Health Savings Experiments

To understand why the poor are constrained in their ability to save for investments in preventative health products, two researchers designed a field experiment in rural Kenya in which they randomly varied access to four innovative saving technologies. By observing the impact of these various technologies on asset accumulation, and by examining which types of people benefit most from them, the researchers were able to identify the key barriers to saving. This exercise is based on:

Dupas, Pascaline and Jonathan Robinson. 2013. "Why Don't the Poor Save More? Evidence from Health Savings Experiments." *American Economic Review*, Vol. 103, No. 4, pp. 1138-1171.

They worked with 113 ROSCAs (Rotating Savings and Credit Associations). A ROSCA is a group of individuals who come together and make regular cyclical contributions to a fund (called the "pot"), which is then given as a lump sum to one member in each cycle. In their experiment, Dupas and Robinson randomly assigned 113 ROSCAs to one of the five study arms. In this exercise, we will focus on three study arms (one control and two treatment arms). The data file, `rosca.csv` is extracted from their original data, excluding individuals who have received multiple treatments for the sake of simplicity.

Individuals in all study arms were encouraged to save for health and were asked to set a health goal for themselves at the beginning of the study. In the first treatment group (*Safe Box*), respondents were given a box locked with a padlock, and the key to the padlock was provided to the participants. They were asked to record what health product they were saving for and its cost. This treatment is designed to estimate the effect of having a safe and designated storage technology for preventative health savings.

In the second treatment group (*Locked Box*), respondents were given a locked box, but not the key to the padlock. The respondents were instructed to call the program officer once they had reached their saving goal, and the program officer would then meet the participant and open the *Locked Box* at the shop where the product is purchased. Compared to the safe box, the locked box offered stronger commitment through earmarking (the money saved could only be used for the prespecified purpose).

Participants are interviewed again 6 months and 12 months later. In this exercise, our outcome of interest is the amount (in Kenyan shilling) spent on preventative health products after 12 months.

Descriptions of the relevant variables in the data file `rosca.csv` are:

Name	Description
`bg_female`	`1` if female, and `0` otherwise
`bg_married`	`1` if married, and `0` otherwise
`bg_b1_age`	age at baseline
`encouragement`	`1` if encouragement only (control group), and `0` otherwise
`safe_box`	`1` if safe box treatment, and `0` otherwise
`locked_box`	`1` if lock box treatment, and `0` otherwise
`fol2_amtinvest`	Amount invested in health products
`has_followup2`	`1` if appears in 2nd followup (after 12 months), and `0` otherwise

Question 1

Load the data set as a `data.frame` and create a single factor variable `treatment` that takes the value `control` if receiving only encouragement, `safebox` if receiving a safe box, and `lockbox` if receiving a locked box. How many individuals are in the control group? How many individuals are in each of the treatment arms?

Answer 1

```
rosca <- read.csv("data/rosca.csv")
rosca$treatment <- NA
rosca$treatment[rosca$encouragement == 1] <- "control"
rosca$treatment[rosca$safe_box == 1] <- "safebox"
rosca$treatment[rosca$locked_box == 1] <- "lockbox"
rosca$treatment <- as.factor(rosca$treatment)
table(rosca$treatment)
```

```
##
## control lockbox safebox
##     111     195     117
```

111 are in the control group. 117 have received a safe box. 195 have received a locked box.

Question 2

Subset the data so that it contains only participants who were interviewed in 12 months during the second followup. We will use this subset for the subsequent analyses. How many participants are left in each group of this subset? Does the drop-out rate differ across the treatment conditions? What does this result suggest about the internal and external validity of this study?

Answer 2

```
rosca2 <- rosca[rosca$has_followup2 == 1, ]
table(rosca2$treatment)
```

```
##
## control lockbox safebox
##     102     184     107
```

```
(table(rosca$treatment)-table(rosca2$treatment))/table(rosca$treatment)
```

```
##
##    control    lockbox    safebox
## 0.08108108 0.05641026 0.08547009
```

In the subset, 102 are in the control group. 107 have received a safe box. 184 have received a locked box. The drop-out rates are similar for control group and safe box treatment, and slighly lower in the lock box treatment group.

If, after 12 months, the participants who remain in treatment groups and control group are no longer similar in their pre-treatment characteristics, the attrition compromises the internal validity. If the characteristics of the participants who remain in the study after 12 months are no longer representative of the population of interest, the external validity may be compromised. The `lockbox` group has a somewhat lower drop-out rate than the other conditions, suggesting that these participants may have been slightly more engaged in the study. However, the difference is quite small, indicating that the bias due to differential drop-out may not be substantial.

Question 3

Does receiving a safe box increase the amount invested in health products? We focus on the outcome measured 12 months from baseline during the second follow-up. Compare the mean of amount (in Kenyan shilling) invested in health products `fol2_amtinvest` between each of the treatment arms and the control group. Briefly interpret the result.

Answer 3

```
tapply(rosca2$fol2_amtinvest, rosca2$treatment, mean)
```

```
##  control  lockbox  safebox
## 257.8333 307.8261 408.2150
```

```
tapply(rosca2$fol2_amtinvest, rosca2$treatment, mean) -
  mean(rosca2$fol2_amtinvest[rosca2$treatment == "control"])
```

```
##   control   lockbox   safebox
##   0.00000  49.99275 150.38162
```

On average, receiving a safe box increases the investment in health products by 150 Kenyan shillings, while receiving a locked box increases the investment in health products by 50 Kenyan shillings.

Question 4

Examine the balance of pre-treatment variables, gender (`bg_female`), age (`bg_b1_age`) and marital status (`bg_married`). Are participants in the two treatment groups different from those in the control group? What does the result of this analysis suggest in terms of the internal validity of the finding presented in the previous question?

Answer 4

```
tapply(rosca2$bg_female, rosca2$treatment, mean)
```

```
##   control   lockbox   safebox
## 0.7254902 0.7336957 0.7943925
```

```
tapply(rosca2$bg_female, rosca2$treatment, mean) -
  mean(rosca2$bg_female[rosca2$treatment == "control"])
```

```
##     control     lockbox     safebox
## 0.000000000 0.008205456 0.068902327
```

The safe box group has 79% female, higher than the control (73%) and locked box group (73%). If gender is associated with amount of health investment, it might have confounded the relation betwen having a safe box and amount of investment. For example, if women are more likely to invest in health products, the effect of having a safe box might have been overestimated.

```
tapply(rosca2$bg_b1_age, rosca2$treatment, mean)
```

```
##  control  lockbox  safebox
## 41.87255 39.58152 38.54206
```

```
tapply(rosca2$bg_b1_age, rosca2$treatment, mean) -
  mean(rosca2$bg_b1_age[rosca2$treatment == "control"])
```

```
##   control   lockbox   safebox
##  0.000000 -2.291027 -3.330493
```

The locked box and safe box groups are 2 and 3 years, respectively, younger than the control group. If younger people tend to spend less on health products, the effects of saving technologies on amount of health investment might have been underestimated.

```
tapply(rosca2$bg_married, rosca2$treatment, mean)
```

```
##   control   lockbox   safebox
```

```
## 0.7450980 0.7608696 0.7289720
```

```
tapply(rosca2$bg_married, rosca2$treatment, mean) -
  mean(rosca2$bg_married[rosca2$treatment == "control"])
```

```
##     control     lockbox     safebox
##  0.00000000  0.01577153 -0.01612608
```

76% of the participants in the locked box group is married, similar to the control group (75%). Compared to the control group, a slightly smaller proportion of the safe box group (73%) is married. If married people are more likely to invest in health products, the effect of having a safe box might have been underestimated. However, the differences are quite small.