100 Years of Social Work Research: A Data Science Perspective

Overview of data

The original data were from a search of PsychInfo using Ebsco Host platform (December 23, 2014). The following search operators and limiters were used:

- SO "social work" OR SO "social welfare" OR SO "social casework" OR SO "social services"
- Limiters - Document Type: Journal Article
- Search modes - Boolean/Phrase Interface - EBSCOhost Research Databases
- Search Screen - Advanced Search
- Database - PsycINFO

The search results were exported in a *generic bibliographic format*, which is an unstructured text (*.txt) file.The text file was processed using the `BibWrangleR` function created by the first author.

Initialize workspace and functions for data wrangling

This section processes raw data. This section of code is executed only one time to transform raw text data into an analyzable format. When new data are obtained for this study (i.e., updated search results), this section should be re-run by changing `echo=FALSE` to `echo=TRUE` in the knitr markdown argument.

```
# Clear workspace
rm(list=ls())

# Read BWR functions
source("/Users/beperron/Git/BibWrangleR/functions/piWrangleR.R")
source("/Users/beperron/Git/BibWrangleR/functions/packages.R")

# Set the path where original raw data are stored
setwd("/Users/beperron/Git/SocialWorkResearch")

# Set the working directory to store files created by BWR functions
my.path <- "/Users/beperron/Git/SocialWorkResearch"

# Wrangle the data with the BWR function suite
#piBWR.f(csv=FALSE, path=my.path)
#save(pi.df, file = "piArticles.R")
```

Initialize workspace and functions for analaysis

All the analyses performed involve the data that have been processed with the `BibWrangleR` functions. This section reads the processed data, loads the required packages, and does a quick quality check to ensure that

the same number of articles (i.e., records) contained in the original search match the number of articles in the transformed data.

```
rm(list=ls())
load("piArticles.R")
library(dplyr)
library(ggplot2)
library(gridExtra)

# Inspect dimensions of the data file (Rows X Columns)
dim(pi.df)
```

```
[1] 495415      3
```

```
# Inspect variable names of the data file
names(pi.df)
```

```
[1] "attributes" "articleID"  "record"
```

```
# How many unique article titles?  Ebsco Results of most current search is $n=24,314$. Do not proceed w
length(which(pi.df$attributes == "TI"))
```

```
[1] 24314
```

What is the overall number and names of journal titles?

```
unique.titles <- filter(pi.df, attributes == "SO")

# Number of unique titles
length(unique(unique.titles$record))
```

```
## [1] 89
```

```
# Unique titles
unique(unique.titles$record)
```

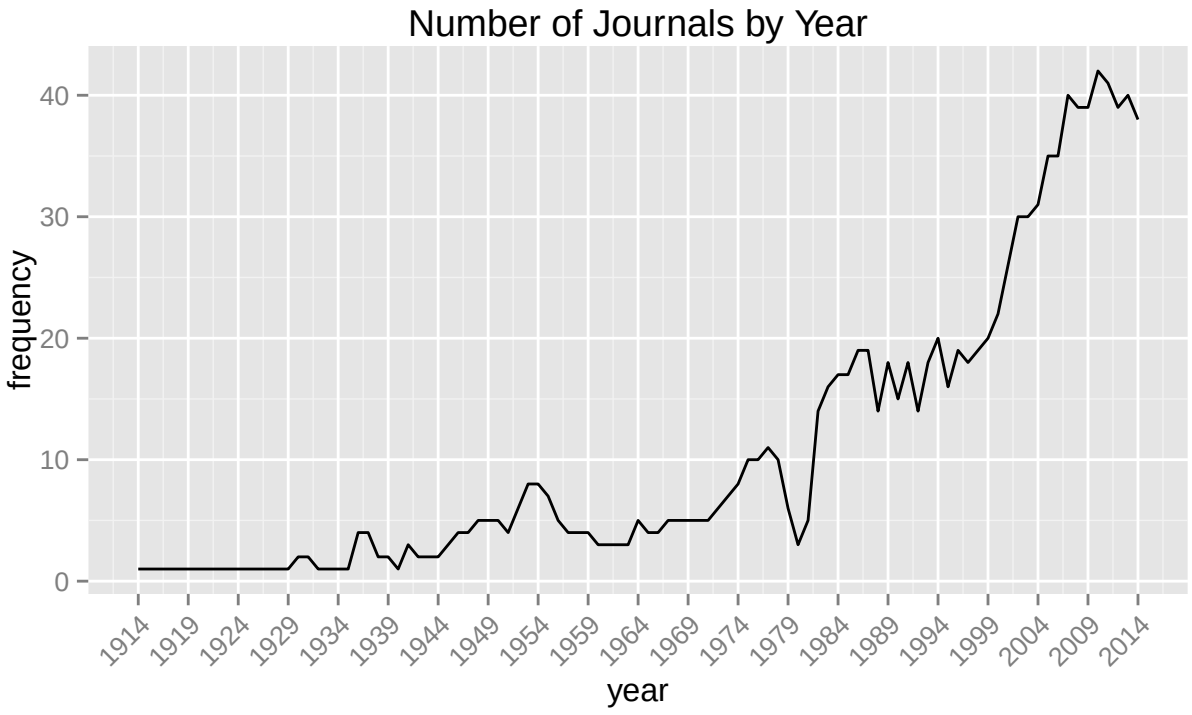
```
##  [1] "Journal of Ethnic & Cultural Diversity in Social Work: Innovation in Theory, Research & Practi
##  [2] "Journal of Sociology and Social Welfare"
##  [3] "Social Work & Christianity"
##  [4] "Journal of Gerontological Social Work"
##  [5] "Research on Social Work Practice"
##  [6] "Child & Family Social Work"
##  [7] "Australian Social Work"
##  [8] "Social Work with Groups: A Journal of Community and Clinical Practice"
##  [9] "Practice: Social Work in Action"
## [10] "Journal of Gay & Lesbian Social Services: The Quarterly Journal of Community & Clinical Practi
## [11] "Smith College Studies in Social Work"
## [12] "Journal of Social Work Practice"
## [13] "Social Work in Health Care"
```

```
## [14] "Journal of Social Work Education"
## [15] "Children & Schools"
## [16] "Social Work"
## [17] "Child & Adolescent Social Work Journal"
## [18] "Clinical Social Work Journal"
## [19] "International Social Work"
## [20] "Journal of Social Work"
## [21] "Social Work Research"
## [22] "Social Work Education"
## [23] "Journal of Evidence-Based Social Work"
## [24] "Health & Social Work"
## [25] "Affilia: Journal of Women & Social Work"
## [26] "Qualitative Social Work: Research and Practice"
## [27] "Families in Society"
## [28] "Social Work in Mental Health"
## [29] "Ethics and Social Welfare"
## [30] "Journal of Religion & Spirituality in Social Work: Social Thought"
## [31] "Journal of HIV/AIDS & Social Services"
## [32] "Journal of Social Work Practice in the Addictions"
## [33] "British Journal of Social Work"
## [34] "School Social Work Journal"
## [35] "Journal of the Society for Social Work and Research"
## [36] "Journal of Social Work in End-of-Life & Palliative Care"
## [37] "International Journal of Social Welfare"
## [38] "Psychoanalytic Social Work"
## [39] "Administration in Social Work"
## [40] "The Journal of Baccalaureate Social Work"
## [41] "The Scientific Review of Mental Health Practice: Objective Investigations of Controversial and
## [42] "Social Work and Social Sciences Review"
## [43] "Journal of Gay & Lesbian Social Services: Issues in Practice, Policy & Research"
## [44] "Practice"
## [45] "Journal of Educational & Psychological Consultation"
## [46] "Rural Social Work"
## [47] "Journal of Technology in Human Services"
## [48] "Journal of Social Service Research"
## [49] "Journal of Applied Social Sciences"
## [50] "Early Child Development and Care"
## [51] "Computers in Human Services"
## [52] "The Clinical Supervisor"
## [53] "Children and Youth Services Review"
## [54] "Journal of Social Work Research and Evaluation"
## [55] "General Hospital Psychiatry"
## [56] "Canadian Journal on Aging"
## [57] "Social Casework"
## [58] "Journal of Multicultural Social Work"
## [59] "Journal of Analytic Social Work"
## [60] "Maatskaplike Werk/Social Work"
## [61] "Issues in Social Work Education"
## [62] "Journal of Teaching in Social Work"
## [63] "Social Work Research & Abstracts"
## [64] "Journal of Social Work & Human Sexuality"
## [65] "Journal of Independent Social Work"
## [66] "Employee Assistance Quarterly"
## [67] "Behavior Modification"
```

```
## [68] "Indian Journal of Social Work"
## [69] "Indian Journal of Psychiatric Social Work"
## [70] "British Journal of Psychiatric Social Work"
## [71] "Social Work in Education"
## [72] "Pediatric Social Work"
## [73] "Journal of Social Welfare"
## [74] "School Social Work Quarterly"
## [75] "Social Work Today"
## [76] "Journal of Psychiatric Social Work"
## [77] "Medical Social Work"
## [78] "Jewish Social Services Quarterly"
## [79] "Proceedings of the National Conference of Social Work"
## [80] "Journal of Social Casework"
## [81] "Social Work Yearbook"
## [82] "Social Work Technique"
## [83] "Journal of Social Work Process"
## [84] "Pennsylvania Social Work"
## [85] "International Conference of Social Work"
## [86] "Eugenics & Social Welfare Bull."
## [87] "New York State Department of Social Welfare, Division Publication"
## [88] "University of Washington Publications: Social Services"
## [89] "Eugenics and Social Welfare Bulletin"
```

Number of unique journal titles by year

```
journals.year <- tbl_df(pi.df)

year <- journals.year %>%
        filter(attributes == "YR") %>%
        select(id = articleID, year = record)

journals <- journals.year %>%
        filter(attributes == "SO") %>%
        select(id = articleID, journal.title = record)

n.journals.year <- journals %>%
        left_join(year) %>%
        group_by(year) %>%
        distinct(journal.title) %>%
        summarise(n = n())

journal.count <- ggplot(n.journals.year, aes(as.numeric(year), y=n, group=1)) +
    geom_line(colour="black") +
    #geom_point(colour="red") +
    theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
    xlab("year") +
    ylab("frequency") +
    ggtitle("Number of Journals by Year") +
    scale_x_continuous(breaks=seq(1914, 2014, 5))

journal.count
```



What journals published the most number of articles

```
n.so.yr <- filter(pi.df, attributes == "SO" | attributes == "YR")

n.so <- filter(pi.df, attributes == "SO") %>% mutate(title = record) %>%
        select(-attributes, -record)

n.yr <- filter(pi.df, attributes == "YR") %>% mutate(year = record ) %>%
        select(-attributes, -record)

n.so.yr <- left_join(n.so, n.yr) %>%
    group_by(title) %>%
    summarise(first = min(year), last = max(year), n.to.date = n()) %>%
    arrange(desc(n.to.date))
```

```
## Joining by: "articleID"
```

```
# 10 highest number of publications
head(n.so.yr, 10)
```

```
## Source: local data frame [10 x 4]
##
##                                 title first last n.to.date
## 1                         Social Work  1948 2014      1866
## 2         British Journal of Social Work  1971 2014      1456
## 3                   Families in Society  1990 2014      1211
## 4  Journal of Gerontological Social Work  1981 2014      1188
## 5             Social Work in Health Care  1975 2014      1171
```

```
## 6                        Social Casework  1950 1989      1095
## 7   Smith College Studies in Social Work  1930 2014      1075
## 8           Clinical Social Work Journal  1973 2014      1068
## 9       Research on Social Work Practice  1991 2014       986
## 10                  Health & Social Work  1976 2014       901
```

What is the lifespan of journals?

```
#10 longest running journals
longest.running <- n.so.yr %>%
       mutate(last = as.numeric(last), first = as.numeric(first),
              year.diff = last - first) %>%
       arrange(desc(year.diff)) %>%
       select(title, first, last, year.diff)

head(longest.running, 10)
```

```
## Source: local data frame [10 x 4]
##
##                                     title first last year.diff
## 1     Smith College Studies in Social Work  1930 2014        84
## 2                               Social Work  1948 2014        66
## 3                   Journal of Social Work  1964 2014        50
## 4            Indian Journal of Social Work  1941 1986        45
## 5           British Journal of Social Work  1971 2014        43
## 6             Clinical Social Work Journal  1973 2014        41
## 7  Journal of Sociology and Social Welfare  1974 2014        40
## 8               Social Work in Health Care  1975 2014        39
## 9                         Social Casework  1950 1989        39
## 10                  Health & Social Work  1976 2014        38
```

```
#10 shortest running journals
shortest.running <- longest.running %>% arrange(year.diff, first, last)
head(shortest.running, 20)
```

```
## Source: local data frame [20 x 4]
##
##                                                                title first
## 1                              Eugenics and Social Welfare Bulletin  1918
## 2                            International Conference of Social Work  1928
## 3             University of Washington Publications: Social Services  1929
## 4                                          Pennsylvania Social Work  1936
## 5                                    Journal of Social Work Process  1937
## 6  New York State Department of Social Welfare, Division Publication  1937
## 7                                             Social Work Yearbook  1947
## 8                                                Social Work Today  1978
## 9                                     School Social Work Quarterly  1979
## 10                                           Pediatric Social Work  1984
## 11                                      Canadian Journal on Aging  1987
## 12                                          Behavior Modification  1989
## 13                                   Employee Assistance Quarterly  1989
```

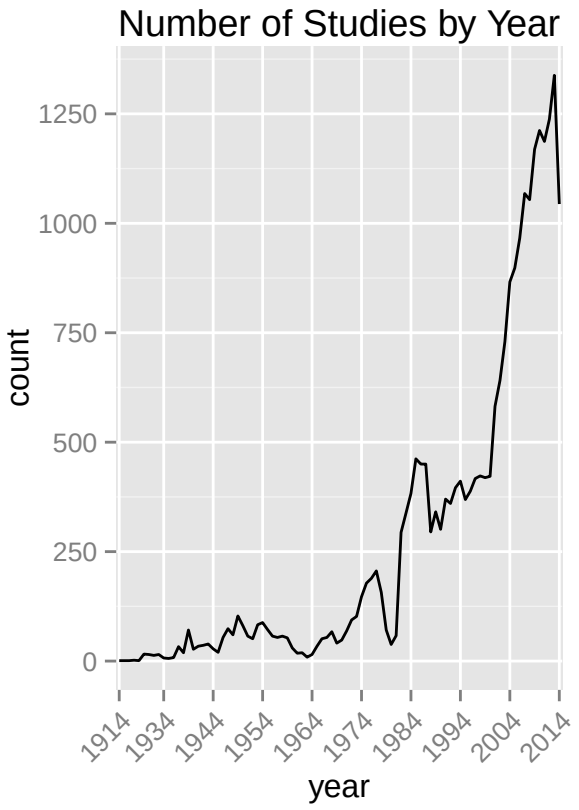
```
## 14                                Children and Youth Services Review  1991
## 15                                       General Hospital Psychiatry  1991
## 16                                       Computers in Human Services  1994
## 17                                           The Clinical Supervisor  1994
## 18                                Journal of Applied Social Sciences  1994
## 19                                Journal of Teaching in Social Work  1994
## 20                                  Early Child Development and Care  1995
## Variables not shown: last (dbl), year.diff (dbl)
```

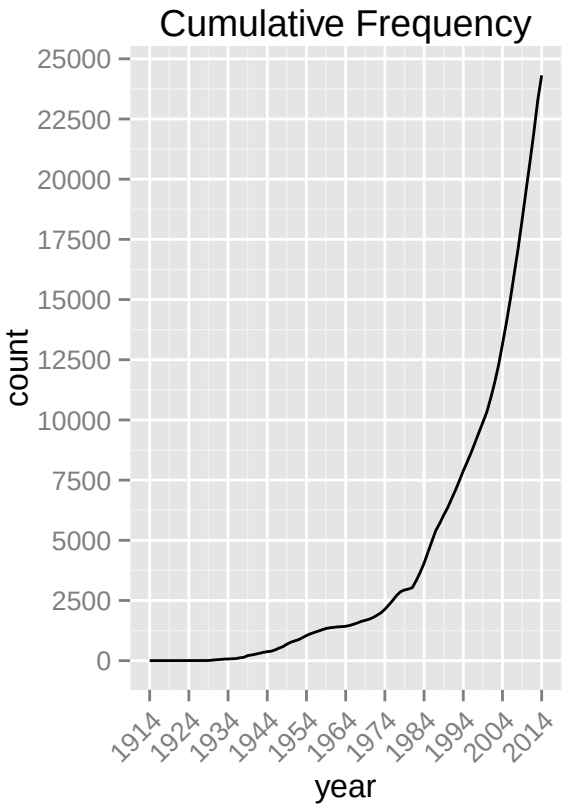
What is the number of articles published per year

```
n.articles.year <- filter(pi.df, attributes == "YR")
year.split <- split(n.articles.year, n.articles.year$record)
year.count <- unlist(lapply(year.split, nrow))
year.count <- year.count[order(names(year.count))]
years <- names(year.count)

df <- data.frame(years, year.count)
rownames(df) <- NULL

plot.article.count <- ggplot(df, aes(as.factor(years),
                     y = year.count, group=1)) +
    geom_line(colour="black") +
    #geom_point(colour="red") +
    theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
    xlab("year") +
    ylab("count") +
    ggtitle("Number of Studies by Year") +
    scale_x_discrete(breaks=c(seq(1914, 2014, 10))) +
    scale_y_continuous(breaks = c(seq(0, 2000, 250)))

df$years <- as.numeric(as.character(df$years))

plot.article.cumulative <- ggplot(df, aes(x = years, y = cumsum(year.count))) +
    geom_line() +
    theme(axis.text.x = element_text(angle=45, hjust=1)) +
    scale_x_continuous(breaks=pretty(df$years)) +
    xlab("year") +
    ylab("count") +
    scale_x_continuous(breaks = c(seq(1914,2014,10))) +
    scale_y_continuous(breaks = c(seq(0, 25000, 2500))) +
    ggtitle("Cumulative Frequency")
```

```
## Scale for 'x' is already present. Adding another scale for 'x', which will replace the existing scal
```

```
grid.arrange(plot.article.count, plot.article.cumulative, ncol=2)
```






```
# Print most recent ten years
head(df, 10)
```

```
##    years year.count
## 1   1914          1
## 2   1915          1
## 3   1918          1
## 4   1928          2
## 5   1929          1
## 6   1930         16
## 7   1931         15
## 8   1932         13
## 9   1933         15
## 10  1934          7
```

What are the topic areas (by Subject Terms)?

```
su.df <- filter(pi.df, attributes == "SU")

subject.terms <- stringr::str_split(su.df$record, pattern = ";")
subject.terms <- unlist(lapply(subject.terms, function(x) gsub(" ", "", x)))

subject.terms.total <- length(unlist(lapply(subject.terms,
                        function(x) gsub(" ", "", x))))
```

```r
subject.terms.unique <- length(unique(subject.terms))

subject.terms.l <- list(subject.terms.total = subject.terms.total,
                        subject.terms.unique = subject.terms.unique)

most.frequent <- as.data.frame(table(subject.terms))

most.frequent <- arrange(most.frequent, desc(Freq))

# Print summary statistics in list form
subject.terms.l
```

```
$subject.terms.total
[1] 92161

$subject.terms.unique
[1] 3037
```

```r
# Print 25 most commmon terms
head(most.frequent, 25)
```

```
                subject.terms Freq
1              SocialCasework 5794
2               SocialWorkers 2933
3         SocialWorkEducation 1696
4              SocialServices 1139
5                ChildWelfare  811
6               SocialSupport  602
7           CommunityServices  572
8                      Family  572
9                  Caregivers  571
10                 ChildAbuse  571
11            MentalDisorders  500
12               HumanFemales  493
13                  DrugAbuse  488
14            FamilyRelations  478
15                      Aging  474
16                        HIV  471
17                FosterCare  470
18                    Blacks  445
19       MentalHealthServices  441
20         HealthCareServices  440
21                MentalHealth  438
22             CopingBehavior  403
23               Intervention  400
24         GroupPsychotherapy  393
25 PsychotherapeuticProcesses  390
```

What are the topic areas over time (by Subject terms)?

```
decade <- filter(pi.df, attributes == "YR") %>%
    mutate(year = as.numeric(record)) %>% select(-record, -attributes)

decade$year <- cut(decade$year, breaks = 20, labels = c(1:20))

keywords <- pi.df %>%
        filter(attributes == "SU") %>%
        select(articleID = articleID, keywords = record)

keywords.decade <- keywords %>%
         left_join(decade)
```

```
## Joining by: "articleID"
```

```
library(plyr)
```

```
## ------------------------------------------------------------------------------
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
## ------------------------------------------------------------------------------
##
## Attaching package: 'plyr'
##
## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
keywords.data.split <- dlply(keywords.decade, .(year))
detach(package:plyr)

terms.f <- function(x){
    split.terms <- stringr::str_split(x[,"keywords"], pattern =";")
    clean.terms <- lapply(split.terms, function(x) gsub(" ", "", x))
    }

keywords.decade <- lapply(keywords.data.split, terms.f)
keywords.decade <- lapply(keywords.decade, unlist)
lapply(keywords.decade, function(x) length(unique(x)))
```

```
## $`5`
## [1] 2
##
## $`6`
## [1] 2
##
## $`7`
## [1] 2
##
## $`8`
```

```
## [1] 3
##
## $`9`
## [1] 4
##
## $`10`
## [1] 44
##
## $`11`
## [1] 337
##
## $`12`
## [1] 512
##
## $`13`
## [1] 796
##
## $`14`
## [1] 902
##
## $`15`
## [1] 1179
##
## $`16`
## [1] 1190
##
## $`17`
## [1] 1384
##
## $`18`
## [1] 1708
##
## $`19`
## [1] 1941
##
## $`20`
## [1] 2003
```

```
temp <- lapply(keywords.decade, function(x) data.frame(table(x)))
temp <- lapply(temp, function(x) arrange(x, desc(Freq)))
lapply(temp, function(x) head(x,10))
```

```
## $`5`
##               x Freq
## 1 ChildGuidance    2
## 2        Agency    1
##
## $`6`
##               x Freq
## 1        Agency    1
## 2 ChildGuidance    1
##
## $`7`
##               x Freq
```

```
## 1        Agency   11
## 2 ChildGuidance    2
##
## $`8`
##                x Freq
## 1          Agency    9
## 2   ChildGuidance    5
## 3 SmallBusinesses    1
##
## $`9`
##                       x Freq
## 1                Agency    9
## 2         ChildGuidance    2
## 3 EmotionalDisturbances    1
## 4       SocialGroupWork    1
##
## $`10`
##                        x Freq
## 1                Clients    3
## 2  EmotionalDisturbances    3
## 3        FamilyRelations    2
## 4          FamilyTherapy    2
## 5             Infidelity    2
## 6          SocialWorkers    2
## 7     AntisocialBehavior    1
## 8             ChildAbuse    1
## 9          ChildGuidance    1
## 10       ChildPsychiatry    1
##
## $`11`
##                           x Freq
## 1            SocialCasework   99
## 2                 Treatment   25
## 3         CommunityServices   20
## 4             FamilyTherapy   15
## 5                    Family   14
## 6  InterpersonalInteraction   12
## 7           FamilyRelations   11
## 8       PsychiatricPatients   11
## 9        ChildPsychotherapy   10
## 10                  Clinics   10
##
## $`12`
##                             x Freq
## 1              SocialCasework  145
## 2               SocialWorkers   39
## 3             FamilyRelations   30
## 4           CommunityServices   25
## 5               FamilyTherapy   25
## 6         PsychiatricPatients   19
## 7          GroupPsychotherapy   17
## 8        ParentChildRelations   16
## 9  PsychotherapeuticProcesses   15
## 10        SocioeconomicStatus   14
```

```
##
## $`13`
##                              x Freq
## 1               SocialCasework  212
## 2                SocialWorkers   99
## 3              FamilyRelations   37
## 4                FamilyTherapy   35
## 5                 HumanFemales   34
## 6   PsychotherapeuticProcesses   34
## 7          SocialWorkEducation   34
## 8                      Parents   30
## 9  PsychotherapeuticTechniques   30
## 10                 Counseling   28
##
## $`14`
##                   x Freq
## 1    SocialCasework  315
## 2     SocialWorkers  129
## 3   GroupCounseling   76
## 4    SocialServices   48
## 5      HumanFemales   45
## 6     SocialSupport   44
## 7  LiteratureReview   43
## 8        ChildAbuse   37
## 9     FamilyTherapy   37
## 10  FamilyRelations   34
##
## $`15`
##                     x Freq
## 1      SocialCasework  566
## 2       SocialWorkers  203
## 3      SocialServices  111
## 4     GroupCounseling  105
## 5       SocialSupport   87
## 6  GroupPsychotherapy   81
## 7       FamilyTherapy   74
## 8          ChildAbuse   68
## 9      CopingBehavior   62
## 10       HumanFemales   59
##
## $`16`
##                   x Freq
## 1   SocialCasework  411
## 2    SocialWorkers  174
## 3   SocialServices   83
## 4  FamilyRelations   78
## 5       Caregivers   75
## 6  MentalDisorders   74
## 7       ChildAbuse   72
## 8    SocialSupport   61
## 9             AIDS   60
## 10 GroupCounseling   55
##
## $`17`
```

```
##                       x Freq
## 1       SocialCasework  419
## 2        SocialWorkers  151
## 3       SocialServices   91
## 4           ChildAbuse   89
## 5  SocialWorkEducation   81
## 6        SocialSupport   70
## 7      FamilyRelations   65
## 8               Blacks   64
## 9                  HIV   62
## 10       ChildWelfare   58
##
## $`18`
##                       x Freq
## 1       SocialCasework  699
## 2        SocialWorkers  399
## 3  SocialWorkEducation  198
## 4       SocialServices  186
## 5         ChildWelfare  140
## 6            DrugAbuse  107
## 7    MaleHomosexuality  103
## 8           Caregivers  102
## 9        SocialSupport   93
## 10          FosterCare   88
##
## $`19`
##                       x Freq
## 1       SocialCasework 1377
## 2        SocialWorkers  824
## 3  SocialWorkEducation  566
## 4         ChildWelfare  291
## 5       SocialServices  281
## 6                Aging  180
## 7                  HIV  169
## 8               Family  164
## 9           Caregivers  163
## 10        Intervention  162
##
## $`20`
##                       x Freq
## 1       SocialCasework 1550
## 2        SocialWorkers  907
## 3  SocialWorkEducation  676
## 4       SocialServices  339
## 5         ChildWelfare  282
## 6         Intervention  201
## 7                Aging  189
## 8         MentalHealth  183
## 9               Family  179
## 10          Caregivers  154
```

What are topic areas over time (by author specified keywords)?

```
kp.df <- filter(pi.df, attributes == "KP")

subject.terms <- stringr::str_split(kp.df$record, pattern = ";")
subject.terms <- unlist(lapply(subject.terms, function(x) gsub(" ", "", x)))
subject.terms.total <- length(unlist(lapply(subject.terms,
                        function(x) gsub(" ", "", x))))

subject.terms.unique <- length(unique(subject.terms))

subject.terms.l <- list(subject.terms.total = subject.terms.total,
                      subject.terms.unique = subject.terms.unique)

most.frequent <- as.data.frame(table(subject.terms))

most.frequent <- arrange(most.frequent, desc(Freq))

# Print summary statistics
print(subject.terms.l)
```

```
$subject.terms.total
[1] 102493

$subject.terms.unique
[1] 46899
```

```
# Print 25 most frequent
head(most.frequent, 25)
```

```
             subject.terms Freq
1             socialworkers 1766
2                socialwork 1757
3      socialworkeducation  756
4       socialworkpractice  538
5           socialservices  340
6       socialworkstudents  314
7             mentalhealth  304
8                 children  283
9             childwelfare  255
10 CHILDHOODANDADOLESCENCE  236
11                     HIV  231
12           socialsupport  226
13             riskfactors  200
14            spirituality  199
15          decisionmaking  188
16              fostercare  187
17                   aging  179
18        domesticviolence  176
19           socialjustice  176
20              TECHNIQUES  175
```

```
21            intervention  174
22             adolescents  173
23             METHODOLOGY  173
24              SOCIALWORK  173
25           CHILDGUIDANCE  167
```

Most Frequent Author Keywords

```
decade <- filter(pi.df, attributes == "YR") %>%
    mutate(year = as.numeric(record)) %>% select(-record, -attributes)

decade$year <- cut(decade$year, breaks = 20, labels = c(1:20))

keywords <- pi.df %>%
        filter(attributes == "KP") %>%
        select(articleID = articleID, keywords = record)

keywords.decade <- keywords %>%
         left_join(decade)
```

```
## Joining by: "articleID"
```

```
library(plyr)
```

```
## ------------------------------------------------------------------------------
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
## ------------------------------------------------------------------------------
##
## Attaching package: 'plyr'
##
## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
keywords.data.split <- dlply(keywords.decade, .(year))
detach(package:plyr)

terms.f <- function(x){
    split.terms <- stringr::str_split(x[,"keywords"], pattern =";")
    clean.terms <- lapply(split.terms, function(x) gsub(" ", "", x))
    }

keywords.decade <- lapply(keywords.data.split, terms.f)
keywords.decade <- lapply(keywords.decade, unlist)
lapply(keywords.decade, function(x) length(unique(x)))
```

```
## $`3`
```

```
## [1] 8
##
## $`4`
## [1] 171
##
## $`5`
## [1] 285
##
## $`6`
## [1] 278
##
## $`7`
## [1] 714
##
## $`8`
## [1] 711
##
## $`9`
## [1] 835
##
## $`10`
## [1] 383
##
## $`11`
## [1] 573
##
## $`12`
## [1] 988
##
## $`13`
## [1] 1705
##
## $`14`
## [1] 2222
##
## $`15`
## [1] 4033
##
## $`16`
## [1] 3702
##
## $`17`
## [1] 4068
##
## $`18`
## [1] 9760
##
## $`19`
## [1] 13125
##
## $`20`
## [1] 13587
```

```r
temp <- lapply(keywords.decade, function(x) data.frame(table(x)))
temp <- lapply(temp, function(x) arrange(x, desc(Freq)))
lapply(temp, function(x) head(x,10))
```

```
## $`3`
##                                x Freq
## 1 SOCIALFUNCTIONSOFTHEINDIVIDUAL    2
## 2                      COMMUNITY    1
## 3                 COMMUNITYSPIRIT    1
## 4                        COUNTRY    1
## 5                    LIMITATIONS    1
## 6                SOCIALADJUSTMENT    1
## 7                         SPIRIT    1
## 8                           WORK    1
##
## $`4`
##                                 x Freq
## 1         CHILDHOODANDADOLESCENCE   38
## 2  SOCIALFUNCTIONSOFTHEINDIVIDUAL   25
## 3                           CHILD   19
## 4       NERVOUSANDMENTALDISORDERS   12
## 5                     DELINQUENCY    8
## 6                          FAMILY    8
## 7                  CHILDABILITIES    6
## 8  MOTHERATTITUDEANDBREASTFEEDING    6
## 9                     PERSONALITY    5
## 10                     ADJUSTMENT    4
##
## $`5`
##                                       x Freq
## 1                  CHILDHOODANDADOLESCENCE   56
## 2  GENERALSOCIALPROCESSES(INCL.ESTHETICS)   53
## 3                                   CHILD   33
## 4                     FUNCTIONALDISORDERS   30
## 5                           SOCIALABILITY   29
## 6                                    WORK   27
## 7                                GUIDANCE   20
## 8                                CASEWORK   16
## 9          CHILD(MALADJUSTMENTANDTHERAPY)   16
## 10                               ATTITUDE   15
##
## $`6`
##                                       x Freq
## 1                  CHILDHOODANDADOLESCENCE   99
## 2                   CHILD(IV.MALADJUSTMENT   51
## 3                                THERAPY)   51
## 4                                GUIDANCE   43
## 5                     FUNCTIONALDISORDERS   40
## 6                                   CHILD   30
## 7          CHILD(MALADJUSTMENTANDTHERAPY)   28
## 8                                  SOCIAL   24
## 9                              ADJUSTMENT   22
## 10 GENERALSOCIALPROCESSES(INCL.ESTHETICS)   21
```

```
##
## $`7`
##                          x Freq
## 1           SOCIALCASEWORK   78
## 2            CHILDGUIDANCE   63
## 3  CHILDHOODANDADOLESCENCE   43
## 4                   SOCIAL   30
## 5         TREATMENTMETHODS   30
## 6                   CHILD   29
## 7                GUIDANCE   23
## 8      FUNCTIONALDISORDERS   22
## 9              COUNSELING   21
## 10          PSYCHOTHERAPY   21
##
## $`8`
##                   x Freq
## 1        SOCIALWORK  111
## 2       METHODOLOGY   76
## 3        TECHNIQUES   76
## 4              CASE   61
## 5     CHILDGUIDANCE   53
## 6  TREATMENTMETHODS   50
## 7        COUNSELING   41
## 8    SOCIALCASEWORK   35
## 9          GUIDANCE   32
## 10           FAMILY   30
##
## $`9`
##                     x Freq
## 1          TECHNIQUES   78
## 2         METHODOLOGY   77
## 3       SOCIALWELFARE   58
## 4    TREATMENTMETHODS   42
## 5          SOCIALWORK   39
## 6       CHILDGUIDANCE   37
## 7              FAMILY   34
## 8          COUNSELING   31
## 9   CRIME&DELINQUENCY   25
## 10 SOCIALINSTITUTIONS   25
##
## $`10`
##                          x Freq
## 1     CASESTUDIES&CASEWORK   14
## 2           SOCIALWELFARE   14
## 3           PSYCHOTHERAPY   11
## 4         BEHAVIORPROBLEMS   10
## 5                CHILDHOOD    6
## 6  MARRIAGE&FAMILYPROBLEMS    6
## 7           SOCIALCASEWORK    6
## 8              ALCOHOLISM    5
## 9        CRIME&DELINQUENCY    5
## 10                 FAMILY    5
##
## $`11`
```

```
##                       x Freq
## 1               clients    7
## 2        socialcasework    6
## 3                 India    5
## 4        SOCIALCASEWORK    5
## 5            socialwork    5
## 6  COUNSELING&GUIDANCE    4
## 7         socialworkers    4
## 8  CHILDGUIDANCECLINIC    3
## 9                   ego    3
## 10                INDIA    3
##
## $`12`
##                              x Freq
## 1                socialworkers   19
## 2                        India   18
## 3                   socialwork    8
## 4                   casereport    4
## 5                  drugaddicts    3
## 6  graduatesocialworkstudents    3
## 7                 grouptherapy    3
## 8                        Israel    3
## 9             literaturereview    3
## 10                       racism    3
##
## $`13`
##                                x Freq
## 1                           India   24
## 2                  socialworkers   22
## 3               literaturereview    9
## 4                           aged    8
## 5             socialworkstudents    8
## 6                       children    5
## 7     implicationsforsocialwork    5
## 8                 socialcasework    5
## 9  implicationsforsocialworkers    4
## 10    malevsfemalesocialworkers    4
##
## $`14`
##                              x Freq
## 1                socialworkers   63
## 2                        India   59
## 3            literaturereview   41
## 4  implicationsforsocialwork   19
## 5                    children   17
## 6                     elderly   15
## 7                        aged   13
## 8                   socialwork   11
## 9          socialworkpractice    9
## 10                adolescents    7
##
## $`15`
##                                x Freq
## 1                  socialworkers  113
```

```
## 2        conferencepresentation   57
## 3     implicationsforsocialwork   44
## 4                         India   35
## 5                    casereport   32
## 6              literaturereview   28
## 7                       elderly   27
## 8        socialworkimplications   25
## 9  implicationsforsocialworkers   24
## 10                 adolescents   22
##
## $`16`
##                            x Freq
## 1              socialworkers   65
## 2     conferencepresentation   47
## 3           literaturereview   34
## 4  implicationsforsocialwork   31
## 5                     Israel   31
## 6                    England   27
## 7                     Canada   17
## 8                    elderly   17
## 9                    clients   16
## 10    socialworkimplications   16
##
## $`17`
##                                    x Freq
## 1                      socialworkers   73
## 2             conferencepresentation   55
## 3                             Israel   38
## 4  implicationsforsocialworkpractice   25
## 5                   literaturereview   25
## 6          implicationsforsocialwork   24
## 7                            England   23
## 8                         casereport   22
## 9       implicationsforsocialworkers   15
## 10                socialworkstudents   14
##
## $`18`
##                      x Freq
## 1           socialwork  312
## 2        socialworkers  282
## 3   socialworkpractice  116
## 4  socialworkeducation   87
## 5              children   66
## 6         mentalhealth   59
## 7       socialservices   53
## 8                gaymen   48
## 9        socialsupport   47
## 10          depression   46
##
## $`19`
##                      x Freq
## 1           socialwork  611
## 2        socialworkers  486
## 3  socialworkeducation  276
```

```
## 4   socialworkpractice  195
## 5   socialworkstudents  109
## 6       socialservices  107
## 7                  HIV  100
## 8         childwelfare   93
## 9             children   87
## 10        mentalhealth   80
##
## $`20`
##                      x Freq
## 1           socialwork  800
## 2         socialworkers  638
## 3  socialworkeducation  385
## 4   socialworkpractice  206
## 5       socialservices  176
## 6         mentalhealth  156
## 7   socialworkstudents  123
## 8         childwelfare  121
## 9                  HIV  110
## 10         riskfactors  110
```

Location

It is easy to explore some of the different fields within the PsychInfo data frame. For example, each record has one or more subject terms (from the article keywords). The total number, unique number, and most frequently occuring key words can be easily computed.

```
LO.df <- filter(pi.df, attributes == "LO")


subject.terms <- stringr::str_split(LO.df$record, pattern = ";")
subject.terms <- unlist(lapply(subject.terms, function(x) gsub(" ", "", x)))
subject.terms.total <- length(unlist(lapply(subject.terms, function(x) gsub(" ", "", x))))
subject.terms.unique <- length(unique(subject.terms))

subject.terms.l <- list(subject.terms.total = subject.terms.total,
                        subject.terms.unique = subject.terms.unique)

most.frequent <- as.data.frame(table(subject.terms))



most.frequent <- arrange(most.frequent, desc(Freq))
most.frequent.t <- head(most.frequent, 50)

print(subject.terms.l)
```

```
$subject.terms.total
[1] 11076

$subject.terms.unique
[1] 204
```

```
print(most.frequent.t)
```

```
     subject.terms Freq
1               US 5308
2    UnitedKingdom  696
3        Australia  558
4           Canada  542
5           Israel  448
6          England  388
7            India  232
8           Sweden  227
9         HongKong  216
10           China  158
11     SouthAfrica  115
12          Norway  101
13      NewZealand   97
14        Scotland   85
15           Wales   84
16         Ireland   83
17         Germany   72
18         Finland   70
19     Netherlands   61
20         Denmark   52
21 NorthernIreland   52
22           Spain   47
23    GreatBritain   45
24           Italy   44
25           Japan   42
26         Belgium   41
27       Singapore   41
28          Taiwan   41
29          Africa   38
30          Mexico   34
31          Europe   31
32          France   31
33          Greece   27
34          Russia   27
35           Ghana   24
36           Korea   24
37        Portugal   24
38         Romania   23
39          Brazil   22
40        Thailand   22
41          Uganda   22
42         Hungary   21
43            Asia   18
44         Nigeria   18
45      PuertoRico   18
46      SouthKorea   18
47         Vietnam   18
48         Austria   17
49     Switzerland   17
50           Kenya   16
```

```
most.frequent
```

	subject.terms	Freq
1	US	5308
2	UnitedKingdom	696
3	Australia	558
4	Canada	542
5	Israel	448
6	England	388
7	India	232
8	Sweden	227
9	HongKong	216
10	China	158
11	SouthAfrica	115
12	Norway	101
13	NewZealand	97
14	Scotland	85
15	Wales	84
16	Ireland	83
17	Germany	72
18	Finland	70
19	Netherlands	61
20	Denmark	52
21	NorthernIreland	52
22	Spain	47
23	GreatBritain	45
24	Italy	44
25	Japan	42
26	Belgium	41
27	Singapore	41
28	Taiwan	41
29	Africa	38
30	Mexico	34
31	Europe	31
32	France	31
33	Greece	27
34	Russia	27
35	Ghana	24
36	Korea	24
37	Portugal	24
38	Romania	23
39	Brazil	22
40	Thailand	22
41	Uganda	22
42	Hungary	21
43	Asia	18
44	Nigeria	18
45	PuertoRico	18
46	SouthKorea	18
47	Vietnam	18
48	Austria	17
49	Switzerland	17
50	Kenya	16

51	Croatia	15
52	Chile	14
53	Ethiopia	14
54	NorthAmerica	14
55	Poland	14
56	Botswana	13
57	Iran	13
58	Turkey	13
59	Zambia	13
60	Malaysia	12
61	Slovenia	11
62	CzechRepublic	10
63	Zimbabwe	10
64	Bangladesh	9
65	Iceland	9
66	Tanzania	9
67	Guatemala	8
68	Lithuania	8
69	Luxembourg	8
70	Nepal	8
71	Peru	8
72	Philippines	8
73	Argentina	7
74	Bulgaria	7
75	Caribbean	7
76	Colombia	7
77	Cyprus	7
78	Egypt	7
79	ElSalvador	7
80	Georgia	7
81	Jordan	7
82	Pakistan	7
83	Palestine	7
84	Rwanda	7
85	USSR	7
86	Albania	6
87	Estonia	6
88	SaudiArabia	6
89	SriLanka	6
90	TrinidadandTobago	6
91	Ukraine	6
92	UnitedArabEmirates	6
93	Afghanistan	5
94	Cambodia	5
95	Cuba	5
96	DominicanRepublic	5
97	Ecuador	5
98	Indonesia	5
99	Latvia	5
100	Lebanon	5
101	Mongolia	5
102	Slovakia	5
103	Somalia	5
104	Barbados	4

105	Cameroon	4
106	DemocraticRepublicofCongo	4
107	Kuwait	4
108	Lesotho	4
109	Moldova	4
110	Nicaragua	4
111	Oceania/PacificIslands	4
112	SierraLeone	4
113	SouthAmerica	4
114	Azerbaijan	3
115	Bolivia	3
116	Bosnia-Herzegovina	3
117	CentralAmerica	3
118	CostaRica	3
119	Czechoslovakia	3
120	Guyana	3
121	Haiti	3
122	Honduras	3
123	Iraq	3
124	Jamaica	3
125	Kazakhstan	3
126	Liberia	3
127	Malawi	3
128	Malta	3
129	MarshallIslands	3
130	Mauritius	3
131	Tajikistan	3
132	Yugoslavia	3
133	Appalachia	2
134	Bermuda	2
135	Bhutan	2
136	EasternEurope	2
137	Fiji	2
138	Gambia	2
139	Kyrgyzstan	2
140	MiddleEast	2
141	Mozambique	2
142	Myanmar	2
143	NewCaledonia	2
144	Palau	2
145	Panama	2
146	PapuaNewGuinea	2
147	Paraguay	2
148	RepublicofSerbia	2
149	Samoa	2
150	Scandinavia	2
151	Swaziland	2
152	Tonga	2
153	Uruguay	2
154	WesternEurope	2
155	Angola	1
156	Armenia	1
157	Bahamas	1
158	Bahrain	1

```
159                     BalticStates    1
160                          Belarus    1
161                           Brunei    1
162                          Burundi    1
163                   ChannelIslands    1
164 CommonwealthofIndependentStates    1
165                          Comoros    1
166                       CookIslands    1
167                          Eritrea    1
168                  FrenchPolynesia    1
169                            Gabon    1
170                          Grenada    1
171                           Guinea    1
172                       IvoryCoast    1
173                         Kiribati    1
174                             Laos    1
175                     LatinAmerica    1
176                    Liechtenstein    1
177                            Macau    1
178                         Macedonia    1
179                        Madagascar    1
180                         Maldives    1
181   Micronesia(FederatedStatesof)    1
182                          Morocco    1
183                          Namibia    1
184                            Nauru    1
185                             Niue    1
186                        NorthKorea    1
187                             Oman    1
188                            Qatar    1
189                  RepublicofCongo    1
190                          Senegal    1
191              SerbiaandMontenegro    1
192                   SlovakRepublic    1
193                   SolomonIslands    1
194                          StKitts    1
195                            Sudan    1
196                             Togo    1
197                           Tuvalu    1
198                  USVirginIslands    1
199                       Uzbekistan    1
200                          Vanuatu    1
201                        Venezuela    1
202                         WestBank    1
203                        WestIndies    1
204                             Yemen    1
```

Location over time

```
decade <- filter(pi.df, attributes == "YR") %>%
    mutate(year = as.numeric(record)) %>% select(-record, -attributes)
```

```
decade$year <- cut(decade$year, breaks = 20, labels = c(1:20))

keywords <- pi.df %>%
        filter(attributes == "LO") %>%
        select(articleID = articleID, keywords = record)

keywords.decade <- keywords %>%
         left_join(decade)
```

```
## Joining by: "articleID"
```

```
library(plyr)
```

```
## ------------------------------------------------------------------------------
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
## ------------------------------------------------------------------------------
##
## Attaching package: 'plyr'
##
## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
keywords.data.split <- dlply(keywords.decade, .(year))
detach(package:plyr)

terms.f <- function(x){
    split.terms <- stringr::str_split(x[,"keywords"], pattern =";")
    clean.terms <- lapply(split.terms, function(x) gsub(" ", "", x))
    }

keywords.decade <- lapply(keywords.data.split, terms.f)
keywords.decade <- lapply(keywords.decade, unlist)
lapply(keywords.decade, function(x) length(unique(x)))
```

```
## $`10`
## [1] 1
##
## $`11`
## [1] 4
##
## $`12`
## [1] 8
##
## $`13`
## [1] 12
##
## $`14`
```

```
## [1] 19
##
## $`15`
## [1] 28
##
## $`16`
## [1] 37
##
## $`17`
## [1] 44
##
## $`18`
## [1] 94
##
## $`19`
## [1] 118
##
## $`20`
## [1] 179
```

```
temp <- lapply(keywords.decade, function(x) data.frame(table(x)))
temp <- lapply(temp, function(x) arrange(x, desc(Freq)))
lapply(temp, function(x) head(x,10))
```

```
## $`10`
##    x Freq
## 1 US    3
##
## $`11`
##                x Freq
## 1          India    8
## 2             US    4
## 3         Africa    1
## 4 Czechoslovakia    1
##
## $`12`
##              x Freq
## 1        India   26
## 2           US    4
## 3 GreatBritain    3
## 4       Israel    3
## 5   PuertoRico    2
## 6        China    1
## 7      England    1
## 8   Yugoslavia    1
##
## $`13`
##               x Freq
## 1         India   31
## 2            US    5
## 3        Canada    3
## 4       England    3
## 5        Israel    2
## 6        Africa    1
```

```
## 7     Australia    1
## 8  GreatBritain    1
## 9        Mexico    1
## 10     Scotland    1
##
## $`14`
##                x Freq
## 1          India   54
## 2             US    7
## 3         Israel    6
## 4  UnitedKingdom    5
## 5        England    4
## 6         Africa    2
## 7           Asia    2
## 8      Australia    2
## 9   GreatBritain    2
## 10    Appalachia    1
##
## $`15`
##                x Freq
## 1          India   28
## 2             US   16
## 3        England   12
## 4  UnitedKingdom   12
## 5         Israel    8
## 6   GreatBritain    6
## 7         Canada    4
## 8         Mexico    3
## 9     PuertoRico    3
## 10         China    2
##
## $`16`
##                x Freq
## 1         Israel   16
## 2       HongKong   11
## 3             US   11
## 4        England    6
## 5  UnitedKingdom    6
## 6         Canada    4
## 7          India    4
## 8    SouthAfrica    4
## 9          Japan    3
## 10      Scotland    3
##
## $`17`
##                x Freq
## 1             US  438
## 2         Israel   52
## 3        England   46
## 4         Canada   20
## 5       HongKong   18
## 6      Australia   16
## 7  UnitedKingdom   13
## 8          Wales   10
```

```
## 9   GreatBritain    8
## 10         China    7
##
## $`18`
##                x Freq
## 1             US 1151
## 2         Israel  124
## 3         Canada  110
## 4  UnitedKingdom  110
## 5      Australia   80
## 6        England   72
## 7       HongKong   54
## 8         Sweden   36
## 9       Scotland   20
## 10         Wales   19
##
## $`19`
##                x Freq
## 1             US 1645
## 2  UnitedKingdom  281
## 3         Canada  190
## 4      Australia  166
## 5         Israel  123
## 6        England   95
## 7         Sweden   79
## 8       HongKong   63
## 9          China   48
## 10   SouthAfrica   42
##
## $`20`
##                x Freq
## 1             US 2024
## 2      Australia  291
## 3  UnitedKingdom  269
## 4         Canada  210
## 5        England  149
## 6         Israel  114
## 7         Sweden  101
## 8          China   82
## 9       HongKong   68
## 10        Norway   67
```

Methodology

It is easy to explore some of the different fields within the PsychInfo data frame. For example, each record has one or more subject terms (from the article keywords). The total number, unique number, and most frequently occuring key words can be easily computed.

```
MD.df <- filter(pi.df, attributes == "MD")


subject.terms <- stringr::str_split(MD.df$record, pattern = ";")
```

```r
subject.terms <- unlist(lapply(subject.terms, function(x) gsub(" ", "", x)))
subject.terms.total <- length(unlist(lapply(subject.terms, function(x) gsub(" ", "", x))))
subject.terms.unique <- length(unique(subject.terms))

subject.terms.l <- list(subject.terms.total = subject.terms.total,
                        subject.terms.unique = subject.terms.unique)

most.frequent <- as.data.frame(table(subject.terms))



most.frequent <- arrange(most.frequent, desc(Freq))
most.frequent.t <- head(most.frequent, 50)

print(subject.terms.l)
```

```
$subject.terms.total
[1] 25380

$subject.terms.unique
[1] 21
```

```r
print(most.frequent.t)
```

```
                   subject.terms  Freq
1                  EmpiricalStudy 11741
2                QuantitativeStudy  4296
3                 QualitativeStudy  3455
4                        Interview  2300
5                 LiteratureReview   879
6                LongitudinalStudy   584
7                      FocusGroup   469
8                ClinicalCaseStudy   423
9             NonclinicalCaseStudy   319
10                  FollowupStudy   288
11                     FieldStudy   133
12                SystematicReview   109
13              RetrospectiveStudy   100
14 TreatmentOutcome/ClinicalTrial    84
15                ProspectiveStudy    69
16                    MetaAnalysis    63
17               MathematicalModel    34
18        ExperimentalReplication    27
19           ScientificSimulation     5
20                   BrainImaging     1
21                      TwinStudy     1
```

Methodology

```
decade <- filter(pi.df, attributes == "YR") %>%
    mutate(year = as.numeric(record)) %>% select(-record, -attributes)

decade$year <- cut(decade$year, breaks = 20, labels = c(1:20))

keywords <- pi.df %>%
        filter(attributes == "MD") %>%
        select(articleID = articleID, keywords = record)

keywords.decade <- keywords %>%
         left_join(decade)
```

```
## Joining by: "articleID"
```

```
library(plyr)
```

```
## ------------------------------------------------------------------------------
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
## ------------------------------------------------------------------------------
##
## Attaching package: 'plyr'
##
## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
keywords.data.split <- dlply(keywords.decade, .(year))
detach(package:plyr)

terms.f <- function(x){
    split.terms <- stringr::str_split(x[,"keywords"], pattern =";")
    clean.terms <- lapply(split.terms, function(x) gsub(" ", "", x))
    }

keywords.decade <- lapply(keywords.data.split, terms.f)
keywords.decade <- lapply(keywords.decade, unlist)
lapply(keywords.decade, function(x) length(unique(x)))
```

```
## $`4`
## [1] 1
##
## $`5`
## [1] 1
##
## $`6`
## [1] 1
##
## $`7`
```

```
## [1] 1
##
## $`8`
## [1] 1
##
## $`9`
## [1] 1
##
## $`10`
## [1] 5
##
## $`11`
## [1] 6
##
## $`12`
## [1] 6
##
## $`13`
## [1] 5
##
## $`14`
## [1] 8
##
## $`15`
## [1] 10
##
## $`16`
## [1] 8
##
## $`17`
## [1] 16
##
## $`18`
## [1] 16
##
## $`19`
## [1] 18
##
## $`20`
## [1] 21
```

```
temp <- lapply(keywords.decade, function(x) data.frame(table(x)))
temp <- lapply(temp, function(x) arrange(x, desc(Freq)))
lapply(temp, function(x) head(x,10))
```

```
## $`4`
##           x Freq
## 1 Interview    1
##
## $`5`
##           x Freq
## 1 Interview    5
##
## $`6`
```

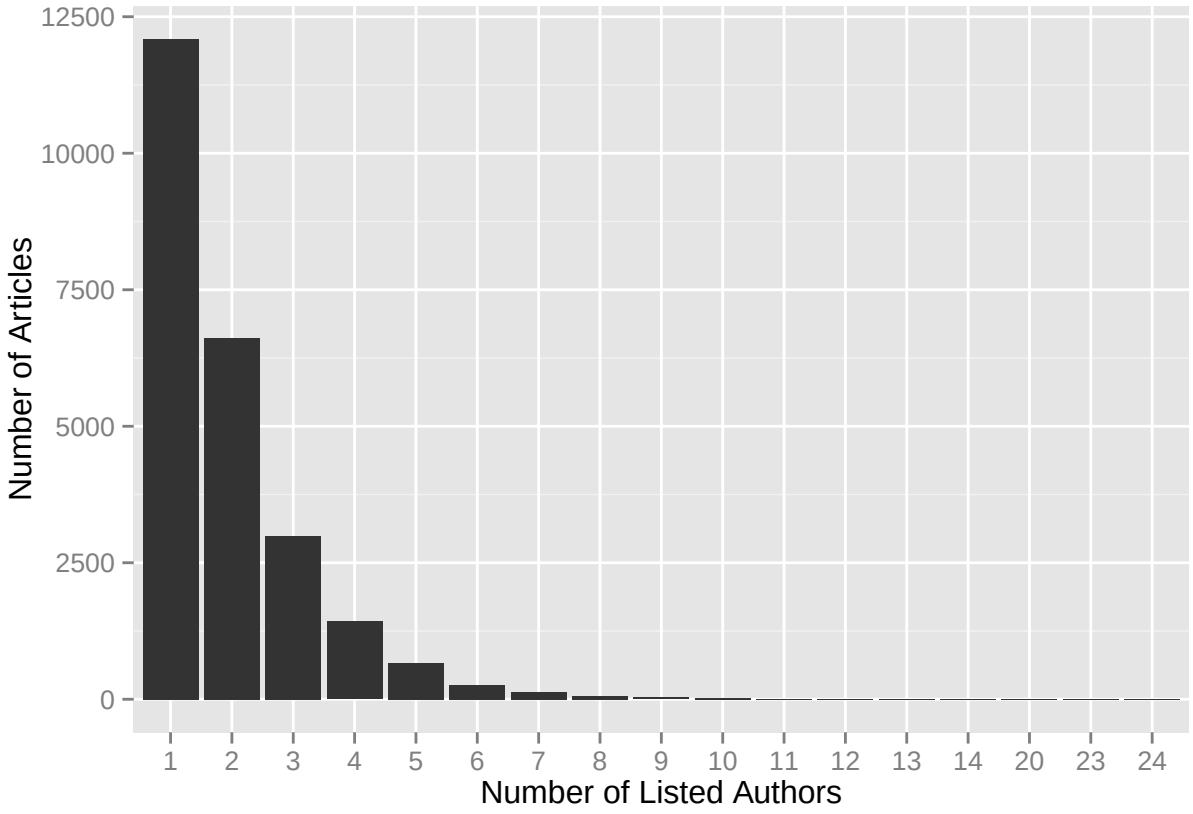
```
##           x Freq
## 1 Interview    3
##
## $`7`
##           x Freq
## 1 Interview    6
##
## $`8`
##           x Freq
## 1 Interview   10
##
## $`9`
##           x Freq
## 1 Interview    9
##
## $`10`
##                   x Freq
## 1    EmpiricalStudy    9
## 2         Interview    5
## 3 QuantitativeStudy    4
## 4  LiteratureReview    1
## 5  QualitativeStudy    1
##
## $`11`
##                   x Freq
## 1    EmpiricalStudy   20
## 2 QuantitativeStudy    8
## 3 ClinicalCaseStudy    6
## 4         Interview    5
## 5     FollowupStudy    3
## 6  LiteratureReview    2
##
## $`12`
##                   x Freq
## 1 ClinicalCaseStudy   10
## 2  LiteratureReview    8
## 3         Interview    5
## 4    EmpiricalStudy    2
## 5     FollowupStudy    1
## 6 LongitudinalStudy    1
##
## $`13`
##                   x Freq
## 1  LiteratureReview   19
## 2 ClinicalCaseStudy   13
## 3    EmpiricalStudy    7
## 4     FollowupStudy    7
## 5         Interview    2
##
## $`14`
##                   x Freq
## 1    EmpiricalStudy  535
## 2  LiteratureReview   49
## 3 ClinicalCaseStudy   22
```

```
## 4     FollowupStudy    6
## 5         Interview    6
## 6 LongitudinalStudy    1
## 7      MetaAnalysis    1
## 8  SystematicReview    1
##
## $`15`
##                                 x Freq
## 1                 EmpiricalStudy  960
## 2               ClinicalCaseStudy   47
## 3                LiteratureReview   30
## 4                   FollowupStudy   17
## 5                       Interview   10
## 6               LongitudinalStudy    7
## 7         ExperimentalReplication    4
## 8                     MetaAnalysis    3
## 9  TreatmentOutcome/ClinicalTrial    2
## 10           NonclinicalCaseStudy    1
##
## $`16`
##                          x Freq
## 1          EmpiricalStudy 1052
## 2        LiteratureReview   40
## 3           FollowupStudy   24
## 4       ClinicalCaseStudy   21
## 5       LongitudinalStudy   20
## 6               Interview    9
## 7           MetaAnalysis    3
## 8 ExperimentalReplication    1
##
## $`17`
##                                 x Freq
## 1                 EmpiricalStudy 1114
## 2                LiteratureReview   70
## 3               LongitudinalStudy   56
## 4               ClinicalCaseStudy   42
## 5                   FollowupStudy   29
## 6            NonclinicalCaseStudy   26
## 7  TreatmentOutcome/ClinicalTrial   15
## 8                       Interview   10
## 9         ExperimentalReplication    5
## 10               QualitativeStudy    5
##
## $`18`
##                                 x Freq
## 1                 EmpiricalStudy 1757
## 2               QuantitativeStudy  487
## 3                QualitativeStudy  372
## 4                LiteratureReview  184
## 5            NonclinicalCaseStudy   81
## 6               ClinicalCaseStudy   72
## 7               LongitudinalStudy   72
## 8                   FollowupStudy   40
## 9                       Interview   28
```

```
## 10 TreatmentOutcome/ClinicalTrial   20
##
## $`19`
##                         x Freq
## 1          EmpiricalStudy 2682
## 2       QuantitativeStudy 1671
## 3        QualitativeStudy 1220
## 4        LiteratureReview  176
## 5              Interview  158
## 6       LongitudinalStudy  154
## 7       ClinicalCaseStudy   89
## 8    NonclinicalCaseStudy   89
## 9           FollowupStudy   61
## 10             FocusGroup   30
##
## $`20`
##                         x Freq
## 1          EmpiricalStudy 3603
## 2       QuantitativeStudy 2122
## 3              Interview 2028
## 4        QualitativeStudy 1857
## 5              FocusGroup  428
## 6        LiteratureReview  300
## 7       LongitudinalStudy  273
## 8    NonclinicalCaseStudy  122
## 9              FieldStudy  116
## 10      ClinicalCaseStudy  101
```

Number of authors

```
n.authors.article <- pi.df %>%
    filter(attributes == "AU") %>%
    select(id = articleID, author= record) %>%
    mutate(id = as.numeric(id))

n_authors <- n.authors.article %>%
        group_by(id) %>%
        summarise(n = n())

ggplot(n_authors, aes(x = factor(n))) +
    geom_bar() +
    stat_bin(binwidth=1) +
    xlab("Number of Listed Authors") +
    ylab("Number of Articles")
```




```
summary(n_authors$n)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   1.00    1.00    2.00    1.94    2.00   24.00
```

Number of authors over time

This figure shows the average number of authors, along with the standard deviation as the ribbon around the average. Note that there is a possible problem in these data, with a single article listing a huge number. That can be corrected at a later time.

```
df.2 <- tbl_df(pi.df)
year <- df.2 %>%
        filter(attributes == "YR") %>%
        select(id = articleID, year = record)

authors <- df.2 %>%
        filter(attributes == "AU") %>%
        select(id = articleID, author = record)

n_authors <- authors %>%
        group_by(id) %>%
        summarise(n=n())

n_authors <- n_authors %>%
        left_join(year) %>%
```

```
        group_by(year) %>%
        summarise(median.n = median(n),
                  average.n = mean(n),
                  min.n = min(n),
                  max.n = max(n),
                  std.dev  = sd(n) )

plot.author.count2 <- ggplot(n_authors, aes(as.numeric(year), y=average.n, group=1)) +
    geom_line(colour="black") +
    geom_ribbon(aes(ymin = average.n-std.dev, ymax=average.n+std.dev), alpha=.2)

head(n_authors, 20)
```

```
Source: local data frame [20 x 6]

   year median.n average.n min.n max.n std.dev
1  1914        1     1.000     1     1      NA
2  1915        1     1.000     1     1      NA
3  1918        1     1.000     1     1      NA
4  1928        1     1.000     1     1  0.0000
5  1929        1     1.000     1     1      NA
6  1930        1     1.000     1     1  0.0000
7  1931        1     1.267     1     2  0.4577
8  1932        1     1.077     1     2  0.2774
9  1933        1     2.600     1    23  5.6543
10 1934        1     1.143     1     2  0.3780
11 1935        1     1.167     1     2  0.4082
12 1936        2     1.750     1     3  0.7071
13 1937        1     1.152     1     4  0.5658
14 1938        1     1.632     1     6  1.3000
15 1939        1     1.070     1     3  0.3082
16 1940        1     1.111     1     3  0.4237
17 1941        1     1.118     1     3  0.4093
18 1942        1     1.139     1     5  0.6825
19 1943        1     1.077     1     4  0.4804
20 1944        1     1.000     1     1  0.0000
```

```
tail(n_authors, 20)
```

```
Source: local data frame [20 x 6]

   year median.n average.n min.n max.n std.dev
1  1995        2     1.921     1     8   1.214
2  1996        2     1.879     1     9   1.185
3  1997        1     1.739     1     6   1.038
4  1998        2     1.934     1     9   1.271
5  1999        1     1.800     1     9   1.185
6  2000        2     1.853     1     8   1.138
7  2001        1     1.842     1     8   1.179
8  2002        2     1.966     1     7   1.155
9  2003        2     1.936     1    20   1.371
10 2004        2     1.928     1     8   1.201
11 2005        2     2.053     1    11   1.388
```

```
12 2006        2     2.122     1    12   1.402
13 2007        2     2.138     1    14   1.488
14 2008        2     2.145     1    12   1.429
15 2009        2     2.246     1    12   1.486
16 2010        2     2.241     1    12   1.488
17 2011        2     2.340     1    13   1.555
18 2012        2     2.305     1    24   1.583
19 2013        2     2.459     1    14   1.660
20 2014        2     2.430     1    12   1.618
```

```
plot.author.count2
```

How Many International Contributors?

This section shows a proof of concept – that is, we can potentially extract all the countries from the author affiliation `AF` tag in the data set. This involves using a set of regular expressions for the extraction. Here I have hard-coded a few countries, but I can obtain a file of all countries and use that to automate the process. We will need to look at the raw data to ensure that the author affiliations have remained in a consistent format throughtout the entirety of the study.

```
df.affiliations <- pi.df %>%
                filter(attributes == "AF")

us.aff <- ifelse(grepl("US", df.affiliations$record, perl=TRUE) == TRUE, "US",
          ifelse(grepl("Canada", df.affiliations$record, perl=TRUE ) == TRUE, "Canada",
          ifelse(grepl("Kong", df.affiliations$record, perl=TRUE ) == TRUE, "Hong Kong",
          ifelse(grepl("China", df.affiliations$record, perl=TRUE) == TRUE, "China",
          ifelse(grepl("Israel", df.affiliations$record, perl=TRUE) == TRUE, "Israel", "Other" )))))
```

```
affiliations <- data.frame(cbind(df.affiliations,us.aff))

ggplot(data=df.affiliations, aes(x = factor(us.aff))) + geom_bar()
```