**The most important foreign languages for**
**English-speaking job seekers in global development and humanitarian relief**
**By Ma. Eliza J. Villarino, June 2016**

Breaking into the field of global development and humanitarian relief (or the aid industry) can be tough. Employers often ask candidates to have a few years of experience relevant to the organizations' operations, even for entry-level positions. They also prefer if not require applicants to have foreign language skills, as assignments may entail being deployed overseas.

For English speakers who are serious about joining the global development and humanitarian relief industry, an important question could be which foreign language to invest their time in learning. Knowing the answer can also benefit universities offering courses focused on the sector as this can improve not only their curriculum but more importantly career guidance to students.

Talking with recruiters could help. But perhaps a more definitive method would be to look at job ads – tens of thousands of them.

But where can you find and how do you gather those job ads?

If you Google "international development jobs," you'll see Reliefweb among the top search results. On any given day, it has more than 2,000 open job announcements, volume that's comparable if not better than similar jobs boards. Being owned by the United Nations, it makes all job ads and other information available to the public. Reliefweb also allows users to extract data from its archive, which for job ads date from 2011.

**Knowing the demand**

The focus here would be on job ads written in English and those indicating that the position is located in countries where English is an official or primary language.

To determine the extent of the demand for bilingual or multilingual English speakers means to know the proportion of job ads that require or prefer English-speaking candidates to be fluent or have knowledge in one or a combination of certain foreign languages. In this case, that would French, Spanish, Arabic, Chinese and Russian, which together with English make up the official languages of the United Nations, as well as others that some career advice articles have mentioned, namely Portuguese and "local languages."

**Collecting the data**

Reliefweb offers an API search of its job ads, which you can run in R using the jsonlite package. The API search string filtered the data based on the month and the year when the job ads were posted, and specified the below fields and subfields. The aim is to use the same extracted data for future data science projects.

- id
- date.created
- title
- body, which contains the job description, including foreign language requirements
- theme.name, or expertise
- experience.name, as expressed by the number of years
- country.name
- career_categories.name, or job functions

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

- type.name, i.e., whether the position is considered a job, consultancy, internship or volunteer opportuning
- source.name, or the name of the employer
- source.type.name, or the type of organization hiring for the job

Documentation on the Reliefweb API indicates that a user can only extract 1,000 data entries per search. This means iterating the searches by setting the "limit" parameter to 1,000 and the "offset" parameter in intervals of 1,000, starting with 0 for the first search, 1,000 for the second search and so forth.

```
library(jsonlite)

fromJSON("http://api.reliefweb.int/v1/jobs?offset=0&limit=1000&preset=analysis&filter[fie
ld]=date.created&filter[value][from]=2015-05-01T00:00:00%2B00:00&filter[value][to]=2015-
05-
31T00:00:00%2B00:00&&fields[include][]title&fields[include][]=body&fields[include][]=them
e.name&fields[include][]=country.name&fields[include][]=type.name&fields[include][]=exper
ience.name&fields[include][]=career_categories.name&fields[include][]=date.created&fields
[include][]=id&fields[include][]=source.name&fields[include][]=source.type.name")

rwjobs1 <- rwjobsraw1$data$fields
```

**Cleaning the data**

The extracted data initially had nested lists, which made it impossible to save the data frame into a csv file. Calling the llply function from the plyr package resolved this issue.

```
library(plyr)

rwjobs1$theme <- llply(rwjobs1$theme, unlist)
rwjobs1$type <- llply(rwjobs1$type, unlist)
rwjobs1$experience <- llply(rwjobs1$experience, unlist)
rwjobs1$career_categories <- llply(rwjobs1$career_categories, unlist)
rwjobs1$country <- llply(rwjobs1$country, unlist)
rwjobs1$date <- llply(rwjobs1$date, unlist)
rwjobs1$source <- llply(rwjobs1$source, unlist)
```

That action, however, resulted in the appearance of unnecessary characters in the strings. Using the gsub function removed these characters.

```
rwjobs1$source <- gsub("\\c\\(", "", rwjobs1$source)
rwjobs1$source <- gsub("\"", "", rwjobs1$source)
rwjobs1$source <- gsub("\\)", "", rwjobs1$source)

rwjobs1$theme <- gsub("\\c\\(", "", rwjobs1$theme)
rwjobs1$theme <- gsub("\"", "", rwjobs1$theme)
rwjobs1$theme <- gsub("\\)", "", rwjobs1$theme)

rwjobs1$career_categories <- gsub("\\c\\(", "", rwjobs1$career_categories)
rwjobs1$career_categories <- gsub("\"", "", rwjobs1$career_categories)
rwjobs1$career_categories <- gsub("\\)", "", rwjobs1$career_categories)

rwjobs1$date <- gsub("\\c\\(", "", rwjobs1$date)
rwjobs1$date <- gsub("\"", "", rwjobs1$date)
```

The values under the "source" and "date" columns were separated using the strsplit function and the separated values filled new columns called "organization", "organization_type", "year" and "month".

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
library(stringr)

source_split <- strsplit(rwjobs1$source, split = ",")
select_el <- function(x, index) {x[index]}
org_name <- lapply(source_split, select_el, index = 1)
org_type <- lapply(source_split, select_el, index = 2)
rwjobs1$organization <- as.character(org_name)
rwjobs1$organization_type <- as.character(org_type)
rwjobs1$source <- NULL

date_split <- strsplit(rwjobs1$date, split = "-")
select_el <- function(x, index) {x[index]}
year <- lapply(date_split, select_el, index = 1)
month <- lapply(date_split, select_el, index = 2)
day <- lapply(date_split, select_el, index = 3)
```

The whole process enabled saving the data into a csv file. The rbind function allowed the csv files for all searches to be combined into a dataset with **102,343 unique data entries or job ads posted from March 2011 to June 15, 2016**.

```
rwjAll <- rbind(rwj2011, rwj2012, rwj2013, rwj2014, rwj2015, rwj2016)
rwjAll <- rwjAll[!duplicated(rwjAll), ]
```

With the combined dataset, the type, experience and organization_type columns were further cleaned to clarify the categorical values and replace missing or NA values.

```
library(gdata)

rwjAll$jobType1 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$jobType1 <- str_match(rwjAll$type, "Consultancy")
rwjAll$jobType1 <- ifelse(rwjAll$jobType1=="Consultancy", 1, 0)
rwjAll$jobType1 <- unmatrix(rwjAll$jobType1)

rwjAll$jobType2 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$jobType2 <- str_match(rwjAll$type, "Internship")
rwjAll$jobType2 <- ifelse(rwjAll$jobType2=="Internship", 2, 0)
rwjAll$jobType2 <- unmatrix(rwjAll$jobType2)

rwjAll$jobType3 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$jobType3 <- str_match(rwjAll$type, "Job")
rwjAll$jobType3 <- ifelse(rwjAll$jobType3=="Job", 3, 0)
rwjAll$jobType3 <- unmatrix(rwjAll$jobType3)

rwjAll$jobType4 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$jobType4 <- str_match(rwjAll$type, "Volunteer Opportunity")
rwjAll$jobType4 <- ifelse(rwjAll$jobType4=="Volunteer Opportunity", 4, 0)
rwjAll$jobType4 <- unmatrix(rwjAll$jobType4)

rwjAll$jobTypeAll <- rowSums(rwjAll[, 13:16], na.rm = TRUE)

rwjAll$jobTypeAll[rwjAll$jobTypeAll==1] <- "1 Consultancy"
rwjAll$jobTypeAll[rwjAll$jobTypeAll==2] <- "2 Internship"
rwjAll$jobTypeAll[rwjAll$jobTypeAll==3] <- "3 Job"
rwjAll$jobTypeAll[rwjAll$jobTypeAll==4] <- "4 Volunteer Opportunity"
rwjAll$jobTypeAll[rwjAll$jobTypeAll==0] <- "5 Other"

rwjAll$jobType1 <- NULL
rwjAll$jobType2 <- NULL
rwjAll$jobType3 <- NULL
rwjAll$jobType4 <- NULL
rwjAll$jobType5 <- NULL
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAll$type <- NULL
names(rwjAll)[names(rwjAll)=="jobTypeAll"] <- "job_type"

rwjAll$orgType1 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType1 <- str_match(rwjAll$organization_type, "Academic and Research
Institution")
rwjAll$orgType1 <- ifelse(rwjAll$orgType1=="Academic and Research Institution", 1, 0)
rwjAll$orgType1 <- unmatrix(rwjAll$orgType1)

rwjAll$orgType2 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType2 <- str_match(rwjAll$organization_type, "Inc")
rwjAll$orgType2 <- ifelse(rwjAll$orgType2=="Inc", 2, 0)
rwjAll$orgType2 <- unmatrix(rwjAll$orgType2)

rwjAll$orgType3 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType3 <- str_match(rwjAll$organization_type, "Government")
rwjAll$orgType3 <- ifelse(rwjAll$orgType3=="Government", 3, 0)
rwjAll$orgType3 <- unmatrix(rwjAll$orgType3)

rwjAll$orgType4 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType4 <- str_match(rwjAll$organization_type, "Media")
rwjAll$orgType4 <- ifelse(rwjAll$orgType4=="Media", 4, 0)
rwjAll$orgType4 <- unmatrix(rwjAll$orgType4)

rwjAll$orgType5 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType5 <- str_match(rwjAll$organization_type, "Non-governmental Organization")
rwjAll$orgType5 <- ifelse(rwjAll$orgType5=="Non-governmental Organization", 5, 0)
rwjAll$orgType5 <- unmatrix(rwjAll$orgType5)

rwjAll$orgType6 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType6 <- str_match(rwjAll$organization_type, "Red Cross/Red Crescent Movement")
rwjAll$orgType6 <- ifelse(rwjAll$orgType6=="Red Cross/Red Crescent Movement", 6, 0)
rwjAll$orgType6 <- unmatrix(rwjAll$orgType6)

rwjAll$orgType7 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType7 <- str_match(rwjAll$organization_type, "International Organization")
rwjAll$orgType7 <- ifelse(rwjAll$orgType7=="International Organization", 7, 0)
rwjAll$orgType7 <- unmatrix(rwjAll$orgType7)

rwjAll$orgType8 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$orgType8 <- str_match(rwjAll$organization_type, "Other")
rwjAll$orgType8 <- ifelse(rwjAll$orgType8=="Other", 8, 0)
rwjAll$orgType8 <- unmatrix(rwjAll$orgType8)

rwjAll$orgTypeAll <- rowSums(rwjAll[, 18:25], na.rm = TRUE)

rwjAll$orgTypeAll[rwjAll$orgTypeAll==1] <- "1 Academic and Research Institution"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==2] <- "2 Consultancy"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==3] <- "3 Government"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==4] <- "4 Media"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==5] <- "5 Non-governmental Organization"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==6] <- "6 Red Cross/Red Crescent Movement"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==7] <- "7 International Organization"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==8] <- "8 Other"
rwjAll$orgTypeAll[rwjAll$orgTypeAll==0] <- "8 Other"

rwjAll$orgType1 <- NULL
rwjAll$orgType2 <- NULL
rwjAll$orgType3 <- NULL
rwjAll$orgType4 <- NULL
rwjAll$orgType5 <- NULL
rwjAll$orgType6 <- NULL
rwjAll$orgType7 <- NULL
rwjAll$orgType8 <- NULL

rwjAll$organization_type <- NULL
names(rwjAll)[names(rwjAll)=="orgTypeAll"] <- "organization_type"
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAllTest <- as.data.frame(rwjAll)
rwjAllTest$experience <- as.character(rwjAllTest$experience)
rwjAllTest$experience[rwjAllTest$experience=="NULL"] <- "Other"
rwjAllTest$experience[rwjAllTest$experience=="N/A"] <- "Other"
```

**Transforming and preparing the data for analysis**

Calling the str_match function and ifelse statements, binary columns were added to the dataset to determine the frequencies and later the proportion of job ads requiring or preferring English speakers with foreign language skills.

The following keyword searches of the "body" column formed the basis of the values in the binary columns:

- "English" which denotes that the ad asks for applicants to be fluent in or knowledge of English.
- "French" which denotes that the ad asks for applicants to be fluent in or knowledge of French.
- "Spanish" which denotes that the ad asks for applicants to be fluent in or knowledge of Spanish.
- "Arabic" which denotes that the ad asks for applicants to be fluent in or knowledge of Arabic.
- "Chinese" which denotes that the ad asks for applicants to be fluent in or knowledge of Chinese.
- "Russian" which denotes that the ad asks for applicants to be fluent in or knowledge of Russian.
- "Portuguese" which denotes that the ad asks for applicants to be fluent in or knowledge of Portuguese.
- "local languages" which denotes that the ad asks for applicants to be fluent in or knowledge of local languages.

More binary columns were created based on keyword searches of the "country" column. The keywords include countries where English is an official or a primary language.

Another binary column was created to combine values for all languages, and this was used to initially filter the dataset.

```
rwjall <- as.data.frame(rwjAll)

rwjAll$English1 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English1 <- str_match(rwjAll$body, "English")
rwjAll$English1 <- ifelse(rwjAll$English1 == "English", 1, 0)
rwjAll$English1 <- unmatrix(rwjAll$English1)

rwjAll$English2 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English2 <- str_match(rwjAll$country, "United States")
rwjAll$English2 <- ifelse(rwjAll$English2 == "United States", 1, 0)
rwjAll$English2 <- unmatrix(rwjAll$English2)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English2[i]=NA

rwjAll$English3 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English3 <- str_match(rwjAll$country, "United Kingdom")
rwjAll$English3 <- ifelse(rwjAll$English3 == "United Kingdom", 1, 0)
rwjAll$English3 <- unmatrix(rwjAll$English3)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English3[i]=NA

rwjAll$English4 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English4 <- str_match(rwjAll$country, "Ireland")
rwjAll$English4 <- ifelse(rwjAll$English4 == "Ireland", 1, 0)
rwjAll$English4 <- unmatrix(rwjAll$English4)
for (i in 1:length(rwjAll$English1))
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
if (!is.na(rwjAll$English1[i])) rwjAll$English4[i]=NA
for (i in 1:length(rwjAll$English3))
if (!is.na(rwjAll$English3[i])) rwjAll$English4[i]=NA

rwjAll$English5 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English5 <- str_match(rwjAll$country, "Canada")
rwjAll$English5 <- ifelse(rwjAll$English5 == "Canada", 1, 0)
rwjAll$English5 <- unmatrix(rwjAll$English5)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English5[i]=NA

rwjAll$English6 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English6 <- str_match(rwjAll$country, "Australia")
rwjAll$English6 <- ifelse(rwjAll$English6 == "Australia", 1, 0)
rwjAll$English6 <- unmatrix(rwjAll$English6)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English6[i]=NA

rwjAll$English7 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English7 <- str_match(rwjAll$country, "Botswana")
rwjAll$English7 <- ifelse(rwjAll$English7 == "Botswana", 1, 0)
rwjAll$English7 <- unmatrix(rwjAll$English7)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English7[i]=NA

rwjAll$English8 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English8 <- str_match(rwjAll$country, "Cameroon")
rwjAll$English8 <- ifelse(rwjAll$English8 == "Cameroon", 1, 0)
rwjAll$English8 <- unmatrix(rwjAll$English8)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English8[i]=NA

rwjAll$English9 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English9 <- str_match(rwjAll$country, "Gambia")
rwjAll$English9 <- ifelse(rwjAll$English9 == "Gambia", 1, 0)
rwjAll$English9 <- unmatrix(rwjAll$English9)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English9[i]=NA

rwjAll$English10 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English10 <- str_match(rwjAll$country, "Ghana")
rwjAll$English10 <- ifelse(rwjAll$English10 == "Ghana", 1, 0)
rwjAll$English10 <- unmatrix(rwjAll$English10)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English10[i]=NA

rwjAll$English11 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English11 <- str_match(rwjAll$country, "Kenya")
rwjAll$English11 <- ifelse(rwjAll$English11 == "Kenya", 1, 0)
rwjAll$English11 <- unmatrix(rwjAll$English11)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English11[i]=NA

rwjAll$English12 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English12 <- str_match(rwjAll$country, "Lesotho")
rwjAll$English12 <- ifelse(rwjAll$English12 == "Lesotho", 1, 0)
rwjAll$English12 <- unmatrix(rwjAll$English12)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English12[i]=NA

rwjAll$English13 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English13 <- str_match(rwjAll$country, "Liberia")
rwjAll$English13 <- ifelse(rwjAll$English13 == "Liberia", 1, 0)
rwjAll$English13 <- unmatrix(rwjAll$English13)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English13[i]=NA

rwjAll$English14 <- as.vector(c(NA * nrow(rwjAll)))
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAll$English14 <- str_match(rwjAll$country, "Malawi")
rwjAll$English14 <- ifelse(rwjAll$English14 == "Malawi", 1, 0)
rwjAll$English14 <- unmatrix(rwjAll$English14)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English14[i]=NA

rwjAll$English15 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English15 <- str_match(rwjAll$country, "Mauritius")
rwjAll$English15 <- ifelse(rwjAll$English15 == "Mauritius", 1, 0)
rwjAll$English15 <- unmatrix(rwjAll$English15)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English15[i]=NA

rwjAll$English16 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English16 <- str_match(rwjAll$country, "Namibia")
rwjAll$English16 <- ifelse(rwjAll$English16 == "Namibia", 1, 0)
rwjAll$English16 <- unmatrix(rwjAll$English16)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English16[i]=NA

rwjAll$English17 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English17 <- str_match(rwjAll$country, "Nigeria")
rwjAll$English17 <- ifelse(rwjAll$English17 == "Nigeria", 1, 0)
rwjAll$English17 <- unmatrix(rwjAll$English17)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English17[i]=NA

rwjAll$English18 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English18 <- str_match(rwjAll$country, "Rwanda")
rwjAll$English18 <- ifelse(rwjAll$English18 == "Rwanda", 1, 0)
rwjAll$English18 <- unmatrix(rwjAll$English18)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English18[i]=NA

rwjAll$English19 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English19 <- str_match(rwjAll$country, "Saint Helena")
rwjAll$English19 <- ifelse(rwjAll$English19 == "Saint Helena", 1, 0)
rwjAll$English19 <- unmatrix(rwjAll$English19)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English19[i]=NA

rwjAll$English20 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English20 <- str_match(rwjAll$country, "Seychelles")
rwjAll$English20 <- ifelse(rwjAll$English20 == "Seychelles", 1, 0)
rwjAll$English20 <- unmatrix(rwjAll$English20)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English20[i]=NA

rwjAll$English21 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English21 <- str_match(rwjAll$country, "Sierra Leone")
rwjAll$English21 <- ifelse(rwjAll$English21 == "Sierra Leone", 1, 0)
rwjAll$English21 <- unmatrix(rwjAll$English21)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English21[i]=NA

rwjAll$English22 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English22 <- str_match(rwjAll$country, "South Africa")
rwjAll$English22 <- ifelse(rwjAll$English22 == "South Africa", 1, 0)
rwjAll$English22 <- unmatrix(rwjAll$English22)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English22[i]=NA

rwjAll$English23 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English23 <- str_match(rwjAll$country, "Swaziland")
rwjAll$English23 <- ifelse(rwjAll$English23 == "Swaziland", 1, 0)
rwjAll$English23 <- unmatrix(rwjAll$English23)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English23[i]=NA
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAll$English24 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English24 <- str_match(rwjAll$country, "Uganda")
rwjAll$English24 <- ifelse(rwjAll$English24 == "Uganda", 1, 0)
rwjAll$English24 <- unmatrix(rwjAll$English24)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English24[i]=NA

rwjAll$English25 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English25 <- str_match(rwjAll$country, "Zambia")
rwjAll$English25 <- ifelse(rwjAll$English25 == "Zambia", 1, 0)
rwjAll$English25 <- unmatrix(rwjAll$English25)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English25[i]=NA

rwjAll$English26 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English26 <- str_match(rwjAll$country, "Zimbabwe")
rwjAll$English26 <- ifelse(rwjAll$English26 == "Zimbabwe", 1, 0)
rwjAll$English26 <- unmatrix(rwjAll$English26)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English26[i]=NA

rwjAll$English27 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English27 <- str_match(rwjAll$country, "Anguilla")
rwjAll$English27 <- ifelse(rwjAll$English27 == "Anguilla", 1, 0)
rwjAll$English27 <- unmatrix(rwjAll$English27)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English27[i]=NA

rwjAll$English28 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English28 <- str_match(rwjAll$country, "Antigua and Barbuda")
rwjAll$English28 <- ifelse(rwjAll$English28 == "Antigua and Barbuda", 1, 0)
rwjAll$English28 <- unmatrix(rwjAll$English28)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English28[i]=NA

rwjAll$English29 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English29 <- str_match(rwjAll$country, "Barbados")
rwjAll$English29 <- ifelse(rwjAll$English29 == "Barbados", 1, 0)
rwjAll$English29 <- unmatrix(rwjAll$English29)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English29[i]=NA

rwjAll$English30 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English30 <- str_match(rwjAll$country, "Belize")
rwjAll$English30 <- ifelse(rwjAll$English30 == "Belize", 1, 0)
rwjAll$English30 <- unmatrix(rwjAll$English30)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English30[i]=NA

rwjAll$English31 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English31 <- str_match(rwjAll$country, "Dominica")
rwjAll$English31 <- ifelse(rwjAll$English31 == "Dominica", 1, 0)
rwjAll$English31 <- unmatrix(rwjAll$English31)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English31[i]=NA

rwjAll$English32 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English32 <- str_match(rwjAll$country, "Grenada")
rwjAll$English32 <- ifelse(rwjAll$English32 == "Grenada", 1, 0)
rwjAll$English32 <- unmatrix(rwjAll$English32)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English32[i]=NA

rwjAll$English33 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English33 <- str_match(rwjAll$country, "Guyana")
rwjAll$English33 <- ifelse(rwjAll$English33 == "Guyana", 1, 0)
rwjAll$English33 <- unmatrix(rwjAll$English33)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English33[i]=NA


rwjAll$English34 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English34 <- str_match(rwjAll$country, "Jamaica")
rwjAll$English34 <- ifelse(rwjAll$English34 == "Jamaica", 1, 0)
rwjAll$English34 <- unmatrix(rwjAll$English34)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English34[i]=NA


rwjAll$English35 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English35 <- str_match(rwjAll$country, "Saint Lucia")
rwjAll$English35 <- ifelse(rwjAll$English35 == "Saint Lucia", 1, 0)
rwjAll$English35 <- unmatrix(rwjAll$English35)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English35[i]=NA


rwjAll$English36 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English36 <- str_match(rwjAll$country, "Trinidad and Tobago")
rwjAll$English36 <- ifelse(rwjAll$English36 == "Trinidad and Tobago", 1, 0)
rwjAll$English36 <- unmatrix(rwjAll$English36)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English36[i]=NA


rwjAll$English37 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English37 <- str_match(rwjAll$country, "Brunei")
rwjAll$English37 <- ifelse(rwjAll$English37 == "Brunei", 1, 0)
rwjAll$English37 <- unmatrix(rwjAll$English37)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English37[i]=NA


rwjAll$English38 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English38 <- str_match(rwjAll$country, "India")
rwjAll$English38 <- ifelse(rwjAll$English38 == "India", 1, 0)
rwjAll$English38 <- unmatrix(rwjAll$English38)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English38[i]=NA


rwjAll$English39 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English39 <- str_match(rwjAll$country, "Pakistan")
rwjAll$English39 <- ifelse(rwjAll$English39 == "Pakistan", 1, 0)
rwjAll$English39 <- unmatrix(rwjAll$English39)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English39[i]=NA


rwjAll$English40 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English40 <- str_match(rwjAll$country, "Philippines")
rwjAll$English40 <- ifelse(rwjAll$English40 == "Philippines", 1, 0)
rwjAll$English40 <- unmatrix(rwjAll$English40)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English40[i]=NA


rwjAll$English41 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English41 <- str_match(rwjAll$country, "Singapore")
rwjAll$English41 <- ifelse(rwjAll$English41 == "Singapore", 1, 0)
rwjAll$English41 <- unmatrix(rwjAll$English41)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English41[i]=NA


rwjAll$English42 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English42 <- str_match(rwjAll$country, "Sri Lanka")
rwjAll$English42 <- ifelse(rwjAll$English42 == "Sri Lanka", 1, 0)
rwjAll$English42 <- unmatrix(rwjAll$English42)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English42[i]=NA


rwjAll$English43 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English43 <- str_match(rwjAll$country, "Fiji")
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAll$English43 <- ifelse(rwjAll$English43 == "Fiji", 1, 0)
rwjAll$English43 <- unmatrix(rwjAll$English43)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English43[i]=NA

rwjAll$English44 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English44 <- str_match(rwjAll$country, "Kiribati")
rwjAll$English44 <- ifelse(rwjAll$English44 == "Kiribati", 1, 0)
rwjAll$English44 <- unmatrix(rwjAll$English44)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English44[i]=NA

rwjAll$English45 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English45 <- str_match(rwjAll$country, "Marshall Islands")
rwjAll$English45 <- ifelse(rwjAll$English45 == "Marshall Islands", 1, 0)
rwjAll$English45 <- unmatrix(rwjAll$English45)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English45[i]=NA

rwjAll$English46 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English46 <- str_match(rwjAll$country, "Micronesia")
rwjAll$English46 <- ifelse(rwjAll$English46 == "Micronesia", 1, 0)
rwjAll$English46 <- unmatrix(rwjAll$English46)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English46[i]=NA

rwjAll$English47 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English47 <- str_match(rwjAll$country, "Nauru")
rwjAll$English47 <- ifelse(rwjAll$English47 == "Nauru", 1, 0)
rwjAll$English47 <- unmatrix(rwjAll$English47)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English47[i]=NA

rwjAll$English48 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English48 <- str_match(rwjAll$country, "New Zealand")
rwjAll$English48 <- ifelse(rwjAll$English48 == "New Zealand", 1, 0)
rwjAll$English48 <- unmatrix(rwjAll$English48)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English48[i]=NA

rwjAll$English49 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English49 <- str_match(rwjAll$country, "Palau")
rwjAll$English49 <- ifelse(rwjAll$English49 == "Palau", 1, 0)
rwjAll$English49 <- unmatrix(rwjAll$English49)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English49[i]=NA

rwjAll$English50 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English50 <- str_match(rwjAll$country, "Samoa")
rwjAll$English50 <- ifelse(rwjAll$English50 == "Samoa", 1, 0)
rwjAll$English50 <- unmatrix(rwjAll$English50)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English50[i]=NA

rwjAll$English51 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English51 <- str_match(rwjAll$country, "Solomon Islands")
rwjAll$English51 <- ifelse(rwjAll$English51 == "Solomon Islands", 1, 0)
rwjAll$English51 <- unmatrix(rwjAll$English51)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English51[i]=NA

rwjAll$English52 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English52 <- str_match(rwjAll$country, "Tonga")
rwjAll$English52 <- ifelse(rwjAll$English52 == "Tonga", 1, 0)
rwjAll$English52 <- unmatrix(rwjAll$English52)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English52[i]=NA
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAll$English53 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English53 <- str_match(rwjAll$country, "Tuvalu")
rwjAll$English53 <- ifelse(rwjAll$English53 == "Tuvalu", 1, 0)
rwjAll$English53 <- unmatrix(rwjAll$English53)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English53[i]=NA

rwjAll$English54 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English54 <- str_match(rwjAll$country, "Vanuatu")
rwjAll$English54 <- ifelse(rwjAll$English54 == "Vanuatu", 1, 0)
rwjAll$English54 <- unmatrix(rwjAll$English54)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English54[i]=NA

rwjAll$English55 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English55 <- str_match(rwjAll$country, "Papua New Guineau")
rwjAll$English55 <- ifelse(rwjAll$English55 == "Papua New Guineau", 1, 0)
rwjAll$English55 <- unmatrix(rwjAll$English55)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English55[i]=NA

rwjAll$English56 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English56 <- str_match(rwjAll$country, "Tanzania")
rwjAll$English56 <- ifelse(rwjAll$English56 == "Tanzania", 1, 0)
rwjAll$English56 <- unmatrix(rwjAll$English56)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English56[i]=NA

rwjAll$English57 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English57 <- str_match(rwjAll$country, "Sudan")
rwjAll$English57 <- ifelse(rwjAll$English57 == "Sudan", 1, 0)
rwjAll$English57 <- unmatrix(rwjAll$English57)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English57[i]=NA

rwjAll$English58 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English58 <- str_match(rwjAll$country, "South Sudan")
rwjAll$English58 <- ifelse(rwjAll$English58 == "South Sudan", 1, 0)
rwjAll$English58 <- unmatrix(rwjAll$English58)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English58[i]=NA

rwjAll$English59 <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$English59 <- str_match(rwjAll$country, "Malaysia")
rwjAll$English59 <- ifelse(rwjAll$English59 == "Malaysia", 1, 0)
rwjAll$English59 <- unmatrix(rwjAll$English59)
for (i in 1:length(rwjAll$English1))
if (!is.na(rwjAll$English1[i])) rwjAll$English59[i]=NA

rwjAll$English_total <- rowSums(rwjAll[, 13:71], na.rm = TRUE)
rwjAll$English_total[rwjAll$English_total == 2] <- 1
rwjAll$English_total[rwjAll$English_total == 3] <- 1
rwjAll$English_total[rwjAll$English_total == 4] <- 1
rwjAll$English_total[rwjAll$English_total == 5] <- 1
rwjAll$English_total[rwjAll$English_total == 6] <- 1
rwjAll$English_total[rwjAll$English_total == 7] <- 1
rwjAll$English_total[rwjAll$English_total == 8] <- 1
rwjAll$English_total[rwjAll$English_total == 9] <- 1
rwjAll$English_total[rwjAll$English_total == 10] <- 1
rwjAll$English_total[rwjAll$English_total == 11] <- 1
rwjAll$English_total[rwjAll$English_total == 12] <- 1
rwjAll$English_total[rwjAll$English_total == 13] <- 1
rwjAll$English_total[rwjAll$English_total == 14] <- 1

rwjAll$French <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$French <- str_match(rwjAll$body, "French")
rwjAll$French <- ifelse(rwjAll$French == "French", 1, 0)
rwjAll$French <- unmatrix(rwjAll$French)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAll$Arabic <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$Arabic <- str_match(rwjAll$body, "Arabic")
rwjAll$Arabic <- ifelse(rwjAll$Arabic=="Arabic", 1, 0)
rwjAll$Arabic <- unmatrix(rwjAll$Arabic)

rwjAll$Spanish <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$Spanish <- str_match(rwjAll$body, "Spanish")
rwjAll$Spanish <- ifelse(rwjAll$Spanish=="Spanish", 1, 0)
rwjAll$Spanish <- unmatrix(rwjAll$Spanish)

rwjAll$Russian <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$Russian <- str_match(rwjAll$body, "Russian")
rwjAll$Russian <- ifelse(rwjAll$Russian=="Russian", 1, 0)
rwjAll$Russian <- unmatrix(rwjAll$Russian)

rwjAll$Chinese <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$Chinese <- str_match(rwjAll$body, "Chinese")
rwjAll$Chinese <- ifelse(rwjAll$Chinese=="Chinese", 1, 0)
rwjAll$Chinese <- unmatrix(rwjAll$Chinese)

rwjAll$Portuguese <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$Portuguese <- str_match(rwjAll$body, "Portuguese")
rwjAll$Portuguese <- ifelse(rwjAll$Portuguese=="Portuguese", 1, 0)
rwjAll$Portuguese <- unmatrix(rwjAll$Portuguese)

rwjAll$local <- as.vector(c(NA * nrow(rwjAll)))
rwjAll$local <- str_match(rwjAll$body, "local language")
rwjAll$local <- ifelse(rwjAll$local=="local language", 1, 0)
rwjAll$local <- unmatrix(rwjAll$local)

rwjAll$French_Arabic <- rowSums(rwjAll[, c("French", "Arabic")], na.rm = TRUE)
rwjAll$French_Spanish <- rowSums(rwjAll[, c("French", "Spanish")], na.rm = TRUE)
rwjAll$French_Arabic_Spanish <- rowSums(rwjAll[, c("French", "Arabic", "Spanish")], na.rm =
TRUE)
rwjAll$French_Arabic[rwjAll$French_Arabic==2] <- 1
rwjAll$French_Spanish[rwjAll$French_Spanish==2] <- 1
rwjAll$French_Arabic_Spanish[rwjAll$French_Arabic_Spanish==2] <- 1
rwjAll$French_Arabic_Spanish[rwjAll$French_Arabic_Spanish==3] <- 1

rwjAll$language_all <- rowSums(rwjAll[, 72:82], na.rm = TRUE)
rwjAll$language_all[rwjAll$language_all == 2] <- 1
rwjAll$language_all[rwjAll$language_all == 3] <- 1
rwjAll$language_all[rwjAll$language_all == 4] <- 1
rwjAll$language_all[rwjAll$language_all == 5] <- 1
rwjAll$language_all[rwjAll$language_all == 6] <- 1
rwjAll$language_all[rwjAll$language_all == 7] <- 1
rwjAll$language_all[rwjAll$language_all == 8] <- 1
rwjAll$language_all[rwjAll$language_all == 9] <- 1
rwjAll$language_all[rwjAll$language_all == 10] <- 1
rwjAll$language_all[rwjAll$language_all == 11] <- 1


library(tidyr)
library(dplyr)

rwjAll_bil <- filter(rwjAll, language_all == 1)
rwjAll_bil <- rwjAll_bil[!duplicated(rwjAll_bil), ]
rwjAll_bil$EF <- rwjAll_bil$English_total + rwjAll_bil$French
rwjAll_bil$EA <- rwjAll_bil$English_total + rwjAll_bil$Arabic
rwjAll_bil$ES <- rwjAll_bil$English_total + rwjAll_bil$Spanish
rwjAll_bil$ER <- rwjAll_bil$English_total + rwjAll_bil$Russian
rwjAll_bil$EC <- rwjAll_bil$English_total + rwjAll_bil$Chinese
rwjAll_bil$EP <- rwjAll_bil$English_total + rwjAll_bil$Portuguese
rwjAll_bil$EL <- rwjAll_bil$English_total + rwjAll_bil$local
rwjAll_bil$EF[rwjAll_bil$EF==2] <- 1
rwjAll_bil$EA[rwjAll_bil$EA==2] <- 1
rwjAll_bil$ES[rwjAll_bil$ES==2] <- 1
rwjAll_bil$ER[rwjAll_bil$ER==2] <- 1
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
rwjAll_bil$EC[rwjAll_bil$EC==2] <- 1
rwjAll_bil$EP[rwjAll_bil$EP==2] <- 1
rwjAll_bil$EL[rwjAll_bil$EL==2] <- 1
```

The filtered dataset (with 84,122 entries) was filtered anew, by year to compare annual trends.

```
rwjAll_bil16 <- filter(rwjAll_bil, year == 2016)
rwjAll_bil15 <- filter(rwjAll_bil, year == 2015)
rwjAll_bil14 <- filter(rwjAll_bil, year == 2014)
rwjAll_bil13 <- filter(rwjAll_bil, year == 2013)
rwjAll_bil12 <- filter(rwjAll_bil, year == 2012)
rwjAll_bil11 <- filter(rwjAll_bil, year == 2011)
```

To get the proportion of job ads asking for English speakers with certain foreign language skills, the values under the columns showing the frequencies were summed up, excluding the NA values, and then divided by the number of the dataset rows.

```
total_EF_16 <- sum(rwjAll_bil16$French, na.rm = TRUE)
EF_percent_16 <- total_EF_16 / nrow(rwjAll_bil16)
total_EA_16 <- sum(rwjAll_bil16$Arabic, na.rm = TRUE)
EA_percent_16 <- total_EA_16 / nrow(rwjAll_bil16)
total_ES_16 <- sum(rwjAll_bil16$Spanish, na.rm = TRUE)
ES_percent_16 <- total_ES_16 / nrow(rwjAll_bil16)
total_ER_16 <- sum(rwjAll_bil16$Russian, na.rm = TRUE)
ER_percent_16 <- total_ER_16 / nrow(rwjAll_bil16)
total_EC_16 <- sum(rwjAll_bil16$Chinese, na.rm = TRUE)
EC_percent_16 <- total_EC_16 / nrow(rwjAll_bil16)
total_EP_16 <- sum(rwjAll_bil16$Portuguese, na.rm = TRUE)
EP_percent_16 <- total_EP_16 / nrow(rwjAll_bil16)
total_EL_16 <- sum(rwjAll_bil16$local, na.rm = TRUE)
EL_percent_16 <- total_EL_16 / nrow(rwjAll_bil16)
total_EFA_16 <- sum(rwjAll_bil16$French_Arabic, na.rm = TRUE)
EFA_percent_16 <- total_EFA_16 / nrow(rwjAll_bil16)
total_EFS_16 <- sum(rwjAll_bil16$French_Spanish, na.rm = TRUE)
EFS_percent_16 <- total_EFS_16 / nrow(rwjAll_bil16)
total_EFAS_16 <- sum(rwjAll_bil16$French_Arabic_Spanish, na.rm = TRUE)
EFAS_percent_16 <- total_EFAS_16 / nrow(rwjAll_bil16)

total_EF_15 <- sum(rwjAll_bil15$French, na.rm = TRUE)
EF_percent_15 <- total_EF_15 / nrow(rwjAll_bil15)
total_EA_15 <- sum(rwjAll_bil15$Arabic, na.rm = TRUE)
EA_percent_15 <- total_EA_15 / nrow(rwjAll_bil15)
total_ES_15 <- sum(rwjAll_bil15$Spanish, na.rm = TRUE)
ES_percent_15 <- total_ES_15 / nrow(rwjAll_bil15)
total_ER_15 <- sum(rwjAll_bil15$Russian, na.rm = TRUE)
ER_percent_15 <- total_ER_15 / nrow(rwjAll_bil15)
total_EC_15 <- sum(rwjAll_bil15$Chinese, na.rm = TRUE)
EC_percent_15 <- total_EC_15 / nrow(rwjAll_bil15)
total_EP_15 <- sum(rwjAll_bil15$Portuguese, na.rm = TRUE)
EP_percent_15 <- total_EP_15 / nrow(rwjAll_bil15)
total_EL_15 <- sum(rwjAll_bil15$local, na.rm = TRUE)
EL_percent_15 <- total_EL_15 / nrow(rwjAll_bil15)
total_EFA_15 <- sum(rwjAll_bil15$French_Arabic, na.rm = TRUE)
EFA_percent_15 <- total_EFA_15 / nrow(rwjAll_bil15)
total_EFS_15 <- sum(rwjAll_bil15$French_Spanish, na.rm = TRUE)
EFS_percent_15 <- total_EFS_15 / nrow(rwjAll_bil15)
total_EFAS_15 <- sum(rwjAll_bil15$French_Arabic_Spanish, na.rm = TRUE)
EFAS_percent_15 <- total_EFAS_15 / nrow(rwjAll_bil15)

total_EF_14 <- sum(rwjAll_bil14$French, na.rm = TRUE)
EF_percent_14 <- total_EF_14 / nrow(rwjAll_bil14)
total_EA_14 <- sum(rwjAll_bil14$Arabic, na.rm = TRUE)
EA_percent_14 <- total_EA_14 / nrow(rwjAll_bil14)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
total_ES_14 <- sum(rwjAll_bil14$Spanish, na.rm = TRUE)
ES_percent_14 <- total_ES_14 / nrow(rwjAll_bil14)
total_ER_14 <- sum(rwjAll_bil14$Russian, na.rm = TRUE)
ER_percent_14 <- total_ER_14 / nrow(rwjAll_bil14)
total_EC_14 <- sum(rwjAll_bil14$Chinese, na.rm = TRUE)
EC_percent_14 <- total_EC_14 / nrow(rwjAll_bil14)
total_EP_14 <- sum(rwjAll_bil14$Portuguese, na.rm = TRUE)
EP_percent_14 <- total_EP_14 / nrow(rwjAll_bil14)
total_EL_14 <- sum(rwjAll_bil14$local, na.rm = TRUE)
EL_percent_14 <- total_EL_14 / nrow(rwjAll_bil14)
total_EFA_14 <- sum(rwjAll_bil14$French_Arabic, na.rm = TRUE)
EFA_percent_14 <- total_EFA_14 / nrow(rwjAll_bil14)
total_EFS_14 <- sum(rwjAll_bil14$French_Spanish, na.rm = TRUE)
EFS_percent_14 <- total_EFS_14 / nrow(rwjAll_bil14)
total_EFAS_14 <- sum(rwjAll_bil14$French_Arabic_Spanish, na.rm = TRUE)
EFAS_percent_14 <- total_EFAS_14 / nrow(rwjAll_bil14)

total_EF_13 <- sum(rwjAll_bil13$French, na.rm = TRUE)
EF_percent_13 <- total_EF_13 / nrow(rwjAll_bil13)
total_EA_13 <- sum(rwjAll_bil13$Arabic, na.rm = TRUE)
EA_percent_13 <- total_EA_13 / nrow(rwjAll_bil13)
total_ES_13 <- sum(rwjAll_bil13$Spanish, na.rm = TRUE)
ES_percent_13 <- total_ES_13 / nrow(rwjAll_bil13)
total_ER_13 <- sum(rwjAll_bil13$Russian, na.rm = TRUE)
ER_percent_13 <- total_ER_13 / nrow(rwjAll_bil13)
total_EC_13 <- sum(rwjAll_bil13$Chinese, na.rm = TRUE)
EC_percent_13 <- total_EC_13 / nrow(rwjAll_bil13)
total_EP_13 <- sum(rwjAll_bil13$Portuguese, na.rm = TRUE)
EP_percent_13 <- total_EP_13 / nrow(rwjAll_bil13)
total_EL_13 <- sum(rwjAll_bil13$local, na.rm = TRUE)
EL_percent_13 <- total_EL_13 / nrow(rwjAll_bil13)
total_EFA_13 <- sum(rwjAll_bil13$French_Arabic, na.rm = TRUE)
EFA_percent_13 <- total_EFA_13 / nrow(rwjAll_bil13)
total_EFS_13 <- sum(rwjAll_bil13$French_Spanish, na.rm = TRUE)
EFS_percent_13 <- total_EFS_13 / nrow(rwjAll_bil13)
total_EFAS_13 <- sum(rwjAll_bil13$French_Arabic_Spanish, na.rm = TRUE)
EFAS_percent_13 <- total_EFAS_13 / nrow(rwjAll_bil13)

total_EF_12 <- sum(rwjAll_bil12$French, na.rm = TRUE)
EF_percent_12 <- total_EF_12 / nrow(rwjAll_bil12)
total_EA_12 <- sum(rwjAll_bil12$Arabic, na.rm = TRUE)
EA_percent_12 <- total_EA_12 / nrow(rwjAll_bil12)
total_ES_12 <- sum(rwjAll_bil12$Spanish, na.rm = TRUE)
ES_percent_12 <- total_ES_12 / nrow(rwjAll_bil12)
total_ER_12 <- sum(rwjAll_bil12$Russian, na.rm = TRUE)
ER_percent_12 <- total_ER_12 / nrow(rwjAll_bil12)
total_EC_12 <- sum(rwjAll_bil12$Chinese, na.rm = TRUE)
EC_percent_12 <- total_EC_12 / nrow(rwjAll_bil12)
total_EP_12 <- sum(rwjAll_bil12$Portuguese, na.rm = TRUE)
EP_percent_12 <- total_EP_12 / nrow(rwjAll_bil12)
total_EL_12 <- sum(rwjAll_bil12$local, na.rm = TRUE)
EL_percent_12 <- total_EL_12 / nrow(rwjAll_bil12)
total_EFA_12 <- sum(rwjAll_bil12$French_Arabic, na.rm = TRUE)
EFA_percent_12 <- total_EFA_12 / nrow(rwjAll_bil12)
total_EFS_12 <- sum(rwjAll_bil12$French_Spanish, na.rm = TRUE)
EFS_percent_12 <- total_EFS_12 / nrow(rwjAll_bil12)
total_EFAS_12 <- sum(rwjAll_bil12$French_Arabic_Spanish, na.rm = TRUE)
EFAS_percent_12 <- total_EFAS_12 / nrow(rwjAll_bil12)

total_EF_11 <- sum(rwjAll_bil11$French, na.rm = TRUE)
EF_percent_11 <- total_EF_11 / nrow(rwjAll_bil11)
total_EA_11 <- sum(rwjAll_bil11$Arabic, na.rm = TRUE)
EA_percent_11 <- total_EA_11 / nrow(rwjAll_bil11)
total_ES_11 <- sum(rwjAll_bil11$Spanish, na.rm = TRUE)
ES_percent_11 <- total_ES_11 / nrow(rwjAll_bil11)
total_ER_11 <- sum(rwjAll_bil11$Russian, na.rm = TRUE)
ER_percent_11 <- total_ER_11 / nrow(rwjAll_bil11)
total_EC_11 <- sum(rwjAll_bil11$Chinese, na.rm = TRUE)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
EC_percent_11 <- total_EC_11 / nrow(rwjAll_bil11)
total_EP_11 <- sum(rwjAll_bil11$Portuguese, na.rm = TRUE)
EP_percent_11 <- total_EP_11 / nrow(rwjAll_bil11)
total_EL_11 <- sum(rwjAll_bil11$local, na.rm = TRUE)
EL_percent_11 <- total_EL_11 / nrow(rwjAll_bil11)
total_EFA_11 <- sum(rwjAll_bil11$French_Arabic, na.rm = TRUE)
EFA_percent_11 <- total_EFA_11 / nrow(rwjAll_bil11)
total_EFS_11 <- sum(rwjAll_bil11$French_Spanish, na.rm = TRUE)
EFS_percent_11 <- total_EFS_11 / nrow(rwjAll_bil11)
total_EFAS_11 <- sum(rwjAll_bil11$French_Arabic_Spanish, na.rm = TRUE)
EFAS_percent_11 <- total_EFAS_11 / nrow(rwjAll_bil11)
```

The proportion of job ads requiring bilingual and multilingual skills (transformed into whole numbers and rounded to two digits) populated a new dataset that also includes the covered years (2011-2016). This dataset was used for the analysis.

```
year <- c(2011, 2012, 2013, 2014, 2015, 2016)
English_French <- c(EF_percent_11, EF_percent_12, EF_percent_13, EF_percent_14,
EF_percent_15, EF_percent_16)
English_Arabic <- c(EA_percent_11, EA_percent_12, EA_percent_13, EA_percent_14,
EA_percent_15, EA_percent_16)
English_Spanish <- c(ES_percent_11, ES_percent_12, ES_percent_13, ES_percent_14,
ES_percent_15, ES_percent_16)
English_Russian <- c(ER_percent_11, ER_percent_12, ER_percent_13, ER_percent_14,
ER_percent_15, ER_percent_16)
English_Chinese <- c(EC_percent_11, EC_percent_12, EC_percent_13, EC_percent_14,
EC_percent_15, EC_percent_16)
English_Portuguese <- c(EP_percent_11, EP_percent_12, EP_percent_13, EP_percent_14,
EP_percent_15, EP_percent_16)
English_local <- c(EL_percent_11, EL_percent_12, EL_percent_13, EL_percent_14,
EL_percent_15, EL_percent_16)
English_French_Arabic <- c(EFA_percent_11, EFA_percent_12, EFA_percent_13,
EFA_percent_14, EFA_percent_15, EFA_percent_16)
English_French_Spanish <- c(EFS_percent_11, EFS_percent_12, EFS_percent_13,
EFS_percent_14, EFS_percent_15, EFS_percent_16)
English_French_Arabic_Spanish <- c(EFAS_percent_11, EFAS_percent_12, EFAS_percent_13,
EFAS_percent_14, EFAS_percent_15, EFAS_percent_16)

bi_lang_pct <- cbind(year, English_French, English_Arabic, English_Spanish,
English_Russian, English_Chinese, English_Portuguese, English_local,
English_French_Arabic, English_French_Spanish, English_French_Arabic_Spanish)
bi_lang_pct <- as.data.frame(bi_lang_pct)
bi_lang_pct$English_French <- bi_lang_pct$English_French * 100
bi_lang_pct$English_French <- round(bi_lang_pct$English_French, digits = 2)
bi_lang_pct$English_Arabic <- bi_lang_pct$English_Arabic * 100
bi_lang_pct$English_Arabic <- round(bi_lang_pct$English_Arabic, digits = 2)
bi_lang_pct$English_Spanish <- bi_lang_pct$English_Spanish * 100
bi_lang_pct$English_Spanish <- round(bi_lang_pct$English_Spanish, digits = 2)
bi_lang_pct$English_Russian <- bi_lang_pct$English_Russian * 100
bi_lang_pct$English_Russian <- round(bi_lang_pct$English_Russian, digits = 2)
bi_lang_pct$English_Chinese <- bi_lang_pct$English_Chinese * 100
bi_lang_pct$English_Chinese <- round(bi_lang_pct$English_Chinese, digits = 2)
bi_lang_pct$English_Portuguese <- bi_lang_pct$English_Portuguese * 100
bi_lang_pct$English_Portuguese <- round(bi_lang_pct$English_Portuguese, digits = 2)
bi_lang_pct$English_local <- bi_lang_pct$English_local * 100
bi_lang_pct$English_local <- round(bi_lang_pct$English_local, digits = 2)
bi_lang_pct$English_French_Arabic <- bi_lang_pct$English_French_Arabic * 100
bi_lang_pct$English_French_Arabic <- round(bi_lang_pct$English_French_Arabic, digits = 2)
bi_lang_pct$English_French_Spanish <- bi_lang_pct$English_French_Spanish * 100
bi_lang_pct$English_French_Spanish <- round(bi_lang_pct$English_French_Spanish, digits =
2)
bi_lang_pct$English_French_Arabic_Spanish <- bi_lang_pct$English_French_Arabic_Spanish *
100
bi_lang_pct$English_French_Arabic_Spanish <-
round(bi_lang_pct$English_French_Arabic_Spanish, digits = 2)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

**Analyzing the data**

The table below illustrates the dataset with the proportions of job ads seeking bilingual and multilingual speakers.

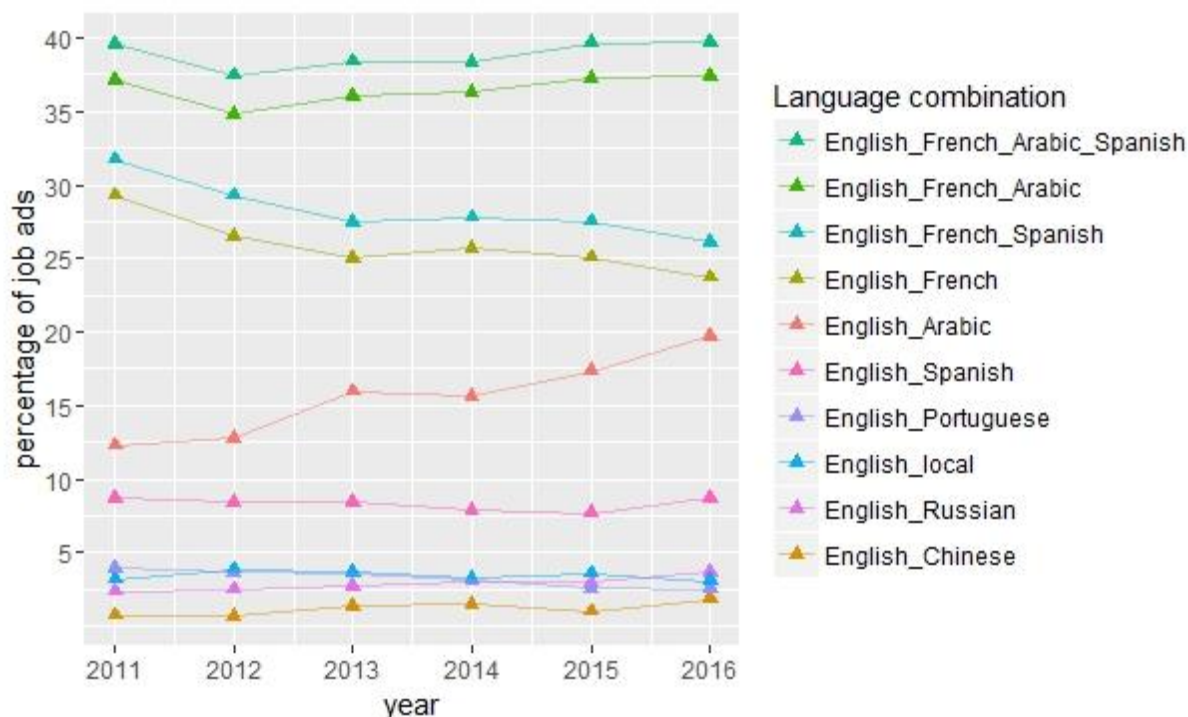| year | English_<br>French | English_<br>Arabic | English_<br>Spanish | English_<br>Russian | English_<br>Chinese | English_<br>Portuguese | English_<br>local | English_<br>French_<br>Arabic | English_<br>French_<br>Spanish | English_<br>French_<br>Arabic_<br>Spanish |
|---|---|---|---|---|---|---|---|---|---|---|
| 2011 | 29.28 | 12.27 | 8.72 | 2.35 | 0.71 | 3.95 | 3.16 | 37.15 | 31.75 | 39.57 |
| 2012 | 26.53 | 12.75 | 8.43 | 2.49 | 0.63 | 3.64 | 3.87 | 34.78 | 29.3 | 37.46 |
| 2013 | 24.98 | 15.96 | 8.44 | 2.67 | 1.34 | 3.6 | 3.68 | 36 | 27.48 | 38.41 |
| 2014 | 25.68 | 15.65 | 7.91 | 3.05 | 1.45 | 3.1 | 3.23 | 36.29 | 27.81 | 38.38 |
| 2015 | 25.08 | 17.34 | 7.69 | 2.97 | 1.01 | 2.57 | 3.58 | 37.29 | 27.53 | 39.66 |
| 2016 | 23.72 | 19.68 | 8.73 | 3.66 | 1.84 | 2.53 | 3.07 | 37.39 | 26.1 | 39.71 |

Reshaping the data frame allowed for plotting of the results using the ggplot2 package

```
library(ggplot2)

ml_comb <- bi_lang_pct %>% gather(bilingual_combination, percentage, 2:11)

plot1 <- ggplot(ml_comb, aes(x = year, y = percentage, color = bilingual_combination)) +
        geom_point(shape = 17, size = 2) +
        geom_line(size = 0.5, alpha = 0.5) +
        scale_y_continuous(name="percentage of job ads", breaks = c(5, 10, 15, 20, 25,
                            30, 35, 40, 45, 50, 55, 60, 65)) +
        scale_color_discrete(name = "Language combination",
                            breaks = c("English_French_Arabic_Spanish",
                            "English_French_Arabic", "English_French_Spanish",
                            "English_French", "English_Arabic", "English_Spanish",
                            "English_Portuguese", "English_local", "English_Russian",
                            "English_Chinese"))
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

The table and the plot show that:

- English speakers who are fluent in or have knowledge of French have the highest demand among bilingual English job seekers in global development and humanitarian relief. Nearly 1 in 4 job ads seek such candidates in 2016, while about 1 in 5 positions requires or prefers English-Arabic speakers. Meanwhile, only around 2 in 100 assignments need or favor English-Chinese speakers so far in 2016.

- Knowing both French and Arabic allows qualified English speakers to apply for or gives them an edge in nearly 4 in 10 jobs in the aid industry.

- The demand for English-French speakers in global development has declined over the years, from 29.3 percent in 2011 to 23.7 percent as of June 15, 2016. On the other hand, the demand for English-Arabic job candidates is on an upswing, rising from 12.3 percent in 2011 to nearly 19.7 percent by mid-June 2016.

- There's a relatively steady demand for English speakers who know Spanish, Russian, Portuguese, Chinese and local languages.

**Verifying the results**

To verify the results, the data were subjected to statistical tests.

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

## One sample t-tests

```
EF_tTest <- t.test(bi_lang_pct$English_French, mu=25)
Results:
t = 1.1296, df = 5, p-value = 0.3099
alternative hypothesis: true mean is not equal to 25
95 percent confidence interval:
 23.87955 27.87712
sample estimates:
mean of x
 25.87833


EA_tTest <- t.test(bi_lang_pct$English_Arabic, mu=15)
Results:
t = 0.53343, df = 5, p-value = 0.6166
alternative hypothesis: true mean is not equal to 15
95 percent confidence interval:
 12.67678 18.53989
sample estimates:
mean of x
 15.60833


ES_tTest <- t.test(bi_lang_pct$English_Spanish, mu=9)
Results:
t = -3.8839, df = 5, p-value = 0.0116
alternative hypothesis: true mean is not equal to 9
95 percent confidence interval:
 7.86994 8.77006
sample estimates:
mean of x
      8.32


EC_tTest <- t.test(bi_lang_pct$English_Chinese, mu=1.5)
Results:
t = -1.7705, df = 5, p-value = 0.1369
alternative hypothesis: true mean is not equal to 1.5
95 percent confidence interval:
 0.6745321 1.6521346
sample estimates:
mean of x
 1.163333


ER_tTest <- t.test(bi_lang_pct$English_Russian, mu=3)
Results:
t = -0.69833, df = 5, p-value = 0.5161
alternative hypothesis: true mean is not equal to 3
95 percent confidence interval:
 2.368061 3.361939
sample estimates:
mean of x
     2.865


EP_tTest <- t.test(bi_lang_pct$English_Portuguese, mu=3)
Results:
t = 0.95487, df = 5, p-value = 0.3835
alternative hypothesis: true mean is not equal to 3
95 percent confidence interval:
 2.608001 3.855332
sample estimates:
mean of x
 3.231667


EL_tTest <- t.test(bi_lang_pct$English_local, mu=3)
Results:
t = 3.2753, df = 5, p-value = 0.02207
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
alternative hypothesis: true mean is not equal to 3
95 percent confidence interval:
 3.092881 3.770452
sample estimates:
mean of x
 3.431667

EFA_tTest <- t.test(bi_lang_pct$English_French_Arabic, mu=36)
Results:
t = 1.1735, df = 5, p-value = 0.2935
alternative hypothesis: true mean is not equal to 36
95 percent confidence interval:
 35.42454 37.54212
sample estimates:
mean of x
 36.48333

EFS_tTest <- t.test(bi_lang_pct$English_French_Spanish, mu=28)
Results:
t = 0.40996, df = 5, p-value = 0.6988
alternative hypothesis: true mean is not equal to 28
95 percent confidence interval:
 26.26956 30.38710
sample estimates:
mean of x
 28.32833

EFAS_tTest <- t.test(bi_lang_pct$English_French_Arabic_Spanish, mu=38)
Results:
t = 2.2956, df = 5, p-value = 0.07015
alternative hypothesis: true mean is not equal to 38
95 percent confidence interval:
 37.8964 39.8336
sample estimates:
mean of x
   38.865
```

The results reject the assumptions on the expected value for each of the variables, i.e, bilingual and multilingual skills. The assumptions were based on the values from previous table and plot.

A two-sample z-test

The near likeness of the proportion of job ads seeking English-Portuguese speakers and that of those seeking English-local language speakers prompted a z-test of the two samples based on the frequencies by month. This would determine whether indeed there are differences in the demand between the two.

The test involved filtering the existing dataset and then creating a new one for the analysis.

```
bidem_jan16 <- filter(rwjAll_bil16, month == 1)
jan16_EP <- sum(bidem_jan16$EP, na.rm = TRUE)
jan16_EL <- sum(bidem_jan16$EL, na.rm = TRUE)

bidem_feb16 <- filter(rwjAll_bil16, month == 2)
feb16_EP <- sum(bidem_feb16$EP, na.rm = TRUE)
feb16_EL <- sum(bidem_feb16$EL, na.rm = TRUE)

bidem_mar16 <- filter(rwjAll_bil16, month == 3)
mar16_EP <- sum(bidem_mar16$EP, na.rm = TRUE)
mar16_EL <- sum(bidem_mar16$EL, na.rm = TRUE)

bidem_apr16 <- filter(rwjAll_bil16, month == 4)
apr16_EP <- sum(bidem_apr16$EP, na.rm = TRUE)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
apr16_EL <- sum(bidem_apr16$EL, na.rm = TRUE)

bidem_may16 <- filter(rwjAll_bil16, month == 5)
may16_EP <- sum(bidem_may16$EP, na.rm = TRUE)
may16_EL <- sum(bidem_may16$EL, na.rm = TRUE)

bidem_jun16 <- filter(rwjAll_bil16, month == 6)
jun16_EP <- sum(bidem_jun16$EP, na.rm = TRUE)
jun16_EL <- sum(bidem_jun16$EL, na.rm = TRUE)

bidem_jan15 <- filter(rwjAll_bil15, month == 1)
jan15_EP <- sum(bidem_jan15$EP, na.rm = TRUE)
jan15_EL <- sum(bidem_jan15$EL, na.rm = TRUE)

bidem_feb15 <- filter(rwjAll_bil15, month == 2)
feb15_EP <- sum(bidem_feb15$EP, na.rm = TRUE)
feb15_EL <- sum(bidem_feb15$EL, na.rm = TRUE)

bidem_mar15 <- filter(rwjAll_bil15, month == 3)
mar15_EP <- sum(bidem_mar15$EP, na.rm = TRUE)
mar15_EL <- sum(bidem_mar15$EL, na.rm = TRUE)

bidem_apr15 <- filter(rwjAll_bil15, month == 4)
apr15_EP <- sum(bidem_apr15$EP, na.rm = TRUE)
apr15_EL <- sum(bidem_apr15$EL, na.rm = TRUE)

bidem_may15 <- filter(rwjAll_bil15, month == 5)
may15_EP <- sum(bidem_may15$EP, na.rm = TRUE)
may15_EL <- sum(bidem_may15$EL, na.rm = TRUE)

bidem_jun15 <- filter(rwjAll_bil15, month == 6)
jun15_EP <- sum(bidem_jun15$EP, na.rm = TRUE)
jun15_EL <- sum(bidem_jun15$EL, na.rm = TRUE)

bidem_jul15 <- filter(rwjAll_bil15, month == 7)
jul15_EP <- sum(bidem_jul15$EP, na.rm = TRUE)
jul15_EL <- sum(bidem_jul15$EL, na.rm = TRUE)

bidem_aug15 <- filter(rwjAll_bil15, month == 8)
aug15_EP <- sum(bidem_aug15$EP, na.rm = TRUE)
aug15_EL <- sum(bidem_aug15$EL, na.rm = TRUE)

bidem_sep15 <- filter(rwjAll_bil15, month == 9)
sep15_EP <- sum(bidem_sep15$EP, na.rm = TRUE)
sep15_EL <- sum(bidem_sep15$EL, na.rm = TRUE)

bidem_oct15 <- filter(rwjAll_bil15, month == 10)
oct15_EP <- sum(bidem_oct15$EP, na.rm = TRUE)
oct15_EL <- sum(bidem_oct15$EL, na.rm = TRUE)

bidem_nov15 <- filter(rwjAll_bil15, month == 11)
nov15_EP <- sum(bidem_nov15$EP, na.rm = TRUE)
nov15_EL <- sum(bidem_nov15$EL, na.rm = TRUE)

bidem_dec15 <- filter(rwjAll_bil15, month == 12)
dec15_EP <- sum(bidem_dec15$EP, na.rm = TRUE)
dec15_EL <- sum(bidem_dec15$EL, na.rm = TRUE)

bidem_jan14 <- filter(rwjAll_bil14, month == 1)
jan14_EP <- sum(bidem_jan14$EP, na.rm = TRUE)
jan14_EL <- sum(bidem_jan14$EL, na.rm = TRUE)

bidem_feb14 <- filter(rwjAll_bil14, month == 2)
feb14_EP <- sum(bidem_feb14$EP, na.rm = TRUE)
feb14_EL <- sum(bidem_feb14$EL, na.rm = TRUE)

bidem_mar14 <- filter(rwjAll_bil14, month == 3)
mar14_EP <- sum(bidem_mar14$EP, na.rm = TRUE)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
mar14_EL <- sum(bidem_mar14$EL, na.rm = TRUE)

bidem_apr14 <- filter(rwjAll_bil14, month == 4)
apr14_EP <- sum(bidem_apr14$EP, na.rm = TRUE)
apr14_EL <- sum(bidem_apr14$EL, na.rm = TRUE)

bidem_may14 <- filter(rwjAll_bil14, month == 5)
may14_EP <- sum(bidem_may14$EP, na.rm = TRUE)
may14_EL <- sum(bidem_may14$EL, na.rm = TRUE)

bidem_jun14 <- filter(rwjAll_bil14, month == 6)
jun14_EP <- sum(bidem_jun14$EP, na.rm = TRUE)
jun14_EL <- sum(bidem_jun14$EL, na.rm = TRUE)

bidem_jul14 <- filter(rwjAll_bil14, month == 7)
jul14_EP <- sum(bidem_jul14$EP, na.rm = TRUE)
jul14_EL <- sum(bidem_jul14$EL, na.rm = TRUE)

bidem_aug14 <- filter(rwjAll_bil14, month == 8)
aug14_EP <- sum(bidem_aug14$EP, na.rm = TRUE)
aug14_EL <- sum(bidem_aug14$EL, na.rm = TRUE)

bidem_sep14 <- filter(rwjAll_bil14, month == 9)
sep14_EP <- sum(bidem_sep14$EP, na.rm = TRUE)
sep14_EL <- sum(bidem_sep14$EL, na.rm = TRUE)

bidem_oct14 <- filter(rwjAll_bil14, month == 10)
oct14_EP <- sum(bidem_oct14$EP, na.rm = TRUE)
oct14_EL <- sum(bidem_oct14$EL, na.rm = TRUE)

bidem_nov14 <- filter(rwjAll_bil14, month == 11)
nov14_EP <- sum(bidem_nov14$EP, na.rm = TRUE)
nov14_EL <- sum(bidem_nov14$EL, na.rm = TRUE)

bidem_dec14 <- filter(rwjAll_bil14, month == 12)
dec14_EP <- sum(bidem_dec14$EP, na.rm = TRUE)
dec14_EL <- sum(bidem_dec14$EL, na.rm = TRUE)

bidem_jan13 <- filter(rwjAll_bil13, month == 1)
jan13_EP <- sum(bidem_jan13$EP, na.rm = TRUE)
jan13_EL <- sum(bidem_jan13$EL, na.rm = TRUE)

bidem_feb13 <- filter(rwjAll_bil13, month == 2)
feb13_EP <- sum(bidem_feb13$EP, na.rm = TRUE)
feb13_EL <- sum(bidem_feb13$EL, na.rm = TRUE)

bidem_mar13 <- filter(rwjAll_bil13, month == 3)
mar13_EP <- sum(bidem_mar13$EP, na.rm = TRUE)
mar13_EL <- sum(bidem_mar13$EL, na.rm = TRUE)

bidem_apr13 <- filter(rwjAll_bil13, month == 4)
apr13_EP <- sum(bidem_apr13$EP, na.rm = TRUE)
apr13_EL <- sum(bidem_apr13$EL, na.rm = TRUE)

bidem_may13 <- filter(rwjAll_bil13, month == 5)
may13_EP <- sum(bidem_may13$EP, na.rm = TRUE)
may13_EL <- sum(bidem_may13$EL, na.rm = TRUE)

bidem_jun13 <- filter(rwjAll_bil13, month == 6)
jun13_EP <- sum(bidem_jun13$EP, na.rm = TRUE)
jun13_EL <- sum(bidem_jun13$EL, na.rm = TRUE)

bidem_jul13 <- filter(rwjAll_bil13, month == 7)
jul13_EP <- sum(bidem_jul13$EP, na.rm = TRUE)
jul13_EL <- sum(bidem_jul13$EL, na.rm = TRUE)

bidem_aug13 <- filter(rwjAll_bil13, month == 8)
aug13_EP <- sum(bidem_aug13$EP, na.rm = TRUE)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
aug13_EL <- sum(bidem_aug13$EL, na.rm = TRUE)

bidem_sep13 <- filter(rwjAll_bil13, month == 9)
sep13_EP <- sum(bidem_sep13$EP, na.rm = TRUE)
sep13_EL <- sum(bidem_sep13$EL, na.rm = TRUE)

bidem_oct13 <- filter(rwjAll_bil13, month == 10)
oct13_EP <- sum(bidem_oct13$EP, na.rm = TRUE)
oct13_EL <- sum(bidem_oct13$EL, na.rm = TRUE)

bidem_nov13 <- filter(rwjAll_bil13, month == 11)
nov13_EP <- sum(bidem_nov13$EP, na.rm = TRUE)
nov13_EL <- sum(bidem_nov13$EL, na.rm = TRUE)

bidem_dec13 <- filter(rwjAll_bil13, month == 12)
dec13_EP <- sum(bidem_dec13$EP, na.rm = TRUE)
dec13_EL <- sum(bidem_dec13$EL, na.rm = TRUE)

bidem_jan12 <- filter(rwjAll_bil12, month == 1)
jan12_EP <- sum(bidem_jan12$EP, na.rm = TRUE)
jan12_EL <- sum(bidem_jan12$EL, na.rm = TRUE)

bidem_feb12 <- filter(rwjAll_bil12, month == 2)
feb12_EP <- sum(bidem_feb12$EP, na.rm = TRUE)
feb12_EL <- sum(bidem_feb12$EL, na.rm = TRUE)

bidem_mar12 <- filter(rwjAll_bil12, month == 3)
mar12_EP <- sum(bidem_mar12$EP, na.rm = TRUE)
mar12_EL <- sum(bidem_mar12$EL, na.rm = TRUE)

bidem_apr12 <- filter(rwjAll_bil12, month == 4)
apr12_EP <- sum(bidem_apr12$EP, na.rm = TRUE)
apr12_EL <- sum(bidem_apr12$EL, na.rm = TRUE)

bidem_may12 <- filter(rwjAll_bil12, month == 5)
may12_EP <- sum(bidem_may12$EP, na.rm = TRUE)
may12_EL <- sum(bidem_may12$EL, na.rm = TRUE)

bidem_jun12 <- filter(rwjAll_bil12, month == 6)
jun12_EP <- sum(bidem_jun12$EP, na.rm = TRUE)
jun12_EL <- sum(bidem_jun12$EL, na.rm = TRUE)

bidem_jul12 <- filter(rwjAll_bil12, month == 7)
jul12_EP <- sum(bidem_jul12$EP, na.rm = TRUE)
jul12_EL <- sum(bidem_jul12$EL, na.rm = TRUE)

bidem_aug12 <- filter(rwjAll_bil12, month == 8)
aug12_EP <- sum(bidem_aug12$EP, na.rm = TRUE)
aug12_EL <- sum(bidem_aug12$EL, na.rm = TRUE)

bidem_sep12 <- filter(rwjAll_bil12, month == 9)
sep12_EP <- sum(bidem_sep12$EP, na.rm = TRUE)
sep12_EL <- sum(bidem_sep12$EL, na.rm = TRUE)

bidem_oct12 <- filter(rwjAll_bil12, month == 10)
oct12_EP <- sum(bidem_oct12$EP, na.rm = TRUE)
oct12_EL <- sum(bidem_oct12$EL, na.rm = TRUE)

bidem_nov12 <- filter(rwjAll_bil12, month == 11)
nov12_EP <- sum(bidem_nov12$EP, na.rm = TRUE)
nov12_EL <- sum(bidem_nov12$EL, na.rm = TRUE)

bidem_dec12 <- filter(rwjAll_bil12, month == 12)
dec12_EP <- sum(bidem_dec12$EP, na.rm = TRUE)
dec12_EL <- sum(bidem_dec12$EL, na.rm = TRUE)

bidem_mar11 <- filter(rwjAll_bil11, month == 3)
mar11_EP <- sum(bidem_mar11$EP, na.rm = TRUE)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
mar11_EL <- sum(bidem_mar11$EL, na.rm = TRUE)

bidem_apr11 <- filter(rwjAll_bil11, month == 4)
apr11_EP <- sum(bidem_apr11$EP, na.rm = TRUE)
apr11_EL <- sum(bidem_apr11$EL, na.rm = TRUE)

bidem_may11 <- filter(rwjAll_bil11, month == 5)
may11_EP <- sum(bidem_may11$EP, na.rm = TRUE)
may11_EL <- sum(bidem_may11$EL, na.rm = TRUE)

bidem_jun11 <- filter(rwjAll_bil11, month == 6)
jun11_EP <- sum(bidem_jun11$EP, na.rm = TRUE)
jun11_EL <- sum(bidem_jun11$EL, na.rm = TRUE)

bidem_jul11 <- filter(rwjAll_bil11, month == 7)
jul11_EP <- sum(bidem_jul11$EP, na.rm = TRUE)
jul11_EL <- sum(bidem_jul11$EL, na.rm = TRUE)

bidem_aug11 <- filter(rwjAll_bil11, month == 8)
aug11_EP <- sum(bidem_aug11$EP, na.rm = TRUE)
aug11_EL <- sum(bidem_aug11$EL, na.rm = TRUE)

bidem_sep11 <- filter(rwjAll_bil11, month == 9)
sep11_EP <- sum(bidem_sep11$EP, na.rm = TRUE)
sep11_EL <- sum(bidem_sep11$EL, na.rm = TRUE)

bidem_oct11 <- filter(rwjAll_bil11, month == 10)
oct11_EP <- sum(bidem_oct11$EP, na.rm = TRUE)
oct11_EL <- sum(bidem_oct11$EL, na.rm = TRUE)

bidem_nov11 <- filter(rwjAll_bil11, month == 11)
nov11_EP <- sum(bidem_nov11$EP, na.rm = TRUE)
nov11_EL <- sum(bidem_nov11$EL, na.rm = TRUE)

bidem_dec11 <- filter(rwjAll_bil11, month == 12)
dec11_EP <- sum(bidem_dec11$EP, na.rm = TRUE)
dec11_EL <- sum(bidem_dec11$EL, na.rm = TRUE)

Year <- c(2011, 2011, 2011, 2011, 2011, 2011, 2011, 2011, 2011, 2011, 2012, 2012, 2012,
2012, 2012, 2012, 2012, 2012, 2012, 2012, 2012, 2012, 2013, 2013, 2013, 2013, 2013, 2013,
2013, 2013, 2013, 2013, 2013, 2013, 2014, 2014, 2014, 2014, 2014, 2014, 2014, 2014, 2014,
2014, 2014, 2014, 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2015,
2016, 2016, 2016, 2016, 2016, 2016)

Month <- c(03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 01, 02, 03, 04, 05, 06, 07, 08, 09,
10, 11, 12, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 01, 02, 03, 04, 05, 06, 07,
08, 09, 10, 11, 12, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 01, 02, 03, 04, 05,
06)

English_Portuguese <- c(mar11_EP, apr11_EP, may11_EP, jun11_EP, jul11_EP, aug11_EP,
sep11_EP, oct11_EP, nov11_EP, dec11_EP, jan12_EP, feb12_EP, mar12_EP, apr12_EP, may12_EP,
jun12_EP, jul12_EP, aug12_EP, sep12_EP, oct12_EP, nov12_EP, dec12_EP, jan13_EP, feb13_EP,
mar13_EP, apr13_EP, may13_EP, jun13_EP, jul13_EP, aug13_EP, sep13_EP, oct13_EP, nov13_EP,
dec13_EP, jan14_EP, feb14_EP, mar14_EP, apr14_EP, may14_EP, jun14_EP, jul14_EP, aug14_EP,
sep14_EP, oct14_EP, nov14_EP, dec14_EP, jan15_EP, feb15_EP, mar15_EP, apr15_EP, may15_EP,
jun15_EP, jul15_EP, aug15_EP, sep15_EP, oct15_EP, nov15_EP, dec15_EP, jan16_EP, feb16_EP,
mar16_EP, apr16_EP, may16_EP, jun16_EP)

English_local <- c(mar11_EL, apr11_EL, may11_EL, jun11_EL, jul11_EL, aug11_EL, sep11_EL,
oct11_EL, nov11_EL, dec11_EL, jan12_EL, feb12_EL, mar12_EL, apr12_EL, may12_EL, jun12_EL,
jul12_EL, aug12_EL, sep12_EL, oct12_EL, nov12_EL, dec12_EL, jan13_EL, feb13_EL, mar13_EL,
apr13_EL, may13_EL, jun13_EL, jul13_EL, aug13_EL, sep13_EL, oct13_EL, nov13_EL, dec13_EL,
jan14_EL, feb14_EL, mar14_EL, apr14_EL, may14_EL, jun14_EL, jul14_EL, aug14_EL, sep14_EL,
oct14_EL, nov14_EL, dec14_EL, jan15_EL, feb15_EL, mar15_EL, apr15_EL, may15_EL, jun15_EL,
jul15_EL, aug15_EL, sep15_EL, oct15_EL, nov15_EL, dec15_EL, jan16_EL, feb16_EL, mar16_EL,
apr16_EL, may16_EL, jun16_EL)

zTestdf <- data.frame(Year, Month, English_Portuguese, English_local)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

The below shows the data to be used for the z-test, which involved calling the BSDA package.

| Year | Month | English_Portuguese | English_Local |
|------|-------|--------------------|---------------|
| 2011 | 3 | 0 | 0 |
| 2011 | 4 | 1 | 0 |
| 2011 | 5 | 9 | 4 |
| 2011 | 6 | 22 | 21 |
| 2011 | 7 | 31 | 35 |
| 2011 | 8 | 57 | 57 |
| 2011 | 9 | 30 | 28 |
| 2011 | 10 | 52 | 26 |
| 2011 | 11 | 42 | 37 |
| 2011 | 12 | 50 | 27 |
| 2012 | 1 | 37 | 24 |
| 2012 | 2 | 74 | 40 |
| 2012 | 3 | 38 | 43 |
| 2012 | 4 | 38 | 46 |
| 2012 | 5 | 17 | 22 |
| 2012 | 6 | 69 | 61 |
| 2012 | 7 | 29 | 46 |
| 2012 | 8 | 32 | 44 |
| 2012 | 9 | 46 | 70 |
| 2012 | 10 | 40 | 39 |
| 2012 | 11 | 42 | 47 |
| 2012 | 12 | 30 | 41 |
| 2013 | 1 | 54 | 45 |
| 2013 | 2 | 41 | 38 |
| 2013 | 3 | 48 | 55 |
| 2013 | 4 | 52 | 60 |
| 2013 | 5 | 56 | 58 |
| 2013 | 6 | 65 | 67 |
| 2013 | 7 | 58 | 66 |
| 2013 | 8 | 50 | 43 |
| 2013 | 9 | 73 | 59 |

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

| | | | |
|---|---|---|---|
| | | 43 | 35 |
| 2013 | 10 | 23 | 43 |
| 2013 | 11 | 45 | 52 |
| 2013 | 12 | 65 | 60 |
| 2014 | 1 | 35 | 48 |
| 2014 | 2 | 36 | 47 |
| 2014 | 3 | 59 | 47 |
| 2014 | 4 | 40 | 72 |
| 2014 | 5 | 40 | 45 |
| 2014 | 6 | 52 | 39 |
| 2014 | 7 | 44 | 35 |
| 2014 | 8 | 60 | 41 |
| 2014 | 9 | 50 | 77 |
| 2014 | 10 | 57 | 39 |
| 2014 | 11 | 47 | 59 |
| 2014 | 12 | 34 | 40 |
| 2015 | 1 | 35 | 55 |
| 2015 | 2 | 39 | 70 |
| 2015 | 3 | 40 | 37 |
| 2015 | 4 | 37 | 48 |
| 2015 | 5 | 0 | 0 |
| 2015 | 6 | 72 | 101 |
| 2015 | 7 | 45 | 51 |
| 2015 | 8 | 30 | 37 |
| 2015 | 9 | 50 | 72 |
| 2015 | 10 | 24 | 56 |
| 2015 | 11 | 48 | 65 |
| 2015 | 12 | 39 | 47 |
| 2016 | 1 | 57 | 46 |
| 2016 | 2 | 44 | 64 |
| 2016 | 3 | 38 | 55 |
| 2016 | 4 | 42 | 59 |
| 2016 | 5 | 29 | 31 |
| 2016 | 6 | | |

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
library(BSDA)

z.test(zTestdf$English_Portuguese, zTestdf$English_local, sigma.x =
sd(zTestdf$English_Portuguese), sigma.y = sd(zTestdf$English_local), conf.level = 0.95)
Results:
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -9.804396  2.304396
sample estimates:
mean of x mean of y
 41.90625  45.65625
```

The two variables were also tested for correlation:

```
cor(zTestdf$English_Portuguese, zTestdf$English_local)
[1] 0.6737045
```

The results suggest that there is a difference between the demand for English-Portuguese speakers and that for English-local language speakers, and that there is a relative association between the two.

Linear regression

The dataset showing annual trends in the demand for English speakers with foreign language skills (see the first table in the "Analyzing the data" section) has prompted questions whether certain variables could predict these trends.

The assumption is that foreign aid, in terms of commitments or disbursements or both, may predict those patterns. To verify such an assumption, data on foreign aid, technically known as official development assistance, were extracted from the website of the Organization for Economic Cooperation and Development.

OECD tracks foreign aid committed and disbursed by donor countries. It has data on ODA through 2014, and allows downloading of such data from its statistics page, http://stats.oecd.org and saving them into a csv file.

To prepare the data for linear modeling, the extracted datasets on foreign aid commitments and disbursements were filtered according to the below criteria:

- Year, from 2011 to 2014.
- French-speaking aid-recipient countries.
- Arabic-speaking aid-recipient countries.
- Values on "total commitments" for the dataset on ODA commitments.
- Values on "grants, total", "technical cooperation" and "humanitarian aid" for the dataset on ODA disbursements.

```
French_speaking_countries <- c("Benin", "Burkina Faso", "Burundi", "Cameroon", "Central
African Republic", "Chad", "Comoros", "Democratic Republic of the Congo", "Congo", "Côte
d'Ivoire", "Djibouti", "Equatorial Guinea", "Gabon", "Guinea", "Madagascar", "Mali",
"Mauritius", "Morocco", "Niger", "Rwanda", "Senegal", "Togo", "Haiti", "Vanuatu",
"Seychelles")
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
Arabic_speaking_countries <- c("Benin", "Chad", "Comoros", "Djibouti", "Egypt",
"Eritrea", "Libya", "Mauritania", "Morocco", "Sudan", "Tunisia", "Tanzania", "Iraq",
"Jordan", "Lebanon", "Oman", "West Bank and Gaza Strip", "Syrian Arab Republic", "Yemen")

ODA_commitments_11_14 <- filter(ODA_commitments, Year >= 2011)


ODA_commitments_French_speaking <- ODA_commitments_11_14[ODA_commitments_11_14$Recipient
%in% French_speaking_countries,]
ODA_commitments_French_speaking <- filter(ODA_commitments_French_speaking, Aid.type ==
"Total Commitments")
ODA_commitments_French_speaking <- filter(ODA_commitments_French_speaking, Donor == "All
Donors, Total")

ODA_commitments_Arabic_speaking <- ODA_commitments_11_14[ODA_commitments_11_14$Recipient
%in% Arabic_speaking_countries,]
ODA_commitments_Arabic_speaking <- filter(ODA_commitments_Arabic_speaking, Aid.type ==
"Total Commitments")
ODA_commitments_Arabic_speaking <- filter(ODA_commitments_Arabic_speaking, Donor == "All
Donors, Total")

ODA_disbursements_11_14 <- filter(ODA_disbursements, Year >= 2011)

ODA_disbursements_French_speaking <-
ODA_disbursements_11_14[ODA_disbursements_11_14$Recipient %in%
French_speaking_countries,]
ODA_disbursements_French_speaking <- filter(ODA_disbursements_French_speaking, Donor ==
"All Donors, Total")
ODA_disbursements_type1 <- filter(ODA_disbursements_French_speaking, Aid.type == "Grants,
Total")
ODA_disbursements_type2 <- filter(ODA_disbursements_French_speaking, Aid.type ==
"Technical Cooperation")
ODA_disbursements_type3 <- filter(ODA_disbursements_French_speaking, Aid.type ==
"Humanitarian Aid")

ODA_disbursements_Arabic_speaking <-
ODA_disbursements_11_14[ODA_disbursements_11_14$Recipient %in%
Arabic_speaking_countries,]
ODA_disbursements_Arabic_speaking <- filter(ODA_disbursements_Arabic_speaking, Donor ==
"All Donors, Total")
ODA_disbursements_type1 <- filter(ODA_disbursements_Arabic_speaking, Aid.type == "Grants,
Total")
ODA_disbursements_type2 <- filter(ODA_disbursements_Arabic_speaking, Aid.type ==
"Technical Cooperation")
ODA_disbursements_type3 <- filter(ODA_disbursements_Arabic_speaking, Aid.type ==
"Humanitarian Aid")
ODA_disbursements_Arabic_speaking <- rbind(ODA_disbursements_type1,
ODA_disbursements_type2, ODA_disbursements_type3)
```

Unnecessary columns were removed.

```
ODA_commitments_French_speaking$DONOR <- NULL
ODA_commitments_French_speaking$RECIPIENT <- NULL
ODA_commitments_French_speaking$PART <- NULL
ODA_commitments_French_speaking$AIDTYPE <- NULL
ODA_commitments_French_speaking$DATATYPE <- NULL
ODA_commitments_French_speaking$TIME <- NULL
ODA_commitments_French_speaking$Unit.Code <- NULL
ODA_commitments_French_speaking$PowerCode.Code <- NULL
ODA_commitments_French_speaking$Reference.Period <- NULL
ODA_commitments_French_speaking$Reference.Period.Code <- NULL
ODA_commitments_French_speaking$Flag.Codes <- NULL
ODA_commitments_French_speaking$Flags <- NULL
ODA_commitments_French_speaking$Part <- NULL

ODA_commitments_Arabic_speaking$DONOR <- NULL
ODA_commitments_Arabic_speaking$RECIPIENT <- NULL
ODA_commitments_Arabic_speaking$PART <- NULL
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
ODA_commitments_Arabic_speaking$AIDTYPE <- NULL
ODA_commitments_Arabic_speaking$DATATYPE <- NULL
ODA_commitments_Arabic_speaking$TIME <- NULL
ODA_commitments_Arabic_speaking$Unit.Code <- NULL
ODA_commitments_Arabic_speaking$PowerCode.Code <- NULL
ODA_commitments_Arabic_speaking$Reference.Period <- NULL
ODA_commitments_Arabic_speaking$Reference.Period.Code <- NULL
ODA_commitments_Arabic_speaking$Flag.Codes <- NULL
ODA_commitments_Arabic_speaking$Flags <- NULL
ODA_commitments_Arabic_speaking$Part <- NULL

ODA_disbursements_French_speaking <- rbind(ODA_disbursements_type1,
ODA_disbursements_type2, ODA_disbursements_type3)
ODA_disbursements_French_speaking$DONOR <- NULL
ODA_disbursements_French_speaking$RECIPIENT <- NULL
ODA_disbursements_French_speaking$PART <- NULL
ODA_disbursements_French_speaking$AIDTYPE <- NULL
ODA_disbursements_French_speaking$DATATYPE <- NULL
ODA_disbursements_French_speaking$TIME <- NULL
ODA_disbursements_French_speaking$Unit.Code <- NULL
ODA_disbursements_French_speaking$PowerCode.Code <- NULL
ODA_disbursements_French_speaking$Reference.Period <- NULL
ODA_disbursements_French_speaking$Reference.Period.Code <- NULL
ODA_disbursements_French_speaking$Flag.Codes <- NULL
ODA_disbursements_French_speaking$Flags <- NULL
ODA_disbursements_French_speaking$Part <- NULL

ODA_disbursements_Arabic_speaking$DONOR <- NULL
ODA_disbursements_Arabic_speaking$RECIPIENT <- NULL
ODA_disbursements_Arabic_speaking$PART <- NULL
ODA_disbursements_Arabic_speaking$AIDTYPE <- NULL
ODA_disbursements_Arabic_speaking$DATATYPE <- NULL
ODA_disbursements_Arabic_speaking$TIME <- NULL
ODA_disbursements_Arabic_speaking$Unit.Code <- NULL
ODA_disbursements_Arabic_speaking$PowerCode.Code <- NULL
ODA_disbursements_Arabic_speaking$Reference.Period <- NULL
ODA_disbursements_Arabic_speaking$Reference.Period.Code <- NULL
ODA_disbursements_Arabic_speaking$Flag.Codes <- NULL
ODA_disbursements_Arabic_speaking$Flags <- NULL
ODA_disbursements_Arabic_speaking$Part <- NULL
```

The filtered datasets were split into separate datasets to determine the annual trends.

```
ODA_commitments_French_speaking_11 <- filter(ODA_commitments_French_speaking, Year ==
2011)
ODA_commitments_French_speaking_12 <- filter(ODA_commitments_French_speaking, Year ==
2012)
ODA_commitments_French_speaking_13 <- filter(ODA_commitments_French_speaking, Year ==
2013)
ODA_commitments_French_speaking_14 <- filter(ODA_commitments_French_speaking, Year ==
2014)

ODA_commitments_Arabic_speaking_11 <- filter(ODA_commitments_Arabic_speaking, Year ==
2011)
ODA_commitments_Arabic_speaking_12 <- filter(ODA_commitments_Arabic_speaking, Year ==
2012)
ODA_commitments_Arabic_speaking_13 <- filter(ODA_commitments_Arabic_speaking, Year ==
2013)
ODA_commitments_Arabic_speaking_14 <- filter(ODA_commitments_Arabic_speaking, Year ==
2014)

ODA_disbursements_French_speaking_11 <- filter(ODA_disbursements_French_speaking, Year ==
2011)
ODA_disbursements_French_speaking_12 <- filter(ODA_disbursements_French_speaking, Year ==
2012)
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
ODA_disbursements_French_speaking_13 <- filter(ODA_disbursements_French_speaking, Year ==
2013)
ODA_disbursements_French_speaking_14 <- filter(ODA_disbursements_French_speaking, Year ==
2014)

ODA_disbursements_Arabic_speaking_11 <- filter(ODA_disbursements_Arabic_speaking, Year ==
2011)
ODA_disbursements_Arabic_speaking_12 <- filter(ODA_disbursements_Arabic_speaking, Year ==
2012)
ODA_disbursements_Arabic_speaking_13 <- filter(ODA_disbursements_Arabic_speaking, Year ==
2013)
ODA_disbursements_Arabic_speaking_14 <- filter(ODA_disbursements_Arabic_speaking, Year ==
2014)
```

The summed ODA amounts populated the final dataset that was used for the linear regression.

```
ESC_FS_11 <- sum(ODA_commitments_French_speaking_11$Value)
ESC_FS_12 <- sum(ODA_commitments_French_speaking_12$Value)
ESC_FS_13 <- sum(ODA_commitments_French_speaking_13$Value)
ESC_FS_14 <- sum(ODA_commitments_French_speaking_14$Value)

ESC_AS_11 <- sum(ODA_commitments_Arabic_speaking_11$Value)
ESC_AS_12 <- sum(ODA_commitments_Arabic_speaking_12$Value)
ESC_AS_13 <- sum(ODA_commitments_Arabic_speaking_13$Value)
ESC_AS_14 <- sum(ODA_commitments_Arabic_speaking_14$Value)

ESD_FS_11 <- sum(ODA_disbursements_French_speaking_11$Value)
ESD_FS_12 <- sum(ODA_disbursements_French_speaking_12$Value)
ESD_FS_13 <- sum(ODA_disbursements_French_speaking_13$Value)
ESD_FS_14 <- sum(ODA_disbursements_French_speaking_14$Value)

ESD_AS_11 <- sum(ODA_disbursements_Arabic_speaking_11$Value)
ESD_AS_12 <- sum(ODA_disbursements_Arabic_speaking_12$Value)
ESD_AS_13 <- sum(ODA_disbursements_Arabic_speaking_13$Value)
ESD_AS_14 <- sum(ODA_disbursements_Arabic_speaking_14$Value)

Year <- c(2011, 2012, 2013, 2014)

ODAcommitments_FS <- c(ESC_FS_11, ESC_FS_12, ESC_FS_13, ESC_FS_14)
ODAdisbursements_FS <- c(ESD_FS_11, ESD_FS_12, ESD_FS_13, ESD_FS_14)
EnglishFrench_pct <- c(EF_percent_11, EF_percent_12, EF_percent_13, EF_percent_14)
ODAvsEFjobs <- data.frame(Year, ODAcommitments_FS, ODAdisbursements_FS,
EnglishFrench_pct)
ODAvsEFjobs$EnglishFrench_pct <- ODAvsEFjobs$EnglishFrench_pct * 100
ODAvsEFjobs$EnglishFrench_pct <- round(ODAvsEFjobs$EnglishFrench_pct, digits = 2)

ODAcommitments_AS <- c(ESC_AS_11, ESC_AS_12, ESC_AS_13, ESC_AS_14)
ODAdisbursements_AS <- c(ESD_AS_11, ESD_AS_12, ESD_AS_13, ESD_AS_14)
EnglishArabic_pct <- c(EA_percent_11, EA_percent_12, EA_percent_13, EA_percent_14)
ODAvsEAjobs <- data.frame(Year, ODAcommitments_AS, ODAdisbursements_AS,
EnglishArabic_pct)
ODAvsEAjobs <- as.data.frame(ODAvsEAjobs)
ODAvsEAjobs$EnglishArabic_pct <- ODAvsEAjobs$EnglishArabic_pct * 100
ODAvsEAjobs$EnglishArabic_pct <- round(ODAvsEAjobs$EnglishArabic_pct, digits = 2)
```

The following table illustrates the resulting dataset:

| Year | ODAcommitments_ FS (in US$ millions) | ODAdisbursements_ FS (in US$ millions) | EnglishFrench_ pct |
|---|---|---|---|
| 2011 | 42640.47 | 46200.75 | 29.28 |
| 2012 | 44283.17 | 44513.33 | 26.53 |

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

| | 41983.15 | 38207.44 | 24.98 |
| 2013 | | | |
| | 38298.24 | 35761.01 | 25.68 |
| 2014 | | | |

| Year | ODAcommitments_ AS (in US$ millions) | ODAdisbursements_ AS (in US$ millions) | EnglishArabic_ Pct |
|---|---|---|---|
| | 36238.31 | 36683.82 | 12.27 |
| 2011 | | | |
| | 47168.99 | 37559.22 | 12.75 |
| 2012 | | | |
| | 59993.11 | 53625.05 | 15.96 |
| 2013 | | | |
| | 48858.18 | 57435.2 | 15.65 |
| 2014 | | | |

Several models looked at whether ODA commitments and disbursements can affect the demand for English-French and English-Arabic speakers in the aid industry.

```
model1 <- lm(EnglishFrench_pct ~ ODAdisbursements_FS + ODAcommitments_FS, data =
ODAvsEFjobs)

summary(model1)

Residuals:
     1       2       3       4
 0.2108 -0.3333  0.2930 -0.1704

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)
(Intercept)         31.6655211  5.6836906   5.571    0.113
ODAdisbursements_FS  0.0006074  0.0001048   5.795    0.109
ODAcommitments_FS   -0.0007190  0.0002067  -3.479    0.178

Residual standard error: 0.52 on 1 degrees of freedom
Multiple R-squared:  0.9746,      Adjusted R-squared:  0.9239
F-statistic:  19.2 on 2 and 1 DF,  p-value: 0.1593

model2 <- lm(EnglishFrench_pct ~ ODAcommitments_FS, data = ODAvsEFjobs)

summary(model2)

Residuals:
      1        2        3        4
 2.44344 -0.73535 -1.68498 -0.02312

Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)       1.571e+01  2.067e+01   0.760    0.527
ODAcommitments_FS 2.610e-04  4.939e-04   0.529    0.650

Residual standard error: 2.162 on 2 degrees of freedom
Multiple R-squared:  0.1226,      Adjusted R-squared:  -0.3162
F-statistic: 0.2793 on 1 and 2 DF,  p-value: 0.6499

model3 <- lm(EnglishFrench_pct ~ ODAdisbursements_FS, data = ODAvsEFjobs)

summary(model3)

Residuals:
      1        2       3       4
 1.1084 -1.1203 -0.7220  0.7339
```

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
Coefficients:
                   Estimate Std. Error t value Pr(>|t|)
(Intercept)       1.390e+01  6.383e+00   2.177    0.161
ODAdisbursements_FS 3.090e-04 1.542e-04   2.004    0.183

Residual standard error: 1.331 on 2 degrees of freedom
Multiple R-squared: 0.6675,      Adjusted R-squared: 0.5013
F-statistic: 4.015 on 1 and 2 DF,  p-value: 0.183

model4 <- lm(EnglishArabic_pct ~ ODAdisbursements_AS + ODAcommitments_AS, data =
ODAvsEAjobs)

summary(model4)

Residuals:
        1        2        3        4
 0.11939 -0.14634  0.11312 -0.08617

Coefficients:
                   Estimate Std. Error t value Pr(>|t|)
(Intercept)        5.016e+00  7.049e-01   7.115   0.0889 .
ODAdisbursements_AS 1.380e-04 1.766e-05   7.817   0.0810 .
ODAcommitments_AS  5.717e-05  1.952e-05   2.929   0.2094
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2364 on 1 degrees of freedom
Multiple R-squared: 0.9949,      Adjusted R-squared: 0.9848
F-statistic: 98.09 on 2 and 1 DF,  p-value: 0.07121

model5 <- lm(EnglishArabic_pct ~ ODAcommitments_AS, data = ODAvsEAjobs)

summary(model5)

Residuals:
        1        2        3        4
 0.04204 -1.26137 -0.14370  1.36303

Coefficients:
                   Estimate Std. Error t value Pr(>|t|)
(Intercept)        6.315e+00  3.818e+00   1.654    0.240
ODAcommitments_AS  1.632e-04  7.823e-05   2.086    0.172

Residual standard error: 1.317 on 2 degrees of freedom
Multiple R-squared: 0.685,       Adjusted R-squared: 0.5275
F-statistic: 4.349 on 1 and 2 DF,  p-value: 0.1723

model6 <- lm(EnglishArabic_pct ~ ODAdisbursements_AS, data = ODAvsEAjobs)

summary(model6)

Residuals:
        1        2        3        4
-0.2103   0.1174   0.5328  -0.4399

Coefficients:
                   Estimate Std. Error t value Pr(>|t|)
(Intercept)       6.0992596  1.3134186   4.644   0.0434 *
ODAdisbursements_AS 0.0001739 0.0000278   6.258   0.0246 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5174 on 2 degrees of freedom
Multiple R-squared: 0.9514,      Adjusted R-squared: 0.9271
F-statistic: 39.16 on 1 and 2 DF,  p-value: 0.0246
```

Correlation among variables were also carried out.

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

```
cor(ODAvsEFjobs$EnglishFrench_pct, ODAvsEFjobs$ODAdisbursements_FS)
[1] 0.8170108
cor(ODAvsEFjobs$EnglishFrench_pct, ODAvsEFjobs$ODAcommitments_FS)
[1] 0.3500767

cor(ODAvsEAjobs$EnglishArabic_pct, ODAvsEAjobs$ODAdisbursements_AS)
[1] 0.975403
cor(ODAvsEAjobs$EnglishArabic_pct, ODAvsEAjobs$ODAcommitments_AS)
[1] 0.827651
```

The results indicate that there is a significant relationship and a high correlation between foreign aid disbursements and the demand for English-Arabic job candidates. Correlation between foreign aid commitment and the demand for English-Arabic job candidates as well as between foreign aid (commitments or disbursements) and the demand for English-French speakers is high but the relationship is not significant given the small sample.

**Takeaways**

1.  If we are to rank the demand for bilingual English speakers in global development and humanitarian relief, those who know French would top the list, followed by English-Arabic speakers. Here's a quick look, together with the extent of the demand based on the 2016 average.

```
English speakers who know…  Demand
                    French  ~ 24 in 100 jobs
                    Arabic  ~ 20 in 100 jobs
                   Spanish  ~ 9 in 100 jobs
                   Russian  ~ 4 in 100 jobs
           Local languages  ~ 3 in 100 jobs
                Portuguese  ~ 3 in 100 jobs
                   Chinese  ~ 2 in 100 jobs
```

2.  English speakers who know French can see their job market access increase significantly if they are also proficient in Arabic (about 14 percentage points in 2016). Meanwhile, English-French speakers who know Spanish can only see a slight increase (about 2 percentage points in 2016).

3.  The demand for English-Arabic speakers is catching up with that for English-French speakers, as the last six years have seen a steady increase of the former while the latter has suffered a decline.

4.  Foreign aid disbursements affect trends in the demand for English-Arab speakers in the aid industry. The same cannot be said for English-French speakers.

**Recommendations**

1.  As a job seeker in global development and humanitarian relief, if there's one foreign language that you plan to acquire, invest your time in being proficient in French.

*The most important foreign languages for*
*English-speaking job seekers in global development and humanitarian relief*
*By Ma. Eliza J. Villarino, June 2016*

2. If you're already fluent in French and want to know another foreign language, consider learning Arabic, as 37 in 100 jobs seek qualified English-speaking candidates who are have knowledge of French or Arabic, or both these languages.

3. Universities offering courses focused global development and humanitarian relief should consider concentrating their language training on French and Arabic as this may improve their students' chances of landing jobs in the future. For those without language training components in their academic programs, this study provides a good case for starting such a program or for partnering with language learning centers.