Genstat 64-bit Release 24.2 (PC/Windows 11) 04 October 2025 14:38:59

Genstat Twenty-fourth Edition
Genstat Procedure Library Release PL33

```
  1  SET [WORKINGDIRECTORY='C:/Varie/GenStat'; DIAGNOSTIC=messages]
  2  JOB
```

End of job.

```
 6936
 6937  "filter the dataset to CIK and LD recipients"
 6938  RESTRICT eGFR_EPI2021, pz_categoria, mese, don_quality_score, don_eta, ric_CIT, C[1], C[2],
\
 6939   ric_eta, ric_sesso, ric_PRA; CONDITION=pz_categoria.IN.!T('CIK recipient','LD
recipient')
 6940
 6941  "generate continuous variable time"
 6942  DELETE [REDEFINE=yes] cmese2
 6943  CALCULATE cmese2 = !(#mese)
 6944
 6945  "Random Coefficient Regression"
 6946  DELETE [REDEFINE=yes] _vcs, _vcst, _cst, _effs, _effst, _sigma2, _cinit
 6947  "Calculating the Initial Values"
 6948  VCOMPONENTS [FIXED=pz_categoria * cmese2 + don_quality_score + don_eta + ric_CIT + C[2]\
 6949   + ric_eta + ric_sesso + ric_PRA; SPLINE=pz_categoria.cmese2; FACTORIAL=9] id/cmese2;
CONSTRAINTS=positive
 6950  REML [PRINT=*; MAXCYCLE=30; FMETHOD=automatic; PTERMS=pz_categoria.cmese2;
PSE=differences;\
 6951   METHOD=AI] eGFR_EPI2021
 6952  VKEEP [SIGMA2 = _sigma2] id/cmese2; COMPONENT = _vcs,_vcst; EFFECTS=_tes,_test
 6953  CALC _vcs,_vcst = _vcs,_vcst / _sigma2
 6954  VARIATE _effs,_effst; VALUE=_tes,_test
 6955  CALC _cst = CORR(_effs;_effst)*SQRT(_vcs*_vcst)
 6956  VARIATE [VALUE=_vcs,_cst,_vcst] _cinit
 6957  "Fit the model and check it"
 6958  VCOMPONENTS [FIXED=pz_categoria * cmese2 + don_quality_score + don_eta + ric_CIT + C[2]\
 6959   + ric_eta + ric_sesso + ric_PRA; SPLINE=pz_categoria.cmese2; FACTORIAL=9] RANDOM=id/cmese2
 6960  VSTRUCTURE [TERMS=id/cmese2; CORRELATE=unrest; FORM=whole; CINITIAL=_cinit]
 6961  REML [PRINT=model,components,deviance; MAXCYCLE=30; FMETHOD=automatic;\
 6962   PTERMS=pz_categoria.cmese2; PSE=differences; METHOD=AI] eGFR_EPI2021; SAVE=wsave
```

REML variance components analysis

Response variate: eGFR_EPI2021
Fixed model: Constant + cmese2 + pz_categoria + cmese2.pz_categoria + don_quality_score + don_eta + ric_CIT + C['volume_attivitàDEC_centrotx'] + ric_eta + ric_sesso + ric_PRA
Random model: id + id.cmese2
Spline model: Spline(cmese2).pz_categoria
Number of units: 244 (260 units excluded due to zero weights or missing values)

Residual term has been added to model

Sparse algorithm with AI optimisation
All covariates centred
Analysis is subject to the restriction on eGFR_EPI2021

Covariance structures defined for random model

Correlated terms:

Set	Correlation across terms
1	Unstructured

Set	Terms	Covariance model within term
1	id	Identity
1	id.cmese2	Identity

Estimated variance components

Random term	component	s.e.
Spline(cmese2).pz_categoria	0.69	1.76

Estimated parameters for covariance models

Random term(s)	Factor	Model(order)	Parameter	Estimate	s.e.
id + id.cmese2	Across terms	Unstructured	v_11	4.200	1.110
			v_21	-0.03919	0.02537
			v_22	0.003364	0.001217
	Within terms	Identity	-	-	-

Note: the covariance matrix for each term is calculated as G or R where
var(y) = Sigma2(ZGZ'+R), i.e. relative to the residual variance, Sigma2.

Residual variance model

Term	Model(order)	Parameter	Estimate	s.e.
Residual	Identity	Sigma2	70.04	8.07

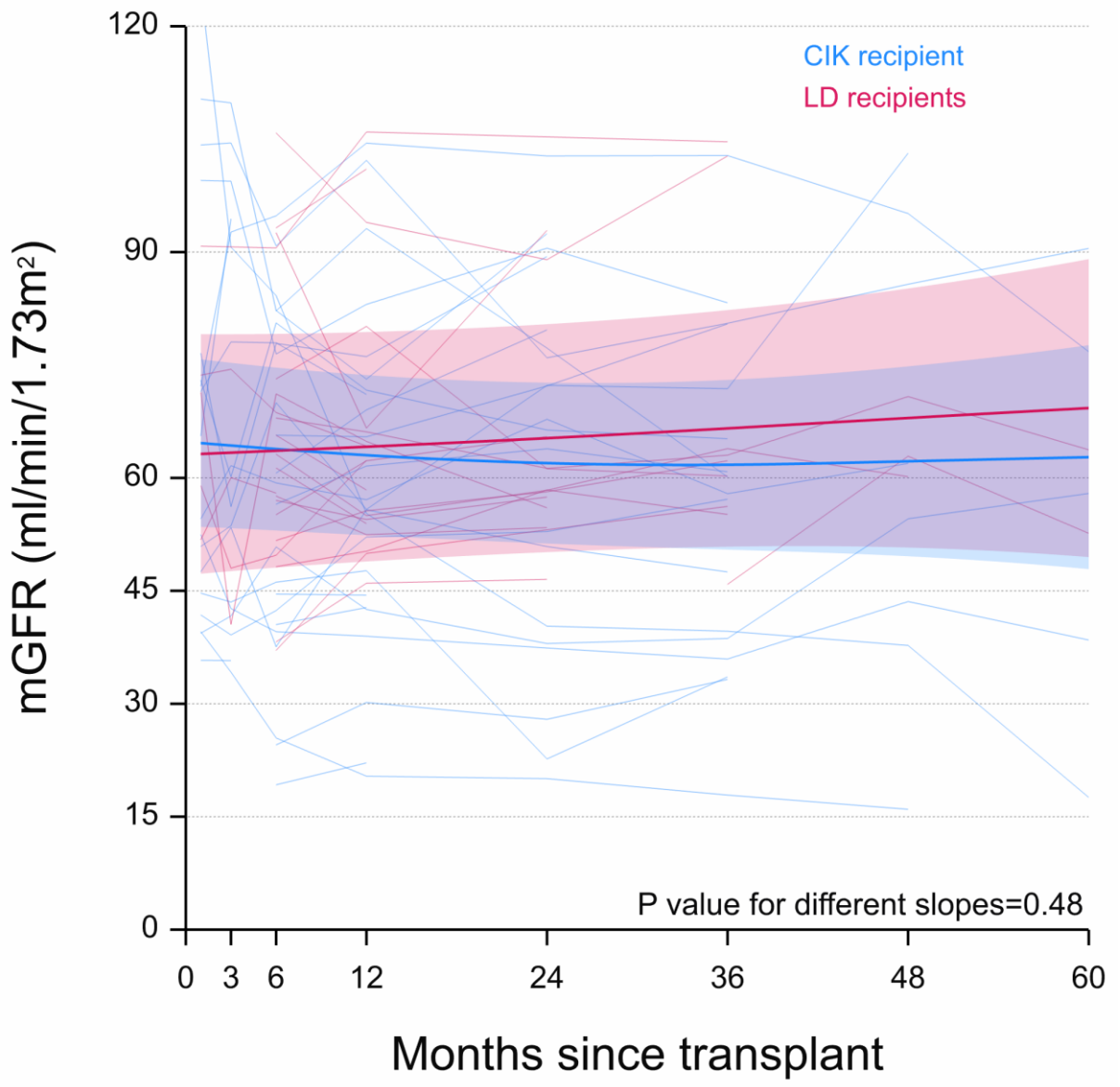
Deviance: -2*Log-Likelihood

Deviance	d.f.
1501.89	228

Note: deviance omits constants which depend on fixed model fitted.

```
 6963  VPLOT
 6964
 6965
 6966  "calculate and save P value and text for the plot (The P value includes non linear spline
component)"
 6967  SCALAR [MODIFY = yes] IDENTIFIER = rdf
 6968  VKEEP [DF= rdf] pz_categoria.cmese2; EFFECTS=beta; SEDEFFECTS=se; NDF=ndf; DDF = ddf;
FSTATISTIC = f; WALD = w
 6969  CALC _Pval_f = CUF(f;ndf;ddf;0)
 6970  TXCONSTRUCT [TEXT=text_Plin_diff] 'P value for different slopes=', #_Pval_f; DECIMALS = 2
 6971
 6972
 6973  "Get the mean population curve via VPREDICT for the plot"
 6974  VPREDICT [PREDICTIONS = mgfr; SE = semgfr] pz_categoria,cmese2; LEVELS=!T('CIK
recipient','LD recipient'),!(1,2...60)
```

```
 6975  VTABLE TABLE= mgfr, semgfr; VARIATE = MGFR, SEMGFR; CLASSIFICATION = CAT
 6976
 6977  "Graph setting for the plot (colours, pattern of mean trajectories lines, axes settings"
 6978  CALC red  = RGB(212; 17; 89)
 6979   &  blue = RGB(26; 133; 255)
 6980  PEN [RESET=yes] 1,2; METHOD=line; COLOUR=#blue,#red; CFILL='match'; SYMBOLS='none';
THICK=2
 6981  YAXIS [RESET=yes] WINDOW=1; TITLE='mGFR (ml/min/1.73m~^{2})'; LOWER=0; UPPER=120;
MARKS=!(0,15,30,45,60,90,120 )
 6982  XAXIS [RESET=yes] WINDOW=1; TITLE='Months since transplant'; LOWER=0; UPPER=60;
MARKS=!(0,3,6,12,24,36,48,60)
 6983  FRAME [GRID=yx; RESET=yes] WINDOW=1; BOX=omit
 6984
 6985  "Calculations to plot Individual trajectories for recipients only"
 6986  SUBSET [pz_categoria .in. !T('CIK recipient','LD recipient'); SETLEVELS=yes] \
 6987         id,pz_categoria,eGFR_EPI2021,cmese2; iid,icat,iY,iX
 6988  TABULATE [CLASS=iid; PRINT=*] !(#icat); MEANS=tid "Get category for individuals"
 6989  VTABLE tid; idcat
 6990  GROUPS [REDEFINE=yes] idcat
 6991  CALC nidpen = NVALUES(idcat)
 6992  CALC idcolour = NEWLEVELS(idcat;!(blue,red))
 6993
 6994  "Calculations to plot 95% confidence intervals as coloured regions by reversin lower bound
and appending
-6995  to the upper bounds to define a region to be shaded "
 6996  SCALAR IDENTIFIER = t
 6997  CALC t = ABS(EDT(0.025; rdf; 0))
 6998  SORT [INDEX=CAT[1,2]] CAT[1,2],MGFR
 6999  CALC LB = MGFR - t * SEMGFR
 7000  CALC UB = MGFR + t * SEMGFR
 7001  CALC RLB,RCAT[1,2] = REVERSE(LB,CAT[1,2])
 7002  APPEND [AY] UB,RLB
 7003  APPEND [AX] CAT[2],RCAT[2]
 7004  APPEND [AP] CAT[1],RCAT[1]
 7005
 7006  "Make the plot"
 7007  DSTART
 7008  DGRAPH [WINDOW=1; KEYWINDOW=0] Y=MGFR; X=CAT[2]; PEN=CAT[1]; LAYER=3 "Mean lines"
 7009  PEN     1,2; METHOD=fill; JOIN=given; TAREA = 200
 7010  DGRAPH [WINDOW=1; KEYWINDOW=0; SCREEN=keep] Y=AY; X=AX; PEN=AP; LAYER=2 "95% Confidence
region"
 7011  PEN     1...nidpen; COLOUR=#idcolour; METHOD=line; SYMBOL='none'; THICK=0.9;
LINESTYLE='solid'; TLINE = 150
 7012  DGRAPH [WINDOW=1; KEYWINDOW=0; SCREEN=keep] Y=iY; X=iX; PEN=iid; LAYER=1 "Individuals
lines"
 7013  PEN    1,2; COLOUR=#blue,#red
 7014  DKEY   [WINDOW=6; NCOLUMNS=1; PENLABELS=!(1,2); BORDER=none; XLOFFSET=-6] \
 7015         !T('CIK recipient','LD recipients');  METHOD='none'
 7016  PEN 2; COLOUR=1; SYMBOL=0; ROTATION=0; SIZE=1; LABELS= text_Plin_diff
 7017  DGRAPH [WINDOW=1; KEYWINDOW=0; SCREEN=keep] 3; 30; PEN=2 "text"
 7018  DFINISH
```




```
7019
 7020
 7021  "Print linear difference between CIK and LD eGFR slopes per year FROM THE REGRESSION TABLE
(NOT INCLUDING SPLINES)"
 7022  VRSETUP [SAVE = wsave]
 7023  VRFIT [PRINT=model] pz_categoria * cmese2 + don_quality_score + don_eta + ric_CIT + C[2]\
 7024   + ric_eta + ric_sesso + ric_PRA
```

Regression analysis of REML fixed model

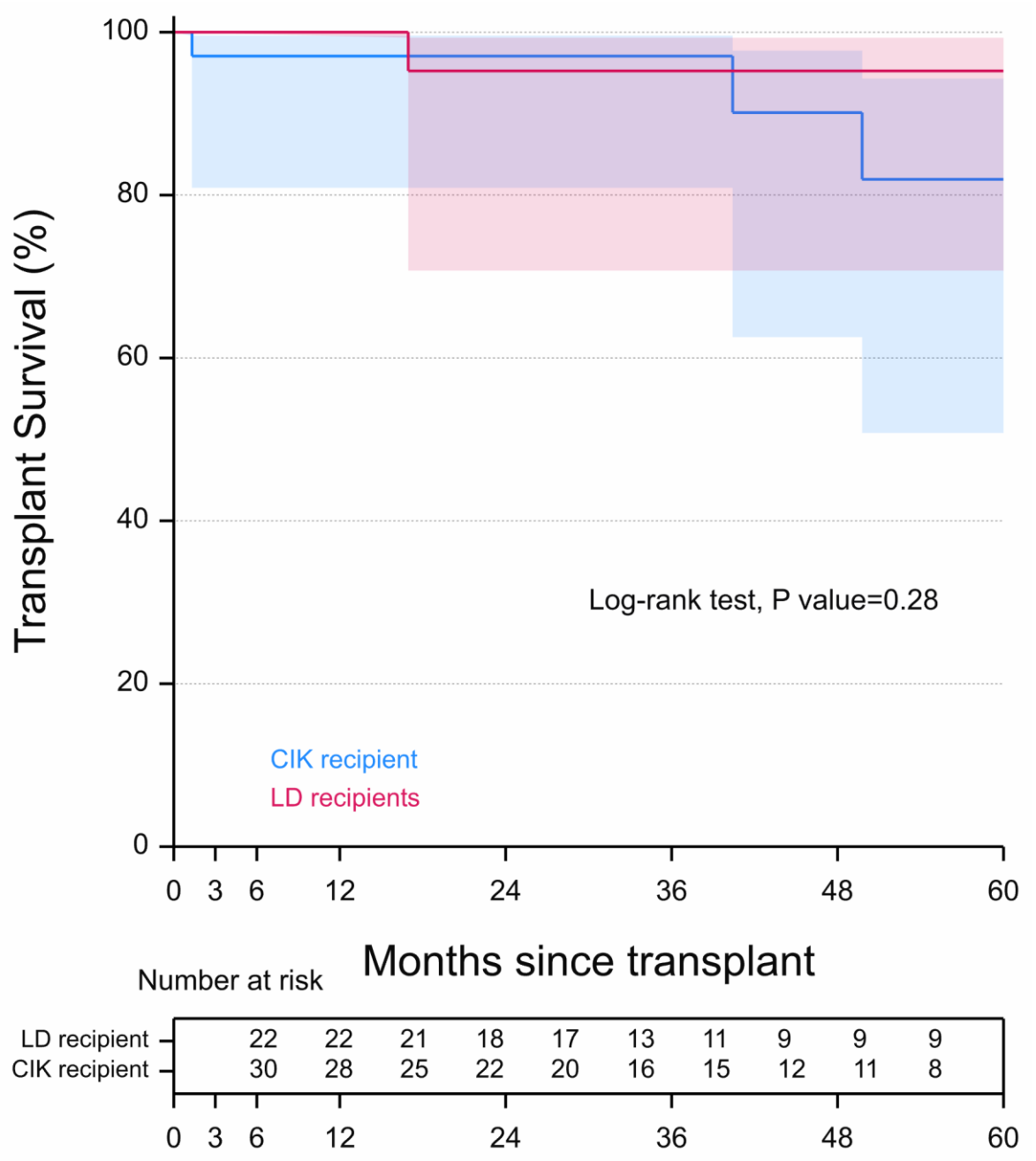
```
       Response variate:  eGFR_EPI2021
          Weight matrix:  REML weights
           Fitted terms:  Constant + pz_categoria + cmese2 + cmese2.pz_categoria +
don_quality_score + don_eta + ric_CIT + C['volume_attivitàDEC_centrotx'] + ric_eta + ric_sesso +
ric_PRA
```

```
 7025  VRKEEP [RDF = rrdf] pz_categoria.cmese2; ESTIMATES = rb_lin_diff; SE = rse_lin_diff; DDF
= ddf
 7026  CALC rt = ABS(EDT(0.025; rrdf; 0))
 7027  SCALAR [MODIFY=yes] zt
 7028  CALC zt = ABS(#rb_lin_diff$[2] /  #rse_lin_diff$[2])
 7029  CALC _Pval_t = 2* CUT(zt;rrdf;0)
 7030  CALC  erb_lin_diff = #rb_lin_diff$[2] * 12 * -1  "Difference in slopes per
ml/min/1.73m2/year CIK vs LD recipients"
 7031  CALC  erse_lin_diff = #rse_lin_diff$[2]* 12
 7032  CALC  erlb_lin_diff = erb_lin_diff - rt * erse_lin_diff
 7033  &     erub_lin_diff = erb_lin_diff + rt * erse_lin_diff
 7034  PRINT erb_lin_diff, erse_lin_diff, rt, erlb_lin_diff, erub_lin_diff; DECIMALS = 2
```

erb_lin_diff	erse_lin_diff	rt	erlb_lin_diff	erub_lin_diff
-2.02	2.21	1.97	-6.37	2.34

```
 7035  TXCONSTRUCT [TEXT=ertext_lin_diff] 'Adjusted linear diff. between CIK and LD recipients:',
#erb_lin_diff, \
 7036     ' (95%CI: ', #erlb_lin_diff, ' to ', #erub_lin_diff, '; P=', #_Pval_t, ')'; DECIMALS =
*,1,*,1,*,1,*,2,*
 7037  PRINT [IPRINT=*] ertext_lin_diff

             Adjusted linear diff. between CIK and LD recipients:-2.0 (95%CI: -6.4 to 2.3; P=0.36)

 7038
 7039
```

```
1586  SUBSET [pz_categoria .in. !T('CIK recipient','LD recipient'); SETLEVELS=yes] \
 1587         id, _d, _t, pz_categoria, don_quality_score, ric_CIT; r_id, r_d, r_t,
r_pz_categoria, r_don_quality_score, r_ric_CIT
 1588  FACTOR [MODIFY=yes; REFERENCELEVEL = 2] r_pz_categoria
 1589
 1590  CALC n = NVALUES(r_d)
 1591  VARIATE [NVALUES = n] CENSOR
 1592  RESTRICT CENSOR; r_d.EQ.1
 1593  CALC CENSOR = 0
 1594  RESTRICT CENSOR
 1595  RESTRICT CENSOR; r_d.EQ.0
 1596  CALC CENSOR=1
 1597  RESTRICT CENSOR
 1598  PRINT n

             n
         56.00

 1599  CALC r_mese = r_t * 12
 1600  FSPREADSHEET [BOOK=0]
CENSOR,r_d,r_don_quality_score,r_id,r_pz_categoria,r_ric_CIT,r_t,r_mese
 1601
 1602  "Prepare setting and text for the Kaplan-Meier plot"
 1603  CALC red  = RGB(212; 17; 89)
 1604   &  blue = RGB(26; 133; 255)
 1605  PEN [RESET=yes] 1,2; METHOD=line; COLOUR=#blue,#red; CFILL='match'; SYMBOLS='none';
THICK=2
 1606  YAXIS [RESET=yes] WINDOW=1; TITLE='Transplant Survival (%)'; LOWER=0; UPPER=1;
MARKS=!(0,.2,.4,.6,.8,1 ); LABELS=!T('0','20','40','60','80','100')
 1607  XAXIS [RESET=yes] WINDOW=1; TITLE='Months since transplant'; LOWER=0; UPPER=60;
MARKS=!(0,3,6,12,24,36,48,60)
 1608  FRAME [GRID=yx; RESET=yes] WINDOW=1; BOX=omit
 1609  RSTEST [METHOD=logrank] TIME=r_mese; CENSOR=CENSOR; GROUPS=r_pz_categoria; TESTS= LOGR


Test statistics for equality of survival curves for r_pz_categoria

                                Statistic    d.f.     probability
                  Log-rank          1.161       1           0.281

 1610  CALC _lrpval = LOGR['logrank']$[3]
 1611  TXCONSTRUCT [TEXT=text_logrank] 'Log-rank test, P value=', #_lrpval; DECIMALS = *,2
 1612  CALC censor = CENSOR.ne.0
 1613
 1614  "Kaplan-Meier Plot"
 1615  KAPLANMEIER [PRINT=graph; XUPPER=60; KEYWINDOW=0; WINDOW=1; PLOT='CI','ATRISKTABLE';
ATRISK=10] \
 1616   TIME=r_mese; CENSOR=censor; GROUPS=r_pz_categoria; NEWGROUPS=groups; \
 1617   ESTIMATE=est; CI=CI; EVENT=event; NATRISK=natrisk
 1618  DKEY   [WINDOW=7; NCOLUMNS=1; PENLABELS=!(1,2); BORDER=none; XLOFFSET=12; TPOSITION =
'inside'] \
 1619         !T('CIK recipient','LD recipients');  METHOD='none'
 1620  PEN 2; COLOUR=1; SYMBOL=0; ROTATION=0; SIZE=1; LABELS= text_logrank
 1621  DGRAPH [WINDOW=1; KEYWINDOW=0; SCREEN=keep] 0.3; 30; PEN=2
```


Transplant Survival (%)
100
80
60
40
20
0
Log-rank test, P value=0.28
CIK recipient
LD recipients
0 3 6 12 24 36 48 60
Months since transplant
Number at risk
LD recipient 22 22 21 18 17 13 11 9 9 9
CIK recipient 30 28 25 22 20 16 15 12 11 8
0 3 6 12 24 36 48 60

```
 1091  "Crude Cox PH Model"
 1092  RPROPORTION [PRINT=_2lo; TIMES=r_mese; CENSORED=CENSOR; _2LOGLIKELIHOOD=llhd; ESTIMATES=
cbHR; SE=cbse] r_pz_categoria
```

Cox's proportional hazards model

-2 x log-likelihood: 31.220
d.f. in fitted model: 1

```
 1093  DELETE [REDEFINE=yes] cHR, lbcHR, ubcHR, cZ, cpval
 1094  SCALAR [MODIFY=yes] cHR, lbcHR, ubcHR, cZ, cpval
 1095  CALC  cHR = exp(cbHR$[1])
 1096  CALC  lbcHR = exp(cbHR$[1] - 1.96 * cbse$[1])
 1097  &     ubcHR = exp(cbHR$[1] + 1.96 * cbse$[1])
 1098  &     cZ = ABS(cbHR$[1]/cbse$[1])
 1099  &     cpval = 2* (1 - CLNORMAL(#cZ;0;1))
 1100
 1101  TXCONSTRUCT [TEXT=crude_hr] 'Crude HR:', #cHR, \
 1102    ' (95%CI: ', #lbcHR, ' to ', #ubcHR, '; P=', #cpval, ')'; DECIMALS = 2
 1103  PRINT [IPRINT=*] crude_hr
```

Crude HR:3.13 (95%CI: 0.35 to 28.10; P=0.31)

```
 1104
 1105  "Adjuted Cox PH Model"
 1106  RPROPORTION [PRINT=_2lo; TIMES=r_mese; CENSORED=CENSOR; _2LOGLIKELIHOOD=llhd; ESTIMATES=
abHR; SE=abse] r_pz_categoria+r_don_quality_score+r_ric_CIT
```

Cox's proportional hazards model

-2 x log-likelihood: 22.875
d.f. in fitted model: 3

change: -8.345 on -2 d.f.
chi-square probability: 0.015

```
 1107  DELETE [REDEFINE=yes] aHR, lbaHR, ubaHR, aZ, apval
 1108  SCALAR [MODIFY=yes] aHR, lbaHR, ubaHR, aZ, apval
 1109  CALC  aHR = exp(abHR$[3])
 1110  CALC  lbaHR = exp(abHR$[3] - 1.96 * abse$[3])
 1111  &     ubaHR = exp(abHR$[3] + 1.96 * abse$[3])
 1112  &     aZ = ABS(abHR$[3]/abse$[3])
 1113  &     apval = 2 * (1 - CLNORMAL(#aZ;0;1))
 1114
 1115  TXCONSTRUCT [TEXT=adjusted_hr] 'Adjusted HR:', #aHR, \
 1116    ' (95%CI: ', #lbaHR, ' to ', #ubaHR, '; P=', #apval, ')'; DECIMALS = 2
 1117  PRINT [IPRINT=*] adjusted_hr
```

Adjusted HR:2.24 (95%CI: 0.12 to 43.41; P=0.59)