UNICORN

Danfeng Chen

2020/1/30

Manhattan plot of crohn's cohort

```
data <- data %>% filter(
  cohort == "germ")
data.gwas <- data %>% filter(type == "UNICORN" & chromosome <= 2 & distca == 2)
data.gwas <- data.gwas %>% mutate(
  log_pvalues = -log_pvalues,
  distco = NA,
  distca = NA)
data <- rbind(data, data.gwas)
dist_co <- c(1, 2, 3, 4, 5)
dist_ca <- c(5)
cohort <- c("germ")
paras   <- expand.grid(cohort, dist_co, dist_ca)
colnames(paras) <- c("cc", "dist_co", "dist_ca")
paras %>% pmap_dbl(plotAndSave)
```

```
## [1] germ
## Levels: germ

## Warning: Removed 202 rows containing missing values (geom_point).

## Warning: Removed 1 rows containing missing values (geom_point).

## [1] germ
## Levels: germ

## Warning: Removed 202 rows containing missing values (geom_point).

## Warning: Removed 1 rows containing missing values (geom_point).

## [1] germ
## Levels: germ

## Warning: Removed 202 rows containing missing values (geom_point).

## Warning: Removed 1 rows containing missing values (geom_point).

## [1] germ
## Levels: germ

## Warning: Removed 202 rows containing missing values (geom_point).

## Warning: Removed 1 rows containing missing values (geom_point).

## [1] germ
## Levels: germ

## Warning: Removed 202 rows containing missing values (geom_point).

## Warning: Removed 1 rows containing missing values (geom_point).
```

```
## [1] 0 0 0 0 0
```

p-values versus p-values

```
data <- readRDS("../scripts/data/raw_data/crohnDisease/crohns_chop.RDS")
meta <- readRDS("../scripts/data/raw_data/crohnDisease/crohn_meta.v2.RDS")
#p <- qq.plot(data=data, meta=meta)
#ggsave(p, filename = "../scripts/data/raw_data/crohnDisease/figures/scatter_logpvals_chop.png")
```

qq-plot

```
cohorts <- c("bel1", "bel2", "chop", "germ")
dist_cos <- c("3.5")
dist_cas <- c("5")

for (cohort in cohorts) {
for (dist_co in dist_cos) {
for (dist_ca in dist_cas) {
    data <- readRDS(
      paste0(
        "../scripts/data/raw_data/crohnDisease/crohns_",
        cohort, "_distco_", dist_co, "_distca_", dist_ca, ".RDS"))
    for (i in 1:50) {
        # Get pvalues for UNICORN
        data.unicorn  <- data %>% filter(type == "UNICORN") %>% sample_n(10000)
        pvals.unicorn <- data.unicorn$pvalues
        lambda.unicorn<- median(data.unicorn$chisq_stats)/qchisq(0.5,1)

        # Get pvalues for standard GWAS
        data.gwas  <- data %>% filter(type != "UNICORN") %>% sample_n(10000)
        pvals.gwas <- data.gwas$pvalues
        lambda.gwas<- median(data.gwas$chisq_stats)/qchisq(0.5,1)

        # Get pvalues list
        my.pvalue.list<-list("UNICORN"=pvals.unicorn, "Standard GWAS"=pvals.gwas)
        filename <- paste0(
          "../scripts/data/raw_data/crohnDisease/figures/qq_",
          cohort, "_distco_", dist_co, "_distca_",
          dist_ca, "-", i, ".png")
        p <- qqunif.plot(my.pvalue.list, auto.key=list(corner=c(.95,.05)), xlim=c(0,5), ylim=c(0,5))
        png(filename)
        print(p)
        dev.off()
        print(
          paste0("Cohort = ",cohort,
                 ", Index = ", i,
                 ", chisq for UNICORN = ", lambda.unicorn,
                 ", chisq for GWAS  = ", lambda.gwas))
    }
```

```
}
}
}
```

```
## Loading required package: grid
## [1] "Cohort = bel1, Index = 1, chisq for UNICORN = 1.25325203924185, chisq for GWAS  = 1.023257523689
## [1] "Cohort = bel1, Index = 2, chisq for UNICORN = 1.27115563980245, chisq for GWAS  = 1.072656844240
## [1] "Cohort = bel1, Index = 3, chisq for UNICORN = 1.29912658113255, chisq for GWAS  = 1.020581460210
## [1] "Cohort = bel1, Index = 4, chisq for UNICORN = 1.30295129138122, chisq for GWAS  = 1.060912329685
## [1] "Cohort = bel1, Index = 5, chisq for UNICORN = 1.24629502318608, chisq for GWAS  = 1.037809502191
## [1] "Cohort = bel1, Index = 6, chisq for UNICORN = 1.29797257372993, chisq for GWAS  = 1.042238503201
## [1] "Cohort = bel1, Index = 7, chisq for UNICORN = 1.27487044458421, chisq for GWAS  = 1.053540127673
## [1] "Cohort = bel1, Index = 8, chisq for UNICORN = 1.26400079390623, chisq for GWAS  = 1.021392157837
## [1] "Cohort = bel1, Index = 9, chisq for UNICORN = 1.23208424631386, chisq for GWAS  = 1.049287588188
## [1] "Cohort = bel1, Index = 10, chisq for UNICORN = 1.28688311211812, chisq for GWAS  = 1.064686101771
## [1] "Cohort = bel1, Index = 11, chisq for UNICORN = 1.27492539731767, chisq for GWAS  = 1.048225307558
## [1] "Cohort = bel1, Index = 12, chisq for UNICORN = 1.28072840597083, chisq for GWAS  = 1.103994238760
## [1] "Cohort = bel1, Index = 13, chisq for UNICORN = 1.30241275459333, chisq for GWAS  = 1.054958769630
## [1] "Cohort = bel1, Index = 14, chisq for UNICORN = 1.28838881701486, chisq for GWAS  = 1.033711393300
## [1] "Cohort = bel1, Index = 15, chisq for UNICORN = 1.27988213387557, chisq for GWAS  = 1.060666290580
## [1] "Cohort = bel1, Index = 16, chisq for UNICORN = 1.27976123786197, chisq for GWAS  = 1.045529976100
## [1] "Cohort = bel1, Index = 17, chisq for UNICORN = 1.29065286963333, chisq for GWAS  = 1.019554870240
## [1] "Cohort = bel1, Index = 18, chisq for UNICORN = 1.25671406144971, chisq for GWAS  = 1.126375557520
## [1] "Cohort = bel1, Index = 19, chisq for UNICORN = 1.28979560699139, chisq for GWAS  = 1.081139709000
## [1] "Cohort = bel1, Index = 20, chisq for UNICORN = 1.24792162409643, chisq for GWAS  = 1.044087905190
## [1] "Cohort = bel1, Index = 21, chisq for UNICORN = 1.30299525356799, chisq for GWAS  = 1.064549293610
## [1] "Cohort = bel1, Index = 22, chisq for UNICORN = 1.25166940051827, chisq for GWAS  = 1.029076506100
## [1] "Cohort = bel1, Index = 23, chisq for UNICORN = 1.28398160779154, chisq for GWAS  = 1.087356914930
## [1] "Cohort = bel1, Index = 24, chisq for UNICORN = 1.26183565620799, chisq for GWAS  = 1.061677735870
## [1] "Cohort = bel1, Index = 25, chisq for UNICORN = 1.29168598102234, chisq for GWAS  = 1.073424808500
## [1] "Cohort = bel1, Index = 26, chisq for UNICORN = 1.31848093385643, chisq for GWAS  = 1.023473866380
## [1] "Cohort = bel1, Index = 27, chisq for UNICORN = 1.26954002943879, chisq for GWAS  = 1.113962341210
## [1] "Cohort = bel1, Index = 28, chisq for UNICORN = 1.25381255712313, chisq for GWAS  = 1.019824945000
## [1] "Cohort = bel1, Index = 29, chisq for UNICORN = 1.25847254892036, chisq for GWAS  = 1.061896399380
## [1] "Cohort = bel1, Index = 30, chisq for UNICORN = 1.24129432444141, chisq for GWAS  = 1.013428613830
## [1] "Cohort = bel1, Index = 31, chisq for UNICORN = 1.26096740301935, chisq for GWAS  = 1.065753337810
## [1] "Cohort = bel1, Index = 32, chisq for UNICORN = 1.27720044048283, chisq for GWAS  = 1.058644414950
```

```
## [1] "Cohort = bel1, Index = 33, chisq for UNICORN = 1.25251567261352, chisq for GWAS  = 1.0595459164
## [1] "Cohort = bel1, Index = 34, chisq for UNICORN = 1.32338271768088, chisq for GWAS  = 1.0631542140
## [1] "Cohort = bel1, Index = 35, chisq for UNICORN = 1.25579085552761, chisq for GWAS  = 1.0414500990
## [1] "Cohort = bel1, Index = 36, chisq for UNICORN = 1.2863775469703, chisq for GWAS  = 1.06999800175
## [1] "Cohort = bel1, Index = 37, chisq for UNICORN = 1.26000023491049, chisq for GWAS  = 1.0874940414
## [1] "Cohort = bel1, Index = 38, chisq for UNICORN = 1.2146422487143, chisq for GWAS  = 1.03485075854
## [1] "Cohort = bel1, Index = 39, chisq for UNICORN = 1.27513421770481, chisq for GWAS  = 1.0095478708
## [1] "Cohort = bel1, Index = 40, chisq for UNICORN = 1.30733651951116, chisq for GWAS  = 1.0581254785
## [1] "Cohort = bel1, Index = 41, chisq for UNICORN = 1.32603143943355, chisq for GWAS  = 1.0774861059
## [1] "Cohort = bel1, Index = 42, chisq for UNICORN = 1.25947268866929, chisq for GWAS  = 1.0734521512
## [1] "Cohort = bel1, Index = 43, chisq for UNICORN = 1.2100701812906, chisq for GWAS  = 1.07762339653
## [1] "Cohort = bel1, Index = 44, chisq for UNICORN = 1.33873651140903, chisq for GWAS  = 1.0769644579
## [1] "Cohort = bel1, Index = 45, chisq for UNICORN = 1.25873632204096, chisq for GWAS  = 1.1150160392
## [1] "Cohort = bel1, Index = 46, chisq for UNICORN = 1.19811246649015, chisq for GWAS  = 1.0591907614
## [1] "Cohort = bel1, Index = 47, chisq for UNICORN = 1.25838462454683, chisq for GWAS  = 1.0502140031
## [1] "Cohort = bel1, Index = 48, chisq for UNICORN = 1.2869050932115, chisq for GWAS  = 1.01931170475
## [1] "Cohort = bel1, Index = 49, chisq for UNICORN = 1.26805630563542, chisq for GWAS  = 1.0446319825
## [1] "Cohort = bel1, Index = 50, chisq for UNICORN = 1.26009914983071, chisq for GWAS  = 1.0122422370
## [1] "Cohort = bel2, Index = 1, chisq for UNICORN = 1.04436570882152, chisq for GWAS  = 0.98285590593
## [1] "Cohort = bel2, Index = 2, chisq for UNICORN = 1.03900232203603, chisq for GWAS  = 1.02699143913
## [1] "Cohort = bel2, Index = 3, chisq for UNICORN = 1.0677865638213, chisq for GWAS  = 1.046155953074
## [1] "Cohort = bel2, Index = 4, chisq for UNICORN = 1.0638629386524, chisq for GWAS  = 1.018798544915
## [1] "Cohort = bel2, Index = 5, chisq for UNICORN = 1.06706118773965, chisq for GWAS  = 0.98748134671
## [1] "Cohort = bel2, Index = 6, chisq for UNICORN = 1.03651845848373, chisq for GWAS  = 1.06794355368
## [1] "Cohort = bel2, Index = 7, chisq for UNICORN = 1.03407855711819, chisq for GWAS  = 1.02880552248
## [1] "Cohort = bel2, Index = 8, chisq for UNICORN = 1.08965775173756, chisq for GWAS  = 1.04270075327
## [1] "Cohort = bel2, Index = 9, chisq for UNICORN = 1.04886084241838, chisq for GWAS  = 1.03208437778
## [1] "Cohort = bel2, Index = 10, chisq for UNICORN = 1.05044348114197, chisq for GWAS  = 1.0076361403
## [1] "Cohort = bel2, Index = 11, chisq for UNICORN = 1.05228989298616, chisq for GWAS  = 1.0360447789
## [1] "Cohort = bel2, Index = 12, chisq for UNICORN = 1.04997088763423, chisq for GWAS  = 1.0031437787
## [1] "Cohort = bel2, Index = 13, chisq for UNICORN = 1.07083094525487, chisq for GWAS  = 1.0672863255
## [1] "Cohort = bel2, Index = 14, chisq for UNICORN = 1.07886503488642, chisq for GWAS  = 1.0151816331
## [1] "Cohort = bel2, Index = 15, chisq for UNICORN = 1.04006840506511, chisq for GWAS  = 0.9887658928
## [1] "Cohort = bel2, Index = 16, chisq for UNICORN = 1.06042289753793, chisq for GWAS  = 1.0122422387
## [1] "Cohort = bel2, Index = 17, chisq for UNICORN = 1.05035555676844, chisq for GWAS  = 1.0667934955
## [1] "Cohort = bel2, Index = 18, chisq for UNICORN = 1.02848436885218, chisq for GWAS  = 1.0190146044
```

```
## [1] "Cohort = bel2, Index = 19, chisq for UNICORN = 1.0587633249875, chisq for GWAS  = 0.991711512381
## [1] "Cohort = bel2, Index = 20, chisq for UNICORN = 1.06415968341307, chisq for GWAS  = 1.028588848
## [1] "Cohort = bel2, Index = 21, chisq for UNICORN = 1.00837166840657, chisq for GWAS  = 1.013886876
## [1] "Cohort = bel2, Index = 22, chisq for UNICORN = 1.0368152032444, chisq for GWAS  = 1.035257771
## [1] "Cohort = bel2, Index = 23, chisq for UNICORN = 1.06178572532769, chisq for GWAS  = 1.027830594
## [1] "Cohort = bel2, Index = 24, chisq for UNICORN = 1.05391649389651, chisq for GWAS  = 0.963303495
## [1] "Cohort = bel2, Index = 25, chisq for UNICORN = 1.05081715972948, chisq for GWAS  = 1.026449926
## [1] "Cohort = bel2, Index = 26, chisq for UNICORN = 1.12781692985075, chisq for GWAS  = 1.075811606
## [1] "Cohort = bel2, Index = 27, chisq for UNICORN = 1.06340133569135, chisq for GWAS  = 1.031569426
## [1] "Cohort = bel2, Index = 28, chisq for UNICORN = 1.09860405674451, chisq for GWAS  = 1.020392301
## [1] "Cohort = bel2, Index = 29, chisq for UNICORN = 1.02351664174758, chisq for GWAS  = 1.011406748
## [1] "Cohort = bel2, Index = 30, chisq for UNICORN = 1.09831830253053, chisq for GWAS  = 1.014183543
## [1] "Cohort = bel2, Index = 31, chisq for UNICORN = 1.03612279880283, chisq for GWAS  = 0.998979612
## [1] "Cohort = bel2, Index = 32, chisq for UNICORN = 1.04255226861741, chisq for GWAS  = 1.032436836
## [1] "Cohort = bel2, Index = 33, chisq for UNICORN = 1.042958918845, chisq for GWAS  = 1.028859693150
## [1] "Cohort = bel2, Index = 34, chisq for UNICORN = 1.03436431133218, chisq for GWAS  = 1.060748295
## [1] "Cohort = bel2, Index = 35, chisq for UNICORN = 1.06916038215774, chisq for GWAS  = 1.028697183
## [1] "Cohort = bel2, Index = 36, chisq for UNICORN = 1.08783332098675, chisq for GWAS  = 1.040933653
## [1] "Cohort = bel2, Index = 37, chisq for UNICORN = 1.01271293434975, chisq for GWAS  = 1.018177476
## [1] "Cohort = bel2, Index = 38, chisq for UNICORN = 1.02634121224732, chisq for GWAS  = 1.013158825
## [1] "Cohort = bel2, Index = 39, chisq for UNICORN = 1.02999007374892, chisq for GWAS  = 1.063126875
## [1] "Cohort = bel2, Index = 40, chisq for UNICORN = 1.01918636635109, chisq for GWAS  = 1.042537600
## [1] "Cohort = bel2, Index = 41, chisq for UNICORN = 1.07233665015161, chisq for GWAS  = 0.991497184
## [1] "Cohort = bel2, Index = 42, chisq for UNICORN = 1.10495659273225, chisq for GWAS  = 1.027126685
## [1] "Cohort = bel2, Index = 43, chisq for UNICORN = 1.0386396339952, chisq for GWAS  = 1.029889096
## [1] "Cohort = bel2, Index = 44, chisq for UNICORN = 1.04471740631565, chisq for GWAS  = 0.983924718
## [1] "Cohort = bel2, Index = 45, chisq for UNICORN = 1.0353754416278, chisq for GWAS  = 1.025340395
## [1] "Cohort = bel2, Index = 46, chisq for UNICORN = 1.01621891874436, chisq for GWAS  = 1.043625439
## [1] "Cohort = bel2, Index = 47, chisq for UNICORN = 1.07921673238055, chisq for GWAS  = 1.011379794
## [1] "Cohort = bel2, Index = 48, chisq for UNICORN = 1.02273631293247, chisq for GWAS  = 0.998013201
## [1] "Cohort = bel2, Index = 49, chisq for UNICORN = 1.10884724626107, chisq for GWAS  = 1.020284225
## [1] "Cohort = bel2, Index = 50, chisq for UNICORN = 1.05565300027378, chisq for GWAS  = 1.018285455
## [1] "Cohort = chop, Index = 1, chisq for UNICORN = 1.12216778885128, chisq for GWAS  = 1.029916213
## [1] "Cohort = chop, Index = 2, chisq for UNICORN = 1.09501014797636, chisq for GWAS  = 1.060447659
## [1] "Cohort = chop, Index = 3, chisq for UNICORN = 1.12260741071894, chisq for GWAS  = 1.066136609
## [1] "Cohort = chop, Index = 4, chisq for UNICORN = 1.10289036995423, chisq for GWAS  = 1.127015344
```

```
## [1] "Cohort = chop, Index = 5, chisq for UNICORN = 1.10192320184537, chisq for GWAS  = 1.04504012423
## [1] "Cohort = chop, Index = 6, chisq for UNICORN = 1.07119363329569, chisq for GWAS  = 1.06485026434
## [1] "Cohort = chop, Index = 7, chisq for UNICORN = 1.09943933829307, chisq for GWAS  = 1.12746047983
## [1] "Cohort = chop, Index = 8, chisq for UNICORN = 1.09191081380933, chisq for GWAS  = 1.04792566473
## [1] "Cohort = chop, Index = 9, chisq for UNICORN = 1.06166482931408, chisq for GWAS  = 1.09339045239
## [1] "Cohort = chop, Index = 10, chisq for UNICORN = 1.11388091664582, chisq for GWAS  = 1.0900556093
## [1] "Cohort = chop, Index = 11, chisq for UNICORN = 1.12173915753031, chisq for GWAS  = 1.0391402760
## [1] "Cohort = chop, Index = 12, chisq for UNICORN = 1.10479173453188, chisq for GWAS  = 1.0501595471
## [1] "Cohort = chop, Index = 13, chisq for UNICORN = 1.15843659293352, chisq for GWAS  = 1.0470271393
## [1] "Cohort = chop, Index = 14, chisq for UNICORN = 1.12898192780006, chisq for GWAS  = 1.0158291892
## [1] "Cohort = chop, Index = 15, chisq for UNICORN = 1.06310459093068, chisq for GWAS  = 1.0655617893
## [1] "Cohort = chop, Index = 16, chisq for UNICORN = 1.06986377714601, chisq for GWAS  = 1.0776233932
## [1] "Cohort = chop, Index = 17, chisq for UNICORN = 1.08744865185255, chisq for GWAS  = 1.0722729843
## [1] "Cohort = chop, Index = 18, chisq for UNICORN = 1.10213202223251, chisq for GWAS  = 1.0299974724
## [1] "Cohort = chop, Index = 19, chisq for UNICORN = 1.06187364970122, chisq for GWAS  = 1.0724100644
## [1] "Cohort = chop, Index = 20, chisq for UNICORN = 1.11850793680298, chisq for GWAS  = 1.0909922216
## [1] "Cohort = chop, Index = 21, chisq for UNICORN = 1.11245214557591, chisq for GWAS  = 1.0555045541
## [1] "Cohort = chop, Index = 22, chisq for UNICORN = 1.11519978224881, chisq for GWAS  = 1.0531310089
## [1] "Cohort = chop, Index = 23, chisq for UNICORN = 1.11695826971946, chisq for GWAS  = 1.0436798398
## [1] "Cohort = chop, Index = 24, chisq for UNICORN = 1.10092306209644, chisq for GWAS  = 1.0508408223
## [1] "Cohort = chop, Index = 25, chisq for UNICORN = 1.12073901778137, chisq for GWAS  = 1.0799031228
## [1] "Cohort = chop, Index = 26, chisq for UNICORN = 1.11811227712208, chisq for GWAS  = 1.0840817012
## [1] "Cohort = chop, Index = 27, chisq for UNICORN = 1.13164164009943, chisq for GWAS  = 1.0520129914
## [1] "Cohort = chop, Index = 28, chisq for UNICORN = 1.12609141402017, chisq for GWAS  = 1.0813870755
## [1] "Cohort = chop, Index = 29, chisq for UNICORN = 1.12885004123976, chisq for GWAS  = 1.0606389581
## [1] "Cohort = chop, Index = 30, chisq for UNICORN = 1.0953508549238, chisq for GWAS  = 1.02888681656
## [1] "Cohort = chop, Index = 31, chisq for UNICORN = 1.14975406104716, chisq for GWAS  = 1.0582074008
## [1] "Cohort = chop, Index = 32, chisq for UNICORN = 1.14769882881584, chisq for GWAS  = 1.0748237362
## [1] "Cohort = chop, Index = 33, chisq for UNICORN = 1.11425459523333, chisq for GWAS  = 1.0373478251
## [1] "Cohort = chop, Index = 34, chisq for UNICORN = 1.10672607074959, chisq for GWAS  = 1.0381624597
## [1] "Cohort = chop, Index = 35, chisq for UNICORN = 1.13138885752552, chisq for GWAS  = 1.0089284260
## [1] "Cohort = chop, Index = 36, chisq for UNICORN = 1.11350723805831, chisq for GWAS  = 1.0317861681
## [1] "Cohort = chop, Index = 37, chisq for UNICORN = 1.07900791199341, chisq for GWAS  = 1.0511406334
## [1] "Cohort = chop, Index = 38, chisq for UNICORN = 1.10967153726294, chisq for GWAS  = 1.0900002558
## [1] "Cohort = chop, Index = 39, chisq for UNICORN = 1.14169799032223, chisq for GWAS  = 1.0501868377
## [1] "Cohort = chop, Index = 40, chisq for UNICORN = 1.13196036595348, chisq for GWAS  = 1.0384883881
```

```
## [1] "Cohort = chop, Index = 41, chisq for UNICORN = 1.08763549114631, chisq for GWAS  = 1.0818543689
## [1] "Cohort = chop, Index = 42, chisq for UNICORN = 1.10764927667169, chisq for GWAS  = 1.0544403542
## [1] "Cohort = chop, Index = 43, chisq for UNICORN = 1.06052181245816, chisq for GWAS  = 1.0438974468
## [1] "Cohort = chop, Index = 44, chisq for UNICORN = 1.09657080560657, chisq for GWAS  = 1.0508953338
## [1] "Cohort = chop, Index = 45, chisq for UNICORN = 1.14167600922885, chisq for GWAS  = 1.0935007568
## [1] "Cohort = chop, Index = 46, chisq for UNICORN = 1.11907944523094, chisq for GWAS  = 1.0742201792
## [1] "Cohort = chop, Index = 47, chisq for UNICORN = 1.09238340731707, chisq for GWAS  = 1.0293743588
## [1] "Cohort = chop, Index = 48, chisq for UNICORN = 1.09591137280507, chisq for GWAS  = 1.0723278166
## [1] "Cohort = chop, Index = 49, chisq for UNICORN = 1.1440829389543, chisq for GWAS  = 1.0485248554
## [1] "Cohort = chop, Index = 50, chisq for UNICORN = 1.10661616528268, chisq for GWAS  = 1.1127149117
## [1] "Cohort = germ, Index = 1, chisq for UNICORN = 1.12387132358847, chisq for GWAS  = 1.0176914629
## [1] "Cohort = germ, Index = 2, chisq for UNICORN = 1.1748015169573, chisq for GWAS  = 1.026368722474
## [1] "Cohort = germ, Index = 3, chisq for UNICORN = 1.09735113442167, chisq for GWAS  = 1.0036545857
## [1] "Cohort = germ, Index = 4, chisq for UNICORN = 1.16417365830653, chisq for GWAS  = 1.0012088092
## [1] "Cohort = germ, Index = 5, chisq for UNICORN = 1.1455227005709, chisq for GWAS  = 1.0409336770
## [1] "Cohort = germ, Index = 6, chisq for UNICORN = 1.11361714352522, chisq for GWAS  = 1.0379995111
## [1] "Cohort = germ, Index = 7, chisq for UNICORN = 1.11000125366369, chisq for GWAS  = 1.0483614222
## [1] "Cohort = germ, Index = 8, chisq for UNICORN = 1.13025683121629, chisq for GWAS  = 1.0319488188
## [1] "Cohort = germ, Index = 9, chisq for UNICORN = 1.15149056742444, chisq for GWAS  = 1.0747688640
## [1] "Cohort = germ, Index = 10, chisq for UNICORN = 1.1080229552592, chisq for GWAS  = 1.0292118227
## [1] "Cohort = germ, Index = 11, chisq for UNICORN = 1.10141763669756, chisq for GWAS  = 1.0336030138
## [1] "Cohort = germ, Index = 12, chisq for UNICORN = 1.07879909160627, chisq for GWAS  = 1.0192036639
## [1] "Cohort = germ, Index = 13, chisq for UNICORN = 1.11901350195079, chisq for GWAS  = 1.0558866484
## [1] "Cohort = germ, Index = 14, chisq for UNICORN = 1.10986936710339, chisq for GWAS  = 1.0461832772
## [1] "Cohort = germ, Index = 15, chisq for UNICORN = 1.1822421170675, chisq for GWAS  = 1.0017461960
## [1] "Cohort = germ, Index = 16, chisq for UNICORN = 1.18617673278309, chisq for GWAS  = 1.0006715301
## [1] "Cohort = germ, Index = 17, chisq for UNICORN = 1.15561202243378, chisq for GWAS  = 1.0325995375
## [1] "Cohort = germ, Index = 18, chisq for UNICORN = 1.11003422530376, chisq for GWAS  = 1.0663554938
## [1] "Cohort = germ, Index = 19, chisq for UNICORN = 1.09919754626586, chisq for GWAS  = 1.0222841917
## [1] "Cohort = germ, Index = 20, chisq for UNICORN = 1.15249070717337, chisq for GWAS  = 1.0088207171
## [1] "Cohort = germ, Index = 21, chisq for UNICORN = 1.10590177974773, chisq for GWAS  = 1.0322199291
## [1] "Cohort = germ, Index = 22, chisq for UNICORN = 1.11706817518638, chisq for GWAS  = 1.0392489564
## [1] "Cohort = germ, Index = 23, chisq for UNICORN = 1.14900670387214, chisq for GWAS  = 1.0266393903
## [1] "Cohort = germ, Index = 24, chisq for UNICORN = 1.10757234284485, chisq for GWAS  = 1.0006715172
## [1] "Cohort = germ, Index = 25, chisq for UNICORN = 1.1085505015004, chisq for GWAS  = 1.0113798069
## [1] "Cohort = germ, Index = 26, chisq for UNICORN = 1.04759692954885, chisq for GWAS  = 1.0088207449
```

```
## [1] "Cohort = germ, Index = 27, chisq for UNICORN = 1.0689515617706, chisq for GWAS  = 1.015505323705
## [1] "Cohort = germ, Index = 28, chisq for UNICORN = 1.10352782166234, chisq for GWAS  = 0.974103954513
## [1] "Cohort = germ, Index = 29, chisq for UNICORN = 1.15564499407386, chisq for GWAS  = 1.037592205784
## [1] "Cohort = germ, Index = 30, chisq for UNICORN = 1.15391947824328, chisq for GWAS  = 1.027938921844
## [1] "Cohort = germ, Index = 31, chisq for UNICORN = 1.05308121234795, chisq for GWAS  = 1.041123964704
## [1] "Cohort = germ, Index = 32, chisq for UNICORN = 1.11650765730511, chisq for GWAS  = 1.015316464544
## [1] "Cohort = germ, Index = 33, chisq for UNICORN = 1.11618893145105, chisq for GWAS  = 1.002068664254
## [1] "Cohort = germ, Index = 34, chisq for UNICORN = 1.09962617758683, chisq for GWAS  = 1.049478318354
## [1] "Cohort = germ, Index = 35, chisq for UNICORN = 1.11446341562047, chisq for GWAS  = 1.049887014994
## [1] "Cohort = germ, Index = 36, chisq for UNICORN = 1.05687295095655, chisq for GWAS  = 1.023663172514
## [1] "Cohort = germ, Index = 37, chisq for UNICORN = 1.14652284031984, chisq for GWAS  = 1.016206892214
## [1] "Cohort = germ, Index = 38, chisq for UNICORN = 1.0808433332909, chisq for GWAS  = 1.047598883424
## [1] "Cohort = germ, Index = 39, chisq for UNICORN = 1.07907385527356, chisq for GWAS  = 1.042564791984
## [1] "Cohort = germ, Index = 40, chisq for UNICORN = 1.09985697906735, chisq for GWAS  = 1.038488394884
## [1] "Cohort = germ, Index = 41, chisq for UNICORN = 1.08853671597502, chisq for GWAS  = 1.077513563784
## [1] "Cohort = germ, Index = 42, chisq for UNICORN = 1.08197535960014, chisq for GWAS  = 1.013374547514
## [1] "Cohort = germ, Index = 43, chisq for UNICORN = 1.17588958107976, chisq for GWAS  = 1.048089088004
## [1] "Cohort = germ, Index = 44, chisq for UNICORN = 1.10827573783311, chisq for GWAS  = 0.994820630144
## [1] "Cohort = germ, Index = 45, chisq for UNICORN = 1.09829632143715, chisq for GWAS  = 1.069340424504
## [1] "Cohort = germ, Index = 46, chisq for UNICORN = 1.14614916173232, chisq for GWAS  = 1.028020142694
## [1] "Cohort = germ, Index = 47, chisq for UNICORN = 1.07212782976447, chisq for GWAS  = 1.040036849894
## [1] "Cohort = germ, Index = 48, chisq for UNICORN = 1.08666832303745, chisq for GWAS  = 1.046101529414
## [1] "Cohort = germ, Index = 49, chisq for UNICORN = 1.11244115502922, chisq for GWAS  = 1.013617212394
## [1] "Cohort = germ, Index = 50, chisq for UNICORN = 1.12852032483902, chisq for GWAS  = 1.018825547884
```