coxph

yimin chen

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In these data a subject changes exposure status from not bereaved to bereaved when his or her spouse dies. The first stage of the analysis therefore is to partition each follow–up into a record describing the period of follow-up pre–bereavement and (for subjects who were bereaved during the study) the period post–bereavement.

```
## Creating times relativ to spouse death (year=0)
brv2 <- mutate(brv,
               id=NULL,
               y_before_sp_dth =  as.numeric(doe -dosp) / 365.24,
               y_after_sp_dth = as.numeric(dox - dosp) / 365.24)

## Splitting at spouse death (year=0)
brvSplit <- survSplit(brv2, cut = 0, end="y_after_sp_dth", start="y_before_sp_dth", id="id",event="fail

## Calculating risk times
brvSplit <- mutate(brvSplit,
                   t_sp_at_risk =   y_after_sp_dth - y_before_sp_dth,
                   brv = ifelse(y_after_sp_dth > 0, 1, 0))
```

```
brvSplit2 <- mutate(brvSplit,
                    sex = as.factor(sex),
                    brv = as.factor(brv))
## Translate time scale from years from spouse death to ages
brvSplit3 <- brvSplit2 %>%
    mutate(age_sp_dth =  as.numeric(dosp - dob) / 365.24, # Age at spouse death
           age_start = age_sp_dth + y_before_sp_dth,      # Age at start of timeband
           age_end = age_sp_dth + y_after_sp_dth)         # Age at end of timeband

age_cat <- seq(70,100,5) # Split at these ages
brvSplit4 <- survSplit(brvSplit3, cut=age_cat, start="age_start", end="age_end", event="fail", zero = 0

brvSplit4 <- mutate(brvSplit4,
                    t_at_risk = age_end- age_start, # Creating new time at risk
                    age = cut(age_end, age_cat))   # Creating age band category

## Calculate crude rates
survRate(Surv(t_at_risk, fail) ~ age, data=brvSplit4)
```

```
##                   age       tstop event       rate      lower      upper
```

```
## age=(75,80]   (75,80]  703.612419    45 0.06395566 0.04664970 0.08557771
## age=(80,85]   (80,85] 1184.684043   123 0.10382515 0.08628885 0.12387811
## age=(85,90]   (85,90]  490.021356    95 0.19386910 0.15685168 0.23699492
## age=(90,95]   (90,95]   55.090352    12 0.21782399 0.11255283 0.38049467
## age=(95,100] (95,100]    2.299858     3 1.30442857 0.26900453 3.81209383
```

```
summary(coxph(Surv(age_start, age_end, fail) ~ brv,
              data = brvSplit4))
```

```
## Call:
## coxph(formula = Surv(age_start, age_end, fail) ~ brv, data = brvSplit4)
##
##   n= 1036, number of events= 278
##
##         coef exp(coef) se(coef)      z Pr(>|z|)
## brv1 -0.2070    0.8131   0.1390 -1.488    0.137
##
##      exp(coef) exp(-coef) lower .95 upper .95
## brv1    0.8131       1.23    0.6191     1.068
##
## Concordance= 0.511  (se = 0.014 )
## Likelihood ratio test= 2.26  on 1 df,   p=0.1
## Wald test            = 2.22  on 1 df,   p=0.1
## Score (logrank) test = 2.22  on 1 df,   p=0.1
```

also model these data using Cox regression. Provided we use the attained age as the time scale and split the data to obtain separate observations for the bereaved and non-bereaved person-time the following command will estimate the effect of bereavement adjusted for attained age.

```
summary(coxph(Surv(age_start, age_end, fail) ~ brv + sex,
              data = brvSplit4))
```

```
## Call:
## coxph(formula = Surv(age_start, age_end, fail) ~ brv + sex, data = brvSplit4)
##
##   n= 1036, number of events= 278
##
##          coef exp(coef) se(coef)      z Pr(>|z|)
## brv1 -0.07842   0.92458  0.14245 -0.551 0.581971
## sex2 -0.47291   0.62318  0.13075 -3.617 0.000298 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##      exp(coef) exp(-coef) lower .95 upper .95
## brv1    0.9246      1.082    0.6993    1.2224
## sex2    0.6232      1.605    0.4823    0.8052
##
## Concordance= 0.56  (se = 0.018 )
## Likelihood ratio test= 15.85  on 2 df,   p=4e-04
## Wald test            = 15.21  on 2 df,   p=5e-04
```

```
## Score (logrank) test = 15.51  on 2 df,   p=4e-04
```

```
summary(coxph(Surv(age_start, age_end, fail) ~ brv,
              data = brvSplit4))
```

```
## Call:
## coxph(formula = Surv(age_start, age_end, fail) ~ brv, data = brvSplit4)
##
##   n= 1036, number of events= 278
##
##         coef exp(coef) se(coef)      z Pr(>|z|)
## brv1 -0.2070    0.8131   0.1390 -1.488    0.137
##
##      exp(coef) exp(-coef) lower .95 upper .95
## brv1    0.8131       1.23    0.6191     1.068
##
## Concordance= 0.511  (se = 0.014 )
## Likelihood ratio test= 2.26  on 1 df,   p=0.1
## Wald test            = 2.22  on 1 df,   p=0.1
## Score (logrank) test = 2.22  on 1 df,   p=0.1
```

Use the Cox model to estimate the effect of bereavement separately for males and females and compare the estimates to those obtained using Poisson regression.

```
summary(coxph(Surv(age_start, age_end, fail) ~ brv + sex,
              data = brvSplit4))
```

```
## Call:
## coxph(formula = Surv(age_start, age_end, fail) ~ brv + sex, data = brvSplit4)
##
##   n= 1036, number of events= 278
##
##          coef exp(coef) se(coef)      z Pr(>|z|)
## brv1 -0.07842   0.92458  0.14245 -0.551 0.581971
## sex2 -0.47291   0.62318  0.13075 -3.617 0.000298 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##      exp(coef) exp(-coef) lower .95 upper .95
## brv1    0.9246      1.082    0.6993    1.2224
## sex2    0.6232      1.605    0.4823    0.8052
##
## Concordance= 0.56  (se = 0.018 )
## Likelihood ratio test= 15.85  on 2 df,   p=4e-04
## Wald test            = 15.21  on 2 df,   p=5e-04
## Score (logrank) test = 15.51  on 2 df,   p=4e-04
```