# Burn Data

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The `burn` data set from `KMsurv` is from Ichida et al. (1993) which is linked on the web site. It represents a study of an attempt to improve infection control by replacing routine bathing with total body washing using an antimicrobial agent. The main outcome of interest is infection with straphylocous aureaus, the time and status of which are represented by T3 and D3. There are 11 ordinary covariates Z1–Z11 and two time dependent predictors that can be constructed for surgical excision of burn tissue (T1, D1) and prophylactic antibiotic treatment (T2, D2).

The input R file on the web site recodes and renames the ordinary covariates, as shown above, to make interpretation easier. The cases with routine bathing are historical controls so this does not represent a single cohort study and in particular the assignment of treatment to patient is not random.
Your assignment is to analyze the data and write a report as if to the head burn surgeon in the hospital. You will be graded on the analysis and also on the quality of the communication in the presentation. Below are some possible things to look at. There may be others as well, and maybe you don't need all of these. If you make a plot or do an analysis, then explain why you did it and what the meaning of the results might be.

Burn Data Set

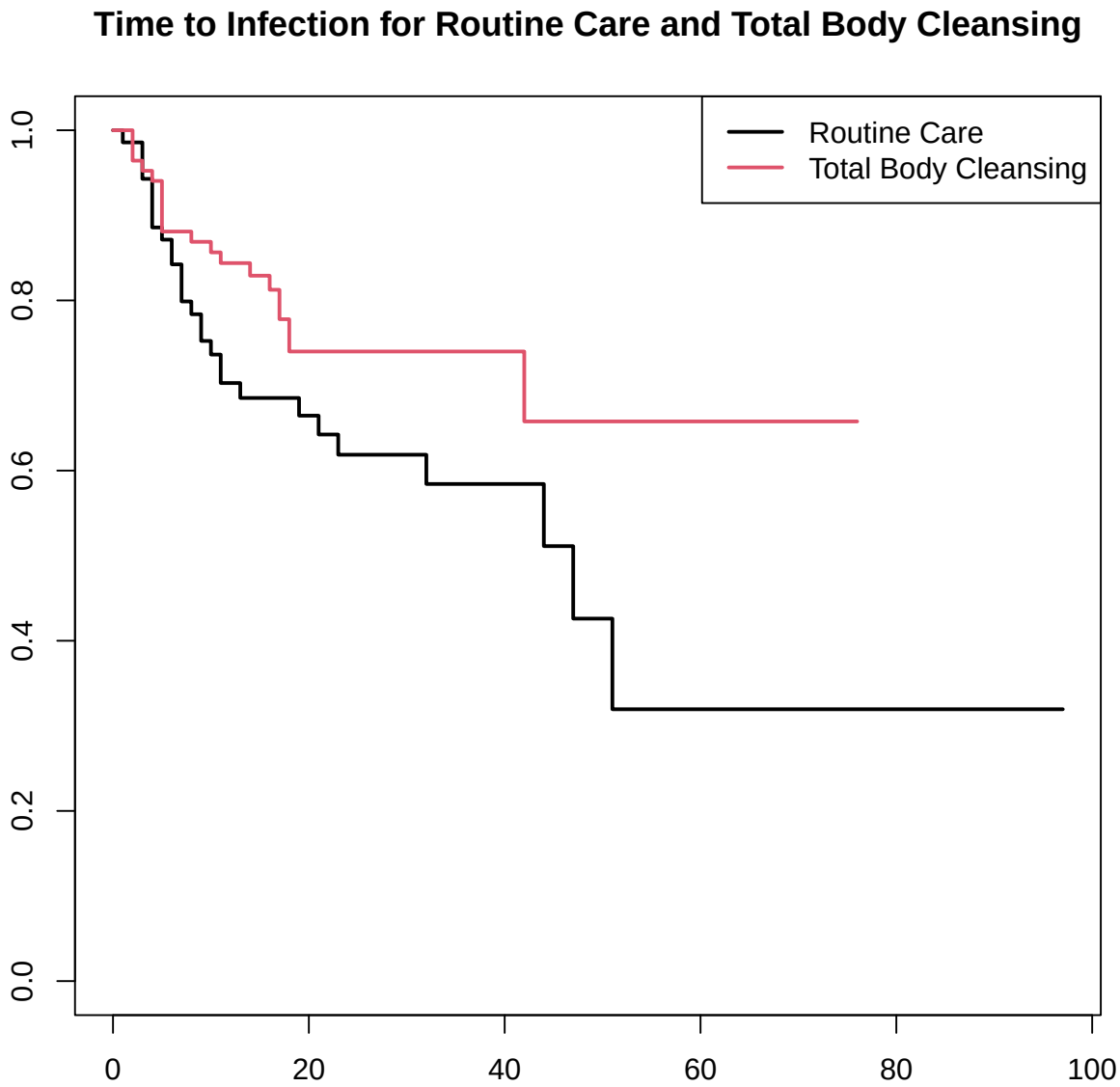
| Var. | Definition |
|---|---|
| Obs | Observation number |
| Z1 | Treatment: 0-routine bathing 1-Body cleansing |
| Z2 | Gender (0=male 1=female) |
| Z3 | Race: 0=nonwhite 1=white |
| Z4 | Percentage of total surface area burned |
| Z5 | Burn site indicator: head 1=yes, 0=no |
| Z6 | Burn site indicator: buttock 1=yes, 0=no |
| Z7 | Burn site indicator: trunk 1=yes, 0=no |
| Z8 | Burn site indicator: upper leg 1=yes, 0=no |
| Z9 | Burn site indicator: lower leg 1=yes, 0=no |
| Z10 | Burn site indicator: respiratory tract 1=yes, 0=no |
| Z11 | Type of burn: 1=chemical, 2=scald, 3=electric, 4=flame |
| T1 | Time to excision or on study time |
| D1 | Excision indicator: 1=yes 0=no |
| T2 | Time to prophylactic antibiotic treatment or on study time |
| D2 | Prophylactic antibiotic treatment: 1=yes 0=no |
| T3 | Time to straphylocous aureaus infection or on study time |
| D3 | Straphylocous aureaus infection: 1=yes 0=no |

Recoded Burn Data Set

| Var. | New Var. | Definition and Factor Levels |
|---|---|---|
| Obs | | Observation number |
| Z1 | Treatment | Routine/Cleansing |
| Z2 | Gender | Male/Female |
| Z3 | Race | Nonwhite/White |
| Z4 | PercentBurned | Percentage of total surface area burned |
| Z5 | SiteHead | NotBurned/Burned |
| Z6 | SiteButtock | NotBurned/Burned |
| Z7 | SiteTrunk | NotBurned/Burned |
| Z8 | SiteUpperLeg | NotBurned/Burned |
| Z9 | SiteLowerLeg | NotBurned/Burned |
| Z10 | SiteRespTract | NotBurned/Burned |
| Z11 | BurnType | Chemical/Scald/Electric/Flame |
| T1 | | Time to excision or on study time |
| D1 | | Excision indicator: 1=yes 0=no |
| T2 | | Time to prophylactic antibiotic treatment or on study time |
| D2 | | Prophylactic antibiotic treatment: 1=yes 0=no |
| T3 | | Time to straphylocous aureaus infection or on study time |
| D3 | | Straphylocous aureaus infection: 1=yes 0=no |

```
require(KMsurv)
require(survival)
data(burn)

burn1 <- burn
burn1 <- data.frame(burn1,Treatment=factor(burn1$Z1,
  labels=c("Routine","Cleansing")))
burn1 <- data.frame(burn1,Gender=factor(burn1$Z2,
  labels=c("Male","Female")))
burn1 <- data.frame(burn1,Race=factor(burn1$Z3,
  labels=c("Nonwhite","White")))
burn1 <- data.frame(burn1,PercentBurned=burn1$Z4)
burn1 <- data.frame(burn1,SiteHead=factor(burn1$Z5,
  labels=c("NotBurned","Burned")))
burn1 <- data.frame(burn1,SiteButtock=factor(burn1$Z6,
  labels=c("NotBurned","Burned")))
burn1 <- data.frame(burn1,SiteTrunk=factor(burn1$Z7,
  labels=c("NotBurned","Burned")))
```

```
burn1 <- data.frame(burn1,SiteUpperLeg=factor(burn1$Z8,
  labels=c("NotBurned","Burned")))
burn1 <- data.frame(burn1,SiteLowerLeg=factor(burn1$Z9,
  labels=c("NotBurned","Burned")))
burn1 <- data.frame(burn1,SiteRespTract=factor(burn1$Z10,
  labels=c("NotBurned","Burned")))
burn1 <- data.frame(burn1,BurnType=factor(burn1$Z11,
  labels=c("Chemical","Scald","Electric","Flame")))

burn1.surv <- with(burn1,Surv(T3,D3))
plot(survfit(burn1.surv~Treatment,data=burn1),col=1:2,lwd=2)
title("Time to Infection for Routine Care and Total Body Cleansing")
legend("topright",c("Routine Care","Total Body Cleansing"),col=1:2,lwd=2)

print(survdiff(burn1.surv~Treatment,data=burn1))

survdiff(formula = burn1.surv ~ Treatment, data = burn1)

                      N Observed Expected (O-E)^2/E (O-E)^2/V
Treatment=Routine    70       28     21.4      2.07      3.79
Treatment=Cleansing 84       20     26.6      1.66      3.79

 Chisq= 3.8  on 1 degrees of freedom, p= 0.05
```


Time to Infection for Routine Care and Total Body Cleansing
Routine Care
Total Body Cleansing
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
100

1. Plot the Kaplan-Meier curves for the treated and untreated patients and use `survdiff` to test for whether the curves are different.
2. Plot the cumulative hazards vs. time and the complimentary log-log survival vs. log time.

3. Construct Cox model using only the time-independent predictors, Maybe start with one using only Treatment. Decide if the burn site variables will be separately included after analysis or included or excluded as a group. Note that this is not a factor, because a patient may have burns at many sites. The respiratory tract burn site variable is different from the others since it does not focus on skin.

4. Run the usual suite of model checking methods and report any interesting findings. Possibly alter the model as a result.
5. Construct the data set with the the time-dependent covariates for surgical excision and prophylactic antibiotic treatment and find a good model which includes useful time-dependent covariates as well as useful time-independent ones.

6. Run the usual suite of model checking methods again and report any interesting findings. Possibly alter the model as a result.
7. Interpret the results and comment on the implications for clinical management. Note that, from other studies, for the endpoint of survival (an outcome not included in this data set), burn percentage and burn degree (first, second, third) are quite important, but the first one may or may not be important for infection control, and information on the second factor is not included in the data set.