Soc 756 Problem Set 2

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(a)

$p \approx 0.5959345 \times 100\% = 59.59\%$

```r
#=====================================================================
#=================================================================== A

us_lt <- read.table("bltper_1x1.txt", header = TRUE, skip = 2,
    stringsAsFactors = FALSE)
us_lt_2005 <- us_lt[us_lt$Year == 2005, ]

us_lt_2005$Age <- as.numeric(gsub("\\+", "", us_lt_2005$Age))

# Add p_accident
f_accident <- function(age) {
  return(0.062 - 0.000053 * (age^2))
}
us_lt_2005$p_accident <- sapply(us_lt_2005$Age, f_accident)

# Create lx_surv_acc
us_lt_2005$lx_surv_acc <- numeric(nrow(us_lt_2005))
us_lt_2005$lx_surv_acc[1] <- us_lt_2005$lx[1]

for(i in 2:nrow(us_lt_2005)) {
  us_lt_2005$lx_surv_acc[i] <- us_lt_2005$lx_surv_acc[i-1] *
    (1 - us_lt_2005$qx[i-1]) *
    (1 - us_lt_2005$p_accident[i-1])
}


```

```r
p_1631 <- us_lt_2005$lx_surv_acc[us_lt_2005$Age == 31] /
          us_lt_2005$lx_surv_acc[us_lt_2005$Age == 16]

print(p_1631)
```

(b)

$p \approx 0.1234985$

```r
#=====================================================================
#=================================================================== B

d_acc <- sum(us_lt_2005$lx_surv_acc[us_lt_2005$Age >= 25 & us_lt_2005$Age
    <= 30] *
             us_lt_2005$p_accident[us_lt_2005$Age >= 25 & us_lt_2005$Age
    <= 30])

p_acc_2530 <- d_acc / us_lt_2005$lx_surv_acc[us_lt_2005$Age == 25]

print(p_acc_2530)
```

(c)

$p \approx 0.0038111$

```r
#=====================================================================
#=================================================================== C

# Cumulative no-accident probability
us_lt_2005$cum_no_acc <- numeric(nrow(us_lt_2005))

for(i in 1:nrow(us_lt_2005)) {
  us_lt_2005$cum_no_acc[i] <- prod(1 - us_lt_2005$p_accident[1:i])
}

death_noacc_1630 <- sum(us_lt_2005$dx[us_lt_2005$Age >= 16 & us_lt_2005$
    Age <= 30] *
                        us_lt_2005$cum_no_acc[us_lt_2005$Age >= 16 & us_lt
    _2005$Age <= 30])

p_death_noacc_1630 <- death_noacc_1630 / us_lt_2005$lx[us_lt_2005$Age ==
    16]

```

```
print(p_death_noacc_1630)
```

(D)

Overestimate if those having accident have a higher probability of dying; underestimate if otherwise.