Plasmid antibiotic resistance gene occurrence diversity analysis

Ilhan Cem Duru

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Load and prepare data for phyloseq

Create counts matrix

```
# Load counts
agr_genes_occurence <- read.csv("plasmid_agr_occurence.csv", header = TRUE,
                        skipNul = TRUE, sep = "\t", as.is = TRUE)
#agr_genes_occurence
#str(agr_genes_occurence)
#row.names(agr_genes_occurence)
#class(agr_genes_occurence)
colnames(agr_genes_occurence)
```

```
##    [1] "ARG"     "C1"      "C102"    "C103"    "C104"    "C105"    "C107"
##    [8] "C111"    "C114"    "C116"    "C118"    "C119"    "C123"    "C124"
##   [15] "C134"    "C135"    "C136"    "C137"    "C140"    "C142"    "C146"
##   [22] "C147"    "C148"    "C15"     "C152IIP" "C18"     "C19"     "C20"
##   [29] "C21"     "C23"     "C24"     "C26"     "C28"     "C30"     "C32"
##   [36] "C33"     "C34old"  "C35"     "C40"     "C44"     "C46"     "C47"
##   [43] "C48"     "C49"     "C5"      "C51"     "C54"     "C59"     "C65"
##   [50] "C68"     "C69"     "C7"      "C70"     "C72"     "C74"     "C75"
##   [57] "C76II"   "C80"     "C82"     "C85"     "C86"     "C87"     "C88"
##   [64] "C89"     "C9"      "C90"     "C95"     "C96"     "C98"     "P100"
##   [71] "P103"    "P104IIP" "P105"    "P107"    "P10old"  "P114"    "P115"
##   [78] "P116"    "P118"    "P119"    "P11old"  "P12"     "P120"    "P14"
##   [85] "P15"     "P16"     "P17"     "P18"     "P19"     "P20"     "P24"
##   [92] "P26"     "P28"     "P31"     "P34"     "P37"     "P38"     "P4"
##   [99] "P42"     "P43"     "P45"     "P46"     "P47"     "P48"     "P5"
##  [106] "P50"     "P51"     "P52"     "P53"     "P56"     "P57"     "P58"
##  [113] "P59"     "P60"     "P61"     "P62P"    "P63"     "P66"     "P67"
##  [120] "P68"     "P69"     "P70"     "P71"     "P72"     "P73"     "P74"
##  [127] "P77"     "P79"     "P8"      "P83"     "P85"     "P87"     "P88"
##  [134] "P9"      "P94"     "P95II"   "P99"
```

```
#head(colnames(agr_genes_occurence))
#dim(agr_genes_occurence)
#agr_genes_occurence$phage

## Put this in `matrix` class for `phyloseq`'s `otu table`, and create it:
counts <- as.matrix(sapply(agr_genes_occurence, as.numeric))
#head(counts)
#head(colnames(counts))
rownames(counts) <- agr_genes_occurence$ARG
```

```r
#head(counts)
#head(colnames(counts))

# delete/remove the newly created "phage" column:
counts <- counts[ , -grep("ARG", colnames(counts))]
#head(counts)
#head(colnames(counts))
#dim(counts)

otu.table <- otu_table(counts, taxa_are_rows = TRUE)
head(otu.table)
```

```
## OTU Table:          [6 taxa and 136 samples]
##                  taxa are rows
##                  C1 C102 C103 C104 C105 C107 C111 C114 C116 C118 C119 C123 C124
## AADA              0    0    0    0    0    0    0    0    0    0    0    0    0
## ABES              0    0    0    0    0    0    0    0    0    0    0    0    0
## ACT               0    0    0    0    0    0    0    0    0    0    0    0    0
## ADEC              0    0    0    0    0    0    0    0    1    0    0    0    0
## ADES              0    0    0    0    0    0    0    0    0    0    0    0    0
## APH(3''')-III     0    2    0    0    0    0    0    0    0    0    0    0    0
##                  C134 C135 C136 C137 C140 C142 C146 C147 C148 C15 C152IIP C18 C19
## AADA               0    0    0    0    0    0    0    0    0    0         0   0   0
## ABES               0    0    0    0    1    0    0    0    0    0         0   0   0
## ACT                0    0    0    0    0    0    0    0    0    0         0   0   0
## ADEC               0    0    0    0    0    0    0    0    0    0         0   0   0
## ADES               0    0    0    0    0    0    0    0    0    0         0   0   0
## APH(3''')-III      0    0    0    0    0    0    0    0    0    0         0   0   0
##                  C20 C21 C23 C24 C26 C28 C30 C32 C33 C34old C35 C40 C44 C46 C47
## AADA               2   0   0   0   0   0   0   0   0      0   0   0   0   0   0
## ABES               1   0   0   0   0   0   0   0   0      0   0   0   0   0   0
## ACT                0   0   0   0   0   0   0   0   0      0   0   0   0   0   0
## ADEC               0   0   0   0   0   0   0   0   0      0   0   0   0   0   0
## ADES               0   0   0   0   0   0   0   0   0      0   0   0   0   0   0
## APH(3''')-III      0   0   0   0   0   0   0   0   0      0   0   0   0   0   0
##                  C48 C49 C5 C51 C54 C59 C65 C68 C69 C7 C70 C72 C74 C75 C76II C80
## AADA               0   0  0   0   0   0   0   0   0  0   0   0   0   0     0   0
## ABES               0   0  0   0   0   0   0   0   0  0   0   0   0   0     0   0
## ACT                0   0  0   0   0   0   0   0   0  0   0   0   0   0     0   0
## ADEC               0   0  0   0   0   0   1   0   0  0   0   0   0   0     0   0
## ADES               0   0  0   0   0   0   0   0   0  0   0   0   0   0     0   0
## APH(3''')-III      0   0  0   0   0   0   0   0   0  0   0   0   0   0     0   0
##                  C82 C85 C86 C87 C88 C89 C9 C90 C95 C96 C98 P100 P103 P104IIP P105
## AADA               0   0   0   0   0   0  0   0   1   0   0    0    2       0    0
## ABES               0   0   0   0   0   1  0   0   0   0   0    0    1       0    0
## ACT                0   0   0   0   0   0  0   0   0   0   0    0    0       0    0
## ADEC               0   0   0   0   0   0  0   0   0   0   0    0    0       0    0
## ADES               0   0   0   0   0   0  0   0   0   0   0    0    0       0    0
## APH(3''')-III      0   0   0   0   0   0  0   0   0   0   0    0    0       0    0
##                  P107 P10old P114 P115 P116 P118 P119 P11old P12 P120 P14 P15 P16
## AADA               0      0    0    0    0    0    0      0   0    0   0   0   0
## ABES               0      0    0    0    0    0    0      0   0    0   0   0   0
## ACT                0      0    0    0    0    0    0      0   0    0   0   0   0
## ADEC               0      0    0    0    0    0    0      0   0    0   0   0   0
```

```
## ADES                  0        0    0    0    0    0    0       0    0    0    0    0    0
## APH(3''')-III      0        0    0    0    0    0    0       0    0    0    0    0    0
##                   P17 P18 P19 P20 P24 P26 P28 P31 P34 P37 P38 P4 P42 P43 P45 P46
## AADA              0   0   0   0   0   0   0   0   0   0   0  0   0   0   0   0
## ABES              0   0   0   0   0   0   0   0   0   0   0  0   0   0   0   0
## ACT               0   0   0   0   0   0   0   0   0   0   0  0   0   0   0   0
## ADEC              0   0   0   0   0   0   0   0   0   0   0  0   0   0   0   0
## ADES              0   0   0   0   0   0   0   0   0   0   0  0   0   0   0   0
## APH(3''')-III     0   0   0   0   0   0   0   0   0   0   0  0   0   0   0   0
##                   P47 P48 P5 P50 P51 P52 P53 P56 P57 P58 P59 P60 P61 P62P P63 P66
## AADA              0   0   0   0   0   0   0   0   0   0   0   0   0    0   0   0
## ABES              0   0   0   0   0   0   0   0   0   0   0   0   0    0   0   0
## ACT               0   0   0   0   0   0   0   1   0   0   0   0   0    0   0   0
## ADEC              0   0   0   0   0   0   0   0   0   0   0   0   0    0   0   0
## ADES              0   0   0   0   0   0   0   0   1   1   0   0   0    0   0   0
## APH(3''')-III     0   0   0   0   0   0   0   0   0   0   0   0   0    0   0   0
##                   P67 P68 P69 P70 P71 P72 P73 P74 P77 P79 P8 P83 P85 P87 P88 P9 P94
## AADA              0   0   0   0   0   0   0   0   0   0  0   0   0   0   0  0   0
## ABES              0   0   0   0   0   0   0   0   0   0  0   0   0   0   0  0   0
## ACT               0   0   0   0   0   0   0   0   0   0  0   0   0   0   0  0   0
## ADEC              0   0   0   0   0   0   0   0   0   0  0   0   0   0   0  0   0
## ADES              0   0   0   0   0   0   0   0   0   0  0   0   0   0   0  0   0
## APH(3''')-III     0   0   0   0   0   0   0   0   0   0  0   0   0   0   0  0   0
##                   P95II P99
## AADA              0     0
## ABES              0     0
## ACT               0     0
## ADEC              0     0
## ADES              0     0
## APH(3''')-III     0     0
```

```r
head(colnames(otu.table))
```

```
## [1] "C1"   "C102" "C103" "C104" "C105" "C107"
```

```r
dim(otu.table)
```

```
## [1]  87 136
```

```r
otu.table
```

```
## OTU Table:          [87 taxa and 136 samples]
##                     taxa are rows
##                                            C1 C102 C103 C104 C105 C107 C111
## AADA                                       0    0    0    0    0    0    0
## ABES                                       0    0    0    0    0    0    0
## ACT                                        0    0    0    0    0    0    0
## ADEC                                       0    0    0    0    0    0    0
## ADES                                       0    0    0    0    0    0    0
## APH(3''')-III                              0    2    0    0    0    0    0
## APH(3'')-I                                 0    1    0    0    0    0    0
## APH(6)-I                                   0    1    0    0    0    0    0
## BACA                                       0    0    0    0    0    0    0
## BCRA                                       0    0    0    0    0    0    0
## BLAI                                       0    0    0    0    0    0    0
## CATA                                       0    0    0    0    0    0    0
## CATD                                       0    0    0    0    0    0    0
```

```
## CATQ                                                0   0   0   0   0   0   0
## CATU                                                0   0   0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE               0   0   0   0   0   0   0
## CFXA6                                               0   0   0   0   0   0   0
## CHLORAMPHENICOL_EXPORTER                            0   0   0   1   0   0   0
## CLASS_A                                             0   0   0   0   0   0   0
## CLBA                                                0   0   0   0   0   0   0
## CMLA                                                0   0   0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                   0   0   0   0   0   0   0
## DFRA12                                              0   0   0   0   0   0   0
## DFRA17                                              0   0   0   0   0   0   0
## DFRA21                                              0   0   0   0   0   0   0
## DFRA3                                               0   0   0   0   0   0   0
## DFRA5                                               0   0   0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                            1   0   0   1   0   0   0
## EDEQ                                                0   0   0   0   0   0   0
## EFRA                                                0   0   0   0   0   0   0
## EFRB                                                0   0   0   0   0   0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER      0   0   0   0   0   0   0
## ERM(42)                                             0   0   0   0   0   0   0
## ERMB                                                0   0   0   0   0   0   0
## ERMF                                                0   0   0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                               0   0   0   0   0   0   0
## GADW                                                0   0   0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                 0   0   0   0   0   1   0
## KDPE                                                0   0   0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE            1   0   0   0   0   0   0
## LMRD                                                0   0   0   0   0   0   0
## LNUA                                                0   0   0   1   0   0   0
## LRFA                                                0   0   0   1   0   0   0
## LSA                                                 0   0   1   0   0   0   0
## MARA                                                0   0   0   0   0   0   0
## MARR                                                0   0   0   0   0   0   0
## MCR-3                                               0   0   0   0   0   0   0
## MECI                                                0   0   0   0   0   0   0
## MEFA                                                0   0   0   0   0   0   0
## MEPA                                                0   0   0   0   0   0   0
## MEXL                                                0   0   0   0   0   0   0
## MTRA                                                0   0   0   1   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                           0   0   0   0   0   0   0
## NMCR                                                0   0   0   0   0   0   0
## OMP36                                               0   0   0   0   0   0   0
## OMPR                                                0   1   0   0   0   0   0
## OPRA                                                0   0   0   0   0   0   0
## PATA                                                0   0   0   0   0   0   0
## PMRF                                                0   0   0   0   0   0   0
## RAMA                                                0   0   0   0   0   0   0
## ROSA                                                0   0   0   0   0   0   0
## ROSB                                                0   0   0   0   0   0   0
## SDIA                                                0   0   0   0   0   0   0
## SUL1                                                0   0   0   0   0   0   0
## SUL3                                                0   0   0   0   0   0   0
## TEM                                                 0   1   0   0   0   0   0
## TET34                                               0   0   0   0   0   0   0
```

```
## TET35                                                  0    0    0    0    0    0    0
## TET40                                                  0    0    0    0    0    0    0
## TETB(60)                                               0    0    0    0    0    0    0
## TETM                                                   0    0    0    0    0    0    0
## TETO                                                   0    0    0    0    0    0    0
## TETP                                                   0    0    0    0    0    0    0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR             0    0    0    0    0    1    0
## UGD                                                    0    0    0    0    0    0    1
## VANH                                                   1    0    0    0    0    0    0
## VANR                                                   0    1    0    0    0    0    0
## VANRI                                                  0    0    0    1    0    0    0
## VANS                                                  10    1    1    7    1    5    4
## VANTRL                                                 0    0    0    0    0    0    0
## VANU                                                   1    0    0    0    1    0    0
## VANY                                                   0    0    0    0    0    0    0
## VANZ                                                   0    0    0    0    0    0    0
## VATB                                                   0    0    0    0    0    0    0
## VATE                                                   0    0    0    0    0    0    0
## VGAC                                                   0    0    0    1    0    0    0
## YKKD                                                   0    0    0    0    0    0    0
##                                                     C114 C116 C118 C119 C123 C124
## AADA                                                   0    0    0    0    0    0
## ABES                                                   0    0    0    0    0    0
## ACT                                                    0    0    0    0    0    0
## ADEC                                                   0    1    0    0    0    0
## ADES                                                   0    0    0    0    0    0
## APH(3''')-III                                          0    0    0    0    0    0
## APH(3'')-I                                             0    0    0    0    0    0
## APH(6)-I                                               0    0    0    0    0    0
## BACA                                                   0    0    0    0    0    0
## BCRA                                                   0    0    0    0    0    0
## BLAI                                                   0    0    0    0    0    0
## CATA                                                   0    0    0    0    0    0
## CATD                                                   0    0    0    0    0    0
## CATQ                                                   0    0    0    0    0    0
## CATU                                                   0    0    0    0    0    0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                  0    0    0    1    0    0
## CFXA6                                                  0    0    0    0    0    0
## CHLORAMPHENICOL_EXPORTER                               0    0    0    0    0    0
## CLASS_A                                                0    0    0    0    0    0
## CLBA                                                   0    0    0    0    0    0
## CMLA                                                   0    0    0    0    0    0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                      0    1    0    0    0    0
## DFRA12                                                 0    0    0    0    0    0
## DFRA17                                                 0    0    0    0    0    0
## DFRA21                                                 0    0    0    0    0    0
## DFRA3                                                  0    0    0    0    0    0
## DFRA5                                                  0    0    0    0    0    0
## DNA-BINDING_PROTEIN_H-NS                               0    1    0    0    0    0
## EDEQ                                                   0    0    0    0    0    0
## EFRA                                                   0    0    0    0    0    0
## EFRB                                                   0    0    0    0    0    0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER         1    0    0    0    0    0
## ERM(42)                                                0    0    0    0    1    0
```

```
## ERMB                                                 0    0    0    0    0    0
## ERMF                                                 0    0    0    0    0    0
## ESCHERICHIA_COLI_MIPA                                0    0    0    0    0    0
## GADW                                                 0    0    0    0    0    0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                  0    0    0    0    0    0
## KDPE                                                 0    0    0    0    1    0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE             0    0    0    0    0    0
## LMRD                                                 0    0    0    0    0    0
## LNUA                                                 0    0    0    0    0    0
## LRFA                                                 0    0    0    0    0    0
## LSA                                                  0    0    0    0    0    0
## MARA                                                 0    0    0    0    0    0
## MARR                                                 0    0    0    0    0    0
## MCR-3                                                0    0    0    0    0    0
## MECI                                                 0    0    0    0    0    0
## MEFA                                                 0    0    0    0    0    0
## MEPA                                                 0    0    0    0    0    0
## MEXL                                                 0    0    0    0    0    0
## MTRA                                                 0    0    0    0    0    0
## MULTIDRUG_ABC_TRANSPORTER                            0    0    0    1    0    0
## NMCR                                                 0    0    0    0    0    0
## OMP36                                                0    0    0    0    0    0
## OMPR                                                 0    0    0    0    0    0
## OPRA                                                 0    0    0    0    0    0
## PATA                                                 0    0    0    0    0    0
## PMRF                                                 0    0    0    0    0    0
## RAMA                                                 0    0    0    0    0    0
## ROSA                                                 0    0    0    0    0    0
## ROSB                                                 0    0    0    0    0    0
## SDIA                                                 0    0    0    0    0    0
## SUL1                                                 0    0    0    0    0    0
## SUL3                                                 0    0    0    0    0    0
## TEM                                                  0    0    0    0    0    0
## TET34                                                0    0    0    0    0    0
## TET35                                                0    0    0    0    0    0
## TET40                                                0    0    0    0    0    0
## TETB(60)                                             0    0    0    0    0    0
## TETM                                                 0    0    0    0    0    0
## TETO                                                 0    0    0    0    0    0
## TETP                                                 0    0    0    0    0    0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR           0    0    0    0    0    0
## UGD                                                  0    0    0    0    0    0
## VANH                                                 0    0    0    0    0    0
## VANR                                                 0    0    0    0    0    0
## VANRI                                                1    0    0    0    0    0
## VANS                                                 3    1    4    2    4    3
## VANTRL                                               1    0    1    0    0    0
## VANU                                                 0    0    0    0    0    0
## VANY                                                 0    0    0    0    0    0
## VANZ                                                 0    0    1    0    0    0
## VATB                                                 0    0    0    0    0    0
## VATE                                                 1    0    0    0    0    0
## VGAC                                                 0    0    0    0    0    0
## YKKD                                                 0    0    0    0    0    0
```

```
##                                                      C134 C135 C136 C137 C140 C142
## AADA                                                   0    0    0    0    0    0
## ABES                                                   0    0    0    0    1    0
## ACT                                                    0    0    0    0    0    0
## ADEC                                                   0    0    0    0    0    0
## ADES                                                   0    0    0    0    0    0
## APH(3''')-III                                          0    0    0    0    0    0
## APH(3'')-I                                             0    0    0    0    0    0
## APH(6)-I                                               0    0    0    0    0    0
## BACA                                                   1    0    0    0    0    0
## BCRA                                                   0    0    0    0    0    0
## BLAI                                                   0    0    0    0    0    0
## CATA                                                   0    0    0    0    0    0
## CATD                                                   0    0    0    0    0    0
## CATQ                                                   0    0    0    0    0    0
## CATU                                                   0    0    0    0    0    0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                  0    0    0    1    0    1
## CFXA6                                                  0    0    0    0    0    0
## CHLORAMPHENICOL_EXPORTER                               0    0    0    0    0    0
## CLASS_A                                                0    0    0    0    0    0
## CLBA                                                   0    0    0    0    0    0
## CMLA                                                   0    0    0    0    0    0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                      0    0    0    0    0    0
## DFRA12                                                 0    0    0    0    0    0
## DFRA17                                                 0    0    0    0    0    0
## DFRA21                                                 0    0    0    0    0    0
## DFRA3                                                  0    0    0    0    0    0
## DFRA5                                                  0    0    0    0    1    0
## DNA-BINDING_PROTEIN_H-NS                               0    0    1    0    0    0
## EDEQ                                                   0    0    0    0    0    0
## EFRA                                                   0    0    0    0    0    0
## EFRB                                                   0    0    0    0    0    0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER         0    0    0    0    0    0
## ERM(42)                                                0    0    0    0    0    0
## ERMB                                                   0    0    0    0    0    0
## ERMF                                                   0    0    0    0    0    0
## ESCHERICHIA_COLI_MIPA                                  0    0    0    0    0    0
## GADW                                                   0    0    0    0    0    0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                    0    0    0    0    0    0
## KDPE                                                   0    0    0    0    0    0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE               1    0    0    0    0    0
## LMRD                                                   0    0    0    0    0    0
## LNUA                                                   0    0    0    0    0    1
## LRFA                                                   0    0    0    0    0    0
## LSA                                                    0    0    0    0    0    0
## MARA                                                   0    0    0    0    0    0
## MARR                                                   0    0    0    0    0    0
## MCR-3                                                  0    0    0    0    0    0
## MECI                                                   0    0    0    0    0    0
## MEFA                                                   0    0    0    0    0    0
## MEPA                                                   0    0    0    0    0    0
## MEXL                                                   0    0    0    0    0    0
## MTRA                                                   0    0    0    0    0    0
## MULTIDRUG_ABC_TRANSPORTER                              1    0    0    0    1    0
```

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```
## NMCR                                                  0    0    0    0    0    0
## OMP36                                                 0    0    0    0    0    0
## OMPR                                                  1    0    0    1    0    0
## OPRA                                                  0    0    0    0    0    0
## PATA                                                  0    0    0    0    0    0
## PMRF                                                  0    0    0    0    0    0
## RAMA                                                  0    0    0    0    0    0
## ROSA                                                  0    0    0    0    0    0
## ROSB                                                  0    0    0    0    0    0
## SDIA                                                  0    0    1    0    0    0
## SUL1                                                  0    0    0    0    1    0
## SUL3                                                  0    0    0    0    0    0
## TEM                                                   0    0    0    0    1    0
## TET34                                                 0    0    0    0    0    0
## TET35                                                 0    0    0    0    0    0
## TET40                                                 0    0    0    0    0    0
## TETB(60)                                              0    0    0    0    0    0
## TETM                                                  0    0    0    0    0    0
## TETO                                                  0    0    0    0    0    0
## TETP                                                  0    0    0    0    0    0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR            0    0    0    0    0    0
## UGD                                                   0    0    0    1    0    0
## VANH                                                  1    0    0    0    0    1
## VANR                                                  0    0    0    0    0    0
## VANRI                                                 0    0    0    0    0    0
## VANS                                                  5    3    2    1    6   12
## VANTRL                                                0    0    0    0    0    0
## VANU                                                  0    0    0    0    0    0
## VANY                                                  3    0    0    0    0    0
## VANZ                                                  0    0    0    0    0    0
## VATB                                                  0    0    0    0    0    0
## VATE                                                  0    0    0    0    0    0
## VGAC                                                  0    0    0    0    0    0
## YKKD                                                  0    0    0    0    0    0
##                                                    C146 C147 C148 C15 C152IIP C18
## AADA                                                  0    0    0    0       0    0
## ABES                                                  0    0    0    0       0    0
## ACT                                                   0    0    0    0       0    0
## ADEC                                                  0    0    0    0       0    0
## ADES                                                  0    0    0    0       0    0
## APH(3'')-III                                          0    0    0    0       0    0
## APH(3'')-I                                            0    0    0    0       0    0
## APH(6)-I                                              0    0    0    0       0    0
## BACA                                                  0    0    0    0       0    0
## BCRA                                                  0    1    0    0       0    0
## BLAI                                                  0    0    0    0       0    0
## CATA                                                  0    0    0    0       0    0
## CATD                                                  0    0    0    0       0    0
## CATQ                                                  0    0    0    0       0    0
## CATU                                                  0    0    0    0       0    0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                 1    0    0    0       0    0
## CFXA6                                                 0    0    0    0       0    0
## CHLORAMPHENICOL_EXPORTER                              0    0    0    0       0    0
## CLASS_A                                               0    0    0    0       0    0
```

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```
## CLBA                                               0    0    0    0      0    0
## CMLA                                               0    0    0    0      0    0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                  0    0    0    0      0    0
## DFRA12                                             0    0    0    0      0    0
## DFRA17                                             0    0    0    0      0    0
## DFRA21                                             0    0    0    0      0    0
## DFRA3                                              0    0    0    0      0    0
## DFRA5                                              0    0    0    0      0    0
## DNA-BINDING_PROTEIN_H-NS                           0    0    0    0      0    1
## EDEQ                                               0    0    0    0      0    0
## EFRA                                               0    1    0    0      0    0
## EFRB                                               0    0    0    0      0    0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER     0    0    0    0      0    0
## ERM(42)                                            0    0    0    0      0    0
## ERMB                                               0    0    0    0      0    1
## ERMF                                               0    0    0    0      0    0
## ESCHERICHIA_COLI_MIPA                              0    0    0    0      0    0
## GADW                                               0    0    0    0      0    0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                0    0    0    0      0    0
## KDPE                                               0    0    0    0      0    0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE           0    0    0    1      0    0
## LMRD                                               0    0    0    0      0    0
## LNUA                                               0    0    0    0      0    1
## LRFA                                               0    0    0    0      0    0
## LSA                                                0    0    0    0      0    0
## MARA                                               0    0    0    0      0    0
## MARR                                               0    0    0    0      0    0
## MCR-3                                              0    0    0    0      0    0
## MECI                                               0    0    0    0      0    0
## MEFA                                               0    0    0    0      0    0
## MEPA                                               0    0    0    0      0    0
## MEXL                                               0    0    0    0      0    0
## MTRA                                               0    0    0    0      0    0
## MULTIDRUG_ABC_TRANSPORTER                          0    1    0    0      0    0
## NMCR                                               0    0    0    0      0    0
## OMP36                                              0    0    0    0      0    0
## OMPR                                               0    0    0    0      0    0
## OPRA                                               0    0    0    0      0    0
## PATA                                               0    1    0    0      0    0
## PMRF                                               0    0    0    0      0    0
## RAMA                                               0    0    0    0      0    0
## ROSA                                               0    0    0    0      0    0
## ROSB                                               0    0    0    0      0    0
## SDIA                                               0    0    0    0      0    0
## SUL1                                               0    0    0    0      0    0
## SUL3                                               0    0    0    0      0    0
## TEM                                                0    0    0    0      0    0
## TET34                                              0    0    0    0      0    0
## TET35                                              0    0    0    0      0    0
## TET40                                              0    0    0    0      0    0
## TETB(60)                                           0    0    0    0      0    0
## TETM                                               0    0    0    0      0    0
## TETO                                               0    0    0    0      0    0
## TETP                                               0    0    0    0      0    0
```

```
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR            0    0    0    0         0    0
## UGD                                                   0    0    0    0         0    0
## VANH                                                   1    0    0    0         0    1
## VANR                                                   0    0    0    0         0    0
## VANRI                                                  0    0    0    0         0    0
## VANS                                                   9    7    4    8         4    8
## VANTRL                                                 0    0    0    0         0    0
## VANU                                                   0    0    0    0         0    0
## VANY                                                   0    0    0    0         0    0
## VANZ                                                   1    0    0    1         0    0
## VATB                                                   0    0    0    0         0    0
## VATE                                                   0    0    0    0         0    0
## VGAC                                                   0    0    0    0         0    0
## YKKD                                                   0    0    0    0         0    0
##                                                      C19 C20 C21 C23 C24 C26 C28 C30
## AADA                                                   0    2    0    0    0    0    0    0
## ABES                                                   0    1    0    0    0    0    0    0
## ACT                                                    0    0    0    0    0    0    0    0
## ADEC                                                   0    0    0    0    0    0    0    0
## ADES                                                   0    0    0    0    0    0    0    0
## APH(3'')-III                                           0    0    0    0    0    0    0    0
## APH(3'')-I                                             0    0    0    0    0    0    0    0
## APH(6)-I                                               0    0    0    0    0    0    0    0
## BACA                                                   0    0    0    0    0    0    0    0
## BCRA                                                   0    0    0    0    0    0    0    0
## BLAI                                                   0    0    0    0    0    0    0    0
## CATA                                                   0    0    0    0    0    0    0    0
## CATD                                                   0    0    0    0    0    0    0    0
## CATQ                                                   0    0    0    0    0    0    0    0
## CATU                                                   0    0    0    0    0    0    0    0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                  0    0    0    0    0    0    0    0
## CFXA6                                                  0    1    0    0    0    0    0    0
## CHLORAMPHENICOL_EXPORTER                               0    0    0    0    0    0    0    0
## CLASS_A                                                0    0    0    0    0    0    0    0
## CLBA                                                   0    0    0    0    0    0    0    0
## CMLA                                                   0    1    0    0    0    0    0    0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                      0    0    0    0    0    0    0    0
## DFRA12                                                 0    3    0    0    0    0    0    0
## DFRA17                                                 0    0    0    0    0    0    0    0
## DFRA21                                                 0    0    0    0    0    0    0    0
## DFRA3                                                  0    0    0    0    0    0    0    0
## DFRA5                                                  0    0    0    0    0    0    0    0
## DNA-BINDING_PROTEIN_H-NS                               0    1    0    0    0    0    0    0
## EDEQ                                                   0    0    0    0    0    0    0    0
## EFRA                                                   0    0    0    0    0    0    0    0
## EFRB                                                   0    0    0    0    0    0    0    0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER         0    0    0    0    0    0    0    0
## ERM(42)                                                0    0    0    0    0    0    0    0
## ERMB                                                   0    0    0    0    0    0    0    0
## ERMF                                                   0    0    0    0    0    0    0    0
## ESCHERICHIA_COLI_MIPA                                  0    0    0    0    0    0    0    0
## GADW                                                   0    0    0    0    0    0    0    0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                    0    0    0    0    0    0    0    0
## KDPE                                                   0    1    0    0    0    0    0    0
```

```
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE          0   0   0   0   1   0   0   0
## LMRD                                              0   0   0   0   0   0   0   0
## LNUA                                              0   0   0   0   0   0   0   0
## LRFA                                              0   0   0   0   0   0   0   0
## LSA                                               0   0   0   0   0   0   0   0
## MARA                                              0   0   0   0   0   0   0   0
## MARR                                              0   0   0   0   0   0   0   0
## MCR-3                                             0   0   0   0   0   0   0   0
## MECI                                              0   0   0   0   0   0   0   0
## MEFA                                              0   0   0   0   0   0   0   0
## MEPA                                              0   0   0   0   1   1   0   0
## MEXL                                              0   1   0   0   0   0   0   0
## MTRA                                              0   0   0   0   0   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                         0   0   1   0   0   0   0   0
## NMCR                                              0   0   0   0   0   0   0   0
## OMP36                                             0   0   0   0   0   0   0   0
## OMPR                                              0   0   0   0   0   0   0   0
## OPRA                                              0   0   0   0   0   0   0   0
## PATA                                              0   0   0   0   0   0   0   0
## PMRF                                              0   0   0   0   0   0   0   0
## RAMA                                              0   0   0   0   0   0   0   0
## ROSA                                              0   0   0   0   0   0   0   0
## ROSB                                              0   0   0   0   0   0   0   0
## SDIA                                              0   0   0   0   0   0   0   0
## SUL1                                              0   0   0   0   0   0   0   0
## SUL3                                              0   0   0   0   0   0   0   0
## TEM                                               0   0   0   0   0   0   0   0
## TET34                                             0   0   0   0   0   0   0   0
## TET35                                             0   0   0   0   0   0   0   0
## TET40                                             0   0   1   0   0   0   0   0
## TETB(60)                                          0   0   0   0   0   0   0   0
## TETM                                              0   0   0   0   0   0   0   0
## TETO                                              0   0   0   0   1   0   0   0
## TETP                                              0   0   1   0   0   0   0   0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR        1   0   1   1   0   1   0   0
## UGD                                               0   0   0   0   0   0   0   0
## VANH                                              0   0   0   0   0   0   0   0
## VANR                                              0   0   0   0   0   1   0   0
## VANRI                                             0   0   0   0   0   0   0   0
## VANS                                              3   6   7   2   6  10   7   3
## VANTRL                                            0   0   0   0   0   0   0   0
## VANU                                              1   0   0   0   0   0   0   0
## VANY                                              0   0   0   0   0   0   0   0
## VANZ                                              0   0   0   0   0   0   1   0
## VATB                                              0   0   0   0   0   0   0   0
## VATE                                              0   0   0   0   0   0   0   0
## VGAC                                              0   0   0   0   0   0   0   0
## YKKD                                              0   0   0   0   0   0   0   0
##                                                  C32 C33 C34old C35 C40 C44 C46
## AADA                                              0   0      0   0   0   0   0
## ABES                                              0   0      0   0   0   0   0
## ACT                                               0   0      0   0   0   0   0
## ADEC                                              0   0      0   0   0   0   0
## ADES                                              0   0      0   0   0   0   0
```

```
## APH(3'')-III                                           0   0    0   0   0   0   0
## APH(3'')-I                                             0   0    0   0   0   0   0
## APH(6)-I                                               0   0    0   0   0   0   0
## BACA                                                   0   0    0   0   0   0   0
## BCRA                                                   0   0    0   0   0   0   0
## BLAI                                                   0   0    0   0   0   0   0
## CATA                                                   0   0    0   0   0   0   0
## CATD                                                   0   0    0   0   0   0   0
## CATQ                                                   0   0    0   0   0   0   0
## CATU                                                   0   0    0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                  0   0    0   0   0   0   0
## CFXA6                                                  2   0    0   1   0   0   0
## CHLORAMPHENICOL_EXPORTER                               0   0    0   0   0   0   0
## CLASS_A                                                0   0    0   0   0   0   0
## CLBA                                                   0   0    0   0   0   0   0
## CMLA                                                   0   0    0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                      0   0    0   0   0   0   0
## DFRA12                                                 0   0    0   0   0   0   0
## DFRA17                                                 0   0    0   0   0   0   0
## DFRA21                                                 0   0    0   0   0   0   0
## DFRA3                                                  0   0    0   0   0   0   0
## DFRA5                                                  0   0    0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                               0   0    0   1   0   0   0
## EDEQ                                                   0   0    0   0   0   1   0
## EFRA                                                   0   0    0   0   0   0   0
## EFRB                                                   0   0    0   0   0   0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER         0   0    0   0   0   0   0
## ERM(42)                                                0   0    0   0   0   0   0
## ERMB                                                   0   0    0   0   0   0   0
## ERMF                                                   0   0    0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                                  0   0    0   0   0   0   0
## GADW                                                   0   0    0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                    0   0    0   0   0   0   0
## KDPE                                                   0   0    0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE               0   0    0   0   0   0   0
## LMRD                                                   0   0    0   0   0   0   0
## LNUA                                                   0   0    1   0   0   0   0
## LRFA                                                   0   0    0   0   0   0   0
## LSA                                                    0   0    0   0   1   0   0
## MARA                                                   0   0    0   0   0   0   0
## MARR                                                   0   0    0   0   0   0   0
## MCR-3                                                  0   0    0   0   0   0   0
## MECI                                                   0   0    0   0   0   0   0
## MEFA                                                   0   0    0   0   0   0   0
## MEPA                                                   0   0    0   0   0   0   0
## MEXL                                                   0   0    0   0   0   0   0
## MTRA                                                   0   0    0   0   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                              0   0    0   0   0   0   0
## NMCR                                                   0   0    0   0   0   0   0
## OMP36                                                  0   0    0   0   0   0   0
## OMPR                                                   0   0    0   0   0   1   0
## OPRA                                                   0   0    0   0   0   0   0
## PATA                                                   0   0    0   0   0   0   0
## PMRF                                                   0   0    0   0   0   0   0
```

```
## RAMA                                             0   0       0   0   0   0   0
## ROSA                                             0   0       0   0   0   0   0
## ROSB                                             0   0       0   0   0   0   0
## SDIA                                             0   0       0   0   0   0   0
## SUL1                                             0   0       0   0   0   0   0
## SUL3                                             0   0       0   0   0   0   0
## TEM                                              0   0       0   0   0   0   0
## TET34                                            0   0       0   0   0   0   0
## TET35                                            0   0       0   0   0   0   0
## TET40                                            0   0       0   0   0   0   0
## TETB(60)                                         0   0       0   0   0   0   0
## TETM                                             0   0       0   0   0   0   0
## TETO                                             0   0       0   0   0   0   0
## TETP                                             0   0       0   0   0   0   0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR       0   0       0   0   0   0   0
## UGD                                              0   0       0   0   0   0   0
## VANH                                             0   0       0   0   0   0   0
## VANR                                             0   0       1   1   0   0   1
## VANRI                                            0   0       0   0   0   0   0
## VANS                                             5   3       5   3   8   5   7
## VANTRL                                           0   0       0   0   0   0   0
## VANU                                             0   0       0   0   1   0   1
## VANY                                             0   0       1   0   0   0   0
## VANZ                                             0   0       0   0   0   0   0
## VATB                                             0   0       0   0   0   0   0
## VATE                                             0   0       0   0   0   0   0
## VGAC                                             0   0       0   0   0   0   0
## YKKD                                             0   0       0   0   0   0   0
##                                                C47 C48 C49 C5 C51 C54 C59 C65
## AADA                                             0   0   0   0   0   0   0   0
## ABES                                             0   0   0   0   0   0   0   0
## ACT                                              0   0   0   0   0   0   0   0
## ADEC                                             0   0   0   0   0   0   0   1
## ADES                                             0   0   0   0   0   0   0   0
## APH(3'')-III                                    0   0   0   0   0   0   0   0
## APH(3'')-I                                      0   0   0   0   0   0   0   0
## APH(6)-I                                         0   0   0   0   0   0   0   0
## BACA                                             0   0   0   0   0   0   0   0
## BCRA                                             1   0   0   0   0   1   0   0
## BLAI                                             0   0   0   0   0   0   0   0
## CATA                                             0   0   0   0   0   0   0   0
## CATD                                             0   0   0   0   0   0   0   0
## CATQ                                             0   0   0   0   0   0   0   0
## CATU                                             0   0   0   0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE            0   0   0   0   1   0   0   0
## CFXA6                                            0   0   0   0   0   0   0   0
## CHLORAMPHENICOL_EXPORTER                         0   0   0   0   0   0   0   0
## CLASS_A                                          0   0   0   0   0   0   0   0
## CLBA                                             0   0   0   0   0   0   0   0
## CMLA                                             0   0   0   0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                0   0   0   0   0   0   0   0
## DFRA12                                           0   0   0   0   0   0   0   0
## DFRA17                                           0   0   0   0   0   0   0   0
## DFRA21                                           0   0   0   0   0   0   0   0
```

```
## DFRA3                                                0  0  0  0  0  0  0  0
## DFRA5                                                0  0  0  0  0  0  0  0
## DNA-BINDING_PROTEIN_H-NS                             0  0  0  0  0  0  0  0
## EDEQ                                                 0  0  0  0  0  0  0  0
## EFRA                                                 0  0  0  0  0  0  0  0
## EFRB                                                 0  0  0  0  0  0  0  0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER       0  0  0  0  0  0  0  0
## ERM(42)                                              0  0  0  0  0  0  0  0
## ERMB                                                 0  0  0  0  0  0  0  0
## ERMF                                                 0  0  0  0  0  0  0  0
## ESCHERICHIA_COLI_MIPA                                0  0  0  0  0  0  0  0
## GADW                                                 0  0  0  1  0  0  0  0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                  0  0  0  0  0  0  0  0
## KDPE                                                 0  0  0  0  0  0  0  0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE             0  1  0  0  0  0  0  0
## LMRD                                                 0  0  0  0  0  0  0  0
## LNUA                                                 0  0  0  2  0  0  0  0
## LRFA                                                 0  0  0  0  0  0  0  0
## LSA                                                  0  0  0  0  0  0  0  0
## MARA                                                 0  0  0  0  0  0  0  0
## MARR                                                 0  0  0  0  0  0  0  0
## MCR-3                                                0  0  0  0  0  0  0  0
## MECI                                                 0  0  0  0  0  0  0  0
## MEFA                                                 0  0  0  0  0  0  0  0
## MEPA                                                 0  0  0  0  0  0  0  0
## MEXL                                                 0  0  0  0  0  0  0  0
## MTRA                                                 0  0  0  0  0  0  0  0
## MULTIDRUG_ABC_TRANSPORTER                            0  0  0  0  0  0  0  1
## NMCR                                                 0  0  0  0  0  0  0  0
## OMP36                                                0  0  0  1  0  0  0  0
## OMPR                                                 0  0  0  0  0  0  0  0
## OPRA                                                 0  0  0  0  0  0  0  0
## PATA                                                 0  0  0  0  0  0  0  0
## PMRF                                                 0  0  0  0  0  0  0  0
## RAMA                                                 0  0  0  0  0  0  0  0
## ROSA                                                 0  0  0  0  0  0  0  0
## ROSB                                                 0  0  0  0  0  0  0  0
## SDIA                                                 0  0  0  0  0  0  0  0
## SUL1                                                 0  0  0  0  0  0  0  0
## SUL3                                                 0  0  0  0  0  0  0  0
## TEM                                                  0  0  0  0  0  0  0  0
## TET34                                                0  0  0  0  0  0  0  0
## TET35                                                0  0  0  0  0  0  0  0
## TET40                                                0  0  0  0  0  0  0  0
## TETB(60)                                             0  0  0  0  0  0  0  0
## TETM                                                 0  0  0  0  0  0  0  0
## TETO                                                 0  0  0  0  0  0  0  0
## TETP                                                 0  1  0  0  0  0  0  0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR           1  0  0  0  0  0  0  0
## UGD                                                  0  0  0  0  0  0  0  0
## VANH                                                 0  0  0  0  0  0  0  0
## VANR                                                 0  0  0  0  0  0  0  0
## VANRI                                                0  0  0  0  0  0  0  0
## VANS                                                 6  2  2  8  4  7  2  8
```

```
## VANTRL                                                   0   0   0  0   0   0   0   0
## VANU                                                     0   0   0  0   0   0   0   0
## VANY                                                     0   0   0  0   0   0   0   0
## VANZ                                                     0   0   0  0   0   0   0   0
## VATB                                                     0   0   0  0   0   0   0   0
## VATE                                                     0   0   0  0   0   0   0   0
## VGAC                                                     0   0   0  0   0   0   0   0
## YKKD                                                     0   0   0  0   0   0   0   0
##                                                         C68 C69 C7 C70 C72 C74 C75 C76II
## AADA                                                     0   0   0  0   0   0   0   0
## ABES                                                     0   0   0  0   0   0   0   0
## ACT                                                      0   0   0  0   0   0   0   0
## ADEC                                                     0   0   0  0   0   0   0   0
## ADES                                                     0   0   0  0   0   0   0   0
## APH(3''')-III                                            0   0   0  0   0   0   0   0
## APH(3'')-I                                               0   0   0  0   0   0   0   0
## APH(6)-I                                                 0   0   0  0   0   0   0   0
## BACA                                                     0   0   0  0   0   0   0   0
## BCRA                                                     0   0   0  0   0   1   0   0
## BLAI                                                     0   0   0  0   0   0   0   0
## CATA                                                     0   0   0  0   0   0   0   0
## CATD                                                     0   0   0  0   0   0   0   0
## CATQ                                                     0   0   0  0   0   0   0   0
## CATU                                                     0   0   0  0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                    0   0   0  0   0   0   0   0
## CFXA6                                                    0   1   0  0   0   0   0   0
## CHLORAMPHENICOL_EXPORTER                                 0   0   0  0   0   0   0   0
## CLASS_A                                                  0   0   0  0   0   0   0   0
## CLBA                                                     0   0   0  0   0   0   0   0
## CMLA                                                     0   0   0  0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                        0   0   0  0   0   0   0   0
## DFRA12                                                   0   0   0  0   0   0   0   0
## DFRA17                                                   0   0   0  0   0   0   0   0
## DFRA21                                                   0   0   0  0   0   0   0   0
## DFRA3                                                    0   0   0  0   0   0   0   0
## DFRA5                                                    0   0   0  0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                                 0   0   0  0   0   0   0   0
## EDEQ                                                     0   0   0  0   0   0   0   0
## EFRA                                                     0   0   0  0   0   0   0   0
## EFRB                                                     0   0   0  1   0   0   0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER           0   0   0  0   0   0   0   1
## ERM(42)                                                  0   0   0  0   0   0   0   0
## ERMB                                                     0   0   0  0   0   0   0   0
## ERMF                                                     0   0   0  0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                                    0   0   0  0   0   0   0   0
## GADW                                                     0   0   0  0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                      0   0   0  0   0   0   0   0
## KDPE                                                     0   0   0  0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE                 0   0   1  0   0   0   1   0
## LMRD                                                     0   0   0  0   0   0   0   0
## LNUA                                                     0   0   1  0   0   0   0   1
## LRFA                                                     0   0   0  0   0   0   0   0
## LSA                                                      0   0   0  0   0   0   1   1
## MARA                                                     0   0   0  0   0   0   0   0
```

```
## MARR                                              0    0    0    0    0    0    0      0
## MCR-3                                             0    0    0    0    0    0    0      0
## MECI                                              0    0    0    0    0    0    0      0
## MEFA                                              0    0    0    0    0    0    0      0
## MEPA                                              0    0    0    0    0    0    0      0
## MEXL                                              0    0    0    0    0    0    0      0
## MTRA                                              0    0    0    0    0    0    0      0
## MULTIDRUG_ABC_TRANSPORTER                         0    0    0    0    0    0    0      0
## NMCR                                              0    0    0    0    0    0    0      0
## OMP36                                             0    0    0    0    0    0    0      0
## OMPR                                              1    0    0    0    0    0    0      0
## OPRA                                              0    0    0    0    0    0    0      0
## PATA                                              0    0    0    0    0    0    0      0
## PMRF                                              0    0    0    0    0    0    0      0
## RAMA                                              0    0    0    0    0    0    0      0
## ROSA                                              0    0    0    0    0    0    0      0
## ROSB                                              0    0    0    0    0    0    0      0
## SDIA                                              0    0    0    0    0    0    0      0
## SUL1                                              0    0    0    0    0    0    0      0
## SUL3                                              0    0    0    0    0    0    0      0
## TEM                                               0    0    0    0    0    0    0      0
## TET34                                             0    0    0    0    0    0    0      0
## TET35                                             0    0    0    0    0    0    0      0
## TET40                                             0    0    0    0    0    0    0      0
## TETB(60)                                          0    0    0    0    0    0    0      0
## TETM                                              0    0    0    0    0    0    0      0
## TETO                                              0    0    0    0    0    0    0      0
## TETP                                              0    0    0    0    0    0    0      0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR        0    0    1    0    1    0    0      0
## UGD                                               0    0    0    0    0    0    0      0
## VANH                                              0    0    0    0    0    0    0      0
## VANR                                              0    0    0    0    0    0    0      0
## VANRI                                             0    0    0    0    0    0    0      0
## VANS                                              9    4   10    8    6    2    5      7
## VANTRL                                            0    0    0    0    0    0    0      0
## VANU                                              0    0    0    0    0    0    0      1
## VANY                                              0    0    0    0    0    0    0      0
## VANZ                                              0    0    1    0    0    0    0      0
## VATB                                              0    0    0    0    0    0    0      0
## VATE                                              0    0    0    0    1    0    0      0
## VGAC                                              0    0    0    0    0    0    0      0
## YKKD                                              0    0    0    0    0    0    0      0
##                                                 C80 C82 C85 C86 C87 C88 C89 C9
## AADA                                              0    0    0    0    0    0    0  0
## ABES                                              0    0    0    0    0    0    1  0
## ACT                                               0    0    0    0    0    0    0  0
## ADEC                                              0    0    0    0    0    0    0  0
## ADES                                              0    0    0    0    0    0    0  0
## APH(3'')-III                                      0    0    0    0    0    0    0  0
## APH(3'')-I                                        0    0    0    0    0    0    0  0
## APH(6)-I                                          0    0    0    0    0    0    0  0
## BACA                                              0    0    0    0    0    0    0  0
## BCRA                                              0    0    0    0    0    0    1  0
## BLAI                                              0    0    0    0    0    0    0  0
```

```
## CATA                                              0   0   0   0   0   0   1   0
## CATD                                              0   0   0   0   0   0   0   0
## CATQ                                              0   0   0   0   0   0   0   0
## CATU                                              0   0   0   0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE             0   0   0   0   1   0   0   0
## CFXA6                                             0   0   0   0   0   0   0   0
## CHLORAMPHENICOL_EXPORTER                          0   0   0   0   0   0   0   0
## CLASS_A                                           0   0   0   0   0   0   0   0
## CLBA                                              0   0   0   0   0   0   0   0
## CMLA                                              0   0   0   0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                 0   0   0   0   0   0   0   0
## DFRA12                                            0   0   0   1   0   0   0   0
## DFRA17                                            0   0   0   0   0   0   1   0
## DFRA21                                            0   0   0   0   0   0   0   0
## DFRA3                                             0   0   0   0   0   0   0   0
## DFRA5                                             0   0   0   0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                          0   0   0   0   0   0   0   0
## EDEQ                                              0   0   0   0   1   0   0   0
## EFRA                                              0   0   0   0   0   0   0   0
## EFRB                                              0   0   0   0   0   0   1   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER    0   0   0   0   0   0   0   0
## ERM(42)                                           0   0   0   0   0   0   0   0
## ERMB                                              0   0   0   0   0   0   0   0
## ERMF                                              0   0   0   0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                             0   0   0   0   0   1   0   0
## GADW                                              0   0   0   0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA               0   0   0   0   0   0   0   0
## KDPE                                              0   0   0   0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE          0   0   0   0   0   0   0   0
## LMRD                                              0   0   0   0   0   0   0   0
## LNUA                                              0   0   0   0   0   0   0   0
## LRFA                                              0   0   0   0   0   0   0   0
## LSA                                               0   0   0   0   0   0   0   0
## MARA                                              0   0   0   0   0   1   0   0
## MARR                                              0   0   0   0   0   0   0   0
## MCR-3                                             0   0   0   0   0   0   0   1
## MECI                                              0   0   0   0   0   0   0   0
## MEFA                                              0   0   0   0   0   0   0   0
## MEPA                                              0   0   0   0   0   0   0   0
## MEXL                                              0   0   0   0   0   0   0   0
## MTRA                                              0   0   0   0   0   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                         0   0   0   0   0   0   0   0
## NMCR                                              0   0   0   0   0   0   0   0
## OMP36                                             0   0   0   0   0   0   0   0
## OMPR                                              0   0   0   0   0   0   0   0
## OPRA                                              0   0   0   0   0   0   0   0
## PATA                                              0   0   0   0   0   0   0   0
## PMRF                                              0   0   0   0   0   0   0   0
## RAMA                                              0   0   0   0   0   0   0   0
## ROSA                                              0   0   0   0   0   0   0   0
## ROSB                                              0   0   0   0   0   0   0   0
## SDIA                                              0   0   0   0   0   0   0   0
## SUL1                                              0   0   0   0   0   0   1   0
## SUL3                                              0   0   0   0   0   0   0   0
```

```
## TEM                                              0   0   0   0   0   0   1   0
## TET34                                            0   0   0   0   0   0   0   0
## TET35                                            0   0   0   0   0   0   0   0
## TET40                                            0   0   0   0   0   0   0   0
## TETB(60)                                          0   0   0   0   0   0   0   0
## TETM                                             0   0   0   0   0   0   0   0
## TETO                                             0   0   0   0   0   0   0   0
## TETP                                             0   0   0   0   0   0   0   0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR        0   0   0   0   0   1   0   0
## UGD                                              1   0   0   0   0   0   0   0
## VANH                                             0   0   0   0   0   0   0   0
## VANR                                             0   0   0   0   0   0   0   0
## VANRI                                            0   0   0   0   0   0   0   0
## VANS                                             5   3   1   2   5   7   1   8
## VANTRL                                           0   0   0   0   0   0   0   0
## VANU                                             0   0   0   0   0   0   0   0
## VANY                                             0   0   0   0   0   0   0   0
## VANZ                                             1   0   0   0   0   0   1   0
## VATB                                             0   0   0   0   0   0   0   0
## VATE                                             0   0   0   0   0   0   0   0
## VGAC                                             0   0   0   1   0   0   1   0
## YKKD                                             0   0   0   0   0   0   0   1
##                                                 C90 C95 C96 C98 P100 P103
## AADA                                             0   1   0   0   0    2
## ABES                                             0   0   0   0   0    1
## ACT                                              0   0   0   0   0    0
## ADEC                                             0   0   0   0   0    0
## ADES                                             0   0   0   0   0    0
## APH(3'')-III                                     0   0   0   0   0    0
## APH(3'')-I                                       0   0   0   0   0    0
## APH(6)-I                                         0   0   0   0   0    0
## BACA                                             0   0   0   0   0    0
## BCRA                                             0   0   0   0   0    0
## BLAI                                             0   0   0   0   0    0
## CATA                                             0   0   0   0   0    0
## CATD                                             0   0   0   0   0    0
## CATQ                                             0   0   0   0   0    0
## CATU                                             0   0   0   0   0    0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE            0   0   0   0   0    0
## CFXA6                                            0   0   0   0   0    0
## CHLORAMPHENICOL_EXPORTER                         0   0   0   0   0    0
## CLASS_A                                          0   0   0   0   0    0
## CLBA                                             0   0   0   0   0    0
## CMLA                                             0   0   0   0   0    1
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                0   0   0   0   0    0
## DFRA12                                           0   0   0   0   0    0
## DFRA17                                           0   0   0   0   0    0
## DFRA21                                           0   0   0   0   0    0
## DFRA3                                            0   1   0   0   0    0
## DFRA5                                            0   0   0   0   0    0
## DNA-BINDING_PROTEIN_H-NS                         0   0   0   0   0    1
## EDEQ                                             0   0   0   0   0    0
## EFRA                                             0   0   0   0   0    0
## EFRB                                             0   0   0   0   0    0
```

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```
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER    0    0    0    0    0    0
## ERM(42)                                           0    0    0    0    0    0
## ERMB                                              0    0    0    0    0    0
## ERMF                                              0    0    0    0    0    0
## ESCHERICHIA_COLI_MIPA                             0    0    0    0    0    0
## GADW                                              0    0    0    0    0    0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA               0    0    0    0    0    0
## KDPE                                              0    0    0    0    0    0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE          0    0    0    0    0    0
## LMRD                                              0    0    0    0    0    0
## LNUA                                              0    0    0    0    0    0
## LRFA                                              0    0    0    0    0    0
## LSA                                               0    0    0    0    0    0
## MARA                                              0    0    0    0    0    0
## MARR                                              0    0    0    0    0    0
## MCR-3                                             0    0    0    0    0    0
## MECI                                              0    0    0    0    0    0
## MEFA                                              0    0    0    0    0    0
## MEPA                                              1    0    0    0    0    0
## MEXL                                              0    0    0    0    0    0
## MTRA                                              0    0    0    0    0    0
## MULTIDRUG_ABC_TRANSPORTER                         0    0    0    0    0    0
## NMCR                                              0    0    0    0    0    0
## OMP36                                             0    0    0    0    0    0
## OMPR                                              0    0    0    0    0    0
## OPRA                                              0    0    0    0    0    0
## PATA                                              0    0    0    0    0    0
## PMRF                                              0    0    1    0    0    0
## RAMA                                              0    0    0    0    0    0
## ROSA                                              0    0    0    0    0    0
## ROSB                                              0    0    0    0    0    0
## SDIA                                              0    0    0    0    0    0
## SUL1                                              0    0    0    0    0    0
## SUL3                                              0    0    0    0    0    1
## TEM                                               0    0    0    0    0    0
## TET34                                             0    0    0    0    0    0
## TET35                                             0    0    0    0    0    0
## TET40                                             0    0    0    0    0    0
## TETB(60)                                          0    0    0    0    0    0
## TETM                                              0    0    0    0    0    0
## TETO                                              0    0    0    0    0    0
## TETP                                              0    0    0    0    0    0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR        0    0    0    0    0    0
## UGD                                               0    0    0    0    0    0
## VANH                                              0    0    1    0    0    0
## VANR                                              0    0    0    0    0    0
## VANRI                                             0    0    0    0    0    0
## VANS                                             10    4    8    2    0    2
## VANTRL                                            0    0    0    0    0    0
## VANU                                              0    0    0    0    0    0
## VANY                                              1    0    0    0    0    0
## VANZ                                              0    1    0    0    0    0
## VATB                                              0    0    0    0    0    0
## VATE                                              0    0    0    0    0    0
```

```
## VGAC                                                  0    0    0    0     0    0
## YKKD                                                  0    0    0    0     0    0
##                                                  P104IIP P105 P107 P10old P114
## AADA                                                  0    0    0    0     0
## ABES                                                  0    0    0    0     0
## ACT                                                   0    0    0    0     0
## ADEC                                                  0    0    0    0     0
## ADES                                                  0    0    0    0     0
## APH(3'')-III                                          0    0    0    0     0
## APH(3'')-I                                            0    0    0    0     0
## APH(6)-I                                              0    0    0    0     0
## BACA                                                  0    0    0    0     0
## BCRA                                                  0    0    0    0     0
## BLAI                                                  0    0    0    0     0
## CATA                                                  0    0    0    0     0
## CATD                                                  0    0    0    0     0
## CATQ                                                  0    0    0    0     0
## CATU                                                  0    0    0    0     0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                 1    0    0    0     0
## CFXA6                                                 0    0    0    0     0
## CHLORAMPHENICOL_EXPORTER                              0    0    0    0     0
## CLASS_A                                               0    0    1    0     0
## CLBA                                                  0    0    0    0     0
## CMLA                                                  0    0    0    0     0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                     1    0    0    0     0
## DFRA12                                                0    0    0    0     0
## DFRA17                                                0    0    0    0     0
## DFRA21                                                0    0    0    0     0
## DFRA3                                                 0    0    0    0     0
## DFRA5                                                 0    0    0    0     0
## DNA-BINDING_PROTEIN_H-NS                              0    0    0    0     0
## EDEQ                                                  0    0    0    0     0
## EFRA                                                  0    0    0    0     0
## EFRB                                                  0    0    0    0     0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER        0    0    0    0     0
## ERM(42)                                               0    0    0    0     0
## ERMB                                                  1    0    0    0     0
## ERMF                                                  0    0    0    0     0
## ESCHERICHIA_COLI_MIPA                                 0    0    0    0     0
## GADW                                                  0    0    0    0     0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                   0    0    0    0     0
## KDPE                                                  0    0    0    0     0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE              0    0    1    0     0
## LMRD                                                  0    0    0    0     0
## LNUA                                                  0    0    0    0     0
## LRFA                                                  0    0    0    0     0
## LSA                                                   0    0    0    0     0
## MARA                                                  0    0    0    0     0
## MARR                                                  0    0    0    0     0
## MCR-3                                                 0    0    0    0     0
## MECI                                                  0    0    0    0     0
## MEFA                                                  0    0    0    0     0
## MEPA                                                  0    0    0    0     0
## MEXL                                                  0    0    0    0     0
```

```
## MTRA                                                 0    0    0      0      0
## MULTIDRUG_ABC_TRANSPORTER                            0    0    1      0      0
## NMCR                                                 0    0    0      0      0
## OMP36                                                0    0    0      0      0
## OMPR                                                 0    0    0      0      0
## OPRA                                                 0    0    0      0      0
## PATA                                                 0    0    0      0      0
## PMRF                                                 0    0    0      0      0
## RAMA                                                 1    0    0      0      0
## ROSA                                                 0    0    0      0      0
## ROSB                                                 0    0    0      0      0
## SDIA                                                 0    0    0      0      0
## SUL1                                                 0    0    0      0      0
## SUL3                                                 0    0    0      0      0
## TEM                                                  0    0    0      0      0
## TET34                                                0    0    0      0      0
## TET35                                                0    1    0      0      0
## TET40                                                0    0    0      0      0
## TETB(60)                                             0    0    0      0      0
## TETM                                                 0    0    0      0      0
## TETO                                                 0    0    0      0      0
## TETP                                                 0    0    0      0      0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR           0    0    0      0      0
## UGD                                                  0    0    0      0      0
## VANH                                                 0    0    0      0      0
## VANR                                                 0    0    0      0      0
## VANRI                                                0    0    0      0      0
## VANS                                                 7    1    4      6      0
## VANTRL                                               0    0    0      0      0
## VANU                                                 0    0    0      0      0
## VANY                                                 0    0    0      0      0
## VANZ                                                 1    0    0      0      0
## VATB                                                 0    0    0      1      0
## VATE                                                 0    0    0      0      0
## VGAC                                                 0    0    0      0      0
## YKKD                                                 0    0    0      0      0
##                                               P115 P116 P118 P119 P11old P12
## AADA                                             0    0    0    0      0   0
## ABES                                             0    0    0    0      0   0
## ACT                                              0    0    0    0      0   0
## ADEC                                             0    0    0    0      0   0
## ADES                                             0    0    0    0      0   0
## APH(3'')-III                                     0    0    0    0      0   0
## APH(3'')-I                                       0    0    0    0      0   0
## APH(6)-I                                         0    0    0    0      0   0
## BACA                                             0    0    0    0      0   0
## BCRA                                             0    0    0    1      1   0
## BLAI                                             0    0    0    0      0   0
## CATA                                             0    0    0    0      0   0
## CATD                                             0    0    0    0      0   0
## CATQ                                             0    0    0    0      0   0
## CATU                                             0    0    0    0      0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE            1    0    0    1      0   0
## CFXA6                                            2    0    0    0      0   0
```

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```
## CHLORAMPHENICOL_EXPORTER                             0   0   0   0   0   0
## CLASS_A                                              0   0   0   0   0   1
## CLBA                                                 0   0   0   0   0   0
## CMLA                                                 0   0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                    0   0   0   0   1   0
## DFRA12                                               0   0   0   0   0   0
## DFRA17                                               0   0   0   0   0   0
## DFRA21                                               0   0   0   0   0   0
## DFRA3                                                0   0   0   0   0   0
## DFRA5                                                0   0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                             0   0   0   0   0   0
## EDEQ                                                 0   0   0   0   0   0
## EFRA                                                 0   0   0   0   0   0
## EFRB                                                 0   0   0   0   0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER       0   0   0   0   0   0
## ERM(42)                                              0   0   0   0   0   0
## ERMB                                                 0   0   0   0   0   1
## ERMF                                                 0   0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                                0   0   0   0   0   0
## GADW                                                 0   0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                  0   0   0   0   0   0
## KDPE                                                 0   0   0   0   0   1
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE             0   0   0   0   0   0
## LMRD                                                 0   0   0   0   0   0
## LNUA                                                 0   1   0   0   0   0
## LRFA                                                 0   0   0   0   0   0
## LSA                                                  0   1   0   0   0   0
## MARA                                                 0   0   0   0   0   0
## MARR                                                 0   0   0   0   0   0
## MCR-3                                                0   0   0   0   0   0
## MECI                                                 0   0   0   0   0   0
## MEFA                                                 0   0   0   0   0   0
## MEPA                                                 0   0   1   0   0   0
## MEXL                                                 0   0   0   0   0   0
## MTRA                                                 0   0   0   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                            0   0   0   0   0   0
## NMCR                                                 0   0   0   0   0   0
## OMP36                                                0   0   0   0   0   0
## OMPR                                                 0   0   0   0   0   0
## OPRA                                                 0   0   0   0   0   0
## PATA                                                 0   0   0   0   0   0
## PMRF                                                 0   0   0   0   0   0
## RAMA                                                 0   0   0   0   0   0
## ROSA                                                 1   0   0   0   0   0
## ROSB                                                 0   0   0   0   0   0
## SDIA                                                 0   0   0   0   0   0
## SUL1                                                 0   0   0   0   0   0
## SUL3                                                 0   0   0   0   0   0
## TEM                                                  0   0   0   0   0   0
## TET34                                                0   0   0   0   0   0
## TET35                                                0   0   0   0   0   0
## TET40                                                0   0   0   0   0   0
## TETB(60)                                             0   0   0   0   0   0
## TETM                                                 0   0   0   0   0   0
```

## TETO	0	0	0	0	0	0
## TETP	0	0	0	0	0	0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR	0	0	0	0	0	0
## UGD	0	0	0	0	0	0
## VANH	0	0	0	0	0	0
## VANR	0	0	0	0	0	0
## VANRI	0	0	0	0	0	0
## VANS	3	6	2	4	1	2
## VANTRL	0	0	0	0	0	0
## VANU	0	0	0	0	0	1
## VANY	0	0	0	0	0	0
## VANZ	0	0	0	0	0	0
## VATB	0	0	0	0	0	0
## VATE	0	0	0	0	0	0
## VGAC	0	0	0	0	0	0
## YKKD	0	0	0	0	0	0

##	P120	P14	P15	P16	P17	P18	P19	P20
## AADA	0	0	0	0	0	0	0	0
## ABES	0	0	0	0	0	0	0	0
## ACT	0	0	0	0	0	0	0	0
## ADEC	0	0	0	0	0	0	0	0
## ADES	0	0	0	0	0	0	0	0
## APH(3'')-III	0	0	0	0	0	0	0	0
## APH(3'')-I	0	0	0	0	0	0	0	0
## APH(6)-I	0	0	0	0	0	0	0	0
## BACA	0	0	0	0	0	0	0	0
## BCRA	0	0	0	0	0	0	0	0
## BLAI	0	0	0	0	0	0	0	0
## CATA	0	0	0	0	0	0	0	0
## CATD	0	0	0	0	0	0	0	0
## CATQ	0	0	0	0	0	0	0	0
## CATU	0	0	0	0	0	0	0	0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE	0	0	0	0	0	1	1	0
## CFXA6	0	0	0	0	0	1	0	0
## CHLORAMPHENICOL_EXPORTER	0	0	0	0	0	0	0	0
## CLASS_A	0	0	0	0	0	0	0	0
## CLBA	0	0	0	0	0	0	0	0
## CMLA	0	0	0	0	0	0	0	0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE	0	0	0	0	0	0	0	0
## DFRA12	0	0	0	0	0	0	0	0
## DFRA17	0	0	0	0	0	0	0	0
## DFRA21	0	0	0	0	0	0	0	0
## DFRA3	0	0	0	0	0	0	0	0
## DFRA5	0	0	0	0	0	0	0	0
## DNA-BINDING_PROTEIN_H-NS	0	0	0	1	0	0	0	0
## EDEQ	0	0	0	0	0	0	0	0
## EFRA	0	0	0	0	0	0	0	0
## EFRB	0	0	0	0	0	0	0	0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER	0	0	0	0	0	0	0	0
## ERM(42)	0	0	0	0	0	0	0	0
## ERMB	0	0	0	0	0	0	0	0
## ERMF	0	0	0	0	0	0	0	0
## ESCHERICHIA_COLI_MIPA	0	0	0	0	0	0	0	0
## GADW	0	0	0	0	0	0	0	0

```
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                     0    0    0    0    0    0    0    0
## KDPE                                                    0    0    0    0    0    0    0    0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE                0    0    0    0    0    0    0    0
## LMRD                                                    0    0    0    0    0    0    0    0
## LNUA                                                    0    0    0    0    0    1    0    0
## LRFA                                                    0    0    0    0    0    0    0    0
## LSA                                                     0    0    0    0    0    0    0    0
## MARA                                                    0    0    0    0    0    0    0    0
## MARR                                                    0    0    0    0    0    0    0    0
## MCR-3                                                   0    0    0    0    0    0    0    0
## MECI                                                    0    0    0    0    0    0    0    0
## MEFA                                                    0    0    0    0    0    0    0    0
## MEPA                                                    0    0    0    0    0    1    0    0
## MEXL                                                    0    0    0    0    0    0    0    0
## MTRA                                                    0    0    0    0    0    0    0    0
## MULTIDRUG_ABC_TRANSPORTER                               0    1    0    0    0    0    0    0
## NMCR                                                    0    0    0    0    0    0    0    0
## OMP36                                                   0    0    0    0    0    0    0    0
## OMPR                                                    0    0    0    0    0    0    0    0
## OPRA                                                    0    0    0    0    0    0    0    0
## PATA                                                    0    0    0    0    0    0    0    0
## PMRF                                                    0    0    0    0    0    0    0    0
## RAMA                                                    0    0    0    0    0    0    0    0
## ROSA                                                    0    0    0    0    0    0    0    0
## ROSB                                                    0    0    0    0    0    0    0    0
## SDIA                                                    0    0    0    0    0    0    0    0
## SUL1                                                    0    0    0    0    0    0    0    0
## SUL3                                                    0    0    0    0    0    0    0    0
## TEM                                                     0    0    0    0    0    0    0    0
## TET34                                                   0    0    0    0    0    0    0    0
## TET35                                                   0    0    0    0    0    0    0    0
## TET40                                                   0    0    0    0    0    0    0    0
## TETB(60)                                                0    0    0    0    0    0    0    0
## TETM                                                    0    0    0    0    0    0    0    0
## TETO                                                    0    0    0    0    0    0    0    0
## TETP                                                    0    0    0    0    0    0    0    0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR              0    0    0    0    0    0    0    0
## UGD                                                     0    0    0    0    0    0    0    0
## VANH                                                    0    1    0    0    0    0    0    0
## VANR                                                    0    0    0    0    0    0    0    0
## VANRI                                                   0    0    0    0    0    0    0    0
## VANS                                                    2    5    3    4    2    5    3    1
## VANTRL                                                  0    0    0    0    0    0    0    0
## VANU                                                    0    0    0    0    0    0    0    0
## VANY                                                    0    0    0    0    0    0    0    0
## VANZ                                                    0    0    0    0    0    0    0    0
## VATB                                                    0    0    0    0    0    0    0    0
## VATE                                                    0    0    0    0    0    0    0    0
## VGAC                                                    0    0    0    1    0    0    0    0
## YKKD                                                    0    0    0    0    0    0    0    0
##                                                       P24 P26 P28 P31 P34 P37 P38 P4
## AADA                                                    0    0    0    0    0    0    0  0
## ABES                                                    0    0    0    0    0    0    0  0
## ACT                                                     0    0    0    0    0    0    0  0
```

```
## ADEC                                                 0   0   0   0   0   0   0   0
## ADES                                                 0   0   0   0   0   0   0   0
## APH(3''')-III                                        0   0   0   0   0   0   0   0
## APH(3'')-I                                           0   0   0   0   0   0   0   0
## APH(6)-I                                             0   0   0   0   0   0   0   0
## BACA                                                 0   0   0   0   0   0   0   0
## BCRA                                                 0   0   0   0   1   0   0   0
## BLAI                                                 0   0   0   0   0   0   0   0
## CATA                                                 0   0   0   0   0   0   0   0
## CATD                                                 0   0   0   0   0   0   0   1
## CATQ                                                 0   0   0   0   0   0   0   0
## CATU                                                 0   0   0   0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                0   0   0   0   0   0   0   1
## CFXA6                                                0   0   0   0   0   0   0   1
## CHLORAMPHENICOL_EXPORTER                             0   0   0   0   0   0   0   0
## CLASS_A                                              0   0   0   0   0   0   0   0
## CLBA                                                 1   0   0   0   0   0   0   0
## CMLA                                                 0   0   0   0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                    0   0   0   0   0   0   0   0
## DFRA12                                               0   0   0   0   0   0   0   0
## DFRA17                                               0   0   0   0   0   0   0   0
## DFRA21                                               0   0   0   0   0   0   0   0
## DFRA3                                                0   0   0   0   0   0   0   0
## DFRA5                                                0   0   0   0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                             0   0   0   0   0   0   0   0
## EDEQ                                                 0   0   0   0   0   0   0   0
## EFRA                                                 0   0   0   0   0   0   0   0
## EFRB                                                 0   0   0   0   0   0   0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER       0   0   0   0   0   0   0   0
## ERM(42)                                              0   0   0   0   0   0   0   0
## ERMB                                                 0   0   0   0   0   0   0   0
## ERMF                                                 0   0   0   0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                                0   0   0   0   0   0   0   0
## GADW                                                 0   0   0   0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                  0   0   0   0   0   0   0   0
## KDPE                                                 0   0   0   0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE             0   0   0   0   0   0   0   1
## LMRD                                                 0   0   0   0   0   0   0   0
## LNUA                                                 0   0   0   0   0   0   0   0
## LRFA                                                 0   0   0   0   0   0   0   0
## LSA                                                  0   0   0   0   0   0   0   0
## MARA                                                 0   0   0   0   0   0   0   0
## MARR                                                 0   0   0   0   0   0   0   0
## MCR-3                                                0   0   0   0   0   0   0   0
## MECI                                                 0   0   0   0   0   0   0   0
## MEFA                                                 0   0   0   0   0   0   0   0
## MEPA                                                 0   0   0   0   0   0   0   0
## MEXL                                                 0   0   0   0   0   0   0   0
## MTRA                                                 0   0   0   0   0   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                            0   0   0   0   0   0   0   0
## NMCR                                                 0   0   0   0   0   0   0   0
## OMP36                                                0   0   0   0   0   0   0   0
## OMPR                                                 0   0   0   0   0   0   0   0
## OPRA                                                 0   0   0   0   0   0   0   0
```

```
## PATA                                                    0   0   0   0   0   0   0   0
## PMRF                                                    0   0   0   0   0   0   0   0
## RAMA                                                    0   0   0   0   0   0   0   0
## ROSA                                                    0   0   0   0   0   0   0   0
## ROSB                                                    0   0   0   0   0   0   0   0
## SDIA                                                    0   0   0   0   0   0   0   0
## SUL1                                                    0   0   0   0   0   0   0   0
## SUL3                                                    0   0   0   0   0   0   0   0
## TEM                                                     0   0   0   0   0   0   0   0
## TET34                                                   0   0   0   0   0   0   0   0
## TET35                                                   0   0   0   0   0   0   0   0
## TET40                                                   0   0   0   0   0   0   0   0
## TETB(60)                                                0   0   0   0   0   0   0   0
## TETM                                                    0   0   0   0   0   0   0   0
## TETO                                                    0   0   0   0   0   0   0   0
## TETP                                                    0   0   0   0   0   0   0   0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR              0   0   0   0   0   0   0   0
## UGD                                                     0   0   0   0   0   0   0   0
## VANH                                                    0   0   0   0   0   0   0   0
## VANR                                                    0   0   0   0   0   0   0   0
## VANRI                                                   0   0   0   0   0   0   0   0
## VANS                                                    2   0   4   1   6   0   3   6
## VANTRL                                                  0   0   0   0   0   0   0   0
## VANU                                                    0   0   0   0   1   0   0   0
## VANY                                                    0   0   0   0   0   0   0   0
## VANZ                                                    0   0   0   0   0   0   0   0
## VATB                                                    0   0   0   0   0   0   0   0
## VATE                                                    0   0   0   0   0   0   0   0
## VGAC                                                    0   0   0   0   0   0   0   0
## YKKD                                                    0   0   0   0   0   0   0   0
##                                                       P42 P43 P45 P46 P47 P48 P5 P50
## AADA                                                    0   0   0   0   0   0   0   0
## ABES                                                    0   0   0   0   0   0   0   0
## ACT                                                     0   0   0   0   0   0   0   0
## ADEC                                                    0   0   0   0   0   0   0   0
## ADES                                                    0   0   0   0   0   0   0   0
## APH(3'')-III                                            0   0   0   0   0   0   0   0
## APH(3'')-I                                              0   0   0   0   0   0   0   0
## APH(6)-I                                                0   0   0   0   0   0   0   0
## BACA                                                    0   0   0   0   0   0   0   0
## BCRA                                                    0   0   0   0   0   0   0   0
## BLAI                                                    0   0   0   0   0   0   0   0
## CATA                                                    0   0   0   0   0   0   0   0
## CATD                                                    0   0   0   0   0   0   0   0
## CATQ                                                    0   1   0   0   0   0   0   0
## CATU                                                    0   0   0   0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE                   1   0   0   0   0   0   0   0
## CFXA6                                                   0   0   0   0   0   0   0   1
## CHLORAMPHENICOL_EXPORTER                                0   0   0   0   0   0   0   0
## CLASS_A                                                 0   0   0   0   0   0   0   0
## CLBA                                                    0   0   0   0   0   0   0   0
## CMLA                                                    0   0   0   0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                       0   0   0   0   0   0   0   0
## DFRA12                                                  0   0   0   0   0   0   0   0
```

```
## DFRA17                                             0   0   0   0   0   0   0   0
## DFRA21                                             0   0   0   0   0   0   0   0
## DFRA3                                              0   0   0   0   0   0   0   0
## DFRA5                                              0   1   0   0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                           0   0   0   0   0   1   1   0
## EDEQ                                               0   0   0   0   0   0   0   0
## EFRA                                               0   0   0   0   0   0   0   0
## EFRB                                               0   0   0   0   0   0   0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER     0   0   0   0   0   0   0   0
## ERM(42)                                            0   0   0   0   0   0   0   0
## ERMB                                               0   0   0   0   0   0   0   0
## ERMF                                               0   0   0   0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                              0   0   0   0   0   0   0   0
## GADW                                               0   0   0   0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                0   0   0   0   0   0   0   0
## KDPE                                               0   0   0   0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE           0   0   0   0   0   0   0   0
## LMRD                                               0   0   0   0   0   0   0   0
## LNUA                                               0   0   0   0   0   0   0   0
## LRFA                                               0   0   0   0   0   0   0   0
## LSA                                                0   0   0   0   0   0   0   0
## MARA                                               0   0   0   0   0   0   0   0
## MARR                                               0   0   0   0   0   0   0   0
## MCR-3                                              0   0   0   0   0   0   0   0
## MECI                                               0   0   0   0   0   0   0   1
## MEFA                                               0   0   0   0   0   0   0   0
## MEPA                                               0   0   0   0   0   0   0   0
## MEXL                                               0   0   0   0   0   0   0   0
## MTRA                                               0   0   0   0   0   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                          0   1   0   0   0   0   0   0
## NMCR                                               0   0   0   0   0   0   0   0
## OMP36                                              0   0   0   0   0   0   0   0
## OMPR                                               0   0   0   0   0   0   0   0
## OPRA                                               0   0   0   0   0   0   0   0
## PATA                                               0   0   0   0   0   0   0   0
## PMRF                                               0   0   0   0   0   0   0   0
## RAMA                                               0   0   0   0   0   0   0   0
## ROSA                                               0   0   0   0   0   0   0   0
## ROSB                                               0   0   0   0   0   0   0   0
## SDIA                                               0   0   0   0   0   0   0   0
## SUL1                                               0   0   0   0   0   0   0   0
## SUL3                                               0   0   0   0   0   0   0   0
## TEM                                                0   0   0   0   0   0   0   0
## TET34                                              0   0   0   0   0   0   0   0
## TET35                                              0   0   0   0   0   0   0   0
## TET40                                              0   0   0   0   0   0   0   0
## TETB(60)                                           0   0   0   0   0   0   0   0
## TETM                                               0   0   0   0   0   0   0   0
## TETO                                               0   0   0   0   0   0   0   0
## TETP                                               0   0   0   0   0   0   0   0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR         0   0   0   1   0   0   0   0
## UGD                                                0   0   0   0   0   0   0   0
## VANH                                               0   0   0   0   0   0   0   0
## VANR                                               0   1   0   0   0   1   0   0
```

```
## VANRI                                              0   0   0   0   0   0   0   0
## VANS                                              11   7   4   6   5   6   4   5
## VANTRL                                             0   0   0   0   0   0   0   0
## VANU                                               0   0   0   0   0   0   0   0
## VANY                                               0   0   0   0   1   0   0   0
## VANZ                                               0   0   0   0   0   0   2   0
## VATB                                               0   0   0   0   0   0   0   0
## VATE                                               0   0   0   0   0   0   0   0
## VGAC                                               0   0   0   0   0   0   0   0
## YKKD                                               0   0   0   0   0   0   0   0
##                                                   P51 P52 P53 P56 P57 P58 P59 P60
## AADA                                               0   0   0   0   0   0   0   0
## ABES                                               0   0   0   0   0   0   0   0
## ACT                                                0   0   0   1   0   0   0   0
## ADEC                                               0   0   0   0   0   0   0   0
## ADES                                               0   0   0   0   1   1   0   0
## APH(3'')-III                                       0   0   0   0   0   0   0   0
## APH(3'')-I                                         0   0   0   0   0   1   0   0
## APH(6)-I                                           0   0   0   0   0   1   0   0
## BACA                                               0   0   0   0   0   0   0   0
## BCRA                                               0   0   0   0   0   0   0   0
## BLAI                                               0   1   0   0   0   0   0   0
## CATA                                               0   0   0   0   0   0   0   0
## CATD                                               0   0   0   0   0   0   0   0
## CATQ                                               0   0   0   0   0   0   0   0
## CATU                                               0   1   0   0   0   0   0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE              0   0   0   0   0   1   1   0
## CFXA6                                              0   0   0   0   0   0   0   0
## CHLORAMPHENICOL_EXPORTER                           0   0   0   0   0   0   0   0
## CLASS_A                                            0   0   0   0   0   0   0   0
## CLBA                                               0   0   0   0   0   0   0   0
## CMLA                                               0   0   0   0   0   0   0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                  0   1   0   0   0   0   0   0
## DFRA12                                             0   0   0   1   0   0   0   0
## DFRA17                                             0   0   0   0   0   0   0   0
## DFRA21                                             0   0   0   0   0   1   0   0
## DFRA3                                              0   0   0   0   0   0   0   0
## DFRA5                                              0   0   0   0   0   0   0   0
## DNA-BINDING_PROTEIN_H-NS                           0   0   0   0   0   1   0   0
## EDEQ                                               0   0   0   0   0   0   0   0
## EFRA                                               0   0   0   0   0   0   0   0
## EFRB                                               0   0   0   0   0   0   1   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER     0   0   0   0   0   0   0   0
## ERM(42)                                            0   0   0   0   0   0   0   0
## ERMB                                               0   0   0   0   0   0   1   0
## ERMF                                               0   0   0   0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                              0   0   0   0   0   0   0   0
## GADW                                               0   0   1   0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                0   0   0   0   0   0   0   0
## KDPE                                               0   0   0   0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE           0   0   0   0   0   0   0   0
## LMRD                                               0   0   0   0   0   0   0   0
## LNUA                                               0   0   0   0   0   0   0   1
## LRFA                                               0   0   0   0   0   0   0   0
```

```
## LSA                                             0    0    0    0    0    0    0    0
## MARA                                            0    0    0    0    0    0    0    0
## MARR                                            0    0    0    0    0    1    0    0
## MCR-3                                           0    0    0    0    0    0    0    0
## MECI                                            0    0    0    0    0    0    0    0
## MEFA                                            0    0    0    0    0    0    0    0
## MEPA                                            0    0    0    0    0    0    0    0
## MEXL                                            0    0    0    0    0    1    0    0
## MTRA                                            0    0    0    0    0    0    0    0
## MULTIDRUG_ABC_TRANSPORTER                       0    0    0    1    0    0    0    0
## NMCR                                            0    0    0    1    0    0    0    0
## OMP36                                           0    0    0    0    0    0    0    0
## OMPR                                            0    0    0    0    0    0    0    0
## OPRA                                            0    0    0    0    0    1    0    0
## PATA                                            0    0    0    0    0    0    0    0
## PMRF                                            0    0    0    0    0    0    0    0
## RAMA                                            0    0    0    0    0    0    0    0
## ROSA                                            0    0    0    0    0    0    0    0
## ROSB                                            0    0    0    0    0    1    0    0
## SDIA                                            0    0    0    0    1    0    0    0
## SUL1                                            0    0    0    0    0    0    0    0
## SUL3                                            0    0    0    0    0    0    0    0
## TEM                                             0    0    0    0    0    0    0    0
## TET34                                           0    0    0    0    1    0    0    1
## TET35                                           0    0    0    0    0    0    0    0
## TET40                                           0    0    0    0    0    0    0    0
## TETB(60)                                        0    1    0    0    0    0    0    0
## TETM                                            0    1    0    0    0    0    0    0
## TETO                                            0    0    0    0    0    0    0    0
## TETP                                            0    0    0    0    0    1    0    0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR      0    0    0    0    0    0    0    1
## UGD                                             0    0    0    0    0    0    0    0
## VANH                                            0    0    0    0    2    0    0    0
## VANR                                            0    0    0    0    0    2    0    2
## VANRI                                           0    0    0    0    0    0    0    0
## VANS                                            1    7    4    3    7    3    1    5
## VANTRL                                          0    0    0    0    0    0    0    0
## VANU                                            0    0    0    0    0    0    0    0
## VANY                                            0    0    0    0    0    0    0    0
## VANZ                                            0    0    0    0    1    0    0    0
## VATB                                            0    0    0    0    0    0    0    0
## VATE                                            0    0    0    0    0    0    0    0
## VGAC                                            0    0    0    0    0    0    0    0
## YKKD                                            0    0    0    0    0    0    0    0
##                                               P61 P62P P63 P66 P67 P68 P69 P70
## AADA                                            0    0    0    0    0    0    0    0
## ABES                                            0    0    0    0    0    0    0    0
## ACT                                             0    0    0    0    0    0    0    0
## ADEC                                            0    0    0    0    0    0    0    0
## ADES                                            0    0    0    0    0    0    0    0
## APH(3'')-III                                    0    0    0    0    0    0    0    0
## APH(3'')-I                                      0    0    0    0    0    0    0    0
## APH(6)-I                                        0    0    0    0    0    0    0    0
## BACA                                            0    0    0    0    0    0    0    0
```

```
## BCRA                                              0    0    0    0    0    1    0    0
## BLAI                                              0    0    0    0    0    0    0    0
## CATA                                              0    0    0    0    0    0    0    0
## CATD                                              0    0    0    0    0    0    0    0
## CATQ                                              0    0    0    0    0    0    0    0
## CATU                                              0    0    0    0    0    0    0    0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE             0    0    0    0    0    0    0    0
## CFXA6                                             0    0    0    0    0    0    0    0
## CHLORAMPHENICOL_EXPORTER                          0    0    0    0    0    0    0    0
## CLASS_A                                           0    0    0    0    0    0    0    0
## CLBA                                              0    0    0    0    0    0    0    0
## CMLA                                              0    0    0    0    0    0    0    0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                 0    0    0    0    0    0    0    0
## DFRA12                                            0    0    0    0    0    0    0    0
## DFRA17                                            0    0    0    0    0    0    0    0
## DFRA21                                            0    0    0    0    0    0    0    0
## DFRA3                                             0    0    0    0    0    0    0    0
## DFRA5                                             0    0    0    0    0    0    0    0
## DNA-BINDING_PROTEIN_H-NS                          1    0    0    0    0    0    0    0
## EDEQ                                              0    0    0    0    0    0    0    0
## EFRA                                              0    0    0    0    0    0    0    0
## EFRB                                              0    0    0    0    0    0    0    0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER    0    0    0    0    0    0    0    0
## ERM(42)                                           0    0    0    0    0    0    0    0
## ERMB                                              0    0    0    0    0    0    0    0
## ERMF                                              0    0    0    0    0    0    0    0
## ESCHERICHIA_COLI_MIPA                             0    0    0    0    0    0    0    0
## GADW                                              0    0    0    0    0    0    0    0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA               0    0    0    0    0    0    0    0
## KDPE                                              0    0    0    0    0    0    0    0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE          0    0    1    0    0    0    0    0
## LMRD                                              0    0    0    0    0    0    0    0
## LNUA                                              0    0    0    0    0    0    0    0
## LRFA                                              0    0    0    0    0    0    0    0
## LSA                                               0    0    0    0    1    0    0    0
## MARA                                              0    0    0    0    0    0    0    0
## MARR                                              0    0    0    0    0    0    0    0
## MCR-3                                             0    0    0    0    0    0    0    0
## MECI                                              0    0    0    0    0    0    0    0
## MEFA                                              0    1    0    0    0    0    0    0
## MEPA                                              0    0    0    0    0    0    0    0
## MEXL                                              0    0    0    0    0    0    0    0
## MTRA                                              0    0    0    0    0    0    0    0
## MULTIDRUG_ABC_TRANSPORTER                         0    0    0    0    0    0    0    0
## NMCR                                              0    0    0    0    0    0    0    0
## OMP36                                             0    0    0    0    0    0    0    0
## OMPR                                              0    0    0    0    0    0    0    0
## OPRA                                              0    0    0    0    0    0    0    0
## PATA                                              0    0    0    0    0    0    0    0
## PMRF                                              0    0    0    0    0    0    0    0
## RAMA                                              0    0    0    0    0    0    0    0
## ROSA                                              0    0    0    0    0    0    0    0
## ROSB                                              0    0    0    0    0    0    0    0
## SDIA                                              0    0    0    0    0    0    0    0
```

```
## SUL1                                            0    0    0    0    0    0    0    0
## SUL3                                            0    0    0    0    0    0    0    0
## TEM                                             0    0    0    0    0    0    0    0
## TET34                                           0    0    0    0    0    0    0    0
## TET35                                           0    0    0    0    0    0    0    0
## TET40                                           0    0    0    0    0    0    0    0
## TETB(60)                                        0    0    0    0    0    0    0    0
## TETM                                            0    0    0    0    0    0    0    0
## TETO                                            0    0    0    0    0    0    0    0
## TETP                                            0    0    0    0    0    0    0    0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR      0    0    0    0    0    0    1    0
## UGD                                             0    0    0    0    0    0    0    0
## VANH                                            0    0    0    0    0    0    0    0
## VANR                                            0    0    0    0    0    0    0    0
## VANRI                                           0    0    0    0    0    0    0    0
## VANS                                            2    3    7    2    2    6    6    2
## VANTRL                                          0    0    0    0    0    0    0    0
## VANU                                            0    0    0    0    0    0    1    0
## VANY                                            0    0    0    0    0    0    0    0
## VANZ                                            0    0    0    0    0    0    0    0
## VATB                                            0    0    0    0    0    0    0    0
## VATE                                            0    0    0    0    0    0    0    0
## VGAC                                            1    0    0    0    0    0    0    2
## YKKD                                            0    0    1    0    0    0    0    0
##                                                 P71 P72 P73 P74 P77 P79 P8 P83
## AADA                                            0    0    0    0    0    0    0    0
## ABES                                            0    0    0    0    0    0    0    0
## ACT                                             0    0    0    0    0    0    0    0
## ADEC                                            0    0    0    0    0    0    0    0
## ADES                                            0    0    0    0    0    0    0    0
## APH(3'')-III                                    0    0    0    0    0    0    0    0
## APH(3'')-I                                      0    0    0    0    0    0    0    0
## APH(6)-I                                        0    0    0    0    0    0    0    0
## BACA                                            0    0    0    0    0    0    0    0
## BCRA                                            0    0    0    0    0    0    0    0
## BLAI                                            0    0    0    0    0    0    0    0
## CATA                                            0    0    0    0    0    0    0    0
## CATD                                            0    0    0    0    0    0    0    0
## CATQ                                            0    0    0    0    0    0    0    0
## CATU                                            0    0    0    0    0    0    1    0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE           0    0    1    0    0    0    1    0
## CFXA6                                           0    0    0    0    0    0    0    0
## CHLORAMPHENICOL_EXPORTER                        0    0    0    0    0    0    0    0
## CLASS_A                                         0    0    0    0    0    0    0    0
## CLBA                                            0    0    0    0    0    0    0    0
## CMLA                                            0    0    0    0    0    0    0    0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE               0    0    0    0    0    0    0    0
## DFRA12                                          0    0    0    0    0    1    0    0
## DFRA17                                          0    0    0    0    0    0    0    0
## DFRA21                                          0    0    0    0    0    0    0    0
## DFRA3                                           0    0    0    0    0    0    0    0
## DFRA5                                           0    0    0    0    0    0    0    0
## DNA-BINDING_PROTEIN_H-NS                        0    1    0    0    0    0    0    0
## EDEQ                                            0    0    0    0    0    0    0    0
```

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```
## EFRA                                                 0   0   0   0   0   0   0   0
## EFRB                                                 0   0   0   0   0   0   0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER        0   0   0   0   0   0   0   0
## ERM(42)                                              0   0   0   0   0   0   0   0
## ERMB                                                 0   0   0   0   0   0   0   0
## ERMF                                                 0   0   0   0   0   0   0   0
## ESCHERICHIA_COLI_MIPA                                0   0   0   0   0   0   0   0
## GADW                                                 0   0   0   0   0   0   0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA                  0   0   0   0   0   0   0   0
## KDPE                                                 0   0   0   0   0   0   0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE             0   0   0   0   0   0   0   0
## LMRD                                                 0   0   0   0   0   0   1   0
## LNUA                                                 0   0   0   0   0   0   0   0
## LRFA                                                 0   0   0   0   0   0   0   0
## LSA                                                  0   0   0   0   0   0   0   0
## MARA                                                 0   0   0   0   0   0   0   0
## MARR                                                 0   0   0   0   0   0   0   0
## MCR-3                                                0   0   0   0   0   0   0   0
## MECI                                                 0   0   0   0   0   0   0   0
## MEFA                                                 0   0   0   0   0   0   0   0
## MEPA                                                 0   0   0   0   1   0   0   0
## MEXL                                                 0   0   0   0   0   0   0   0
## MTRA                                                 0   0   0   0   0   0   0   0
## MULTIDRUG_ABC_TRANSPORTER                            0   0   0   0   1   0   0   0
## NMCR                                                 0   0   0   0   0   0   0   0
## OMP36                                                0   0   0   0   0   0   0   0
## OMPR                                                 0   1   0   0   0   0   0   0
## OPRA                                                 0   0   0   0   0   0   0   0
## PATA                                                 0   0   0   0   0   0   0   0
## PMRF                                                 0   0   0   0   0   0   0   0
## RAMA                                                 0   0   0   0   0   0   0   0
## ROSA                                                 0   0   0   0   0   0   0   0
## ROSB                                                 0   0   0   0   0   0   0   0
## SDIA                                                 0   0   0   0   0   0   0   1
## SUL1                                                 0   0   0   0   0   0   0   0
## SUL3                                                 0   0   0   0   0   0   0   0
## TEM                                                  0   0   0   0   0   0   0   0
## TET34                                                0   0   0   0   0   0   0   0
## TET35                                                0   0   0   0   0   0   0   0
## TET40                                                0   0   0   0   0   0   0   0
## TETB(60)                                             0   0   0   0   0   0   0   0
## TETM                                                 0   0   0   0   0   0   0   0
## TETO                                                 0   0   0   0   0   0   0   0
## TETP                                                 0   0   0   0   0   0   0   0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR           0   0   0   0   0   0   0   0
## UGD                                                  0   0   0   0   0   0   0   0
## VANH                                                 0   0   0   0   0   0   0   0
## VANR                                                 0   0   1   0   0   0   0   0
## VANRI                                                0   0   0   0   0   0   0   0
## VANS                                                 3   4   2   3   4   3   0   2
## VANTRL                                               0   0   0   0   0   0   0   0
## VANU                                                 1   0   0   0   0   0   0   0
## VANY                                                 0   0   0   0   0   0   0   0
## VANZ                                                 0   0   0   0   1   0   0   0
```

```
## VATB                                              0    0    0    0    0    0  0    0
## VATE                                              0    0    0    0    0    0  0    0
## VGAC                                              0    0    0    0    0    1  0    0
## YKKD                                              0    0    0    0    0    0  0    0
##                                                  P85 P87 P88 P9 P94 P95II P99
## AADA                                              0    0    0    0    0    0   0
## ABES                                              0    0    0    0    0    0   0
## ACT                                               0    0    0    0    0    0   0
## ADEC                                              0    0    0    0    0    0   0
## ADES                                              0    0    0    0    0    0   0
## APH(3''')-III                                     0    0    0    0    0    0   0
## APH(3'')-I                                        0    0    0    0    0    0   0
## APH(6)-I                                          0    0    0    0    0    0   0
## BACA                                              0    0    0    0    0    0   0
## BCRA                                              0    0    0    0    0    0   0
## BLAI                                              0    0    0    0    0    0   0
## CATA                                              0    0    0    0    0    0   0
## CATD                                              0    0    0    0    0    0   0
## CATQ                                              0    0    0    1    0    0   0
## CATU                                              0    0    0    0    0    0   0
## CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE             0    0    0    0    0    0   0
## CFXA6                                             0    0    0    0    0    0   0
## CHLORAMPHENICOL_EXPORTER                          0    0    0    0    0    0   0
## CLASS_A                                           0    0    0    0    0    0   0
## CLBA                                              0    0    0    0    0    0   0
## CMLA                                              0    0    0    0    0    0   0
## COB(I)ALAMIN_ADENOLSYLTRANSFERASE                 0    0    0    0    0    0   0
## DFRA12                                            0    0    0    0    0    0   0
## DFRA17                                            0    0    0    0    0    0   0
## DFRA21                                            0    0    0    0    0    0   0
## DFRA3                                             0    0    0    0    0    0   0
## DFRA5                                             0    0    0    0    0    0   0
## DNA-BINDING_PROTEIN_H-NS                          0    0    1    1    1    0   0
## EDEQ                                              0    0    0    0    0    0   0
## EFRA                                              0    0    0    0    0    0   0
## EFRB                                              0    0    0    0    0    0   0
## EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER    0    1    0    0    0    0   0
## ERM(42)                                           0    0    0    0    0    0   0
## ERMB                                              0    0    1    0    0    0   0
## ERMF                                              0    0    0    1    0    0   0
## ESCHERICHIA_COLI_MIPA                             0    0    0    0    0    0   0
## GADW                                              0    0    0    0    0    0   0
## KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA               0    0    0    0    0    0   0
## KDPE                                              0    0    0    0    0    0   0
## LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE          0    0    0    0    0    0   0
## LMRD                                              0    0    0    0    0    0   0
## LNUA                                              0    0    0    0    0    0   0
## LRFA                                              0    0    0    0    0    0   0
## LSA                                               0    0    0    0    0    0   0
## MARA                                              0    0    0    0    0    0   0
## MARR                                              0    0    0    0    0    0   0
## MCR-3                                             0    0    0    0    0    0   0
## MECI                                              0    0    0    0    0    0   0
## MEFA                                              0    0    0    0    0    0   0
```

```
## MEPA                                          0   0   0   0   0    0   0
## MEXL                                          0   0   0   0   0    0   0
## MTRA                                          0   0   0   0   0    0   0
## MULTIDRUG_ABC_TRANSPORTER                     0   0   0   0   0    0   0
## NMCR                                          0   0   0   0   0    0   0
## OMP36                                         0   0   0   0   0    0   0
## OMPR                                          0   0   0   0   0    0   0
## OPRA                                          0   0   0   0   0    0   0
## PATA                                          0   0   0   0   0    0   0
## PMRF                                          0   0   0   0   0    0   0
## RAMA                                          0   0   0   0   0    0   0
## ROSA                                          0   0   0   0   0    0   0
## ROSB                                          0   0   0   0   0    0   0
## SDIA                                          0   0   0   0   0    0   0
## SUL1                                          0   0   0   0   0    0   0
## SUL3                                          0   0   0   0   0    0   0
## TEM                                           0   1   0   0   0    0   0
## TET34                                         0   0   0   0   0    0   0
## TET35                                         0   0   0   0   0    0   0
## TET40                                         0   0   0   0   0    0   0
## TETB(60)                                      0   0   0   0   0    0   0
## TETM                                          0   0   0   0   0    0   0
## TETO                                          0   0   0   0   0    0   0
## TETP                                          0   0   0   0   0    0   0
## TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR    0   1   0   0   0    0   0
## UGD                                           0   0   0   0   0    0   0
## VANH                                          0   0   0   0   1    0   0
## VANR                                          0   0   0   0   0    0   0
## VANRI                                         0   0   0   0   0    0   0
## VANS                                          4   2   6   1   2    0   6
## VANTRL                                        0   0   0   0   0    0   0
## VANU                                          0   0   0   0   0    0   0
## VANY                                          0   0   0   1   0    0   0
## VANZ                                          0   0   0   0   0    0   0
## VATB                                          0   0   0   0   0    0   0
## VATE                                          1   0   0   0   0    0   0
## VGAC                                          0   0   0   0   0    0   0
## YKKD                                          0   0   0   0   0    0   0
```

```r
#get otu.table ARGs name from the index
rownames(otu.table)
```

```
##  [1] "AADA"
##  [2] "ABES"
##  [3] "ACT"
##  [4] "ADEC"
##  [5] "ADES"
##  [6] "APH(3'')-III"
##  [7] "APH(3'')-I"
##  [8] "APH(6)-I"
##  [9] "BACA"
## [10] "BCRA"
## [11] "BLAI"
## [12] "CATA"
## [13] "CATD"
```

```
## [14] "CATQ"
## [15] "CATU"
## [16] "CAT_CHLORAMPHENICOL_ACETYLTRANSFERASE"
## [17] "CFXA6"
## [18] "CHLORAMPHENICOL_EXPORTER"
## [19] "CLASS_A"
## [20] "CLBA"
## [21] "CMLA"
## [22] "COB(I)ALAMIN_ADENOLSYLTRANSFERASE"
## [23] "DFRA12"
## [24] "DFRA17"
## [25] "DFRA21"
## [26] "DFRA3"
## [27] "DFRA5"
## [28] "DNA-BINDING_PROTEIN_H-NS"
## [29] "EDEQ"
## [30] "EFRA"
## [31] "EFRB"
## [32] "EMRB-QACA_FAMILY_MAJOR_FACILITATOR_TRANSPORTER"
## [33] "ERM(42)"
## [34] "ERMB"
## [35] "ERMF"
## [36] "ESCHERICHIA_COLI_MIPA"
## [37] "GADW"
## [38] "KASUGAMYCIN_RESISTANCE_PROTEIN_KSGA"
## [39] "KDPE"
## [40] "LLMA_23S_RIBOSOMAL_RNA_METHYLTRANSFERASE"
## [41] "LMRD"
## [42] "LNUA"
## [43] "LRFA"
## [44] "LSA"
## [45] "MARA"
## [46] "MARR"
## [47] "MCR-3"
## [48] "MECI"
## [49] "MEFA"
## [50] "MEPA"
## [51] "MEXL"
## [52] "MTRA"
## [53] "MULTIDRUG_ABC_TRANSPORTER"
## [54] "NMCR"
## [55] "OMP36"
## [56] "OMPR"
## [57] "OPRA"
## [58] "PATA"
## [59] "PMRF"
## [60] "RAMA"
## [61] "ROSA"
## [62] "ROSB"
## [63] "SDIA"
## [64] "SUL1"
## [65] "SUL3"
## [66] "TEM"
## [67] "TET34"
```

```
## [68] "TET35"
## [69] "TET40"
## [70] "TETB(60)"
## [71] "TETM"
## [72] "TETO"
## [73] "TETP"
## [74] "TRUNCATED_PUTATIVE_RESPONSE_REGULATOR_ARLR"
## [75] "UGD"
## [76] "VANH"
## [77] "VANR"
## [78] "VANRI"
## [79] "VANS"
## [80] "VANTRL"
## [81] "VANU"
## [82] "VANY"
## [83] "VANZ"
## [84] "VATB"
## [85] "VATE"
## [86] "VGAC"
## [87] "YKKD"
```

Create dummy tax table for TAX

```r
taxmat = matrix(sample(letters, 87, replace = TRUE),
                nrow = nrow(otu.table), ncol = 7)
rownames(taxmat) <- rownames(otu.table)
colnames(taxmat) <- c("Domain", "Phylum", "Class", "Order",
                      "Family", "Genus", "Species")
#taxmat
TAX = tax_table(taxmat)
```

Import the metadata:

```r
sampledata <- as.data.frame(read.csv
                            (file = "pd_meta_with_ffq_and_scfa_only_oursamples_3variables_ordered.csv",
                             header = TRUE, sep = ",", row.names = 1))
#rownames(sampledata)
#colnames(otu.table)
identical(rownames(sampledata), colnames(otu.table))
```

```
## [1] TRUE
```

```r
sampledata = sample_data(sampledata)
```

Create physeq

```r
physeqfinal <- phyloseq(otu.table,TAX, sampledata)
#physeqfinal
#sample_data(physeqfinal)
#summary(sample_data(physeqfinal))

physeqfinal.2 <- subset_taxa(physeqfinal, taxa_sums(physeqfinal) >0)
#head(sort(taxa_sums(physeqfinal.2), decreasing = FALSE))
```

```
physeqfinal.2
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:          [ 87 taxa and 136 samples ]
## sample_data() Sample Data:        [ 136 samples by 4 sample variables ]
## tax_table()   Taxonomy Table:     [ 87 taxa by 7 taxonomic ranks ]
```

```
physeqfinal
```

```
## phyloseq-class experiment-level object
## otu_table()   OTU Table:          [ 87 taxa and 136 samples ]
## sample_data() Sample Data:        [ 136 samples by 4 sample variables ]
## tax_table()   Taxonomy Table:     [ 87 taxa by 7 taxonomic ranks ]
```

```
summary(sample_data(physeqfinal.2))
```

```
##     Group              gender         age_at_stool_collection      BMI
##  Length:136         Length:136         Min.   :51.00         Min.   :17.51
##  Class :character   Class :character   1st Qu.:61.00         1st Qu.:24.13
##  Mode  :character   Mode  :character   Median :65.00         Median :26.31
##                                        Mean   :64.98         Mean   :26.69
##                                        3rd Qu.:69.00         3rd Qu.:28.62
##                                        Max.   :78.00         Max.   :37.87
##                                                              NA's   :13
```

Alpha Diversity for Group (C vs P)

```
richness.table <- estimate_richness(physeqfinal.2, split = TRUE,
                                    measures = c("Observed", "Chao1",
                                    "ACE", "Shannon", "InvSimpson"))
```

```
head(richness.table)
```

```
##       Observed Chao1  se.chao1      ACE     se.ACE   Shannon InvSimpson
## C1           5  11.0  7.012975 20.78462 2.4677437 0.9943537   1.884615
## C102         7  14.5  8.064530 28.00000 0.9698548 1.9061547   6.400000
## C103         2   3.0  2.041241      NaN       NaN 0.6931472   2.000000
## C104         8  29.0 17.206154 53.69231 3.3584607 1.6661023   3.500000
## C105         2   3.0  2.041241      NaN       NaN 0.6931472   2.000000
## C107         3   4.0  2.121320  7.00000 1.1461852 0.7963116   1.814815
```

```
richness.table$Group <- sample_data(physeqfinal.2)$Group
```

Plot Alpha Diversity

```
theme_set(theme_bw())

grid.arrange(
  ggplot(richness.table, aes(x = Group, y = Observed)) +
    geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
    stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
  ggplot(richness.table, aes(x = Group, y = Chao1)) +
    geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
    stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
```

```r
ggplot(richness.table, aes(x = Group, y = ACE)) +
  geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
  stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
ggplot(richness.table, aes(x = Group, y = Shannon)) +
  geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
  stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
ggplot(richness.table, aes(x = Group, y = InvSimpson)) +
  geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
  stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
nrow = 1)
```


Observed Richness Wilcoxon rank sum test (Group)

```r
wilcox.test(richness.table$Observed ~ sample_data(physeqfinal.2)$Group,
            conf.level = 0.95, conf.int = TRUE)
```
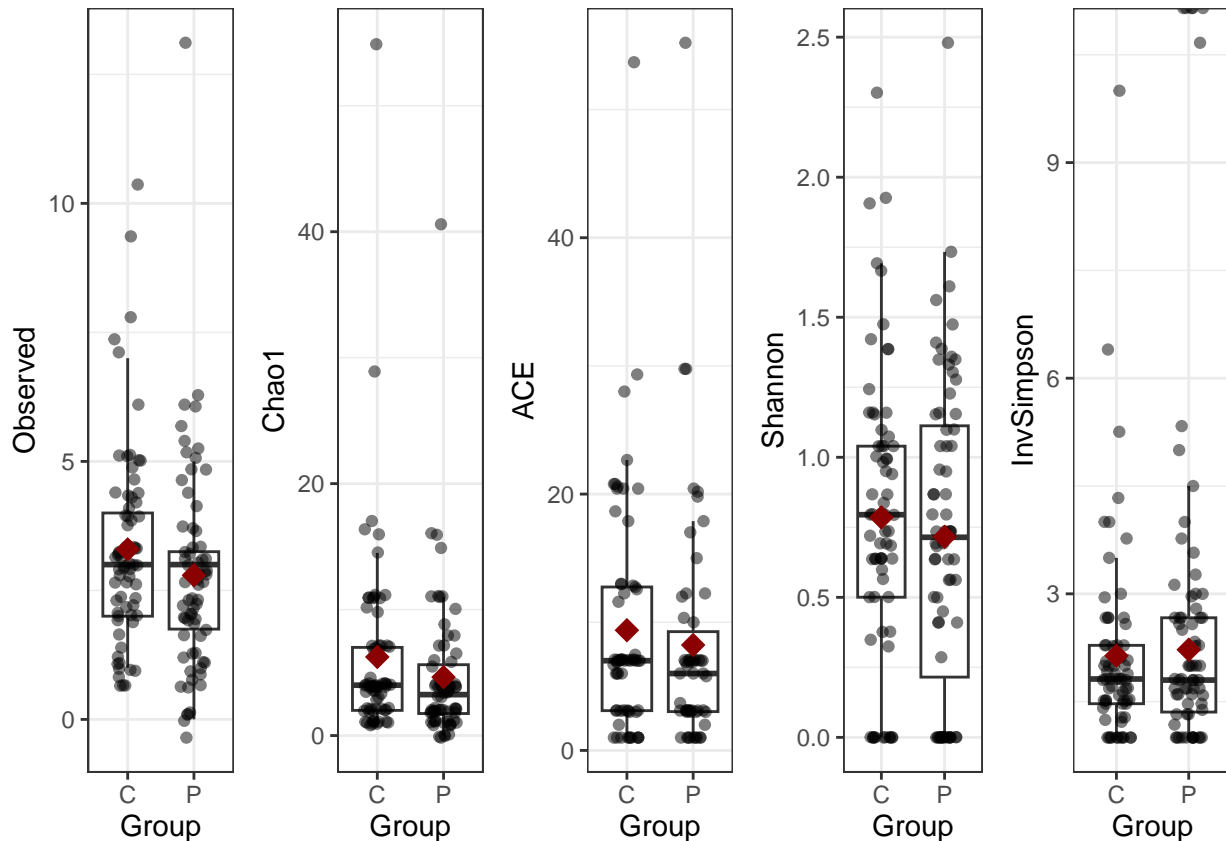
```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$Observed by sample_data(physeqfinal.2)$Group
## W = 2708, p-value = 0.07896
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -1.333564e-06  1.000055e+00
## sample estimates:
## difference in location
```

```
##            5.362855e-05
```

CHAO1 Wilcoxon rank sum test (Group)

```
wilcox.test(richness.table$Chao1 ~ sample_data(physeqfinal.2)$Group,
            conf.level = 0.95, conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$Chao1 by sample_data(physeqfinal.2)$Group
## W = 2746.5, p-value = 0.05615
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -4.367662e-05  2.000039e+00
## sample estimates:
## difference in location
##               0.9999652
```

ACE Wilcoxon rank sum test (Group)

```
wilcox.test(richness.table$ACE ~ sample_data(physeqfinal.2)$Group,
            conf.level = 0.95, conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$ACE by sample_data(physeqfinal.2)$Group
## W = 1870.5, p-value = 0.2101
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -0.04767301  3.65368448
## sample estimates:
## difference in location
##               0.1893541
```

InvSimpson Wilcoxon rank sum test (Group)

```
richness.table$InvSimpson[which(is.infinite(richness.table$InvSimpson))] <- NA
wilcox.test(richness.table$InvSimpson ~ sample_data(physeqfinal.2)$Group,
            conf.level = 0.95, conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$InvSimpson by sample_data(physeqfinal.2)$Group
## W = 2061, p-value = 0.7099
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -0.3294410  0.2004612
## sample estimates:
## difference in location
##           -4.424907e-05
```

Shannon Wilcoxon rank sum test (Group)

```
wilcox.test(richness.table$Shannon ~ sample_data(physeqfinal.2)$Group,
            conf.level = 0.95, conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$Shannon by sample_data(physeqfinal.2)$Group
## W = 2483.5, p-value = 0.4546
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -0.08874981  0.24338387
## sample estimates:
## difference in location
##              0.03455073
```

Alpha Diversity for Gender (F vs M)

```
richness.table$gender <- sample_data(physeqfinal.2)$gender
```

Plot Alpha Diversity for Gender (F vs M)

```
theme_set(theme_bw())

grid.arrange(
  ggplot(richness.table, aes(x = gender, y = Observed)) +
    geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
    stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
  ggplot(richness.table, aes(x = gender, y = Chao1)) +
    geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
    stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
  ggplot(richness.table, aes(x = gender, y = ACE)) +
    geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
    stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
  ggplot(richness.table, aes(x = gender, y = Shannon)) +
    geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
    stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
  ggplot(richness.table, aes(x = gender, y = InvSimpson)) +
    geom_boxplot(outlier.shape = NA) + geom_jitter(width = 0.2, alpha =.5) +
    stat_summary(fun = mean, color = "darkred", geom = "point", shape = 18, size = 4),
  nrow = 1)
```

Observed Richness Wilcoxon rank sum test (gender)

```
wilcox.test(richness.table$Observed ~ sample_data(physeqfinal.2)$gender,
            conf.level = 0.95, conf.int = TRUE)
```
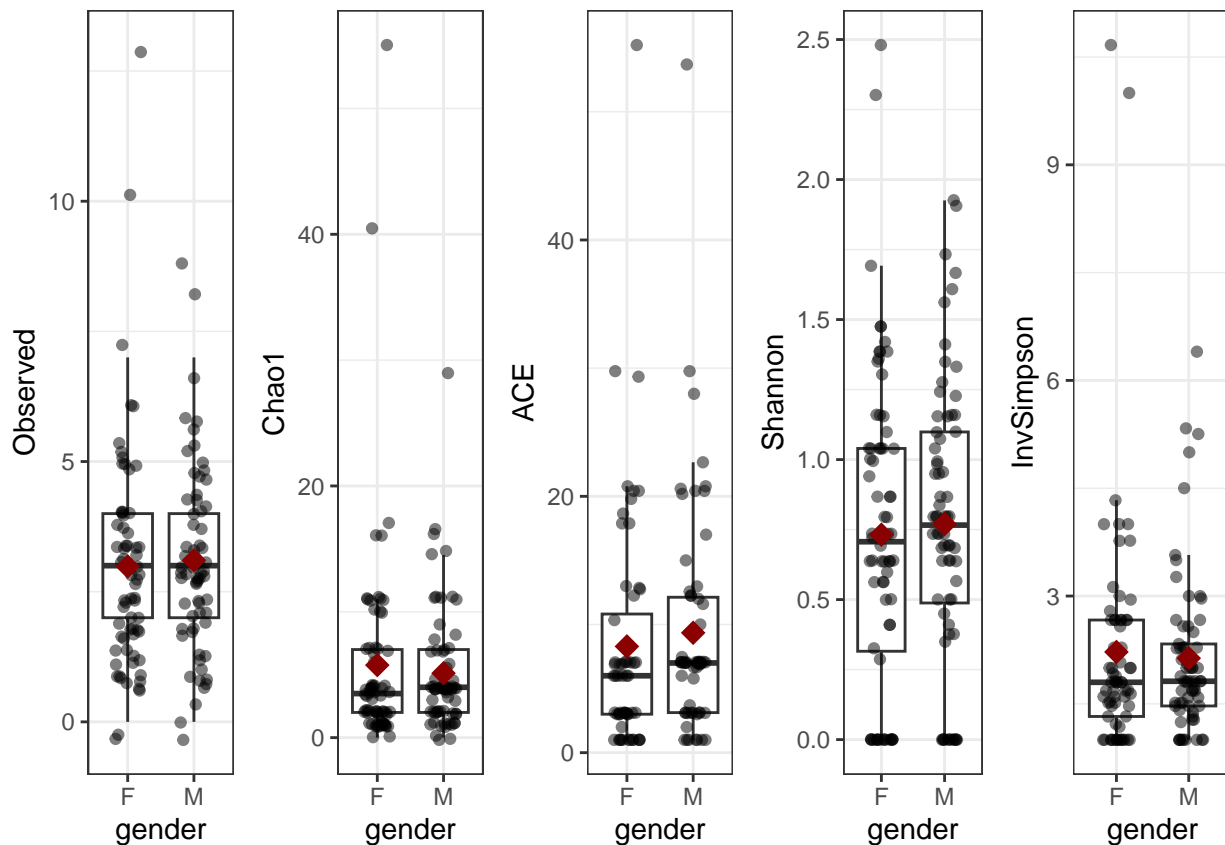
```
##
##   Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$Observed by sample_data(physeqfinal.2)$gender
## W = 2110, p-value = 0.3708
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -9.999408e-01  1.609902e-05
## sample estimates:
## difference in location
##            -4.99234e-06
```

CHAO1 Wilcoxon rank sum test (gender)

```
wilcox.test(richness.table$Chao1 ~ sample_data(physeqfinal.2)$gender,
        conf.level = 0.95, conf.int = TRUE)
```

```
##
##   Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$Chao1 by sample_data(physeqfinal.2)$gender
```

```
## W = 2096.5, p-value = 0.3441
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -1.000042e+00  6.483986e-05
## sample estimates:
## difference in location
##             -6.31708e-05
```

ACE Wilcoxon rank sum test (gender)

```
wilcox.test(richness.table$ACE ~ sample_data(physeqfinal.2)$gender,
            conf.level = 0.95, conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$ACE by sample_data(physeqfinal.2)$gender
## W = 1339.5, p-value = 0.07997
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -3.8889146819  0.0000038722
## sample estimates:
## difference in location
##              -1.00005
```

InvSimpson Wilcoxon rank sum test (gender)

```
wilcox.test(richness.table$InvSimpson ~ sample_data(physeqfinal.2)$gender,
            conf.level = 0.95, conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$InvSimpson by sample_data(physeqfinal.2)$gender
## W = 2062.5, p-value = 0.7049
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -0.3177253  0.2117986
## sample estimates:
## difference in location
##           -1.75061e-05
```

Shannon Wilcoxon rank sum test (gender)

```
wilcox.test(richness.table$Shannon ~ sample_data(physeqfinal.2)$gender,
            conf.level = 0.95, conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  richness.table$Shannon by sample_data(physeqfinal.2)$gender
## W = 2168.5, p-value = 0.5317
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
```

```
## -0.2200162  0.1005600
## sample estimates:
## difference in location
##         -0.002531018
```

Alpha Diversity for BMI (Continuous variable)

```r
richness.table$BMI <- sample_data(physeqfinal.2)$BMI
```

Plot Alpha Diversity for BMI (Continuous variable)

```r
common_theme <- theme(
  axis.text.x = element_text(angle = 45, hjust = 1),
)

grid.arrange(
  ggplot(richness.table, aes(x = BMI, y = Observed)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "BMI", y = "Observed") +
    scale_x_continuous(breaks = seq(20, 35, by = 5)) +  # Adjust range as needed
    common_theme,

  ggplot(richness.table, aes(x = BMI, y = Chao1)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "BMI", y = "Chao1") +
    scale_x_continuous(breaks = seq(20, 35, by = 5)) +
    common_theme,

  ggplot(richness.table, aes(x = BMI, y = ACE)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "BMI", y = "ACE") +
    scale_x_continuous(breaks = seq(20, 35, by = 5)) +
    common_theme,

  ggplot(richness.table, aes(x = BMI, y = Shannon)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "BMI", y = "Shannon") +
    scale_x_continuous(breaks = seq(20, 35, by = 5)) +
    common_theme,

  ggplot(richness.table, aes(x = BMI, y = InvSimpson)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "BMI", y = "InvSimpson") +
    scale_x_continuous(breaks = seq(20, 35, by = 5)) +
    common_theme,

  nrow = 1
```

```
)
```

```
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
```


Observed Richness Spearman rank sum test (BMI)

```
cor.test(richness.table$Observed, sample_data(physeqfinal.2)$BMI, method = "spearman")
```
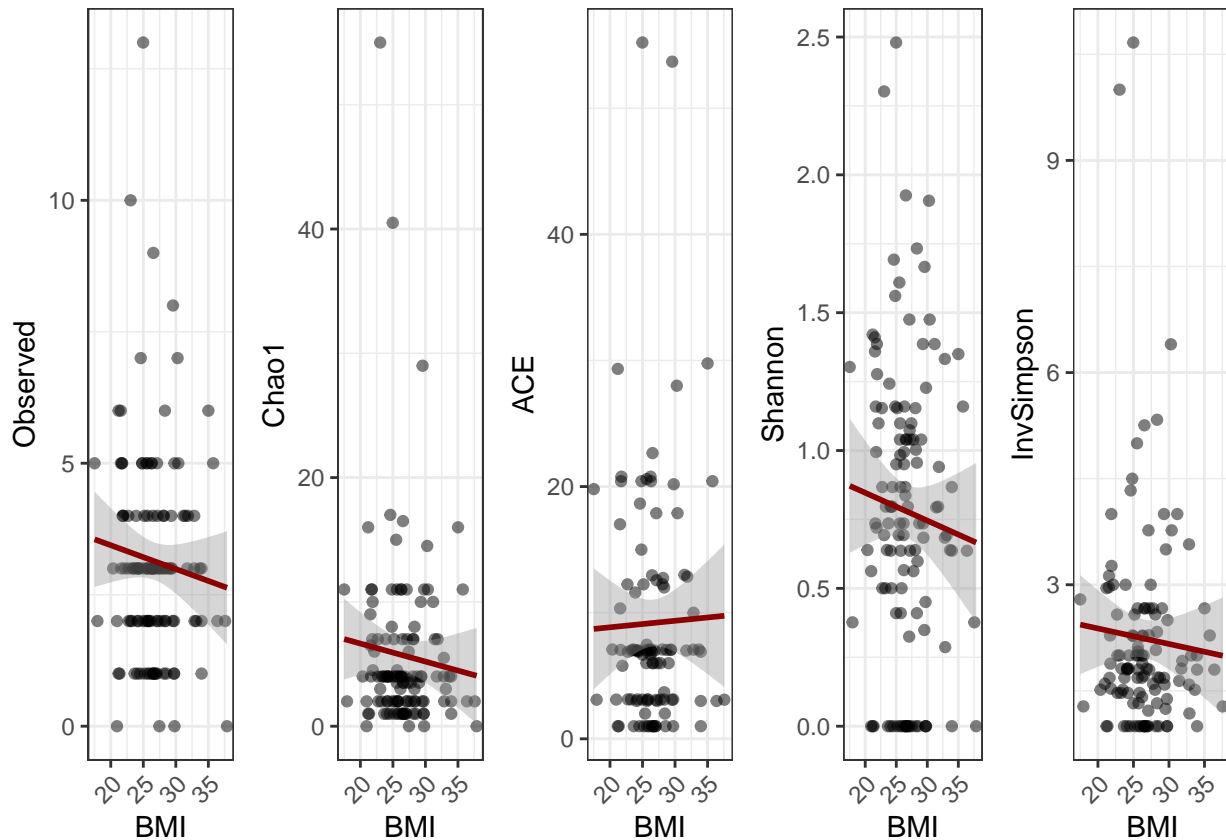
```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$Observed and sample_data(physeqfinal.2)$BMI
## S = 335408, p-value = 0.37
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##          rho
## -0.08152781
```

CHAO1 Richness Spearman rank sum test (BMI)

```
cor.test(richness.table$Chao1, sample_data(physeqfinal.2)$BMI, method = "spearman")
```

```
##
```

```
##  Spearman's rank correlation rho
##
## data:  richness.table$Chao1 and sample_data(physeqfinal.2)$BMI
## S = 336421, p-value = 0.3511
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##         rho
## -0.08479362
```

ACE Richness Spearman rank sum test (BMI)

```
cor.test(richness.table$ACE, sample_data(physeqfinal.2)$BMI, method = "spearman")
```

```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$ACE and sample_data(physeqfinal.2)$BMI
## S = 183511, p-value = 0.9383
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##          rho
## -0.007726253
```

InvSimpson Richness Spearman rank sum test (BMI)

```
cor.test(richness.table$InvSimpson, sample_data(physeqfinal.2)$BMI, method = "spearman")
```

```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$InvSimpson and sample_data(physeqfinal.2)$BMI
## S = 292555, p-value = 0.6524
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##         rho
## -0.04171462
```

Shannon Richness Spearman rank sum test (BMI)

```
cor.test(richness.table$Shannon, sample_data(physeqfinal.2)$BMI, method = "spearman")
```

```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$Shannon and sample_data(physeqfinal.2)$BMI
## S = 332576, p-value = 0.4262
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##         rho
## -0.07239689
```

Alpha Diversity for Age (Continuous variable)

```
richness.table$age <- sample_data(physeqfinal.2)$age_at_stool_collection
```

Plot Alpha Diversity for Age (Continuous variable)

```
common_theme <- theme(
  axis.text.x = element_text(angle = 45, hjust = 1),
)

grid.arrange(
  ggplot(richness.table, aes(x = age, y = Observed)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "age", y = "Observed") +
    scale_x_continuous(breaks = seq(50, 80, by = 10)) +  # Adjust range as needed
    common_theme,

  ggplot(richness.table, aes(x = age, y = Chao1)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "age", y = "Chao1") +
    scale_x_continuous(breaks = seq(50, 80, by = 10)) +
    common_theme,

  ggplot(richness.table, aes(x = age, y = ACE)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "age", y = "ACE") +
    scale_x_continuous(breaks = seq(50, 80, by = 10)) +
    common_theme,

  ggplot(richness.table, aes(x = age, y = Shannon)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "age", y = "Shannon") +
    scale_x_continuous(breaks = seq(50, 80, by = 10)) +
    common_theme,

  ggplot(richness.table, aes(x = age, y = InvSimpson)) +
    geom_point(alpha = 0.5) +
    geom_smooth(method = "lm", color = "darkred") +
    labs(x = "age", y = "InvSimpson") +
    scale_x_continuous(breaks = seq(50, 80, by = 10)) +
    common_theme,

  nrow = 1
)

## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
## `geom_smooth()` using formula = 'y ~ x'
```

```
## `geom_smooth()` using formula = 'y ~ x'
```


Observed Richness Spearman rank sum test (age)

```
cor.test(richness.table$Observed,
         sample_data(physeqfinal.2)$age_at_stool_collection, method = "spearman")
```
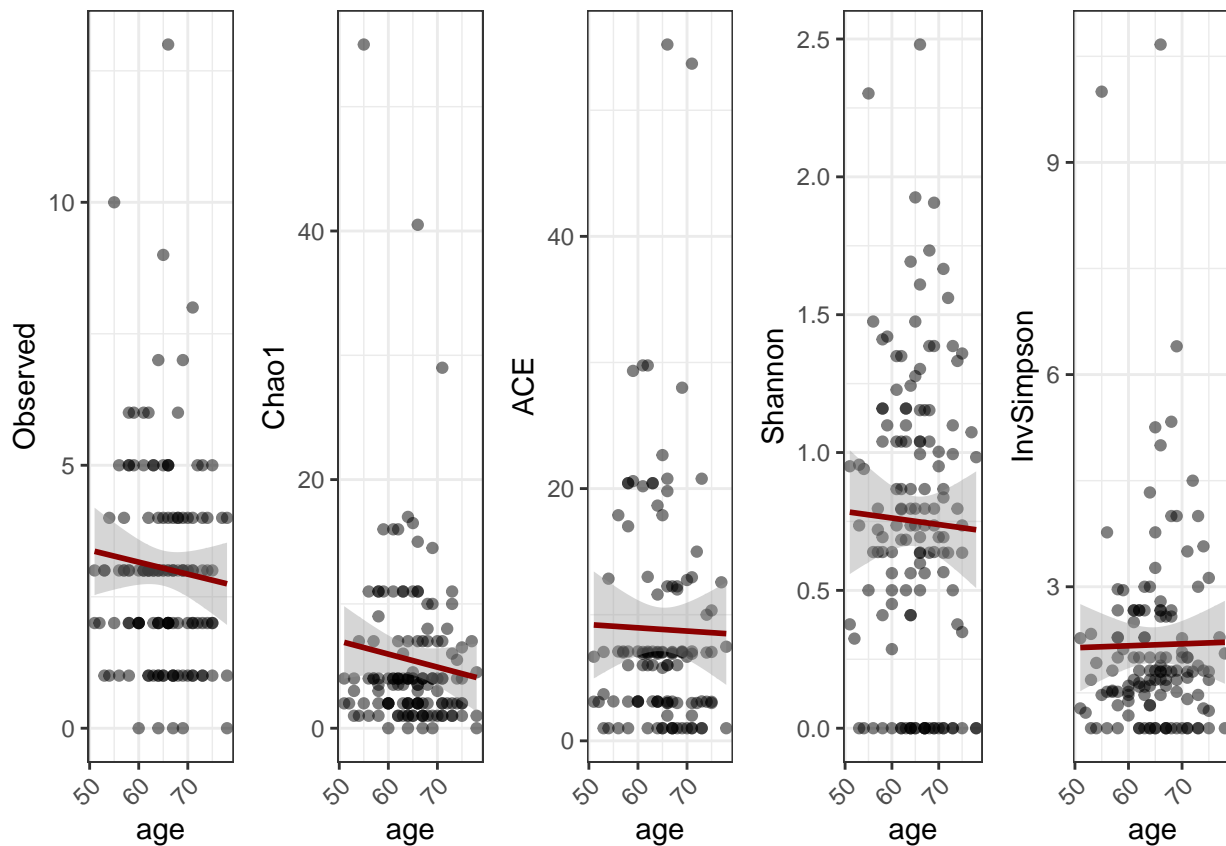
```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$Observed and sample_data(physeqfinal.2)$age_at_stool_collection
## S = 450411, p-value = 0.3893
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##        rho
## -0.07440267
```

CHAO1 Richness Spearman rank sum test (age)

```
cor.test(richness.table$Chao1,
         sample_data(physeqfinal.2)$age_at_stool_collection, method = "spearman")
```

```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$Chao1 and sample_data(physeqfinal.2)$age_at_stool_collection
## S = 448422, p-value = 0.4203
```

```
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##         rho
## -0.06965858
```

ACE Richness Spearman rank sum test (age)

```
cor.test(richness.table$ACE,
         sample_data(physeqfinal.2)$age_at_stool_collection, method = "spearman")
```

```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$ACE and sample_data(physeqfinal.2)$age_at_stool_collection
## S = 276443, p-value = 0.3352
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##         rho
## -0.09067628
```

InvSimpson Richness Spearman rank sum test (age)

```
cor.test(richness.table$InvSimpson,
         sample_data(physeqfinal.2)$age_at_stool_collection, method = "spearman")
```

```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$InvSimpson and sample_data(physeqfinal.2)$age_at_stool_collection
## S = 357338, p-value = 0.6
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##         rho
## 0.04623493
```

Shannon Richness Spearman rank sum test (age)

```
cor.test(richness.table$Shannon,
         sample_data(physeqfinal.2)$age_at_stool_collection, method = "spearman")
```

```
##
##  Spearman's rank correlation rho
##
## data:  richness.table$Shannon and sample_data(physeqfinal.2)$age_at_stool_collection
## S = 428387, p-value = 0.8005
## alternative hypothesis: true rho is not equal to 0
## sample estimates:
##         rho
## -0.0218662
```

Distance-based multivariate analysis / beta diversity

CLR transformation followed by Euclidian Distance (a.k.a. Aitchinson Distance)

```r
physeqfinal.2.clr <- microbiome::transform(physeqfinal.2, transform = "clr", target = "OTU",
                                            shift = 0, scale = 1)
physeqfinal.2.clr.eucl_dist <- vegdist(t(as.data.frame(as.matrix(otu_table(physeqfinal.2.clr)))),
                                       method = "euclidean", binary = FALSE)

sample_data(physeqfinal.2.clr)$Group <- factor(sample_data(physeqfinal.2.clr)$Group,
                                               levels=c("C" , "P"),
                                               ordered = FALSE)
sample_data(physeqfinal.2.clr)$gender <- factor(sample_data(physeqfinal.2.clr)$gender,
                                                levels=c("F" , "M"),
                                                ordered = FALSE)
```

Run the statistics for group variable

```r
set.seed(1337)
adonis.Res.clr <- adonis2(physeqfinal.2.clr.eucl_dist ~
                          sample_data(physeqfinal.2.clr)$Group,
                          by = "margin",
                          perm = 10000,
                          na.action = na.exclude,
                          parallel = 10)

adonis.Res.clr

## Permutation test for adonis under reduced model
## Marginal effects of terms
## Permutation: free
## Number of permutations: 10000
##
## adonis2(formula = physeqfinal.2.clr.eucl_dist ~ sample_data(physeqfinal.2.clr)$Group, permutations =
##                                          Df SumOfSqs      R2      F Pr(>F)
## sample_data(physeqfinal.2.clr)$Group   1     8.05 0.00919 1.2429 0.1408
## Residual                             134   868.03 0.99081
## Total                                135   876.08 1.00000
```

Principal Coordinates Analysis (PCoA) for Group

```r
ord_clr <- ordinate(physeqfinal.2.clr, method = "PCoA",
                    distance = "euclidean", binary = FALSE, autotransform = FALSE,
                    trymax = 1000, maxit = 10000, sratmax = 0.999999,
                    previous.best, parallel = 10)

plot_ordination(physeqfinal.2.clr, ord_clr,
                type = "Samples", color = "Group") + geom_point(size = 3) +
  stat_ellipse(level = 0.95)
```
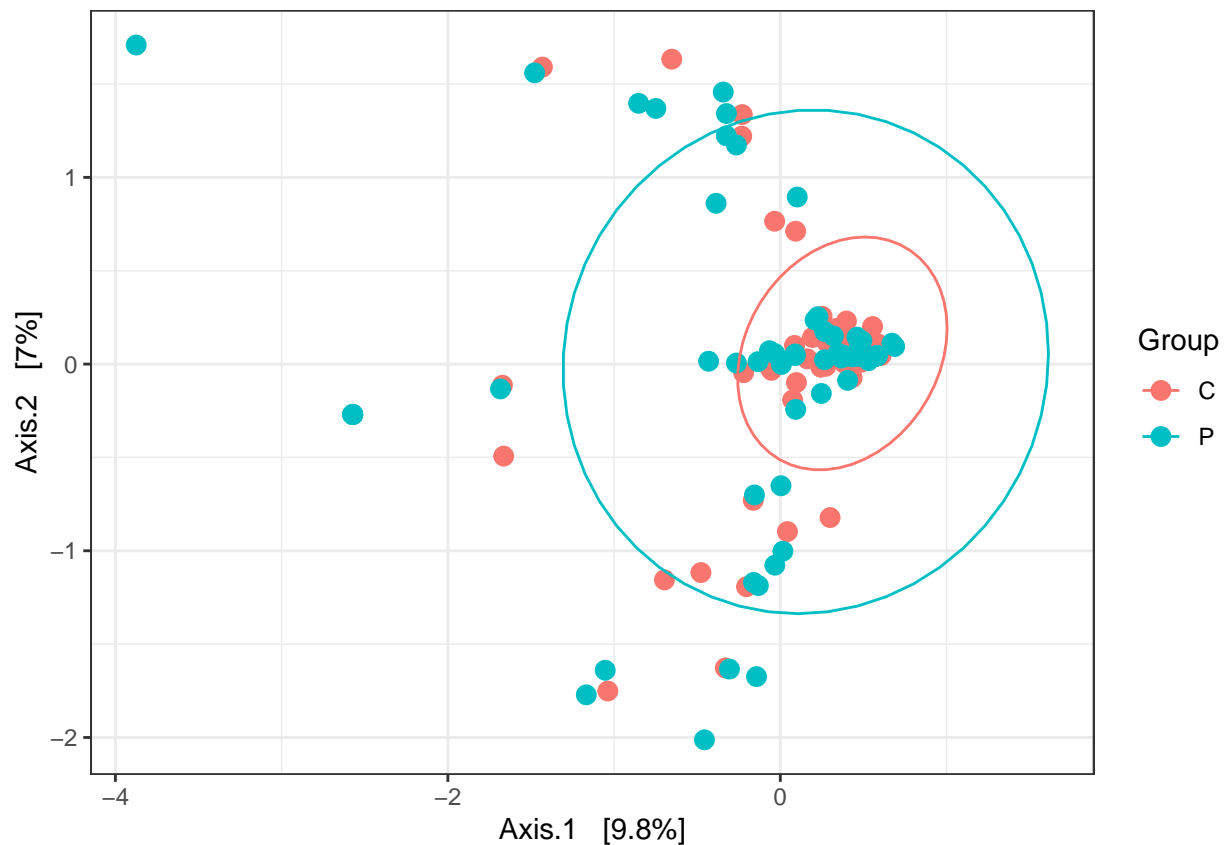
Run the statistics for gender variable

```
set.seed(1337)
adonis.Res.clr <- adonis2(physeqfinal.2.clr.eucl_dist ~
                          sample_data(physeqfinal.2.clr)$gender,
                          by = "margin",
                          perm = 10000,
                          na.action = na.exclude,
                          parallel = 10)
adonis.Res.clr
```

```
## Permutation test for adonis under reduced model
## Marginal effects of terms
## Permutation: free
## Number of permutations: 10000
##
## adonis2(formula = physeqfinal.2.clr.eucl_dist ~ sample_data(physeqfinal.2.clr)$gender, permutations =
##                                        Df SumOfSqs      R2      F Pr(>F)
## sample_data(physeqfinal.2.clr)$gender   1     5.74 0.00655 0.8839 0.6572
## Residual                              134   870.34 0.99345
## Total                                 135   876.08 1.00000
```

Principal Coordinates Analysis (PCoA) for Gender

```
ord_clr <- ordinate(physeqfinal.2.clr, method = "PCoA",
                    distance = "euclidean", binary = FALSE, autotransform = FALSE,
```

```
                    trymax = 1000, maxit = 10000, sratmax = 0.999999,
                    previous.best, parallel = 10)
plot_ordination(physeqfinal.2.clr, ord_clr,
                type = "Samples", color = "gender") + geom_point(size = 3) +
  stat_ellipse(level = 0.95)
```
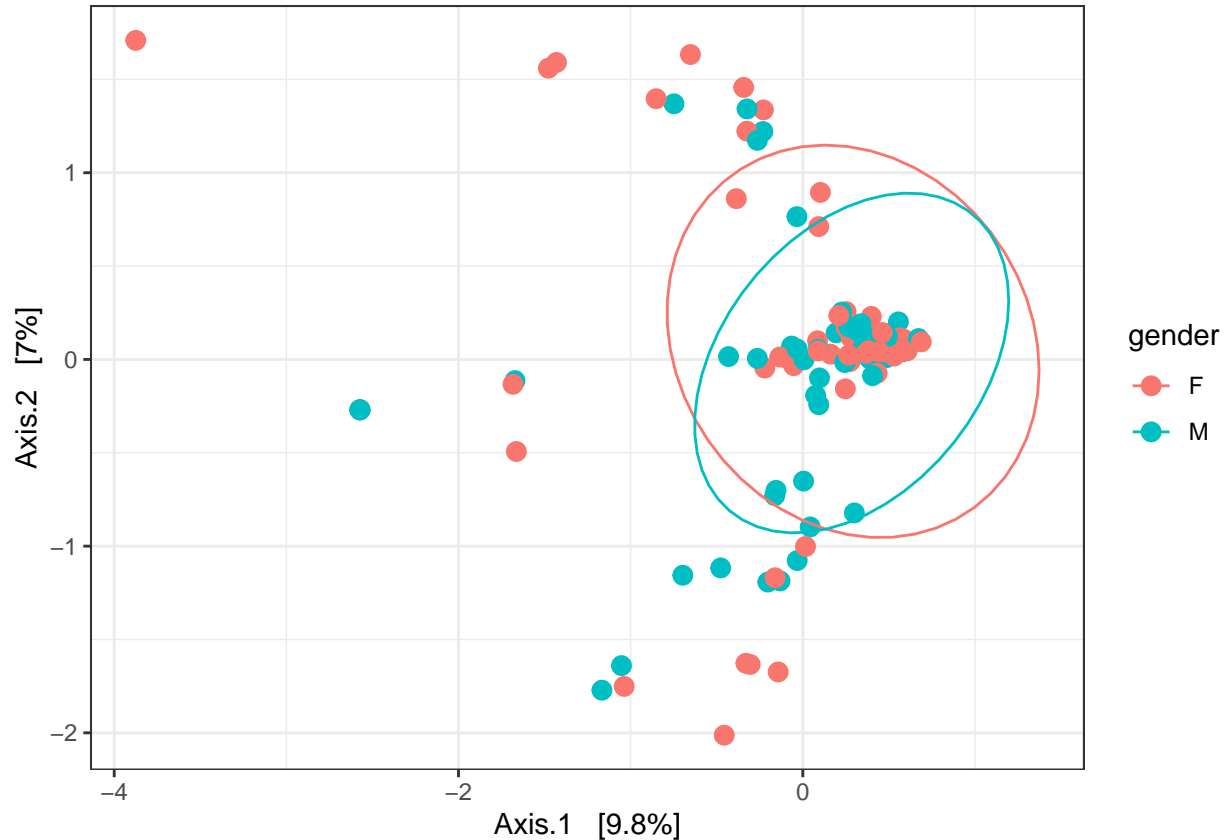

Run the statistics for BMI variable

```
set.seed(1337)
adonis.Res.clr <- adonis2(physeqfinal.2.clr.eucl_dist ~
                          sample_data(physeqfinal.2.clr)$BMI,
                          by = "margin",
                          perm = 10000,
                          na.action = na.exclude,
                          parallel = 10)


adonis.Res.clr

## Permutation test for adonis under reduced model
## Marginal effects of terms
## Permutation: free
## Number of permutations: 10000
##
## adonis2(formula = physeqfinal.2.clr.eucl_dist ~ sample_data(physeqfinal.2.clr)$BMI, permutations = 1(
##                                      Df SumOfSqs      R2      F Pr(>F)
## sample_data(physeqfinal.2.clr)$BMI    1     6.14 0.00752 0.9173 0.5916
```

```
## Residual                                    121    810.08 0.99248
## Total                                        122    816.22 1.00000
```

Principal Coordinates Analysis (PCoA) for BMI

```r
ord_clr <- ordinate(physeqfinal.2.clr, method = "PCoA",
                    distance = "euclidean", binary = FALSE, autotransform = FALSE,
                    trymax = 1000, maxit = 10000, sratmax = 0.999999,
                    previous.best, parallel = 10)
plot_ordination(physeqfinal.2.clr, ord_clr,
                type = "Samples", color = "BMI") + geom_point(size = 3) +
  stat_ellipse(level = 0.95)
```
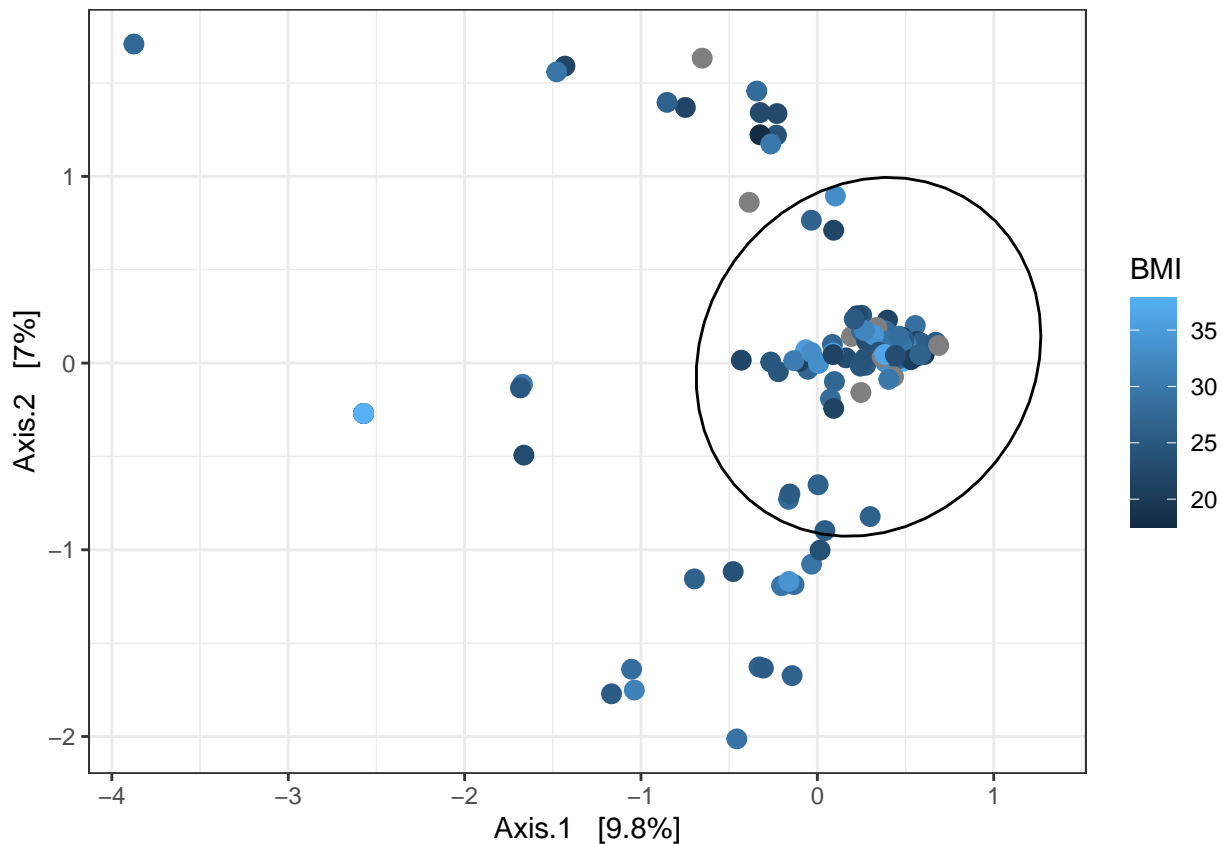

Run the statistics for Age variable

```r
set.seed(1337)
adonis.Res.clr <- adonis2(physeqfinal.2.clr.eucl_dist ~
                          sample_data(physeqfinal.2.clr)$age_at_stool_collection,
                          by = "margin",
                          perm = 10000,
                          na.action = na.exclude,
                          parallel = 10)

adonis.Res.clr
```

```
## Permutation test for adonis under reduced model
## Marginal effects of terms
```

```
## Permutation: free
## Number of permutations: 10000
##
## adonis2(formula = physeqfinal.2.clr.eucl_dist ~ sample_data(physeqfinal.2.clr)$age_at_stool_collecti
##                                                  Df SumOfSqs      R2
## sample_data(physeqfinal.2.clr)$age_at_stool_collection   1     7.06 0.00806
## Residual                                        134   869.02 0.99194
## Total                                           135   876.08 1.00000
##                                                       F Pr(>F)
## sample_data(physeqfinal.2.clr)$age_at_stool_collection 1.0893 0.3113
## Residual
## Total
```

Principal Coordinates Analysis (PCoA) for Age

```r
ord_clr <- ordinate(physeqfinal.2.clr, method = "PCoA",
                    distance = "euclidean", binary = FALSE, autotransform = FALSE,
                    trymax = 1000, maxit = 10000, sratmax = 0.999999,
                    previous.best, parallel = 10)
plot_ordination(physeqfinal.2.clr, ord_clr,
                type = "Samples", color = "age_at_stool_collection") + geom_point(size = 3) +
  stat_ellipse(level = 0.95)
```
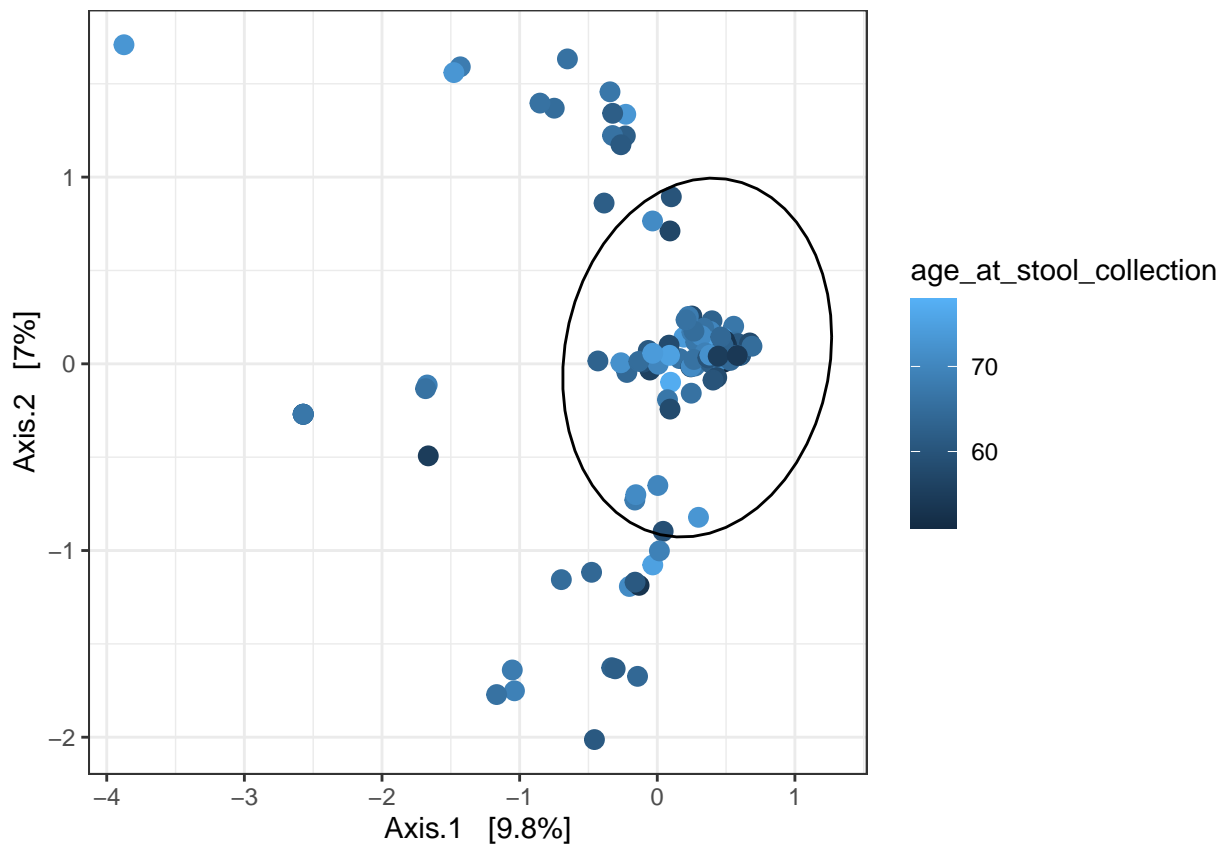
Session Info for reproducibility

```r
sessionInfo()
```

```
## R version 4.4.1 (2024-06-14)
## Platform: x86_64-pc-linux-gnu
## Running under: Ubuntu 22.04.4 LTS
##
## Matrix products: default
## BLAS:   /usr/lib/x86_64-linux-gnu/openblas-pthread/libblas.so.3
## LAPACK: /usr/lib/x86_64-linux-gnu/openblas-pthread/libopenblasp-r0.3.20.so;  LAPACK version 3.10.0
##
## locale:
##  [1] LC_CTYPE=en_GB.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_GB.UTF-8        LC_COLLATE=en_GB.UTF-8
##  [5] LC_MONETARY=en_GB.UTF-8    LC_MESSAGES=en_GB.UTF-8
##  [7] LC_PAPER=en_GB.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_GB.UTF-8 LC_IDENTIFICATION=C
##
## time zone: Europe/Helsinki
## tzcode source: system (glibc)
##
## attached base packages:
## [1] stats4    stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] microbiome_1.26.0          fido_1.1.1
##  [3] DESeq2_1.44.0              SummarizedExperiment_1.34.0
##  [5] Biobase_2.64.0            MatrixGenerics_1.16.0
##  [7] matrixStats_1.3.0         GenomicRanges_1.56.1
##  [9] GenomeInfoDb_1.40.1       IRanges_2.38.1
## [11] S4Vectors_0.42.1          BiocGenerics_0.50.0
## [13] vegan_2.6-6.1             lattice_0.22-5
## [15] permute_0.9-7             phyloseq_1.48.0
## [17] dabestr_2023.9.12         coin_1.4-3
## [19] survival_3.7-0            ggridges_0.5.6
## [21] qqplotr_0.0.6             MatrixCorrelation_0.10.0
## [23] energy_1.7-11             corrr_0.4.4
## [25] GGally_2.2.1              patchwork_1.2.0
## [27] cowplot_1.1.3             gridExtra_2.3
## [29] kableExtra_1.4.0          magrittr_2.0.3
## [31] purrr_1.0.2               reshape2_1.4.4
## [33] tidylog_1.1.0             tidyr_1.3.1
## [35] dplyr_1.1.4               RColorBrewer_1.1-3
## [37] ggplot2_3.5.1             BiocParallel_1.38.0
## [39] knitr_1.48
##
## loaded via a namespace (and not attached):
##   [1] libcoin_1.0-10            tensorA_0.36.2.1         rstudioapi_0.16.0
##   [4] jsonlite_1.8.8           TH.data_1.1-2            modeltools_0.2-23
##   [7] farver_2.1.2             rmarkdown_2.27           zlibbioc_1.50.0
##  [10] vctrs_0.6.5              multtest_2.60.0          tinytex_0.52
```

```
##  [13] htmltools_0.5.8.1      S4Arrays_1.4.1         progress_1.2.3
##  [16] distributional_0.4.0   plotrix_3.8-4          tidybayes_3.0.6
##  [19] Rhdf5lib_1.26.0        SparseArray_1.4.8      rhdf5_2.48.0
##  [22] pracma_2.4.4           plyr_1.8.9             sandwich_3.1-0
##  [25] zoo_1.8-12             igraph_2.0.3           lifecycle_1.0.4
##  [28] iterators_1.0.14       pkgconfig_2.0.3        Matrix_1.6-5
##  [31] R6_2.5.1               fastmap_1.2.0          GenomeInfoDbData_1.2.12
##  [34] digest_0.6.36          colorspace_2.1-1       RSpectra_0.16-2
##  [37] labeling_0.4.3         fansi_1.0.6            httr_1.4.7
##  [40] abind_1.4-5            mgcv_1.9-1             compiler_4.4.1
##  [43] withr_3.0.1            doParallel_1.0.17      gsl_2.1-8
##  [46] backports_1.5.0        ggstats_0.6.0          highr_0.11
##  [49] MASS_7.3-61            DelayedArray_0.30.1    biomformat_1.32.0
##  [52] caTools_1.18.2         tools_4.4.1            ape_5.8
##  [55] qqconf_1.3.2           glue_1.7.0             nlme_3.1-165
##  [58] rhdf5filters_1.16.0    grid_4.4.1             Rtsne_0.17
##  [61] checkmate_2.3.2        cluster_2.1.6          ade4_1.7-22
##  [64] generics_0.1.3         gtable_0.3.5           data.table_1.15.4
##  [67] hms_1.1.3              xml2_1.3.6             utf8_1.2.4
##  [70] XVector_0.44.0         ggdist_3.3.2           foreach_1.5.2
##  [73] pillar_1.9.0           stringr_1.5.1          posterior_1.6.0
##  [76] robustbase_0.99-3      splines_4.4.1          tidyselect_1.2.1
##  [79] locfit_1.5-9.10        Biostrings_2.72.1      arrayhelpers_1.1-0
##  [82] svglite_2.1.3          xfun_0.46              DEoptimR_1.1-3
##  [85] stringi_1.8.4          UCSC.utils_1.0.0       yaml_2.3.10
##  [88] boot_1.3-30            evaluate_0.24.0        codetools_0.2-19
##  [91] twosamples_2.0.1       tibble_3.2.1           cli_3.6.3
##  [94] pbmcapply_1.5.1        systemfonts_1.1.0      munsell_0.5.1
##  [97] Rcpp_1.0.13            coda_0.19-4.1          svUnit_1.0.6
## [100] parallel_4.4.1         prettyunits_1.2.0      opdisDownsampling_1.0.1
## [103] bitops_1.0-8           viridisLite_0.4.2      mvtnorm_1.2-5
## [106] scales_1.3.0           crayon_1.5.3           clisymbols_1.2.0
## [109] rlang_1.1.4            multcomp_1.4-26
```