

## 17. Writing about Event History Analysis

### SOLUTIONS

1. Based on figure 17.1 from the study by Tammemagi et al (2005),
  - a. At baseline (time of diagnosis), the sample included 629 white women and 257 black women.
  - b. Median survival time following breast cancer diagnosis was about one-third longer for white than for black women: 13.5 years and 10 years, respectively (figure 17.1).
  - c. White women were approximately 13 percentage points more likely to survive at least 5 years after diagnosis as were their black counterparts ( $p < 0.01$ ; figure 17.1).
  
3. Based on the information in figure 17.2 from the study by Smith and colleagues (2005)
  - a. For the methods section
    - i. Smith and colleagues (2005) estimated competing risks models of rehospitalization or death within 30 days of discharge, with “no event” as censoring.
    - ii. They included 9,003 persons in their model of outcomes in the 30 days after index admission (see  $N$  in the “Index Admission” box). Persons discharged from that admission could have been readmitted more than once, or readmitted and then died, which is why the sum of the three numbers in the 30-day outcomes boxes (9,167) can exceed the 9,003. In other words, some people contributed more than one event (and hence more than one spell) to the analysis of the competing events within 30 days of discharge.
    - iii. The competing risks model for the subsequent 11 months also analyzed relative hazards of rehospitalization or death.
    - iv. The analysis of the subsequent 11 months included information on 1,262 persons competing risks model of events in the 11 months subsequent to rehospitalization. Again, the sum of the numbers in the three 11-month outcomes boxes (1,295) is greater than the number of persons at risk because some people contributed more than one event (and hence more than one spell) to that analysis.
    - v. A total of 2,866 deaths were observed during their study period. (= 1,324 after discharge from index admission + 1,176 among

- those who were not rehospitalized in the 30 days after index discharge + 366 among those who were rehospitalized in the 30 days after index discharge.)
- b. For the results section, report and interpret the direction, magnitude, and statistical significance of the following associations for HMO compared to fee-for-service clients:
    - i. Adults who were covered by an HMO were 1.29 times as likely as those covered by fee-for-service to be rehospitalized following the discharge from their index admission ( $p < 0.05$ ).
    - ii. There was no statistically significant difference in the risk of death following the index admission for HMO versus fee-for-service clients (HR = 1.07; 95% CI 0.95–1.21).
    - iii. Type of health insurance coverage was not associated with risk of a rehospitalization in the 11 months after a first rehospitalization (HR = 0.96; 95% CI 0.79–1.16 for HMO compared to fee-for-service).
5. Describe the temporal pattern of financial aid shown in figure 17.5.
- a. Amount and type of financial aid is specified as a series of time-varying covariates, with observations in each term during which a student was enrolled in college. It is classified into six types: scholarships, loans, grants, work/study, other on-campus earnings, and no aid (the reference category). A student could have more than one type of aid in each term. In the model of college stopout, measures of each type of aid (in \$1,000s) were included for each term that a student was enrolled up until their first stopout or graduation.
  - b. Hazard of college stopout<sub>*t*</sub> =  $\beta_0 + \beta_{1t} \text{Loan amount}_t + \beta_{2t} \text{Scholarship amount}_t + \beta_{3t} \text{Grant amount}_t + \beta_{4t} \text{Work/study amount}_t + \beta_{5t} \text{Earnings amount}_t$ , where amount of each type of financial aid is measured in \$1,000s (see footnote to table 17A). Note that each of the financial aid covariates and their associated coefficients have subscript *t*, indicating that financial aid is specified as a series of time-varying covariates, each of which is allowed to have a time-varying effect on the dependent variable (stopout).
  - c. Figure 17.5 in *Writing about Multivariate Analysis, 2nd Edition* portrays the average amount of each three types of financial aid offered in Minnesota colleges and universities, by duration of enrollment. In the first three terms of enrollment, average work/study offers were 2.5 times as high as loan amounts and more than three times as high as on-campus earnings (\$2,000 per term for work/study, \$800 per term for loans, and \$600 for earnings). After the fourth term, however, work/study offers were cut in half (to less than \$1,000 per term, on average), while on-campus earnings increased to about the same amount. Loan amounts remained roughly constant until the sixth term, and then rose slightly. By the eighth term, average offers from on-campus employment provided

the highest average offer (\$1,300), followed by work/study (\$900) and loans (\$850).

7a. Create a chart from the data in table 17A.

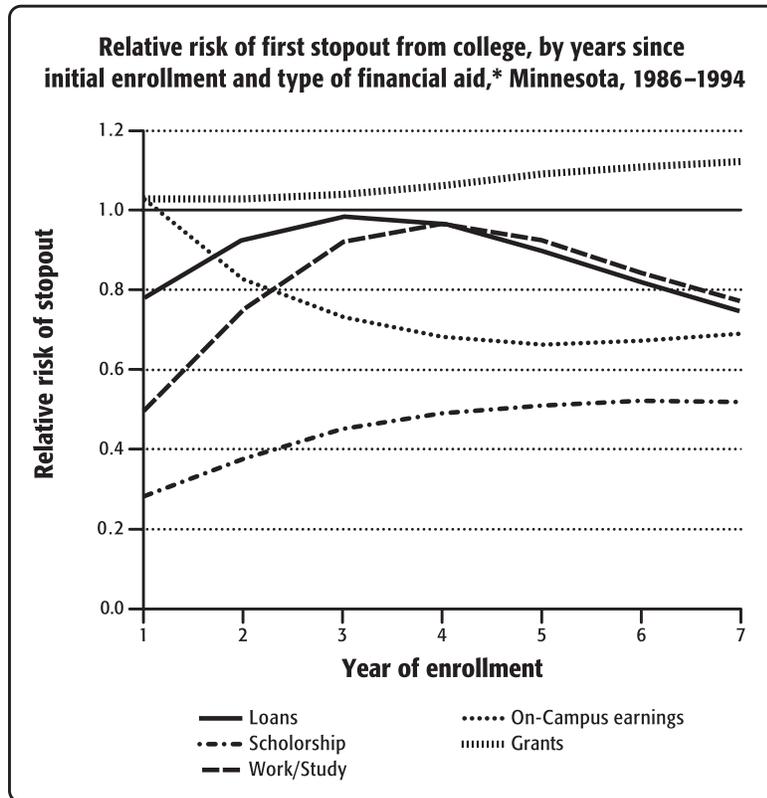


Figure 17A. See notes to table 17A.

7b. In the first year of enrollment, financial aid in the form of scholarships was associated with the lowest risk of stopout among Minnesota college students, followed by work/study funding and loans (RR = 0.28, 0.50, and 0.78 per \$1,000 of the specified type of aid, respectively, when each was compared against no financial aid; figure 17A). Risks of stopout were similar for other on-campus earnings, grants (RR = 1.03 per \$1,000 for either type of aid), and no aid.

However, the relative risks of stopout for scholarships, work/study, and loans each rose over time, bringing them closer to the risk among students with no financial aid. By year 4, the relative risk for scholarships rose to about 0.5 per \$1,000 of aid. In contrast, relative risk of stopout associated with other on-campus earnings decreased with time since enrollment; RR by year 4 = 0.70 compared to no aid. As a consequence of these different temporal patterns of stopout for the various types of financial aid, by the fourth year of enrollment, scholarships were associated with the lowest risk of stopout (RR = 0.5 per \$1,000 compared to no aid), followed by own earnings (RR = 0.68),

and work/study, loans, and grants, for which risks of stopout were quite close to one another and to no aid (RR = 0.96, 0.97, and 1.06, respectively).

In other words, for equivalent dollar amounts of financial aid, scholarships consistently had the most beneficial effects on student retention in college throughout their years of enrollment. In the first year of college, work/study and loans also substantially increased retention rates, but their beneficial effects faded with time. Conversely, although non-work/study earnings had little effect on retention in the first year of college, by the third year, they were associated with a substantial improvement in retention compared to students who had financial aid other than scholarships.