Version 3: 3 clusters

Simulate data

```
I <- 50
K <- 3
S <- 10

# choose diffuse priors for gamma
a_gamma <- 2
b_gamma <- 10

set.seed(123)

a <- matrix(NA, nrow=K, ncol=S)
b <- matrix(NA, nrow=K, ncol=S)
for (s in 1:S) {
  a[, s] <- rgamma(K, a_gamma, rate = 1/b_gamma)
  b[, s] <- rgamma(K, a_gamma, rate = 1/b_gamma)
}

# reorder a,b matrices to match ordering of means (U) in S1
U <- a/(a+b)
V <- a+b
U.ordered <- U[order(U[,1]), ]
a.ordered <- a[order(U[,1]),]
b.ordered <- b[order(U[,1]),]
V.ordered <- V[order(U[,1]),]

pi <- as.vector(rdirichlet(1, rep(1, K)))
z <- sample(1:K, size = I, replace = T, prob = pi)

w <- matrix(NA, nrow=I, ncol=S)
for (s in 1:S) {
  w[, s] <- rbeta(I, a.ordered[,s][z], b.ordered[,s][z])
}

tcn <- matrix(2, nrow=I, ncol=S)
m <- matrix(rep(sample(1:2, size = I, replace = T), S), nrow=I, ncol=S)

calcTheta <- function(m, tcn, w) {
  (m * w) / (tcn * w + 2*(1-w))
}
theta <- calcTheta(m, tcn, w)

n <- replicate(S, rpois(I, 100))
y <- matrix(NA, nrow=I, ncol=S)
for (i in 1:I) {
  for (s in 1:S) {
    y[i, s] <- rbinom(1, n[i, s], theta[i,s])
  }
```

```
}
```

JAGS

```
jags.file <- file.path(models.dir, "v3_no_constraints.jags")

test.data <- list("I" = I, "S" = S, "K" = K,
                  "y" = y, "n" = n,
                  "m" = m, "tcn" = tcn)
jags.m <- jags.model(jags.file, test.data,
                     n.chains = 1,
                     inits = list(".RNG.name" = "base::Wichmann-Hill",
                                  ".RNG.seed" = 123))
```

```
## Compiling model graph
##    Resolving undeclared variables
##    Allocating nodes
## Graph information:
##    Observed stochastic nodes: 500
##    Unobserved stochastic nodes: 611
##    Total graph size: 8511
##
## Initializing model
```

```
params <- c("z", "w", "U", "V")
samps <- coda.samples(jags.m, params, n.iter=10000, thin=7)
s <- summary(samps)
effectiveSize(samps)
```

```
##    U[1,1]    U[2,1]    U[3,1]    U[1,2]    U[2,2]    U[3,2]    U[1,3]
## 1428.0000 1428.0000 1297.3029 1428.0000 1428.0000 1428.0000 1152.5976
##    U[2,3]    U[3,3]    U[1,4]    U[2,4]    U[3,4]    U[1,5]    U[2,5]
## 1428.0000  976.8978 1552.8050 1161.8770  893.8038 1428.0000 1428.0000
##    U[3,5]    U[1,6]    U[2,6]    U[3,6]    U[1,7]    U[2,7]    U[3,7]
## 1033.8394 1428.0000 1428.0000 1428.0000 1297.1739 1494.7361 1321.4984
##    U[1,8]    U[2,8]    U[3,8]    U[1,9]    U[2,9]    U[3,9]   U[1,10]
## 1295.3060 1428.0000 1428.0000 1318.5763  919.7238 1428.0000 1428.0000
##   U[2,10]   U[3,10]    V[1,1]    V[2,1]    V[3,1]    V[1,2]    V[2,2]
## 1121.4799 1428.0000 1060.7427 1341.1655 1243.7323 1041.4335 1160.2492
##    V[3,2]    V[1,3]    V[2,3]    V[3,3]    V[1,4]    V[2,4]    V[3,4]
## 1428.0000 1027.5904 1297.3604 1428.0000 1428.0000 1111.1758 1323.8550
##    V[1,5]    V[2,5]    V[3,5]    V[1,6]    V[2,6]    V[3,6]    V[1,7]
## 1262.6416 1106.0785 1428.0000 1213.5663 1227.5473 1179.6867  975.8869
##    V[2,7]    V[3,7]    V[1,8]    V[2,8]    V[3,8]    V[1,9]    V[2,9]
## 1322.4188 1318.8038 1196.2823 1290.0080 1147.4586 1321.8595 1235.9250
##    V[3,9]   V[1,10]   V[2,10]   V[3,10]    w[1,1]    w[2,1]    w[3,1]
## 1428.0000 1146.0415 1100.2285 1428.0000 1428.0000 1302.8235 1428.0000
##    w[4,1]    w[5,1]    w[6,1]    w[7,1]    w[8,1]    w[9,1]   w[10,1]
## 1428.0000 1428.0000 1754.1837 1225.5711 1428.0000 1428.0000 1428.0000
##   w[11,1]   w[12,1]   w[13,1]   w[14,1]   w[15,1]   w[16,1]   w[17,1]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1238.0391
##   w[18,1]   w[19,1]   w[20,1]   w[21,1]   w[22,1]   w[23,1]   w[24,1]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
```

```
##   w[25,1]   w[26,1]   w[27,1]   w[28,1]   w[29,1]   w[30,1]   w[31,1]
## 1428.0000 1309.7052 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[32,1]   w[33,1]   w[34,1]   w[35,1]   w[36,1]   w[37,1]   w[38,1]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[39,1]   w[40,1]   w[41,1]   w[42,1]   w[43,1]   w[44,1]   w[45,1]
## 1072.7007 1428.0000 1742.1245 1259.2489 1428.0000 1428.0000 1428.0000
##   w[46,1]   w[47,1]   w[48,1]   w[49,1]   w[50,1]    w[1,2]    w[2,2]
## 1428.0000 1428.0000 1428.0000 1428.0000 1533.2586 1271.0901 1192.2402
##    w[3,2]    w[4,2]    w[5,2]    w[6,2]    w[7,2]    w[8,2]    w[9,2]
## 1428.0000 1428.0000 1262.9358 1542.3137 1428.0000 1283.7385 1223.7473
##   w[10,2]   w[11,2]   w[12,2]   w[13,2]   w[14,2]   w[15,2]   w[16,2]
## 1241.7292 1428.0000 1428.0000 1428.0000 1428.0000 1161.5203 1774.5950
##   w[17,2]   w[18,2]   w[19,2]   w[20,2]   w[21,2]   w[22,2]   w[23,2]
## 1300.0468 1428.0000 1161.8935 1292.6190 1428.0000 1428.0000 1428.0000
##   w[24,2]   w[25,2]   w[26,2]   w[27,2]   w[28,2]   w[29,2]   w[30,2]
## 1428.0000 1119.2824 1073.0253 1428.0000 1428.0000 1428.0000 1209.9154
##   w[31,2]   w[32,2]   w[33,2]   w[34,2]   w[35,2]   w[36,2]   w[37,2]
## 1456.4475 1310.6904 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[38,2]   w[39,2]   w[40,2]   w[41,2]   w[42,2]   w[43,2]   w[44,2]
## 1428.0000 1258.3415 1428.0000 1428.0000 1601.3119 1249.7262 1321.4996
##   w[45,2]   w[46,2]   w[47,2]   w[48,2]   w[49,2]   w[50,2]    w[1,3]
## 1428.0000 1428.0000 1551.9392 1428.0000 1428.0000 1114.4002 1311.6850
##    w[2,3]    w[3,3]    w[4,3]    w[5,3]    w[6,3]    w[7,3]    w[8,3]
## 1428.0000 1428.0000 1456.5083 1428.0000 1309.0388 1428.0000 1428.0000
##    w[9,3]   w[10,3]   w[11,3]   w[12,3]   w[13,3]   w[14,3]   w[15,3]
## 1428.0000 1125.5992 1269.0993 1428.0000 1428.0000 1617.6567 1428.0000
##   w[16,3]   w[17,3]   w[18,3]   w[19,3]   w[20,3]   w[21,3]   w[22,3]
## 1428.0000 1520.4208 1428.0000 1428.0000 1428.0000 1322.0618 1428.0000
##   w[23,3]   w[24,3]   w[25,3]   w[26,3]   w[27,3]   w[28,3]   w[29,3]
## 1428.0000 1428.0000 1236.8089 1428.0000 1363.7133 1428.0000 1428.0000
##   w[30,3]   w[31,3]   w[32,3]   w[33,3]   w[34,3]   w[35,3]   w[36,3]
## 1428.0000  520.4625 1193.0965 1237.6974 1428.0000 1584.9545 1428.0000
##   w[37,3]   w[38,3]   w[39,3]   w[40,3]   w[41,3]   w[42,3]   w[43,3]
## 1428.0000 1428.0000  879.6023 1428.0000 1428.0000 1329.9659 1428.0000
##   w[44,3]   w[45,3]   w[46,3]   w[47,3]   w[48,3]   w[49,3]   w[50,3]
## 1428.0000 1428.0000 1321.7824 1598.1330 1683.8639 1428.0000 1428.0000
##    w[1,4]    w[2,4]    w[3,4]    w[4,4]    w[5,4]    w[6,4]    w[7,4]
## 1719.9791 1428.0000 1428.0000 1428.0000 1218.2528 1428.0000 1428.0000
##    w[8,4]    w[9,4]   w[10,4]   w[11,4]   w[12,4]   w[13,4]   w[14,4]
## 1428.0000 1428.0000 1428.0000 1428.0000 1019.5470 1294.1545 1428.0000
##   w[15,4]   w[16,4]   w[17,4]   w[18,4]   w[19,4]   w[20,4]   w[21,4]
## 1303.8244 1428.0000 1428.0000 1260.4206 1428.0000 1428.0000 1428.0000
##   w[22,4]   w[23,4]   w[24,4]   w[25,4]   w[26,4]   w[27,4]   w[28,4]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[29,4]   w[30,4]   w[31,4]   w[32,4]   w[33,4]   w[34,4]   w[35,4]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1621.8752 1319.5539
##   w[36,4]   w[37,4]   w[38,4]   w[39,4]   w[40,4]   w[41,4]   w[42,4]
## 1428.0000 1828.0510 1296.6045 1428.0000 1428.0000 1428.0000 1428.0000
##   w[43,4]   w[44,4]   w[45,4]   w[46,4]   w[47,4]   w[48,4]   w[49,4]
## 1807.8993 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1724.2767
##   w[50,4]    w[1,5]    w[2,5]    w[3,5]    w[4,5]    w[5,5]    w[6,5]
## 1428.0000 1301.8887 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##    w[7,5]    w[8,5]    w[9,5]   w[10,5]   w[11,5]   w[12,5]   w[13,5]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1297.5777
```

```
##   w[14,5]   w[15,5]   w[16,5]   w[17,5]   w[18,5]   w[19,5]   w[20,5]
## 1428.0000 1314.6364 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[21,5]   w[22,5]   w[23,5]   w[24,5]   w[25,5]   w[26,5]   w[27,5]
## 1744.8559 1428.0000 1182.3931 1428.0000 1428.0000 1428.0000 1568.7735
##   w[28,5]   w[29,5]   w[30,5]   w[31,5]   w[32,5]   w[33,5]   w[34,5]
## 1428.0000 1428.0000 1400.4406  973.1680 1428.0000 1645.1626 1101.4643
##   w[35,5]   w[36,5]   w[37,5]   w[38,5]   w[39,5]   w[40,5]   w[41,5]
## 1251.8031 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1137.5064
##   w[42,5]   w[43,5]   w[44,5]   w[45,5]   w[46,5]   w[47,5]   w[48,5]
## 1609.5172 1428.0000 1494.6517 1322.4288 1428.0000 1849.3216 1428.0000
##   w[49,5]   w[50,5]    w[1,6]    w[2,6]    w[3,6]    w[4,6]    w[5,6]
## 1428.0000 1428.0000 1428.0000 1428.0000 1304.1294 1428.0000 1428.0000
##    w[6,6]    w[7,6]    w[8,6]    w[9,6]   w[10,6]   w[11,6]   w[12,6]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1468.7654 2038.7361
##   w[13,6]   w[14,6]   w[15,6]   w[16,6]   w[17,6]   w[18,6]   w[19,6]
## 1298.5384 1285.5674 1428.0000 1428.0000 1428.0000 1428.0000 1151.0462
##   w[20,6]   w[21,6]   w[22,6]   w[23,6]   w[24,6]   w[25,6]   w[26,6]
## 1320.8176 1428.0000 1428.0000 1428.0000 1323.7352 1428.0000 1428.0000
##   w[27,6]   w[28,6]   w[29,6]   w[30,6]   w[31,6]   w[32,6]   w[33,6]
## 1169.3108 1239.5290 1428.0000 1608.2033 1428.0000 1428.0000 1428.0000
##   w[34,6]   w[35,6]   w[36,6]   w[37,6]   w[38,6]   w[39,6]   w[40,6]
## 1583.0439 1267.9449 1428.0000 1428.0000 1428.0000 1133.2705 1181.5334
##   w[41,6]   w[42,6]   w[43,6]   w[44,6]   w[45,6]   w[46,6]   w[47,6]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1336.5682 1611.1722
##   w[48,6]   w[49,6]   w[50,6]    w[1,7]    w[2,7]    w[3,7]    w[4,7]
## 1361.2421 1428.0000 1552.7649 1428.0000 1551.9589 1428.0000 1254.0176
##    w[5,7]    w[6,7]    w[7,7]    w[8,7]    w[9,7]   w[10,7]   w[11,7]
## 1277.0477 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[12,7]   w[13,7]   w[14,7]   w[15,7]   w[16,7]   w[17,7]   w[18,7]
## 1428.0000 1428.0000 1550.1879 1428.0000 1624.7292 1428.0000 1356.3225
##   w[19,7]   w[20,7]   w[21,7]   w[22,7]   w[23,7]   w[24,7]   w[25,7]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1396.1919 1308.8856
##   w[26,7]   w[27,7]   w[28,7]   w[29,7]   w[30,7]   w[31,7]   w[32,7]
## 1428.0000 1428.0000 1408.8106 1428.0000 1428.0000 1428.0000 1299.2064
##   w[33,7]   w[34,7]   w[35,7]   w[36,7]   w[37,7]   w[38,7]   w[39,7]
## 1428.0000 1428.0000 1428.0000 1300.0821 1428.0000 1428.0000 1428.0000
##   w[40,7]   w[41,7]   w[42,7]   w[43,7]   w[44,7]   w[45,7]   w[46,7]
## 1678.9580 1428.0000 1428.0000 1319.6491 1428.0000 1754.9268 1428.0000
##   w[47,7]   w[48,7]   w[49,7]   w[50,7]    w[1,8]    w[2,8]    w[3,8]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1320.1924
##    w[4,8]    w[5,8]    w[6,8]    w[7,8]    w[8,8]    w[9,8]   w[10,8]
## 1428.0000 1428.0000 1366.1411 1707.4025 1428.0000 1321.5736 1813.1329
##   w[11,8]   w[12,8]   w[13,8]   w[14,8]   w[15,8]   w[16,8]   w[17,8]
## 1428.0000 1428.0000 1585.4578 1428.0000 1216.1470 1428.0000 1428.0000
##   w[18,8]   w[19,8]   w[20,8]   w[21,8]   w[22,8]   w[23,8]   w[24,8]
## 1735.2547 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[25,8]   w[26,8]   w[27,8]   w[28,8]   w[29,8]   w[30,8]   w[31,8]
## 1428.0000 1428.0000 1579.6081 1288.9688 1428.0000 1304.1655 1428.0000
##   w[32,8]   w[33,8]   w[34,8]   w[35,8]   w[36,8]   w[37,8]   w[38,8]
## 1428.0000 1428.0000 1428.0000 1538.5571 1428.0000 1807.0714 1428.0000
##   w[39,8]   w[40,8]   w[41,8]   w[42,8]   w[43,8]   w[44,8]   w[45,8]
## 1705.9803 1428.0000 1289.6982 1428.0000 1428.0000 1556.0307 1456.0885
##   w[46,8]   w[47,8]   w[48,8]   w[49,8]   w[50,8]    w[1,9]    w[2,9]
## 1428.0000 1428.0000 1428.0000 1574.7555 1428.0000 1428.0000 1428.0000
```

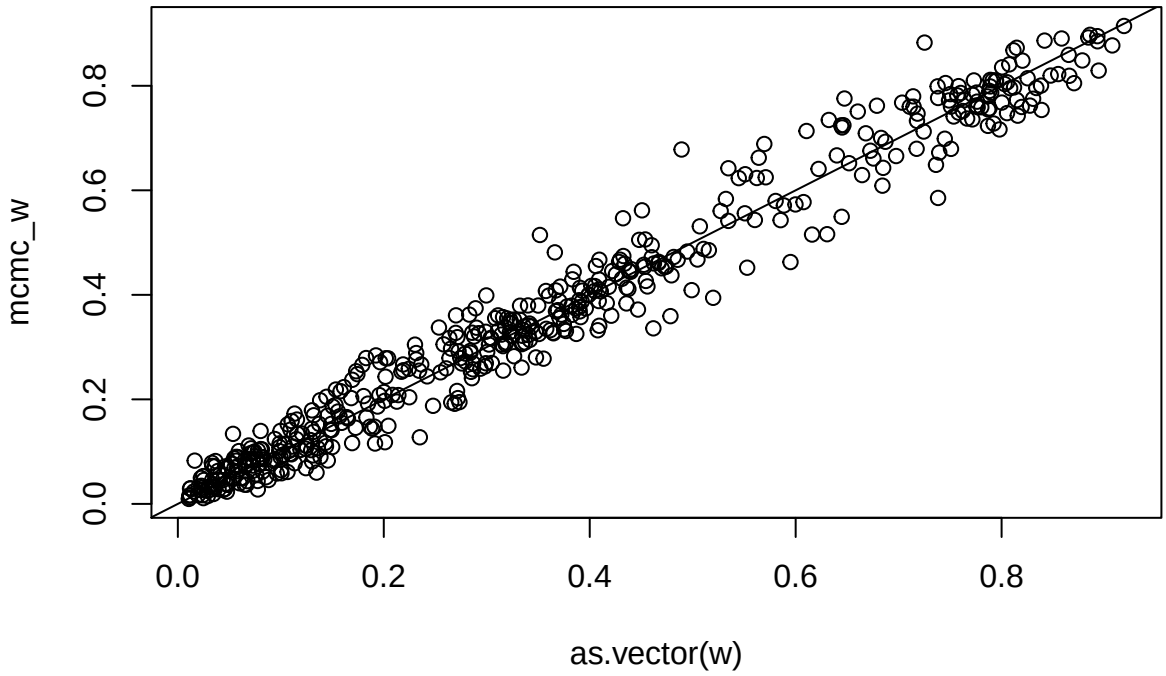
```
##    w[3,9]    w[4,9]    w[5,9]    w[6,9]    w[7,9]    w[8,9]    w[9,9]
## 1565.3462 1252.2781 1714.6094 1428.0000 1428.0000 1101.3697 1428.0000
##   w[10,9]   w[11,9]   w[12,9]   w[13,9]   w[14,9]   w[15,9]   w[16,9]
## 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1258.6297 1428.0000
##   w[17,9]   w[18,9]   w[19,9]   w[20,9]   w[21,9]   w[22,9]   w[23,9]
## 1322.6948 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000 1428.0000
##   w[24,9]   w[25,9]   w[26,9]   w[27,9]   w[28,9]   w[29,9]   w[30,9]
## 1428.0000 1428.0000 1261.5114 1307.4107 1428.0000 1428.0000 1215.6876
##   w[31,9]   w[32,9]   w[33,9]   w[34,9]   w[35,9]   w[36,9]   w[37,9]
## 1312.4764 1428.0000 1225.6483 1428.0000 1428.0000 1428.0000 1428.0000
##   w[38,9]   w[39,9]   w[40,9]   w[41,9]   w[42,9]   w[43,9]   w[44,9]
## 1428.0000 1079.8748 1428.0000 1636.0093 1428.0000 1428.0000 1428.0000
##   w[45,9]   w[46,9]   w[47,9]   w[48,9]   w[49,9]   w[50,9]   w[1,10]
## 1428.0000 1292.0882 1428.0000 1428.0000 1428.0000 1577.8626 1428.0000
##   w[2,10]   w[3,10]   w[4,10]   w[5,10]   w[6,10]   w[7,10]   w[8,10]
## 1428.0000 1428.0000 1254.0950 1428.0000 1314.1497 1428.0000 1834.8144
##   w[9,10]  w[10,10]  w[11,10]  w[12,10]  w[13,10]  w[14,10]  w[15,10]
## 1428.0000 1428.0000 1269.8671 1305.5872 1428.0000 1465.3959 1428.0000
##  w[16,10]  w[17,10]  w[18,10]  w[19,10]  w[20,10]  w[21,10]  w[22,10]
## 1295.3850 1293.2998 1276.8298 1262.4561 1428.0000 1428.0000 1428.0000
##  w[23,10]  w[24,10]  w[25,10]  w[26,10]  w[27,10]  w[28,10]  w[29,10]
## 2132.5067 1428.0000 1428.0000 1428.0000 1495.8117 1310.4923 1428.0000
##  w[30,10]  w[31,10]  w[32,10]  w[33,10]  w[34,10]  w[35,10]  w[36,10]
## 1428.0000 1428.0000 1505.8842 1428.0000 1428.0000 1428.0000 1428.0000
##  w[37,10]  w[38,10]  w[39,10]  w[40,10]  w[41,10]  w[42,10]  w[43,10]
## 1562.9672 1428.0000 1428.0000 1089.9585 1308.7590 1226.0675 1283.3772
##  w[44,10]  w[45,10]  w[46,10]  w[47,10]  w[48,10]  w[49,10]  w[50,10]
## 1428.0000 1428.0000 1428.0000 1564.9821 1428.0000 1320.9959 1429.0144
##      z[1]      z[2]      z[3]      z[4]      z[5]      z[6]      z[7]
##    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
##      z[8]      z[9]     z[10]     z[11]     z[12]     z[13]     z[14]
##    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
##     z[15]     z[16]     z[17]     z[18]     z[19]     z[20]     z[21]
##    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
##     z[22]     z[23]     z[24]     z[25]     z[26]     z[27]     z[28]
##    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
##     z[29]     z[30]     z[31]     z[32]     z[33]     z[34]     z[35]
##    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
##     z[36]     z[37]     z[38]     z[39]     z[40]     z[41]     z[42]
##    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
##     z[43]     z[44]     z[45]     z[46]     z[47]     z[48]     z[49]
##    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
##     z[50]
##    0.0000
```

```
pdf(file.path(trace.dir, paste0(runName, "_trace.pdf")))
plot(samps)
dev.off()
```

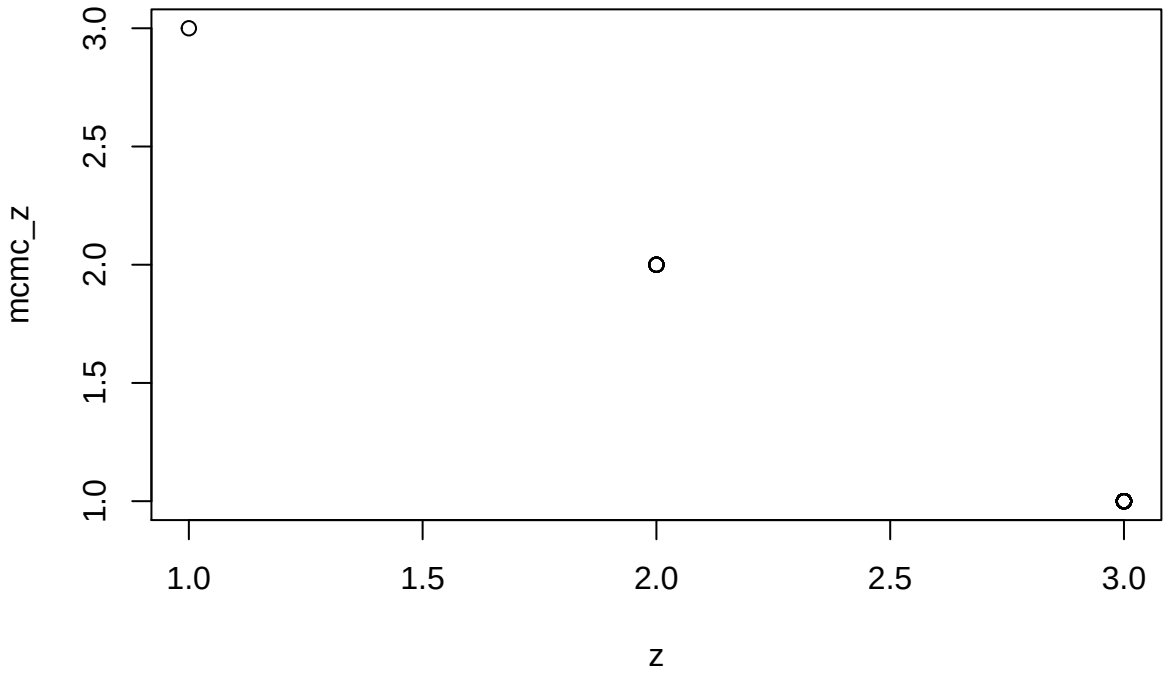
```
## pdf
##   2
```

```
mcmc_vals <- s$statistics
mcmc_w <- mcmc_vals[substr(rownames(mcmc_vals), 1, 1) == "w", "Mean"]
plot(as.vector(w), mcmc_w, type = "p")
```

```
abline(a=0, b=1)
```

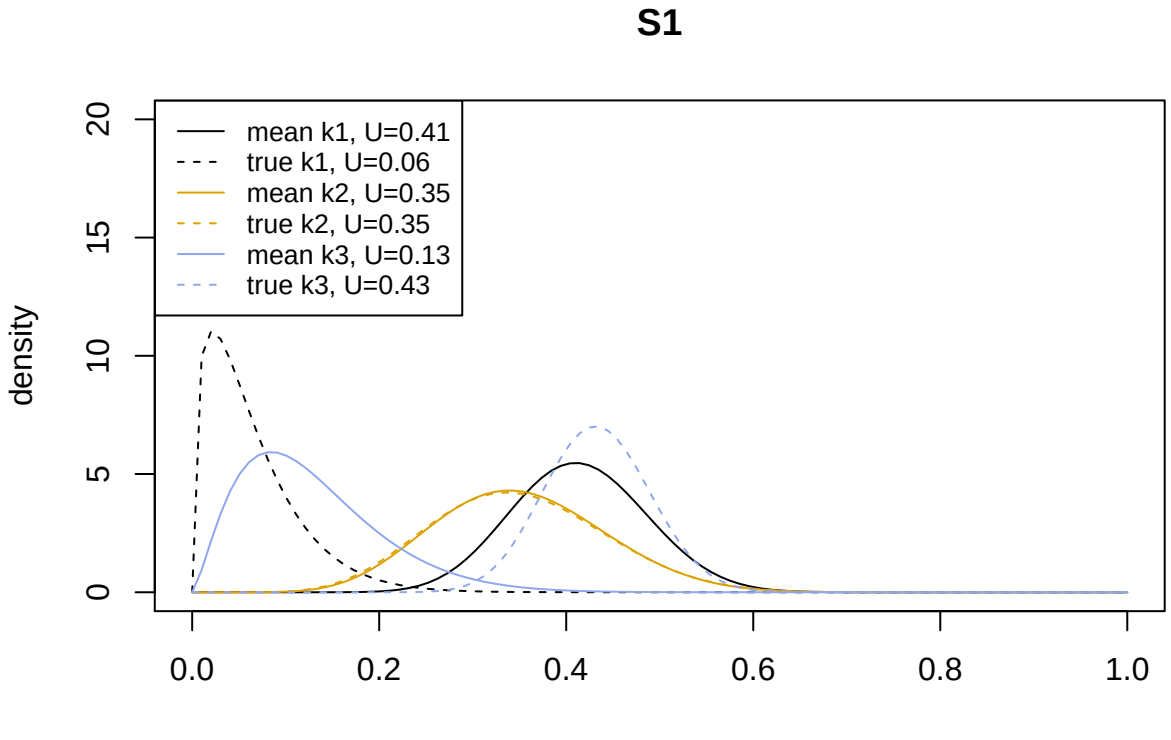


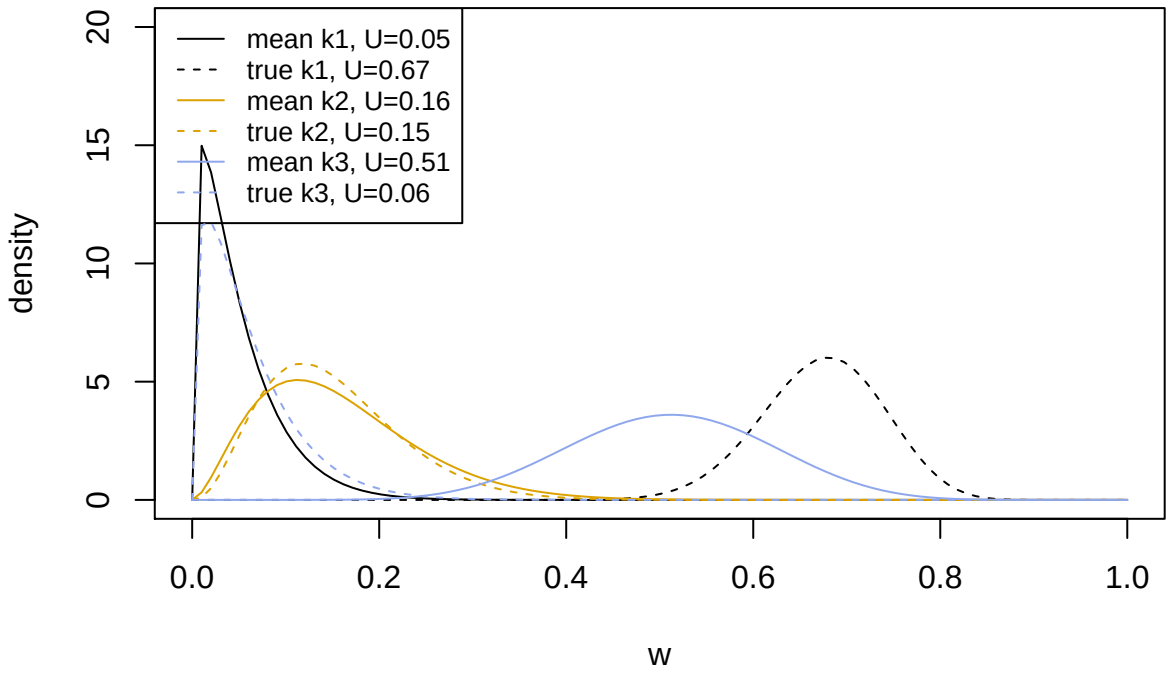

```
mcmc_z <- as.vector(mcmc_vals[substr(rownames(mcmc_vals), 1, 1) == "z", "Mean"])
#mcmc_z <- round(mcmc_z, 0)
plot(z, mcmc_z, type = "p")
```

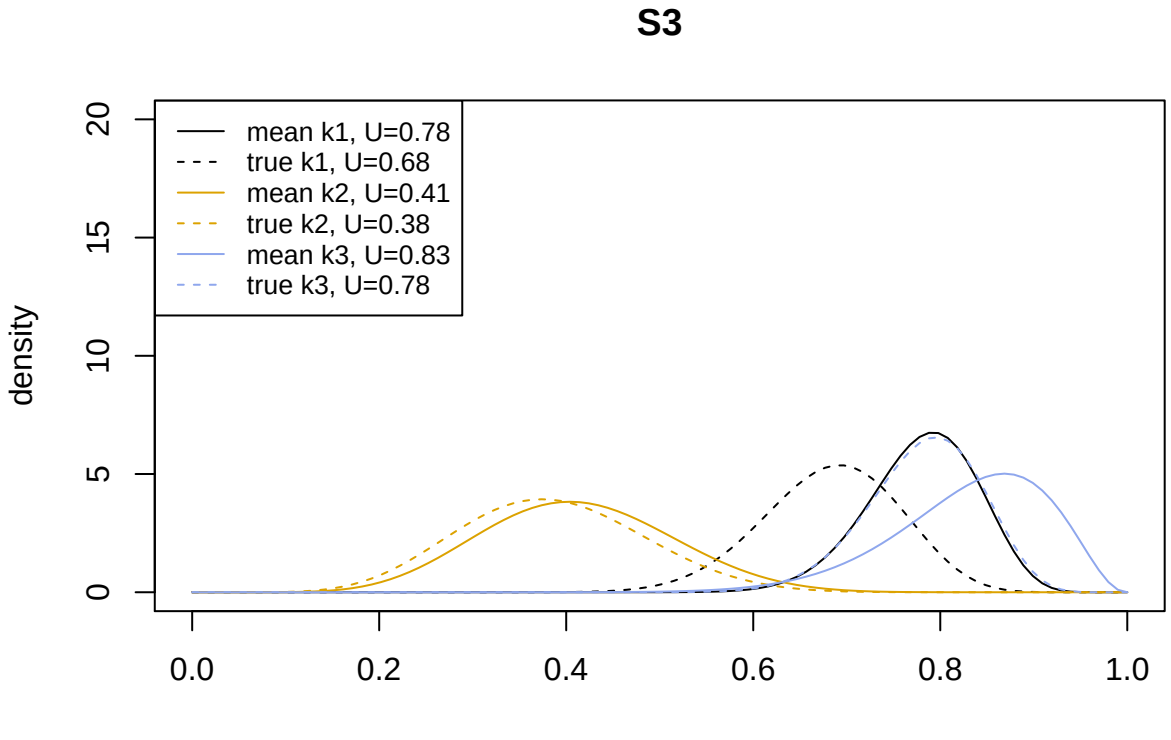


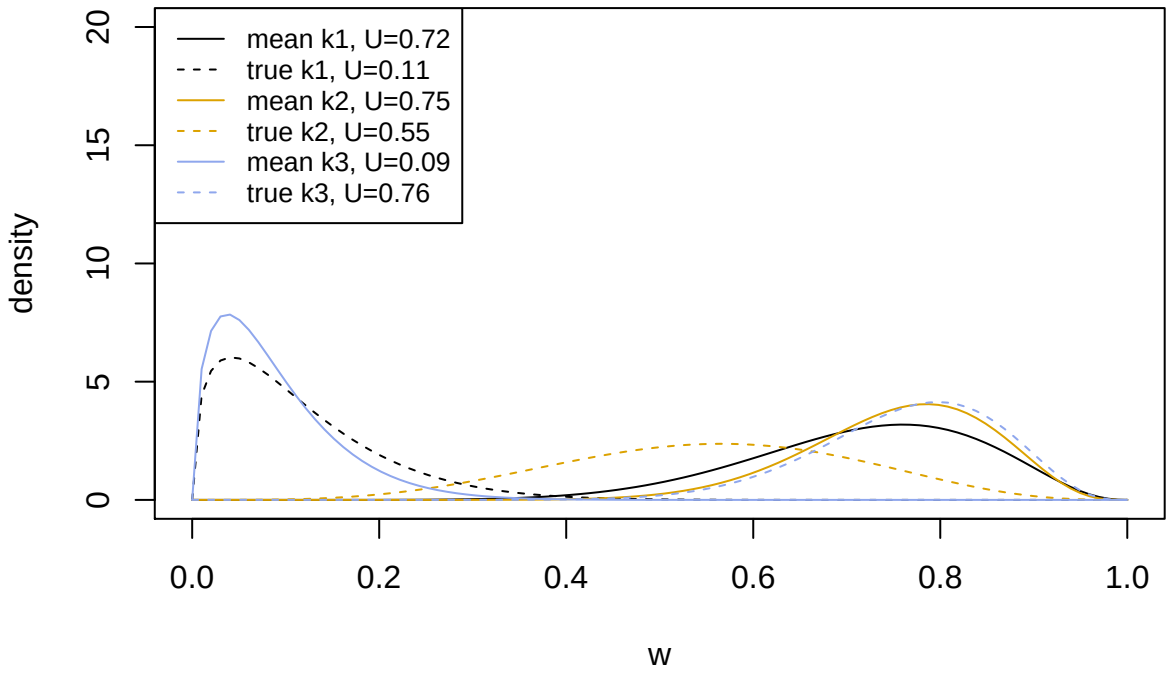

```
mcmc_U <- mcmc_vals[substr(rownames(mcmc_vals), 1, 1) == "U", "Mean"]
mcmc_U <- matrix(mcmc_U, nrow=K)
mcmc_V <- mcmc_vals[substr(rownames(mcmc_vals), 1, 1) == "V", "Mean"]
mcmc_V <- matrix(mcmc_V, nrow=K)
```

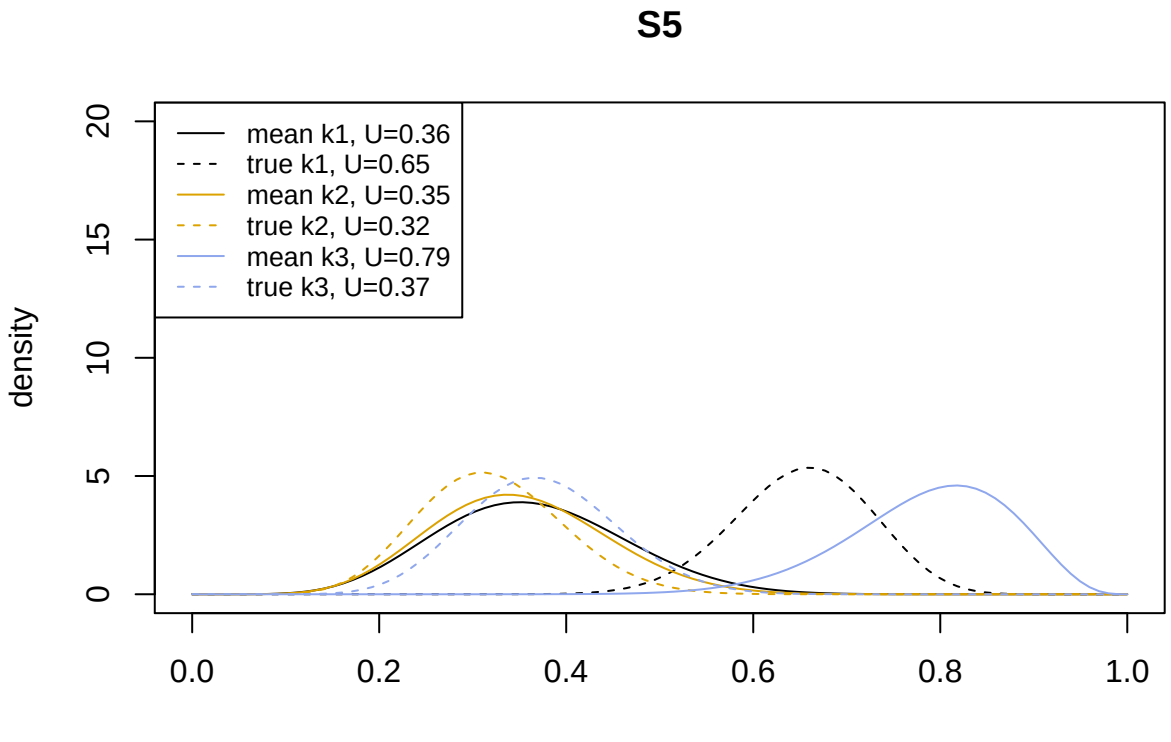
```r
samples_matrix <- as.matrix(samps)
getMaxDens <- function(vals) {
  d <- density(vals)
  round(d$x[which.max(d$y)], 2)
}
m <- apply(samples_matrix, 2, getMaxDens)
mode_U <- m[substr(names(m), 1, 1) == "U"]
mode_U <- matrix(mode_U, nrow=K)
mode_V <- m[substr(names(m), 1, 1) == "V"]
mode_V <- matrix(mode_V, nrow=K)

p <- seq(0, 1, length = 100)
colors <- c("#000000", "#DCA200", "#8FA7ED", "#9D847A", "#A47901")
for (s in 1:S) {
  for (k in 1:K) {
    if (k == 1) {
      # plot mcmc mean U,V
      plot(p, dbeta(p, mcmc_U[k,s] * mcmc_V[k,s], (1-mcmc_U[k,s])*mcmc_V[k,s]),
           main = paste0("S", s),
           ylab = "density", xlab = "w", type = "l", col = colors[k],
           ylim = c(0, 20))
      # plot truth
      lines(p, dbeta(p, a.ordered[k,s], b.ordered[k,s]), type = "l", col = colors[k], lty=2)
      # add legend
      allU <- round(as.vector(rbind(mcmc_U[,s], U.ordered[,s])), digits = 2)
      legend(x = "topleft",
             legend = paste0(c("mean k", "true k"), rep(1:K, each=2), ", U=", allU),
             col = colors[rep(1:K, each=2)],
             lty = rep(1:2, K),
             cex=0.8)
    } else {
      # plot mcmc mean U,V
      lines(p, dbeta(p, mcmc_U[k,s] * mcmc_V[k,s], (1-mcmc_U[k,s])*mcmc_V[k,s]),
            type = "l", col = colors[k])
      # plot truth
      lines(p, dbeta(p, a.ordered[k,s], b.ordered[k,s]), type = "l", col = colors[k], lty=2)
    }
  }
}
```

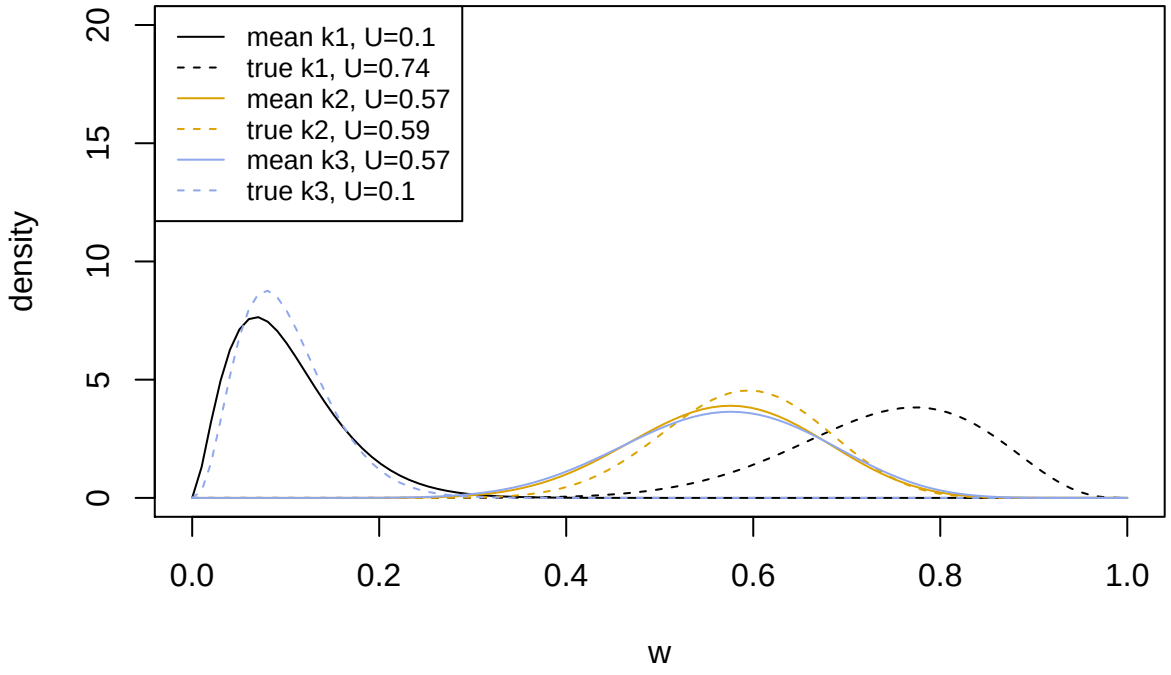

S1
mean k1, U=0.41
true k1, U=0.06
mean k2, U=0.35
true k2, U=0.35
mean k3, U=0.13
true k3, U=0.43
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w

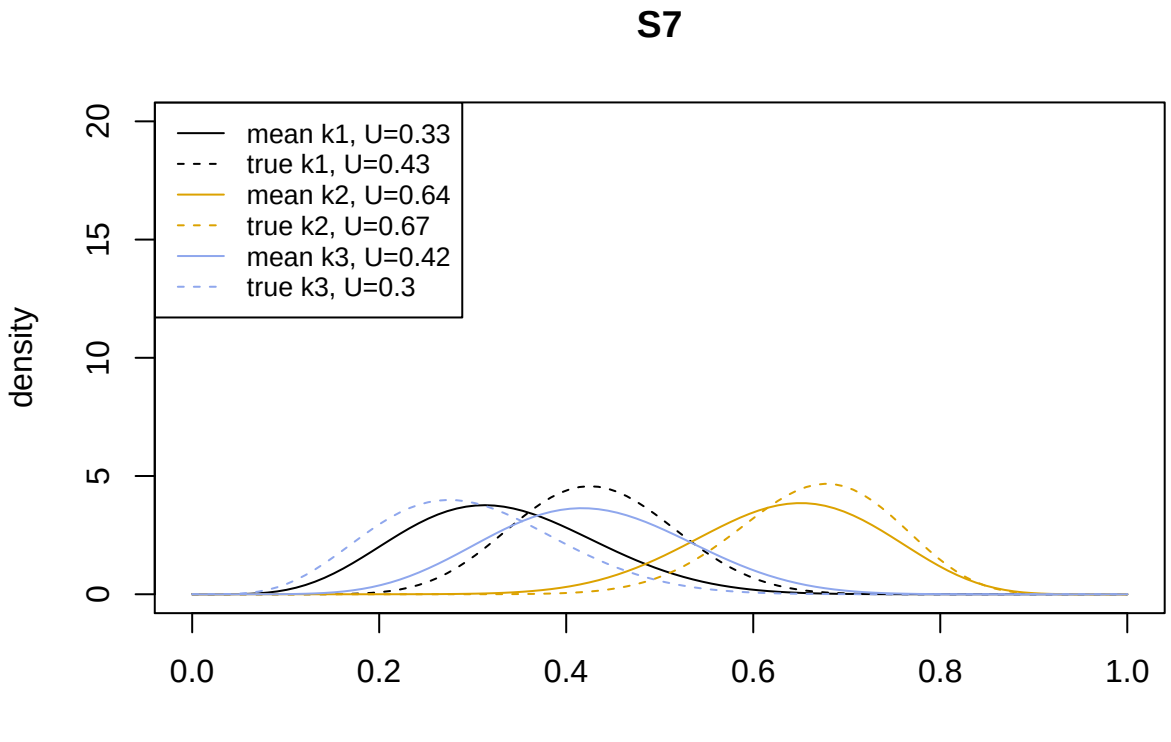

S2
mean k1, U=0.05
true k1, U=0.67
mean k2, U=0.16
true k2, U=0.15
mean k3, U=0.51
true k3, U=0.06
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w

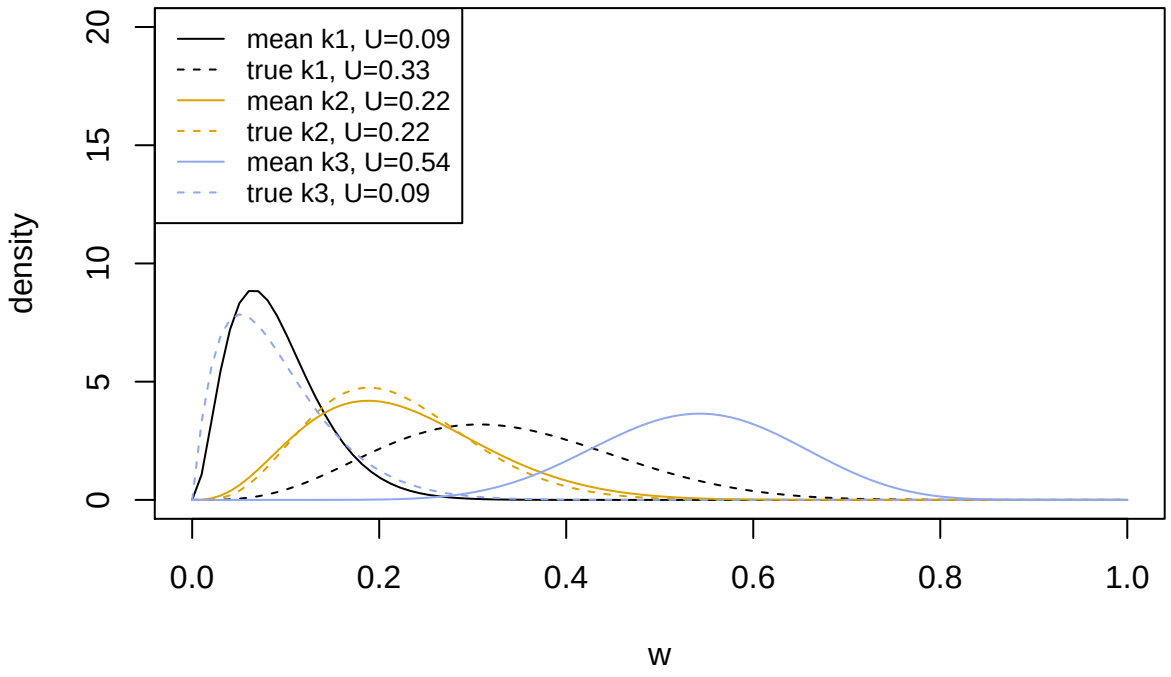

S3
mean k1, U=0.78
true k1, U=0.68
mean k2, U=0.41
true k2, U=0.38
mean k3, U=0.83
true k3, U=0.78
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w

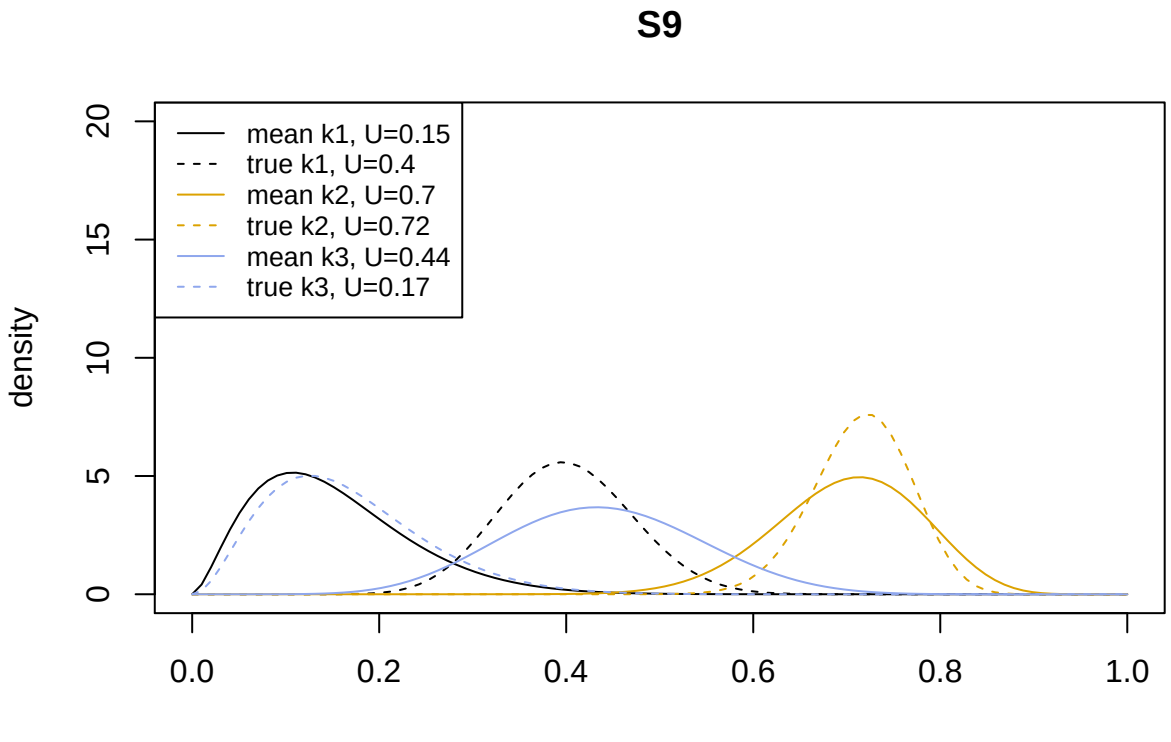

S4
mean k1, U=0.72
true k1, U=0.11
mean k2, U=0.75
true k2, U=0.55
mean k3, U=0.09
true k3, U=0.76
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w

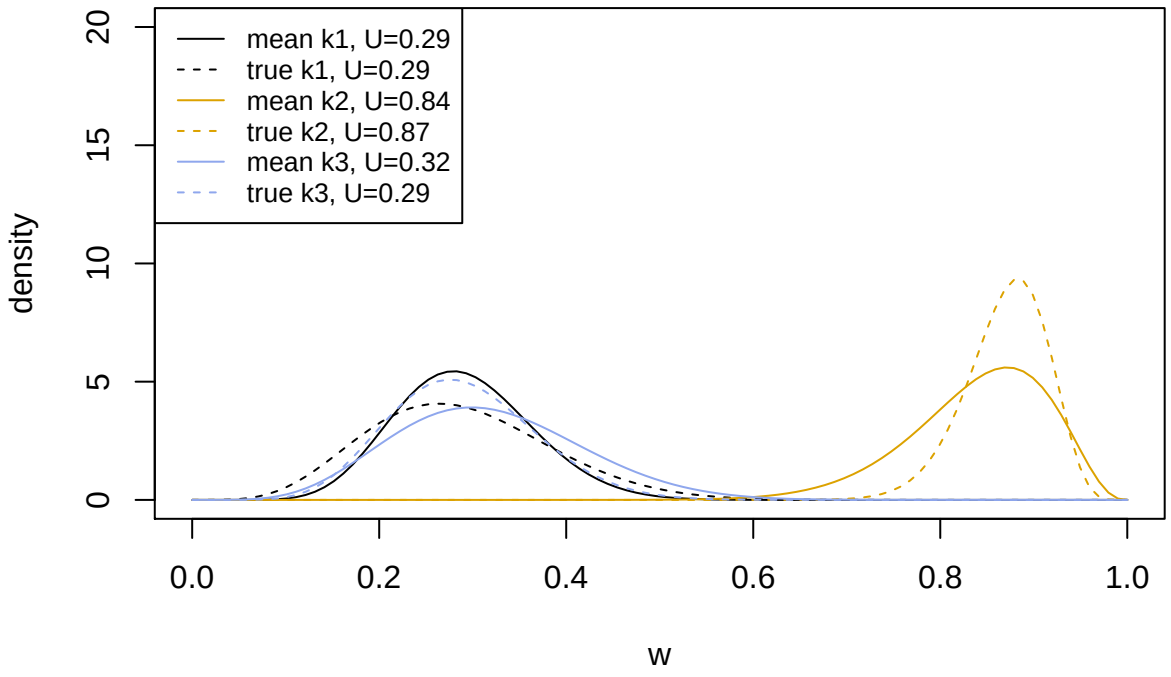

S5
mean k1, U=0.36
true k1, U=0.65
mean k2, U=0.35
true k2, U=0.32
mean k3, U=0.79
true k3, U=0.37
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w


S6
mean k1, U=0.1
true k1, U=0.74
mean k2, U=0.57
true k2, U=0.59
mean k3, U=0.57
true k3, U=0.1
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w


S7
mean k1, U=0.33
true k1, U=0.43
mean k2, U=0.64
true k2, U=0.67
mean k3, U=0.42
true k3, U=0.3
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w


S8
mean k1, U=0.09
true k1, U=0.33
mean k2, U=0.22
true k2, U=0.22
mean k3, U=0.54
true k3, U=0.09
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w


S9
mean k1, U=0.15
true k1, U=0.4
mean k2, U=0.7
true k2, U=0.72
mean k3, U=0.44
true k3, U=0.17
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w


S10
mean k1, U=0.29
true k1, U=0.29
mean k2, U=0.84
true k2, U=0.87
mean k3, U=0.32
true k3, U=0.29
density
0
5
10
15
20
0.0
0.2
0.4
0.6
0.8
1.0
w