

S2: Supplementary material for Figures 2, 3 and 4 depicting associations with loneliness (UCLA) and wellbeing (EQ5D):

Model convergence

```
> # check model convergence  
> conv.check(mod)
```

```
Largest absolute gradient value: 1.719205e-06  
Observed information matrix is positive definite  
Eigenvalue range: [0.2336655,202420832681]
```

```
Trust region iterations before smoothing parameter estimation: 7  
Loops for smoothing parameter estimation: 50  
Trust region iterations within smoothing loops: 151  
Estimated overall probability range: 0.001199307 0.9999966  
Estimated overall density range: 1.013634e-05 7.587381
```

Model output – overall

```
> # check model summary
> summary(mod)

COPULA: Clayton
MARGIN 1: gamma
MARGIN 2: gamma

EQUATION 1
Link function for mu.1: log
Formula: UCLAtotal ~ sexbinary + s(age) + s(SIMDquintile, k = 3) + SIMDurbrural3fold +
  factor(PACat) + ideal_sleeper + s(BPSSQttotal) + s(socialnetworksize) +
  s(socialhourperweek) + s(healthrating) + s(weeklyWALKmin) +
  s(screenhrstruncated)

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   2.446927   0.036336  67.341 < 2e-16 ***
sexbinary2     0.077445   0.023292   3.325 0.000884 ***
SIMDurbrural3fold2 -0.041863  0.024753  -1.691 0.090801 .
SIMDurbrural3fold3 -0.009605  0.039099  -0.246 0.805948
factor(PACat)2 -0.003665  0.034647  -0.106 0.915764
factor(PACat)3  0.013883  0.036491   0.380 0.703605
ideal_sleeperless 0.024631  0.020395   1.208 0.227161
ideal_sleepermore -0.028548  0.050059  -0.570 0.568479
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Smooth components' approximate significance:
              edf Ref.df Chi.sq p-value
s(age)         3.474  4.326   5.533 0.31412
s(SIMDquintile) 1.000  1.000   0.073 0.78758
s(BPSSQttotal) 3.289  4.084 134.057 < 2e-16 ***
s(socialnetworksize) 8.136  8.708  25.237 0.00157 **
s(socialhourperweek) 1.497  1.833   0.574 0.70896
s(healthrating) 1.478  1.821  30.493 6.49e-08 ***
s(weeklyWALKmin) 6.779  7.835  16.158 0.03866 *
s(screenhrstruncated) 1.000  1.000   1.743 0.18681
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

EQUATION 2
Link function for mu.2: log
Formula: EQ5Dtotal ~ sexbinary + s(age) + s(SIMDquintile, k = 3) + SIMDurbrural3fold +
  factor(PACat) + ideal_sleeper + s(BPSSQttotal) + s(socialnetworksize) +
  s(socialhourperweek) + s(healthrating) + s(weeklyWALKmin) +
  s(screenhrstruncated)

Parametric coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   1.885890   0.019135  98.555 <2e-16 ***
sexbinary2     0.027021   0.012413   2.177 0.0295 *
SIMDurbrural3fold2 -0.009627  0.013509  -0.713 0.4761
SIMDurbrural3fold3 -0.040985  0.021543  -1.902 0.0571 .
factor(PACat)2 -0.035662  0.018109  -1.969 0.0489 *
factor(PACat)3 -0.043354  0.019314  -2.245 0.0248 *
ideal_sleeperless 0.026309  0.011102   2.370 0.0178 *
ideal_sleepermore 0.003611  0.027599   0.131 0.8959
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Smooth components' approximate significance:
              edf Ref.df Chi.sq p-value
s(age)         2.322  2.952   6.233 0.07882 .
s(SIMDquintile) 1.000  1.000   7.315 0.00684 **
s(BPSSQttotal) 3.620  4.477 11.890 0.03140 *
s(socialnetworksize) 1.000  1.000   3.477 0.06223 .
s(socialhourperweek) 1.000  1.000   0.018 0.89240
s(healthrating) 5.298  6.396 310.597 < 2e-16 ***
s(weeklyWALKmin) 3.058  3.793  14.430 0.00521 **
s(screenhrstruncated) 1.000  1.000   3.490 0.06173 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

sigma.1 = 0.299(0.287,0.31) sigma.2 = 0.164(0.159,0.172)
theta = 0.351(0.25,0.483) tau = 0.149(0.111,0.194)
n = 976 total edf = 63.9
```