Denis Ostroushko - PUBH 7420 - HW1

Problem 1

1 - A

Let four treatments be assigned the following symbols for representation randomization assignment:

- NNC + patch = T1
- NNC + no patch = T2
- VLNC + patch = T3
- VLNC + no patch = T4

To get random treatment assignments we will use this rule:

- assign to T1 if a random number is 1 or 5
- assign to T2 if a random number is 2 or 6
- assign to T3 if a random number is 3 or 7
- assign to T4 if a random number is 4 or 8
- discard a random number if it is 0 or 9

A list of random numbers provided to us:

```
 [1] 5 3 7 2 3 2 2 3 4 6 3 2 8 7 5 1 4 2 4 4
```

Corresponding assignments to the entire list of numbers:

```
 [1] "T1" "T3" "T3" "T2" "T3" "T2" "T2" "T3" "T4" "T2" "T3" "T2" "T4" "T3" "T1"
[16] "T1" "T4" "T2" "T4" "T4"
```

First ten assignments:

```
 [1] "T1" "T3" "T3" "T2" "T3" "T2" "T2" "T3" "T4" "T2"
```

1 - B

Let two treatments and control be assigned the following symbols for representation randomization assignment:

- NNC + no patch = C
- VLNC + no patch = T1
- VLNC + patch = T2

We want to have 1:1.5:1.5 ratio, which will randomize more participants to the two VLNC groups. Taking the ratios to whole numbers, we will work with 2:3:3 ratio.

To get random treatment assignments we will use this rule: * assign to C if a random number is 1 or 2 * assign to T1 if a random number is 3,5,7 * assign to T2 if a random number is 4,6,8 * discard 0 and 9

Corresponding assignments to the entire list of numbers:

```
 [1] "T1" "T1" "T1" "C"  "T1" "C"  "C"  "T1" "T2" "T2" "T1" "C"  "T2" "T1" "T1"
[16] "C"  "T2" "C"  "T2" "T2"
```

First ten assignments:

```
 [1] "T1" "T1" "T1" "C"  "T1" "C"  "C"  "T1" "T2" "T2"
```

1 - C

Two possible block sizes are 3 and 6. We can extend this to further multiples of three, such as 9,12,15, etc… but for this exercise I will stick with 3 and 6.

Design:

- For blocks of size 3 we will have the following combinations of C, T1, T2 (Table 1):
- Ideally we want to have three of these combinations (due to the limited number of random numbers between 0 and 9)
- So, I will sample three random numbers from 1 to 6 and use three block options that were randomly selected. Setting seed. randomly selected numbers are 2, 3, 5
- Combinations to be used for schedule (Table 2):
- Similarly, for bock of size 6 we will have the following options. Each of C, T1, and T2 is represented in candidate blocks twice (Table 3). I will print out the first five options out of the total 6:

Table 1: Examples of blocks of size 3

			Block ID
C	T1	T2	1
C	T2	T1	2
T1	C	T2	3
T1	T2	C	4
T2	C	T1	5
T2	T1	C	6

Table 2: Selected block desgins for blocks of size 3

			Block ID
C	T2	T1	2
T1	C	T2	3
T2	C	T1	5

Table 3: Examples of blocks of size 6

						Block ID
C	C	T1	T1	T2	T2	1
C	C	T1	T2	T1	T2	2
C	C	T1	T2	T2	T1	3
C	C	T2	T1	T1	T2	4
C	C	T2	T1	T2	T1	5

Table 4: Selected block desgins for blocks of size 6

						Block ID
C	T1	T2	C	T1	T2	13
C	T1	T2	T2	T1	C	18
C	T2	C	T1	T1	T2	19
T2	C	T2	T1	C	T1	71
T2	T1	C	C	T1	T2	73
T2	T1	T2	C	T1	C	83

- For these block options, I will select six random numbers between 1 and 90. These blocks will be used for randomization schedule: 13, 18, 19, 71, 73, 83
- So, these blocks will be used when we sample a number corresponding to a block of size six (Table 4):

We have a total of nine blocks, randomization schedule will be crated using this scheme:

- use block of size 3 ID number 2 when random number is 1. Next three study subjects will be assigned using a sequence from this block
- use block of size 3 ID number 3 when random number is 2. Next three study subjects will be assigned using a sequence from this block
- use block of size 3 ID number 5 when random number is 3. Next three study subjects will be assigned using a sequence from this block
- use block of size 6 ID number 13 when random number is 4. Next six study subjects will be assigned using a sequence from this block
- use block of size 6 ID number 18 when random number is 5. Next six study subjects will be assigned using a sequence from this block
- use block of size 6 ID number 19 when random number is 6. Next six study subjects will be assigned using a sequence from this block
- use block of size 6 ID number 71 when random number is 7. Next six study subjects will be assigned using a sequence from this block
- use block of size 6 ID number 73 when random number is 8. Next six study subjects will be assigned using a sequence from this block
- use block of size 6 ID number 83 when random number is 9. Next six study subjects will be assigned using a sequence from this block
- random number 0 will be discarded

Randomization schedule according to the rule, first 10 observations printed:

```
 [1] "C"  "T1" "T2" "T2" "T1" "C"  "T1" "C"  "T2" "C"
```

1 - D

- Step 1:
  - when random number = 0, let block size be 3
  - when random number = 1, let block size be 6
  - …
  - when random number = 9, let block size be 30
- Step 2:
  - for each block size option, find all possible combinations of Treatments and Control that correspond to 1:1:1 ratio
  - using random number sampling, select one of the options for each block and use results
- Step 3:
  - Apply randomization scheme to the random number schedule and get a schedule.
  - This works best for trials that have 100s of participants.