

# Mapa\_internet\_Veracruz

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**Se cargan librerías. La paquetería sf es la que nos permitirá hacer los mapas.**

```
rm(list = ls())
library(sf)

## Warning: package 'sf' was built under R version 4.0.5

## Linking to GEOS 3.9.1, GDAL 3.4.0, PROJ 8.1.1; sf_use_s2() is TRUE

library(ggplot2)
library(tmap)

## Warning: package 'tmap' was built under R version 4.0.5

library(tmaptools)
library(leaflet)

## Warning: package 'leaflet' was built under R version 4.0.5

library(dplyr)

## Warning: package 'dplyr' was built under R version 4.0.5

##
## Attaching package: 'dplyr'

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

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

```

library(readxl)

## Warning: package 'readxl' was built under R version 4.0.5

list.files()

## [1] "30a.dbf"                      "30a.prj"
## [3] "30a.sbx"                      "30a.shp"
## [5] "30a.shx"                      "30ar.dbf"
## [7] "30ar.prj"                     "30ar.shp"
## [9] "30ar.shx"                     "30e.dbf"
## [11] "30e.prj"                      "30e.sbx"
## [13] "30e.shp"                      "30e.shx"
## [15] "30ent.dbf"                    "30ent.prj"
## [17] "30ent.shp"                    "30ent.shx"
## [19] "30l.dbf"                      "30l.prj"
## [21] "30l.shp"                      "30l.shx"
## [23] "30lpr.dbf"                   "30lpr.prj"
## [25] "30lpr.shp"                   "30lpr.shx"
## [27] "30m.dbf"                      "30m.prj"
## [29] "30m.sbx"                      "30m.shp"
## [31] "30m.shx"                      "30mun.dbf"
## [33] "30mun.prj"                   "30mun.shp"
## [35] "30mun.shx"                   "30sia.dbf"
## [37] "30sia.prj"                   "30sia.sbx"
## [39] "30sia.shp"                   "30sia.shx"
## [41] "30sil.dbf"                    "30sil.prj"
## [43] "30sil.sbx"                   "30sil.shp"
## [45] "30sil.shx"                   "30SIP.dbf"
## [47] "30SIP.prj"                   "30SIP.sbx"
## [49] "30SIP.shp"                   "30SIP.shx"
## [51] "catalogos"                   "conectividad_mapa.png"
## [53] "conjunto_de_datos"           "Cuartiles_internet.csv"
## [55] "Datos"                        "Datos.zip"
## [57] "Mapa_AccesoInternet_Veracruz.Rmd" "Mapa_Conectividad_Veracruz.Rproj"
## [59] "Metadatos"                    "README.md"

getwd()

## [1] "/Users/edsonsanchezgonzalez/Desktop/Mapa_Conectividad_Veracruz"

```

**Se descarga el shape para Veracruz. Primero se crea el url y se ejecuta el comando para descargarlo.**

```
url <- "https://www.inegi.org.mx/contenidos/productos/prod_serv/contenidos/espanol/bvinegi/productos/ge
```

```
if (!file.exists("conjunto_de_datos_iter_30CSV20.csv")) {  
  download.file(url, destfile = "Datos.zip", quiet = FALSE, mode="wb")}
```

Se extrae la base de datos.

```
unzip("Datos.zip")  
unzip("conjunto_de_datos/cgura_pei2015_ver.zip")
```

Se importa la base de datos de los cuartiles de acceso a internet de los municipios de Veracruz.

```
mydata <- read.csv("Cuartiles_internet.csv")
```

Se importa el shape de Veracruz

```
mymap <- st_read("30mun.shp")
```

```
## Reading layer '30mun' from data source  
##   '/Users/edsonsanchezgonzalez/Desktop/Mapa_Conectividad_Veracruz/30mun.shp'  
##   using driver 'ESRI Shapefile'  
## Simple feature collection with 212 features and 4 fields  
## Geometry type: MULTIPOLYGON  
## Dimension:     XY  
## Bounding box: xmin: -98.68155 ymin: 17.13696 xmax: -93.60794 ymax: 22.47175  
## Geodetic CRS:  ITRF92
```

```
mymap <- st_read("30mun.shp", stringsAsFactors = FALSE)
```

```
## Reading layer '30mun' from data source  
##   '/Users/edsonsanchezgonzalez/Desktop/Mapa_Conectividad_Veracruz/30mun.shp'  
##   using driver 'ESRI Shapefile'  
## Simple feature collection with 212 features and 4 fields  
## Geometry type: MULTIPOLYGON  
## Dimension:     XY  
## Bounding box: xmin: -98.68155 ymin: 17.13696 xmax: -93.60794 ymax: 22.47175  
## Geodetic CRS:  ITRF92
```

Ambas bases de datos tienen dos variables que contiene datos con las que se pueden unir, solo se nombra igual. En mydata tenemos a NOM\_MUN y en mymap NOMGEO

```
Mapa <- mymap %>% rename(NOM_MUN=NOMGEO)
str(Mapa)

## Classes 'sf' and 'data.frame': 212 obs. of 5 variables:
## $ CVEGEO : chr "30001" "30002" "30004" "30006" ...
## $ CVE_ENT : chr "30" "30" "30" "30" ...
## $ CVE_MUN : chr "001" "002" "004" "006" ...
## $ NOM_MUN : chr "Acajete" "Acatlán" "Actopan" "Acultzingo" ...
## $ geometry:sfc_MULTIPOINT of length 212; first list element: List of 1
##   ..$ :List of 1
##     ...$ : num [1:877, 1:2] -97 -97 -97 -97 -97 ...
##     ..- attr(*, "class")= chr [1:3] "XY" "MULTIPOINT" "sfg"
##     - attr(*, "sf_column")= chr "geometry"
##     - attr(*, "agr")= Factor w/ 3 levels "constant","aggregate",...: NA NA NA NA
##     ..- attr(*, "names")= chr [1:4] "CVEGEO" "CVE_ENT" "CVE_MUN" "NOM_MUN"

names(Mapa)

## [1] "CVEGEO"    "CVE_ENT"    "CVE_MUN"    "NOM_MUN"    "geometry"

names(mydata)

##  [1] "X"                      "ENTIDAD"
##  [3] "NOM_ENT"                "MUN"
##  [5] "NOM_MUN"                "LOC"
##  [7] "NOM_LOC"                "VPH_RADIO"
##  [9] "VPH_TV"                 "VPH_PC"
## [11] "VPH_TELEF"              "VPH_CEL"
## [13] "VPH_INTER"              "TOTHOG"
## [15] "VPH_SINTIC"             "VPH_SINCINT"
## [17] "VIVTOT"                 "Porcentaje_Internet"
## [19] "Porcentaje_Celular"      "Porcentaje_TV"
## [21] "Porcentaje_PC"          "Porcentaje_SinInternet_PC"
## [23] "Porcentaje_SinTic"       "Categorias"

unique(mydata$NOM_MUN)

##  [1] "Acajete"
##  [2] "Acatlán"
##  [3] "Acayucan"
##  [4] "Actopan"
##  [5] "Acula"
##  [6] "Acultzingo"
##  [7] "Camarón de Tejeda"
##  [8] "Alpatláhuac"
```

```
## [9] "Alto Lucero de Gutiérrez Barrios"
## [10] "Altotonga"
## [11] "Alvarado"
## [12] "Amatitlán"
## [13] "Naranjos Amatlán"
## [14] "Amatlán de los Reyes"
## [15] "Angel R. Cabada"
## [16] "La Antigua"
## [17] "Apazapan"
## [18] "Aquila"
## [19] "Astacinga"
## [20] "Atlahuilco"
## [21] "Atoyac"
## [22] "Atzacan"
## [23] "Atzalan"
## [24] "Tlaltetela"
## [25] "Ayahualulco"
## [26] "Banderilla"
## [27] "Benito Juárez"
## [28] "Boca del Río"
## [29] "Calcahualco"
## [30] "Camerino Z. Mendoza"
## [31] "Carrillo Puerto"
## [32] "Catemaco"
## [33] "Cazones de Herrera"
## [34] "Cerro Azul"
## [35] "Citlaltépetl"
## [36] "Coacoatzintla"
## [37] "Coahuitlán"
## [38] "Coatepec"
## [39] "Coatzacoalcos"
## [40] "Coatzintla"
## [41] "Coetzala"
## [42] "Colipa"
## [43] "Comapa"
## [44] "Córdoba"
## [45] "Cosamaloapan de Carpio"
## [46] "Cosautlán de Carvajal"
## [47] "Coscomatepec"
## [48] "Cosoleacaque"
## [49] "Cotaxtla"
## [50] "Coxquihui"
## [51] "Coyutla"
## [52] "Cuichapa"
## [53] "Cuitláhuac"
## [54] "Chacaltianguis"
## [55] "Chalma"
## [56] "Chiconamel"
## [57] "Chiconquiaco"
## [58] "Chicontepec"
## [59] "Chinameca"
## [60] "Chinampa de Gorostiza"
## [61] "Las Choapas"
## [62] "Chocamán"
```

```
## [63] "Chontla"
## [64] "Chumatlán"
## [65] "Emiliano Zapata"
## [66] "Espinal"
## [67] "Filomeno Mata"
## [68] "Fortín"
## [69] "Gutiérrez Zamora"
## [70] "Hidalgotitlán"
## [71] "Huatusco"
## [72] "Huayacocotla"
## [73] "Hueyapan de Ocampo"
## [74] "Huiloapan de Cuauhtémoc"
## [75] "Ignacio de la Llave"
## [76] "Ilamatlán"
## [77] "Isla"
## [78] "Ixcatepec"
## [79] "Ixhuacán de los Reyes"
## [80] "Ixhuatlán del Café"
## [81] "Ixhuatlancillo"
## [82] "Ixhuatlán del Sureste"
## [83] "Ixhuatlán de Madero"
## [84] "Ixmatlahuacan"
## [85] "Ixtaczoquitlán"
## [86] "Jalacingo"
## [87] "Xalapa"
## [88] "Jalcomulco"
## [89] "Jáltipan"
## [90] "Jamapa"
## [91] "Jesús Carranza"
## [92] "Xico"
## [93] "Jilotepec"
## [94] "Juan Rodríguez Clara"
## [95] "Juchique de Ferrer"
## [96] "Landero y Coss"
## [97] "Lerdo de Tejada"
## [98] "Magdalena"
## [99] "Maltrata"
## [100] "Manlio Fabio Altamirano"
## [101] "Mariano Escobedo"
## [102] "Martínez de la Torre"
## [103] "Mecatlán"
## [104] "Mecayapan"
## [105] "Medellín de Bravo"
## [106] "Miahuatlán"
## [107] "Las Minas"
## [108] "Minatitlán"
## [109] "Misantla"
## [110] "Mixtla de Altamirano"
## [111] "Moloacán"
## [112] "Naolinco"
## [113] "Naranjal"
## [114] "Nautla"
## [115] "Nogales"
## [116] "Oluta"
```

```
## [117] "Omealca"
## [118] "Orizaba"
## [119] "Otatitlán"
## [120] "Oteapan"
## [121] "Ozuluama de Mascareñas"
## [122] "Pajapan"
## [123] "Pánuco"
## [124] "Papantla"
## [125] "Paso del Macho"
## [126] "Paso de Ovejas"
## [127] "La Perla"
## [128] "Perote"
## [129] "Platón Sánchez"
## [130] "Playa Vicente"
## [131] "Poza Rica de Hidalgo"
## [132] "Las Vigas de Ramírez"
## [133] "Pueblo Viejo"
## [134] "Puente Nacional"
## [135] "Rafael Delgado"
## [136] "Rafael Lucio"
## [137] "Los Reyes"
## [138] "Río Blanco"
## [139] "Saltabarranca"
## [140] "San Andrés Tenejapan"
## [141] "San Andrés Tuxtla"
## [142] "San Juan Evangelista"
## [143] "Santiago Tuxtla"
## [144] "Sayula de Alemán"
## [145] "Soconusco"
## [146] "Sochiapa"
## [147] "Soledad Atzompa"
## [148] "Soledad de Doblado"
## [149] "Soteapan"
## [150] "Tamalín"
## [151] "Tamiahua"
## [152] "Tampico Alto"
## [153] "Tancoco"
## [154] "Tantima"
## [155] "Tantoyuca"
## [156] "Tatatila"
## [157] "Castillo de Teayo"
## [158] "Tecolutla"
## [159] "Tehuipango"
## [160] "Álamo Temapache"
## [161] "Tempoal"
## [162] "Tenampa"
## [163] "Tenochtitlán"
## [164] "Teocelo"
## [165] "Tepatlaxco"
## [166] "Tepetlán"
## [167] "Tepetzintla"
## [168] "Tequila"
## [169] "José Azueta"
## [170] "Texcatepec"
```

```

## [171] "Texhuacán"
## [172] "Texistepec"
## [173] "Tezonapa"
## [174] "Tierra Blanca"
## [175] "Tihuatlán"
## [176] "Tlacojalpan"
## [177] "Tlacolulan"
## [178] "Tlacotalpan"
## [179] "Tlacotepec de Mejía"
## [180] "Tlachichilco"
## [181] "Tlalixcoyan"
## [182] "Tlalnelhuayocan"
## [183] "Tlapacoyan"
## [184] "Tlaquilpa"
## [185] "Tlilapan"
## [186] "Tomatlán"
## [187] "Tonayán"
## [188] "Totutla"
## [189] "Tuxpan"
## [190] "Tuxtilla"
## [191] "Ursulo Galván"
## [192] "Vega de Alatorre"
## [193] "Veracruz"
## [194] "Villa Aldama"
## [195] "Xoxocotla"
## [196] "Yanga"
## [197] "Yecuatla"
## [198] "Zacualpan"
## [199] "Zaragoza"
## [200] "Zentla"
## [201] "Zongolica"
## [202] "Zontecomatlán de López y Fuentes"
## [203] "Zozocolco de Hidalgo"
## [204] "Agua Dulce"
## [205] "El Higo"
## [206] "Nanchital de Lázaro Cárdenas del Río"
## [207] "Tres Valles"
## [208] "Carlos A. Carrillo"
## [209] "Tatahuicapan de Juárez"
## [210] "Uxpanapa"
## [211] "San Rafael"
## [212] "Santiago Sochiapan"

```

```
unique(Mapa$NOM_MUN)
```

```

## [1] "Acajete"
## [2] "Acatlán"
## [3] "Actopan"
## [4] "Acultzingo"
## [5] "Camarón de Tejeda"
## [6] "Alpatláhuac"
## [7] "Altotonga"
## [8] "Alvarado"
## [9] "Amatitlán"

```

```
## [10] "Amatlán de los Reyes"
## [11] "Angel R. Cabada"
## [12] "Apazapan"
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## [23] "Catemaco"
## [24] "Cerro Azul"
## [25] "Citlaltépetl"
## [26] "Coatzacoalcos"
## [27] "Coatzintla"
## [28] "Coetzala"
## [29] "Comapa"
## [30] "Córdoba"
## [31] "Cosautlán de Carvajal"
## [32] "Cotaxtla"
## [33] "Coxquihui"
## [34] "Cuichapa"
## [35] "Cuitláhuac"
## [36] "Chacaltianguis"
## [37] "Chiconamel"
## [38] "Chiconquiaco"
## [39] "Chicontepec"
## [40] "Las Choapas"
## [41] "Chocamán"
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## [44] "Filomeno Mata"
## [45] "Fortín"
## [46] "Gutiérrez Zamora"
## [47] "Huatusco"
## [48] "Huayacocotla"
## [49] "Hueyapan de Ocampo"
## [50] "Isla"
## [51] "Ixcatepec"
## [52] "Ixhuacán de los Reyes"
## [53] "Ixhuatlancillo"
## [54] "Ixhuatlán del Sureste"
## [55] "Ixhuatlán de Madero"
## [56] "Ixmatlahuacan"
## [57] "Jalacingo"
## [58] "Xalapa"
## [59] "Jáltipan"
## [60] "Jesús Carranza"
## [61] "Jilotepéc"
## [62] "Juchique de Ferrer"
## [63] "Landero y Coss"
```

```
## [64] "Lerdo de Tejada"
## [65] "Mariano Escobedo"
## [66] "Martínez de la Torre"
## [67] "Medellín"
## [68] "Miahuatlán"
## [69] "Las Minas"
## [70] "Misantla"
## [71] "Moloacán"
## [72] "Naranjal"
## [73] "Nautla"
## [74] "Nogales"
## [75] "Omealca"
## [76] "Orizaba"
## [77] "Ozuluama de Mascareñas"
## [78] "Pajapan"
## [79] "Papantla"
## [80] "Paso de Ovejas"
## [81] "Perote"
## [82] "Playa Vicente"
## [83] "Las Vigas de Ramírez"
## [84] "Pueblo Viejo"
## [85] "Puente Nacional"
## [86] "Rafael Delgado"
## [87] "Río Blanco"
## [88] "Saltabarranca"
## [89] "San Andrés Tenejapan"
## [90] "San Juan Evangelista"
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## [96] "Tamiahua"
## [97] "Tampico Alto"
## [98] "Tancoco"
## [99] "Tantoyuca"
## [100] "Tecolutla"
## [101] "Tehuipango"
## [102] "Tempoal"
## [103] "Tenochtitlán"
## [104] "Teocelo"
## [105] "Tepatlaxco"
## [106] "Tepetzintla"
## [107] "Tequila"
## [108] "José Azueta"
## [109] "Tezonapa"
## [110] "Tihuatlán"
## [111] "Tlacojalpan"
## [112] "Tlacolulan"
## [113] "Tlacotalpan"
## [114] "Tlalixcoyan"
## [115] "Tlalnelhuayocan"
## [116] "Tlilapan"
## [117] "Tomatlán"
```

```

## [118] "Tonayán"
## [119] "Tuxpan"
## [120] "Tuxtilla"
## [121] "Ursulo Galván"
## [122] "Veracruz"
## [123] "Xoxocotla"
## [124] "Yanga"
## [125] "Zacualpan"
## [126] "Zaragoza"
## [127] "Zentla"
## [128] "Zontecomatlán de López y Fuentes"
## [129] "Zozocolco de Hidalgo"
## [130] "Agua Dulce"
## [131] "Tres Valles"
## [132] "Uxpanapa"
## [133] "San Rafael"
## [134] "Santiago Sochiapan"
## [135] "Acayucan"
## [136] "Acula"
## [137] "Alto Lucero de Gutiérrez Barrios"
## [138] "Naranjos Amatlán"
## [139] "La Antigua"
## [140] "Atlahuilco"
## [141] "Atzalan"
## [142] "Tlaltetela"
## [143] "Boca del Río"
## [144] "Cazones de Herrera"
## [145] "Mecatlán"
## [146] "Mecayapan"
## [147] "Minatitlán"
## [148] "Mixtla de Altamirano"
## [149] "Naolinco"
## [150] "Oluta"
## [151] "Otatitlán"
## [152] "Oteapan"
## [153] "Pánuco"
## [154] "Paso del Macho"
## [155] "La Perla"
## [156] "Platón Sánchez"
## [157] "Poza Rica de Hidalgo"
## [158] "Rafael Lucio"
## [159] "Los Reyes"
## [160] "San Andrés Tuxtla"
## [161] "Sochiapa"
## [162] "Soledad Atzompa"
## [163] "Tamalín"
## [164] "Tantima"
## [165] "Tatatila"
## [166] "Castillo de Teayo"
## [167] "Álamo Temapache"
## [168] "Tenampa"
## [169] "Tepetlán"
## [170] "Texcatepec"
## [171] "Texhuacán"

```

```

## [172] "Texistepec"
## [173] "Tierra Blanca"
## [174] "Tlacotepec de Mejía"
## [175] "Tlachichilco"
## [176] "Tlapacoyan"
## [177] "Tlaquilpa"
## [178] "Totutla"
## [179] "Vega de Alatorre"
## [180] "Villa Aldama"
## [181] "Yecuatla"
## [182] "Zongolica"
## [183] "El Higo"
## [184] "Nanchital de Lázaro Cárdenas del Río"
## [185] "Tatahuicapan de Juárez"
## [186] "Coacatzintla"
## [187] "Coahuitlán"
## [188] "Coatepec"
## [189] "Colipa"
## [190] "Coscomatepec"
## [191] "Cosoleacaque"
## [192] "Coyutla"
## [193] "Chalma"
## [194] "Chinameca"
## [195] "Chinampa de Gorostiza"
## [196] "Chontla"
## [197] "Espinal"
## [198] "Hidalgotlán"
## [199] "Huiloapan de Cuauhtémoc"
## [200] "Ignacio de la Llave"
## [201] "Ilamatlán"
## [202] "Ixhuatlán del Café"
## [203] "Ixtaczoquitlán"
## [204] "Jalcomulco"
## [205] "Jamapa"
## [206] "Xico"
## [207] "Juan Rodríguez Clara"
## [208] "Magdalena"
## [209] "Maltrata"
## [210] "Manlio Fabio Altamirano"
## [211] "Carlos A. Carrillo"
## [212] "Cosamaloapan de Carpio"

```

Se une por la variable comun el mapa y la base de datos.

```
mapa_y_datos <- inner_join(Mapa,mydata)
```

```
## Joining, by = "NOM_MUN"
```

*# Hay una diferencia entre el nombre del municipio 105 Medellín (Mapa) y Medellín de Bravo (mydata)*

Se cambia el nombre del municipio 105, Medellín de Bravo (mydata) a Medellín.

```
mydata[105,5] <- "Medellín"
```

Se vuelve a unir la base del mapa y la base de datos.

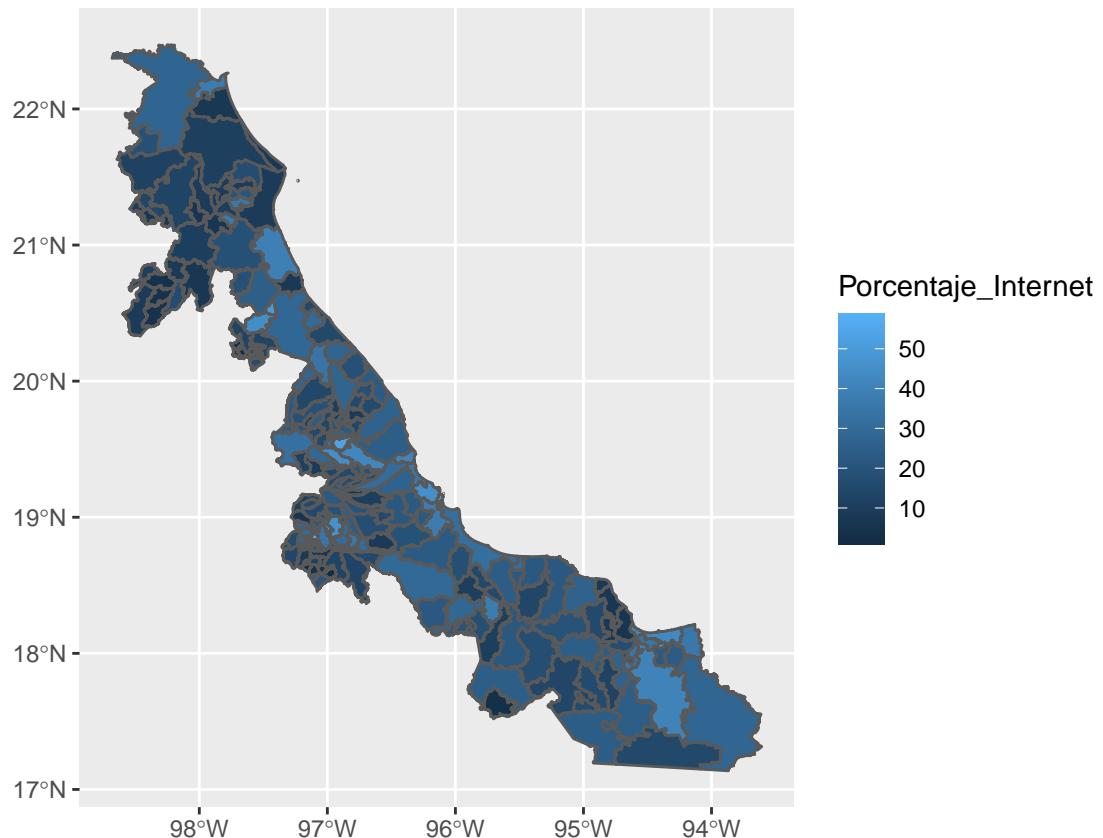
```
mapa_y_datos <- inner_join(Mapa,mydata)
```

```
## Joining, by = "NOM_MUN"
```

*#Ahora se muestran las 212 variables.*

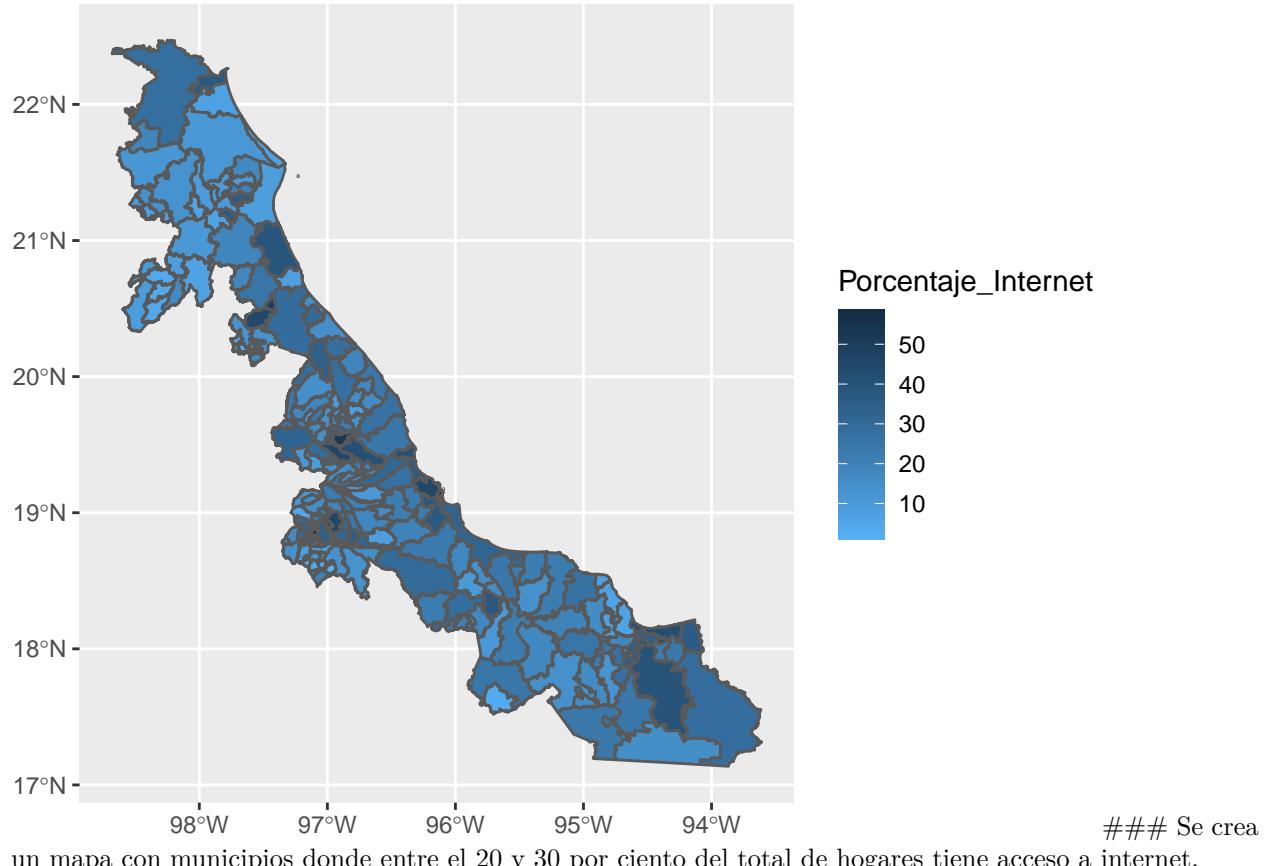
Se crea el mapa

```
ggplot(mapa_y_datos) +  
  geom_sf(aes(fill=Porcentaje_Internet))
```



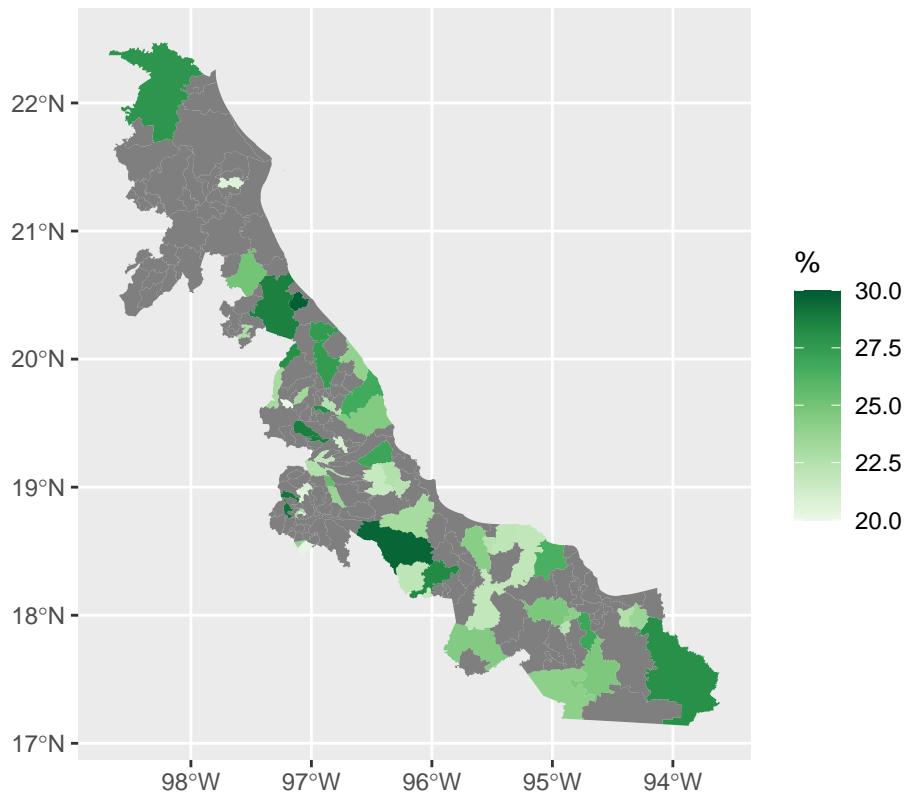
Se cambian los colores por intensidad

```
ggplot(mapa_y_datos) +  
  geom_sf(aes(fill=Porcentaje_Internet)) +  
  scale_fill_gradient(low = "#56B1F7", high = "#132B43") +  
  theme_update(plot.title = element_text(hjust = 0.5))
```



```
ggplot() + geom_sf(data = mapa_y_datos,aes(fill=Porcentaje_Internet), colour = "#1C00ff00", size = 0.07)  
  scale_fill_distiller("% ", palette = "Greens", direction = 1, limits=c(20,30)) +  
  labs(title = "Municipios donde 20 y 30 por ciento del total de hogares tiene acceso a internet en Ecuador")
```

e 20 y 30 por ciento del total de hogares tiene acceso a internet en Veracruz, CEM

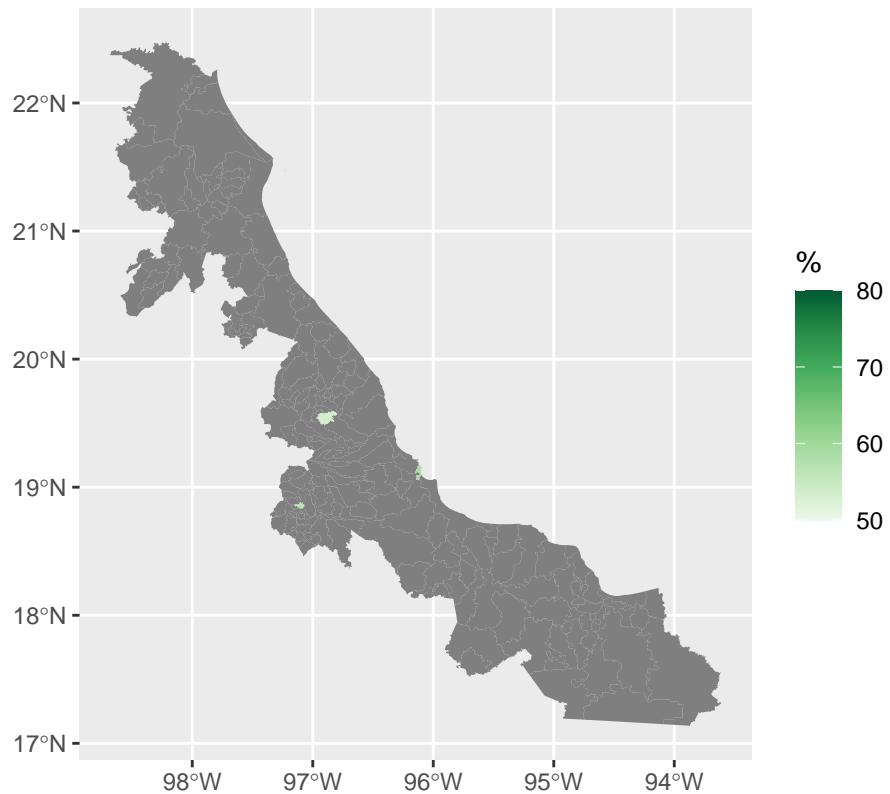


```
#+
#     ggsave("conectividad_mapa.png", width = 15, height = 8,dpi = 300)
```

Se crea un mapa con municipios donde mas del 50 por ciento del total de hogares tiene acceso a internet.

```
ggplot() + geom_sf(data = mapa_y_datos,aes(fill=Porcentaje_Internet), colour = "#1C00ff00", size = 0.01)
  scale_fill_distiller("% ", palette = "Greens", direction = 1, limits=c(50,80)) +
  labs(title = "Municipios donde mas del 50 por ciento del total de hogares tiene acceso a internet")
```

mas del 50 por ciento del total de hogares tiene acceso a internet en Veracruz, C



## R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

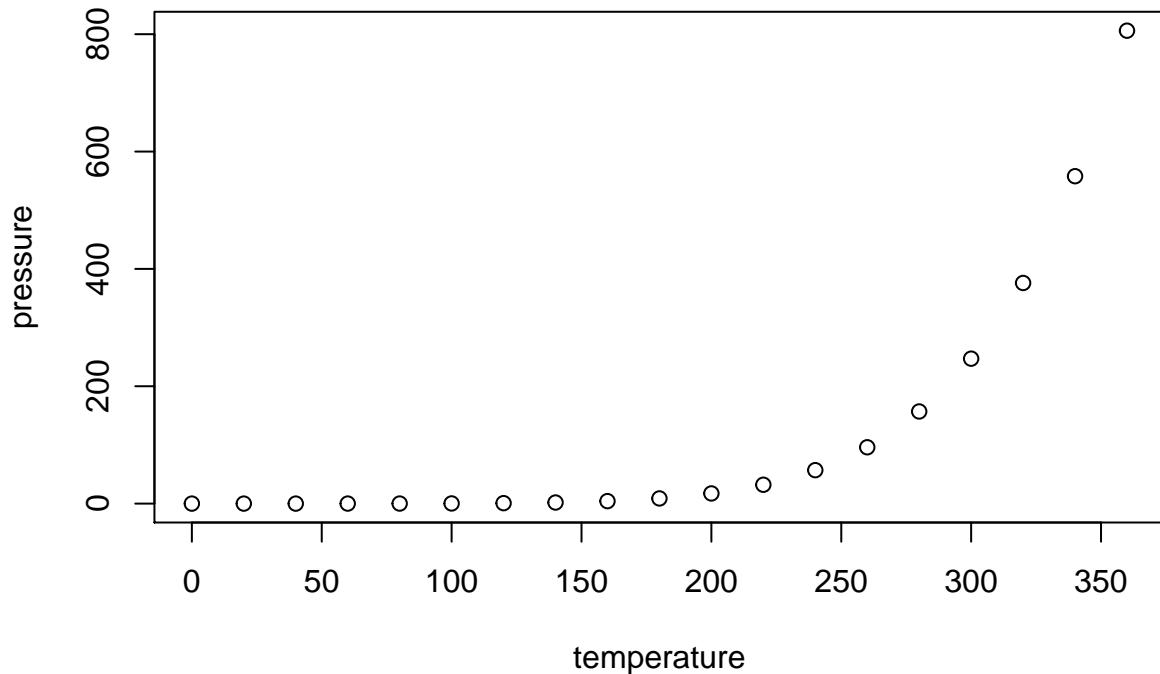
When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed          dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

## Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.