_MaxLifetime	107.5	
ML_lnprob	-377729.849896	

	std	\
xc/eta	[0.562, 0.575]	
beta/eta	[0.61, 0.614]	
xc^2/epsilon	[0.135, 0.138]	
xc	[1.97, 2.28]	
ExtH	[0.038, 0.0382]	
eta	[0.0937, 0.112]	

beta	[8.878, 10.511]
epsilon	[9.361, 12.935]
sqrt(xc/eta)	[0.0568, 0.0575]
s= eta^0.5*xc^1.5/epsilon	[0.0192, 0.0195]
beta*xc/epsilon	[0.365, 0.371]
eta*xc/epsilon	[0.00165, 0.00166]
Fx=beta^2/eta*xc	[0.977, 0.979]
Dx =beta*epsilon/eta*xc^2	[0.16, 0.162]
Pk=beta*k/epsilon	[0.133, 0.158]
Fk=beta^2/eta*k	[1663.961, 1961.825]
Dk =beta*epsilon/eta*k^2	[3879.706, 5412.36]
Fk^2/Dk=beta^3/eta*epsilon	[33.568, 33.693]
epsilon/beta^2	[3.63e-05, 3.64e-05]
k/beta	[0.00136, 0.00161]
k^2/epsilon	[0.00204, 0.00281]
eta/xc	[0.000916, 0.000937]
beta/xc	[0.0508, 0.0514]
epsilon/xc^2	[0.00395, 0.00404]
k/xc	[0.00468, 0.00541]
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	[-377729.8498961141, -377729.8498961141]

	mode \
xc/eta	24.89
beta/eta	97.827
xc^2/epsilon	5.866
xc	14.087
ExtH	7.012
eta	0.556
beta	55.19
epsilon	31.72
sqrt(xc/eta)	4.989
s= eta^0.5*xc^1.5/epsilon	1.198
beta*xc/epsilon	24.139
eta*xc/epsilon	0.243
Fx=beta^2/eta*xc	390.079
Dx =beta*epsilon/eta*xc^2	16.945
Pk=beta*k/epsilon	0.87
Fk=beta^2/eta*k	10599.318
Dk =beta*epsilon/eta*k^2	12805.06
Fk^2/Dk=beta^3/eta*epsilon	9055.62
epsilon/beta^2	0.0104

k/beta	0.00906
k^2/epsilon	0.00787
eta/xc	0.0402
beta/xc	3.966
epsilon/xc^2	0.17
k/xc	0.0355
best fit no ext hazard_MedianLifetime	76.95
best fit no ext hazard_MaxLifetime	108.53
best fit_MedianLifetime	75.83
best fit_MaxLifetime	107.45
data_MedianLifetime	72.5
data_MaxLifetime	107.5
ML_lnprob	-377729.849896

	percentile_16 \
xc/eta	[24.171, 25.63]
beta/eta	[97.436, 98.221]
xc^2/epsilon	[5.751, 5.984]
xc	[13.655, 14.534]
ExtH	[7.007, 7.018]
eta	[0.541, 0.571]
beta	[53.878, 56.534]
epsilon	[29.76, 33.809]
sqrt(xc/eta)	[4.916, 5.063]
s= eta^0.5*xc^1.5/epsilon	[1.182, 1.215]
beta*xc/epsilon	[23.672, 24.615]
eta*xc/epsilon	[0.239, 0.247]
Fx=beta^2/eta*xc	[376.461, 404.189]
Dx =beta*epsilon/eta*xc^2	[16.552, 17.347]
Pk=beta*k/epsilon	[0.828, 0.914]
Fk=beta^2/eta*k	[10353.614, 10850.853]
Dk =beta*epsilon/eta*k^2	[12047.655, 13610.081]
Fk^2/Dk=beta^3/eta*epsilon	[8588.363, 9548.298]
epsilon/beta^2	[0.0099, 0.0109]
k/beta	[0.00884, 0.00928]
k^2/epsilon	[0.00738, 0.00839]
eta/xc	[0.039, 0.0414]
beta/xc	[3.84, 4.097]
epsilon/xc^2	[0.167, 0.174]
k/xc	[0.0344, 0.0366]
best fit no ext hazard_MedianLifetime	[76.46000000000001, 77.46000000000001]
best fit no ext hazard_MaxLifetime	[108.53, 108.53]
best fit_MedianLifetime	[75.34, 76.34]
best fit_MaxLifetime	[107.45, 107.45]
data_MedianLifetime	[72.01, 73.0]
data_MaxLifetime	[107.5, 107.5]

ML_lnprob	[-377729.8498961141, -377729.8498961141]

	percentile_50 \
xc/eta	[24.171, 25.63]
beta/eta	[97.436, 98.221]
xc^2/epsilon	[5.751, 5.984]
xc	[13.655, 14.534]
ExtH	[7.007, 7.018]
eta	[0.541, 0.571]
beta	[53.878, 56.534]
epsilon	[29.76, 33.809]
sqrt(xc/eta)	[4.916, 5.063]
s= eta^0.5*xc^1.5/epsilon	[1.182, 1.215]
beta*xc/epsilon	[23.672, 24.615]
eta*xc/epsilon	[0.239, 0.247]
Fx=beta^2/eta*xc	[376.461, 404.189]
Dx =beta*epsilon/eta*xc^2	[16.552, 17.347]
Pk=beta*k/epsilon	[0.828, 0.914]
Fk=beta^2/eta*k	[10353.614, 10850.853]
Dk =beta*epsilon/eta*k^2	[12047.655, 13610.081]
Fk^2/Dk=beta^3/eta*epsilon	[8588.363, 9548.298]
epsilon/beta^2	[0.0099, 0.0109]
k/beta	[0.00884, 0.00928]
k^2/epsilon	[0.00738, 0.00839]
eta/xc	[0.039, 0.0414]
beta/xc	[3.84, 4.097]
epsilon/xc^2	[0.167, 0.174]
k/xc	[0.0344, 0.0366]
best fit no ext hazard_MedianLifetime	[76.46000000000001, 77.46000000000001]
best fit no ext hazard_MaxLifetime	[108.53, 108.53]
best fit_MedianLifetime	[75.34, 76.34]
best fit_MaxLifetime	[107.45, 107.45]
data_MedianLifetime	[72.01, 73.0]
data_MaxLifetime	[107.5, 107.5]
ML_lnprob	[-377729.8498961141, -377729.8498961141]

	percentile_95 \
xc/eta	[24.171, 25.63]
beta/eta	[97.436, 98.221]
xc^2/epsilon	[5.751, 5.984]
xc	[13.655, 14.534]
ExtH	[7.007, 7.018]
eta	[0.541, 0.571]
beta	[53.878, 56.534]
epsilon	[29.76, 33.809]

sqrt(xc/eta)	[4.916, 5.063]
s= eta^0.5*xc^1.5/epsilon	[1.182, 1.215]
beta*xc/epsilon	[23.672, 24.615]
eta*xc/epsilon	[0.239, 0.247]
Fx=beta^2/eta*xc	[376.461, 404.189]
Dx =beta*epsilon/eta*xc^2	[16.552, 17.347]
Pk=beta*k/epsilon	[0.828, 0.914]
Fk=beta^2/eta*k	[10353.614, 10850.853]
Dk =beta*epsilon/eta*k^2	[12047.655, 13610.081]
Fk^2/Dk=beta^3/eta*epsilon	[8588.363, 9548.298]
epsilon/beta^2	[0.0099, 0.0109]
k/beta	[0.00884, 0.00928]
k^2/epsilon	[0.00738, 0.00839]
eta/xc	[0.039, 0.0414]
beta/xc	[3.84, 4.097]
epsilon/xc^2	[0.167, 0.174]
k/xc	[0.0344, 0.0366]
best fit no ext hazard_MedianLifetime	[76.46000000000001, 77.46000000000001]
best fit no ext hazard_MaxLifetime	[108.53, 108.53]
best fit_MedianLifetime	[75.34, 76.34]
best fit_MaxLifetime	[107.45, 107.45]
data_MedianLifetime	[72.01, 73.0]
data_MaxLifetime	[107.5, 107.5]
ML_lnprob	[-377729.8498961141, -377729.8498961141]

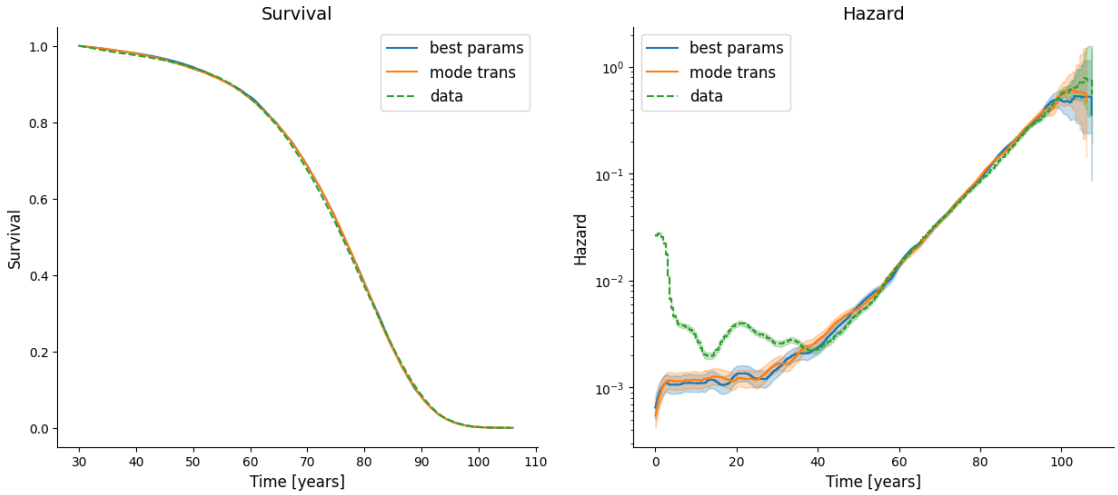
	max_likelihood	mode_overall
xc/eta	24.312	24.312
beta/eta	98.043	98.043
xc^2/epsilon	5.903	5.903
xc	13.662	13.662
ExtH	7.015	7.015
eta	0.562	0.562
beta	55.092	55.092
epsilon	31.616	31.616
sqrt(xc/eta)	4.931	4.931
s= eta^0.5*xc^1.5/epsilon	1.197	1.197
beta*xc/epsilon	23.806	23.806
eta*xc/epsilon	0.243	0.243
Fx=beta^2/eta*xc	395.374	395.374
Dx =beta*epsilon/eta*xc^2	16.608	16.608
Pk=beta*k/epsilon	0.871	0.871
Fk=beta^2/eta*k	10802.884	10802.884
Dk =beta*epsilon/eta*k^2	12398.764	12398.764
Fk^2/Dk=beta^3/eta*epsilon	9412.415	9412.415
epsilon/beta^2	0.0104	0.0104
k/beta	0.00908	0.00908
k^2/epsilon	0.00791	0.00791

eta/xc	0.0411	0.0411
beta/xc	4.033	4.033
epsilon/xc^2	0.169	0.169
k/xc	0.0366	0.0366
best fit no ext hazard_MedianLifetime	76.95	NaN
best fit no ext hazard_MaxLifetime	108.53	NaN
best fit_MedianLifetime	75.83	NaN
best fit_MaxLifetime	107.45	NaN
data_MedianLifetime	72.5	NaN
data_MaxLifetime	107.5	NaN
ML_lnprob	-377729.849896	-377729.849896

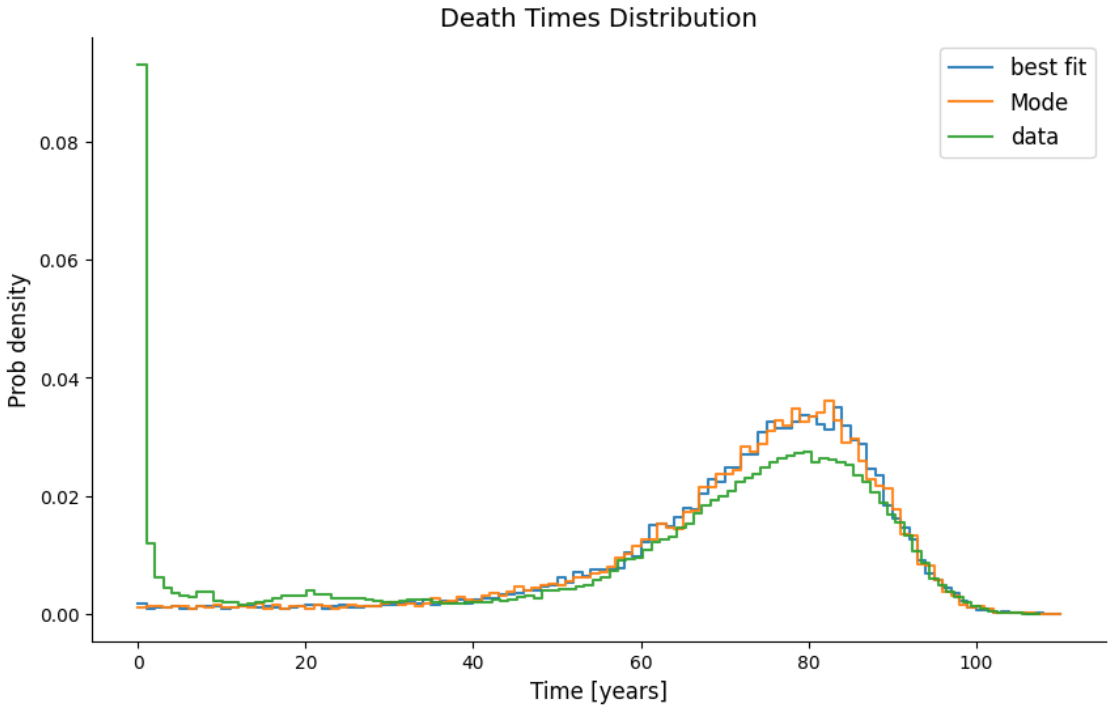
5 5. Fits of simulations to data

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
0.08
0.06
0.04
0.02
0.00
0
20
40
60
80
100
Time [years]