

simulations_markdown_scenarios_610

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```
set.seed(219)
source("bayesian_ssr.R")
```

```
-- Attaching packages ----- tidyverse 1.3.2 --
v ggplot2 3.5.0      v purrr   1.0.1
v tibble  3.1.8      v dplyr   1.0.10
v tidyr   1.2.1      v stringr 1.5.0
v readr   2.1.3      v forcats 0.5.2
```

Warning: package 'ggplot2' was built under R version 4.2.3

```
-- Conflicts ----- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()     masks stats::lag()
```

Scenario 6-10

```
alpha<-runif(5000,0,1000)
beta<-alpha
df_sample_size<-tibble()

df_q_andmu_posteriors_50<-tibble()
df_alpha_beta_posteriors_50<-tibble()
df_D_posteriors_50<-tibble()
interim_allocation_50<-tibble()

df_q_andmu_posteriors_25<-tibble()
df_alpha_beta_posteriors_25<-tibble()
df_D_posteriors_25<-tibble()
```

```

interim_allocation_25<-tibble()

df_q_andmu_posteriors_125<-tibble()
df_alpha_beta_posteriors_125<-tibble()
df_D_posteriors_125<-tibble()
interim_allocation_125<-tibble()

for(i in 1:length(alpha)){
  aux<-sample_size_calculation(alpha_prior = alpha[i],beta_prior = beta[i], eta=0.95, zeta
  if(any(is.na(aux)))next
  df_sample_size<-rbind(df_sample_size,aux)
  #Scenario 1
  length1<-round(aux$treatment1/2)
  y1_aux=rnorm(length1,mean=0, sd=1)
  length2<-round(aux$treatment2/2)
  y2_aux=rnorm(length2,mean=0.1, sd=1)
  length3<-round(aux$treatment3/2)
  y3_aux=rnorm(length3,mean=0.2, sd=1)
  length4<-round(aux$treatment4/2)
  y4_aux=rnorm(length4,mean=0.6, sd=1)

  y=c(y1_aux,y2_aux,y3_aux,y4_aux)
  treatment_assignment<-c(rep(1,length1),rep(2,length2),
                           rep(3,length3),rep(4,length4))
  df_50=tibble(treatment_assignment,y)
  aux_post_50<-posterior_calculations(alpha_prior=alpha[i],beta_prior=beta[i],q_prior=c(1,
                                             N_treat = c(length1,length2,length3,length4),
                                             y_treatment = df_50)

  df_q_andmu_posteriors_50<-rbind(df_q_andmu_posteriors_50,aux_post_50$q_andmu_posteriors)
  df_alpha_beta_posteriors_50<-rbind(df_alpha_beta_posteriors_50,aux_post_50$alpha_beta_pa
  df_D_posteriors_50<-rbind(df_D_posteriors_50,aux_post_50$D)

  treatment_differences_50<-get_treatment_difference(aux_post_50$q_andmu_posteriors,aux_po
  new_r<-allocation_calculation(treatment_differences_50)
  interim_allocation_50<-rbind(interim_allocation_50,new_r)

  #Scenario 2

  length1<-round(aux$treatment1/4)
  y1_aux=rnorm(length1,mean=0, sd=1)

```

```

length2<-round(aux$treatment2/4)
y2_aux=rnorm(length2,mean=0.1, sd=1)
length3<-round(aux$treatment3/4)
y3_aux=rnorm(length3,mean=0.2, sd=1)
length4<-round(aux$treatment4/4)
y4_aux=rnorm(length4,mean=0.6, sd=1)

y=c(y1_aux,y2_aux,y3_aux,y4_aux)
treatment_assignment<-c(rep(1,length1),rep(2,length2),
                        rep(3,length3),rep(4,length4))
df_25=tibble(treatment_assignment,y)

aux_post_25<-posterior_calculations(alpha_prior=alpha[i],beta_prior=beta[i],q_prior=c(1,
                                           N_treat = c(length1,length2,length3,length4),
                                           y_treatment = df_25)

df_q_andmu_posteriors_25<-rbind(df_q_andmu_posteriors_25,aux_post_25$q_andmu_posteriors)
df_alpha_beta_posteriors_25<-rbind(df_alpha_beta_posteriors_25,aux_post_25$alpha_beta_pa
df_D_posteriors_25<-rbind(df_D_posteriors_25,aux_post_25$D)

treatment_differences_25<-get_treatment_difference(aux_post_25$q_andmu_posteriors,aux_po
new_r<-allocation_calculation(treatment_differences_25)
interim_allocation_25<-rbind(interim_allocation_25,new_r)

#Scenario 3

length1<-round(aux$treatment1/8)
y1_aux=rnorm(length1,mean=0, sd=1)
length2<-round(aux$treatment2/8)
y2_aux=rnorm(length2,mean=0.1, sd=1)
length3<-round(aux$treatment3/8)
y3_aux=rnorm(length3,mean=0.2, sd=1)
length4<-round(aux$treatment4/8)
y4_aux=rnorm(length4,mean=0.6, sd=1)

y=c(y1_aux,y2_aux,y3_aux,y4_aux)
treatment_assignment<-c(rep(1,length1),rep(2,length2),
                        rep(3,length3),rep(4,length4))
df_125=tibble(treatment_assignment,y)

```

```

aux_post_125<-posterior_calculations(alpha_prior=alpha[i],beta_prior=beta[i],q_prior=c(1
                                N_treat = c(length1,length2,length3,length4),
                                y_treatment = df_125)

df_q_andmu_posteriors_125<-rbind(df_q_andmu_posteriors_125,aux_post_125$q_andmu_posterior
df_alpha_beta_posteriors_125<-rbind(df_alpha_beta_posteriors_125,aux_post_125$alpha_beta
df_D_posteriors_125<-rbind(df_D_posteriors_125,aux_post_125$D)

treatment_differences_125<-get_treatment_difference(aux_post_125$q_andmu_posteriors,aux_
new_r<-allocation_calculation(treatment_differences_125)
interim_allocation_125<-rbind(interim_allocation_125,new_r)

}
colMeans(df_sample_size)

```

```

treatment1 treatment2 treatment3 treatment4
482.1633    482.1633    482.1633    482.1633

```

```

#no RAR
interim_ss50<-tibble()
for(i in 1:nrow(df_alpha_beta_posteriors_50)){
  interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_50$alpha_post
                                xi=0.95,r=c(1/4,1/4,1/4,1/4),q_prior =as.numeric( d
                                delta_star=0.2)
  interim_ss50<-rbind(interim_ss50,interim_aux)
}

colMeans(interim_ss50)

```

```

treatment1 treatment2 treatment3 treatment4
204.3572    204.3572    204.3572    204.3572

```

```

interim_ss_rar50<-tibble()
for(i in 1:nrow(df_alpha_beta_posteriors_50)){
  interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_50$alpha_post
                                xi=0.95,r=as.numeric(interim_allocation_50[i,]),q_p
                                delta_star=0.2)
  interim_ss_rar50<-rbind(interim_ss_rar50,interim_aux)
}

```

```
colMeans(interim_ss_rar50,na.rm = T)
```

```
treatment1 treatment2 treatment3 treatment4
177.7200    254.0280    326.4593    355.4707
```

```
#no RAR
interim_ss25<-tibble()
for(i in 1:nrow(df_alpha_beta_posteriors_25)){
  interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_25$alpha_post
                                       xi=0.95,r=c(1/4,1/4,1/4,1/4),q_prior =as.numeric( d
                                       delta_star=0.2)
  interim_ss25<-rbind(interim_ss25,interim_aux)
}

colMeans(interim_ss25)
```

```
treatment1 treatment2 treatment3 treatment4
328.213    328.213    328.213    328.213
```

```
interim_ss_rar25<-tibble()
for(i in 1:nrow(df_alpha_beta_posteriors_25)){
  interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_25$alpha_post
                                       xi=0.95,r=as.numeric(interim_allocation_25[i,]),q_p
                                       delta_star=0.2)
  interim_ss_rar25<-rbind(interim_ss_rar25,interim_aux)
}

colMeans(interim_ss_rar25,na.rm = T)
```

```
treatment1 treatment2 treatment3 treatment4
350.3030    402.8864    550.5705    699.6668
```

```
#no RAR
interim_ss125<-tibble()
for(i in 1:nrow(df_alpha_beta_posteriors_125)){
  interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_125$alpha_pos
                                       xi=0.95,r=c(1/4,1/4,1/4,1/4),q_prior =as.numeric( d
                                       delta_star=0.2)
```

```

    interim_ss125<-rbind(interim_ss125,interim_aux)
  }

  colMeans(interim_ss125)

```

```

treatment1 treatment2 treatment3 treatment4
392.1653    392.1653    392.1653    392.1653

```

```

interim_ss_rar125<-tibble()
for(i in 1:nrow(df_alpha_beta_posteriors_125)){
  interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_125$alpha_pos
                                       xi=0.95,r=as.numeric(interim_allocation_125[i,]),q_
                                       delta_star=0.2)
  interim_ss_rar125<-rbind(interim_ss_rar125,interim_aux)
}

colMeans(interim_ss_rar125,na.rm = T)

```

```

treatment1 treatment2 treatment3 treatment4
460.9461    477.3532    642.3432    905.5623

```

```

interim_ss_rar25<-tibble()
df_sample_size<-tibble()
interim_ss_rar50<-tibble()
df_q_andmu_posteriors_50<-tibble()
df_alpha_beta_posteriors_50<-tibble()
df_D_posteriors_50<-tibble()
interim_allocation_50<-tibble()

df_q_andmu_posteriors_25<-tibble()
df_alpha_beta_posteriors_25<-tibble()
df_D_posteriors_25<-tibble()
interim_allocation_25<-tibble()

for(i in 1:length(alpha)){
  aux<-sample_size_calculation(alpha_prior = alpha[i],beta_prior = beta[i], eta=0.95, zeta
  if(any(is.na(aux)))next
}

```

```

df_sample_size<-rbind(df_sample_size,aux)
#Scenario 4
length1<-round(aux$treatment1/4)
y1_aux=rnorm(length1,mean=0, sd=1)
length2<-round(aux$treatment2/4)
y2_aux=rnorm(length2,mean=0.1, sd=1)
length3<-round(aux$treatment3/4)
y3_aux=rnorm(length3,mean=0.2, sd=1)
length4<-round(aux$treatment2/4)
y4_aux=rnorm(round(aux$treatment4/4),mean=0.6, sd=1)
y=c(y1_aux,y2_aux,y3_aux,y4_aux)

treatment_assignment<-c(rep(1,length1),rep(2,length2),
                        rep(3,length3),rep(4,length4))
df_25=tibble(treatment_assignment,y)

aux_post_25<-posterior_calculations(alpha_prior=alpha[i],beta_prior=beta[i],q_prior=c(1,
                                           N_treat = c(length1,length2,length3,length4),
                                           y_treatment = df_25)

df_q_andmu_posteriors_25<-aux_post_25$q_andmu_posteriors
df_alpha_beta_posteriors_25<-aux_post_25$alpha_beta_params
df_D_posteriors_25<-aux_post_25$D

treatment_differences_25<-get_treatment_difference(aux_post_25$q_andmu_posteriors,aux_po
new_r<-allocation_calculation(treatment_differences_25)
interim_allocation_25<-rbind(interim_allocation_25,new_r)

interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_25$alpha_post
                                   xi=0.95,r=as.numeric(new_r),q_prior =as.numeric( df
                                   delta_star=0.2)

if(any(is.na(interim_aux)))next
interim_ss_rar25<-rbind(interim_ss_rar25,interim_aux)

#Scenario 4
length1<-max(0,round(interim_aux$treatment1/2-aux$treatment1/4))
y1_aux=rnorm(length1,mean=0, sd=1)
length2<-max(0,round(interim_aux$treatment2/2-aux$treatment2/4))
y2_aux=rnorm(length2,mean=0.1, sd=1)
length3<-max(0,round(interim_aux$treatment3/2-aux$treatment3/4))

```

```

y3_aux=rnorm(length3,mean=0.2, sd=1)
length4<-max(0,round(interim_aux$treatment4/2-aux$treatment4/4))
y4_aux=rnorm(length4,mean=0.6, sd=1)

y=c(y1_aux,y2_aux,y3_aux,y4_aux)
treatment_assignment<-c(rep(1,length1),rep(2,length2),rep(3,length3),rep(4,length4))
df_50=tibble(treatment_assignment,y)
df<-rbind(df_25,df_50)
aux_post_50<-posterior_calculations(alpha_prior=alpha[i],beta_prior=beta[i],q_prior=c(1,
                                     N_treat = c(max(round(aux$treatment1/4),round(interim_a
                                     max(round(aux$treatment2/4),round(interim_a
                                     max(round(aux$treatment3/4),round(interim_a
                                     max(round(aux$treatment4/4),round(interim_a
                                     y_treatment = df)

df_q_andmu_posteriors_50<-aux_post_50$q_andmu_posteriors
df_alpha_beta_posteriors_50<-aux_post_50$alpha_beta_params
df_D_posteriors_50<-aux_post_50$D
treatment_differences_50<-get_treatment_difference(aux_post_50$q_andmu_posteriors,aux_po
new_r<-allocation_calculation(treatment_differences_50)
interim_allocation_50<-rbind(interim_allocation_50,new_r)
interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_50$alpha_post
                                     xi=0.95,r=as.numeric(new_r),q_prior =as.numeric( df
                                     delta_star=0.2)

  if(any(is.na(interim_aux)))next
  interim_ss_rar50<-rbind(interim_ss_rar50,interim_aux)

}
colMeans(interim_ss_rar50)

```

```

treatment1 treatment2 treatment3 treatment4
262.1673    344.0464    472.5216    524.6414

```

```

interim_ss_rar25<-tibble()
df_sample_size<-tibble()
interim_ss_rar75<-tibble()
df_q_andmu_posteriors_75<-tibble()
df_alpha_beta_posteriors_75<-tibble()
df_D_posteriors_75<-tibble()
interim_allocation_75<-tibble()

```



```

df_q_andmu_posteriors_25<-tibble()
df_alpha_beta_posteriors_25<-tibble()
df_D_posteriors_25<-tibble()
interim_allocation_25<-tibble()

for(i in 1:length(alpha)){
  aux<-sample_size_calculation(alpha_prior = alpha[i],beta_prior = beta[i], eta=0.95, zeta
  if(any(is.na(aux)))next
  df_sample_size<-rbind(df_sample_size,aux)
  #Scenario 4
  length1<-round(aux$treatment1/4)
  y1_aux=rnorm(length1,mean=0, sd=1)
  length2<-round(aux$treatment2/4)
  y2_aux=rnorm(length2,mean=0.1, sd=1)
  length3<-round(aux$treatment3/4)
  y3_aux=rnorm(length3,mean=0.2, sd=1)
  length4<-round(aux$treatment2/4)
  y4_aux=rnorm(round(aux$treatment4/4),mean=0.6, sd=1)
  y=c(y1_aux,y2_aux,y3_aux,y4_aux)

  treatment_assignment<-c(rep(1,length1),rep(2,length2),
                          rep(3,length3),rep(4,length4))
  df_25=tibble(treatment_assignment,y)

  aux_post_25<-posterior_calculations(alpha_prior=alpha[i],beta_prior=beta[i],q_prior=c(1,
                                          N_treat = c(length1,length2,length3,length4),
                                          y_treatment = df_25)

  df_q_andmu_posteriors_25<-aux_post_25$q_andmu_posteriors
  df_alpha_beta_posteriors_25<-aux_post_25$alpha_beta_params
  df_D_posteriors_25<-aux_post_25$D

  treatment_differences_25<-get_treatment_difference(aux_post_25$q_andmu_posteriors,aux_po
  new_r<-allocation_calculation(treatment_differences_25)
  interim_allocation_25<-rbind(interim_allocation_25,new_r)

  interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_25$alpha_post
                                          xi=0.95,r=as.numeric(new_r),q_prior =as.numeric( df
                                          delta_star=0.2)

```

```

if(any(is.na(interim_aux)))next
interim_ss_rar25<-rbind(interim_ss_rar25,interim_aux)

#Scenario 5
length1<-max(0,round(interim_aux$treatment1*0.75-aux$treatment1/4))
y1_aux=rnorm(length1,mean=0, sd=1)
length2<-max(0,round(interim_aux$treatment2*0.75-aux$treatment2/4))
y2_aux=rnorm(length2,mean=0.1, sd=1)
length3<-max(0,round(interim_aux$treatment3*0.75-aux$treatment3/4))
y3_aux=rnorm(length3,mean=0.2, sd=1)
length4<-max(0,round(interim_aux$treatment4*0.75-aux$treatment4/4))
y4_aux=rnorm(length4,mean=0.6, sd=1)

y=c(y1_aux,y2_aux,y3_aux,y4_aux)
treatment_assignment<-c(rep(1,length1),rep(2,length2),rep(3,length3),rep(4,length4))
df_75=tibble(treatment_assignment,y)
df<-rbind(df_25,df_75)
aux_post_75<-posterior_calculations(alpha_prior=alpha[i],beta_prior=beta[i],q_prior=c(1,
N_treat = c(max(round(aux$treatment1/4),round(interim_a
max(round(aux$treatment2/4),round(interim_a
max(round(aux$treatment3/4),round(interim_a
max(round(aux$treatment4/4),round(interim_a
y_treatment = df)

df_q_andmu_posteriors_75<-aux_post_75$q_andmu_posteriors
df_alpha_beta_posteriors_75<-aux_post_75$alpha_beta_params
df_D_posteriors_75<-aux_post_75$D
treatment_differences_75<-get_treatment_difference(aux_post_75$q_andmu_posteriors,aux_po
new_r<-allocation_calculation(treatment_differences_75)
interim_allocation_75<-rbind(interim_allocation_75,new_r)
interim_aux<-sample_size_calculation(alpha_prior =df_alpha_beta_posteriors_75$alpha_post
xi=0.95,r=as.numeric(new_r),q_prior =as.numeric( df
delta_star=0.2)

if(any(is.na(interim_aux)))next

interim_ss_rar75<-rbind(interim_ss_rar75,interim_aux)

}
colMeans(interim_ss_rar75)

```

treatment1	treatment2	treatment3	treatment4
177.5699	244.1025	333.7442	355.3094