first look at the dataset

- library data
- automation

Load Library Package

“Use the Tidyverse, Luke” – O-W.Kenobi

```
library(tidyverse)
```

```
## Registered S3 methods overwritten by 'ggplot2':
##   method         from
##   [.quosures     rlang
##   c.quosures     rlang
##   print.quosures rlang
```

```
## -- Attaching packages -------------------- tidyverse 1.2.1 --
```

```
## v ggplot2 3.1.1     v purrr   0.3.2
## v tibble  2.1.1     v dplyr   0.8.1
## v tidyr   0.8.3     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.4.0
```

```
## -- Conflicts ----------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(skimr)
```

```
##
## Attaching package: 'skimr'
```

```
## The following object is masked from 'package:stats':
##
##     filter
```

Get Data

Crossref data used from the **Setup** to the LC OpenRefine Workshop

```
crossref_data <- read_csv("https://raw.githubusercontent.com/LibraryCarpentry/lc-open-refine/gh-pages/da
    col_types = cols(Date = col_date(format = "%m/%d/%Y")))
```

```
crossref_data
```

```
## # A tibble: 1,001 x 11
##    Title Authors DOI   URL   Date       Language Subjects ISSNs Publisher
##    <chr> <chr>   <chr> <chr> <date>     <chr>    <chr>    <chr> <chr>
##  1 The ~ Flavia~ 10.3~ http~ 2015-01-11 English  Fisher ~ 1099~ MDPI AG
##  2 Afla~ Naveed~ 10.3~ http~ 2015-01-11 English  aflatox~ 2077~ MDPI AG
##  3 Meta~ Rafael~ 10.3~ http~ 2015-01-11 English  PKS|NRP~ 1422~ MDPI AG
##  4 Synt~ Fabriz~ 10.3~ http~ 2015-01-11 EN       lanthan~ 2304~ MDPI AG
##  5 Perf~ Magali~ 10.3~ http~ 2015-01-11 EN       snow mo~ 2306~ MDPI AG
##  6 Dihy~ Xiaoxi~ 10.3~ http~ 2015-01-11 English  Malus c~ 1420~ MDPI AG
##  7 Ioni~ Anton ~ 10.3~ http~ 2015-01-11 English  ionic l~ 2073~ MDPI AG
##  8 Char~ Weihon~ 10.3~ http~ 2015-01-11 English  Coryneb~ 1422~ MDPI AG
##  9 Quat~ Tosiak~ 10.3~ http~ 2015-01-11 English  infinit~ 2073~ MDPI AG
## 10 Imag~ Christ~ 10.3~ http~ 2015-01-11 <NA>     hepatoc~ 2075~ MDPI AG
## # ... with 991 more rows, and 2 more variables: Citation <chr>,
## #   Licence <chr>
```

skimr

```
skim(crossref_data)
```

```
## Skim summary statistics
##  n obs: 1001
##  n variables: 11
##
## -- Variable type:character ----------------------------------
##   variable missing complete    n min max empty n_unique
##    Authors       0     1001 1001   7 291     0      883
##   Citation       0     1001 1001  39 104     0     1000
##        DOI      23      978 1001  16  29     0      977
##      ISSNs       0     1001 1001   9  19     0       51
##   Language      15      986 1001   2   7     0        4
##    Licence       6      995 1001   5  11     0        3
##  Publisher       0     1001 1001   7  47     0        6
##   Subjects       0     1001 1001  17 337     0      988
##      Title       0     1001 1001  18 318     0     1000
##        URL       0     1001 1001  57  57     0     1000
##
## -- Variable type:Date ---------------------------------------
##  variable missing complete    n        min        max     median n_unique
##      Date       0     1001 1001 2015-01-01 2015-01-12 2015-01-07       12
```

Facetting

Generate a quick table of the languages represented in the dataframe. Looks like English (spelled two different ways), FRench and ?Spanish? (represented by ES).

```
crossref_data %>%
  count(Language)
```

```
## # A tibble: 5 x 2
##   Language     n
##   <chr>    <int>
## 1 <NA>        15
## 2 EN         871
## 3 English    107
## 4 ES           7
## 5 FR           1
```

This time, facet on the governing license

```r
crossref_data %>%
  count(Licence)
```

```
## # A tibble: 4 x 2
##   Licence         n
##   <chr>       <int>
## 1 <NA>            6
## 2 CC BY         954
## 3 CC BY-NC       11
## 4 CC BY-NC-ND    30
```

Facet on the publisher

```r
crossref_data %>%
  count(Publisher)
```

```
## # A tibble: 6 x 2
##   Publisher                                           n
##   <chr>                                           <int>
## 1 Akshantala Enterprises                             13
## 2 Aurel Vlaicu University Editing House              17
## 3 Consejo Superior de Investigaciones Científicas    11
## 4 International Union of Crystallography            858
## 5 MDPI AG                                            96
## 6 Society of Pharmaceutical Technocrats               6
```

Facet by authors, and sort by the most prolific. This field appears to be a multi-valued field that is pipe `|` separated. How do we count and visualize how many articles have multiple authors?

```r
crossref_data %>%
  count(Authors) %>%
  arrange(-n)
```

```
## # A tibble: 883 x 2
##    Authors                                                                n
##    <chr>                                                              <int>
##  1 Yoshinobu Ishikawa                                                     7
##  2 Gihaeng Kang|Jineun Kim|Hyunjin Park|Tae Ho Kim                        6
##  3 M. P. Savithri|M. Suresh|R. Raghunathan|R. Raja|A. SubbiahPandi        6
##  4 Gamal A. El-Hiti|Keith Smith|Amany S. Hegazy|Saud A. Alanazi|Bens~     5
##  5 Gihaeng Kang|Jineun Kim|Eunjin Kwon|Tae Ho Kim                         5
##  6 Hea-Chung Joo|Ki-Min Park|Uk Lee                                       5
##  7 Dohyun Moon|Jong-Ha Choi                                           4
##  8 M. S. Krishnamurthy|Noor Shahina Begum                             4
##  9 Rajamani Raja|Subramani Kandhasamy|Paramasivam T. Perumal|A. Subb~     4
## 10 Augusto Rivera|Jicli José Rojas|Jaime Ríos-Motta|Michael Bolte         3
## # ... with 873 more rows
```

Exploring some methods to generate a cound of the pipe delimeter. `stringr::str_count()` appears to be a great way to calculate this.

```
dim(as_tibble(str_split(crossref_data$Authors[5], "\\|", simplify = TRUE)))[2]
```

```
## Warning: `as_tibble.matrix()` requires a matrix with column names or a `.name_repair` argument. Using
## This warning is displayed once per session.
```

```
## [1] 3
```

```
str_count(crossref_data$Authors[1:5], "\\|")
```

```
## [1] 1 1 2 3 2
```

Transform Data

Use `dplyr::mutate` to generate a new field that calculates how many authors each observation contains.

```
crossref_data %>%
  select(Authors) %>%
  mutate(multi_authorship = str_count(Authors, "\\|") + 1) %>%
  select(Authors, multi_authorship)
```

```
## # A tibble: 1,001 x 2
##    Authors                                                 multi_authorship
##    <chr>                                                              <dbl>
##  1 Flavia Pennini|Angelo Plastino                                         2
##  2 Naveed Aslam|Peter C. Wynn                                             2
##  3 Rafael R. C. Cuadrat|Juliano C. Cury|Alberto M. R. Dáv~                3
##  4 Fabrizio Ortu|Hao Zhu|Marie-Emmanuelle Boulon|David P.~                4
##  5 Magali Troin|Richard Arsenault|François Brissette                      3
##  6 Xiaoxiao Qin|Yun Feng Xing|Zhiqin Zhou|Yuncong Yao                     4
##  7 Anton Axelsson|Linda Ta|Henrik Sundén                                  3
##  8 Weihong Min|Huiying Li|Hongmei Li|Chunlei Liu|Jingshen~                5
##  9 Tosiaki Kori|Yuto Imai                                                 2
## 10 Christina Schraml|Sascha Kaufmann|Hansjoerg Rempp|Rola~                7
## # ... with 991 more rows
```

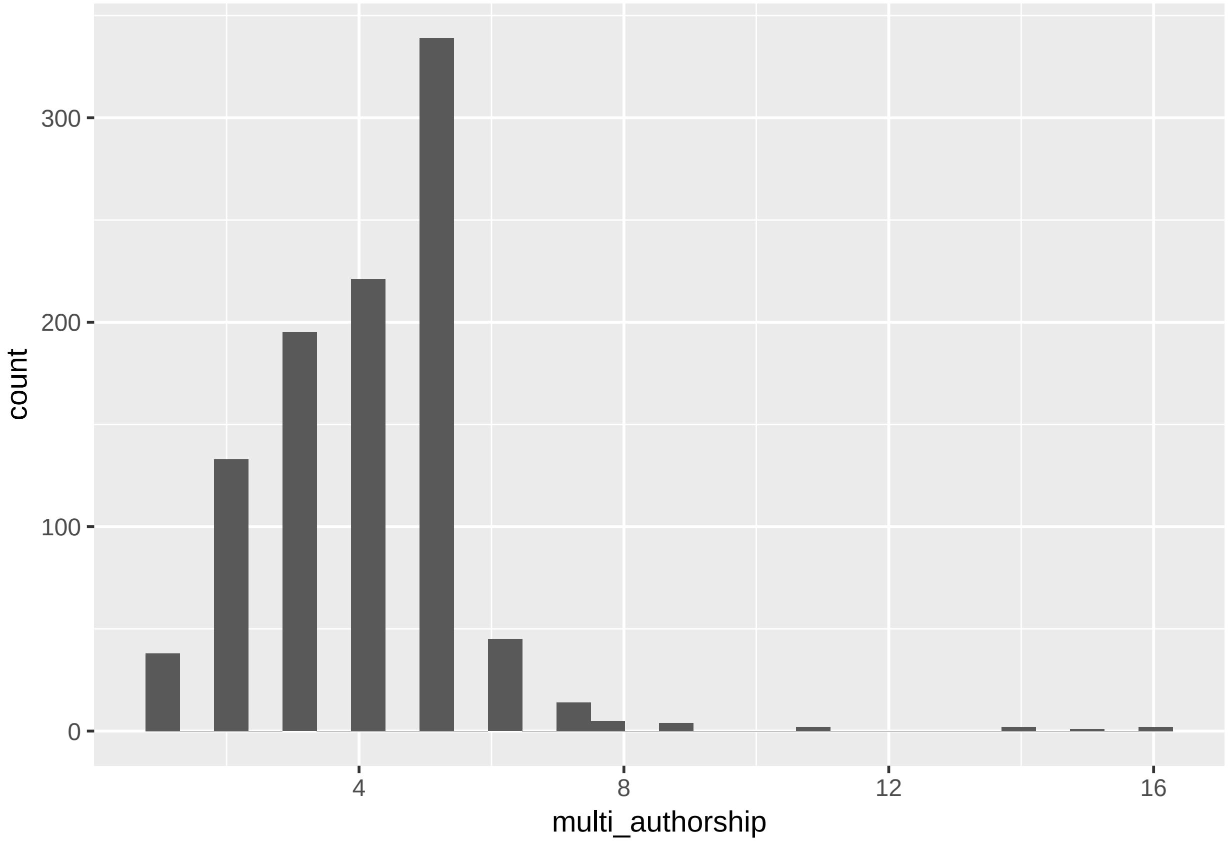
Visualize

Authors

Generate a histogram distribution of the multiple authorship variable.

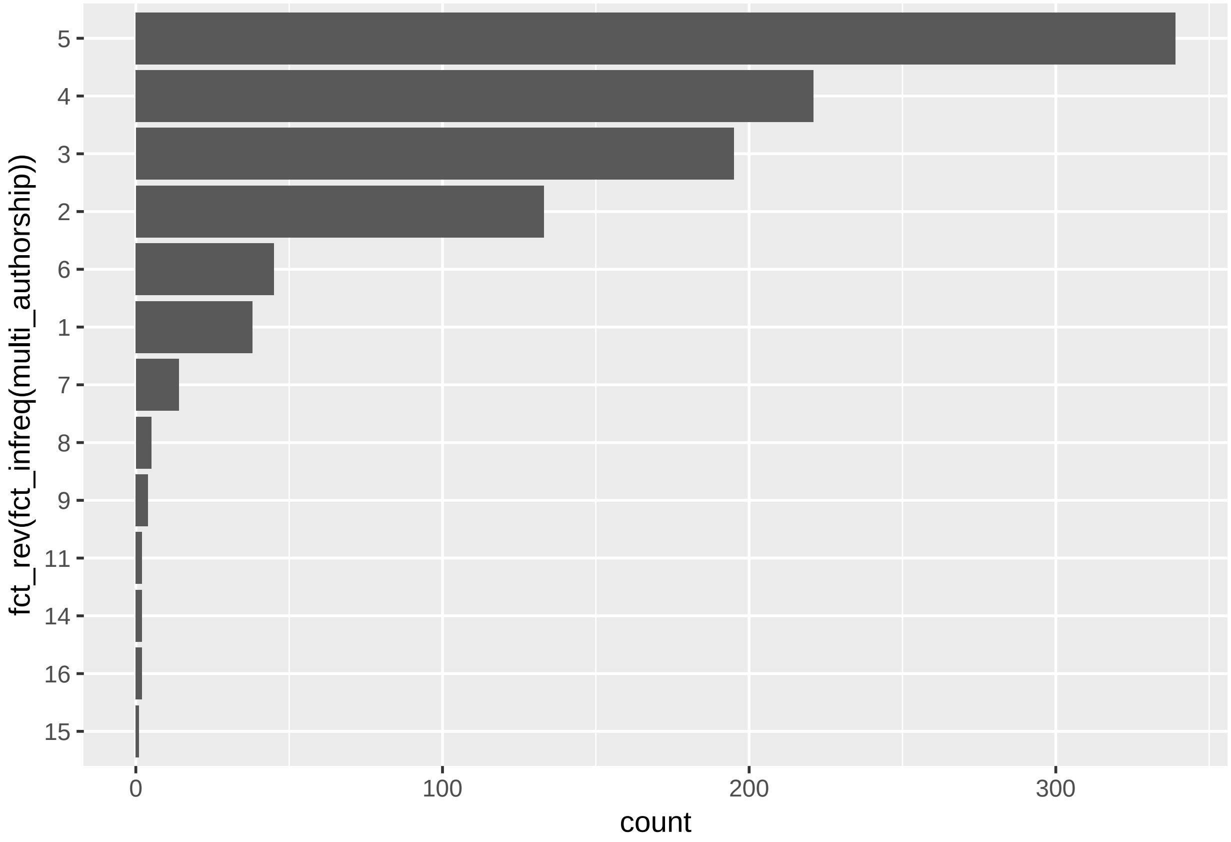
```
crossref_data %>%
  select(Authors) %>%
  mutate(multi_authorship = str_count(Authors, "\\|") + 1) %>%
  select(multi_authorship, Authors) %>%
  ggplot() +
  aes(multi_authorship) +
  geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



This time generate as a bargraph and sort by the most frequent representation. Articles with five authors is the most frequent representation in the dataset.

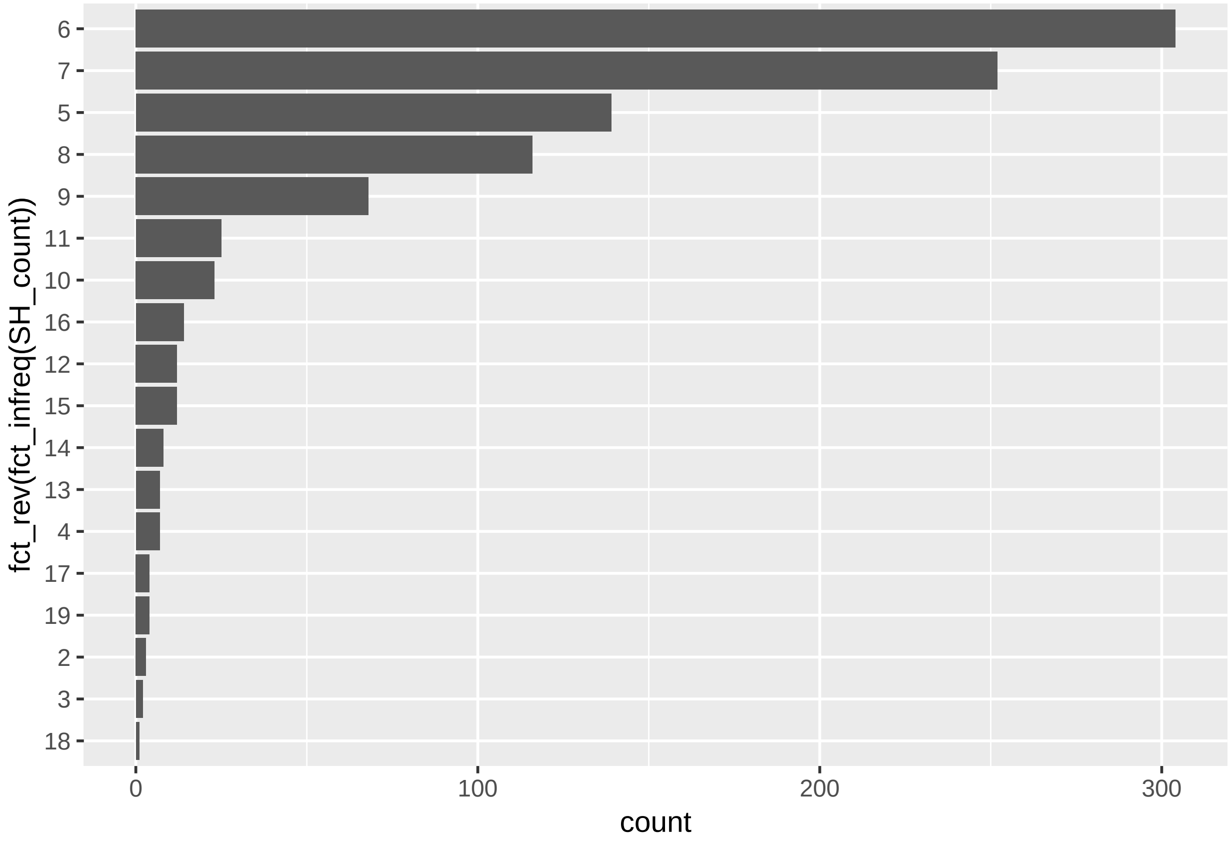
```
auth_count <- crossref_data %>%
  select(Authors) %>%
  mutate(multi_authorship = str_count(Authors, "\\|") + 1) %>%
  mutate(multi_authorship = as.character(multi_authorship)) %>%
  select(multi_authorship, Authors)

ggplot(auth_count) +
  aes(fct_rev(fct_infreq(multi_authorship))) +
  geom_bar() +
  coord_flip()
```



Explore Subject Headings

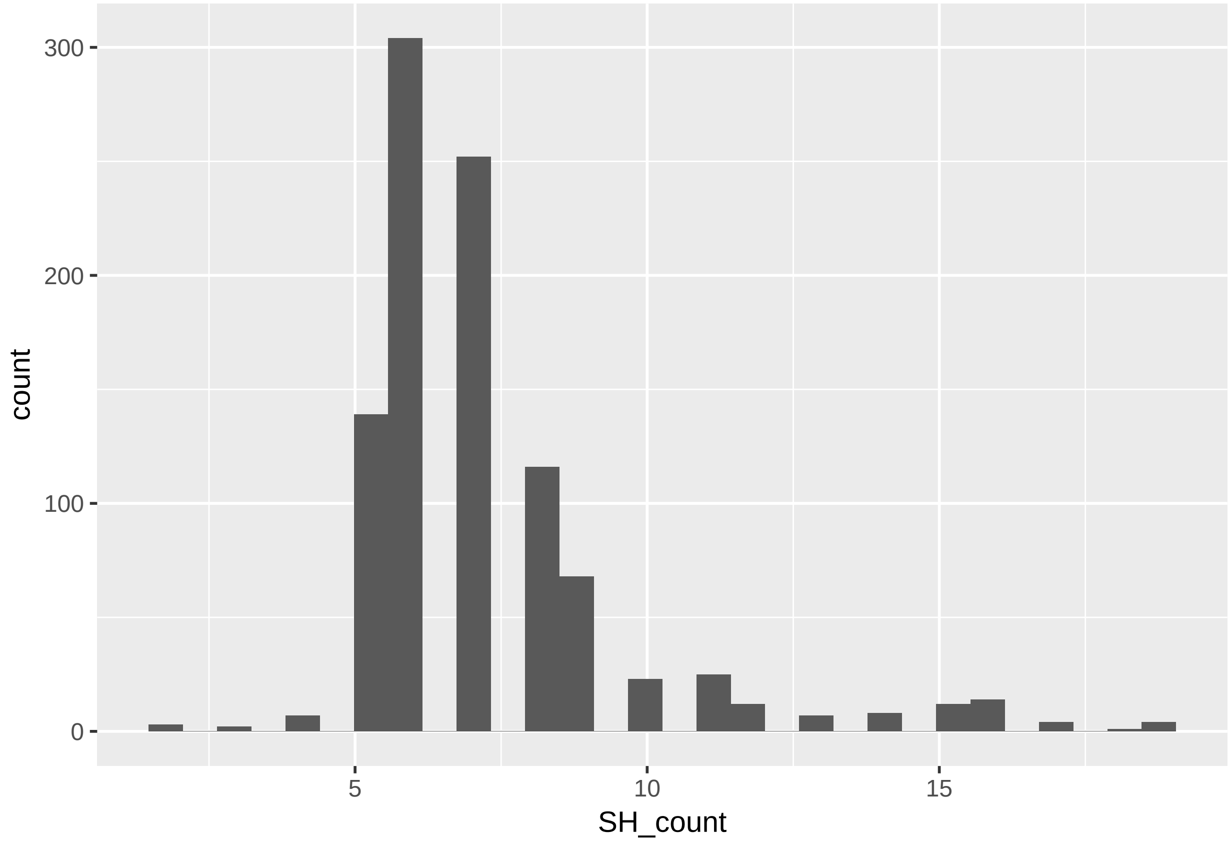
Visualize the frequency of multiple subject headings, just as with authors (A bargraph and a histogram)

```
crossref_data %>%
  mutate(SH_count = str_count(Subjects, "\\|") + 1) %>%
  mutate(SH_count = as.character(SH_count)) %>%
  ggplot() +
  aes(fct_rev(fct_infreq(SH_count))) +
  geom_bar() +
  coord_flip()
```



```
crossref_data %>%
  mutate(SH_count = str_count(Subjects, "\\|") + 1) %>%
  ggplot() +
  aes(SH_count) +
  geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



Data Transformations

Using dplyr, mutate a new variable and transform the data so that 'EN' and 'English' are the same. Transform 'ES' to "Spanish", and 'FR' to "French".

`dplyr::case_when()` is one specialized way to perform an `if_else` transformation.

```
crossref_data %>%
  count(Language)
```

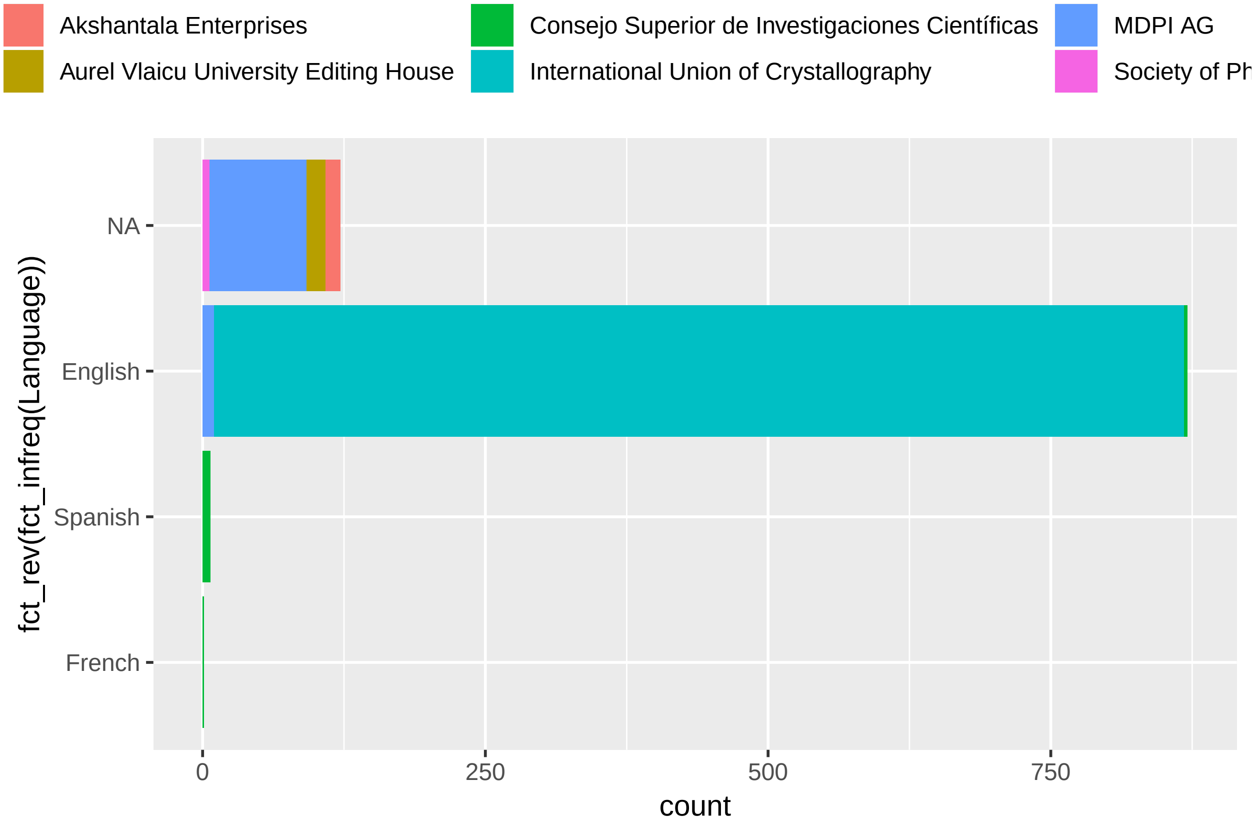
```
## # A tibble: 5 x 2
##   Language     n
##   <chr>    <int>
## 1 <NA>        15
## 2 EN         871
## 3 English    107
## 4 ES           7
## 5 FR           1
```

```
crossref_data <- crossref_data %>%
  mutate(Language = case_when(
    Language == "EN" ~ "English",
    Language == "ES" ~ "Spanish",
    Language == "FR" ~ "French"
  ))
```

Visualize the Languages.

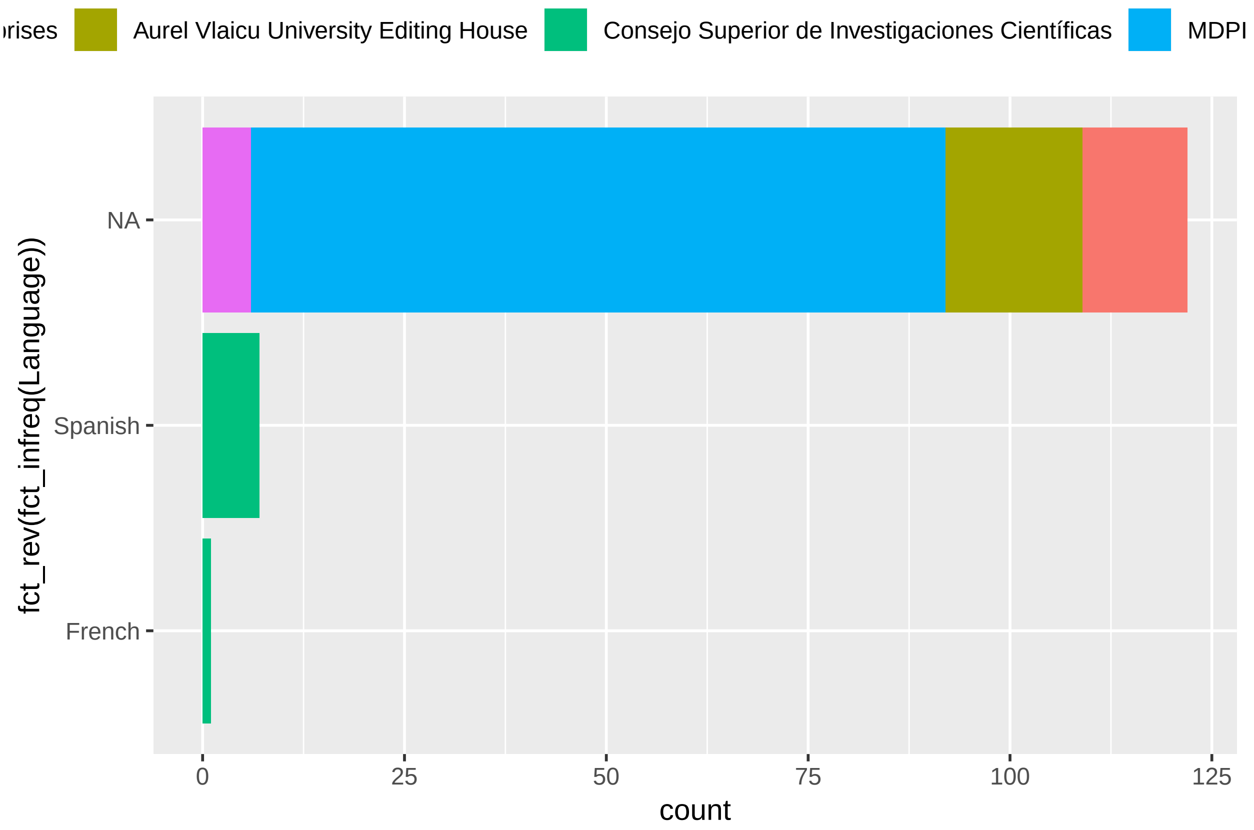
Stacked Bargraph shows frequency by Language. Each stack of a bar distinguishes the publishers. English Language is huge and somewhat over-powers the reset of the graph. Make a second graph (below) to drill down on the lesser represented languages.

```
crossref_data %>%
  ggplot() +
  aes(fct_rev(fct_infreq(Language)), fill = Publisher) +
  geom_bar() +
  coord_flip() +
  theme(legend.position="top")
```



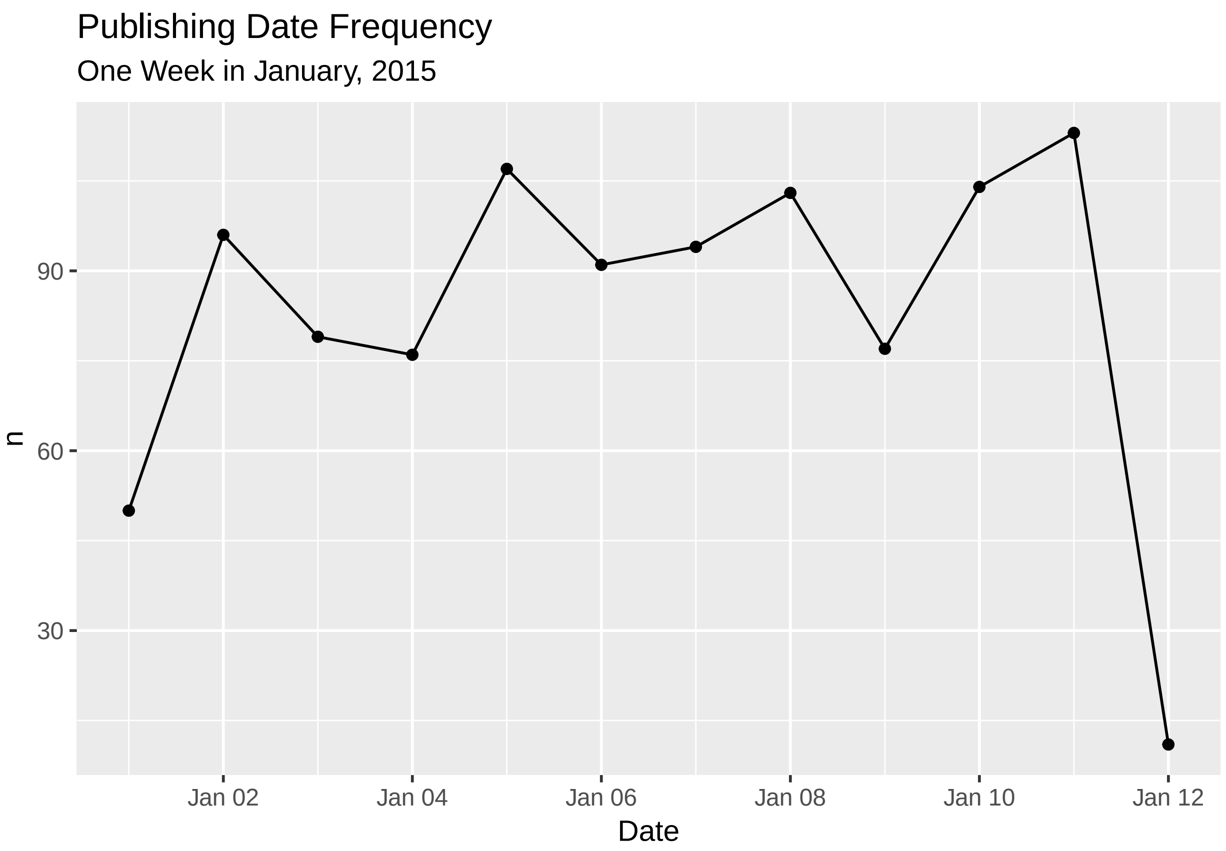
Filter the data to show only the “NA”, “French”, and “Spanish”.

```
crossref_data %>%
  filter(is.na(Language) | Language == "French" | Language == "Spanish") %>%
  ggplot() +
  aes(fct_rev(fct_infreq(Language)), fill = Publisher) +
  geom_bar() +
  coord_flip() +
  theme(legend.position="top")
```



Time Series

```
crossref_data %>%
  count(Date) %>%
  ggplot(aes(Date, n)) +
  geom_point() +
  geom_line() +
  ggtitle("Publishing Date Frequency", subtitle = "One Week in January, 2015")
```


Publishing Date Frequency
One Week in January, 2015
n
90
60
30
Jan 02
Jan 04
Jan 06
Jan 08
Jan 10
Jan 12
Date