1. This data is clearly connected with a market research project which is seeking to to determine what influences people's decision to shop near or far from home. The near/far variable is thus probably best regarded as a *response*, and the other variables as *explanatory*.

   There are four variables in all, so the best tool we have at hand is the mosaic plot. The appearance of a mosaic plot depends strongly on the order the variables are used to produce it, so we need to consider a number of different variable orderings. Because shopping centre is the response variable, we will always make the last variable in the ordering. This means that there are $3! = 6$ possible orderings. In order to really understand the data set you must look at all these orderings, but to keep these solutions short, I'll just look at one:

age	old / young
income	low / high
car	yes / no
shopping centre	near / far

   Here is the computer code to read in the observations and to get them ready for the analysis.

```
x <- c(12, 57, 17, 48, 3, 24, 2, 3,
       18, 53, 51, 105, 2, 11, 1, 0)
dim(x) <- rep(2, 4)
dimnames(x) <- list(loc=c("near","other"),
                    car=c("yes","no"),
                    income=c("low","high"),
                    age=c("young","old"))
```

   To generate the desired mosaic plot we must permute the order of the variables. We can get the order we want as follows.

```
xp <- aperm(x, c(4, 3, 2, 1))
```

   The mosaic plot can then be produced with the statement:

```
mosaicplot(xp)
```

   The resulting plot is shown in figure 1. The following results are apparent in the plot.

   1. There are rather more older people than younger people.
   2. Within the older group, there are many fewer people in the high income group, but the high income group is quite small for both old and young age groups.

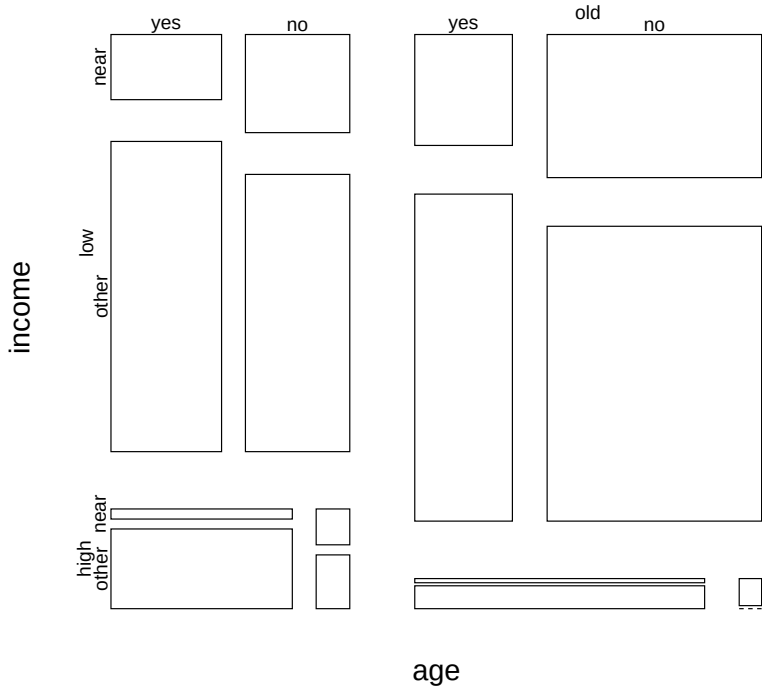

Figure 1: The mosaic plot.

3. Within the young/low-income group, about 50% of the group are car owners and within the old/low-income group rather less than 50% of the group own cars. Both the high income age groups have a high proportion of car ownership.
4. Among the low income age groups, the pattern of near/other shopping seems to be broadly similar, and the effect of car ownership is to increase the proportion of people shopping further away. This effect is also observed in the young/high-income group. The older, high income group is very small (one person) and it would be silly to try to read a pattern in those values.
5. Across the board, high income and a car seem to increase the number of people shopping non-locally. Surprisingly, even in the other groups, there is a tendency to shop elsewhere.