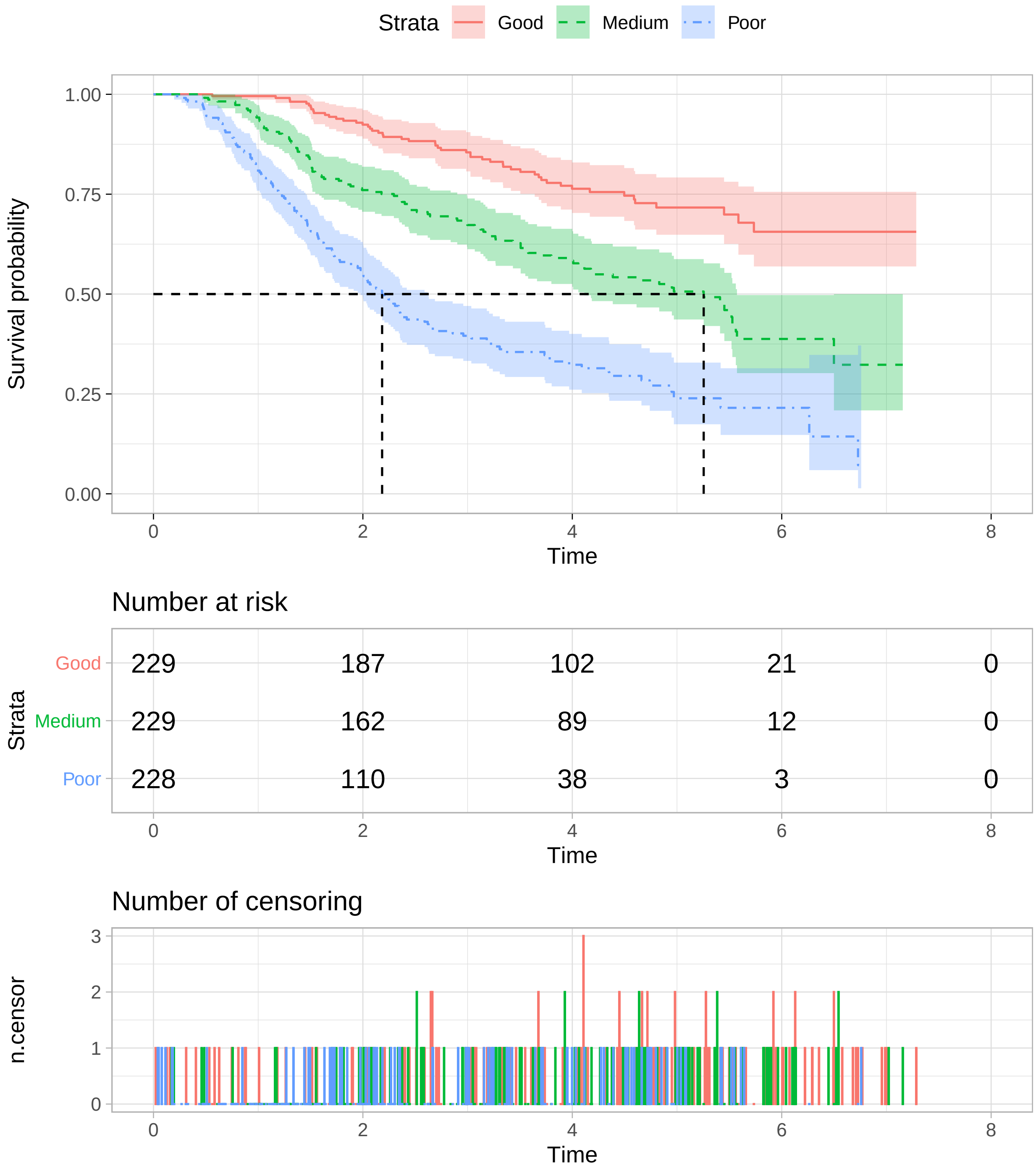
# PERSUADE BC_OS_output

2021-05-17

## Contents

Link to PERSUADE GitHub page

# 1. Kaplan-Meier



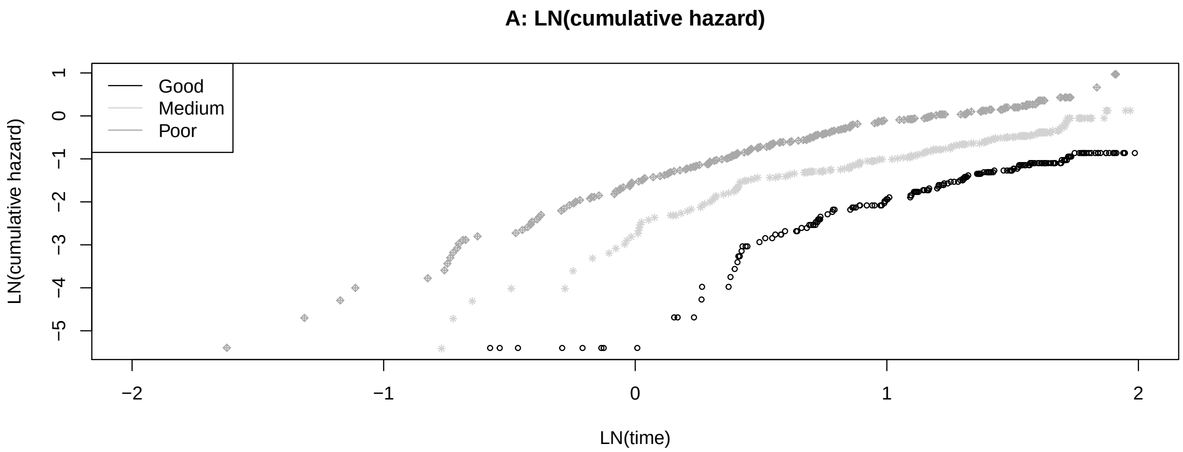

| | records | n.max | n.start | events | *rmean | *se(rmean) | median | 0.95LCL | 0.95UCL |
|---|---|---|---|---|---|---|---|---|---|
| group=Good | 229 | 229 | 229 | 51 | 5.934330 | 0.1616003 | NA | NA | NA |
| group=Medium | 229 | 229 | 229 | 103 | 4.600852 | 0.1856699 | 5.254795 | 4.115068 | 5.572603 |
| group=Poor | 228 | 228 | 228 | 145 | 3.101736 | 0.1772520 | 2.183562 | 1.978082 | 2.619178 |

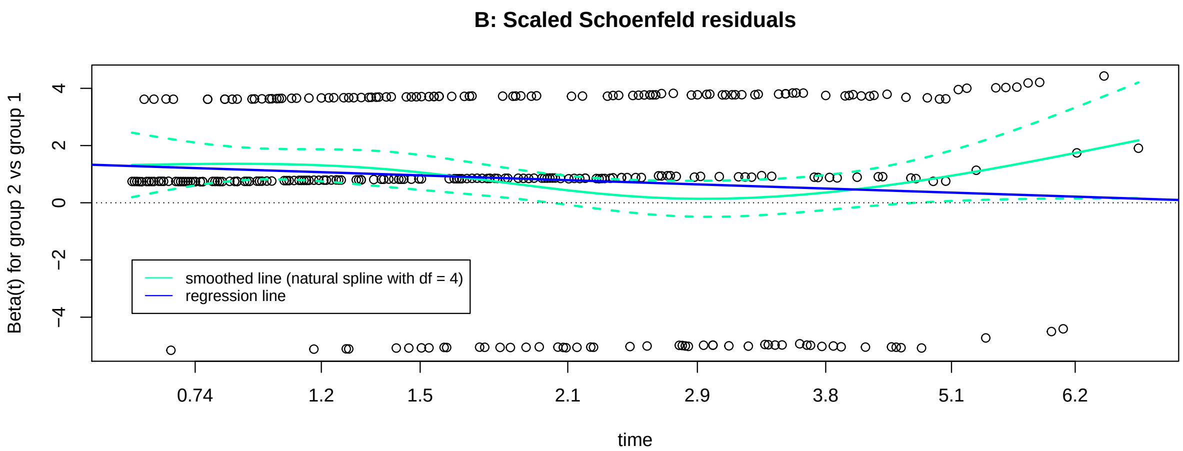
# 2. Proportional hazards assumption

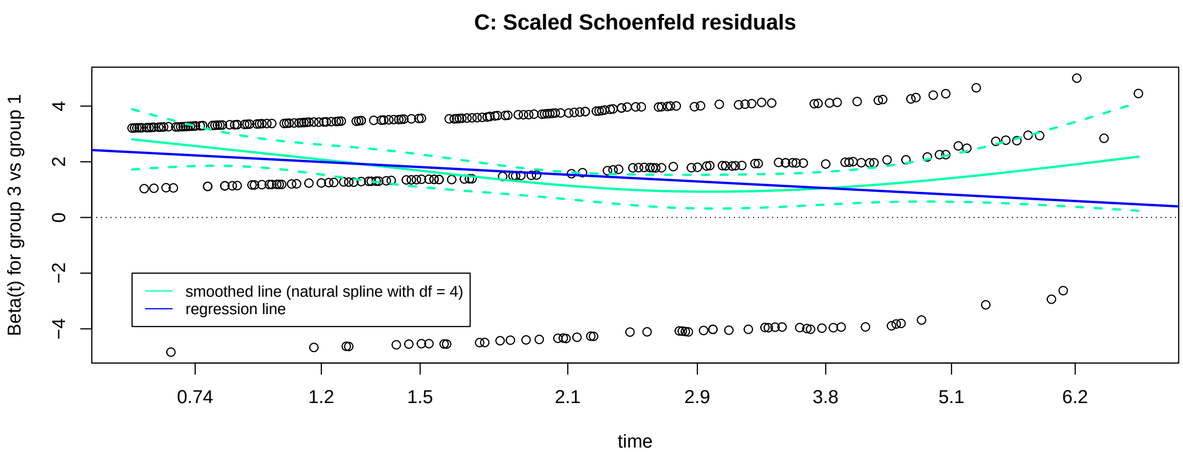
Should stratified parametric survival models be used?

To inform the decision whether stratified or non-stratified models should be used. One should assess whether the proportional hazard (PH) assumption holds. The PH assumption entails that the ratio of the hazards of two groups is constant over time. When the PH assumption holds, one may fit non-stratified (parametric) survival models, meaning that a single (parametric) survival model can be fitted to all groups with the group effect(s) included as a covariate of the model. When the PH assumption does not hold it is advised to fit separate (parametric) survival models to the different groups. Finally, this section only provides plots to assess the proportional hazards assumption over the period for which data are observed. Even if these plots indicate that the PH assumption does hold, it might be violated in the period for which no data are observed. For more information, please refer to the NICE TSD 14.
The Figures below allow to examine whether the PH assumption holds over the observed data period. Figure A shows the relation between the natural logarithm of time (x-axis) and the natural logarithm of the cumulative hazard (y-axis). The lines in the Figure representing the different groups. An indication that the PH assumption holds is when these lines are parallel. Figures B and C represent the scaled Schoenfeld residual plots. In those plots, the relation of time (x-axis) and the residuals of the observed events (y-axis) is plotted. For the PH assumption to hold, there should be not apparent relations between these residuals and time. To investigate this, a smoothed spline has been plotted (cyan). Once this smoothed line systematically deviates from a straight line, one can consider that the PH assumption is violated, because it indicates a relation between the coefficient (or group variable in this case) and time. This is demonstrated by Grambsch and Therneau (1994).
Another indication that the PH assumption does not hold is when the lines from different groups Kaplan-Meier plot (previous page) cross each other.

**CAUTION**: These plots apply to the observed data period and do not allow to make inferences about the proportional hazard function assumption beyond this period. Additionally, the end of the observed data period may be affected by the low number of observations. One should consider this when interpreting the tail of the curves.


A: LN(cumulative hazard)
Good
Medium
Poor
LN(cumulative hazard)
LN(time)


B: Scaled Schoenfeld residuals
smoothed line (natural spline with df = 4)
regression line
Beta(t) for group 2 vs group 1
time


C: Scaled Schoenfeld residuals
smoothed line (natural spline with df = 4)
regression line
Beta(t) for group 3 vs group 1
time

# 3. Hazard function

## Shape of the observed smoothed hazard function

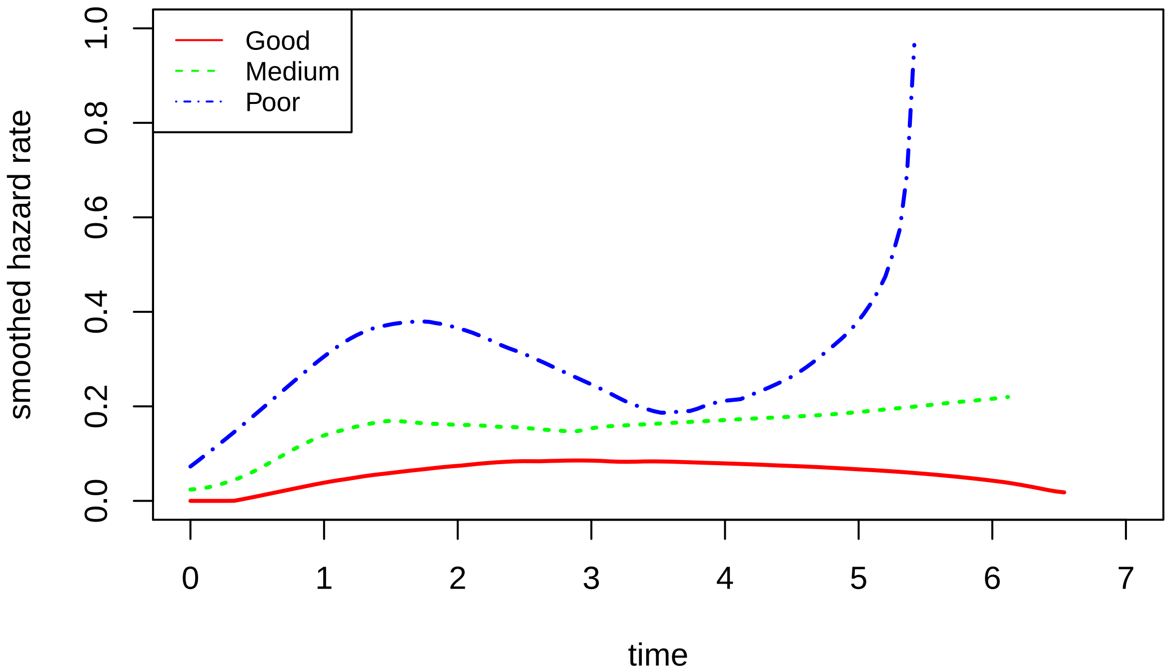
The hazard function, or the instantaneous rate at which an event occurs at a specific time point given survival until that time point. The hazard function can take a variety of shapes depending on the distribution/parametric survival model considered. The plausibility of different shapes for the hazard function should be considered given the observed hazard function (considered below) and/or external data (not considered below).

See below for an overview of the potential shapes for the hazard function for standard parametric survival models:

| No | Distribution | Hazard function shape |
|---|---|---|
| 1 | Exponential | constant hazard |
| 2 | Weibull | monotonically increasing or decreasing hazards |
| 3 | Gompertz | monotonically increasing or decreasing hazards |
| 4 | Log-normal | arc-shaped or monotonically decreasing hazards |
| 5 | Log-logistic | arc-shaped or monotonically decreasing hazards |
| 6 | Gamma | monotonically increasing or decreasing hazards |
| 7 | Generalised Gamma | arc-shaped, bathtub-shaped, monotonically increasing or monotonically decreasing hazards |

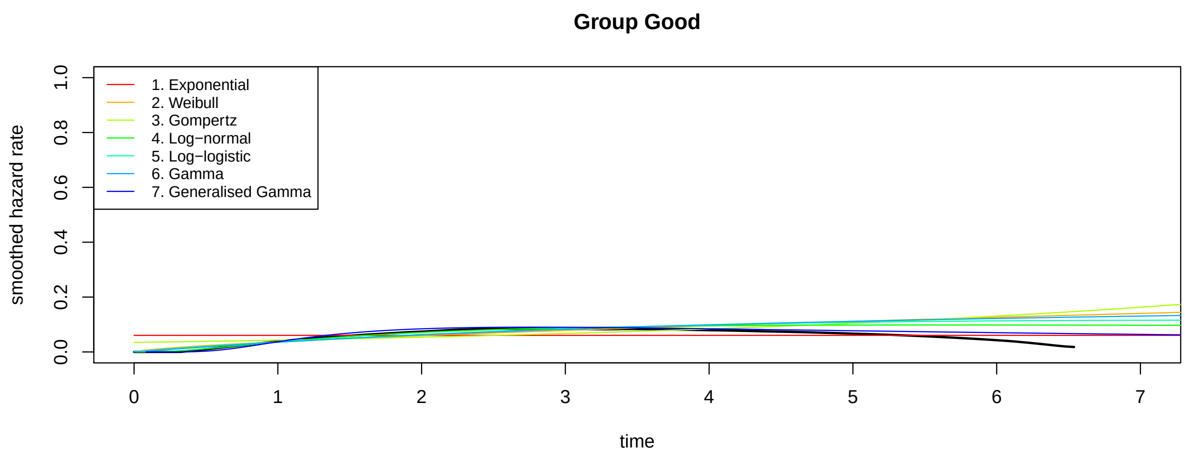
as the spline-based and (non-)mixture cure models are based on the standard parametric models, the assumed hazard functions can be derived from the Table above as well. For spline-based models using the hazard scale, the Weibull distribution (thus monotonically increasing and decreasing hazards) is used and the hazard function can differ for the different segments (i.e. between the knot locations). Similarly for spline-based models using the odds (log-logistic distribution) and normal scale (log-normal distribution) as well as the distributions used for the (non-)mixture cure models (different hazard functions are potentially estimated for the (non-)cure fraction). More information and visualisation of the shape of the hazard function that can be estimated by the different parametric survival models can be found here.

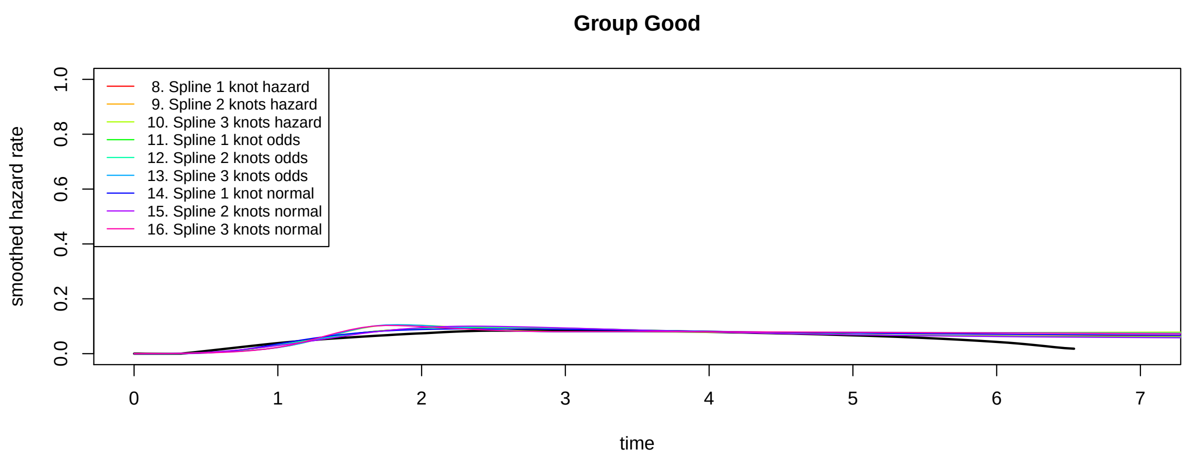
**CAUTION**: These plots apply to the observed data period and do not allow to make inferences about the shape of the hazard function beyond this period. Additionally, the end of the observed data period may be affected by the low number of observations. One should consider this when interpreting the tail of the curves.

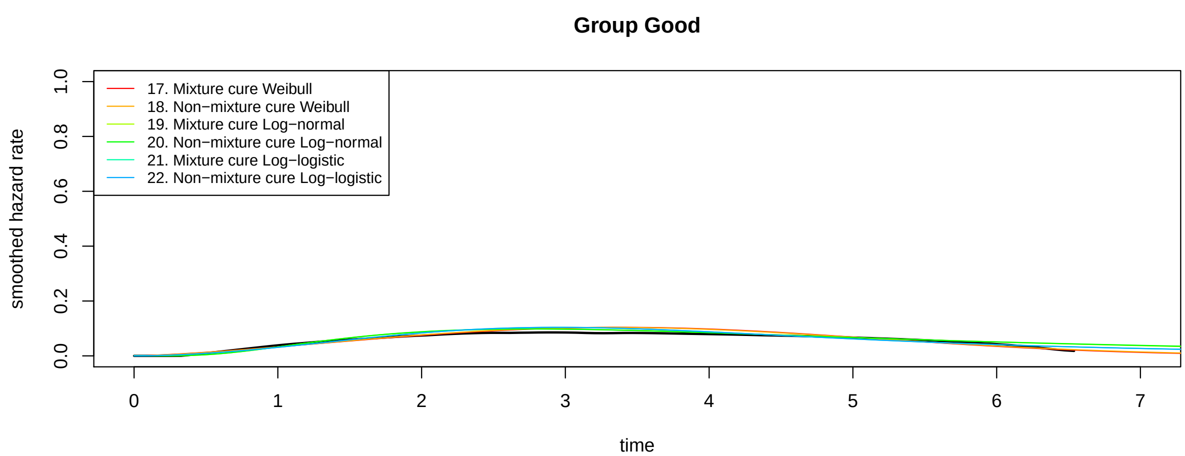

Good
Medium
Poor
smoothed hazard rate
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
7
time

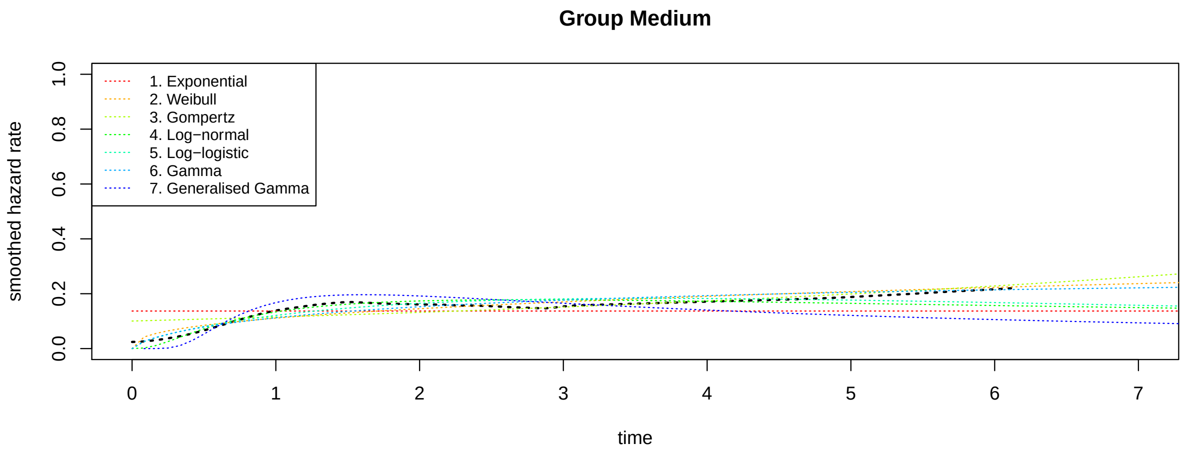
### Shape of the predicted hazard function

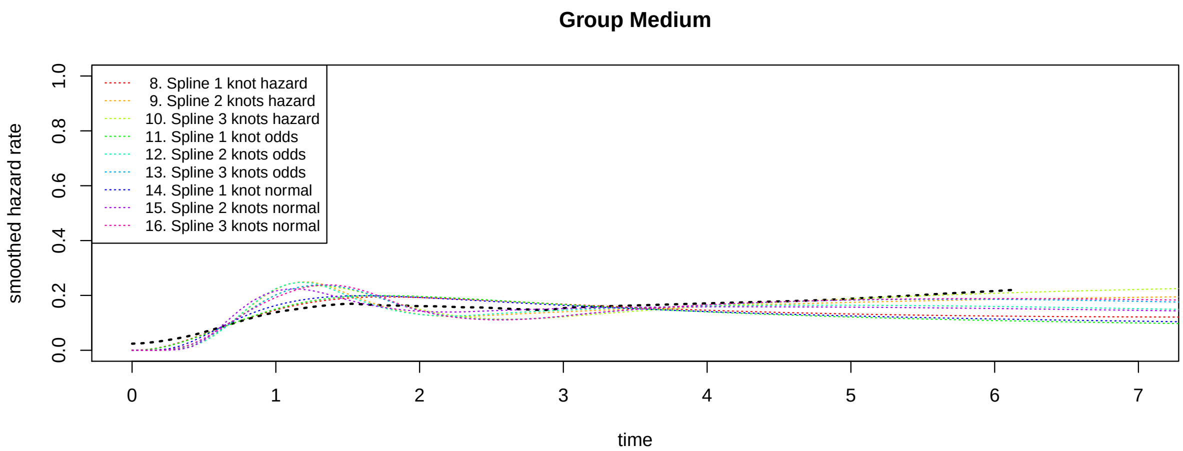
The following plots dislay how the hazard rates is estimated using the different parametric survival models.

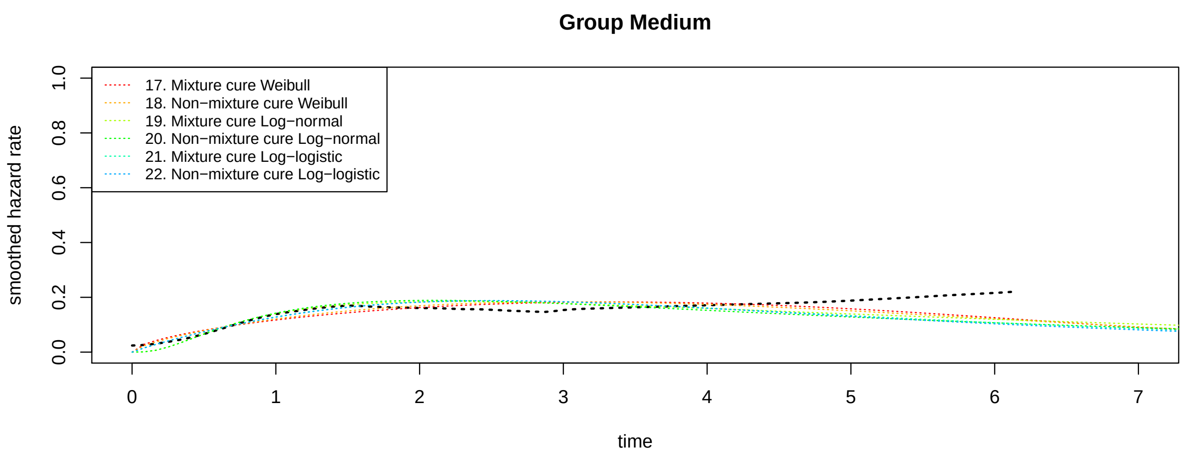


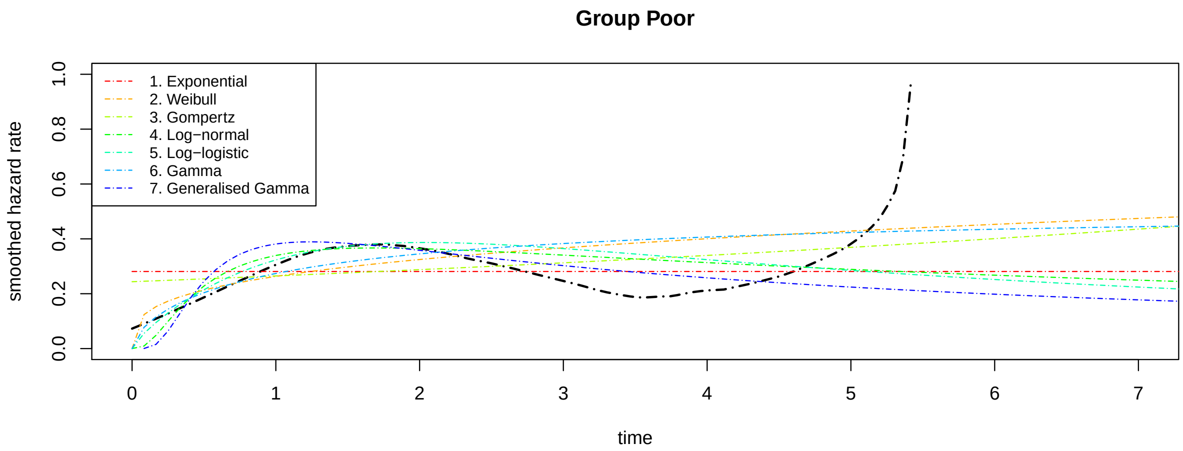



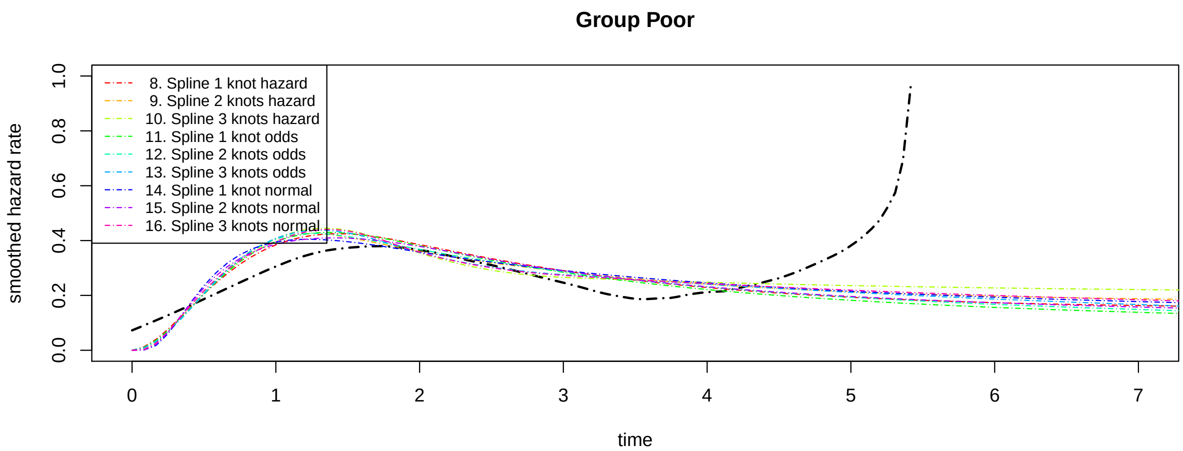



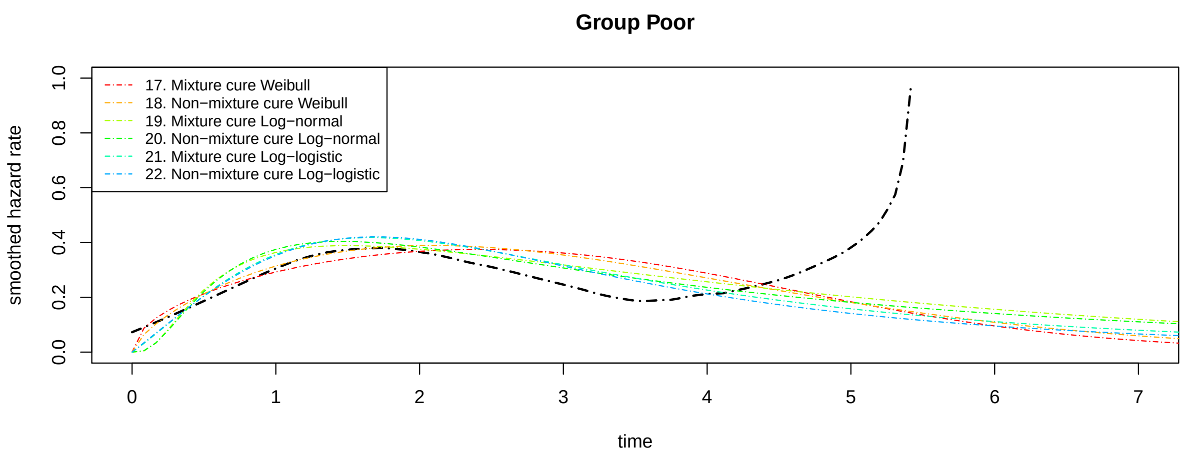

Group Medium
smoothed hazard rate
time
1. Exponential
2. Weibull
3. Gompertz
4. Log−normal
5. Log−logistic
6. Gamma
7. Generalised Gamma


Group Medium
smoothed hazard rate
time
8. Spline 1 knot hazard
9. Spline 2 knots hazard
10. Spline 3 knots hazard
11. Spline 1 knot odds
12. Spline 2 knots odds
13. Spline 3 knots odds
14. Spline 1 knot normal
15. Spline 2 knots normal
16. Spline 3 knots normal


Group Medium
smoothed hazard rate
time
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic


Group Poor
smoothed hazard rate
time
1. Exponential
2. Weibull
3. Gompertz
4. Log−normal
5. Log−logistic
6. Gamma
7. Generalised Gamma
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
7


Group Poor
smoothed hazard rate
time
8. Spline 1 knot hazard
9. Spline 2 knots hazard
10. Spline 3 knots hazard
11. Spline 1 knot odds
12. Spline 2 knots odds
13. Spline 3 knots odds
14. Spline 1 knot normal
15. Spline 2 knots normal
16. Spline 3 knots normal
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
7


Group Poor
smoothed hazard rate
time
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
7

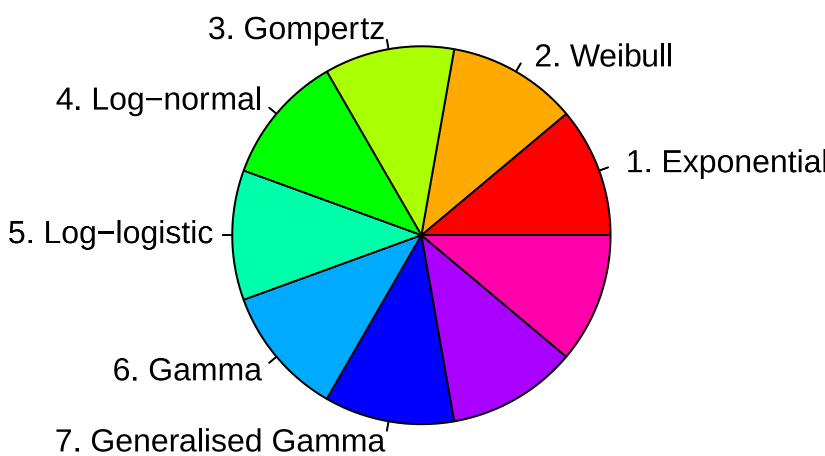
## 4.1 Standard parametric models

The circle displays the colours that are attributed to each parametric survival model in the graphs on the following pages.
The Table below displays the goodness-of-fit statistics for each parametric survival model, ordered from 'best' fitting to less well fitting based on the Akaike Information Criterion (AIC). The AIC and Bayesian Information Criterion (BIC) provide a measure of the relative fit of each model to the data, while penalising for the number of parameter included in the fitted models. The lower the AIC or BIC, the better the relative fit of a model compared to other fitted models.

In the following pages, three plots per fitted parametric survival model are displayed to support the visual inspection of the fit of the models to the observed data. Figure A shows the Kaplan-Meier curves (black and gray) versus the fitted parametric survival models (colour). Figure B displays a comparison of the smoothed hazard rates based on the empirical data (black and gray) versus the estimated transition probabilities (colour). In all Figures A and B, the Kaplan-Meier curves and the smoothed hazard rates are the same. Figure C shows a specific diagnostic plot for each fitted parametric survival model (see graphical test in Table 1 by Ishak et al. (2013). For all these plots, the rule is: the closer the coloured lines are to the black and grey lines, the better.

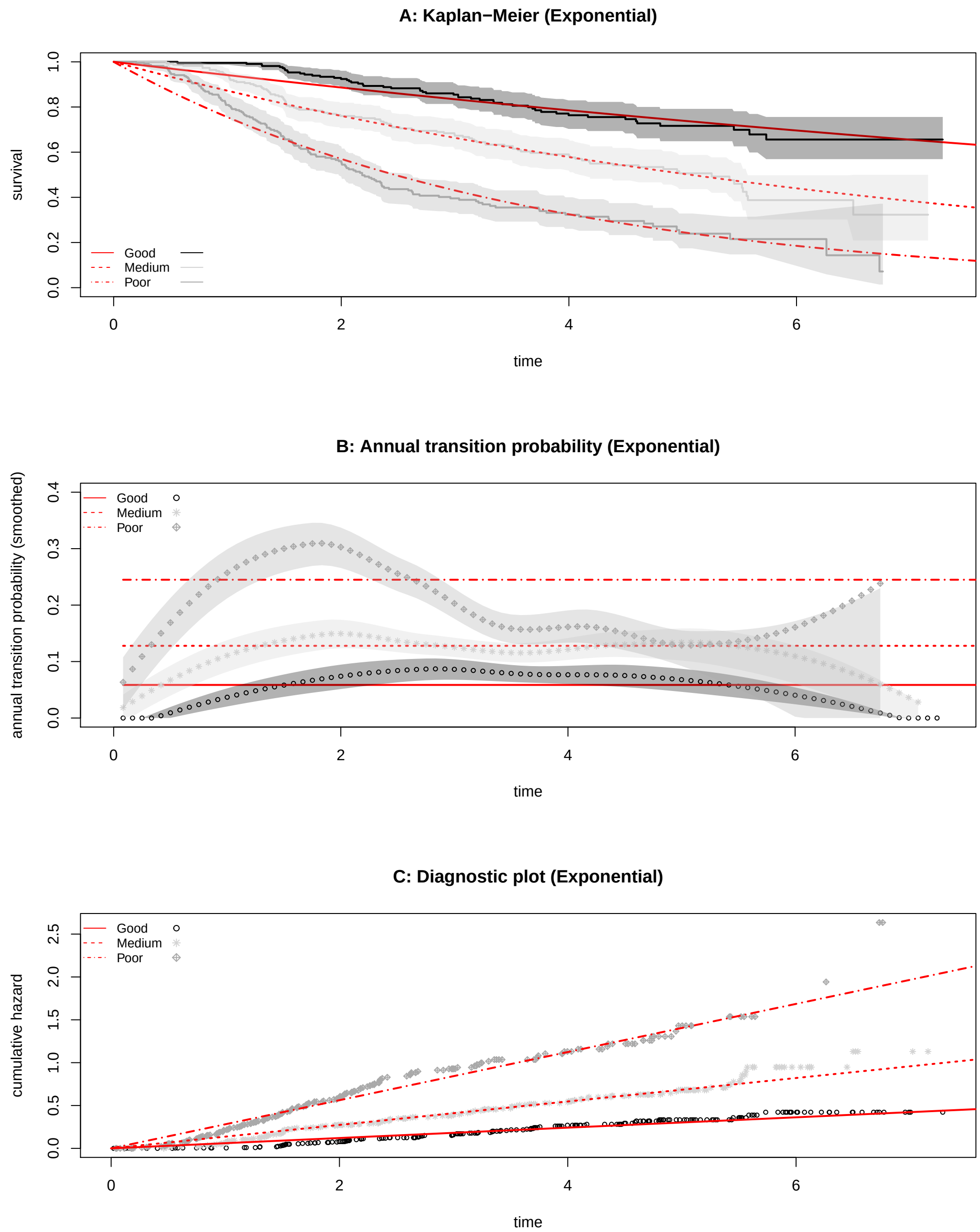
Notably, the Weibull (shape = 1), Gompertz (shape = 0) and gamma (shape = 1) distributions can simplify to the exponential distribution. The generalised gamma distribution can simplify to the log-normal (Q = 0), Weibull (Q = 1), exponential (Q = 1 and scale = 1) and gamma (Q = scale) distributions. Information regarding the parameterisation of the parametric survival models can be found here.

**CAUTION**: These goodness-of-fit statistics only apply to the observed data period and do not allow to issue statements about the suitability of the extrapolated survival by these fitted models beyond this period. Additionally, the end of the observed data period may be affected by the low number of observations. One should consider this when interpreting the tail of the curves.

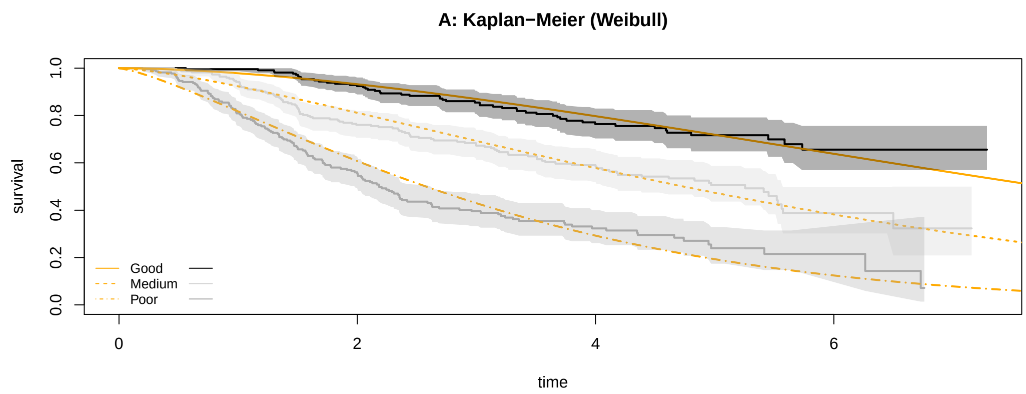


| Model | AIC | BIC |
|---|---:|---:|
| 7. Generalised Gamma | 1589.049 | 1629.826 |
| 4. Log-normal | 1592.880 | 1620.066 |
| 5. Log-logistic | 1609.294 | 1636.479 |
| 6. Gamma | 1621.982 | 1649.167 |
| 2. Weibull | 1632.618 | 1659.803 |
| 3. Gompertz | 1660.954 | 1688.140 |
| 1. Exponential | 1668.212 | 1681.805 |

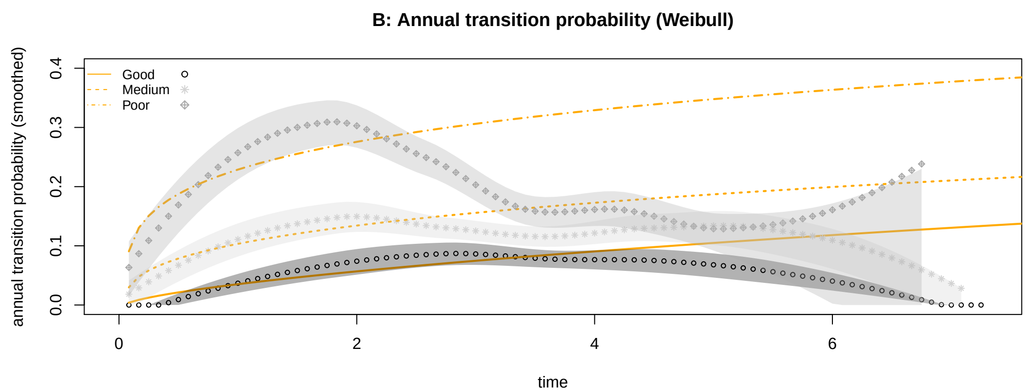
## Exponential



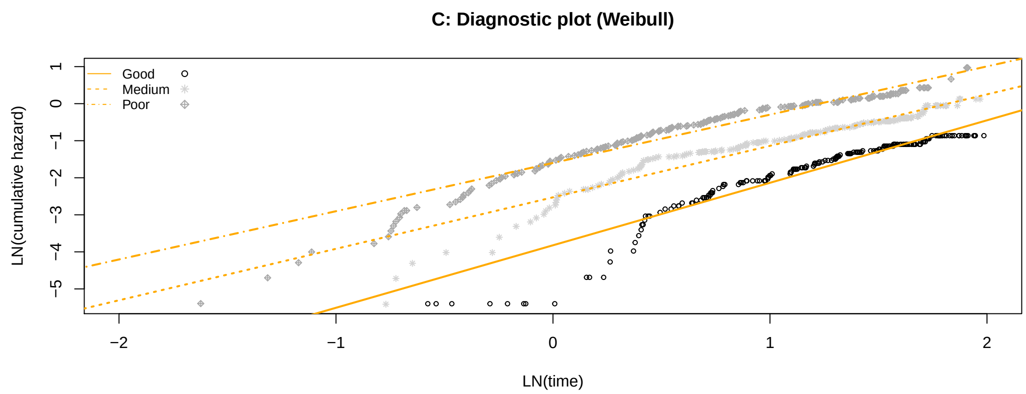
## Weibull



A: Kaplan−Meier (Weibull)
survival
1.0
0.8
0.6
0.4
0.2
0.0
Good
Medium
Poor
0
2
4
6
time

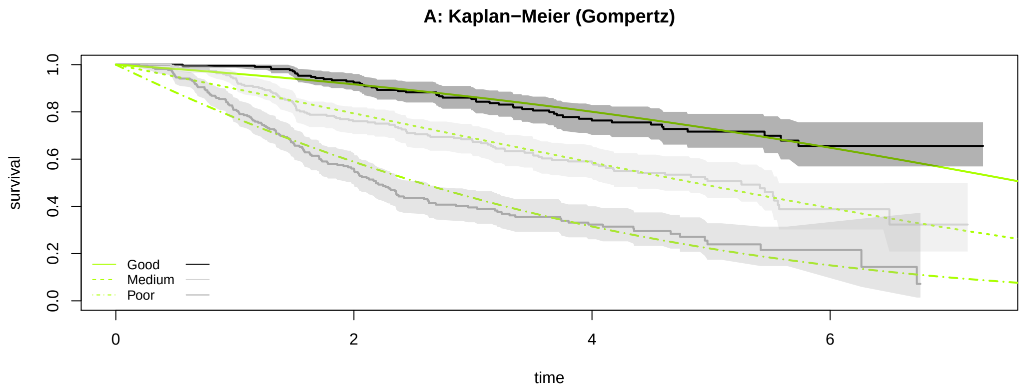



B: Annual transition probability (Weibull)
annual transition probability (smoothed)
0.4
0.3
0.2
0.1
0.0
Good
Medium
Poor
0
2
4
6
time

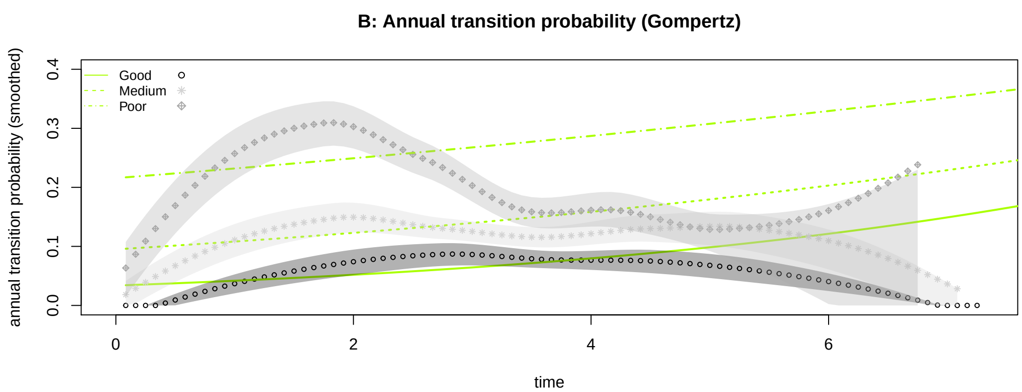



C: Diagnostic plot (Weibull)
LN(cumulative hazard)
1
0
−1
−2
−3
−4
−5
Good
Medium
Poor
−2
−1
0
1
2
LN(time)

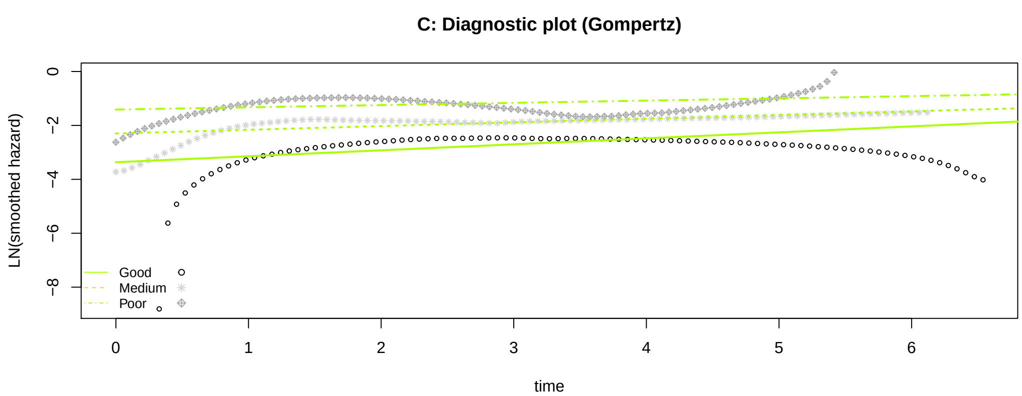
## Gompertz



A: Kaplan−Meier (Gompertz)
survival
1.0
0.8
0.6
0.4
0.2
0.0
Good
Medium
Poor
0
2
4
6
time

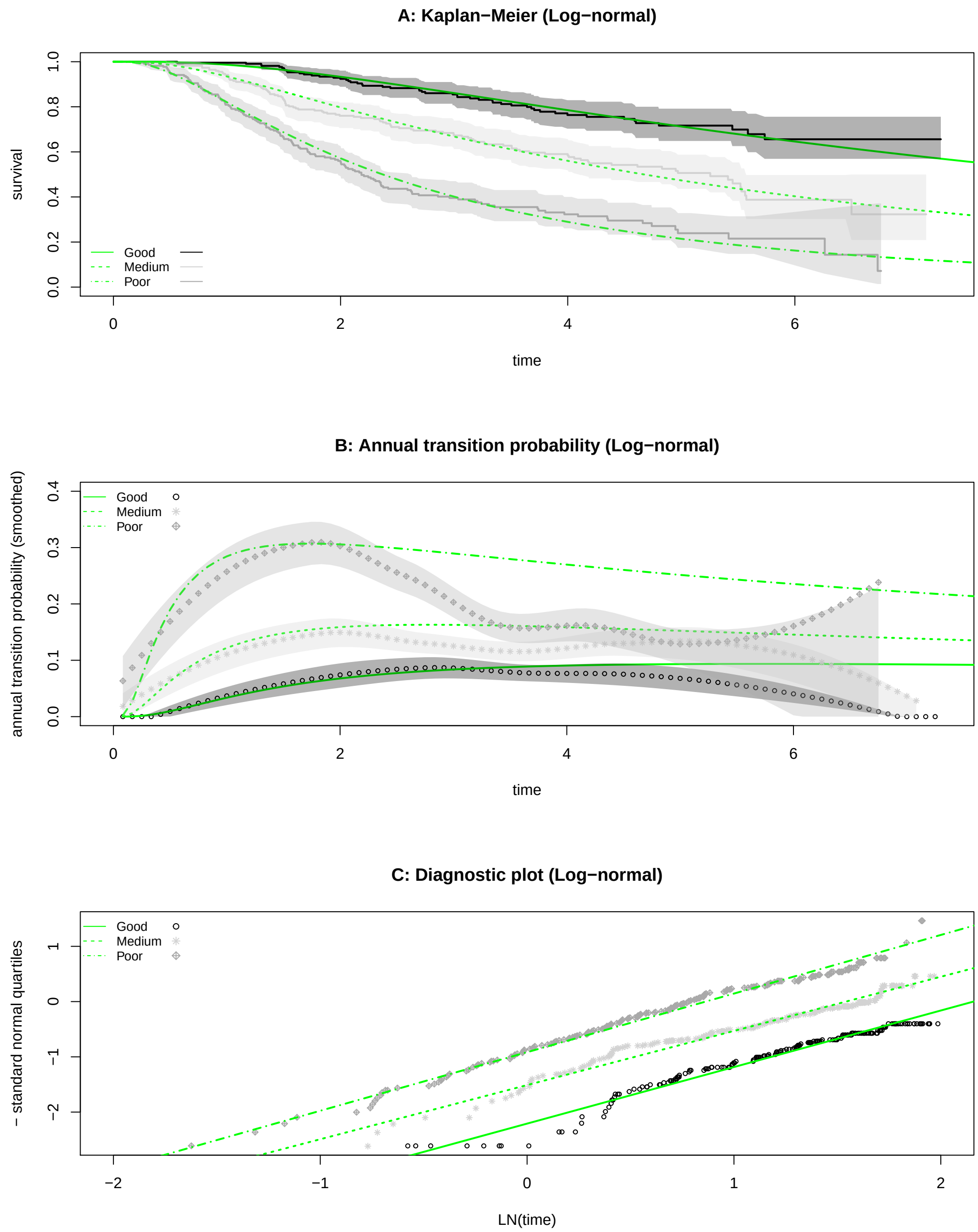



B: Annual transition probability (Gompertz)
annual transition probability (smoothed)
0.4
0.3
0.2
0.1
0.0
Good
Medium
Poor
0
2
4
6
time

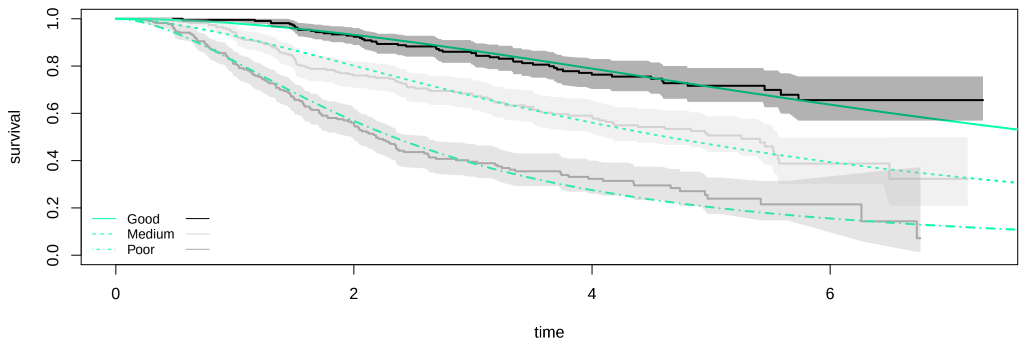
C: Diagnostic plot (Gompertz)
LN(smoothed hazard)
0
−2
−4
−6
−8
Good
Medium
Poor
0
1
2
3
4
5
6
time

## Log-normal

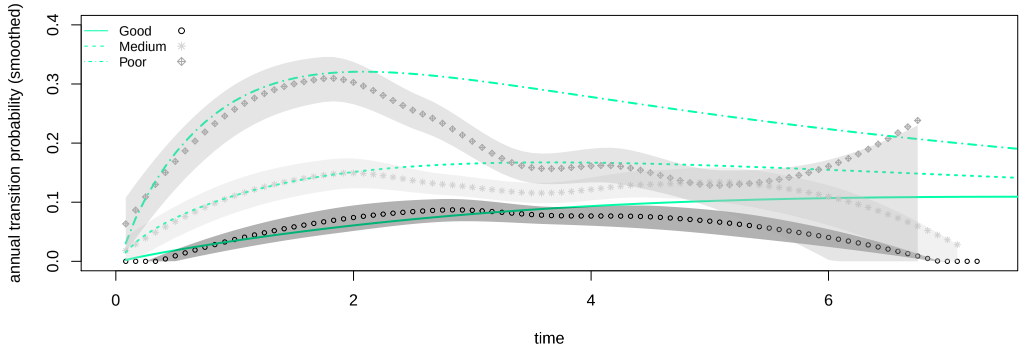

A: Kaplan−Meier (Log−normal)
survival
time
Good
Medium
Poor
B: Annual transition probability (Log−normal)
annual transition probability (smoothed)
C: Diagnostic plot (Log−normal)
− standard normal quartiles
LN(time)

## Log-logistic

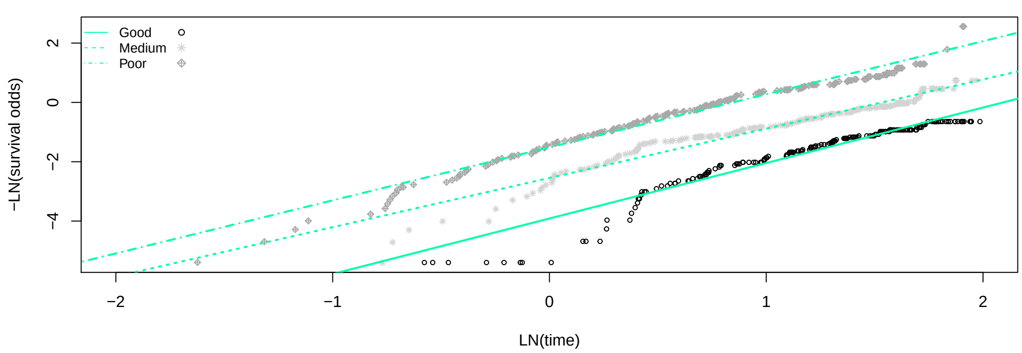
**A: Kaplan−Meier (Log−logistic)**



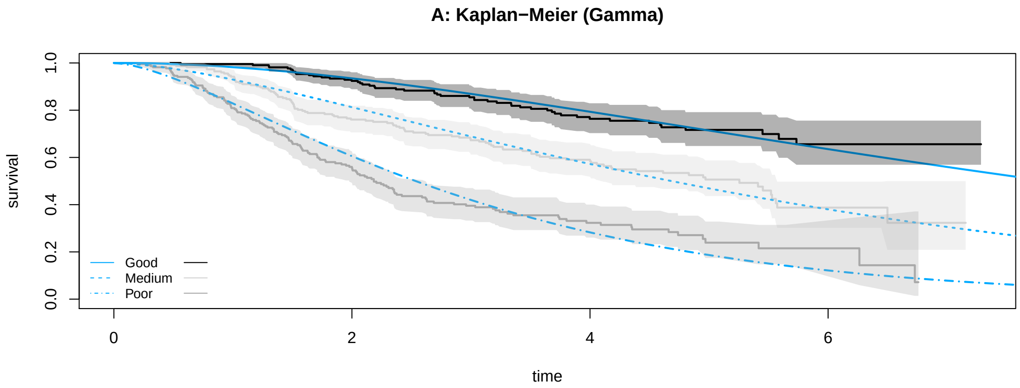

**B: Annual transition probability (Log−logistic)**



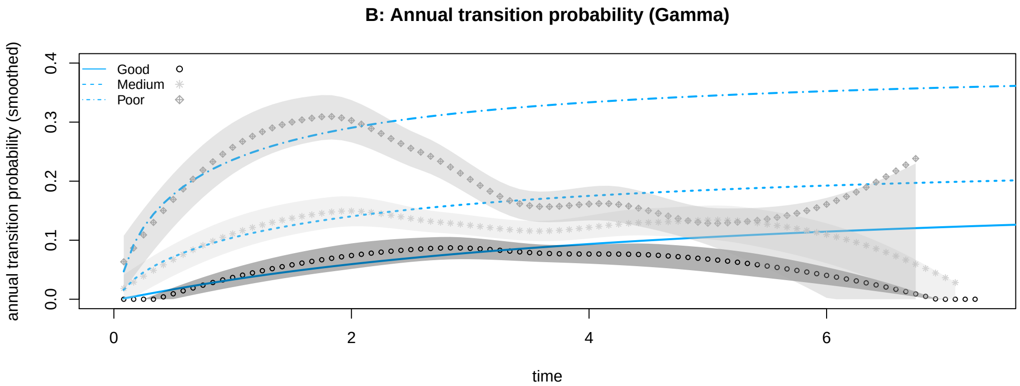

**C: Diagnostic plot (Log−logistic)**



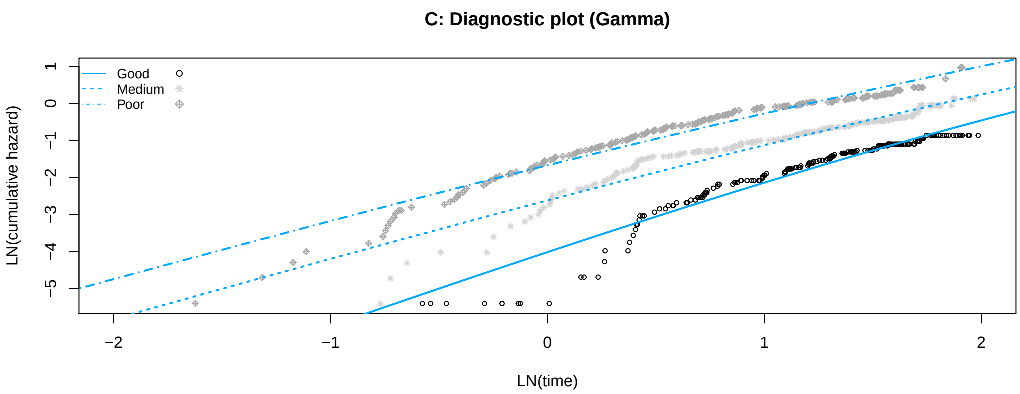
## Gamma



A: Kaplan−Meier (Gamma)
survival
time
Good
Medium
Poor

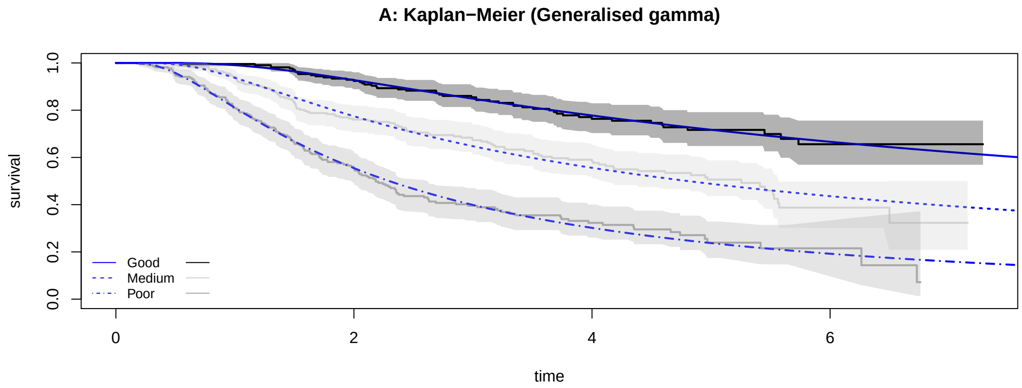



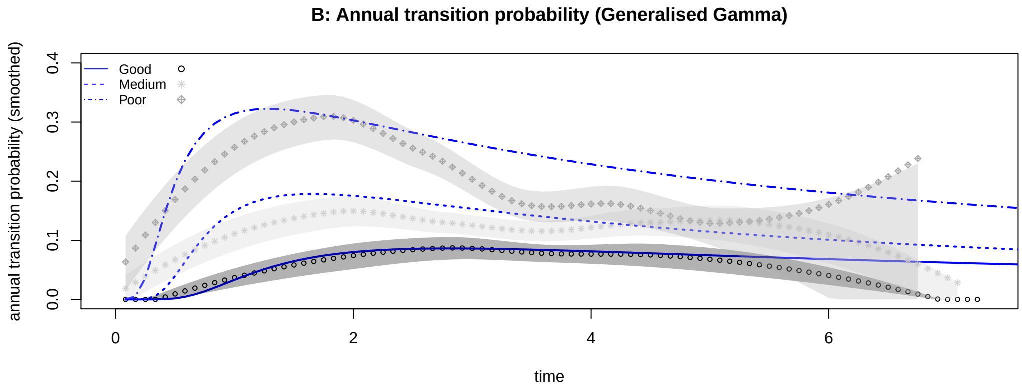
B: Annual transition probability (Gamma)
annual transition probability (smoothed)
time
Good
Medium
Poor

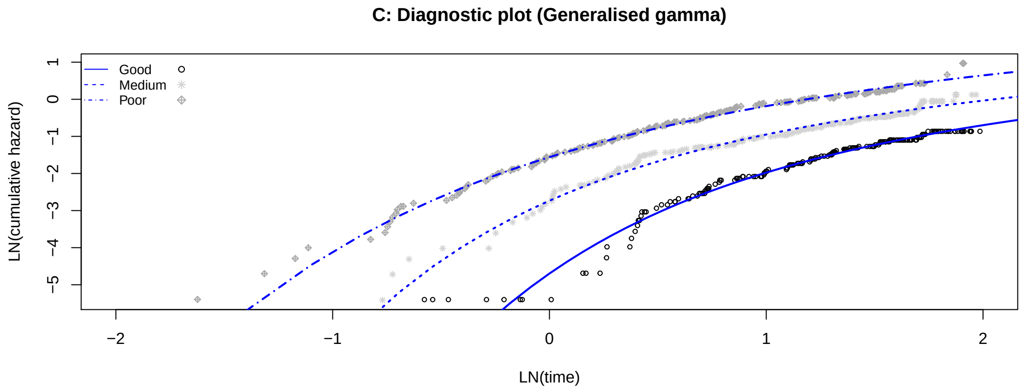



C: Diagnostic plot (Gamma)
LN(cumulative hazard)
LN(time)
Good
Medium
Poor

## Generalised Gamma



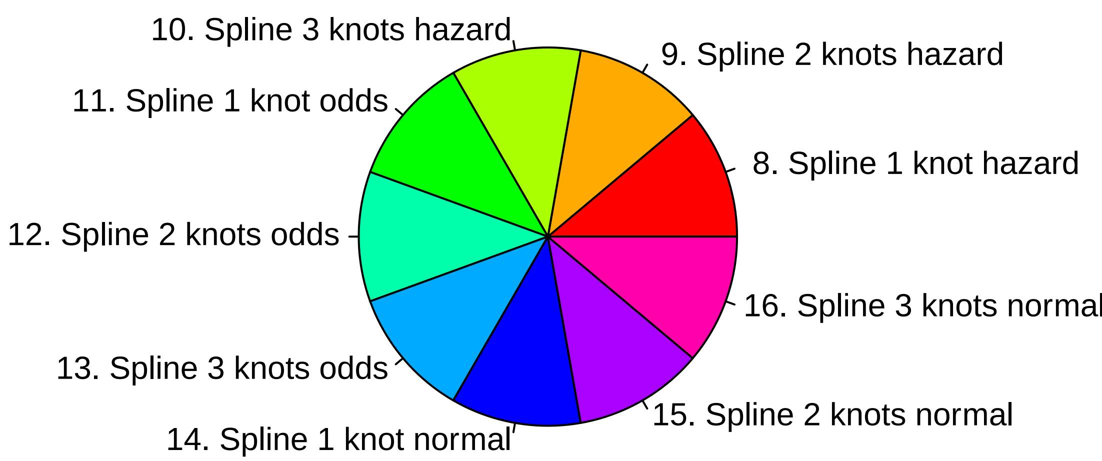



## 4.2 Parametric natural cubic spline models

If standard parametric models do not provide a satisfactory fit to the data based on previous observations, do spline-based models provide a more satisfactory fit to the data? An explanation concerning these natural cubic spline models, henceforth spline-based models, is provided in Royston and Pamar - 2002.

Similar plots are provided as provided (and explained) in the previous section. As highlighted above, spline-based models using the hazard scale, odds scale and normal scale are extensions of the standard parametric survival models using the Weibull, log-logistic and log-normal distribution respectively.

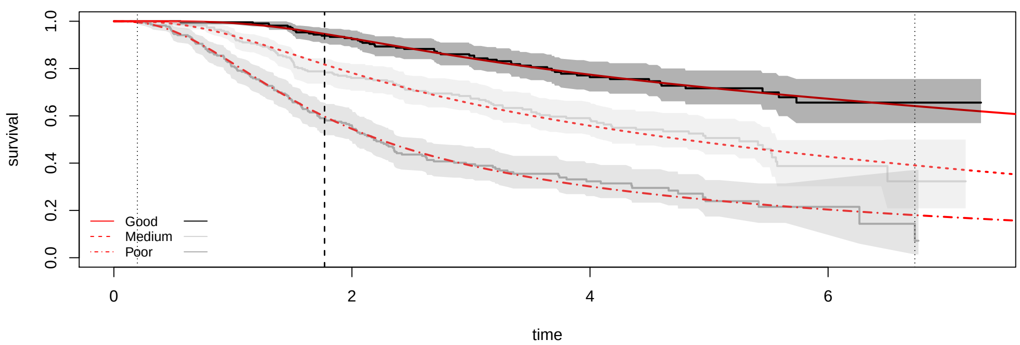
**CAUTION**: These goodness-of-fit statistics only apply to the observed data period and do not allow to issue statements about the suitability of the extrapolated survival by these fitted models beyond this period. Additionally, the end of the observed data period may be affected by the low number of observations. One should consider this when interpreting the tail of the curves.



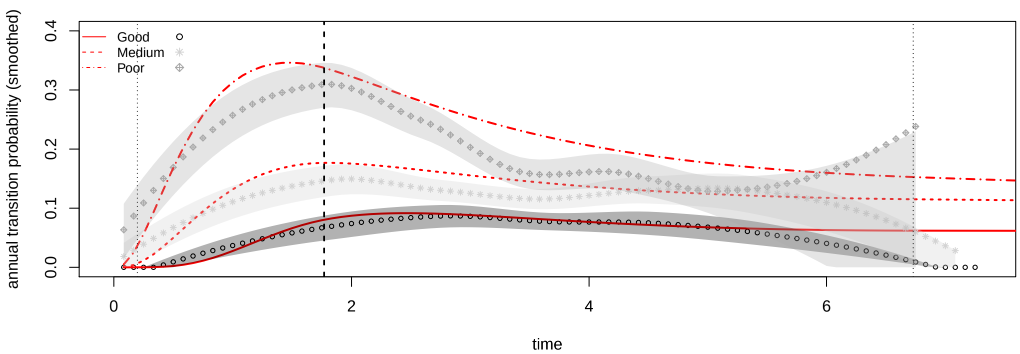
| Model | AIC | BIC |
|---|---|---|
| 9. Spline 2 knots hazard | 1585.894 | 1640.264 |
| 12. Spline 2 knots odds | 1587.289 | 1641.659 |
| 14. Spline 1 knot normal | 1587.682 | 1628.460 |
| 15. Spline 2 knots normal | 1588.343 | 1642.714 |
| 7. Generalised Gamma | 1589.049 | 1629.826 |
| 8. Spline 1 knot hazard | 1589.327 | 1630.105 |
| 16. Spline 3 knots normal | 1589.832 | 1657.795 |
| 10. Spline 3 knots hazard | 1589.875 | 1657.838 |
| 11. Spline 1 knot odds | 1590.221 | 1630.999 |
| 13. Spline 3 knots odds | 1590.720 | 1658.683 |
| 4. Log-normal | 1592.880 | 1620.066 |
| 5. Log-logistic | 1609.294 | 1636.479 |
| 6. Gamma | 1621.982 | 1649.167 |
| 2. Weibull | 1632.618 | 1659.803 |
| 3. Gompertz | 1660.954 | 1688.140 |
| 1. Exponential | 1668.212 | 1681.805 |

## Spline 1 knot hazard

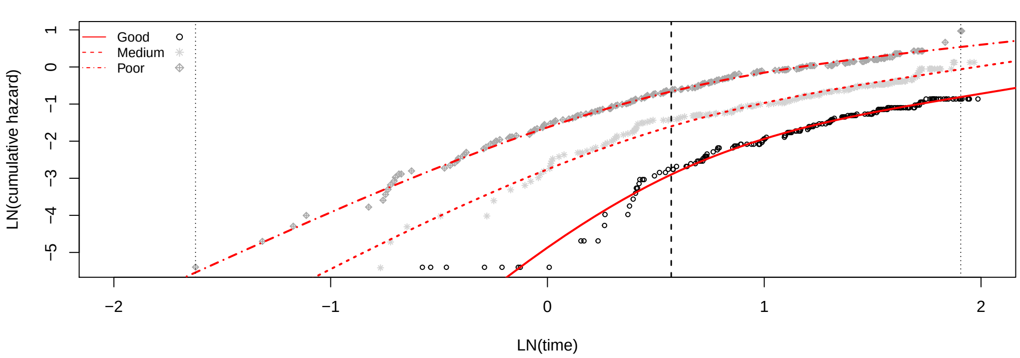
**A: Kaplan−Meier (Spline, 1 knot, hazard scale)**



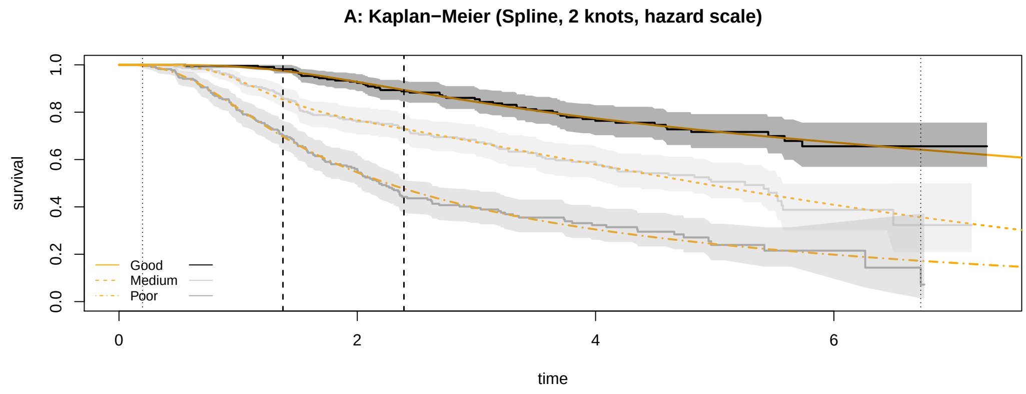

**B: Annual transition probability (Spline, 1 knot, hazard scale)**

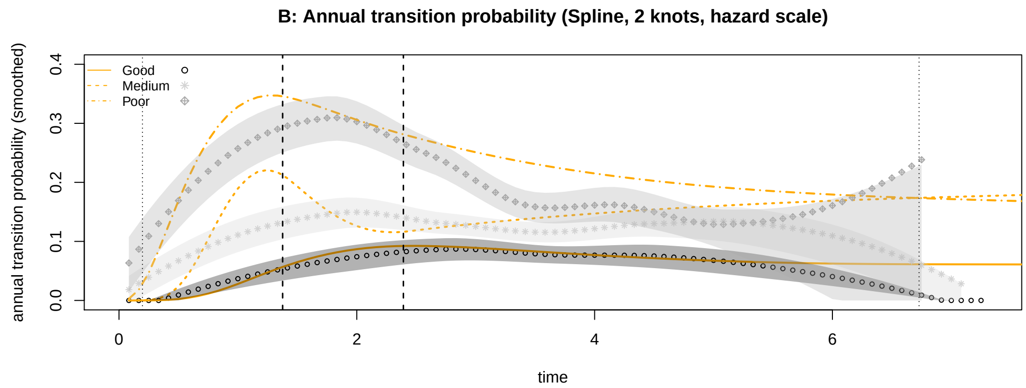


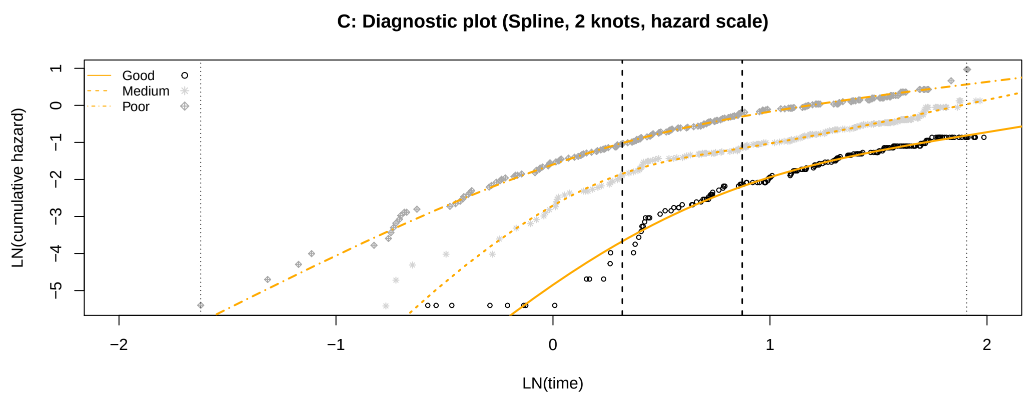

**C: Diagnostic plot (Spline, 1 knot, hazard scale)**



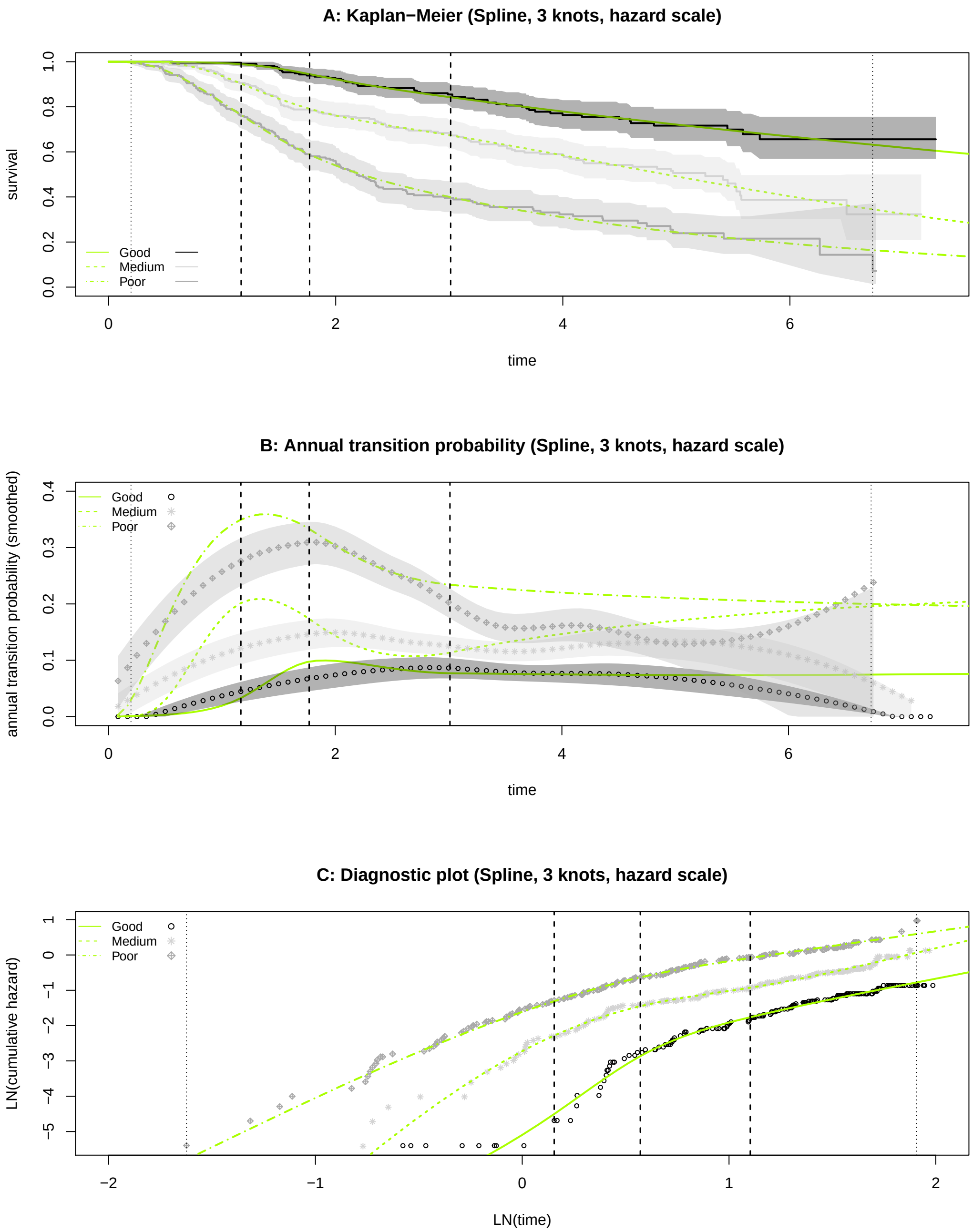
# Spline 2 knots hazard



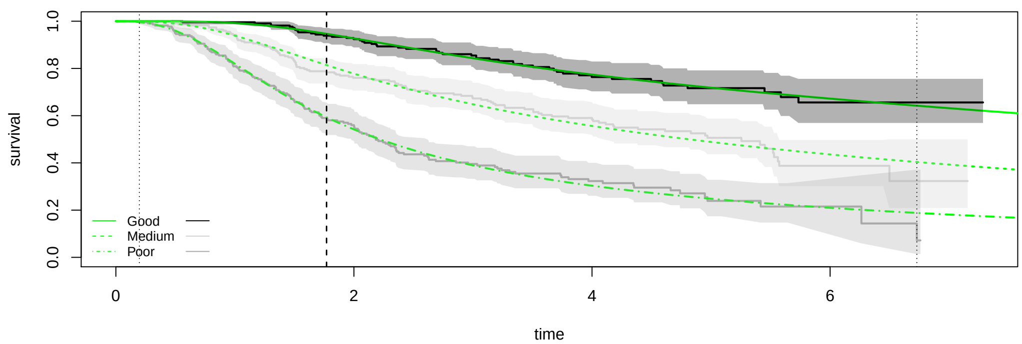



## Spline 3 knots hazard

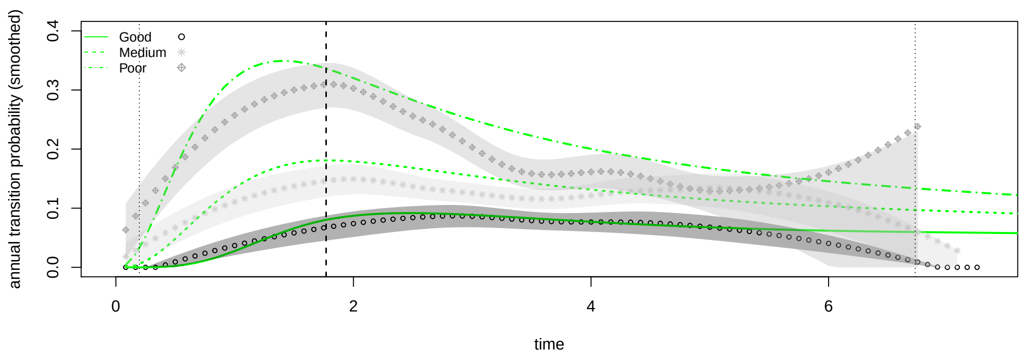


## Spline 1 knot odds

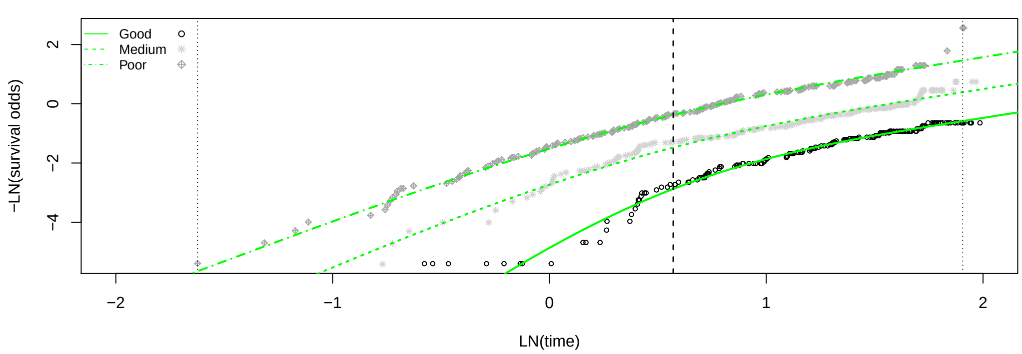
A: Kaplan−Meier (Spline, 1 knot, odds scale)




B: Annual transition probability (Spline, 1 knot, odds scale)

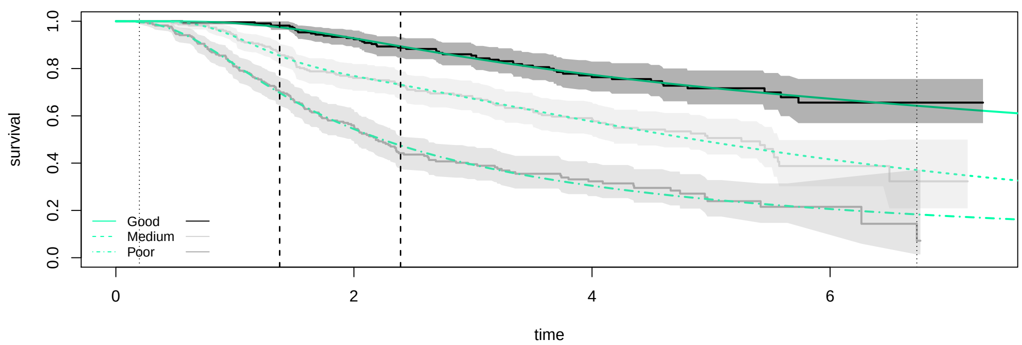



C: Diagnostic plot (Spline, 1 knot, odds scale)

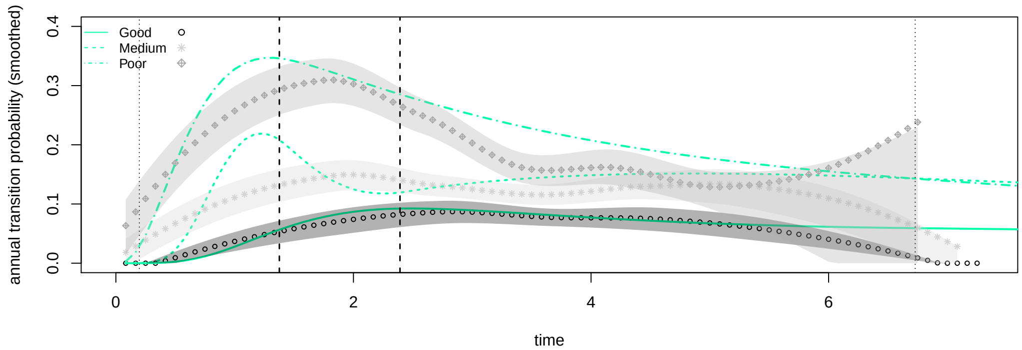


## Spline 2 knots odds

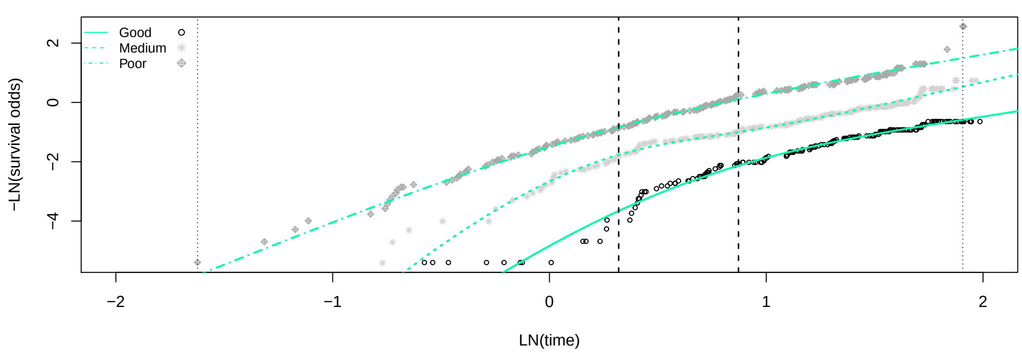
A: Kaplan−Meier (Spline, 2 knots, odds scale)



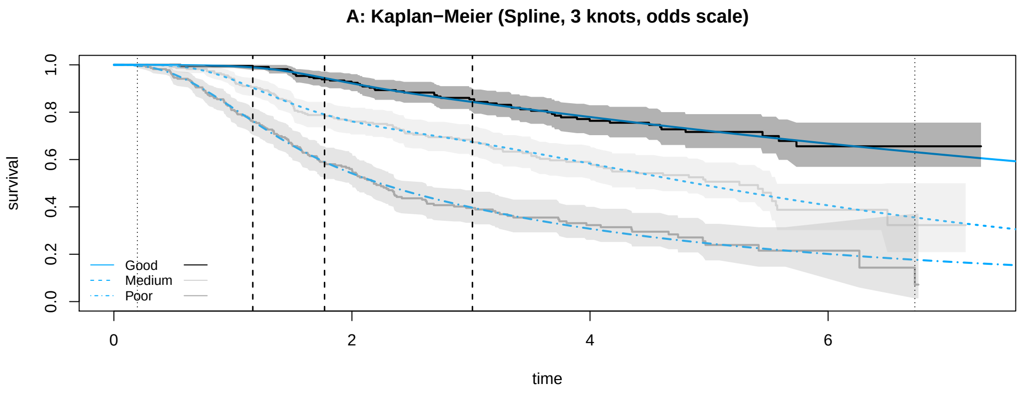

B: Annual transition probability (Spline, 2 knots, odds scale)

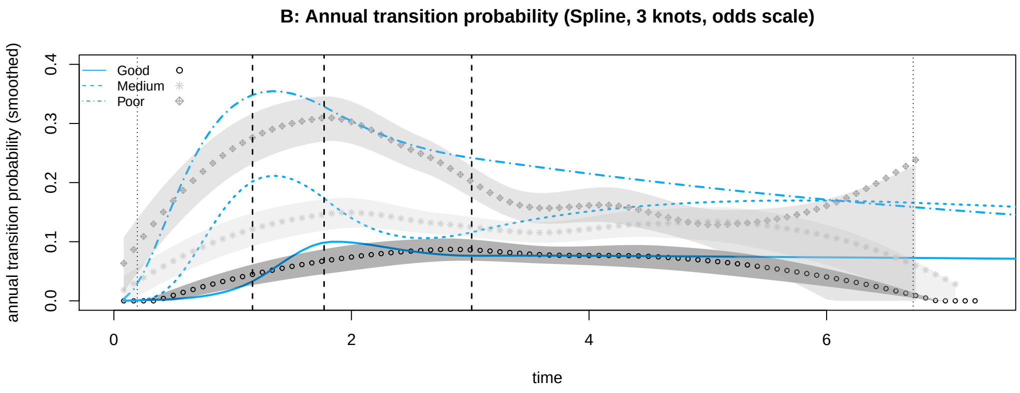


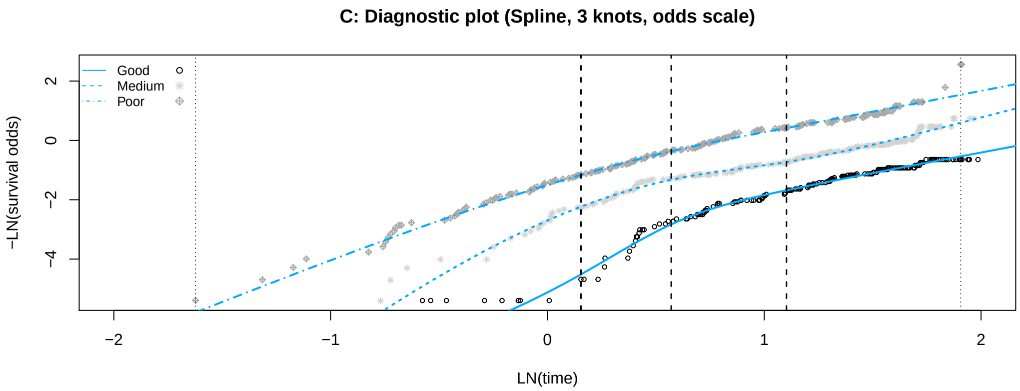

C: Diagnostic plot (Spline, 2 knots, odds scale)



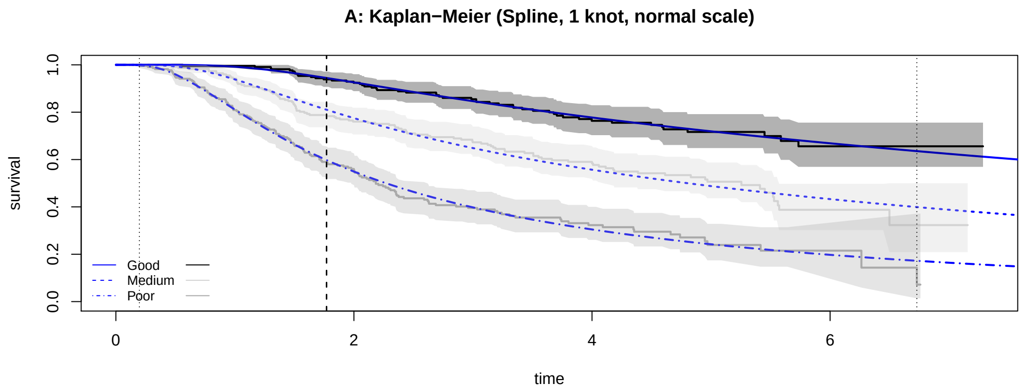
## Spline 3 knots odds

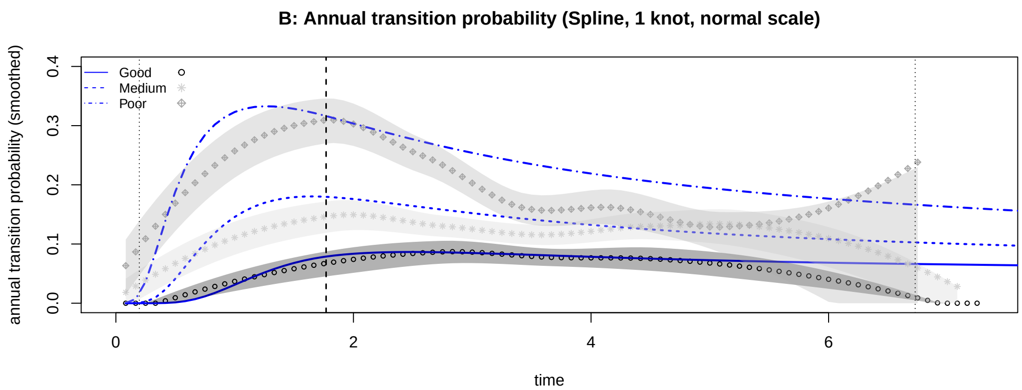


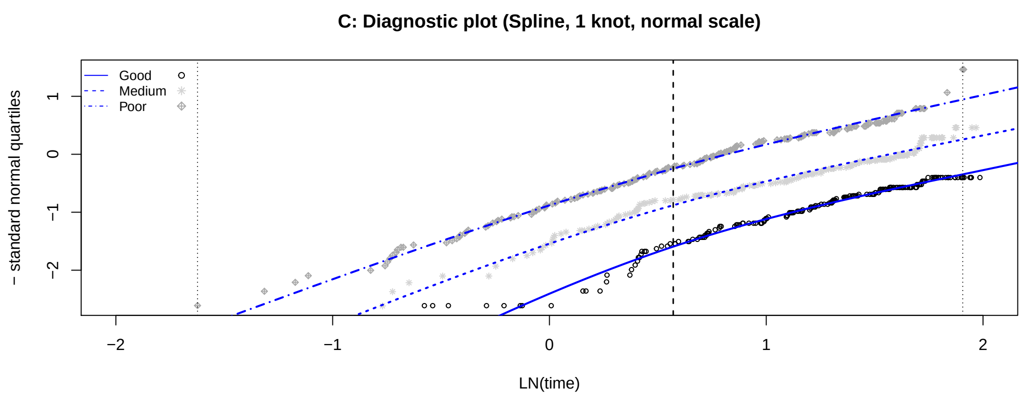



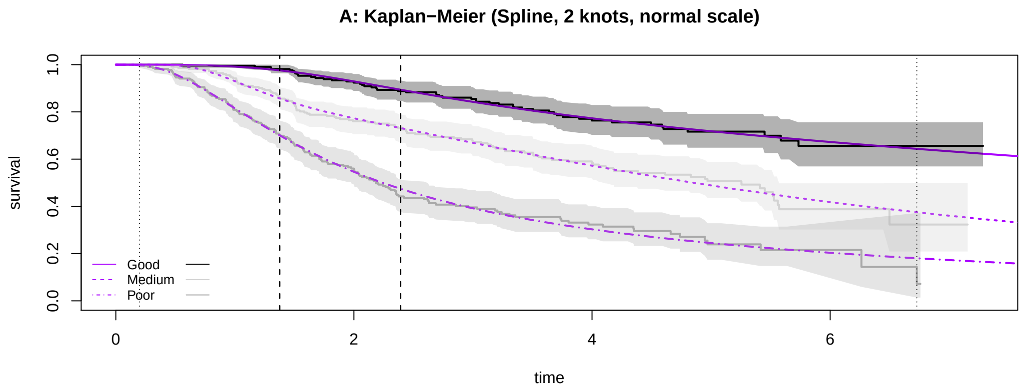
## Spline 1 knot normal

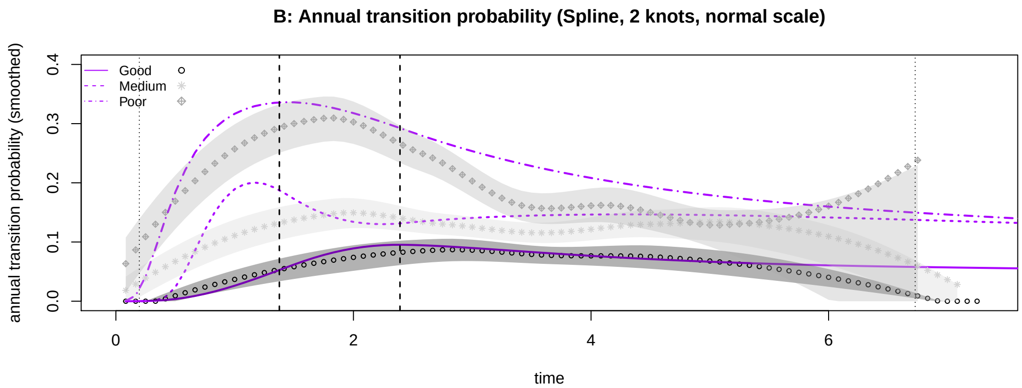


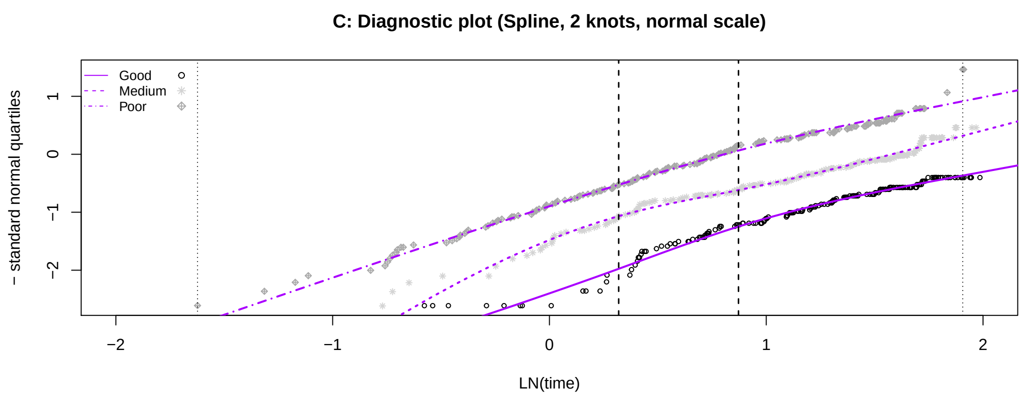



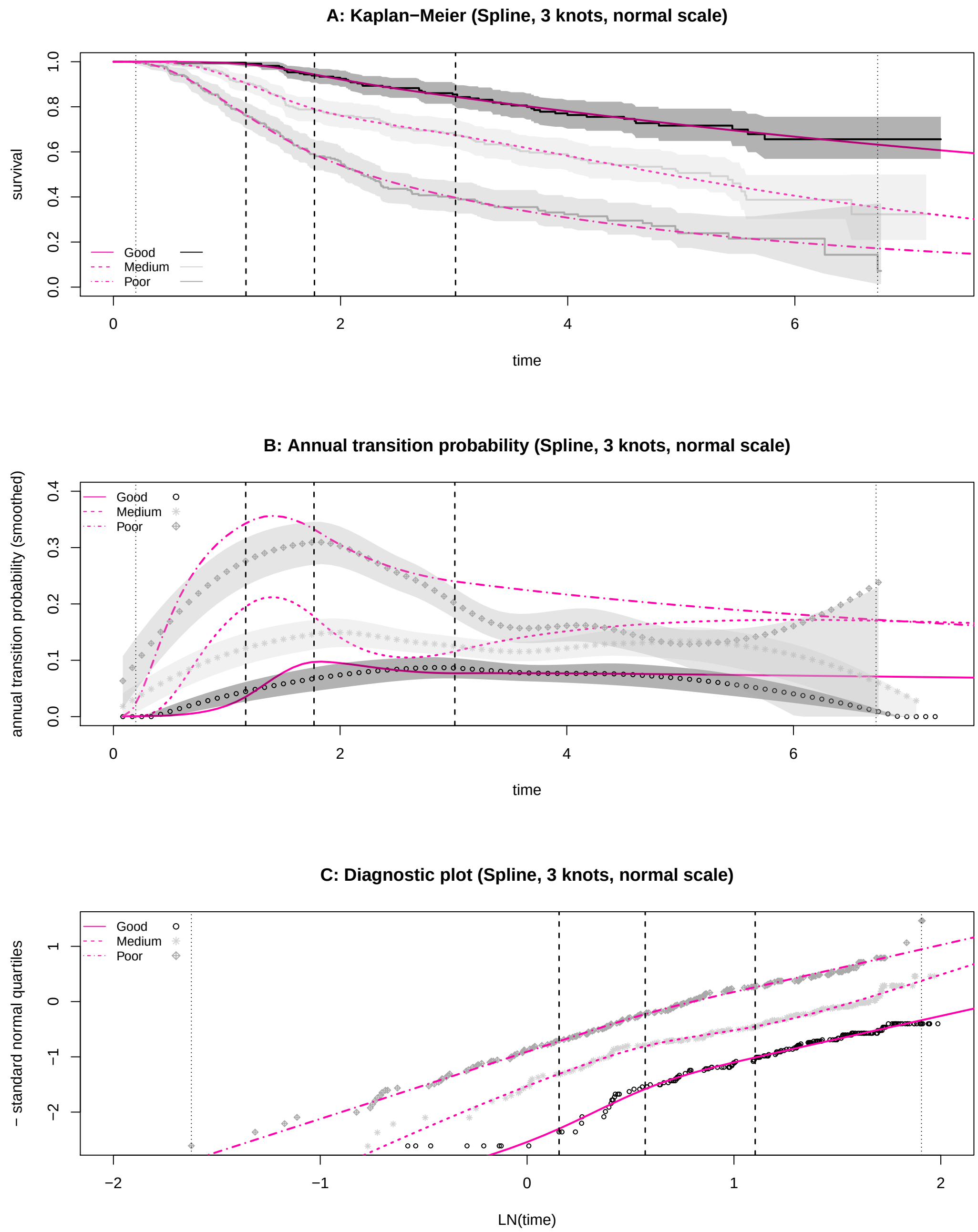
## Spline 2 knots normal



## Spline 3 knots normal



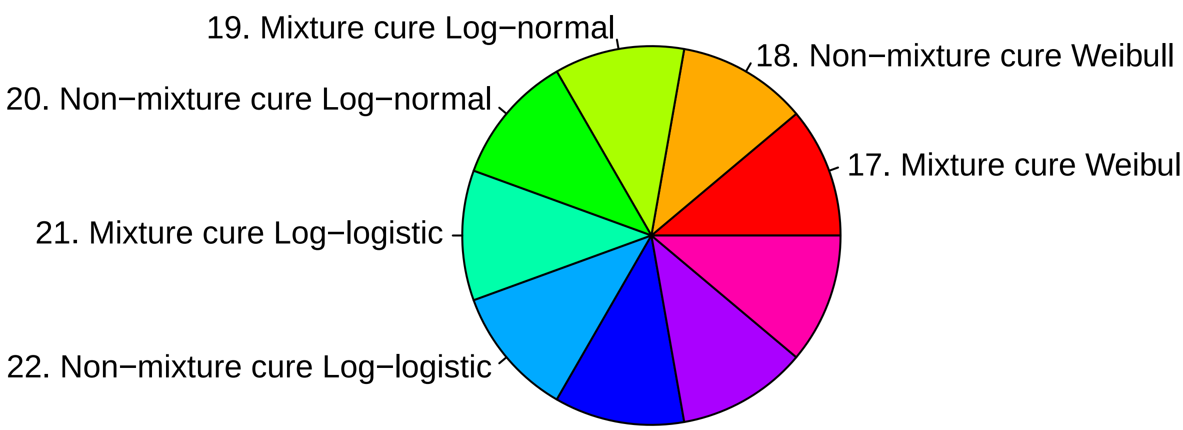
## 4.3 Parametric (non-)mixture cure models

If standard parametric models do not provide a satisfactory fit to the data based on previous observations, do cure models provide a more satisfactory fit to the data?
ADD SIMILAR AS SPLINE AND EXPLAIN DIFFERENCE (NON)MXITURE CURE MODELS ##### mixture cure models:

$$S\text{Ö}(1-theta)+theta\text{Ö}1$$

(theta * 1 assumes that the cure fraction has 100% survival) non-mixture cure models:

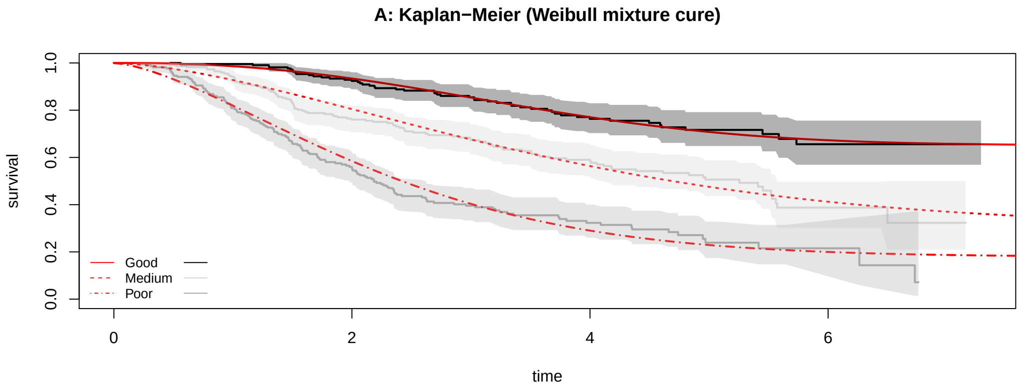
$$exp((1-S)\text{Ö}log(theta))$$

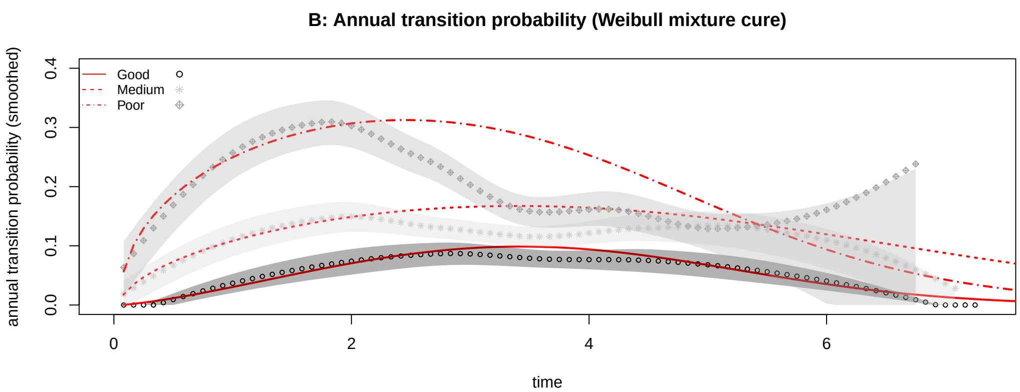


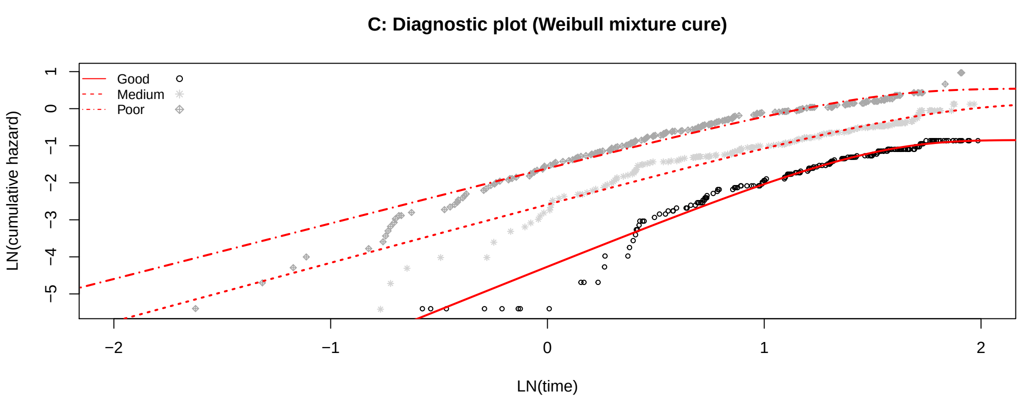

| Model | AIC |
|---|---|
| 7. Generalised Gamma | 1589.049 |
| 4. Log-normal | 1592.880 |
| 19. Mixture cure Log-normal | 1593.762 |
| 20. Non-mixture cure Log-normal | 1593.793 |
| 21. Mixture cure Log-logistic | 1604.290 |
| 22. Non-mixture cure Log-logistic | 1605.960 |
| 5. Log-logistic | 1609.294 |
| 18. Non-mixture cure Weibull | 1615.016 |
| 6. Gamma | 1621.982 |
| 17. Mixture cure Weibull | 1622.730 |
| 2. Weibull | 1632.618 |
| 3. Gompertz | 1660.954 |
| 1. Exponential | 1668.212 |

| Model | Cure fraction Good | Cure fraction Medium | Cure fraction Poor |
|---|---|---|---|
| 17. Mixture cure Weibull | 65.2% (53.9% - 75%) | 30.9% (15% - 53.1%) | 17.9% (10.2% - 29.5%) |
| 18. Non-mixture cure Weibull | 64.9% (53.2% - 75.1%) | 29.6% (12.9% - 54.5%) | 16.8% (9.1% - 28.8%) |
| 19. Mixture cure Log-normal | 57.1% (35.1% - 76.7%) | 19.3% (2.9% - 65.8%) | 10.7% (2.6% - 35.3%) |
| 20. Non-mixture cure Log-normal | 56% (32.6% - 77%) | 20.3% (4.7% - 56.9%) | 9.9% (2.7% - 30.2%) |
| 21. Mixture cure Log-logistic | 60.3% (44.6% - 74.2%) | 23.4% (7.3% - 54.4%) | 13.6% (5.6% - 29.6%) |
| 22. Non-mixture cure Log-logistic | 60.4% (44.8% - 74.2%) | 25% (9.7% - 51%) | 15.5% (8% - 27.9%) |

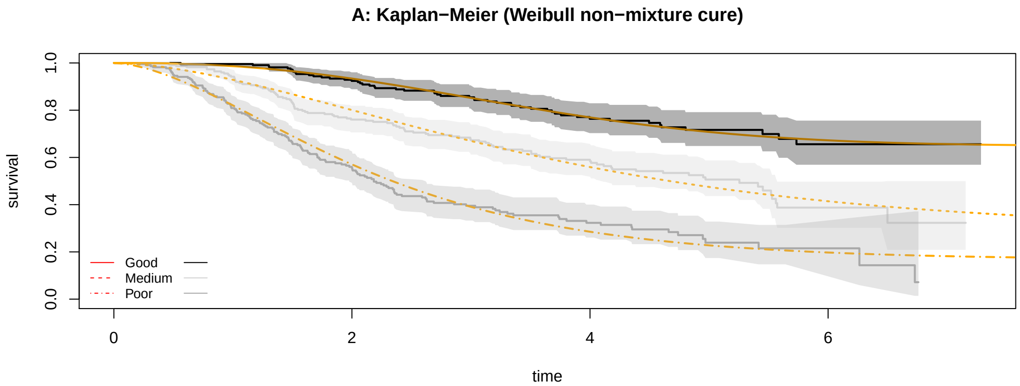
## Mixture cure Weibull

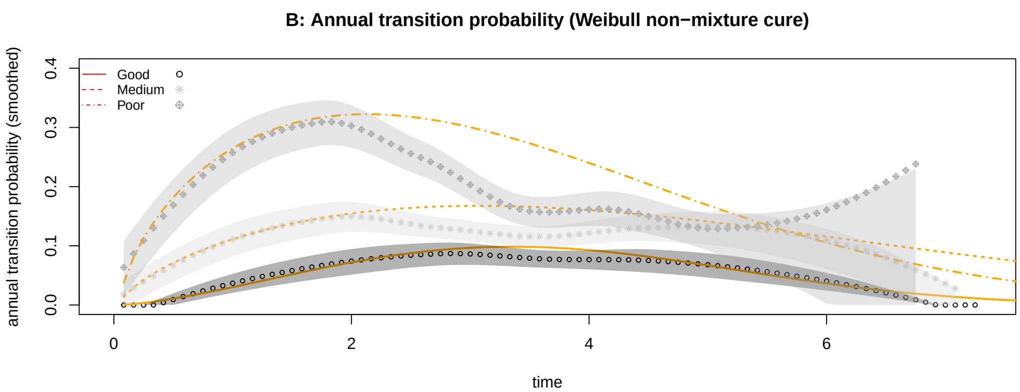


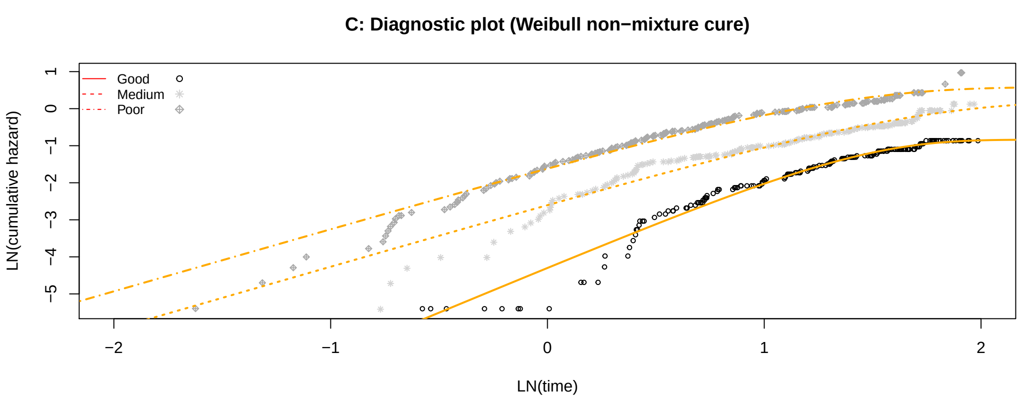



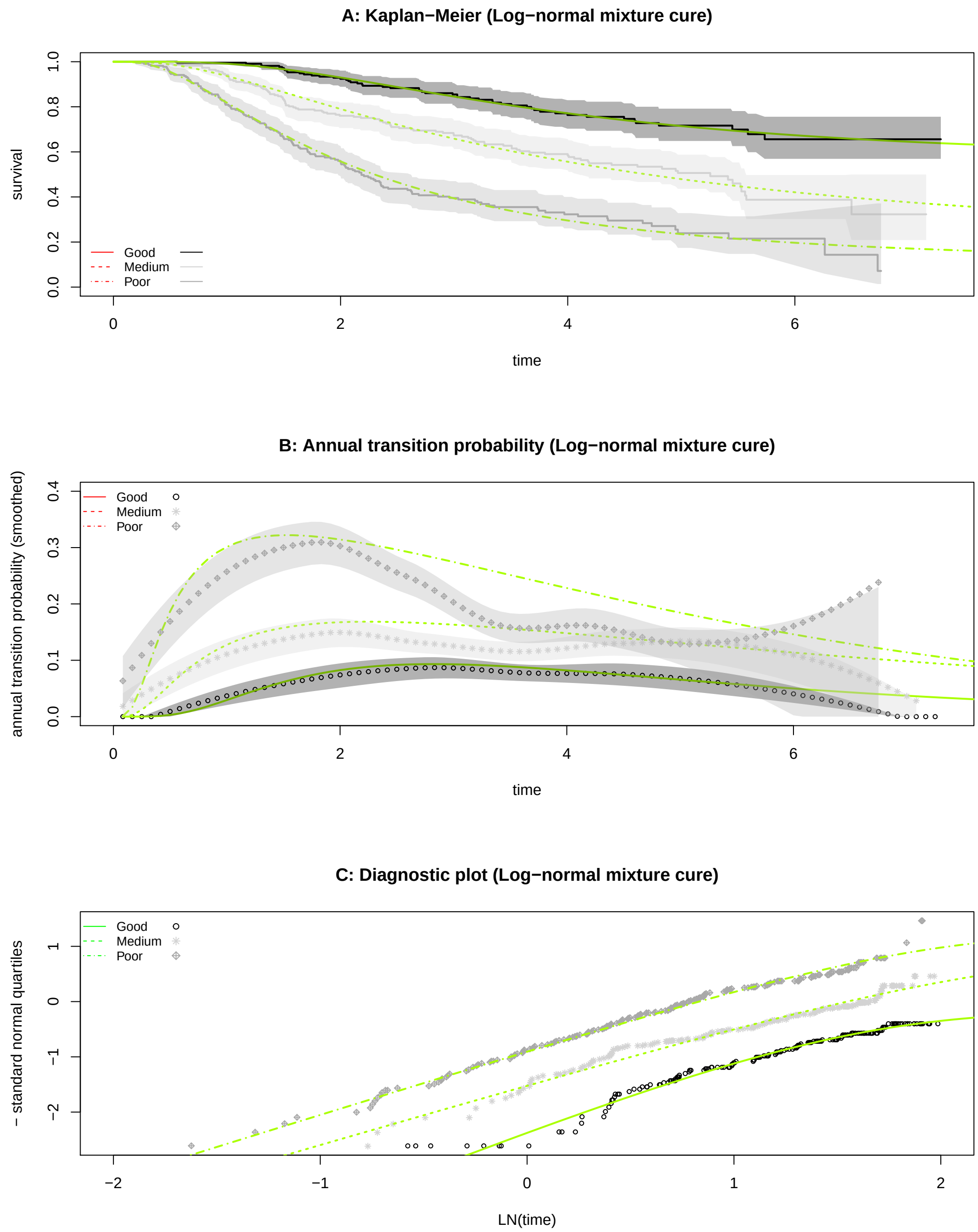
## Non-mixture cure Weibull



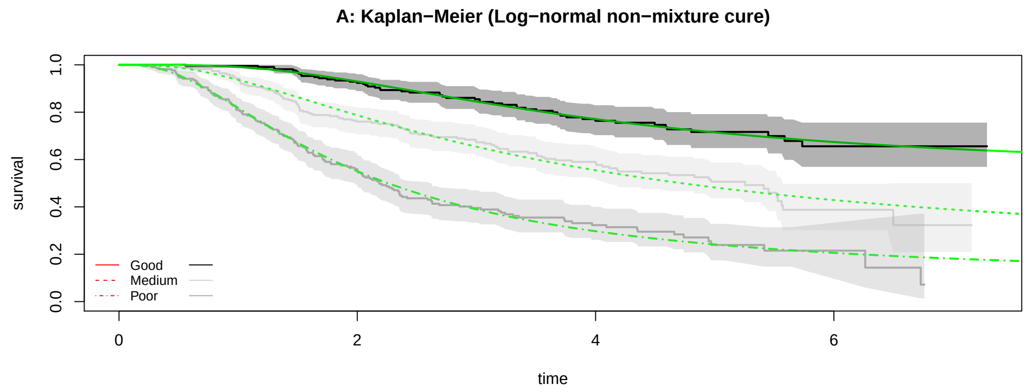



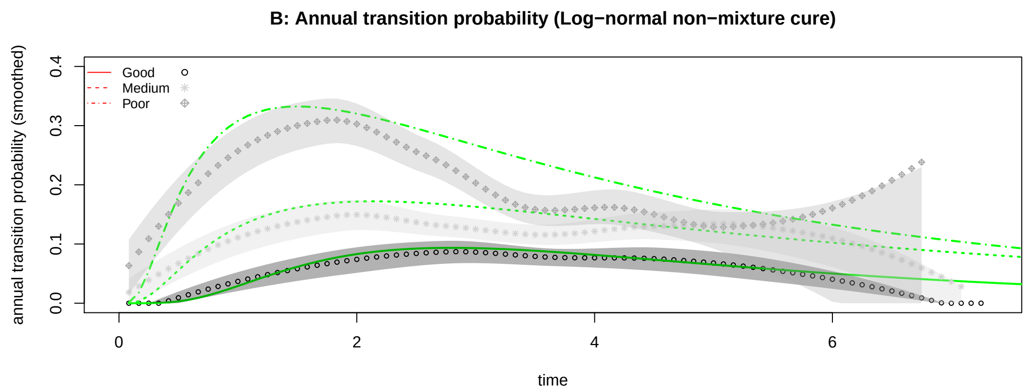



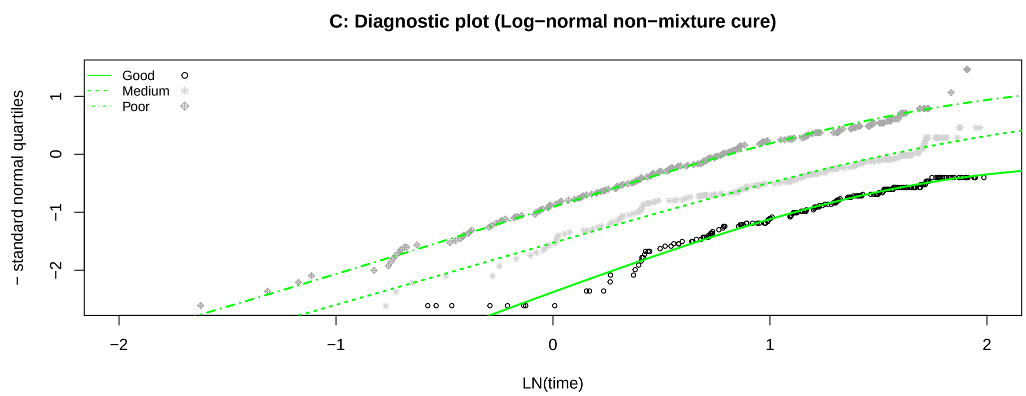
## Mixture cure Log-normal



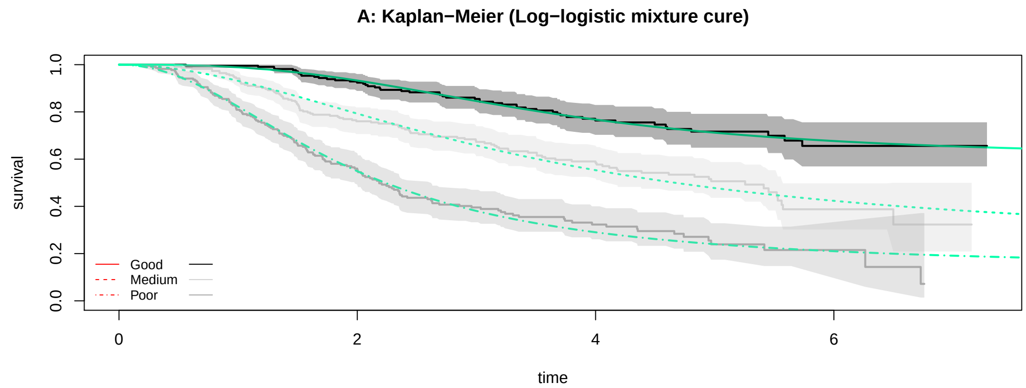
## Non-mixture cure Log-normal

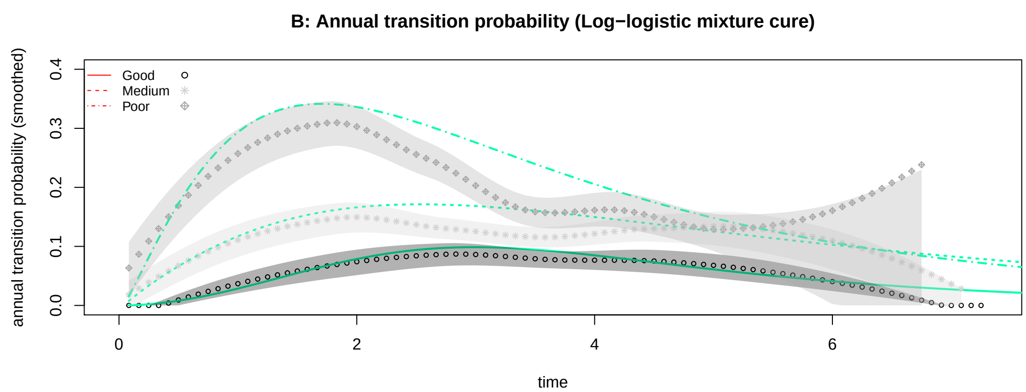


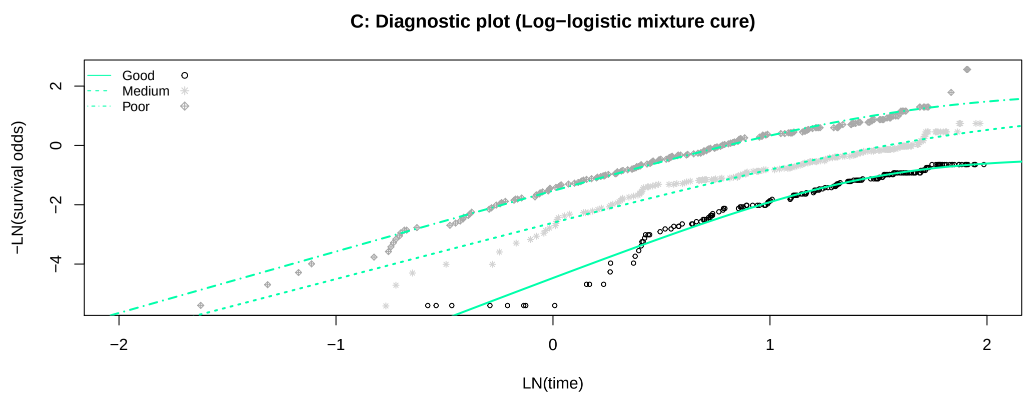



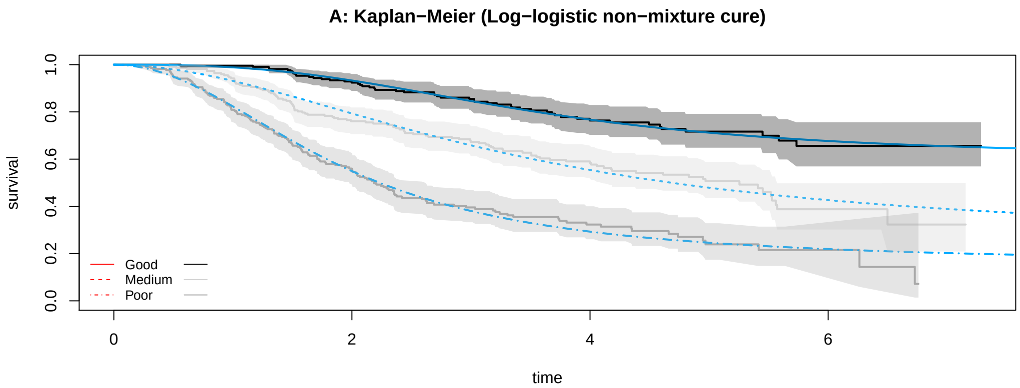
# Mixture cure Log-logistic

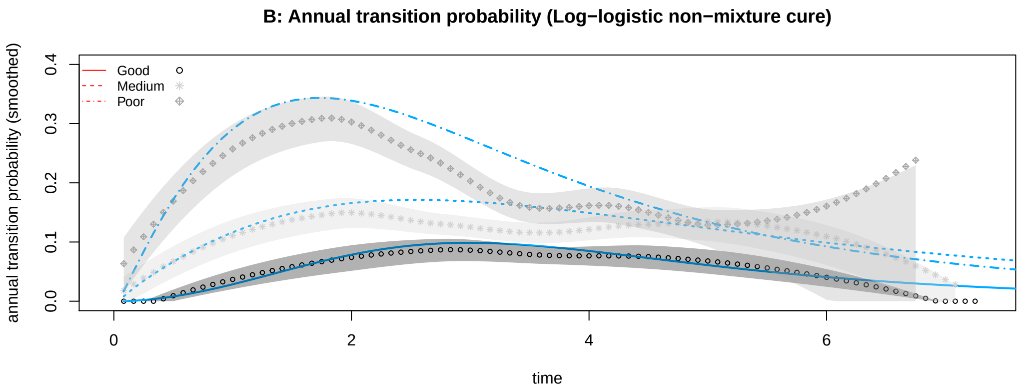


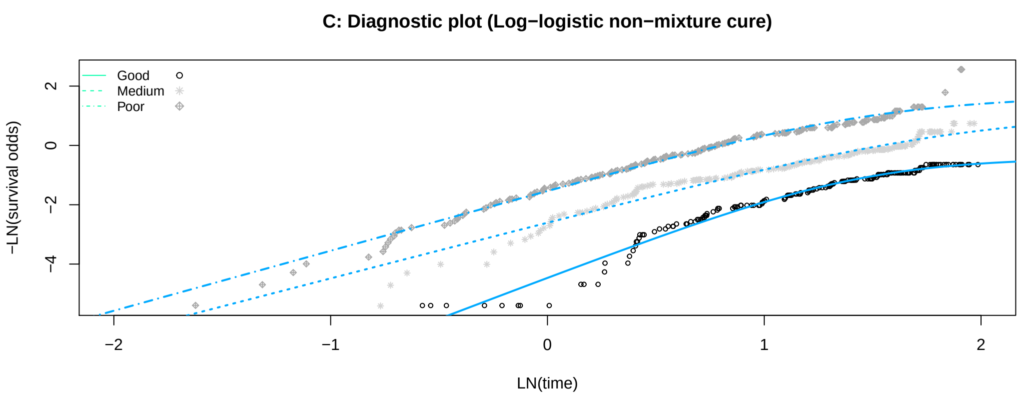



## Non-mixture cure Log-logistic



# 5. Extrapolated survival

The plausibility of the estimated survival beyond the oberseved data period should be considered and is typically an influential aspect of health economic models. This includes considering model(s) is/are more appropriate/plausible for long-term extrapolation when compared to external data (including general population mortality)?
In this section, the estimated survival probabilities for the period of time within and beyond data collection, i.e. the extrapolation are presented (can be specified by the user). This is done by 1) plotting the survival curves (Figures A, B and C), 2) displaying the survival probabilities at multiple time points (first Table), 3) ploting annual transition probabilities (Figures D, E and F), 4) ploting the smoothed hazard functions (Figures G, H and I), and providing the summary statistics of the estimated annual transition probabilities (second Table). This information is provided for each group separately.
One way to assess the plausibility of the extrapolated survival probabilities is to compare the estimated survival probabilities at different time points with external data (e.g. observational data and/or expert opinion). Another way to check for plausibility is to compare the annual transition probability with those observed in the general population (general population mortality can be obtained through national statistics). Parametric survival models annual conditional transition probabilities more favourable than those observed for the general population may not be plausible. This would require either to select an alternative parametric survival model or to adjust the selected parametric survival model for general population probabilities.

## Group Good

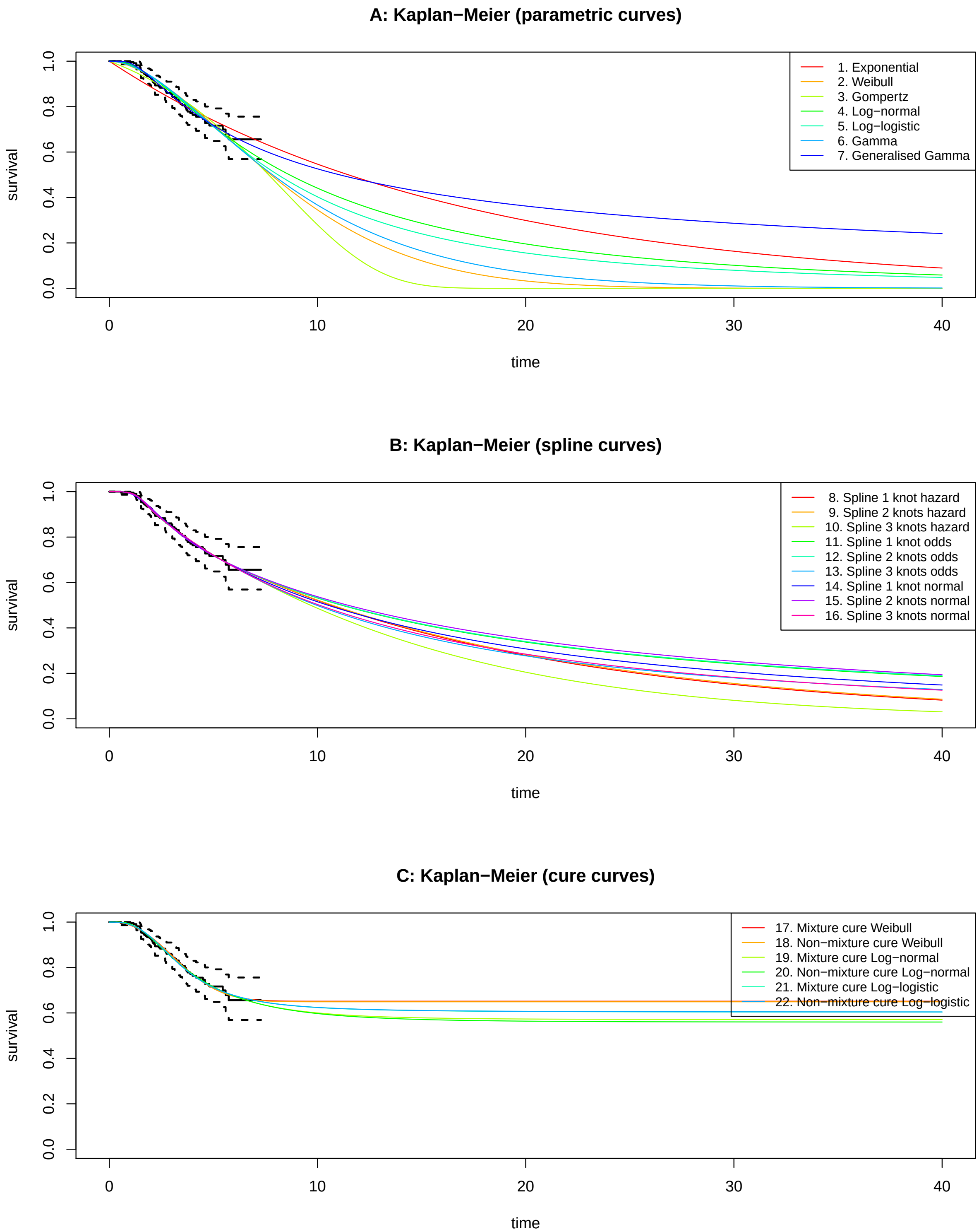
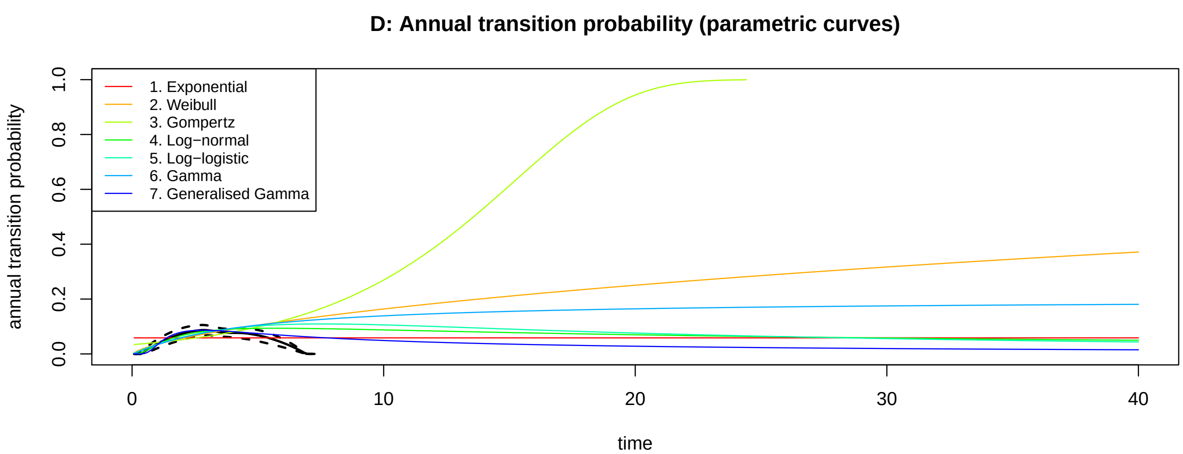
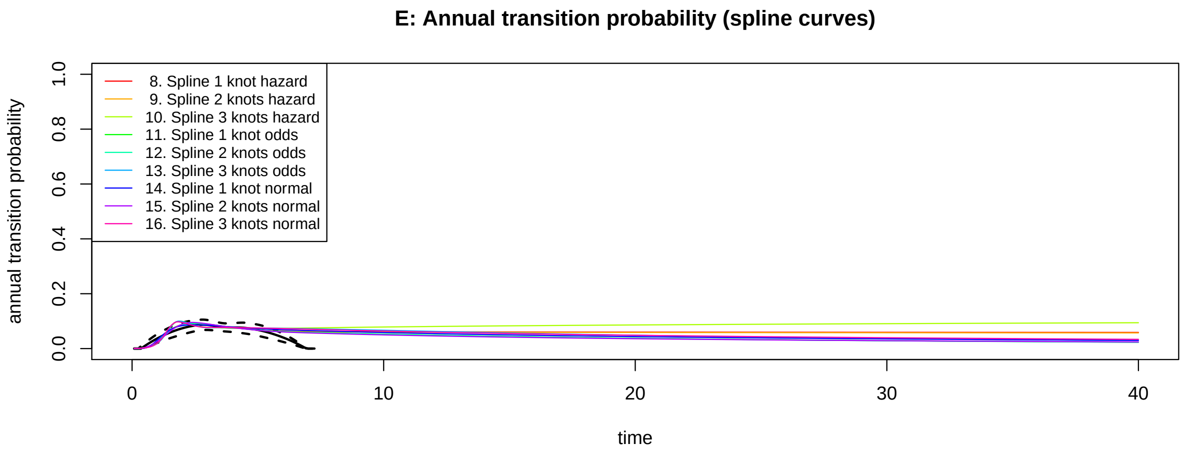
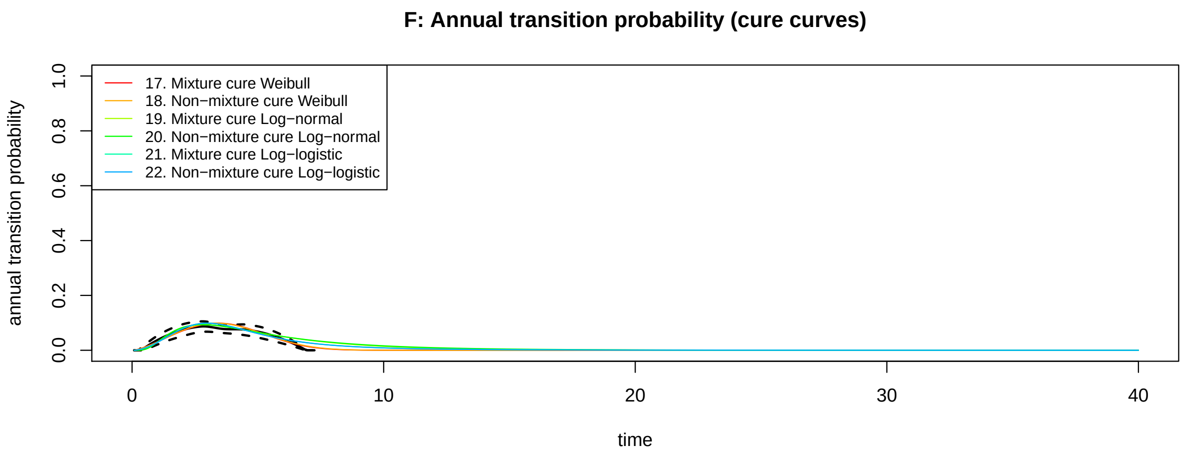

A: Kaplan−Meier (parametric curves)
1. Exponential
2. Weibull
3. Gompertz
4. Log−normal
5. Log−logistic
6. Gamma
7. Generalised Gamma
survival
time
B: Kaplan−Meier (spline curves)
8. Spline 1 knot hazard
9. Spline 2 knots hazard
10. Spline 3 knots hazard
11. Spline 1 knot odds
12. Spline 2 knots odds
13. Spline 3 knots odds
14. Spline 1 knot normal
15. Spline 2 knots normal
16. Spline 3 knots normal
survival
time
C: Kaplan−Meier (cure curves)
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic
survival
time

Table 2: Survival probability at different time points

| | T= 0 | T= 1 | T= 2 | T= 3 | T= 4 | T= 5 | T= 10 | T= 15 | T= 20 | T= 25 | T= 30 | T= 35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Exponential | 1 | 0.941 | 0.886 | 0.834 | 0.785 | 0.739 | 0.547 | 0.404 | 0.299 | 0.221 | 0.163 | 0.121 |
| 2. Weibull | 1 | 0.978 | 0.932 | 0.870 | 0.797 | 0.719 | 0.345 | 0.122 | 0.033 | 0.007 | 0.001 | 0.000 |
| 3. Gompertz | 1 | 0.962 | 0.917 | 0.863 | 0.801 | 0.729 | 0.280 | 0.015 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4. Log-normal | 1 | 0.986 | 0.933 | 0.861 | 0.785 | 0.713 | 0.441 | 0.287 | 0.196 | 0.139 | 0.102 | 0.076 |
| 5. Log-logistic | 1 | 0.980 | 0.932 | 0.865 | 0.789 | 0.712 | 0.403 | 0.240 | 0.156 | 0.108 | 0.080 | 0.061 |
| 6. Gamma | 1 | 0.982 | 0.935 | 0.869 | 0.793 | 0.714 | 0.367 | 0.165 | 0.069 | 0.027 | 0.011 | 0.004 |
| 7. Generalised Gamma | 1 | 0.991 | 0.928 | 0.849 | 0.778 | 0.717 | 0.526 | 0.425 | 0.362 | 0.319 | 0.286 | 0.261 |
| 8. Spline 1 knot hazard | 1 | 0.992 | 0.927 | 0.843 | 0.774 | 0.719 | 0.521 | 0.381 | 0.279 | 0.205 | 0.151 | 0.111 |
| 9. Spline 2 knots hazard | 1 | 0.992 | 0.928 | 0.843 | 0.774 | 0.719 | 0.523 | 0.384 | 0.283 | 0.210 | 0.156 | 0.116 |
| 10. Spline 3 knots hazard | 1 | 0.994 | 0.922 | 0.843 | 0.779 | 0.721 | 0.486 | 0.319 | 0.205 | 0.130 | 0.081 | 0.050 |
| 11. Spline 1 knot odds | 1 | 0.992 | 0.927 | 0.843 | 0.774 | 0.718 | 0.532 | 0.415 | 0.338 | 0.283 | 0.242 | 0.211 |
| 12. Spline 2 knots odds | 1 | 0.992 | 0.928 | 0.843 | 0.774 | 0.718 | 0.533 | 0.418 | 0.340 | 0.285 | 0.245 | 0.213 |
| 13. Spline 3 knots odds | 1 | 0.994 | 0.922 | 0.844 | 0.780 | 0.721 | 0.498 | 0.363 | 0.277 | 0.220 | 0.180 | 0.151 |
| 14. Spline 1 knot normal | 1 | 0.992 | 0.926 | 0.847 | 0.778 | 0.719 | 0.515 | 0.391 | 0.308 | 0.250 | 0.207 | 0.174 |
| 15. Spline 2 knots normal | 1 | 0.992 | 0.929 | 0.842 | 0.773 | 0.718 | 0.538 | 0.426 | 0.350 | 0.295 | 0.253 | 0.220 |
| 16. Spline 3 knots normal | 1 | 0.994 | 0.921 | 0.845 | 0.780 | 0.721 | 0.503 | 0.371 | 0.285 | 0.225 | 0.182 | 0.150 |
| 17. Mixture cure Weibull | 1 | 0.986 | 0.934 | 0.853 | 0.770 | 0.708 | 0.652 | 0.652 | 0.652 | 0.652 | 0.652 | 0.652 |
| 18. Non-mixture cure Weibull | 1 | 0.987 | 0.934 | 0.852 | 0.770 | 0.708 | 0.649 | 0.649 | 0.649 | 0.649 | 0.649 | 0.649 |
| 19. Mixture cure Log-normal | 1 | 0.991 | 0.930 | 0.845 | 0.771 | 0.715 | 0.600 | 0.578 | 0.573 | 0.572 | 0.571 | 0.571 |
| 20. Non-mixture cure Log-normal | 1 | 0.991 | 0.930 | 0.845 | 0.771 | 0.715 | 0.597 | 0.571 | 0.564 | 0.561 | 0.561 | 0.560 |
| 21. Mixture cure Log-logistic | 1 | 0.989 | 0.933 | 0.846 | 0.767 | 0.712 | 0.624 | 0.610 | 0.607 | 0.605 | 0.604 | 0.604 |
| 22. Non-mixture cure Log-logistic | 1 | 0.989 | 0.933 | 0.846 | 0.767 | 0.712 | 0.624 | 0.611 | 0.607 | 0.606 | 0.605 | 0.605 |




E: Annual transition probability (spline curves)
annual transition probability
0.0
0.2
0.4
0.6
0.8
1.0
8. Spline 1 knot hazard
9. Spline 2 knots hazard
10. Spline 3 knots hazard
11. Spline 1 knot odds
12. Spline 2 knots odds
13. Spline 3 knots odds
14. Spline 1 knot normal
15. Spline 2 knots normal
16. Spline 3 knots normal
0
10
20
30
40
time


F: Annual transition probability (cure curves)
annual transition probability
0.0
0.2
0.4
0.6
0.8
1.0
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic
0
10
20
30
40
time

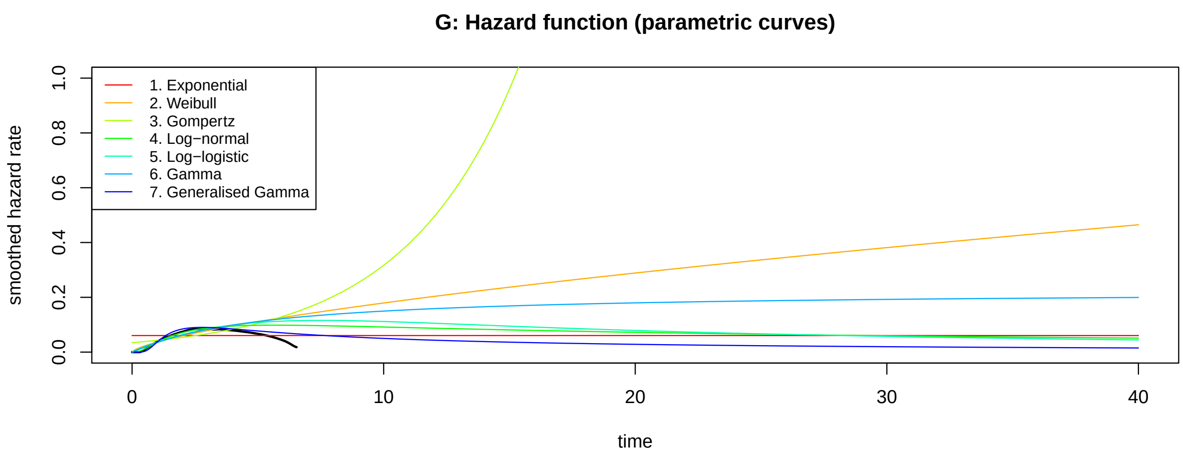
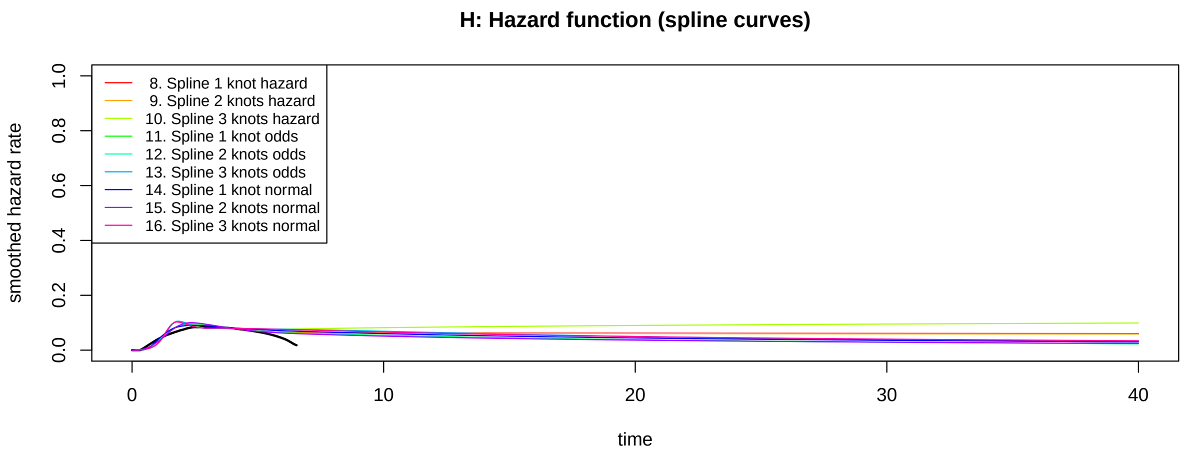
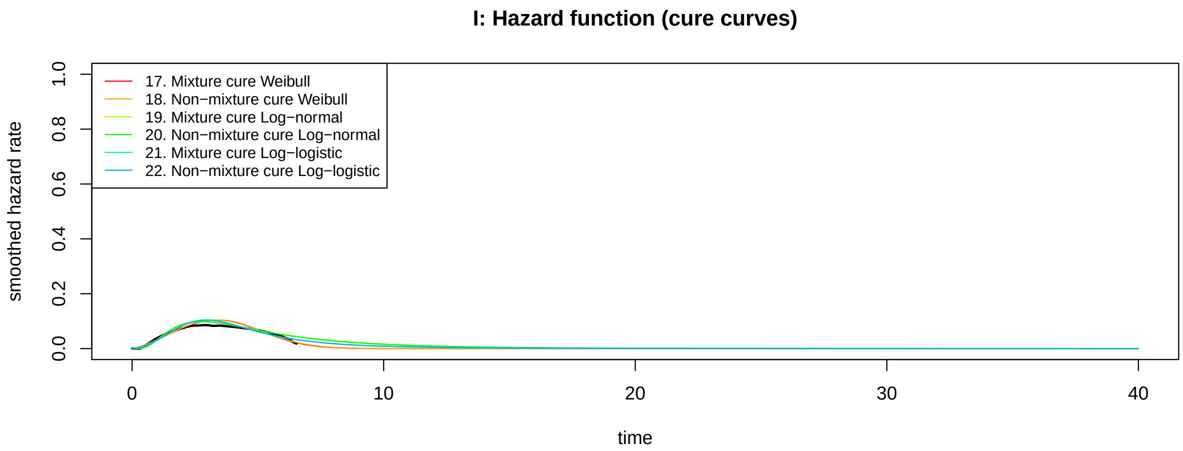

G: Hazard function (parametric curves)
smoothed hazard rate
0.0
0.2
0.4
0.6
0.8
1.0
1. Exponential
2. Weibull
3. Gompertz
4. Log−normal
5. Log−logistic
6. Gamma
7. Generalised Gamma
0
10
20
30
40
time

Table 3: Summary statistics of annual transition probabilities

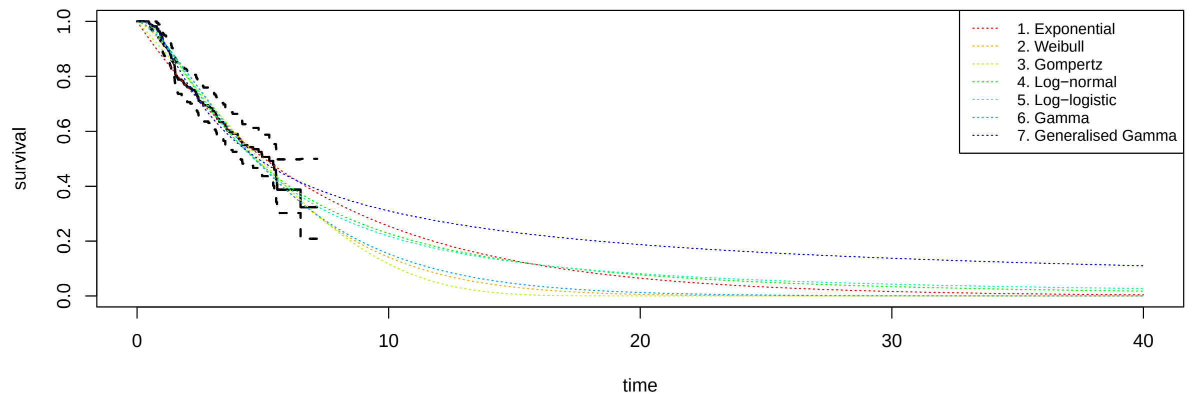
| | Mean | Std.Dev | Min | Q1 | Median | Q3 | Max | IQR |
|---|---|---|---|---|---|---|---|---|
| 1. Exponential | 0.0585969 | 0.0000000 | 0.0585969 | 0.0585969 | 0.0585969 | 0.0585969 | 0.0585969 | 0.0000000 |
| 2. Weibull | 0.2349897 | 0.0957992 | 0.0039603 | 0.1641779 | 0.2507544 | 0.3170901 | 0.3714738 | 0.1525734 |
| 3. Gompertz | 0.4784514 | 0.3579470 | 0.0342601 | 0.1256322 | 0.4037134 | 0.8634656 | 1.0000000 | 0.7378334 |
| 4. Log-normal | 0.0683436 | 0.0166027 | 0.0000121 | 0.0563972 | 0.0670524 | 0.0819079 | 0.0936091 | 0.0254606 |
| 5. Log-logistic | 0.0728032 | 0.0230017 | 0.0022936 | 0.0533146 | 0.0700441 | 0.0935993 | 0.1092616 | 0.0401882 |
| 6. Gamma | 0.1493002 | 0.0379093 | 0.0014181 | 0.1390361 | 0.1644882 | 0.1750195 | 0.1807519 | 0.0358775 |
| 7. Generalised Gamma | 0.0347149 | 0.0206128 | 0.0000000 | 0.0191123 | 0.0269247 | 0.0452063 | 0.0862100 | 0.0260182 |
| 8. Spline 1 knot hazard | 0.0605266 | 0.0109221 | 0.0000002 | 0.0592140 | 0.0598953 | 0.0610195 | 0.0916043 | 0.0018010 |
| 9. Spline 2 knots hazard | 0.0593803 | 0.0110234 | 0.0000002 | 0.0576502 | 0.0585313 | 0.0599923 | 0.0923962 | 0.0023363 |
| 10. Spline 3 knots hazard | 0.0832632 | 0.0146134 | 0.0003310 | 0.0798260 | 0.0865334 | 0.0909988 | 0.0996328 | 0.0111549 |
| 11. Spline 1 knot odds | 0.0410014 | 0.0174571 | 0.0000002 | 0.0281269 | 0.0363823 | 0.0502992 | 0.0917044 | 0.0221203 |
| 12. Spline 2 knots odds | 0.0406443 | 0.0174917 | 0.0000002 | 0.0278516 | 0.0359503 | 0.0497462 | 0.0924439 | 0.0218428 |
| 13. Spline 3 knots odds | 0.0497623 | 0.0176792 | 0.0003253 | 0.0358147 | 0.0466608 | 0.0638606 | 0.0999099 | 0.0279854 |
| 14. Spline 1 knot normal | 0.0463860 | 0.0161648 | 0.0000000 | 0.0345970 | 0.0424046 | 0.0560095 | 0.0865141 | 0.0213599 |
| 15. Spline 2 knots normal | 0.0400250 | 0.0171948 | 0.0000006 | 0.0281480 | 0.0348987 | 0.0473455 | 0.0953359 | 0.0191484 |
| 16. Spline 3 knots normal | 0.0503355 | 0.0161995 | 0.0007793 | 0.0386308 | 0.0470013 | 0.0611992 | 0.0975846 | 0.0225147 |
| 17. Mixture cure Weibull | 0.0103115 | 0.0253657 | 0.0000000 | 0.0000000 | 0.0000000 | 0.0001031 | 0.0987558 | 0.0000986 |
| 18. Non-mixture cure Weibull | 0.0104098 | 0.0254044 | 0.0000000 | 0.0000000 | 0.0000000 | 0.0001575 | 0.0985854 | 0.0001510 |
| 19. Mixture cure Log-normal | 0.0135710 | 0.0252751 | 0.0000000 | 0.0000929 | 0.0008027 | 0.0116086 | 0.0931907 | 0.0114404 |
| 20. Non-mixture cure Log-normal | 0.0140594 | 0.0251944 | 0.0000000 | 0.0001962 | 0.0012968 | 0.0132969 | 0.0934968 | 0.0130702 |
| 21. Mixture cure Log-logistic | 0.0122019 | 0.0249146 | 0.0000516 | 0.0001512 | 0.0006917 | 0.0075147 | 0.0986522 | 0.0073113 |
| 22. Non-mixture cure Log-logistic | 0.0121786 | 0.0249023 | 0.0000517 | 0.0001509 | 0.0006881 | 0.0074554 | 0.0987027 | 0.0072528 |



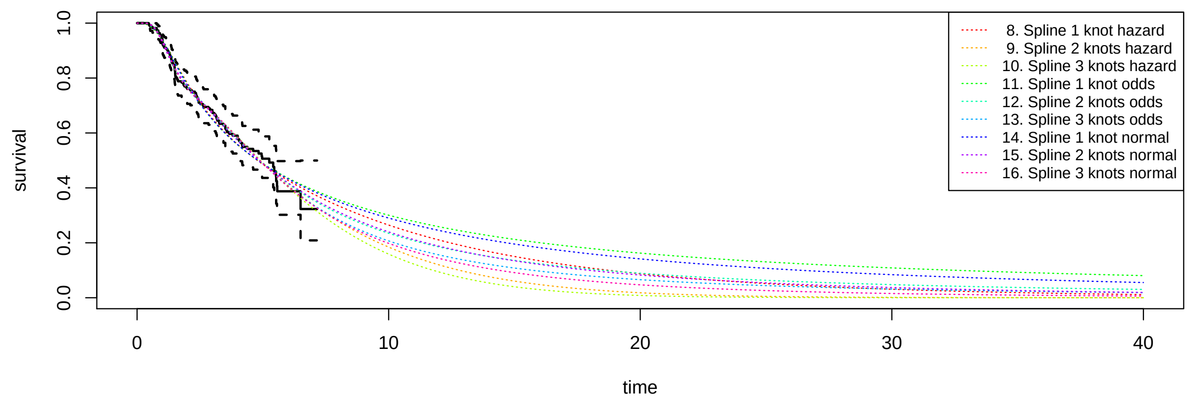

I: Hazard function (cure curves)
smoothed hazard rate
time
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic

## Group Medium

A: Kaplan−Meier (parametric curves)




B: Kaplan−Meier (spline curves)




C: Kaplan−Meier (cure curves)

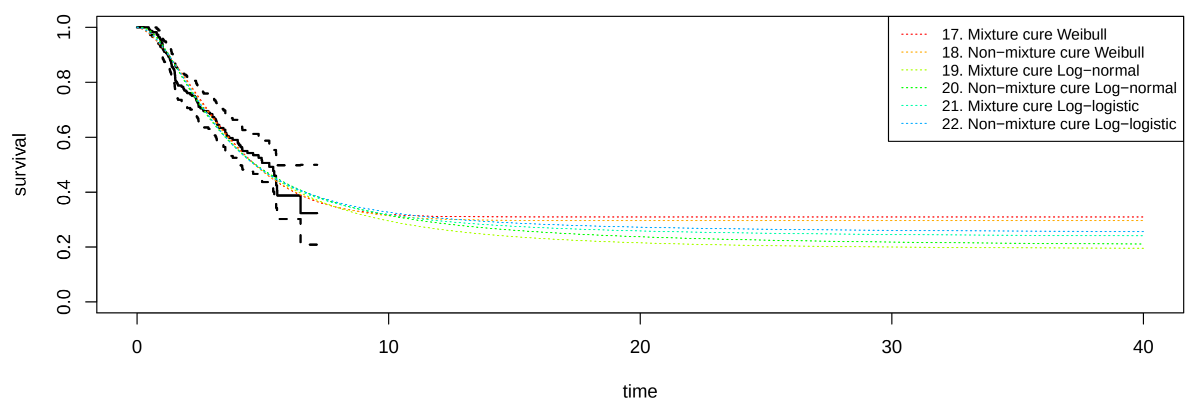
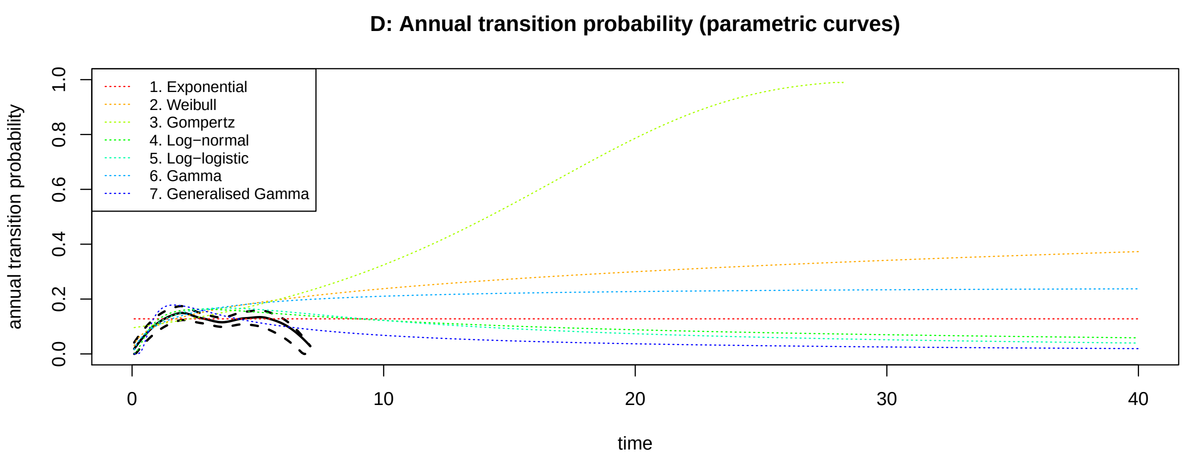
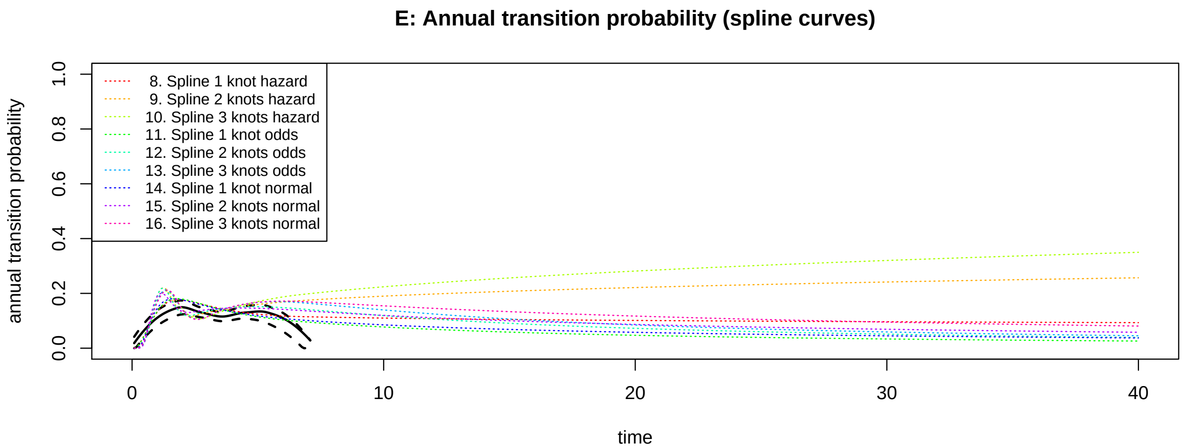
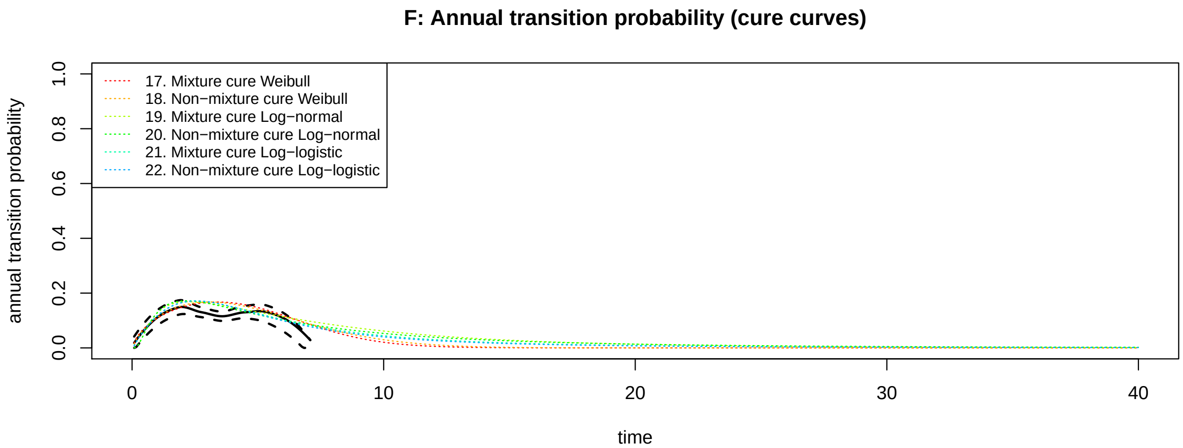


Table 4: Survival probability at different time points

| | T= 0 | T= 1 | T= 2 | T= 3 | T= 4 | T= 5 | T= 10 | T= 15 | T= 20 | T= 25 | T= 30 | T= 35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Exponential | 1 | 0.872 | 0.761 | 0.663 | 0.578 | 0.505 | 0.255 | 0.128 | 0.065 | 0.033 | 0.016 | 0.008 |
| 2. Weibull | 1 | 0.923 | 0.811 | 0.693 | 0.578 | 0.474 | 0.141 | 0.032 | 0.006 | 0.001 | 0.000 | 0.000 |
| 3. Gompertz | 1 | 0.898 | 0.794 | 0.689 | 0.586 | 0.486 | 0.117 | 0.007 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4. Log-normal | 1 | 0.935 | 0.797 | 0.668 | 0.560 | 0.473 | 0.228 | 0.126 | 0.077 | 0.050 | 0.034 | 0.024 |
| 5. Log-logistic | 1 | 0.927 | 0.801 | 0.673 | 0.561 | 0.468 | 0.218 | 0.124 | 0.081 | 0.057 | 0.043 | 0.034 |
| 6. Gamma | 1 | 0.930 | 0.813 | 0.689 | 0.572 | 0.469 | 0.154 | 0.045 | 0.013 | 0.003 | 0.001 | 0.000 |
| 7. Generalised Gamma | 1 | 0.937 | 0.774 | 0.648 | 0.556 | 0.488 | 0.310 | 0.232 | 0.187 | 0.158 | 0.138 | 0.122 |
| 8. Spline 1 knot hazard | 1 | 0.939 | 0.782 | 0.652 | 0.558 | 0.486 | 0.265 | 0.150 | 0.087 | 0.052 | 0.031 | 0.019 |
| 9. Spline 2 knots hazard | 1 | 0.935 | 0.766 | 0.673 | 0.579 | 0.490 | 0.184 | 0.061 | 0.018 | 0.005 | 0.001 | 0.000 |
| 10. Spline 3 knots hazard | 1 | 0.936 | 0.761 | 0.674 | 0.585 | 0.491 | 0.159 | 0.040 | 0.008 | 0.001 | 0.000 | 0.000 |
| 11. Spline 1 knot odds | 1 | 0.939 | 0.778 | 0.648 | 0.556 | 0.489 | 0.301 | 0.213 | 0.162 | 0.131 | 0.109 | 0.093 |
| 12. Spline 2 knots odds | 1 | 0.935 | 0.769 | 0.673 | 0.576 | 0.489 | 0.235 | 0.136 | 0.089 | 0.063 | 0.048 | 0.037 |
| 13. Spline 3 knots odds | 1 | 0.937 | 0.761 | 0.675 | 0.583 | 0.489 | 0.207 | 0.108 | 0.066 | 0.044 | 0.032 | 0.024 |
| 14. Spline 1 knot normal | 1 | 0.938 | 0.775 | 0.648 | 0.557 | 0.488 | 0.290 | 0.195 | 0.141 | 0.107 | 0.084 | 0.067 |
| 15. Spline 2 knots normal | 1 | 0.930 | 0.773 | 0.669 | 0.572 | 0.489 | 0.240 | 0.135 | 0.083 | 0.054 | 0.037 | 0.026 |
| 16. Spline 3 knots normal | 1 | 0.937 | 0.761 | 0.675 | 0.583 | 0.489 | 0.198 | 0.091 | 0.047 | 0.026 | 0.015 | 0.010 |
| 17. Mixture cure Weibull | 1 | 0.928 | 0.804 | 0.676 | 0.563 | 0.475 | 0.319 | 0.310 | 0.309 | 0.309 | 0.309 | 0.309 |
| 18. Non-mixture cure Weibull | 1 | 0.929 | 0.801 | 0.670 | 0.559 | 0.475 | 0.314 | 0.297 | 0.296 | 0.296 | 0.296 | 0.296 |
| 19. Mixture cure Log-normal | 1 | 0.936 | 0.790 | 0.658 | 0.556 | 0.479 | 0.295 | 0.238 | 0.215 | 0.205 | 0.200 | 0.197 |
| 20. Non-mixture cure Log-normal | 1 | 0.937 | 0.787 | 0.654 | 0.555 | 0.482 | 0.315 | 0.261 | 0.237 | 0.225 | 0.218 | 0.214 |
| 21. Mixture cure Log-logistic | 1 | 0.931 | 0.793 | 0.658 | 0.553 | 0.477 | 0.318 | 0.275 | 0.259 | 0.250 | 0.246 | 0.243 |
| 22. Non-mixture cure Log-logistic | 1 | 0.931 | 0.793 | 0.659 | 0.554 | 0.479 | 0.327 | 0.287 | 0.272 | 0.265 | 0.261 | 0.258 |




E: Annual transition probability (spline curves)
8. Spline 1 knot hazard
9. Spline 2 knots hazard
10. Spline 3 knots hazard
11. Spline 1 knot odds
12. Spline 2 knots odds
13. Spline 3 knots odds
14. Spline 1 knot normal
15. Spline 2 knots normal
16. Spline 3 knots normal
annual transition probability
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
time


F: Annual transition probability (cure curves)
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic
annual transition probability
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
time

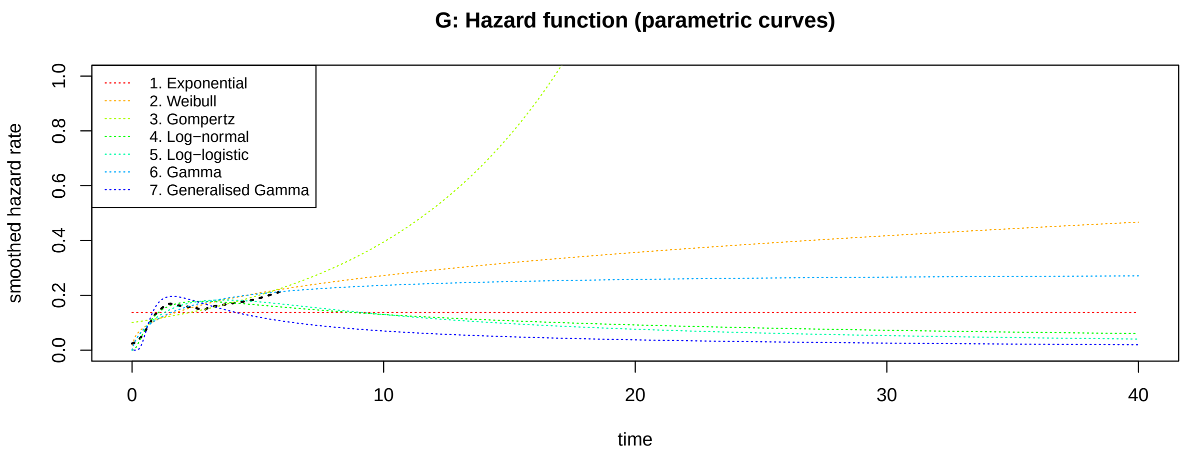
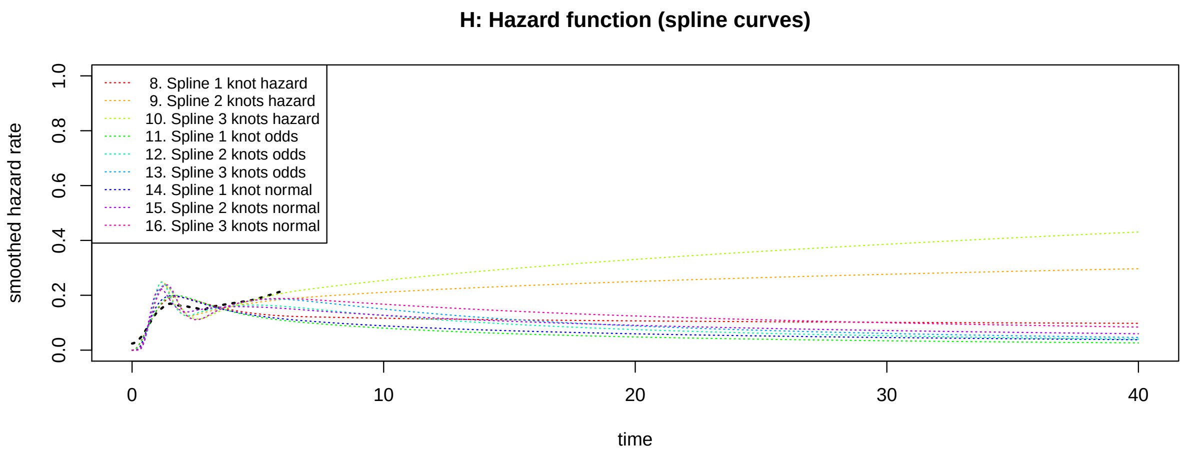
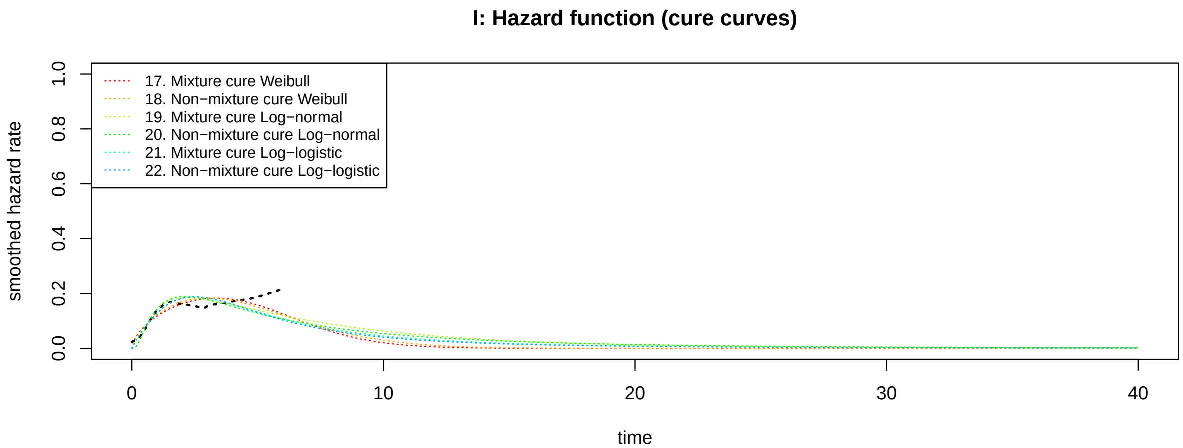

G: Hazard function (parametric curves)
1. Exponential
2. Weibull
3. Gompertz
4. Log−normal
5. Log−logistic
6. Gamma
7. Generalised Gamma
smoothed hazard rate
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
time

Table 5: Summary statistics of annual transition probabilities

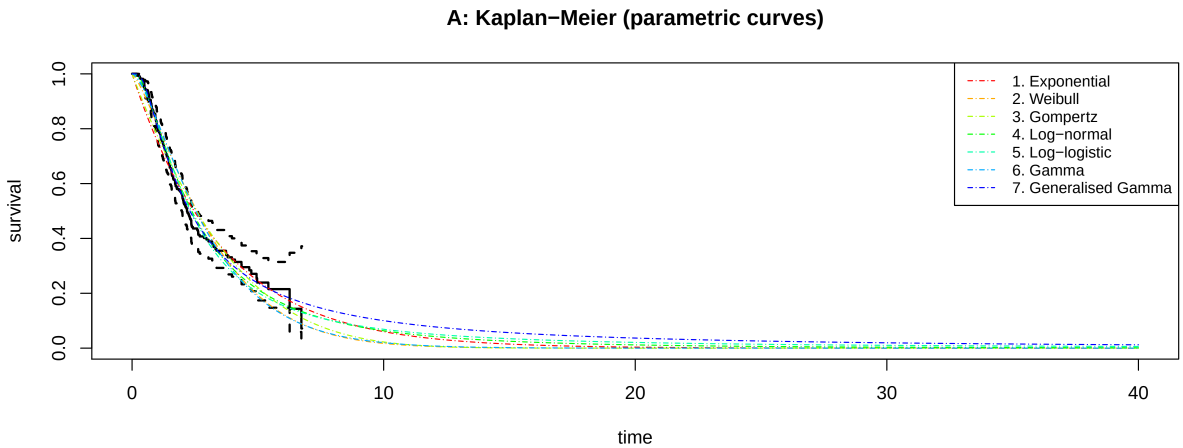
| | Mean | Std.Dev | Min | Q1 | Median | Q3 | Max | IQR |
|---|---|---|---|---|---|---|---|---|
| 1. Exponential | 0.1278820 | 0.0000000 | 0.1278820 | 0.1278820 | 0.1278820 | 0.1278820 | 0.1278820 | 0.0000000 |
| 2. Weibull | 0.2818916 | 0.0732627 | 0.0298491 | 0.2382194 | 0.2998675 | 0.3413164 | 0.3730304 | 0.1028543 |
| 3. Gompertz | 0.5313783 | 0.3082529 | 0.0960264 | 0.2326209 | 0.5026105 | 0.8415103 | 1.0000000 | 0.6074770 |
| 4. Log-normal | 0.0954433 | 0.0321269 | 0.0004751 | 0.0692201 | 0.0864990 | 0.1175437 | 0.1630482 | 0.0482006 |
| 5. Log-logistic | 0.0853562 | 0.0400803 | 0.0150627 | 0.0512119 | 0.0722192 | 0.1148301 | 0.1673124 | 0.0634470 |
| 6. Gamma | 0.2142916 | 0.0338979 | 0.0159374 | 0.2105278 | 0.2273428 | 0.2338793 | 0.2373538 | 0.0232792 |
| 7. Generalised Gamma | 0.0527725 | 0.0403634 | 0.0000000 | 0.0249765 | 0.0361491 | 0.0643696 | 0.1783037 | 0.0392711 |
| 8. Spline 1 knot hazard | 0.1055301 | 0.0199804 | 0.0005533 | 0.0961200 | 0.1007177 | 0.1087714 | 0.1767370 | 0.0126190 |
| 9. Spline 2 knots hazard | 0.2108105 | 0.0424037 | 0.0000006 | 0.1921569 | 0.2213494 | 0.2415978 | 0.2568265 | 0.0493204 |
| 10. Spline 3 knots hazard | 0.2648787 | 0.0695995 | 0.0000040 | 0.2243467 | 0.2816554 | 0.3202621 | 0.3498686 | 0.0956896 |
| 11. Spline 1 knot odds | 0.0602433 | 0.0377595 | 0.0004610 | 0.0331955 | 0.0461415 | 0.0743721 | 0.1809477 | 0.0410625 |
| 12. Spline 2 knots odds | 0.0828374 | 0.0396992 | 0.0000004 | 0.0500917 | 0.0706148 | 0.1135216 | 0.2192447 | 0.0632652 |
| 13. Spline 3 knots odds | 0.0937702 | 0.0420449 | 0.0000052 | 0.0581364 | 0.0821832 | 0.1255993 | 0.2117141 | 0.0672824 |
| 14. Spline 1 knot normal | 0.0691260 | 0.0346943 | 0.0000012 | 0.0444894 | 0.0569700 | 0.0823605 | 0.1804334 | 0.0378197 |
| 15. Spline 2 knots normal | 0.0933942 | 0.0319718 | 0.0000000 | 0.0682231 | 0.0852159 | 0.1164045 | 0.2005479 | 0.0480608 |
| 16. Spline 3 knots normal | 0.1188116 | 0.0321078 | 0.0000001 | 0.0939627 | 0.1132858 | 0.1426801 | 0.2122248 | 0.0486132 |
| 17. Mixture cure Weibull | 0.0274205 | 0.0519801 | 0.0000000 | 0.0000000 | 0.0000059 | 0.0191609 | 0.1672892 | 0.0189217 |
| 18. Non-mixture cure Weibull | 0.0284836 | 0.0517239 | 0.0000000 | 0.0000000 | 0.0000548 | 0.0281639 | 0.1675628 | 0.0279040 |
| 19. Mixture cure Log-normal | 0.0386248 | 0.0496451 | 0.0001478 | 0.0035974 | 0.0128314 | 0.0569406 | 0.1684663 | 0.0533108 |
| 20. Non-mixture cure Log-normal | 0.0369202 | 0.0476273 | 0.0001962 | 0.0048679 | 0.0133317 | 0.0491721 | 0.1721086 | 0.0441369 |
| 21. Mixture cure Log-logistic | 0.0336695 | 0.0485634 | 0.0012991 | 0.0028998 | 0.0085638 | 0.0419015 | 0.1712400 | 0.0388233 |
| 22. Non-mixture cure Log-logistic | 0.0321761 | 0.0482523 | 0.0010967 | 0.0024492 | 0.0073855 | 0.0377612 | 0.1712106 | 0.0351424 |

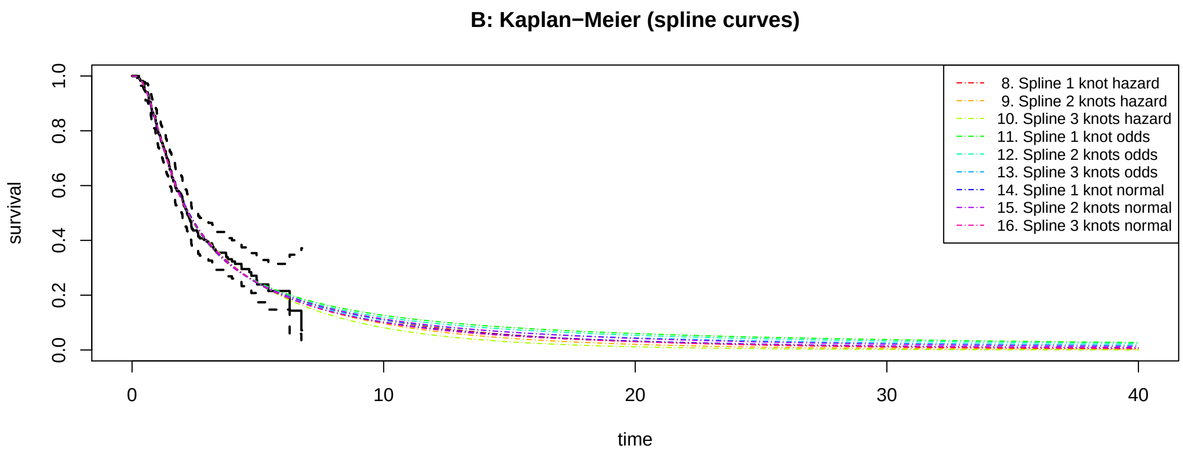




I: Hazard function (cure curves)
smoothed hazard rate
time
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40

## Group Poor


A: Kaplan−Meier (parametric curves)
survival
time
0
10
20
30
40
0.0
0.2
0.4
0.6
0.8
1.0
1. Exponential
2. Weibull
3. Gompertz
4. Log−normal
5. Log−logistic
6. Gamma
7. Generalised Gamma


B: Kaplan−Meier (spline curves)
survival
time
0
10
20
30
40
0.0
0.2
0.4
0.6
0.8
1.0
8. Spline 1 knot hazard
9. Spline 2 knots hazard
10. Spline 3 knots hazard
11. Spline 1 knot odds
12. Spline 2 knots odds
13. Spline 3 knots odds
14. Spline 1 knot normal
15. Spline 2 knots normal
16. Spline 3 knots normal

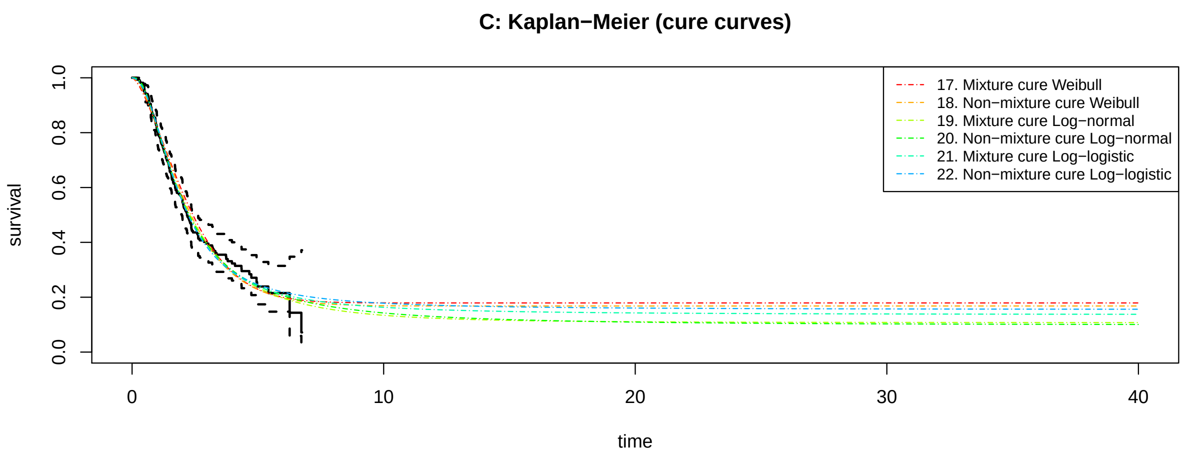
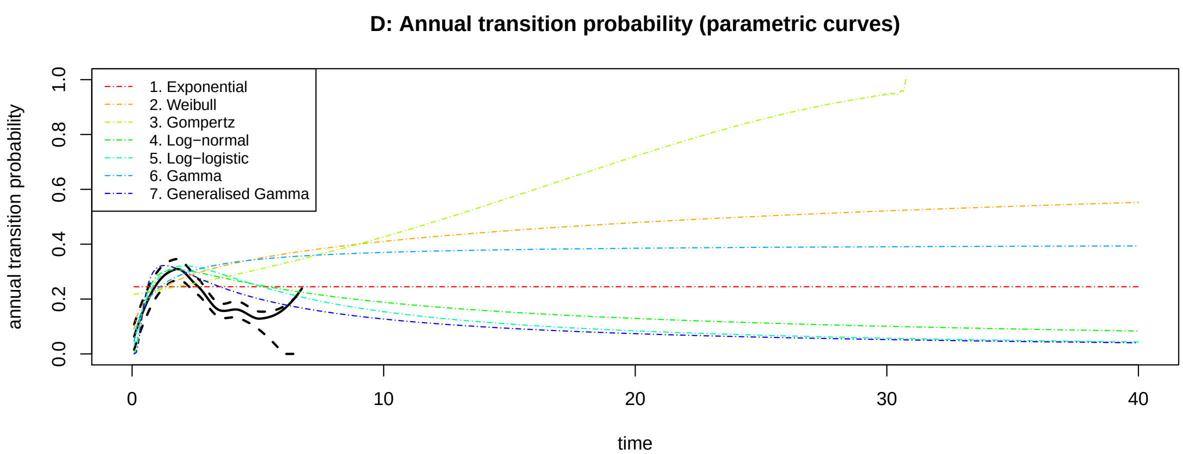
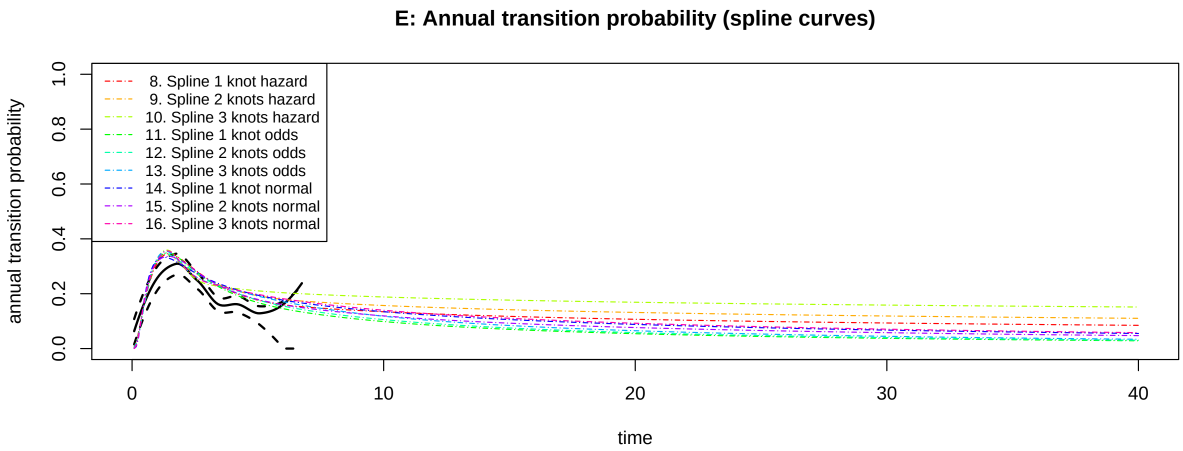
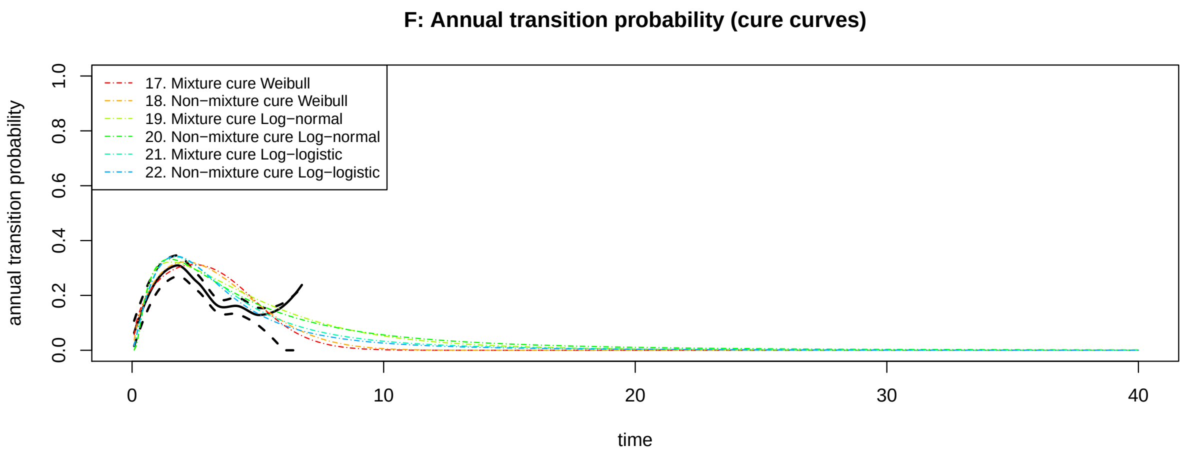

C: Kaplan−Meier (cure curves)
survival
time
0
10
20
30
40
0.0
0.2
0.4
0.6
0.8
1.0
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic

Table 6: Survival probability at different time points

| | T= 0 | T= 1 | T= 2 | T= 3 | T= 4 | T= 5 | T= 10 | T= 15 | T= 20 | T= 25 | T= 30 | T= 35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Exponential | 1 | 0.755 | 0.570 | 0.430 | 0.325 | 0.245 | 0.060 | 0.015 | 0.004 | 0.001 | 0.000 | 0.000 |
| 2. Weibull | 1 | 0.817 | 0.608 | 0.430 | 0.292 | 0.193 | 0.017 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3. Gompertz | 1 | 0.776 | 0.588 | 0.436 | 0.315 | 0.221 | 0.022 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4. Log-normal | 1 | 0.820 | 0.572 | 0.401 | 0.289 | 0.214 | 0.063 | 0.025 | 0.012 | 0.006 | 0.004 | 0.002 |
| 5. Log-logistic | 1 | 0.819 | 0.568 | 0.389 | 0.275 | 0.203 | 0.069 | 0.034 | 0.021 | 0.014 | 0.010 | 0.008 |
| 6. Gamma | 1 | 0.829 | 0.605 | 0.420 | 0.283 | 0.187 | 0.020 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 |
| 7. Generalised Gamma | 1 | 0.810 | 0.555 | 0.399 | 0.302 | 0.237 | 0.100 | 0.057 | 0.037 | 0.026 | 0.019 | 0.015 |
| 8. Spline 1 knot hazard | 1 | 0.822 | 0.545 | 0.390 | 0.301 | 0.244 | 0.109 | 0.056 | 0.031 | 0.018 | 0.011 | 0.007 |
| 9. Spline 2 knots hazard | 1 | 0.817 | 0.546 | 0.396 | 0.305 | 0.243 | 0.096 | 0.043 | 0.021 | 0.010 | 0.005 | 0.003 |
| 10. Spline 3 knots hazard | 1 | 0.819 | 0.540 | 0.400 | 0.310 | 0.243 | 0.081 | 0.030 | 0.012 | 0.005 | 0.002 | 0.001 |
| 11. Spline 1 knot odds | 1 | 0.820 | 0.542 | 0.390 | 0.303 | 0.248 | 0.127 | 0.082 | 0.060 | 0.047 | 0.038 | 0.032 |
| 12. Spline 2 knots odds | 1 | 0.817 | 0.544 | 0.393 | 0.304 | 0.246 | 0.120 | 0.075 | 0.054 | 0.041 | 0.033 | 0.027 |
| 13. Spline 3 knots odds | 1 | 0.818 | 0.542 | 0.398 | 0.308 | 0.246 | 0.110 | 0.065 | 0.044 | 0.033 | 0.026 | 0.021 |
| 14. Spline 1 knot normal | 1 | 0.811 | 0.549 | 0.398 | 0.305 | 0.242 | 0.102 | 0.054 | 0.033 | 0.021 | 0.015 | 0.011 |
| 15. Spline 2 knots normal | 1 | 0.815 | 0.546 | 0.392 | 0.303 | 0.245 | 0.113 | 0.065 | 0.042 | 0.029 | 0.021 | 0.016 |
| 16. Spline 3 knots normal | 1 | 0.818 | 0.541 | 0.398 | 0.308 | 0.244 | 0.100 | 0.051 | 0.030 | 0.019 | 0.013 | 0.009 |
| 17. Mixture cure Weibull | 1 | 0.819 | 0.585 | 0.403 | 0.290 | 0.229 | 0.179 | 0.179 | 0.179 | 0.179 | 0.179 | 0.179 |
| 18. Non-mixture cure Weibull | 1 | 0.820 | 0.570 | 0.391 | 0.285 | 0.228 | 0.169 | 0.168 | 0.168 | 0.168 | 0.168 | 0.168 |
| 19. Mixture cure Log-normal | 1 | 0.818 | 0.558 | 0.394 | 0.295 | 0.235 | 0.134 | 0.116 | 0.111 | 0.109 | 0.108 | 0.108 |
| 20. Non-mixture cure Log-normal | 1 | 0.818 | 0.551 | 0.390 | 0.297 | 0.241 | 0.143 | 0.118 | 0.109 | 0.105 | 0.103 | 0.101 |
| 21. Mixture cure Log-logistic | 1 | 0.822 | 0.549 | 0.381 | 0.290 | 0.240 | 0.163 | 0.148 | 0.143 | 0.140 | 0.139 | 0.138 |
| 22. Non-mixture cure Log-logistic | 1 | 0.823 | 0.549 | 0.380 | 0.293 | 0.246 | 0.178 | 0.165 | 0.161 | 0.158 | 0.157 | 0.157 |




E: Annual transition probability (spline curves)
annual transition probability
time
8. Spline 1 knot hazard
9. Spline 2 knots hazard
10. Spline 3 knots hazard
11. Spline 1 knot odds
12. Spline 2 knots odds
13. Spline 3 knots odds
14. Spline 1 knot normal
15. Spline 2 knots normal
16. Spline 3 knots normal
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40


F: Annual transition probability (cure curves)
annual transition probability
time
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40

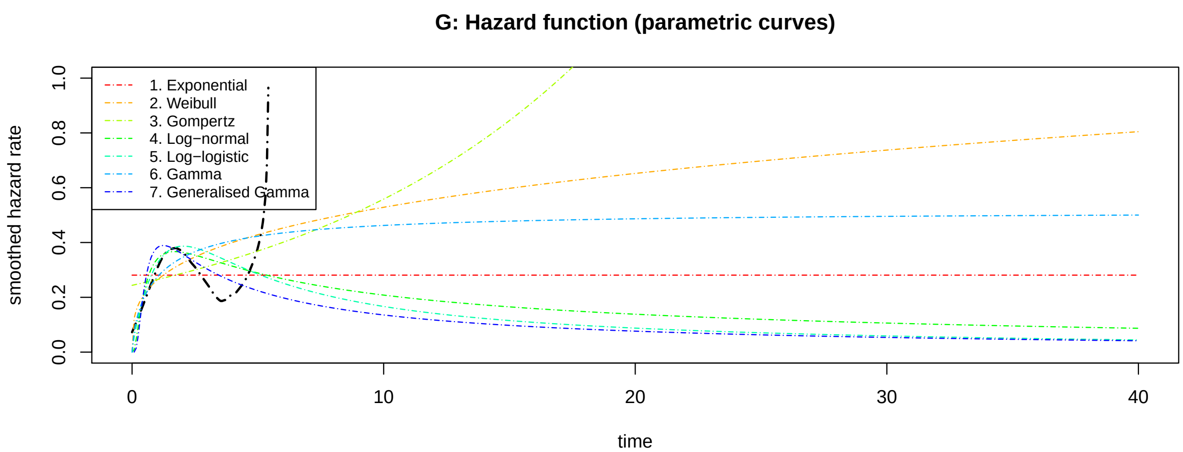
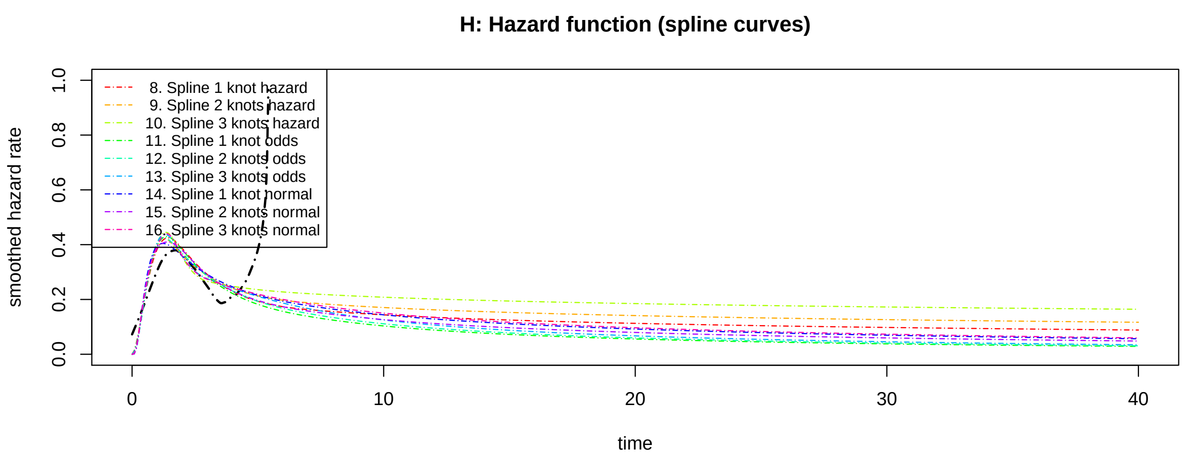
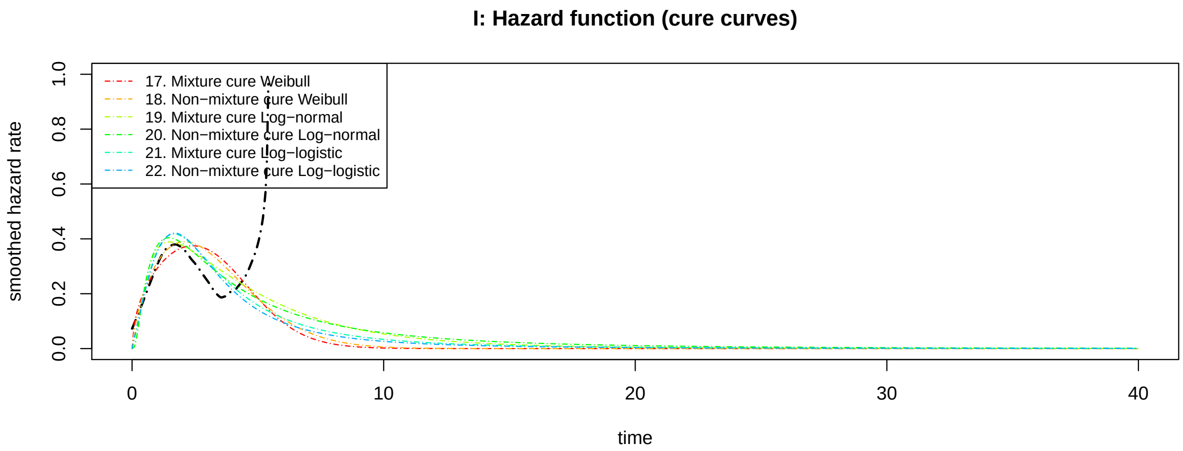

G: Hazard function (parametric curves)
smoothed hazard rate
time
1. Exponential
2. Weibull
3. Gompertz
4. Log−normal
5. Log−logistic
6. Gamma
7. Generalised Gamma
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40

Table 7: Summary statistics of annual transition probabilities

| | Mean | Std.Dev | Min | Q1 | Median | Q3 | Max | IQR |
|---|---|---|---|---|---|---|---|---|
| 1. Exponential | 0.2449482 | 0.0000000 | 0.2449482 | 0.2449482 | 0.2449482 | 0.2449482 | 0.2449482 | 0.0000000 |
| 2. Weibull | 0.4544976 | 0.0865169 | 0.0907442 | 0.4105709 | 0.4790585 | 0.5216195 | 0.5525972 | 0.1107778 |
| 3. Gompertz | 0.5870906 | 0.2349728 | 0.2169796 | 0.3698466 | 0.5818235 | 0.8071868 | 1.0000000 | 0.4373402 |
| 4. Log-normal | 0.1496409 | 0.0630510 | 0.0022958 | 0.1000774 | 0.1279068 | 0.1841659 | 0.3070152 | 0.0838631 |
| 5. Log-logistic | 0.1158111 | 0.0780753 | 0.0305143 | 0.0571627 | 0.0832145 | 0.1494462 | 0.3207417 | 0.0920005 |
| 6. Gamma | 0.3702654 | 0.0421058 | 0.0471845 | 0.3701940 | 0.3852535 | 0.3907371 | 0.3935697 | 0.0204764 |
| 7. Generalised Gamma | 0.1013639 | 0.0706160 | 0.0000317 | 0.0518395 | 0.0728961 | 0.1237607 | 0.3222943 | 0.0717062 |
| 8. Spline 1 knot hazard | 0.1254303 | 0.0555367 | 0.0048605 | 0.0929348 | 0.1060806 | 0.1322263 | 0.3462113 | 0.0391837 |
| 9. Spline 2 knots hazard | 0.1469155 | 0.0485978 | 0.0027621 | 0.1183362 | 0.1309295 | 0.1552006 | 0.3471134 | 0.0367658 |
| 10. Spline 3 knots hazard | 0.1787527 | 0.0386871 | 0.0031604 | 0.1581132 | 0.1681704 | 0.1865373 | 0.3590229 | 0.0283502 |
| 11. Spline 1 knot odds | 0.0828358 | 0.0722684 | 0.0040186 | 0.0370407 | 0.0534928 | 0.0956147 | 0.3493116 | 0.0583932 |
| 12. Spline 2 knots odds | 0.0867603 | 0.0720369 | 0.0029239 | 0.0397013 | 0.0573770 | 0.1025038 | 0.3469030 | 0.0626095 |
| 13. Spline 3 knots odds | 0.0933644 | 0.0716684 | 0.0031346 | 0.0443526 | 0.0641665 | 0.1145082 | 0.3547245 | 0.0699417 |
| 14. Spline 1 knot normal | 0.1114168 | 0.0648053 | 0.0001727 | 0.0667705 | 0.0870224 | 0.1315769 | 0.3327152 | 0.0646236 |
| 15. Spline 2 knots normal | 0.1011547 | 0.0666094 | 0.0003302 | 0.0575542 | 0.0758377 | 0.1164719 | 0.3361441 | 0.0587484 |
| 16. Spline 3 knots normal | 0.1148143 | 0.0640431 | 0.0005575 | 0.0702242 | 0.0912163 | 0.1362709 | 0.3562720 | 0.0658618 |
| 17. Mixture cure Weibull | 0.0374953 | 0.0871122 | 0.0000000 | 0.0000000 | 0.0000000 | 0.0019526 | 0.3124571 | 0.0019062 |
| 18. Non-mixture cure Weibull | 0.0389260 | 0.0878954 | 0.0000000 | 0.0000000 | 0.0000000 | 0.0058137 | 0.3224039 | 0.0057065 |
| 19. Mixture cure Log-normal | 0.0496395 | 0.0871508 | 0.0002039 | 0.0008353 | 0.0048810 | 0.0495432 | 0.3220204 | 0.0484359 |
| 20. Non-mixture cure Log-normal | 0.0514956 | 0.0842490 | 0.0012590 | 0.0032428 | 0.0107457 | 0.0537620 | 0.3323853 | 0.0503940 |
| 21. Mixture cure Log-logistic | 0.0439682 | 0.0847543 | 0.0005930 | 0.0014141 | 0.0047437 | 0.0321531 | 0.3414361 | 0.0305649 |
| 22. Non-mixture cure Log-logistic | 0.0410716 | 0.0836704 | 0.0004619 | 0.0010900 | 0.0036280 | 0.0253772 | 0.3434417 | 0.0241440 |





I: Hazard function (cure curves)
smoothed hazard rate
time
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
17. Mixture cure Weibull
18. Non−mixture cure Weibull
19. Mixture cure Log−normal
20. Non−mixture cure Log−normal
21. Mixture cure Log−logistic
22. Non−mixture cure Log−logistic

## PERSUADE object information

```
## List of 6
##  $ name      : chr "BC_OS"
##  $ input     :List of 11
##   ..$ years              : num [1:686] 3.68 4.32 4.82 3.16 2.65 ...
##   ..$ status             : num [1:686] 0 0 0 0 0 0 0 1 0 0 ...
##   ..$ group              : Factor w/ 3 levels "Good","Medium",..: 1 1 1 1 1 1 1 1 1 1 ...
##   ..$ strata             : logi TRUE
##   ..$ spline_mod         : logi TRUE
##   ..$ cure_mod           : logi TRUE
##   ..$ cure_link          : chr "logistic"
##   ..$ time_unit          : num 0.0833
##   ..$ time_horizon       : num 40
##   ..$ time_pred_surv_table: num [1:12] 0 12 24 36 48 60 120 180 240 300 ...
##   ..$ time_pred          : num [1:481] 0 0.0833 0.1667 0.25 0.3333 ...
##  $ surv_obs  :List of 6
##   ..$ km      :List of 23
##   .. ..- attr(*, "class")= chr [1:2] "npsurv" "survfit"
##   ..$ km_names: num [1:646] 1 1 1 1 1 1 1 1 1 1 ...
##   ..$ cum_haz :'data.frame': 256 obs. of  15 variables:
##   ..$ haz     :List of 5
##   ..$ tp      :List of 4
##   ..$ cox_reg :List of 21
##   .. ..- attr(*, "class")= chr "coxph"
##  $ surv_model:List of 26
##   ..$ expo           :List of 28
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ weib           :List of 28
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ gom            :List of 28
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ lnorm          :List of 28
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ llog           :List of 28
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ gam            :List of 28
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ ggam           :List of 28
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ IC             :'data.frame':  7 obs. of  3 variables:
##   ..$ spl_hazard1    :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_hazard2    :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_hazard3    :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_odds1      :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_odds2      :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_odds3      :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_normal1    :List of 31
```

```
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_normal2    :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ spl_normal3    :List of 31
##   .. ..- attr(*, "class")= chr "flexsurvreg"
##   ..$ IC_spl         :'data.frame':  9 obs. of  3 variables:
##   ..$ cure_weib_mix  :List of 3
##   ..$ cure_weib_nmix :List of 3
##   ..$ cure_lnorm_mix :List of 3
##   ..$ cure_lnorm_nmix:List of 3
##   ..$ cure_llog_mix  :List of 3
##   ..$ cure_llog_nmix :List of 3
##   ..$ IC_cure        :'data.frame':  6 obs. of  5 variables:
##   ..$ survmod        : chr [1:21, 1:105] "1. Exponential" "rate" "-2.80703426596042" "-3.08148409638
##   .. ..- attr(*, "dimnames")=List of 2
##  $ surv_pred :List of 3
##   ..$ model:List of 44
##   ..$ gr   :List of 3
##   ..$ tp_gr:List of 3
##  $ misc      :List of 8
##   ..$ form       :Class 'formula'  language Surv(years, status) ~ group
##   .. .. ..- attr(*, ".Environment")=<environment: 0x00000000241ac8d8>
##   ..$ group_names: chr [1:3] "Good" "Medium" "Poor"
##   ..$ ngroups    : int 3
##   ..$ lbls_all   : chr [1:23] "time" " 1. Exponential" " 2. Weibull" " 3. Gompertz" ...
##   ..$ lbls       : chr [1:7] " 1. Exponential" " 2. Weibull" " 3. Gompertz" " 4. Log-normal" ...
##   ..$ lbls_spline: chr [1:9] " 8. Spline 1 knot hazard" " 9. Spline 2 knots hazard" "10. Spline 3 kn
##   ..$ lbls_cure  : chr [1:6] "17. Mixture cure Weibull" "18. Non-mixture cure Weibull" "19. Mixture c
##   ..$ cols_tp    : num 23
## NULL
```

## Session information

```
## R version 4.0.1 (2020-06-06)
## Platform: x86_64-w64-mingw32/x64 (64-bit)
## Running under: Windows 10 x64 (build 19041)
##
## Matrix products: default
##
## Random number generation:
##  RNG:     Mersenne-Twister
##  Normal:  Inversion
##  Sample:  Rejection
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] sft_2.2-1          SuppDists_1.1-9.5  fda_5.1.7          fds_1.8
##  [5] RCurl_1.98-1.2     rainbow_3.6        pcaPP_1.9-73       MASS_7.3-51.6
##  [9] Matrix_1.2-18      kableExtra_1.3.1   knitr_1.30         summarytools_0.9.6
## [13] data.table_1.13.4  survminer_0.4.8    ggpubr_0.4.0       muhaz_1.2.6.1
## [17] flexsurv_1.1.1     rms_6.1-0          SparseM_1.78       Hmisc_4.4-2
## [21] ggplot2_3.3.2      Formula_1.2-4      survival_3.2-7     lattice_0.20-41
##
## loaded via a namespace (and not attached):
##   [1] TH.data_1.0-10      colorspace_2.0-0    ggsignif_0.6.0
##   [4] pryr_0.1.4          ellipsis_0.3.1      rio_0.5.16
##   [7] mclust_5.4.7        htmlTable_2.1.0     base64enc_0.1-3
##  [10] rstudioapi_0.13     farver_2.0.3        MatrixModels_0.4-1
##  [13] mvtnorm_1.1-1       lubridate_1.7.9.2   xml2_1.3.2
##  [16] codetools_0.2-16    broom_0.7.2         km.ci_0.5-2
##  [19] cluster_2.1.0       png_0.1-7           compiler_4.0.1
##  [22] httr_1.4.2          backports_1.2.0     htmltools_0.5.0
##  [25] quantreg_5.75       tools_4.0.1         gtable_0.3.0
##  [28] glue_1.4.2          dplyr_1.0.2         Rcpp_1.0.5
##  [31] carData_3.0-4       cellranger_1.1.0    vctrs_0.3.5
##  [34] nlme_3.1-148        conquer_1.0.2       xfun_0.19
##  [37] stringr_1.4.0       openxlsx_4.2.3      rvest_0.3.6
##  [40] lifecycle_0.2.0     gtools_3.8.2        rstatix_0.6.0
##  [43] polspline_1.1.19    zoo_1.8-8           scales_1.1.1
##  [46] hms_0.5.3           sandwich_3.0-0      RColorBrewer_1.1-2
##  [49] yaml_2.2.1          curl_4.3            gridExtra_2.3
##  [52] KMsurv_0.1-5        pander_0.6.3        rpart_4.1-15
##  [55] latticeExtra_0.6-29 stringi_1.5.3       checkmate_2.0.0
##  [58] zip_2.1.1           hdrcde_3.3          bitops_1.0-6
##  [61] rlang_0.4.9         pkgconfig_2.0.3     matrixStats_0.57.0
##  [64] evaluate_0.14       purrr_0.3.4         labeling_0.4.2
##  [67] ks_1.11.7           rapportools_1.0     htmlwidgets_1.5.2
##  [70] tidyselect_1.1.0    deSolve_1.28        plyr_1.8.6
##  [73] magrittr_2.0.1      R6_2.5.0            magick_2.5.2
##  [76] generics_0.1.0      multcomp_1.4-15     pillar_1.4.7
##  [79] haven_2.3.1         foreign_0.8-80      withr_2.3.0
##  [82] abind_1.4-5         nnet_7.3-14         flexsurvcure_1.2.0
```

```
##  [85] tibble_3.0.4        mstate_0.2.12       crayon_1.3.4
##  [88] car_3.0-10          survMisc_0.5.5      KernSmooth_2.23-17
##  [91] rmarkdown_2.5       jpeg_0.1-8.1        grid_4.0.1
##  [94] readxl_1.3.1        forcats_0.5.0       digest_0.6.27
##  [97] webshot_0.5.2       xtable_1.8-4        tidyr_1.1.2
## [100] munsell_0.5.0       viridisLite_0.3.0   tcltk_4.0.1
## [103] quadprog_1.5-8
```