Exercise 2: Age-specific decomposition of a difference between life expectancies

The aim of this exercise is to illustrate how to calculate age-specfic contritbutions to a difference between two life expectancies. We will use the most common method: Arriaga (1984), although there exist several methods that would lead to similar resutls.

The COD1 object contains the cause of death structure by age group for 2000-2005, and COD2 for 2005-2010. The LT1 object is the UN lifetables for females in Saudi Arabia in 2000-2005 and LT2 corresponds to 2005-2010.

First load the data

```
library(ggplot2)
library(plotly)

#load data for Saudia Arabian females
load('Exercise_2_Data.RData')
```

Follow the algorithm described in Arriaga (1984):

1. Get the info needed from the lifetables:

```
# Algorithm to get the age decomposition

  l1<- LT1$lx
  l2<- LT2$lx
  d1<- LT1$dx
  d2<- LT2$dx
  L1<- LT1$Lx
  L2<- LT2$Lx
  T1<- LT1$Tx
  T2<- LT2$Tx

  LAG<- length(l1)
```

2. Calculate the direct and indirect components

```
  DE<-(l1/l1[1])*((L2/l2)-(L1/l1))

  IE<-(T2[-1]/l1[1])*((l1[-LAG]/l2[-LAG])-(l1[-1]/l2[-1]))

  # one extra value for the indirect component
  # since there is only direct component in the last age group
  IE<-c(IE,0)
```

3. Sum the direct and indirect components to get the age specific contribution and chech with the total change

```
## add both to get the overall age-decomposition
  ALL<-DE+IE
  # check
  # difference in life expectancies
  LT2$ex[1] - LT1$ex[1]
```

```
## [1] 0.22
```

```r
# sum of age-speific effects
sum(ALL)
```

```
## [1] 0.22613
```

4. Which age group contributed the most to increasing life expectancy betweeb 2005-2010 and 2000-2005?
5. Which age group contributed the most to decreasing life expectancy betweeb 2005-2010 and 2000-2005?
6. Plot and interpret results

```r
fig <- ggplot() +
geom_bar(aes(x = factor(unique(LT1$Age)), y = ALL), stat = "identity")

fig
```