Results Section: Public Metadata

```r
library(staphopia)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
library(ggplot2)
library(reshape2)
```

Aggregating Data For Public Samples

First we'll get all publicly available *S. aureus* samples.

```r
ps <- get_public_samples()
```

We now have 42949 samples to work with. Next we will acquire metadata associated with each sample.

We will also get information pertaining to submissions by year and how any publication links were made.

```r
submissions <- get_submission_by_year()
publication_links <- get_publication_links()
```

Next we are going to pull down any metadata associated with the public samples.

```r
metrics <- merge(
    ps,
    get_metadata(ps$sample_id),
    by='sample_id'
)
```

We are now going to add two columns `rank_name` and `year`.

```r
metrics$year <- sapply(
    metrics$first_public,
    function(x) {
        strsplit(x, "-")[[1]][1]
    }
)

metrics$rank_name <- ifelse(
    metrics$rank.x == 3,
    'Gold',
    ifelse(
        metrics$rank.x == 2,
        'Silver',
        'Bronze'
    )
)
```

Publication Information

Summary

Here are details looking at total submissions and their publication status.

```
t(submissions[submissions$year == max(submissions$year),])
```

```
##                         8
## year                 2017
## published              17
## unpublished          6698
## count                6715
## overall_published   11921
## overall_unpublished 31028
## overall             42949
```

Here is information on how publication links were made.

```
t(publication_links)
```

```
##                1
## elink       6712
## text        5656
## elink_pmid    48
## text_pmid     30
## total      11921
## total_pmid    78
```

There are 6 rows and their names are as follows:

1. elink: Number samples linked to a PubMed ID identified from eLink
2. text: Number samples linked to a PubMed ID identified from text mining (not through eLink)
3. elink_pmid: Number of PubMed IDs identified from eLink
4. text_pmid: Number of PubMed IDs identified from text mining (not through eLink)
5. total: Total number of samples associated with a PubMed ID
6. total_pmid: Total number of PubMed IDs associated with published samples

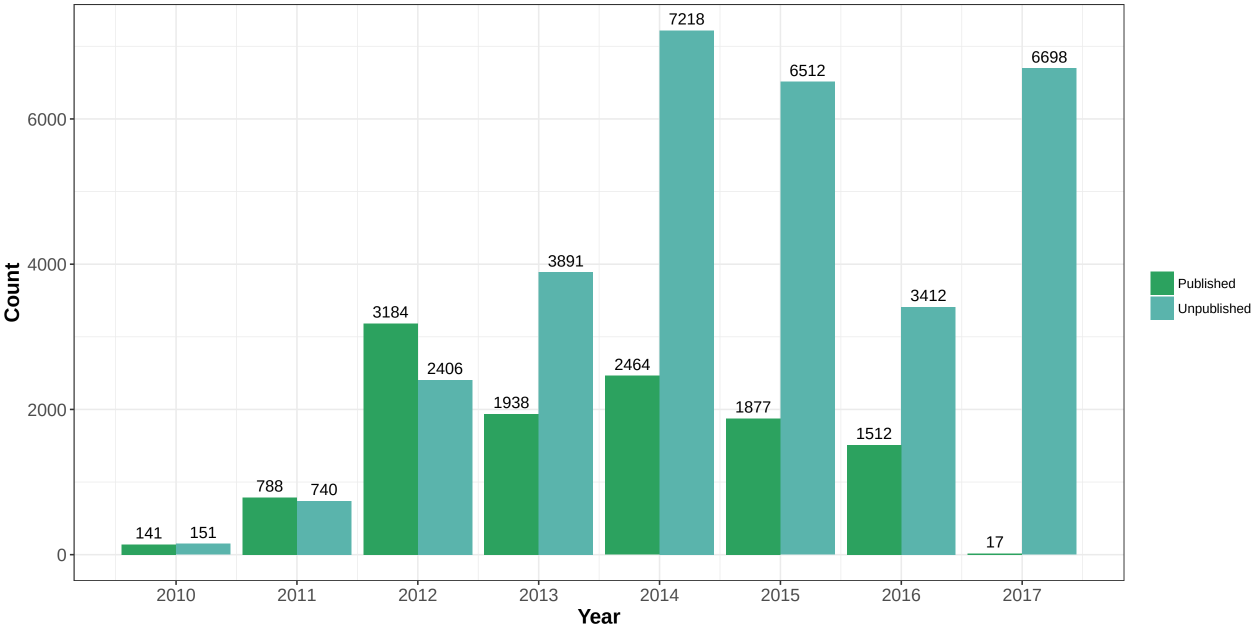
Percent of Samples Published

```
stats <- submissions[submissions$year == max(submissions$year),]
stats$overall_published / stats$overall * 100
```

```
## [1] 27.75618
```

Published vs Unpublished Submissions Per Year

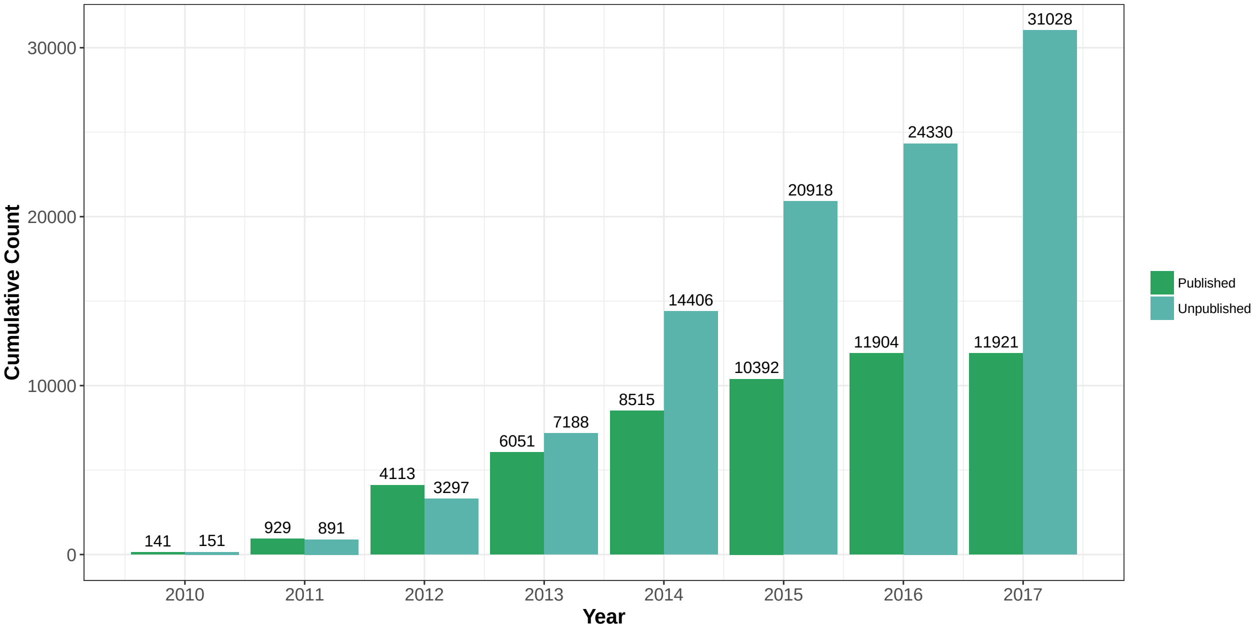
```
melted <- melt(submissions, id=c('year'),
               measure.vars = c('published', 'unpublished'))
melted$title <- ifelse(melted$variable == 'published', 'Published', 'Unpublished')
p <- ggplot(data=melted, aes(x=year, y=value, fill=title)) +
    xlab("Year") +
    ylab("Count") +
    geom_bar(stat='identity', position='dodge') +
    geom_text(aes(label=value), vjust = -0.5, position = position_dodge(.9)) +
    scale_fill_manual(values=c("#2ca25f", "#5ab4ac")) +
    scale_x_continuous(breaks = round(
        seq(min(submissions$year), max(submissions$year), by = 1), 1
    )) +
    theme_bw() +
    theme(axis.text=element_text(size=12),
          axis.title=element_text(size=14,face="bold"),
          legend.title = element_blank())


p
```



Overall Published vs Unpublished Submissions

```
melted <- melt(submissions, id=c('year'),
               measure.vars = c('overall_published', 'overall_unpublished'))
melted$title <- ifelse(melted$variable == 'overall_published', 'Published', 'Unpublished')
p <- ggplot(data=melted, aes(x=year, y=value, fill=title)) +
    xlab("Year") +
    ylab("Cumulative Count") +
    geom_bar(stat='identity', position='dodge') +
    geom_text(aes(label=value), vjust = -0.5, position = position_dodge(.9)) +
    scale_fill_manual(values=c("#2ca25f", "#5ab4ac")) +
    scale_x_continuous(breaks = round(
        seq(min(submissions$year), max(submissions$year), by = 1), 1
    )) +
    theme_bw() +
    theme(axis.text=element_text(size=12),
          axis.title=element_text(size=14,face="bold"),
          legend.title = element_blank())
```

```
p
```



```
# Output plot to PDF and PNG
staphopia::write_plot(p, paste0(getwd(), '/../figures/figure-08-published-per-year'))
```

Metadata Information

Number of Samples With A Collection Date

```
has_collection_date <- nrow(metrics[metrics$collection_date != "",])
paste0(has_collection_date," (", has_collection_date / nrow(metrics) * 100, " %)")
```

```
## [1] "17034 (39.660993271089 %)"
```

Number of Samples With A Location Information

```
has_location <- nrow(metrics[metrics$location != "unknown/missing",])
paste0(has_location," (", has_location / nrow(metrics) * 100, " %)")
```

```
## [1] "14983 (34.8855619455633 %)"
```

Number of Locations

```
nrow(as.data.frame(table(metrics[metrics$location != "unknown/missing",]$location)))
```

```
## [1] 123
```

Countries

```
country_data <- as.data.frame(table(
    metrics[(metrics$country != "unknown/missing" ) & (metrics$country != ""),]$country
))
colnames(country_data) <- c("Country", "total")
```

```
country_data <- arrange(country_data, desc(total))
country_data
```

```
##                           Country total
## 1  United States of America (USA)  5823
## 2             United Kingdom (UK)  5177
## 3                         Germany   966
## 4                         Denmark   480
## 5                        Thailand   277
## 6                       Singapore   247
## 7                        Tanzania   153
## 8                     Netherlands   138
## 9                       Australia   131
## 10                     Luxembourg   122
## 11                        Ireland   111
## 12                         Gambia    88
## 13                    New Zealand    82
## 14                         Canada    59
## 15                       Colombia    59
## 16                          Gabon    59
## 17                         France    55
## 18                         Taiwan    54
## 19                        Belgium    53
## 20                      Argentina    50
## 21                          Spain    40
## 22                         Sweden    35
## 23                          Italy    29
## 24                       Portugal    28
## 25                         Russia    27
## 26                          Chile    25
## 27                    Switzerland    25
## 28                           Perú    24
## 29                         Poland    21
## 30                     Mozambique    17
## 31                       Malaysia    14
## 32                          Ghana    12
## 33                        Finland    10
## 34                         Norway     7
## 35                         Brazil     6
## 36                          China     6
## 37                         Greece     6
## 38                         Turkey     6
## 39                        Hungary     5
## 40                     Martinique     1
```

Number of Countries

```
paste0(nrow(country_data), " countries, represented by ", sum(country_data$total), " samples")
```

```
## [1] "40 countries, represented by 14528 samples"
```

Number of Samples With Isolation Source

```
has_source <- nrow(metrics[metrics$isolation_source != "",])
paste0(has_source," (", has_source / nrow(metrics) * 100, " %)")
```

```
## [1] "14768 (34.3849682181192 %)"
```

Isolation Sources

```
df <- as.data.frame(table(substr(tolower(
    metrics[metrics$isolation_source != "",]$isolation_source), 1, 50
)))
df[order(-df$Freq),]
```

```
##                                                   Var1 Freq
## 23                                               blood 2201
## 184                                               nose 1548
## 174                                              nares 1236
## 333                                              wound 1196
## 188                                          not known 1116
## 65                                             culture  704
## 244                                             sputum  629
## 177                                              nasal  265
## 191                                              other  253
## 29                                        bodily fluid  229
## 171                 mrsa screen - nose/throat/perineum  228
## 221                                        respiratory  210
## 241                                        soft tissue  205
## 122                                         human body  202
## 118                                               host  201
## 262                                             throat  186
## 78                                         environment  176
## 169                                        mrsa screen  164
## 123                                     human clinical  151
## 175                                nares or umbillicus  141
## 326                                              urine  128
## 258                     swabs, multiple swab locations  127
## 148                                      leg infection  125
## 180                                         nasal swab  120
## 131                                           invasive  119
## 143                                         laboratory  118
## 199                                           perineum  118
## 187                                      not collected  116
## 234                                               skin   97
## 43                                      bulk tank milk   93
## 237                                skin or soft tissue   88
## 119                                  household surface   79
## 58                                   clinical specimen   78
## 265                                             tissue   74
## 42                                           bulk milk   71
## 165                                               milk   69
## 337                                         wound swab   69
## 125                            human clinical specimen   67
## 99                                            foremilk   63
## 5                                              abscess   61
## 168                                       mrsa [broth]   57
## 144                                  laboratory strain   52
## 136                                        joint fluid   46
## 190                                      osteomyelitis   45
## 223                                 respiratory sample   43
## 68                                diabetic foot sample   40
## 26                                   blood for culture   38
## 120                                              human   38
## 227                            sample from soft tissue   38
## 264                                                tip   38
## 106                                      ground turkey   36
## 103                                              groin   34
## 215                                                pus   34
## 213                         prosthetic joint infection   30
## 178                               nasal or rectal swab   29
## 35                           bronchial alveolar lavage   26
## 259                                     swine facility   26
## 132                                   in vitro derived   25
## 37                                  bronchial washings   24
## 128                                                icu   24
## 31                                                bone   21
## 209                                          pork chop   21
## 91                                               fluid   20
## 72                                            drainage   19
## 105                                        ground beef   17
## 239                                          skin swab   17
## 266                                            tissues   17
## 277                                         ulcer swab   17
## 124                             human clinical isolate   15
## 134                               isolate from a human   15
## 176                             nares/umbilicus/acilla   14
## 211                            post surgical secretion   14
## 81                                                 eye   13
## 335                                    wound infection   13
## 4                                       abdominal wound   12
## 151                                          leg wound   12
## 228                                        screen swab   12
## 7                                      abscess/pus swab   10
## 59                                        colonization   10
## 93                                                food   10
## 200                                   peritoneal fluid   10
## 206                                      pleural fluid   10
## 240                                         skin wound   10
## 36                                bronchial secretions    9
## 60                                           commensal    9
## 129                                          infection    9
## 226                          sample from bone or joint    9
## 255                                     surgical wound    9
## 24                                       blood culture    8
## 41                                         broncoscopy    8
## 47                                            catheter    8
## 64                                                 csf    8
## 77                                         elbow wound    8
## 98                                          foot wound    8
## 183                                            non-icu    8
## 212                                       pressure sore    8
## 49                                    cellulitis of leg    7
## 95                                    footpad infection    7
## 104                                          groin swab    7
## 150                                     leg swab - left    7
## 170                                 mrsa screening swab    7
## 235                                        skin abscess    7
## 246                             sputum from endotrachea    7
## 158                                                lung    6
## 2                                       abdominal fluid    5
## 11                                               armpit    5
## 39                               bronchoalveolar lavage    5
## 53                                       chicken breast    5
## 155                                     liver infection    5
## 157       lower respiratory tract specimens of patients    5
## 172                   mrsa screen - other site/specimen    5
## 182                                          neck wound    5
## 189                                                oral    5
## 323                                             urethra    5
## 1                                     abdominal abscess    4
## 3                                        abdominal swab    4
## 10                                                  arm    4
## 15                                             aspirate    4
## 32                                bone marrow infection    4
## 62                                        corneal ulcer    4
## 67                                      decubitus ulcer    4
## 82                                         eye drainage    4
## 85                                               faeces    4
## 89                                         finger wound    4
## 94                                                 foot    4
## 114                                       hip infection    4
## 142                                          knee wound    4
## 153                                               liver    4
## 193                                   peg tube drainage    4
## 208                                              pooled    4
## 232                                    septic arthritis    4
## 236                                      skin infection    4
## 250                                               stool    4
## 269                                           toe wound    4
## 270                                   tonsillar abscess    4
## 320                                            unknown7    4
## 22                                                 bile    3
## 30                                           body fluid    3
## 40                                         bronchoscopy    3
## 44                                                 burn    3
## 79                                        environmental    3
## 86                                                 farm    3
## 115                                     hip joint fluid    3
## 130                             intra-abdominal abscess    3
## 160                  lungs of cystic fibrosis patient a    3
## 194                                         penile swab    3
## 238                       skin or soft tissue infection    3
## 242                                        spinal fluid    3
## 249                                       sternal wound    3
## 257                                               swab    3
## 284                                          umbilicus    3
## 298                                          unknown22    3
## 301                                          unknown26    3
## 6                              abscess/pus collection    2
## 12                                    arm swab - left    2
## 14                                      ascitic fluid    2
## 17      bakery environment - assembly production room    2
## 25                                    blood - culture    2
## 28                                              blops    2
## 33                                      brain abscess    2
## 34                                             bronch    2
## 38                           bronchoalveolar aspirate    2
## 51                                              chest    2
## 54                   child - hospital pneumology ward    2
## 56                                           clinical    2
## 80                          excreted bodily substance    2
## 87  fatal septicaemia and septic arthritis in a 16-mon    2
## 90                                   fish drying yard    2
## 92                                   fluid left elbow    2
## 101                                             graft    2
## 102                                         granuloma    2
## 109                                       heart valve    2
## 111                                          hematoma    2
## 126                                     human samples    2
## 133 isolated from pus and debrided tissue at surgical     2
## 135                                    joint aspirate    2
## 137                                       jp drainage    2
## 138                                  jugular catheter    2
## 140                                              knee    2
## 152                                            lesion    2
## 163                                              mass    2
## 192                                   p.e.g site swab    2
## 198                                          perineal    2
## 203                              peritoneum infection    2
## 205                                         pin tract    2
## 216                                          pus swab    2
## 222                               respiratory culture    2
## 256                                            suture    2
## 263                                       throat swab    2
## 272                                 tracheal aspirate    2
## 274                            tracheostomy site swab    2
## 280                             ulcer swab - left leg    2
## 282                            ulcer swab - right leg    2
## 285                                          unknown1    2
## 287                                         unknown11    2
## 288                                         unknown12    2
## 289                                         unknown13    2
## 291                                         unknown15    2
## 292                                         unknown16    2
## 303                                          unknown3    2
## 309                                         unknown35    2
## 314                                          unknown4    2
## 315                                         unknown41    2
## 318                                           unknown5    2
## 321                                           unknown8    2
## 322                                           unknown9    2
## 329                                urine (nephrostomy)    2
## 334                              wound from outpatient    2
## 336                                         wound site    2
## 338                      wound swab (site unspecified)    2
## 8                                        abscess swab    1
## 9                                  ankle swab - right    1
## 13                                arthritis aspirates    1
## 16                                         aspiration    1
## 18  bakery environment - bottom metal shelf on table u    1
## 19   bakery environment - concentrated whipped topping    1
## 20                        bakery environment - hallway    1
## 21                                                bal    1
## 27          bloodstream of an adult female icu patient    1
## 45                  buttock abscess; community aquired    1
## 46                                buttock swab - left    1
## 48                            catheter specimen urine    1
## 50                                cerebrospinal fluid    1
## 52                               chest cavity abscess    1
## 55                 child in a hospital pneumology ward    1
## 57                                    clinical sample    1
## 61                                  community aquired    1
## 63                                         cough swab    1
## 66                                      darcocystitis    1
## 69                                       diced chiken    1
## 70                                doctor&apos;s hands    1
## 71                                              drain    1
## 73                                    drain site swab    1
## 74                                           ear swab    1
## 75                                    ear swab - left    1
## 76                                 elbow swab - right    1
## 83                                   eye swab - right    1
## 84                                          face swab    1
## 88                                fatting pig at farm    1
## 96                                  foot swab - right    1
## 97                   foot ulcer of a diabetic patient    1
## 100                             gastrostomy site swab    1
## 107                                 hand swab - right    1
## 108                                          hardware    1
## 110                                  heel swab - left    1
## 112           hexachlorocyclohexane-contaminated soil    1
## 113                                 high vaginal swab    1
## 116                                        hip - left    1
## 117                              hospital environment    1
## 121                                     human abscess    1
## 127                                       human urine    1
## 139                                  kidney infection    1
## 141                                  knee swab - left    1
## 145                                        lab strain    1
## 146                                       lean turkey    1
## 147                                        leg abcess    1
## 149                                          leg swab    1
## 154                                         liver cyst    1
## 156                                  lower jaw abscess    1
## 159                                     lung infection    1
## 161                 lungs of cystic fibrosis patient b    1
## 162                 lungs of cystic fibrosis patient c    1
## 164                                   mid-stream urine    1
## 166                                        minced pork    1
## 167                                         mouth swab    1
## 173                               mrsa screen - throat    1
## 179                                       nasal sample    1
## 181                                          neck swab    1
## 185                                          nose swab    1
## 186                                            nostril    1
## 195                                              penis    1
## 196                                   pericardic fluid    1
## 197                    pericardium infection infection    1
## 201              peritoneal fluid inpatient/outpatient    1
## 202                                   peritoneum fluid    1
## 204                                      pernasal swab    1
## 207                                               pool    1
## 210                                     pork valentine    1
## 214           purulent sputum, cardio thoracic surgery    1
## 217                                        raw chicken    1
## 218                                     raw pork mince    1
## 219                                         raw turkey    1
## 220                                        rectal swab    1
## 224                       respritory; pharyngeal smear    1
## 225                                        right ankle    1
## 229                                 secretion left hip    1
## 230                                 secretion surgical    1
## 231                                     sepsis patient    1
## 233                                      sheep abscess    1
## 243                                   spleen infection    1
## 245                                        sputum - cf    1
## 247                                     sputum induced    1
## 248                      staphylococcus aureus usa 300    1
## 251          stool of child with non-specific diarrhea    1
## 252                              sub-cutaneous abscess    1
## 253                                            surface    1
## 254                                      surgical ward    1
## 260                                              thigh    1
## 261                                  thigh swab -right    1
## 267                                           toe swab    1
## 268                                    toe swab - left    1
## 271                                  trachael aspirate    1
## 273                                 tracheal secretion    1
## 275                       transtracheal aspirate fluid    1
## 276                                  ulcerated maxilla    1
## 278                                ulcer swab - key-in    1
## 279                             ulcer swab - left foot    1
## 281                            ulcer swab - right heel    1
## 283                                     umbilical swab    1
## 286                                          unknown10    1
## 290                                          unknown14    1
## 293                                          unknown17    1
## 294                                          unknown19    1
## 295                                           unknown2    1
## 296                                          unknown20    1
## 297                                          unknown21    1
## 299                                          unknown23    1
## 300                                          unknown24    1
## 302                                          unknown28    1
## 304                                          unknown30    1
## 305                                          unknown31    1
## 306                                          unknown32    1
## 307                                          unknown33    1
## 308                                          unknown34    1
## 310                                          unknown36    1
## 311                                          unknown37    1
## 312                                          unknown38    1
## 313                                          unknown39    1
## 316                                          unknown42    1
## 317                                          unknown43    1
## 319                                           unknown6    1
## 324                                    urethral meatus    1
## 325                         urinary catheter site swab    1
## 327                               urine collection bag    1
## 328                 urine from long term care facility    1
## 330                                     vaginal tampon    1
## 331                              ventral vulva abscess    1
## 332                                  veterinary school    1
```

Number of Isolation Sources

```
nrow(as.data.frame(table(tolower(
    metrics[metrics$isolation_source != "",]$isolation_source
))))
```

```
## [1] 338
```

Session Info

```
sessionInfo()
```

```
## R version 3.4.3 (2017-11-30)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 16.04.2 LTS
##
## Matrix products: default
## BLAS: /usr/lib/libblas/libblas.so.3.6.0
## LAPACK: /usr/lib/lapack/liblapack.so.3.6.0
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8        LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=en_US.UTF-8    LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=en_US.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] bindrcpp_0.2    reshape2_1.4.3  ggplot2_2.2.1   dplyr_0.7.4
## [5] staphopia_0.1.9
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_0.12.15        knitr_1.20          bindr_0.1.1
##  [4] magrittr_1.5        munsell_0.4.3       colorspace_1.3-2
##  [7] R6_2.2.2            rlang_0.1.6         httr_1.3.1
## [10] plyr_1.8.4          stringr_1.2.0       tools_3.4.3
## [13] grid_3.4.3          data.table_1.10.4-3 gtable_0.2.0
## [16] htmltools_0.3.6     lazyeval_0.2.1      yaml_2.1.18
## [19] rprojroot_1.3-2     digest_0.6.15       assertthat_0.2.0
## [22] tibble_1.4.2        curl_3.1            glue_1.2.0
## [25] evaluate_0.10.1     rmarkdown_1.9       labeling_0.3
## [28] stringi_1.1.6       compiler_3.4.3      pillar_1.1.0
## [31] scales_0.5.0        backports_1.1.2     jsonlite_1.5
## [34] pkgconfig_2.0.1
```