Methods 6

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Q1)

Here, we'll just multiply the successive probabilities of being selected together.

$$\pi_{ij} = \frac{nx_i}{t_x} \frac{m_i x_{ij}}{x_i} \frac{q_{ij}}{x_{ij}} = \frac{nmq_{ij}}{t_x}$$

Q2)

First, we have to create unique values for the ppsu's, we'll do this by multiplying by 1000 and adding the ppsu's.

```
ncvs = ncvs |>
  mutate(ppsu_unique = pstrat * 1000 + ppsu)

ncvs_survey = svydesign(~ppsu_unique, strata=~pstrat, weight=~pweight, data=ncvs)
```

a)

Here, I checked the codebook and `numinc` is the number of incidents per person, so we just use the usual code. The total is 15,850,360.

```
svytotal(~numinc, ncvs_survey)
```

```
          total     SE
numinc 15850360 492124
```

b)

Same thing here, just using `medexp` for medical expenses. The total is $86,285,440

```r
svytotal(~medexp, ncvs_survey)
```

```
          total       SE
medexp 86285440 28354406
```

c)

And a similar thing here but with robbery. The mean is fairly low, which probably makes sense. About 1 in 610 people commits a robbery.

```r
svymean(~robbery, ncvs_survey)
```

```
           mean     SE
robbery 0.00164 2e-04
```